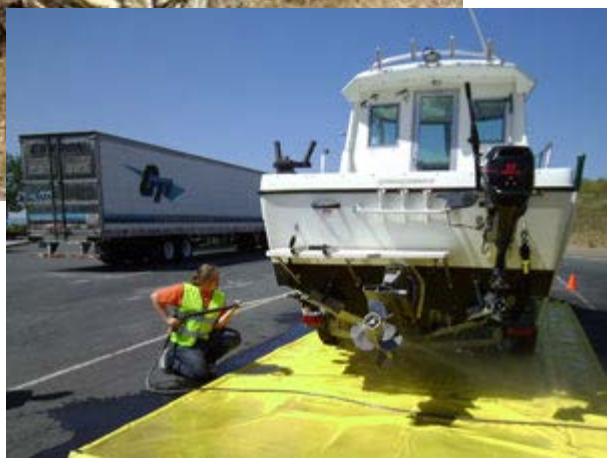
Oregon Dreissenid Mussel Rapid Response Plan



Portland State University

OREGON DREISSENID MUSSEL RAPID RESPONSE PLAN

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INTRODUCTION

In 2007, both zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*) were found to have established populations west of the Rocky Mountains. The risk posed to the Pacific Northwest by the proximity of these new infestations is significant. This plan was developed in response to the increasing likelihood of the successful transport and introduction of these species into the State of Oregon and Pacific Northwest. Although prevention remains the most cost-effective means of addressing potential infestations of aquatic invasive species, if prevention efforts fail, the State of Oregon must be prepared to respond rapidly and effectively to minimize environmental and economic impacts and reduce the risk of spread.

The purpose of this plan is to protect Oregon's waters, aquatic resources, and facilities from the deleterious effects of Dreissenid mussel establishment. This plan serves as a guidance document for natural resource managers to plan for and provide a rapid response effort to a Dreissenid mussel infestation in Oregon waters. This plan is intended to complement the *Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissena Species* drafted by the Columbia River Basin 100th Meridian Team as well as provide stand-alone guidance should mussels be found in Oregon but outside of the Columbia River Basin. This plan applies to all Dreissenid mussels, although the current focus is on zebra and quagga mussels. Many of the strategies listed herein can be applied to rapid response efforts for other aquatic invasive species (AIS) of concern. [1]

[1] Although devised specifically to respond to Dreissenid mussels, this plan should be useful for responding to any invasive freshwater animal. Freshwater plants fall under the purview of the Oregon Department of Agriculture and are governed by different rules and regulations regarding response. Marine plants and animals will require unique considerations not included in this plan.

OBJECTIVES

This plan is designed to align with a comprehensive regional effort to protect aquatic resources in the Pacific Northwest by preventing the introduction of AIS, including Dreissenid mussels, by employing detection strategies to discover incipient infestations early enough to facilitate successful eradication or control efforts.

Although eradication should always be the foremost goal of any rapid response plan, eradication may not always be feasible, especially in aquatic systems where removal and/or treatment can be challenging, if not impossible. In these cases, responders must determine which goals are attainable and cost-effective. The final response may have one of several possible goals, such as containing the invasion to a given area, suppressing population densities to reduce the rate of spread, prohibiting high-risk transport vectors, or in the worst case scenario, developing adaptive strategies to co-exist with the invader.

There is a limited window of opportunity to respond once an introduction is suspected, or a population identified, thus it is imperative that the State of Oregon have a plan outlining tasks, actions and responsibilities to increase response effectiveness. Such a plan is considered a "working" document, updated and/or revised to reflect new information and emerging technologies. The foundation for the response plan is the Incident Command System (ICS), a standardized protocol for cooperation and coordination among state and federal agencies as well as industry and others. It addresses:

- Responsibilities and authorities for rapid response beginning with the discovery of an introduction and continuing through containment and response.
- Long-term monitoring and control of infestations should eradication be deemed unfeasible.

Objectives include responding to and minimizing impacts of infestations of Dreissenid mussels; providing timely and accurate information to managers, stakeholders and the general public; and providing for the safety of the public as well as all personnel involved at any stage of a response.

The response plan is divided into the following functional sections: pre-planning, initial response (incident action plan), and extended response.

BACKGROUND

Developing a state response to an AIS introduction, such as Dreissenid mussels, requires an understanding of the threat, the existing AIS response framework, and the management and response capacity of the state.

THE THREAT[2]

Zebra and quagga mussels are closely related filter-feeding freshwater mussels in the genus *Dreissena*. These bivalves produce free-swimming planktonic larvae that eventually settle out of the water column and attach to hard surfaces using byssal threads. First discovered in Lake Erie in 1988, Dreissenid mussels have spread rapidly throughout North America and are found in all of the Great Lakes and many drainages in the Midwest, North Atlantic and Southwestern United States.

Dreissenid mussels are introduced into new water bodies through both natural and human-mediated transport. Natural dispersal occurs through larval drift, or by the transport of adults attached to floating objects. Human-mediated dispersal occurs through the movement of larvae in the ballast water tanks of vessels, via internal water stored in engine compartments of trailered boats, or via the movement of adults attached to the hulls of conveyances. Also, mussels may be introduced to new water bodies in contaminated bait livewells and fishery stocking programs.[3, 4]

Adult mussels may survive out of water up to five days in dry environments and for several weeks in wet areas and compartments of boats, motors, trailers, and other conveyances, making overland transport by recreational boaters a high risk

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[2] Excerpted and revised from the OISC Zebra Quagga Mussel Risk Assessment http://www.oregon.gov/OISC/calendar_may10.shtml

[3] Johnson L.E, A. Ricciardi, J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. Ecological Applications. 11(6): 1789-1799.

[4] Karatayev, A. Y., D.K. Padilla, D. Minchin, D. Boltovskoy, L.E. Burlakova. 2007. Changes in global economies and trade: the potential spread of exotic freshwater bivalves. Biological Invasions. 9:161-180.

pathway for the introduction of zebra and quagga mussels into Oregon waters.[5, 6] The chance of establishment of aquatic invasive species by overland transport increases by a factor of the square of the distance from existing populations.[7]

Many factors contribute to the risk of Dreissenid introduction and establishment, including environmental parameters (e.g., dissolved calcium, pH), and the extent and types of public usage (e.g., total day use, presence of boat ramps and marinas, proximity to transportation corridors, motorized boating, fishing). Boat transport from contaminated waters is the most likely pathway of introduction to new water bodies in Oregon.[8, 9, 10, 11] Once introduced, pH and calcium concentrations are likely to determine the success of the introduction. These factors are considered critical environmental parameters for Dreissenid mussel survival and growth.[12, 13]

Once established, Dreissenid mussels can dramatically alter the ecology of a water body and associated fish and wildlife populations. As filter feeders, they remove phytoplankton and other particles from the water column and thus shift production

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[5] Johnson L.E, A. Ricciardi, J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. Ecological Applications. 11(6): 1789-1799.

[6] Timar, L., and D.J. Phaneuf, 2009. Modeling the human-induced spread of an aquatic invasive: The case of the zebra mussel. Ecological Economics. 68(12):3060–3071.

[7] Leung, B., J.M. Bossenbroek, and D.M. Lodge. 2004. Boats, Pathways, and Aquatic Biological Invasions: Estimating Dispersal Potential with Gravity Models. Biological Invasions. 8(2): 241–254.

[8] Lucy, A., J. Buchan, and D.K. Padilla, 1999. Estimating the Probability of Long Distance Overland Dispersal of Invading Aquatic Species. Ecological Applications. 9(1):254-265.

[9] Frischer, M.E., B.R. McGrath, A.S. Hansen, P.A. Vescio, J.A. Wyllie, J. Wimbush and S.A. Nierzwicki-Bauer, 2005. Introduction Pathways, Differential Survival of Adult and Larval Zebra Mussels (*Dreissena polymorpha*), and Possible Management Strategies, in an Adirondack Lake, Lake George, NY. Lake and Reservoir Management. 21(4):391-402.

[10] Johnson L.E, A. Ricciardi, J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. Ecological Applications. 11(6): 1789-1799.

[11] Karatayev, A. Y., D.K. Padilla, D. Minchin, D. Boltovskoy, L.E. Burlakova. 2007. Changes in global economies and trade: the potential spread of exotic freshwater bivalves. Biological Invasions. 9:161-180.

[12] Hincks, S.S. and G.L. Mackie. 1997. Effects of pH, calcium, alkalinity, hardness, and chlorophyll on the survival, growth, and reproductive success of zebra mussel (*Dreissena polymorpha*) in Ontario lakes. Can. J. Fish. Aquat. Sci. 54:2049-2057.

[13] McMahon, R.F., 1996. The Physiological Ecology of the Zebra Mussel, *Dreissena polymorpha*, in North America and Europe. Amer. Zool. 36:339-363.

from the pelagic to the benthic portion of the water column.[14] Native mussels are significantly threatened by the presence of invasive mussels. By attaching themselves to the surfaces of other bivalves, Dreissenid mussels can starve freshwater mussels and drive indigenous populations to local extinction. Dreissenid mussels can also affect dissolved oxygen through respiration, and dissolved calcium carbonate concentrations through shell building.[15]

Dreissenid mussels can cause substantial economic damage by infesting municipal, industrial, and agricultural water systems and attaching themselves to the hard substrates of pipes, dams, and diversion pathways. This restricts the flow of water through the systems impacting component service life, system performance, and maintenance activities. The annual cost to power plants and municipal drinking water systems in North America has been estimated between $267 million and $1 billion dollars.[16, 17]

Establishment of Dreissenid mussels in the Columbia River Basin would be expensive, requiring extensive maintenance to the nuclear power plant and the hydroelectric dams, fish ladders and irrigation pumping. In an economic impact report prepared for Bonneville Power Administration, the one-time cost to install mussel treatment systems was estimated at more than $23 million dollars; annual costs were estimated at $1.5 million.[18] Because of the high value of fishery and aquatic resources in the CRB, and because no controls exist for mussels in open

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[14] Sousa, R., J.L. Gutiérrez, and D.C. Aldridge, 2009. Non-indigenous invasive bivalves as ecosystem engineers. Biological Invasions. 11(10):2367–2385.

[15] Strayer, D.L., 2009. Twenty years of zebra mussels: lessons from the mollusk that made headlines. Front Ecol. Environ. 7(3): 135–141.

[16] Connelly N., C.R. O'Neill, B.A. Knuth, and T.L. Brown. 2007. Economic Impacts of Zebra Mussels on Drinking Water Treatment and Electric Power Generation Facilities. Environmental Management. 40(1): 105–112.

[17] Pimentel, D., 2005. Aquatic Nuisance Species in the New York State Canal and Hudson River Systems and the Great Lakes Basin: An Economic and Environmental Assessment. Environmental Management 35(5):692–701.

[18] Phillips, S., T. Darland, and M. Sytsma. 2005. Potential Economic Impacts of Zebra Mussels on Hydropower Facilities in the Columbia River Basin. Prepared for Bonneville Power Administration. 22 pg.

natural systems, the ecological costs of a Columbia basin invasion could be much larger than other costs.[19]

The Columbia River Basin Interagency Invasive Species Response Plan

In 2008, the 100th Meridian Initiative's Columbia River Basin Team (CRB Team) drafted a *Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species*.[20] The purpose of the plan is to coordinate a rapid, effective, and efficient interagency response to delineate, contain, and when feasible, eradicate zebra, quagga, and other Dreissenid mussel populations if they are introduced into CRB waters.

The CRB Plan includes 10 response objectives to delineate and control zebra, quagga, and other Dreissenid mussel populations if detected in the CRB.

Rapid Response Objectives:

1. Make initial notifications
2. Active appropriate organizational elements of the CRB Interagency Response Plan
3. Verify reported introduction
4. Define extent of colonization
5. Establish external communications system
6. Obtain and organize resources
7. Prevent further spread via quarantine and pathway management
8. Initiate available/relevant control actions
9. Institute long-term monitoring
10. Evaluate the response and the plan

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[19] Independent Economic Analysis Board. 2013. Invasive Mussels Update: Economic Risk of Zebra and Quagga Mussels in the Columbia River Basin. Task Number 201. Document IEAB 2013-2. 42pp.

[20] http://100thmeridian.org/ActionTeams/Columbia/CRB%20Dreissenid%20Rapid%20Response%20Plan%20OCTOBER%201%202008.pdf

Of the 10 objectives presented, six of them rely on action or planning and response by the state invasive species coordinator or the lead agency with response authority as determined by the location of the infestation.

OREGON AIS MANAGEMENT AND RESPONSE CAPACITY

AUTHORITY, LEADERSHIP AND ORGANIZATION

Agencies and entities authorized to respond to a discovery of Dreissenid mussels will largely depend on the location of the initial discovery. The entities with primary responsibility for Dreissenid mussel management and response in Oregon are the Oregon Department of Fish and Wildlife (ODFW) – designated lead agency – Oregon State Marine Board (OSMB) and Portland State University (PSU); each has an AIS or invasive species coordinator tasked with varied responsibilities relating to AIS, and all three entities are ex-officio members of the Oregon Invasive Species Council (OISC). For the purposes of this response plan, these three entities comprise the initial AIS coordination team. Numerous other agencies have AIS management and/or coordination responsibilities (Table 1). Because of the importance of the role of the Office of Emergency Management in terms of declaring an emergency in the State of Oregon, information is included about them along with the three lead entities.

Table 1. Agencies and entities with AIS management and coordination responsibilities or interests in Oregon and/or regionally (entities listed in bold have primary responsibility for Dreissenid mussel management and response in Oregon).

- Bureau of Land Management (BLM)
- Bureau of Reclamation (BOR)
- City and County Emergency Management Coordinators
- Bonneville Power Administration (BPA)
- City and County Governments
- Columbia River Basin 100th Meridian Team
- Columbia River Intertribal Fish Commission (CRITFC)
- Governor's Natural Resource Cabinet
- Individual Tribes in Oregon

- National Park Service (NPS)
- NOAA Fisheries
- Northwest Power and Conservation Council (NWPCC)
- Oregon Department of Agriculture (ODA)
- Oregon Department of Environmental Quality (DEQ)
- **Oregon Department of Fish and Wildlife (ODFW)**
- Oregon Department of Forestry(ODF)
- Oregon Invasive Species Council (OISC)
- Oregon Office of Emergency Management (OEM)
- Oregon Parks and Recreation Department (OPRD)
- Oregon Sea Grant (OSG)
- **Oregon State Marine Board (OSMB)**
- Oregon State Police (OSP)
- Pacific States Marine Fisheries Commission (PSMFC)
- **Portland State University (PSU)**
- Ports
- US Army Corps of Engineers (USACE)
- US Department of Agriculture (USDA)
- US Environmental Protection Agency (EPA)
- US Fish and Wildlife Service (USFWS)
- US Geological Survey (USGS)
- USDA Forest Service (USFS)
- Western Regional Panel on Aquatic Nuisance Species

OREGON STATE MARINE BOARD (OSMB)

The OSMB is the state agency responsible for managing recreational boating, and has the lead role to implement the Aquatic Invasive Species Permit Program (AISPP). This permit program is an important funding mechanism for boat inspection teams, public education and outreach efforts and other related AIS awareness and prevention activities. The AIS coordinator for the OSMB is engaged in public education and outreach activities about AIS topics. The coordinator develops and distributes printed material (brochures, posters, signs, etc.) to statewide partners, including recreational water sport businesses. Coordination and law enforcement training is an OSMB and ODFW shared activity.

OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW)

Charged with managing wildlife by preventing the depletion of indigenous species while providing optimum recreational benefits, ODFW is the state agency tasked

with managing invasive species. The ODFW AIS coordinator participates in education and outreach activities and is also involved with statewide projects to manage species of concern and implement strategies that address eradication, control or containment of AIS. ODFW is the primary agent responsible for implementing state boat inspection stations (outlined in the AISPP). Stations are staffed by trained ODFW employees with the necessary skills and equipment to decontaminate watercraft and engage with the public in education and outreach efforts. Inspectors also sample water bodies for the presence of Dreissenids and other AIS.

PORTLAND STATE UNIVERSITY (PSU)

The Center for Lakes and Reservoirs (CLR) at PSU assists state and federal agencies in researching and mitigating nonindigenous, invasive aquatic species in Oregon and works with communities to develop effective management strategies for lakes and reservoirs. The CLR created and coordinates the Oregon Aquatic Nuisance Species Management Plan, which was approved by the Governor of Oregon and the Aquatic Nuisance Species (ANS) Task Force in 2001.

OREGON OFFICE OF EMERGENCY MANAGEMENT (OEM)

The OEM executes the Governor's responsibilities to maintain an emergency services system by planning, preparing and providing for the prevention, mitigation and management of emergencies or disasters that present a threat to the lives and property of citizens and visitors to the State of Oregon. The agency is responsible for coordinating and facilitating emergency planning, preparedness, response and recovery activities with the state and local emergency services agencies and organizations.

Oregon Revised Statute 401.165[21] authorizes the Governor to declare a state of emergency by proclamation at the request of a county. All such requests by a county governing body are sent to the OEM. Cities must submit requests through the governing body of the county in which the majority of the city's property is located. Requests from counties include a certification signed by the county governing body that all local resources have been expended; and a preliminary assessment (including property damage or loss, injuries and deaths). The proclamation of a

[21] http://www.leg.state.or.us/ors/401.html

state of emergency specifies the geographical area covered by the proclamation. The governing body of each county has a procedure for receiving, processing and transmitting to the Office of Emergency Management[22] a request to declare a state of emergency in a timely manner. If the Governor issues an emergency or disaster declaration, OEM will be contacted via the Oregon Emergency Response System (OERS) for possible allocation of State resources to support the response.

Funding and Resources

The OISC administers a state invasive species emergency fund, The Oregon Invasive Species Control Account, for the purposes of eradicating or controlling new infestations or infections of invasive species in Oregon (ORS 570.810).[23] The OISC may be petitioned and asked to declare an Invasive Species Emergency and release funds for a rapid response (See Appendix I for eligibility and the process for the release of funds). The fund is currently valued at $356,210 (July 2013) and should be considered as seed funds to initiate a response. Existing funds are inadequate to implement a large-scale rapid response that would likely be needed (statement based on a recent economic evaluation of rapid response fund options for California recommended a starting dollar amount of $1–2 million).[24]

In addition, the AIS Prevention Program enacted in 2009 provides annual income for Oregon Watercraft Inspection Team (WIT) teams as well as limited additional funds held by the OSMB should they be needed to respond to a Dreissenid invasion. The CRB Plan charges that all signatories to the plan develop and maintain a list of resources in the event of a Dreissenid introduction (Appendix II).

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[22] http://www.oregon.gov/OMD/OEM/docs/plan_train/locals_list.pdf

[23] http://www.oregonlaws.org/ors/570.810

[24] Cardno ENTRIX and A. Cohen 2011. California Aquatic Invasive Species Rapid Response Fund an Economic Evaluation. Prepared for the USFWS. https://nrm.dfg.ca.gov/documents/ContextDocs.aspx?cat=AquaticInvasiveSpecies

QUARANTINE ESTABLISHMENT AND ENFORCEMENT

To prevent or slow the spread of Dreissenid mussels, it may be necessary to mobilize a quarantine or emergency closure of the affected water body immediately upon the detection and verification of an introduction. This may be difficult, if not impossible, in large open water bodies, or flowing systems, such as rivers, and water bodies that span multiple jurisdictions. Various management actions may require quarantine authority to protect other areas from infestation or to slow spread in a regional context.

Although closure may be impractical for larger water bodies, there may be isolated water bodies or unique infestation scenarios that provide for the ability to quarantine an area. The ability to close or limit ingress and/or egress to all vehicles and equipment capable of carrying Dreissenid mussels and to maintain closures or limited (controlled) access until an acceptable management plan has been developed and implemented is critically important.

At this juncture, no agency in Oregon has clear authority to require the mandatory closure of access points in response to a Dreissenid mussel discovery. Individual entities with jurisdiction and/or direct ownership of water bodies and/or boat ramps may choose to respond by closing or limiting access. It may be likely that an emergency rule by the Governor's office could temporarily grant quarantine authority. If a Dreissenid infestation is found in Oregon and the agency responsible for the management of the water body does not have the incident management capability or technical expertise to conduct quarantine and pathway management tasks, it may formally delegate that responsibility to the CRB Interagency Rapid Response Team.[25]

Granting quarantine authority to a state agency has precedent. In Oregon, quarantine authority is granted to ODA in response to animal and plant health issues (ORS 561.510, 561.540) as well as noxious weed issues (ORS 561.180, 561.350). Other wildlife departments in western states, such as California[26],

[25] http://www.100thmeridian.org/ActionTeams/Columbia/CRB_Dreissenid_Rapid_Response_Plan_September_19_2011.pdf

[26] http://law.onecle.com/california/fish/2301.html

Montana[27], and Utah[28], have recently been granted quarantine authority through legislative action to respond to Dreissenid mussels.

State agency representatives are considering proposing statutory language (Appendix III), similar to language proposed in the State of Washington, which grants quarantine authority to a state agency.

ENVIRONMENTAL REGULATORY COMPLIANCE

The success of any eradication effort aimed at Dreissenid mussels will depend on the availability of tools for rapid response. A combination of pre-planning efforts and adaptability to advances in control technology and efforts by other entities will be needed. Contingency planning exercises will allow managers to determine what tools will be appropriate to which areas, whether or not environmental compliance standards have been met (Appendix IV), and what regulatory compliance and permitting actions are required prior during and following control tactic operations.

If (in accordance with integrated pest management (IPM) principles) it is determined that pesticides will be required to meet the eradication or control objectives, then applications must comply with regulatory processes as outlined in Appendices IV and V. In particular, pesticide applications to waters of the state must meet the terms and timelines identified by both the state CWA/NPDES pesticide general permit (administered by ODEQ), as well as product label directions and restrictions identified under the Federal Insecticide Fungicide Rodenticide Act (FIFRA) as administered by the Oregon Department of Agriculture. For products not currently registered for aquatic use in Oregon (or at application rates necessary for mussel eradication), emergency exemption FIFRA labels may be attained by requests made to ODA.

If an infestation occurs in habitat that supports threatened and endangered species, NEPA and Endangered Species Act consultation will be required with appropriate state and federal agencies prior to implementing any control measures.

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[27] http://data.opi.mt.gov/bills/2011/billhtml/HB0621.htm
[28] http://www.rules.utah.gov/publicat/code/r657/r657-060.htm

PRE-PLANNING

EARLY DETECTION AND RAPID RESPONSE

Early detection is the key to successful rapid response. Early detection often provides the only chance at eradication, especially for aquatic invasive species, which are notoriously difficult to eradicate, successfully control or manage. The cost to respond to a population that was not detected during early stages of an invasion increases exponentially over time.

EARLY DETECTION EFFORTS

Early detection of Dreissenid mussels relies upon the discovery of either veligers in the water column or juveniles and adults colonizing hard substrates. Oregon has thousands of lakes—there are limited resources available for early detection. Efforts must be focused on high-risk water bodies—those with both high risk of introduction and risk of establishment should receive the highest monitoring priority.

HIGH RISK WATER BODIES[29]

Recreational boating is the primary vector for overland transport of mussels and increases the risk of inter-basin Dreissenid introduction.[30, 31, 32] The ongoing discovery of recreational trailered-watercraft with attached mussels in the CRB, and throughout the western United States, corroborates the importance of this vector. Total day use of a water body, presence of boat ramps and marinas, water body size and access, and the presence of motorized boating and fishing activities,

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[29] Wells, S., T.D. Counihan, A. Puls, M. Sytsma and B. Adair. 2010. Prioritizing Zebra and Quagga Mussel Monitoring in the Columbia River Basin Prepared for Bonneville Power Administration and the Pacific States Marine Fisheries Commission BPA Contract Number: 00003373 TI Project Number: 152.

[30] Lucy, A., J. Buchan, and D.K. Padilla, 1999. Estimating the Probability of Long Distance Overland Dispersal of Invading Aquatic Species. Ecological Applications. 9(1):254-265.

[31] Johnson L.E, A. Ricciardi, J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. Ecological Applications. 11(6): 1789-1799.

[32] Karatayev, A. Y., D.K. Padilla, D. Minchin, D. Boltovskoy, L.E. Burlakova. 2007. Changes in global economies and trade: the potential spread of exotic freshwater bivalves. Biological Invasions. 9:161-180.

including angling tournaments that attract boats from outside the Pacific Northwest, are important risk determinants.

The risk of Dreissenid establishment is also influenced by environmental parameters, such as dissolved calcium, pH, water temperature, salinity, dissolved oxygen, and substrate. Veliger survivorship increases from 3% at 12 mg Ca^{2+}/L to 20–25% at 47 mg Ca^{2+}/L.[33] North American Dreissenid juveniles show initial growth at calcium concentrations between 8.5 and 11 mg Ca^{2+}/L[34, 35] and moderate shell growth between 25 and 26 mg Ca^{2+}/L.[36] In general, Dreissenid adults inhabit waters with calcium concentrations greater than or equal to 15 mg Ca^{2+}/L, and populations become dense at concentrations greater than or equal to 21 mg Ca^{2+}/L.[37] Dissolved calcium concentrations and pH are likely the most limiting environmental parameters to Dreissenid establishment in the CRB and greater Northwest.[38, 39] Water temperature is not expected to limit growth, as Dreissenids inhabit a wide range of temperatures in North America. They are found in the Great Lakes at temperatures less than 5°C, and in the lower Mississippi where temperatures reach and exceed 30°C.[40]

Table 2 is a prioritized partial listing of water bodies for Dreissenid monitoring in Oregon (for complete table, see Appendix VI). The prioritization is based on an assessment of the relative risk of introduction and establishment of Dreissenids into individual lakes, reservoirs, and rivers.

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[33] Sprung, M. 1987. Ecological requirements of developing *Dreissena polymorpha* eggs. Archiv für Hydrobiologie Supplement 79:69–86.

[34] Hincks, S.S. and G.L. Mackie. 1997. Effects of pH, calcium, alkalinity, hardness, and chlorophyll on the survival, growth, and reproductive success of zebra mussel (*Dreissena polymorpha*) in Ontario lakes. Can. J. Fish. Aquat. Sci. 54:2049-2057.

[35] McMahon, R.F., 1996. The Physiological Ecology of the Zebra Mussel, *Dreissena polymorpha*, in North America and Europe. Amer. Zool. 36:339-363.

[36] Ibid.

[37] Ibid.

[38] Hincks, S.S. and G.L. Mackie. 1997. Effects of pH, calcium, alkalinity, hardness, and chlorophyll on the survival, growth, and reproductive success of zebra mussel (*Dreissena polymorpha*) in Ontario lakes. Can. J. Fish. Aquat. Sci. 54:2049-2057.

[39] McMahon, R.F., 1996. The Physiological Ecology of the Zebra Mussel, *Dreissena polymorpha*, in North America and Europe. Amer. Zool. 36:339-363.

[40] Ibid.

Dreissenid mussel surveys of water bodies with the greatest risk of introduction and establishment should employ standardized protocols for the examination of solid surfaces and sediment samples for adult mussel detection, plankton samples for veliger analysis, and shoreline walks to search for mussel shells, particularly in reservoirs that have been drawn down. Monitoring should be coordinated regionally.

Table 2. Top high-risk water bodies in Oregon based on water chemistry and boat use data.[41] Detailed information about the top five water bodies can be found in Appendix VII.

Water Body Name	Ca++ mg/L	pH	Establishment	Introduction
Prineville Reservoir	33.4	7.72	High	High
Owyhee Reservoir	28.2	7.55	High	High
Paulina Lake	28.0	8.25	High	High
East Lake	25.5	7.25	High	High
Snake River, Brownlee Reservoir	31.3	8.13	High	High
Snake River, Hells Canyon Reservoir	31.0	8.20	High	Medium
Applegate Reservoir	18.1	7.75	Medium	High
John Day River	17.3	7.79	Medium	High
Columbia River, Lake Celilo	17.0	8.07	Medium	High
Columbia River, Lake Bonneville	16.5	8.11	Medium	High
Ochoco Reservoir	20.1	8.40	Medium	Medium
Wallowa Lake	14.0	8.09	Low	High
Emigrant Lake	12.6	7.02	Low	High

[41] Wells, S., T.D. Counihan, A. Puls, M. Sytsma and B. Adair. 2010. Prioritizing Zebra and Quagga Mussel Monitoring in the Columbia River Basin Prepared for Bonneville Power Administration and the Pacific States Marine Fisheries Commission BPA Contract Number: 00003373 TI Project Number: 152.

Verification and Initial Response to Dreissenids and Other AIS Reports

Determining the credibility of any AIS report and further verifying an AIS or Dreissenid mussel introduction can be difficult and time consuming. The initial response to an AIS report, including that of Dreissenids, depends on protocols and steps established before any introduction. Clearly anticipating the nuances of any report can be difficult, and final determination of status/action is ultimately determined by the AIS Coordinators. Guidelines have been established for verifying a report, assigning a status to water bodies of concern, and addressing the tasks associated with each status level to facilitate the objectives of the CRB Plan as well as prepare for a complete response to a positive introduction. Steps are primarily focused on information gathering and preventing further spread while awaiting final confirmation of Dreissenid or other AIS presence.

Verify Reported Introduction

Oregon has a three-step process relative to positive mussel identification (Table 3). The process assigns a status level to the water body in question and sets forth a list of corresponding actions to be undertaken by the AIS coordinators as the verification proceeds. Figure 2 shows a mock timeline of how these actions might unfold along the report verification timeline.

The verification process is divided into categories based on life stage and identification technique: adult mussel, veliger discovered under cross-polarized light microscopy (XPLM), or veliger detected using a PCR assay. Each of these categories is subdivided to allow for various levels of confidence within each type of sample/report.

After an initial detection report is received and evaluated by the AIS coordinators, the verification matrix is activated. In an ideal situation, no more than 7 business days elapse between the results of the initial notification and the verification step. In reality, times will likely vary divergently on a case-by-case basis.

If the verification results are contradictory or vague, the status of the water body will remain "Inconclusive" until further verification results are available. The status remains "Inconclusive" until a rationale is provided and accepted. This may require additional sampling the following season or reevaluating

archived samples from the water body. This will be undertaken on a case-by-case basis by an advisory team assembled by Oregon AIS coordinators.

If further verification efforts fail to confirm the initial detection, the Oregon AIS coordinators may evaluate the situation and determine if down-grading the status of the water body or further research/exploration is warranted and in accordance with the de-listing protocols below.

It should be noted that verified reports for the presence of Dreissenid veligers or a single adult mussel/druise does not indicate that a water body is "positive" for a mussel infestation or "infested" i.e. supports a reproducing mussel population (see definitions below).

Definitions for water body status categories and requirements for delisting are as follows:

Definitions:

- **Verification** – the scientifically-based process to confirm the presence of Aquatic Invasive Species (AIS).
- **Detect or detected** – the verified presence of AIS.

Water body definitions:

- **Status Unknown** – Waters that have not been monitored.
- **Undetected/Negative** - sampling/testing is ongoing and nothing has been detected, or nothing has been detected within the time frames for de-listing.
- **Inconclusive** (temporary status) – Water body has not met the minimum criteria for detection, but has had one positive test result.

Management Trigger →

- **Suspect** – Water body that has met the minimum criteria for detection.
- **Positive** – Multiple (2 or more) subsequent sampling events that meet the minimum criteria for detection.
- **Infested** – A water body that has an established population of AIS.

De-listing a Water Body for Dreissenids:

- **Inconclusive** – 1 year of negative testing including at least one sample taken in the same month of subsequent year as the positive sample (accounting for seasonal environment variability) to get to undetected/negative.

- **Suspect** – 3 years of negative testing to become undetected/negative.
- **Positive** – 5 years of negative testing to become undetected/negative.
- **Infested** – Following a successful eradication or extirpation event including a minimum of 5 years post-event testing/monitoring with negative results.

Table 3. Protocols for verifying adult and veliger stages of Dreissenids, with corresponding water body determinations.[42]

Adult		**Veliger/Microscopy (XPLM)** (Veliger sample preservation/handling to meet minimum PCR requirements (e.g., 70% buffered EtOH, cold storage)			**Veliger/PCR** (PCR results require gel Polaroid and sequencing data for review, PCR results without corresponding XPLM confirmation may require multiple gene targets, qPCR and/or other information as the technology continues to develop)	
Visual ID of settled adult by expert	Plausible report, no shell/specimen available, survey water body	Strong positive visual ID [multiple larval states, high quality sample]	Positive visual ID [lacking "strong" criteria]	Weak visual ID [suspect bivalve, poor quality sample]	Positive	Suspicious/ weakly positive result → evaluate sample preservation and handling; evaluate PCR technique; gene sequencing; seek confirmation by independent lab, rerun split/other samples where available
Confirmation of visual ID by additional expert [photo okay]		Independent expert confirmation of Dreissenid veliger [photo okay] – must be confirmed by at least 2 independent experts	Same as "strong"	[Evaluate other samples if avail.]	Validation of PCR results through independent review	
Confirmation of ID and determination of species		Microscopy by independent lab and/or PCR by independent lab	Same as "strong"	PCR confirmation X 2 and gene sequence match	Microscopy verification by an independent lab and 2 PCR confirmations by independent labs	

"Suspect"

State Preparation Begins

"Inconclusive"

[42] Unusual or contradictory results to be evaluated on a case-by-case basis by committee. Microscopy refers to cross-polarized light microscopy or XPLM. Protocols for scanning electron microscopy or SEM have not yet been developed.

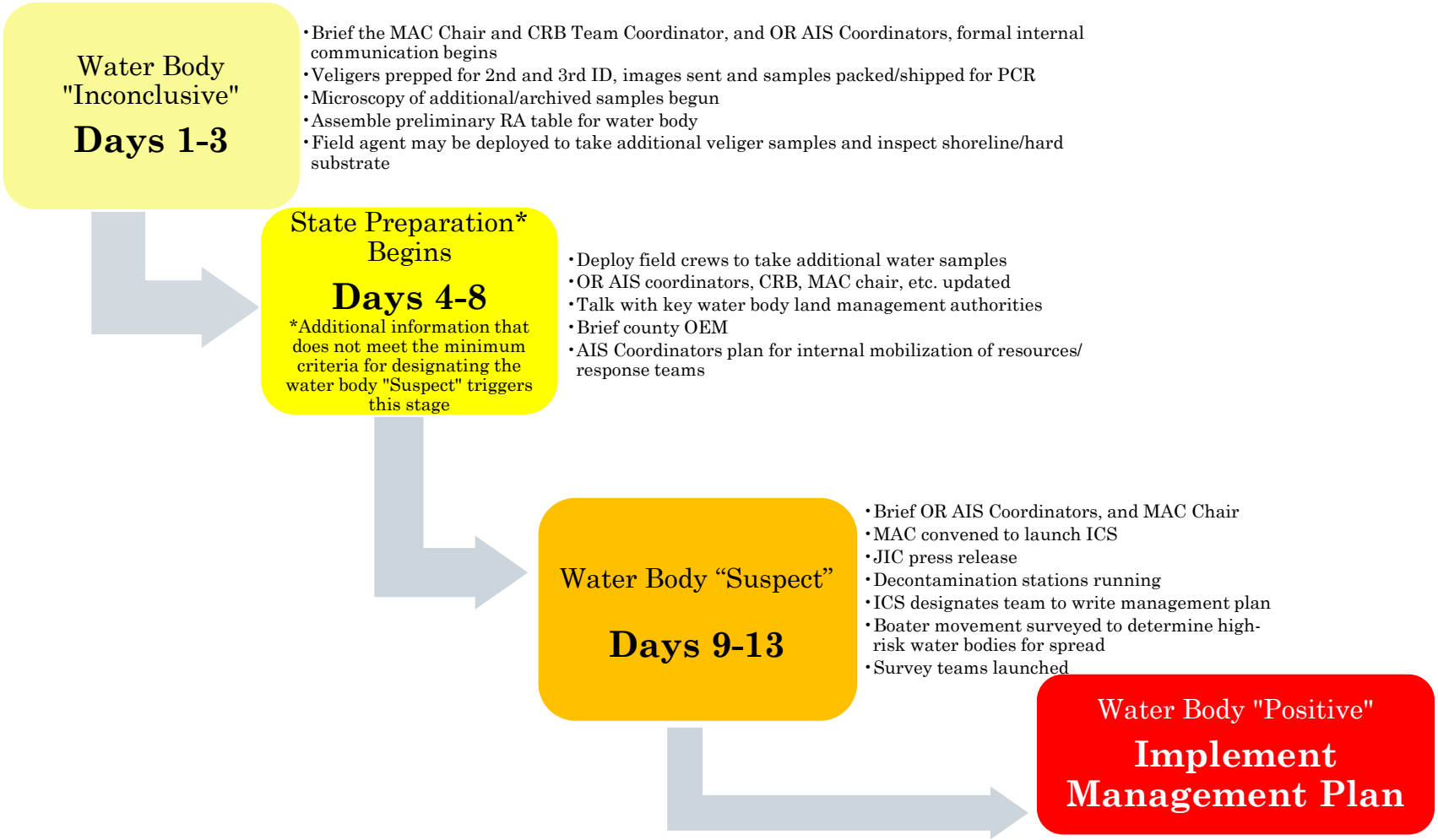


Figure 2. Mock timeline (in days) showing verification of identification, accompanying tasks and water body status following preliminary identification/reporting of Dreissenid mussel veligers.

STATUS LEVELS AND CORRESPONDING ACTIONS

Water Body Status: INCONCLUSIVE

- Brief the MAC Chair and CRB Team Coordinator, and OR AIS Coordinators, formal internal communication begins
- Veligers prepped for 2nd and 3rd ID, images sent and samples packed/shipped for PCR
- Microscopy of additional/archived samples begun
- Assemble preliminary RA table for water body
- Field agent may be deployed to take additional veliger samples and inspect shoreline/hard substrate

State Preparation Begins

- Deploy field crews to take additional water samples
- OR AIS coordinators, CRB, MAC chair, etc. updated
- Governor's office, ODFW director, and OISC ex-officio members notified
- Talk with key water body land management authorities
- Brief county OEM
- AIS Coordinators plan for internal mobilization of resources/ response teams

Water Body Status: SUSPECT

- Brief OR AIS Coordinators, and MAC Chair
- MAC convened to launch ICS
- Joint Information Center press release
- Decontamination stations running
- ICS designates team to write management plan
- Boater movement surveyed to determine high-risk water bodies for spread
- Survey teams launched:
    - Veliger samples taken (re-sample at 2 week intervals minimum in spawning season)
    - Additional WQ sampling as needed

- Shoreline and fixed/temporary hard substrate surveys for adults (including any Portland Samplers, or exposed infrastructure - stakeholders)
- Benthic sampling and or diver/snorkeler surveys of hard substrate
- Survey moored boats/moorages/marinas if any for potential "carriers"

INITIAL RESPONSE

REPORTING AND NOTIFICATION

In Oregon, there are two key recommended venues for reporting sightings of aquatic invasive species:

- The 1-877-STOP-ANS number is a national hotline established by the 100th Meridian Initiative. Its staff can contact the appropriate federal and state authorities 24-7.
- The OISC staffs http://www.oregoninvasiveshotline.org, an online hotline to report suspected sightings of invasive species. Upon reporting a suspected sighting of an aquatic invasive species to the hotline, experts in aquatic invasive species identification immediately receive an email.

The first participating agency to discover or receive a report of a potential Dreissenid [or other AIS infestation] will notify the ODFW Invasive Species Coordinator. The initial recipient should collect:

- Date and time of the report.
- Name and contact information of the report recipient
- Name and type of organism (e.g. zebra mussel, seaweed, etc.)
- Date and time of the sighting(s).
- Name, agency and contact information for the person making the report.
- Name, agency/entity and contact information of identifying biologist (if any)
- Details of the location of the infestation
    - Name of the affected water body,
    - Landmarks, highway mile, and other identifying details
    - GPS (if possible)
    - Description of surface attached to (if fouling organism) or substrate found on/in if appropriate

    - Other relevant conditions (draw down, low tide, etc.)
- An estimate of the number, density, and extent of the introduction
- Digital or other photographs (with scale indicator), ideally images shot from multiple angles
- If no photograph possible, obtain a detailed description of organism (size, coloration, flowering, etc.). Ensure reporter is looking at actual specimen not at an ID card/wanted poster.
- A sample of the organism (inform caller of proper storage/handling if necessary)
- Comments: These might include notes about the condition the specimen was in when found, how reporter came across organism, had they seen it before, access limitation to site, etc.

Notification of positive results from veliger monitoring (either through cross-polarized light microscopy or PCR) should be sent directly to the State Aquatic Invasive Species Coordinator(s) along with all supporting documents and the sample collection information (Appendix VIII describes documentation requested for veliger analysis).

NOTIFICATION

OREGON AIS INCIDENT SYSTEM (OAISIS)

The coordinating structure of OAISIS is designed to comply with the requirements of a National Incident Management System (NIMS) and describes the composition of the Oregon Incident Command Structure Team, which focused on interagency decision-making and communication.

In the case of a mussel report, the Oregon AIS Coordinator will alert the other state AIS coordinators and the Regional USFWS AIS coordinator. Should the Columbia River Basin Rapid Response Plan (CRBRRP) be deemed by the MAC to not be the appropriate response structure to respond to the introduction,[43] OAISIS will be used. The OAISIS structure has also been created to fit into the CRBRRP incident command structure to implement those objectives that are delegated to the state or responsible agency (see Table 1).

[43] This may happen for one of several reasons: the infestation may be located outside of the Columbia River Basin (e.g., in the Klamath Basin); the CRB MAC deems a situation to be better situated to a single state response; the plan is used for a non-Dreissenid AIS response; etc.

The objective of notification is to ensure that all parties that have jurisdiction over response decisions are engaged quickly and at the appropriate stage of any response. Table 2 of this document lists the agencies and entities with AIS management and coordination responsibilities or interests in Oregon. Additional stakeholders may need to be notified in the course of a response, including, but not limited to, irrigation districts, municipal water users, marinas, and boat ramp operators.

Although the lead entity for undertaking initial notifications at the alert and suspect levels is ODFW, it may be appropriate for other agencies to take the lead in notifying their existing partners (e.g., OSMB could notify marina and boat ramp operators).

Appendix IX provides the contact information for individuals that should be notified when water bodies are determined to be inconclusive and suspect.

Inconclusive notification:

- ODFW
- OSMB
- PSU
- USFWS RO, CRB MAC chair
- State/Federal AIS Coordinators as appropriate if shared waters

Suspect Notification (in addition to the above)

- Oregon MAC/Incident Command, CRB MAC
- Primary stakeholders, OISC
- Governor's Office/ Governor's Natural Resource Cabinet
- Initial Press Release and briefing
- Notification of affected user groups
- Communicating with stakeholders and other agencies

Generic language for this initial release of information about the initial infestation is as follows:

> *We are currently investigating reports of* [name of invasive species] *in the vicinity of* [general location]. *Experts from the* [Columbia River Basin Interagency Team or OR AIS Coordinators] *and local agencies are responding, and we will have additional information available as we are able to confirm it. We will hold a briefing at* [location] *and will notify the press at least ½ hour prior to the briefing. At this time, the briefing is the*

only place where officials are authorized to speak about the incident and confirmed information will be available. Thank you for your assistance.

A sample press release for a Suspect water body is provided in Appendix X.

An external communications system will be established and activated consistent with the guidance for a CRBANS. The Communications Team (CommTeam) is responsible for the coordinated formulation and release of information about the infestation to the news media, the public, and other agencies. The CommTeam is also responsible for disseminating summary information on the project if and when the ICS is disbanded.

Lead Agency: CommTeam: ODFW, OSMB Public Information Officers

OREGON MULTI-AGENCY COORDINATION GROUP (OR MAC)

The Oregon Multi-Agency Coordination Group (OR MAC) will be led by ODFW and include OSMB, CLR, USFWS, ODEQ, ODA, the Chair of the OISC, a representative of the Governor's Natural Resources Board and others as determined by the incident (e.g., USFS, BLM, OPRD, etc.) and the incident location.

Reporting directly to the OR MAC is the Planning and Response Coordinator. This will be staffed by ODFW. The Planning and Response Coordinator will oversee the Planning Team, the Response Team and any logistics staff.

The composition of the Planning Team, similar to the MAC, will be dependent on the location of the incident, but will include all the state AIS leads and major stakeholders.

The Joint Information Center will be a shared position staffed by ODFW and the OSMB Public Information Officers.

The Scientific Advisory Panel membership will include academia, AIS responders with experience in Dreissenid infested waters and others who can provide planning advice and review response plans.

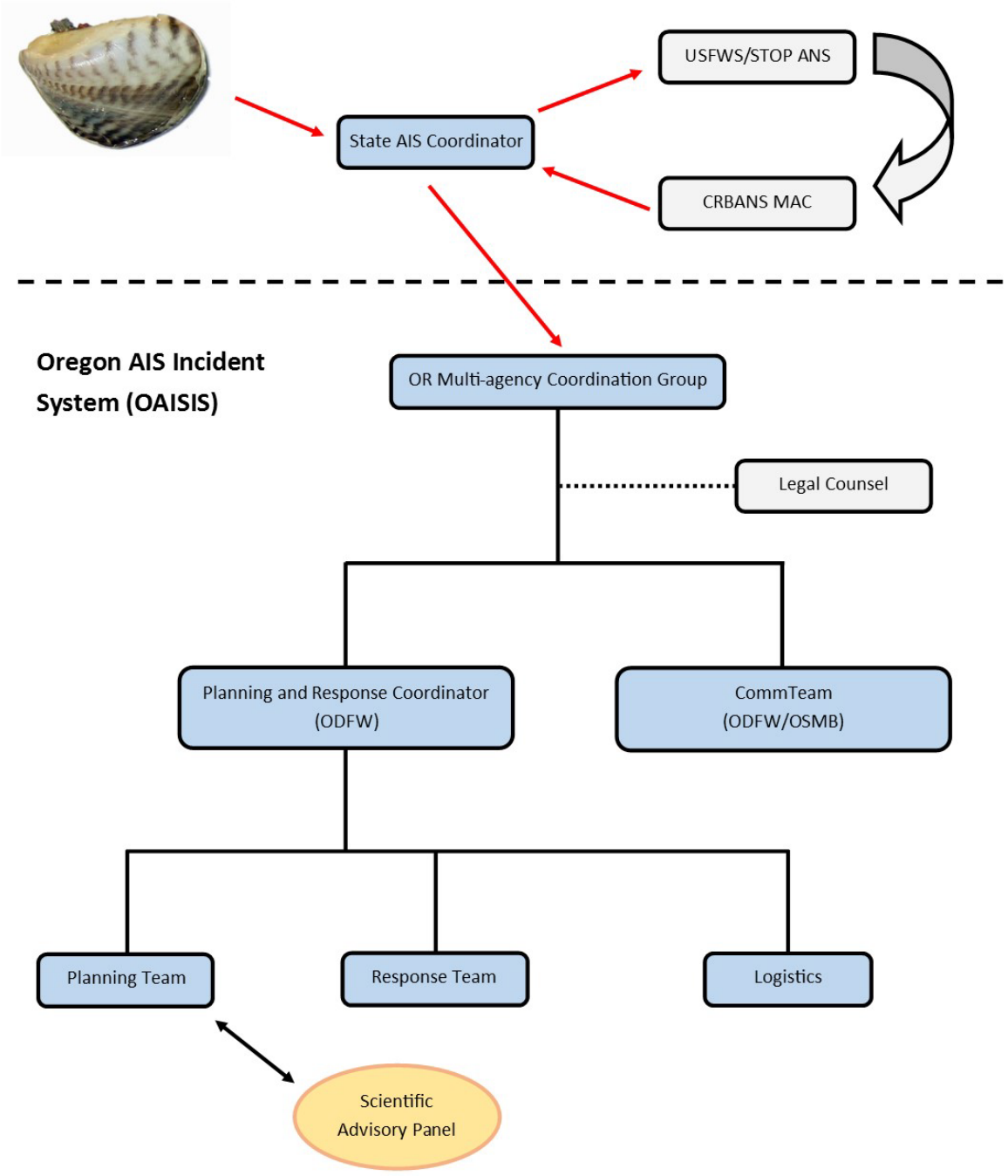


Figure 2. Oregon AIS Incident System (OAISIS).

DEFINING THE EXTENT OF COLONIZATION

To inform policy and tactical response to the infestation, survey crews will establish the physical range of infestation and identify the life-cycle phase(s)/age of infestation of mussels present. These demographics will guide subsequent management decisions, including survey design. Investigation of the geographic extent of infestation will require surveying upstream and downstream areas and any connected water bodies.

Lead entity: ODFW, lead agency where incident occurs, CLR

Tasks:

1. Survey nearby water bodies with vulnerability to the same vectors (using information from boater surveys, where available, to determine high traffic areas). Potential methodologies include:

    - sampling fixed and temporary hard substrates
    - shoreline surveys
    - SCUBA and snorkel surveys
    - plankton sampling. Plankton sampling may be analyzed microscopically or via Polymerase Chain Reaction (PCR) genetic analysis. Plankton samples should involve sufficient water volume to detect low veliger concentrations via either of those methods. These efforts should follow existing regional or national protocols.

2. Assess maturity and spawning condition of mussels at the infestation site(s).

3. Determine likely water flow dispersal of mussel veligers. Potential methodologies include:

    - dye studies
    - other hydrographic research techniques
    - interviewing field personnel

4. Identify facilities (e.g., hydropower, fish hatcheries, irrigation systems, etc.) that could be affected.

5. Ensure that surveys are completed and that results are reported

PREVENTING FURTHER SPREAD

Preventing spread of an original introduction is crucial to the success of EDRR. The use of a quarantine or temporary closure will be necessary until prevention techniques can be implemented to manage the pathways that spread Dreissenid mussels. The duration of the emergency closure will last until a prevention plan is implemented for the water body. If closure is untenable, WIT Teams must be on hand for decontamination.

Lead entity: ODFW, OSMB, CLR

Tasks:

1. Identify dispersal vectors (including movement by humans, fish and wildlife, water traffic, water flow, and other processes). Assume measures are needed to prevent release of veligers as well as movement of adult mussels.

    - Assess the likely movement of boats that recently used the infested water body to identify inspection needs in other water bodies.

2. Establish public outreach efforts, including:

    - Ensure that zebra/quagga mussel —alert signs are adequately deployed.
    - Alert prior users of these waters of the risks their boats and equipment create for other water bodies.
    - Design and implement educational outreach programs using print, electronic media and other avenues, with an emphasis on raw water users.

3. Restrict dispersal pathways, where feasible, including:

    - If feasible, identify and eliminate the likely source of mussel inoculation (e.g., infested boat).
    - Quarantine any hatcheries or aquaculture operations that are likely to spread mussels or their larvae via transfers outside the affected watershed(s).
    - Quarantine infested water bodies as needed to prevent spread by watercraft.
    - Consider and implement any needed prevention of overland veliger or adult mussel transport to other water bodies.

- Develop and implement Hazard Analysis and Critical Control Point (HACCP) plans to ensure that response personnel do not further spread the original introduction.
- Stop or slow water release to potentially uninfested sites.
- Draw water from below thermocline.
- Install physical barriers.
- Consider special management measures for operations of locks and commercial vessel traffic.

4. Establish wash and inspection requirements on boats and equipment, and provide for associated logistical support (e.g., disinfection kits).

- Begin a post haul-out inspection of boats and equipment in the areas where mussels were found.
- Begin a pre-launch inspection program for all boats and equipment in places where boats and equipment from a contaminated area are likely to be launched next.

A template that includes information that should be included in a management plan is described in Appendix XI.

INITIATING AVAILABLE/RELEVANT CONTROL ACTIONS

Evaluate management options and proceed either with eradication efforts or containment/mitigation activities. Convene scientific advisory team to consult.

Lead entity: ODFW

Tasks:

1. Decide if eradication is possible based on rapid analysis of population dynamics and pathways of spread. Consider the following:

- Cost versus benefit of treatment options.
- Type of water body (e.g., contained lake, mainstem reservoir, tributary reservoir, small stream, large river, estuary, or water diversion facility).
- Type of substrate (e.g., rocks that allow mussel attachment on their undersides where chemicals may not reach them).
- Extent of population distribution (isolated vs. widespread coupled with a priori assumptions about the spread of mussels before detection).

- Life stage(s) present (default assumption is both veligers and adults).
- Time of year in relation to spawning season.
- Is spawning occurring now or possible based on current water temperature (e.g., 12 °C or greater)?
- When is the likely spawning season based on predicted temperature conditions?
- How do mean monthly temperature patterns for the water body relate to mussel spawning requirements?
- Amount of water in reservoir or waterway.
- Does the reservoir need to be drawn down before treatment?
- How much can the reservoir be drawn down?
- Is river flow low enough for effective treatment?
- Circulation patterns in water body.
- Spreading pattern of population within the water body.
- Inflow rates and sources.
- If drawdown needs to occur, what is the feasibility given input source(s)?
- Rate of outflow and distance of veliger dispersal.
- Do flow patterns help or hinder eradication options?
- Presence of state or federally listed threatened or endangered species.
- Special status of water body, including:
    - Water use designation (e.g., drinking water).
    - Wild and scenic designation.
    - Wilderness area.
    - Potential impact to cultural resources.
    - Department of Defense or other restricted access areas.
    - Tribal lands.
    - Endangered Species Act critical habitat.
    - Presence of marine mammals covered by Marine Mammal Protection Act.
    - Clean Water Act 303(d) listing.
    - Beneficial uses of water bodies.
    - Use of area by Threatened and Endangered species.

2. If eradication is attempted, select appropriate method(s).

3. If eradication is not possible or fails, develop control objectives and select/design appropriate control measures.

4. Obtain relevant permits and regulatory agency concurrence (see Appendices IV and V).

5. Implement eradication or control strategies.

EXTENDED RESPONSE

LONG-TERM MONITORING

This objective provides data for adaptive management and long-term evaluation of management and control efforts, and will be included in the management plan for each water body.

Lead entity: The responsible agency where the infestation of mussels is found/ODFW.

Tasks:

1 Continue control strategy developed during Initial Response.

2. Develop long-term control objectives

3. Design a monitoring program to evaluate the status of the zebra/quagga mussel populations, emphasizing veliger sampling. Monitoring activities should be implemented in coordination with other field operations, such as environmental monitoring requirements associated with control action regulatory compliance (e.g., National Pollutant Elimination Discharge System [NPDES] permits).

4. Disseminate findings through an easily-accessible, consolidated, coordinated real-time database and listserv.

5. Evaluate control strategy against results of monitoring program and revise strategy as needed to meet long-term control objectives.

APPENDICES

Appendix I.	Oregon Invasive Species Control Account.
Appendix II.	List of State Resources for *Dreissena* Response.
Appendix III.	Draft Quarantine Statutory Language.
Appendix IV.	Oregon Environmental Regulatory Compliance Framework.
Appendix V.	Flow Chart of Permitting Alternatives and Associated Contacts.
Appendix VI.	At-Risk Water Bodies.
Appendix VII.	Details for Top Five High-Risk Water Bodies in Oregon.
Appendix VIII.	Veliger Analysis Documentation.
Appendix IX.	Notification List for Reports of Dreissenids in Oregon.
Appendix X.	Sample Press Release.
Appendix XI.	Outline for Draft Management Plan.

APPENDIX I. OREGON INVASIVE SPECIES CONTROL ACCOUNT

609-010-0100
Definitions
As used in this division of administrative rules, unless the context requires otherwise:
(1) "Agreement" means a document describing an understanding between the Council and a recipient of Funds, including but not limited to a grant, loan, or memorandum of understanding.
(2) "Council" means the Oregon Invasive Species Council.
(3) "Emergency" means that one or more Invasive Species that is new to the state, or that exhibits a substantial range expansion within the state, threatens the health and integrity of Oregon's native flora and fauna.
(4) "Funds" means money in or disbursed from the Invasive Species Control Account.
(5) "Invasive Species" has the meaning given that term in ORS 570.755.
(6) "Invasive Species Emergency" means a declaration by the Council that an Emergency exists or is imminent, and that the Emergency is of such magnitude that Funds are needed to terminate or lessen the threat.

609-010-0110
Purpose
The purpose of this division of rules is to provide criteria and procedures for administration of the Oregon Invasive Species Control Account.

609-010-0120
Eligible Applicants
(1) A person, state or local government, unit of state or local government, an Indian tribe, or a unit of the federal government, may request that the Council declare an Invasive Species Emergency and release Funds.
(2) The request must be sent to the Council in writing and include a response plan with the following elements:
(a) A risk assessment for the Invasive Species;
(b) Information about efforts implemented to control or eradicate the Invasive Species in other locales;
(c) Methodology proposed to eradicate or control the infestation;
(d) Budget to respond to the infestation;
(e) Timeline for activities associated with response to the infestation; and
(f) Methods to evaluate control or eradication success.

(3) Requests not meeting review standards may be returned for correction or completion, or may be denied further consideration.

609-010-0130
Standards to Determine Eligibility for Release of Funds
(1) The Council may release Funds only after declaring an Invasive Species Emergency and determining that the action items that are described in the response plan:
(a) Are economically, scientifically, and environmentally defensible and sound;
(b) Contribute to the effective control or eradication of Invasive Species populations or infections;
(c) Achieve a favorable cost/benefit ratio relative to other options considered; and
(d) Respond to an Invasive Species that the Council has deemed to be a high risk to Oregon's economy and environment.
(2) The following expenditures are not eligible for funding through the Oregon Invasive Species Control Account:
(a) Operational costs of managing Invasive Species that are widely established in Oregon; and
(b) Any cost that the Council deems is not necessary to respond to an Emergency.
(3) Outreach, education, and research related to Invasive Species are not generally eligible, but in a specific Emergency they might be part of an appropriate response plan and may be approved by the Council.

609-010-0140
Process for Declaration and Release of Funds
(1) Council members will review the request to declare an Invasive Species Emergency.
(2) During the review process, the Council may consider technical and other information obtained from sources other than the applicant, including, but not limited to, the Governor's Natural Resources Cabinet.
(3) If the Council declares an Invasive Species Emergency, the Council may enter an agreement with a person, state or local government, unit of state or local government, Indian tribe, or federal government that will be responsible for implementing a portion or all of the response plan. The agreement must include all terms required by law and include provisions for the following:
(a) Incorporation of the response plan.
(b) The maximum amount of Funds to be disbursed.
(c) Disbursement of the Funds according to a payment schedule that is incorporated as an integral part of the agreement.

(d) The recipient of Funds shall submit one or more interim reports for evaluation by the Council. The recipient of Funds shall submit the reports either on a schedule that is incorporated into the agreement or upon the request of the Council. Each report must include:
(A) Documentation of project results to date;
(B) Projections of short-range and long-range results;
(C) Any modifications to the response plan;
(D) Budget status; and
(E) An update on the likelihood of successful eradication.
(e) In the event an interim report is deemed unsatisfactory by the Council, the Council reserves the right to cancel the agreement and stop payments.
(f) Within six months of the official close of the action items designated in the agreement, the Fund recipient shall submit a final report to the Council. This report will provide the most current and detailed information on project benefits as compared with the original criteria.
(g) In the event that a Fund recipient cannot complete any project within the agreement timelines, the Fund recipient shall inform the Council and request a formal extension for use of the Funds.
(h) The Fund recipient shall return all unexpended Funds to the Council for deposit in the Invasive Species Control Account.
Stat. Auth.: ORS 570.800
Stats. Implemented: ORS 570.800, 570.810

APPENDIX II. LIST OF STATE RESOURCES FOR *DREISSENA* RESPONSE.

WIT 1 and II Level Trained Personnel

Name		Level I	Level II	
Last	**First**	**Year**	**In-house**	**Lake Mead**
Bailey	**Tim**	2011		2011
Beyer	**Garth**	2013	2013	
Boatner	**Rick**	2009		2009
Coulter	**Jessica**	2013	2013	
Craft	**Nadine**	2011		2011
Dodenhoff	**Sam**	2010		2010
Dolphin	Glenn	2007		2008
French	**Rod**	2012		2012
Hamilton	**Darin**	2013	2013	
Howell	**Hayden**	2010		2010
Kinney	**Shane**	2013	2013	
Little	**Christian**	2013	2013	
McNassar	**Gabe**	2013	2013	
Mohler	**June**	2013	2013	
Parker	**Beth**	2011	2011	
Parker	Blaine	2007		2008
Patterson	**Dirk**	2010		2010
Reesman	**Martyne**	2010		2010
Sanders	**Dale**	2013		2013
Space	**Jason**	2012	2012	
Stanton	**Holly**	2011	2011	
Tinniswood	**Bill**	2012		2012
Warren	**Ray**	2013	2013	
Wells	Steve	2007		2008
Bold - current employees of ODFW				

APPENDIX III. DRAFT QUARANTINE STATUTORY LANGUAGE

If the Oregon Department of Fish and Wildlife determines it is necessary to protect the environmental, economic, or human health interests of the State from the threat of a prohibited species (ORS 635-056-0050), the Department may declare a quarantine against a water body, property, or region within the state. The Department may prohibit or condition the movement of conveyances and waters from such quarantined places or areas that are likely to contain such prohibited species.

A quarantine declaration under this section may be implemented through rapid response management actions in a manner and for a duration necessary to protect the interests of the state from the threat of a prohibited species. A quarantine declaration must include:

(a) The reasons for the action;

(b) The boundaries of the area affected;

(c) The action timeline;

(d) Types of conveyances and areas affected by the quarantine and any prohibition or conditions on the movement of those conveyances and waters from the quarantine area; and

(e) Inspection and decontamination requirements for conveyances.

APPENDIX IV. OREGON ENVIRONMENTAL REGULATORY COMPLIANCE FRAMEWORK

Of particular relevance to the application of pesticides to state waters is the recently revised status of Clean Water Act NPDES permitting requirements. Prior to 2009, the Environmental Protection Agency (EPA) ruled that a CWA NPDES permit was not required when legally registered pesticides are applied for pest control purposes (Federal Register Vol. 71, No. 227, November 27, 2006). In response to legal challenges in 2009, however, the sixth circuit federal court determined that EPA must issue NPDES permits for all chemical pesticide applications that leave a residue or excess pesticide in water (as well as biological pesticide applications). In response, EPA issued a Pesticide General Permit in October 2011 to cover discharges in areas under their permitting authority, which included six states (including Idaho), most tribal lands, and federal facilities in four additional states (including Washington). States with EPA delegated authority to issue NPDES permits (e.g., Montana, Oregon, Washington) have developed state-specific permitting approaches that may be similar or more stringent than the federally issued Pesticide General Permit.

Fact Sheet:

http://www.deq.state.or.us/wq/pubs/factsheets/permits/2300APesticides.pdf

Pesticide General Permit (2300A)

PESTICIDE APPLICATIONS COVERED UNDER THE PERMIT

"Nuisance animal control for invasive or other nuisance animals and pathogens in water and at the water's edge. Coverage extends to but is not limited to, control of fish, mollusks, fungi and bacteria. The term "in water" includes, but is not limited to applications made to creeks, rivers, lakes, riparian areas, wetlands, and other seasonally wet areas when water is present. The term "water's edge" means within 3 feet of waters of the state and conveyances with a hydrologic surface connection to waters of the state at the time of pesticide application. The 3 feet is measured horizontally from the water's edge and conveyance."

TABLE IV1. PESTICIDE USE MATRIX FOR AN ISOLATED ZEBRA MUSSEL INFESTATION IN OREGON'S COLUMBIA RIVER BASIN.

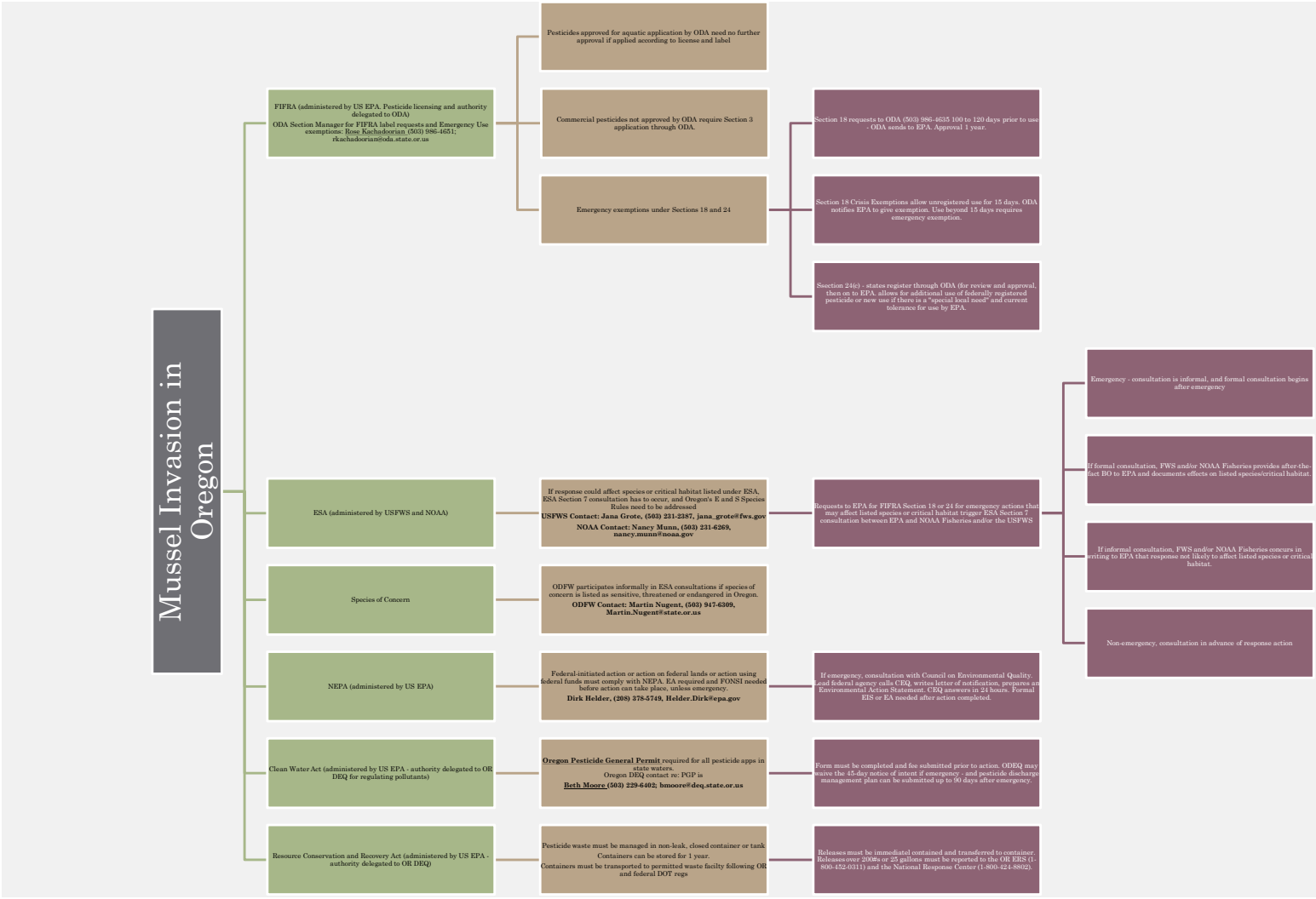
REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) administered by US EPA. Pesticide licensing and application authority delegated to Oregon Department of Agriculture (ODA). Implemented under the **Oregon Pesticide Control Law (OAR 603-57)**	▪ Pesticides approved for aquatic application by the ODA need no approval from DEQ or ODFW if they are applied according to label and license requirements. ▪ For commercial pesticides not currently approved by ODA, a formal Section 3 application process would be required. The pesticide registrant would submit an application through the ODA. ▪ For an emergency situation, FIFRA provides for exemptions under Sections 18 and 24. See next column.	▪ Section 18 of FIFRA allows for emergency use exemption for a pesticide that is not already approved. The request would go through the ODA who would evaluate the request and forward it to EPA. Requests should be submitted 100 to 120 days prior to expected use. This timeframe includes the EPA 50-day risk assessment. If approved, the approval would last for one year. ▪ Section 18 also allows for a crisis exemption that would allow unregistered use for 15 days. The state agriculture department would notify EPA, EPA would do a cursory review, confer with the state and give crisis exemption. Use beyond the 15 days would require an emergency exemption. ▪ Section 24 (c) allows the states to register an additional use of a federally registered pesticide or a new use as long as there is a "special local need" and a current tolerance for the use approved by EPA. The request would go through the ODA for review and approval and then be submitted to EPA for review.
Endangered Species Act (ESA). The ESA is administered jointly by the U.S. Fish and Wildlife Service (USFWS) for freshwater and terrestrial species, and NOAA Fisheries for	▪ Pesticide-related response actions undertaken in the CRB could affect species or critical habitat listed under the ESA. In those cases, an ESA Section 7 consultation would need to occur. See next column for Section 7 consultation emergency provisions. Oregon's Endangered and Sensitive Species Rules would also need to be addressed.	▪ Federal agency requests to EPA for FIFRA Section 18 or Section 24 approval to use pesticides for emergency response actions that may affect a listed species or critical habitat would trigger the requirement for an ESA Section 7 consultation between EPA and NOAA Fisheries and/or the FWS depending on the species and critical habitat affected.

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
anadromous and marine species.		▪ Under emergency circumstances, such consultation would be conducted informally during the emergency and formal consultation would be initiated, as appropriate, as soon as practicable after the emergency is under control. ▪ If formal consultation is required, the FWS and/or NOAA Fisheries provide an after-the-fact biological opinion to the EPA that documents the effects of the emergency response action on listed species and/or critical habitat. ▪ If informal consultation is appropriate, the FWS and/or NOAA Fisheries provide written concurrence to the EPA that the response action is not likely to adversely affect listed species or critical habitat. ▪ Under non-emergency circumstances, the same response action would be the subject of a completed consultation in advance of the response action being implemented.
Oregon Department of Fish and Wildlife (ODFW) administers the **Oregon Endangered Species Rules** and **Oregon Sensitive Species Rules** for species native to Oregon.(OAR 635-0100)		▪ ODFW would have to participate on an informational basis in ESA consultations if the species of concern was listed as sensitive, threatened or endangered in Oregon
National Environmental Policy Act (NEPA) administered by US EPA	▪ Any federally initiated action or action on federal lands or action using federal funds must also comply with the provisions of NEPA. An environmental assessment (EA) would be required and a finding of no significant impact (FONSI) needed before the action could take place. For an emergency situation, see next column.	▪ NEPA provides for an emergency action through consultation with the Council on Environmental Quality. The lead federal action agency would call CEQ, write a letter of notification, and prepare an environmental action statement. CEQ would respond in 24 hours. After the action is complete, a formal EIS or EA would have to be prepared.

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
Clean Water Act (CWA) administered by US EPA with authority delegated to the Oregon Department of Environmental Quality (DEQ) for regulating pollutants in state waters. Implemented under the **Oregon Water Quality Act (OAR Chapter 340, Division 45)**	▪ The Oregon Pesticide General Permit, 2300-A (http://www.deq.state.or.us/wq/wqpermit/pesticides.htm), is required for all pesticide application to state waters. Large-scale applications, federal and state agencies must register with ODEQ for permit coverage. The permit covers pesticides applied in accordance with FIFRA label instructions, does not allow for application of pesticides to a waterbody that is already listed as impaired by that pesticide or its by-products, and must not cause or contribute to water quality standards violations.	▪ Oregon PGP coverage requires that the application form must be filled out and fee submitted prior to planned activity. However, during a declared pest emergency situation ODEQ may waive the 45 day advance notice of intent on a case-by-case basis and the required pesticide discharge management plan (PDMP) may be submitted up to 90 days after responding to the emergency.
Resource Conservation and Recovery Act administered by US EPA with authority delegated to the Oregon Department of Environmental Quality under **Oregon Hazardous Wastes Laws (OAR Chapter 340, Division 109)**	▪ Pesticide waste must be managed in a non-leak, closed container or tank that is appropriately labeled ▪ Properly managed containers may be stored for up to one year ▪ Containers must be transported to permitted hazardous waste facility following Oregon and Federal Department of Transportation regulations	▪ Releases must be immediately contained and transferred to appropriate container. Releases over 200 #s or 25 gallons must be reported to the Oregon Emergency Response System. 1-800-452-0311 and the National Response Center at 1-800-424-8802.

Notes: Section 18 requests should go to the Section 18 coordinator at the Pesticides Division of the ODA (phone: 503-986-4656).

APPENDIX V. FLOW CHART OF PERMITTING ALTERNATIVES AND ASSOCIATED CONTACTS


Mussel Invasion in Oregon
FIFRA (administered by US EPA. Pesticide licensing and authority delegated to ODA)
ODA Section Manager for FIFRA label requests and Emergency Use exemptions: Rose Kachadoorian (503) 986-4651; rkachadoorian@oda.state.or.us
Pesticides approved for aquatic application by ODA need no further approval if applied according to license and label
Commercial pesticides not approved by ODA require Section 3 application through ODA.
Emergency exemptions under Sections 18 and 24
Section 18 requests to ODA (503) 986-4635 100 to 120 days prior to use - ODA sends to EPA. Approval 1 year.
Section 18 Crisis Exemptions allow unregistered use for 15 days. ODA notifies EPA to give exemption. Use beyond 15 days requires emergency exemption.
Ssection 24(c) - states register through ODA (for review and approval, then on to EPA. allows for additional use of federally registered pesticide or new use if there is a "special local need" and current tolerance for use by EPA.
ESA (administered by USFWS and NOAA)
If response could affect species or critical habitat listed under ESA, ESA Section 7 consultation has to occur, and Oregon's E and S Species Rules need to be addressed
USFWS Contact: Jana Grote, (503) 231-2387, jana_grote@fws.gov
NOAA Contact: Nancy Munn, (503) 231-6269, nancy.munn@noaa.gov
Requests to EPA for FIFRA Section 18 or 24 for emergency actions that may affect listed species or critical habitat trigger ESA Section 7 consultation between EPA and NOAA Fisheries and/or the USFWS
Emergency - consultation is informal, and formal consultation begins after emergency
If formal consultation, FWS and/or NOAA Fisheries provides after-the-fact BO to EPA and documents effects on listed species/critical habitat.
If informal consultation, FWS and/or NOAA Fisheries concurs in writing to EPA that response not likely to affect listed species or critical habitat.
Non-emergency, consultation in advance of response action
Species of Concern
ODFW participates informally in ESA consultations if species of concern is listed as sensitive, threatened or endangered in Oregon.
ODFW Contact: Martin Nugent, (503) 947-6309, Martin.Nugent@state.or.us
NEPA (administered by US EPA)
Federal-initiated action or action on federal lands or action using federal funds must comply with NEPA. EA required and FONSI needed before action can take place, unless emergency.
Dirk Helder, (208) 378-5749, Helder.Dirk@epa.gov
If emergency, consultation with Council on Environmental Quality. Lead federal agency calls CEQ, writes letter of notification, prepares an Environmental Action Statement. CEQ answers in 24 hours. Formal EIS or EA needed after action completed.
Clean Water Act (administered by US EPA - authority delegated to OR DEQ for regulating pollutants)
Oregon Pesticide General Permit required for all pesticide apps in state waters.
Oregon DEQ contact re: PGP is
Beth Moore (503) 229-6402; bmoore@deq.state.or.us
Form must be completed and fee submitted prior to action. ODEQ may waive the 45-day notice of intent if emergency - and pesticide discharge management plan can be submitted up to 90 days after emergency.
Resource Conservation and Recovery Act (administered by US EPA - authority delegated to OR DEQ)
Pesticide waste must be managed in non-leak, closed container or tank
Containers can be stored for 1 year.
Containers must be transported to permitted waste facilty following OR and federal DOT regs
Releases must be immediatel contained and transferred to container. Releases over 200lbs or 25 gallons must be reported to the OR ERS (1-800-452-0311) and the National Response Center (1-800-424-8802).

APPENDIX VI. AT-RISK WATER BODIES

Table 19. Water bodies in Oregon that have a high to medium relative risk of Dreissenid mussel establishment and/or introduction. Risk categories were formulated using best professional judgment. The amount of data used to assign risk categories varied for each water body. Data is summarized in Appendix 1 and II, and risk categories based on one or two data points are flagged with an asterisk. Dreissenids can also establish in areas identified with low to very low risk of establishment.

Water Body Name	mg/L	pH	Risk of Establishment	Risk of Introduction
Prineville Reservoir	33.4	7.72	High	High
Owyhee Reservoir	28.2	7.55	High	High
Paulina Lake	28.0	8.25	High	High
East Lake	25.5	7.25	High	High
Snake River, Brownlee Reservoir	31.3	8.13	High	High**
Snake River, Hells Canyon Reservoir	31.0	8.20	High	Medium
Applegate Reservoir	18.1	7.75	Medium	High
John Day River	17.3	7.79	Medium	High
Columbia River, Lake Celilo	17.0	8.07	Medium	High
Columbia River, Lake Bonneville	16.5	8.11	Medium	High
Ochoco Reservoir	20.1	8.40	Medium	Medium
Wallowa Lake	14.0	8.09	Low	High
Emigrant Lake	12.6	7.02	Low	High
Lake Billy Chinook	11.0	9.00	Very Low	High
Klamath Lake	7.3	7.57	Very Low	High
Howard Prairie Lake	6.9	7.56	Very Low	High
Willamette River	6.8	7.12	Very Low	High

Deschutes River	6.5	7.91	Very Low	High
North Fork Reservoir	5.7	7.48	Very Low	High
Henry Hagg Lake	5.6	7.07	Very Low	High
Fern Ridge Reservoir	5.2	7.80	Very Low	High
Lost Creek Lake	5.0	7.30	Very Low	High
Devils Lake (Lincoln)	4.7	7.8	Very Low	High
Dexter Lake	4.7	7.60	Very Low	High
Foster Reservoir	4.4	7.20	Very Low	High
Loon Lake	4.2	7.00	Very Low	High
Green Peter Lake	4.0	7.30	Very Low	High
Wickiup Reservoir	3.5	7.60	Very Low	High
Detroit Lake	3.5	7.51	Very Low	High
North Tenmile Lake	3.4	7.10	Very Low	High
Mercer Lake	3.0	7.87	Very Low	High
Odell Lake	3.0	7.79	Very Low	High
Lake of the Woods	2.5	7.14	Very Low	High
Diamond Lake	2.5	7.36	Very Low	High
Crescent Lake	2.4	7.20	Very Low	High
Crane Prairie Reservoir	2.2	9.80	Very Low	High
Lava Lake	2.1	7.90	Very Low	High
Simtustus Lake	10.4	8.90	Very Low	Medium
Hyatt Reservoir	10.0	7.34	Very Low	Medium
Phillips Lake	8.9	8.20	Very Low	Medium
Chickahominy Reservoir	8.1	7.70	Very Low	Medium
Agency Lake	7.0	7.46	Very Low	Medium
Dorena Reservoir	6.9	7.63	Very Low	Medium
Cottage Grove Lake	6.4	6.77	Very Low	Medium

Hills Creek Lake	5.3	8.10	Very Low	Medium
Selmac Lake	4.7	-	Very Low	Medium
Pine Hollow Reservoir	4.5	7.40	Very Low	Medium
Timothy Lake	4.5	7.64	Very Low	Medium
Smith Reservoir	4.2	7.20	Very Low	Medium
Fall Creek Reservoir	4.1	7.58	Very Low	Medium
Eel Lake	3.6	7.40	Very Low	Medium
Lemolo Lake	3.5	7.53	Very Low	Medium
Siltcoos Lake	3.4	7.48	Very Low	Medium
Blue River Reservoir	3.2	7.49	Very Low	Medium
Triangle Lake	2.4	7.00	Very Low	Medium
Munsel Lake	2.1	7.05	Very Low	Medium
Cultus Lake	2.0	7.50	Very Low	Medium
Woahink Lake	1.9	7.10	Very Low	Medium
Olallie Lake	0.5	-	Very Low	Medium

** Water body had high relative risk of introduction in Idaho.

APPENDIX VII. DETAILS FOR TOP FIVE HIGH-RISK WATER BODIES IN OREGON

	Prineville Reservoir	Owyhee Reservoir	Paulina Lake	East Lake	Brownlee Reservoir
Type of waterbody	Reservoir	Reservoir	Natural Lake	Natural Lake	Reservoir
Location					
Latitude	44 06'36"N	43 27'41"N	43 43'12"N	43 43'48"N	44 50'32"N
Longitude	120 47'08"W	117 20'18"W	121 15'21"W	121 12'53"W	116 53'56"W
County	Crook	Malheur, Hells Canyon County, OR; Owyhee County, ID	Deschutes	Deschutes	Hells Canyon, Baker County, OR; Washington County, ID
Drainage	Crooked	Owyhee	Newberry Caldera	Newberry Caldera	Hells Canyon
Inflow	Crooked River, Bear Creek, Sanford Creek, Deer Creek, Alkali Creek, Antelope Creek, Owl Creek	Owyhee	Springs/East Lake	Springs	Snake R. Powder R. Burnt R.
Outflow	Crooked River	Owyhee	Paulina Cr.	None	Snake R.
Atlas of Oregon Lakes URL	http://aol.research.pdx.edu/?q=lake/378	http://aol.research.pdx.edu/?q=lake/375	http://aol.research.pdx.edu/?q=lake/376	http://aol.research.pdx.edu/?q=lake/355	N/A
Statistics					
Surface Elevation (ft)	3,257	2,657	6,331	6,370	2,077
Basin Area (mi^2)	2,635	11,160	17	9	72,590
Surface Area (ac)	3,030	13,900	1,531	1,044	15,000
Volume (ac ft)	150,200	715,000	249,850	69,576	1,426,700
Max. Depth (ft)	130	117	250	180	277
Mean Depth (ft)		81	163	67	106
Shoreline length (mi)	43	150	6.7	5	
Realtime water level	www.usbr.gov/pn/hydromet/destea.html	www.usbr.gov/pn/hydromet/ramps/owyhee.html	N/A	N/A	www.idahopower.com/aboutus/companyinformation/search.cf

					m?q=brownleereservoir
Trophic state	eutrophic	eutrophic	mesotrophic	mesotrophic	varies
Water quality/monitoring					
pH	7.72	7.55	8.25	7.25	8.13
Ca++	33.4	28.2	28.0	25.5	31.3
Secchi	1.5	6	9-12	6–7	>3–13
Other		Very high phosphorus	Very high alkalinity and conductivity and high sulfate	Very high sulfate and high alkalinity and conductivity	High phosphorus levels
The Center for Lakes and Reservoirs at Portland State University maintains a searchable database of water bodies in the United States that are sampled for Dreissenids and *Corbicula*. Results are reported as "non-detect," "unknown," and "results pending," and identify substrate type (e.g., natural, artificial, plankton, SCUBA, ROV, other, and unspecified). For additional information, or updated information not yet loaded into the database, contact: Steve Wells Ph. 503-725-8946 Fx. 503-725-9040 Email. sww@pdx.edu Mailing: Portland State University, PO BOX 751-ESM, Portland OR 97207-0751 Physical: Portland State University, 1719 SW 10th Ave, SRTC Rm 218, Portland OR 97201					
Information					
Dam	Arthur R. Bowman Dam	Owyhee Dam	None	None	Brownlee Dam
Owned/ Administered by:	Bureau of Reclamation	Bureau of Reclamation	Forest Service	Forest Service	Idaho Power
URL	http://www.usbr.gov/projects/Facility.jsp?fac_Nae=Arthur+R+Bowman+Dam	http://www.usbr.gov/projects/Facility.jsp?fac_Nae=Owyhee+Dam	http://www.fs.usda.gov/detail/centraloregon/recreation/?cid=stelprdb5269836	http://www.fs.usda.gov/detail/centraloregon/recreation/?cid=stelprdb5269841	http://www.idahopower.com/aboutus/companyinformation/search.cfm?q=brownleereservoir
Contact Info	http://tinyurl.com/d3b43ed				Idaho Power
System	Crooked River Project	Owyhee Project	N/A	N/A	Hells Canyon
Dam type	Zoned earthfill	Concrete	none	none	Earthfill/ Concrete
Draw down y/n			N	N	Y
Irrigation y/n	Y	Y	N	N	Y
Irrigation District	Ochoco Irrigation District	Owyhee Irrigation District	N/A	N/A	

Other Facilities		Snake River Pumps Electric Power Generation			
T&E Species	Contact ODFW Regional Office (below) for current species status				
ODFW Contact	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	Northeast Region (541) 963-2138
Adjacent land managers/owners					
	Crook County (with lease to State Parks)	BLM, BIA, USFS Oregon State Parks; Malheur County	Private	Private	BLM, Oregon State Parks; Baker County
ODFW Contact	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	High Desert Region (541) 388-6363	Northeast Region (541)963-2138
Access					
Public ramps?	Y	Y	Y	Y	Y
Private ramps?	Y	Y	Y	Y	N
Moorages?	Y	Y	N	Y	N

APPENDIX VIII. VELIGER ANALYSIS DOCUMENTATION

Sample information:

Name

Date

Location

Preservation Technique

Handling: (OR Veliger sample preservation/handling to meet minimum PCR requirements (e.g. 70% EtOH, cold storage)

Cross Polarized Light microscopy:

Ideal: Images (with scale bar) of multiple life stages, multiple veligers

Description of matrix

PCR:

Amplification technique

Sequencing data

Gel Polaroid

APPENDIX IX. NOTIFICATION LIST FOR REPORTS OF DREISSENIDS IN OREGON. NAMES LISTED IN LIGHT GREY BOXES ARE CONTACTED WHEN WATER BODIES ARE DETERMINED TO BE INCONCLUSIVE. NAMES IN DARKER GREY BOXES ARE CONTACTED WHEN WATER BODIES ARE DETERMINED TO BE SUSPECT.

AGENCY	NAME	PHONE	MOBILE	FAX	EMAIL
Portland State University	Mark Sytsma, Director for the Center for Lakes and Reservoirs	(503) 725-2213	(502) 307-6131	(503) 725-3834	sytsmam@pdx.edu
Oregon Department of Fish and Wildlife	Rick Boatner, AIS Coordinator	(503) 947-6308	(503) 302-5294		rick.j.boatner@state.or.us
Oregon State Marine Board	Glenn Dolphin	(503) 378-2625			glenn.dolphin@state.or.us
Pacific States Marine Fisheries Commission	Stephen Phillips	(503) 595-3100			stephen_phillips@psmfc.org
U.S. Fish and Wildlife Service	Robyn Draheim, Region 1 AIS Coordinator	(503) 736-4722			robyn_draheim@fws.gov
Oregon Department of Environmental Quality	Rian Hooff, Ballast Water Program Manager	(503) 229-6865		(503) 229-6124	hooff.Rian@deq.state.or.us
Oregon State University	Sam Chan, Assistant Professor	(503) 679-4828		(541) 737-3039	samuel.chan@oregonstate.edu
Oregon Governor's Office	Nancy Salber, Office of the Governor	(503) 378-6549		(503) 378-3225	nancy.salber@state.or.us
Oregon Department of Fish and Wildlife	Curt Melcher, Deputy Director	(503) 947-6044	(503) 507-5159	(503) 947-6042	curt.melcher@state.or.us
Oregon Department of Agriculture	Dan Hilburn, Administrator	(503) 986-4663		(503) 986-6330	dhilburn@oda.state.or.us
Oregon Department of Forestry	Wyatt Williams, Invasive Species Specialist	(503) 945-7472			wwilliams@odf.state.or.us
U.S. Fish and Wildlife Service	Mike Carrier, Assistant Regional Dir. – Fisheries	(503) 872-2763			michael_carrier @fws.gov
Washington Department of Fish and Wildlife	Bill Tweit, Special Assistant to Director	(360) 902-2723	(360) 489-2644		william.tweit@dfw.wa.gov
Washington Department of Fish and Wildlife	Allen Pleus, AIS Coordinator	(360) 902-2724	(360) 918-3868		allen.pleus@dfw.wa.gov
Washington Department of Fish and Wildlife	Sgt. Carl Klein, AIS Enforcement Coordinator	(360) 902-2426	(360)790-8006		carl.klein@dfw.wa.gov

Idaho Department of Agriculture	Lloyd Knight, Administrator	(208) 332-8664	(308) 859-4173		lloyd.knight@agri.idaho.gov
Idaho Department of Agriculture	Nic Zurfluh	(208) 332-8686			nicholas.zurfluh@agri.idaho.gov
Idaho Department of Fish and Game	Dave Parrish, Sport Fishing Program Coor.	(208) 287-2773	(208) 539-3937		david.parrish@idfg.idaho.gov
Montana Fish, Wildlife, and Parks	Allison Begley, AIS Coordinator	(406) 444-1267	(406) 431-3784	(406) 444-4952	abegley@mt.gov
Montana Fish, Wildlife, and Parks	Linnaea Schroeer, State Liaison	(406) 444-3378	(406) 461-7413		lschroeer@mt.gov
Nevada Department of Wildlife	Karen Vargas, AIS Coordinator	(775) 688-1532			kvargas@ndow.org
U.S. Fish and Wildlife Service	Kevin Aitkin, AIS Coor., Western WA F&W Office	(360) 753-9508		(360) 753-9407	kevin_aitkin@fws.gov
U.S. Fish and Wildlife Service	Bob Kibler, AIS Coordinator, Idaho F&W Office	(208) 378-5255		(208) 378-5264	bob_kibler@fws.gov
U.S. Fish and Wildlife Service	Joanne Grady, Region 6 AIS Coordinator	(303) 236-4519	(303)842-5268	(303) 236-8163	joanne_grady@fws.gov
U.S. Fish and Wildlife Service	Ron Smith, Region 8 AIS Coordinator	(209) 334-2968, ext. 321			ronald_smith@fws.gov
U.S. Fish and Wildlife Service	Steve Chilton, Northern Nevada AIS Coordinator	(775) 589-5265			steve_chilton@fws.gov
National Oceanic and Atmospheric Administration	Ritchie Graves, Supervisory Fisheries Biologist	(503) 231-6891	(503) 730-5148		ritchie.graves@noaa.gov
National Oceanic and Atmospheric Administration	Scott Rumsey, Salmon Recovery Branch Chief	(503) 872-2791			scott.rumsey@noaa.gov
Columbia River Intertribal Fish Commission	Paul Lumley, Executive Director	(503) 238-0667		(503) 235-4228	plumley@critfc.org
Columbia River Intertribal Fish Commission	Blaine Parker, AIS Coordinator	(503) 731-1268	(503) 314-8238	(503) 235-4228	parb@critfc.org
Columbia River Intertribal Fish Commission	Mike Matylewich, Fish. Management Director	(503) 731-1251	(503) 756-3329	(503) 235-4228	matm@critfc.org
Bonneville Power Administration	Mark Jones, Manager, Federal Hydro Projects	(503) 230-3420		(503) 230-3752	mjones@bpa.gov
Northwest Power and Conservation Council	Jim Ruff, Manager, Mainstem Passage and River Ops.	(503) 222-5161			jruff@nwcouncil.org

APPENDIX X. SAMPLE PRESS RELEASE.

Contact
Rick Boatner, ODFWF Invasive Species Coordinator, (503) 947-6308,
rick.j.boatner@state.or.us

The Oregon Department of Fish and Wildlife (ODFW) has declared _____-_____ a "suspect location" for infestation of invasive quagga mussels. This report has been initially verified by [agency/recognized expert], and efforts are underway to [describe what's next, if anything, to confirm identification].

This discovery is a serious environmental and economic concern for the Pacific Northwest. Invasive quagga and zebra mussels are small nonnative freshwater mollusks that have caused major problems in the United States after their introduction in the 1980s.

Officials have not yet determined how these mussels entered _____. Recreational boats are known to be a major source of invasive mussel spread in the United States, and there are a number of past incidents where boats fouled by live invasive mussels have been intercepted prior to launching in Northwest waters.

In preparation for an introduction of invasive mussels in Oregon, officials developed a rapid response plan outlining a set of actions to address the initial finding and monitor the situation long term.

Until additional surveys are conducted, the extent of the infestation is unknown. During this phase of rapid response, the _____ (agency) has _____ (restricted access) to _____ (infected location) to help prevent further potential dispersal of the invasive mussels. The public can help by avoiding the ____ (infected area) and following some good general guidelines. They should clean all boats, trailers, and other equipment after leaving a lake or stream and never release any live organisms into the wild.

ODFW Invasive Species Coordinator Rick Boatner manages Oregon's boat inspection program and commented on its importance. "We recognize the inconvenience to boaters and understand the need for additional sampling and identification to determine if this water body is positive for quagga mussels," said Boatner. "Our staff will ensure that boats will go through the inspection process as efficiently as possible."

Boaters can assist with the process by arriving at _____ with a clean, drained and dry vessel.

For more information, visit ODFW's website at http://www.oregon.gov/ODFW

APPENDIX XI. OUTLINE FOR DRAFT MANAGEMENT PLAN

Upon discovery of a suspected infestation, the State of Oregon implements its Dreissenid Rapid Response Plan, which includes:

a. Detection activities—define the extent of the mussel infestation, its distribution and maturity.
b. Coordination activities—define the lead agency, coordinate collaboration among agencies, and allocate resources for a response and coordinate communication.
c. Mitigation and control strategies—to avoid further spread of the infestation, control[44] and reduce the size of the infestation and establish a monitoring plan to assess control effectiveness.

Upon confirmation of an infestation (i.e., a water body is determined to be positive for invasive mussels), the State will develop a management plan for that water body. The plan will include the following elements:

- **Identify objectives, priorities, and timeframes.**
    - **Objective: Determine extent of infestation**
        - Establish training and assessment protocols
        - Conduct surveys
        - Compile findings and distribute online
        - Collect additional samples
        - Identify at-risk infrastructure and coordinate with local infrastructure authorities
    - **Objective: Contain infestation**

[44] Details on potential treatment methods can be found in Appendix D1 of the *Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other* Dreissenid *Species*.

- **Coordinate with land management authority to implement mandatory inspection and decontamination of boats upon entry and exit of water body**
- **Ensure decontamination units are available at water body**
- **Communications**
    - **Management Authority-specific**
        - Develop and distribute survey decontamination protocols
        - Train individuals in mussel detection and communication with the public (draft key messages)
        - **Establish and maintain internal communication** protocols with partner agencies.
        - **Establish and maintain communications** with other geographic response organizations.
        - **Develop briefing statements** to inform senior management within the partner agencies.
        - **Establish an interagency public affairs team** to promote coordinated public outreach effort.
        - **Continue to participate in efforts to address quagga/zebra mussels** via 100th meridian, Western Regional Panel, Pacific Northwest Economic Region, and others.
    - **External**
        - **Raise public awareness** via media outlets by issuing news releases, sponsoring a media day event.
        - Post signs at water body and throughout local community.
        - Promote Clean, Drain, Dry

- **Objective: Investigate treatment options**
  - Determine most appropriate option to control or eradication mussels (Review Appendix D1 of the *Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species* to explore treatment options)
  - Explore and implement permitting requirements needed to effect management actions (Refer to Table IV1. Pesticide Use Matrix For An Isolated Zebra Mussel Infestation In Oregon's Columbia River Basin as well as appendices of *Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species*).
  - Coordinate with water body land management authority(ies) to manage use of the lake and control implementation actions.

- **Objective: Identify actions needed to meet statutory responsibility of management agencies**

- **Identify Members of the Scientific Advisory Panel**, composed of both subject matter experts on *Dreissena* spp. as well as limnologists and aquatic ecologists familiar with the watershed (academia, AIS responders with experience in Dreissenid infested waters and others), who can provide planning advice and review response plans.

- **Economics**
  - **Accurately track costs and cost estimates** of the response and share with management authorities and the public. Provide justifications for expenditures.
  - Communicate financial responsibility to all incident responders

- **Identify ecological impacts**
  - Measure and track ecological changes, develop mitigation plans, and implement long-term mitigation actions (examples listed below).
    - Food chain

- Water clarity
- Bioaccumulation of pollutants and toxic metals
- Alteration of waterfowl migration
- Effects on sport fisheries
- Effects on threatened and endangered species