Northwest Power and Conservation Council

July 30, 2009

MEMORANDUM

TO: Council members

FROM: Jim Ruff -- Manager, Mainstem Passage and River Operations

SUBJECT: Follow-up action items from the USBR's July 14 presentation to Council on invasive mussels in the West

As a follow-up to the U.S. Bureau of Reclamation's (USBR) July 14 presentation to the Council about its experiences trying to control invasive mussels in the West, and based on subsequent discussions with members of the 100th Meridian Initiative-Columbia Basin Team, this purpose of this memo is threefold: 1) to provide some background information about invasive mussels and the problems they cause; 2) to identify actions that are currently being implemented; and 3) to propose some additional high priority action items for Council consideration.

Background

Curt Brown and Fred Nibling of USBR's Technical Service Center in the Denver office provided an informative and compelling presentation to the Council in July on invasive mussels in the Bureau's water systems in the West, particularly at Lake Mead and Hoover Dam on the Colorado River. To recap some of their major points, the Council heard that quagga mussels (*Dreissena rostriformis bugensis*), and their close cousin, zebra mussels (*Dreissena polymorpha*), were introduced into the Great Lakes in the ballast water of ships from eastern Europe and the Ukraine in the late 1980s. Quagga mussels were subsequently found in Lake Mead on the Colorado River in January 2007. Since the arrival of this non-native species at Lake Mead, their numbers have multiplied exponentially. The invasive mussels have since colonized the lower Colorado River system, from which 27 million people rely on to irrigate crops, provide drinking water and operate businesses, produce hydropower and recreate.

Of greater concern, mussels have now spread into the states of Nevada, California, Arizona, Utah and Colorado.[1] These western states now face implementing multimillion-dollar control and

[1] Besides Lake Mead and Hoover Dam, some of the major dams, waterbodies and aquaducts the mussels have colonized include Davis Dam and Lake Mohave, Parker Dam and Lake Havasu, Imperial Dam, the Colorado River aquaduct into southern California, the Central Arizona Project canal and Lake Pleasant, San Justo Reservoir south of San Francisco, Grand Lake in northern Colorado, and Electric Lake and Red Fleet Reservoir in northern Utah.

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

mitigation programs to protect their water distribution and irrigation systems, recreational facilities and hydropower infrastructure. These mussels, which can be unknowingly spread by contaminated recreational watercraft, are getting closer to invading Columbia basin waters.

The Bureau representatives explained why *dreissenid* mussels are a problem species. First, they are a non-native species that has broad environmental tolerances and few natural predators in the U.S. They are prolific reproducers because they have early sexual maturity, high fecundity and a good dispersal mechanism. Moreover, the warmer weather in the West has allowed quagga mussels to reproduce much more quickly than in the East. For example, one adult female quagga can have up to six reproductive cycles in a single year, releasing up to a million eggs, and their microscopic larvae (called veligers) float freely downstream in the water currents.

As noted above, one way these invasive mussels can be spread is by being carried by water currents, either in natural water courses or in man-made conveyances such as canals or water distribution systems. They can also be spread by adult mussels attaching to moveable surfaces such as boat hulls, anchors or aquatic plants. Water managers say the best way to prevent their spread is to ensure that recreational boats traveling from one water body to another are mussel-free. Lake Powell, which is upstream of Lake Mead on the Colorado River, now requires mandatory boat inspections. Although the U.S. Department of Interior has boat inspection stations operating at many boat launches around Lake Mead, it recently indicated that "limited resources restrict the feasibility of decontaminating every individual watercraft leaving mussel-infested waterways managed by the Department."[2] California has trained dogs to sniff out mussels at inspection points, and boats can be quarantined at the border if a single mussel is spotted on them. Plus all four Northwest states now have boat inspection programs in place.

Once they colonize a water body, a number of significant problems are caused by *dreissenid* mussels, including flow restriction or blockage of pipes, chemical degradation, mechanical damage, and alteration of aquatic ecosystems. The Bureau showed slides of trash racks that protect Hoover and Davis dams' powerhouse water intakes, where the four-inch gaps between the rack grates were literally closed in less than one year by massive quagga mussel populations. Nibling observed that mussels, if introduced into the Columbia River system, would wreak havoc with juvenile fish screens and bypass facilities at the mainstem dams.

For aquatic ecosystem effects, mussels are voracious filter feeding organisms that can alter the food chain, impact water quality, cause habitat damage and create toxic accumulations when they die. Should these invasive mussels become established in waters of the Columbia River basin, they would impact hydropower generating infrastructure, fish screens and passage facilities, and water delivery systems resulting in costly treatment or cleaning measures. The Bureau indicated that, because they clog water intake and cooling pipes, mussels have affected water cooling systems for turbine bearings, compressors and transformers, with the potential to disrupt hydropower operations at its dams on the Colorado River.

Mussels can grow on just about any surface, except copper, and concrete at dams is one of their favorite surfaces, according to the Bureau. Western water delivery systems have long, continuous reaches of managed, flowing water so mussels can easily spread downstream, and the water systems were not designed to control mussels.

[2] Quote from a July 16, 2009, letter from Secretary of the Interior Ken Salazar to Idaho Governor Butch Otter.

Mussel Control Strategies

To control mussels, the cheapest and best way is to try to prevent their colonization in the first place with boat inspection programs. Where mussels have become established, control strategies become reactive. That is, water delivery systems or hydropower facilities need to be shut down and cleaned out periodically, which can be labor intensive and costly. Redesign of systems is another option that might include retrofitting water intakes or installing filters at power plants to keep out mussel larvae.

In addition, the Bureau is exploring ways to coat surfaces to prevent mussel attachment, and other strategies designed to kill only d*reissenid* mussels, including using irradiation with ultraviolet light and/or a bacterial control method. However, while the bacterial control method has shown some promise, it can only be used in localized or confined areas. As our counterparts in the Northeast and Great Lakes region have found, eradicating the invasive mussels is costly and virtually impossible.[3] The Bureau representatives also predicted that, within about five years or so, the Northwest states should expect to have these mussels invade our waters despite our best efforts at prevention. However, every year of prevention saves the region money.

Cost Estimates of Mussel Control Strategies

The Metropolitan Water District of Southern California delivers water to 19 million people in the greater Los Angeles area. It expects to spend between $10 million and $15 million per year to address recent quagga mussel infestations in its 242-mile Colorado River aquaduct and reservoir water delivery system.

The State of Idaho has stated that, should invasive mussels enter Idaho waters, the adverse impacts would be extreme -- affecting drinking water, irrigation, hydropower and recreational pursuits such as fishing and boating. Idaho has estimated recently that to try to control these mussels, should they become established in state waters, would cost the state roughly $100 million annually.

In addition, the Corps of Engineers (the Corps) has estimated recently that, should invasive mussels become established in Lake Tahoe, Nevada, it could cost that area's tourism-dependent economy more than $22 million per year. Similarly, a 2005 report by the Pacific States Marine Fisheries Commission (PSMFC) found the cost for installing invasive mussel control systems at mainstem Columbia-Snake river hydroelectric projects could range from the hundreds of thousands of dollars to over a million dollars per facility. That report estimated the cost for a hypothetical *dreissenid* mussel mitigation strategy, based on two response scenarios (a sodium hypochlorite[4] injection system and use of anti-fouling paint), at 13 selected federal hydropower projects in the Columbia Basin would be over $23.6 million.

In summary, colonization of invasive mussels can significantly alter aquatic ecosystems. Should these invasive mussels become established in waters of the Columbia River basin, they would impact our hydropower generating infrastructure, fish screen and passage facilities, water

[3] The U.S. Coast Guard estimates that economic losses and mussel control efforts together cost about $5 billion each year in those states where they have already settled.

[4] The use of sodium hypochlorite as a tool to control invasive mussels at mainstem Columbia-Snake river hydropower dams would be problematic due to the expense for the chlorine and buffering system, as well as the environmental scoping that would need to be undertaken as required by NEPA and Endangered Species Act protections and requirements for listed salmonids.

delivery systems, and recreational facilities, resulting in costly treatment or cleaning measures. Moreover, a quagga or zebra mussel presence in Columbia basin would complicate recovery and preservation efforts for aquatic species listed under the ESA (e.g., salmon, steelhead, bull trout, and Kootenai River sturgeon) and may even increase number of listed species in basin. Finally, resources expended on controlling these mussels would likely come at the expense of ongoing regional fish and wildlife restoration efforts.

New[5] Actions Currently Being Implemented or Expected to be Implemented in Pacific Northwest

1. Comprehensive plan for addressing invasive mussels in the West.
    - The USFWS has a $2 million add-on in its FY 2010 Senate Interior appropriations budget. If these funds are appropriated, the USFWS will likely use the funding to implement the Quagga/Zebra Mussel Action Plan (QZAP).[6] The QZAP is being developed by the Western Regional Panel on Aquatic Nuisance Species at the request of the national Aquatic Nuisance Species Task Force.[7] It identifies the highest priority actions and resources needed to minimize the impacts of invasive mussels. Actions include implementation of watercraft inspection and decontamination stations, development of a rapid response fund and increased monitoring efforts.[8] These add-on funds are to be used "for enhanced efforts to control the spread of and eradicate quagga and zebra mussels." Bill language also says "The Committee is concerned with the growing quagga mussel infestation in Western States and the Lower Colorado River, which poses a serious threat to Federal, State, and local natural resources and infrastructure." The bill also "directs the Secretary to develop an Invasive Mussel Control Plan for both quagga and zebra mussels, and to provide the Committee a preliminary plan within 90 days and a final plan no later than 180 days following enactment of this act." The QZAP will likely serve as the mussel control plan. Support and assistance from the Council and other regional parties to maintain this level of funding in the final Interior budget would be most helpful.

    - Northwest states could benefit directly from the proposed $2 million add-on to the USFWS budget based on provisions in the QZAP. Section 1204 (b) of National Invasive Species Act provides grants, administered by the USFWS, to states that have federally-approved Aquatic Nuisance Species (ANS) management plans.[9] Currently there are 31 approved state plans, with additional plans in preparation.

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[5] Note there are already numerous early detection and monitoring, education and outreach, rapid response planning, and watercraft interception projects ongoing in the region being coordinated by the 100th Meridian Initiative-Columbia Basin Team and implemented by state/federal agencies and tribes. The Council should support sustaining the existing staff and resources allocated to maintain these ongoing efforts.

[6] The USFWS is using the QZAP as its primary guidance document for investment; thus any new funds allocated to the Service for enhanced invasive mussel efforts would likely be used to implement this plan.

[7] A second draft of the QZAP is currently being prepared and will be presented to the national Aquatic Nuisance Species Task Force in October 2009 for consideration at its November 2009 meeting. However, large portions of the draft QZAP are being referenced by agencies as part of the ongoing dialogue on steps that need to be taken now.

[8] To fund all of these actions, the draft QZAP recommends an increase in annual funding to $30 million for implementation of federally-approved state Aquatic Nuisance Species (ANS) management plans (see further discussion below on pp. 4-5 and footnote 10).

[9] All four Northwest states currently have federally-approved ANS plans.

The appropriation for FY 2009 (and FY 2010 is expected to be similar) was $1.075 million for state grants. This level of appropriation means that state grants are averaging about $35,000 per state. This funding level is down from approximately $100,000 per state six years ago (when there were fewer approved plans). Additionally, once additional state plans are approved, state funding levels will decrease even further. The QZAP's highest priority is to provide funding for state ANS programs. These funds are critical for states to be able to carry out additional monitoring, outreach and education, rapid response planning, and watercraft inspections. This action is consistent with 2009 Fish and Wildlife Program language which says "each of the four Northwest states should implement the preventative strategies in their respective state aquatic nuisance species management plans." Therefore, support from the Council and other regional parties for maintaining the current $2 million add-on in the current Interior Appropriations budget is needed, as well as seeking secure funding in future years for approved state ANS programs.[10] If the $2 million add-on is appropriated, some of those funds are expected to be used to implement the QZAP, and some funds would likely be distributed by the USFWS to those states with approved state ANS plans, including the four Northwest states.

2. Enhanced early detection monitoring and analysis of larval and settled mussels.
    - At the July 14 Council meeting, the Bureau of Reclamation indicated it has initiated an 18-month evaluation for early mussel detection at 60 of its reservoirs throughout the West. This monitoring, funded under the 2009 American Recovery and Reinvestment Act, includes 27 reservoirs in the Pacific Northwest region ranging from Hungry Horse in Montana, to American Falls in Idaho, to Lake Roosevelt in Washington, to Owyhee in Oregon. The sampling will involve the use of plankton tows; some samples have already been taken from Columbia basin reservoirs and have been sent to the Bureau's Technical Service Center in Denver for analysis. Implementing this veliger monitoring program in a timely manner, including rapid laboratory analysis of water samples, will be critical, as this represents the largest single monitoring effort for *dreissenid* mussels that has been undertaken to date.

    - In addition, the USFWS decided recently to provide $26,000 to implement the second phase of an early detection and analysis study which will compare the accuracy and effectiveness of various methods available to detect mussel veligers, e.g., microscopy vs. molecular analysis vs. visual imaging software/hardware.[11]

    - Similarly, the USGS has a $350,000 add-on in its FY 2010 House and Senate appropriations budgets "for the development and testing of protocols for monitoring invasive species, including zebra mussels, in the Columbia River Basin in collaboration with Washington State University and its partners."

[10] Seeking more secure funding in future years could include support for reauthorization of the national Invasive Species Act, which is long overdue and likely where parties will advocate for $30 million in annual funding for implementation of approved state ANS plans, as identified in footnote 8.

[11] An workshop on early detection was held early this year in Denver as part of the 100th Meridian Initiative. That meeting identified a number of needs to enhance analysis, sampling protocols, etc., some of which are now being implemented, and which are consistent with those identified in the Quagga/Zebra Mussel Action Plan.

Support for, and assistance from, the Council and other regional parties to maintain this level of funding in the final Interior budget would be helpful.

3. Evaluation and refinement of watercraft decontamination protocols and alternative methods**.**
    - USBR has asked USGS to develop a proposal to address this issue. The Bureau has some funding to allocate for this evaluation. Presently, a group of USGS scientists, private industry, and the National Park Service staff is working to develop this proposal. The objectives will be to create a research structure (possibly on National Park Service property at Lake Mead) that has all the necessary equipment, etc. to research, develop, test and evaluate various watercraft cleaning methods. Research will be conducted on existing methods and new cleaning methods will also be developed and evaluated. The study plan will include a short-term component to quickly evaluate existing cleaning methods and a longer term component to improve the testing capacity and develop improved watercraft cleaning methods. The Council should support the need for this two-pronged evaluation.

    - In addition, the USFWS is planning to fund a competitive-bid study to evaluate the efficacy of hot power wash watercraft decontamination. The goal is to have the successful candidate begin this research in late 2009. For the immediate future, using hot power wash to decontaminate boats will be the main mitigation technique and is the current foundation of the Northwest states' decontamination programs.[12] This short-term study will help the region make the hot power wash cleaning method more effective and standardized, or it will provide more reason to pursue additional technologies as evaluated and identified in the USBR/USGS study above. This effort will need to be accomplished in phases and require multiple sources of funding. States will likely continue to resist accepting each other's watercraft cleaning methods until reliable methods are rigorously tested and approved.[13] The Council should support the need for this short-term evaluation.

4. Research and development of new mussel prevention and eradication tools, particularly within water delivery systems**.**
    - On July 14, the Bureau informed the Council it has undertaken a series of tests to determine whether a common bacteria can kill *dreissenid* mussels. Some preliminary testing has been done at Davis Dam on the Colorado River at Laughlin, Nevada. Quagga mussels were exposed to a dead form of *Pseudomonas fluorescens* bacteria, which is a non-infectious microbe that occurs commonly in soil and water. Testing was also conducted in a laboratory setting under conditions simulating water flowing through a dam. A third experiment will involve a domestic water intake line at a dam that is currently encrusted with 2 to 3 inches of mussels. If these tests provide positive results, USBR may then

[12] Resource agencies are aware that hot power wash, as practiced, is not 100 percent effective in all cases.

[13] On issue of improving Northwest states' coordination on watercraft inspections, states are beginning to realize the wisdom of accepting each other's inspections. Currently, boat inspections done in other states will serve to "expedite" acceptance of the watercraft by the receiving state.

implement a larger scale evaluation, possibly at a marina, pending obtaining necessary permits, cost and availability of large quantities of the bacteria.

- In addition, USGS scientists are working with a biocide manufacturer to conduct preliminary tests on their product to evaluate its potential for killing zebra/quagga mussels in the environment and/or within water delivery systems. Data should be available in November to determine if further testing is warranted.

Additional High Priority Action Items for Council Consideration

The following are some additional high priority action items for Council consideration, which are largely consistent with 2009 Fish and Wildlife Program language. Specifically, the Program states "where aquatic non-native species pose both a direct threat to the hydropower system or to native fish and wildlife species, federal action agencies should support ongoing federal, state, and tribal efforts to: 1) detect and respond; 2) educate the public; and 3) prevent, monitor, control, and stop or minimize the spread of non-native species, including zebra or quagga mussels … that threaten the success of Fish and Wildlife Program measures."[14]

1. Enhanced early detection monitoring and analysis of larval and settled mussels.
    - The Corps of Engineers recognizes the needs to increase its monitoring efforts for mussel larvae (veligers) at its mainstem hydropower projects, as invasive mussels pose a serious risk to Corps projects' infrastructure (fish passage and navigation facilities as well as hydropower) and the regional ecosystem. However, the Corps is limited by lack of authorities to address invasive species that are not currently in the Columbia basin.[15] The Corps will be conducting monitoring this summer for mussel veligers at only Bonneville, The Dalles and John Day dams.[16] These projects were identified as priority areas for monitoring through discussions with the 100th Meridian Initiative-Columbia Basin Team. The Corps is in the scoping stage of setting priorities for other veliger monitoring locations for 2010. The level of monitoring in 2010 will be based on funding availability and the extent of ongoing sampling by others in the basin, and priority monitoring areas will be coordinated with others in the region. Funding for veliger monitoring would normally come out of the Corps' O&M budget, which is limited. Support for, and assistance from, the Council and other regional parties to identify and include funding for this work in the Corps' FY 2011 O&M budget[17] is needed. If additional funding could be identified, the Corps could likely develop and implement a broader monitoring plan beginning in 2010. As additional high priority monitoring locations are identified, the Corps should be encouraged to find funds to expand its veliger monitoring beginning in 2010 and certainly by 2011.

[14] This Program language can be found on page 100 of the 2009 Columbia River Basin Fish and Wildlife Program.
[15] While lack of authority does not prevent the Corps from conducting monitoring, it presents a budget problem when requesting funding specifically for mussel monitoring activities. The Corps says it also does not have the capability to re-program existing funds for purposes that are not authorized.
[16] The Corps has indicated that project personnel are looking for adult quagga/zebra mussels on structures on all its dams in the Northwest as part of their regular weekly O&M inspections.
[17] The Corps' FY 2011 budget cycle included requests for funds to conduct veliger monitoring at specific Corps facilities, as well as allocations to prepare rapid response plans, including risk assessments to the facilities.

- There are opportunities to expand the use of Hazard Analysis and Critical Control Point (HACCP) plans, which is the most established risk assessment method in place to address early detection and prevention of non-native species such as mussels. USFWS already has an established training program for HACCP plans, as well as pilot programs that can be used as models to assist in development of HACCP plans to provide documentation of prevention best management practices by an agency such as Bonneville. The Council should support the need for all future projects implemented under the Fish and Wildlife Program to include an explanation of how the project sponsor(s) considered and reduced the risk of spreading aquatic nuisance species. To document prevention best management practices, Bonneville, in its contracting process, could require development of HACCP plans as part of all future Fish and Wildlife Program projects or, at a minimum, require all project sponsor(s) to explain in writing how the project considered and reduced the risk of spreading aquatic nuisance species. Again, this recommendation is consistent with 2009 Fish and Wildlife Program language which states "The federal action agencies should incorporate the most up-to-date risk assessment methodology for aquatic nuisance species into on-the-ground fish and wildlife projects." (p. 100 of the Council's 2009 Fish and Wildlife Program)

2. Development of Rapid Response Plans.
    - The Corps needs to initiate and complete mitigation planning for invasive mussels, e.g., scoping the possible risks and impacts of mussels at all of its mainstem dams and fish passage facilities and develop potential control measures. Some initial mitigation planning has occurred at a couple of projects, but every mainstem dam needs to undertake a "vulnerability assessment," as well as prepare rapid response plans, in the event that mussels are found in Columbia basin waters. Currently the Corps, while recognizing the need to conduct such vulnerability assessments and prepare rapid response plans, has no funding identified to implement such work. Funding for these assessments would normally come out of the Corps' O&M budget, which is very limited. Support for, and assistance from, the Council and other regional parties to identify and include funding for this work in the Corps' FY 2011 budget is needed.[18] If options for additional funding could be identified, the Corps could likely initiate vulnerability assessments and rapid response planning at some of its projects beginning in next year.

    - The federal action agencies, as well as NOAA Fisheries and regional utilities, should be encouraged to continue to align their mussel monitoring, prevention and mitigation efforts under the two primary existing regional coordination forums: the 100th Meridian Initiative-Columbia Basin Team and the Western Regional Panel on Aquatic Nuisance Species. The federal action agencies are active participants in the former group, although the Corps and USBR have not been major contributors to some of the regional prevention collaborations, such as the

[18] According to the Corps, the earliest it could obtain Congressional funding to conduct additional mussel monitoring, develop rapid response plans and/or conduct vulnerability assessments would be as part of its FY 2011 budget (see footnote 16).

Watercraft Inspection Training program. NOAA's regional office has been completely disengaged in these efforts.

- The federal action agencies, as well as NOAA Fisheries and regional utilities, should be strongly encouraged by the Council to embrace and use the Western Regional Panel's draft Quagga-Zebra Mussel Action Plan (QZAP) as the region's initial common plan for federal agencies to follow in terms of direct action, priority funding needs, and support.

- The QZAP states "a dedicated fund is necessary to rapidly implement containment at waters found to be positive with zebra or quagga mussels. Rapid response is necessary to contain infestations and limit impacts." QZAP identifies numerous actions related to a rapid response plan, including create and maintain a rapid response fund, finalize a notification database, complete rapid response plans for all major western water bodies, establish an effective response personnel infrastructure, and develop processes and documents to expedite approval of response tactics that may have short-term environmental impacts. NOAA Fisheries has not yet signed onto the Columbia River Basin Rapid Response Plan; the Council should encourage NOAA management to do so immediately. Although all of the QZAP needs described above apply to the Columbia basin, a particularly critical gap in the region involves availability of information and frameworks to expedite environmental compliance permitting for rapid response tactics (e.g., using chlorine-based compounds to try to eradicate an isolated mussel population in a watershed with listed species). An estimated $200,000 is needed, either in funding or dedicated staff support, to fill this gap. USFWS and other agencies will continue supporting rapid response exercises and other strategies designed to enhance readiness to implement the Columbia River Basin Rapid Response Plan. In the long-term funding for this permitting work will most likely come from appropriations to implement the QZAP. However, if additional funds could be identified in the near term, this work could be initiated and completed sooner.

- USGS is working with USFWS and PSMFC to develop the capacity for a trained team of divers to respond rapidly to a reported zebra/quagga mussel infestation in the Columbia basin. The dive team would explore the site, verify if the mussels are present, and estimate abundance and the range of the infested area. The type of rapid response, if any, would be determined from this scoping effort. USFWS is providing $20,000 to USGS in FY09 to begin development of diver-based detection protocols and associated training materials. An estimated $20,000 in additional funds is needed annually to support further training, protocol refinement, and periodic exercises. In the long-term funding for this rapid response dive work will most likely come out of appropriations to implement the QZAP. However, if additional funds could be identified in the near term, this work could be initiated and completed sooner.

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Follow-Up Actions for Invasive Mussels in Columbia River Basin

Council Meeting
August 12, 2009
Spokane, Washington

Zebra/Quagga Mussel Facts

- Adults are relatively small (0.25 to 2 inches long)
- Benthic organisms that can attach to almost anything (boats, trailers, docks, pilings, concrete, rocks, mud) using byssal threads (native mussels do not have)
- Mussel densities have been recorded as high as 700,000 per sq. meter
- Each mussel can filter more than 1 liter of water/day
- Can reproduce in waters between 42-77 degrees F
- Prolific reproductive cycle: one adult female can have 2-6 reproductive cycles in a year & produce more than 1 million eggs in a 2-3 year lifetime
- Adults can survive in air for days -- larvae can survive in water for weeks
- Have not been eliminated from any large bodies of water in East, Midwest or Southwest

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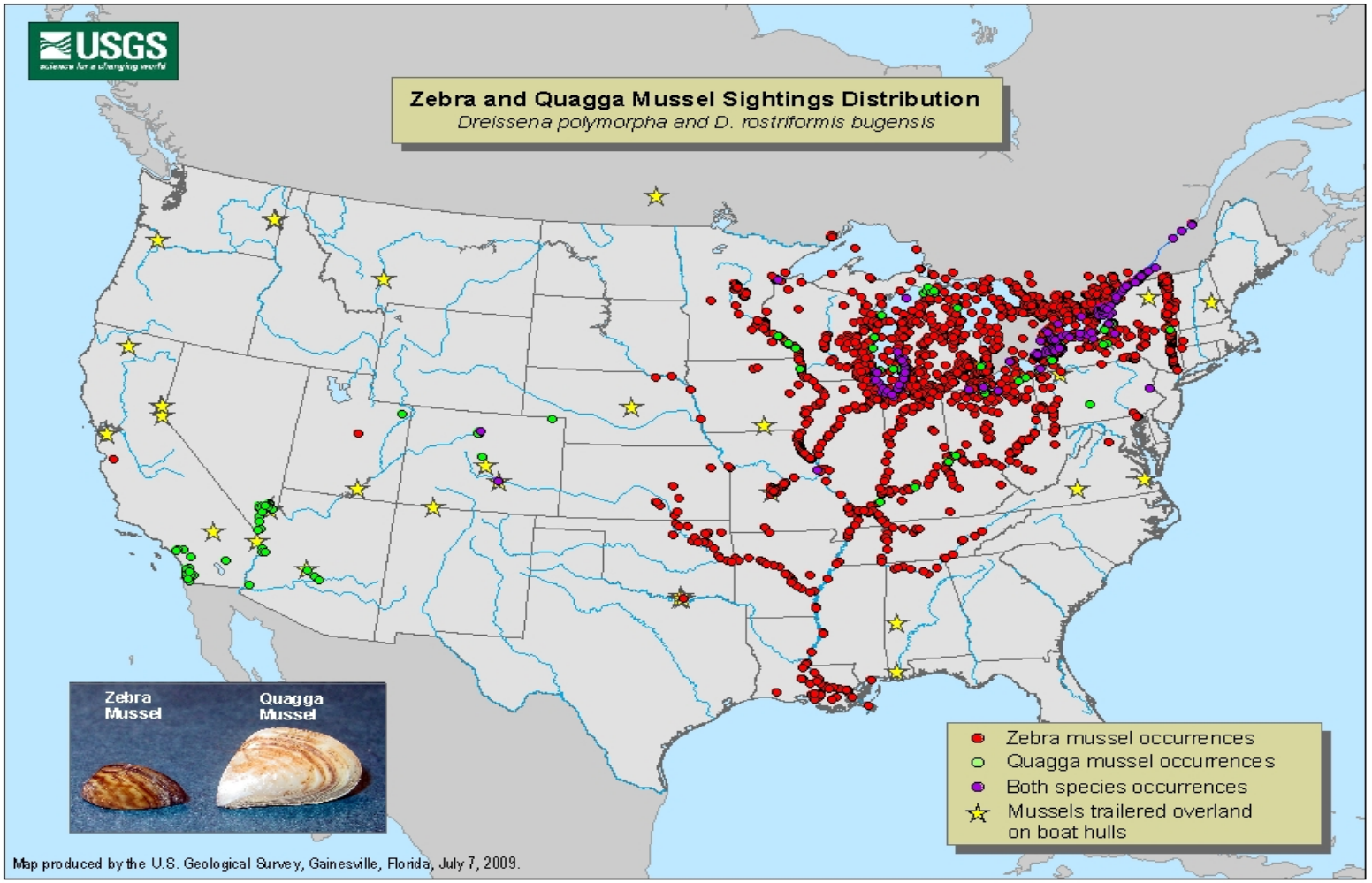
Current Mussel Distribution in U.S.



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Problems Caused by Q/Z Mussels

- Flow Restriction
  - Roughening (friction loss)
  - Blockage
- Chemical Degradation
- Mechanical Damage
  - Abrasion
  - Lifting coatings when removed
- Ecological/Environmental
  - Disrupts food chain
  - Habitat damage
  - Water quality changes
  - Toxic accumulations
  - Water resource industry
  - Water-based recreation

Ecological Effects of Z/Q Mussels

- Outcompete and kill native mussels & clams
- Cover all available substrate
- Disrupt entire food web
  - Filter-feed on algae and animals (zooplankton) in water column
  - Can remove 80% of edible plankton
  - Deprive juvenile and smaller fish of food
  - Can cause a crash in fish populations
- Concentrate toxins in their tissue and waste
  - Aquatic invertebrates and fish feed on mussels and pass toxins up through the food web
- Increase water clarity
  - Can cause more algal or aquatic plant growth along shorelines
  - Can contribute to toxic algal blooms

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Spillway Gate at Davis Dam on Colorado River

Photo courtesy of USBR

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Impacts of Z/Q Mussels on People

- Clog intake pipes and distribution networks for municipal, agricultural and power plant water supplies
  - Est'd. $1 billion in damages and control efforts per year, with an est'd. $7 billion spent since 1988 in U.S.
    - Manual removal, chemicals, electrical current, screens, de-watering and drawdowns
  - Costs are passed on to rate payers
  - Invasive mussels would have a significant cost to region's ratepayers and impact regional F&WL restoration efforts
- Decreased recreation and angling opportunities
  - Fish population crashes
  - Water bodies closed to recreation
  - Beaches unusable when covered w/sharp mussel shells

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Trashracks at Hoover Dam

Photo courtesy of USBR

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New Actions Underway in NW-I

- Q/Z Mussel Action Plan (QZAP)
  - QZAP is being developed for Western Regional Panel on ANS
  - Will serve as Q/Z mussel action plan for western states
  - Actions include boat inspection/decontamination stations, rapid response fund and increased monitoring efforts
  - FWS has $2 million add-on to its FY 2010 Senate budget
  - Support is needed from NPCC and regional parties to maintain this level of funding
- Funding for State ANS Programs
  - National Invasive Species Act provides grants thru FWS to states with approved ANS plans
  - All four NW states have approved ANS plans
  - Highest priority in QZAP is to provide funding for state ANS programs
  - Action is consistent with 2009 F&WL Program language
  - Support needed from NPCC & regional parties to maintain $2M Senate add-on funding in 2010 FWS budget & secure funding in out-years

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New Actions Underway in NW-II

- Enhanced early detection monitoring and analysis
  - USBR veliger monitoring effort at 27 reservoirs in NW
  - FWS and USBR will evaluate effectiveness of various detection methods
  - USGS has $350K add-on in its FY2010 budget to develop and test Q/Z monitoring protocols in Columbia Basin
  - Support is needed from NPCC and regional parties to maintain this level of funding
- Evaluate & refine watercraft decontamination protocols
  - USBR is working with USGS to develop a study proposal to develop, test & evaluate various boat cleaning methods
  - FWS is funding a study through PSMFC to evaluate hot power wash boat cleaning method to make it effective/standardized
  - Support needed from NPCC & regional parties for both evaluations

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New Actions Underway in NW-III

- Research and development of new Q/Z mussel prevention and eradication tools
  - USBR has multi-phased tests underway at Davis Dam on Colorado River to determine whether a common soil bacteria can kill Q/Z mussels
  - USGS is working with a biocide manufacturer to conduct preliminary tests to evaluate its potential to kill mussels
  - Council staff will keep up-to-date on status of these studies

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High Priority Action Items

- Enhanced early detection and monitoring-I
  - Corps understands need to increase monitoring at its hydro projects, but lacks “authority”
  - Corps will be monitoring only at BON, TDA & JDA dams in 2009; monitoring level for 2010 depends on availability of limited O&M funding
  - Support is needed from NPCC and regional parties to identify and include funding in Corps’ 2011 O&M budget & secure funding in out-years

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High Priority Action Items

- Enhanced early detection and monitoring-II
  - Expand opportunities to use FWS' Hazard Analysis & Critical Control Point (HACCP) plans
  - HACCP planning is established risk assessment method to address early detection & prevention of non-native species such as Z/Q mussels
  - Current FWS policy to use HACCP plans as ANS compliance documentation for fish passage grant projects
  - Action is consistent with 2009 F&WL Program
  - Council should support the need for all future projects implemented under F&WL Program to include evaluation of risk of spreading ANS

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High Priority Action Items

- Development of Rapid Response Plans
  - Corps needs to complete mitigation planning for Z/Q mussels – scoping risks, impacts & possible control measures – at all of its hydro dams and fish facilities in CRB
  - Corps understands it needs to conduct such vulnerability assessments, but has no funding
  - Support is needed from NPCC and regional parties to identify and include funding for these assessments in Corps' 2011 O&M budget

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High Priority Action Items

- Development of Rapid Response Plans-II
  - Council should encourage the federal action agencies and NOAA-F to continue to align mussel monitoring, prevention and mitigation efforts under 100th Meridian Initiative-CRB Team and Western Regional Panel on ANS
  - Council should also encourage same parties, as well as regional utilities, to embrace and use the QZAP as region's common plan for Q/Z mussels
  - NOAA Fisheries should be encouraged to sign onto the CRB Rapid Response Plan

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High Priority Action Items

- Development of Rapid Response Plans-III
  - While QZAP actions will form basis for region's response to threat of Q/Z mussels, a critical gap exists in available information & frameworks to expedite environmental compliance permitting to allow for rapid response
  - Estimated $200K is needed in funding or staff support to fill this gap
  - In long term, funding for this permitting work likely come from appropriations to implement the QZAP
  - Support is needed from NPCC and action agencies to identify some funding to expedite this work in near-term

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High Priority Action Items

- Development of Rapid Response Plans-IV
  - USGS, FWS & PSMFC are working to develop a trained team of divers for rapid response in CRB
  - Dive team would explore site and scope the level of rapid response needed
  - FWS is providing $20K to USGS in 2009 to begin developing diver protocols and training materials
  - Est'd. $20K is needed in future years to support training, diver protocols and periodic exercises
  - In long term, funding for this diver training work likely come from appropriations to implement the QZAP
  - Support is needed from NPCC and action agencies to identify some funding to continue work in near-term

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