Northwest Power and Conservation Council

June 28, 2007

MEMORANDUM

TO: Council Members

FROM: Steve Waste, manager, program analysis and evaluation
Jim Ruff, manager, mainstem passage and river operations

SUBJECT: Panel briefing on aquatic invasive species -- Zebra and Quagga mussels

This will be an informational briefing to compliment the Science-Policy exchange in preparation for the upcoming Program amendment process. No decision by the Council is necessary.

An interagency panel of experts will brief the Council on the current status of aquatic invasive species in the Columbia River Basin, focusing on Zebra and Quagga mussels, the epidemiology of invasive species outbreaks, and efforts underway to develop an early detection system. The panelists will include:

- Stephen Phillips of the Pacific States Marine Fisheries Commission
- Scott Smith of the U.S. Geological Survey
- Paul Heimowitz of the U.S. Fish and Wildlife Service

Invasive Species in the Columbia River Basin: Three key Issues

Preventative v. Curative Approach - There have been relatively few examples of success in eradicating well-established invasive species at an ecosystem level. Thus, the prevention and early detection of new introductions are essential. A proactive approach to preventative efforts, i.e., anticipating invasions and identifying at-risk areas, could potentially save the region many millions of dollars in future efforts to control invasive species. Once they become established, they can adversely affect the ecosystem by threatening native flora and fauna.

Early Detection - Early detection efforts are essential to prevent the incursion of aquatic invasive species. The panelists will describe proposed early detection research and development projects to identify pathways of introduction and related preventive actions that can reduce the risks of introduction and the spread of aquatic non-native species.

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Rapid Response - The panel will also describe how an interagency work group is preparing for a rapid response in the event invasive species are introduced into the waters of the Columbia River basin. They will describe the development of a Rapid Response Plan, as well as discuss future plans and needs to support a rapid response to aquatic invasive species.

Attachment 1 is a briefing paper prepared by the panelists about the Zebra and Quagga Mussel threat to the Columbia River Basin.

Background Information on Invasive Species

For the purpose of this memo, invasive and native species are defined as, as follows:

- "invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health

- "native species" means a species that historically occurred or currently occurs in an ecosystem, without being the result of an introduction

(From Section 1 of Presidential Executive Order 13112 Invasive Species).

In 1993 a detailed review of invasive species by the Office of Technology Assessment determined that they comprise one of the most significant alterations of native ecosystems and are rapidly becoming a dominant component of ecosystems within the Columbia River basin. A regional survey found 81 nonnative aquatic species below Bonneville Dam and, although the impacts of non-native fish stocked for recreation are widely recognized, many other non-native plants and animals also could have a large impact on aquatic habitat and productivity, including such introduced species as Eurasian milfoil, New Zealand mud snail, Japanese knotweed, Himalayan blackberry, giant reed, and Zebra and Quagga mussels.

Non-native species affect native fish and wildlife both directly such as predators or competitors, or indirectly, by altering food webs, water chemistry, and physical habitat attributes. Some of the most challenging long-term management problems involve species such as rainbow and brook trout which were introduced to provide angling opportunities. Such intentional introductions of taxa have proven just as likely to cause harm as unintentional introductions. This concern has been voiced by the ISRP, and it triggered their recent request to the Council for an ISAB review of the use of non-native fish in resident fish substitution programs within the Fish and Wildlife Program.

Additionally, there may be conflict between the value of fish passage restoration for native species and the chance that providing such passage may allow non-native species and new diseases to spread. Thus, there is a need for better assessments of the biological and economic consequences of such invasions, including work to identify patterns and consequences of invasions on native species and ecosystems. The Research Plan for the Columbia River basin found that initial baseline information and monitoring are necessary to detect trends in abundance of non-native and invasive species, and targeted research on invasives is required to

better understand the structural and functional changes in ecosystems, habitats, and food webs that they cause. In addition, the plan identified three critical uncertainties:

- What is the current distribution and abundance of invasive and deliberately introduced nonnative species (e.g., the baseline condition), and how is this distribution related to existing habitat conditions (e.g., flow and temperature regimes, human development, restoration actions)?

- What are the primary pathways of introduction of invasive and nonnative species, and what methods could limit new introductions or mitigate the effects of currently established invasives?

- To what extent do (or will) invasive and nonnative species significantly affect the potential recovery of native fish and wildlife species in the Columbia River Basin?

Attachment 1.

Briefing Paper:
The Zebra and Quagga Mussel Threat to the Columbia River Basin

Background and Prevention
Early Detection
Rapid Response

Prepared for the
Northwest Power and Conservation Council

Stephen Phillips, Pacific States Marine Fisheries Commission, Portland, OR
Scott Smith, US Geological Survey, Seattle, WA
Paul Heimowitz, US Fish and Wildlife Service, Portland, OR

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I. Background and Prevention Efforts

(Stephen Phillips, PSMFC, stephen_phillips@psmfc.org)

Aquatic nuisance (or invasive) species (ANS) are nonindigenous organisms that threaten the diversity or abundance of native species. They also threaten the ecological stability of infested waters and commercial, agricultural, aquacultural or recreational activities dependent on such waters. In addition to adversely affecting activities dependant on waters of the United States, ANS can adversely affect individuals, i.e., health effects. Some more familiar invasive species include the common carp, nutria and Eurasian watermilfoil.

Zebra/Quagga Mussels: Two closely related nuisance species — the zebra mussel (*Dreissena polymorpha*) and the quagga mussel (*Dreissena rostriformis bugensis*) — are of particular concern to the Columbia River Basin (CRB) because of their proven capability to cause significant ecosystem and economic damage. These mussels can reach astonishing densities — up to 750,000 individuals per square meter in layers more than a foot thick — although lower densities are more common. Their destructive power lies in their sheer numbers and their ability to attach themselves to solid objects, such as water intake pipes, turbine generator coolers, irrigation pipes, boat hulls, dock pilings, submerged rocks, and even other aquatic animals. Billions of dollars have been spent in the eastern U.S. on zebra mussel prevention and control.

If introduced into the Columbia River Basin, zebra mussels and quagga could threaten the health and survival of native salmon and steelhead stocks, many of which are protected under the Endangered Species Act. These mussels, with their sharp shells, will infest fish ladders, fish diversion screens, and other pipes and conduits that are used by salmonids (and lamprey) to make their way around dams. Extensive and costly maintenance at fish passage facilities could be required in order to protect salmonids from the damaging affects of zebra/quagga mussels. Being filter feeders, these mussels can also have profound effects on the ecosystems they invade because they can consume huge quantities of phytoplankton, thus affecting the food web of the invaded ecosystem.

Lake Mead Infestation: Prior to January 2007, it was thought that the zebra/quagga mussel distribution in the United States was limited to east of the 100th Meridian (See Figure 1). However, the threat to the CRB from these mussels was significantly amplified when in January 2007 quagga mussels were discovered in Lake Mead. The mussels have spread downstream into Lakes Havasu and Mohave, and subsequently entered the California Aqueduct. Mussels were also found in the Lake Mead state trout hatchery. Prior to their discovery, it is possible that trout and contaminated water from the hatchery were transported to several locations in Nevada in 2006; including the Wild Horse Reservoir in the Owyhee River system in northern Nevada, which is part of the Columbia River Basin. Monitoring at the reservoir through June 15 has not detected any quagga mussels.

Prevention Activities: It is generally agreed that the most effective means for stopping the spread of dreissenid mussels is by mandatory inspection/decontamination stations

at key highway points for all recreational watercraft. Implementing such a program, however, is extremely costly and beyond the means of resource agencies at this time. Therefore, resource managers have concentrated efforts to combat quagga/zebra mussels through educational outreach such as distributing information through print and electronic public service advertisements, traveler information stations, newsletters, videos, brochures, public presentations, etc. These efforts have been targeted at water-based user groups, industries and field personnel most likely to come into contact with zebra mussel vectors (e.g. recreational watercraft) and include marinas, commercial boat haulers, and law enforcement, marine safety and natural resource agencies. Evaluation data demonstrates that these efforts lead to increased awareness and behavior change among the target audiences.

With the zebra and quagga mussel threat now coming from both the eastern United States and the Lower Colorado River Basin and interceptions of contaminated watercraft occurring on a consistent basis, it is imperative that prevention activities target invasion pathways. Zebra/quagga mussels are not the only invasive species threat that is transported by recreational watercraft into the Columbia River Basin. Other species of concern include the Eurasian watermilfoil, Asian carp and the New Zealand mudsnail. Outreach and regulation aimed at stopping the spread of zebra and quagga mussels will stop other ANS transported by the same pathways.

Watercraft Inspection Training: Beginning in 2006, the PSMFC (with funds from the USFWS and BPA) began training boating law enforcement personnel in the western U.S. on the background, biology and impacts of zebra mussels; how to identify high risk watercraft and conduct an inspection of all types of watercraft; how to perform a vessel decontamination; and what their legal authority is to stop, detain, and require decontamination of watercraft suspected of harboring zebra mussels. To date 10 trainings have been conducted across the western United States, including Idaho, Oregon and Washington. A dozen more trainings are anticipated in the next 12 months. A video version of the training has been developed.

FUTURE NEEDS

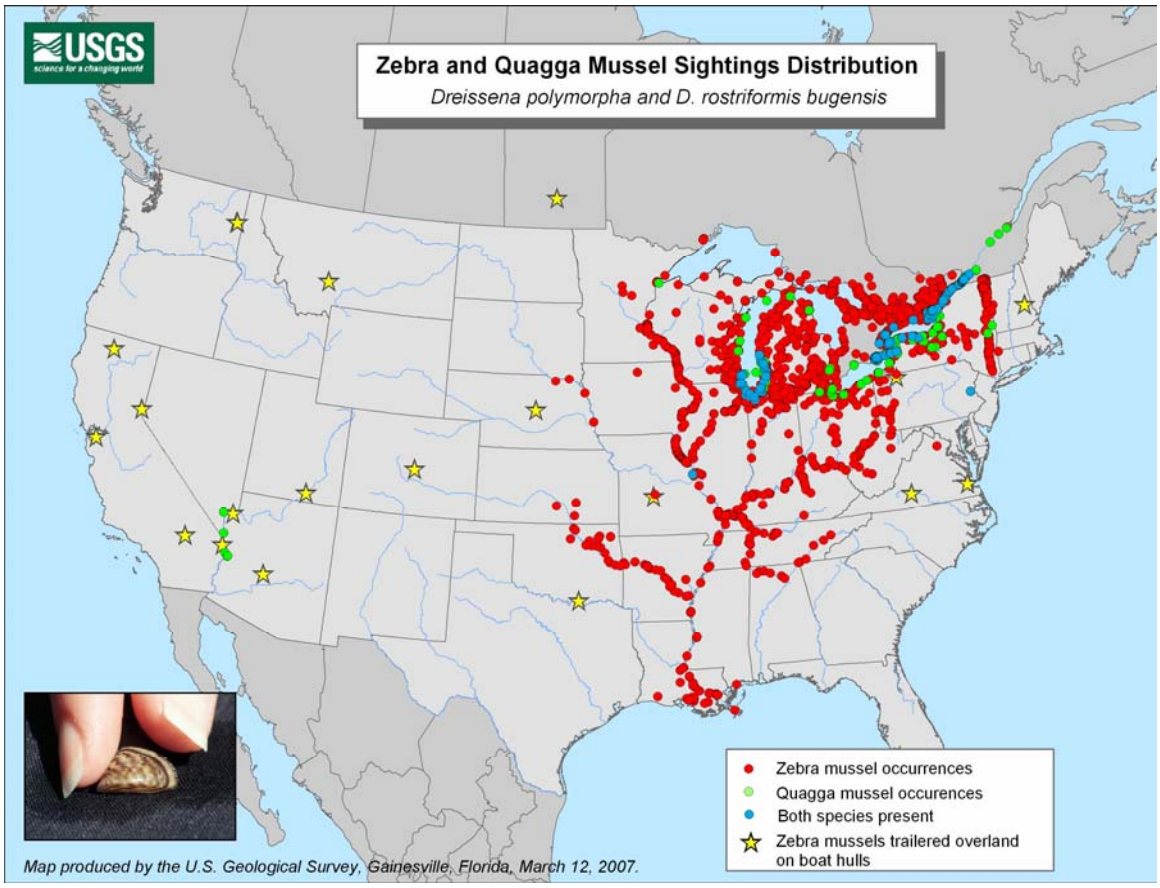
1. **State Program Support:** Currently, the four CRB states all have aquatic nuisance species programs with Washington State having the most comprehensive program. Oregon, Idaho and Montana are the most in need of additional ANS program support for monitoring, outreach and education and prevention activities. (Note: Because of the Lake Mead quagga mussel invasion, the State of Utah is hiring 35 new ANS staff. In January, the State of California released $1 million for quagga mussel response).

2. **State Legal Authority:** ANS laws in Oregon, Idaho and Montana need to be strengthened so that law enforcement has clear authority to stop suspected contaminated vessels and seize/decontaminate if they are infested with ANS.

3. **Boater Inspection Stations:** The only CRB state with boat inspection stations is Washington. Interception capability at state borders needs to be enhanced and this includes staffed decontamination facilities.

4. **Expanded Outreach:** Although current programs reach a large portion of the target audience, there are still many users of Northwest waters who are not aware of zebra/quagga mussels and/or have not adopted practices that prevent spread. A larger cadre of outreach workers can ensure more direct contact at all major water use areas in the Columbia Basin.

Figure 1: Zebra and quagga mussel distribution through March 2007.



II. Zebra/Quagga Mussels: Implementing and Improving Early Detection *(Scott Smith, US Geological Survey, sssmith@usgs.gov)*

Background:

- Despite existing early detection efforts in the Lower Colorado River quagga mussels were not discovered until 3 or more years after their introduction.

- Inability to quickly detect the quagga mussel introduction in the Lower Colorado River eliminated any hope of eradication, caused a fish hatchery to stock 5 lakes

with potentially infested water, and allowed many potentially infested boats to leave the area without proper cleaning to avoid spread.

Status:

- The Columbia Basin Team of the 100th Meridian Initiative has created an early detection program for zebra/quagga mussels in western states. The existing program contains the following elements:

    1. A system for reporting zebra/quagga mussel sightings, supported by state and national reporting numbers and a variety of outreach programs and materials (e.g., identification cards)

    2. A network of professionals and volunteers who deploy settling substrates in over 15 states to detect juvenile and adult mussels

    3. A system of periodic plankton sampling in 10 states, and associated microscopic and genetic analysis, for detecting larval zebra/quagga mussels

    4. An organizational structure to coordinate the individual monitoring efforts conducted by multiple individuals and organizations

    5. Online database and map that shows where zebra/quagga mussel monitoring is occurring (http://100thmeridian.org/monitoring.asp)

    6. Integrated reporting of new zebra/quagga mussel introductions into the USGS Nonindigenous Aquatic Species national database and alert system (http://nas.er.usgs.gov/)

Future Plans/Needs:

- Existing early detection efforts for zebra/quagga mussels in the Columbia River Basin are a good start, but the following improvements are needed in order to avoid repeating the problems caused by the lack of early detection in the Lower Colorado River.

    1. Sampling sites should be reviewed for their level of risk, and the frequency of sampling needed to produce a high probability of detecting zebra/quagga mussels early.

    2. No one detection method is sufficient to provide a high probability of detection. A mix of existing detection methods should be employed and new improved methods developed

    3. No one organization/agency has all of the resources required to implement a truly effective early detection program. New partners and

additional funds are needed to support a truly effective early detection effort for zebra/quagga mussels and other aquatic invasive species in the Columbia River Basin.

4. The USGS Western Fisheries Research Center is working with the 100th Meridian Initiative partners to develop a proposal for submission to the Department of Interior. If funded, this proposal will fill the gaps in our existing early detection program and improve our current ability for early detection. The following is a description of the 5 elements of this proposal.

Proposed Cooperative Early Detection Research and Development Projects

1. Develop faster, easier to use, cheaper and more effective methods of detecting zebra mussels in plankton samples.

2. Research and develop new methods of detecting adult zebra mussels by using high-resolution sonar and advanced optical technologies deployed on Remote Operated Vehicles (ROV) or Autonomous Underwater Vehicles (AUV).

3. Develop improved methods to identify sites within the Columbia River Basin that are at a high-risk of a zebra mussel infestation and supplement ongoing monitoring efforts to increase the probability of early detection.

4. Develop a rapid response dive team to locate and evaluate reported findings of adult zebra mussels in the Columbia River Basin.

5. Establish a volunteer diver program to assist in the detection of adult zebra mussel populations in the Columbia River Basin.

III. Preparing for Rapid Response

(Paul Heimowitz, USFWS, Paul_Heimowitz@fws.gov)

Background:

- Despite substantial programs to prevent the spread of zebra and quagga mussels into the Columbia Basin, continuing interceptions of contaminated boats emphasize the simultaneous need for a strong rapid response capacity.

- Although the chances for eradicating a new introduction of zebra and quagga mussels are small, those changes depend on the ability to respond quickly and effectively. Even when eradication is not possible, rapid response capacity is critical for minimizing economic and ecological impacts.

Status:

- The Columbia Basin Team of the 100th Meridian Initiative has adopted a working draft rapid response plan for zebra mussels and other *Dreissena* species. This plan is available on-line at http:100thmeridian.org/ColumbiaRT.asp

- This plan is intended to be operational, not strategic. It focuses on actions that need to immediately follow a reported mussel introduction. Its goal is to maximize delineation and control. It functions as a road map, not a prescription.

- The plan covers 10 major response objectives:

    1. Verification of the reported introduction
    2. Initial notifications of all relevant managers
    3. Definition of the extent of colonization
    4. Establishment of an intergovernmental rapid response organization
    5. Establishment of an external communications system
    6. Organization of available resources
    7. Pathway management to prevent further spread
    8. Implementation of available/relevant control actions
    9. Long-term monitoring
    10. Evaluation of the response and the plan

- The plan incorporates the Incident Command System and designates the U.S. Fish and Wildlife Service and each directly affected state and tribe as initial lead jurisdictions.

- Appendices to the plan include response notification lists, summaries of control options and associated regulatory compliance requirements, a rapid response plan specifically for the Bonneville Hydroelectric Project and lower Columbia Basin hydropower fish facilities, and a sample press release.

Future Plans/Needs:

- There is no dedicated funding source to support rapid response to zebra mussels or other aquatic invasive species in the Pacific Northwest. A regional or national fund, modeled after similar resources for oil spill and other emergency response, would eliminate the potential delay of response actions while funds were frantically pursued.

- A mechanism is needed to secure agreement by all lead jurisdictions regarding implementation of the plan and associated roles within the response organization. A draft letter of agreement is under development.

- Not all lead government jurisdictions have been adequately engaged in plan development. Particular emphasis is needed to involve Canada at the provincial and federal levels.

- The plan relies on internal agency preparedness (e.g., flow of information during the initial notification process); more work is needed to reach parity.

- A “table-top” exercise is scheduled in October to help test existing readiness and point out areas where the plan or individual agencies need improvement.

- The plan describes environmental compliance processes (e.g. permits) that will need to be satisfied before certain control actions can occur, as well as associated emergency provisions in laws such as the Endangered Species Act. However, completion of associated regulatory review materials in advance (e.g., environmental assessments) for the most likely control actions will greatly expedite response decisions if zebra/quagga mussels are introduced.

- Although the plan outlines a variety of methods that can control zebra mussels, there is little information available on what actually works to eradicate or contain mussels in a field response situation. Research is needed to explore new tools and their potential detrimental effects.

- This plan provides a basic framework for response to quagga mussels in the Columbia Basin. The same framework does not exist for other watersheds, or other aquatic invasive species, and therefore it could serve as a model for developing similar plans.