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Western Fisheries Science News

Many culverts are barriers to fish passage (left) and need to be replaced to improve passage and connectivity. Joe Acosta, U.S. Forest Service engineer, assesses a recently replaced culvert in Siuslaw National Forest. Photo credit: Rachel Reagan, USGS

Where the Stream Meets the Road: Prioritizing Culvert Replacement for Fish Passage

When people think about fish passage barriers, they often think of dams situated in large rivers. But, smaller streams across the world are also highly fragmented by in-stream structures such as culverts, many of which restrict or completely block fish passage. Retrofitting or replacing these structures is a high priority for restoring habitat connectivity for native fishes and other aquatic organisms in the Pacific Northwest. However, the task of restoring habitat connectivity for problematic stream-road crossings is daunting. Thousands of barriers are scattered throughout the region, and removal or changes to these barriers would require massive financial investments. Based on current assessments, land management agencies (i.e., the U.S. Forest Service and Bureau of Land Management) estimate that efforts to restore fish passage may ultimately cost over $375 million on federal lands in Oregon and Washington alone and will take decades to accomplish (GAO 2001). Because of these extreme time and cost estimates, there has been great need to ensure best allocation of resources. Assessing potential risks to road infrastructure from flooding, debris flows, and climate change is not always considered and may play an important role in the success of our investments over the long-term. (Continued on page 2)

Events

USGS Hosts Department of State-Sponsored Field Trip for International Journalists: On August 25, the WFRC hosted a visit from Department of State International Journalists from Southeast Asia. Jill Rolland, WFRC Director, and scientists John Beeman, Toby Kock, Rachel Reagan, and Jim Winton participated in scientific talks and a tour of the WFRC laboratories. The objective of this tour was intended to showcase U.S. leadership in developing sustainable fishing practices and addressing climate change's impact on oceans. Talks by WFRC scientists covered work on fish passage, implications of climate change in the Columbia River, and fish health. For more information, contact Jill Rolland at jrolland@usgs.gov or 206-526-6291.

USGS Scientists at National American Fisheries Society Meeting: On August 16-20, USGS scientists from the WFRC lead sessions and presented research at the 145th annual meeting of the American Fisheries Society (AFS) in Portland, Oregon. Sessions and presentations included many topics, including fish passage, climate change impacts, fish health, habitat restoration, long-term river monitoring, dam removal evaluations, forage fish research, lamprey biology, and salmon life-cycle modeling. Many scientists at WFRC are active members of the AFS and participate in a variety of chapters and sections throughout the society. For more information, contact Jill Rolland at jrolland@usgs.gov or 206-526-6291.

U.S Department of the Interior Scientists Lead Tour for Scientists from the People's Democratic Republic of Laos: On August 15, John Beeman (WFRC) and David Hand (U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office) hosted five scientists from Laos on a day-long (Continued on page 2)

In a project supported by the North Pacific Landscape Conservation Cooperative (NPLCC[1]), USGS researchers Rachel Reagan (WFRC) and Jason Dunham (Forest and Rangeland Ecosystem Science Center) developed and implemented an approach for prioritizing culvert replacements that included considerations of fish access, culvert replacement costs, and potential climate change impacts on the risk of culvert failure.

The project involved collaboration with Jesse O'Hanley, University of Kent (UK), to include climate change and economic considerations to a fish passage optimization model. This project approach included consideration of expected costs throughout the life-cycle of culverts and an optimization model to select culvert replacements in the context of multiple objectives. The study was applied in Siuslaw National Forest, Oregon, a forest with hundreds of stream-road crossings where culverts are actively being replaced. Siuslaw National Forest is home to a variety of native fishes, including salmon, trout, sculpin, dace, and lamprey, all of which were considered in this study. The researchers worked together with biologists, hydrologists, and engineers to incorporate important elements and trade-offs that affect decisions for culvert replacements on Forest Service lands.

Researchers found that the selection of culverts for replacement varied, depending on the replacement costs used, site-specific risk, upstream habitat goals, and species in question. The framework within this study will help determine which culverts to replace in order to improve connectivity for stream fishes, while considering a number of variables. The evaluation showed that climate change impacts did not change culvert replacement or size selections, but this could be different in areas predicted to have greater climate change impacts. This approach can be applied in other areas to aid on-the-ground decisions in terms of adapting to anticipated climate effects, allocating limited resources for restoration, and will lead to greater efficiencies. Findings from this research have already attracted interest and will be used in another NPLCC-funded project led by the Washington Fish & Wildlife Department that focuses on integrating climate change into design and permitting of water crossing structures.

Reagan, a biologist and Pathways Career Intern at WFRC, recently completed her graduate work at Oregon State University in the Fisheries and Wildlife Department. The prioritization project discussed here represents part of her graduate work and can be viewed at http://hdl.handle.net/1957/56111. To learn more about this project, contact Rachel Reagan at rreagan@usgs.gov or 509-538-2299, ext. 354.

1 The NPLCC is a self-directed partnership between federal agencies, states, Tribes/First Nations, non-governmental organizations, universities, and other entities to collaboratively define science needs and jointly address broad-scale conservation issues, such as climate change.

Events (Continued)

tour of the area near Portland, Oregon prior to the annual meeting of the AFS. Beeman and Hand worked with the foreign scientists, representing the Lao Living Aquatic Resources Research Center and National University of Laos, earlier this year during a project of Interior's International Technical Assistance Program. For more information contact: John Beeman at jbeeman@usgs.gov or 509-538-2299, ext. 257.

SISNAR Intern Earns MS: Laurie Porter successfully defended for her MS degree in resource management at Central Washington University in early August, 2014. Ms. Porter's thesis was titled, "Behavioral response of Pacific lamprey (*Entosphenus tridentatus*) to predator odorants." Data from her thesis will be used to develop new management techniques aimed at improving the upstream passage of adult fish. The MS thesis was the direct result of work Ms. Porter completed through a USGS, SISNAR (Student Interns in Support of Native American Relations) internship awarded to the WFRC in 2014. Major co-operators on the project were the Confederated Tribes of the Umatilla Indian Reservation and NOAA. For more information contact: Mike Hayes at mhayes@usgs.gov or 206-526-2537.

Press/Media

WFRC Researcher Discusses Changes in Fish Related to this Summers Warming Water Temperatures: In a recent article for Inside the Outdoors with Jim Huckabay titled "Warm Water, Low Oxygen, Dead Salmon" USGS Fishery Biologist Toby Kock discusses how low flows and warm water temperatures are affecting salmon in the Columbia River during 2015. Warmer temperatures are causing salmon to change their behavior and many are dying from columnaris, a bacterial infection that can affect fish. Additionally higher water temperatures lead to decreased dissolved oxygen levels in the water which can also kill fish. For more information contact: Toby Kock at tkock@usgs.gov or 509-538-2299 ext. 215

Publications

Beeman, J.W., A.C. Hansen, and J.M. Sprando. 2015. Observational data on the effects of infection by the copepod Salmincola californiensis on the short- and long-term viability of juvenile Chinook salmon (*Oncorhynchus tshawytscha*) implanted with telemetry tags. Anim. Biotelem.3:20.

Emmenegger, E.J., G.E. Sanders, C.M. Conway, F.P. Binkowski, J.R. Winton, and G. Kurath. 2016. Experimental infection of six North American fish species with the North Carolina strain of spring Viremia of Carp Virus. Aquaculture 450: 273-282.

Tiffan, K.F., J.R. Hatten, and D.A. Trachtenbarg. 2015. Assessing juvenile salmon rearing habitat and associated predation risk in a lower Snake River reservoir. River Res. Appl. (Early View).

USGS Western Fisheries Research Center
6505 N.E. 65th Street
Seattle, Washington 98115
http://wfrc.usgs.gov/ 206-526-6282