USGS
science for a changing world

WFRC Partners: Our Extended Family

For more than five decades the Western Fisheries Research Center (WFRC) has worked with partners to provide research findings to managers of aquatic resources. Those partners form an extended family, a network of clients, colleagues, co-investigators, and customers. Our partners include numerous clients in other Department of Interior bureaus such as the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation, and the National Park Service. But there is much more--we have partners in other federal agencies, state agencies, and universities. The extended family includes tribal governments, and non-government organizations such as the Nature Conservancy and the Lower Columbia River Estuary Program.

Sampling juvenile salmon at a U.S. Fish and Wildlife Service hatchery

Contributing to Partnerships

The WFRC brings to its many partnerships expertise, research capabilities, and an unbiased approach to conducting and reporting results. Of course, some of our partners are our customers and provide funding that enables WFRC scientists to conduct studies. However, most resource managers also bring insight and relevance to problems with endangered or invasive species not always apparent to scientists. And of course, partners bring natural resource problems and questions that challenge the research scientists.

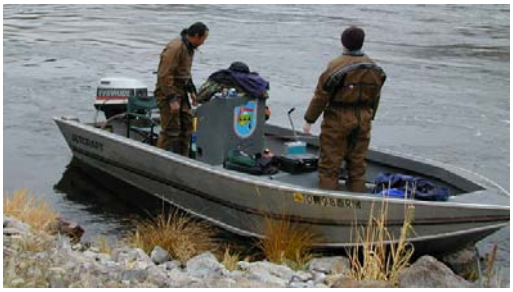
How USGS Science Helps Partners Benefit the Resource

Our partners use the results of science to benefit the resource. For example, the WFRC has a long history of developing new diagnostic tests for fish diseases. Our partners in the U.S. Fish and Wildlife Service use these tests to diagnose fish diseases at National Fish Hatcheries to minimize disease in hatchery-raised fish released to the wild. Our partners at the Bureau of Reclamation in the Klamath Basin of Oregon use the results of studies by WFRC scientists to understand the impacts of water management and poor environmental conditions on two endangered sucker species in upper Klamath Lake and its tributaries.

WFRC Research with Partners

Decline of Chinook Salmon in Lake Michigan

Bacterial kidney disease (BKD) caused by *Renibacterium salmoninarum* has been considered an important factor in the decline of non-native Chinook salmon *Oncorhynchus tshawytscha* in Lake Michigan, but the precise relation between *R. salmoninarum* infection and fish mortality has not been determined. In addition, the possible impacts of *R. salmoninarum* on native salmonids in the Great Lakes are largely unknown. A lack of standardized *R. salmoninarum* diagnostic tools among agencies managing Great Lakes salmonid fisheries has made it difficult to compare *R. salmoninarum* data and to create databases of meaningful information on



USGS scientists worked with the Confederated Tribes of Warm Springs Reservation monitoring radio-tagged juvenile hatchery salmon movements in the Deschutes River, Oregon.

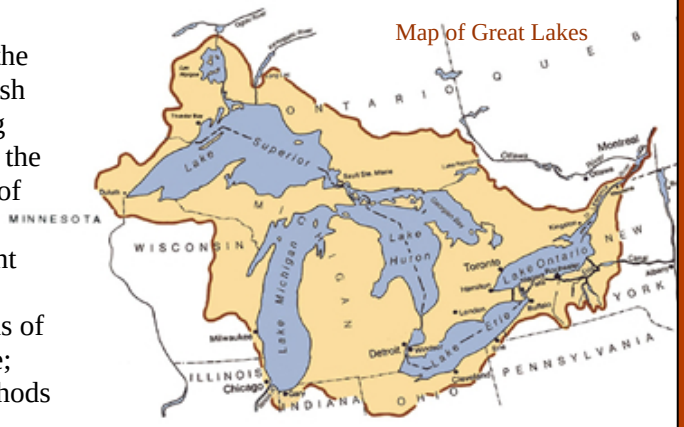
the prevalence and levels of *R. salmoninarum* in Great Lakes salmonids. These databases could be used for developing predictive models of the dynamics of *R. salmoninarum* infections in Great Lakes salmonid populations.

Control of *R. salmoninarum* will require a better understanding of the bacteria itself, the salmonid immune system, and how the bacteria and host defenses interact. Researchers at the WFRC are seeking answers by: (1) working to determine the effects of various aspects of juvenile fish collection, transportation, and handling operations (including fish marking) on the health and bacterial disease resistance of juvenile salmonids; (2) investigating aspects of the pathogenesis of important bacterial diseases of fish for the development of more effective methods of control or avoidance of clinical disease; and (3) developing more effective methods of detecting and quantifying fish pathogenic bacteria in fish and environmental samples to aid in pathogenesis studies. Funding to complete this research is provided by the Great Lakes Fisheries Trust and the U.S. Geological Survey.

Wind River Watershed

The return of adult steelhead *Oncorhynchus mykiss* to the Wind River watershed substantially declined in the 1980s and 1990s. This steelhead run is part of the Lower Columbia River steelhead stock that is listed as threatened under the Endangered Species Act. As members of the Wind River Restoration Team since 1994, personnel from the Columbia River Research Laboratory have had a primary role in guiding efforts to restore steelhead to the Wind River subbasin. The objectives of the study are to monitor physical habitat conditions and natural production of juvenile and adult steelhead in this area and to restore stream habitats and watershed processes that will support self-sustaining populations of steelhead.

Efforts involve research, evaluation, and monitoring of the steelhead populations. Our focus has been on the parr stage of the steelhead life history, while our partners at the Washington Department of Fish and Wildlife and the U.S. Forest Service concentrate their efforts on monitoring the smolt and adult stages of steelhead. The U.S. Forest Service and the Underwood Conservation District are involved in physical stream restoration activities, and the U.S. Fish and Wildlife provides in-kind services to monitor known fish diseases in the system (such as Bacterial Kidney Disease and *Epistylis*) and to screen for



Map of Great Lakes

new diseases. The project includes compiling data and information to help understand factors that contribute to steelhead production including variations in its historical and probable-future range. This task has been funded by the Bonneville Power Administration since 1998.

We have conducted habitat and fish surveys in mainstem and tributary streams of the Wind River Basin, targeting the Trout Creek, upper Wind River, and Panther Creek watersheds. Specific sites within these study areas have been surveyed for distribution and abundance of juvenile steelhead and other fish species by backpack electroshocking and snorkeling. A network of 25-30 thermographs and stream discharge measurements have been maintained, with records of 8 years for some stations. Many of the recent restoration activities, such as riparian plantings, road decommissioning, and large wood

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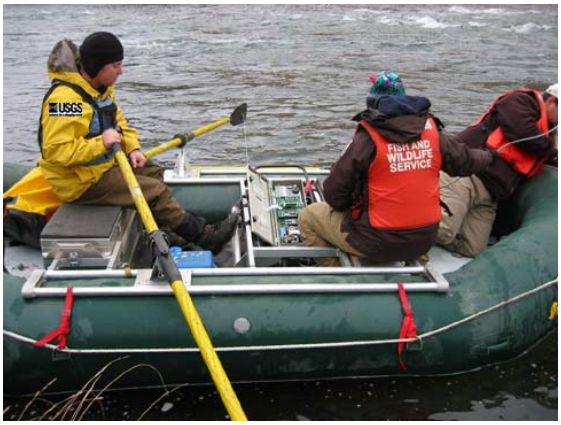


USGS and U.S. Fish and Wildlife Service biologists experiment with a detection system for locating tagged juvenile Chinook salmon.

placements, are expected to have long-term benefits rather than an immediate response of fish production.

Marine Fish Health

Researchers are investigating the cause of the decline in stocks of Pacific herring *Clupea pallasi* and other marine fish species in Puget Sound, Washington and in other locations along the west coast of North America. In 1993, approximately two-thirds (about 100,000 tons) of the 5-year old Pacific herring that were expected to return to spawn in Prince William Sound, Alaska failed to appear. Hence, this commercially important fishery never opened. Among the herring that did return, 15-42% had hemorrhages beneath the skin and behaved abnormally. Pathologists from the Alaska Department of Fish and Game isolated Viral Hemorrhagic Septicemia (VHS) from these herring and from skin lesions of a Pacific cod *Gadus macrocephalus* caught nearby. In 1994, VHS was again isolated from the reduced numbers of fish in Prince William Sound. Pathologists at the Alaska Department of Fish and Game noted that VHS could generally be isolated from the lesions of the herring but only infrequently from internal organs giving added credibility to the hypothesis that VHS was responsible for the hemorrhagic lesions. Whether the lesions and virus have a role in the population decline is the subject of this investigation.

Specific objectives of this research are to: (1) determine the epizootiology (e.g., replication, host specificity, transmission, pathology, and host response) of VHS virus in Pacific herring and Pacific salmon; (2) understand the molecular nature of the virus; (3) design improved methods for detection and identification of the virus; (4) understand the basis of the differences between herring and salmon in features such as virus replication, host specificity, transmission, pathology, and host response; and (5) investigate the effect of oil from the Exxon-Valdez oil spill on the immune system of herring and their subsequent resistance to the virus.

This research is being conducted at the WFRC Marrowstone Marine Field Station, a unique salt water containment facility where disease studies can be safely performed. The research is being conducted in collaboration with scientists from the University of Washington School of Aquatic and Fishery Sciences, Peninsula College, Washington Department of Fish and Wildlife, Department of Fisheries and Oceans Canada, and other academic or governmental agencies. Results from this study will aid in determining the importance of various factors in the epizootiology of pathogens of marine fish species.

Above: Pacific herring not infected with VHS.

Below: Pacific herring demonstrating gross signs of VHS disease. Note hemorrhages around the mouth, eyes, and fin bases.

Willamette Falls Adult Pacific Lamprey Research

The Willamette Falls, Oregon hydroelectric project has recently gone through the Federal Energy Regulatory Commission relicensing process. As part of the Settlement Agreement, Portland General Electric (PGE),

which owns and operates the project dam, will be required to fund an Adult Lamprey Passage Plan (ALPP), which includes a research study on adult Pacific lamprey *Lampetra tridentata* passage and behavior. In 2004, an "ad-hoc" group of lamprey experts convened to advise PGE on recommended research objectives and general approaches that would enable a research team to meet the goals of the ALPP. The approach and objectives of the ALPP were then further refined in consultation with the Willamette Falls Fisheries Technical Committee.

The study is designed to develop additional information and understanding of the behavior and passage of this fish at Willamette Falls, consistent with the final ALPP approach and objectives. We plan to identify specific routes of passage at the dam and falls, duration of passage through different routes, overall passage success, and potential barriers to lamprey passage. Eventually, results from this work may allow managers to develop and refine an appropriate project structure related performance goal for Pacific lamprey upstream passage and will identify modifications to the dam and fish ladder necessary to improve adult lamprey upstream passage.

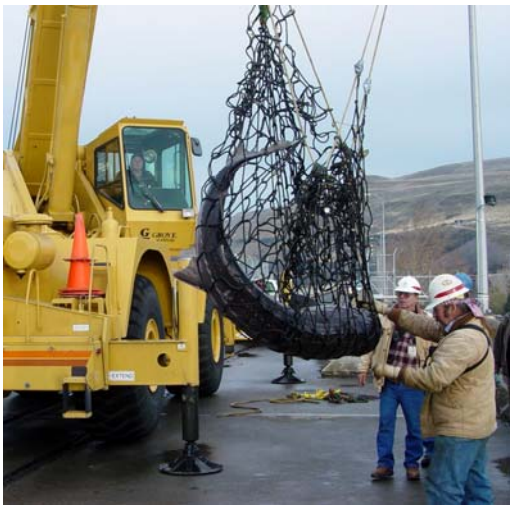
As of August 2005, a functional lamprey trap has been built and installed, a radio receiver array has been installed around the dam, and nearly 100 lampreys have been tagged with radio transmitters and released. Dozens more lamprey have been counted, weighed, and measured.

White Sturgeon Restoration and Enhancement in the Columbia River Basin

To further understanding of white sturgeon *Acipenser transmontanus* population dynamics in the Columbia River Basin,

Spawning

Pacific Lamprey



USGS scientists aid the U.S. Army Corps of Engineers in removing a white sturgeon trapped in a dam fishway and releasing it into the Columbia River.

we have conducted work in collaboration with the Oregon and Washington Departments of Fish and Wildlife, Idaho Department of Fish and Game, the U.S. Fish and Wildlife Service, NOAA Fisheries, the U.S. Army Corps of Engineers, Bonneville Power Administration, the Kootenai Tribe of Idaho, the Columbia River Inter-tribal Fish Commission, and others.

Our studies have increased knowledge of how construction and operation of dams on the Columbia and Snake rivers and regulated river flows influence sturgeon populations. The results of studies on sturgeon movements, habitat use, and factors influencing survival of young fish can be used by managers to operate dams in a manner more favorable to sturgeon.

White sturgeon populations in some river reaches are severely depleted with little successful spawning. Therefore, we have studied factors that might affect survival of eggs and larvae. We found that young white sturgeon is more susceptible to predation than previously thought. We also determined that sturgeon eggs and larvae can occur in shallow riparian habitats where water level fluctuations due to dam operations may affect their survival. Since sturgeon eggs are benthic and adhesive, a recent study is examining how substrate affects their survival. This information will be used to determine how changes in river substrates due to development have affected spawning success.

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Northwest Indian Fisheries Commission

CRITFC
Columbia River Inter-Tribal Fish Commission

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