



Salmonid Rivers Observatory Network

The problem

Wild Pacific salmon throughout California, Oregon, Washington, Idaho, and southern British Columbia have been declining for more than 100 years. Many runs are now less than 10% of their historical numbers, and even these diminished runs are dominated not by sustainable wild salmon populations but hatchery-bred fish which are poured into rivers to replace the dwindling wild runs. Often, wild salmon are less than 25% of current West Coast salmon runs (Lackey, 2008).

In addition to hatcheries, billions of dollars have been spent on other restoration measures, such as barging salmon around dams on the Columbia River. Despite these efforts, wild Pacific salmon continue to decline, and in 2008 and 2009 commercial salmon fishing was closed off the coast of California for the first time in history (Obegi, 2009). It is apparent that the current approach of applying a temporary bandage to the persistent challenges faced by wild Pacific salmon is not working.

The approach

The Salmonid Rivers Observatory Network (SaRON) was created by the University of Montana's Flathead Lake Biological Station (FLBS) and cooperators. SaRON is a long-term, international scientific effort to describe the ecology of wild salmon and the rivers that they depend upon. A suite of pristine wild salmon rivers around the entire Pacific Rim were chosen because most of the intensively studied salmon ecosystems have been significantly impacted by human activities. Understanding the vital ecological processes of healthy salmon rivers is key to the conservation and restoration of all salmon rivers.

Over the course of 10 years, SaRON, researchers have studied 23 rivers in the US, Russia and Canada with nearly 20 different partners.

Figure 1. Kol River Observatory, Kamchatka, Russia.



The basic premise of this research is that salmon thrive in a mosaic of different freshwater habitat types which are extremely dynamic, shifting through time. These habitats are created and destroyed by changing river flows, and wild salmon respond to these changing habitats by developing an array of genetic, physical, and behavioral adaptations. Each wild salmon population and each individual within each population has a unique combination of adaptations to deal with the ever changing environment of its home river.

The solution

The ability of wild salmon to adapt to a changing environment fosters resiliency and sustainability of wild salmon populations across the Pacific Rim. Different adaptations across salmon individuals and populations are like stocks in a balanced and diversified portfolio – spreading risk across of a range of different investments. Some populations and

individuals may not do well under a particular condition, but other individuals and populations will, maintaining sustainability of the overall salmon population. And, conserving the complexity and variability of the habitats that shaped salmon populations will help to conserve and sustain the populations themselves.

The more physically complex a river is, the greater range of habitat types and food resources are available to salmon. In response, salmon themselves diversify and display multiple life history types. Some remain in the rivers while others migrate to the ocean. For example, SaRON researchers have shown that steelhead and rainbow trout can be interbreeding populations with different behavioral patterns depending on the habitat conditions. In one complex Kamchatkan river, scientists found 6 different behavioral variations of steelhead/rainbow trout, ranging from anadromous (fish that migrate to the open ocean) to estuarine (fish that spend a major portion of their lives near the river mouth) to resident (fish that reside entirely in the river).

Figure 1. *O. mykiss* individuals from the same river can exhibit different life history variations, ranging from adult residents (top) to estuarine (middle) to anadromous (bottom).



Rivers which are not physically complex and do not have a variety of habitat types tend to support salmon which have little choice but to become anadromous (migrating to the ocean) in search of food. Therefore, the presence of a range of habitat types in a complex river supports greater fish diversity and sustainability.

The advantage

SaRON emphasizes an ecosystem-based approach to salmon management and conservation. Better knowledge of the processes and functions of healthy salmon rivers can be used to conserve important habitat variability and applied to restore impacted rivers. For example, traditional approaches to habitat restoration have focused on planting riparian vegetation along stream banks. However, results from SaRON suggests that restoration efforts should focus on the types of river flows which ensure riparian vegetation is able to reproduce and grow from tiny seedlings to mature gallery forests. The basic principle is to maximize ecosystem function and the sustainability of fish populations not by trying to “fix” rivers, but rather, to understand how not to interfere with them.

Humans cannot subdue the basic forces which organize river systems. Attempts at controlling natural forces have been and always will be a losing battle. The greatest ecological gains with minimal economic investment will be made by working with the basic organizing principles of river systems and not against them. The key to effective and sustainable management and conservation of our wild Pacific salmon populations is to allow the ecosystems to sustain themselves, or to facilitate a return to this condition. Trying to control rivers and put a temporary bandage over the wounds of our impacts on salmon populations will not work.

References

Lackey, Robert T. 2008. Salmon Decline in Western North America: Historical Context. In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, DC, Environmental Information Coalition, National Council for Science and the Environment).

Obegi, Doug. 2009. California’s Salmon Fishery Closed Again. Living Sustainability. National Resources Defense Council.