



NOAA FISHERIES SERVICE

For information on Puget Sound fish recovery efforts:

www.psp.wa.gov/

For information on floodplain management and the Endangered Species Act, visit FEMA's website at:

www.fema.gov/about/regions/regionx/nfipesa.shtm

The Importance of Healthy Floodplains to Puget Sound Salmon

How do floodplains contribute to healthy salmon runs?

Floodplains are vital to the health and viability of Pacific salmon runs because they provide important habitat during the freshwater phase of the salmon life cycle.

In particular, healthy floodplains contribute to the biological processes necessary for salmon survival by:

- Inundating and creating access to spawning and rearing habitat during high flow seasons;
- Allowing large woody debris to accumulate for ecologically sound, complex habitat;
- Providing off-channel areas with high abundance of food;
- Allowing younger, smaller salmon into areas where there are fewer predators;
- Providing refuge for juvenile salmon to avoid high flow volume and velocities, allowing them to rear as long as necessary and conserve energy for their entry to the ocean;
- Providing coarse beds of sediment through which flow passes, which filters nutrients and other chemicals to maintain high water quality; and
- Providing an expanded area for depositing and storing excess sediment, particularly fine sediment. This reduces the effects of turbidity on fish.

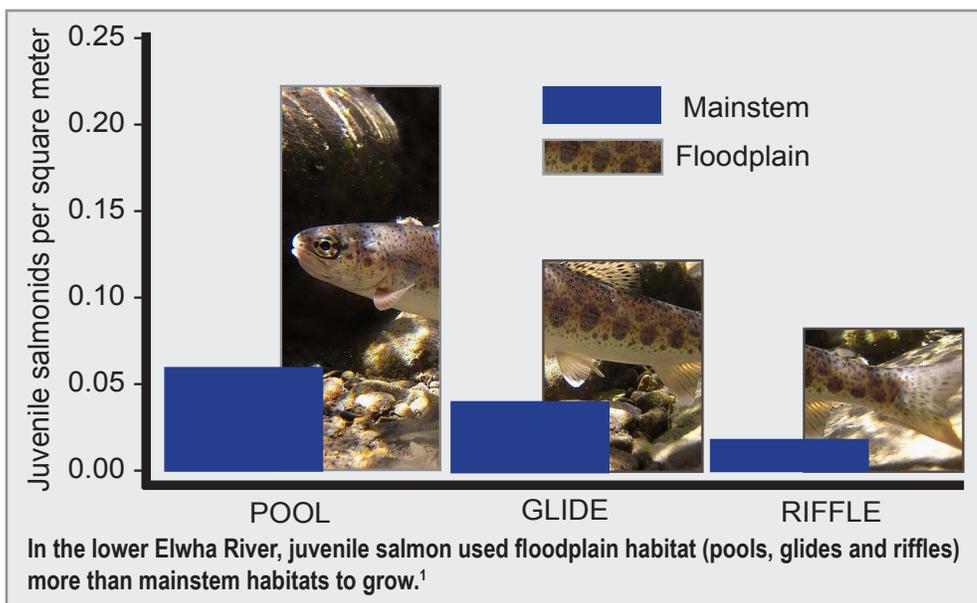
Additionally, the water storage and recharge function of floodplains ensures a source of cold water in summer months. Water seeps into the groundwater table during floods, recharging wetlands, off-channel areas, and shallow aquifers. In turn, these areas release water to the stream during the summer months. Without this recharge, flows are typically lower and water is warmer. Finally, the groundwater storage/recharge process reduces the likelihood of high-energy flood events that can scour away salmon nests during the winter months.

What does the best available science tell us about floodplains and their relationship to salmon?

Connectivity

Floodplain connectivity, forage, and natural cover in the form of undercut banks and backwaters are important for the long-term productivity of salmon populations. When rivers are connected to floodplains, floodwaters and channel migration are able to disperse and develop channels away from the mainstem. This off-channel habitat provides important refuge for young salmon.





relationship between floodplains and salmon production is pronounced. For instance, roughly 73 percent of the wetland vegetation in major deltas of Puget Sound rivers have been lost in the last 100 years. This loss of functioning habitat directly correlates to the declining status of salmon runs. However, it is one factor among many. Loss of functioning habitat in conjunction with disconnected mainstem and tributary habitat due to dam operations, unsustainable harvest practices, and hatchery operations have all contributed to the listing of Pacific salmon under the Endangered Species Act (ESA).

Rearing Habitat

Coho salmon in particular rely heavily on floodplain habitat for rearing. Juvenile coho show strong preference for pools and woody debris cover in the summer months and for side-channel and pond habitats in the winter months. But other salmon species also depend on functioning floodplain habitat. Chum salmon, for example, rely primarily on floodplain areas for spawning. Chinook juveniles use the floodplain for rearing when it is inundated.

How does development impact floodplains?

Large portions of floodplains no longer function in their natural form because they have been restructured to meet urban and agricultural needs. Development affects floodplain by disconnecting river channels from their floodplain and by destroying natural riparian upland and wetland vegetation.

There is a direct relationship between this loss of floodplain function and trends in declining salmon runs. In particular, altering the natural processes that allow habitat to form and recover from disturbances such as floods, landslides, and droughts has the following effects on salmon:

- Elimination of off-channel habitats and refuge areas;
- Increased flow velocity during flood events;
- Increased severity and frequency of peak and low flows;
- Reduced subsurface flows and groundwater contributions to the river;
- Simplified habitat complexity, due to loss of large woody debris, meanders, and side channels; and
- Reduced shade that helps to regulate water temperatures.

When viewing these effects on a regional scale, the rela-

How do functioning floodplains contribute to ecosystem health?

Currently, salmon listed under the Endangered Species Act in Puget Sound include Puget Sound Chinook salmon, Puget Sound steelhead and Hood Canal chum salmon. Functioning floodplains allow for effective habitat formation—providing refuge to salmon, increasing their energy reserves, and protecting the reproductive processes necessary for salmon recovery. To achieve recovery objectives, like adequate population distribution and genetic diversity, it is important to both preserve and restore those floodplains used by salmon.

Floodplains not only serve an important role in the freshwater phase of the salmon life cycle, but they contribute to the health of the larger ecosystem as well. Salmon, for instance, is the primary food source for numerous other species.

¹Pess, G. R., M. L. McHenry, T. J. Beechie, and J. Davies. 2008. Biological impacts of the Elwha River dams and potential salmonid responses to dam removal. Northwest Science 82 (Special Issue):72-90. Photo: John McMillan

Functioning floodplains are part of healthy ecosystems

During high water episodes, floodplains provide a vast low-water-velocity area where suspended particles fall out of the water column and are deposited. These materials are a result of higher water velocity upstream which scours the channels, cleaning the gravels and cobbles and reducing their width:depth ratio. The resulting clean gravel and cobbles are a better environment to aerate salmon eggs, to provide cover for juveniles and invertebrate forage species. The deeper, narrower stream is an ideal habitat for growing salmon and reduces solar heating. Not coincidentally, this process also contributes to excellent soil quality on the floodplains. Those superb soils support complex vegetation development.