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Oregon Floodplains: Working to Conserve Pacific Salmon & Local Communities

Overview

Floods are the nation's most common natural disaster, something Oregon knows all too well. The deadly Vanport floods of 1948, massive 1996 flooding in the Willamette Valley and seasonal coastal flooding have caused millions of dollars-worth of damage to homes and businesses. Climate change projections anticipate an increasing future toll. Looking forward, Oregon communities must make informed decisions about developing land in the path of floodwaters, especially floodplains that include important wetlands where flooding rivers spread beyond their banks.

The National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA) influences development in floodplains, and NOAA Fisheries has examined the impacts of the development on native salmon and steelhead protected by the Endangered Species Act (ESA). NOAA Fisheries determined that the NFIP reduces the floodplain and wetland habitat available to salmon in Oregon, which in turn jeopardizes the continued existence of 15 salmon and steelhead species, plus eulachon and Southern Resident killer whales. To avoid harm to these species, NOAA Fisheries provided FEMA with recommendations, called a Reasonable and Prudent Alternative (RPA). In brief, NOAA Fisheries recommends that FEMA improve floodplain mapping so hazards are clear, limit development in the areas of highest flood hazard and require developers to mitigate floodplain losses by restoring floodplains elsewhere.

These recommendations will help Oregon communities make informed decisions about development in floodplains, recognizing the implications for both public safety and the environment.

Floodplains, Public Safety & the Environment

Floodplains play important roles, environmentally and in terms of public safety. They provide room for floodwaters to spread out and slow down, soaking up water like giant sponges and gradually releasing it back into rivers and streams. This reduces the severity of floods and the damage they cause. Floodplains also provide vital wetland habitat for the 15 Oregon salmon and steelhead species listed under the ESA. Salmon grow faster and have improved survival rates when they mature in the nutrient-rich waters of floodplain wetlands.

But floodplains are disappearing from Oregon. Draining and development has eliminated close to 85 percent of the Willamette River's historic floodplain. In the Columbia River, at least half of the floodplain has been developed. The picture is similar elsewhere across the state, with thousands of acres of one-time floodplain diked, drained and developed, and no longer playing their natural role. This transformation poses challenges to both ecosystems and communities across Oregon. Shrinking floodplains constrain floodwaters and lead to more severe flood damage. Loss of floodplain habitat also translates into reduced growth and survival for salmon species already facing extinction.

Tillamook Bay, for example, has lost nearly 90 percent of its historic tidal wetlands to development. The conversion of floodplain habitat to farmland and residential land use has contributed to more destructive floodwaters. The Wilson and Trask rivers now crest above flood stage every year, and often more frequently. From 1970 to 1996 the Wilson River exceeded flood stage 43 times, resulting in significant economic costs. Between 1996 and 2000 alone, Tillamook County accrued over \$60 million in flood damages to homes, farmland, businesses, and infrastructure.



Oregon flooding, 2007



Science Supports Stronger Floodplain Protections

Floodplains provide vital rearing & spawning habitat

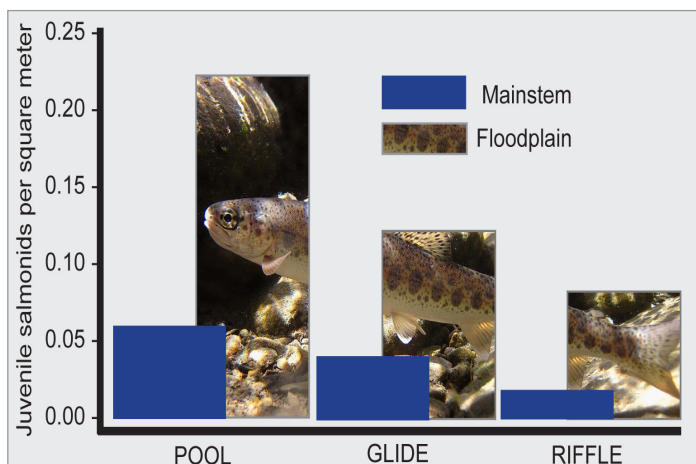
When rivers are connected to their floodplains, river channels are able to migrate naturally. This process creates side channels, back-water sloughs, and other off-channel habitats that are important refuge for salmon. High flow spreads across floodplain habitats—dissipating hydraulic energy and increasing the exchange of nutrients and organic material between aquatic and riparian habitats. 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.¹ Other salmon species also depend on healthy floodplain habitat.² Chum salmon, for example, rely primarily on floodplains for spawning, while juvenile Chinook salmon rear in floodplains.³

Here's how floodplains support the biological processes necessary for salmon survival, they:

- allow the river to naturally migrate and form a diversity of habitat types critical to the survival of different salmon species at various life stages;
- facilitate the exchange of nutrients and organic material between land and water, thus increasing habitat complexity via food subsidies and large woody debris;
- provide off-channel areas with a high abundance of terrestrial and aquatic food sources;
- create shallow habitat with cover that allows small salmon to hide from larger predators;
- improve riparian habitat for species such as aquatic insects, beaver, and bear that are important elements of salmon ecology;
- provide slow-water refuge for juvenile salmon to avoid high river flow volume, which allows salmon to rear as long as necessary and conserve energy for their entry to the ocean;
- provide coarse beds of sediment through which water flows, which filters excess nutrients and other chemicals to maintain high water quality; and
- provide an expanded area for depositing and storing excess sediment, particularly fine sediment. This reduces the effects of turbidity on fish.



Above: Juvenile Chinook salmon reared for 21 days in either a rice field managed as an agricultural floodplain, a canal or a mainstem river. The caged hatchery fish were equal in size when the experiment began, and grew depending on which habitat they lived in. These are preliminary results from *Transect of Riverine Aquatic Habitat* by California Trout. The fish were stocked on February 19 and removed on March 11, 2016. Used by permission.



In the lower Elwha River, juvenile salmon used floodplain habitat (pools, glides and riffles) more than mainstem habitats to grow.¹

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

Floodplains serve as mitigation for the impacts of climate change

Climate projections indicate that the region is at increased risk of extreme flood events, which are anticipated to occur in greater frequency and severity in the coming years.⁴ Healthy floodplains help mitigate these catastrophic events—saving communities millions of dollars in damages—while conserving protected salmon in a changing climate. Many organizations across Oregon are investing in floodplain restoration for just this reason.

Restoring the water storage and recharge function of floodplains reduces the likelihood of high-energy flood events that currently impact Oregon communities. These natural processes allow water to seep into the groundwater table during floods, recharging wetlands, off-channel areas, and shallow aquifers. Floodplains absorb what would otherwise be destructive floodwaters and slowly release the water back into streams. The benefits of this process are two-fold: Oregon communities are safeguarded against catastrophic flooding; and protected salmon have a consistent source of cold water refuge during the heat of summer, and critical rearing habitat during the winter. Without this recharge, stream flows are typically lower and water is warmer during the summer.



Biological Opinion for the Federal Emergency Management Agency's National Flood Insurance Program in the State of Oregon

NOAA Fisheries' Role in Conserving Floodplains

NOAA Fisheries works to conserve ESA-listed salmon and steelhead, and their habitats, through a number of efforts. Each year, NOAA Fisheries provides funding through the Pacific Coastal Salmon Recovery Fund and Restoration Center grant programs to support on-the-ground habitat restoration efforts that contribute to the recovery of salmon and steelhead, including floodplain re-connection projects in Oregon. Additionally, under our ESA regulatory authorities, we evaluate the effects of federal projects on listed species and their habitats.

In 2011, FEMA consulted with NOAA Fisheries to determine whether implementation of its National Flood Insurance Program in Oregon impacts the survival of 18 listed species. Through the consultation process, NOAA Fisheries' determined that the NFIP in Oregon reduces the quantity and quality of floodplain and in-channel habitat, which jeopardizes 17 marine species (15 salmon and steelhead species, as well as eulachon and Southern Resident killer whales), and adversely modifies critical habitat for 16 of these species. NOAA Fisheries' provided an RPA to ensure FEMA's implementation of the NFIP avoids harming these species—recommending that FEMA improve floodplain mapping and limit development in the areas of highest flood hazard, as well as mitigation for the loss of floodplain habitat.

Updated Floodplain Mapping Supports Sound Development

Rethinking how we use floodplains requires updated tools that rely on the best available science. Updating floodplain maps, for example, allows managers to assess flood risk and plan accordingly. In 1973, the NFIP was premised on the concept that mapping flood-prone areas allows people to make wise decisions about whether or not to build in these areas. This is also true today. But today's maps are outdated and do not accurately reflect current flood risk. By improving map accuracy we will have a better understanding of the areas and scale of flood events facing Oregon communities. This allows us to evaluate current and future risk, such as areas prone to erosion, and implement sound development and conservation decisions.

Stronger management of floodplains does not prohibit or curb development. It simply means communities are more strategic about where development occurs. The riskiest areas, such as floodways where floods are fast and deep, and erosion-prone areas, should be limited to water-dependent and non-structural uses. This keeps people out of harm's way and reduces the economic costs associated with flood damages—it also supports conservation of protected salmon and steelhead.



Tillamook, November 1999

Oregon Coastal Community Takes the Lead

Communities across Oregon are experiencing the devastating impacts of floodplain development and taking action. Tillamook County, for example, is partnering with NOAA Fisheries, FEMA and others to reduce flood risk and restore salmon habitat in Tillamook Bay. The Southern Flow Corridor Project, as the project is known, will restore roughly 10 percent of the watershed's historical tidal acreage. The corridor currently is modified with levees and dikes that constrict the natural river channels and disconnect them from their floodplains. To allow flood waters to flow freely across the floodplain, project partners are removing seven miles and modifying three miles of levees. One mile of new set back levees will be constructed to protect remaining lower delta agricultural

lands and businesses. In addition, an 85-acre easement will allow high flows to pass directly to Tillamook Bay, and flood elevations will be reduced across the entire area. The entire project will restore 526 acres of tidal wetlands. This effort will provide greater security for a county that experiences catastrophic flooding annually, and ecological benefits to coho, Chinook, chum salmon, and steelhead.

¹ Roni, P., S.A. Morley, P. Garcia, C. Detrick, D. King, and E. Beamer. 2006. Coho salmon smolt production from constructed and natural floodplain habitats. *Transactions of the American Fisheries Society* 135:1398-1408.

² Solazzi, M.F., T.E. Nickelson, S.L. Johnson, and J.D. Rodgers. 2000. Effects of increasing winter rearing habitat on abundance of salmonids in two coastal Oregon streams. *Canadian Journal of Fisheries and Aquatic Sciences* 57:906-914.

³ Sommer, T.R., M.L. Nogriva, W.C. Harrell, W. Batham, and W.J. Kimmerer. 2001b. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58:325-333.

⁴ AECOM. 2013. "The impact of climate change and population growth on the National Flood Insurance Program through 2100." Prepared for Federal Insurance and Mitigation Administration, Federal Emergency Management Agency. In association with Michael Baker Jr., Inc., and Deloitte Consulting, LLP. June. See also: USGCRP (U.S. Global Change Research Program). 2009. *Global climate change impacts in the United States*. U.S. Global Change Research Program. Washington, D.C. 188 p.

Learn More...

Floodplains & Salmon: www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/floodplains_fact_sheet_3.22.2016.pdf

NOAA Fisheries Biological Opinion FAQs: www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/oregon_fema_biop_qanda_april2016.pdf

Restoring Floodplains in Tillamook County: www.westcoast.fisheries.noaa.gov/stories/2015/17_06172015_floodplain_restoration_tillamook.html

Southern Flow Corridor Project: <http://southernfloweis.org/>