

# HISTORY OF CHANGES IN THE WILLAMETTE RIVER AND EFFECTS ON OREGON CHUB



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Nearly two centuries ago, Euro-American settlement of the Willamette Valley began with the opening of the Oregon Trail around 1830. The Willamette River of 1830 was a vastly different river from what it is today. A federal land survey conducted in the 1850s described the southern two-thirds of the valley as a complex of open prairie and woodland with a broad riparian corridor. A dense deciduous forest covered the floodplains of the Willamette and its tributaries with thick underbrush and large cottonwood trees. This floodplain was estimated to be 1–2 miles wide and up to seven miles wide at tributary junctions. The river consisted of multiple braided channels and was choked with logs and log jams. During floods, which were frequent, new channels were opened and old ones closed, sloughs became the main channel while the latter became sloughs, and the formation of islands and bars was a constant process. Large downed trees and piles of wood contributed to the formation and movement of Willamette River channels.

In the lazy off-channel sloughs lived a small speckled minnow, now known as the Oregon Chub, which was found exclusively in the Willamette River. This small minnow thrived in off-channel habitats that were also home to countless beavers, herons, deer, mink, otters, amphibians, turtles, waterfowl, and young salmon and trout. However, as settlement progressed, this small speckled minnow struggled to survive in a world that was rapidly changing. Starting around 1880, for a period of 60 years, the Army Corps of Engineers removed nearly 70 thousand downed trees or snags, many up to six feet in diameter. These downed trees and wood jams created diverse off-channel habitat and played an important ecological role through the creation and

movement of secondary channels and the formation of floodplain islands. During this same time period, the Corps began building a series of revetments to contain the main river channel and stabilize its banks. These revetments were primarily constructed along the outside banks of river bends, locations where the channel was most active in lateral cutting and movement. This also had ecological consequences by reducing channel migration, the creation of off-channel habitats and gravel bars for cottonwoods, and the delivery of large wood to the channel from the banks.

Historically, the Willamette River experienced frequent large floods, with water extending up to two miles across the valley. These floods were devastating to towns and settlements along the river, with many being destroyed completely. Ecologically, flooding provided linkages and interactions between the channel, the floodplain, and the watershed, including nutrient and sediment cycling. The floods formed new channels, gravel bars, and deep pools, and redistributed large wood, creating a diverse habitat for fish and other aquatic organisms. Beginning in the 1940s, the Corps constructed 13 flood control dams, which reduced the frequency and magnitude (and associated ecological processes) of these flood events, such that an event with a pre-dam 10 year occurrence interval now occurs at a 100-year interval. Flood control led to increased agricultural and municipal development along the river corridor and with this development additional wetlands were drained. The combination of snag removal, construction of revetments and flood control dams, and drainage of wetlands for bottom land agriculture resulted in the elimination of up to 70 percent of the historical channel, depending on the



Oregon Chub habitat in the North Santiam (top) and McKenzie (bottom) basins (Brian Banks, photos)

location within the watershed. In addition, the water quality in the Willamette declined dramatically as cannery and sawmill waste were dumped into the river to the point where in the 1940s certain river sections had such low oxygen concentrations that they no longer supported aquatic life.

The Willamette River floodplain was partially shaped by the American beaver, nature's hydrologic engineer. Beavers dam small rivers and side channels to escape predators and in doing so create habitat for other plants and animals. Behind the dams, they create shallow wetlands and pools that support otters, turtles, amphibians, birds, and fishes. Beaver ponds are one of the Oregon Chub's preferred habitats. The abundance of beavers attracted trappers into the Willamette Valley in the 1700s, when beaver pelts were in high demand in Europe for hats. From 1810 through 1840, beavers were harvested in very large numbers, nearly to extinction.

Combined, these changes to the Willamette River

severely altered the habitat for the Oregon Chub. To make matters worse, their neighborhood (fish community) was also changing in a negative way. New settlers and management agencies introduced fish from the eastern and Midwestern U.S. that were foreign to the river. These fish, typically warmwater game fish, expanded rapidly in the same habitats used by the Oregon Chub. They not only competed for food but also preyed upon the tiny minnows, which are only 2–3 inches long. The chub hid and held on until the late 1980s, when biologists recognized the species' plight and started taking action to help it out. The Oregon chub was listed as endangered in 1993 under the Endangered Species Act.

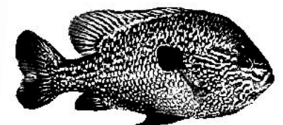
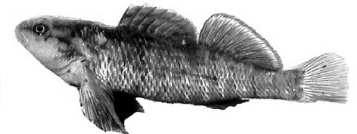
For 22 years teams of biologists and managers, led by the Oregon Department of Fish and Wildlife, worked to understand the needs of the fish, created and protected off-channel habitats, introduced chub back into suitable, predator-free sites, and worked to understand the floodplain processes and factors that can allow the species to co-occur with, but not be decimated by, nonnative fishes. This remarkable teamwork by state and federal agencies, NGOs, private landowners, watershed councils, and tribes resulted in a rare success story. In 2012 and 2013, the Oregon Chub met all of the recovery criteria as outlined in their recovery plan. In 2014 the Oregon Chub will be the first fish to be recovered and removed from the endangered species list, which coincides with the 40th anniversary of the Endangered Species Act.

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