Humboldt Bay (/refuge/Humboldt_Bay)

National Wildlife Refuge | California

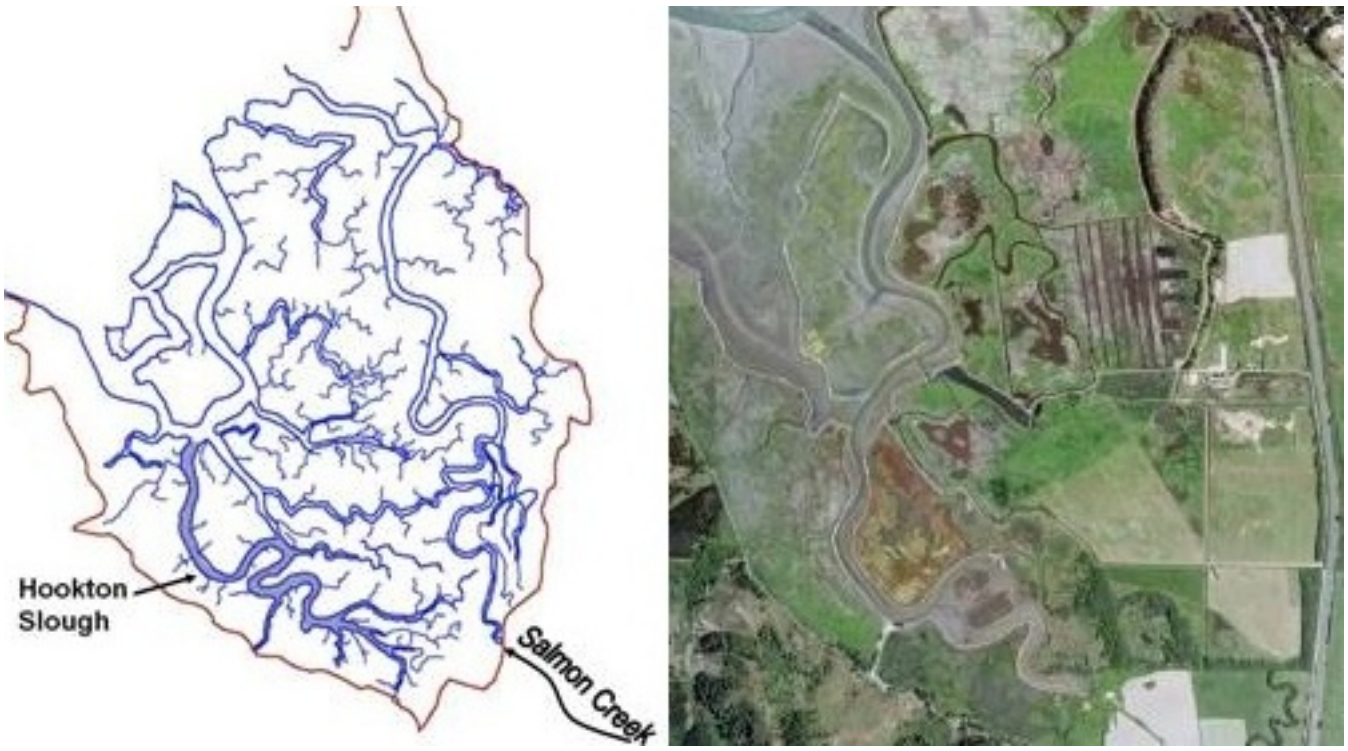
Salmon Creek Restoration

Aerial photo of the restored meandering channel and oxbows of salmon creek.

History

Salmon Creek is the third largest tributary to Humboldt Bay. As the name implies, Salmon Creek historically supported significant runs of coho (silver) salmon, steelhead and coastal cutthroat trout, as well as chinook (king) salmon and pacific lamprey.

The Salmon Creek delta was historically tidal salt marsh with a mosaic of slough channels. However, these lands were reclaimed for grazing during the early 1900's through construction of dikes and levees, draining of salt marshes, straightening or relocation of stream channels, and installation of tide-gates to eliminate tidal influence. After these lands were acquired by Humboldt Bay NWR in 1988, management plans identified Salmon Creek as needing habitat improvements to reestablish estuarine and off-channel habitat. Off-channel habitat consists of sloughs, ponds and oxbows adjacent to the main channel that naturally would have slower water velocities, moderately higher temperatures and more large wood and food where fish (especially salmonids) can spend time while they make the physiological transition from a freshwater animal to saltwater animal. In comparison to pre-1900's conditions, almost all rearing habitat in the lower portion of Salmon Creek has been lost.



The schematic on the left shows what the Salmon Creek delta looked like in 1870. The aerial photo to the right shows what the Salmon Creek delta looked like in 2009. Despite the significant changes, if you look closely, you can find spots that still match up with the historical channels.

The Refuge initiated efforts to improve fish access and habitat for Salmon Creek in the early 1990's. One of the first projects was adding a small opening ("fish door") to one of the flaps on the tide gates. This slightly improved fish passage and allowed some minor tidal exchange upstream of the tidegate, creating a small muted estuary inside the levees. In 1993, the refuge dug a new channel, re-establishing channel sinuosity and complexity to replace a portion of the lower channel that had been ditched and straightened. While this improved habitat, further restoration was needed to increase tidal circulation, improve fish access, and improve hydrology, fish access, and habitat for estuarine dependent species.

Restoration of the Salmon Creek Delta

In 2006-2007, Phase I of the project increased Salmon Creek's tidal prism, tidal connectivity, and tidal influence by replacing an existing tide gate structure, constructing a new tide gate structure in the Salmon Creek overflow area, and re-connecting several off-channel ponds to the stream.

The tidegate to the left restricted movement of bay water into the salmon creek channel. These were replaced with the tidegate shown in the picture to the right and another similar one at a separate location. The new tidegates have two side-hinged doors which provide better fish passage by reducing flow velocities and staying open longer through tide cycles. The middle door on the new tidegates is top-hinged but has a 2' x 4' slide door which can be kept open for constant movement of bay water into the upstream reaches of Salmon Creek, creating muted tidal conditions which improve ecosystem function.

With increased tidal inundation, Phase II of the project focused on construction of 4,200 feet of new estuarine channel with a larger capacity and increased sinuosity. Much of this channel followed the alignment of slough channels through the historic marsh. Connection to the former ditched channel was maintained to allow it to serve as a backwater habitat. Five off-channel habitat features were also constructed to provide freshwater rearing habitat for salmonids in winter. A connecting channel between Salmon Creek and Cattail Creek was excavated to improve seasonal freshwater habitat and fish movement between the two systems. To further enhance this restored habitat, large log structures were added to the channels and ponds to provide resting and hiding places for fish and to add complexity to the stream hydrology. Over 200 logs of various sizes were anchored within banks to provide a diversity of habitat for fish. In the fall following construction, 12 different species of native trees and shrubs were planted adjacent to the channel and ponds to create a riparian component to this effort.

The left picture shows two excavators digging the new channel. To the right is a newly connected channel with large wood added for salmonid and other species habitat.

Fish Response

Almost immediately after restoration was completed, fish monitoring conducted by our partners with California Department of

Fish & Wildlife yielded some interesting results. Within the first year post-construction juvenile salmonids, tidewater goby, long-finned smelt, and multiple other estuarine species of fish were detected. in fact, more juvenile coho salmon were captured during 2011- 2012 sampling season than in all previous sampling years combined. In addition, four endangered fish species were captured in a single pond during one sampling day. This monitoring effort is ongoing and will be used to continually track fish response to the restoration efforts.

The excavation of the channel and ponds generated over 40,000 cubic yards of fill. Rather than dispose of this off site, the Refuge used this material to raise the elevation of of a nearby area that was historically salt marsh but had subsided and turned to mudflat over recent decades. By adding material and increasing elevation, an area of new salt marsh was created. Within two years after the addition of the fill, this area was dominated by native plants, especially pickleweed (Salicornia virginica) This effort provides a habitat type that is lacking around the bay, as over 90% of salt marsh habitat in Humboldt Bay has been lost in the last 150 years.

This aerial photo shows the restored channel and off-channel habitat features in the middle, and the newly excavated Cattail Creek channel in the upper left.

Partners

Restoration projects like these are happening all over the west coast and indeed the country, but as is generally the case, it is hard and expensive to repair damaged ecosystems and it can't be done without many partners. This project has had many partners both public and private including Pacific Coast Fish, Wildlife and Wetlands Restoration Association, USFWS Coastal Program, CA Dept. of Fish and Wildlife, CA Conservation Corps, Ducks Unlimited, and National Fish and Wildlife Foundation among others.

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WHAT WE DO

Leafcutter Bee

The leafcutter bee (Megachile wheeleri) is one of the of specialized, solitary, ground-nesting bees that are crucial to the survival of our native dune mat community. The leafcutter bee, shown here pollinating dune goldenrod, cuts semi-circular pieces from goldenrod leaves and uses them to construct its nest cell. Native bees are gaining increased attention as pollinators due to the decline of the imported honey bee (Apis mellifera) through colony collapse disorder. Photo courtesy of Andrea Pickart.

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