

Beavers Role in the Creation and Maintenance of Aquatic and Riparian Habitat in California's Coastal Redwood Ecosystems

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Many coastal watersheds within California's Northcoast possess low gradient, alluvial valley bottoms that were historically composed of a complex channel network of estuarine and tidal wetlands as well as tidally-influenced freshwater habitat. This habitat has been shown to be particularly limiting to the persistence of threatened and endangered salmonids and other fish species (e.g., *Oncorhynchus kisutch*, *Oncorhynchus tshawytscha*, *Oncorhynchus clarki*, and *Eucyclogobius newberryi*). Currently the vast majority of this habitat type has been diked and leveed over the last 150 years for conversion into agricultural land. The historic multi-threaded (i.e., anabranching) channels in this setting are now often contained within one artificial, straightened channel, and are effectively disconnected from historic marshlands/floodplains except during high flow/high tide events. The substantial alterations within the valley bottom have left these areas vulnerable to flooding. Explicit documentation of historic conditions within these areas is lacking, but the basic geomorphic context as well as analysis of historic photos and current Lidar analysis reveals evidence of a complex multi-threaded channel network which historically comprised the valley bottom. The valley bottom was likely wet and densely vegetated with spruce, alder, and willow as the dominant tree species with redwoods dominant in the uplands. Additionally, a mix of salt tolerant shrubs, forbs, and grasses were also present and reflective of a complex salinity profile throughout lower watersheds. Regular high flow events (~2yr return interval) coupled with a high natural sediment supply (of northern California coastal watersheds) and the low gradient of the valley bottom would have likely maintained a dynamic channel network with high rates of lateral adjustment, channel avulsion, and overbank flow.

Beaver (*Castor Canadensis*) are native to the Northcoast of California including the coastal redwood ecosystems of Humboldt County (Lanman et al., 2013; Lundquist et al., 2013). The dam building activities of beaver have been shown to profoundly influence the development and maintenance of aquatic, riparian and wetland habitat in many different physiographic settings (Hood and Bayley, 2008; Pollock et al., 2014, 2003; Westbrook et al., 2006) but to date the effects of dam building activity by beaver in structuring and maintaining complex, high quality habitat in the coastal redwood setting is poorly understood. Here we present conceptual information and case study examples about the likely role that beaver played in creating and maintaining a complex, multi-threaded channel planform within the low gradient valley bottoms in coastal watersheds with an emphasis on the creation and maintenance of low velocity and slack water habitat essential for the persistence of salmonids. We also present information on the design and implementation of Beaver Dam Analogs (BDAs), artificial instream structures that mimic the form and function of natural beaver dams which can be used in a restoration context to enhance the amount and quality of instream, riparian and wetland habitat in the coastal setting.

References

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