Lawrence Creek Off-Channel Restoration Project

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Introduction

Juvenile coho salmon seek slow velocity areas as rivers rise during storm events. Studies have shown significant increase in juvenile coho salmon growth and survival when they have access to slow water refuge in off-channel habitats during these storms. In addition, off channel features also provide habitat for several other animals including reptiles, amphibians and numerous bird species. In 2014, Humboldt Redwood Company (HRC) identified an abandoned secondary channel that had the potential to become off channel habitat in Lawrence Creek (located within the Van Duzen River watershed) and asked the National Marine Fisheries Service (NMFS) to partner on the project. NMFS conducted the physical surveys, created the design, and a small competitive internal grant from NOAA provided funding for part of the project construction. HRC procured the permits, donated heavy equipment and operator’s time as well as several large logs with root wads to build the off channel structures.

In September of 2015, an off-channel pond was created that is approximately ¼ acre in size and 150 feet long and 45 feet wide, containing two separate deep pools which range from 4 to 6 feet deep at low flow (and deeper as flows rise). In addition to the deep water pools, the pond was designed to have edge water habitat from 1-2 feet deep to provide temperature and food diversity.

Approximately 20 pieces of large woody debris (LWD) with root wads, 20 pieces of smaller debris and slash, and native boulders were used to create 4 unanchored LWD habitat structures. The LWD structures were pushed in to the bank and covered with native boulders to provide ballast and ensure the structures will not move during high flows. The pond entrance is a 15 foot long narrow channel approximately 15 feet wide at the existing ground surface and two feet wide at the base. The confluence channel meets Lawrence Creek at an acute angle to avoid sedimentation and is tucked behind an existing engineered log jam built by PWA in 2014 to provide an attractive eddy for easier fish access during high flows.

Biological Monitoring

The goal of the biological monitoring in the Lawrence Creek Off Channel Habitat Project is to assess the spatial and temporal seasonal fish use by monitoring presence, absence, and distribution of salmonids. Minnow traps were baited with roe and deployed at 10 sites around the perimeter of the pond for soaking times ranging from 40 minutes to 80 minutes. Captured fish were enumerated and identified by species, measured to fork length, and weighed. The sampled fish were released back into the habitat where they were collected. NOAA intends to continue this monitoring on a monthly basis for at least a year to determine fish utilization and water quality.
Physical Monitoring

The goal of the physical monitoring is to assess the physical elements of the off channel feature such as outlet channel elevations, temperature and dissolved oxygen, variations in water levels to ensure that it provides conditions in which salmonids and other animals can exist. On December 14, NMFS deployed an Onset Tidbit dissolved oxygen and temperature logger along with 2 pressure transducers to develop a long term water quality and water level dataset for the newly constructed pond. In addition, spot water temperature and dissolved oxygen measurements have been taken at each minnow trapping site to calibrate the Onset logger and to assess if there is a gradient of different water quality as you move from the top to the bottom of the pond.

Conclusions

The Lawrence Creek off-channel pond project has provided a valuable opportunity to learn more about off-channel pond design, construction, physical monitoring, fish utilization and overall project performance. After one post-construction winter we have learned the following:

-Coho salmon and steelhead/coastal rainbow trout were found utilizing the habitat after the first storm backwatered the feature and provided access to the off channel habitat. Previous surveys in Lawrence Creek have found relatively low numbers of coho, yet coho were abundant in the newly created pond, suggesting the pond could provide significant benefits to coho rearing in Lawrence Creek.

-The pond outlet was excavated and was not hardened with rock or other stabilizing material. The pond outlet stayed connected throughout the winter and naturally adjusted based on the water level of the main Lawrence Creek channel. The presence of tributary inflow from an adjacent wetland to the pond was important in maintaining a dynamic outlet channel and carving through sediments that deposit at the mouth.

-Although the DO in the pond was often was much lower than published values necessary for salmonids to thrive, the salmonids seemed to be healthy and abundant in the habitat. This phenomenon has also been observed in other off-channel ponds throughout Northern California suggesting that coho salmon can tolerate much lower DO values than the literature suggests during the winter months when the temperatures are cooler.

-The design accurately predicted the pond connection and inundation flows and the entire site, including the adjacent floodplain was overtopped by storm flows, yet all structures and banks remained intact, suggesting a sound project location and design was chosen.

-Using complex large woody debris with root wads along with small woody debris stuffed into each structure provided much more complexity and surface area than cut round cull logs. The complex wood structures and willow plantings provided habitat diversity in the pond that allowed for increased macroinvertebrate production and utilization by northwestern, pacific tree and red legged frogs as evidenced by egg masses observed on small woody debris and submerged willow plantings.
-Humboldt Redwood Company owns and manages over 200,000 acres in CA and is an important partner in restoration and recovery of threatened species.