SALMON CREEK ESTUARY HABITAT STRUCTURES PROJECT

INTERIM PROJECT REPORT

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Introduction

The purpose of the Salmon Creek Estuary Habitat Structures Project (Project) is to improve aquatic habitat in the lower Salmon Creek estuary (Figure 1) through installation of large woody debris (LWD) in-stream habitat structures and floating willow rafts. Improvements in habitat diversity will provide refuge during high flows and cover from predation during low flow periods. Funds have been provided by the State Coastal Conservancy, California Department of Fish and Game (CDFG), Trout Unlimited (TU), and The Nature Conservancy and NOAA Community-based Restoration Program for permitting and design, construction, transportation of project materials, and construction and monitoring, respectively.

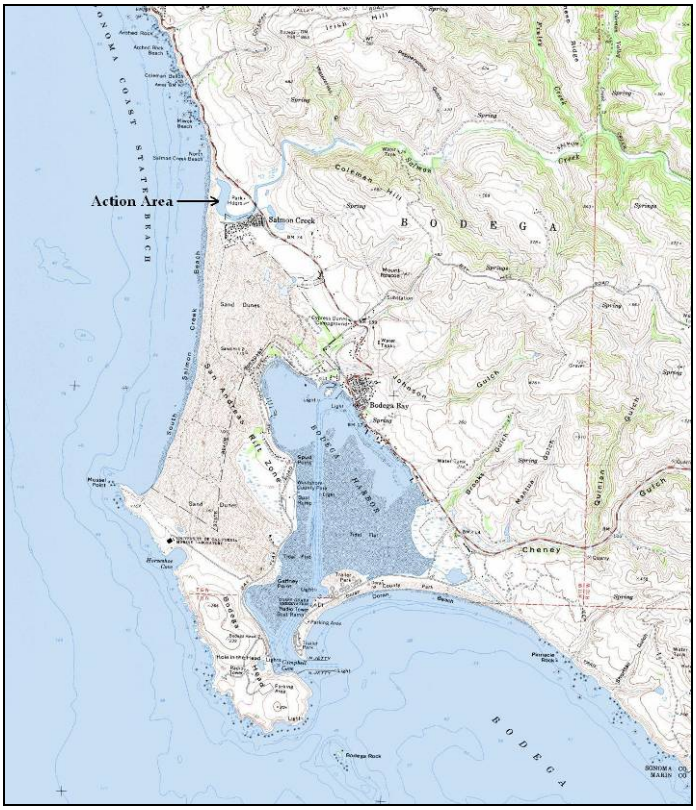

Figure 1. Location of Project area. The Salmon Creek estuary is approximately 1 mile north of Bodega Bay, Sonoma County, California.

Project work will include installing 4 multi-log and root wad structures that will be anchored with boulders, 3 at the deepest section of the estuary before it exits to the ocean and another similar structure further upstream on a right bend (Figure 2). Multiple (4 to 6) rootwad pairs will placed on the inside edge of the right bend as the estuary parallels the sand bar (Figure 2). Floating willow mats

will be installed annually to provide additional cover and lower water temperatures in the summer and fall.

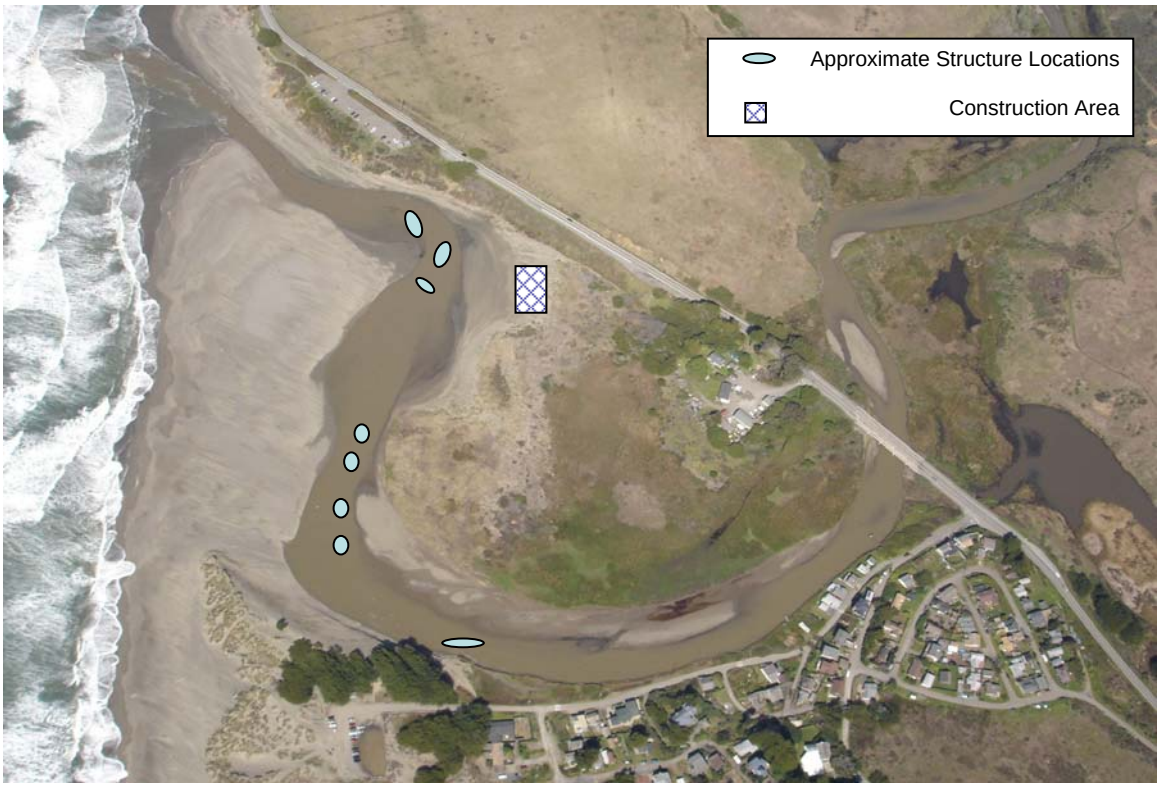

Figure 2. Site map of LWD structures to be constructed and installed in summer/fall 2010.

Project Background

The estuary habitat improvement project is part of a larger effort to address the decline of salmonid runs in Salmon Creek, a tributary to the Pacific Ocean in western Sonoma County, California, and to implement an integrated, effective restoration strategy. Salmon Creek, like many of California's coastal streams, has lost its coho salmon *(Oncorhynchus kisutch)* run in the last 10 years and is left with a dwindling steelhead trout *(Oncorhynchus mykiss)* population. Restoration efforts have been spearheaded by the Salmon Creek Watershed Council, Occidental Arts and Ecology Center (OAEC), Gold Ridge Resource Conservation District (GRRCD), Sonoma County Agricultural Land Preservation and Open Space District, Bodega Land Trust, Trout Unlimited, State Parks, private consultants, and regulatory agencies.

Research indicates that estuaries play a critical role in the life cycle of salmonids in the small coastal streams of northern California. Multiple studies indicate a direct relationship between the rapid growth of juveniles that occurs in coastal estuaries, which results in greater size upon entry to the ocean, and higher rates

of marine survival and return. Important habitat features in estuaries for anadromous fish and other aquatic species include side channels, substrate complexity, and adequate woody debris for cover.

Estuarine habitat is particularly important in systems like Salmon Creek where upstream habitat is degraded or absent during the summer and early fall. In areas with poor summer rearing habitat and during drought years, juveniles will emigrate downstream seeking available habitat. If suitable habitat in the estuarine lagoon is unavailable or of poor quality, the portion of the annual production of juveniles and smolts within the estuary may perish.

The *Salmon Creek Estuary Study Results and Enhancement Recommendations* was prepared by Prunuske Chatham, Inc. (PCI) for the watershed council and OAEC (PCI 2006). It includes a summary of the results of sampling, an assessment of factors that affect estuarine function and its value as salmonid habitat, and recommendations for additional data collection and habitat enhancement. The bed of the estuary and the beach at the mouth were surveyed at the beginning of the study in fall of 2004 and then again after 3 storm events. Water surface elevation was continuously monitored for one year to document hydrodynamics and water quality relationships. Temperature, dissolved oxygen, and salinity in the estuary were monitored monthly for one year and at one additional time in fall of 2005. Biotic monitoring of the estuary to examine fish use was conducted on the same schedule. In addition, historical information was gathered from many local sources, and oral history interviews were conducted.

The *Salmon Creek Estuary Study Results and Enhancement Recommendations* found:

- Many juvenile steelhead trout (likely in the thousands) migrate from upstream to the Salmon Creek estuary in the late summer/early fall and congregate near the mouth where the water remains mixed and cool;
- This large complement of the watershed's annual salmonid production becomes trapped in the shallow, open area as flows upstream drop, and water quality becomes inhospitable in other areas of the estuary;
- Predation by pelagic birds significantly reduces fish populations in this critical habitat, with up to 100% predation occurring during drought years; and
- Siltation of the estuary, reductions in summer inflows from upstream water use, and removal of in-stream habitat such as LWD and tidal flats have radically degraded the habitat quantity and quality in the last 60 years.

Based on these conclusions, a number of recommendations were made, including enhancement of habitat diversity in the estuary through installation of in-stream habitat structures to improve fish survival. Large woody debris structures have been installed in the estuaries of the Mattole River in 2002 and 2007 and the Carmel River in 2006 to provide habitat complexity and cover. Monitoring of the Mattole River structures since installation indicates high utilization by juvenile salmonids and lower water temperatures. The structure installed in the Carmel River lagoon was immediately utilized by juvenile steelhead. Additional structures for the Carmel lagoon are planned.

Project Goals

The goals of the Project are to:

- **Provide critical, protective habitat and shelter for juvenile salmonids that have migrated to the Salmon Creek estuary to complete the rearing cycle before entering the ocean.** Beneficial water quality is found in the reach near the mouth along the beach. Juvenile and adult steelhead were found to cluster in this reach in the late summer and early fall in anticipation of the sand bar breaching. Low water depths and lack of cover contribute to high predation of smolts, with nearly total mortality of the watershed's annual smolt production likely occurring in drought years.

- **Increase the annual production and survival of salmonid smolts from the Salmon Creek watershed and ultimately the number of returning adults.** Providing necessary cover and territorial feeding habitat will reduce predation and increase the number of estuary-reared smolts entering the ocean. The result, it is hoped, will be an increase in the number of adult returns. Estuary-reared smolts tend to be significantly larger than their tributary-reared cousins, and consequently larger percentages of estuary-reared smolts survive in the ocean and return to spawn.

- **Expand and improve upon the estuary LWD habitat-enhancement work done in the Mattole and Carmel Rivers' lagoon/estuary systems.** The Salmon Creek estuary provides an ideal location to utilize the knowledge gained from these recent habitat development projects and to implement a larger-scale project that will increase the regional restoration experience and success in this historically ignored, critical coastal habitat.

- **Promote education and awareness of salmonid issues and the estuarine environment in a highly visible and public location.** The Salmon Creek estuary is located within Sonoma Coast State Park and is adjacent to one of the most heavily visited beaches in northern California. The project will

provide a unique opportunity to educate the public about the sensitive resources that occur in the area, including the species that are the subject of this consultation. Further, the project will utilize local volunteers to build seasonal, floating willow rafts for additional cover and habitat improvement.

Project Process to Date

- Development of this project began in April 2006 with stakeholders and agency staff.
- It took two years, and three grants from different agencies (State Coastal Conservancy, California Dept of Fish and Game, and TNC/NOAA's Community Based Habitat Restoration Program) to secure funding to design, permit, construct, and monitor the proposed project.
- Permitting for the project has taken an additional two years, as complexities with the project surfaced related to special-status species protections, coastal zone permitting, and non-standard construction season requirements in the estuarine environment.
- Construction is scheduled for fall 2010, see below for details.

Construction Timing

Construction was originally planned for spring 2009. Due to an insufficient permit and consultation timeline, and the State of California's stop-work-order limiting the use of matching funds for project planning, the Salmon Creek Estuary Habitat Structures Project was unable to go to construction in spring of 2009.

Excessive delays in the USFWS consultation held up permit finalization and the NEPA process such that construction could not occur in the February-March 2010 construction window. Multiple requests for refinements to the tidewater goby monitoring plan in the BA were requested by USFWS through November 2009. Final internal approval of the USFWS BO was not completed until February 26th. The California Department of Fish and Game and the Regional Water Quality Control Board fast tracked their permit process after receiving the BO. However, the three-week NEPA process timeline could not be adjusted. The 1602 and 401 permits have been issues under the FGRP. NOAA Fisheries Service has determined that the action is consistent with the Coastal Zone Management Act (CZMA), and the State Coastal Commission permit has been secured through a federal agency nexus. All permits and NEPA are scheduled to be complete by July 1st.

Construction of the large wood habitat structures is now scheduled for September-October 2010. Final hydraulic design calculations were completed to determine the number and weight of boulders necessary to secure the log structures. The structures will be constructed on the sandbar, adjacent to the lagoon, in late June or July to facilitate efficient installation in September or October. Floating willow mats will be installed in summer to provide temporary shelter for the rearing juvenile steelhead and coho.

Construction delays beyond fall 2010 will result in the two year monitoring program shifting to include 1 year of pre-project and 1 year post-project biologic monitoring. Pre-construction biological monitoring will occur in summer 2010 to document salmonid presence and populations. Topographic surveys will provide baseline data for evaluating changes in channel bed topography related to the structures and their placement.

Outreach to neighboring residents is planned for summer 2010, prior to structure construction and installation.