



Tillamook Estuaries Partnership
A National Estuary Project

Wolfe Creek Culvert Replacement Engineering

**Final Report
to the
Pacific Salmon Commission**

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Introduction

This comprehensive, collaborative project approaches restoration from a watershed scale, proposing to replace a culvert, enhance salmonid spawning and rearing habitat, and restore riparian habitats on the Nestucca River tributary of Wolfe Creek.

Draining 2.9 mi², Wolfe Creek enters the mainstem Nestucca River at approximately rivermile 13. Over 3 miles of salmon spawning and rearing habitat exists in the Wolfe Creek watershed, 2.3 on the mainstem and 0.9 miles on Swab Creek, a tributary entering Wolfe Creek from the east. Coho, winter steelhead, fall chinook, coastal cutthroat, brook lamprey, and Pacific lamprey all inhabit Wolfe Creek.

The culvert at the mouth of Wolfe Creek was historically a log bridge until the 1920's when Tillamook County replaced it with a culvert. This culvert was surveyed by the Bureau of Land Management in 2001, which clearly reveals it as a fish passage barrier to adult and juvenile salmonids due to an undersized pipe and excessive gradients at the inlet and below the outlet pool. Only 50 feet from the Nestucca River, the 60 foot long mitered pipe arch culvert is 108 inches wide and 132 inches high. Small quantities of sand and gravel line the culvert, but high water velocities through the culvert keep it bare. The streambed immediately above the culvert is comprised of bedrock and boulders. An outlet pool with no culvert drop exists that is 3 feet deep and extends approximately 25 feet downstream. The undersized culvert, culvert slope of 2%, and inlet drop of 18", collectively result in a difficult passage situation for migrating fish entering Wolfe Creek.

The US Forest Service (USFS) surveyed Wolfe Creek and Swab Creek in 1980 and Wolfe Creek in 1997, collectively painting a picture of the past and present conditions. The 1980 survey described an abundance of large log jams (natural and accumulations from upslope logging in the headwaters) on both Wolf and Swab Creek that were recommended for removal or modification to enhance fish production. These large accumulations were removed and the 1997 survey reports low amounts of instream wood. Wolfe Creek's lower reach retained much of its historic meander, channel braiding, and abundance of spawning gravels despite the loss of instream structure.

Wolfe Creek's lower reach meanders through private agricultural land. Where trees and shrubs have not been impacted by grazing, bigleaf maple, alder, Sitka spruce, salmonberry, elderberry, and stinking black currant thrive. The upper reaches on USFS land are dominated more by hemlock and Douglas fir.

The objectives of this project are to:

- 1) Provide adult and juvenile fish passage to 3.2 miles of spawning and rearing habitats, through the replacement of a fish barrier culvert at the mouth of Wolf Creek.
- 2) Enhance approximately 2 miles of instream habitat, through the addition of large wood and/or boulder structures.
- 3) Establish a healthy riparian zone, through the fencing and establishment of native tree and shrub species in the lower 1.3 miles of private agricultural land.

- 4) Optimize populations of commercially, recreationally, and culturally important salmonid species.
- 5) Educate the local community about the benefits of watershed restoration, through local newspaper articles, internet, and local landowner word-of-mouth.

Collectively, the achievement of these objectives will enhance the productivity of salmonid and lamprey species. There is a clear connection between the project objectives and the objectives of the Pacific Salmon Treaty. The Treaty identifies the restoration of freshwater habitat and ultimately the restoration of Pacific salmon stocks as a priority. This project addresses this priority by restoring adult and juvenile fish passage, enhancing instream spawning and rearing habitat, and improving riparian conditions.

TEP requested PSC funds to support engineering a replacement for the fish passage barrier culvert. Funding for all other planning and on the ground expenses are secured by other funders.

Methods

The following table summarizes the project timeline and methods undertaken by TEP to complete the engineering phase and initiate the construction phase of the culvert replacement component of this project.

Timeline	Task
March 2005	PSC agreement signed
December 2005	Receive PSC agreement extension to postpone completion of engineering design
March 2006	Consultant hired to complete engineering design
August 2006	Permit applications submitted
October 2006	Submit grant application to the Oregon Watershed Enhancement Board (OWEB) to fund the culvert replacement
November 2006	Engineering designs altered to address site changes resultant from large flood event
January 2007	Receive PSC agreement extension to allow for permitting delays Engineering design completed
February 2007	Permits received
March 2007	Receive formal notice of OWEB award
April 2007	Construction contractor selected to implement the culvert replacement
July-August 2007	On-the-ground work begins
September 2007	On-the-ground work complete

Results *(see attached designs)*

This project proposes to replace the existing 9-foot wide, 11-foot tall, 60-foot long elliptical culvert with a 22-foot wide, 11-foot tall, 68-foot long bottomless arch culvert that will span the entire 22-foot active channel width.

The culvert replacement design approach follows the ODFW Stream Simulation Method for Fish Passage Criteria at culverts and bridges (ODFW, 2004). The main criteria of this method is that any bridge or culvert stream crossing shall not alter the character of the stream significantly from that found just up and downstream of the crossing. The proposed culvert width (22 feet) is sized to meet the upper end of the existing active channel width range (18-22 feet) found in the lowest reach of Wolfe Creek.

Simulated Streambed (Roughened Channel)

In November 2006, during the 60% design completion phase, record flooding occurred in the northern Oregon Coast watersheds. These flood events significantly altered the short reach between the culvert outlet and the mainstem Nestucca River. The bedrock shelf and split channel had been confined to one channel with gravel and cobble substrates. The natural change was positive and ultimately resulted in what our design was striving to achieve. As a result, the 60% engineering designs were altered to reflect the new site conditions.

The completed project design includes constructing a 'simulated streambed' beneath the new open bottom culvert. The simulated streambed will consist of larger anchor rock placed to anchor the bed in place and form alternating pool and riffle sections. Smaller diameter streambed material will also be used to supplement the anchor rock forming the balance of the streambed. None of the materials will be artificially anchored with cables.

At the submission of this report, TEP has selected a construction contractor who will begin replacing the culvert in July or August 2007 and complete the project by September 2007.

Conclusion

This PSC grant supported the engineering design of the culvert replacement, which was completed in January 2007. The resulting project objectives have not yet been achieved as all on-the-ground activities are scheduled to occur this summer. TEP still aims to achieve all the project objectives.

Project delays resulted in completion of the engineering in January 2007 instead of summer 2005, which also postponed the on-the-ground work until summer 2007. In addition, all the instream and riparian restoration activities were postponed one year. Postponing the project allowed TEP additional time to focus on the project and implement a current engineering design. Aside from delays in the project timeline, this project developed smoothly and no complications are anticipated with on-the-ground implementation.

TEP and ODFW are undertaking several monitoring activities to evaluate the project's effectiveness. TEP and ODFW will establish photopoints and take photos before, during, and after implementation. ODFW is conducting several Aquatic Inventory Surveys, which characterize and quantify instream habitats. ODFW completed the first survey in January 2007 and additional ones will be completed in January and June 2008, after implementation. TEP and ODFW will continue conducting salmon spawning surveys in the reaches above the culvert.

Appendix

Financial Statement of Expenditures

Financial Summary signed off by your financial officer/admin person, to verify its authenticity.