

Peacock Creek Pool and Weir Fishway

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THE PROBLEM



Jim Schlotter holds a dead female chinook (not spawned) found in the outlet pool.

Old County Culvert was:

- Undersized, (7.5 ft) overtops at 5-yr flow
- Perched with an Outlet Weir
- Too Steep, 4.3%
- Complete Barrier to all Species and Life Stages
- Previously Modified with Baffles that failed

Fish Passage Barriers at the site identified by Ross Taylor using FishXing included:

- High Velocities
- Excessive Leap
- Lack of Depth in Outlet Pool

THE DESIGN SOLUTION – VORTEX POOL and WEIR FISHWAY



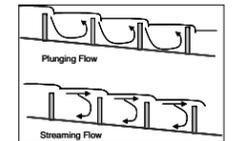
Looking downstream at culvert inlet (fishway exit). Vortex weirs with 8 inch drops concentrate flow to create scoured pools. This weir shape increases the ranges of flows for fish passage, and improves jump conditions for juvenile fish.

Looking upstream at culvert outlet (fishway entrance). The last two weirs are backwatered to provide a swim in entrance at low flows and energy dissipation at high flows.

Looking downstream at outlet. A boulder weir was installed to provide tailwater control and maintain the swim in entrance and to protect the downstream channel from the erosion of high flows.

POOL and WEIR FISHWAY

Pool and weir fishways operate in **Plunging Flow** regime during fish passage flows and in streaming flow at higher discharges

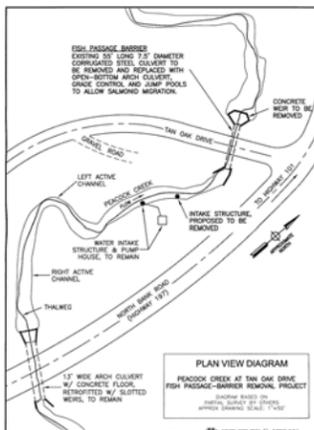


The **Energy Dissipation Factor** is a measure of turbulence in each pool. EDF values greater than 4 lb/ft²-s indicate flow may be turbulent enough to disorient and fatigue fish.

The pool must be deep enough to provide adequate volume to dissipate energy from the plunge.



PROJECT CONTEXT and SITE CONSTRAINTS



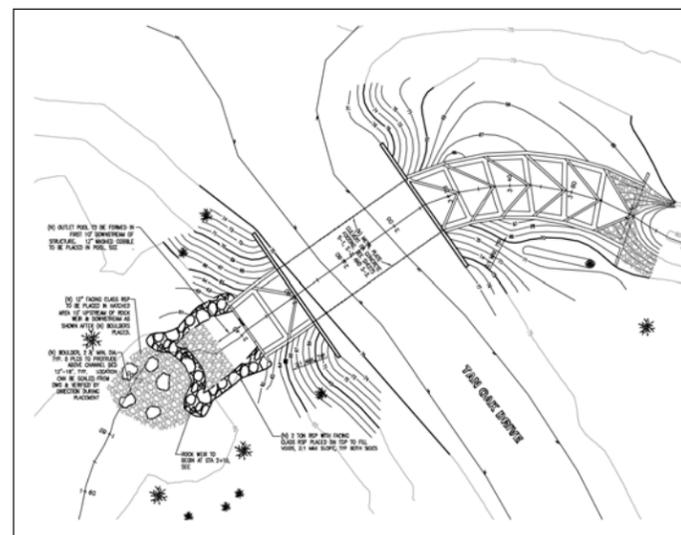
Peacock Creek is a tributary to the **Smith River** which is an un-dammed pristine watershed with healthy anadromous fish populations. The project site is located approximately 4,000 feet from the confluence with the lower Smith River.

Removal of the barrier could open over **7,000 feet** of stream habitat for cutthroat trout, steelhead, coho and chinook.

Site Constraints included:

- Two upstream water intakes (one to be removed)
- Caltrans culvert upstream (not a barrier)
- Need to minimize headcutting & project limits
- 7 Feet vertical drop over 80 feet of channel
- Adjacent fill prism (Hwy 197)
- Pristine State Parks downstream

FINAL DESIGN – PLAN VIEW



HIGH and LOW FLOW



At **High Flows**, above fish passage flows, the weirs are completely submerged and acts as roughness elements that dissipate energy down the steep slope of the fishway.

The downstream **roughened channel** protects the channel from high exit velocities. Photos taken December 13, 2003. The first winter after installation



Looking upstream at fishway exit.



Looking upstream at fishway entrance.

VORTEX WEIR SHAPE

Vortex weirs allow for wider range of fish passage flows than other weir configurations:

- Concentrates the plunge and scour to maintain pool volume
- Increases the crest length which results in a lower velocity for a given flow
- Provides a leaping margin for juveniles and swim up conditions for adults



ALTERNATIVES ANALYSIS

Maintaining a stable grade to protect the water supply and prevent the upstream culvert from becoming perched was a major design consideration.

Grade Control Methods Considered

- Uncontrolled Regrade (no grade control)
- Boulder Weirs
- Roughened Channel
- Traditional Pool and Weir Fishway
- Vortex Pool and Weir Fishway

Headcut was not an option!

PROJECT METRICS

Habitat and Hydrology		Fishway and Weir Dimensions			
Upstream Habitat	7,000 ft	Total Length	120 ft	Drop Over Weirs	8 in
Watershed area	2.2 mi ²	Total Headloss	7 ft	Weir Side Slope	5:1 (h:v)
100-year Flow	1,250 cfs	Fishway Slope	6.7%	Vortex Angle	90°
Adult High Passage Flow	78.8 cfs	Fishway Width	20 ft	Pool Depth	2.5 ft
Adult Low Passage Flow	3.0 cfs	Pool Spacing	10 ft		

Date Completed	Nov. 2003
Total Project Cost	\$474,000

EFFECTIVENESS MONITORING

Spawner Surveys conducted during the winter of 2003–04 identified several redds upstream of the fishway.

On at least two occasions public works personnel observed several adult salmonids successfully migrating up the fishway.

PARTNERS



Del Norte County Road Crew during construction, October, 2003

- Funding**
- Department of Fish and Game
 - California Coastal Conservancy
 - Del Norte County Community Development Dept.
- Design**
- Winzler & Kelly Consulting Engineers
 - Michael Love & Associates
 - NOAA Fisheries
- Construction and Revegetation**
- Del Norte County Div. Roads, Engineering & Surveying
 - Hemmingson Construction Company
 - California Conservation Corps