Peacock Creek Pool and Weir Fishway

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THE PROBLEM

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

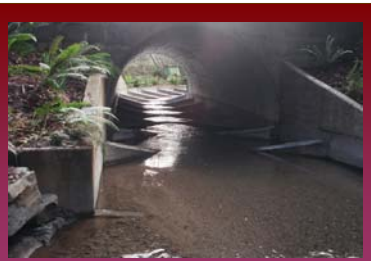
Old County Culvert was:
- Undersized, (7.5 ft) overtops at 5-yr flow
- Perched with an Outlet Weir
- Too Steep, 4.3%
- Complete Barrier to all Species and Life Stages

Stages
- Previously Modified with Baffles that failed

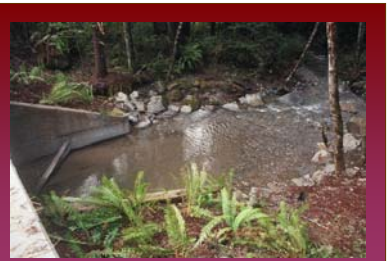
Fish Passage Barriers at the site identified by Ross Taylor using FishXing included:
- High Velocities
- Excessive Leap
- Lack of Depth in Outlet Pool

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.

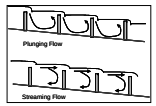


Looking upstream at culvert outlet (fishway entrance). The last two weirs are backwatered to provide a swim in entrance at low flows and energy dissiapation at high flows.



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

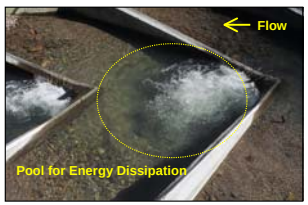
POOL and WEIR FISHWAY



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

The **Energy Dissipation Factor** is a measure of of turbulence in each pool. EDF values greater greater than 4 lb/ft^2-s indicate flow may be turbulent enough to disorient and fatigue fish. fish.

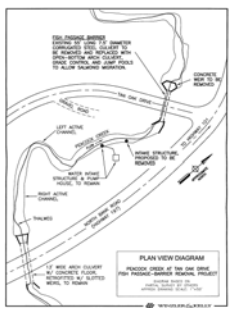
The pool must be deep enough to provide adequate volume to dissipate energy from the the plunge.



VORTEX WEIR SHAPE

Vortex weirs allow for wider range of fish passage flows than other weir configurations: configurations:
- Concentrates the plunge and scour to maintain pool volume
- Increases the crest length which results in a a lower velocity for a given flow
- Provides a leaping margin for juveniles and and swim up conditions for adults

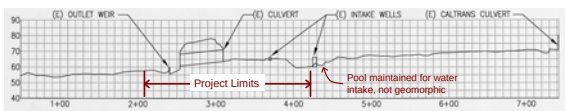
PROJECT CONTEXT and SITE CONSTRAINTS



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



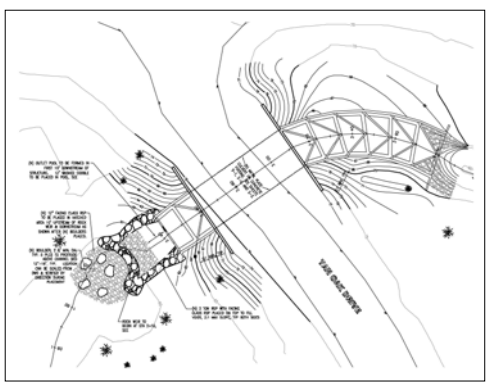
ALTERNATIVES ANALYSIS

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

Headcut was not an option!

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

FINAL DESIGN – PLAN VIEW



PROJECT METRICS

Habitat and Hydrology	
Upstream Habitat	7,000 ft
Watershed area	2.2 mi^2
100-year Flow	1,250 cfs
Adult High Passage Flow	78.8 cfs
Adult Low Passage Flow	3.0 cfs

Fishway and Weir Dimensions			
Total Length	120 ft	Drop Over Weirs	8 in
Total Headloss	7 ft	Weir Side Slope	5:1 (h:v)
Fishway Slope	6.7%	Vortex Angle	90º
Fishway Width	20 ft	Pool Depth	2.5 ft
Pool Spacing	10 ft		

Date Completed	Oct 2003
Total Project Cost	$400,000

HIGH and LOW FLOW

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

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

Looking upstream at fishway exit.

Looking upstream at fishway entrance.

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

Poster by A.Llanos, 2004