

# Peacock Creek Pool and Weir Fishway

Steven Allen, Winzler & Kelly Consulting Engineers, SteveAllen@w-and-k.com

Michael Love, Michael Love & Associates, mlove@h2odesigns.com

Antonio Llanos, Michael Love & Associates, llanos@h2odesigns.com

## THE PROBLEM



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

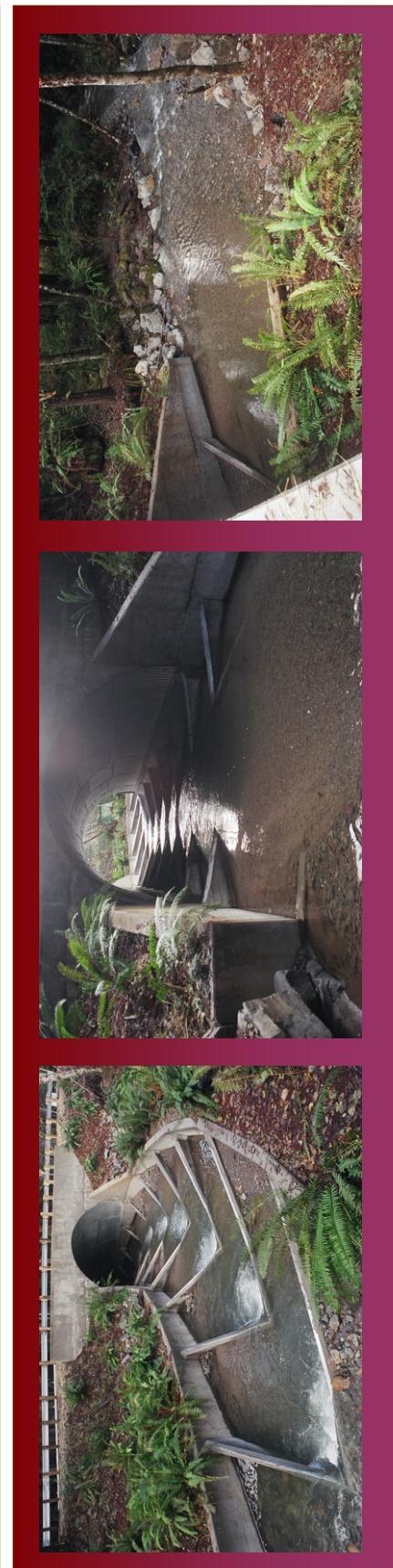
Old County Culvert was:

- 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



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

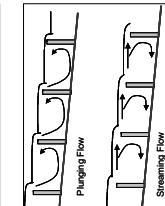
Looking downstream at culvert inlet (fishway exit). Vortex weirs with 8 inch drops concentrate flow to create scoured pools. This weir shape increases the ranges of flows for fish passage, and improves jump conditions for juvenile fish.

Looking downstream at outlet (fishway entrance). The last two weirs are backwatered to provide a swim in entrance and to protect the downstream channel from the erosion of high high flows.

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

energy dissipation at 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 than 4 lb/ft<sup>2</sup>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.



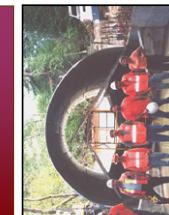
## VORTEX WEIR SHAPE

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



## PARTNERS



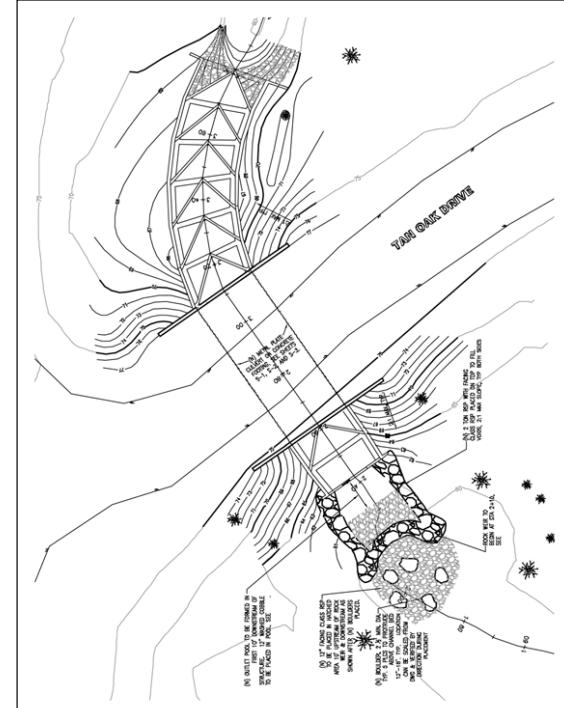
Looking upstream at fishway entrance.

Looking downstream at outlet.

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.

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

## FINAL DESIGN - PLAN VIEW



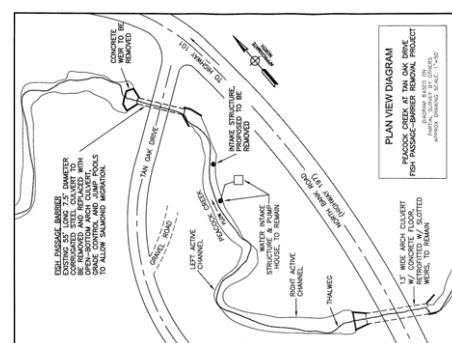
## PROJECT CONTEXT and SITE CONSTRAINTS

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.

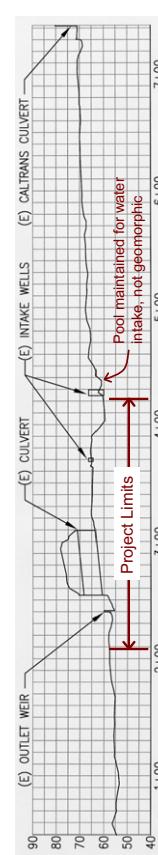
### Site Constraints included:

- 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



## PROJECT METRICS

Fishway and Weir Dimensions					
Upstream Habitat	7,000 ft	Total Length	120 ft	Drop Over Weirs	8 in
Watershed area	2.2 mi <sup>2</sup>	Total Headloss	7 ft	Weir Side Slope	5:1 (hv)
100-year Flow	1,250 cfs	Fishway Slope	6.7%	Vortex Angle	90°
Adult High Passage Flow	78 cfs	Fishway Width	20 ft	Pool Depth	2.5 ft
Adult Low Passage Flow	3.0 cfs	Pool Spacing	10 ft		



## ALTERNATIVES ANALYSIS

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

Maintaining a stable grade to protect water supply and prevent upstream culvert from becoming perched was a major design consideration.  
**Headcut was not an option!**

## 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.

## Funding

- Department of Fish and Game
- California Coastal Conservancy
- Del Norte County Community Development Dept.
- 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