Sidney Gulch at Weaver Bally Loop Road Migration Barrier Removal Project

Final Report For
California Coastal Conservancy
(Agreement 15-011)




Prepared By:
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Summary:

The purpose of this project was to provide for full passage of all life stages of coho salmon and steelhead to the natural limits of anadromy in upper Sidney Gulch by removing a 7' diameter round metal culvert at Bally Loop Road. The culvert, which was installed in 1999, was replaced with an embedded 12' x 9' concrete box culvert in 2015. Additional project objectives included restoring natural stream function upstream of the crossing, improving bedload transport downstream, reducing the significant risk of road failure and catastrophic flooding downstream, and maintaining underground utilities.

When Bally Loop Road was constructed in 1999 to access a new subdivision west of Sidney Gulch, it included the installation of a culvert crossing of Sidney Gulch. The design requirements for the stream crossing included allowing for upstream fish migration. The culvert installed was undersized but matched the diameter of the downstream culvert on Memorial Drive. It was, however, set at a much steep gradient (5%) then the downstream crossing.

In 2001 (and again in 2014) stand replacing wildland fires upstream of the road increased runoff and sediment deposition in the channel. By 2007 the crossing had formed a 4' jump at the outlet and was a barrier to fish migration. It downcut and scoured the channel for at least 125' downstream of the crossing and allowed for aggradation upstream. The crossing did provide some limited storm flow metering capability and a basin upstream entrained hundreds of tons of soil washed off the burned hillsides.

The Trinity County Department of Transportation, in considering the project, established a goal to retain some flood metering capacity in upper Sidney Gulch to reduce flooding in the historic district of Weaverville. Sidney Gulch downstream of Bally Loop is generally trapezoidal and lined to maximize hydraulic efficiency, but overbank flooding occurs at Forest Avenue and Oregon Street somewhere between the 10 and 25 year storm events (USACoE, 1989). Flooding occurs at the J. Jake Jackson Museum on even small storm flows.

Storm flow metering was possible under the pre-existing condition because the 7' diameter CMP culvert could only convey the ~Q_{10} year flows before it would begin backwatering into the basin upstream of Bally Loop Road. The basin is estimated to be capable of retaining ~4.5 acre feet of water before overtopping the road. This basin could in effect help meter storm effects for ~Q_{10} to Q_{20} flows[1]. The DoT indicated a desired to develop a design that would allow fish passage while retaining some of these flood metering capabilities.

Project phases include: 1) Engineering; 2) Environmental/Permitting; 3) Construction; and, 4) Monitoring. Engineering and permitting tasks was completed from 2011 through June 2015 utilizing CA Coastal Conservancy design grant and Trinity County Department of Transportation (DoT) in-kind funds. Post project monitoring began in November 2015 with photo, Thalweg and cross section surveys.

A dynamic stream simulation design was used within the context of the crossing sizing constraints established by the DoT and factoring in utilities placement. Even before a design was considered the 5C contacted Margaret Tauzer, NMFS Engineer in Arcata to discuss a design exception for crossings to convey the 100 year flows through the crossing. A site inspection and discussion about downstream flooding and limited coho migration opportunities was done in 2012. It was agreed that a conceptual design could allow some flow retention upstream while allowing fish passage, provided that the design included a critical dip to safely allow overtopping of the road without it failing.

Following design completion in 2015, a consultation with the US Army Corp of Engineers (as part of a 404 Clean Water Act certification of the project) included NFMS determination that the project would not take coho salmon. At the same time a 1600 streambed alteration agreement with the CA Department of Fish and Wildlife and a North Coast Regional Water Quality Control Board 401 Waiver of Waste Discharge certification (Order R1-2013-0004) were completed.

The design selected allowed for fish passage on migration flows (Q_2 flow) while allowing backwatering on ~Q_{35} flows and installation of a critical dip and return flow channel once the upstream basin filled. The final design consisted of a 60-foot long by 12' wide by 9' deep pre-cast box culvert embedded ~3' with streambed materials and set at a gradient of 3.4%. A broad critical dip and 10' wide return flow channel was installed on the downstream side of Bally Loop Road. A series of grade structures were installed upstream and downstream and 250' of the channel reconstructed using a hybrid of roughened channel and stream simulation designs.

The design for the project was completed through consultation with the Engineering staff at the Trinity County Department of Transportation (TCDOT). The permitting was completed by 5C Program staff. The crossing and channel construction was completed by the TCDOT. The 5C staff completed grade staking, landowner coordination, staging area design, spoils erosion control, channel jetting, revegetation, erosion control, and monitoring components. The 5C Program purchased all materials and the County provided labor and equipment for the project.

[1] In the 15 years between installation and replacement there was never a sufficiently large storm flow to backwater and meter discharges downstream.

This project was funded by the Coastal Conservancy (design, permitting, and construction); Trinity River Restoration Program (construction); Trinity County Department of Transportation, Trinity Public Utilities District, Weaverville Community Services District, Weaverville Sanitary District, and the RC&DC. Land was provided by the Trinity Alps Unified School District and Frank Zabel. For detailed budget information refer to Table 1.

Location

Sidney Gulch is a tributary to Weaver Creek, a major tributary to the Trinity River below Lewiston Dam. The project is located in Section 1 of T33N, R10W, MDBM (USGS Weaverville Quadrangle; Latitude: 40.7373°W -122.9496°N (NAD83)) and is accessible by taking Highway 299 west out of Weaverville for approximately 0.5 miles and turning right at Weaver Bally Road . Take Weaver Bally Road to the intersection of Victory Lane and Bally Loop Roads. This project was conducted with the full support of the direct upstream and downstream landowners: Frank Zabel and Trinity Alps Unified School District Superintendent and Board.

Figures 1 and 2: Pre-project jump and 5% channel gradient in the 7' diameter metal culvert made if culvert impassible to fish migrating upstream. Above left the 12' x 9' box culvert was imbedded 3' and allows for migration on all fish flows.

Purpose and Need

Weaver Creek is the 4th largest stream tributary to the Trinity River below Lewiston Dam (behind Browns, Horse Linto, and Canyon Creeks). It has one of the lowest gradient channels in the upper river system and is preferred spawning and rearing habitat for coho salmon. Stream habitat typing from the 1980s combined with on-going fish presence surveys indicates that Weaver Creek supports anadromous salmonids in all of its major tributaries (West and East Weaver, Little Browns, and Sidney Gulch). The CA Coho Recovery Strategy (CRS) (CDFG, 2004) rated the area as having a high potential for both risk of extinction as well as for restoration and management of coho populations.

The main stem Trinity River TMDL identified the project area as a significant contributor of human caused sedimentation to the Trinity River (EPA, 2000). Weaver Creek has been mined, channelized and stripped of large wood over the past 100 years. The three mile segment bisecting the greater Weaverville

area is among the most significantly impacted due to the urban nature of the area and floodplain management. The Five Counties Salmonid Conservation Program (5C)[2] in cooperation with Trinity County, Trinity River Restoration Program and other partners have undertaken a number of planning and implementation projects in the Weaver Creek watershed to improve fish habitat, water quality and floodplain. This project represents the third project in the Sidney Gulch sub-watershed and the first one to be constructed.

The project represents the uppermost physical barrier to fish as well a disruption to bedload transport. The project was recognized as important for reestablishing sediment routing downstream. There are five downstream crossings on Sidney Gulch (from upstream to downstream) as follows: Memorial Drive – county maintained corrugated metal culvert (stream mile (SM ≈ 1.32)); CalTrans Highway 299 (SM) ≈ 1.22 miles); Forest Road crossing – county owned (SM≈ 0.87 miles); county-maintained bridge on Oregon Street (SM≈ 0.71 miles); a county-maintained crossing on Lorenz RD (SM≈ 0.65 miles); multi-plate arch culvert over Bremer Rd (SM ≈ 0.50 miles); and a railroad car footbridge in Lee Fong Park (SM ≈ .27).

The Forest Service has recently improved a crossing approximately 4750' upstream of the project site. The 5C is currently working with the USFS Weaverville Ranger Station to modify the trapezoid channel configuration with the Forest Service compound to improve flood and fish passage characteristics of the channel reach.

This project was part of a larger effort known as 5C is a conservation strategy formed by the counties of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity to develop land use conservation standards and implement changes in practices to reduce erosion and restore anadromous salmonid fisheries habitat within the Southern Oregon-Northern California Coast coho ESU. Developed in 1997 as a result of the listing of coho salmon as Threatened under the federal Endangered Species Act, the Program's implementation of the migration barrier component has been, and continues to be, an essential step toward the delisting of the SONCC coho salmon as a Federal and State listed Threatened species. This project also continued a series of many 5C projects, both barrier removal and sediment reduction, aimed at maintaining and restoring steelhead habitat to avoid the listing of this species as Threatened or Endangered within the Sidney Gulch watershed and the larger upper Trinity River watershed.

The culvert on Sidney Gulch blocked access to approximately 1.2 miles of anadromous fishery habitat, including mainstem Sidney Gulch and several tributaries. The culvert was removed and replaced with a 60-foot long by 12' wide by 9' deep pre-cast box culvert embedded 3' with streambed materials (at a gradient of 3.4%). A broad critical dip and 10' wide return flow channel was installed on the downstream side of Bally Loop Road. A series of grade structures were installed upstream and downstream and the channel for 250' and the channel reconstructed using roughened channel designs.

A design exception to the full stream simulation design (*NMFS Guidelines for Salmonid Passage at Stream Crossings* (September 2001)), was required because the crossing would not accommodate the100-year flood flows and associated bedload and debris to pass safely through the replacement structure. Instead the design allows for the approximately Q_{35} flows to pass through the structure and then the upstream basin will backwater up to ~4.5 acre of runoff. Once the backwater elevation reaches the low broad point of the road, it is conveyed across the road and into a constructed return flow channel. The return flow channel was rock armored to prevent road washout.

As-Built Project Description

Permitting and Aquatic Species Relocation

2 The 5C Program is part of the Northwest CA RC&DC

This project was subject to CEQA and NEPA (due to federal funding sources) and 5C staff completed the environmental review process in cooperation with Trinity County DoT. Environmental data was collected for the general project area including botanical and wildlife studies, cultural review, and completion of an Initial Study. The project was filed as a CEQA Categorical Exemption under Section 15333 – Small Habitat Restoration Projects (2004 Amendment to CEQA Guidelines, Title 14, California Code of Regulations). The 5C obtained a stream alteration agreement (1600 permit) from CDFW, a 404 Wetlands Certification from U.S Army Corp Of Engineers, and a Waiver for a 401 Water Quality Certification from the North Coast Regional Water Quality Control Board prior to project construction.

After an internal review of the Five Counties' road manual (specifically the culvert replacement section), NMFS's NEPA evaluation (EA) and approval determination (FONSI) of the road manual under Limit 10 of the 4(d) Rule, and the associated intra-service Section 7 memo, NMFS concluded that this project falls within the scope of the approved road maintenance manual under the ESA's 4(d) Rule Limit 10 and did not require a separate informal consultation.

Because the channel was dry at the time of construction neither de-watering or fish relocation was needed

Construction Activity Summary

In August 2015 notices were posted on Bally Loop Road informing residents of the planned start of operations as well as individual notices were delivered to each home. During the last week of August 2015 the Trinity County Public Utilities District and Verizon Inc. installed 3 temporary power poles to relocate underground power, phone and cable around the work site. One pole was set for a temporary power drop to run a pump within a sewer vault to carry waste around the work site, allowing 40’ of the sewer main to be removed during construction. Maintaining the sewer main gradient was a critical design factor in the project construction.

At the same time that the power was being rerouted the Trinity County DoT began clearing and grubbing for both a temporary upstream detour and a downstream access road for a crane to pick box culvert sections to place. All water quality measures described in the project plans and permits were installed prior to start of these operations.

A 24” smooth bore plastic culvert was installed and a temporary road ramp built into and out of the crossing approximately 15’ upstream of the road to provide homeowners access. The crossing was tested by Weaverville Fire Department to make sure that engines could reach homes on the opposite side of the detour.

Once the detour road was open, the Bally Road fill was excavated down to the depth of the Weaverville Community Services District water main, the Weaverville Sanitary District sewer main, and the buried power, phone and cable conduit. All pipes and conduit were cut and removed with temporary pipes routed around the work area. Once utilities were removed the fill was excavated to a depth of ~12’ on the outlet end and 15’ on the inlet end. Spoils were end hauled to the staging area. A bed of sand was leveled at the bottom of the excavation at the end of the second week of September. A water main break at the project site that weekend required emergency repairs and pumping to dry out the work area sufficient to stay on schedule to place the box culvert segments.

Figures 3-5. Excavating the road fill and preparing the bottom for placement of box culvert segments (Above left). The road excavation (Right)

The 15-20 ton Jensen Pre-Cast concrete box culvert sections arrived from the Fresno area the day before being set and were temporarily staged at the Alps View School parking lot utilizing a flatbed truck with a 20 ton self-loading crane. The self-loading crane was used to off load the culvert segments and then reload each one for delivery to the work site approximately 300' away. At the work site, a pad had been constructed to lift, or pick, each segment with a 100 ton crane. The pick distance for the upstream culvert segments was the maximum feasible for the 100 ton DuraCrane and required additional grading to assure stability of the pad. The crane set up, culvert segment placement and crane breakdown was completed in under 8 hours. With the box culvert set the DoT immediately started replacing fill and compacting the material in lifts. Once the fill reached the elevation of the underground utilities the pipe and conduit were reinstalled. The section was then filled and compacted to the subgrade level. Asphalt grindings were then placed to allow for vehicle traffic to use the road in lieu of the detour route.

Bally Road was reopened three weeks after work began. The detour road then was used to install streambed material into the box culvert. Within the crossing a combination of mechanical compaction and jetting was used to bind smaller clay and sand particles into the voids of gravels, pebbles and boulders. At the same time that the channel in the box culvert was being installed, an excavator and loader installed the downstream grade structures and the scoured out reaches were filled with engineered bed materials and compacted. Excess channel excavation materials from upstream provided a portion of the bed materials used in the crossing and downstream channel reaches.

Once the lower channel was established the excavator moved upstream and rerouted the channel to add meander and length to reach the desired overall channel gradient. Bank shaping and grade structures were installed and bank slope protection installed once the grade was completed. Larger size rock (1/4 to 1.5-ton RSP) was installed upstream as part of the roughened channel and streambank stabilization components.


Figures 6 to 11. Box culvert segments being lifted from the road and set in the project site




The detour was pulled allowing for the remainder of the roughened channel construction to be done between the detour and the box culvert. Approximately 150 yd^3 of excess spoils from the channel reconstruction and road fill were end hauled to an approved disposal area. The oil-absorbing boom was removed with the completion of equipment operations.

The streambank stabilization, riparian planting and seeding of the detour, all other disturbed areas was completed by December 1. Final large tree planting was delayed until sufficient rains saturated the soil.

Roughened/Stream Simulation Channel Construction

Approximately 1,500 square feet (0.05 acre) of riparian/mixed chaparral vegetation was removed in order to build a temporary access for a 100 ton crane, excavate the old crossing, and reconstruct the channel upstream. The total length of stream channel treated was 220 feet, including the 60-foot long section within the box culvert. Construction of the channel occurred in two phases. The upstream roughened channel was constructed after the box culvert was installed and deemed safe for public use. The upstream channel was excavated to a 14-foot width with slopes at 3:1 and ~5.8% average grade (with lower gradient segments in the culvert and at the inlet). Downstream channel gradient was ~2.8% and 3.4% within the culvert. Approximately 300 yd^3 of material was excavated from the channel area and ~500 yd^3 temporarily removed in the road crossing. Approximately 415yd^3 of the road fill was reinstalled and 200 yd^3 of stream bed material reused in the streambed mix.

Figures 12 to 16. Upstream channel construction began with cutting excess material and preparing the channel bottom (Left). Jetting fine sand and clay into voids in a grade structure (Middle). Placing the roughened channel bottom, grade structures and apron upstream of the crossing inlet (Right).

The 220 feet of constructedchannel consists of 8 rock ribbon grade-control structures (1 and 1.5-ton RSP), buried 2 layers deep and keyed into the banks as well as a 50 foot roughened channel set at 5.7% slope At the downstream terminus of the roughened channel a channel ribbon and low gradient transition were installed upstream of the culvert inlet to dissipate energy from the roughened channel before the flow enters the culvert. The side channel was partially rocked with RSP.

Engineered streambed material designed to be stable up to the 100-year flows was placed in the upstream roughened channel reaches. All streambed material was jetted to compaction.

Figures 17 and 18- Channel grade was set with a level and lagre grade rocks set in the channel and on the banks.

Streambank Stabilization & Revegetation

Twenty-three pounds of native grass (California fescue, California brome, and Blue wildrye mix) was planted and mulched with certified weed-free straw in October and November. Rooted cuttings of 34 Arroyo willow were planted on the upstream and downstream banks (but were pulled up by kids building a fort in the channel shortly after plantings were done). Three incense cedars, two Oregon ash, 9 white alder, and two big leaf maple saplings (1/2”-1”+ diameter) will be planted in the detour and staging areas in February 2016.

Overflow Channel Construction

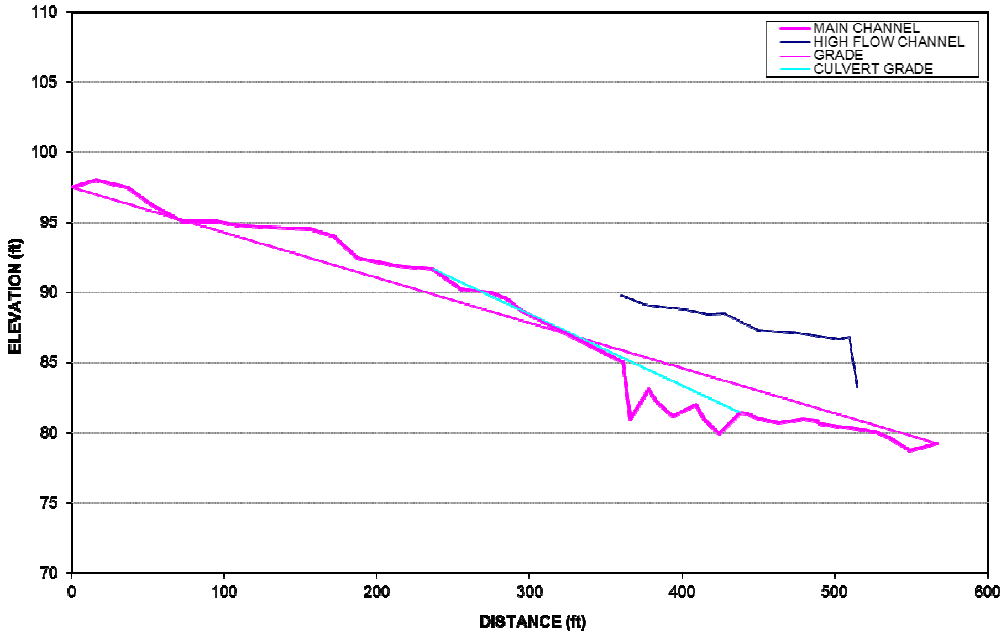
A static overflow channel was constructed on the downstream of the road to carry overbank/over road flows back to the stream. The critical dip in the road is relatively broad (10') allowing for low flow velocities and shallow depth when the road floods. The RSP for the overflow channel was sized to remain stable when the road overflows and the channel bottom was rocked to prevent downcutting.

Figure 19 `- 21- The overflow channel on the downstream side of the road was designed with larger RSP where the water overtops the road and a return channel to Sidney Gulch.

Project Monitoring

Longitudinal Profile/Thalweg Monitoring: The pre-project longitudinal and thalweg surveys utilized for designing the crossing and channel were completed in 2011 and entered into AutoCAD. Four cross-sections were also measured. A post-project profile was taken again immediately following project construction. Post project surveys of the same areas will be done at a future date in response to storm flows and channel adjustments.

Figure 22 (Below) Pre-project Thalweg Survey showing aggraded channel reach upstream of the culvert,the jump pool at the outlet and the scour reach downstream of the jump.



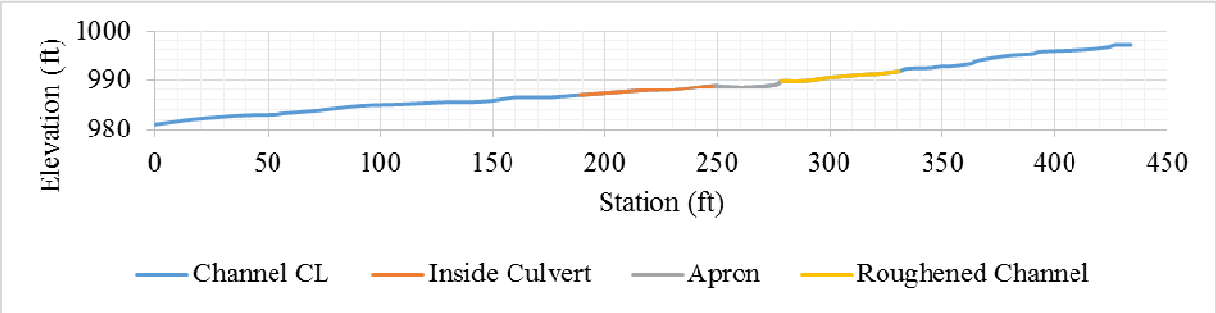


Figure 23- A post construction Thalweg survey shows the culvert, apron and reconstructed channel reach gradient.

Photo Monitoring: A photo-monitoring program to determine the project's effectiveness was developed and is being continually implemented. Photo documentation of pre-project conditions including before, during, and after late fall and early winter rains was performed. Photo monitoring during construction and post-project monitoring activities has also occurred.

Figure 24-Figure 27. Above (Left) Upstream on December 20th, 2015 and Above (Right) on January 17th, 2016 during a ~Q_7 flow. Below Left- Pre-project looking downstream of outlet of 7' culvert and Right looking downstream during Q7 flow on January 17th, 2016 from 12' x 6' box culvert.

Figure 28 and 29- Looking upstream before (Above) in spring and after (Below) in winter

Project Results:

Completion of the project provided the following benefits:

- Opened 1.2 miles of stream for spawning and rearing habitat;
- Improved sediment routing downstream
- Reduced risk of catastrophic road fill failure and a surge of up to 4.5 acre of backwater stored upstream in >Q25 year storms
- Retained some storm metering capabilities for Q_{35}-Q_{50} storm flows
- Reduced the potential for some of the ~14,500 yd^3 of sediment stored upstream of the crossing from future delivery;
- Implementing the Trinity River Record of Decision (ROD), by providing:
    - Watershed restoration efforts, addressing negative impacts which have resulted from land use practices in the basin.
    - Sediment management, including the reduction in fine sediments which degrade coho salmon habitat;

Project Costs:

The overall cost of the project for the project is $317,344.44. The Trinity River Restoration Program Grant funded 46% of the project cost and the CA Coastal Conservancy funded 16%. The TCDoT funded

32% and in-kind funding from utilities relocation and RC&DC (post project environmental compliance monitoring) accounted for 6% of the overall costs.

	TRRP	Coast Conservancy	TCDoT	RC&DC	Other**	TOTAL
Personnel	$ 7,825.10	$ -				**$ 7,825.10**
Supplies/Materials*	$ 17,300.78	$ 5,805.00				**$ 23,105.78**
RC&DC Construction	$ 22,945.72					**$ 22,945.72**
Contractual Construction**	$ 78,125.99	$ 39,195.00	$102,884.43	$1,500.00	$14,523.00	**$ 236,228.42**
Environmental/Monitoring	$ 1,551.50	$ -		$1,500.00		**$ 3,051.50**
Sub Total	**$127,749.09**	**$ 45,000.00**	**$102,884.43**	**$3,000.00**	**$14,523.00**	**$ 293,156.52**
Indirect	$ 19,187.92	$ 5,000.00				**$ 24,187.92**
Total	**$146,937.01**	**$ 50,000.00**	**$102,884.43**	**$3,000.00**	**$14,523.00**	**$ 317,344.44**
* Portions of Jenson Pre-Cast expense for the box culvert was classified as Contractual Construction						
** TCDOT, Trinity PUD, Verizon, WCSD, WSD, Velocity						