Conner Creek Migration Barrier Removal Project

Red Hill Road – Conner Creek - December 2012

CA DEPARTMENT OF FISH AND GAME
FINAL REPORT

Partners
Coastal Conservancy Grant Nos. 08-090, 05-114
United States Fish & Wildlife Service Grant No. 81331BJ155
National Association of Counties Grant No. DOC.749.10-04
United States Forest Service Grant No. 10-PA-11051400-049
Trinity River Basin Fish & Wildlife Restoration Program
Trinity County Department of Transportation

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Summary

Conner Creek is a tributary to the Trinity River in the Junction City area of Trinity County, California. The project consisted of the removal of two migration barriers structures on county roads in the Conner Creek watershed. The projects are located in Section 2, T33N, R11W, MDBM on the USGS 7.5 Dedrick Quadrangle and are accessible by taking Highway 299 west out of Weaverville 8 miles, turn left at Dutch Creek Road and cross the Trinity River, turn right on Red Hill Rd. The downstream project, on Conner Creek Road is accessed by turning right onto Conner Creek Road from Red Hill Road at approximately road mile 2.2 . The upstream project site is located on Red Hill Road approximately 500' past the Conner Creek Road turnoff. The staging area for both projects is located at the intersection of Conner Creek Rd and Red Hill Rd. Refer to page 4 for a detailed map of the Project area.

The purpose of the Conner Creek projects were to provide full passage for all life stages of coho salmon and steelhead to the natural limits of anadromy by removing two County road culverts that were migration barriers to salmonids. The projects were accomplished using grant funds and in-kind services from the following: California Coastal Conservancy (geotechnical investigation, design, permitting, construction); California Department of Fish and Game's Fisheries Restoration Grant Program (CDFG FRG); United States Forest Service Resource Advisory Committee (RAC), US Forest Service/National Fish and Wildlife Foundation; the United States Fish and Wildlife Service (USFWS); a joint National Oceanographic and Atmospheric Administration (NOAA) and National Association of Counties (NACo) grant (construction and monitoring); the US Bureau of Reclamation-Trinity River Restoration Program Watershed Restoration Program (construction); the Trinity County Department of Transportation (TCDOT), The National Fish Habitat Action Plan (NFHAP) and LanMark Forestry (construction). For detailed budget information refer to Table 1.

Objectives included:

- Provide full fish and flood/debris passage at Conner Creek Road consistent with NOAA/NFMS Fish Passage Criteria;
- Improve stream conveyance in response to the upslope wildfires of 2008;
- Eliminate the potential for 2,189 cubic yards of road prism fill from delivering to Conner Creek;
- Reconnect downstream watersheds areas consistent with the Trinity River Total Maximum Daily Load Allocation Plan for Sediment (EPA, 2000);
- Decrease the potential for upstream headcutting if the road should fail;
- Improve the flow capacity at Conner Creek Road at road crossings
- Reintroduce large wood routing in the stream;

The Conner Creek Road project was completed in 2011 and the Red Hill Road project was completed in 2012. Guard rail installation at Conner Creek Road is the last remaining task and has been contracted and expected to be completed in December 2012.

This project encompassed all of the preparatory work to replace the migration barriers, completion of supplemental NEPA and design analysis for both sites, obtaining final permitting for both sites, purchasing both crossing structures (precast ConSpan arch bridge and multi-plate metal arch culvert), developing the staging area for both projects, and completion of the projects. The figures and costs presented in this report are for all work and expenses incurred through December 31st, 2012 for both sites.

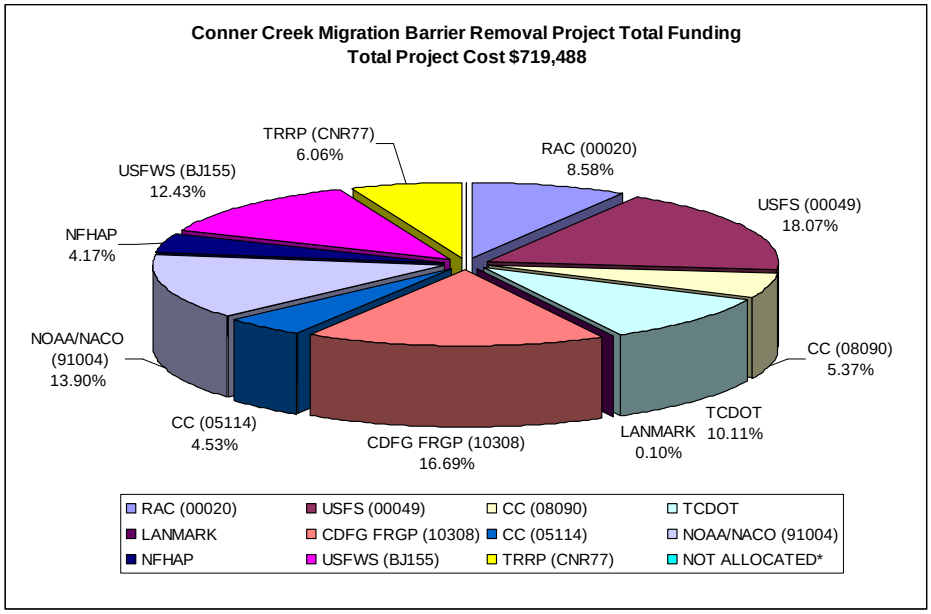
The completion of the Conner Creek Road site in 2011 opened up 1,100 feet of habitat to adult

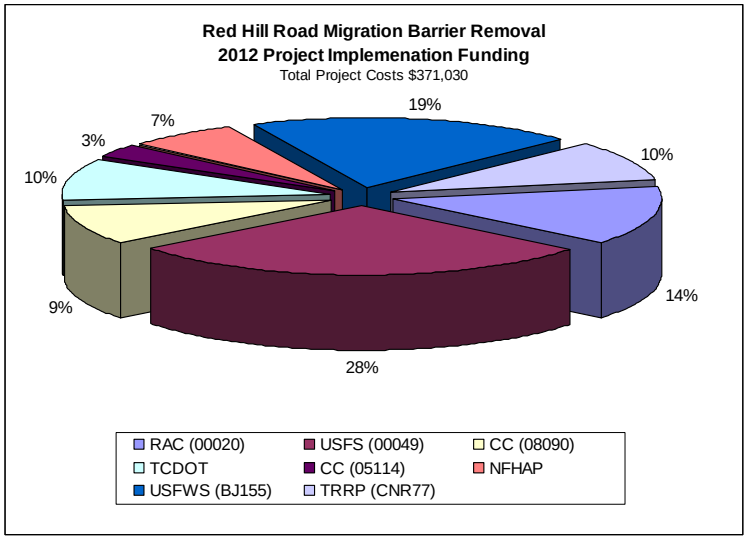
and juvenile salmonids. It also established the staging and storage area which was re-used in the Red Hill project and was decommissioned by ripping (de-compaction and seeding) during renovation of the site.

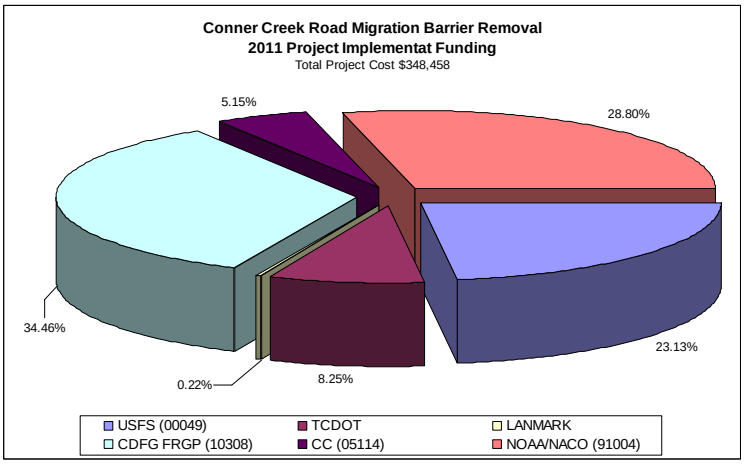
Red Hill Road Project before with 10’ metal pipe culvert looking upstream (left) and restored channel with 18’ multi-plate arch (right).


Red Hill Road Project before with 10’ metal pipe culvert looking downstream (left) and restored channel with 18’ multi-plate arch (right).


Project Location Map


Conner Creek Migration Barrier Removal Project Total Funding
Total Project Cost $719,488
TRRP (CNR77) 6.06%
RAC (00020) 8.58%
USFWS (BJ155) 12.43%
USFS (00049) 18.07%
NFHAP 4.17%
NOAA/NACO (91004) 13.90%
CC (08090) 5.37%
CC (05114) 4.53%
TCDOT 10.11%
LANMARK 0.10%
CDFG FRGP (10308) 16.69%
RAC (00020)
USFS (00049)
CC (08090)
TCDOT
LANMARK
CDFG FRGP (10308)
CC (05114)
NOAA/NACO (91004)
NFHAP
USFWS (BJ155)
TRRP (CNR77)
NOT ALLOCATED*


Red Hill Road Migration Barrier Removal
2012 Project Implemenation Funding
Total Project Costs $371,030
19%
7%
3%
10%
10%
14%
9%
28%
RAC (00020)
USFS (00049)
CC (08090)
TCDOT
CC (05114)
NFHAP
USFWS (BJ155)
TRRP (CNR77)


Conner Creek Road Migration Barrier Removal
2011 Project Implementat Funding
Total Project Cost $348,458
5.15%
28.80%
34.46%
23.13%
0.22%
8.25%
USFS (00049)
TCDOT
LANMARK
CDFG FRGP (10308)
CC (05114)
NOAA/NACO (91004)

BUDGET ITEM DESCRIPTION	RAC (00020)	USFS (00049)	CC (08090)	TCDOT	LANMARK	CDFG FRGP (10308)	CC (05114)	NOAA/NACO (91004)	NFHAP	USFWS (BJ155)	TRRP (CNR77)	NOT ALLOCATED*	TOTAL REVISED COST
	$80,000	$130,000	$80,605			$120,068	$85,404	$100,000	$30,000	$115,402	$43,201		
1. SALARIES AND WAGES --Position title x hourly wage/salary x est. hours for assisted activity. Describe this information for each position.													
	00020	00049	08090			10308	05114	91004		BJ155	CNR77		TOTAL
5C staff Salary by grant:	$ -	$ -	$ 3,101.69	$ -	$ -	$ 15,778.00	$ 612.70	$ 6,200.00		$ 2,888.69	$ 20,002.00		$ 48,583.08
Project Coordinator								$ 3,578.88					$ 3,578.88
County of Trinity DOT		$ 55,303.77		$ 68,541.31									$ 123,845.08
5C Program Director		$ 581.57						$ 1,236.09					$ 1,817.66
5C Accounts Clerk		$ 74.66											$ 74.66
Total:	$ -	$ 55,960.00	$ 3,101.69	$ 68,541.31	$ -	$ 15,778.00	$ 612.70	$ 11,014.98	$ -	$ 2,888.69	$ 20,002.00		**$ 177,899.36**
4. EQUIPMENT—													
3. TRAVEL													
5C Project Coordinator											$388.83		$ 388.83
5C Program Director											$170.94		$ 170.94
Skilled Intern											$34.98		$ 34.98
TOTAL:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$594.75		**$ 594.75**
5. SUPPLIES/MATERIALS-													
Ace Hardware	$ 531.52							$45.03					$ 576.55
CA DFG								$2,521.50					$ 2,521.50
Colbeck, David	$ 329.06												$ 329.06
ConTech						44616		$65,517.75					$ 110,133.75
County of Trinity DOT	$ 58,654.00	$ 30,659.69				29752		$1,997.50					$ 121,063.19
DuraCrane								$17,617.95					$ 17,617.95
Lancaster, Mark	$ 109.94				750			$145.30			$ 400.00		$ 1,405.24
Steve Metcalf		2111.4											$ 2,111.40
Trinity Lumber	$ 87.52												$ 87.52
Eagle Rock				754.83									$ 754.83
Trinity PUD				3423.82									$ 3,423.82
TOTAL:	$ 59,712.04	$ 32,771.09	$ -	$ 4,178.65	$ 750.00	$ 74,368.00	$ -	$ 87,845.03	$ -	$ -	$ 400.00		**$ 260,024.81**
6. CONTRACTUAL/ CONSTRUCTION—													
Christine Jordan Consultant		$ 1,890.00	$ 1,270.00					$ 140.00					$ 3,300.00
County of Trinity DOT		$ 6,999.57	$ 22,778.79			19006	$ 31,543.57			$ 75,780.00	$ 13,944.83		$ 170,052.76
Lancaster, Mark			$ 10.20										$ 10.20
Mike Love & Assoc		$ 23,249.50					$ 431.68						$ 23,681.18
Plumbing Plus		$ 2,135.00									$ 2,068.42		$ 4,203.42
Ross Taylor & Assoc		$ 2,366.43											$ 2,366.43
Taber		$ 2,027.50	$ 11,459.40										$ 13,486.90
TOTAL	$ -	$ 38,668.00	$ 35,518.39	$ -	$ -	$ 19,006.00	$ 31,975.25	$ 140.00	$ -	$ 75,780.00	$ 16,013.25		**$ 217,100.89**
TOTAL													$ 655,619.81
ADMIN	$2,000	$2,600				$10,915		$1,000		$10,764	$6,590		$33,869
													$689,489
GRAND TOTAL (ALL GRANTS)	$ 61,712.04	$ 129,999.09	$ 38,620.08	$ 72,719.96	$ 750.00	$ 120,067.00	$ 32,587.95	$ 100,000.01	$ 30,000.00	$ 89,432.69	$ 43,600.00	$61,603.65*	**$ 719,488.81**
Conner Road													
GRAND TOTAL	$0.00	$0.00	$80,605.00	$28,733.00	$750.00	$120,067.00	$17,958.00	$100,345.00	$0.00	$0.00	$0.00		**$ 348,458.00**
Red Hill Road													
GRAND TOTAL	$61,712.04	$129,999.09	-$41,984.92	$43,986.96	$0.00	$0.00	$14,629.95	-$344.99	$30,000.00	$89,432.69	$43,600.00		**$ 371,030.81**

*- Funds to be allocated

Purpose and Need

This project is part of a larger cooperative effort by Trinity County and the Five Counties Salmonid Conservation Program (5C) to protect, maintain and restore anadromous salmonid habitat and water quality while also enhancing public infrastructure. These projects represent the 11th and 12th salmonid migration barrier removal projects on County roads since 2000. The 12 projects have restored access to 25.35 miles of upstream habitat, reduced approximately 40,000 yd^3 of potential road fill material from entering streams if the old crossing should have failed, and restored natural wood and bedload routing significantly enhancing downstream habitat features.

The 5C Program is a non-profit organization formed by the counties of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity. The 5C working cooperatively with the counties have contributed to over 150 county projects in these counties since 2000. Their goal is to formulate strategic land use conservation standards and implement practices to restore fisheries habitat. . Developed in 1997 as a result of the listing of coho salmon as Threatened under the federal Endangered Species Act, the 5C Program's migration barrier removal strategy is an essential step toward conservation of the Southern Oregon-Northern California Coast Coho (SONCC) coho salmon. The Conner Creek project continues 5C efforts, 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 Conner Creek watershed and the larger upper Trinity River watershed.

This two-year project funded from eight partnerships and ten funding sources, removes a complete fish barrier downstream at Conner Creek Road and a partial barrier upstream on Red Hill Road[1]. The size, complexity, and permitting timelines for the project necessitated that it be completed in two consecutive construction seasons as discussed below.

Before removal in 2011, the concrete box culvert on Conner Creek at Conner Creek Road, effectively blocked access to approximately 2.5 miles of anadromous fishery habitat, including main stem Conner Creek and several tributaries that include designated coho critical habitat. The 10' x 6' concrete box culvert with a 3' jump was replaced with a 24' x 7' concrete arch structure (for additional information on this project refer to the Final Report for Conner Creek Road.

In 2012 the 10' diameter corrugated metal pipe (CMP) culvert was removed and replaced with an 80 foot long 18-foot span corrugated metal multi-plate arch, implementing a full stream simulation design through the road crossing. The old culvert created a 2' jump at the outlet that did not allow for almost fish passage. Also the undersized crossing reduced passage of bedload and debris associated with the high flows. The full stream simulation design complies with the *NMFS Guidelines for Salmonid Passage at Stream Crossings* (September 2001 as amended), allowing for the 100-year flood flows and associated bedload and debris to pass safely through replacement structures. This treatment minimized the potential for future culvert failures in larger storms (<100 year storms). The pre-existing culvert at Conner Creek Road and the existing structure on Red Hill Road overtopped on relatively small storms and the roads overtopped on 18-year and 43-year storm flows. The new crossings reduce maintenance costs associated with storm flows and culvert plugging and/or weir clearing, and eliminate the potential for delivery of approximately 2,189 cubic yards of road fill material into the downstream reaches of Conner Creek and the Trinity River.

Objectives for the projects include:

[1] Based on a migration barrier inventory utilizing Fish Xing analysis (Ross Taylor, 2001).

Objectives included:

- Provide full fish and flood/debris passage at Conner Creek Road consistent with NOAA/NFMS Fish Passage Criteria;
- Improve stream conveyance in response to the upslope wildfires of 2008;
- Eliminate the potential for 2,189 cubic yards of road prism fill from delivering to Conner Creek;
- Reconnect downstream watersheds areas consistent with the Trinity River Total Maximum Daily Load Allocation Plan for Sediment (EPA, 2000);
- Decrease the potential for upstream headcutting if the road should fail;
- Improve the flow capacity at Conner Creek Road at road crossings
- Reintroduce large wood routing in the stream;

provide full fish and flood/debris passage within the crossing consistent with NFMS Fish Passage Criteria; eliminate the potential for cubic yards of combined road prism fill from delivering to the downstream reaches of the creek and connected downstream watersheds, including the Trinity River; decrease the potential for upstream headcutting; improve the flow capacity of crossing at Red Hill Road; reintroduce large wood routing in the stream, restore natural stream function upstream of the crossing and restore the site using native vegetation, All objectives were met.

Original Design

The project was originally designed and funded in 2007-2008 to retrofit an existing 10' box culvert at Conner Creek Road and to install jump and pool structures, baffles and an overflow pipe at the Red Hill Road crossing. These designs were never considered optimal. Additionally, in the summer of 2008 the Eagle Wild Fire significantly burned the upper 42% of the watershed and in late 2009 a post-fire watershed assessment found a significant increase in the risk of large flows and bedload transport in Conner Creek in the next 10-20 years (refer to Hydrology Report). Based on this and other factors, it was determined that the project should be upgraded to convey flood and debris flow and meet full fish passage design criteria.

Project Redesign and Supplemental Environmental Analysis

Project monitoring began in November 2005 with photo, physical and biological monitoring components. The initial engineering designs for both crossings and permitting tasks were completed from January 2006 through August 2007. The 90% design for the sites was completed in 2007 by SHN Consulting. This engineering phase included two design options for the Red Hill Road Site (retrofit and full replacement) and to remove approximately 60% of the bottom of the concrete box culvert on Conner Creek Road. At that time the Red Hill Road retrofit design was chosen and funding for construction of these projects was secured.

As noted above in 2008 a large wildland fire burned the upper 42% of the watershed and in late 2009 a post-fire watershed assessment found a significant increase in the risk of increased flows and bedload transport in Conner Creek in the next 10-20 years because of hydrophytic watershed conditions. Based on this and other factors, it was determined that the project should be upgraded to convey flood and debris flow and meet full fish passage design criteria. Beginning in 2010, supplemental engineering to convey the 100-year flow and debris began. At that same time supplemental funding sources were pursued and the project implementation was delayed pending redesign and funding.

Because the Red Hill Road design included a full stream simulation option as well as a retrofit option, the decision was made to drop the retrofit design and pursue the full stream simulation option. Only minor supplemental design details were needed to address this crossing. Concurrent with the redesign efforts, the FRGP grant scope of work and budget was amended

to allow for the replacement of both crossings. See the Conner Creek report from December 2011 for a full accounting of the Conner Creek Road design and implementation

In July 2010, the Forest Service determined that the existing NOAA Programmatic Environmental Assessment used for projects funded under the Fisheries Restoration Grant Program would not meet their NEPA requirements for this site. The Forest Service indicated that an Environmental Assessment (EA) would be needed for the project to go forward and they could not program NEPA for the project until 2012. The 5C Program staff and consultant Christine Jordan, working with Forest Service and NOAA staff, undertook completion of Specialist Reports, Biological Evaluations and other reports needed to determine if the project met the criteria for a Categorically Excluded (CE) NEPA project or if it would require an EA. The purchase of the bridge and arch structures was postponed until the NEPA and design revisions could be approved by NOAA and the Forest Service.

In July 2011, the Trinity River Management Unit District Ranger approved the NEPA review and issued a Decision Memo to Categorically Exclude the project from further NEPA review. Following the Ranger's decision, a 30-day waiting period passed with no public comments. During the same period NOAA/NMFS Fisheries affirmed that the designs complied with their fish passage criteria and US Fish and Wildlife Service affirmed their NEPA review. With federal compliance only assured by August 2011 it was impossible to order both structures, bid construction and/or build both crossings in the remaining two months of the 2011 construction season. In August 2011, with the federal approvals, state permits were obtained, the pre-cast arch bridge structures for the Conner Creek Road project were ordered (it took approximately 45 days to fabricate them once ordered), and an aggressive construction schedule was developed to complete the highest priority site, Conner Creek Road, by October 15th (subsequently extended to October 31st). The delay in NEPA determination, however, made it impossible to order the structures and construct both sites in 2011 and the Red Hill site was scheduled for construction in 2012.

Conner Creek Road Project

Refer to the Final Report for Conner Creek Road for a detailed project description of this site.

Red Hill Road Project Description

The project was constructed by the TCDOT Weaverville, Hayfork crews with Dennis Fullerton, Deputy Director overseeing logistics and operations and the Hayfork crew leader overseeing day-to-day removal of the old structure and construction and placement of the new multi-plate pipe. Between July 5th and September 21st, 2012 the Red Hill Road site was completed, with less than 35 days of actual construction activity.

The 5C Program staff coordinated and worked with the TCDOT crew to carry out mobilization, staging area development, installation of diversions, screen maintenance, de-watering and pump management, streambed construction, erosion control, riparian management, revegetation and overall site control. Having 5C Program staff on-site and responsible for many of the non-traditional excavating and construction tasks proved valuable in minimizing impacts on riparian areas and assuring water quality objectives at all times.

The multi-plate arch structures were ordered from ConTech of Redding during winter 2011/12 and was stored at the TCDOT Weaverville yard. All other equipment rentals, rock, lumber, electrical and plumbing supplies were contracted locally.

A 100-foot section of the stream channel was reconstructed with engineered streambed mix using D_5-D_{85} sized materials. A self-priming gas pump was rented in an attempt to dewater the site during construction, but it was not effective. A 2 HP Self Priming GT Pump with a 2" flomatic

foot valve was purchased and installed in the same upstream pool using power provide from an overhead power line. A drop line was installed by the Trinity Public Utility District (PUD) and a temporary power pole with electric meter and breaker was installed by Plumbing Plus Construction Services, INC. The streambed materials were jetted into place using a ¼" bore nozzle on a 2 horse power, electric (HP) Self Priming GT pump. Regrettably the electric pump was stolen from the site during the demobilization phase fo the project.

During jetting of the streambed, water was recycled by means of an excavated hole at the pipe outlet which collected surface and subsurface flow before it could enter the stream channel. Excess water was discharged onto a stable bench away from the live channel and beyond a cross slope ditch to avoid sediment delivery to the channel. The primary function of the reconstructed channel is to provide for improved fish passage in a 4.7% gradient channel reach, including passage of all life stages of salmonids during all migration flows. In addition to the channel modifications, riparian planting and streambank stabilization techniques were utilized. Attachment 1 includes the project plans and a photo-log is included in this text. Pre, during and post-project monitoring consists of photo-points; fish presence/absence survey counts; and a pre and post-project longitudinal profiles in 2011, 2012 and 2013 with additional monitoring possible in subsequent years.

CEQA/Fish and Game Permitting

This project was subject to CEQA and NEPA (due to federal funding sources and federal land ownership). The CEQA review was completed as part of the Fisheries Restoration Grant Program and the Regional General Permit 12 was applicable to the project. However, review by the Forest Service determined that supplemental NEPA analysis was required for projects on National Forest lands. The 5C Program staff completed the supplemental environmental review process in cooperation with the USFS, USFWS and NMFS staff (refer to discussion above).. Biological survey information collected by the USFS was utilized in conjunction with subsequent 5C Program surveys. The 5C Program obtained a stream alteration agreement (1602 permit) from CDFG, a non-reporting Nationwide 27 Permit from ACOE, and a 401 Water Quality Certification from the North Coast Regional Water Quality Control Board prior to project construction. A NOAA Biological Opinion to address the project's effect on SONCC coho salmon was issued to the USFWS on June 9, 2010. All permit managers were contacted prior to initiation of construction as per permit requirements.

Aquatic Species Relocation

Fish Relocation for the Red Hill Project was conducted on July 9, 2012 by Ross Taylor (5C Program contracted fisheries biologist), David Colbeck (5C Program Project Coordinator) and Claire Lindstrand (5C staff fisheries biologist). At the time of relocation, there was surface flow upstream of the crossing. Several pools were located downstream of the project area that were suitable for releasing captured fish and amphibians. Flowing, fine-meshed block nets were set across the stream channel approximately 100 feet above and 50 feet below the project area's construction limits to prevent aquatic dependent species entering the worksite during construction. The mesh nets were maintained on a regular basis throughout the construction period by 5C staff. Five passes were made below the crossing and three passes were made above the crossing until no fish were observed. A total of 22 fish (from 40 mm to 180 mm) and 11 amphibians were captured and relocated with no mortalities. See Attachment Table 2 below for details.

Pass Number		Coastal Rainbow Trout - Young-of-Year (≈40-100 mm in length)	Coastal Rainbow Trout – 1+ Age Class (≈110-140 mm in length)	Coastal Rainbow Trout – 2+ Age Class (≈160-180 mm in length)	Tailed Frog	Yellow-legged Frog	Pacific Giant Salamander
Below Crossing	Pass #1	**3**	**1**	**2**	**0**	**0**	**3**
	Pass #2	**0**	**0**	**1**	**0**	**0**	**0**
	Pass #3	**0**	**3**	**0**	**0**	**0**	**1**
	Pass #4	**1**	**0**	**0**	**0**	**0**	**0**
	Pass #5	**0**	**0**	**0**	**0**	**0**	**0**
Above Crossing	Pass #1	**2**	**4**	**3**	**1**	**0**	**5**
	Pass #2	**0**	**2**	**0**	**0**	**0**	**2**
	Pass #3	**0**	**0**	**0**	**0**	**0**	**0**
	TOTALS	**6**	**10**	**6**	**1**	**0**	**11**

Table 2. Fish Relocation Results, Conner Creek Migration Barrier Removal Project, 7-9-12

Due to complex fish habitat features, including large and small woody debris, a four foot deep plunge pool immediately below the existing crossing and overhung banks, the project reach was not electrofished to depletion. Therefore, after installation of the stream diversion and the gradual dewatering of the plunge pool, 25 additional resident trout were removed with small nets and buckets and relocated approximately 20 feet below the downstream fish exclusion fencing. Department of Fish and Game fisheries biologists and acting project managers were contacted. Water temperatures were monitored and determined to be well within safe limits.

Construction Activity Summary

On July 11 and 12th 2012 the staging areas were developed and all water quality measures described in the project plans and permits were installed to protect water quality against any accidental sediment, oil or petroleum discharge into the stream. On July 16rd the 66-foot long, 10-foot tall, corrugated metal pipe culvert was excavated along with the 700 cubic yards (yd^3) of road fill material and pavement; the pavement and vegetation debris was end-hauled to the county materials storage yard at Junction City for disposal and the fill material was stored on site in the first staging area for use in either the roughened channel or as backfill for the new pipe. A detour was installed between July 16 and August 24 using half width road for a few days before a Bailey bridge was set (7/19). The site was excavated and the 10' diameter CMP culvert removed (7/25) and the new 18' CMP arch was installed over the next two weeks. The roughened channel was constructed and jetted into place at the end of August. From August 27 through September 5, the detour bridge was pulled and the road base was constructed and finalized with a super elevation. The streambank stabilization, installation of the irrigation system, riparian planting and seeding of the staging area and all other disturbed areas was completed between October 29 and November 1 in time for seasonal rains. The road was paved by a contractor and painted by the TCDOT November 9.

Creek Dewatering and Water Quality Protection

The stream which had a consistent 2-3 cfs flow was dewatered by running it through the project site in a pipe prior to excavation of the old culvert. The initial stage of dewatering required an approximately 3 foot dam to be constructed out of plastic sand bags and plastic sheeting inside the old culvert. The water was diverted into a 40' long by 24" wide double-walled HDPE culvert

in order to carry the creek flow beyond the tailwater control of the plunge pool and out of the project area. The diversion pipe was comprised of two sections chained together and stabilized with 4” by 4” wood beams below and on top of the culvert joint. A chain was strung between two trees and put under tension with a come-along to further support the diversion pipe and the weight of the water flowing through it. Once the fill surrounding the old culvert had been excavated and the second diversion pipe installed, the first diversion was removed in order to extricate the old culvert.

The second creek diversion was constructed of an approximately 3 foot high dam made out of plastic sand bags, rocks and plastic sheeting at the upper end of the project. It was located at the downstream side of a natural pool below the upper fish exclusion screen. Flows were diverted through a 120’ long by 24” wide HDPE culvert with a 20’ section of 24” single-walled flexible pipe at the outlet end. The flexible pipe section at the bottom end of the diversion pipe was required in order to allow the creek water to reenter the creek channel with a drop of less the 12’ inches and avoid excessive scour of the creek bank. The dewatering culvert was chained together with lever binders at each pipe segment to assure that it would not come apart during construction and to minimize leakage. Having the dewatering pipe to the side of the construction site did slow some excavation work as in impinged on the crews ability to place fill material and required the need to cut a trench.

Left: The initial water diversion pipe placed within the old culvert was used to allow excavation of the road fill and installation of the main diversion pipe, which is visible in the right side of the photo. Once the main diversion pipe was installed, the initial diversion pipe in the 10’ diameter CMP was removed. Right: Diversion Dam upstream of the project

Approximately 95% of flows were successfully diverted through the diversion culvert but subsurface flows were encountered during culvert excavation. A sump with a gas powered pump was installed downstream of the project construction area, above the downstream fish screen, to pump water out of the construction area. Due to the depth of the pre-existing plunge pool at the bottom of the project, but upstream of the diversion culvert carrying creek flow, all water draining through the site was captured and sediment was allowed to settle out before entering the creek. As a precaution, woven geotextile fabric was installed at the outlet of the plunge pool in order to assure that any water re-entering the stream was filtered and sediment introduction was minimized. Due to this construction technique, it was not necessary to continually pump the plunge/sump pool at the bottom of the project. Gas pumps were used periodically to maintain the pool depth and allow sediment time to settle out.

The discharge pipe for the lower sump was located approximately 100 feet from the creek and was initially discharged into a mining ditch downstream of the project and to the right of the creek. A pre-existing ditch failure in the ditch collecting discharge water allowed for water to reenter the creek. Therefore, TCDOT crews devised an alternative system wherein a perforated

flex pipe was attached to the end of the discharge pump hose and laid out cross slope to allow water to diffuse across the hillside. The discharge was monitored daily to assure no delivery to the creek. The discharge pipe for the upper pump was routed through the main diversion pipe to flow back into the creek at the bottom of the project. In addition to the pumping, an oil-absorbing boom was installed prior to culvert excavation to prevent any incidental petroleum contamination to the downstream portion of the creek.

Half width construction was possible with the use of a bailey bridge. Left: Bailey bridge installation, Middle: construction of the multiplate in place, underneath the bridge, Right: lowering the small backhoe into place alongside the newly constructed pipe.

Detour Installation and Culvert Removal

One of the goals of the project was to minimize construction disturbance to only the area necessary for project construction access and to remove only those trees and vegetation necessary for safety and access. To accomplish that goal the half-width construction was utilized and detour design had to be flexible enough to allow to minimize vegetation disturbance and road access. The initial excavation began at the downstream side of the project in order to allow one lane of residential access along the upstream half of the road. TCDOT installed two solar power traffic light trailers, set to blink red light, at either end with construction signage. A Bailey bridge was installed for a detour and remained in place for most of the project construction time. The use of the Bailey bridge allowed TCDOT to lower a small 20 hp Terramite T5 backhoe onto the fill material in order to work under the bridge.

Channel Excavation and Multi-Plate Construction

Construction of the channel occurred in two phases. The existing fill material was first entirely removed with unusable spoils (fill dirt with relatively large amount of organic matter) end-hauled to the Junction City materials storage yard. Fill material that could be reused was hauled to the staging area.

The downstream 12-foot section of the multi-plate culvert was constructed off-site at the Weaverville DOT maintenance yard before being trucked in and installed at the project site. The remaining sections of the pipe were stored at the second staging area and were constructed in place one section at a time. The bottom pieces were installed first by lifting the bottom, upstream lip of the culvert and bolting the bottom panels together. The remaining side and overhead pieces were then installed before the next bottom piece was attached. Large rocks, from 3 to 4 tons, were placed in the culvert (2 every 10 feet) with the excavator as the culvert was constructed. The alignment of the pipe was finalized before the remaining sections were put together and large rock added.

TCDOT pre constructed the first multi-plate section and set it in place (left) before the installing remaining sections (middle). Large boulders were placed as the multi-plate was constructed (right).

Engineered Channel Construction

In order to install the roughened channel inside the multi-plate culvert, the last 20 feet of top pipe sections were not installed. This allowed access to the inside of the culvert from the access road. A 20 hp Terramite T5 two-wheel drive backhoe was used for construction of the streambed channel but it proved to be inefficient. A 314 Komatsu skid steer with over wheel tracks and four-wheel drive, and operator were contracted to place streambed material inside the pipe. The material was dropped into the pipe by the 320 excavator. Due to the number of large boulders placed in the pipe prior to the installation of the engineered streambed, the maneuverability of the skid steer was limited. Two side wall puncture flat tires on the skid steer resulted from contact with large boulders.

The total length of stream channel treated was 100 feet consisting almost entirely of the section within the newly constructed culvert. The remaining roughened channel consists of the filled in plunge pool at the outlet and the two rock ribbon grade-control structures constructed with 2 ton rock, buried 2 layers deep and keyed together and into the banks. The plunge pool below the replaced culvert was installed first. A natural rock ribbon that acted as the tail water control of the plunge pool was left in place. A single 1.5 – 2 ton boulder was added to the river left side along with streambed material to assure erosion protection along the full creek width. The first engineered rock ribbon was installed before the first section of the multi-plate culvert was installed due to limited downstream excavator access after the culvert was in place. The second rock ribbon was installed upstream after the final bottom sections of the multi-plate culvert were installed and before Trinity crews moved the streambed material in to place.

Engineered streambed material designed to be stable up to the 100-year flows was placed in the channel and jetted to compaction using a both the upstream electric pump and the TCDOT trash pump downstream. Streambed material was mixed on site at the staging area using a combination of native and purchased material. Initial streambed material proved to be too fine and was amended with sand, crushed gravel and cobble. A ¼ inch smooth bore brass nozzle and ½ inch fire nozzle supplied sufficient water pressure to jet the streambed material and fill interstitial gaps. Jetting occurred as material was added and while the remaining culvert pieces were installed. During jetting, turbid water was pumped from the lower end of the project and recirculated into the jetted material. A sump hole at the downstream river left side of the culvert

was used to trap water and allow for recirculation during the jetting process. A straw bale, sand bag, plastic sheet and non-woven geo-fabric dam trapped fine sediment at the lower end of the project. Turbid water was removed by pump before it could re-enter the stream. Jetting continued from August 20 to 25 for a total of five days.

Once the engineered streambed material was set in place and fully jetted, the creek was returned to the channel. The diversion dam was breeched in stages to prevent a rapid flush of the engineered streambed material and resulting release of turbidity. As the creek flow was returned to the channel, 5C staff monitored downstream turbidity levels and adjusted flows as necessary to minimize sediment delivery to the creek. The straw bale dam constructed downstream of the lower rock ribbon (see description above) was periodically pumped out when turbidity levels were deemed to be too high. Over an approximate four hour period, the diversion dam was completed removed and the full water flow of the creek was returned to the channel. At one point during this process, 5C staff determined that creek turbidity levels were above desired condition for a short period and both the USFS and DFG project supervisors were notified.

5C Program staff assisted with the channel engineering construction and inspection as needed, and conducted the water quality, fish exclusion, and Best Management Practice during this phase of the project

TCDOT constructed the upstream rock ribbon at the inlet of the culvert (left) before the streambed mix was installed in the pipe (middle). A temporary sediment basin was constructed downstream of the former plunge pool (right)

Streambank Stabilization & Road Construction

As the streambed material was installed, as described above, TCDOT crews began backfilling around the pipe. The 20 hp Terramite T5 backhoe, supplied by LanMark Forestry, was used to place fill material in preparation for compaction with a plate compactor. Once the engineered streambed material was fully set and full creek flows were returned to the channel, the diversion pipe was removed and the remaining upstream fill material was constructed and compacted. A detour road was reinstalled on the upstream fill slope in order to provide access while the Bailey bridge was deconstructed and removed. The TCDOT crews then reconstructed the downstream portion of the fill, installing an alder rootwad on the river right side of the creek at the same time. An approximately 25-foot section of 20” diameter ponderosa pine was installed on the river left side of the creek downstream of the culvert outlet. The butt of the tree section was anchored into the left bank with large rock outside of the fill material to in order to avoid compromise of the fill material. The tree section was angled downstream at approximately forty-five degrees from the stream channel. Both pieces of LWD were placed to promote scour and deposition of streambed material during high flows in order to create and maintain fish habitat.

Large rock slope protection material was placed at the inlet and outlet of the multi-plate culvert for bank stabilization and project from high flows. Due to the large size of the culvert, rock slope projection was only required to cover approximately half the height of the culvert.

Constructing the upstream fill material (left), the detour road and traffic control lights (middle), constructing the downstream fill (right).

Installing large wood at the culvert outlet (left) and completed LWD (right)

Revegetation

On November 1st the site final erosion control and temporary reseeding effort was completed. 20 pounds of native grass (Blue Wild Rye: (Elymus glaucus), Meadow Barley: (Hordeum Brachyantherum), Beardless Wild Rye (Leymus Triticoides) was planted and mulched with native mulch/compost collected from forest land adjacent to the site. Seed was purchased by the Trinity County Resource Conservation District (RCD) and was a locality mix. California Brome (Bromus carinatus) was obtained from the Forest Service and added to the seed mix. Seeded portions included sections of Red Hill Road adjacent to the bridge that were disturbed during construction as well as all disturbed soil along Conner Creek, the riparian area and the staging area at the barrier site. Five larger diameter (2") incense cedars (*Calocedrus decurrens)* , 5- 1" diameter Douglas-fir (*Pseudotsuga menziesii*), and 3- 1" interior live oak (*Quercus chrysolepis*) were planted along the road side and in the access road. Jute mate was laid across the steepest sections of fill slope and stapled in place in order to provide added protection from rain impact. The large spoils staging area was mulched, reseeded with the described mix and locally collected acorns were planted. All silt fences and wattles were removed.

Native pine mulch, certified weed-free straw, grass seed, straw wattle, tree plantings and jute matt (left) were applied to the site. Native mulch, straw and grass seed were applied to the equipment staging area (middle). Mulch, seed and acorns were used at the large staging area (right).

Project Monitoring

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 was performed. Photo monitoring during construction and post-project monitoring activities has also occurred. Storm monitoring during late fall and winter of 2012 will continue to assure that no soil mobilization occurs.

Longitudinal Profile/Thalweg Monitoring: The pre-project longitudinal and thalweg surveys utilized for designing the bridge and channel were completed in 2006 by SHN Consulting and entered into AutoCAD. Another pre-project longitudinal profile was taken starting from approximately 920 feet upstream of the project to 141 feet below the project (total length of 1,061 feet). Four cross-sections were also measured. A post-project profile was taken again following project construction in December 2012. The third profile will be taken in April/May 2013, and again after the second and third winters (April/May 2013 and 2014). Post project surveys of the same areas will be done immediately following construction and again at a future date in response to storm flows and channel adjustments.

Biological Monitoring:
Spawning and presence/absence surveys will be conducted at the project site. The initial survey data consists of USFS and 5C Program Migration Barrier Inventory data collected prior to the project. The culverts were assessed as complete barriers to juvenile coho and steelhead during the Trinity County barrier inventory. The Conner Creek Road barrier was a complete barrier for adults in most flows and the Red Hill Road crossing is a partial barrier to adults.

Other Monitoring:
The Trinity County Department of Transportation will maintain the new crossing. During high rainfall/storm events, the new structure will be inspected in a timely manner and debris will be removed if necessary. This project will provide both short and long-term objectives by reducing culvert maintenance costs and emergency time for the Trinity County Department of Transportation maintenance crews and engineers.

Quantitative Results

A. Stream length treated/assessed/made more accessible (distance in feet): **2.5 miles of adult habitat and 1,000' of juvenile habitat. In 2012 the upstream project will open 2.3 miles of juvenile habitat.**
B. Instream habitat structures to be installed (number): **0**
C. Fencing length to be installed/repaired (distance in feet): **0**
D. Road length treated/assessed (distance in miles): **0**
E. Stream crossings treated (number): **1**
F. Sediment prevented from entering the stream (volume in cubic yards): **250 cubic yards**
G. Trees planted (number): **10**
H. Area planted/preserved/assessed (area in acres): **0.25 acres total (area reseeded along riparian zone and the staging area**
I. Public meetings (number): **0. Public meets were not required, however all neighbors were sent a public notice as part of the NEPA process. Two newspaper articles and above-the-fold front page photo were published on September 21, 2011 and November 16th in the Trinity Journal. The CEQA Categorical Exemption was posted for 31 days in the Trinity County Courthouse, with no comments received.**
J. Public meeting attendees (number): **Not applicable**
K. Students trained (number): **0**
L. Juvenile fish produced: **0** released: **0**
M. spoils volumes:

Measure Category	**Measure**
Stream crossings treated to improve fish passage (number)	1
Stream length opened for fish passage by improving stream crossings (miles)	2.5 miles
Bridges installed or improved (number)	1
Rocked fords replaced (number)	N/A
Road crossings removed (number)	N/A
Total length of stream made accessible by removing blockages (miles)	2.5 miles
Total blockages/impediments/barriers removed/altered (number)	1
Overall stream length treated (miles, count one side of stream only)	.019
Length of aquatic habitat disturbed (feet)	100
Area (footprint) of instream features installed within bankfull channel (square feet)	1900 ft^2

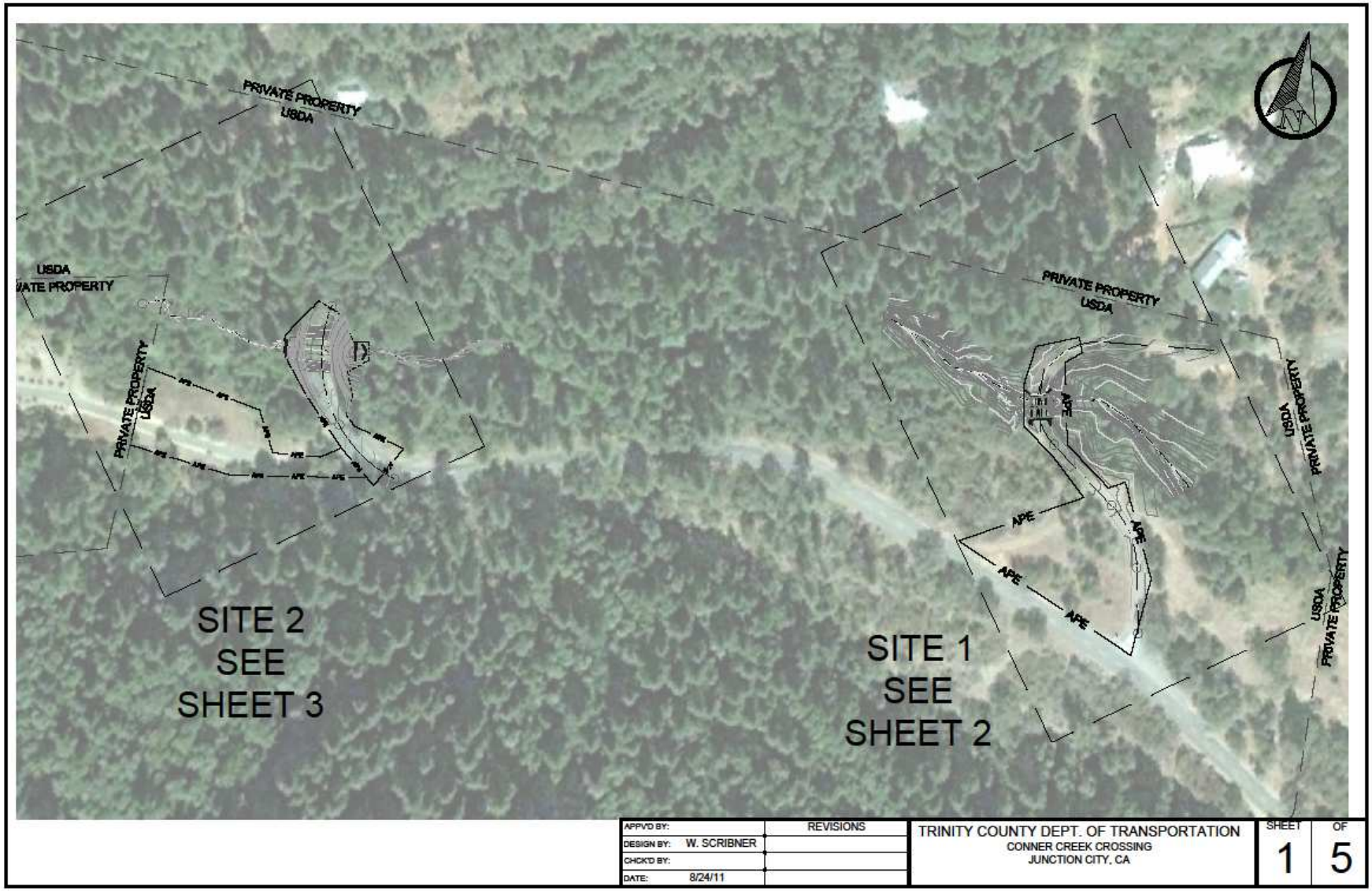
1. An annual report will be submitted each year, no later than December 1, detailing the work completed that field season. The annual report will include, but not necessarily be limited to the following where applicable:
    - Implementation start and end dates; September 1, 2011 – November 1, 2011
    - Percentage of the project completed to date; 50%
    - Dewatering and fish relocation data on DFG data sheet (to be provided by the DFG Grant manager upon request); fish relocation data included with report

List of Attachments

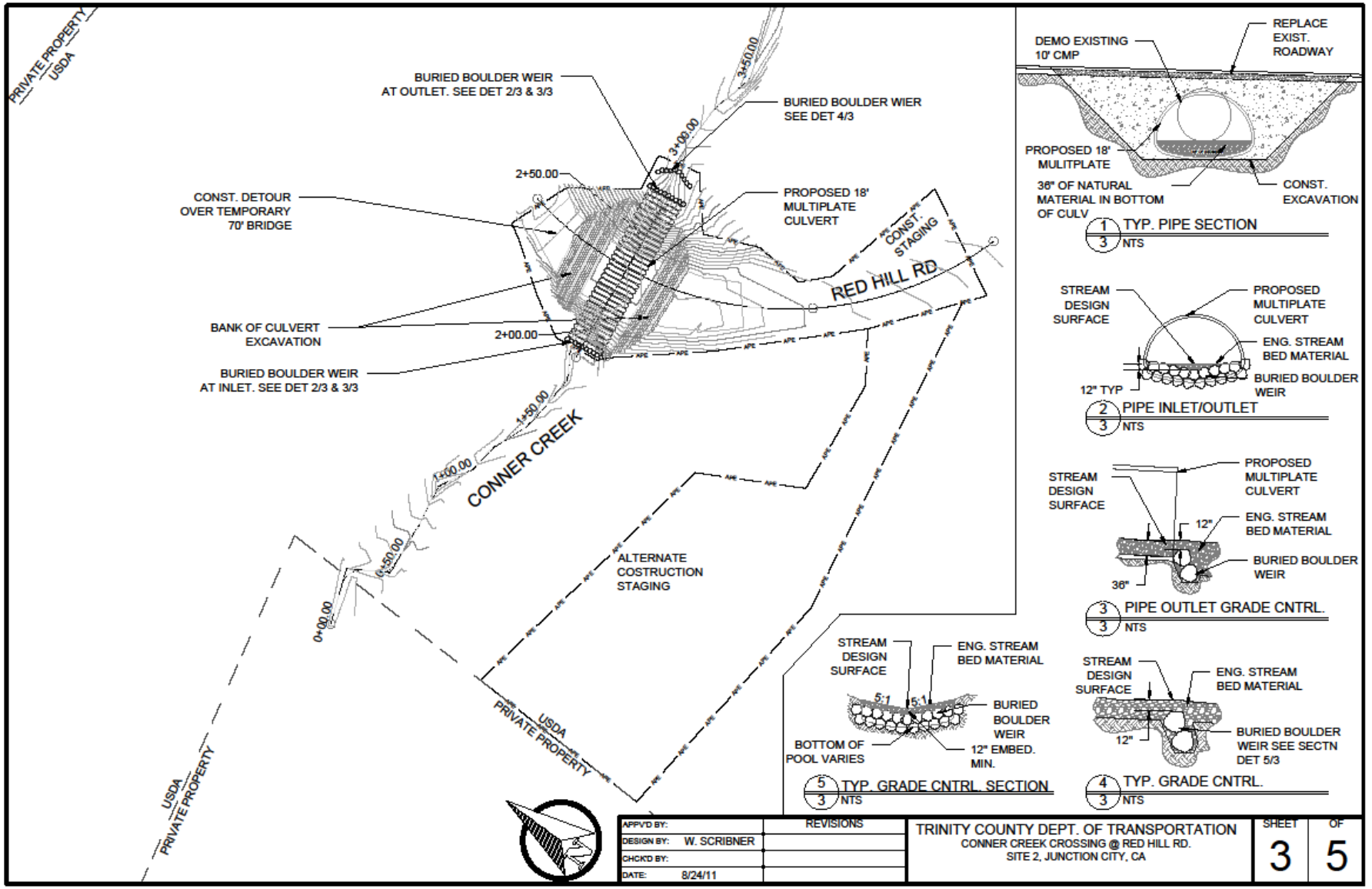
Attachment 1 – Project Plans

Attachment 2 – Fish Relocation Report

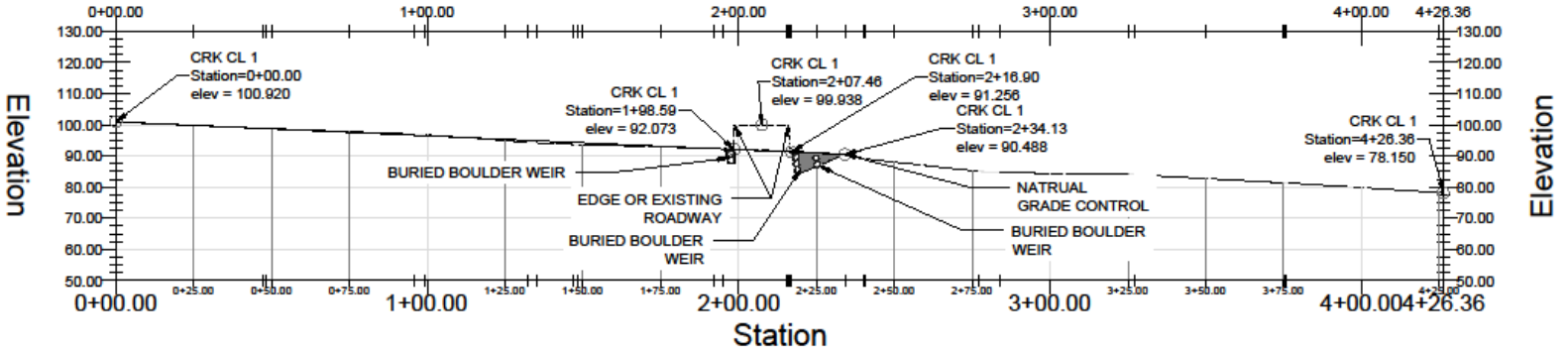
Attachment 1 – Red Hill Road Migration Barrier Removal Project Designs*



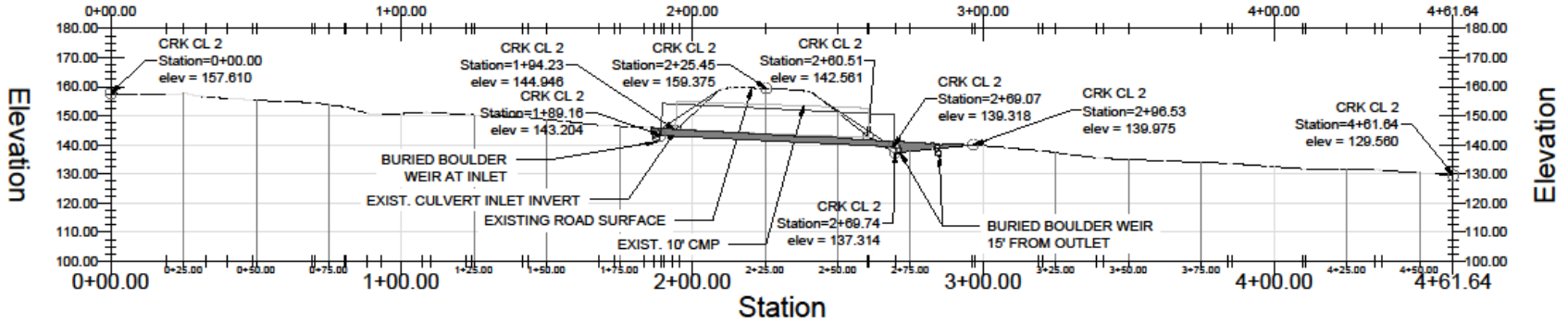
*Pages not represented are for the Conner Creek Migration Barrier Removal Project. See the Conner Creek report for details



CREEK PROFILE @ CONNER CREEK RD. CROSSING (SITE 1)



CREEK PROFILE @ REDHILL RD. CROSSING (SITE 2)



APP'D BY:		REVISIONS	TRINITY COUNTY DEPT. OF TRANSPORTATION CONNER CREEK CROSSING JUNCTION CITY, CA CREEK CL PROFILES	SHEET 4	OF 5
DESIGN BY:	W. SCRIBNER				
CHCK'D BY:					
DATE:	8/24/11				

Attachment 2 – Red Hill Road Migration Barrier Removal Project Fish Relocation Report

Summary of Fish Capture and Relocation at Conner Creek #2 for Trinity County DOT's Culvert Replacement Project on Red Hill Road

Conner Ck #2 – Red Hill Road.
Trinity Co. 7/09/12

Introduction and Site Description

On July 9, 2012 the Five-County fisheries biologist Ross Taylor and Associates (RTA) arrived at the Conner Creek #2 project site at 0800 hrs to capture and relocate fish from the stream reach to be de-watered for the replacement of a Trinity County-maintained culvert on Red Hill Road. David Colbeck (Five-County) and Claire Lindstrand (Five-County) accompanied Taylor to assist with the fish relocation. The exclusion fencing had already been set above and below the project area by Colbeck and Lindstrand. However, the coffer dam and streamflow diversion pipe had not yet been installed. The streamflow was visually estimated at 6-8 cfs.

The water temperature in Conner Creek was 12° C at 0830 hrs, which was measured in the outlet pool downstream of the crossing. The conductivity was 145 µS/cm and was measured with a Milwaukee C65 conductivity meter (serial #M145947). Prior to conducting the fish relocation, we identified several pools downstream of Red Hill Road that were suitable for releasing captured fish and amphibians.

Fish Relocation Methods

During the fish relocation Taylor operated the electrofisher, while Colbeck and Lindstrand netted fish and monitored the condition of the captured fish in the holding containers. The electrofisher utilized was provided by RTA and was a Smith-Root; model LR-20B (serial #B25939). We used an initial setting of DC/150 volts. The fish responded well to this setting, they were effectively immobilized, yet all of them recovered quickly when the electrofisher's power was turned off. We used 150 volts throughout most of the fenced-off reach, except the outlet pool where we used 200 volts.

All electrofishing passes were made starting at the lower exclusion fence and we worked in an upstream direction and then we turned around and worked in a downstream direction. All captured fish and amphibians were temporarily held in 5-gallon buckets with battery-powered aerators attached. Age-0 fish were separated from older age classes of fish and the larger Pacific giant salamanders. Because the water diversion had not been installed we were unable to use a pump to lower the water level in the outlet pool. The outlet pool was too large and too deep to effectively capture all of the fish with a single electrofisher. Prior to starting the removal of the existing culvert, the water diversion should be installed and outlet pool drained so that any remaining fish can be netted and relocated by Colbeck and Lindstrand.

Results

The following table summarizes (by species and age class) the fish and amphibians captured and relocated from the Conner Creek/Red Hill Road project area to pools located downstream of the lower exclusion fencing. All fish were in good condition at the time of release.

Pass Number		Coastal Rainbow Trout - Young-of-Year (≈40-100 mm in length)	Coastal Rainbow Trout – 1+ Age Class (≈110-140 mm in length)	Coastal Rainbow Trout – 2+ Age Class (≈160-180 mm in length)	Tailed Frog	Yellow-legged Frog	Pacific Giant Salamander
Below Crossing	Pass #1	**3**	**1**	**2**	**0**	**0**	**3**
	Pass #2	**0**	**0**	**1**	**0**	**0**	**0**
	Pass #3	**0**	**3**	**0**	**0**	**0**	**1**
	Pass #4	**1**	**0**	**0**	**0**	**0**	**0**
	Pass #5	**0**	**0**	**0**	**0**	**0**	**0**
Above Crossing	Pass #1	**2**	**4**	**3**	**1**	**0**	**5**
	Pass #2	**0**	**2**	**0**	**0**	**0**	**2**
	Pass #3	**0**	**0**	**0**	**0**	**0**	**0**
	TOTALS	**6**	**10**	**6**	**1**	**0**	**11**

We also captured and relocated a single tailed frog tadpole from the reach above the culvert on the first electrofishing pass. As shown in the above table, no fish were captured or observed during the final electrofishing passes in both reaches, above and below the Red Hill Road culvert. The relocation effort occurred between 0830-1230 hrs. The total electrofishing effort was 3,889 seconds (1,894 seconds below the culvert and 1,995 above the culvert). Water temperature was 13° C at 1230 hrs in the outlet pool downstream of Red Hill Road. All data and field notes were recorded in a bound field notebook.

Recommendations

The fish-relocation fencing should be inspected and cleaned of leaf debris on at least a daily basis. Any fish impinged on the screens should be saved (placed in a plastic baggie and frozen) for examination by CDFG or Five-County biologist. The fencing needs to be better secured along the bottom and sides to prevent additional fish from entering the project area. At the start of construction project a Five-County employee should be present to look for any amphibians and fish missed during the relocation effort. The outlet pool should be drained with a properly screened pump and any remaining fish should be netted and relocated to the downstream channel. Any relocated fish should be reported to the Five-County fish biologist and CDFG.