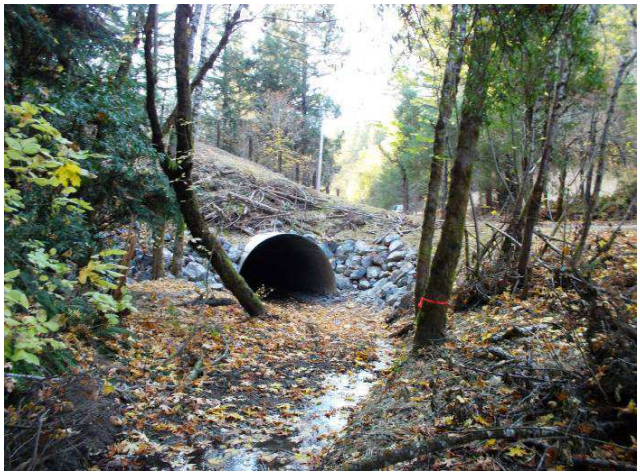
Five Counties Salmonid Conservation Program
Coastal Conservancy Grant Agreement #08-090

Final Report



Acknowledgements:

This project represents thousands of hours of effort and dedication by people throughout Northern California, many of whom cannot be individually recognized for their assistance and support.

The Del Norte, Humboldt, Mendocino, Siskiyou and Trinity County engineering and road division staffs undertook projects, contributed in-kind funds, and provided valuable insight on 12 projects. Thank you: Howard Dashiell and Alex Straessle - Mendocino County; Chris Whitworth and the Humboldt County Engineering Staff; Jeff Daniels - Del Norte County; Scott Sumner and Scott Waite- Siskiyou County; and, Rick Tippett, Wes Scribner, Randy Cessna, and Andrew Pence - Trinity County.

On the private lands side the support of numerous property owners allowed access to their properties, disruption of their lives as projects were built, and in the end allowed threatened species back onto their properties. The Gardner, Juarez and Rhine families in Ryan Creek in Mendocino County opened and improved more than 1.2 miles of habitat, which was immediately colonized by coho salmon and steelhead trout in 2011. The Trinity High School District and Frank Zabel allowed us to work on their properties in Weaverville, CA. Numerous landowners in the Browns Creek Watershed in Trinity County participated in the inventory, design and construction of the first of several road upgrades and have lead the way for other landowners to improve roads and water quality.

The cooperation of the Weaver Community Service District and Weaver Sanitary District continue to demonstrate how habitat restoration and public infrastructure can work hand in hand.

Many agencies, organizations and individuals have supported these efforts including: Richard Geinger, Leah Mahan, Bob Pagliuco and David White (NMFS); Scott Harris, Kevin Gale, Margie Caisley, Marcin Whitman, and Kate Grossman (CDFW); Andrea McBroom, Mike McCain and Eric Wiseman (USFS).

The project would not have been possible with the dedication, talent and hardwork of the 5C staff including Christine Jordan who began this project in 2008 and left to pursue other goals in 2010. Sandra Pérez, David Colbeck, Claire Lindstrand, Dimitri Dolci, Anna Leeper, Carla De Juilio, Jacob Hymas, Carolyn Rourke, and Sue Rhodes.

The project would not have been successful without the advice, direction and help of Michael Bowen of the Coastal Conservancy staff.

Respectfully,

Mark Lancaster, Director
Five Counties Salmonid Conservation Program

Photo 1. Ryan Creek, Mendocino County post construction (Photo: Scott Harris. 2014).

Summary

This grant contributed to the design and permitting of 22 migration barrier and sediment reduction projects on private, county, special district, and state roads or stream crossings within Mendocino, Humboldt, Del Norte, Siskiyou and Trinity counties. The original grant goal was to fund 20 projects.

During the terms of this agreement the designs directly contributed to success in obtaining construction funding of 14 projects and the completion of 10 of those. Five migration barriers were removed (County Ryan and Private Ryan Creek crossings, Conner Creek #1 and #2, and Griffin Creek) restoring more than 5.2 miles of coho and/or steelhead habitat. Four additional migration barrier removal projects designed under this grant were funded for construction including Bally Loop migration barrier removal (2015), Fish Creek (2016), Sharber Creek (2016) and Frances Creek (construction date not determined). With the completion of these projects 11 miles of salmon/steelhead habitat will be restored.

Four remaining barrier removal sites are fully designed, but are not currently funded for construction (Dinner Creek #1 and #2, McKinney Creek, and Telegraph Creek). Four migration barrier projects require additional design and permitting (East Weaver Dam Removal, Fish Creek, Rowdy Creek, and Salt River-Cutoff Slough) as does one sediment reduction project (Lower East Weaver Creek). Fish Creek, while still needing some additional design and permitting was funded for construction.

Five of the sediment/habitat projects designed were constructed between 2011 and 2014 (Browns Creek Roads, Lower East Weaver Creek, Ryan Creek LWD, Usal Road, and Fish Rock Road). The Browns Creek Roads and Fish Rock Road projects will be continuing with Phase III implementation work in 2015. Sediment savings from road failures from all ten projects completed between 2011 and 2014 totaled more than 14,500yd^3.

Completion of all projects will restore more than 26 miles of habitat and prevent in excess of 25,000 yd^3 of road material from reaching streams. All of the projects improve resilience to flood flows while improving routing of bedload and debris in stream channels.

Funds from this grant contributed to leveraging an additional $2.39 million in engineering, permitting and construction funding of the ten projects that were constructed between 2010 and 2014 as well as $1.5 million for projects that will be implemented between 2015 and 2017.

Introduction

For decades, culverts have disrupted the spawning and rearing behavior of all four species of anadromous salmonids in California: Chinook and coho salmon, coastal rainbow trout, and coastal cutthroat trout as well as Pacific lamprey. The problem was recognized more than 80 years ago, when the Forest Service and the California Division of Highways (Caltrans) were constructing roads in the Klamath River watershed:

> *"In a number of instances both State and Forest Service crews have in the process of road construction cut off spawning tributaries…. They have done this especially by directing streams through culverts whose low ends terminate in vertical drops of fifteen to thirty feet, barring the way to spawning steelhead and salmon… It cannot be too strongly emphasized that when possible, small bridges rather than culverts, should be installed in spawning streams, even though the cost of construction be greater. It is certainly "robbing Peter to pay Paul" to put in low-cost, impassible culverts on the one hand and to expend money for stream improvement on the other."* -A.G. Taft & Leo Shapovalov (Dept. of Commerce, Bureau of Fisheries) February,1935

Eighty years later restoration of streams has become an important tool for these same and many other agencies, key among them the California Coastal Conservancy. The Coastal Conservancy in 2009 provided the Five Counties Salmonid Conservation Program[1] a grant totaling $500,000 to "*design, permit, and prepare for implementation at least fifteen fish passage improvement projects and five associated water quality improvement projects in the counties of Del Norte, Humboldt, Mendocino, Trinity, and Siskiyou*." Between 2009 and 2014 the program successfully met, and exceeded the goals of the grant and partnered with Counties, special districts and private landowners to actually construct 10 of the designed projects.

Five migration barriers were removed (County Ryan and Private Ryan Creek crossings, Conner Creek #1 and #2, and Griffin Creek) restoring more than 5.2 miles of coho and/or steelhead habitat. Four additional migration barrier removal projects designed under this grant were funded for construction including Bally Loop migration barrier removal (2015), Fish Creek (2016), Sharber Creek (2016) and Frances Creek (construction date not determined). With the completion of these projects 10 additional miles of salmon/steelhead habitat will be restored.

Three remaining barrier removal projects are fully designed, but are not currently funded for construction (Dinner Creek, McKinney Creek, and Telegraph Creek). Five migration barrier projects require additional design and permitting (East Weaver Dam Removal, Fish Creek, Lower Sidney Gulch, Rowdy Creek, and Salt River-Cutoff Slough) as does one sediment reduction project (Lower East Weaver Creek). Fish Creek, while still needing some additional design and permitting, was funded for construction.

Five of the sediment/habitat projects designed were also constructed between 2011 and 2014 (Browns Creek Roads, Lower East Weaver Creek, Ryan Creek LWD, Usal Road, and Fish Rock Road). The Browns Creek Roads and Fish Rock Road projects will be continuing with Phase III implementation work in 2015. Sediment savings from road failures from all ten projects completed between 2011 and 2014 totaled more than 14,500yd^3.

Completion of all projects will restore more than 26 miles of habitat and prevent in excess of 25,000 yd^3 of road material from reaching streams. All of the projects improve resilience to flood

[1] The Five Counties Salmonid Conservation Program was an element of the Trinity County Planning Department from 1998-2008. In 2009 the 5C Program transferred to the non-profit organization Northwest CA Resource Conservation and Development Council. The 5C Program works with Counties via Memorandum of Agreements.

flows while improving routing of bedload and debris in stream channels. The projects will reduce transportation maintenance activities, and associated costs, during high storm flows. In total 40 consultants, engineering design teams, and/or specialists contributed to the designs of the projects including engineering teams from all five counties in the target area (Del Norte, Humboldt, Mendocino, Siskiyou and Trinity. Tables 1 & 2 summarize the status of all elements (Table 1) and Overall Project status (Table 2).

Table 1: Project Element Status

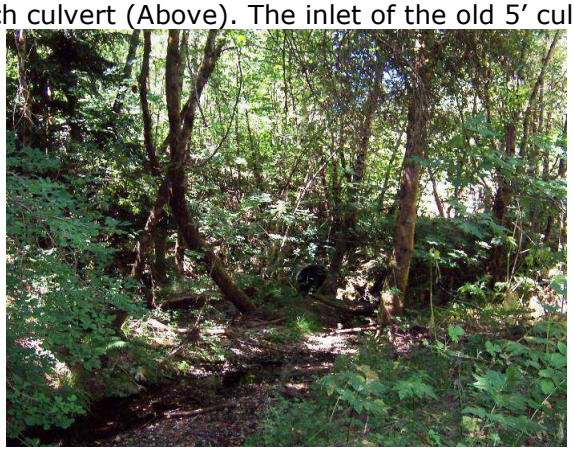
Project	Design Task	Environmental (NEPA/CEQA)	Permitting
Browns Creek Watersheds	Completed	Completed	Completed
Conner Creek @ Conner Creek Rd	Completed	Completed	Completed
Conner Creek at Red Hill Road	Completed	Completed	Completed
Dinner Creek #1 & #2 Design	Completed	N/A	N/A
Fish Creek Design	60%	Initiated	N/A
Fish Rock Road Design and CEQA	Completed	Completed	Completed
Frances Creek Design	Completed	Completed	N/A
Griffin Creek #2 Design	Completed	Completed	Completed
Lower East Weaver Habitat	Completed	Completed	Completed
McKinney Creek Design	95%	N/A	N/A
Rowdy Creek	30%	N/A	N/A
Ryan Creek County Design	Completed	Completed	Completed
Ryan Creek LWD	Completed	Completed	Completed
SF Ryan Creek Private Barrier	Completed	Completed	Completed
Salt River- Cutoff Slough	70%	N/A	N/A
Sharber Creek Design	65%	N/A	N/A
Sidney Gulch at Bally View	95%	Initiated	N/A
Sidney Gulch at Lee Fong Park	50%	Initiated	N/A
Telegraph Creek	Completed	Completed	N/A
Upper East Weaver	20%	N/A	N/A
Usal Road	Completed	Completed	Completed

Photo 2. Adult chinook upstream of the former County road barrier site and just downstream of the Private Ryan crossing on Ryan Creek. (Photo: Scott Harris)

Table 2: Project Overall Status

Project	Construction Status
Browns Creek Watersheds	Phase 1 & 2 Completed 2014
Conner Creek @ Conner Creek Rd	Completed 2011
Conner Creek at Red Hill Road	Completed 2012
Dinner Creek #1 & #2 Design	Unknown
Fish Creek	Construction Scheduled 2016
Fish Rock Road Design and CEQA	Phase 1 & 2 Completed 2014
Frances Creek	Construction Funded
Griffin Creek #2	Completed 2013
Lower East Weaver Habitat	Completed 2014
McKinney Creek	Unknown
Rowdy Creek	Unknown
Ryan Creek County	Completed 2011
Ryan Creek LWD	Completed 2011
Ryan Creek Private Barrier	Completed 2013
Salt River- Cutoff Slough	Unknown
Sharber Creek Barrier	Construction Scheduled 2016
Sidney Gulch at Bally View	Construction Scheduled 2015
Sidney Gulch at Lee Fong Park	Unknown
Telegraph Creek	Unknown
Upper East Weaver	Unknown
Usal Road	Completed in 2011

Photos 3-6. Private Ryan Creek Project-preparing the channel bottom for construction of an arch culvert (Above). The inlet of the old 5' culvert (Right Below) and the new 18' arch (Left)



Migration Barrier Inventories within the 5C Program Area

The projects selected by 5C staff for inclusion in this grant agreement were based on the previous barrier inventory and prioritization efforts as well as discussions with California Department of Fish and Wildlife (CDFW), NOAA's National Marine Fisheries Service (NMFS), Forest Service biologists, and Conservancy staff.

Three major barrier inventory sources were consulted in the development of projects under this grant:

- 5C Migration Barrier Inventory was completed from 1998 through 2004 and resulted in the identification of 257 barriers on county maintained road/stream crossings within anadromous salmonid reaches. The County projects selected under this grant agreement were based on the 5C Program-wide prioritization ranking matrix. With the inclusion of the projects addressed under this grant, the counties will have designed replacements for 67 of the priority barriers on their road systems.
- CalTrans District 1 initiated the North Coast Pilot Research Study to identify State Highway System culverts that blocked or impeded upstream or downstream passage of anadromous salmonids in 2001. The study identified 411 potential stream crossings for fish passage improvement and ranked them by priority.
- Inventory Of Barriers To Fish Passage In California's Coastal Watersheds inventory report was completed by the California Coastal Conservancy in 2004. This report was also utilized to determine priority projects.

In addition to the reports the Calfornia Fish Passage Database (CFPD) was consulted for barriers in the same watersheds as identificed priority projects.

Uninventoried barriers were investigated in watersheds where projects under this grant were targeted or where fisheries biologist located high priority barrier sites and contacted 5C Staff. As a result numerous significant barriers on private lands or on other public lands (special district managed facilities) were considered and submitted to the Conservancy for inclusion in the grant. This resulted in the addition of design work for East Weaver Creek, Frances Creek, Rowdy Creek, Sharber Creek, Salt River-Cutoff Slough, and Telegraph Creek. The funding to work on these designs was facilitated by the removal of two originally proposed projects: Garden Gulch Creek and Mill Creek and saving in costs to complete other projects. The Garden Gulch Creek project was dropped when an additional complete barrier site was discovered on private lands upstream of the project. It was determined it would be better to delay work on this stream until all barrier sites could be addressed at the same time. The Mill Creek sites were dropped when it was determined that the extent of the barrier was not as significant as originally intended and initial cost assessments indicated the cost to replace them was relatively high.

Nine of the projects completed under this grant were County roads with 5C priority rankings. One was selected from the Caltrans inventory, Fish Creek on Highway 254, and one private crossing upstream of a Highway 101 partial barrier site was selected (private Ryan Creek crossing). The Salt River-Cutoff Slough project was determined from the Coastal Conservancy barrier report. Three barrier sites were identified outside of the existing barrier inventories as a result of independent investigations or contacts from fisheries biologists familiar with uninventoried sites. These site were

the East Weaver Creek Dam, Cutoff Slough Tidegates, and Sharber Creek road crossing.

All of the sites addressed in this project will be updated into the CFPD.

Sediment Inventories and Habitat Assessments
The sediment reduction projects design under this grant were selected based on results of the 5C Program Direct Inventory of Roads and Treatments (DIRT) inventories of county roads in Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity Counties or as the result of other 5C sediment source assessments (for non-county sites). The Fish Rock Road and Usal Road projects were high priority DIRT project sites, while the Browns Creek and Lower Sidney Gulch sites were based on non-county road sites.

One site, the Private Ryan Large Wood Project, was the outgrowth of a barrier removal project. The Ryan Creek County Road Barrier Removal project involved the removal of 15 large diameter Douglas-fir trees within the road fill. These trees were relocated upstream between the county road crossing and the Highway 101 crossing. The creek lacked large wood prior to the projects. The installed wood and tree recruitment from the banks have significantly increased wood in the stream.

Grant Agreement Objectives and Work ProgramTasks
The objectives of this grant included:

- Design, obtain permits, and prepare for the implementation of at least ten fish passage improvement projects and five sediment reduction projects in streams within the counties of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity, in which initial design and placement of instream structures have created fish barriers and existing roads are contributing sediment to priority fish bearing streams and rivers;
- Facilitate local and state governments and agencies, as well as private firms, with the development and preparation of designs;
- Complete the design and required state and federal permitting, excluding CDFG Stream Habitat Alteration Agreements as these relate to actual construction time periods, which will, through project implementation, result in the restoration of anadromous habitat for coho and Chinook salmon, steelhead, and Coastal cutthroat trout.
- Seek funding for implementation of the projects.

The grant objectives were exceeded in all aspects. A total of 16 fish passage improvement projects were completely designed (11) or partially designed (5). Of the 11 completely designed, five were constructed and 4 additional projects are funded for construction in Upper Sidney Gulch (2015), Sharber Creek (2016), Fish Creek (2016) and Frances Creek (construction will be done concurrent with other Salt River restoration projects). Six sediment/habitat reduction projects were designed with 5 being completely designed, permitted and implemented.

TASK 1: Grant Administration and Project Planning Manage the grant, conduct proposed project assessments, coordinate meetings, develop contracts, Scopes of Work and MOUs as appropriate (subject to Coastal Conservancy review), assure timely compliance for all project requirements with each contracting entity, manage

invoicing, prepare progress and final report(s), and transfer funds to Counties and Consultants.

Photos 7-8. Conner Creek crossing at Red Hill Road before (Left) and immediately after construction (Right)

A) Complete MOUs with Counties and other Government and contracts with various local consultants and non-profit entities for project design: Formulate statements of work, budgets, deliverables, timeframes for completion, and/or other tasks.

Design work done by Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity County engineering staffs was done under the existing 5C MOA with each County. In addition to county engineering staff 16 consultants (engineers, hydrologists, geotechnical specialists, biologists, botanists and archaeologists) were contracted to work on designs or permitting as shown in the Table 3.

B) Assure timely compliance of Contract/MOU implementation – start dates; subcontracts; progress reports; required documents (engineer certified plans, permits, CEQA documentation, insurance documents, etc.).

The 5C Program staff conducted site visits to each location as needed; set timelines and assured consultants met the timelines for project design tasks and deliverables. Staff worked with Counties and contractors to develop designs, timelines, budgets, surveys, and other tasks. They also Site meetings were held at project sites, often with a team of agencies representatives from county, state (CalFire, CDFW and/or CA Geologic Services), federal (NMFS) and landowners (e.g. Redwood Forest Foundation Inc., Sinkyone Inter-Tribal Timber Council, Bob Gardner's, Sharber Creek Road Association members, Shady Lane Road owners, etc.).

Staff coordinated and worked on and/or completed documentation of project CEQA and NEPA compliance (including doing CEQA/NEPA for numerous projects as Task 2 work items). 5C Staff assisted agencies in permitting and NMFS compliance. These task included coordination with Forest Service Interdisciplinary Team staff, Fish and Game biologists, and several NOAA staff members Work included setting up pre/during/post photo points for monitoring. Projects included conducting tree marking and site surveys for Lower East Weaver project, developing a tracking

system for large wood movement within the watershed and preparation of LWD maps.

The 5C Program provided information to the CA Contractors Board regarding an allegation that Davis/Bacon rules were not followed on Ryan Creek Large Wood contract. Review by the Contracting Board found no merit to complaint.

C) Report Task Compliance to Coastal Conservancy: Invoices, Progress Reports and Final Report

Work under this task included invoicing and invoice management, progress reports, progress reviews and adjusted budgets. Other tasks include preparation of reports and photo management and communication with project partners.

Work performed under this task, with detail, was included in Progress Reports 1-14 (May 1, 2009 through December 31, 2014). Costs associated with this task increased as a result of extension of the time of the agreement and addition of projects.

D) Grant Administration: Communications, Utilities, Rent, Office Supplies, Travel; Training; Council Office Manager Salary costs; Other Non-Project Related Tasks

Office management for the Council side and 5C related administrative tasks such as: Audit compliance, contractor compliance for taxes, insurance endorsements; workers compensation coverage; staff reports to the Council; monthly payroll taxes, health and retirement contributions; manages all fund deposits and payments; and other administrative duties. Preparation of invoices, expense vouchers, journal entries, tracking of salaries, reviews all invoices for back up receipts and other 5C fiscal matters.

Program tasks completed include participation in numerous meetings (CA Coho Recovery Team, Board of Forestry VTAC, CA Fish Passage Forum), and presenting at workshops (Fish Passage Design, North Coast Integrated Watershed Management Plan).

Work performed under this task, with detail, was included in Progress Reports 1-14 (May 1, 2009 through December 31, 2014). Costs associated with this task increased as a result of extension of the time of the agreement and addition of projects.

Table 3. Contracting and Design Partners For Projects

CONTRACTING ENTITY	PROJECT
Christine Jordan Wildlife & Consulting	Fish Rock Road Sediment Reduction Project; Conner Creek #1 and Fish Creek Migration Barrier Removal Projects
Del Norte County Community Development Department	Griffin Creek #2 Sediment Reduction/Migration Barrier Removal Project
Galea Wildlife Consulting	Griffin Creek #2 Sediment Reduction/Migration Barrier Removal Project
Geoscience Services	Browns Creek Sediment Reduction Project
GHD Inc.	Rowdy Creek Fish Hatchery and Salt River-Cutoff Slough Migration Barrier Projects
GMA Hydrology, Inc.	Sidney Gulch at Lee Fong Park Sediment Reduction/Habitat Project; Upper East Weaver Creek Migration Barrier Removal Project
Humboldt County Department of Public Works	Dinner Creek, Telegraph Creek, and Frances Creek Migration Barrier Removal Projects
Jerome Hauke Civil Engineer	Sharber Creek Migration Barrier Project
Jessica Stauffer Consulting	Lower East Weaver Sediment Reduction/Habitat Project
Kamman Hydrology & Engineering	Salt River-Cutoff Slough Migration Barrier Project
Mendocino County Department of Transportation	Ryan Creek Road Migration Barrier Removal Project, Usal and Fish Rock Road Sediment Reduction Projects
Michael Love & Associates	Sidney Gulch at Lee Fong Park Sediment Reduction/Habitat Project; Salt River-Cutoff Slough Migration Barrier Projects
NewFields River Basin Services, LLC.	Fish Creek Migration Barrier Project
Pacific Watershed Associates	South Fork Ryan Creek Migration Barrier Project
Prunuske Chatham Inc.	Ryan Creek Large Wood Placement at County Ryan Project Area; Private Ryan Migration Barrier Project
Ross Taylor & Associates	Sidney Gulch at Lee Fong Park Sediment Reduction/Habitat Project; Lower East Weaver Sediment Reduction/Habitat Project; Sidney Gulch at Bally Loop and Salt River-Cutoff Slough Migration Barrier Projects
Siskiyou County Department of Public Works	McKinney Creek Migration Barrier Removal Project
Taber Geo-Technical Inc.	Conner Creek #1 Migration Barrier Design Project
Trinity County Department of Transportation	Conner Creek #1 and #2, Sidney Gulch at Bally View Migration Barrier Removal Projects
Watershed Training and Research Center	Browns Creek Sediment Reduction Project
William Rich & Associates	Griffin Creek #2 Sediment Reduction/Migration Barrier Removal Project

TASK 2: PROJECT DESIGN:

Conner Creek Fish Passage Improvement Project (#1 &#2)
The two sites are located on a tributary stream to the Trinity River in the Junction City area of Trinity County. The project consisted of completing final designs, environmental review and permitting for two road crossings that were velocity and jump barriers (Photos 7-10).

Conner Creek #1 was a 5' x 10' concrete box culvert that was designed in 2010 to be replaced with a 24' ConSpan arch (Photos 9-10). Conner Creek #2 on Red Hill Road is located approximately 1,000' upstream of the Conner Creek #1 crossing and was a 10' CMP culvert. Conner Creek #2 was partially designed in 2007 by SHN Consulting Engineers with a final design completed under this grant in 2010. The crossing was replaced with an 18' x 12' plate pipe arch in 2012 (Photos 7-8).

Photos 9-10. In 2011, the downstream 10' wide by 5' tall migration barrier box culvert on Conner Creek (Left) was replaced with a 24' x 9' bridge (Right).

Preliminary designs for the crossing were completed in 2007, but the designs called for retrofits to install boulder controlled weirs and jumps at the outlet pools. The project, if constructed as originally designed, would have left the undersized structures in place. The jump structures would have improved passage for steelhead and resident trout, but would not convey the 100 year flows.

In June 2008, a wildland fire burned the upper 42% of the Conner Creek watershed upstream of the two road crossings. In 2009, the U.S. Forest Service completed a hydrologic study of the burn area and determined that the burn was severe enough to increase the potential for increased flows, bedload and debris transport in the short term (~20 years). In 2009 the 5C and Trinity County DOT staffs determined that the undersized crossings should be upgraded to allow for passage of the 100 year storm flows and bedload and debris as well as for fisheries. Design revisions and additional grants were developed to fund the more complex structures being designed.

As part of the design revision the Trinity County Department of Transportation (TCDoT) engineering staff completed HEC-RAS modeling for the revised structural designs. They completed footings, abutments, channel gradient, and structural designs. Taber Geo-Technical Services was contracted to complete a foundation

investigation and characterize the streambed and subsurface materials at the Conner Creek #1 site.

5C staff [2] completed supplemental surveying, rock ribbon designs (subsequently modified at the request of Margaret Tauzer of NMFS), hydrology, de-watering plan, erosion control, revegetation/mulch plan, Pollution and Storm Water Management Plan and NEPA investigations required by USFS. They also completed a NMFS project questionnaire needed for concurrence from that agency on the design.

The Conner Creek #1 project was constructed in the fall of 2011. Conner Creek #2 was constructed in the fall of 2012.

Dinner Creek Migration Barrier Removal Project (#1 & #2)
Dinner Creek is tributary to the South Fork Eel River and the crossing are on Briceland Thorne Road. The undersized CMP culverts are perched (Photos 11 & 12). The Dinner Creek #1 culvert is rotted and is in danger of imminent failure. The replacement of the crossing is a priority of the County. Dinner Creek #1 is a complete barrier while crossing #2 is a partial barrier. The projects when constructed would restore access to 1.8 miles of habitat for chinook, coho and steelhead.

Photos 11-12. Dinner Creek #1 and 2 showing the jumps at the outlets and undersized pipe conditions.

Humboldt County Public Works completed all survey work for both Dinner Creek migration barrier projects under this grant, but did not completed design or initiate CEQA review. They subsequently completed design and permitting under separate funding sources. At that time they also completed design for a third private crossing that is a partial barrier. In 2013 they submitted a CDFW Fisheries Restoration Grant Proposal (FRGP) proposal, which was not funded. In 2014 they resubmitted the proposal to FRGP and were placed on the contingency list for funding.

Fish Creek Fish Passage Improvement Project
Fish Creek is a tributary to the South Fork Eel River and the Highway 254 crossing was identified as the highest priority barrier site within the District I Caltrans barrier inventory. The oversteepened and undersized box culvert is a velocity and depth barrier to chinook, steelhead and coho. The project is located in a grove of old growth redwood trees within Humboldt Redwoods State Park. A 15’ diameter

[2] Working with TCDOT engineers and under Registered Professional Forester license #2464

redwood tree is located on the stream bank next to the crossing. Protection of the tree was identified as an important constraint to design by CA State Parks. Protection of the Federally Threatened marbled murrelett habitat and potential cultural sites were other park considerations. Caltrans also indicated that the road lane and shoulders widths would have to widen under a project unless a design exception was approved.

Photos 13-15. Fish Creek box culvert under Highway 254 outlet (Left), inlet (Middle) and upstream habitat (Right).

In 2010 New Fields Engineering was contracted to complete field work and developed two conceptual design alternatives to improve fish passage in consideration of the design constraints. The initial designs consisted of a retrofit of the existing structure as well as replacement of the structure. Because the project is on a state highway within a state park and has suitable habitat for two federally listed species (coho and marbled murreletts multiple agencies have a stakeholder interest in the project. A stakeholder group consisting of Caltrans, State Parks, CDFW, NMFS, USFWS, Coastal Conservancy, 5C Program and NewFields staff was formed and site visits documented the potential constraints and challenges to meeting all needs with an economical design.

The initial designs prepared by NewFields included assessment of the backwater effects of the Eel River and Fish Creek on the existing culvert, as well as the culvert's ability to pass adult salmonids. NewFields flow modeling demonstrated that no structure could convey the 100 flows under a crossing without building up the road elevation which was not acceptable to either Caltrans or State Parks.

As a result of a stakeholder meeting in April 2011 a number of concerns were raised about the design concepts including: juvenile fish passage, extent of channel excavation, extent of redwood root impact, need for greater knowledge of the sediment "wedge" that the current culverts sits on, need for a sediment assessment and geotechnical investigation, murrelet limited operating period restrictions, and the need for a geotechnical investigation.

5C Forester Lancaster completed literature research on impacts of construction on tree roots, prepared alternatives analysis and mitigation measures to reduce root

impact. He met with Caltrans (Suchanek, Moore and Ash) in April 2012 regarding design, mitigation measures for tree roots, geotechnical investigation, and Caltrans allocation of SHOPP funds for the project. Lancaster met with State Parks (Vaughn, Harris, Goodard, and Allsop) in May 2012 regarding concerns that Caltrans existing structure lies outside of Caltrans encroachment right-of-way. In July 2012 Lancaster discussed with Andrew Orahoske (EPIC) concerns regarding root impacts at other project sites and EPIC's lawsuit with Caltrans on the issue.

NewFields worked on the plan set, additional revisions to the replacement culvert alignment and specifications, and additional hydraulic modeling to refine replacement culvert design. NewFields completed 30% design based on a selected alternative of a 20' wide arch crossing. The design balanced the need to protect redwood trees, flows and fish passage. By June 2013 NewFields had completed a 60% design sufficient to submit a grant proposal for implementation to CDFW's FRGP Program. That proposal was not funded and NewFields revised the design in response to geo-technical data provided by Caltrans and the project was again submitted for FRGP funding in February 2014. The CDFW FRGP program funded the project in 2015. The project is currently moving from a 60% design to 90% with a goal to construct the crossing in 2016 or 2017.

Francis Creek

Frances Creek is a tributary to the Salt River and the Eel River. The project was developed as an addendum to the much larger Salt River Restoration Project. Humboldt County Public Works was able to quickly and inexpensively complete a design for this project using extensive survey, flow, hydraulic, geotechnical and biological data previously developed as part of the Salt River Project. An implementation grant submitted as part of the North Coast Integrated Regional Water Management Program grant to the State Department of Water Resources was funded. Construction will be done as part of the larger Salt River Project. The Humboldt County RCD is overseeing the project.

Griffin Creek/Oregon Mountain Road Migration Barrier Removal & Sediment Reduction Project

Griffin Creek is a tributary to the Middle Fork of the Smith River and supports steelhead, coastal cutthroat, and rainbow trout. The highly rotted culvert was substantially undersized and often plugged at the inlet (Photos 16 & 17). The project was considered both a migration barrier removal and a sediment reduction project. The project was originally designed in 2007 to "jack and bore" a 7' steel pipe through the 40' deep road fill. That plan was dropped when the County determined that the costs to construct it were too high. The flow data for that project was used as part of this project.

Under this grant the project was redesigned to excavate the 3,000 yd^3 of fill and install a 7' squash culvert. The hydraulics did not change with the revisions, but designs for excavations of 35' depth (Photos 18-22), storage of materials, de-watering and reconstruction were needed. The revised project also trigged significant revision to the NEPA for the project. 5C staff worked on NEPA Specialist Reports: Wildlife- Carla De Juilio (5C wildlife biologist), Fisheries- Claire Lindstrand (Project Coordinator), flow modeling- Dimitri Dolci (Engineering Technician), Hydrology- Mark Lancaster (Director) and schematic drawings were developed by David Colbeck. In addition contracts were awarded for Archaeology (William Rich and Associates) and

Botany (Christine Jordan). Spotted owl and marbled murrelett surveys were done by Galea Wildlife Consulting.

Photos 16 & 17. Griffin Creek culvert on Oregon Mountain Road has a 3,000yd^3 fill on top of a rotted, undersized culvert. The crossing was a migration barrier with an imminent threat of failure. The replacement project was completed in 2013.

Photos 18-19. Cutthroat trout and steelhead were relocated prior to beginning of construction at Griffin Creek.

Photos 20-21. The initial clearing and excavation (above left) began in mid-August 2013 and the project was completed in September 2014

Photo 22. Griffin Creek fill material being replaced (Above)

The project was constructed between August 15th and September 30th, 2013 with final tree planting and erosion control work completed in November and December.

Lower East Weaver Creek Fish Passage & Habitat Improvement Project
East Weaver Creek is an important coho and steelhead tributary to Weaver Creek and the Trinity River. The stream has been highly altered with a levee upstream of the project site. The lack of large wood components due to tree removal in the levee reaches also impact habitat downstream. The project is located on BLM managed lands.

The channel in the project reach has meandered ~90' to the west over the past 17 years, eroding several hundred feet of stream bank, delivering over 3,000 yd^3 of sediment to the stream (within the 300' channel reach) and exposed a sewer main that had been buried below ground. An 18" thick concrete apron protected the sewer line in the portion that cross under the channel prior to its meandering. The concrete apron lip created a juvenile fish passage barrier, but the channel meandering has again exposed unprotected sewer main segments.

The project was designed to retain the stream channel in its current location (versus plans to force it back over the concrete apron), create a bio-engineering component to reduce bank erosion (Photos 23-28); restoration of LWD and habitat elements (Photos 29-30) and installation of grade structures to maintain the flow away from the concrete apron and to prevent undermining of the sewer line.

As an initial step, site visits and consultations were made in 2010 with CDFW staff, BLM fisheries biologist (Diridoni), Weaverville Sanitary District (Cloud), TRRP staff (Gaeuman), Trinity Management Council (Leyedecker), TCRDC (Condon) and consultants Mike Love and Associates, Ross Taylor and Associates, and Jessica Stauffer and Associates to develop design concepts and environmental constraints.

A survey of the site and downstream constraints was completed by 5C staff and Ross Taylor and Associates. An assessment of large wood routing and existing wood was completed by 5C staff to determine if large wood could benefit the area and to identify potential at risk infra-structure downstream of the project. It was determined

that the only existing infrastructure in the active channel was a downstream sewer and water line that have been treated to prevent damage from bedload and debris. In addition review of existing large wood in the channel/active floodplain indicates that the stream routes materials currently.

A roughened channel design was initiated by 5C Staff during the period. The design was submitted to NMFS for fluvial hydrology review in 2012. NEPA Specialists reports (Botany, Wildlife, Threatened and Endangered Species, Fisheries, Archaeology and Hydrology) were completed and submitted to the BLM in late 2012.

Photo 23 & 24. The pre-project streambank (above) and post construction (below)

Photos 25-28 (Above) shows the bio-engineered wall designed to reduce future bank erosion

Photos 29-30. Pre-project ~75' downstream of eroding bank and WSD line (above left) taken March 2013 and after construction (right) in December 2014. Initial large wood (LWD) installation included tieing logs into subsurface rock ribbons and trees on the banks. The logs are anticipated to provide beneficial samlmonid habitat (below).

A Categorical Exclusion and Decision Memo were prepared for the BLM. Final design was completed in 2012 but project implementation was delayed to 2014 due to delays in NOAA Fisheries completion of a Letter of Concurrence. The delay did not provide the BLM sufficient time to complete a consultation with the US Army Corp to construct the project in 2013. All permitting and NEPA approvals were received in May 2014 and the project was constructed in September 2014.

McKinney Creek Fish Passage Improvement Project

McKinney Creek is a tributary to the Klamath River in Siskiyou County and supports coho, steelhead and Pacific lamprey. The crossing is undersized and has washed out on several occasions including February 2015 (Photos 31 & 32).

Taber Geo-Technical was contracted to complete a geo-technical investigation and foundation report (March 2011). Siskiyou County Public Works Department Engineering Division completed a longitudinal profile, cross sections, flow calculations, hydraulics, and developed three project alternatives modeling various flow levels under a bridge span. The alternatives were necessary because the 100-year flows could not be contained in a single span crossing. In 2012 Siskiyou Public Works Engineers met on-site with CA Fish and Game (Gale and Caisley) regarding their design and its non-conformance with NOAA Fish Passage Guidelines to convey the 100 year flow under the structure. Based on that review CDFW indicated that they "*would be willing [to] initiate consultation with NOAA Fisheries for the exception and provide programmatic coverage of the project under our permits (RGP12, 401, CEQA).*"

Photos 31 & 32. McKinney Creek culvert crossing in 2009 and February 2015.

Siskiyou County completed a 90% design for the preferred alternative and the 5C staff submitted a CDFW FRGP grant application in 2013 but the project was not funded. The road washed out in February 2015 and was rebuilt to the existing condition.

Photos 33 & 34. Ryan Creek County Road box culvert prior to replacement in 2011 (Above Left) and after (Above Right).

Ryan Creek (County) Fish Passage Improvement Project

Ryan Creek is a headwater tributary of the Eel River and supports one of the most inland coho populations in northern California. Three road barriers exist on the stream. The lowest one is on Ryan Creek Road, a county road, and is a jump and velocity barrier (Photo 33). The next is a partial velocity barrier under Highway 101 and the last is a complete jump barrier on a private road. This grant addressed the design for the two complete barriers, County Ryan and "Private" Ryan. In addition the project included a project between the two projects to reuse large wood that had to be removed to construct the County Ryan project.

5C staff worked with the Mendocino County Department of Transportation (MCDOT) staff on final design and permitting, including the addition of the large woody debris structures in the upstream and downstream channel reaches. Prunuske Chatham, Inc. (PCI) was contracted to work on the LWD design and construction. PCI completed long profile surveys and the LWD design upstream of the County project reach. Alex Straessle (Mendocino County DOT engineer) completed the road

structure plans and channel design. Straessle completed the CDFG 1600 Notification permit for the county crossing.

Bids to construct the County Ryan project as originally designed exceeded funding and the project was withdrawn. The project was reviewed and redesigned to see if changes to the outlet structure could reduce the total excavation and project costs. MCDoT right-of-way and encroachment staff acquired property easements/title and access agreements from the adjacent landowners for the new right-of-way widths needed to accommodate the design. In 2011, design was completed, permitting was submitted and bid documents for the project were prepared. In May 2011, a contractor was selected to construct the site was constructed in the summer/fall of 2011.

Concurrent with the redesign of the County crossing, placement of large wood designs and permitting were done.

Photos 35 & 36. Large wood in Ryan Creek (December 2012). The large wood came from the County Ryan Road project fill removal process. A total of 12 structures were placed 600' stream upstream of the County road. Channel adjustments in 2011 reduced effectiveness of some structures while others were enhanced.

Photo 37. Large wood structures in Ryan Creek in April 2014 (Photo: Ross Taylor)

Extensive channel degradation occurred the first winter following project completion and some of the large wood placed was undercut reducing its effectiveness. By 2015 small wood racking on the large wood structures had contributed to habitat complexity but bank incision in the reach immediately above the County Road has increased.

Photo 38 & 39. 2014 spawning surveys of Ryan Creek found adult coho upstream of the County Ryan Creek Project and downstream of the Private Ryan Project. A total of 35 coho redds have been mapped in the projects areas in 2013-14. Prior to the winter of 2011-12 no coho redds had been observed in these reaches.

South Fork (Private) Ryan Creek Fish Passage Improvement Project

The Private Ryan crossing consisted of a 5′ CMP culvert that had ~30′ of fill over it. The center segment of the culvert had separated and it was a complete barrier with a jump at the outlet. Prunuske Chatham, Inc was contracted to complete a 30% design and hydraulic analysis of a structure to convey fish passage as well as bedload and debris. PCI completed the preliminary design for the installation of an 18′ wide by 9′ arch embedded multi-plate arch culvert . During the design process, the 5C Program staff proposed an alternative design that would remove the existing crossing and restore the stream channel rather than replace the crossing with a new one.

It was determined that a previously existing driveway route controlled by Caltrans might be able to be reopened and used in lieu of the current route. The previous roadway is located mid-slope and does not require crossing Ryan Creek. This route also meets Fire Safe standards, whereas the existing driveway is at 30% slope. The current route has significant annual ditch and road surface erosion due to its steepness.

Extensive discussions with Caltrans were undertaken to assess the feasibility of re-establishing the prior driveway route. The first step was an internal Caltrans review by the Willits Bypass design team to see if the abandoned driveway route was needed as part of the access to the proposed borrow site for the Willits Bypass. That review determined the re-opening of the road would not affect the bypass project. Once that was determined, 5C staff submitted an encroachment permit to survey approximately 250′ of Highway 101 to map the approaches to the driveway. After a long delay, Caltrans approved the permit and PCI completed the survey and prepared a design shortly thereafter. Caltrans requested another encroachment permit with a $10,000 deposit to complete Highway 101 traffic safety study for the new encroachment. In discussion with Encroachment Division staff, they have indicated that there would be no rush to complete this study. If deemed safe by Encroachment Division staff, the project would be passed on for further review within Caltrans, and

then submitted to the California Transportation Commissions for final approval. Finally, an appraisal would be prepared and the landowner would be required to pay Caltrans for the value of the access route before title could be transferred.

Photos 40 & 41. Private Ryan Creek stream crossing showing a 5' diameter culvert with a jump at the outlet (left) and the rotted and disconnected condition (right). The crossing has approximately 4,000yd^3 of fill over it. The culvert was replaced with 2013.

Photo 42. Private Ryan Creek new crossing during high flow in April, 2014 (Photo: Scott Harris)

Based on review of the timeline to implement the alternative design it was determined that it could not be done within remaining time to expend awarded construction grants from CDFW and NMFS. The alternative to re-use the old driveway was abandoned and work shifted back to excavating out the old culvert and installing a new crossings.

5C staff prepared final designs details, set bench marks, staked construction zones, established spoils and staging areas, and developed a Pollution and Storm Water Management Plan. In addition the 5C staff completed a revised design drawings to

changing the structure dimensions from an 18′ by 11′ tall arch to a 14′ x 12′ tall arch structure. The change was necessary to reduce the overall extent of excavation. The design changes were analyzed in HEC RAS. In addition to modeling the flows at the site, 5C staff modeled flows under Highway 101 under two alternatives, one with the existing 5′ diameter culvert and one with the planned twin 7′ diameter culverts.

The results showed that under the existing 5′ culvert condition this project would continue to backwater and under the replacement culverts it would not. The results were submitted to David White (NMFS-Santa Rosa) for review for compliance with Fish Passage Guidelines. Mr. White approved the design revisions in June 2013. The design changes were then submitted to the Mendocino DOT engineering staff for review and concurrence.

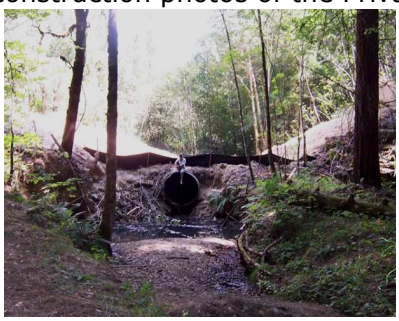
The 5C began discussions with potential contractors to assess construction slope stability and selected Pacific Watershed Associates to work with a construction contractor to build the project in 2013. A design/build contract was awarded to Pacific Watershed Associates for project implementation. A Mendocino County Building Department grading and building permit was obtained as was a CA Fish and Wildlife 1600 agreement.

Construction began in August 2013 and was completed on September 30th, 2013.

Coho were reported upstream of the crossing in January 2014 by neighbors who were alerted to them by the noise of their spawning.

Photos 43-47. Ryan Creek preparing the channel bottom for the construction of the plate arch structure (Below).

Before, during and following construction photos of the Private Ryan Creek outlet (Below)



Biological, thalweg, and photo point monitoring was initiated in the winter of 2013-14. Spawning surveys in February and March 2014 found coho and steelhead up to the project. Sampling of upstream pools was done in the summer of 2014 as well.

Salt River Cutoff Slough

Photos 48 & 49. Cutoff Slough Tidegate (Left) and estuary (Right)

This project was added to the work program in 2011. Cutoff Slough is a coastal estuarine and tidally influence stream that drains from the Wildcat Mountains. The stream parallels the coast and is separated from the ocean by a narrow band of sand dunes. Occasional dune breaches result in salt water incursion in the freshwater marshes. The area is important habitat for coho and Chinook salmon, steelhead trout and the Tidewater Goby. Access too much of the stream is limited by a tide gate as well as land use practices that have altered the esturaian nature of the area to a dike and berm stream system.

Work included site meetings with the landowners where work is to be done as well as upstream landowners who are affected by changes in the stream system. In addition, the project occurs in an area with numerous stakeholder agencies having jurisdiction. The site is zoned Agricultural Preserve which limits loss of agricultural lands, is within the CA Coastal Zone and requires permits from the CA Coastal Commission as well as has both listed fisheries species and migratory bird habitat.

Kamman Hydrology and Engineering (KH&E) was contracted to develop design proposals in response to landowner and agency design constraints. Delays in obtaining processed Lidar imagery to complete photogrammetry of the wetlands and channels contributed to delays in design development through 2011 and into 2012. Concerns regarding reduction of agricultural production as a result of habitat restoration were raised. Humboldt County has a no net loss of agricultural lands policy that required an Agricultural Assessment of the project. This work was under taken in 2013. KH&E participated in numerous Project Team and landowners meetings regarding alternative developments and drafted a Technical Report on the Project Alternatives for the EREP, ORFP and RFP.

KH&E developed salt intrusion and dune over wash assessments based on historic hydrologic and wave power conditions. GHD Consulting was retained to complete the Agricultural assessment of the project area (in coordination with Coastal Conservancy staff and KH&E). Mike Love and Associates was retained to review developed design concepts, provided comments and suggested alternatives and Ross Taylor and Associates was retained to prepare Salt River fisheries information for the Wildlands Conservancy field tour and meeting with GHD, CDFW, NOAA and the Coastal Conservancy.

Sharber Creek Barrier Removal Design

Sharber Creek is one of only a few low gradient tributary streams in the middle reach of the Trinity River. The stream is actually a former channel of the Trinity River (refer to arrow on Map 1 below). The stream is cutoff from migration by an undersized CMP culvert on a private road (Photos 50 & 51). At the time that the culvert was installed the road was a Trinity County maintained road, but it was abandoned to the private landowner in 1972. Subsequent subdivision of the parcels resulted in multiple landowners forming a road association.

The Sharber Creek road culvert was identified as a high priority coho salmon barrier by the Fisheries staff of the Willow Creek Ranger District, Six Rivers Forest Supervisor's office and NMFS Arcata office. In 2005 the Forest Service funded a barrier removal design for the site, but it was rejected by the landowners because of concerns about maintenance obligations. The Forest Service requested that the 5C consider redesigning the project and work with landowners to restore passage at the site. Because of the prior design data the 5C was able to develop a 20% design in 2013 and secure two grants (US Fish and Wildlife Service and the National Fish Habitat Action Plan) to cover approximately 40% of the construction costs for a project.

Map 1. Sharber Creek (arrow shows channel) is the former Trinity River channel.

This project was added to this design grant in late 2013 with the intent of completing additional design work, reaching a 65% design prior to March 17th, 2014 in order to submit an implementation grant proposal for the FRGP grant cycle. Thalweg surveys, fish presence surveys, flow modeling, wildlife assessment, and crossing designs were developed by the the 5C staff working with NMFS engineering staff and Civil Engineer Jerome Hauke. The project was awarded construction funding from CDFW in 2015.

Photos 50 & 51. Outlet of 4' culvert on Sharber Creek (left) showing jump and velocity barrier. Right- two adult coho salmon observed downstream of culvert crossing in January 2014 (right).

Sidney Gulch at Bally View Road Barrier Removal

Sidney Gulch is a tributary to Weaver Creek in Trinity County and is one of a few low gradient streams in the upper middle portion of the river system. It is utilized by coho and steelhead trout. Extensive design and engineering has been invested in improving salmonid habitat and migration in this highly urbanized stream. The Bally Loop Road culvert, a 7' CMP, is a complete jump barrier (Photo 52 below). While there are two additional partial barriers downstream designs are well under way to improve habitat and passage at each. The Bally Loop barrier is not only a complete barrier by is impeding the transport of bedload downstream. In 2001 much of the watershed upstream of the crossing was burned in a severe wildfire. Two additional fires in 2006 and 2014 have hampered restoration of the watershed. The current culvert is too small to convey accelerated bedload material transport downstream.

Photo 52. Sidney Gulch at Bally Loop Road. The 7' diameter culvert is a jump barrier and is undersized.

5C staff completed cross section and thalweg surveying of Sidney Gulch, analyzed overflow channel designs, completed flow calculations and modeled design alternatives in HEC RAS. A crossing design consisting of an embedded 12' x 9' concrete box culvert with upstream grade controls and an overflow critical dip was developed in coordination with County DoT engineering division and the County will construct the project. The project was partially funded for construction with Trinity River Restoration Program Watershed Restoration Program funds.

Sidney Gulch Habitat Restoration & Water Quality Improvement Project at Lee Fong Park

The Sidney Gulch Habitat Restoration Project is located ~0.5 miles downstream of the Bally Loop Barrier Project. While

Sidney Gulch has been artificially constricted into a narrow bed and bank channel greatly restricting the 5-50 year floodplains, it supports a consistent coho and steelhead population as well as 6 other fish species, including Pacific lamprey. Large wood recruitment has been greatly reduced upstream of the project due to the highly urban nature of the watershed. The habitat project would reduce sediment delivery to the stream from bank erosion, improve floodplain connectivity, and increase habitat complexity for salmonids.

Ross Taylor and Associates was contracted to conduct habitat typing in coordination with 5C staff. Graham Mathews and Associates was contracted to establish two continuous flow stream gauges in Sidney Gulch in late 2011. The 5C staff built, set up, and surveyed 5 crest flow gauges in the stream, which were monitored throughout winter and spring 2012. The data was used to improve flow modeling and channel condition designs. Spawning and fish presence/absence was monitored by 5C and Forest Service Staff in 2010-2012 with steelhead redds and emergent young of the year coho observed in each year.

Botanical and wildlife surveys were completed by Jessica Stauffer and Associates during the same period and cultural surveys were completed by William Rich and Associates.

A Technical Advisory Team was established and coordination meetings were held with the team members (Weaverville-Douglas City Parks and Recreation District-project area land owner, FEMA, NOAA Fisheries, CDFW, Forest Service, Trinity River Restoration Program and others). Mike Love and Associates was retained to design two alternatives and presented them to the Technical Advisory Team. Most of the features focus on: creating more riparian habitat and reducing the amount of over-steepened slopes; allowing for more natural stream meander, creating more complex instream habitat features (large wood, boulders); removing blackberries, scotch broom, mullein, and other invasive species; removing non-native locust trees; replanting with suitable native, riparian species; preserving important heritage orchard trees; and relocating pedestrian paths to allow for stream meander in some sections. Discussions during the meeting resulted in requesting that a third alternative be developed to the approximate 30% design level. MLA added a third alternative, conducted addition flow analysis, prepared schematic drawings and updated the design memorandum.

Telegraph Creek

Telegraph Creek is a high gradient stream that drains directly into Pacific Ocean. The stream supports steelhead trout and resident trout. This project was added to the design program because it had a relatively low design cost and was integral to a dam removal project immediately downstream of the site. The dam is for the community water intake for the Shelter Cove Recreation Improvement District.

Photos 53 & 54. Telegraph Creek at the existing twin barrel culverts (Left) and upstream habitat (Right)

The road design was undertaken by Humboldt County Public Works Department engineering staff. Thalweg, topographic and cross section survey data as well as flow, hydrology and hydraulic date for the site had already been generated as part of the dam remove a design. The road crossing design provides for the conveyance of the 100-year flows. The County road project will be done in coordination with the dam removal.

Upper East Weaver Creek Fish Passage Improvement Project- Phase I
East Weaver Creek, like Sidney Gulch, is one of a limited number of low gradient tributary streams to the Trinity River that supports coho salmon. East Weaver Creek headwaters start high in the Trinity Alps Wilderness and the stream joins West Weaver and Sidney Gulch in the town of Weaverville. The Weaverville Community Service District East Weaver Creek Dam is the only migration barrier on East Weaver Creek.

The design work proposed for this grant was to collect existing condition data including long profile, cross sections, fisheries presence, downstream diversions status and preparation of an existing conditions report. Additional feasibility and design funds were approved by the Trinity River Restoration Program. As part of this grant, the 5C Program staff completed a 1,600’ thalweg survey, cross sections, topographic mapping, and an assessment of ditch diversions downstream of the channel. Presentations regarding the project were made at two WCSD Board of Directors meetings.

Photo 55. East Weaver Creek Dam

Browns Creek Sediment Reduction Project

Browns Creek is a major tributary stream to the Trinity River and supports chinook, coho, steelhead and Pacific lamprey. While most watersheds in Trinity County have a large component of public ownership, Browns Creek is largely owned by private landowners. As such there has been minimal past efforts to inventory and assess road related sediment sources on private non-industrial timberlands. The Trinity River Restoration Program has been a significant partner to the 5C Program in targeting sediment sources in the upper middle reach of the Trinity River and partnered with this grant to reduce sediment delivery from this watershed to the Trinity River.

The Browns Creek project is built on working with numerous private landowners that share common roads, but often without a road maintenance agreement. The lack of coordinated road program often resulted in roads in significant disrepair and inadequate drainage. The project included formation of a project team consisting of 5C, NRCS, Watershed Center and Trinity County RCD staff. Protocols for a private roads Access Database inventory were developed and field tested. Landowner's were contact and assessments completed. Treatments were developed and Phase 1 (2013) and Phase 2 (2014) projects were completed for Shady Lane (funded under a Trinity River Restoration Program- Watershed Restoration Grant).

Photo 56. Road outsloping in progress on a private road located above Browns Creek (Above).

Fish Rock Sediment Reduction Project
Fish Rock Road is within the Garcia River watershed in Mendocino County and is among the highest priority watersheds targeted for reduce sediment under the Clean Water Act Section 303 D program. Fish Rock Road is a 28 mile long road connecting the coast to the Ukiah Valley. The road was constructed more than 75 years ago using techniques that would not be acceptable by today's design standards.

The North Coast Regional Water Quality Control Board awarded a grant to Mendocino County to upgrade drainage features on the road. This grant contributed to the design of treatments and the permitting aspects of the project. Project layout, design, and CEQA Mitigated Negative Declaration were completed and after review accepted by the State Water Resources Control Board. Initial implementation of the 2-3 year construction project began in August 2012, with the majority of construction done in 2013. Mendocino County continues to implement the 3 year long project.

Usal Road Sediment Reduction Project
The Usal Road project consisted of inventorying and designing a range of treatments to test the effectiveness of alternative surfacing and drainage improvements on a portion of Usal Road. Usal Road is very remote, narrow and steep and costs to bring rock to the road can account for 50%-80% of any drainage upgrade project. The high costs of rock have resulted in limited ability to improve drainage as well as contributing to significant rutting, riling and gullying on the road.

The project was implemented with $40,000 contributed by Mendocino County DoT and $15,000 from Fish and Game to compliment the Conservancy funds. Over two miles of road were treated using a variety of drainage techniques including use of geo-fabrics under rock and sections without geo-fabric. Native and non-native mulch

materials were placed in different road segments. Culverts with drop inlets and those without were installed. Monitoring of the project site is on-going. The participants were recognized by NMFS for their conservation efforts.

Photos 56-59. Usal Road rutting before and after treatment (Above). A variety of treatments including geo-fabric (Below) and varying road rock depth were used to access cost effective methods to maintain remote road systems.