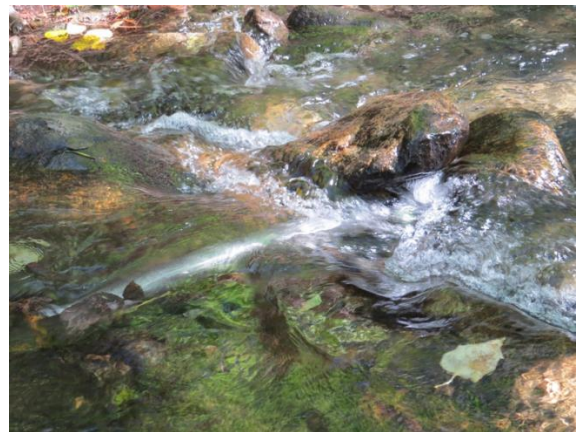


**Final Report**  
East Weaver Creek Dam Intake  
Relocation & Dam Removal  
Project &  
McKnight Ditch Water  
Conservation Project

East Weaver Creek Watershed

Trinity River Restoration Program,  
US Bureau of Reclamation  
US Department of Interior

Grant Number: R18AP00075



## Introduction

This grant funded two separate, but inter-related salmonid restoration projects located in the upper reaches of East Weaver Creek watershed. The projects resulted in the restoration of more than 2 cfs of previously diverted flows out of East Weaver Creek back into the stream. When fully completed the projects will both improve instream habitat for more than 3 miles downstream of East Weaver Creek Dam and open 2.5 miles of historically disconnected habitat upstream of the dam.

The projects are approximately one mile apart<sup>1</sup> (Figures 1 & 2). They address three of the most significant impacts to fisheries within the creek (diversion, migration barrier and summer rearing habitat). The summer and winter refugia habitat is especially valuable as downstream reaches lack these elements as a result of urban development, levees, roads and historic mining.

The projects led to the removal of the only complete migration barrier to salmonids on East Weaver Creek. The McKnight Ditch project replaced an open ditch diverting up to ~2 cfs with a 2" HDPE welded irrigation piping system that reduced the diversion to 0.06 cfs. The East Weaver Creek Dam intake relocation project removed the water intake off of the concrete dam (facilitating removal of the dam) and installed a 4' diameter Intake Systems Inc, fish exclusion screened intake. Both projects established minimum bypass flows with metering and valve controls.

The East Weaver Creek dam and intake was integral parts of the community of Weaverville's water supply for the past 65+ years. The revised intake and dam removal will continue to supply the majority of water to the community, while restoring fish passage to high quality upstream cold water spawning and rearing habitat. The project will also restore natural sediment and bedload.

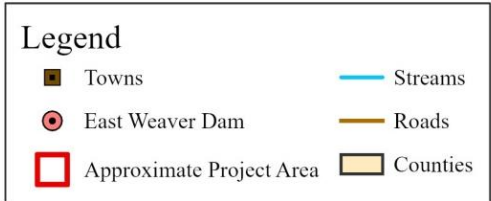
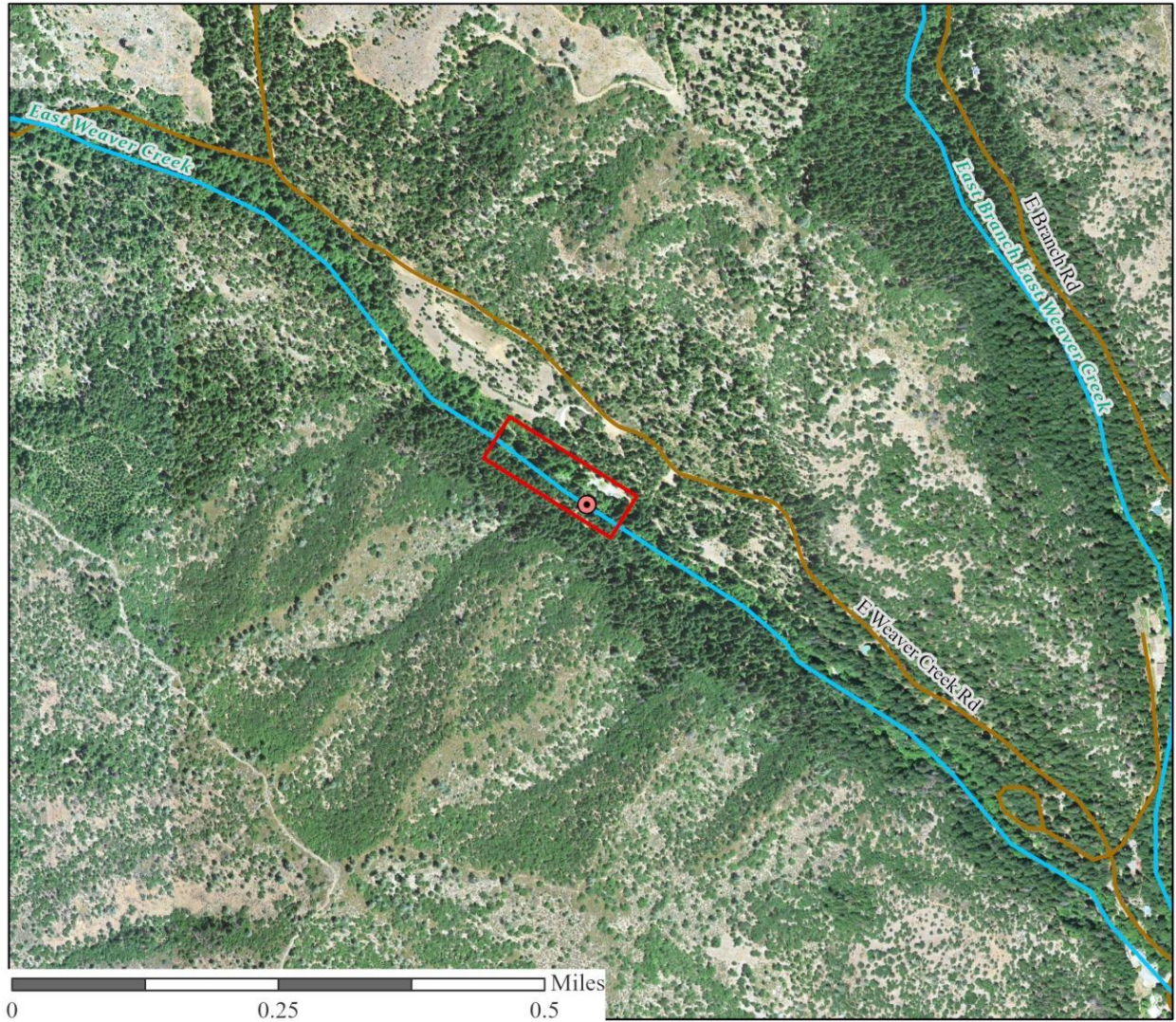
This project is a collaboration between the Five Counties Salmonid Conservation Program<sup>2</sup>, Weaverville Community Services District, Trinity River Restoration Program's Watershed Restoration Program, US Fish and Wildlife Service's Partners for Fish and Wildlife Program, National Fish and Wildlife Foundation and the CA Coastal Conservancy.

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<sup>1</sup> Section 29 (McKnight Ditch, 40.760398, -122.918359) and Section 30 (East Weaver Dam- 40.73525, -122.93026), Township 34N, Range 9W, MDB&M

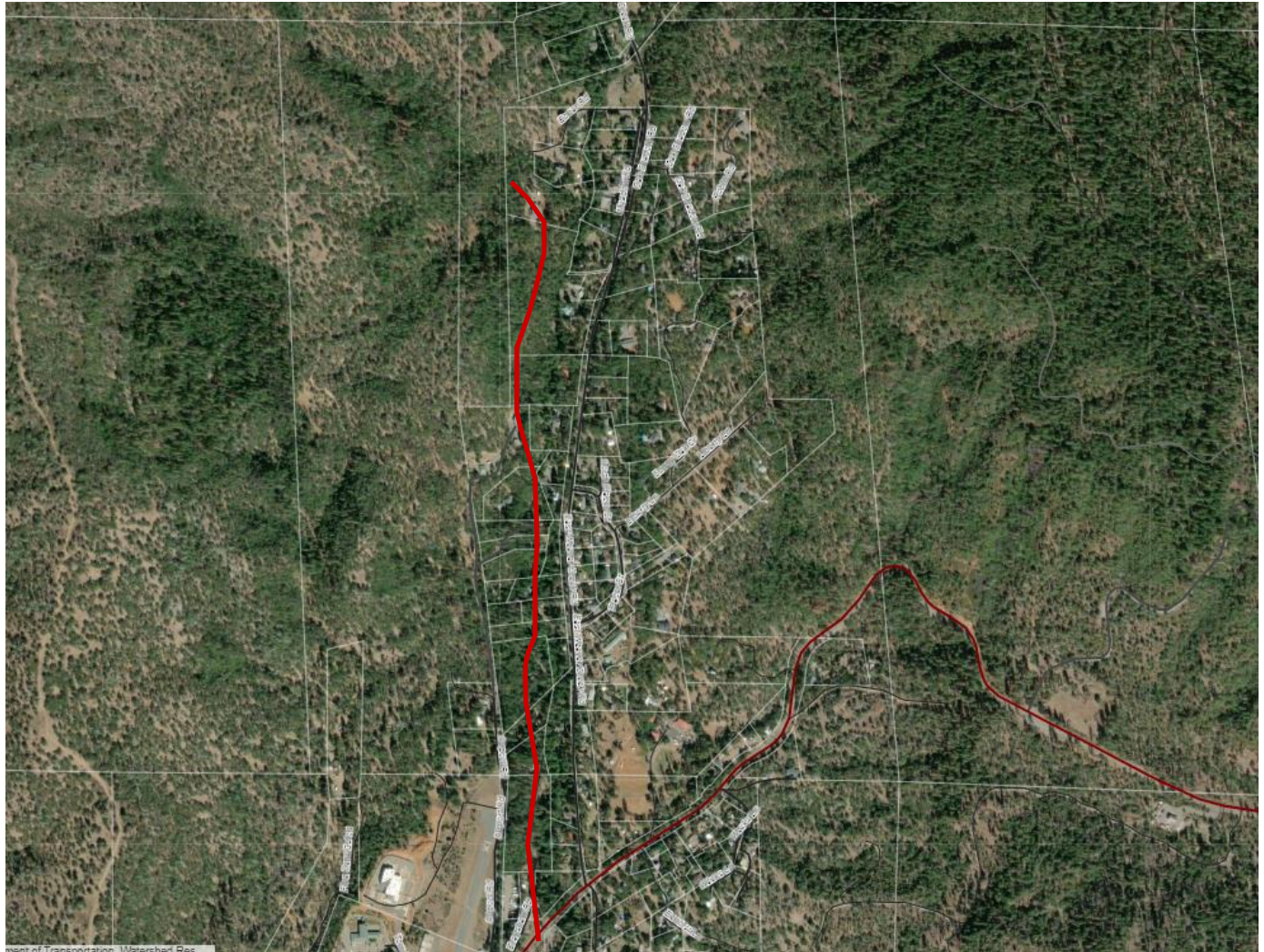
<sup>2</sup> A program of the nonprofit Northwest California Resource Conservation and Development Council

# Project Location Maps



Northwest California Resource Conservation & Development Council  
 Five Counties Salmonid Conservation Program  
 Created by: Lesli Mounivong  
 NAD 1983 UTM Zone 10  
 Sources: Esri, USGS, TCRDC, TCDOT

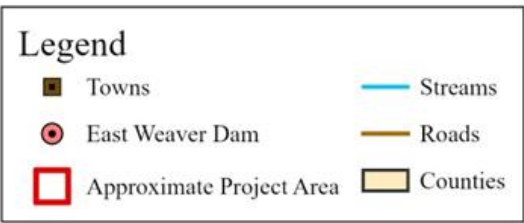
**Figure 1.** East Weaver Dam and approximate project area.



ment of Transportation, Watershed Res



1:1,440,000 meters



Northwest California Resource  
 Conservation & Development  
 Council  
 Five Counties Salmonid  
 Conservation Program  
 C  
 NAD 1983 UTM Zone 10  
 Sources: Esri, USGS, TCRDC,  
 TCDOT

Figure 2. McKnight Ditch and Irrigation Pipe Line Route.

## Project #1- East Weaver Creek Dam Intake Relocation and Dam Removal

### Purpose and Need

The East Weaver Dam (EWD) is a complete barrier to aquatic species including Threatened Coho salmon (*Oncorhynchus kisutch*). It is the only complete barrier to upstream fish migration for all life stages of all fish species in East Weaver Creek<sup>3</sup>. The NMFS *Final Recovery Plan for the SONCC Coho Salmon* lists barriers and diversions as “very high” threats to the survival of all life stages of Coho, except the egg stage. The Recovery Plan also lists migration barriers as a “key limiting factor” to salmonid recovery in the Upper Trinity River basin for adult life stages and ranks them as “high” stressors for Coho.

The habitat upstream of EWD is cold water habitat capable of providing some of the best critical summer salmon rearing habitat in the Weaver Creek watershed. Downstream of the East Weaver Campground (EWC), the stream provides marginal summer rearing habitat due to the high amount of diverted flows, lack of cover, limited instream large wood components, and simplified habitat (entrenched with narrow floodplains and riparian bands). Roads, bridges, houses, and levees confine the channel for several miles in the middle and lower reaches of the creek.

Water diversions for domestic, agricultural, and industrial uses further reduce summer rearing habitat opportunities below EWD. Restoring access to habitat upstream of EWD provides significant opportunities in the stream reaches with the least level of human impacts.

### Grant Objectives

Project goals are to implement Phase 1 and 2a of dam removal in conjunction with other funding sources. The grant agreement period was August 31, 2018 to August 30, 2022. In 2021 a one-year extension was approved extending the Agreement to August 30, 2023.

### Program of Work

This grant contributed to accomplishing the follow construction tasks

- Construction Bid and Award- Seven qualified bidders were contacted to request Time and Materials bids for the project. Two companies conducted site visits: Cross Country Inc. and R. Brown Inc. Two companies responded and sent rate bid sheets: Cross Country Inc. and M. Peters Inc. with maximum estimated costs to complete Phase 1. A construction contract was awarded to Cross Country Inc. based on cost and experience.
- Materials & Supplies Purchases- Construction materials including solid and perforated well casings, valve boxes, shutoffs, 8” diameter C900 pipe, metal

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<sup>3</sup> A single barrier remains on East Branch East Weaver, a tributary to East Weaver Creek.

valves, flanges, meters, and other fittings, ISI cone screen, control box, mesh screen, conduit, wiring, rock, RSP, and other materials were purchased as needed.

- Botanical and Wildlife Surveys- The operations were timed to avoid typical nesting, denning and roosting periods for listed species, raptors, or species of concern. While construction work was started outside the critical period for these activities 5C staff conducted surveys prior to start of construction as a precaution. Surveys for amphibians and reptiles were conducted as well. No listed animals, roosting, denning or nesting activities were noted.

A California Native Plant Society California Rare Plant Rank 1B.3 ranked species English peak greenbrier (*Smilax jamesii*), was located in the project reach. A consultation with the CA Department of Fish and Wildlife was completed in 2019 that allowed the project to proceed.

A unique phenotype of Pacific Hounds Tongue (*Cynoglossum grande*) was identified within the pipeline route area of potential effect (APE) and an equipment exclusion zone was flagged around it during the 2022 construction.<sup>4</sup>

- Topographical Surveys and Construction Staking- Supplemental survey<sup>5</sup> and staking was completed as a result of channel adjustments between the design period (2016-18) and construction.
- Aquatic Species Relocation- Fish and leaf exclusion nets were installed upstream of the water intake relocation site in early October 2022. California Department of Fish and Wildlife (CDFW) fisheries biologist Kenneth Lindke, 5C Staff, and BLM staff conducted electrofishing and netting of aquatic species from the dam to approximately 300' upstream. The drought impacted late summer low flows resulted in the reach below the dam consisting of isolated pools with dry reaches between pools<sup>6</sup>.

A total of 45 steelhead and 55 Pacific giant salamanders (PGS) were relocated downstream of the work area in 2022. No other aquatic vertebrates were found in the project reach. Maintenance of exclusion nets was done daily during the course of construction. Nets were pulled on November 8<sup>th</sup>, 2022.

Nets were installed in late August 2023 at the start of Phas2, dam removal project similar to 2022, except high flows required installation of nets on the downstream reach as well.

- Mobilization- The contractor mobilized into the site in September 2022 with two excavators (Cat 238, Cat 88), a dozer (Cat D6), fire suppression equipment, and

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<sup>4</sup> Post grant closure surveys for both plant species documented their successful flowering in 2023 and 2024.

<sup>5</sup> Between the time of initial survey and construction a significant wood debris jam formed in the planned inlet reach portion of the project resulting in ~4' aggradation of bedload.

<sup>6</sup> During flows of less than ~2.5 cfs the height of the dam diverts 100% of surface flows into the WCSD intake structure. The only downstream flows under those conditions are interstitial.

a spill containment kit. The 5C mobilized in 1 mini-backhoe (Terramite T5C), fire suppression equipment, shoring and trenching safety systems, two 2" water pumps, 600' 1 1/2' fire hose, assorted plumbing, chainsaw, hand and electrical carpentry tools, and erosion control materials (straw waddles, native needle mulch, native seedling trees, native grass seed.

- Weaver Basin Trail Relocation- Prior to the start of earth moving at the dam site, the East Weaver Loop Trail was closed in the work zone. A 0.5 mile long temporary detour trail was constructed around the work area using a combination of existing skid roads, public roads, and new trail construction. A Terramite T5C was used to "construct" new segments of the trail.
- Pioneering Pipeline Route- Once the channel was de-watered and the trail closed the contractor pioneered ~410' of pipeline route and inlet access. During pioneering 8 trees over 12" in diameter were removed<sup>7</sup>. These trees were subsequently incorporated into the channel as large wood elements or incorporated into site restoration as downed wood. Once the contractor reached the new inlet location de-watering was implemented.
- De-Watering- A modified channel de-water plan was developed to take advantage of a wood debris jam that formed at the inlet site. The wood debris jam created a side channel that was opportunistically used to divert flows around the inlet construction zone. Two de-water pools were installed and water pumped around the work area (refer to photo log).
- Pipeline and Inlet Construction- Inlet construction upstream, and pipeline construction downstream, began simultaneously once the pipeline route was pioneered in and the de-water system was installed. At the upper- inlet a 12' deep seep well was excavated in the active channel location and 4' diameter concrete casement rings set below channel grade. Porous 1 1/2" minus drain rock was placed around the concrete casement well rings for approximately 5'.

Construction of the 8" diameter C900 water pipeline, vaults, valves, and meters, began at the water treatment plant and advanced to the inlet. A total of 410' of trench, up to 15' depth, was excavated between the new inlet location and the water treatment plant. The trench was backfilled with 3/4" minus gravel under and around the pipe and then native material above this layer. The trench was backfilled as each segment of 8" C900 pipe and 1 1/2" conduit was placed in the trench.

Excess rock from trenching was stockpiled for use in Phase 2.

Once the pipeline was connected to the inlet well, the area surrounding the well was backfilled with native streambed mix materials. A grade weir was placed in the stream channel, a bank and grade weir was placed 80' downstream on the right bank, and large wood removed during pioneering was incorporated into 3

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7

Douglas-fir (5), incense cedar (1), Oregon ash (1), big leaf maple (1)

segments within 125' of the inlet. The large wood features were located to stabilize banks, sort gravels, create pools and deflect large bedload away from the inlet.

Construction of Structures- The WCSD crew completed framing and pouring for the concrete housing needed to hold the ISI fish screen and electrical/hydraulic components in place. A small wooden building was simultaneously constructed by 5C staff to hold the electrical and hydraulic motors and pumps that operate the fish screen sweepers. A licensed electrician then completed the electrical components of the screen operations. With the completion of the inlet structure and power to the site, ISI specialists installed the operating systems for the screen brush motors and tested all components.

- Weir Placement- The contractor set an at grade weir downstream of the new inlet concurrent with other work as well as four wood features, two on the left bank upstream of the new inlet and one each on the left and right banks downstream of the inlet. The left bank wood features were designed to deflect flows, sort gravels and create pool habitat. The right bank elements were to protect an active bank undercutting feature that pre-dated the project.
- Downstream of Dam Rock Placement- The contractor placed ~75 yd<sup>3</sup> of 0.5-1.5 ton round boulders under the left bank of the downstream end of the dam as well as ~75yd<sup>3</sup> of round cobble-boulder mix (0.5'-2') on the face of the dam. The left bank placement was set to fill a large undercut and scoured bank while the smaller material was placed to deposit downstream of the dam in the scour reach.
- Site Clean Up, Erosion Control, and Revegetation-On November 18<sup>th</sup> 5C staff completed remaining site clean-up including removal of excess lumber and construction debris, removal of upstream waddles, placement of rock on portions of the access road impacted by trenching and heavy equipment operations. Native mulch and seed were spread on the trench route. Waddles were placed as necessary around rock and bedload materials stored for use in Phase 2.

#### Phase 2a Tasks Completed

- Phase 1 Monitoring- Following completion of Phase 1 performance of both the intake and channel was done for approximately one year. Three monitoring systems were used: flow rates, channel adjustment, and photo point.
  - Flow Monitoring-The WCSD switched from the East Weaver Dam intake to the new screened intake on October 15<sup>th</sup>, 2022. The new intake has been operated continuously since. The new intake was successfully tested in both record low flows (October-early November 2022) and in significant winter flows (December 27<sup>th</sup>, 2022 and January 19<sup>th</sup>, 2023). During early January 2023 ~Q<sub>5-10</sub> flows occurred for both short and long duration flow periods<sup>8</sup>.

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<sup>8</sup> Review of precipitation data for the Five Cent Gulch weather station (Weaverville CA) recorded ~15" total precipitation between December 29<sup>th</sup>, 2022 and January 14<sup>th</sup>, 2023 which is within the Q<sub>5</sub> to Q<sub>10</sub>

Percent of Average Precipitation

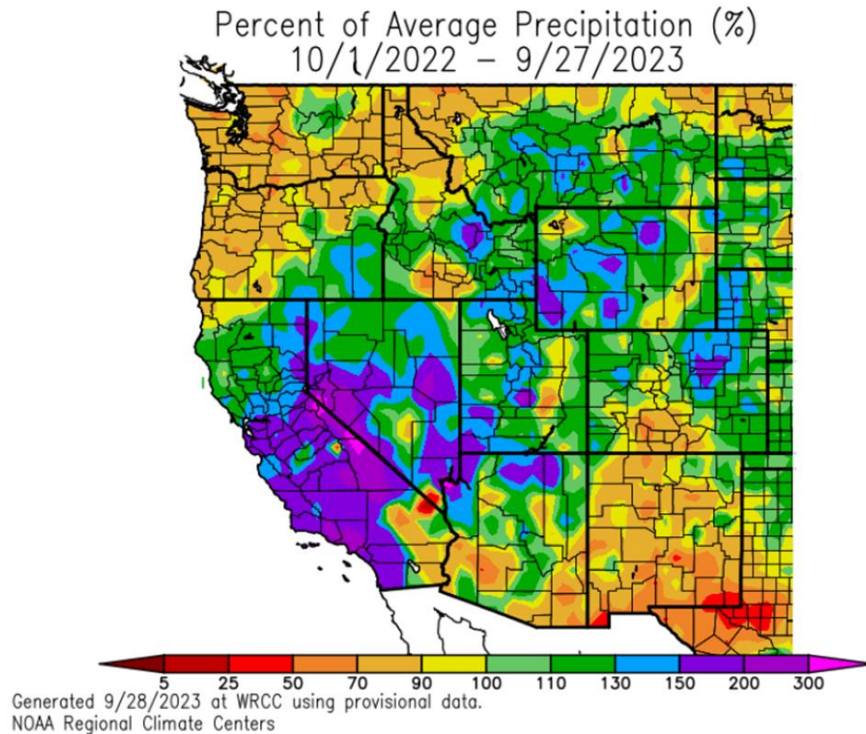


Figure 3. Summary of Precipitation During 2022-2023 Monitoring Period.

Source: Water Year 2023: Weather Whiplash, From Drought To Deluge California Department of Water Resources California Natural Resources Agency State of California. October 2023 [https://water.ca.gov/-/media/DWR%20Website/Web%20Pages/Water%20Basics/Drought/Files/Publications%20And%20Reports/Water%20Year%202023%20wrap%20up%20brochure\\_01?utm\\_medium=email&utm](https://water.ca.gov/-/media/DWR%20Website/Web%20Pages/Water%20Basics/Drought/Files/Publications%20And%20Reports/Water%20Year%202023%20wrap%20up%20brochure_01?utm_medium=email&utm)

- Late spring heavy snow melt resulted in even higher observed peak flows than those measured in January 2023. It is estimated that discharge may have been in the Q<sub>10</sub> range in peak spring runoff periods.
- Channel Adjustments- Channel adjustments were noted both upstream of the new inlet and downstream of the dam.
    - Upstream channel adjustments consisted of ~25' of channel incision within the reach aggraded by the wood debris jam. Removal of the jam allowed for channel adjustments.
    - Placement of a grade weir downstream of the intake resulted in no adjustments downstream of the inlet. Large wood placement upstream of the inlet did contribute to formation of a series of 6" jump pools between the inlet and the wood features. Additional surveying will be done after Phase 2 to assess upstream channel adjustments.

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discharge range for NOAA's point precipitation frequency (pf) estimates ([https://hdsc.nws.noaa.gov/pfds/pfds\\_map\\_cont.html?bkmrk=ca](https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=ca))

Large wood placement remained unchanged during monitoring period. Gravel sorting and pool formation was obvious at the all left bank wood features.

- Downstream of the dam channel adjustments were significant within 100' of the dam. The ~150 yd<sup>3</sup> of rock placed on the concrete spillway of the dam mobilized and filled the large scour void on the left bank. Material mobilized from the steep, slippery dam face and redeposited in the exposed Weaverville Formation hardpan downstream as well. The mobilization cobble and boulders overlaid the clay hardpan reach, raising the channel elevation by up to 1' for ~100' downstream of the dam.
  - Photo Monitoring- Photo monitoring was done throughout the 11-month period between Phase 1 and Phase 2a implementation. Photo Monitoring report for this project is attached.
- Topographical Surveys and Construction Staking- Supplemental survey and staking was completed as a result of channel adjustments between the design period (2018) and construction.
- Materials & Supplies Purchases- Phase 2 construction materials including 8" diameter HDPE pipe for diverted stream flows, mesh screen, lumber, sheathing, a high pressure pump (for jetting), monitoring equipment, rock, RSP, etc. were purchased. Other materials were purchased as needed.
- Aquatic Species Relocation- Fish and leaf exclusion nets were installed upstream of the Phase 1 work area in July 2023. California Department of Fish and Wildlife (CDFW) fisheries biologists Kenneth Lindke, Hali Schwasnick, and Kate Blanchard worked with 5C Staff to electrofish and net fish to be relocated 250' downstream of the dam and approximately 300' upstream. Prior to electrofishing, a series of six minnow traps were used to relocate fish and Pacific giant salamanders (PGS). Minnow trapping continued until de-watering was initiated

A total of 35 steelhead and 60 PGS were relocated upstream and downstream of the work area. No other aquatic vertebrates were found in the project reach.

Maintenance of exclusion nets was done daily during since installation of the nets.

- Mobilization- A subcontract for jack hammer services was completed with R Brown Inc. in August 2023. Both contractors, Cross Country and R Brown, mobilized equipment in late August 2023 with excavators (Cat 335, Cat 336, Cat 88), dozer (Cat D6), off road dump truck, fire suppression equipment, and spill containment kits.

The 5C mobilized in two 2" water pumps, 500' 1 11/2' fire hose, assorted plumbing, chainsaw, hand and electrical carpentry tools, and erosion control materials (straw waddles, native needle mulch, native seedling trees, native grass seed.

- Weaver Basin Trail Relocation- Prior to the start of earth moving approximately 0.5 miles of the East Weaver Loop Trail was closed. The existing temporary detour trail was brushed to allow for reuse.
- De-Watering- A modified channel de-water plan was developed and implemented utilizing the new inlet site, a series of temporary dams, and the existing stilling basin on the dam to de-water the creek during construction.

## Project #2- McKnight Ditch Open Ditch to Delivery Pipe System

### Purpose and Need

This project goal was to increase instream flows for ~3 miles of East Weaver Creek downstream of the project. The goal was to ensure greater return flows (minimum of 1 cfs) and enhance the quality of anadromous habitat by increasing pool depth and connectivity.

- Design and Cost Estimate- The 5C staff worked with water right holders (Powers and Butler), Weaverville Community Services District (Tim Kasper), and the USDA Natural Resources Conservation District engineering staff (Lori Bundy) to develop and evaluate five design alternatives in 2018 & 2019. Alternatives evaluated included:

- 1) Abandon the waterline and water right and enter into a Fish and Game Code Section 1707 water right agreement with CA Department of Fish and Wildlife<sup>9</sup>. Under this alternative the value of replacing the water with an alternative source (WCSD water hook-up) was considered. The alternative included increased water district pipe sizing to each water right holder, installation and operation of efficient watering systems, and an offset to the cost of WCSD water). The water right holders considered the cost and benefits of this approach but opted to not select the alternative. The landowners understood that a future opportunity could be possible to transfer these rights.
- 2) Locate the irrigation line along the edge of East Weaver Creek Road. Under this alternative the line would be co-located with an upgraded WCSD 10" water main constructed on the road edge. This alternative removed the line from all non-beneficiary landowners' properties and would bury the line, reducing maintenance. The alternative would require an encroachment permit from Trinity County and an easement from WCSD. This alternative was dropped when WCSD determined it could not obtain funding and complete a water main construction within the project planning horizon.
- 3) Relocating the intake ~0.5 miles downstream adjacent to the Butler parcel, install an electric pump, meters and pipeline for ~500' to tie into the existing pipeline at the water rights holder's property. The alternative would require obtaining an encroachment permit from Trinity County, obtaining easements from two landowners for the pipeline, obtaining an easement from one landowner to construct a power/pump shed; obtaining a change in location for the existing water right from the North Coast Regional Water Quality Control Board, obtaining a new Streambed and Lake Alteration Agreement from CDFW, installation of a screen and pump in the creek at the new location, installation of a new electrical meter and power to operate pumps and screens, and construction of 500' of trench and water line placement. The

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<sup>9</sup> In lieu of an appraised value for the water replace the water right holders would dedicate and deed their water right to beneficial uses of water for the State.

- alternative was not selected due to water right holders concerns about costs of operations and inability to obtain easements from adjacent landowners.
- 4) Install the waterline within the existing ditch and burying it. A survey of the ditch identified potential to impact tree roots. Access options for trenching equipment indicated that burying was possible but difficult. This alternative would require changes in the easements of the intervening landowners from surface to sub-surface flows. Discussions with some landowners indicated they would not be interested in providing an easement because of the level of disturbance in their backyards and other concerns.
  - 5) Selected Alternative- The selected alternative was installing a 2" gravity flow fusion welded HDPE pipe located on the surface of historic ditch path. The line would be equipped with a Pump-Rite Model # MM-L30 intake screen compliant with National Marine Fisheries Service/ NOAA Fisheries. The new 2" HDPE mainline pipe would be capable of delivering ~50,000 gallons/day from the stream. The system would incorporate a check valves, flow-limiting Dole valves such that the pipe would deliver 36,314 gallons/day (32,314 gallons per day to the Butler property (Permit #010423- 0.05 cfs between 5/1 and 11/1) and 4,000 gallons per day to the Powers property (Permit #009671 for 4,000 gallons/day between 04/01 and 10/15).

The Powers water delivery would be via a 1" lateral polyethylene pipe coming off of the 2" main line installed on the Butler property. The water right holders would retain easements across numerous private parcels for the ditch and water conveyance. The new inlet system design included two intake systems: an early season gravity intake and a mid-late season siphon intake to charge the water pipe.

The Early Season Intake System (ESIS) consists of a 2" diameter HDPE inlet pipe with a SUPR992000 MM-L30 Body Assembly (3" diameter x 27" long, 30 GPM capacity) screen, or equivalent screen installed on May 1 or thereafter and remain in place until stream elevation reduces the water depth over the intake screen to 7" or less. Minor rock anchoring will be used to secure the screen to the stream bottom. Once the stream elevation drops to less than 7" of flow over the top of the screen, the intake would be removed and the siphon activated. At that time, the intake will be switched to the Mid-Late Season Siphon Intake. The ESIS intake, based on the screen capacity, can deliver 43,200 gallons per day. A Dole flow control valve was installed before each water right holders meter to limit water delivery to the specified water right.

The Mid-Late Season Siphon Intake (MLSSI) utilizes the same SUPR992000 MM-30 screen, or equivalent screen, be reattached to the bottom of the siphon. A permanent surge tank (~10-100-gallon tank) would be installed in the historic ditch at the high point of the system (top of stream bank approximately 10' north of the stream edge during the average annual water high flow). A backflow preventer valve would be annually installed in the

channel with the screen at approximately 4' from the north bank of the stream. Minor rock anchoring used to hold the pipe and siphon in place. Minor rock placement will be done to maintain 8" of water over the screen as the summer flows change. The siphon would be charged by either gravity flow, pump or other manual means. The dole valve will be set to deliver the water volume specified above.

Under all alternatives intake systems will be removed from East Weaver Creek each November 1 or earlier.

Permitting and CEQA Support- The project is located in a suburban area that lacked habitat for listed terrestrial species of plants or animals due to past development. The project would have minimal amounts of activity within the riparian zone of East Weaver Creek and would not change streamside habitat. When implemented, the project would have long-term benefits of improving instream flows, benefiting riparian and aquatic species.

The project is not within a Federal Emergency Management Agency (FEMA) mapped floodplain, or zoned Flood Hazard or Flood Hazard Overlay. It did not require a Trinity County Floodplain Development Permit or Grading Permit. A CDFW Lake and Streambed Alteration Notification was submitted to CDFW in May 2019. After review CDFW determined that the project did not require a Streambed Alteration Agreement (other than the landowners pre-existing agreement).

The project did not result in grading, ground disturbance or placement of fill in a waterway and it was determined that it did not require a Section 401 Clean Water Act permit or a Trinity County Grading Permit.

The project did not require disturbance of a public roadway or contribute to growth inducing activities or alter land use patterns.

A CA Environmental Quality Act Initial Study was completed in May 2019. The project was determined to be Categorically Exempt under Section 15333.

Landowner Coordination- The water right holders supported the 5C with preliminary permitting and CEQA documentation. This support included responses to requests for information, construction quantities, review of draft documents, and attending multiple on-site meetings. This included notifying all affected landowners along the McKnight Ditch easement at least 3 days in advance of work done on landowners' property during the installation of water line pipe. Questions regarding the project from adjacent landowners were referred to the 5C staff as part of the public participation and notification processes.

Supplies and Materials Acquisition – The 5C and water right holders worked cooperatively to order and arrange all deliveries of construction materials, water

conservation pipe, plumbing and associated items as specified in the detailed plans. Construction materials were staged on the Butler property.

Specialized Training, Quality Control and Quality Assurance- The 5C staff as well as Butler traveled to Sacramento for a multi-day training in the use of the specialty welding equipment needed to install the HDPE water conservation pipe, plumbing and associated facilities in June 2019.<sup>10</sup> Based on that training, the 5C staff and Butler installed the pipeline. A licensed, qualified plumber was retained to oversee construction quality control and provide guidance to installation crews as necessary.

Implementation- Project construction began in September 2019 and was completed in October 2019. A total of 3540' of 2" HDPE pipe was installed as well as ~1500' of 1" pipe. A series of check valves, breather valves, shutoff valves, magnetic meters and flow control valves were installed. A series of storage tanks and adapters were installed on the Powers property to allow utilization of the water delivered via piping.

5C Engineer Rogers provided engineering design, field inspections, flow testing, performance and monitoring, and acquisition of specialty parts. Butler (Water Right holder) and 5C staff (Rogers, King and Reed) installed pipe and valves including fusion welding of each joint.

Once the line was installed it failed to sustain consistent flows. A process of elimination determined that the issue was with air vent valves that were not sufficiently closing to create and/or maintain a vacuum within the line. The underlying issue was determined to be that flow within the pipe was not fully developed, nor sufficient to create suction necessary to maintain a steady flowrate. A combination of valve replacements- with manually operated valves- resulted in improved flow.

The new 1" line was required to be buried within the Butler pasture to avoid damage by grazing animals. When the ditch ran as an open flow conduit animal impacts were not significant. The line was run across Highway 3 in the existing highway drainage culvert (same as pre-project). The line was run across Powers' driveway in the existing drainage culvert (same as pre-project). Water storage tanks, pads and pumps were installed at the Powers property.

In December 2019, Caltrans informed Powers that the water line in the Highway 3 crossing lacked permitting<sup>11</sup>.

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<sup>10</sup> Butler purchased the HDPE welding equipment and went on to install additional water piping for conservation projects including the West Weaver Creek RCD/Weaverville Community Services District Moon Lee water ditch piping project.

<sup>11</sup> The 5C provided Caltrans with documentation that indicates that Highway 3 was installed over the ditch and water right and that the state may have failed to document the pre-existing facilities at that time. Caltrans never followed up after reviewing the documentation. Mr. Powers passed away suddenly in 2021 and the outcome of the Caltrans review is unknown to the grantee.

Restoration of Private Property and Maintenance of Facilities- At the completion of the project gates, fences, which were moved, modified or altered during installation of the water conservation pipe were restored. Water right holders were responsible for maintenance of the water conservation pipe, plumbing, meters and siphons.

At the completion of construction design flows were not achieved for nearly a week. Air gaps, air bubbles, and debris are believed to have reduced efficiency after initial system installation and clearing of the lines followed for the next several days. It is anticipated that both issues: valves not closing and air entrainment will be an annual maintenance issue but not an insurmountable problem occurring mostly during the first week of operation after screen intake installation. The replacement of automatic valves with manual ones will allow for the line to charge and the system to reach full operational flows.

Once flows were fully established after installation, monitoring of daily water delivery was done to verify that the Dole Valve flow limiter was properly functioning and that the magnetic flow meter was working correctly for each Water Right holder. The lines were tested and found to be performing to standards on November 1 but in order to complete the test (before the intake had to be removed) lines were left above ground from Butlers to Powers property. With the system functioning properly the final construction elements of the Powers water line were installed. This included disconnecting the Powers 1" HDPE water line and running the new waterline inside the underground portion of the pre-existing 6" pipeline (acting as a conduit for the new line). Due to a number of bends and root blockages in the existing line it had to be dug up to clear obstructions.

Monitoring- Between 2019-2022 5C staff completed flow monitoring in November each year based on the Dole Valve flow limiter and magnetic flow meter readings. The water right holders also report annual water use to the North Coast Regional Water Quality Control Board as part of their water use reporting. Based on meter readings the system performed as designed although drought conditions in 2021-2022 resulted in discontinuation of diversion earlier than legally required.

Water right holder Butler reported that the pipe distributes a more reliable water supply, increases performance for the two water right holders at the end of the irrigation canal (the pipeline allowed the owners to capture water pressure that was not available from the open channel flows), ensures seasonal diversion volumes are within the stated water rights. The piped water deters illegal water diversions and other irrigation uses compared to the open ditch.

**Accomplishments:** 5,015 feet of irrigation ditch/canal was cleared and grubbed out and 3,540 feet of 2 inch HDPE pipe and 1,480 feet of 1 inch HDPE was laid. There are 28 (twenty-eight) parcels that directly are involved, benefiting from this change in delivery system resulting in better water conservation and less erosion. WCSD gained badly needed infrastructure that eases the call for water at the end of the ditch. There will be 19 (nineteen) acres sprinkler irrigated at total buildout. This had been mostly

flood irrigated prior to the delivery system causing the supply of water to be very sporadic and inefficient. The tax base for WCSD will be not increase annually as a result of the project. Silt in East Weaver Creek and Crofton Gulch will be reduced as the erosion in the unlined open ditch will be nearly stopped.

Conservation Benefits include:

- Reduced Evaporations
- Increased water Quality
- Eliminates end of channel water losses
- Enables more precise flow measurements
- Allows installation of automated control valves
- Enables automation of entire system

Project photos and media documents attached.



**Figure 4: Existing East Weaver Creek Intake Structure had deteriorating pipe and materials.**



**Figure 5: New intake structure equipped with 20 gauge perforated stainless steel screen with 0.075" screen openings and low entrance velocity design to minimize vortices and debris accumulation. This is a non self-cleaning, passive screen with no moving parts to maintain or replace.**



**Figure 61: New HDPE Butt-fusion intake pipe with quick-disconnect cam-lock fitting and shutoff valve utilizes portions of the existing East Weaver Creek Intake Structure thus minimizing disturbance to the streambed and bank.**



**Figure 7: Gate Valve with HDPE fusible ends and Netafim 1" Combination Air/Vacuum and Continuous Acting Air Vent installed at existing overflow structure. Vents allow for discharge and intake of large volumes of air along mains and at the end of mainlines and provide continuous air release at high points in pipe network or upstream of manifolds.**



**Figure 82: Seametrics Magnetic flow meter (2-inch) and flow regulating Dole valve. Plastic-bodied and battery-powered magmeter irrigation flow meter with digital display functions with no moving parts for unobstructed flow and minimal flow disturbances. Meter allows the user to easily read instantaneous flowrate in GPM and Total volume in gallons. System ensures durable fluid measurement**

### **Final Budget**

A total of \$434,559 was expended completing the McKnight Water Conservation Project and advancing the East Weaver Dam Intake Relocation and Dam Removal Project into Phase 2 implementation.

The TRRP Watershed Grant#00075 accounted for 53% of project expenditures. The US Fish and Wildlife Grant #00673 funded \$98,500, accounting for 23% of the project expenses. The Weaverville Community Services District contributed personnel, water use credits, equipment, materials (trees for large wood components, 450 tons rock) and administrative expenses with a value of \$55,747, or 13% of the project costs. The National Fish and Wildlife Foundation Grant#54682 provided \$27,064 or 6% of funding. The McKnight Water Right holders contributed labor, equipment, materials and support totaling \$17,500 or 4.7% of the total grant costs. The 5C Program and its affiliates contributed \$2,125, approximately 0.5% of in-kind resources of software, tools, pumps, hoses, and equipment used during construction. Figures 9 and 10 and Table 1 summarizes the project funding by all sources.

### Total Expenditures By Type

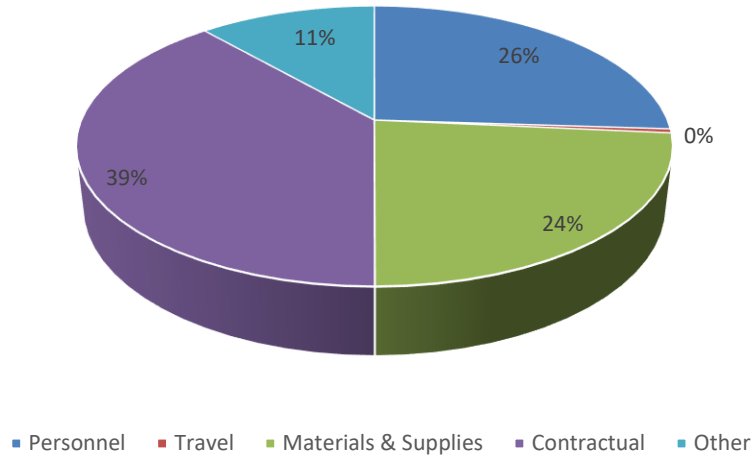


Figure 9 & 10 and Table 1. Summary of Budget By Funding Source

### Funding By Source

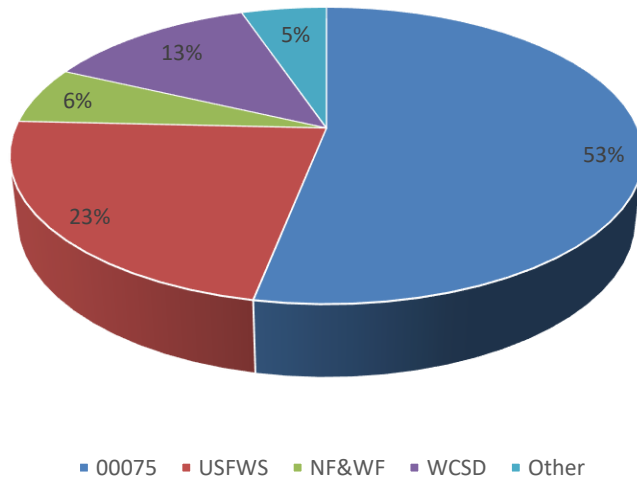


Table 1 Budget Summary

	00075	USFWS	NF&WF	WCSD	Other	
<b>Personnel</b>	\$65,833	\$16,295	\$19,878			<b>\$102,006</b>
<b>Travel</b>	\$1,023	\$42		\$576	\$150	<b>\$1,791</b>
<b>Materials &amp; Supplies</b>	\$37,036	\$22,000	\$2,000	\$31,050		<b>\$92,086</b>
<b>Contractual</b>	\$103,175	\$45,209	\$2,725			<b>\$151,109</b>
<b>Other</b>	\$2,641	\$6,000		\$16,850	\$19,475	<b>\$44,966</b>
<b>Subtotal Operating</b>	<b>\$143,875</b>	<b>\$73,251</b>	<b>\$4,725</b>	<b>\$48,476</b>	<b>\$19,625</b>	<b>\$289,952</b>
<b>A/O</b>	\$20,971	\$8,955	\$2,460	\$7,271	\$2,944	<b>\$42,601</b>
<b>TOTAL</b>	<b>\$230,679</b>	<b>\$98,500</b>	<b>\$27,064</b>	<b>\$55,747</b>	<b>\$22,569</b>	<b>\$434,559</b>