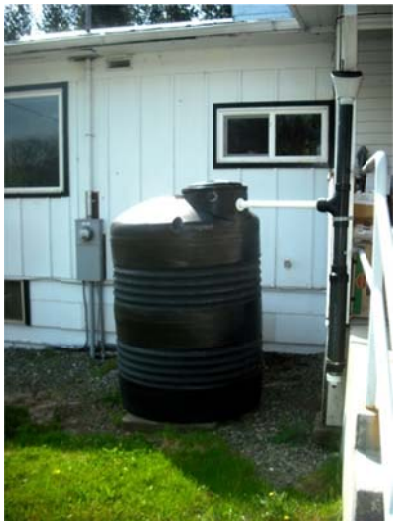
# Weaver Creek Water Conservation, Reliability, and Habitat Restoration Project





## Final Report

April 22nd, 2014

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# 1. Executive Summary

Studies and precipitation data have shown that the Weaver Creek watershed has had drier winters and reduced snowpack over the past 50 years compared to earlier periods and this is impacting community water reliability and critical habitat for native fish species. These changes have occurred in combination with a general warming trend throughout California. A 2009 study by the Five Counties Salmonid Conservation Program (5CP) found that not all "Beneficial Uses of Water" could be met in the Weaver Creek watershed during summers and mortality of fish was not uncommon. A need to increase water conservation and reduce surface water diversion was critically needed but there has been little or no effort placed on water conservation education or installation of conservation systems.

The Weaverville Water Conservation Project (WCP) originated as a design and demonstration project. The design element consisted of completing plans for a reclaimed water treatment facility within the Weaverville Sanitary District's (WSD) Waste Water Treatment Plant, located in Weaverville, CA (Trinity County). Once constructed the reclaimed water treatment plant would reduce treated water for irrigation and some industrial uses by up to 500,000 gallons per day. The demonstration component originally was to install a demonstration project capable of delivering up to 40,000 gallons of WSD outfall water per day to a concrete batch plant for use in concrete manufacturing and rock washing.

Water Works Engineering of Redding, California completed the design drawings, details and budget to construct a tertiary plant capable of treating 500,000+ gallons of water per day in 2009. At the same time that the design was underway, the Weaverville-Douglas City Park and Recreation District installed a "purple pipe" reclaimed water irrigation system within a 9 acre community park (Lee Fong Park) in anticipation of future reclaimed water deliveries.

The treatment plant construction budget was $2.1 million and 5CP worked with the WSD to develop 5 separate grant proposals to fund construction. The economic downturn from 2008 to 2011 and the American Recovery and Reinvestment Act of 2009 emphasis on "shovel ready" projects (CEQA/NEPA and permitted completed) contributed to none of the grant proposals being selected for funding.

In 2009 the North Coast Regional Water Quality Control Board staff determined that the WSD water, without tertiary treatment, could not be used in the concrete and rock washing facility due to potential incidental human contact during the manufacturing processes. A series of other implementation projects (e.g. installing portions of the water lines from the WSD plant to the Trinity Alps Golf Course or the concrete patch plant) were considered and ultimately rejected for the implementation component of the grant.

In 2012, an alternative Water Conservation Project (AWCP) proposal was submitted to Humboldt County (and the SWRCB) to target water efficiencies and conservation in order to reduce water diversions from streams. On January 9th, 2014 an amendment to the state grant authorized the WSD and the RC&DC to initiate a series of three water conservation projects as well as water conservation education efforts, in lieu of the original concrete plant water conservation project. The projects would all have to be completed in the last two months of the grant life. While the projects were not 100% complete by March 31, 2014 all were functioning prior to that date. All final work was completed in April 2014.

The largest of the three water saving projects was the conversion of a flood irrigated pasture in the East Branch of East Weaver Creek watershed to a more efficient sprinkler irrigation system. The change results in the return flow of approximately 40,000-80,000 gallons of water per day to East Weaver Creek in the critical low flow summer period. The project modified the irrigation system to use 15,000-32,000 gallons in the pasture and for other domestic uses. Excess water is returned to East Weaver Creek via "Deadwood Gulch" an ephemeral stream on the property. The new system also returns winter runoff intercepted by the 0.4 mile long side hill ditch and directs it to Deadwood Gulch and East Weaver Creek. Prior to the new pasture irrigation and tailwater return system hillslope runoff flooded the pasture even in winter. The effect of this was noted during a 0.25" rainstorm March 2014, when intercepted slope runoff exceeded 0.25 cfs in the ditch. The net summer return flows to East Weaver Creek from the project are estimated to be 5-9 million gallons between June and September of an average year, or ~0.06-0.12 cfs.

The second project consisted of a combined water conservation education effort and the installation of 10 rooftop rainwater tanks at a greenhouse program at Trinity High School, a children's garden at Weaverville Elementary School,

demonstration agriculture and education program at the Young Family Ranch, and a landscape demonstration project at the Trinity Alps Performing Arts Center. All of the rooftop rainwater projects have an interpretative component on water collection, reuse and minimizing use. The projects would collectively store approximately 23,000 gallons of rainwater for re-use at any one time and teach people about the need for conservation in the community. Based on average summer rainfall rates the tanks would fully recharge once during the summer period.

As part of the water conservation education effort, impacts of climate and surface water diversion and use of roof top rainwater were presented at 11 workshops and/or community events between March 2013 and March 2014. In addition the 5CP staff participated in 3 KMUD radio station (Garberville, CA) call-in/live broadcast programs on water conservation. The 5CP staff attended, testified, and/or presented conservation information at 6 public meetings (Trinity County Board of Supervisors-2, Weaverville Community Services District-2, Weaverville Sanitary District Board of Directors-1, and Young Family Ranch Board of Directors-1) in 2013-2014. There were 7 newspaper or newsletter articles about the 5CP water conservation in the same period.

The final project was the replace a 24,000 gallon redwood water tank operated by the Weaverville Community Services District (WCSD). The tank, which was installed in 1979, was replaced with three 10,000 gallon tanks. The 35 year old redwood tank was leaking 1,400 gallons/day at the time of removal and had required maintenance to repair larger leaks resulting from woodpecker damage. The project when completed increased fire capacity, reduced maintenance, increased flexibility in servicing tanks, and saved 500,000+ gallons of water per year.

The three projects combined are estimated to directly reduce water consumption by approximately 40,000-100,000 gallons per day, but are expected to have equally significant benefits by encouraging others to implement similar conservation efforts.

# 2. Background

**City & County**– The project is located in Weaverville, Trinity County. The watershed includes the communities of Weaverville and portions of Douglas City as well as satellite clusters of homes along Little Browns Creek Road, Democrat Gulch Road, Blue Rock Road, Roundy Road, Oregon Mountain, Musser Hill, and Weaver Bally areas. The population of Weaverville and surrounding rural residential developments is approximately 5,000 people. Weaverville has had a slow but steady growth in population over time.

Trinity County is one of the most rural counties in California and is the third smallest, population wise. The area is dependent on natural resources for its economic base. Mining and ranching dominated the early settlement years (1849-1930's) followed by logging and National Forest management (1930's-1990's). In 1964, the Central Valley Project was completed diverting as much as 50% of the water in the river upstream of Lewiston to the Sacramento River. The inter-basin water transfers are among the largest in North America, and contributed to decimating wild fish runs on the Trinity River.

Since the mid 1970's, the general economy of the area has declined as timber harvesting and wood manufacturing declined in the region. Currently government, logging, wood manufacturing, tourism (fishing, camping, backpacking, etc), watershed restoration, retail services, and marijuana cultivation are the primary sources of employment. A few historic ranches remain, primarily in the southern half of the County.

**Watershed Area-** The Weaver Creek watershed encompasses approximately 31,800 acres and is the most populated watershed in Trinity County. Elevations range from 7,770' at Monument Peak to almost 1,700' at the confluence of Weaver Creek and the Trinity River. Wilderness forms the uppermost 20% of the watershed; forests managed for timber surround the community of Weaverville which lies in valley in the middle of watershed. Douglas City sits at the confluence of Weaver Creek and the Trinity River. The high elevation mountains that form the northern bowl above the community supply Weaverville residents with year round water. The eastern and western portions of the Weaver Creek watershed drain from mid elevation mountains including Oregon Mountain and Browns Mountain. Weaver Creek generally flows south and the lower half cuts through a moderately steep canyon.

**Historical Uses-** Weaverville sites in a valley in the central portion of the watershed and has been the county seat for more than 150 years. The streams of the watershed were rich in gold and timber and portions were heavily mined and logged in the 1850's to 1930's. Some of the flat slopes in the watershed were created as a result of mining which washed away hills and leaving only large rock and gravel mounds (refer to Figure 1). Most of these gravel tailings were leveled and much of Weaverville is built on the tailings. Much of the town was built in the low stream bottoms, narrowing the channels and floodplains and creating numerous riparian parcels.

Timber harvest remains a significant land use on private timberlands and stand replacing wildland fires over the past 20 years have impacted both private and federally managed lands.

**Climatic History:**

**Klamath Basin Climate Data-** The Klamath Mountain range, which includes the project area, lies within a climatic boundary region between the two major Pacific Ocean weather engines, the Pacific Decadal Oscillation (PDO) to the north and the El Nino Southern-Oscillation (ENSO) to the south. Because the region lies in the boundary layer between these ocean thermal tracts, it is somewhat more difficult to model annual weather patterns in northwest California compared to areas north or south of the Klamath Mountains range. Malevich, et al (2013) summarized this by noting that "cool season storm tracks appear to be a direct driver of hydroclimatic variability, leading to see-saw like relationships with neighboring [geographic] regions."

A 2013 hydro-climate study of the Upper Klamath River basin provides a multi-centuries perspective of the region's climatic variability. The tree ring reconstruction study provides records dating back to 1564 and 1000 respectively (Figure 1) and provides a correlation of current precipitation records with past drought severity (Malevich, et al 2013). The study found that tree ring growth was most effective at detecting moderate to long duration droughts (6-20 years) but not short duration droughts (1-3 year) or very long droughts (50-year). The study supported past data showing climatic variability over time as well as the cyclic nature of both long and short period droughts, including a relatively long drought between 1917 and 1934.

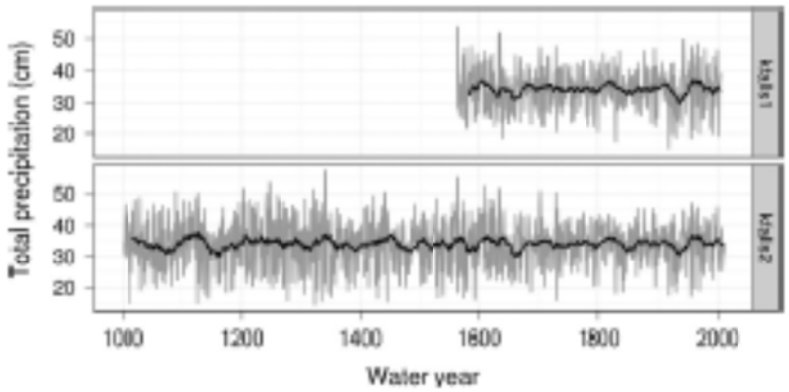



**Figure 1:** From Malevich, et al, 2013 graph of annual (gray) and 20 year moving average (black) precipitation values for two sites in the Upper Klamath River basin.

While Malevich's work documented the cyclic nature of weather patterns in the region, Mote (2003b) documented a shift in timing of precipitation that may be as important as drought conditions. Mote has shown that there has been a decrease in winter precipitation and snow water equivalent (SWE) storage in the Pacific Northwest and northwestern California over the past 50+ years. The overall rate of SWE loss in the Pacific Northwest, including northwest California has averaged 30% for the period 1950–2000 (Mote, 2003a). This contrasts with only a 1% SWE loss in the remainder of California. The difference between northwest California and the remainder of the state is due in part to weakening and offshore shifts of the Pacific winter storm track (Minobe, 1997) and "the anomalously strong El Nino–Southern Oscillation events in the past 20 years, which strengthen winter storms, resulting in more precipitation in California" (Piechota, et al, 1997). Howat and Tulaczyk (2005) summarize this difference as follows:

> "*Such a contrast should not be completely unexpected, as previous researchers have found an anti-correlation between the climates of California and the Pacific Northwest, largely driven by the relative forcing of tropical and northern Pacific climate modes (Dettinger and Cayan, 1995; Cayan, 1996; Cayan et al, 1998)….In addition to a trend of drier and warmer winters in the recent past, snow pact levels have declined. The amount of snow water equivalent (SWE) storage trends is dependent on both latitude and elevation of the mountain range being measures.*"[1]

In addition to, or contributing to, the reduced SWE in the region is the rise in air temperatures both globally (Figure 2) and within California (Groisman et al, 2001; Lund et al, 2001).

[1] Howat and Tulaczyk (2005) found that snow gauge stations below 2300m elevation lost, on average, 13% SWE while higher-altitude stations gained 12%. This spatial distinction was also found between northern and southern stations, averaging –15% and 10% respectively.

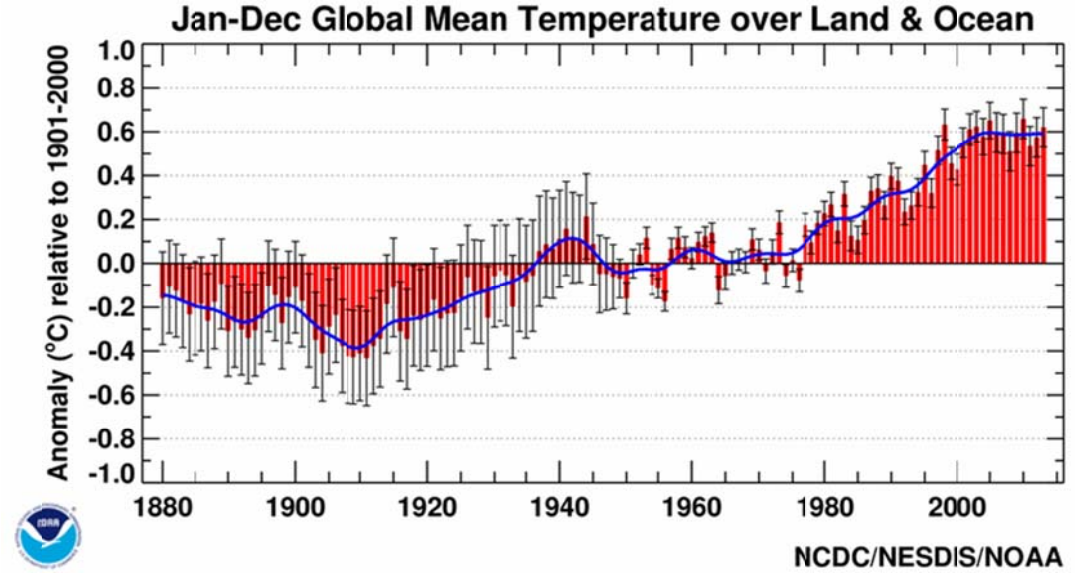



**Figure 2:** Global average temperature since 1880. This graph from NOAA shows the annual trend in average global air temperature in degrees Celsius, through December 2013. For each year, the range of uncertainty is indicated by the gray vertical bars. The blue line tracks the changes in the trend over time. (Image courtesy NOAA's National Climatic Data Center.)

**Weaverville Climate Data-** Review of 120 years of precipitation data from the Weaverville Ranger District shows that annual precipitation has become more erratic over the past 40 years compared to the 80 years prior to that. Over the past 40 years 55% of the extreme years have been dry and 45% were wet (Figure 2). The opposite was true for the prior 80 years, between 1895 and 1974 75% of the extreme years were wet.

Precipitation rates have become more erratic over the past 40 years and the rate of extreme conditions is accelerating. Between 1895 and 1974 there were 4 years with extreme variation[2] from the mean precipitation rate of 37.3" per year. This equated to 5% of all years being extremely wet or dry during the 80 year period. Between 1975 and 2014 there have been 9 extreme years[3], or 23% of all years. This represents a 450% increase in the number of extreme years compared to the prior 80 years (Figure 3). The past 20 years have seen an even more dramatic swing with 6 extreme years, an increase to 30% of all years. The more erratic precipitation and reduced SWE levels of the past 40 years are possible functions of the boundary region effects of the PDO and ENSO. The influence of increasing global temperatures may increase the probability that the region will continue to experience erratic shifts from very wet to very dry at accelerated rates.

While the annual extremes have increased in the past 40 years, it should be noted that one of the longest dry periods occurred between 1917-1934 when 53% of all years were very dry[4] or extremely dry. The 1917-34 drought is also reflected in the tree ring record of the Upper Klamath River basin as discussed above.

[2] Extreme for the purpose of this report is defined as greater than or less 50% of the average annual precipitation or ~1.5 standard deviations from the mean,

[3] Two of the 9 years were marginally place in the extreme category because they were less than 1% (< than 0.15 " of precipitation) from under 50% of the average precipitation. No similar situation was observed in the data for the prior 80 year period.

[4] Very dry or very wet for purposes of this report is greater than one standard deviation of the mean

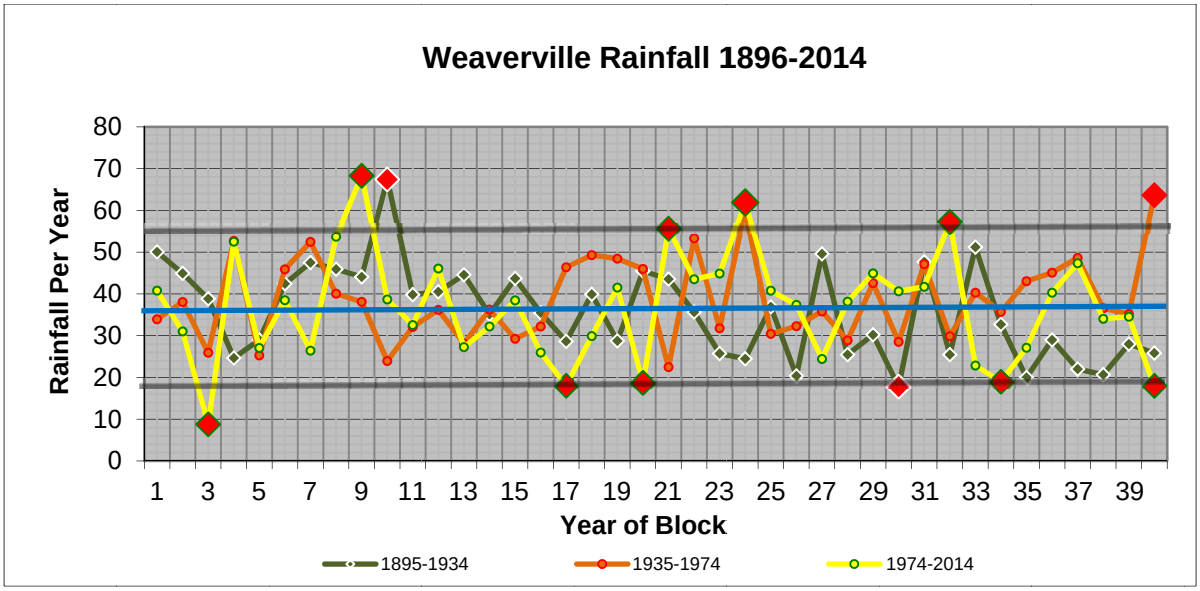



**Figure 3.** Weaverville Ranger Station annual precipitation for 120 years (1895-2014[5]) broken down into three 40 year periods. The red diamonds represent years that exceeded 50% of the annual average rainfall for the period. The gray lines represent 50% variance from the mean (blue line).

**Problem Statement & Relevant Issues**- Weaver Creek and its major tributaries have been identified as "key habitat to maintain and improve" coho populations (CDFG, 2004). The low gradient reaches make Weaver Creek among the highest priority streams in northwest California for coho recovery (CDFG, 2004). But the extent of past in-stream mining (Figure 5), urban development, loss of floodplain area, and degraded riparian habitat contributes to relatively low numbers of these fish in the streams. Water diversions can reduce surface flows and increase water temperatures to levels lethal to salmonids in even average rainfall years. Dry years or droughts not only increase impacts to water quantity and quality, but can exacerbate watershed conditions, especially if fires occur during drought conditions[6].

In 2009 the 5CP completed an assessment of water resources in tributary watersheds of the Trinity River, downstream of Lewiston Reservoir (Pérez and Lancaster, 2009). That assessment documented there was insufficient water in the Weaver Creek watershed to meet human and other beneficial uses, especially cold water fisheries. The report found that a number of homeowners in the Weaver Creek drainage rely on importing water in the summer to meet their needs and some communities lack even minimal fire flow reserves during critical fire danger periods. It also documented that the combination of individual user surface diversions, droughts and community water systems were leading to annual fish kills, including sensitive species such as coho and steelhead (Figures 5 & 6). The report indicated that without improving alternative water sources (Trinity River) and conservation, communities relying on Weaver Creek would be limited in their ability to add water uses and violations of several state and federal laws to protect fisheries could occur. Prior to that work there have been minimal efforts to address water conservation or diversions in the watershed.

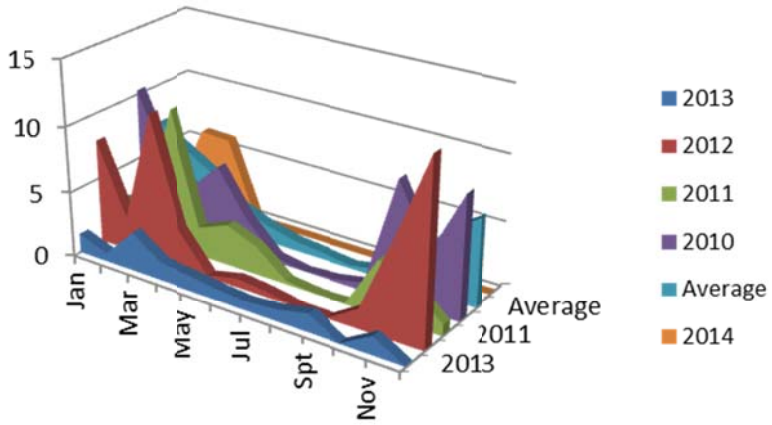



**Figure 4.** Weaverville precipitation totals 2010-2014

[5] 2014 projected based on precipitation totals through March 2014

[6] The increased summer droughts have contributed to stand replacing wildfires, which create hydrophilic soil conditions, increased runoff rates and soil erosion. Increased peak runoff rates and excess sediment delivery to streams further impacts water users and fisheries resources.

During the period of this grant (2009-2013) Weaverville experienced one slightly wetter and one slightly drier than average year along with four average precipitation years (Figure 4). Ironically the watershed experienced the driest calendar year (2013) ever, recording 13.1" inches of precipitation, compared to an annual average annual total of 37.3". The hydrologic year 2013 was "average" as the result of a single series of storms totaling 13.9" of precipitation in December 2012 (Figure 4). Significant portions of Weaver Creek were dry from August 2013 thru January 2014, disrupting normal coho migration patterns. As of March 25, 2014, the watershed received 46% of the average precipitation and is on track to record an extremely dry 2014 hydrologic year.

Surface water diverters using Weaver Creek and its tributaries experience water reliability and capacity issues during the normal summer dry periods[7]. Some residents living in the Democrat Gulch and Little Browns Creek watersheds must import water to meet basic household needs in summer. The Weaverville Community Services District (WCSD), the largest water district in Trinity County serves ~1,800 households from intakes in East and West Weaver Creeks and the Trinity River. The WCSD had a water connection moratorium in place from the mid 1980's to the mid 1990's due to limited water supplies. At that time WCSD got 100% of its water from East and West Weaver Creeks. These creeks support coho salmon and numerous water diversions in 1987 led to a significant fish kill in West Weaver Creek[8] (Figure 5). Smaller fish kills have been observed in Weaver Creek downstream of West Weaver Creek over the past 20 years Figure 6).


**Figures 5 & 6:** West Weaver Creek August 1987 (left) and Little Browns Creek August 2010 (right)

The water hook up moratorium ended when the WCSD acquired a 2.9 cubic feet per second (cfs) water right to the Trinity River. The WCSD pumps from the river in critical summer periods, but relies on the gravity flow of East and West Weaver Creek at all other times of the year. During extended droughts or major wild land or structure fires the WCSD can rely on the Trinity River water. Increased diversions and the listing of coho salmon as an Endangered Species could impact water diversion from East Weaver Creek in the future. In the late summer, especially in dry years, all of East Weaver Creek is diverted to the WCSD intakes, except for what leaks from below its intake dam. This leakage has been observed to be less than one cfs. The WCSD is working on ways to economically reduce its summer diversion of East Weaver Creek in order to protect Coho salmon while meeting future growth needs of its customers. Within a mile downstream of the WCSD intake, water is again diverted into an old mining ditch at the US Forest Service's East Weaver Creek campground. This unscreened ditch no longer serves mining but carries water to a series of homes and may carry water to Five Cent Gulch. Approximately 1,000 feet downstream of the unscreened ditch is a ditch on a major tributary- East Branch of East Weaver Creek- that diverts ~1 cfs to a pasture uphill of East Weaver Creek Road. This diversion is one of the projects addressed under this project.

Approximately 2,000' downstream of East Weaver Creek Campground, the McKnight Ditch carries water from East Weaver Creek to the north side of East Weaver Creek Road. This ditch and its riparian tree cover backs up to many homes. Residents use the ditch for recreation but some minor flooding of yards or beneath homes occurs. Downstream

[7] Average rainfall for the summer "half" of the hydrologic year (May-September) is 3.57" or ~10% of the annual rainfall

[8] The WCSD reduced the rate of diversion in West Weaver Creek during the revision of its use permit from the U.S. Forest Service. The reduced diversion rate, combined with removal of a migration barrier on Oregon Street have improved fish habitat in that stream.

of Browns Ranch Road, another diversion is used by Trinity River Sawmill for its log watering operations. The mill has installed a closed water loop system that recycles water throughout its operations, greatly reducing surface diversion from the stream. In dry years the mill purchases water from the WCSD to meet log watering needs.

These ditch diversions deplete East Weaver stream flows and in many years portions of East Weaver Creek can go subsurface with intermittent pools. In dry years, the entire stream from the confluence with West Weaver Creek to above Browns Ranch Road can go dry. It is not unusual in a dry year for Weaver Creek downstream of the confluence of East and West Weaver Creeks to dry up or only have intermittent pools or flows in the late summer. In contrast, the upper reaches of the tributary streams, above the mined reaches and water diversions, tend to have flow year round.

# 3. **Project Description**

The completed project included project types Reclaimed Water, Water Conservation Education, Water Conservation Implementation and Habitat Restoration.

**Reclaimed Water Treatment Plant (RWTP) Design**- The RWTP design was completed by Water Works Engineering of Redding CA in coordination with the Weaverville Sanitary District (Appendix C-1). The plant when constructed will be able to treat up to 500,000 gallons of secondary treated effluent to a tertiary level allowing for use in areas with incidental human contact such as fields, parks and other open space areas. CEQA was initiated for the project, including completing wildlife, botanical and cultural surveys of proposed disturbed areas. CEQA review was suspended when the proposed amendment to the grant was prepared.

**Water Conservation Education Project-** A water conservation education effort was undertaken including the construction of a water conservation education demonstration trailer (WCEDT) that included a roof top rainwater system. Interpretive displays and a series of PowerPoint programs were developed that highlighted both community and individual impacts of overuse of water and solutions. The power points focused on the impacts of climate and surface water diversion. The WCEDT and/or Power Point program were presented at 11 workshops and/or community events between March 2013 and March 2014. Among the events attended were the Trinity County Fair, Weaverville Farmer's Market, and the 2013 Salmon Festival. In addition to the events described above the WCEDT booth and Power Point presentations were made at 6 additional public events including three water conservation workshops.

The 5CP staff participated in 3 KMUD radio station (Garberville, CA) call-in/live broadcast programs on water conservation and attended, testified, and/or presented conservation information at 6 public meetings (Trinity County Board of Supervisors-2, Weaverville Community Services District-2, Weaverville Sanitary District Board of Directors-1, and Young Family Ranch Board of Directors-1) in 2013-2014. There were 5 newspaper articles, and 2 newsletter articles about the water conservation efforts in the same period. Several additional requests have been made for the 5CP to present the Water Conservation PowerPoint program and in the near future, including the Weaverville Lion's Club monthly speakers meeting and the Willow Creek Fire Safe Fair.

**Figures 7, 8 & 9** Water conservation education utilized the demonstration trailer, interpretative materials and public presentations.

The vast majority of the education effort occurred later than planned due to delays in approval of the amendment to the Agreement. While education efforts began as early as June 2013 in order to meet the targets of this grant, much of it was done between January and March 2014. Metrics regarding reduced summer use could not be measured during the effective period of the grant.

**Roof Top Rain Water Demonstration Project-** As part of water conservation efforts, the grant funded the design and construction of 4 community based roof top rainwater systems in Weaverville CA. The systems are located at Weaverville Elementary School (WES), Trinity High School THS), Young Family Ranch (YFR) and the Trinity Alps Performing Arts Center (TAPA). Table 1 provides design information for each site (the cover page photos of this report features the YFR and TAPA rainwater systems).



**Figures10, 11 & 12:** Trinity High School's greenhouse program's largest tank is located outside of the greenhouse (above left and right). The exterior system includes a rainwater diverter and diffuser, overflow system and discharge pipe and one way valves (above middle). The interior tanks (**Figure 13 & 14** below) warm water and provide thermal mass to the greenhouse. The greenhouse roof yields ~750 gallons of water per inch of rainfall.


The TAPA, THS, and WES systems all rely on electric pumps to move water from the storage tanks to the gardens and landscaping. The Young Family Ranch system collects rainwater into two tanks (2,825 and 500 gallon respectively) and then pumps it upslope to two additional 2,825 gallon tanks where it gravity flows to gardens as needed. Trinity High School's greenhouse program uses rooftop rainwater collection to water plants managed by students. A 2,825 gallon tank is located outside of the greenhouse and the interior tanks hold an additional 1,060 gallons. While the interior and exterior tanks fill simultaneously, valves control and allow the interior tanks to both warm the water and provide thermal mass to retain heat in the greenhouse. The warmer water increases winter growth rates for poinsettia's, which are sold to support the high school agriculture programs. The greenhouse is switching to year round program growing vegetables for the school lunch program.


**Figures 15 & 16-** Weaverville Elementary School Childrens Garden Rooftop rainwater tanks are integrated into the garden space. All garden water will come from rainwater collection beginning in 2014.

All CEQA was completed for the rooftop rainwater projects and Notice of Categorical Exemption was filed with Trinity County on June 4, 2013 and the CA State Clearing House on August 2, 2013 and a Notice of Concurrence was received from the State Water Board on September 13, 2013.

Table 1: Rooftop rainwater system components by project location:

| Rooftop Rain Water Project Location | 2825 Gallon Bushman Rainwater Tanks | 2825 Gallon Bushman Standard Tanks | 530 Gallon Bushman Pillow Tanks | Norwest 3000 Gallon Water Tanks | Norwest 500 Gallon Tanks | Total Gallons Rooftop Rainwater | Bushman RoofTop Rainwater Diverter | 1 HP Grundfos Pump | 3/4 HP Ace Sump Pump | 3 HP Sump Pump | Water Tank Pad Constructed | Back Flow Preventer Installed | Other BackFlow Prevention Installed | New Irrigation or Water Line | Drip Irrigated Landscape Added | Xeric Landscape Added |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |
| Weaverville Elementary | 2 | | | | | 5650 | 2 | | 1 | | No | Yes | Yes | No | | |
| | | | | | | | | | | | | | | | | |
| Trinity High School | | 1 | 2 | | | 3885 | 1 | | 1 | | Yes | No | Yes | No | | |
| | | | | | | | | | | | | | | | | |
| Young Family Ranch | | | | 3 | 1 | 9500 | 1 | | | 1 | Yes | No | Yes | Yes | Yes | Yes |
| | | | | | | | | | | | | | | | | |
| Trinity Alps Performing Arts Center | | | | 2 | | 6000 | 1 | 1 | | | No | No | Yes | No | Yes | |

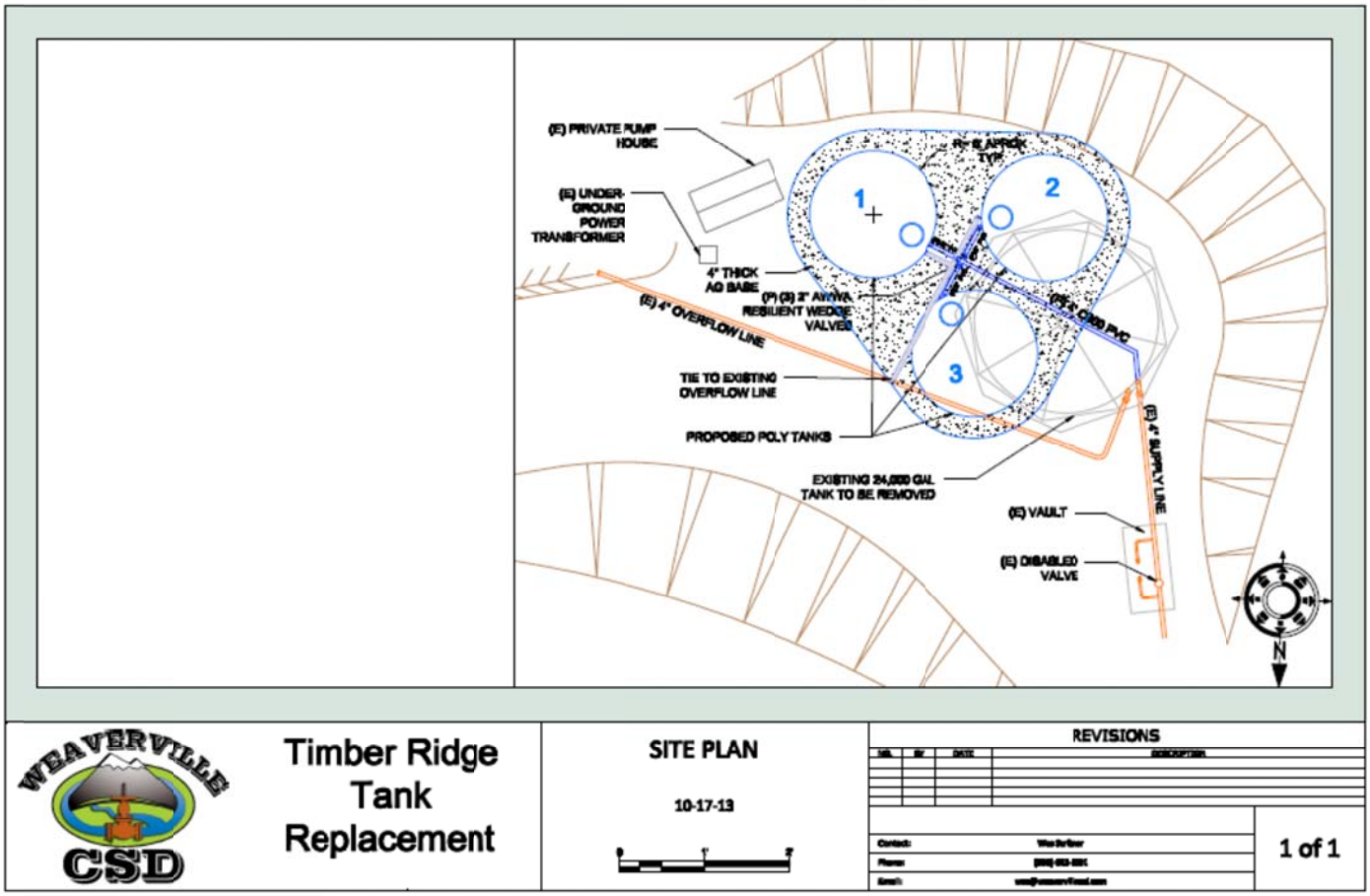
**Weaverville Community Services District- Timber Ridge Water Tank Replacement Project-** The WCSD provides drinking water to more than 3,000 people and 1,800 hookups in the Weaverville area and has three main water reservoirs/tanks serving the community, excepting the Timber Ridge development. Timber Ridge is located too high in elevation for the main reservoir tanks to adequately serve. This neighborhood was served by a 35 year old 24,000 gallon redwood tank placed above the small community prior to this project. The redwood tank provided the equivalent of ~570 gallons of storage capacity per parcel, but was losing ~1,400 gallons per day due to leaks. Inspection of the tank found significant rot in the bottom portion of the tank as well. WCSD engineer, Wes Scribner, designed a replacement water tank system consisting of three 10,000 gallon tanks that would increase storage capacity to the equivalent of 710 gallons per parcel.

All CEQA was completed for WCSD tank replacement project and Notice of Categorical Exemption was filed with Trinity County and the CA State Clearing House on June 4, 2013 and a Notice of Concurrence was received from the State Water Board prior to project initiation.

The WCSD began construction on the three tanks in March 2014. A base pad was developed for the first replacement tank and a trench was excavated to tie the three tank system together. New valves, water lines, and related plumbing tying the tanks together were installed with the first tank placement. Once that tank was in place and plumbed water quality and flow rate testing were done before the redwood tank was taken offline. Once the first tank was brought online, the redwood tank was drained and decommissioned. The concrete pad for the redwood tank was removed and a new base installed followed by the placement of the second and third tanks. Testing for water quality and flows for the two additional tanks was completed. All three new tanks will be on line and fully functioning in April-May

2014. The design and layout will allow for the placement of a fourth tank that will be able to utilize the plumbing of the former redwood tank, further increasing the storage passage to 950 gallons per unit.

**Figure 17 & 18**- The 13.6' tall tanks were placed with a lift. The first tank was placed with redwood tank still providing community water (left). Once testing of the new tank and water was complete the redwood tank was removed and the second tank set (right).




**Hansen Ditch Pasture (HDP) Irrigation Conservation Project**- The Hansen parcel[9] water right is 32,313 gallons per day, or 2 "miners inch"[10] of water. The Hansen ditch flows were measured during the summer in 2012 and 2013 at different times and ranged from ~60,000 to 120,000 gallons per day. Occasional summer thunderstorms increased the amount of water diverted for short periods. Steelhead were observed in the pasture overflow channel in 2013 and a fish rescue at the end of the year relocated 316 steelhead from the ditch back to East Branch Creek on in late

[9] The "Hansen" parcel is owned by three sisters and is referred to by their maiden name.
[10] In northern California, Nevada, Arizona, Oregon, and Montana, a miners inch equals 0.025 cfs (1/40th of a cfs)

October and early November. In addition to the summer diversion from East Branch Creek, the ditch can flow in the winter from hillslope runoff. Prior to the project the 3.3 acre Hansen parcel pasture was irrigated via sheet flooding resulting in uneven watering. Approximately 30% of the pasture was well watered and the remainder was over or under irrigated. In the over irrigated segments extensive compaction and rutting resulted from hooves of grazing horses, further reducing yield and productivity.

All CEQA was completed for the Hansen Ditch project and Notice of Categorical Exemption was filed with Trinity County and the CA State Clearing House on August 7, 2013 and a Notice of Concurrence was received from the State Water Board on November 25, 2013.

The HDP design proposal was to install a pressurized irrigation system that could more evenly distribute water over a larger area, increasing the productive area significantly. The new system would utilize water storage tanks that can be filled from ditch flow and pumped via underground irrigation lines, rather than relying on constant field flooding. At the same time excess water that the ditch intake would be directed back to East Weaver Creek via a ditch and Deadwood Gulch, an ephemeral stream channel. A 65% design was completed in September 2013 and the 95% design was completed by the contractor and 5CP in February 2014, with slight modifications occurring during construction. Construction began in January, 2014 and the system was completed but not tested in March, 2014.

The design preserves the ditch function and integrity through all parcels preceding the "Hansen" parcel. At the Hansen parcel a new 2" PVC feeder line fills 2 5,000 gallon water tanks and a 4" PVC return flow line carries excess flows to Deadwood Gulch (Figures 17 & 18). A 5 HP Gould pump set on a controller/timer was installed and can be set to activate as often as needed each day to deliver between 10,000 and 30,000 gallons of water as needed for optimal growth. The controller can be adjusted seasonally and in response to precipitation levels. The tanks have a passive overflow line that carries excess water back to the 4" PVC return flow line in the event of power outages or pump failure. Table 2 lists the key elements of the project.

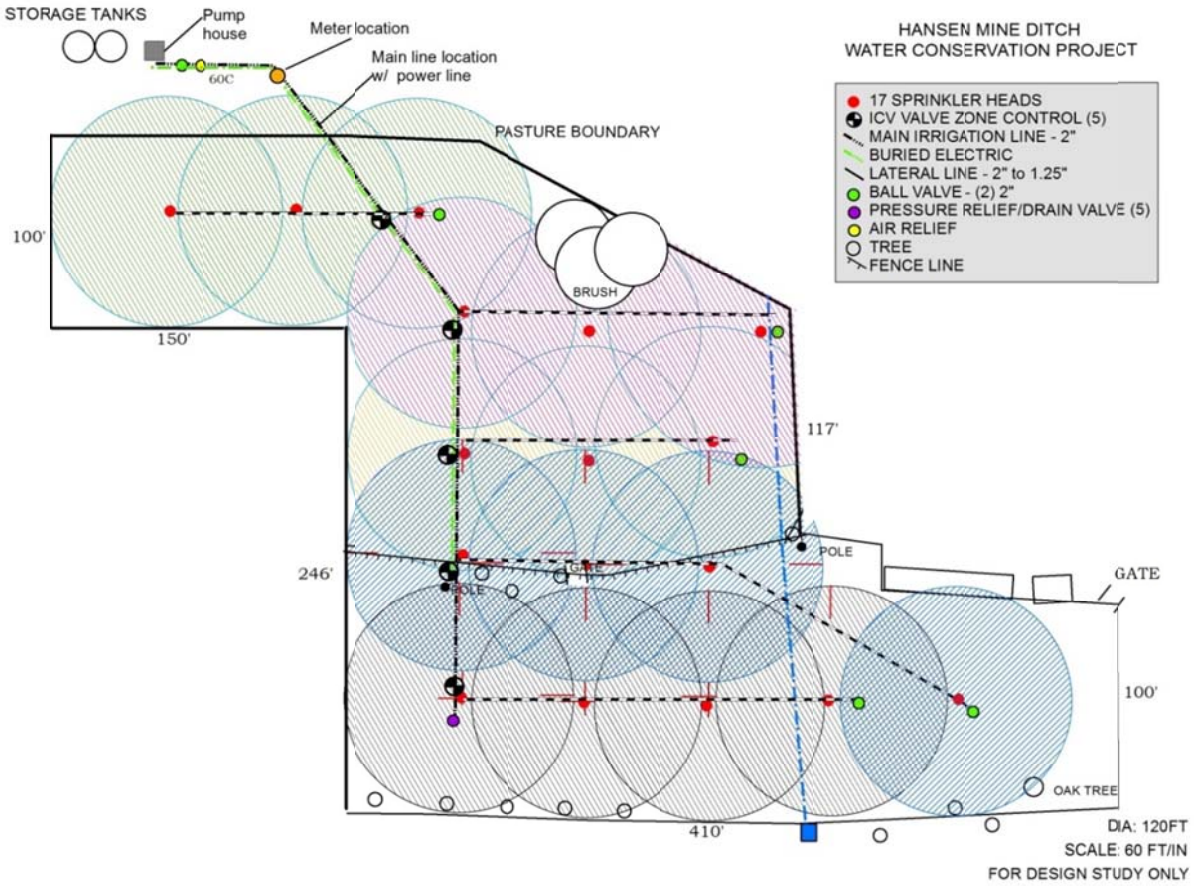



**Figure 19**- Irrigation line layout for the Hansen Ditch Project

The project required installation of a transformer and power drop from a utility pole in the pasture and underground burial to the water tanks. A series of valve controllers are used to water the pasture in 5 stages with a total of 17 60' radius sprinkler heads. Check valves and drain valves were installed to prevent freeze damage and swivel joints were installed at each sprinkler to prevent breakage from animals. Sprinkler head heights were set at approximately 12" above ground, high enough to be seen but low enough to not be rubbing posts by horses.

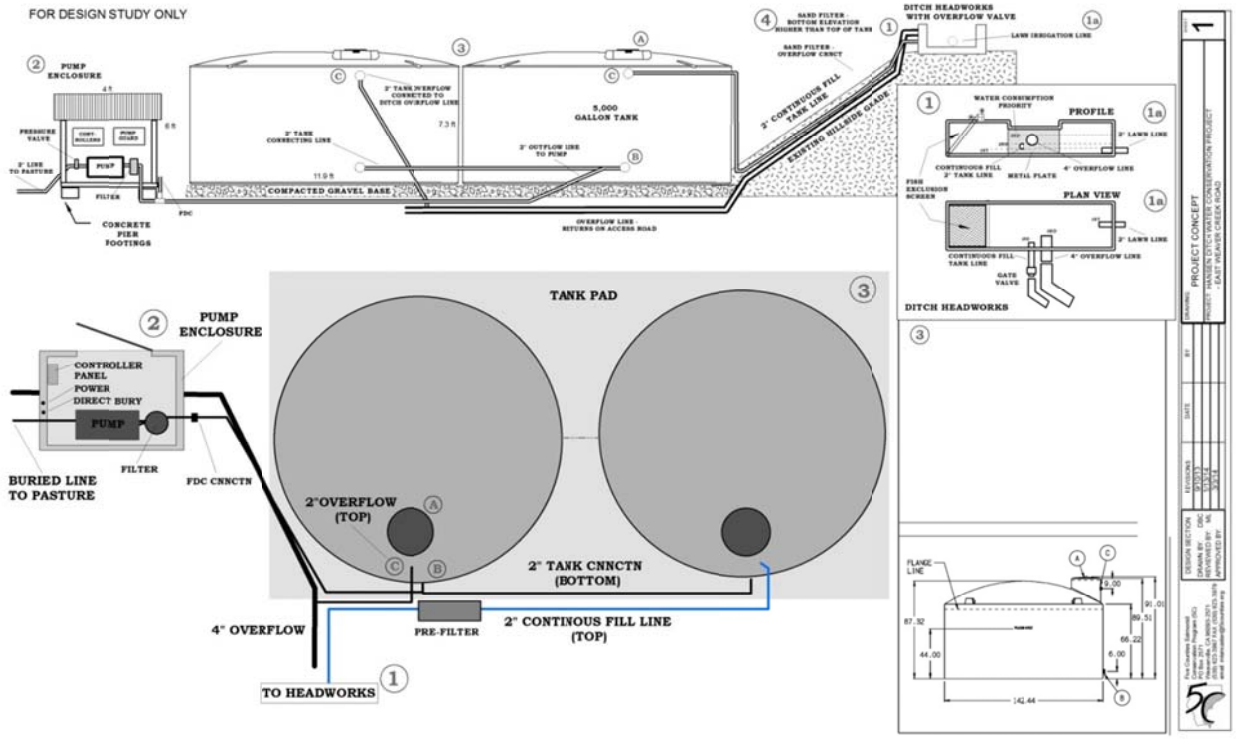



**Figure 20**- Headworks and tank design elements of the Hansen Ditch Project.

Figure 20 & 21- The 5,000 gallon water tanks were rolled up a narrow trail above the pasture (left) and the 4" return flow line was placed in the center of the trail (right).

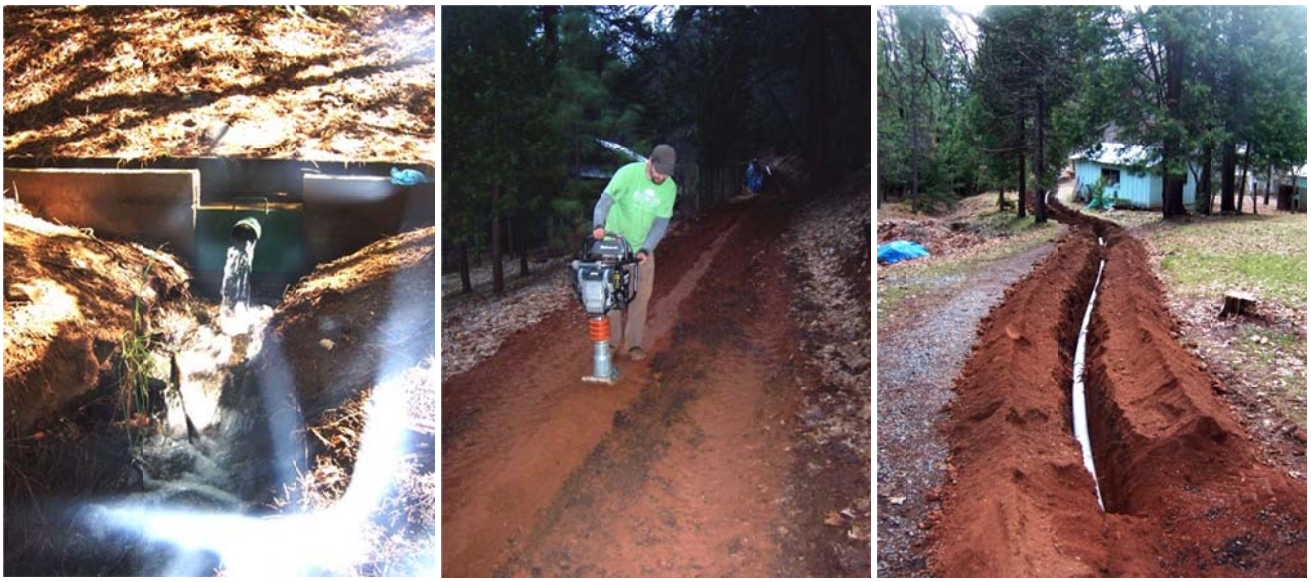


**Figure 22 – 24**- The Ditch flow in the summer of 2013 prior to project initiation (left), the return flow line trench was installed in the trail (middle) and main driveway (left). The trench was compacted and road rock replaced following installation of the water line.

**Table 2- Structural Elements of the Hansen Ditch Project**

| Structural Elements | Quantity | Units | Underground Component |
|---|---|---|---|
| Power Line Transformer & Fuse | 1 | Each | |
| Main Power Wire (#0 Gauge) | 900 | Linear Feet | Y |
| Main Breaker to Subpanel Conduit- 3" | 300 | Linear Feet | Y |
| Main Circuit Box and Breakers | 1/2 | Each | |
| Subpannel Circuit Box & Breakers | 1/2 | Each | |
| Wire (#8 Gauge) Main Breaker to Pump House | 300 | Linear Feet | Y |
| Main Panel to PumpHouse Conduit- 1" | 300 | Linear Feet | Y |
| 5 HP Gould Pump | 1 | Each | |
| 330V Gould Converter | 1 | Each | |
| 28 Gallon Pressure/Relief Tank | 1 | Each | |
| Spin Down Filter | 1 | Each | |
| Pump Timer Controller | 1 | Each | |
| Light Switches/Outlets | 1/2 | Each | |
| Zone Controller | 5 | Each | Y |
| Wire (#18 Gauge) Pump/Zone | 2,000 | Linear Feet | Y |
| Irrigation Main Line 2" Schedule 40 PVC | 800 | Linear Feet | Y |
| Irrigation Trunk Line 1 1/4" Schedule 40 PVC | 320 | Linear Feet | Y |
| Irrigation Trunk Line 1 1/2" Schedule 40 PVC | 280 | Linear Feet | Y |
| Return Flow 4" Schedule 40 PVC Pipe | 880 | Linear Feet | Y |
| 5,000 Gallon Water Storage Tanks | 2 | Each | |
| Pump House | 4' x 6' | Each | |
| Sprinklers | 17 | Each | |
| Rock. Sand, and Gravel | 72 | Tons | |

**Project Cost**- The overall project costs are shown in Tables 3 and 4 below:

**Table 3. Overall Project Cost**: Projects costs to date are shown in the following table:

| Line Items | Amended Budget Grant Allotment | Total Grant Expenditures | In-Kind Match* |
|---|---|---|---|
| Direct Project Administration | $10,044.00 | $10,044.00 | $1,840.00 |
| Land Purchase/Easement | $0.00 | $0.00 | |
| Planning/Design/Eng/Enviro | $159,500.00 | $159,500.00 | |
| Construction: Labor | $50,493.60 | $50,493.60 | $14,454.71 |
| Construction: Materials | $58,484.00 | $58,484.00 | $14,525.80 |
| Enviro Compliance: Labor | $648.40 | $648.40 | |
| Enviro Compliance: Materials | $0.00 | $0.00 | |
| Construction Administration | $0.00 | $0.00 | |
| Other Costs: Labor | $0.00 | $0.00 | |
| Other Costs: Material | $0.00 | $0.00 | |
| Construction Contingency | $1,518.00 | $1,518.00 | |
| **Totals** | **$280,688.00** | **$280,688.00** | **$30,820.51** |

*- Does not include NWCARC&DC, WSD and WSCD in-kind labor and materials after March 31, 2014

**Table 4- Budget By Project**

| Line Items | Grant Expenditures | In-Kind Match* | Total |
|---|---|---|---|
| Direct Project Administration | $10,044.00 | $1,840.00 | $11,884.00 |
| Reclaimed Water Treatment Plant Design | $154,192.18 | | $154,192.18 |
| Water Conservation Education Program | $19,536.03 | $464.50 | $20,000.53 |
| Roof Top Rainwater Project | $20,900.73 | $14,411.20 | $35,311.94 |
| Hansen Ditch Project | $55,043.05 | $4,582.36 | $59,625.41 |
| WCSD Timber Ridge Tank Replacement Project | $20,972.00 | $9,522.45 | $30,494.45 |
| **Totals** | $280,688.00 | $30,820.51 | $311,508.51 |

*In Kind Match Only through March 31, 2014

**Project Schedule:**

i. Released Request for Proposal and Bid Notices for Weaverville Sanitary District (**WSD**) Reclaimed Water Treatment Plant (**RWTP**) design 2009
ii. Awarded RWTP design to Water Works Engineering- 2009
iii. Water Works Engineering completed RWTP design- 2009
iv. WSD worked with Northwest CA RC&DC (**5CP**) to prepare and submit 5 construction grant proposals for RWTP between 2009-2012
v. Initiated RWTP CEQA- 2010
vi. Suspended RWTP CEQA (botanical, wildlife surveys, and fisheries completed)- July 2012
vii. Submitted request to amend WSD Scope of Work and Agreement with Humboldt County- July 2012 and Revised March, 2013

viii. 5CP testified to Trinity County Board of Supervisors on need for increased water conservation and alternative water supplies- October 3, 2012

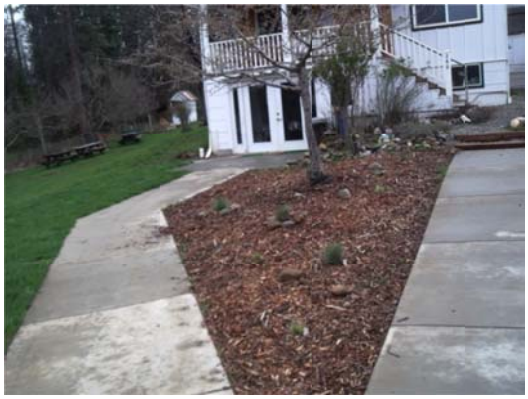
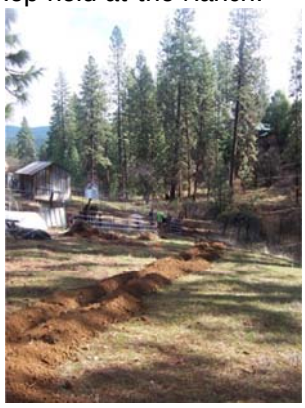



Figure 24 & 25: A 500 gallon water tank collects rooftop rainwater from the Young Family Ranch roof. Water collected in this tank is used on the lawn and drought landscaping (Above right) installed as part of the March 8th, 2014 water conservation workshop held at the Ranch.





5CP initiated Water Conservation Public Education Outreach Program- March 2013. Outreach efforts were on-going to end of grant

ix. Trinity Journal featured 5CP initiated article "*Workshop on Water Conservation to Be Held March 23rd* "- March 13, 2013
x. 5CP hosted Water Conservation Workshop, March 23rd, 2013- Weaverville, CA
xi. Trinity Journal featured 5CP initiated article "*Conservation Urged As Creeks Draw, Dry Year Puts Stress On Fish*" on June 26, 2013
xii. WSD approved Agreement For Services with 5CP to implement tasks in Amended Agreement - June 2013[11]
xiii. 5CP constructed Water Conservation Education Demonstration Trailer (**WCEDT**) and educational materials- June 2013
xiv. WCEDT featured in July 4th parade in Weaverville CA- July 4th, 2013
xv. 5CP Presents Water Conservation PowerPoint to Weaverville Rotary- July 30, 2013
xvi. 5CP demonstrated water conservation program and WCEDT at Trinity County Fair- August 19-21, 2013
xvii. 5CP completed 75% design for Hansen Ditch Project (**HDP**)- August 2013
xviii. 5CP completed 75% design for Rooftop Rainwater Systems (**RRS**) designs August 2013
xix. 5CP completed CEQA for RRS & Weaverville Community Services District (**WSCD**) Water Tank Replacement Project (**WTRP**)- August 2013
xx. 5CP and Trinity County RCD published water conservation article in RCD Conservation Almanac- September 1, 2013
xxi. WSCD completed Bid Specs For WTRP- September 2013
xxii. 5CP completed Informal Bid for RRS- September 2013

[11] Pending Humboldt & State Water Resources Control Board Amended Project approval

xxiii. 5CP demonstrates water conservation and WCEDT at 3 separate Weaverville Farmers Market events- September-October 2013
xxiv. 5CP completed CEQA for HDP- October 2013
xxv. 5CP orders RRS Tanks, Supplies, and Materials- October 2013
xxvi. 5CP completed 85% design for HDP- October 2014
xxvii. 5CP prepared informal bid outreach for construction of HDP pending authorization to proceed from Humboldt County- October 2013
xxviii. 5CP relocated steelhead from HDP- October 2013- (see related Trinity Journal article)
xxix. Trinity Journal published article on Hansen Ditch fish relocation entitled *"Fish Rescue"* on October 31, 2013
xxx. Draft Final Report Prepared- October, 31 2013
xxxi. 5CP participated in KMUD Radio*- Water Conservation and Fisheries Live radio call-in show- October 31st, 2013
xxxii. 5CP continued to move HDP to 85% design with Contractor to complete 100% design under design/build agreement November-January
xxxiii. 5CP finalized design, materials lists and coordination with rooftop rainwater systems November-January
xxxiv. 5CP met on HDP site with prospective contractors- November 1, 2013
xxxv. 5CP contacted tank distributors for rooftop rainwater tanks - November 5, 2013
xxxvi. 5CP contacted tank distributors for WSCD tank purchase- November 6, 2013
xxxvii. 5CP ordered rooftop rainwater tanks from Scott Tanks- November 12, 2013
xxxviii. 5CP took possession of rooftop rainwater tanks- December 2013
xxxix. WSD and 5CP received notice of approved Amendment from Humboldt County and State Water Resources Control Board- January 9, 2014
xl. 5CP with Young Family Ranch and Trinity Performing Arts Center staff placed rooftop rainwater tanks- January 9, 2014
xli. 5CP participated in KMUD Radio- Water Conservation and Fisheries Live radio call-in show- January 14th, 2014
xlii. 5CP met with partial owner interest of HDP and their attorney on agreement to proceed- January 23, 2014
xliii. 5CP awarded 100% design/build construction contract for HDP to Three Seasons Landscaping of Weaverville CA, January 27, 2014
xliv. 5CP staff presented update on drought conditions, water conservation strategy, and water tanks to the WCSD Board of Directors- January 29, 2014
xlv. 5CP staff presented update on water conservation project and their cost share for the rooftop rainwater system to the Young Family Foundation Board of Directors- January 30, 2013
xlvi. 5CP participated in Water Conservation Workshop- Briceland, CA- February 1, 2014
xlvii. KMUD simulcast broadcast of Water Conservation Workshop- February 1st, 2014
xlviii. Three Season's and 5CP staff began construction of HDP- February 2014
xlix. 5CP began installation of RRS Projects- February 2014
l. WCSD ordered water tanks for WTRP- February 2014
li. Water Conservation Workshop, WCEDT, & 5CP PowerPoint at Young Family Ranch, Weaverville, CA- March 8th, 2014
lii. 5CP presented Water Conservation and Drought Impacts PowerPoint to Trinity County Board of Supervisors, Weaverville CA- March 11, 2014
liii. The Trinity Journal ran a photo of the WCDET and caption about the Water Conservation Workshop held March 8th, 2014
liv. The Trinity Journal ran an article entitled "*County Preps For Water Woes*" regarding presentation on water conservation and impacts of drought and excess surface water diversions.
lv. 5CP presented Water Conservation and Drought Impacts PowerPoint to UCCE Small Forest Management Workshop, Weaverville Fire Dept., Weaverville CA March 22, 2014
lvi. 5CP presented Water Conservation and Drought Impacts PowerPoint to the Weaverville Rotary, Weaverville CA- March 25th, 2014
lvii. 5CP completes construction of RRS Projects- March 2014
lviii. Three Season's and 5CP completes construction of HDP- March 2014
lix. WCSD completes construction and installation of 1st of three water tanks- March 2014

lx. WCSD completes installation of two remaining water tanks- April 2014
lxi. Prepare Final Report

**Project Goals**: The objective submitted in the original proposal was:
*"to reduce the diversion of surface water from Weaver Creek and replace it with reclaimed water from the WSD wastewater treatment plant. The reclaimed water will reduce late summer mortality to fish as well as provide the water purchasers with reliable and less expensive water (compared to purchasing treated water).*

*The project is consistent with the Weaverville Community Plan (WCP) and CA Coho Recovery Plan as follows: "As the community grows, additional diversions may occur. The reduction of flows in the creeks in the summer increases the water temperature and can result in adverse impacts to aquatic wildlife, as well as reduces the stream's ability to absorb and dissipate sediment/pollutants (WCP)." The Recovery Plan has the following region-wide recommendation RW-II-B-01 "…Develop incentives for water right holders to dedicate instream flows for the protection of coho salmon (Water Code §1707)."*

*This project would increase summer water flow in Weaver Creek benefiting the State and federally listed coho salmon and other fisheries. Direct benefits to the creek would be higher summer flows, lower water temperatures, and better biological conditions. It would also reduce demand on the Weaverville Community Service Districts treated water supplies. It would provide economic benefits to the reclaimed water users by providing reliable water (compared to summer flow levels in the creeks) at a lower price compared to purchasing treated water. This project would also demonstrate the potential for use of reclaimed water and set up opportunities to develop additional uses."*

The AWCP contains three elements to:

- Modification of a historic agricultural ditch that currently diverts one cfs to irrigate a series of small pastures, yards and orchards. Implementation of the project will return approximately 40,000-100,000 gallons/day of diverted stream to East Weaver Creek. This return flow is located 6 miles upstream of the WSD plant but will have net benefits to this downstream reach. This element would greatly exceed the return flow objectives of the original plan.
- Demonstration rainwater catchment and water conservation workshops. These projects will result in the capture of more than 100,000 gallons of storm water during the year and approximately 33,000 gallons during the critical low flow period. The project will also increase awareness of water conservation opportunities, impacts of water diversion and fish friendly practices that can be implemented by landowners.
- Purchase of 3- 10,000 gallon potable water tanks to be installed by the Weaverville Community Services District to replace the leaking 24,000 gallon redwood water tank that serves the Timber Ridge neighborhood. The existing tank has weeps and leaks and is periodically damaged by acorn woodpeckers, necessitating patching. The tank is estimated to weep/leak 200 gallons/day. Under this project, the new plastic tanks will provide 20+ years of service, increase storage by 25% and increases flexibility in tank management. The project will save at least 73,000 gallons annually as well as increase available fire flows.

The revised proposal will exceed the objectives of the original proposal to save 420,000 gallons of treated, potable WCSD water by reducing the amount of WCSD water used for lawn and garden irrigation (water captured by roof top water collectors); reduce water loss from the WCSD redwood tank; reduce water consumption with the installation of water conservation devices and increase water conservation education. These efforts are estimated to save 5.1 million gallons of water during the critical low flow period. If all of the water savings is from East Weaver Creek, these projects would restore approximately 0.06-0.12 cfs of flows in the creek during the critical low flow period.

This project met the following goals of the original project or a slightly revised goal as noted in strikeout and underline:

1. Supporting and improving the local and regional water supply reliability by reducing the diversion of surface water from Weaver Creek for non-consumptive uses and replacing water used for non-consumptive uses with reclaimed water from ~~the WSD wastewater treatment plant~~. Households and other sources.
2. Reducing late summer mortality to fish while providing water purchasers with a reliable and less expensive water (compared to purchasing treated drinking water) source.
3. Increasing the summer water flow in Weaver Creek, ultimately benefiting the State and Federally listed coho salmon and other fisheries.
4. Contributing expeditiously and measurably to the long-term attainment and maintenance of water quality standards by inducing higher summer flows, lower water temperatures, and better biological conditions in Weaver Creek.
5. Reducing the growing demand on the Weaverville Community Services District's treated water supplies.
6. ~~Providing economic benefits to the reclaimed water users by providing reliable water (compared to summer flow levels in the creeks) at a lower price compared to purchasing treated water.~~
7. Demonstrating the potential for use of reclaimed water and setting up opportunities to develop additional uses by developing this project for water supply reliability, water conservation, and water use efficiency.
8. Implement the North Coast Regional Water Quality Control Board's Basin Plan specifically in relation to beneficial uses for municipal water, cold water fisheries and sediment.
9. Facilitate the North Coast Regional Water Quality Control Board's Watershed Management Initiative, and the Non-Point Source Program Plan.
10. Implement watershed indicators identified in Table 3.3: "Sediment Indicators and Targets" of the Trinity River Sediment TMDL (EPA, 2001). The work will minimize sediment accumulation in Weaver Creek by providing increased instream flows that would otherwise be diverted for non-potable uses.
11. Implement CA Coho Recovery Strategy C RW-SF-03: "Plan water supply development and growth that are not harmful to coho"
12. Implement CA Coho Recovery Strategy C RW-SF-04: "Increase agency coordination in planning water supply development and growth that are not harmful to coho salmon habitat"
13. Implement CA Coho Recovery Strategy C RW-SF-05: "Fund planning and education to accomplish water supply development and growth that is not harmful to coho salmon habitat"
14. Implement CA Coho Recovery Strategy E RW-WT-01: "Identify actions to maintain and restore water temperatures to meet habitat requirements for coho salmon in specific streams"
15. Implement CA Coho Recovery Strategy D RW-WT-02: "Implement actions to maintain and restore water temperatures to meet habitat requirements for coho salmon in specific streams."

**How project will address the problem discussed in Background**

b. Project Methodology/CEQA/Permitting/Construction/Description/Pollutant Load
c. Data – Existing and New (graphs & tables); BMPs implemented; monitoring locations (map)
d. Data Evaluation/Pollutant Load Reduction

4. **Public Outreach**

The 5CP staff worked with the Trinity Journal newspaper, Weaverville Elementary School, Trinity High School, Trinity County RCD, WCSD, Bushman Rainwater, Scott Tanks, Salmonid Restoration Federation, Weaverville Rotary, and Trinity County Board of Supervisors to increase public awareness of water conservation needs in the Weaver Creek watershed. The effort included three components to reach residents: public workshops, print, radio, & web media coverage, and public demonstrations.

**Water Conservation Media Outreach:** The effort began during the extremely dry spring of 2013 when an article entitled "*Workshop on Water Conservation To Be Held March 23rd*" was run in the Trinity Journal newspaper on March 13th and featured a large picture spread of a local rooftop rainwater project. A second article was run on June 26th titled "*Conservation Urged As Creeks Draw, Dry Year Puts Stress On Fish*". In August, 2013 the Trinity County Resource Conservation Districts Conservation Almanac's lead story was *Ten Water Conservation Best Practices* and included a picture of the Water Conservation Demonstration Trailer (discussed below). This newsletter is distributed to over 2,500 households in Trinity County and is published on the RCD website. It was also

linked to the 5 Counties Salmonid Conservation Program website. On October 30th "*Fish Rescue*" was published in the Trinity Journal regarding fish relocation as part of the Hansen Ditch Water Conservation Project. On March 12th the Trinity Journal ran a photo of the WCEDT which resulted in a request to display the trailer at community events in Willow Creek, CA in May, 2014. On March 19th the Trinity Journal ran a story *"County Preps For Water Woes"* regarding the 5CP presentation of water conservation and planning. On March 25th the Weaverville Rotary Newsletter, *the Mountaineer,* ran an article on the Water Conservation Program presented to them.

In addition to print media outreach, three live radio call-in shows on KMUD Radio were held to discuss water conservation, drought impacts of water diversion on fisheries, water quality and effects of illegal diversions (10/31/2013, 1/1/4/2014 & 2/1/2014). KMUD is broadcast throughout Humboldt and northern Mendocino Counties and is available as downloadable media.

**Public Workshops -** On March 23rd 2013 and on March 8th, 2014 water conservation workshops were held in Weaverville with approximately 108 people in attendance between the two workshops. The first workshop date coincided with several other workshops in the community and turnout was lower than expected. A third workshop was held in Briceland CA with approximately 100 in attendance on February 1, 2014. That workshop was broadcast live on KMUD Radio.

In addition to community workshops the water conservation efforts were highlighted in power point presentations to the Weaverville Rotary (July, 2013 & March 2014), Weaverville Community Services District Board of Directors (January 29th, 2014), Briceland Water Conservation Workshop (February 1, 2014), and in a presentation to the Trinity County Board of Supervisors (March 11th, 2014).

**Water Conservation Demonstration Trailer-** The Water Conservation Demonstration Trailer was completed in July, 2013. The trailer provided interpretive posters and demonstrations on rooftop rainwater catchment systems, low flow showerheads, water efficient plumbing devices, and alternative landscape designs. Pamphlets and brochures with specific rainfall data, rooftop calculations, native plants species, and household water use were also distributed. Due to the trailers design and mobility, the trailer was towed to several public events including:

a) A simple rooftop rainwater collection system (rooftop rainwater diverter and 200 gallon Bushman Rainwater Harvest tank) was installed at the Young Family Ranch Education Center in June 2013. In November 2013, BBW Forest Consulting donated a 500 gallon tank for use at the Center in lieu of the 200 gallon tank. The Center hosts workshops and children's camps throughout the summer. A complete rainwater harvest system will be installed in November 2013 as part of this grant and will include a permanent interpretive poster display;
b) Weaverville 4th of July Parade- It is estimated that approximately 6,000 persons saw the trailer during the annual holiday parade;
c) Trinity County Fair (August 10th and 11th, 2013)- It is estimated that 2,500 people saw the trailer and approximately 150 persons contacted and discussed aspects of water conservation with 5CP personnel during the period that the trailer was staffed;
d) Weaverville Farmer's Market (August and September, 2013)- The trailer was displayed during 3 of the Wednesday Farmers Markets which were attended by approximately 300 people per day. Approximately 40 people discussed aspects of the project with staff,
e) Weaverville Salmon Festival (October 12, 2013)- Approximately 1,000 persons saw the trailer and approximately 50 discussed aspects with staff.
f) Weaverville Water Conservation Workshop (March 8, 2014)- Approximately 100 people participated in a day long water conservation workshop at the Young Family Ranch Education Center sponsored by more than 10 agencies, community groups and special districts.

# Project Evaluation and Effectiveness

### Project Objectives:

1. *Supporting and improving the local and regional water supply reliability by reducing the diversion of surface water from Weaver Creek for non-consumptive uses and replacing water used for non-consumptive uses with reclaimed water from ~~the WSD wastewater treatment plant~~. Households and other sources-* The project will have met this goal in the following ways:
    - The rooftop rainwater demonstration systems will capture of more than 92,000 gallons of storm water during the year and approximately 42,000 gallons will be available during the critical low flow period May and September. The projects have already generated interest in the installation of rooftop rainwater systems. During public workshops 4 landowners indicated to 5CP staff they intend to investigate installation of systems on their homes.
    - The WCSD Timber Ridge Water Tank replacement project will save a minimum of 1,400 gallons of water per day (rate of leak measured on 3/25/2014) or 511,000 gallons per year as well as improve water supply reliability and fire flows.
    - The Hansen Ditch Project will return between 40,000-80,000 gallons of water per day (4.8-96 million gallons during the critical low flow period of May-September) to East Weaver Creek via Deadwood Gulch. In addition, the irrigation return water system will direct hillslope runoff that is captured by the ditch back into the stream system.
    - There is no way to estimate the effect of the water conservation education efforts on reduced water flow.

    The combined water savings during the critical flow months of May-September are estimated to range from 5.35 to 10.13 million gallons. This represents 0.065 to 0.13 cfs of additional stream flow in the stream in the summer period.

2. *Reducing late summer mortality to fish while providing water purchasers with a reliable and less expensive water (compared to purchasing treated drinking water) source.* All of the projects contributed to reducing treated water demand in the summer. The conservation projects (rooftop rainwater collection, Hansen Ditch irrigation system, and the WCSD water tank replacement) are estimated to save, or return to the streams, 5 to 10 million gallons of water during the critical summer low flow periods of May-September of each year. This does not include any voluntary water conservation efforts initiated by landowners as a result of education and outreach efforts, however follow up contact with residents indicates interest in several of the programs presented.

    Implementing construction of the Hansen Ditch Project resulted in immediate benefits including reduction of fish mortality. On October 31st, 2013 as a result of this project, 316 steelhead trout were relocated from the ditch before it was de-watered. In addition, the Hansen Ditch Project will return winter hillslope interception to Deadwood Gulch and East Weaver Creek. During one moderate rainstorm observed in March 2014 the ditch flow was estimated to be 0.25 cfs. In the past this flow saturated the field in winter, increased the risk of slope instability and altered hydrologic patterns. The project will now transport the flows from the headworks to Deadwood, rather than excessively flood the field.

3. *Increasing the summer water flow in Weaver Creek, ultimately benefiting the State and Federally listed coho salmon and other fisheries.* See objective #2 discussions above.
4. *Contributing expeditiously and measurably to the long-term attainment and maintenance of water quality standards by inducing higher summer flows, lower water temperatures, and better biological conditions in Weaver Creek.* While no biological or water quality measurements were taken during the period, research has shown a direct relationship between flow levels and water temperature and biological conditions. In East Weaver Creek the addition of 40,000-80,000 gallons per day (0.06-0.13 cfs) to the stream can be significant compared to the pre-project conditions. The reduced mortality to fish in the Hansen Ditch Project has been documented during this project.

5. *Reducing the growing demand on the Weaverville Community Services District's treated water supplies.* There is no direct way to measure changes in water demand to the WCSD, however, the WCSD completed a retrofit of their infiltration galleries in the Trinity River which will improve their ability to tap the river water and reduce reliance on tributary flows in the critical summer period. The WCSD is working on a water management strategy to assure greater reliance on river flows in the summer.
6. ~~Providing economic benefits to the reclaimed water users by providing reliable water (compared to summer flow levels in the creeks) at a lower price compared to purchasing treated water.~~
7. *Demonstrating the potential for use of reclaimed water and setting up opportunities to develop additional uses by developing this project for water supply reliability, water conservation, and water use efficiency.* A water conservation demonstration trailer was constructed that traveled to several local venues to demonstrate conservation devices and education efforts. The trailer will remain available for future outreach and training venues.
8. *Implement the North Coast Regional Water Quality Control Board's Basin Plan specifically in relation to beneficial uses for municipal water, cold water fisheries and sediment.* The project cumulatively works towards these beneficial uses.
9. *Facilitate the North Coast Regional Water Quality Control Board's Watershed Management Initiative, and the Non-Point Source Program Plan.* All implementation projects that involve ground disturbance (Hansen Ditch project) utilize the 5C Program Roads and Water Quality Manual BMP's.
10. *Implement watershed indicators identified in Table 3.3: "Sediment Indicators and Targets" of the Trinity River Sediment TMDL (EPA, 2001). The work will minimize sediment accumulation in Weaver Creek by providing increased instream flows that would otherwise be diverted for non-potable uses.* Refer to discussion under #9 above.
11. *Implement CA Coho Recovery Strategy C RW-SF-03: "Plan water supply development and growth that are not harmful to coho"* The project ranging from a completed design for a reclaimed water treatment facility to the water conservation projects implement this goal.
12. *Implement CA Coho Recovery Strategy C RW-SF-04: "Increase agency coordination in planning water supply development and growth that are not harmful to coho salmon habitat"* The project has resulted in direct working relationships between the water agencies in the Weaver Creek watershed and the 5C Program. This in turn has facilitated several projects to improve coho habitat, including a feasibility study to remove the WCSD dam on East Weaver Creek.
13. *Implement CA Coho Recovery Strategy C RW-SF-05: "Fund planning and education to accomplish water supply development and growth that is not harmful to coho salmon habitat"* The project education, media and water conservation trailer are consistent with this strategy.
14. *Implement CA Coho Recovery Strategy E RW-WT-01: "Identify actions to maintain and restore water temperatures to meet habitat requirements for coho salmon in specific streams"* Refer to discussion under #2 above.
15. *Implement CA Coho Recovery Strategy D RW-WT-02: "Implement actions to maintain and restore water temperatures to meet habitat requirements for coho salmon in specific streams."* Refer to discussion under #2 above.

## 5. Project Evaluation & Assessment Plan

### Education, Outreach, and Capacity Building

| Project Goals | Desired Outcomes | Output Indicators | Outcome Indicators | Measurement Tools and Methods | Targets |
|---|---|---|---|---|---|
| Provide water conservation education, tools, techniques, and services to residents and locations within the community. | Reduce surface water extraction of Weaver Creek during critical low-flow summer months. | Deliver water conserving tools and techniques to community members. | Provide accessible, informative, interactive, and educational devices and displays to increase public understanding of the need for water conservation. | Record the number of people who visit the conservation booth, number of flyers taken, and provide pre- and -post surveys given to participants of workshops. | Occupy a water conservation booth for regional events, including the Trinity County Fair, Weaverville Farmer's Market, 2013 Salmon Festival and the North Coast Resource Partnership Conference (Fortuna CA). Also attend school programs at Weaverville Elementary and Trinity High School as well as other opportunities that arise. Deliver up to 250 low flow, water conserving devices (showerheads, garden timers, or toilets) to water 1000 consumers. |

***Target Outcome For Goal 1-*** *As part of the water conservation education effort a water conservation education demonstration trailer (WCEDT) that included a roof top rainwater system was built and a PowerPoint program on the impacts of climate and surface water diversion was developed. The WCEDT and/or Power Point program were presented at 11 workshops and/or community events between March 2013 and March 2014. Among the events attended were the Trinity County Fair, Weaverville Farmer's Market, and the 2013 Salmon Festival. While the 5CP did not present the water trailer at the North Coast Resource Partnership Conference in October 2013, 5CP staff presented a Power Point program that included discussion of the Water Conservation efforts. In addition to the events described above the WCEDT booth and Power Point presentations were made at 6 additional public events including three water conservation workshops.*

*The 5CP staff participated in 3 KMUD radio station (Garberville, CA) call-in/live broadcast programs on water conservation and attended, testified, and/or presented conservation information at 6 public meetings (Trinity County Board of Supervisors-2, Weaverville Community Services District-2, Weaverville Sanitary District Board of Directors-1, and Young Family Ranch Board of Directors-1) in 2013-2014. There were 5 newspaper articles, and 2 newsletter articles about the water conservation efforts in the same period. Several additional requests have been made for the 5CP to present the Water Conservation PowerPoint program and in the near future, including the Weaverville Lion's Club monthly speakers meeting and the Willow Creek Fire Safe Fair.*

*The vast majority of the education effort occurred later than planned due to delays in approval of the amendment to the Agreement. While education efforts began as early as June 2013 in order to meet the targets of this grant, much of it was done between January and March 2014. Metrics regarding reduced summer use could not be measured during the effective period of the grant.*

*The extensive drought education efforts state-wide since February 2014 will compliment and affect the ability to measure the effectiveness of the water conservation efforts of this grant. In addition, the WCSD has developed a summer water conservation outreach effort that most likely will also influence summer water consumption. Parts of that conservation education effort will utilize the materials and demonstrations prepared under this Agreement.*

## Water Conservation, Reliability Enhancement, and Recycling

| Project Goals | Desired Outcomes | Output Indicators | Outcome Indicators | Measurement Tools and Methods | Targets |
|---|---|---|---|---|---|
| **Goal 1- Installing rooftop catchment systems on buildings used by the public.** | Reduce surface water extraction of Weaver Creek during critical low-flow summer months. Mitigate impacts of storm water run-off. | Cost of treated water for irrigation verses catchment water. | Facilitate water conservation on a large scale and increase community members' awareness of, interest in, and practice of water management tools and techniques. | Monitor water catchment and consumer use at each demonstration sight. | Install 4-Rooftop catchment systems on buildings used by the public. Save 160,000 gallons of water from June-September. |
| ***Target Outcome For Goal 1-*** *Four rooftop rainwater catchment systems, consisting or 10 rainwater tanks, were installed in February 2014. The estimated water capture/saving associated with the four projects during an "average" summer are approximately 42,000 gallons. Based on review of water demand for each system location, is was determined that current landscape and garden needs could be met with this level of water storage. Expansion of the storage capacity at three of the four locations (Trinity High School, Weaverville Elementary School and Trinity Alps Performing Arts Ceneter) can be done by connecting existing gutter components to the tanks. This was not done under this grant because current landscape needs did not warrant the cost to retrofit large commercial gutter systems to meet current demand**. *The target volume included anticipated water savings by WCSD customers and other water diverters in the Weaver Creek watershed as a result of water conservation education efforts discussed under Education, Outreach, and Capacity Building Goal #1 above.* | | | | | |
| **Goal 2- Replace storage tank serving Timber Ridge residents and operated by the Weaverville Community Services District (WCSD).** | Eliminate the estimated 200 gallons per day of water leakage; increasing water to Weaver Creek during critical low-flow summer months. | Greater flows for Weaver Creek. | Reduce water losses to the WSCD, improve water security and reliability, and increase abilities to combat fire in residential neighborhood due to increased storage. | Leaks will be eliminated and storage capacity will be increased. Measure the leakage rate before and after the tank installation | Install 2-12,500 ACE potable water plastic tanks. Reduce the leakage by approximately 16,800 gallons during the critical summer period and more than 65,000 gallons per year at current leak rates. Leak rates will continue to increase each year that the redwood tanks remain in service. |
| ***Target Outcome For Goal 2-*** *During the bid process to purchase tanks the WCSD was able to locate a distributor that could provide 3-10,000 gallon ACE potable water tanks for less cost than two 12,500 gallon tanks. A change in the project was approved to allow the purchase of these tanks. The new tank system increases capacity by 25% (from 24,000 to 30,000 gallons), reduces maintenance and improves flexibility in managing the facilities. The three tank system allows the WCSD to take one tank off line for maintenance while maintaining reliable flows to customers from the other two tanks. Substantial changes were required to the systems plumbing including adding additional valves, unions, and other hardware to tie three tanks in where there was only one before.*<br><br>*In the process of excavation for pipe and valve placement an accurate measurement of the daily leak from the tank was done. The leak, originally estimated at 200 gallons per day, was measured at 1,400 gallons per day. The original goal was to save 65,000 gallons per year. Replacing the tank actually will save approximately 511,000 gallons per year.*<br><br>*In addition to the constant leak the tank replacement eliminates the patches required from woodpecker damage to the wooden structure. Examination of the wood tank once drained found that wood at the base of the tank was significantly rotted and a screwdriver could be pushed through the wood with minimal force. This would indicate that the tank was at the end of its effective life.*<br><br>*Delays in state approval of the grant amendment resulted in construction delays with all work occurring in March 2014 when weather conditions were sub-optimal.* | | | | | |

| Water Conservation, Reliability Enhancement, and Recycling | | | | | |
|---|---|---|---|---|---|
| **Goal 3- Return percentage of water diverted from Hansen Ditch to Weaver Creek water system.** | Provide greater flows and lower temperatures in Weaver Creek during summer months. | Greater flow for Weaver Creek. | Greater flow and potential lower temperatures provide increased positive benefit for coho salmon and other fisheries. | Monitor summer time Weaver Creek flows and temperatures. Measure the quantity of water flow being returned to Weaver Creek from Hansen Ditch. | Prevent fish from entering Hansen Ditch by installing a fish screen. Bury pipe in ditch to return excess flows to East Branch and establish irrigation system for the pasture. Return between 50,000 and 120,000gallons of water per day from the ditch return pipe. |

***Target Outcome For Goal 3-*** *An investigation by CA Department of Fish and Wildlife biologist Kevin Gale and Engineer Margie Caisley determined that the fall and flow from East Branch East Weaver Creek was not sufficient to install a self-cleaning fish screen at the ditch inlet. The 5CP installed a fish screen at the headworks of the ditch to prevent fish from being washed into the pasture. On October 31st, 2013 the 5CP in cooperation with CDFW, US Forest Service and volunteers netted and relocated 316 young of the year steelhead from the ditch and relocated them in East Branch Creek.*

*The ditch irrigation system was installed in February and March 2014. The system utilizes a 5 hp Gould pump with 16- 60' radius sprinklers on four zones to water the 3.3 acre pasture that was previously flood irrigated. The sprinkler system will use between 15,000-30,000 gallons per day for irrigation. The system has a 4" passive return flow pipe system that will return all excess flows to Deadwood Gulch, an ephemeral stream draining to East Weaver Creek. It is anticipated that return flows of 40,000-100,000 gallons per day will be realized.*

*In addition to the improved summer water use and return flows to the creek, the passive return flow system directs intercepted hillslope runoff captured in the ditch back to Deadwood Gulch and East Weaver Creek. Prior to installation of the irrigation system this water flooded the pasture even in winter, degrading its capacity and damaging soils due to compaction.*

*Significant delays in approving the amendment to the Agreement to do this work resulted in construction activities occurring in February-March 2014 including working in inclement weather. This resulted in having to shift from heavy equipment to manual labor to do some pasture trenching, filling and other tasks. The delays significantly increased the cost and time to do work, increased the level of ground disturbance and created several delays. One of the landowners become very upset at the process and further delayed implementation. The project components were installed but appropriate system checks will be delayed until after closure of the grant.*

# 6. **Conclusions**

The Weaver Creek watershed is substantially better prepared for drought and reduced surface flows as a result of this project, although much more remains to done. The implementation projects completed will save 5-11 millions of water in the summer and when the reclaimed water plant is constructed this number will increase 5 fold.

Prior to initiation of this project there had been limited water conservation education efforts directed to the general community. While some work was done on ranches and in schools and at the Yound Family ranch children's programs there had been no organized community wide efforts to address conservation for the urban area. This project required the coordination and cooperation of five separate boards (water, sewer, school, Young Family Foundation, and Trinity Performing Arts Foundation, three private landowners, four agencies, two non-profits, two schools and contractors and suppliers). All construction work was completed in less than 60 days beginning in mid-January 2014 including working in wet weather conditions. While work was done in winter every measure was taken to protect soils and water quality.

As part of this project a design was completed to provide up to 500,000 gallons of reclaimed water per day from the Weaverville Sanitary Districts outfall. If and when a treatment plant is completed, the Weaverville Community Services District will be able to reduce its potable water deliveries to several irrigation and industrial users.

The water conservation education efforts have generated interest locally for individuals to install rooftop rainwater systems and local hardware stores have begun caring rooftop rainwater hardware for the first time. The four rooftop rainwater demonstration sites will be emphasized over the next several years to encourage greater implementation of these systems. The replacement of a failing redwood water tank on Timber Ridge has improved reliability to residents in the area as well as eliminating leaks that averaged 6% of the tanks capacity per day.

The largest water saving project, the Hansen Ditch will result in significant return flows in the summer to East Weaver Creek totaling between 5-11 million gallons during the critical low flow periods of May-September.

In addition, the WCSD may be reaching the upper limits of the amount of water it can provide reliably in summers and all of these efforts improve its ability to meet growth while protecting public resources, especially native cold water fisheries.