

Weaver Creek Private Roads Sediment Assessment

Final Report



A stream overtops the culvert but does not divert out of the crossing.

Prepared by

Five Counties Salmonid Conservation Program

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A TRRP Watershed Sediment Source Control Project through the Bureau of Reclamation's Trinity River Restoration Program via the Trinity County Resource Conservation District (BOR #R12AP20020 Modification 03)

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Introduction

Project purpose:

The purpose of this project was to inventory private roads within the Weaver Creek watershed for existing or future sediment sources. The subwatersheds include East Weaver Creek, West Weaver Creek, Sidney Gulch, Little Browns Creek and Democrat Gulch. The goal was to locate and assess problematic sediment sources to Weaver Creek from private roads. Participating landowners benefitted from having experts identify sediment sources on their roads and prescribe treatment recommendations (such as upgraded stream crossings, installation of rolling dips, and modifying the shape of the road) at no cost. An initial prioritization of inventory sites based on watershed factors was also completed. The products of this project will be used to develop future projects to implement high priority treatments for sites with willing landowners. More detailed information on each aspect of the project activities is included in the progress reports submitted quarterly throughout the project period.

Background Information

Fisheries and Roads

Roads have been shown to be major contributors of sediment to streams. Weaver Creek and its tributaries contain spawning and rearing environments for salmonids and other aquatic species within the Trinity River watershed. Excessive sediment loads to Weaver Creek and the Trinity River can negatively impact salmon and steelhead populations by reducing the survival rate of eggs and young fish before they have a chance to out-migrate to the ocean. The road sourced sediment can fill the interstitial spaces between gravels, resulting in suffocation of salmonid eggs. In California, Coho and Chinook salmon are listed species and on the verge of extinction. In the Weaver Creek and larger Trinity River watershed, Coho are listed as a Threatened species both by the CA Department of Fish & Wildlife and by National Ocean and Atmospheric Administration (NOAA). Decreasing the road sourced sediment will reduce the negative anthropogenic impacts on young salmonids. Road improvements can reduce sediment loads significantly.

Physical Setting:

The Weaver Creek watershed encompasses 31,782 acres and is the most populated watershed in Trinity County. The high elevation mountains that form the northern headwall basins above the community of Weaverville supply residents with year-round water that constitutes a significant portion of the drinking water supply. 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 majority of the watershed (59%) has southeast to west facing slopes. Approximately 20% of the Weaver Creek watershed area is located above 4,000' and 6% is below 2,000'. The remaining 74% of the watershed is within the 2,000-4,000 foot elevation band that has the highest potential for heavy snow accumulations followed by warm rains.

The Weaver Creek watershed is flat relative to other portions of the Trinity River watershed; yet 62% of the area has slopes greater than 30%. The streams of the watershed were rich in gold and most were heavily mined and damaged in the quest to extract gold. Some of the flat slopes present in the watershed today were created as a result of intensive hydraulic mining between the 1850's-1930's which washed away small hills leaving large mounds of rock and gravel. Most of these gravel tailings were leveled and much of Weaverville is built on the tailings.

Aspect, elevation, and slope contribute to the ability of soils to hold and store water. Slope steepness influences stream flow due to the depth and extent of soils. Soils can hold and slowly release water into streams. Steep, folded mountain sides with moderate to deep soils have far greater quantities of soil to store water. Very steep slopes, however, may have shallow soils. Southeast to west facing slope aspects typically have higher rates of evapo-transportation and less soil water holding capacity compared to northeast to east slopes. Water in the form of snow melt also absorbs into the soil and recharges soil moisture levels more thoroughly than rain, which runs off more quickly. When "rain on snow" events occur, significant flooding can occur.

Land Ownership and Roads

The Weaver Creek watershed consists of Federal lands (55%: 45% USFS, 10% BLM), Private (41%: zoned 20% PVT, 20% TPZ, 1% NPO), and State 4% (1% CA, 3% TC).

306 Miles of roadways are currently mapped in the Weaver Creek watershed. Ownership of these roads consist of Federal (USFS and BLM), State, and Private.

Sierra Pacific Industries (SPI), the largest private landowner did not wish to participate in a cooperative inventory. This is consistent with its reluctance to participate in and share data for large scale, coordinated conservation efforts. It has sometimes cooperated on small scale, site specific efforts. 42 Miles of road on SPI lands have been previously mapped, some of which could be skid trails.

Additional private road miles have been recently constructed but not yet mapped in official road GIS layers. The expansion of unmapped roads is evident in the recent boom of alternative agriculture within the County, which has led to rapid infrastructure development. Some additional road segments were identified.

Methods

Inventory protocol

A modified DIRT inventory protocol was used (similar to one that was used in past Trinity River Restoration Program (TRRP) Watershed funded private sediment inventories). Like the DIRT inventory, this approach collects on-the-ground measurements of each source feature (e.g., stream crossings, cutbanks, road surfaces, landslides) and develops quantified estimates and likelihood of potential sediment delivery to streams. Crews are trained to also prescribe treatments for the sediment sources at each site. A 3 day training was between April 25th and the 27th. PWA conducted the training for the main crew members (5C Resources Technician and an inventory crew partner from the Watershed Research & Training Center) as well as alternate crew members. The training consisted of classroom sessions to introduce the concepts of the inventory methodology as well as field visits to numerous road sites to discuss how treatment methodologies are applied. This methodology is unique in that it provides very specific and quantified treatments, total potential volumes, and erosion potentials that are tailored to each site and can be readily translated to an actual implementation proposal.

GIS Analysis

To identify private roads and property owners in the Weaver Creek watershed project area, we utilized Trinity County's GIS data. The private roads data was intersected with the parcel data to obtain the list of property owners to contact within the Weaver Creek watershed.

The road data included general ownership (i.e. USFS, CA State, Trinity County, Private). The parcel data included parcel boundaries, Assessor Parcel Numbers, ownership name and mailing address, which are all publically accessible via the County Assessor's office. The

stream dataset was obtained from the TCRCDD and originally compiled from the Fire Resource Assessment Program (FRAP) dataset.

Private Property Owner Permissions

To access the private roads and perform the inventory, 5C staff needed to obtain permission from the property owners whose property the road crossed. In January 2016, an informational letter and response form was mailed to the property owners to mailing addresses on file. February through May, 5C staff member consistently called property owners who did not return the response form. This was challenging and was the most time consuming aspect of the project for various reasons: 1) most landowners did not respond to the initial mailing; 2) many landowners no longer maintain landlines and instead rely on cell phones, which are not readily available; 3) some of the landlines that do remain are unlisted; and 4) some landowners live out of the area and rent out their properties to tenants that are not listed in the Assessor's records. Flyers at popular stores within Weaverville were posted to notify local landowners about this inventory opportunity. Outreach at multiple public events within Weaverville was also done to try to reach landowners with inaccessible contact information. In some cases, personal knowledge of 5C staff of the neighborhoods and individual landowners proved valuable in obtaining permissions.

This effort identified some publically accessible roads based on a drive-by initial reconnaissance in order to better prioritize what should be targeted, or not, for extra outreach efforts. For some roads where landowners were not responsive but where there were readily observable sediment sources delivering into nearby streams, posters were placed near the target road segments from publically accessible road right-of-way intersections. Additional phone calls were made throughout the project period – particularly in areas where some permissions were received in order to maximize field survey efforts. The results of the outreach are discussed below.

Field Survey

Prior to surveying roads in which permission to survey was granted, 5C staff would call the property owners to inform them in advance of our survey. This was a courtesy to the property owners and also provided the property owner an opportunity to be present during the survey and discuss past issues, current concerns, and future remedies.

Measurements and site identification methods are detailed in the DIRT Methodology Description v2.1 that accompanies the database in Attachment A.

If the road sourced sediment has potential to connect and deliver to a water course, the delivery point was marked as a site and surveyed. All sources of sediment delivering to each site were characterized and captured based on the point of delivery. Sometimes this meant that specific sediment sources coming from areas where there were no permissions were not fully inventoried but were noted in the recorded site/point of delivery. All stream crossing culverts were assessed (perennial, intermittent, or ephemeral) for condition. Ditch relief culverts were identified and assessed if plugged or other failure present or if on-the-ground conditions indicated a potential for failure. For road sourced erosion observed to be significant but with no connectivity to surface water, technicians did not perform the field measurements and full assessment but did make note of the location and situation.

As part of the field survey, seasoned DIRT Resources Specialist Carolyn Rourke accompanied the inventory crew during initial field visits to ensure that the methodology was being applied correctly and to help provide additional guidance to crew members. Additional training by consulting geologists and other specialists were also provided after the initial training and included discussions of treatments and implementation techniques. On the ground site visits to past treated sediment source sites were conducted with crew members to help highlight on-the-ground implementation techniques.

Data

Field measurements were recorded in a Rite-in-the-Rain field notebook. Photographs and GIS location points were obtained using an iPad and the AVENZA PDF Maps Application. Field data was entered from the field notebooks directly into the DIRT database (Microsoft Access) and is included as Attachment A. A GIS shapefile was produced with basic site information captured from the database and is included as Attachment B. Photos of various site types as well as more complex sites were taken. Digital photographs from the field were labeled. A representative group of photos is included as Attachment C. All digital data is stored on the 5C server.

Public Outreach

Two roads related workshops were presented in the Weaverville Fire Hall. The first was June 6th 2016, the second was August 24th 2017. The Summer 2016 workshop was attended by ~30 people and included presentations by Pacific Watershed Associates and 5Counties. The Fall 2017 workshop was attended by 24 people and included a presentation by CA Geological Survey with the participation of Cross Country, construction firm seasoned in implementing sediment reduction treatments. Recognition of common road sediment sources, techniques on

proper road maintenance, and solutions to common road sediment sources were discussed. Informational handouts and online resources were made available to workshop participants.

Two articles were published in the local newspaper, the Trinity Journal. The first in spring 2016, the second was early summer 2017. Both included sample pictures of before and after treated road segments from other watersheds.

Fliers were displayed at multiple businesses and community boards throughout the community of Weaverville in spring and summer of 2016. 5C staff also was present at a few community events: Community fire protection plan meeting (2016 Douglas City) and Plant and Seed exchange (2016).

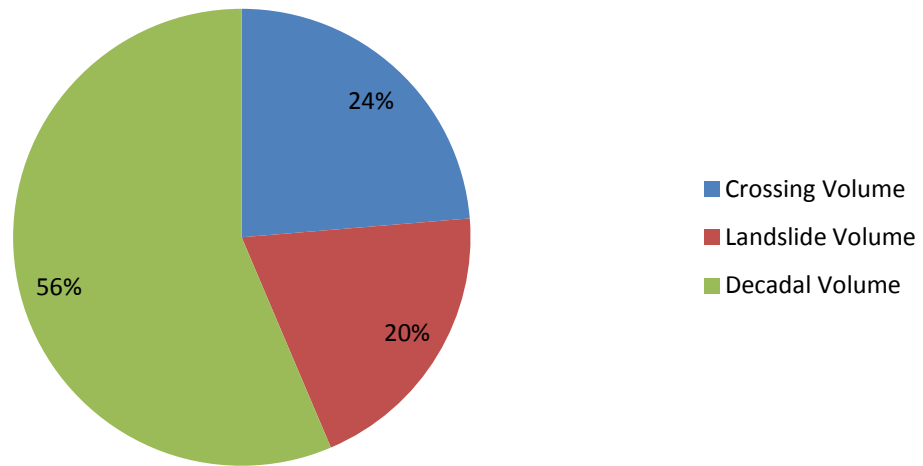
Design

Given that not all private property owners elected to participate in the inventory, some preliminary designs of more complex sites were completed with the assistance of Council engineering staff as well as consulting Engineering Geologist GeoServ, Inc. Detailed measurements via formal survey utilizing a total station were obtained for the ford on Democrat Gulch (Site 77). This site was particularly challenging given that the turn in the road and steepness of the road approaches in and out of the crossing made it difficult to design a crossing that would accommodate a large storm event without bringing in extraordinary amounts of fill. Specifically preliminary designs for the Site 77 ford as well as a suite of recommendations for improvements on Site 90 on Bear Creek Road were completed and are included as Attachment D.

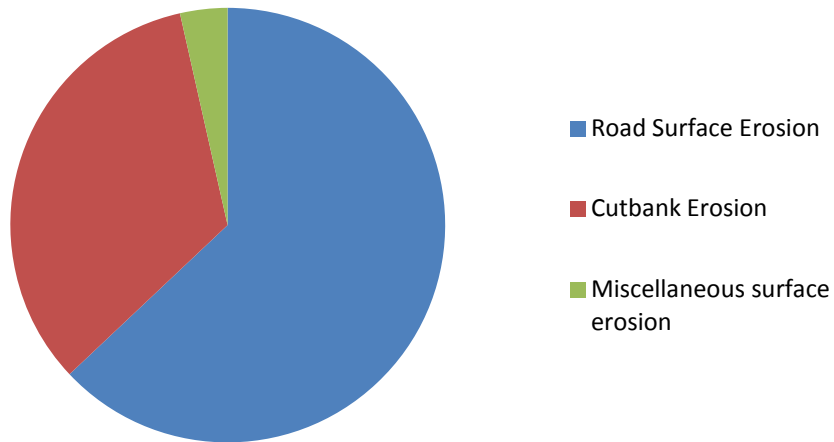
Results

Type of Volume	Sediment (yd ³)
Crossing Volume	1,272
Landslide Volume	1,071
Decadal Volume	3,028
Total Yield	5,371

Types of Sediment Delivery



Chronic Sediment Delivery Summary



Site Type	# Sites	Total Volume (yd ³)	%Volume
Ditch relief culvert	14	599.58	11.16
Gully	2	47	0.88
Landslide (cutbank)	1	74	1.38
Landslide (fillslope)	1	1,009.26	18.79
Landslide (hillslope)	1	42	0.78

Road bed	15	1,093.90	20.37
Road ditch	2	31.38	0.58
Stream crossing	41	2,473.85	46.06

Treatment Immediacy	# Sites	Total Volume (yd ³)	% Volume
H	12	1,950.95	36.32
HM	15	1,251.40	23.30
M	21	1,011.80	18.84
ML	13	543.28	10.12
L	16	613.54	11.42

Private Roads in Study Area

Total Private Roads	107 miles
SPI Roads	42 miles
Private Roads Targeted in Project	65 miles
Inventoried	22 miles

Road Name	Total Volume (yd ³)
Abbey Road	3
Ash Hollow Road	29
Bear Creek Road	743
Black Bear Road	1,283
Democrat Gulch Road	441
East Branch Weaver Creek Road	267
Landecena Road	58
Lesley Lane	117
Little Browns Creek Road	668
Oak Shadow	25
Raspberry Lane	152
Robin Road	34
Squires Road	41
Sydney Gulch Rd	104
Tucker Hill Rd	486
Union Ridge Rd	565
Upper Democrat Gulch Road	131
Weeks Lane	63
Yarborough Drive-Bear Creek Road	163

Outreach Statistics

Mail Outreach	
Total Mailers	460
Wrong Address	19
Responded	23
<i>Access Granted</i>	20
<i>Access Denied</i>	3

Telephone Outreach	
Listed Telephone Number	190
Landowners Reached	57
Access Granted	45
Access Denied	12

Discussion

Overall

The success of this project is reliant on the participation of private property owners. Without their permission to access the privately owned and maintained roads, no accurate data could be collected. The greatest difficulty of this project was obtaining those permissions.

Of the 306 miles of mapped roads within the Weaver Creek Watershed, 107 miles are private. Of these private miles, approximately 42 miles (40%) are on Sierra Pacific Industries land, a land owner who opted not to cooperate with the survey. This left 65 miles of private road with the potential to be surveyed as part of this project.

In January 2016, 460 letters were mailed to parcel owners identified in the GIS exercise as having a portion of private road on their property. Persons who owned multiple parcels were mailed one letter for all parcels. Of the 460 letters, 19 were returned by the U.S. Postal Service (i.e. Insufficient address, Not Deliverable) and 23 were returned (via mail or hand delivery) by the property owner: 20 granting access and 3 denied access. This initial outreach effort was costly in terms of labor stuffing envelopes, printing and postage. This mailing was followed by a telephone outreach effort.

Landowner contact was difficult to acquire due to unlisted phone numbers (i.e., cell phones), absentee landowners, or recent property sales that have not been reflected in the survey. Of over 500 private property parcels (excluding private timber, Government properties) only 37% (190 parcels including duplicates) have either a listed telephone number or the telephone number was provided via a neighbor or acquaintance.

After the mailing and telephone call efforts, only 65 (14%) of the property owners had given permission to survey road. Fifteen (3%) property owners had explicitly denied permissions. Some permissions were granted by landowners while the survey crew was on-site, these numbers are not reflected in the previous calculations. As previously mentioned, outreach to cannabis cultivators is very difficult to achieve. They represent an estimated 11% of parcels based on recent Google Earth imagery (May 2016) and on the ground observations.

Of the 65 miles of private road targeted in this project, over 22 miles (34%) were surveyed, some of which were deemed non-delivering. We have performed a detailed inventory of nearly 14 miles of private roads in the Weaver Creek Watershed with sediment delivery potential. Approximately 4.3 miles of roads were identified as municipal roads (Lowden Park, Town Reservoir) and were not surveyed. Some private roads (8.3 miles) where permission was neither granted nor denied were visited in an attempt to reach the landowners. It was possible to assess delivery versus non-delivery from the vehicle.

Data collection had some typical field conditions that made the process difficult or unsafe including thick blackberry, poison oak, and ground bees. Some culvert outlets were on very steep slopes with loose substrate. Timing of the survey was also a factor especially as the cannabis harvest season was in full swing. Surveyors avoided areas with known cannabis activity during harvest season in particular. Safety was a first priority over data collection.

Approximately 80% of the roads surveyed were deemed to be in relatively good condition and 20% were deemed to have priority treatment potential.

Road Associations

Roads that belong to a road association or have very pro-active landowners include: East Branch Weaver Creek, Bear Creek, Little Browns Creek Road (upper), Elderberry Road (upper), Brooks Lane, Democrat Gulch (lower). Other road systems that may be part of a road association but where we were unable to contact property owners include Snowy Ridge Road-Tye Lane.

The majority of road associations were generous in allowing access for the survey, provided history and identified problem areas. Overall the roads in these areas were well maintained. Stream crossings with undersized culverts or poor choice of culvert material (mining pipe or plastic) were the main potential sediment delivery sites. Upper Little Browns Creek Road and Brooks Lane are paved with asphalt and driveways are graveled or have a native surface.

Sierra Pacific Industries land

As previously mentioned, SPI is not a willing participant in this project. SPI appears to generally manage the roads adjacent to the private roads targeted by this project in consideration of hydrologic connectivity and future timber management needs. Many SPI roads are gated and closed to vehicular traffic during winter or spring which decreases use and wear on native surface roads when they are most vulnerable to erosion. Of the few SPI roads observed during the survey, no significant issues were identified.

Cannabis Cultivation

Cannabis cultivators have a strong presence on many of the “out of town” roads. These roads typically are poorly maintained, do not have sufficient (if any) gravel surface, have steep grades, cross class 2 or 3 streams, and are gated. Contact with landowners is difficult due to lack of contact information, gated properties and roads, and the private, paranoid nature of the business. Specific areas identified include: Upper Democrat Gulch, Democrat Gulch, Tucker Hill, Little Browns lower, upper Oregon, Union Hill, and Elderberry. Oddly, in-town, Ransom Road appeared to be predominantly developed for cannabis cultivation.

Some access roads to the private parcels cross federal lands (BLM and USFS) or other private parcels. These roads get heavily used in the spring when the roadbed is wet and soft. The vehicular traffic on the roads during this time include heavy soil trucks, trailers, and large pickups. This results in deep ruts and compromised surfacing material, which over time captures run-off and results in gullies in the roadbed. Roads that cross Weaverville formation geology appear to have the greatest erosion and roadbed destruction.

Trinity County lacks a grading ordinance. Future regulations of the cannabis industry by the North Coast Regional Water Quality Control Board, Trinity County Planning department, and other agencies may force some cannabis producers to improve and maintain their roads. Without some regulatory enforcement, reducing the sediment contribution from these poorly maintained access roads will remain difficult.

Sub-areas

Little Browns Creek

The headwaters to Little Browns Creek originate in the upper Bear Creek Road neighborhood, which has an active road association. A few roads were identified and assessed in the Bear Creek Road area that were not on the GIS roads data layer. This area gets snow and rain-on-snow events. The roads are long, connected, and some are steep. Many springs and seeps are

present. Four Sites in this area are good candidates for improvements. (Sites 19, 22, 23, 90 and 91)

The next area on Little Browns Creek is Raspberry Lane. This private road accesses two properties, one of which is a year round residence. The road is steep and narrow with two switchbacks. One undersized culvert has been plugged from a hillslope failure. The road could be improved with upsizing the culvert at the hillslope failure and installation of rolling dips to decrease the amount of water in the inboard ditches. (Sites 50-52)

The next subdivision on Little Browns Creek includes Snowy Ridge Rd-Tye Ln, which may be part of a road association but we have no contact with property owners. This area has paved roads and native surface driveways at its entry. Across the highway is Musser Heights subdivision which has well built and maintained roads. Only one area had connectivity but lack of permission from the property owner restricted access to survey.

Further down Little Browns Creek, accessed from Little Browns Creek Road off State Highway 299 is another group of homes. The driveways on the county portion of Little Browns Creek need assessment because many pump loads of sediment and a few dump nearly directly into Little Browns Creek. As an example of the poor driveway conditions, one private driveway on the county portion of Little Browns Creek Road was surveyed. The surveyor observed a clay roadbed that absorbed all applied road gravel. It switchbacked upslope at a 15% grade throughout for over 600 feet with few options to disperse the road run-off along the entire length of roadbed. (Sites 53 and 54).

The upper portion of Little Browns Creek Road has a road association. The road is paved and well maintained. The sites identified in this area include one undersized culvert and a long driveway that contributes much run-off to the creek. (Sites 32 and 34)

Above the Little Browns Creek subdivision are three other clusters of homes: Union Ridge, Elderberry lower and Elderberry upper. Union Ridge Road is at the end of US Forest Service Road 34N77. The steep, narrow native surface USFS Road has rolling dips 300 to 400 ft apart, some of which have cut-offs to divert water off the roadbed. The road is maintained by one landowner who resides in the first property on the top of the ridge. The private roads in this area were built to access recreational properties but have since become year round residences and cannabis cultivation properties. Some roads are well surfaced, sloped or ditched properly to shed surface water. The upper most road that accesses three properties that all are

developed for cannabis cultivation is built on Weaverville formation, red clayish base with seeps that exasperate the degradation of the roadbed. These roads are driven early in the spring by trucks transporting soil and building supplies for the agricultural operations. The heavy trucks increase rutting, capturing water run-off from the upper most property, seeps from road cut, and surface run-off. Sediment laden water moves past the crossing of Union Gulch into a lush green meadow or into Union Gulch and eventually into Little Browns Creek. The Union Gulch crossing is a priority site (Site 59) due to the hodge-podge of poorly aligned, undersized plastic culverts that are barely below the roadbed and connected to a mining pipe with a water diversion at the outlet. One access road to a residence on a cannabis cultivation site was surveyed and road related issues were identified along with other grading issues related to building/garden pads (Site 58).

Further down the Union Ridge line but accessed from Little Browns Creek Road are the upper and lower Elderberry Road areas. Upper Elderberry Road appeared to be well maintained. No major issues were identified when performing reconnaissance. No permissions were granted for this area. Lower Elderberry Road was not observed beyond its junction with Little Browns Creek Road. It was apparent that significant amounts of road sourced sediment comes from this area. But due to the number of no trespassing signs, lack of permissions, and knowledge of cannabis cultivation occurring in the area, we did not observe the road.

East Weaver Creek:

The East Weaver Creek sub-watershed originates on U.S. Forest Service lands and crosses SPI lands before entering into residential areas. The upper residential areas are accessed by East Weaver Creek Road, a county owned road north of State Highway 3. East Branch East Weaver Creek Road is a private road that accesses multiple parcels and is managed by a road association. Run-off from roads and the surrounding area are directed into ditches which often over top during winter precipitation events. While breaking the connectivity of these ditches to reduce the quantity of water and associated sediment is the most obvious and affordable solution, the density of housing in the area and property owner preference to not have water ditched through their property restricts opportunities for sediment treatments. One significant site (# 14 in the database) is the receiving end of a long connected ditch, which contains multiple undersized and poorly aligned plastic and metal culverts and is under an asphalt driveway with landscaping. This particular site is also near an active irrigation ditch. The next cluster of private roads off East Weaver Creek Road includes Oak Shadow Road, Sunny Oak Road, Liberty Road, Meadow Road, Hansen Mine, Bonar Road and Robin Road. Oak Shadow

Road is paved and appeared to have suitable sized culverts, however only one culvert was surveyed due to lack of permissions. Robin Road has one DRC culvert that is undersized and clogs and overtops regularly according to neighbor (Site18). Another cluster of culverts further up Robin Road converge in a buried cement box under a metal grate and disrupt the natural path of water through the swale (Site 55). Oddly, the cement drop box diverts the water entering in from the swale and upslope ditch into both the swale and down slope ditch which feeds into the undersized DRC mentioned above. Liberty Road was observed to be in good condition with a roadside ditch and no DRCs (no permissions). Sunny Oak Road was surveyed but not inventoried in detail. Bonar Road was steep but did not have connectivity as run-off went into a meadow instead of toward the bridge crossing East Weaver Creek. Hansen Mine was not observed. A few private driveways on East Weaver Creek Road were identified in the initial scoping but were not surveyed due to permission being denied. Overall, the upper East Weaver Creek area appears to suffer from relic hydrologic mining activities that rearranged local hydrology and has housing density that restricts landowners' ability to divert run-off away from the roads.

Across Highway 3, Brooks Lane properties parallel East Weaver Creek. While Brooks Lane has a road association, the head of the association refused to grant access for the survey. Brooks Lane is paved and has multiple ditches and culverts that feed into intermittent stream channels. Overall, the area looked well maintained and in good condition. Up the highway is Weeks Lane, another paved, well maintained road. Culverts on Weeks Lane may be undersized, specifically DIRT site 45. Neighbor states that the culvert clogs often but has never over topped the road. The other culverts in this area are mining pipe or ceramic.

Abbey Lane, Squires Road, and Country Road are in a residential area accessed from a bridge that crosses East Weaver Creek. Abbey Road is paved and crowned. A partially developed lot off upper Abbey Road has an undersized mining pipe culvert under the access road which captures a seep, ephemeral swale, and 300' of ditch, which then connects to a culvert under Abbey Road (sites 40 and 41) and eventually flows over a steep hillside to Squires Road below (Site 42). Squires Road is graveled. Site 42 is a poorly placed mining pipe culvert that captures run off from site 41, diverts the water out of its natural flow and away from a home site.

Accessed from Lance Gulch Road, the Browns Ranch Road area was observed (Granwood Hill Road, Old Orchard Road, and Shasta Springs Road) as a few permissions were granted in this area. Many of the private roads identified in the Browns Ranch area are long and steep

driveways. Like the upper East Weaver area, the hydrology of these areas (Abbey and Browns Ranch) has been influenced from past mining activities and residential development.

The lower East Weaver Creek sub-watershed passes through dense residential areas of the Weaverville community. Multiple short sections of private road were identified, many were surveyed, and few granted permissions to inventory in detail. Five Cent Gulch Road has multiple driveways with culvert crossings of Five Cent Gulch. However, no permissions to survey were granted. Angel Hill Road is a steep dirt and gravel road that has not been observed beyond its junction with Highway 3 and should be surveyed should permissions be granted.

West Weaver Creek:

The headwaters of West Weaver Creek originate on US Forest Service land. When West Weaver Creek crosses under Highway 299, it is flanked by private and some BLM land. Oregon Street is the main access for properties on the west side of West Weaver Creek. Roads that depart from Oregon Street include Dutch Lane, Jennings Road, Oregon Spring, and Ward Placer. These roads were not surveyed due to lack of permissions and cannabis cultivation on many properties. One person contacted for the survey denied permissions because "most people live up there to not have people nosing around their business". The red soil of Weaverville formation was observed in the area. Some land slide or movement is apparent in spots and the overall area is erosive. On the east side of West Weaver Creek is McCoy Lane, which is a named private driveway. It was well designed and has no connectivity to West Weaver Creek (the property recently sold and future maintenance or land use is unknown). Below these areas, West Weaver Creek enters into the dense residential area of Weaverville where the creek flows behind many properties. A few private roads and long driveways are in this area but are not hydrologically connected (Hart, Hatley, Quail, and Rocky roads).

Sidney Gulch:

Between East Weaver Creek and West Weaver Creek is Sidney Gulch. Private roads in upper Sidney Gulch include Leslie Lane and Fisher Price Road on the east side of Highway 299 and Wendy Lane and Trinco on the west side of the highway. Leslie Lane is a long graveled road with undersized culverts, lengthy ditches and road connectivity (Sites 28-30) to the stream. One area (no permission) had cracks in the road that appears to be the start of a mass failure (Site 31). The upper most property has a paved driveway that funnels water directly into the property

and home below, which has soured neighbor relations. Fisher-Price Trail is a paved road with suitable culverts. Wendy Road is paved with no stream crossings. Trinco Road which connects to Wendy Road and Oregon Road is gated and permission to access was denied. Below this, Sidney Gulch enters the residential area of Weaverville near the High School.

Democrat Gulch

Upper Democrat Gulch Road is the main access to multiple cannabis cultivation parcels. Some of the roads were in raw, native surface of Weaverville Formation, the red clay that is not suitable to drive during wet weather. The steep upper Democrat Road was not surveyed due to lack of permissions, gates, and no trespassing signs. Only two landowners in the area gave permission to survey the road. Access to upper Democrat Road is through BLM land and roads.

Lower Democrat Gulch Road is the access for a small cluster of homes at the road end. Access to this area is via BLM Roads 107 and 105 through the Weaverville Community Forest. The road departs from BLM 107 at what is called the “meadow” by the residents. The single lane road quickly begins to descend (<15% slope) the steep hillside which includes two major switchbacks, one stream crossing (improved by TCRCD), and two driveways before reaching Democrat Gulch (creek) where a ford provides seasonal access to three parcels on the opposite side of the creek. This ford is a fish passage barrier and impassable in the winter when creek flow is high (Site 77). The winter run-off often is captured by the roadbed and funneled into Democrat Gulch. Remnants of rolling dips and ditch cut-offs are present. However, due to the steepness of the road, drivers attempting to drive safely in winter driving conditions, and increased use of the road, these measures have not withstood the test of time. The most difficult area of the road to remedy and drive is the very steep “s-turn” switchback at the entrance to the community (Site 83). Multiple options were discussed on how to remedy this sediment source but none were without complexities that may not be overcome (i.e. private property, steepness, winter access). The ford across Democrat Gulch should be replaced with some type of crossing that will allow for fish passage. A major issue with installing a bridge or appropriate sized culvert is lack of access for large equipment or supplies due to the narrow and steep access road. The site was surveyed using a total station. Design options have been explored and some preliminary design was completed (see Attachment D). Across the creek, the road provides access to three properties, one of which is at the far end of the road. This access road crosses 2 intermittent creeks and has remnants of rolling dips that should be

reformed. The intermittent creek crossings may need to be replaced but the watershed discharge would need to be checked (Sites 72-74).

Wild Rose Lane was once a seldom used dirt road but is now heavily used by trucks hauling cultivation supplies. The upper access to Wild Rose Lane was a steep narrow road that appeared to be accessible only by ATV or 4x4 vehicles (2016) but in 2017, the road has been turned into two large pads with giant greenhouses for cannabis cultivation (this area has not been surveyed but observed from BLM road 101). Bonnie Lane is a short road off the BLM access to Democrat Gulch. This road was not surveyed due to lack of permission, No trespass signs, and known cannabis cultivation., However the presence of a stream crossing in the form of a ford or culvert was mentioned by locals in the course of the inventory.

Weaver Creek:

Two subdivisions are present on Weaver Creek downstream of the community of Weaverville. These include Union Hill and Tucker Hill. Union Hill was not observed due to lack of permission. Tucker Hill was partially observed as permission was granted by a couple of landowners. Tucker Hill consists of Tucker Hill Road, Hillside Road, and Cross Road,. Hillside Road had multiple no trespass signs and cannabis cultivations. Tucker Hill Road is a native and gravel surfaced road that hugs the hillside. Several intermittent stream crossings were observed; however due to blackberry and poison oak, measurements were estimated. One driveway (no permission) captures a seep and diverts the flow into a depression on Tucker Hill Road that was a point of delivery (Site 67). Another driveway had a landslide this past wet winter. The property owner is attempting to remedy the situation. However the underlying issue is beyond the scope of this project (Site 64). Of interest is the first intermittent stream crossing at the first property up from the highway (Site 69). One can hear a waterfall in the dense vegetation but without permission, this was not located. Although the outflow from the waterfall is not apparent, a wetland area is present. Further down toward Tucker Hill Road, a small stream magically appears from under the building pad and goes into a culvert under Tucker Hill Road, emerging below the culvert on the outlet side of the road. A resident who passed by stated the road often floods in the winter from water coming across the building pad. With a lack of permissions, further investigation into what is occurring hydrologically is not possible. The property owner at the top of Cross Road provided us access; however, the property owners whose land the road crosses at the point of delivery did not. These properties are cannabis cultivation sites with multiple access roads crossing the steep slopes that we were unable to observe. The upper part of Cross Road was in fine condition. Lorenz Rest was not observed

as we did not have permission to access the property. Overall, the Tucker Hill area is a precarious subdivision built upon an active landslide area that has seeps and altered hydrology.

Weaverville:

Many in-town roads are paved with mostly suitable culverts: Fairway, Glen, Baudizzon, Beryl, Martin, Horseshoe, and Manzanita. Some driveways off these roads are not paved and have not been assessed. A few in-town roads are graveled with varying levels of maintenance: Dusty, Dou, Country, Upper Manzanita, end of Odd Fellows, Ransom, Harold, Boudreaux, and Ash Hollow. Some of these roads have a county maintained portion and are paved with only a small portion at the end where an individual private property has a graveled road. The majority of these roads had negligible observed sediment sources.

Recommendations:

Some of the roads observed would benefit greatly from appropriate shaping and surfacing regardless of sediment delivery capacity. Some roads were in terrible condition (rutting, ponding) but had no connectivity to deliver sediment to nearby water courses and are therefore not considered high priority for this inventory. Therefore, those locations are not included in the inventory database. However some locations have been identified and solutions discussed with landowners.

Private road development in Trinity County is not regulated by a county grading ordinance. However, should the county adopt an ordinance, future road development may avoid some of the poor designs observed during this survey. Of note, many rural roads have steep grades (>10%), no or undersized drainage structures, built on unsuitable geology (Weaverville formation clay) with insufficient road base, and are driven on by heavy trucks when the road base is wet, pliable, and prone to distortion. An earth moving contractor should be aware of certain conditions in the Weaverville formation before implementing a landowner's request, such as the presence of Decomposed Granite soil, sub-surface water, landslide prone areas, and slope grade. A need for a grading ordinance in Trinity County goes beyond road development as poorly placed building pads, garden plots, and winter run-off control structures were observed to result in or exacerbate erosion during this survey.

Isolated parcels which were once recreational properties or zoned as Timber Production are now utilized as year round residences or for cannabis production. The access roads that were

designed for dry summer travel are now driven on during the wet seasons with no change to the road design. One of the greatest complaints from the residents of these isolated communities is the road condition in the winter. A properly designed road with appropriate drainage, slope, and surfacing can improve winter driving conditions. However, an increase in trips across the wet roads and an increase in the weight of the vehicles (i.e. large trucks with trailers) only increases the design criteria and cost of road maintenance (i.e. paving the road surface). Some of the isolated communities do not have enough private funds available to improve their access roads, let alone maintain present conditions.

Sediment reduction efforts should first be focused on the Little Browns Creek sub-watershed. This area contributes large amounts of sediment during rain events. This is evidenced by DIRT data as well as through observations of the reddish brown creek dumping into Weaver Creek along Highway 299 and reddish brown surface run-off coming from private driveways up the watershed. Besides the potential reduction of volumes of road sourced sediment that could be achieved from implementation in this sub-watershed, the participation of private property owners and the access granted by road associations (Upper Little Browns Creek Road, Bear Creek Road, and Union Ridge road associations) will make implementation easier and improve the chances of long term maintenance and success.

The next priority area should be Democrat Gulch sub-watershed and the fish passage barrier ford across Democrat Gulch, a fish bearing stream. The lower Democrat Gulch area has a loose road association and participation in implementation will generally be accepted by the current group of landowners. Replacing the ford with a flat bottom culvert will provide fish passage, winter access to residents on the opposite side of the creek and will break the road-stream connectivity, allowing for a dramatic reduction of sediment directly entering the fish bearing stream. Lower Democrat Gulch Road would also benefit from strategic placement of rolling dips and road reshaping (crowning). Unfortunately, the middle and upper Democrat Gulch areas were mostly developed for cannabis cultivation and access was not permitted. Field reconnaissance showed a great need for road improvement in this area as many of the roads were steep, insufficiently surfaced, and poorly drained. Regulatory action may be required to improve these conditions.

East Branch Weaver Creek has had many years of winter run-off issues. This area is heavily populated with dense infrastructure that limits options for dealing with the large volumes of winter run-off that get funneled through ditches. Undersized, poorly placed culverts sometimes

over top the road or negatively impact houses (i.e. flooded crawl spaces). Although the area has a road association, discussions of potential fixes for the most apparent issues does not have full support of individual property owners. This project area will require quite a bit of negotiation with individual property owners during the design phase and is thus not a shovel ready project.

The Sidney Gulch and Leslie Lane area could be good candidates for implementation projects. Majority of the culverts would need to be upsized with rock facing on inlet and outlets. Long road connectivity could be remedied with two rolling dips. The upper section of Leslie Lane that is paved and diverts water directly to the property below can be remedied with a few strategically placed Ditch Relief Culverts and a reshape (and surface) of the road with the goal of directing the water down the slope and not the roadbed. This area has a loose road association and permissions for implementation may be easy.

Project Summary:

Reaching landowners and obtaining permissions to survey roads was the most time consuming aspect of the project, as expected. Of the 65 miles of private road with the potential to be surveyed as part of this project, over 22 miles (34%) were surveyed. Intensive training was provided to crew members throughout the project. As described above, preliminary designs were completed for some of the more complex sites. Public outreach included trainings for landowners in recognition of common sediment sources and an overview of typical treatments to address those sources. The data and recommended treatments generated from this project will serve as the basis for future implementation proposals with willing landowners.

Attachments

- A. DIRT database (Microsoft Access) & DIRT Methodology Description v2.1
- B. GIS shapefile with basic site information
- C. Photos of representative and unusual site types
- D. Preliminary designs for more complex sites. Note that most treatments captured within the database.