# STREAM INVENTORY REPORT

## East Weaver Creek

### INTRODUCTION

A stream inventory was conducted during the summer of 1999 in East Weaver Creek. The survey began at the bridge in East Weaver Campground and extended upstream 1.7 miles.

The East Weaver Creek survey was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in East Weaver Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

### WATERSHED OVERVIEW

East Weaver Creek is a tributary to Weaver Creek, a tributary to the Trinity River, a tributary to the Klamath River, which drains to the Pacific Ocean. It is located in Trinity County, California (Map 1). East Weaver Creek's legal description at the confluence with Weaver Creek is T33N R09W S18. Its location is 40.7213 degrees north latitude and 122.9404 degrees west longitude. East Weaver Creek is a third order stream and has approximately 20 miles of blue line stream according to the USGS Weaverville 7.5 minute quadrangle. East Weaver Creek drains a watershed of approximately 14.6 square miles. Elevations range from about 1,310 feet at the mouth of the creek to 7,600 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is located within Shasta-Trinity National Forest and state lands and is managed for timber production, rangeland, and recreation. Vehicle access exists via East Weaver Campground and the road that parallels the creek.

### METHODS

The habitat inventory conducted in East Weaver Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

## SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field dorm. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

## HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in East Weaver Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.
Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". East Weaver Creek habitat typing used standard basin level measurement criteria. These parameters require that the

minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics were measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In East Weaver Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate particle size, a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In East Weaver Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified hand held spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In East Weaver Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to

withstand winter flows. In East Weaver Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

## BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in East Weaver Creek. In addition, nine sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for East Weaver Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in the pool tail-outs
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

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HABITAT INVENTORY RESULTS

The habitat inventory of August 9 through August 11, 1999 was conducted by Gina Capser (CCC) and Michelle Hoffman (WSP\AmeriCorps). The total length of the stream surveyed was 8,844 feet with an additional 217 feet of side channel.

Stream flow was measured at the upstream end of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.7 cfs on October 15, 1999.

East Weaver Creek is a B3 channel type for the entire 8,844 feet of stream reach surveyed. B3 channels consist of moderate entrenchment, moderate gradient, and are riffle dominated cobble channels. Pools are spaced infrequently, plan and profile are very stable, and banks are stable.

Water temperatures taken during the survey period ranged from 53 to 60 degrees Fahrenheit. Air temperatures ranged from 62 to 78 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 53% riffle units, 43% pool units, and 4% flatwater units (Graph 1). Based on total length of Level II habitat types there were 85% riffle units, 12% pool units, and 3% flatwater units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffles, 36%; mid-channel pools, 24%; low gradient riffles, 12%; and plunge pools, 11% (Graph 3). Based on percent total length, high gradient riffles made up 70%, low gradient riffles 14%, mid-channel pools 7%, and plunge pools 2%.

A total of eighty-three pools were identified (Table 3). Main channel pools were the most frequently encountered pool type at 63% and comprised 67% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Two of the 83 pools (2.4%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 83 pool tail-outs measured, 29 had a value of 1 (35%); 52 had a value of 2 (63%); and two had a value of 5 (2%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the two pool tail-outs that had an embeddedness value of 5 was 50% cement and 50% wood.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 55, flatwater habitat types had a mean shelter rating of 18, and pool habitats had a mean shelter rating of 42 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 54. Backwater pools had a mean shelter rating of 38 (Table 3).

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Table 5 summarizes mean percent cover by habitat type. Boulders and whitewater are the dominant cover type in East Weaver Creek. Graph 7 describes the pool cover in East Weaver Creek. Boulders are the dominant pool cover type followed by whitewater.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 35% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 28%.

The mean percent canopy density for the surveyed length of East Weaver Creek was 90%. The mean percentages of deciduous and coniferous trees were 26% and 74%, respectively. Graph 9 describes the mean percent canopy in East Weaver Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 62%. The mean percent left bank vegetated was 62%. The dominant elements composing the structure of the stream banks consisted of 56% boulders, 21% sand/silt/clay, 17% cobble/gravel, and 7% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 52% of the units surveyed. Additionally, 27% of the units surveyed had coniferous trees as the dominant vegetation type, and 11% had brush as the dominant vegetation (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Nine sites in East Weaver Creek were electrofished on October 15, 1999 by Michelle Gilroy (DFG) and Linda Peak (USFS). The air temperature recorded during the electrofishing period of 1140 hours to 1355 hours ranged from ranged from 59 to 67 degrees Fahrenheit. The water temperature was 51 degrees Fahrenheit. Four sites were electrofished downstream of the diversion and five sites were sampled upstream of the diversion.

The first site sampled included Habitat Unit #004, a run, approximately 192 feet upstream of the beginning of the survey. The site yielded one young-of-the-year (YOY) steelhead.

The second site sampled was Habitat Unit #010, a plunge pool, located approximately 397 feet upstream of the beginning of the survey. The site yielded two YOY steelhead.

The third site sampled was Habitat Unit #015, a run, located approximately 468 feet upstream of the beginning of the survey. The site yielded one YOY and one age 2+ steelhead.

The fourth site sampled was Habitat Unit #025, a plunge-pool, located approximately 941 feet upstream of the beginning of the survey. The site yielded one YOY, one age 1+ and one age 2+ steelhead/rainbow trout.

The fifth site sampled was Habitat Unit #055, a mid-channel pool located approximately 2,792 upstream of the beginning of the survey. No fish were captured at this site.

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The sixth site sampled included Habitat Units #063-064, a riffle, and boulder-formed backwater pool, located approximately 3,203 feet upstream of the beginning of the survey. The site yielded two YOY and one age 1+ steelhead.

The seventh site sampled was Habitat Unit #069, a mid-channel pool with root wad cover, located approximately 3,475 feet upstream of the beginning of the survey. The site yielded one age 1+ steelhead.

The eighth site sampled was Habitat Unit #072, a mid-channel pool with boulder cover, located approximately 3,595 feet upstream of the beginning of the survey. The site yielded one YOY and two age 1+ steelhead.

The ninth site sampled was Habitat Unit #077, a high gradient riffle, located approximately 3,811 feet upstream of the beginning of the survey. The site yielded two YOY and one age 2+ steelhead.

The following chart summarizes the electrofishing data collected:

| Date | Site # | Approx. Distance from mouth (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | Steelhead YOY | 1+ | 2+ |
|---|---|---|---|---|---|---|---|---|---|
| 10/15/99 | 1 | 192 | 4 | RUN | 1 | B3 | 1 | 0 | 0 |
| 10/15/99 | 2 | 397 | 10 | PLP | 1 | B3 | 2 | 0 | 0 |
| 10/15/99 | 3 | 468 | 15 | RUN | 1 | B3 | 1 | 0 | 1 |
| 10/15/99 | 4 | 941 | 25 | PLP | 1 | B3 | 1 | 1 | 1* |
| 10/15/99 | 5 | 2,792 | 55 | MCP | 1 | B3 | 0 | 0 | 0 |
| 10/15/99 | 6 | 3,203 | 63-64 | LGR BPB | 1 | B3 | 2 | 1 | 0 |
| 10/15/99 | 7 | 3,475 | 69 | MCP | 1 | B3 | 0 | 1 | 0 |
| 10/15/99 | 8 | 3,595 | 72 | MCP | 1 | B3 | 1 | 2 | 0 |
| 10/15/99 | 9 | 3,811 | 77 | HGR | 1 | B3 | 2 | 0 | 1 |

*Steelhead 9-10" long.

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DISCUSSION

East Weaver Creek is a B3 channel type for the entire 8,844 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures is as follows: excellent for plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days of August 9 through August 11, 1999 ranged from 53 to 60 degrees Fahrenheit. This is a good water temperature range for salmonids. Air temperatures ranged from 62 to 78 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 3% of the total length of this survey, riffles 85%, and pools 12%. The pools are shallow, with only two of the 83 pools having a maximum depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Twenty-nine of the 83 (35%) pool tail-outs measured had an embeddedness rating of 1. Fifty-two (63%) of the pool tail-outs had an embeddedness rating of 2. Two (2%) of the pool tail-outs had a rating of 5 or were considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Fifty-two of the 83 pool tail outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating in the flatwater habitats was 18. The shelter rating for pools was 42. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders and whitewater in most habitat types. Log and root wad cover structure in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 90%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 62% for both. In areas of stream bank erosion or where bank vegetation is not at an acceptable level, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) East Weaver Creek should be managed as an anadromous, natural production stream.

2) Modify diversion dam structure located 2,554 feet upstream of the East Weaver Creek Campground in order to improve fish passage for adult and juvenile salmonids.

3) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools or deepen the existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) Increase the large wood component in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

6) In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

| Position (ft): | Comments: |
|---|---|
| 0' | Start of survey at East Weaver Campground bridge. The bridge measures 6' long x 30' wide x 8' high. The channel type is a B3. |
| 192' | First electrofishing site. |
| 397' | Second electrofishing site. |
| 468' | Third electrofishing site. |
| 576' | Right bank failure, 80' long x 20' high, contributing fine sediment to the channel. |
| 930' | Left bank side channel. |

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941' Left bank water tank. Fourth electrofishing site.

1,586' Left bank failure, 100' long x 25' high, contributing fine sediment to the channel.

2,274' Left bank tributary.

2,554' Diversion dam with bedrock sheet, 20' long x 30' wide.

2,577' Right bank failure, 35' long x 1' high, contributing fine sediment to the channel.

2,792' Fifth electrofishing site.

3,203' Sixth electrofishing site.

3,475' Seventh electrofishing site.

3,595' Eighth electrofishing site.

3,811' Ninth electrofishing site.

4,470' Log debris accumulation, 4' long x 15' wide x 4' high, providing shelter.

4,708' Road 5' from bankfull width.

4,863' Road next to creek (2' above channel) within bankfull width.

5,444' Right bank failure, 50' long x 15' high, contributing fine sediment to the channel.

6,022' Bike trail and bridge. Clear cut logged area on the right bank, less than 50' from bankfull width.

7,239' Left bank failure, 75' long x 25' high, contributing fine sediment to the channel.

7,440' Left bank failure, 80' long x 20' high, contributing fine sediment to the channel. No vegetation.

7,724' Left bank failure, 25' long x 8' high, contributing fine sediment to the channel.

8,087' High gradient bedrock sheet.

8,101' Cascade with an approximate 10% gradient, pools are present.

8,606' Bike trail crosses through creek.

8,620' Cascade with bedrock sheet.

8,844' End of survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

| | | | |
|---|---|---|---|
| RIFFLE | | | |
| Low Gradient Riffle | (LGR) | [1.1] | { 1} |
| High Gradient Riffle | (HGR) | [1.2] | { 2} |
| | | | |
| CASCADE | | | |
| Cascade | (CAS) | [2.1] | { 3} |
| Bedrock Sheet | (BRS) | [2.2] | {24} |
| | | | |
| FLATWATER | | | |
| Pocket Water | (POW) | [3.1] | {21} |
| Glide | (GLD) | [3.2] | {14} |
| Run | (RUN) | [3.3] | {15} |
| Step Run | (SRN) | [3.4] | {16} |
| Edgewater | (EDW) | [3.5] | {18} |
| | | | |
| MAIN CHANNEL POOLS | | | |
| Trench Pool | (TRP) | [4.1] | { 8} |
| Mid-Channel Pool | (MCP) | [4.2] | {17} |
| Channel Confluence Pool | (CCP) | [4.3] | {19} |
| Step Pool | (STP) | [4.4] | {23} |
| | | | |
| SCOUR POOLS | | | |
| Corner Pool | (CRP) | [5.1] | {22} |
| Lateral Scour Pool - Log Enhanced | (LSL) | [5.2] | {10} |
| Lateral Scour Pool - Root Wad Enhanced | (LSR) | [5.3] | {11} |
| Lateral Scour Pool - Bedrock Formed | (LSBk) | [5.4] | {12} |
| Lateral Scour Pool - Boulder Formed | (LSBo) | [5.5] | {20} |
| Plunge Pool | (PLP) | [5.6] | { 9} |
| | | | |
| BACKWATER POOLS | | | |
| Secondary Channel Pool | (SCP) | [6.1] | { 4} |
| Backwater Pool - Boulder Formed | (BPB) | [6.2] | { 5} |
| Backwater Pool - Root Wad Formed | (BPR) | [6.3] | { 6} |
| Backwater Pool - Log Formed | (BPL) | [6.4] | { 7} |
| Dammed Pool | (DPL) | [6.5] | {13} |
| | | | |
| ADDITIONAL UNIT DESIGNATIONS | | | |
| Dry | (DRY) | [7.0] | |
| Culvert | (CUL) | [8.0] | |
| Not Surveyed | (NS) | [9.0] | |
| Not Surveyed due to a marsh | (MAR) | [9.1] | |