

STREAM INVENTORY REPORT

Sweathouse Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Sweathouse Creek. The survey began at the confluence with Redwood Creek and extended upstream 1,859 feet. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Sweathouse Creek.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for chinook salmon, 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

Sweathouse Creek is a tributary to Redwood Creek, a tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Sweathouse Creek's legal description at the confluence with Redwood Creek is T06N R03E S03. Its location is 40°55'51" north latitude and 123°49'27.5" west longitude. Sweathouse Creek is a first order ephemeral stream and has approximately 1.5 miles stream according to the USGS Lord-Ellis Summit 7.5 minute quadrangle. Sweathouse Creek drains a watershed of approximately 0.6 square miles. Elevations range from about 780 feet at the mouth of the creek to 2,480 feet in the headwater areas. Redwood/Douglas fir and grassland dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Highway 299 to Redwood Valley Road.

METHODS

The habitat inventory conducted in Sweathouse Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The 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 form. 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 Sweathouse 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 hand level, hip chain, tape measure, and a 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". Sweathouse 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 are measured using a 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 Sweathouse 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 unsuited for spawning due to inappropriate substrate particle size, bedrock, 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 Sweathouse 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 handheld 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 Sweathouse 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 Sweathouse 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 Sweathouse Creek. No biological sampling was conducted on Sweathouse Creek.

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 Sweathouse 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 low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 25, 2001, was conducted by T. Saunders and D. Resnik (WSP/AmeriCorps). The total length of the stream surveyed was 1,859 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.6cfs on June 25, 2001.

Sweathouse Creek is a C3 channel type for the first 1,692 feet of the stream surveyed and a A3 channel type for the remaining 167 feet surveyed. C3 channel types are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplain and cobble channel. A3 channel types are steep, narrow, cascading, step-pool streams; high energy/debris transport associated with depositional soils and cobble channel.

Water temperatures taken during the survey period ranged from 54° to 57° Fahrenheit. Air temperatures ranged from 58° to 62° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 41% riffle units, 31% flatwater units, 25% pool units, and 3% dry units (Graph 1). Based on total **length** of Level II habitat types there were 39% riffle units, 34% flatwater units, 17% pool units, and 10% dry units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 22%; low gradient riffles, 19%; and high gradient riffles, 19% (Graph 3). Based on percent total **length**, step runs made up 30%, low gradient riffles 26%, and step pools 14%.

A total of 8 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 63%, and comprised 88% 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. Four of the 8 pools (50%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 8 pool tail-outs measured, none had a value of 1; 3 had a value of 2 (37.5%); 3 had a value of 3 (37.5%); 1 had a value of 4 (12.5%); and 1 had a value of 5 (12.5%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the one pool tail-out that had a embeddedness value of 5 was boulder.

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 11, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 13 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 20. Main channel pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Sweathouse Creek. Graph 7 describes the pool cover in Sweathouse 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 75% of pool tail-outs while large cobble and boulder was the next most frequently observed substrate type, both at 12.5%.

The mean percent canopy density for the surveyed length of Sweathouse Creek was 85%. The mean percentages of deciduous and coniferous trees were 97% and 3%, respectively. Graph 9 describes the mean percent canopy in Sweathouse Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 91.6%. The mean percent left bank vegetated was 91.3%. The dominant elements composing the structure of the stream banks consisted of 72.7% sand/silt/clay, 18.2% cobble/gravel and 9.1% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 86.4% of the units surveyed. Additionally, 13.6% of the units surveyed had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological sampling was conducted on Sweathouse Creek.

DISCUSSION

Sweathouse Creek is a C3 channel type for the 1,692 feet of stream surveyed and a A3 channel type for the remaining 167 feet. The suitability of C3 channel types for fish habitat improvement structures is as follows: excellent for bank-placed boulders; good for plunge weirs, boulder clusters, single and opposing wing deflectors and log cover. The suitability of A3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, opposing wing deflectors and log cover; poor for boulder clusters and single wing deflectors.

The water temperatures recorded on the survey days June 25, 2001, ranged from 54° to 57° Fahrenheit. Air temperatures ranged from 58° to 62° Fahrenheit. This is a good water temperature for juvenile salmonids. 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 31% of the total **length** of this survey, riffles 41%, and pools 25%. The pools are relatively deep, with 4 of the 8 (50%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

Three of the 8 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. One of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. One of the 8 were unsuitable for spawning due to the dominant substrate being boulder. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Six of the 8 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 for pools was 13. The shelter rating in the flatwater habitats was 8. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, small woody debris contributes a small amount. Log and root wad cover structures 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 85%. In general, revegetation projects are considered when canopy density is less than 80% or the canopy composition is dominated by deciduous trees. The percentage of right and left bank covered with vegetation was high at 91.6% and 91.3%, respectively.

RECOMMENDATIONS

- 1) Sweathouse Creek should be managed as an anadromous, natural production stream.
- 2) 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.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.
- 4) Increase the canopy on Sweathouse Creek by planting redwood, Douglas fir or other native conifers within the riparian zone. Tributaries to Sweathouse Creek and the reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream.

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.

0'	Begin survey at confluence with Redwood Creek. Channel type is C3. Stream is flowing subsurface at confluence.
935'	Erosion approximately 10' high x 30' long.
971'	Plunge of 3.5'.
1,188'	Plunge of 2.5'.
1,219'	Erosion approximately 10' high x 30' long.
1,374'	Plunge of 2.8'.
1,692'	Channel type changes from C3 to A3.
1,763'	Plunge of 2.2'.
1,859'	End of survey due to high gradient of stream and very low flow.

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.

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]	