STREAM INVENTORY REPORT

Bear Wallow Creek

INTRODUCTION

A stream inventory was conducted from June 25 to June 26, 1990 on Bear Wallow Creek. The survey began at the confluence with Huckleberry Creek and extended upstream 1.4 miles.

The Bear Wallow Creek inventory 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 Bear Wallow 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

Bear Wallow Creek is a tributary to Huckleberry Creek, a tributary to Hollow Tree Creek, a tributary to the South Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Bear Wallow Creek's legal description at the confluence with Hollow Tree Creek is T22N R17W S26. Its location is 39.7313 degrees north latitude and 123.7250 degrees west longitude, LLID number 1237239397314. Bear Wallow Creek is a first order stream and has approximately 2.4 miles of blue line stream according to the USGS Lincoln Ridge 7.5 minute quadrangle. Bear Wallow Creek drains a watershed of approximately 1.4 square miles. The watershed is a second growth redwood forest, under the ownership of the Louisiana-Pacific Corporation and is managed for timber production. Vehicle access is from Hales Grove Road, through the locked Louisiana-Pacific gate.

METHODS

The habitat inventory conducted in Bear Wallow Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) personnel 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 Bear Wallow Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near 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 (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 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 (1990). 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". Bear Wallow 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 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 Bear Wallow 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 like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. 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 Bear Wallow 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 Bear Wallow 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 hardwood 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 Bear Wallow 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.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

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 Bear Wallow Creek. In addition, three sites were electrofished using a Smith-Root Model LR-24 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

HABITAT INVENTORY RESULTS

The habitat inventory of June 25 through June 26, 1990 was conducted by J. Fredrick and S. Holzerland (CCC). The total length of the stream surveyed was 7,617 feet with an additional 149 feet of side channel.

Stream flow was not measured on Bear Wallow Creek.

Bear Wallow Creek is a B2 channel type for the entire length of the survey, 7,617 feet. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 31% flatwater units, and 26% riffle units. Based on total length of Level II habitat types there were 42% pool units, 40% flatwater units, and 17% riffle

units.

Sixteen Level IV habitat types were identified. The most frequent habitat types by percent occurrence were low gradient riffle units, 25%; log enhanced lateral scour pools, 15%; step run units, 14%; and glide units, 10%.

A total of 106 pools were identified. Scour pools were the most frequently encountered at 78%, and comprised 81% of the total length of all pools.

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-four of the 106 pools (32%) had a maximum residual depth of greater than two feet.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 106 pool tail-outs measured, 81 had an embeddedness value of 1 (76%); 18 had a value of 2 (17%); four had a value of 3 (4%); and three had a value of 4 (3%). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

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. Of the pool types, the backwater pools had the highest mean shelter rating at 148. Scour pools had a mean shelter rating of 114. Main channel pools had a mean shelter rating of 64.

Boulders, large woody debris and undercut banks provide the primary cover in many pools.

Gravel was the dominant substrate observed in 60% of the units, sand was dominant in 16% of the units, and small cobble dominant in 10% of the units.

The mean percent canopy density for the surveyed length of Bear Wallow Creek was 84%.

For the stream reach surveyed, the mean percent right bank vegetated was 48%. The mean percent left bank vegetated was 57%. The dominant elements composing the structure of the stream banks consisted of 25% grass, 19% bare soil, 18% bedrock, 17% brush, 14% deciduous trees, and 7% coniferous trees.

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted an electrofishing survey at three sites for species composition and distribution in Bear Wallow Creek on August 1, 1990. The sites were sampled by J. Frederick and S. Holzerland (CCC).

The first unit sampled was a corner pool approximately 72 feet from the confluence of Huckleberry Creek. The site yielded six steelhead/rainbow trout from 39 mm to 105 mm long, and 16 coho salmon ranging from 34 mm to 75 mm long.

The second unit sampled was a log enhanced lateral scour pool above a log and debris accumulation, approximately 1,880 feet from the mouth. The site yielded three steelhead/rainbow trout ranging from 51 mm to 95 mm long, and 19 coho salmon ranging from 48 mm to 89 mm long.

The third unit sampled was a log enhanced lateral scour pool approximately 8,000 feet from the confluence with Huckleberry Creek. No fish were found.

DISCUSSION

Bear Wallow Creek is a B2 channel type. The suitability of B2 channel types for fish habitat improvement structures is as follows: B2 channel types excellent for plunge weirs, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 25 through June 26, 1990 ranged from 50 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 40% of the total length of this survey, riffles 17%, and pools 42%. Thirty-four of the 106 pools had a maximum depth greater than two 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 residual 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Ninety-nine of the pool tail-outs measured had embeddedness ratings of 1 or 2. Seven of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is 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. Sediment sources in Bear Wallow Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for backwater pools is 148. The mean shelter rating for scour pools in 114. The mean shelter rating for main channel pools is 64. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders, large woody debris, and undercut banks in Bear Wallow Creek. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

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The mean percent canopy density for the stream was 84%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 48% and 57%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Bear Wallow Creek should be managed as an anadromous, natural production stream.

2) Increase woody cover in the pools. Boulders currently provide the primary cover in most pools. Large woody debris cover added to the pools would increase the complexity of woody cover available.

3) Stabilize stream banks and revegetate with alders and willows to provide additional bank stability and canopy.

4) Modify debris accumulations to provide fish passage and prevent further bank erosion. The wood should be removed carefully, leaving as much of the woody debris as possible for cover. This may need to be done over a period of years to allow the silt and fines accumulated behind the debris accumulations to flush out a little at a time, lessening the impact of the sediment downstream.

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:
1166'	Log debris accumulation (LDA).
1373'	LDA measures 33' high x 30' wide x 8' high and is associated with bank erosion.
2562'	LDA.
2694'	Road crossing through the stream
3067'	LDA measures 5' high x 20' wide and is retaining gravel.
3466'	LDA measures 5' high x 30' wide x 30' long.
4431'	LDA measures 6' high x 30' wide x 30' long.

4462' Left bank erosion site measures 6' high x 51' long.

4713' LDA measures 50' long x 30' wide x 8' high.

4854' Right bank eroding.

5510' Tributary enters from the right bank.

5719' Road crosses the channel.

6202' LDA measures 60' long x 6' high x 40' wide.

6562' LDA measures 6' high x 35' wide x 40' long.

6994' LDA measures 5' high x 30' wide x 35' long.

7200' LDA measures 10' high x 35' wide x 20' long.

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]	