

STREAM INVENTORY REPORT

BURBECK CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on Burbeck Creek. The survey began at the confluence with the Noyo River and extended upstream 1.2 miles.

The Burbeck 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 Burbeck 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 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

Burbeck Creek is a tributary to the Noyo River, a tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Burbeck Creek's legal description at the confluence with the Noyo River is T18N R14W S08. Its location is 39°25'42" north latitude and 123°26'22" west longitude. Burbeck Creek is a second order stream and has approximately 1.3 miles of blue line stream according to the USGS Burbeck 7.5 minute quadrangle. Burbeck Creek drains a watershed of approximately 1.9 square miles. Elevations range from about 600 feet at the mouth of the creek to 2,500 feet in the headwater areas. Redwood/Douglas fir/mixed hardwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 20 and Irmulco Road.

METHODS

The habitat inventory conducted in Burbeck 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 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 Burbeck 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 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". Burbeck 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 Burbeck 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 Burbeck 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 Burbeck 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 Burbeck 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 root wads) 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 Burbeck Creek. In addition, two 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 Burbeck 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 July 12- 25, 2000, was conducted by Randy Turner and Daria Leibel (WSP), and Jennifer Jenkins (CCC). The total length of the stream surveyed was 6,228 feet with an additional 29 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model

2000 flowmeter at 0.15 cfs on July 27, 2000.

Burbeck Creek is an F3 channel type for the entire 6,228 feet of the stream surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble dominated substrate.

Water temperatures taken during the survey period ranged from 58 to 65 degrees Fahrenheit. Air temperatures ranged from 58 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% riffle units, 29% flatwater units, and 32% pool units (Graph 1). Based on total length of Level II habitat types there were 49% riffle units, 36% flatwater units, and 13% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 36%; mid-channel pools, 30%; and step-runs, 16% (Graph 3). Based on percent total length, low gradient riffles made up 48%, step runs 29%, and mid-channel pools 12%.

A total of 48 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 94%, and comprised 94% 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. Ten of the 38 pools (26%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 48 pool tail-outs measured, 6 had a value of 1 (12.5%); 19 had a value of 2 (39.5%); 13 had a value of 3 (23%); 4 had a value of 4 (8%); and 8 had a value of 5 (17%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the 8 pool tail-outs 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 14, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 39 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 49. Scour pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Burbeck Creek. Graph 7 describes the pool cover in Burbeck Creek. Boulders are the dominant pool cover type followed by large woody debris.

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 50% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 27%.

The mean percent canopy density for the surveyed length of Burbeck Creek was 95%. The mean percentages of deciduous and coniferous trees were 46% and 49%, respectively. Graph 9 describes the mean percent canopy in Burbeck Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 84.8%. The mean percent left bank vegetated was 86.6%. The dominant elements composing the structure of the stream banks consisted of 32% cobble/gravel, and 68% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 59% of the units surveyed. Additionally, 27% of the units surveyed had deciduous trees as the dominant vegetation type and 14% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished for species composition and distribution in Burbeck Creek on July 18, 2000. The sites were sampled by the Mendocino Redwood Company.

The first site sampled included habitat units 2-4, located at the mouth of Burbeck Creek. The site yielded 16 young-of-the-year steelhead, 5 sculpin, and 7 Pacific giant salamanders.

The second site included habitat units 82-89, located approximately 3,429' above the creek mouth. The site yielded 10 young-of-the-year steelhead, 3 one-plus age class steelhead, 6 sculpin, 5 Pacific giant salamanders, and 2 yellow legged frogs.

The following chart displays the information yielded from these sites:

*The site numbers are according to the Mendocino Redwood company data and correspond to the habitat unit numbers listed in the table.

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY 1+ 2+		
7/18/2000	1 *(70-49)	0	2-4	3.3,4.2, 5.6	1	F3	16	0	0
7/18/2000	2 *(70-50)	3,429'	82-89	5.3,3.3, 4.2	1	F3	10	3	0

DISCUSSION

Burbeck Creek is an F3 channel type for the entire 6,228 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders and single and opposing wing deflectors; fair for plunge weirs, boulder clusters, channel constrictors and log cover.

The water temperatures recorded on the survey days July 12 to July 25, 2000, ranged from 58 to 65 degrees Fahrenheit. Air temperatures ranged from 58 to 82 degrees Fahrenheit. This is a

suitable water temperature range for 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 36% of the total length of this survey, riffles 49%, and pools 13%. The pools are relatively shallow, with only 10 of the 48 (21%) 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. Installing structures that will increase or deepen pool habitat is recommended.

Twenty-five of the 48 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifteen of the pool tail-outs had embeddedness ratings of 3 or 4. Eight of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. All eight 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. Sediment sources in Burbeck Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-seven of the 38 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 39. The shelter rating in the flatwater habitats was 9. 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, large woody debris contributes a small amount. 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 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 84.8% and 86.6%, respectively. 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.

RECOMMENDATIONS

- 1) Burbeck 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.

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'	Start of survey at confluence with the Noyo River. Channel type is an F3.
201'	Road crosses channel.
444'	Concrete box culvert measures 122' long x 7' wide x 6.5' high.
2,363'	Log in channel retaining approximately 2 feet of gravel.
3,118'	Road crosses channel.
3,507'	Steep, bare left bank measures 10' high x 58' long.
4,498'	Small tributary enters on right bank. Water flow was a trickle at the time of survey.
5,596'	Log debris accumulation, 15' long x 20' wide x 5' high, not retaining sediment/gravel.
5,704'	Log debris accumulation, 12' long x 15' wide x 6' high, not retaining sediment/gravel.
6,196'	High gradient tributary enters on right bank, water temperature was 61° Fahrenheit.
6,228'	End of survey. Plunge of 6 feet with a succession of 3-4 foot plunges continuing for 300 feet upstream. Gradient measured to be 23%.

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]	
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Culvert	(CUL)	[8.0]
Not Surveyed	(NS)	[9.0]
Not Surveyed due to a marsh	(MAR)	[9.1]