

STREAM INVENTORY REPORT

BUTLER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Butler Creek. The survey began at the confluence with Hollow Tree Creek and extended upstream 1.4 miles.

The Butler 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 Butler 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

Butler Creek is a tributary to Hollow Tree Creek, tributary to the Eel River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Butler Creek's legal description at the confluence with Hollow Tree is T 22N R 17W S 25. Its location is 39E44N15.970 north latitude and 123E14N21.200 west longitude. Butler Creek is a second order stream and has approximately 4.43 miles of solid blue line stream according to the USGS Leggett 7.5 minute quadrangle. Butler Creek drains a watershed of approximately 2.6 square miles. Elevations range from about 1,397 feet at the mouth of the creek to 2,500 feet in the headwater areas. Mixed hardwood and mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Hwy 1 to a private road at Hales Grove.

METHODS

The habitat inventory conducted in Butler 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

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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 Butler 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:

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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". Butler 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 Butler 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 Butler 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Butler Creek, an estimate of the

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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 Butler 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 Butler Creek. In addition, three 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 Butler Creek include:

- × Riffle, flatwater, pool habitats by percent occurrence
- × Riffle, flatwater, pool habitats by total length
- × Total habitat types by percent occurrence

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- × 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 September 3 & 4, 2002, was conducted by Janelle Breton (WSP) and Matt Davis (CCC). The total length of the stream surveyed was 7,531 feet.

Stream flow was not measured on Butler Creek.

Butler Creek is an F4 channel type for the entire 7,531 feet of the stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54° to 60° Fahrenheit. Air temperatures ranged from 48° to 72° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 23% riffle units, 20% flatwater units, and 37% pool units (Graph 1). Based on total length of Level II habitat types there were 18% riffle units, 17% flatwater units, and 27% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 36%; low-gradient riffles, 20%; runs, 20% and dry, 20% (Graph 3). Based on percent total length, mid channel pools made up 26%, low-gradient riffles 17%, and runs 17%.

A total of 67 pools were identified (Table 3). Main channel pools were the most frequently encountered at 99%, and comprised 99% 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

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increases with depth. Twenty-one of the 67 pools (31.3%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 66 pool tail-outs measured, 35 had a value of 1 (53%); 12 had a value of 2 (18.2%); 12 had a value of 3 (18.2%); 4 had a value of 4 (6%); and 2 had a value of 5 (3%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 5, flatwater habitat types had a mean shelter rating of 12, and pool habitats had a mean shelter rating of 35 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 35. Scour pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Butler Creek. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Butler Creek. Large woody debris is the dominant pool cover type followed by boulders.

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 83.3% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 10.6%.

The mean percent canopy density for the surveyed length of Butler Creek was 96%. The mean percentages of deciduous and coniferous trees were 74% and 22%, respectively. Graph 9 describes the mean percent canopy in Butler Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 90%. The mean percent left bank vegetated was 92.1%. The dominant elements composing the structure of the stream banks consisted of 21.2% bedrock, 8.9% boulder, 43.8% cobble/gravel, and 26% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 72.6% of the units surveyed. Additionally, 20.6% of the units surveyed had coniferous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in Butler Creek on October 21, 2002. Water temperatures taken during the electrofishing period (1235-1535) ranged from 46° to 52° Fahrenheit. Air temperatures ranged from 54° to 57° Fahrenheit. The sites were sampled by Chris Ramsey (DFG), Lindsay Selvaggio and Robert Pagliuco (WSP).

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The first site sampled included habitat unit 0052, a mid-channel pool approximately 1,790 feet from the confluence with Hollow Tree Creek. The site yielded two age one plus steelhead and 11 young-of-the-year (YOY) coho.

The second site included habitat unit 0151, a mid-channel pool located approximately 5,808 feet above the creek mouth. The site yielded 12 YOY coho.

The third site sampled included habitat unit 0153, a mid-channel pool located approximately 6,278 feet above the creek mouth. The site yielded two YOY steelhead.

The following chart displays the information yielded from these sites:

| Date | Site # | Approx. Dist. from mouth (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | SH coho | | |
|----------|--------|--------------------------------|-------------|-----------|---------|--------------|---------|----|----|
| | | | | | | | 0+ | 1+ | 0+ |
| 10/21/02 | 1 | 1,790 | 0052 | 4.2 | 1 | F4 | 0 | 2 | 11 |
| 10/21/02 | 2 | 5,808 | 0151 | 4.2 | 1 | F4 | 0 | 0 | 12 |
| 10/21/02 | 3 | 6,278 | 0153 | 4.2 | 1 | F4 | 2 | 0 | 0 |

DISCUSSION

Butler Creek is an F4 channel type for the entire 7,531 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing deflectors, channel constrictors and log cover; poor for boulder clusters.

The water temperatures recorded on the survey days September 3 & 4, 2002, ranged from 54° to 60° Fahrenheit. Air temperatures ranged from 48° to 72° Fahrenheit. This is a good water temperature 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 17% of the total length of this survey, riffles 18%, and pools 27%. The pools are relatively shallow, with only 21 of the 67 (31.3%) 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

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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.

Forty-seven of the 66 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixteen of the pool tail-outs had embeddedness ratings of 3 or 4. Two of the pool tail-outs had a rating of 5, which is considered unsuitable 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 Butler Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-seven of the 66 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 35. The shelter rating in the flatwater habitats was 12. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in nearly all habitat types. Additionally, large 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 96%. 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 90% and 92.1%, 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) Butler 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) Where feasible, design and engineer pool enhancement structures to increase the number

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of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

- 4) 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.
- 5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

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 the confluence with Hollow Tree Creek. Channel type is an F4.
- 15' Tributary enters on right bank. Dry at the time of the survey.
- 1,769' Log debris accumulation (LDA), 5' high x 23' wide x 15' long, retaining sediment.
- 1,790' Electrofishing site # 1.
- 2,797' LDA, 7' high x 40' wide x 40' long, retaining sediment.
- 3,802' LDA, 8' high x 26' wide x 30' long, retaining sediment.
- 4,428' LDA, 20' high x 40' wide x 40' long, retaining sediment.
- 5,426' Tributary enters from right bank. Dry at the time of the survey.
- 5,734' Tributary enters from left bank with a water temperature of 54° F at the time of survey. This creek was habitat typed on 9/5/02. See report for unnamed tributary to Butler Creek.
- 5,808' LDA, 6' high x 9' wide x 34' long, retaining sediment.
Electrofishing site #2.
- 5,823' LDA, 6' high x 40' wide x 25' long, retaining sediment.
- 6,278' Electrofishing site #3.

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6,846' LDA, 6' high x 9' wide x 6' long, retaining sediment.

6,974' LDA, 6' high x 27' wide x 15' long, retaining sediment.

7,531' End of survey due to lack of fish and numerous LDA's.

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] | |