STREAM INVENTORY REPORT

# Burger Creek

## INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Burger Creek to assess habitat conditions for anadromous salmonids. The 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 Burger Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Burger 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.

## WATERSHED OVERVIEW

Burger Creek is tributary to the Eel River, located in Mendocino County, California. Burger Creek's legal description at the confluence with the Eel River is T22N R14W S36. Its location is 39°43'26" N. latitude and 123°21'51" W. longitude. Burger Creek is a third order stream and has approximately 16.1 miles of blue line stream according to the USGS Dos Rios and Laytonville 7.5 minute quadrangles. Burger Creek drains a watershed of approximately 18.3 square miles. Summer base runoff is approximately 1.5 cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 1,080 feet at the mouth of the creek to 2,400 feet in the headwater areas. Mixed hardwood and mixed conifer forests dominate the watershed. The watershed is privately owned, and is managed for rural residential subdivision. Vehicle access exists via the Dos Rios Road from Laytonville to the railroad tracks. Foot access is available by walking approximately a quarter mile north along the railroad tracks to the mouth of Burger Creek.

## METHODS

The habitat inventory conducted in Burger Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Pacific Coast Fisheries Wetlands and Wildlife Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Burger Creek personnel were trained in May, 1995, by Scott Downie and Ruth Goodfield. This inventory was conducted by a two-person team.

## 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 Burger 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 standard flow measuring equipment, if available. In some cases flows are estimated. Flows should also be measured or estimated at major tributary confluences.

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.

3. Temperatures:

Both water and air temperatures are measured and recorded at each tenth unit typed. 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". Burger 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were measured for mean width, mean depth, and maximum depth (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Burger 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), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having 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 Burger 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.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Burger 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. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results were recorded.

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 Burger Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) 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 was estimated and recorded.

## BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, or 3)

electrofishing. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes: 25.4, 12.5, 4.7, 2.37, and 0.85 mm (*Stream Substrate Quality for Salmonids: Guidelines for Sampling, Processing, and Analysis*, Valentine, 1995).

## DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat7.3, 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 these 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 Burger 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
- 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 10 to July 26, 1995, was conducted by Ray Bevitori and Dylan Brown (PCFWWRA). The total length of the stream surveyed was 34,875 feet with an additional 1,156 feet of side channel.

Flows were not measured on Burger Creek.

Burger Creek is a B2 channel type for the first 22,530 feet of stream reach surveyed. B2 channels are moderate gradient (4-10%), moderately entrenched streams with predominantly boulder substrate and stable stream banks. The remaining 12,345 feet of stream surveyed is classified as an F3 channel type. F3 channels are low gradient, well entrenched stream with predominantly cobble substrate.

Water temperatures ranged from 62 to 80° Fahrenheit. Air temperatures ranged from 59 to 88° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37%, pools 37%, and flatwater types 26% (Graph 1). Flatwater habitat types made up 35% of the total survey **length**, riffles 34%, and pools 31% (Graph 2).

Thirteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 21%; mid-channel pools, 18%; and runs, 14% (Graph 3). By percent total **length**, step-runs made up 22%, low gradient riffles 21%, and mid-channel pools 17%.

Two hundred and three pools were identified (Table 3). Main channel pools were most often encountered at 58% and comprised 67% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat

types. Depth is an indicator of pool quality. One hundred and ninety-seven of the 203 pools (97%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 64 pool tail-outs measured, zero had a value of 1; 10 had a value of 2 (16%); 19 had a value of 3 (76%); and five had a value of 4 (8%). On this scale, a value of 1 is the best for fisheries (Graph 6).

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. Pool habitat types had the highest shelter rating at 36. Riffle habitats followed with a rating of 17 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 52, and main channel pools rated 31 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 8 of the 16 low gradient riffles measured (50%). Large cobble was the next most frequently observed dominant substrate type and occurred in 25% of the low gradient riffles (Graph 8).

The mean percent canopy for the stream reach surveyed was 59%. The mean percentages of deciduous and coniferous trees were 75% and 25%, respectively. Graph 9 describes the canopy in Burger Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 56%. The mean percent left bank vegetated was 57%. The dominant elements composing the structure of the stream banks consisted of 20.6% bedrock, 40% boulder, 38.2% cobble/gravel, and 1.2% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 19% of the units surveyed. Additionally, 55% of the units surveyed had deciduous trees as the dominant vegetation type, and 13.5% had coniferous trees as the dominant vegetation, including down trees, logs, and root

wads (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Ocular observation from the streambanks was conducted throughout the survey. Steelhead fry and juveniles to approximately 14" in length were observed during the survey period.

## GRAVEL SAMPLING RESULTS

No gravel samples were taken on Burger Creek.

## DISCUSSION

Burger Creek is a B2 channel type for the first 22,530 feet of stream surveyed and an F3 for the remaining 12,345 feet. The suitability of B2 channel types for fish habitat improvement structures is excellent for low and medium stage weirs, single and opposing wing deflectors, and bank cover. F3 channel types are well suited for bank-placed boulders, and single and opposing wing deflectors. F3 channels are considered fair for low stage weirs, boulder clusters, channel constrictors, and log cover structures.

Water temperatures recorded on the survey days July 10 to July 26, 1995 ranged from 62° Fahrenheit to 80° Fahrenheit. Air temperatures ranged from 59° Fahrenheit to 88° Fahrenheit. This is a poor water regime for salmonids. The warmer water temperatures, if sustained, are above the threshold stress level for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 35% of the total **length** of this survey, riffles 34%, and pools 31%. The pools are relatively deep, with 133 of the 203 pools having a maximum depth greater than 3 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total 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.

Twenty-four of the 64 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In Burger Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 36. The shelter rating in the flatwater habitats was substantially lower at 16. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock ledges contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

Eight of the 16 low gradient riffles measured had boulders as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy for the stream was 59%. This is a relatively moderate percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

The percentage of right and left bank covered with vegetation was moderate at 56% and 57%, 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) Burger Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Burger Creek, as well as

upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, more biological sampling is also required.

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 and in some areas the material is at hand.

4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 11,443', should then be treated to reduce the amount of fine sediments entering the stream.

5) Increase the canopy on Burger Creek by planting willow, alder, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the upper surveyed portion of the stream, and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

## PROBLEM SITES 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 Eel River. Channel type is a B2 for the first 22,530' of stream surveyed.

2681' Railroad car bridge crosses creek.

1151' Old road fords streambed.

Burger Creek

| | |
|---|---|
| 2328' | Small spring enters from right bank (RB). |
| 2511' | Small spring enters from RB. |
| 2903' | Spring enters from RB. |
| 2991' | Evidence of cattle loafing in the streambed. |
| 8450' | Site of old bridge - now a jeep trail. |
| 9646' | Tributary enters from RB. |
| 11443' | Slide on RB - approximately 50' high X 100' wide. |
| 11733' | Slide on left bank (LB) - approximately 110' high X 80' wide. |
| 13192' | Small spring enters from RB. |
| 14158' | Small slide on LB - approximately 70' high X 25' wide. |
| 14594' | Bridge crosses stream - in good shape. |
| 15160' | One Eyed Creek enters from LB. Water is 62°F. |
| 15892' | Plunge pool with 10-foot drop - probable fish barrier. |
| 17671' | Tributary enters from LB - water temperature in tributary is 58°F. |
| 18285' | Slide on RB - approximately 200' high X 110' wide. |
| 18921' | Slide on LB - approximately 200' high X 100' wide. |
| 22530' | Channel type changes from a B2 to an F3 for the remaining 12,345' of survey. |
| 22636' | Confluence with Bear Pen Canyon Creek. Dos Rios Road bridge crosses stream. Juvenile SHRT observed. |
| 23607' | Slide on LB - approximately 90' high X 110' wide. |
| 24639' | Evidence of cattle loafing in the creek. |

Burger Creek

25070' Slide on LB - approximately 80' high X 160' wide. Trees from slide are laying across the creek.

28547' Foot bridge crosses creek. Evidence of vehicles fording the stream.

31963' Spring enters from RB.

33339' Fence is stretched across the creek.

34827' Burger Creek forks. Survey continues up the South fork.

34875' Steel culvert laying in the middle of the creek. Flow has disappeared. End of Survey.

# LEVEL III and LEVEL IV HABITAT TYPE KEY

| HABITAT TYPE | LETTER | NUMBER |
|---|---|---|
| **RIFFLE** | | |
| Low Gradient Riffle | [LGR] | 1.1 |
| High Gradient Riffle | [HGR] | 1.2 |
| **CASCADE** | | |
| Cascade | [CAS] | 2.1 |
| Bedrock Sheet | [BRS] | 2.2 |
| **FLATWATER** | | |
| Pocket Water | [POW] | 3.1 |
| Glide | [GLD] | 3.2 |
| Run | [RUN] | 3.3 |
| Step Run | [SRN] | 3.4 |
| Edgewater | [EDW] | 3.5 |
| **MAIN CHANNEL POOLS** | | |
| Trench Pool | [TRP] | 4.1 |
| Mid-Channel Pool | [MCP] | 4.2 |
| Channel Confluence Pool | [CCP] | 4.3 |
| Step Pool | [STP] | 4.4 |
| **SCOUR POOLS** | | |
| Corner Pool | [CRP] | 5.1 |
| Lateral Scour Pool - Log Enhanced | [LSL] | 5.2 |
| Lateral Scour Pool - Root Wad Enhanced | [LSR] | 5.3 |
| Lateral Scour Pool - Bedrock Formed | [LSBk] | 5.4 |
| Lateral Scour Pool - Boulder Formed | [LSBo] | 5.5 |
| Plunge Pool | [PLP] | 5.6 |

**BACKWATER POOLS**

| | | |
|---|---|---|
| Secondary Channel Pool | [SCP] | 6.1 |
| Backwater Pool - Boulder Formed | [BPB] | 6.2 |
| Backwater Pool - Root Wad Formed | [BPR] | 6.3 |
| Backwater Pool - Log Formed | [BPL] | 6.4 |
| Dammed Pool | [DPL] | 6.5 |