STREAM INVENTORY REPORT

BURNS CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Burns Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Burns 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

Burns Creek is tributary to Bull Creek, tributary to the South Fork Eel River River, tributary to the Eel River, tributary to the Pacific Ocean, located in Humboldt County, California. Burns Creek's legal description at the confluence with Bull Creek is T02S R01E S02. This location is at 40°19′18″ north latitude and 124°02′02″west longitude. Burns Creek is a second order stream and has approximately 1.3 miles of blue line stream according to the USGS Bull Creek 7.5 minute quadrangle. Burns Creek drains a watershed of approximately 1.8 square miles. Elevations range from about 460 feet at the mouth of the creek to 2,680 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the State of California and is managed as part of Humboldt Redwoods State Park. Vehicle access exists from Highway 101 at Dyerville, via the Bull Creek-Mattole Road. From it, upper Bull Creek Road (which has a park controlled locked gate) provides access. Burns Creek is located about 0.7 miles south of the locked gate. Subsequent to this survey, the upper Bull Creek Road was removed as part of a road decommissioning project. Currently, to access Burns Creek, enter Bull Creek at Cuneo Creek. Then, walk up Bull Creek until you reach the confluence with Burns Creek.

METHODS

The habitat inventory conducted in Burns Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The AmeriCorps Watershed Stewards Project (WSP) 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

Burns Creek

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, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further 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 Burns 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.

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 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". Burns 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 sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 Burns 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, 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 Burns 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 Burns 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 Burns 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Burns Creek fish presence was observed from the stream banks. 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 Burns Creek include:

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

Burns Creek

- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in the pool tail outs
- 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 October 27 and November 3, 1998, was conducted by J. Wooster and M. Anderson (WSP). The total length of the stream surveyed was 3,674 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.25 cfs on November 3, 1998.

Burns Creek is an A2 channel type for the entire 3,674 feet of stream reach surveyed. A2 channels are steep, narrow, cascading, step-pool gravel channeled streams showing high energy/debris transport associated with depositional soils.

Water temperatures taken during the survey period ranged from 51° to 55° F. Air temperatures ranged from 56° to 61° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 51% riffle units, 36% flatwater units, and 13% pool units (Graph 1). Based on total length of Level II habitat types there were 56% riffle units, 41% flatwater units, and 3% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run, 36%; cascade, 22%; and bedrock sheet, 20% (Graph 3). Based on percent total length, step run made up 41%, bedrock sheet 21%, and cascade 20%.

A total of eight pools were identified (Table 3). Scour pools were most frequently encountered at 62% and comprised 66% 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. Three of the 8 pools (37.5%) had a depth of two feet or greater (Graph 5). The depth of cobble embeddedness was estimated at pool tail-outs. Of the eight pool tail-outs

measured, one had a value of 1 (12.5%); four had a value of 2 (50.0%); two had a value of 3 (25.0%); none had a value of 4 and one had a value of 5 (12.5%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning.

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 20, flatwater habitat types had a mean shelter rating of 19, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 30. Main channel pools had a mean shelter rating of 15 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Small cobble and boulder were the dominant substrates observed, each accounting for 4 of the 8 pool tail-outs measured (50%). (Graph 8).

The mean percent canopy density for the stream reach surveyed was 49%. The mean percentages of deciduous and coniferous trees were 82% and 18%, respectively. Graph 9 describes the canopy in Burns Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 62%. The mean percent left bank vegetated was 55%. The dominant elements composing the structure of the stream banks consisted of 54.2% boulder and 45.8% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 92% of the units surveyed. Additionally, none of the units had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological inventory was conducted on Burns Creek. However, juvenile salmonids were observed from the stream bank by the survey team.

DISCUSSION

Burns Creek is an A2 channel type for the entire 3,674 feet of stream surveyed. The A2 channel type is high energy with stable stream banks and poor gravel retention capabilities. Streams with an A2 channel type are generally not suitable for fish habitat improvement structures.
The water temperatures recorded on the survey days October 27 and November 3, 1998, ranged

from 51° to 55° F. Air temperatures ranged from 56° to 61° F. This is an good water temperature range for salmonids. However, 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 41% of the total length of this survey, riffles 56%, and pools 3%. The pools are relatively shallow, with only 3 of the 8 (37.5%) pools having a maximum depth greater than 2 feet. 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. Primary pools only comprise 1% of the total length of stream habitat surveyed.

One of the eight (12.5%) pool tail-outs measured had an embeddedness rating of 1, 50% had a rating of 2, 25% had ratings of 3 or 4, and 12.5% had a rating of 5 and was 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.

The mean shelter rating for pools was 25. The shelter rating in the flatwater habitats was 19. 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, small woody debris contributes 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.

Four of the eight (50%) pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

The mean percent canopy density for the stream was 49%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 62% and 55%, 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) Burns Creek should be managed as an anadromous, natural production stream.

2) Increase the canopy and bank vegetation on Burns Creek by planting willow, alder,

redwood, and Douglas fir along the stream where shade canopy and bank vegetation 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.

3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

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'	Survey begins at the confluence with Bull Creek. Channel type is an A2.
173'	Left bank failure, 45' high x 400' long.
384'	Right bank failure, 45' high x 385' long.
769'	Left bank failure, 40' high x 200' long.
828'	Right bank failure, 30' high x 280' long.
892'	Young-of-the-year steelhead rainbow trout observed.
908'	Culvert on the left bank has rip rap at the base.
1,108'	A bridge located at the top of the unit is 20' wide.
1,935'	Right bank failure, 150' high x 80' long.
2,196'	Right bank failure, 150' high x 240' long.
2,867'	Right bank failure, 80' high x 110' long. Slide is depositing small woody debris and adding complex cover to the creek.
3,674'	End of survey. A cascade located above the pool is 150' long with a slope of 20%. No fish have been observed since the bridge.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. *California salmonid stream habitat restoration manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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