STREAM INVENTORY REPORT

Hulls Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Hulls 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 Hulls 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 Hulls 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

Hulls Creek is tributary to the North Fork Eel River, located in Trinity and Mendocino counties, California. Hulls Creek's legal description at the confluence with North Fork Eel River is T05S R08E S34. Its location is 40°00'15" N. latitude and 123°16'21" W. longitude. Hulls Creek is a third order stream and has approximately 28.8 miles of blue line stream according to the USGS Long Ridge, Mina, Bluenose Ridge, Leech Lake Mountain, and Black Rock Mountain 7.5 minute quadrangles. Hulls Creek drains a watershed of approximately 55.8 square miles. Summer base runoff is approximately 1.0 cubic feet per second (cfs) at the mouth. Elevations range from 1,240 feet at the mouth of the creek to about 4,800 feet in the headwater areas. Oak/grasslands dominates the watershed, with pine, Douglas fir and mixed hardwood forests as a secondary component. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Bald Mountain Road to a locked gate owned by Louisiana Pacific Corporation and other private landowners.

METHODS

The habitat inventory conducted in Hulls Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and

Watershed Stewards Project/AmeriCorps members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Hulls Creek personnel were trained in May, 1995, by Scott Downie, DFG. 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 Hulls 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". Hulls 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 Hulls 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 Hulls 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 Hulls 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 Hulls 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.

Biological inventory was conducted in Hulls Creek to document the fish species composition and distribution. Three sites were electrofished in Hulls Creek using one Smith-Root Model 12 electrofisher. A single electrofishing pass was made at each site. Fish from each site were counted by species and age class and returned to the stream.

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 Habitat 7.2, 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 Lotus 1,2,3. Graphics developed for Hulls 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 August 1 to September 20, 1995, was conducted by Greg Mullins and Frank Humphrey (Pacific Coast Fisheries Wetlands and Wildlife Restoration Association). The total length of the stream surveyed was 88,424 feet with an additional 3,815 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.0 cfs on August 30, 1995.

Hulls Creek

Hulls Creek is an F3 channel type for the first 22,024 feet of stream reach surveyed. F3 channels are low gradient (<2%), entrenched and meandering streams, with predominantly cobble substrate. The second channel type is a B2 for 33,138 feet. B2 channels are moderately entrenched, moderate gradient (2-4%), riffle dominated streams with predominantly boulder substrate. The stream then becomes a B4 channel type for the next 23,864 feet of survey. B4 types are similar to the B2 channel, but with gravel as the dominant substrate material. The last 9,398 feet of the stream surveyed is classified as a B2 channel.

Water temperatures ranged from 57 to 82° Fahrenheit. Air temperatures ranged from 54 to 90° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, flatwater made up 38%, riffle types 30%, and pools 27% (Graph 1). Flatwater habitat types made up 45% of the total survey **length**, pools, 27%, and riffles 17% (Graph 2).

Nineteen Level IV habitat types were identified. These data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were runs, 20%; step-runs, 16%; and low-gradient riffles, 13% (Graph 3). By percent total **length**, step-runs made up 28%, runs 15%, and dewatered habitat 11%.

Four hundred thirty-four pools were identified (Table 3). Scour pools were most often encountered at 51% and comprised 46% 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. Three hundred seventy-eight of the 434 pools (87%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 371 pool tail-outs measured, 30 had a value of 1 (8%); 181 had a value of 2 (49%); 160 had a value of 3 (43%); and one had a value of 4 (0%). 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 82. Riffle habitats followed with a rating of 73 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 116, and scour pools rated 84 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 97 of the 207 low gradient riffles measured (47%). Gravel was the next most frequently observed dominant substrate type and occurred in 12% of the low gradient riffles (Graph 8).

Fifty-seven percent of the survey reach lacked canopy. Of the 43% of the stream covered with canopy, 75% was composed of deciduous trees, and 25% was composed of coniferous trees. Graph 9 describes the canopy in Hulls Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 9%. The mean percent left bank vegetated was also 9%. The dominant elements composing the structure of the stream banks consisted of 5.7% bedrock, 29.4% boulder, 2.7% cobble/gravel, and 0.95% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 12% of the units surveyed. Additionally, 17% of the units surveyed had deciduous trees as the dominant vegetation type, and 1% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on August 29 and 30, 1995, in Hulls Creek. The units were sampled by Greg Mullins, Frank Humphrey, Ruth Goodfield, and Scott Downie (PCFWWRA and DF&G).

The first site sampled was habitat unit 010, a low gradient riffle approximately 441 feet from the confluence with North Fork Eel River. This site had an area of 3,848 sq ft and a volume of 3,078 cu ft. The unit yielded eight steelhead, ranging from 44 to 129mm FL; 45 California roach, ranging from 36 to 61mm FL; and two suckers, 38 and 33mm FL.

The second site included habitat units 165 and 166, a run and mid-channel pool located approximately 16,169 feet above the creek mouth. This site had an area of 5,811 sq ft and a volume of 7554 cu ft. The site yielded 51 steelhead, ranging from 50 to 171mm FL; 17 suckers, ranging from 42 to 54mm FL; and 32

California roach, ranging from 26 to 100mm FL.

The third site sampled was habitat unit 557, a run located approximately 34,471 feet above the creek mouth. The site had an area of 2,064 sq ft and a volume of 1,857 cu ft. The site yielded 13 steelhead, ranging from 61 to 155mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Hulls Creek.

DISCUSSION

Hulls Creek is an F3 channel type for the first 22,024 feet of stream surveyed, and a B2 type for the next 33,138 feet. The third channel type is a B4 for 23,864 feet, and a B2 for the remaining 9,398 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is good for bank-placed boulders and wing deflectors, fair for low-stage weirs and log cover structures, and poor for medium stage weirs. B2 and B4 channel types are excellent for low-stage plunge weirs, boulder clusters, wing deflectors and log cover structures. They are also good for medium-stage plunge weirs.

The water temperatures recorded on the survey days August 1 to September 20, 1995, ranged from 54° to 82° Fahrenheit. Air temperatures ranged from 54° to 90° Fahrenheit. This is a very warm water temperature range for salmonids. These high temperatures, if sustained, is at or near the threshold stress level for salmonids. In Hulls Creek, temperatures should be monitored throughout the warm summer months in various reaches, and more extensive biological sampling should be conducted.

Flatwater habitat types comprised 45% of the total **length** of this survey, riffles 17%, and pools 27%. The pools are relatively deep, with 113 of the 434 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.

One hundred sixty-one of the 371 pool tail-outs measured had

embeddedness ratings of 3 or 4. Only 30 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 Hulls 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 high with a rating of 82. The shelter rating in the flatwater habitats was slightly lower at 55. A pool shelter rating of approximately 100 is desirable. The relatively large amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, terrestrial vegetation 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.

Ninety-seven of the 207 low gradient riffles had boulders as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy for the stream was 27%. This is a relatively low 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 low at 9% for both banks. 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) Hulls Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Hulls Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) Increase the canopy on Hulls Creek by planting willow, alder, redwood, 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.

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 19,160', should then be treated to reduce the amount of fine sediments entering the stream.

5) 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.

6) Due to the high gradient in some sections of Hulls Creek, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in much of the stream and offer 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 North Fork Eel River. Channel type is an F3 for the first 22,024 feet of stream survey.

441' Low-water ford crosses stream. Foot bridge just upstream.

441' Bioinventory site #1.

2421' Road on right bank (LB) allows access to creek.

13357' Casoose Creek enters from RB.

15336' Horse Canyon Creek enters from RB.

16169' Horse Canyon 4X4 road crosses stream.

16169' Bioinventory site #2.

19160' Large slide on RB, approximately 1,650 feet in length.

20652' Hell's Canyon begins; a high-gradient boulder rough,

approximately 1,200 feet in length. Possible access problem for anadromous species.

21382'Slide on left bank (LB), approximately 560 feet in length.

21447'Waterfall, approximately 12 feet high. Possible barrier to migration.

21519'Waterfall, approximately 8 feet high. Possible barrier to migration.

21563'Gradient is greater than 25% for the next 225 feet.

22024'Reach #2 begins. Channel type changes from an F3 to a B2 for the next 33,138 feet of stream survey.

25557'Waterfall, approximately 8 feet high. Possible barrier to migration.

25696'Waterfall, approximately 9 feet high. Possible barrier to migration.

26005'Small blue-goo slide on RB.

26119'Creek runs beneath large boulders for approximately 200 feet. Possible barrier to migration.

26335'Small blue-goo slide on LB.

29022'Old stream ford to Buck Mountain - currently washed-out.

30678'Crooked Gulch enters from LB.

34471' Bioinventory site #3.

34904'Bridge crosses creek at lower Buck Mountain crossing.

35522'Lost Cabin Creek enters from LB.

48024'Who-Who Creek enters from RB.

50110'Small tributary enters from LB.

50406'Main bridge to Buck Mountain crosses creek (to Richard Wilson's ranch-house).

52752'Hulls Valley Creek enters from LB.

53052'Ford crosses stream.

Hulls Creek

55162'Reach #3 begins. Channel type is a B4 for the next 23,864 feet of stream survey.

61704'Small tributary enters from LB.

72678' Young-of-the-year (YOY) steelhead/rainbow trout observed

73553'Dry tributary enters from LB.

78972'Dry tributary enters from RB.

79026' Reach #4 begins. Channel type is a B2 for the remaining 9,398 feet of stream survey.

83008' Very large blue-goo slide on LB, approximately 300 feet in length.

85059' Dry tributary enters from RB.

85422' Waterfall, approximately 9 feet high. Possible barrier to migration.

88328' Small tributary enters from LB.

88424' Flow becoming intermittent. END OF SURVEY.

SEE NEXT PAGE (PAGE DOWN) FOR HABITAT TYPE KEY

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

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Dammed Pool	[DPL]	6.5