STREAM INVENTORY REPORT

JAMES CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on James Creek. 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 James 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 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

James Creek is tributary to the North Fork Big River, tributary to the Big River, located in Mendocino County, California (Map 1). James Creek's legal description at the confluence with North Fork Big River is T17N R15W S11. Its location is 39E20'41" north latitude and 123E30'52" west longitude. James Creek is a second order stream and has approximately 2.3 miles of blue line stream according to the USGS Burbeck, Comptche, Greenough Ridge, and Northspur 7.5 minute quadrangles. James Creek drains a watershed of approximately 7.1 square miles. Elevations range from about 440 feet at the mouth of the creek to 1600 feet in the headwater areas. Redwood and Douglas fir forests are the dominant forest type, although tan oak occurs as a visible component of the stands. The watershed is primarily owned by the Jackson Demonstration State Forest and is managed by the California Department of Forestry and Fire Protection for timber production. Vehicle access exists via a Jackson State Forest access road from Highway 20.

METHODS

The habitat inventory conducted in James 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 (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 (Hopelain, 1994). 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. 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 James 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". James 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 (Hopelain, 1995). 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 James 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 James 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 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 James 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 James 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 James Creek fish presence was observed from the stream banks, and three sites were electrofished using one 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 James 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

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HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of October 24, 25, 28, 29 and 30, 1996, was conducted by Mark Dombrowski and Shelly Dunn (CCC), and Julie Brush (WSP/AmeriCorps). The total length of the stream surveyed was 23,326 feet with an additional 568 feet of side channel.

Flow was measured to be 1.3 cfs, approximately 250 feet from the confluence with North Fork Big River on October 25, 1996. A second flow of 0.21 cfs was measured on October 31, 1996, ten feet above the confluence with North Fork James Creek. Flows were measured with a Marsh-McBirney Model 2000 flowmeter.

James Creek is an F3 channel type for the entire 23,326 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble dominant substrates.

Water temperatures taken during the survey period ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 45 to 59 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 29% flatwater units, 31% riffle units, 39% pool units, and 1% was dry (Graph 1). Based on total **length** of Level II habitat types there were 44% flatwater units, 28% pool units, and 28% riffle units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 30%; mid-channel pools, 23%; and step runs, 16% (Graph 3). Based on percent total **length**, step runs made up 35%, low gradient riffles 26%, and mid-channel pools 17%.

A total of 252 pools were identified (Table 3). Main channel pools were most frequently encountered at 60% and comprised 64% 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. Of the 252 pools, 108 had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 250 pool tail-outs, 46 (18%) had a value of 1; 57 (23%) had a value of 2; 82 (33%) had a value of 3; 50 (20%) had a value of 4; and 15 (6%) had a value 5, and were considered not suitable for spawning (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. Pool habitat types had a mean shelter rating of 14, and riffle habitats had a mean shelter rating of 8 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 17. Scour pools had a mean shelter rating of 14 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in James Creek. Undercut banks are the next most common cover type. Large and small woody debris are lacking in all habitat types. Graph 7 describes the pool cover in James Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 85% of the low gradient riffles measured. Small cobble was the next most frequently observed dominant substrate type and occurred in 8% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 63%. The mean percentages of deciduous and coniferous trees were 54% and 46%, respectively. Graph 9 describes the canopy in James Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 85.1%. The mean percent left bank vegetated was 89.7%. The dominant elements composing the structure of the stream banks consisted of 7% bedrock, 9% boulder, 47% cobble/gravel, and 37% sand/silt/clay (Graph 10). Deciduous and coniferous trees were the dominant vegetation types. Both vegetation types were observed in approximately 30% of the units surveyed. Additionally, 19% of the units surveyed had grass as the dominant vegetation type, and 15% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on October 24 and 25, 1996, in James Creek. The sites were sampled by Craig Mesman (CCC) and Dionne Wrights (WSP/AmeriCorps).

The first site sampled included habitat units 144-147, approximately 6,030 feet from the confluence with the North Fork Big River. The site yielded a total of 24 steelhead, 1 sculpin, and 2 salamanders.

The second site included habitat units 392-399, approximately 15,281 feet from the confluence. The site yielded a total of 9 steelhead, 3 sculpin, and 1 salamander.

The third site sampled included habitat units 517-526, approximately 19,975 feet from the confluence. The site yielded a total of 6 steelhead.

DISCUSSION

James Creek is an F3 channel type for the entire 23,326 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank

placed boulders, and single and opposing wing deflectors; fair for low stage weirs, boulder clusters, channel constrictors and log cover, and poor for medium stage weirs.

The water temperatures recorded on the survey days October 24 through 30, 1996, ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 45 to 59 degrees Fahrenheit. This is a good 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 44% of the total **length** of this survey, riffles 28%, and pools 28%. The pools are relatively deep, with 108 of the 252 (42.9%) 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.

Of the 250 pool tail-outs measured, 147 (58.8%) had embeddedness ratings of 3, 4 or 5. Only 46 (18.4%) had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In James 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 14. The shelter rating in the flatwater habitats was slightly lower at 3. 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, undercut banks contribute a small amount. Log and root wad cover structure 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.

Of the 26 low gradient riffles measured 93% had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 63%. This is a moderate percentage of canopy. 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 85.1% and 89.7%, 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.

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RECOMMENDATIONS

1) James Creek should be managed as an anadromous, natural production stream.

2) 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 locally available.

3) 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.

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) Increase the canopy on James Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels.

6) 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.

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 began at confluence with North Fork Big River. Channel type is an F3.

77' Culvert, 18' wide x 14' high x 75' long.

328' Highway 20 bridge crossing.

2,290' Fourteen foot overall change in elevation for step pool.

3,184' Right bank tributary, dry.

3,366' Left bank erosion, 150' high x 20' wide.

5,673' Log debris accumulation (LDA), 5' long x 8' wide x 5' high. Not retaining gravel, not a barrier.

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6,030' First electrofishing site.

6,587' Arch culvert 9' high x 22' wide from Road 100.

7,028' Right bank tributary (culvert).

8,645' Left bank tributary not accessible to salmonids.

9,911' LDA, 7' high x 10' wide x 20' long. Not a barrier.

10,804' Left bank tributary, dry.

11,325' Right bank tributary, dry.

11,688' Left bank tributary, <0.1 cfs. Not accessible to salmonids.

11,826' LDA, 20' wide x 7' high x 12' long. Not a barrier.

12,864' LDA, 7' high x 15' wide x 40' long. Not a barrier.

14,953' Failed gabion structure.

14,975' Failed gabion structure.

15,054' Confluence with North Fork James Creek.

15,281' Second electrofishing site.

16,274' Left bank tributary, <0.1 cfs.

16,509' LDA, 22' wide x 8' high x 33' long.

17,551' Left bank erosion 40' high x 20' wide.

17,586' LDA, 18' wide x 10' high x 16' long. Retaining 3.5' of sediment.

17,724' LDA, 7' high x 12' long x 12' wide. Retaining 6' of sediment.

17,816' Right bank tributary, <0.1 cfs.

18,372' LDA, 6' high x 10' wide x 12' long. Retaining 4' of sediment.

18,517' Left bank erosion, 25' wide x 25' high.

18,808'	LDA, 4' high x 12' wide x 15' long. Not retaining gravel.
19,975'	Third electrofishing site.
20,726'	LDA, 4' high x 10' long x 8' wide.
21,074'	Right bank tributary.
22,292'	Three foot diameter culvert. Road washed out. Creek goes through the road.
22,478'	Left bank tributary, dry.
22,918'	LDA, 10' long x 10' wide x 3' high. Retaining 5' of sediment. Possible barrier.
23,266'	Right bank tributary, <0.1 cfs.
23,271'	LDA, 50' long x 20' wide x 7' high. Possible barrier.
23,326'	End of survey. Surveyors walked 300' above the unit and no fish were seen. Flow is less than 0.1 cfs and there is a greater than 5% gradient increase.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, 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
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5