STREAM INVENTORY REPORT

Jewett Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Jewett 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 Jewett Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Jewett 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

Jewett Creek is tributary to Bear Creek, tributary to the Mattole River, located in Humboldt County, California. Jewett Creek's legal description at the confluence with the Mattole River is T04S R01E S12. Its location is 40°07'43" North latitude and 124°00'51" West longitude. Jewett Creek is a first order stream and has approximately 2.8 miles of ephemeral stream according to the USGS Honeydew 7.5 minute quadrangle. Jewett Creek drains a watershed of approximately 2.3 square miles. Summer base flow is approximately 1.0 cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 640 feet at the mouth of the creek to 1,200 feet in the headwater areas. Grassland and mixed hardwood dominate the watershed. The watershed is entirely privately owned and is managed for rangeland, timber production and rural residence. Vehicle access exists via Wilder Ridge Road to the community of Ettersburg. From Ettersburg drive south approximately 0.7 miles on a private dirt road to the mouth of Jewett Creek.

METHODS

The habitat inventory conducted in Jewett Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Pacific Coast Fisheries, Wildlife, and Wetlands Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California

Department of Fish and Game (DFG). Jewett Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. 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 Jewett 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". Jewett 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 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 Jewett 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 Jewett 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*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Jewett 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 Jewett 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. In Jewett Creek fish presence was observed from the stream banks, and one site was electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9-inch diameter 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 (Valentine, 1995).

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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 Lotus 1,2,3. Graphics developed for Jewett 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 16, 17, and 18, 1996, was conducted by Dave Smith and Ray Bevitori (PCFWWRA). The total length of the stream surveyed was 14,415 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.3 cfs on July 8, 1996.

Jewett Creek is an F4 channel type for the entire 14,415 feet of stream reach 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 55 to 62 degrees Fahrenheit. Air temperatures ranged from 55 to 75

degrees Fahrenheit.
Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39% riffle units, 35% flatwater units, and 25% pool units (Graph 1). Based on total **length** of Level II habitat types there were 50% flatwater units, 33% riffle units, and 16% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 37%; mid-channel pools, 20%; and step runs, 19% (Graph 3). Based on percent total **length**, step runs made up 38%, low gradient riffles 33%, and mid-channel pools 14%.

A total of seventy pools were identified (Table 3). Main channel pools were most frequently encountered at 83% and comprised 85% 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. Thirty-one of the 70 pools (44%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 70 pool tail-outs measured, 1 had a value of 1 (2%); 3 had a value of 2 (4%); 63 had a value of 3 (90%); and none had a value of 4 (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 47, and flatwater habitats had a mean shelter rating of 28 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 90. Main channel pools had a mean shelter rating of 38 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in three of the seven low gradient riffles measured (43%). Sand was also the most frequently observed dominant substrate type and occurred in 43% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and coniferous trees were

98% and 2%, respectively. Graph 9 describes the canopy in Jewett Creek.
For the stream reach surveyed, the mean percent right bank vegetated was 67%. The mean percent left bank vegetated was 65%. The dominant elements composing the structure of the stream banks consisted of 16.9% bedrock, 6-4% boulder, 15.7% cobble/gravel, and 61.0% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 12% of the units surveyed. Additionally, 78.5% of the units surveyed had deciduous trees as the dominant vegetation type, and 1.2% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on July 8, 1996, in Jewett Creek. The sites were sampled by Ruth Goodfield (DFG) and Kelley Garrett (WSP/AmeriCorps).

The site sampled included habitat units 002-003, a riffle/pool sequence approximately 99 feet from the confluence with Bear Creek. This site had an area of 576 sq ft and a volume of 461 cu ft. The site yielded seven young-of-the-year (YOY) steelhead rainbow trout.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Jewett Creek.

DISCUSSION

Jewett Creek is an F4 channel type for the entire 14,415 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is good for bank-placed boulders; fair for low-stage weirs, single and opposing wing-deflectors, and log cover; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days July 16, 17, and 18, 1996, ranged from 55 to 62 degrees Fahrenheit. Air temperatures ranged from 55 to 75 degrees Fahrenheit. This is a good water temperature range for salmonids, and Jewett Creek seems to have temperatures favorable to 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.

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Flatwater habitat types comprised 50% of the total **length** of this survey, riffles 33%, and pools 16%. The pools are relatively deep, with 31 of the 70 (44%) 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 for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Sixty-three of the 70 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one 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 Jewett 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 47. The shelter rating in the flatwater habitats was slightly lower at 28. 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, large woody debris 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.

Four of the seven low gradient riffles had sand or large cobble as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy density for the stream was 90%. This is a relatively high percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

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The percentage of right and left bank covered with vegetation was moderate at 67% and 65%, 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) Jewett Creek should be managed as an anadromous, natural production stream.

2) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 8780', should then be treated to reduce the amount of fine sediments entering the stream.

3) There are at least two sections where the stream is being impacted from cattle trampling the riparian zone and defecating in the water. Alternatives should be explored with the grazier and developed if possible.

4) There are several log debris accumulations present on Jewett Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

5) 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.

6) 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.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and measured from the beginning of the survey reach.

0' Begin survey at confluence with Bear Creek. Channel type is an F4 for the entire 14,415' of stream surveyed.

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99'	Bioinventory site; 7/8/96.
241'	Evidence of cattle browsing and defecating in creek.
825'	Large debris accumulation (LDA) in stream channel. Not a barrier to salmonids.
1024'	Evidence of cattle browsing and defecating in the creek.
1686'	LDA in stream channel - causing lateral erosion on both banks. Not a barrier to salmonids.
3120'	Spring on right bank (RB). Temperature of spring is 56°F.
3741'	Spring on left bank (LB). Temperature of spring is 57°F.
5073'	Spring on LB - 60°F.
7214'	Small tributary enters from LB. Temperature is 56°F.
8780'	Large slope failure on right bank; 60'L x 80'H. Left bank is also failing; 120'L x 60'H.
9015'	Right bank slope failure; approximately 210' long.
10194'	Spring on RB - 57°F.
11631'	Bedrock sheet - channel gradient increases 7' within a distance of 30' (23%). Possible barrier for salmonids.
12340'	LDA in stream channel; approximately 100'L x 70'W x 8'H. Gravel is being retained behind LDA.
14162'	Slope failure on RB; approximately 70'L x 50'H.
14362'	Spring on RB - 56°F.
14415'	Stream gradient is steep (10%). Probably too steep for salmonids. End of survey.

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.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, 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