STREAM INVENTORY REPORT

Oil Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Oil Creek. The survey began at the confluence with the Eel River and extended upstream 0.83 miles.

The Oil Creek 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 Oil 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 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

Oil Creek is tributary to the Eel River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Oil Creek's legal description at the confluence with the Eel River is T02N R01W S27. Its location is 40.5271 north latitude and 124.161056 west longitude. Oil Creek is a first order stream and has approximately 2.1 miles of blue line stream according to the USGS Fortuna 7.5 minute quadrangle. Oil Creek drains a watershed of approximately 1.74 square miles. Elevations range from about 36 feet at the mouth of the creek to 1,477 feet in the headwater areas. Redwood/Douglas fir forest and grassland dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Blue Slide Road.

METHODS

The habitat inventory conducted in Oil 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.

Oil Creek

SAMPLING STRATEGY

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 (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 Oil 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 a Marsh-McBirney Model 2000 flow meter.

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. Channel characteristics are measured using a hand level, hip chain, tape measure, and a stadia rod.

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 within one foot of the water surface.

Oil Creek

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". Oil 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a modified spherical densiometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Oil 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, bedrock, 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 Oil 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 Oil Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the upstream end of the unit 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 Oil 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 (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Oil Creek. In addition, twelve sites were electrofished using a 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 Oil Creek include:

- Riffle, flatwater, pool habitats by percent occurrence

Oil Creek

- 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
- 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 June 25, 26, 27 and 28, 2002, was conducted by Morguine Flynn-Sousa and Anne Jeffrey (WSP). The total length of the stream surveyed was 4,403 feet.

Stream flow was not measured on Oil Creek.

Oil Creek is a G3 channel type for the first 2,276 feet of the stream surveyed; then an F6 for the remaining 2,217 feet. G3 channel types are entrenched gully step-pool and low width/depth ratio on moderate gradient. F6 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio; silt/clay channel.

Water temperatures taken during the survey period ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 67 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 34% riffle units, 26% flatwater units, and 39% pool units (Graph 1). Based on total length of Level II habitat types there were 28% riffle units, 31% flatwater units, and 42% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 34%; mid-channel pool, 29%; and run, 24% (Graph 3). Based on percent total length, mid-channel pools made up 30%, runs 29%, and low gradient riffles 29%.

A total of 63 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 75%, and comprised 76% of the total length of all pools (Graph 4).

Oil Creek

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-three of the 63 pools (52%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 63 pool tail-outs measured, 46 had a value of 1 (73%); 9 had a value of 2 (14%); 8 had a value of 5 (13%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 8 pool tail-outs that had an embeddedness value of 5 were as follows: 62.5% bedrock and 37.5% silt/clay/sand or small gravel.

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 8, flatwater habitat types had a mean shelter rating of 16, and pool habitats had a mean shelter rating of 44 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 90. Scour pools had a mean shelter rating of 48 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris and boulders are the dominant cover types in Oil Creek. Graph 7 describes the pool cover in Oil Creek. Large woody debris is the dominant pool cover type followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 71% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 14%.

The mean percent canopy density for the surveyed length of Oil Creek was 94%. The mean percentages of deciduous and coniferous trees were 65% and 35%, respectively. Graph 9 describes the mean percent canopy in Oil Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 3% bedrock and 97% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 51.5% of the units surveyed. Additionally, 25.8% of the units surveyed had coniferous trees as the dominant vegetation type. (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twelve sites were electrofished for species composition and distribution in Oil Creek on October 30, 2002. Water temperatures taken during the electrofishing period ranged from 48 to 49 degrees Fahrenheit. Air temperatures ranged from 48 to 54 degrees Fahrenheit. The sites were sampled by Trevor Tollefson (DFG), Elizabeth Pope and Lindsay Selvaggio (WSP) and Lori Schmitz, California Conservation Corps Technical Advisor.

Oil Creek

The first site sampled included habitat unit 0019, a mid-channel pool approximately 402 feet from the confluence with the Eel River. The site yielded six young-of-the-year (YOY) steelhead and 4 YOY coho.

The second site included habitat unit 0021, a mid-channel pool located approximately 493 feet above the creek mouth. The site yielded 26 YOY steelhead.

The third site sampled included habitat unit 0039, a plunge pool located approximately 1,006 feet above the creek mouth. The site yielded six YOY and one 1+ steelhead.

The fourth site sampled included habitat unit 0067, a mid-channel pool located approximately 1,708 feet above the creek mouth. The site yielded six YOY steelhead, one 1+ steelhead and one 2+ steelhead.

The fifth site sampled included habitat unit 0077, a mid-channel pool located approximately 1,958 feet above the creek mouth. The site yielded one 1+ steelhead.

The sixth site sampled included habitat unit 0090, a lateral scour root wad enhanced pool located approximately 2,340 feet above the creek mouth. The site yielded no fish.

The seventh site sampled included habitat unit 0101, a dam pool located approximately 2,672 feet above the creek mouth. The site yielded one 1+ steelhead.

The eighth site sampled included habitat unit 0111, a mid-channel pool located approximately 3,055 feet above the creek mouth. The site yielded one 1+ steelhead.

The ninth site sampled included habitat unit 0129, a mid-channel pool located approximately 3,617 feet above the creek mouth. The site yielded two YOY steelhead.

The tenth site sampled included habitat unit 0145, a mid-channel pool located approximately 3,948 feet above the creek mouth. The site yielded two YOY steelhead and one 2+ steelhead.

The eleventh site sampled included habitat unit 0160, a plunge pool located approximately 4,382 feet above the creek mouth. The site yielded three YOY steelhead.

The twelfth site sampled was 75 feet above end of survey. The site yielded four YOY steelhead.

Oil Creek

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	Steelhead 1+	Steelhead 2+	Coho YOY
10/30/02	1	402	0019	4.2	1	G3	6	0	0	4
10/30/02	2	493	0021	4.2	1	G3	26	0	0	0
10/30/02	3	1,006	0039	5.6	1	G3	6	1	0	0
10/30/02	4	1,708	0067	4.2	1	G3	6	1	1	0
10/30/02	5	1,958	0077	4.2	1	G3	0	1	0	0
10/30/02	6	2,340	0090	5.3	2	F6	0	0	0	0
10/30/02	7	2,672	0101	6.5	2	F6	0	1	0	0
10/30/02	8	3,055	0111	4.2	2	F6	0	1	0	0
10/30/02	9	3,617	0129	4.2	2	F6	2	0	0	0
10/30/02	10	3,948	0145	4.2	2	F6	2	0	1	0
10/30/02	11	4,382	0160	6.5	2	F6	3	0	0	0
10/30/02	12	4,478	Not surveyed	Not surveyed	Not surveyed	Not surveyed	4	0	0	0

DISCUSSION

Oil Creek is a G3 channel type for the first 2,276 feet of stream surveyed and an F6 channel type for the remaining 2,127 feet. The suitability of G3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors and log cover; and poor for boulder clusters and single wing-deflectors. The

suitability of F6 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; and fair for plunge weirs, boulder clusters, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days June 25, 26, 27 and 28, 2002 ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 67 degrees Fahrenheit. This is a suitable water temperature 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 31% of the total length of this survey, riffles 28%, and pools 42%. Thirty-three of the 63 (52.4%) pools have 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.

Fifty-five of the 63 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. Eight of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Four of the 63 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or small gravel. The remainder of pool tails valued at 5 were dominated by boulders. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Fifty-four of the 63 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 44. The shelter rating in the flatwater habitats was 16. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, boulders contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log and rootwad cover structures provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. Reach 1 had a canopy density of 94% while Reach 2 had canopy density of 95%. In general, re-vegetation projects are considered when canopy density is less than 80%. The percentage of right and left bank covered with vegetation was 100.

Oil Creek

RECOMMENDATIONS

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

2) 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.

3) The biological sampling conducted found coho salmon below but not above the concrete box culvert that runs under Blue Slide Road. Survey the culvert for fish passage.

4) Increase woody cover in the pools and flatwater habitat units. Adding high quality complexity with woody cover is desirable.

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' Begin survey at confluence with the Eel River. Channel type is G3.

367' Log debris accumulation (LDA) 12' long x 14' wide x 4' high.

402' Concrete box culvert under Blue Slide Road. Electrofishing site #1.

493' Electrofishing site #2.

1,006' Electrofishing site #3.

1,368' LDA, 11' long x 43' wide x 7.5' high.

1,708' Electrofishing site #4.

1,757' LDA, 10' long x 24' wide x 7.5' high.

1,815' LDA, 33' long x 40' wide x 11' high.

1,958' Electrofishing site #5.

2,276' LDA, 20' long x 22' wide x 8' high.
2,299' Channel type changes from G3 to F6.

2,340’ Electrofishing site #6.

2,672’ LDA, 19’ long x 12’ wide x 7’ high. Electrofishing site #7.

2,834’ Unnamed tributary enters from right bank.

2,900’ Unnamed tributary enters from right bank.

3,055’ Electrofishing site #8.

3,493’ LDA, 17’ long x 16’ wide x 7’ high.

3,617’ Electrofishing site #9.

3,948’ Electrofishing site #10.

4,303’ LDA, 11’ long x 12’ wide x 5.5’ high.

4,382’ Electrofishing site #11.

4,403’ End of Survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. California Salmonid Stream Habitat Restoration Manual, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	