STREAM INVENTORY REPORT

OIL CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Oil 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 Oil 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 being conducted on Oil Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon, and steelhead trout.

WATERSHED OVERVIEW

Oil Creek is a tributary to the Upper North Fork Mattole River, a tributary to the Mattole River, located in Humboldt County, California (Figure 1). Oil Creek's legal description at the confluence with the Upper North Fork Mattole River is T2S R1E S19. Its location is 40°17'27" latitude and 124°06'36" longitude. Oil Creek is a third order stream. The total length of blue line stream, according to the USGS Bull Creek and Buckeye Mountain quadrangles is 3.6 miles.

Oil Creek drains a watershed of approximately 9.4 square miles. Douglas fir forest and oak grassland dominate the watershed. The watershed is privately owned and is managed for timber production and cattle grazing. In the summer of 1991, a timber harvest plan was carried out in this watershed. This was in response to portions of the left bank of the headwaters being subjected to extensive forest fires in the summer of 1990. The road system in this watershed was upgraded under the Department of Fish and Game and the Department of Forestry. This was due to anticipated and projected sediment yield increases from burned areas of the watershed. Vehicle access exists from U.S. Highway 101, via the Bull Creek/Mattole Road. Follow the Bull Creek Road for approximately 12 miles to the top of the ridge. At the ridge, a private road heads northwest for seven miles and leads to Rainbow Ranch. From Rainbow Ranch, a private road heads west and leads

to Oil Creek, 2.5 miles from Rainbow Ranch.

METHODS

The habitat inventory conducted in Oil Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The inventory was conducted by a two person team. The California Conservation Corps (CCC), Technical Advisors conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Oil Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie.

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 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 was conducted according to the classification system developed by David Rosgen (1985). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing operations and follows a standard form to record measurements and observations. There are four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded. Temperatures are taken in fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing used 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. Channel measurements were accomplished using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the pool tail crest at each pool habitat unit was measured at 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 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), 76 - 100% (value 4).

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 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

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 Oil Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

9. Bank Composition:

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 in both the right and left banks was selected from a list of eight options on 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, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Oil Creek to document the salmonid species composition and distribution. One site was electrofished in Oil Creek using one Smith Root Model 12 electrofisher. Fish from the site was counted by species, measured, and returned to the stream.

DATA ANALYSIS:

Data from the habitat inventory form is entered into Habtype, a dBASE 3+ data entry program developed by the Department and Fish

and Game. From Habtype, the data is summarized by Habtab a dBASE 4.1 program in development by DFG.

The Habtab program produces the following summary 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 Oil 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

HABITAT INVENTORY RESULTS:

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

The habitat inventory of August 5, 6, 7, and 14, 1991, was conducted by Shea Monroe and Brian Humphrey (CCC). The total length of stream surveyed was 16,574 feet, with an additional 773 feet of side channel.

This section of Oil Creek has three channel types: from the mouth to 1,953 an A4; next 10,584 feet a B2; next 460 feet an A4; and the upper 3,577 feet an A2. A4 channels are steep (4-10% gradient), very well confined streams, with unstable fine-grained stream banks. B2 channels are moderate gradient (1.0-2.5%), moderately confined, with stable streambanks. A2 channels are steep, very well confined boulder channels.

Oil Creek

Water temperatures ranged from 61 to 76 degrees fahrenheit. Air temperatures ranged from 64 to 86 degrees fahrenheit.

Table 1 summarizes the riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles make up 35.9%, flatwater types make up 34.1%, and pools make up 29.3% (Graph 1). Flatwater habitat types make up 36.9% of the total **length**, riffles make up 45.7%, and pools make up 16.9% (Graph 2).

Sixteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 24.4%; mid-channel pools, 19.3%; step runs, 15.9%; and high gradient riffles, 11.1% (Graph 3). By percent total **length**, low gradient riffles made up 34.0%, step runs made up 25.1%, high gradient riffles made up 10.2%, and mid-channel pools made up 9.6%.
Table 3 summarizes the pool habitat types. Main channel pools were most often encountered at 79.8% and comprised 80.5% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. The maximum depth for 42 of the 79 pools (53.2%) was two feet or greater (Graph 3).

The depth of the embeddedness was estimated for 70 of the pool tail-outs. Of the 70 pool tail outs, 5 had a value of 1 (7.1%), 15 had a value of 2 (21.4%), 25 had a value of 3 (35.7%), and 25 had a value of 4 (35.7%). On this scale, a value of one 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 29.2 (Table 1). For the pool types, the main channel pools had the highest mean shelter rating at 30.2, and scour pools had a mean shelter rating of 25.3 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Oil Creek and are extensive. Graph 7 describes the pool cover in Oil Creek.

Table 6 is a summary of the dominant substrate by habitat type. Gravel was the estimated dominant substrate in 75.8% of the low gradient riffles (Graph 8).

The mean percent canopy was 8.2%. The canopy was composed of

81.7% deciduous trees and 18.3% coniferous trees. Graph 9 summarizes the percent canopy.

Table 2 summarizes mean percent right and left bank vegetated by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 56.4%. The mean percent left bank vegetated was 50.0%. The stream bank composition consisted of 32.7% bedrock, 3.0% boulder, 5.6% cobble/gravel, 8.6% bare soil, 23.4% grass, 1.9% brush, 13.4% deciduous trees, and 11.5% coniferous trees (Graph 10).

BIOLOGICAL INVENTORY RESULTS

One electrofishing site was sampled on Oil Creek, on August 27, 1991. The site sampled was habitat unit 072, a step pool, approximately 5,110 feet from the confluence of the Upper North Fork Mattole River. The unit had an area of 448 sq ft and a volume of 403.2 cubic feet. The combined total of fish for three passes was 217 steelhead, ranging from 37 to 169 mm fork length, and 4 Pacific lamprey ammocetes, ranging from 70 to 91 mm.

GRAVEL SAMPLING RESULTS

McNeil sediment samples were taken by Greg Moody, Scott Downie, and Gary Flosi at the electrofishing sample site on August 27, 1991. The four samples from the site on Oil Creek had a combined mean of 41% for fine sediments <4.7mm. The combined mean of sediments <0.86mm in the samples is 19%. These are slightly above threshold levels for optimum salmonid egg and embryo incubation. Table 7 describes the percentage of fines in the McNeil sediment samples by sample and particle size. The last column describes the total percentage of all fines <4.7mm.

DISCUSSION

Oil Creek has three channel types: A2, A4, and B2. The high energy and steep gradients of the A2 and A4 channel types are generally not suitable for instream enhancement structures. The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 10,584 feet of this type of channel in Oil Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days August 5-14,

1991, ranged from 61° F to 76° F. Air temperatures ranged from 64° F to 86° F. These temperatures, if sustained, are above the threshold stress level for salmonids. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 36.9% of the total **length** of this survey, riffles 45.7%, and pools 16.9%. The pools are relatively deep with 42 of the 79 pools having a maximum depth greater than 2 feet. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, 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.

Fifty of the 70 pool tail-outs measured had embeddedness ratings of 3 or 4. Five had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Oil Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was low with a rating of 29.2. The shelter rating in the flatwater habitats was slightly lower at 22.8. However, 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. 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.

Sixty of the 66 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the survey reach was only 8%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures

are desirable in Oil Creek. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) 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.

3) Temperatures in this section of Oil 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.

4) 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.

5) There are several log debris accumulations present on Oil Creek that are retaining fine sediment. The modification of these debris accumulations is desirable, but must be done over time and in a manner that will not release an overabundance of fine sediment into the system.

6) 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.

PROBLEM SITES AND LANDMARKS

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

0' Begin survey at the confluence with the Upper North Fork Mattole River. Reach #1 is an A4 channel type.

61' Tributary enters from the left bank.

Oil Creek

339' Bedrock spring enters from the right bank.

560' Log and debris accumulation (LDA) 15' wide x 10' long x 15' high, retaining gravel and cobble.

641' LDA with opening of 3' is retaining gravel.

673' Spring enters from the right bank.

844' Bedrock spring enters from the left bank.

1097' 2.5' high plunge/cascade.

1190' Small LDA created by boulder is retaining gravel.

1281' 4' bedrock plunge.

1502' Tributary enters from the right bank.

1752' Large LDA on the left bank, is forcing stream to the right bank.

1917' Small tributary enters from the left bank.

1953' Channel type changes from an A4 to a B2 (reach #2).

3058' Tributary enters from the left bank.

3409' Tributary enters from the right bank--20' waterfall.

4940' Bank erosion 300' high x 200' long.

5443' High gradient riffle with a 3-4' drop in gradient.

5524' Small tributary enters from the right bank.

6041' Right bank erosion 150' high x 150' long.

6264' Small tributary enters from the left bank.

6540' Right bank erosion 150' long x 80' high.

6762' Left bank slide 180' long x 120' high.

8191' Tributary enters from the left bank.

Oil Creek

8442' Right bank erosion 85' long x 70' high.

8469' Small tributary enters from the right bank.

8812' Stable right bank slide 100' high x 160' long.

9142' Right bank slide 200' high x 120' long.

9396' Right bank slide 200' high x 200' long.

9461' Braided channel due to fines from slide.

9659' Stable slide area 100' high x 250' long.

10034' Stream banks have been degraded by cows.

10497' Left bank "blue goo" slide 70' high x 100' long.

10932' "Blue goo" slide 100' high x 125' long.

11209' Stable slide 70' high x 100' long.

11273' Tributary enters from the left bank.

12120' Green Gulch Creek.

12537' Channel type changes from a B2 to an A4 (reach #3).

12748' LDA is retaining gravel and cobble.

12918' Bedrock slide 10' high x 60' long.

12997' Channel type changes from an A4 to an A2 (reach #4).

13534' Stable right bank slide 80' high x 100' long.

13614' Blue slide on the left bank 50' high x 100' long is depositing fines into the channel.

13683' Devil's Creek enters from the right bank.

14116' Braided channel has been created by a left bank slump/slide, depositing fines into the channel.

14745' Blue goo slide 100' long x 70' high is depositing large amounts of fines.

Oil Creek

14846' Right bank slump 100' long x 50' high.

15719' Tributary enters from the right bank.

16128' Three LDAs 30' apart, which are 15' wide x 5' long x 3' high.

16563' "Blue goo" slump 200' long x 60' high is depositing fines into the channel.

16574' End of survey.