STREAM INVENTORY REPORT
KILER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Kiler 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 Kiler 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 Kiler 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

Kiler Creek is tributary to the Eel River, located in Humboldt County, California (Figure 1). Kiler Creek's legal description at the confluence with the Eel River is T1N R1E S20. Its location is 40°27'33" N. latitude and 124°05'35" W. longitude. Kiler Creek is a first order stream and has approximately 2.2 miles of blue line stream, according to the USGS Scotia 7.5 minute quadrangle. Kiler Creek drains a watershed of approximately 1.6 square miles. Summer base runoff is approximately 1.0 cfs at the mouth. Elevations range from about 80 feet at the mouth of the creek to 2,500 feet in the headwater areas. Second growth redwood forest dominates the watershed. The watershed is owned by the Pacific Lumber Company and is managed for timber production. Vehicle access exists from U.S. Highway 101 via the Stafford Road exit, approximately two miles west along the Pacific Lumber Company haul road.

METHODS

The habitat inventory conducted in Kiler Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and contract seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Kiler Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. 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 Kiler 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 by David Rosgen (1985). 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 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. Both 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 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". Kiler 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. 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 Kiler 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 Kiler 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 Kiler Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Kiler 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 Kiler Creek to document the fish species composition and distribution. Three sites were electrofished in Kiler Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were

counted by species, measured, and returned to the stream.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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 Kiler 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
- Fish species by fork length

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 3, 4, 8, and 9, 1992, was conducted by Brian Humphrey and Judah Sanders (CCC and contract seasonal). The total length of the stream surveyed was 5,206 feet, with an additional 431 feet of side channel.

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Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at .97 cfs on June 3, 1992.

This section of Kiler Creek has three channel types: from the mouth to 1,063 feet an A3; next 935 feet a B2; next 1,763 feet an A3; next 262 feet a B1; and the upper 1,183 feet an A3. A3 channels are steep (4-10% gradient), very well confined streams, with unstable stream banks. B2 channels are moderate gradient (1.0-2.5%), moderately confined, cobble/gravel channels. B1 channels are moderate gradient (2.5-4.0%), moderately confined, boulder/cobble channels.

Water temperatures ranged from 54 to 63 degrees fahrenheit. Air temperatures ranged from 60 to 79 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 41.5%, pools 39.2%, and flatwater 17.6% (Graph 1). Riffle habitat types made up 56.1% of the total survey **length**, flatwater 25.1%, and pools 17.6% (Graph 2).

Thirteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were high gradient riffles, 27.8%; plunge pools, 14.8%; and mid-channel pools, 11.9% (Graph 3). By percent total **length**, high gradient riffles made up 33.6%, step runs 20.6%, and low gradient riffles 19.5%.

Sixty-nine pools were identified (Table 3). Scour pools were most often encountered at 53.6%, and comprised 47.2% 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. Fifty-four of the 69 pools (78%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 59 pool tail-outs measured, 2 had a value of 1 (3.4%); 39 had a value of 2 (66.1%); 16 had a value of 3 (27.1%); and 2 had a value of 4 (3.4%). 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 32.1. Flatwater habitats followed with a rating of 16.5 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 37.6, and main channel pools rated 25.8 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Kiler Creek and are extensive. Large woody debris is the next most common cover type. Graph 7 describes the pool cover in Kiler Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 8 of the 19 low gradient riffles (42.1%). Gravel was also dominant in 42.1% of the low gradient riffles (Graph 8).

Twenty-two percent of the survey reach lacked shade canopy. Of the 78% of the stream covered with canopy, 61% was composed of deciduous trees, and 39% was composed of coniferous trees. Graph 9 describes the canopy in Kiler Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 73.4%. The mean percent left bank vegetated was 70.5%. The dominant elements composing the structure of the stream banks consisted of 0.6% bedrock, 1.4% boulder, 6.8% cobble/gravel, 1.2% bare soil, 12.2% grass, 4.8% brush. Additionally, 37.5% of the banks were covered with deciduous trees, and 35.5% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on June 10, 1992, in Kiler Creek. The units were sampled by Brian Humphrey and Judah Sanders (CCC and contract seasonal). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 030, a mid-channel pool, approximately 1,054 feet from the confluence with the Eel River. This site had an area of 64 sq ft, and a volume of 39 cu ft. The unit yielded 15 steelhead, ranging from 30 to 78 mm FL.

The second site was habitat unit 121, a plunge pool, located approximately 4,083 feet above the creek mouth. This site had an area of 39 sq ft, and a volume of 27 cu ft. Six steelhead were sampled. They ranged from 35 to 55 mm FL.

The third site sampled was a plunge pool, located approximately 5,226 feet above the creek mouth. This site is 20 feet above the end of the habitat inventory survey. No fish were found.

DISCUSSION

Kiler Creek has three channel types: A3, B1, and B2. The high energy and steep gradient of the A3 channel type is generally not suitable for instream enhancement structures. Both B1 and B2 channels are excellent for many types of low and medium stage instream enhancement structures. There are 1,112 feet of these types of channels in Kiler Creek. Many site specific projects can be designed within these channel types, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days June 3-9, 1992 ranged from 54° F to 63° F. Air temperatures ranged from 60° F to 79° F. This is a very good water temperature regime for salmonids. However, to make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Riffle habitat types comprised 56.1% of the total **length** of this survey, flatwater 25.1%, and pools 17.6%. The pools are relatively shallow with only 15 of the 69 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 the high stream energy of the A3 channel type.

Eighteen of the 59 pool tail-outs measured had embeddedness ratings of 3 or 4. Only two had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat.

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The mean shelter rating for pools was moderate with a rating of 32.1. The shelter rating in the flatwater habitats was lower at 16.5. 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. Additionally, large woody debris 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.

Sixteen of the 19 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 stream was 78%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.
In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Kiler 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders and large woody debris. Adding high quality complexity with additional woody cover is desirable.

4) 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.

5) There are several log debris accumulations present on Kiler 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.

6) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers 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 the distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with the Eel River. Channel type is an A3 (reach #1).
750'	Young-of-the-year steelhead (YOY) observed.
1063'	Logging road bridge 11' wide x 47' long x 8' high. Channel type changes from an A3 to a B2 (reach #2).
1998'	Channel type changes from a B2 to an A3 (reach #3).
3517'	Log and debris accumulation (LDA) with steep gradient, causing a cascade.
3565'	LDA 35' wide x 15' long x 8' high.
3761'	Channel type changes from a A3 to an B1 (reach #4).
3929'	Small woody debris accumulation, retaining gravel 2' high.
3961'	Right bank erosion 45' high x 40' long, contributing sediment into the channel.
4023'	Right bank erosion 15' high x 30' long, contributing trees into the channel. Channel changes from an B1 to to an A3 (Reach #5).

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4062'	LDA causing 7' high plunge. Left bank erosion 60' high x 50' long.
4152'	YOY observed.
4269'	LDA causing 5' high plunge.
4374'	Left cut bank 15' high x 40' long.
4443'	Plunge 3.5' high.
4648'	Gradient is approximately 20% for the next 100'.
4842'	LDA causing 3.5' high plunge.
4920'	LDA causing 4.5' high plunge.
5032'	Tributary enters from the right bank. Plunge 4' high over log.
5190'	YOY observed.
5206'	LDA with 7' high plunge. No fish observed above this LDA. Very steep gradient with log jams for the next 100'. End of survey.

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