STREAM INVENTORY REPORT

Elk Creek

INTRODUCTION

A California Department of Fish and Game (CDFG) fisheries inventory was conducted in summer 2001 on Elk Creek and its fish-bearing tributaries.

The stream inventory consists of a habitat inventory and biological inventory. The objective of the habitat inventory is to assess the amount and quality of habitat available to anadromous salmonids; the objective of the biological inventory is to document the presence and distribution of juvenile salmonid species. This report presents the inventory results and recommends options for potential habitat improvements for coho salmon and steelhead trout. The recommendations are based on target habitat values suitable for salmonids in California's north coast streams.

Elk Creek was surveyed by B. Finlayson and J. Nelson of the CDFG from July 23 to 25 1973 (California Department of Fish and Game 1973). It was noted in their report that no coho were observed, but were known to exist in Elk Creek; steelhead were observed. A 1976 CDFG survey of Elk Creek from the South Fork to the headwaters found steelhead and coho, with coho confined to the lower reaches (California Department of Fish and Game 1976). Sampling of Elk Creek by Louisiana Pacific Corporation at 19 stations from 1994- to 1996 found coho on only one occasion (Mendocino Redwood Co. Unpublished data). Recent downstream migrant trapping surveys conducted by Mendocino Redwood Company (2001) found no current coho populations in the Elk Creek watershed.

WATERSHED OVERVIEW

Elk Creek, located in Mendocino County, California, is a tributary to the Pacific Ocean. Elk Creek's legal description at the confluence with the Pacific Ocean is T14NR17WS2. Its mouth is located at 39°6’ 7” north latitude and 123°42’2” west longitude. Elk Creek is a third order stream and has approximately 12.6 miles of blue line stream according to the USGS Mallo Pass and Cold Springs 7.5 minute quadrangle maps. Elk Creek drains a watershed of approximately 20 square miles. Elevations range from about 0 feet at the mouth to 1280 feet in the headwater areas. Mixed deciduous forest dominates the watershed. The watershed is privately owned, with Mendocino Redwood Company owning the middle and upper reaches, and the lower reaches in smaller privately held parcels. Present land uses in the watershed are mainly timber production and hunting. Vehicle access exists via private logging road about 1 mile north of the mouth.

METHODS

The habitat inventory conducted followed the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi *et al.*, 1998). Two-person teams of CDFG Scientific Aids and AmeriCorps Watershed Stewards Project (WSP) members, trained in standardized habitat inventory methods by CDFG, conducted the field inventory.

HABITAT INVENTORY COMPONENTS

The standardized habitat inventory protocol has nine components:

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:

As 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:

Water and air temperatures are taken in degrees Fahrenheit at the middle of the habitat unit, within one foot of the water surface.

4. Habitat Unit Type and Dimensions:

Habitat units are numbered sequentially and assigned a habitat type selected from a standard list of 24 habitat types (Appendix 1). Dewatered units are labeled "dry". The length of a described habitat unit must be equal to or greater than the streams mean wetted width. Habitat unit dimensions of mean length, mean width, mean depth, and maximum depth are measured. In pool units, maximum depth at the pool tail crest is also measured. Measurements are taken to the nearest 1/10 foot using hip chains, measuring tapes, or stadia rods.

5. Embeddedness:

Embeddedness is defined as the percent of a cobble that is surrounded or buried by fine sediment. The values are 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 is assigned to substrates deemed unsuitable for spawning due to inappropriate substrate particle size (e.g. bedrock) or other considerations. On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail crest is not suitable for spawning. Embeddedness, estimated by eye, is taken in pool habitat units at the pool tail crest.

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 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. A standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) is assigned according to the complexity of the cover. Thus shelter rating can range from 0-300.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. Dominant and sub-dominant substrate elements in the habitat unit are estimated by eye using a list of seven size classes. In addition, the dominant substrate composing the pool tail outs is recorded in pool habitat units.

8. Canopy:

Canopy density relates to the amount of stream shaded from the sun. Stream canopy density in the habitat unit is estimated using a handheld spherical densiometer. In addition, the area of canopy is estimated by eye into percentages of coniferous and deciduous trees.

9. Streambank Substrate and Vegetation:

Streambank substrate ranges from bedrock to silt/clay/sand, and may be covered with vegetation that enhances streambank stability. The dominant substrate type and the dominant vegetation type of both the right and left banks of the habitat unit are estimated by eye and recorded. Additionally, the percent of each bank covered by vegetation is estimated by eye and recorded.

SAMPLING STRATEGY

The sampling protocol calls for partial sampling of all habitat units within the survey reach and full sampling in approximately 10% of the habitat units. All habitat units are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat types encountered for the first time are fully sampled for all parameters on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for full sampling. Canopy density is recorded for every third unit, in addition to every fully described unit, giving an approximate 30% sub-sample. Air temperature, water temperature, and time of day are recorded at every tenth habitat unit (once per field form page).

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence is observed from the stream banks during the habitat inventory survey. Additionally, selected sites are sampled using a Smith-Root Model 12-B electrofisher. The sampling techniques are described in the *California Salmonid Stream Habitat Restoration Manual*. Since Mendocino Redwood Company sampled Elk Creek fish populations

extensively in 2001, with steelhead but no coho found, no electrofishing presence-absence survey was conducted pursuant to this stream inventory.

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, CDFG. This program processes and summarizes the data, and produces the following tables:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of mean percent cover by habitat type
- Summary of dominant substrates by habitat type
- Summary of mean percent vegetative cover for entire stream
- Fish habitat inventory data summary
- Summary of streambank substrate and vegetation, and pool tail crest cobble embeddedness
- Mean percent of shelter cover types for entire stream

A standard set of graphics is produced from the tables for selected habitat parameters. Those included in this report are:

- Riffle, flatwater, pool habitats by percent total length
- Total pools by maximum depths
- Embeddedness
- Dominant substrate in the pool tail crests

HABITAT INVENTORY RESULTS

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

Kristi Knechtle and Shiras Corella of CDFG and Josh Carron and Bethany Lourie (WSP/AmeriCorps) conducted the habitat inventory field survey from June 16 thru September 12, 2001. The total length of stream surveyed was 70,643 feet.

Flow measurements were taken in the mainstem of Elk Creek on July 31, 2001. The habitat unit was a run with sand and gravel as the major substrate. The flow was calculated at 3.5 cfs.

Water temperatures taken during the survey period ranged from 55 to 62 degrees Fahrenheit. Air temperatures ranged from 58 to 70 degrees Fahrenheit.

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The two main channel types for Elk Creek were B4 and F4. B4 channels are moderately entrenched, of moderate gradient (2-4%), dominated by riffles, with mainly gravel substrate. F4 channels are entrenched meandering riffle/pool channel on low gradients with high width/depth ratio with mostly gravel substrate.

Based on frequency of occurrence of Level II habitat types there were 14% riffle units, 47% flatwater units, and 39% pool units (Table 1). Based on total length of Level II habitat types there were 11% riffle units, 61% flatwater units, and 28% pool units (Table 1).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools 17%, and runs 17%, step runs 16%, low gradient riffles 13%, glides 13%, and lateral scour bedrock pools at 10%. Based on percent total length, step runs comprised 37%, runs 14%, mid-channel pools 13%, and low gradient riffles 11%.

A total of 327 pools were identified (Table 3). Scour pools were most frequently encountered at 53% and comprised 49% of the total length of all pools. Of the 327 pools, 287 (88%) had a depth of two feet or greater (Table 4).

A primary pool is defined as a pool with a maximum depth of at least 3 feet, occupies at least half the width of the low flow channel, and is as long as the low flow channel width. In Elk Creek, primary pools totaled 13,714 feet, or 19% of the total stream surveyed.

Of the 327 pool tail crest embeddedness estimates, 63 had a value of 1 (19%), 133 had a value of 2 (40%), 89 had a value of 3 (27%), 13 had a value of 4 (3%), and 29 had a value of 5 (8%) (Table 8). The 29 pool tail crests with an embeddedness value of 5 were rated unsuitable for spawning due to substrate composed boulder, bedrock, sedimentation, or wood.

Riffle habitat types had a mean shelter rating of 38, flatwater habitat types had a mean shelter rating of 25, and pool habitats had a mean shelter rating of 4 (Table 1). Mid-channel pools, the dominant pool type, had a mean shelter rating of 5 (Table 2).

Cover in Elk Creek is provided mainly by a mix of boulders, terrestrial vegetation, undercut banks, small and large woody debris, and root masses (Table 5). Boulders, bedrock ledges, small and large woody debris, and root masses provided the main cover in pools (Table 10).

Gravel was most commonly the dominant substrate in the main habitat types (Table 6). Of the 11 low gradient riffles fully measured 45% were dominated by gravel, 27% were dominated by large cobble, and 18% were dominated by small cobble. 20 runs were fully measured and 70% of those were dominated by gravel. 75% of the12 glides fully measured were dominated by gravel, and the 7 step runs, 57% were dominated by gravel. Of the 16 mid-channel pools fully measured, 44% were dominated by gravel and 38% dominated by sand. Gravel was the dominant pool tail crest substrate in 271 of the 327 pool units (82%).

The mean percent canopy density for the stream reach surveyed was 88%, with deciduous and coniferous trees comprising 72% and 28%, respectively (Table 7).

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Sand/silt/clay dominated the streambank substrate in 52% of the fully measured units, followed by cobble/gravel dominating in 30% (Table 9). In the fully measured units, right streambanks had a mean vegetative cover of 83%. Left streambanks had a mean vegetative cover of 83% (Table 7). Streambank vegetation was mainly composed of deciduous trees (59%), followed by coniferous trees (36%), brush (1.5%), and grass at (0.5%) (Table 9).

DISCUSSION

There are various channel types throughout Elk Creek, the most dominant being the B4 and F4 channel types. The suitability of B4 channel types for fish habitat improvement structures is: excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing deflectors, and log cover. The suitability of F4 channel types for fish habitat improvement structures is : good for bank placed boulders. Fair for plunge weirs; single and opposing wing deflectors; channel constrictors; and log cover. The F4 channel type is poor for boulder clusters. Numerous locations show evidence that the creek is downcutting through debris slide material, and is thus recovering from past land use practices. This kind of recovery is evident on numerous north coast streams purging themselves of excess sediment.

Water temperatures, for Elk Creek, recorded on the survey days were within the suitable ranges for rearing of coho salmon and steelhead. But since the maximum temperatures recorded (59 and 62 degrees Fahrenheit) are near to the upper limits of suitability, continuous monitoring of temperature throughout the warm season would be needed to verify temperature suitability.

For Elk Creek, flatwater habitat types comprised 47% of the total length of this survey, pools 39%, and riffles 14% (Table 1). Primary pools composed 28% of the total length surveyed. CDFG data indicates that the better coastal coho streams have as much as 40% of their total habitat length in primary pools. Pool enhancement should be considered when primary pools comprise less than that percentage.

The mean shelter ratings for flatwater, riffle, and especially pool habitats for Elk Creek are all much below the desirable rating of 100 (Tables 1 and 2).

The prevalence of gravel (82%) as the dominant pool tail crest substrate is generally considered suitable for spawning salmonids (Graph 8). However, frequencies of embeddedness ratings of 3, 4, or 5 (Table 8) in Elk Creek indicate lower spawning substrate quality due to the presence of fine sediments.

The mean percent canopy density for Elk Creek was 87%.

RECOMMENDATIONS

1) Elk Creek should be managed as an anadromous, natural production stream. If habitat conditions sufficiently recover, consideration should be given to introduction of a compatible strain of coho salmon.

2) Active and potential sediment delivery from roads and other sources in the watershed should be identified, mapped, and quantified. Sources should be treated according to their potential for sediment yield to the stream and its tributaries. This kind of source control will hasten stream recovery from excess sedimentation.

3) Increase in stream wood to improve shelter rating, help sort sediments, and increase the depths of existing pools.

COMMENTS AND LANDMARKS

The following landmarks and site conditions were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
194	Begin Survey about ¼ mile upstream of the Pacific Ocean. Salmonids present.
467	Left bank lined with sandbags about four feet high and 200 feet long. Substrate above the sandbags is silt. Dozens of salmonids present ranging in size from one to five inches.
567	Possible presence of old redd noticed in this unit. Sandbags continue on the left bank.
594	Left bank composition is four foot sandbags. Above the sandbags silt is the dominant substrate.
1011	Salmonids present ranging in size between three and five inches long. 90% of this pool has submerged vegetative cover.
1104	End of unit located under Highway 1 bridge. Canopy taken under the bridge.
1173	Three-inch dead steelhead found in stream channel.
1267	Pool caused by large woody debris (LWD) pile up. Six pieces of LWD over 20 feet long associated with some small woody debris (SWD). Salmonids present in pool.
1343	Undercut bank about three feet deep and about 20 feet long.
1457	Several dozen salmonids noted ranging in size from young-of-the-year (YOY) to five inches long.
1537	Dense submerged vegetation. Marsh-like.

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1784	LWD submerged in channel. Pool possibly created by lateral scour on the LWD. Salmonids present.
2014	Undercut bank on the left bank. Undercut ranges from three to five feet deep for about 15 feet.
2163	LWD pile associated with SWD across stream channel. About 12 feet long and about three to four feet high.
2283	Two 20-foot pieces of LWD in stream channel.
2365	LWD of various sizes in the stream channel.
2478	Undercut bank between one and 3.5 foot undercut about eight feet long.
2565	Salmonids present in the channel. We removed an old car battery from the bottom of the pool.
2806	LWD pile in channel measures 30’ long x 15’ wide x 5’ high. Salmonids present.
3001	Salmonids present.
3152	Tributary from the right bank runs into a pool. Possibly the North Fork of Elk Creek. Salmonids present.
3321	LWD pile on the right bank. Seven pieces of LWD associated with SWD.
3614	LWD in creek has created a six-foot bubble curtain about one foot deep. Also in this unit is a LWD pile about 10 feet high, and 15 feet long. Further up the unit is another LWD pile associated with SWD about 25 feet wide and 15 feet long and 5 feet high. Red-legged frog noted in this unit.
3666	Salmonids present.
3685	Possible eggs in a purple/gray tube like structure. Not sure what type of eggs they are.
3707	LWD pile associated with SWD on the right bank. No measurements taken.
3808	Trees overgrown into the stream on the right bank.
4024	Downed tree on the right bank overgrown into the channel. About 152 feet long.
4161	Salmonids present. 50-foot log stretched across the stream channel.
4343	Downed tree overgrown along the right bank of the pool.

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4491	LWD pile on the right bank containing 10 to 15 logs.
4941	Bedrock wall along the left bank of the pool. Salmonids present.
5551	50 foot logs on the left bank of the pool.
5697	Clusters of LWD associated with SWD span the width of the creek along both the right and left banks.
5764	Downed and dead tree across the channel.
5912	LWD associated with root mass located in the middle of the pool.
5978	S. Corella noted that he thought the water level was lower than the previous week.
6026	Most of this unit is covered by LWD. About 10 logs and large piles and SWD. About 30 feet wide, 20 feet long, and 5 to 7 feet tall.
6077	Five foot undercut bank with associated root mass.
6125	Left bank erosion. About 26 vertical feet of exposed dirt falling into a 20-foot section of the stream.
6152	LWD pile along the right bank. 4 to 5 feet tall, 30 feet long, and about 12 feet deep.
6310	Three to four inch salmonids noted.
6523	Undercut bank about five feet long. One 10-foot log about 2.5 feet in diameter.
7276	Six to eight inch salmonid noted. Substantial undercut bank.
7455	Several salmonids bigger than 4 inches. LWD pile located on the right bank.
7744	LWD pile causes an abrupt slowing of the flow. 6 pieces of LWD associated with some SWD.
7784	Numerous bedrock ledges. Salmonids present.
7961	Three pieces of LWD wide, but not long. Pool forming.
8380	Right bank erosion on exposed clay surface. About 3.5 vertical feet.
8668	Possible redd noted. Two foot undercut bank for 15 feet.
8879	LWD on right bank. Seven pieces associated with SWD.

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9624	Boulders noted in channel. Undercut bank with vegetative cover.
9778	Three pieces of LWD associated with SWD in the middle of the channel.
9955	Salmonids noted.
10494	Five pieces of LWD associated with some SWD.
10632	Submerged LWD along the right bank. Five pieces of LWD exposed. Undercut bank associated with root mass.
11020	Possible boulder enhanced pool. Root mass on the left bank providing substantial cover.
11256	LWD pile on the left bank.
11412	LWD pile in the stream channel. 20 feet wide and 5 feet long.
12244	LWD pile associated with SWD. No measurements taken.
12481	Two types of pools grouped into this unit. First pool is 5.4 and the second pool is a 4.2. LWD pile across the stream channel. About five logs across the channel with LWD piles on both sides of the channel.
12807	Bedrock scour pool. The scour is greater than 60% of the wetted width.
13003	Small bubble curtain created as water falls off of the bedrock.
15043	There is a 5.5 foot undercut bank for about 10 feet. There is also a LWD pile 15 feet long, eight feet wide, and about five feet high.
15614	Several salmonids ranging in size from three to six inches.
15951	River otter in stream about 2 feet long from head to tail.
16141	Small tributary enters on the left bank. Also noted was a four foot long cut bank ranging in depth from one to two feet.
16718	Several three to seven inch salmonids.
17127	Narrow gage rails throughout the wetted channel for about 100 yards. Appear to have been in channel for quite some time.
17654	Undercut bank with a four foot undercut about 20 feet long.
17787	Corrugated metal pipe in the stream about 20 feet long. LWD pile associated with some SWD on the right bank.

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17961	Right bank erosion.
18254	Red-legged frog noted in unit.
18343	Lateral scour from both boulder and LWD on the right bank.
19297	2.5 foot undercut bank for about five feet.
19551	Downed tree with root wad in the stream channel.
19706	Tributary enters on the right bank about half way through the unit.
19871	Pool located on the left bank.
19969	Bedrock scour corner pool on the right bank.
21571	Large logs stacked to buttress the road on the right bank.
21668	Tributary enters on the right bank.
22252	Habitat unit type was not included in the field notes. A six-inch salmonid and red-legged frog were noted.
22555	Undercut bank with about a four-foot undercut that extends about 10 feet. Several two to four inch salmonids.
23769	Seven to eight inch salmonid present. Log weir about 15 to 20 feet long in the stream channel. Creating around a two-foot bubble curtain.
24410	Salmonids present.
25034	Several salmonids present up to five inches long.
25189	Small tributary enters into the stream on the left bank at the end of this unit.
25871	Red-legged frog in unit. Body length about 1.5 inches long.
25927	Narrow gage metal tracks located in stream channel in several units. Some tracks over 20 feet long.
25949	Possible old redd.
26779	Tributary enters on the right bank.
28074	Small tributary enters on the left bank. LWD pile 35 feet long, 6 feet wide, and 6 feet high.

28365	Substantial bubble curtain created by the plunge.
28539	Tributary enters on the right bank. Not accessible to fish. About a 35 foot bedrock cascade.
29168	Tributary enters on the right bank in the middle of this step run.
30081	Channel narrowed by boulders on right and left side of stream.
30561	Left bank erosion about 200 feet into the unit. Erosion has caused trees to fall into the channel.
30854	Pool formed by boulder, but the pool size is greater than 60% of the wetted width so it was categorized as a mid channel pool.
32007	Downed redwood tree in the channel. Fairly recent.
32188	Tributary enters on the right bank.
32298	Several salmonids present. Unit also contained about six feet of bubble curtain.
32577	Several salmonids present. Three pieces of LWD in the channel and right bank.
32991	Foothill yellow legged frog noted along with some salmonids. Left bank erosion about 75 feet long and 35 feet high.
33416	Newly downed redwood tree across channel.
33527	Small tributary enters on the right bank. Log jam at the top of the pool. 40 feet wide, 15 feet high, and 15 feet deep. Water slowly moving through the jam causing slow runs on the side channel.
34107	LWD pile in channel creating pool. 10 feet high and 35 feet wide.
34550	Landslide on left bank piling trees and LWD in the stream channel.
34950	Small tributary enters on the right bank.
35999	Downed tree in channel. Fairly recent.
36044	Boulders on right and left bank creating the mid channel pool.
36609	Small LWD pile on a boulder in the bend of the stream.
37584	Logging road crosses in/through the stream channel and up the other side of the channel.

38137	Substantial tributary on the left bank. Red-legged frog at this location.
38797	Small tributary enters from the right bank. Two large boulders and LWD for the pool.
39983	Several salmonids present some over three inches long.
40547	Left bank is a house-sized boulder.
41375	Pool begins as a mid channel pool then becomes a lateral scour on the right bank.
41578	Tributary enters from the left bank about 110 feet into this unit.
42948	Bank erosion present on the left bank about 20 feet high.
43094	LWD accumulation across the stream channel.
43456	Right bank erosion along bank. Almost no vegetative cover for an area of about 30 feet long and 40 feet high.
44774	Downed bay tree in the stream.
44828	Undercut bank about four feet deep and five feet long.
45171	Downed redwood tree in the channel. Area of erosion on the right bank. Pacific giant salamander noted in unit.
45171	Flow in side channel is very slow, almost stagnant.
45171	50 feet of rushing cable in the stream channel.
45517	Tributary enters on the right bank is almost dry. Foothill yellow legged frog present in unit.
46101	Right bank erosion with no vegetative cover. Pacific giant salamander about 4 inches long.
46529	Single piece of LWD associated with SWD.
46672	Tributary enters on the right bank.
47156	40 feet of left bank erosion.
47677	Salmonids present.
47842	Tributary enters on the left bank.

47893	20 feet of right bank erosion. Steep, exposed silt.
48174	Foothill yellow legged frog.
48610	Undercut bank two feet deep for about 30 feet.
49181	Tributary enters on the left bank. Largest tributary so far. Flagging indicates it is the Mayville Fork. Near the Wilderness Unlimited camp.
49250	80 feet of plastic tubing in the stream not attached to anything.
49701	Salmonids present.
49900	Two-inch PVC pipe running up the side of the hill on the right bank. Possibly up to the Wilderness Unlimited camp.
50369	Salmonids two to three inches long.
50951	Unit small, but has abundant cover. SWD, LWD, bubble curtain, and undercut bank.
51390	Three foot undercut bank.
51468	LWD pile formed the backwater pool.
51657	LWD pile across stream channel.
54232	Left bank erosion. Landslide caused downed trees on the left bank. Estimated landslide of about 40 feet long and 50 feet high.
54245	Cut stumps placed in the stream channel. Three to four stumps associated with LWD and SWD. Left bank erosion continues.
54357	Erosion of right bank causing trees and lwd to fall into the stream.
54474	LWD pile that extends for 70 feet and is 30 feet wide. Erosion continues of right bank.
54796	Very small tributary enters on the right bank just dripping water.
55291	Downed redwood across and above the stream.
55546	Three pieces of LWD located on the right bank.
55955	LWD pile located on the right bank associated with SWD.

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56624	Undercut bank about 3.5 feet to five feet deep and about 15 feet long.
56898	Log weir in the stream channel attached to the left bank. Log is about 25 feet long.
57134	Bridge crosses over part way through this unit.
57417	233 feet into this unit two tributaries enter, one from the right bank and one from the left. Bridge crosses over the tributary from the right bank about 40 feet up the tributary. The tributary on the right is believed to be Sulphur Fork.
57490	Log weir at the top of this unit. Substantial undercut bank with exposed roots. Two foot undercut for about 15 feet.
57565	LWD pile associated with SWD pile at the top of the pool. 30 feet wide and about seven feet high.
57717	Possible old side channel in this unit but currently dry.
57828	Considerable left bank erosion about 70 feet high and about 150 feet long. Contributing fines into the water.
57883	LWD associated with SWD pile about 10 feet high, and 15 feet wide. Right bank erosion 50 feet long and 10 feet high.
57919	LWD pile across stream 15 feet wide, five feet tall, and 10 feet wide.
58188	LWD associated with SWD across channel. Pool located on the downstream side of the pile. LWD pile is about 25 feet long, four feet high, and five feet deep.
58329	Right bank erosion with exposed roots about 20 feet long and five feet high. Contributing fines into the stream.
58419	LWD pile associated with SWD, 4’ high x 20’ long x 4’ wide.
58466	LWD pile at the top of the pool. 25 feet wide, 10 feet long, and 5 feet high.
59017	LWD pile on the right bank. Good shelter. Two feet high, 10 feet long, five feet wide.
59333	Boulder and log are contributing to the scour.
59405	This pool has a variety of contributing factors. Lateral scour, mid channel pool, corner, root, and boulder.
59726	Redwood stump with root mass has scoured a backwater pool.

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59914	Considerable right bank scour during high flows.
59941	SWD associated with root mass. LWD located on the right bank about 15 feet long.
60105	Dried tributary on the left bank. A seven-foot high boulder is located at the mouth of this tributary with a 10% or higher gradient after the boulder.
60223	Downed piece of LWD about 24 inches in diameter is underwater in the stream.
61375	Tributary enters on the right bank about 236 feet into the unit.
62198	Data not entered on data sheet for the left bank dominant vegetation and % left bank vegetated.
62210	Tributary enters on the left bank at the end of this unit. Tributary runs across a 25-foot bedrock surface before it enters into Elk Creek.
62451	Undercut bank about three feet deep and about 10 feet long.
62518	LWD pile about five feet high and 25 feet wide.
62569	Landslide about 30 feet high and 40 feet long. Contributing considerable sediment and fines.
63017	The Soda Fork tributary enters on the right bank.
63771	Large amounts of iron bacteria in the stream channel. All substrate is covered with the orange bacteria.
64034	SWD accumulating in the stream channel.
64386	Sediment accumulations in the stream channel.
64700	LWD pile four feet high, 25 feet wide. And 20 feet long.
65179	LWD pile 10 feet high, 20 feet wide, 40 feet long.
65426	LWD seven feet high, 30 feet wide, and 25 feet long. Tributary enters on the left bank about 80 feet into the unit.
65444	Sediment accumulation very high in this pool.
65494	LWD accumulation eight feet high, 10 feet wide, and 50 feet long.
65710	Salmonids present in pool.

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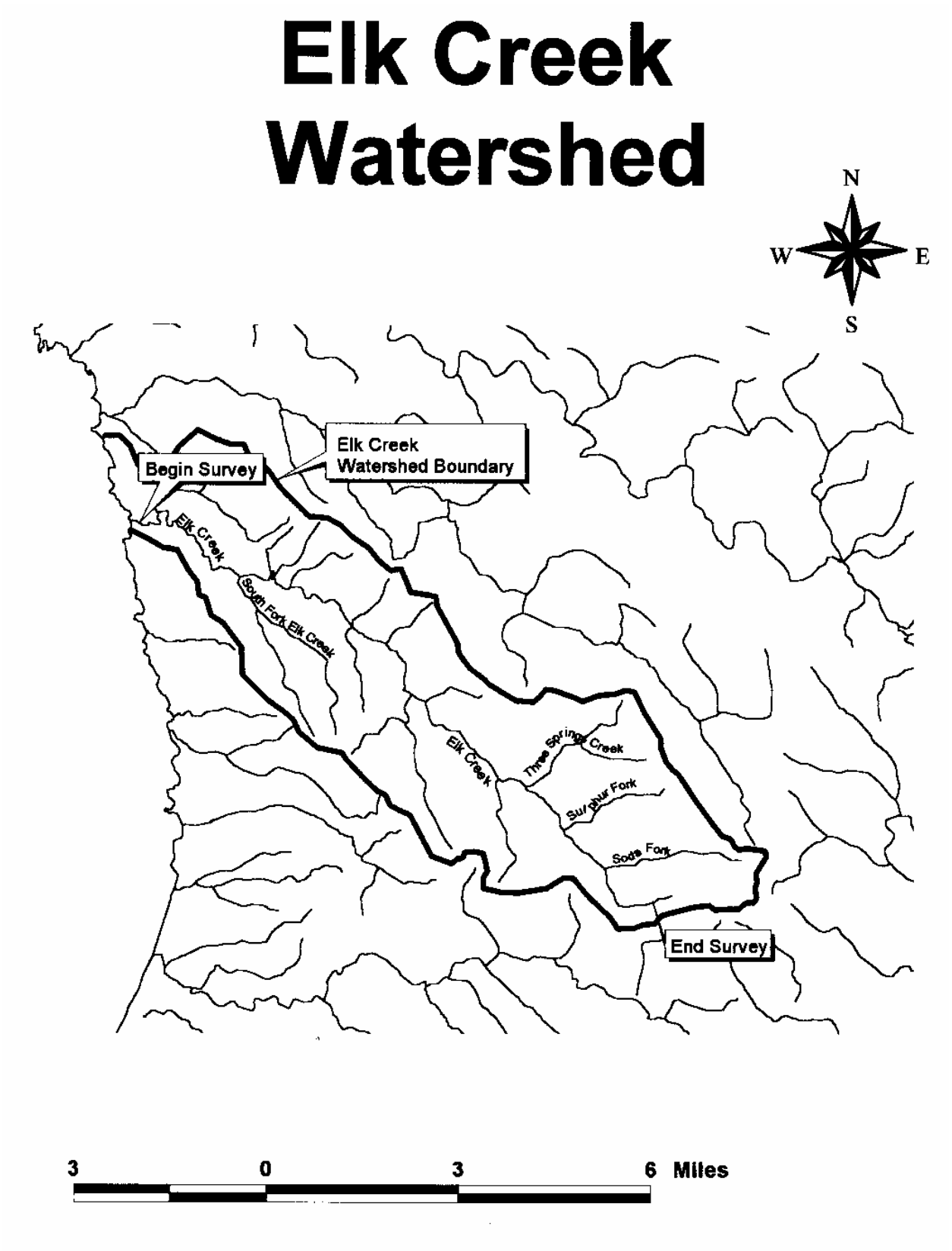
66286	Tributary enters on the left bank.
67308	Tributary enters on the right bank.
67322	LWD accumulation six feet high, 10 feet wide, and 10 feet long. Tributary enters from the left bank.
68046	225 feet into the unit a bridge crosses over the stream.
68257	Four-foot waterfall in this unit.
68409	Landslide contributing fines. 20 feet high and 40 feet long.
68479	Dry tributary located on the right bank.
68912	Small tributary enters on the left bank. Non-anadromous.
68922	LWD pile three feet high, 10 feet wide, and 15 feet long. Undercut bank on the left bank. Bank erosion about 10 feet high and 10 feet long.
69179	Tributary enters on the left bank barely seeping. High gradient, non-anadromous. 25 feet of dry channel in this unit. LWD pile 200 feet into unit. 30 feet of long sporadic piles 18 feet wide and three feet high.
69521	LWD pile associated with SWD 15 feet long, 20 feet wide, and 5 feet high. Left bank seeping water at the top of the unit. Possible spring.
69532	Bottom of pool covered with sediment.
69684	20 feet of dry channel. LWD and SWD piled throughout the channel sizes vary.
69694	LWD pile at the tip of the pool. Six feet high, 17 feet wide, and 10 feet deep.
69856	Two foot plunge into pool.
69952	Right and left banks very steep both contributing fines into the stream.
70044	LWD with SWD throughout the channel. Gravel and sediment pile at the top of the woodpile.
70056	Salamander noted in the stream channel.
70116	Bedrock located on both sides of the pool creating a mid channel pool.
70163	Seven foot plunge down bedrock.

Elk Creek

70284	Both right and left banks are very steep with almost no vegetative cover on either slope.
70295	Sediment cover over the entire bottom of the pool.
70352	17 feet of dry channel within this unit. LWD with a sediment pile at the top. 10 feet wide, four feet high, and eight feet long.
70435	Two foot plunge into two different pools.
70523	No brush cover on the right bank just a few leaves and sporadic trees.
70595	End of survey. SWD pile with boulders piled three feet high in the channel. Greater than a 10% gradient, LWD piles throughout the channel with boulder and sediment piles at the top. Heavy sedimentation in all pools. No salmonids noted for about 50 units. Continued to walk up stream and found another dried tributary on the right bank and another 100 feet past that was dried trib on the left bank.

Appendix 1: HABITAT TYPE KEY

LEVEL I	LEVEL II	LEVEL III	LEVEL IV		
RIFFLE	**RIFFLE**	**Riffle**	Low Gradient Riffle	[LGR]	1.1
			High Gradient Riffle	[HGR]	1.2
		Cascade	Cascade	[CAS]	2.1
			Bedrock Sheet	[BRS]	2.2
	FLATWATER	**Flatwater**	Pocket Water	[POW]	3.1
			Glide	[GLD]	3.2
			Run	[RUN]	3.3
			Step Run	[SRN]	3.4
			Edgewater	[EDW]	3.5
POOL	**POOL**	**Main Channel Pool**	Trench Pool	[TRP]	4.1
			Mid-Channel Pool	[MCP]	4.2
			Channel Confluence Pool	[CCP]	4.3
			Step Pool	[STP]	4.4
		Scour Pool	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 Pool	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


Elk Creek Watershed
N
W
E
S
Begin Survey
Elk Creek Watershed Boundary
Elk Creek
South Fork Elk Creek
Elk Creek
Three Springs Creek
Sulphur Fork
Soda Fork
End Survey
3
0
3
6 Miles

Elk Creek

ELK CREEK — Drainage: PACIFIC OCEAN

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17WS2 LATITUDE:39°6'7" LONGITUDE:123°42'2"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
115	14	RIFFLE	14	70	8036	11	15.2	0.6	813	93524	491	56435	0	38
390	40	FLATWATER	47	111	43373	61	17.7	0.7	1396	544571	1021	398005	0	25
325	325	POOL	39	62	20020	28	17.7	2.0	1248	405634	2874	933968	2299	4

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
830	379	71429	1043728	1388408

ELK CREEK — Drainage: PACIFIC OCEAN

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17WS2 LATITUDE:39°6'7" LONGITUDE:123°42'2"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
105	11	LGR	13	72	7610	11	15	0.5	1.7	895	93923	536	56287	0	27	87
10	3	HGR	1	43	426	1	15	0.7	2.0	515	5153	325	3245	0	77	93
2	1	POW	0	67	133	0	17	0.8	1.6	1462	2924	1170	2339	0	100	65
112	12	GLD	13	58	6494	9	24	0.9	2.6	1998	223768	1950	218407	0	19	90
138	20	RUN	17	72	9998	14	16	0.5	1.9	1120	154618	594	81931	0	24	91
130	7	SRN	17	194	26748	37	11	0.6	1.7	1144	157870	625	86282	0	28	89
138	138	MCP	17	70	9636	13	20	2.1	6.0	1569	216576	3640	502300	2855	5	84
4	4	CCP	0	61	243	0	16	1.6	5.2	1260	5040	2412	9649	1531	5	93
1	1	STP	0	26	26	0	9	1.1	1.5	234	234	257	257	234	0	0
4	4	CRP	0	53	213	0	20	2.1	4.2	1269	5076	3559	14235	3098	15	56
32	32	LSL	4	45	1444	2	15	1.5	4.6	810	25922	1420	45456	1030	3	84
14	14	LSR	2	41	575	1	14	2.1	5.2	606	8478	1390	19458	1215	11	73
84	84	LSBk	10	70	5838	8	16	2.1	8.5	1279	107473	3112	261410	2628	2	88
28	28	LSBo	3	54	1521	2	17	2.0	6.9	1050	29410	2365	66234	1850	3	75
10	10	PLP	1	24	244	0	11	1.6	4.3	338	3379	738	7377	606	15	92
3	3	SCP	0	28	85	0	9	1.8	2.9	276	828	521	1564	459	23	97
4	4	BPL	0	37	148	0	17	1.8	3.6	656	2623	1270	5079	936	0	46
3	3	DPL	0	16	47	0	13	1.6	2.5	198	595	317	950	260	0	96

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
830	379	71429	1043890	1382459

Elk Creek

ELK CREEK — Drainage: PACIFIC OCEAN

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17W32 LATITUDE:39°6'7" LONGITUDE:123°42'2"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
143	143	MAIN	44	69	9905	49	20.2	2.1	1551	221850	3582	512206	2799	5
172	172	SCOUR	53	57	9835	49	15.8	1.9	1045	179738	2408	414168	1982	4
10	10	BACKWATER	3	28	280	1	13.3	1.7	405	4046	759	7594	590	7

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
325	325	20020	405634	933968

ELK CREEK — Drainage: PACIFIC OCEAN

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17W32 LATITUDE:39°6'7" LONGITUDE:123°42'2"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
138	MCP	42	0	0	6	4	54	39	45	33	33	24
4	CCP	1	0	0	2	50	1	25	0	0	1	25
1	STP	0	0	0	1	100	0	0	0	0	0	0
4	CRP	1	0	0	0	0	2	50	1	25	1	25
32	LSL	10	0	0	8	25	14	44	8	25	2	6
14	LSR	4	0	0	2	14	3	21	7	50	2	14
84	LSBk	26	0	0	10	12	28	33	23	27	23	27
28	LSBo	9	0	0	3	11	9	32	8	29	8	29
10	PLP	3	0	0	6	60	2	20	1	10	1	10
3	SCP	1	0	0	0	0	3	100	0	0	0	0
4	BPL	1	0	0	0	0	2	50	2	50	0	0
3	DPL	1	0	0	1	33	2	67	0	0	0	0

TOTAL UNITS
325

ELK CREEK — Drainage: PACIFIC OCEAN

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17W32 LATITUDE:39°6'7" LONGITUDE:123°42'2"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SMD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
105	11	LGR	1	6	16	1	14	9	7	46	0
10	3	HGR	0	0	3	0	3	0	22	70	2
2	1	POW	0	5	0	0	0	0	0	95	0
112	12	GLD	11	20	5	4	22	0	0	29	8
138	20	RUN	23	14	12	6	16	0	0	25	0
138	7	SRN	14	9	16	3	13	0	6	36	4
138	18	MCP	12	14	14	8	11	0	0	29	1
4	1	CCP	85	15	0	0	0	0	0	0	0
1	0	STP	0	0	0	0	0	0	0	0	0
4	1	CRP	0	10	5	0	85	0	0	0	0
32	4	LSL	0	40	48	0	3	0	0	10	0
14	3	LSR	7	15	15	48	3	0	0	12	0
84	7	LSBk	1	4	6	0	19	0	1	20	49
28	4	LSBo	3	3	10	5	13	0	0	20	23
10	2	PLP	0	0	0	0	0	0	20	78	3
3	3	SCP	22	13	8	23	3	0	0	10	20
4	0	EPL	0	0	0	0	0	0	0	0	0
3	0	DPL	0	0	0	0	0	0	0	0	0

ELK CREEK — Drainage: PACIFIC OCEAN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 06/18/01 to 09/12/01

Confluence Location: QUAD: MALLO PASS LEGAL DESCRIPTION: T14NR17W32 LATITUDE:39°6'7" LONGITUDE:123°42'2"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
105	11	LGR	0	0	45	18	27	9	0
10	3	HGR	0	0	33	0	33	33	0
2	1	POW	0	0	0	0	0	100	0
112	12	GLD	0	0	75	25	0	0	0
138	20	RUN	0	10	70	10	10	0	0
138	7	SRN	0	0	57	14	29	0	0
138	16	MCP	0	38	44	6	6	6	0
4	1	CCP	0	0	100	0	0	0	0
1	0	STP	0	0	0	0	0	0	0
4	1	CRP	0	0	100	0	0	0	0
32	4	LSL	0	50	25	0	25	0	0
14	3	LSR	0	0	33	0	33	33	0
84	8	LSBk	0	13	63	0	0	0	25
28	3	LSBo	0	33	67	0	0	0	0
10	2	PLP	0	50	0	0	0	50	0
3	3	SCP	0	33	67	0	0	0	0
4	0	EPL	0	0	0	0	0	0	0
3	0	DPL	0	0	0	0	0	0	0

TABLE 7

ELK CREEK

Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Deciduous	Mean Percent Open Units	Mean Right Bank Percent Cover	Mean Left Bank Percent Cover
88	28	72	0	83	83

Note: Mean percent conifer and deciduous for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: ELK CREEK
SAMPLE DATES: 06/18/01 to 09/12/01
STREAM LENGTH: 70643 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: MALLO PASS Latitude: 39°6'7"
Legal Description: T14NR17WS2 Longitude: 123°42'2"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01
Channel Type: B4 Canopy Density: 76%
Channel Length: 5551 ft. Coniferous Component: 0%
Riffle/flatwater Mean Width: 23 ft. Deciduous Component: 100%
Total Pool Mean Depth: 2.4 ft. Pools by Stream Length: 41%
Base Flow: 3.5 cfs Pools >=3 ft.deep: 73%
Water: 055- 062°F Air: 059-070°F Mean Pool Shelter Rtn: 30
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Terrestrial Veg.
Vegetative Cover: 75% Occurrence of LOD: 16%
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.

Embeddness Value: 1. 39% 2.42% 3. 15% 4. 3% 5. 0%

STREAM REACH 02
Channel Type: F4 Canopy Density: 84%
Channel Length: 5978 ft. Coniferous Component: 17%
Riffle/flatwater Mean Width: 24 ft. Deciduous Component: 84%
Total Pool Mean Depth: 1.8 ft. Pools by Stream Length: 41%
Base Flow: 3.5 cfs Pools >=3 ft.deep: 63%
Water: 056- 060°F Air: 058-069°F Mean Pool Shelter Rtn: 80
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Terrestrial Veg.
Vegetative Cover: 92% Occurrence of LOD: 13%
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.

Embeddness Value: 1. 23% 2.50% 3. 27% 4. 0% 5. 0%

STREAM REACH 03
Channel Type: B4 Canopy Density: 90%
Channel Length: 8589 ft. Coniferous Component: 15%
Riffle/flatwater Mean Width: 18 ft. Deciduous Component: 85%
Total Pool Mean Depth: 2.5 ft. Pools by Stream Length: 47%
Base Flow: 3.5 cfs Pools >=3 ft.deep: 86%
Water: 057- 060°F Air: 060-070°F Mean Pool Shelter Rtn: 39
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Small Woody Debris
Vegetative Cover: 93% Occurrence of LOD: 13%
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.

Embeddness Value: 1. 17% 2.39% 3. 33% 4. 8% 5. 3%

STREAM REACH 04
Channel Type: G4 Canopy Density: 90%
Channel Length: 5937 ft. Coniferous Component: 15%
Riffle/flatwater Mean Width: 23 ft. Deciduous Component: 85%
Total Pool Mean Depth: 2.3 ft. Pools by Stream Length: 23%
Base Flow: 3.5 cfs Pools >=3 ft.deep: 88%
Water: 056- 059°F Air: 058-070°F Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Boulders

```
   Vegetative Cover: 84%                    Occurrence of LOD: 15%
   Dom. Bank Substrate: Silt/Clay/Sand      Dry Channel: 0 ft.

   Embeddness Value: 1. 19%   2.44%   3. 38%  4. 0%   5.  0%

STREAM REACH 05
   Channel Type: F4                         Canopy Density: 89%
   Channel Length: 6049 ft.                 Coniferous Component: 27%
   Riffle/flatwater Mean Width: 19 ft.      Deciduous Component: 73%
   Total Pool Mean Depth: 2.5 ft.           Pools by Stream Length: 8%
   Base Flow: 3.5 cfs                       Pools >=3 ft.deep: 88%
   Water: 057- 061°F  Air: 056-064°F        Mean Pool Shelter Rtn: 45
   Dom. Bank Veg.: Deciduous Trees          Dom. Shelter: Boulders
   Vegetative Cover: 90%                    Occurrence of LOD: 7%
   Dom. Bank Substrate: Silt/Clay/Sand      Dry Channel: 0 ft.

   Embeddness Value: 1. 13%   2.50%   3. 38%  4. 0%   5.  0%

STREAM REACH 06
   Channel Type: B2                         Canopy Density: 88%
   Channel Length: 4243 ft.                 Coniferous Component: 40%
   Riffle/flatwater Mean Width: 19 ft.      Deciduous Component: 60%
   Total Pool Mean Depth: 2.2 ft.           Pools by Stream Length: 29%
   Base Flow: 3.5 cfs                       Pools >=3 ft.deep: 74%
   Water: 054- 058°F  Air: 062-065°F        Mean Pool Shelter Rtn: 58
   Dom. Bank Veg.: Deciduous Trees          Dom. Shelter: Boulders
   Vegetative Cover: 86%                    Occurrence of LOD: 2%
   Dom. Bank Substrate: Silt/Clay/Sand      Dry Channel: 0 ft.

   Embeddness Value: 1. 35%   2.45%   3. 15%  4. 5%   5.  0%

STREAM REACH 07
   Channel Type: F3                         Canopy Density: 81%
   Channel Length: 4740 ft.                 Coniferous Component: 41%
   Riffle/flatwater Mean Width: 14 ft.      Deciduous Component: 59%
   Total Pool Mean Depth: 2.1 ft.           Pools by Stream Length: 29%
   Base Flow: 3.5 cfs                       Pools >=3 ft.deep: 58%
   Water: 055- 058°F  Air: 065-070°F        Mean Pool Shelter Rtn: 28
   Dom. Bank Veg.: Deciduous Trees          Dom. Shelter: Boulders
   Vegetative Cover: 81%                    Occurrence of LOD: 0%
   Dom. Bank Substrate: Silt/Clay/Sand      Dry Channel: 0 ft.

   Embeddness Value: 1. 17%   2.54%   3. 21%  4. 4%   5.  4%

STREAM REACH 08
   Channel Type: F4                         Canopy Density: 92%
   Channel Length: 8698 ft.                 Coniferous Component: 24%
   Riffle/flatwater Mean Width: 16 ft.      Deciduous Component: 76%
   Total Pool Mean Depth: 1.9 ft.           Pools by Stream Length: 27%
   Base Flow: 3.5 cfs                       Pools >=3 ft.deep: 36%
   Water: 057- 063°F  Air: 061-070°F        Mean Pool Shelter Rtn: 16
   Dom. Bank Veg.: Deciduous Trees          Dom. Shelter: Boulders
   Vegetative Cover: 80%                    Occurrence of LOD: 8%
   Dom. Bank Substrate: Silt/Clay/Sand      Dry Channel: 0 ft.

   Embeddness Value: 1. 24%   2.49%   3. 24%  4. 3%   5.  0%

STREAM REACH 09
   Channel Type: F3                         Canopy Density: 88%
   Channel Length: 13523 ft.                Coniferous Component: 35%
```

Riffle/flatwater Mean Width: 12 ft.
Total Pool Mean Depth: 1.9 ft.
Base Flow: 3.5 cfs
Water: 053- 061°F Air: 058-068°F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 83%
Dom. Bank Substrate: Silt/Clay/Sand

Deciduous Component: 65%
Pools by Stream Length: 29%
Pools >=3 ft.deep: 34%
Mean Pool Shelter Rtn: 27
Dom. Shelter: Boulders
Occurrence of LOD: 11%
Dry Channel: 0 ft.

Embeddness Value: 1. 15% 2.44% 3. 36% 4. 2% 5. 3%

STREAM REACH 10

Channel Type: A4
Channel Length: 7335 ft.
Riffle/flatwater Mean Width: 4 ft.
Total Pool Mean Depth: 1.2 ft.
Base Flow: 3.5 cfs
Water: 053- 057°F Air: 062-068°F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 73%
Dom. Bank Substrate: Silt/Clay/Sand

Canopy Density: 92%
Coniferous Component: 65%
Deciduous Component: 35%
Pools by Stream Length: 7%
Pools >=3 ft.deep: 3%
Mean Pool Shelter Rtn: 18
Dom. Shelter: Large Woody Debris
Occurrence of LOD: 34%
Dry Channel: 0 ft.

Embeddness Value: 1. 3% 2.12% 3. 30% 4. 18% 5. 36%

TABLE 9

ELK CREEK

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	6	15	11.05
Boulder	5	5	5.26
Cobble/Gravel	28	30	30.53
Silt/clay	55	44	52.11

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	0	1	0.53
Brush	1	2	1.58
Decid. Trees	54	59	59.47
Conif. Trees	39	31	36.84
No Vegetation	0	0	0

Total stream average embeddedness value for pool 2.34

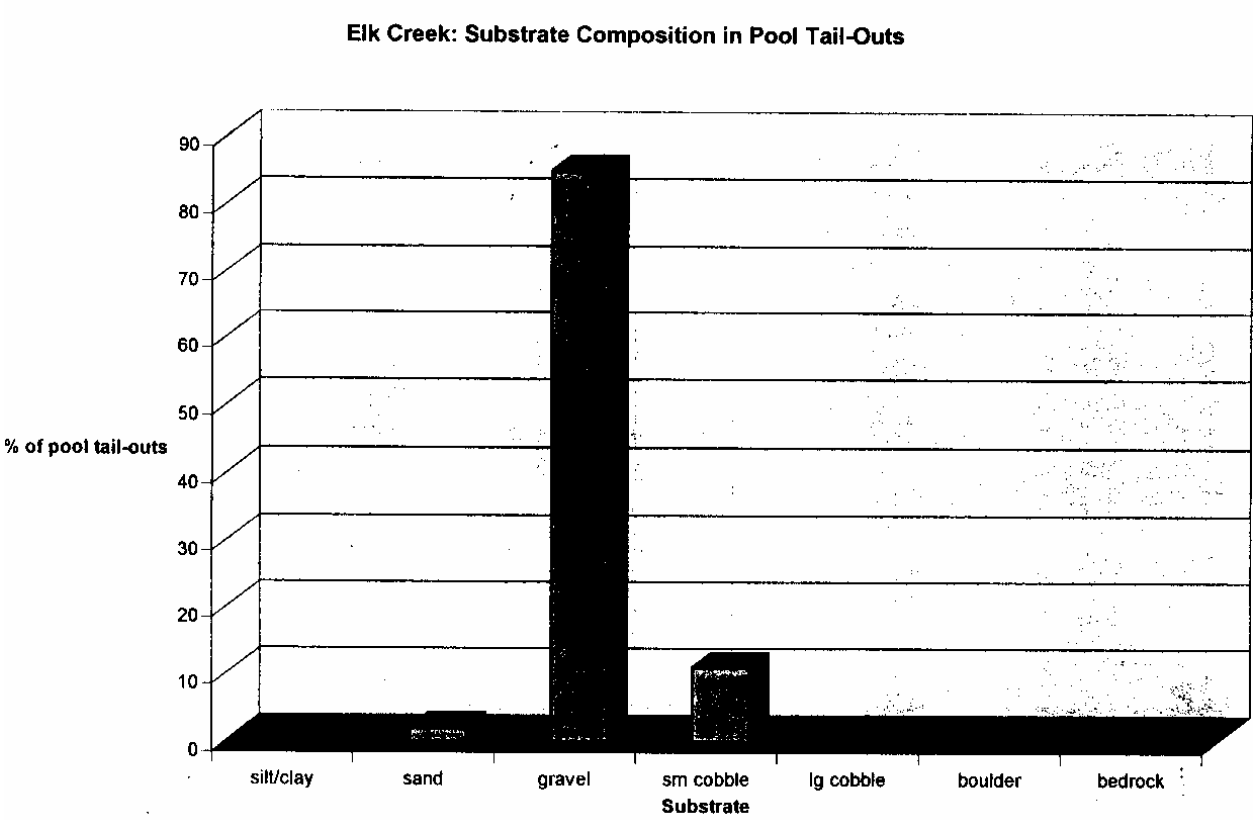


TABLE 10. MEAN PERCENT OF SHELTER COVER TYPES FOR ENTIRE STREAM

Stream: ELK CREEK Drainage: PACIFIC OCEAN

Survey Date: 06/18/01 to 09/12/01

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	10.84	17.13	9.30
SMALL WOODY DEBRIS	11.93	14.63	11.80
LARGE WOODY DEBRIS	11.88	10.38	12.50
ROOTS	5.69	4.63	8.90
TERRESTRIAL VEG	13.56	16.63	11.10
AQUATIC VEG	0.99	0	0
WHITEWATER	2.23	1	0.90
BOULDERS	28.91	29.88	20.80
BEDROCK LEDGES	7.03	3.25	12.70