

# STREAM INVENTORY REPORT

## Three Springs Creek

### INTRODUCTION

A California Department of Fish and Game (DFG) fisheries inventory was conducted during the summer of 2001 on Three Springs Creek. A stream inventory and report was also completed for one tributary to Three Springs Creek.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids. 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.

### WATERSHED OVERVIEW

Three Springs Creek, located in Mendocino County, California, is a tributary to Elk Creek. Three Springs Creek legal description at the confluence with Elk Creek is T14NR16W25. Its mouth is located at 39°2'48" north latitude and 123°35'16" west longitude. Three Springs Creek is a second order stream and has approximately 2 miles of blue line stream according to the USGS Cold Springs 7.5 minute quadrangle map. Three Springs Creek drains a watershed of approximately 4 square miles. Elevations range from about 520 feet at the mouth to 2200 feet in the headwater areas.

Mixed deciduous forest dominates the watershed. Mendocino Redwood Company owns the whole Three Springs Creek watershed. Past land uses in the watershed include timber harvests as well as road building, which likely contributed to the elimination of coho salmon from Three Springs Creek. The present land uses in the watershed are logging as well as hunting on the Wilderness Unlimited area, which is owned by MRC.

Vehicle access exists via the MRC logging road about 1 mile north of the mouth. The access road to the creek is closed to the public, and controlled by MRC. The Three Springs Creek Bridge is about 12.5 miles down the logging road, the first bridge past the Wilderness Unlimited camp.

### METHODS

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

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### 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

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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).

## 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, DFG. 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

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- 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 \*

### **Three Springs Creek**

Kristi Knechtle of DFG and Josh Carron (WSP/AmeriCorps) conducted the habitat inventory field survey from August 27-30, 2001. The total length of stream surveyed was 7,135 feet.

Flow measurements were not taken for Three Springs Creek.

Three Springs Creek was classified as an E4 channel type for the whole reach surveyed. E4 channel types are generally low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition; very efficient and stable; high meander width ratio with a gravel channel.

Water temperatures taken during the survey period ranged from 55 to 60 degrees Fahrenheit. Air temperatures ranged from 68 to 82 degrees Fahrenheit.

Based on frequency of occurrence of Level II habitat types there were 29% riffle units, 25% flatwater units, and 46% pool units (Table 1). Based on total length of Level II habitat types there were 30% riffle units, 44% flatwater units, and 25% pool units (Table 1, Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles 27%, lateral-scour bedrock pools 19%, step runs 15%, and lateral-scour boulder pools at 13%. Based on percent total length, step runs comprised 34%, low gradient riffles 28%, and lateral-scour bedrock at 12%.

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A total of 57 pools were identified (Table 3). Scour pools were most frequently encountered at 88% and comprised 87% of the total length of all pools followed by mid-channel pools at 7% and comprised 13% of the total length. Of the 57 pools, 29 (50%) had a depth of two feet or greater (Table 4, Graph 5).

A primary pool is defined as a pool with a maximum depth of at least 2 feet, occupies at least half the width of the low flow channel, and is as long as the low flow channel width. In Three Springs Creek, primary pools totaled 1772 feet, or 25% of the total stream surveyed.

Of the 57 pool tail crest embeddedness estimates, 3 had a value of 1 (4%), 15 had a value of 2 (26%), 20 had a value of 3 (35%), 8 had a value of 4 (13%), and 13 had a value of 5 (22%) (Table 8, Graph 6). The 29 pool tail crests with an embeddedness value of 5 were rated unsuitable for spawning due to substrate composed of boulder, bedrock, sedimentation, or wood.

Riffle habitat types had a mean shelter rating of 8, flatwater habitat types had a mean shelter rating of 15, and pool habitats had a mean shelter rating of 3 (Table 1). Lateral-scour pools, the dominant pool type, had a mean shelter rating of 2 (Table 2).

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

Sand was most commonly the dominant substrate in the main habitat types (Table 6). Six of the 7 lateral-scour pools fully measured were dominated by sand at 100%. Two mid-channel pools were fully sampled and were dominated by sand at 100%. Seven low-gradient riffles were fully measured with gravel dominating 43% and small cobble dominating 29%. Gravel was the dominant pool tail crest substrate in 39 of the 57 pool units (68%).

The mean percent canopy density for the stream reach surveyed was 88%, with deciduous and coniferous trees comprising 57% and 43%, respectively (Table 7).

Sand/silt/clay dominated the streambank substrate in 54% of the fully measured units, followed by bedrock dominating in 20%, and cobble/gravel dominating 18% (Table 9). In the fully measured units, right streambanks had a mean vegetative cover of 74%. Left streambanks had a mean vegetative cover of 79% (Table 7). Streambank vegetation was mainly composed of deciduous trees (43%) followed by coniferous trees (56%) (Table 9).

## **Unnamed Tributary to Three Springs Creek**

Kristi Knechtle of DFG and Josh Carron (WSP/AmeriCorps) conducted the habitat inventory field survey from August 30, 2001. The total length of stream surveyed was 712 feet.

Water temperatures taken during the survey period ranged from 55 to 56 degrees Fahrenheit. Air temperatures ranged from 68 to 74 degrees Fahrenheit.

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Based on frequency of occurrence of Level II habitat types there were 35% riffle units, 35% flatwater units, and 30% pool units (Table 1). Based on total length of Level II habitat types there were 31% riffle units, 58% flatwater units, and 11% pool units (Table 1, Graph 2).

Six Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles 30%, runs 30%, lateral scour boulder pools 20%, and lateral-scour bedrock pools at 10%. Based on percent total length, runs comprised 41%, low gradient riffles comprised 26%, and step runs comprised 17% of the total length measured.

A total of 6 pools were identified (Table 3). Scour pools were most frequently encountered at 100% and comprised 100% of the total length of all pools. Of the 6 pools, 1 (16%) had a depth of two feet or greater (Table 4, Graph 5).

A primary pool is defined as a pool with a maximum depth of at least 2 feet, occupies at least half the width of the low flow channel, and is as long as the low flow channel width. In Three Springs Creek, primary pools totaled 78 feet, or 10% of the total stream surveyed.

Of the 6 pool tail crest embeddedness estimates, none had a value of 1 or 2, 3 had a value of 3 (50%), 1 had a value of 4 (16%), and 2 had a value of 5 (33%) (Table 8, Graph 6). The 2 pool tail crests with an embeddedness value of 5 were rated unsuitable for spawning due to substrate composed of bedrock.

Riffle habitat types had a mean shelter rating of 3, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 3 (Table 1). Lateral-scour pools, the dominant pool type, had a mean shelter rating of 3 (Table 2).

Cover in Three Springs Creek is provided mainly by a boulders and small and large woody debris (Table 5). Boulders provided the main cover in pools (Table 10).

Sand and bedrock were the most common substrate in the main habitat types (Table 6). Of the 2 runs fully measured 50% were dominated by sand and 50% were dominated by bedrock. Of the 2 lateral-scour pools that were fully measured, 1 was dominated completely by sand (100%) and the other completely by bedrock (100%). Gravel was the dominant pool tail crest substrate in 4 of the 6 pool units (66%).

The mean percent canopy density for the stream reach surveyed was 93%, with deciduous and coniferous trees comprising 45% and 52%, respectively (Table 7).

Sand/silt/clay dominated the streambank substrate in 85% of the fully measured units, followed by bedrock dominating in 14% (Table 9). In the fully measured units, right streambanks had a mean vegetative cover of 88%. Left streambanks had a mean vegetative cover of 88% (Table 7). Streambank vegetation was mainly composed of coniferous trees (78%), followed by deciduous trees (21%) (Table 9).

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### DISCUSSION

The suitability of E3 channel types for fish habitat improvement structures is: good for bank-placed boulders. Fair for opposing with-deflectors, and poor for plunge weirs; boulder clusters; and single wing-deflectors. Numerous locations show evidence that the creek is down cutting 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 Three Springs Creek, recorded on the survey days were within the suitable ranges for rearing of coho salmon and steelhead. But since the maximum temperatures recorded (55 and 60 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. Given Three Spring Creek's location in the coastal fog belt and the high canopy density found it is doubtful that stream temperatures are unsuitable for coho or steelhead.

For Three Springs Creek, flatwater habitat types comprised 25% of the total length of this survey, pools 46%, and riffles 29% (Table 1, Graph 2). Primary pools composed 25% of the total length surveyed. DFG 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 Three Springs Creek are all much below the desirable rating of 100 (Tables 1 and 2).

The prevalence of gravel (68%) as the dominant pool tail crest substrate is generally considered suitable for spawning salmonids (Table 6, Graph 8). However, frequencies of embeddedness ratings of 3, 4, or 5 (Table 8) in Three Springs Creek indicate lower spawning substrate quality due to the presence of fine sediments, boulders, and bedrock.

The mean percent canopy density for Three Springs Creek was 88%.

### RECOMMENDATIONS

- 1) Three Springs 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) Greatly increase instream wood to improve shelter rating, help sort sediments, and increase the depths of existing pools.

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### 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

## Three Springs Creek

Position  
(ft):

Comments:

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45	Begin survey about 75 feet upstream from the confluence with Elk Creek.
116	Right bank erosion with exposed roots. 20 feet long and four feet high.
386	Salmonids present
461	Black half inch tubing tangled in the stream channel. About 300 feet in length.
507	Pacific Giant Salamander noted in unit. Left bank erosion above the bedrock layer. Eight feet wide and 10 feet high.
609	Plastic black tubing still present into this unit.
840	Bridge crosses the creek at the top of the unit. Erosion on the left bank under the bridge.
935	Salmonids present.
1294	Two car sized boulders formed pools on each side of the boulders. Large woody debris (LWD) pile at the top of the unit at the beginning of the boulders. Six to eight pieces of LWD associated with some small woody debris (SWD).
1520	Salmonids present
1663	One four-inch salmonid and five to 10 young-of-the-year (YOY).
1803	Downed redwood tree in stream with some new growth.
1935	One piece of LWD associated with some SWD.
2093	Small tributary enters on the right bank. Non-anadroumous.
2119	LWD pile 15 feet wide, four feet tall. Sediment piling at the top of LWD pile and pool.

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- 2209 Right and left bank erosion 40 feet long. Downed trees and LWD pile in the channel with sediment beginning to pile at the top. Could be possible issue in the near future.
- 2269 Left bank erosion 15 feet wide and 40 feet high. Almost no vegetative cover.
- 2285 LWD pile 10 feet wide, five feet high, with some SWD throughout.
- 2418 Tributary enters on the left bank. Very little water coming from the tributary. Very steep gradient.
- 2459 LWD being used as a weir. Three-four pieces of LWD with some SWD.
- 2531 LWD pile associated with some SWD six feet high, 30 feet wide and it extends about 30 feet upstream.
- 2757 Five pieces of LWD with some SWD located over and in the pool. Salmonids present.
- 2859 Two submerged logs helping to create this pool.
- 3039 About 167 feet into this unit there is a tributary on the right bank, barely flowing. Almost dripping.
- 3209 Chopped wood stacked on the left bank. LWD pile with some SWD 30 feet wide, seven feet high, and 10 feet long.
- 3499 Salmonids present
- 4045 Tributary enters on the right bank.
- 5636 Tributary enters on the right bank.
- 6268 Tributary enters on the right bank. Anadromous.
- 6304 LWD accumulation five feet high, 20 feet wide, and seven feet long.
- 6330 Tributary enters on the left bank.
- 6431 LWD pile five feet high, 15 feet wide, and 10 feet deep.
- 6462 Right bank erosion 35 feet long and 12 feet high. Silt accumulating in the channel.
- 6906 Tributary enters from the left bank. 150 feet up the tributary is an LWD and boulder about 25 feet high and 30 feet wide. Major erosion on both the right and left banks in the tributary. Trees, sediment, and boulders piled in the channel.

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Hiked about 300 to 400 feet up the tributary and no fish were noted. High sediment in all riffles and pools on the tributary. Two salamanders were noted.

7018 End of survey. Channel went dry. Walked about 200 to 300 feet up stream. Massive erosion from both the right and left banks. Boulders and trees fallen into the channel. Most likely a fish barrier with flowing water.

## Unnamed Tributary to Three Springs Creek

Position

(ft):            Comments:

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7	Begin Survey about 20 feet up from the confluence with Three Springs Creek.
79	The final 20 feet of this unit was dry.
205	Five-six inch salmonid noted.
392	Fence runs across the creek about five feet above the channel. Not a barrier.
558	Pool contains a large amount of sediment.
636	Spring enters on the right bank. Last 34 feet of the channel in this unit is dry.
712	End of survey. End of anadromy.

## REFERENCES

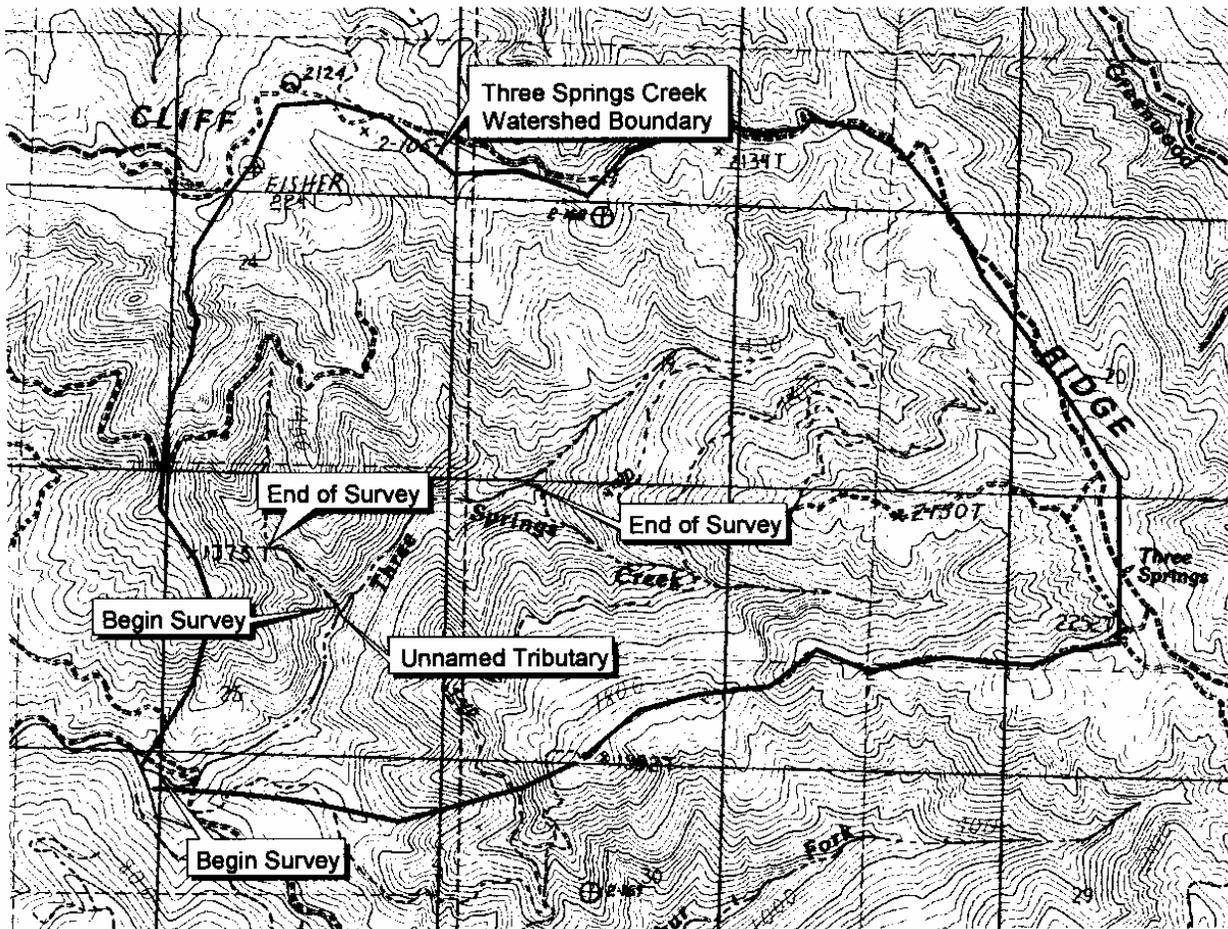
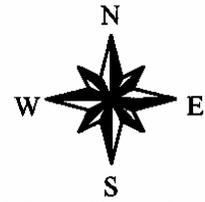
Flosi, Gary, S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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### Appendix 1: HABITAT TYPE KEY

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

# Three Springs Creek Watershed Tributary to Elk Creek



# Three Springs Creek

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 1 - SUMMARY OF RIPPLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16W825 LATITUDE:39°2'48" LONGITUDE:123°35'16"

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 ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
36	8	RIFFLE	29	59	2123	30	7.1	0.3	145	5231	46	1648	0	8
31	3	FLATWATER	25	101	3123	44	7.7	0.5	784	24297	410	12703	0	15
57	57	POOL	46	31	1772	25	11.1	1.5	342	19521	632	36052	529	3
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)					TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)		
124	68				7018					49049		50403		

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16W825 LATITUDE:39°2'48" LONGITUDE:123°35'16"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	PERCENT TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MEAN MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN EST. AREA	TOTAL EST. VOLUME	MEAN EST. VOLUME	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
#	#		%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
33	7	LGR	27	60	1984	28	8	0.3	1.2	155	5123	50	1656	0	7	85	
1	0	HGR	1	87	87	1	0	0.0	0.0	0	0	0	0	0	0	0	
2	1	HRS	2	26	52	1	3	0.2	0.5	76	151	15	30	0	10	93	
3	1	POW	2	110	331	5	5	0.4	0.9	225	676	90	270	0	30	89	
10	1	RUN	8	41	412	6	8	0.8	1.2	722	7220	578	5776	0	10	91	
18	1	SRN	15	132	2380	34	10	0.4	0.6	1404	25272	562	10109	0	5	90	
6	6	MCP	5	35	212	3	13	1.8	3.6	440	2642	796	4777	665	7	88	
1	1	STP	1	26	26	0	3	1.3	0.7	74	74	96	96	92	5	91	
6	6	L6L	5	26	153	2	9	1.1	2.0	218	1308	204	1225	147	5	84	
5	5	L6R	4	33	167	2	8	1.2	2.2	275	1377	336	1679	249	4	90	
23	23	L6BK	19	36	835	12	11	1.7	5.4	401	9231	797	18940	683	2	92	
16	16	L6Bo	13	24	379	5	13	1.4	6.4	306	4889	621	9935	517	3	89	
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)					AREA (sq.ft.)		TOTAL VOL. (cu.ft.)					
124	68				7018					57964		53893					

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16W825 LATITUDE:39°2'48" LONGITUDE:123°35'16"

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 (sq.ft.)	MEAN EST. VOLUME (cu.ft.)	TOTAL EST. VOLUME (cu.ft.)	MEAN EST. VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
7	7	MAIN	12	34	238	13	11.3	1.8	388	2716	696	4873	582	6	
50	50	SCOUR	88	31	1534	87	11.0	1.5	336	16805	624	31180	522	3	
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)					TOTAL AREA (sq.ft.)		TOTAL VOL. (cu.ft.)			
57	57				1772					19521		36052			

# Three Springs Creek

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14N016W02S LATITUDE:39°2'48" LONGITUDE:123°35'16"

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
6	MCP	11	0	0	2	33	2	33	2	33	0	0
1	STP	2	1	100	0	0	0	0	0	0	0	0
6	LSL	11	0	0	5	83	1	17	0	0	0	0
5	LGR	9	0	0	3	60	2	40	0	0	0	0
23	LSBK	40	0	0	5	22	13	57	2	9	3	13
16	LSBo	28	0	0	12	75	3	19	0	0	1	6

TOTAL  
UNITS  
57

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14N016W02S LATITUDE:39°2'48" LONGITUDE:123°35'16"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS VEGETATION	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
33	7	LGR	5	3	0	0	6	0	0	77	9
1	0	HGR	0	0	0	0	0	0	0	0	0
2	1	BRS	0	30	0	0	0	0	0	70	0
3	1	POM	0	0	0	0	0	0	0	100	0
10	1	RUN	60	10	0	0	0	0	0	20	0
18	1	SEN	0	10	0	10	0	0	0	60	0
6	2	MCP	15	43	30	0	0	0	0	13	0
1	1	STP	0	0	0	0	10	0	0	0	90
6	1	LSL	25	50	20	0	0	0	0	5	0
5	1	LGR	0	10	0	40	0	0	0	10	20
23	4	LSBK	6	10	10	3	2	0	0	21	48
16	2	LSBo	0	5	5	0	0	0	0	90	0

# Three Springs Creek

THREE SPRINGS TRIB TO ELK

Drainage: ELK CREEK TO PACIFIC OCEAN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/27/01 to 08/29/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°2'48" LONGITUDE:123°35'16"

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
33	7	LGR	0	0	43	29	14	14	0
1	0	HRK	0	0	0	0	0	0	0
2	1	RRS	0	0	0	0	0	100	0
3	1	POW	0	0	100	0	0	0	0
10	1	RUN	0	0	0	0	100	0	0
18	1	SEN	0	0	100	0	0	0	0
6	2	MCP	0	100	0	0	0	0	0
1	1	STP	0	0	0	0	0	0	100
6	1	LGL	0	100	0	0	0	0	0
5	1	LGR	0	0	0	100	0	0	0
23	4	LBRK	0	100	0	0	0	0	0
16	2	LESo	0	100	0	0	0	0	0

TABLE 7

## THREE SPRINGS CREEK - 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	43	56	0	74	79

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: THREE SPRINGS TRIB TO ELK

SAMPLE DATES: 08/27/01 to 08/29/01

STREAM LENGTH: 7018 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: COLDSRING  
Legal Description: T14NR16WS25

Latitude: 39°2'48"  
Longitude: 123°35'16"

### SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

#### STREAM REACH 1

Channel Type: E3	Canopy Density: 88%
Channel Length: 7018 ft.	Coniferous Component: 43%
Riffle/flatwater Mean Width: 7 ft.	Deciduous Component: 57%
Total Pool Mean Depth: 1.5 ft.	Pools by Stream Length: 25%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 14%
Water: 055- 060°F Air: 068-082°F	Mean Pool Shelter Rtn: 18
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 77%	Occurrence of LOD: 6%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 5% 2. 2.25% 3. 35% 4. 12% 5. 23%

# Three Springs Creek

**TABLE 9**

**THREE SPRINGS CREEK**

**Mean Percentage of Dominant Substrate**

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	5	4	20.45
Boulder	2	1	6.82
Cobble/Gravel	4	4	18.18
Silt/clay	11	13	54.55

**Mean Percentage of Dominant Vegetation**

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	0	0	0
Brush	0	0	0
Decid. Trees	10	9	43.18
Conif. Trees	12	13	56.82
No Vegetation	0	0	0

Total stream average embeddedness value for pool 3.23

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

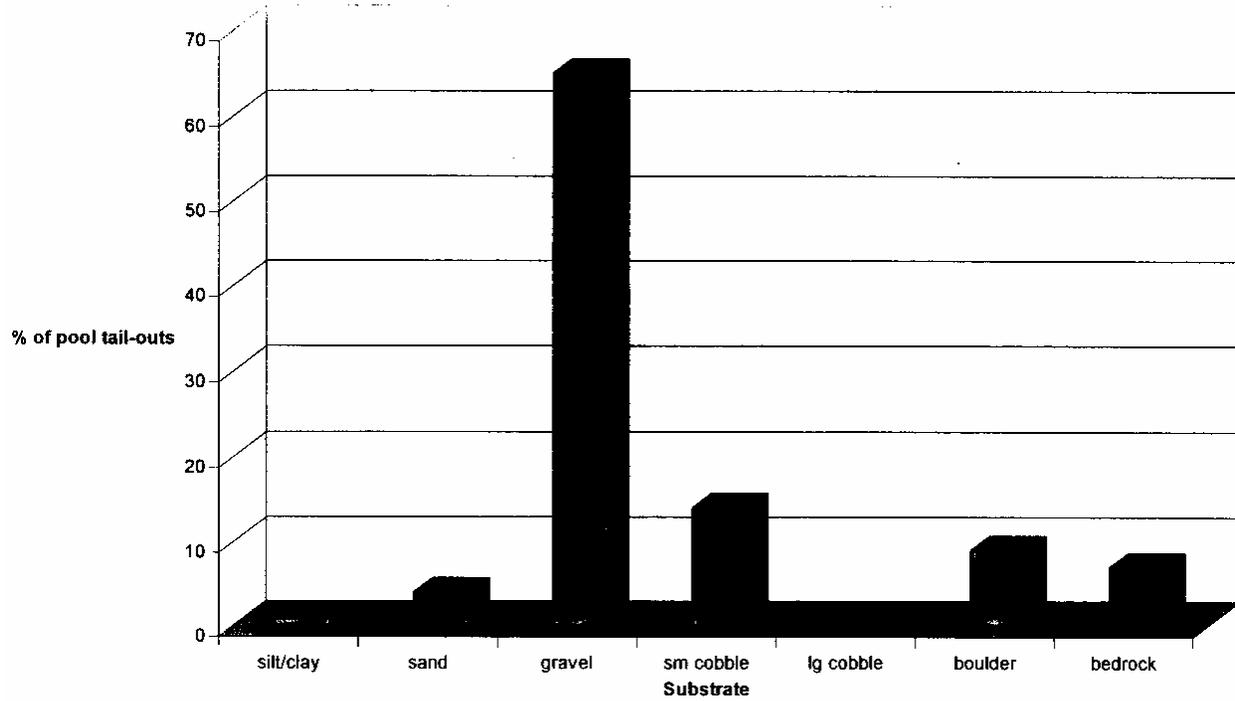
Stream: THREE SPRINGS TRIB TDrainage: ELK CREEK TO PACIFIC OCEAN

Survey Date: 08/27/01 to 08/29/01

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	7.95	20	7.27
SMALL WOODY DEBRIS	12.05	6.67	17.73
LARGE WOODY DEBRIS	5.91	0	11.82
ROOTS	2.73	3.33	4.55
TERRESTRIAL VEG	2.73	0	1.82
AQUATIC VEG	0	0	0
WHITewater	0	0	0
BOULDERS	52.05	70	29.55
BEDROCK LEDGES	16.59	0	27.27

# Three Springs Creek

## Three Springs Creek: Substrate Composition in Pool Tail-Outs



UNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16W825 LATITUDE:39°3'8" LONGITUDE:123°34'56"

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 ESTIMATED VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
7	2	RIFFLE	35	31	220	31	4.5	0.1	77	536	8	54	0	3
7	3	FLATWATER	35	59	414	58	5.0	0.4	284	1777	79	555	0	8
6	6	POOL	30	13	78	11	7.2	1.2	92	551	114	685	77	3
<b>TOTAL UNITS</b>	<b>TOTAL UNITS</b>				<b>TOTAL LENGTH (ft.)</b>				<b>TOTAL AREA (sq. ft.)</b>		<b>TOTAL VOL. (cu. ft.)</b>			
20	11				712				2864		1295			

# Three Springs Creek

UNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°3'8" LONGITUDE:123°34'56"

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 (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
6	6	SCOUR	100	13	78	100	7.3	1.2	92	551	114	685	77	3
<b>TOTAL UNITS</b>	<b>TOTAL UNITS</b>				<b>TOTAL LENGTH (ft.)</b>				<b>TOTAL AREA (sq.ft.)</b>		<b>TOTAL VOL. (cu.ft.)</b>			
6	6				78				551		685			

UNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°3'8" LONGITUDE:123°34'56"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL PERCENT LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN MAXIMUM DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING	MEAN CANOPY
6	1	LGR	30	31	188	26	5	0.1	0.1	32	189	3	19	0	0	95
1	1	ERS	5	32	32	4	4	0.1	0.4	122	122	12	12	0	5	84
6	2	RUN	30	49	293	41	5	0.4	0.9	199	1196	65	287	0	8	96
1	1	SRN	5	121	121	17	5	0.3	1.0	363	363	109	109	0	10	92
2	2	LSBk	10	16	32	4	6	1.0	1.6	77	155	77	155	43	5	99
4	4	LSBo	20	12	46	6	8	1.3	2.1	99	397	123	531	94	1	90
<b>TOTAL UNITS</b>	<b>TOTAL UNITS</b>				<b>TOTAL LENGTH (ft.)</b>					<b>AREA (sq.ft.)</b>		<b>TOTAL VOL. (cu.ft.)</b>				
20	11				712					2420		1213				

UNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°3'8" LONGITUDE:123°34'56"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<3 FT. MAXIMUM DEPTH	1-<3 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	3-<6 FOOT MAXIMUM DEPTH	3-<6 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
2	LSBk	33	0	0	2	100	0	0	0	0	0	0	0	0
4	LSBo	67	0	0	3	75	1	25	0	0	0	0	0	0
<b>TOTAL UNITS</b>														
6														

# Three Springs Creek

UNNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°3'8" LONGITUDE:123°34'56"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SMD	MEAN % LMD	MEAN % ROOT MASS VEGETATION	MEAN % TERN. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
6	0	LGR	0	0	0	0	0	0	0	0	0
1	1	BRS	0	90	0	0	0	0	0	10	0
6	2	RUN	0	25	0	0	0	0	0	75	0
1	1	SRN	0	0	0	0	0	0	0	100	0
2	1	LSBK	0	0	0	0	0	0	0	100	0
4	1	LSBo	0	0	0	0	0	0	0	100	0

UNNAMED TRIB THREE SPRINGS

Drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/30/01

Confluence Location: QUAD: COLDSRING LEGAL DESCRIPTION: T14NR16WS25 LATITUDE:39°3'8" LONGITUDE:123°34'56"

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
6	1	LGR	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	0
6	2	RUN	0	50	0	0	0	0	50
1	1	SRN	0	0	0	100	0	0	0
2	1	LSBK	0	0	0	0	0	0	100
4	1	LSBo	0	100	0	0	0	0	0

TABLE 7

## UNNAMED TRIBUTARY - THREE SPRINGS CREEK - 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
93	55	45	0	88	87

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.

# Three Springs Creek

**TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY**

**STREAM NAME:** UNAMED TRIB THREE SPRINGS  
**SAMPLE DATES:**  
**STREAM LENGTH:** 712 ft.  
**LOCATION OF STREAM MOUTH:**  
 USGS Quad Map: COLDSRING                      Latitude: 39°3'8"  
 Legal Description: T14NR16WS25                      Longitude: 123°34'56"

**SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH**

**STREAM REACH**  
 Channel Type:    Canopy Density: 93%  
 Channel Length: 712 ft.                                      Coniferous Component: 55%  
 Riffle/flatwater Mean Width: 5 ft.                      Deciduous Component: 45%  
 Total Pool Mean Depth: 1.2 ft.                      Pools by Stream Length: 11%  
 Base Flow: 0.0 cfs    Pools >=3 ft.deep: 0%  
 Water: 056- 057°F    Air: 060-064°F                      Mean Pool Shelter Rtn: 8  
 Dom. Bank Veg.: Coniferous Trees                      Dom. Shelter: Boulders  
 Vegetative Cover: 88%                                      Occurrence of LOD: 0%  
 Dom. Bank Substrate: Silt/Clay/Sand                      Dry Channel: 0 ft.

Embeddness Value: 1. 0%    2.0%    3. 50%    4. 17%    5. 33%

**TABLE 9**

**UNNAMED TRIBUTARY TO THREE SPRINGS CREEK**

**Mean Percentage of Dominant Substrate**

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	1	1	14.29
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	6	6	85.71

**Mean Percentage of Dominant Vegetation**

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	0	0	0
Brush	0	0	0
Decid. Trees	3	0	21.43
Conif. Trees	4	7	78.57
No Vegetation	0	0	0

Total stream average embeddedness value for pool                      3.83

# Three Springs Creek

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

Stream: UNAMED TRIB THREE SPD  
 drainage: THREE SPRINGS TO ELK TO PACIFIC OCEAN  
 Survey Date: 08/30/01

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	0	0	0
SMALL WOODY DEBRIS	20	16.67	0
LARGE WOODY DEBRIS	0	0	0
ROOTS	0	0	0
TERRESTRIAL VEG	0	0	0
AQUATIC VEG	0	0	0
WHITewater	0	0	0
BOULDERS	80	83.33	100
BEDROCK LEDGES	0	0	0

Unnamed Trib to Three Springs Creek: Substrate Composition in Pool Tail-Outs

