

STREAM INVENTORY REPORT

Line Creek

INTRODUCTION

A stream inventory was conducted from June 27 to June 30, 2005 on an unnamed tributary to South Fork Elk River, LLID number 1240603406631, herein after referred to as Line Creek. The survey began at the confluence with South Fork Elk River and extended upstream 0.7 miles.

The Line Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Line Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

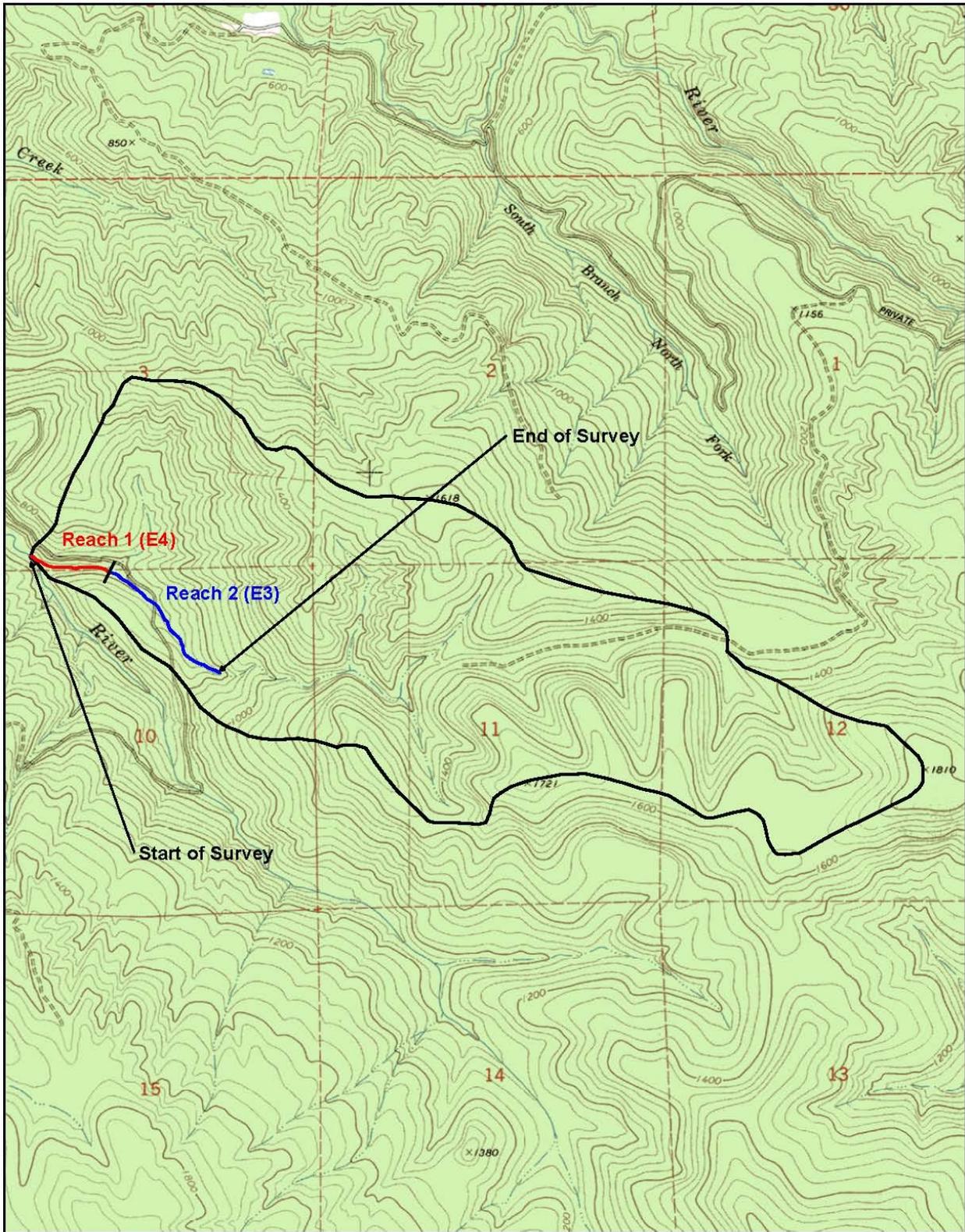
Line Creek is a tributary to South Fork Elk River, a tributary to Elk River, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Line Creek's legal description at the confluence with South Fork Elk River is T03N R01E S03. Its location is 40.6631 degrees north latitude and 124.0603 degrees west longitude, LLID number 1240603406631. Line Creek is an intermittent stream according to the USGS McWhinney Creek 7.5 minute quadrangle. Line Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 540 feet at the mouth of the creek to 1,800 feet in the headwater areas. Redwood forest and Douglas fir forest dominate the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via US Highway 101 take the Elk River Road Exit, to Elk River Road.

METHODS

The habitat inventory conducted in Line Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

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Map 1



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SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Line Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit 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 (1990). 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". Line Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured

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using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Line Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Line Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Line Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated visually into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Line Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation

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(including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Line Creek. In addition, 10 sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.0.17, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Line Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

The habitat inventory of June 27 to June 30, 2005 was conducted by C. Hines (CCC) and S. Young (WSP). The total length of the stream surveyed was 3,638 feet with an additional 356 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.33 cfs on June 16, 2005.

Line Creek is an E4 channel type for 1,285 feet of the stream surveyed (Reach 1) and an E3 channel type for 2,353 feet of the stream surveyed (Reach 2). E4 channel types indicate a low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition; very efficient and stable, they have a high meander width ratio and are gravel dominated. E3 channel types indicate a low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition; very efficient and stable; they have a high meander width ratio and are cobble dominated.

Water temperatures taken during the survey period ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 57 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% riffle units, 31% pool units, and 29% flatwater units (Graph 1). Based on total length of Level II habitat types there were 48% riffle units, 36% flatwater units, and 17% pool units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 23%; step run units, 21%; and low gradient riffle units, 18% (Graph 3). Based on percent total length; step run units made up 29%, high

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gradient riffle units 25%, and mid-channel pool units, 13%.

A total of 27 pools were identified (Table 3). Mid-channel pools were the most frequently encountered, at 78%, and comprised 82% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Ten of the 27 pools (37%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 27 pool tail-outs measured, one had a value of 1 (4%); seven had a value of 2 (26%); seven had a value of 3 (26%); seven had a value of 4 (26%); five had a value of 5 (19%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 66, flatwater habitat types had a mean shelter rating of 65, and pool habitats had a mean shelter rating of 104 (Table 1). Of the pool types, the mid-channel pools had a mean shelter rating of 93, scour pools had a mean shelter rating of 143 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 52% of pool tail-outs and small cobble was observed in 19% of pool tail-outs.

The mean percent canopy density for the surveyed length of Line Creek was 98%. The mean percentages of hardwood and coniferous trees were 54% and 44%, respectively. Two percent of the canopy was open. Graph 9 describes the mean percent canopy in Line Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 99% sand/silt/clay and 1% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 56% of the units surveyed. Additionally, 43% of the units surveyed had hardwood trees as the dominant vegetation type, and 1% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Ten sites were electrofished for species composition and distribution in Line Creek on October 25, 2005. Water temperatures taken during the electrofishing period (1020-1410) ranged from 50 to 52 degrees Fahrenheit. Air temperatures ranged from 50 to 56 degrees Fahrenheit. The

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sites were sampled by S. Wilson and H. Sgalitzer (WSP) and T. Tollefson (DFG).

In Reach 1, which comprised the first 1,285 feet of stream, two sites were sampled. The reach sites yielded six young-of-the-year (YOY) steelhead/rainbow trout (SH/RT) and seven YOY coho.

In Reach 2, eight sites were sampled starting approximately 1,285 feet from the confluence with South Fork Elk River and continuing upstream 2,353 feet. The reach sites yielded six YOY SH/RT, one age 1+ SH/RT, one age 2+ SH/RT/CT, and six YOY coho.

The following chart displays the information yielded from these sites:

Date	Site #	Hab. Unit #	Hab. Type	Position (feet)	Coho	SH/RT		
					YOY	YOY	1+	2+
Reach 1 E4 Channel Type								
10/25/05	1	005	4.2	130	2	4	0	0
10/25/05	2	028	3.4	981	5	2	0	0
Reach 2 E3 Channel Type								
10/25/05	3	031	4.2	1285	6	1	0	0
10/25/05	9	034	4.2	1348	0	0	0	0
10/25/05	10	042	4.2	1611	0	1	1	1
10/25/05	8	044	4.2	1737	0	1	0	0
10/25/05	7	049	4.2	1905	0	1	0	0
10/25/05	4	052	4.2	1982	0	1	0	0
10/25/05	5	054	4.2	2035	0	1	0	0
10/25/05	6	061	5.1	2196	0	0	0	0

DISCUSSION

Line Creek is an E4 channel type for the first 1,285 feet of stream surveyed and an E3 channel type for the next 2,353 feet. The suitability of E4 and E3 channel types for fish habitat improvement structures are considered good for bank-placed boulders; fair for opposing wing-deflectors; and poor for plunge weirs, boulder clusters and single wing-deflectors.

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The water temperatures recorded on the survey days June 27 to June 30, 2005 ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 57 to 63 degrees Fahrenheit. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 36% of the total length of this survey, riffles 48%, and pools 17%. The pools are relatively shallow, with 10 of the 27 (37%) pools having a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channels width.

Eight of the 27 pool tail-outs measured had embeddedness ratings of 1 or 2. Fourteen of the pool tail-outs had embeddedness ratings of 3 or 4. Five of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Line Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Nineteen of the 27 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 104. The shelter rating in the flatwater habitats was 65. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Line Creek. Large woody debris is the dominant cover type in pools followed by boulders. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

Reach 1 had a canopy density of 98%. Reach 2 had a canopy density of 98%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 100% each. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

- 1) Line Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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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.

Position (ft):	Habitat unit #:	Comments:
0	001	Start of survey at the confluence with South Fork Elk River. The channel type is an E4. Log stringer bridge
130	005	First electrofishing site.
348	012	Bridge.
456	015	Log debris accumulation (LDA) measures 6' high x 20' wide x 35' long. It consists of 13 pieces of large wood.
826	024	Two foot plunge over two log weirs.
981	028	Second electrofishing site.
1,045	029	Right bank tributary.
1,285	031	Channel type change from E4 to E3. Third electrofishing site.
1,348	034	Fourth electrofishing site.
1,518	039	LDA measures 6' high x 25' wide x 15' long with a 4.5' high plunge. It consists of eight pieces of large wood and is retaining sediment. Steelhead were observed above.
1,611	042	LDA measures 8' high x 26' wide x 19' long. It consists of seven pieces of large wood and is retaining sediment. Fifth electrofishing site.
1,737	044	Sixth electrofishing site.
1,843	047	LDA measures 7' high x 26' wide x 15' long with a 4' high plunge. It consists of 10 pieces of large wood and is retaining sediment.
1,905	049	Seventh electrofishing site.
1,929	050	Collapsed bridge. LDA measures 6' high x 25' wide x 20' long. It consists of 10 pieces of large wood and is retaining sediment.

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1,982	052	Eighth electrofishing site.
2,035	054	Ninth electrofishing site.
2,196	061	Tenth electrofishing site.
2,727	070	One 1+ steelhead/rainbow trout observed from the bank.
2,962	071	LDA measures 6' high x 35' wide x 40' long. It consists of 12 pieces of large wood and is retaining sediment.
3,125	073	Stream gradient is greater than 10% until the end of the survey.
3,638	083	End of survey due to high gradient.

REFERENCES

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

McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

Large Woody Debris (LWD) Riparian Inventory

**Elk River Watershed
Humboldt County
June 2005**

BACKGROUND

The importance of large woody debris (LWD) in the development of a stream’s morphological and biological productivity has been well documented. It strongly influences stream habitat characteristics and biotic composition. Large woody debris is often the structural element associated with pool formation and is considered one of the major elements that create complex fish habitat vital for juvenile salmonid survival. Habitat complexity is particularly important for coho salmon and steelhead trout juveniles because these salmonids remain in the stream for at least one year before migrating to the ocean.

Large woody debris inventories describe the present relative abundance of LWD elements providing, or with the potential to provide, fish habitat within the stream channel. Large woody debris inventories also describe the relative abundance of “recruitable” LWD. Recruitable LWD is the large wood existing out of the stream channel that has a high potential of entering the stream channel in the future.

METHODS

Prior to conducting the LWD inventory, the stream was habitat typed employing the methods described by Flosi, et al (1998). The Line Creek habitat typing survey delineated 2 stream reaches. The start and end points for the LWD inventory reaches correspond to stream reach start and end points of the habitat survey.

Large woody debris inventory methods, data recording forms, and database structure are described in Flosi, et al (1998). Large woody debris minimum size criteria was 12-inches in diameter and 6 feet in length. Root wads had the 12-inch minimum diameter criteria but had no minimum length requirement. Diameter and length categories consisted of the following:

Diameter Category	Length Category
1. 1-2 feet	1. 6-20 feet
2. 2-3 feet	2. Over 20 feet
3. 3-4 feet	
4. Over 4 feet	

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Condition or status categories included:

- a) dead and down
- b) dead and standing
- c) perched for imminent delivery to the stream channel
- d) live coniferous trees
- e) live broadleaf trees (a.k.a. deciduous/hardwood)

The sampling strategy consisted of selecting a random starting point near the beginning of the LWD survey reach, and then systematically sampling 200 foot sections out of every 1,000 feet of stream length surveyed. The first 1,200 feet of the LWD survey reach was segmented into 200 foot sections and consecutively numbered 1 through 6. One of these six 200 foot sections was randomly selected as the beginning of the *first* sample section. After conducting the inventory survey in the initial 200 foot section, surveyors proceeded upstream 800 feet and surveyed the next 200 feet as the *second* sample section. The *third* sample section began 800 feet upstream of the end of the second sample section and the next 200 feet were surveyed, and so on. Systematic sampling continued upstream until the end of the LWD survey reach. This method produced a sampling level of approximately 20 percent. For channel type reaches that were less than 1000 feet, the entire reach was surveyed.

RESULTS

*Tables 1 and 2 are located at the end of this report.

Expressed in Number of Pieces Per 100 linear Feet of Stream Channel.

STREAM	REACH	CHANNEL TYPE	TOTAL LENGTH	DEAD DOWN	DEAD STANDING	PERCHED	--LIVE TREES-- CONIFER BROADLEAF		TOTAL
Number of pieces per 100 linear feet of stream out of channel on right and left banks									
Line Creek	1	E4	1285	2	0	0	9	1.5	12.5
	2	E3	2709	4.8	1.2	0.2	9.2	0.7	16.1
Number of pieces per 100 linear feet of stream within the bankfull channel									
Line Creek	1	E4	1285	11.5	0	0	0	0	11.5
	2	E3	2709	1.8	0.2	0	0	0.2	2.2
Number of pieces per 100 linear feet of stream out of channel on right and left banks and within the bankfull channel									
Line Creek	1	E4	1285	13.5	0	0	9	1.5	24
	2	E3	2709	6.7	1.3	0.2	9.2	0.8	18.2
Percentage of LWD pieces found out of channel on right and left banks									
Line Creek	1	E4	1285	16	0	0	72	12	100
	2	E3	2709	29.81366	7.4534161	1.242236	57.14286	4.347826087	100
Percentage of LWD pieces found within the bankfull channel									
Line Creek	1	E4	1285	100.0	0.0	0.0	0.0	0.0	100
	2	E3	2709	81.8	9.1	0.0	0.0	9.1	100
Percentage of LWD pieces found out of channel on right and left banks and within the bankfull channel									
Line Creek	1	E4	1285	56.3	0.0	0.0	37.5	6.3	100
	2	E3	2709	36.8	7.1	1.1	50.5	4.4	100

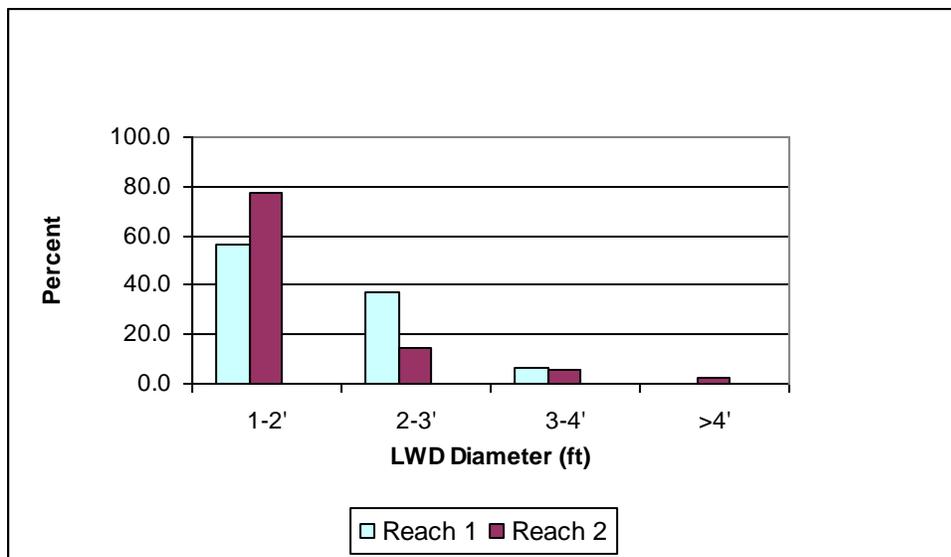
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The Line Creek LWD inventory consisted of 2 inventory reaches:

Reach 1, an E4 channel type extended upstream approximately 1285 feet from the mouth. This reach contained 12.5 pieces of LWD on both the right and the left banks per 100 linear feet of stream. In descending proportions, the condition of the pieces were 72% live coniferous, 16% dead and down, 12% live broadleaf, 0% dead and standing, and 0% perched (Figure 1). Within the bankfull channel, Reach 1 contained 11.5 pieces of LWD per 100 linear feet of stream. The conditions of the pieces were 100% dead and down and 0% live coniferous, 0% live broadleaf, 0% dead and standing, and 0% perched. The total number of pieces per 100 linear feet for both the banks and bankfull channel were 24, of which 56.3% were dead and down, 37.5% were live coniferous, 6.3% live broadleaf, 0% dead and standing, and 0% perched. Of the pieces in Reach 1, 56.3% were in LWD size category of 1-2 foot in diameter, 37.5% were in the 2-3 foot category, 6.3% were in the 3-4 foot category and 0% were in the >4 foot category (Figure 2).

Reach 2, an E3 channel type extended upstream approximately 2709 feet from the mouth. This reach contained 16.1 pieces of LWD on both the right and the left banks per 100 linear feet of stream. In descending proportions, the condition of the pieces were 57.1% live coniferous, 29.8% dead and down, 7.5% dead and standing, 4.3% live broadleaf and 1.2% perched (Figure 1). Within the bankfull channel, Reach 2 contained 2.2 pieces of LWD per 100 linear feet of stream. The conditions of the pieces were 29.8% dead and down and 57.1% live coniferous, 7.5% dead and standing, 4.3% live broadleaf and 1.2% perched. The total number of pieces per 100 linear feet for both the banks and bankfull channel were 18.2, of which 9.2% dead and standing, 6.7% were dead and down, 1.3% were live coniferous, 0.8% perched and 0.2% live broadleaf. Of the pieces in Reach 2, 77.1% were in LWD size category of 1-2 foot in diameter, 14.7% were in the 2-3 foot category, 5.5% were in the 3-4 foot category and 2.8% were in the >4 foot category (Figure 2).

Figure 2: Percent of LWD according to diameter size class and stream reach



Line Creek

DISCUSSION

One goal of conducting LWD inventories is to provide data that, along with fish population and habitat type data, will enable resource managers to characterize the quality of available and potential fish habitat. Although, the relationship between the number, size, and type of LWD pieces per 100 feet, and quality of fish habitat has not been fully established, it is generally accepted that LWD in the stream channel plays a vital role in contributing to the quality of fish habitat. Large woody debris within the bank zone is the source for future instream LWD and addresses the issue of LWD recruitment to the stream channel. Information in this report will enable resource managers to identify areas lacking in LWD, subsequently leading to planning and prioritizing prescriptions for improvement. This information will also be useful in detecting changes in LWD relative abundance with relation to land use practices or riparian zone restoration projects.