STREAM INVENTORY REPORT

"South Fork Caspar Creek"

INTRODUCTION

A stream inventory was conducted from August 10 to August 15, 2006 on an unnamed tributary to Caspar Creek commonly know as and hereinafter referred to as South Fork Caspar Creek. The survey began at the confluence with Caspar Creek and extended upstream 2.3 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in South Fork Caspar Creek.

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

South Fork Caspar Creek is a tributary to Caspar Creek, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). South Fork Caspar Creek's legal description at the confluence with Caspar Creek is T17N R17W S09. Its location is 39.3465 north latitude and 123.7557 west longitude, LLID number 1237544393465. South Fork Caspar Creek is an intermittent stream with no blue line according to the USGS Mendocino 7.5 minute quadrangle. South Fork Caspar Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 80 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is located in Jackson Demonstration State Forest and is managed for timber production. The watershed is under study as a cooperative agreement between the California Department of Forestry and Fire Protection (CDF) and the United States Forest Service (USFS). Access exists from Highway 1 to CDF roads.

METHODS

The habitat inventory conducted in South Fork Caspar Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians 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.

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 South Fork Caspar 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". South Fork Caspar 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 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 South Fork Caspar Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited 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 South Fork Caspar 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 ocularly 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In South Fork Caspar 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 ocularly 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 South Fork Caspar 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 (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.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, 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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for South Fork Caspar 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

\ast ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT \ast

The habitat inventory of August 10 to August 15, 2006, was conducted by C. Hines and D. Wright (PSMFC). The total length of the stream surveyed was 11,935.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.25 cfs on August 07, 2006.

South Fork Caspar Creek is an F4 channel type for 1,882 feet of the stream surveyed (Reach 1), an undetermined channel type for 360 feet of the stream that was not surveyed (Reach 2), and an F4 channel type for 9,693 feet of the stream surveyed (Reach 3). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 63 degrees Fahrenheit. Air temperatures ranged from 60 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% flatwater units, 31% pool units, and 29% riffle units (Graph 1). Based on total length of Level II habitat types there were 66% flatwater units, 20% riffle units, and 13% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 30%; low gradient riffle units, 28%; and mid-channel pool units, 23% (Graph 3). Based on percent total length, step run units made up 62%, low gradient riffle units 19%, and mid-channel pool units 8%.

A total of 46 pools were identified (Table 3). Main channel pools were the most frequently encountered at 74% (Graph 4), and comprised 62% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seventeen of the 46 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 46 pool tail-outs measured, 4 had a value of 1 (8.7%); 21 had a value of 2 (45.7%); 15 had a value of 3 (32.6%); 3

had a value of 4 (6.5%); 3 had a value of 5 (6.5%) (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 unsuited 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 3, flatwater habitat types had a mean shelter rating of 27, and pool habitats had a mean shelter rating of 72 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 99. Main channel pools had a mean shelter rating of 63 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in South Fork Caspar Creek. Graph 7 describes the pool cover in South Fork Caspar Creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 76% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 17% of the pool tail-outs.

The mean percent canopy density for the surveyed length of South Fork Caspar Creek was 90%. Ten percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 33% and 67%, respectively. Graph 9 describes the mean percent canopy in South Fork Caspar Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 95%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 99% sand/silt/clay and 1% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 70.9% of the units surveyed. Additionally, 29.1% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

DISCUSSION

South Fork Caspar Creek is an F4 channel type for the first 1,882 feet of stream surveyed, an undetermined channel type for the next 360 feet that was not surveyed, and an F4 channel type for the remaining 9,693 feet. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days August 10 to August 15, 2006 ranged from 54 to 63 degrees Fahrenheit. Air temperatures ranged from 60 to 70 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 66% of the total length of this survey, riffles 20%, and pools 13%. Seventeen of the 46 (37%) pools had a maximum residual depth greater than 2 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 channel width. Installing large wood structures that will increase or deepen pool habitat is recommended.

Twenty-five of the 46 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen of the pool tail-outs had embeddedness ratings of 3 or 4. Three of the pool tail-outs had a rating of 5, which is considered unsuitable 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 South Fork Caspar Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-three of the 46 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 is 72. The shelter rating in the flatwater habitats is 27. 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 South Fork Caspar Creek. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 90%. Reach 1 had a canopy density of 81.4% and Reach 3 had a canopy density of 92.2%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 95% and 98%, respectively. 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) South Fork Caspar 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.

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

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:
30	0002.00	Start of survey 30 feet from the confluence with Caspar Creek.
821	0022.00	There is a large landslide 215' into the habitat unit where the road is washed out.
1105	0023.00	The landslide from the previous unit raises channel bed forming a damned pool.
1742	0028.00	There is a footbridge at 85' into the habitat unit.
1882	0030.00	A weir forms a pool with a sand bottom.
2242	0031.00	Tributary #1 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes to 20% of the flow to South Fork Casper Creek. The water temperature downstream of the tributary is 59 degrees Fahrenheit, the water temperature of the tributary is 59 degrees Fahrenheit, and the water temperature upstream of the confluence is 60 degrees Fahrenheit. The slope of the tributary is 6% and fish are not observed in the 80 feet explored though it does appear accessible.
2334	0032.00	There is a footbridge at 40' into the habitat unit.
2439	0033.00	There is a footbridge and gauging station 84' into the habitat unit.
3051	0041.00	Bridge #01 is an unnamed road, and is 7' high x 16' wide x 30' long. It is a log stringer bridge made of redwood logs and steel braces.
3663	0049.00	Tributary #02 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes to15% of the flow to South Fork Caspar Creek. The water temperature downstream of the tributary is 58 degrees Fahrenheit, the water temperature of the tributary is 59 degrees Fahrenheit, and the water temperature upstream of the confluence is 59 degrees Fahrenheit.

The slope of the tributary is 5% and fish are not observed in the 100 feet explored though it does appear to be accessible to fish.

- 4981 0071.00 There is a landslide on the left bank that measures 20' long x 25' high.
- 5887 0083.00 Coho salmon have been observed throughout this survey. This is the last habitat unit with positive identification of coho salmon.
- 6184 0088.00 Tributary #03 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes to 20% of the flow to South Fork Caspar Creek. The water temperature downstream of the tributary is 58 degrees Fahrenheit, the water temperature of the tributary is 58 degrees Fahrenheit, and the water temperature upstream of the confluence is 56 degrees Fahrenheit. The slope of the tributary is 3% and fish are not observed in the 75 feet.
- 6228 0090.00 There is a footbridge at 29' into the habitat unit.
- 7518 0106.00 Tributary #04 enters on the right bank. The estimated flow is less than 0.1 cfs, and it contributes to 2% of the flow to South Fork Caspar Creek. The water temperature downstream of the tributary is 56 degrees Fahrenheit, the water temperature of the tributary is 58 degrees Fahrenheit, and the water temperature upstream of the confluence is 56 degrees Fahrenheit. The slope of the tributary is 3% and fish are not observed in the 60 feet surveyed.
- 7794 0107.00 There is a footbridge at 84' into the habitat unit.
- 8252 0115.00 The channel is nearly dry for nearly 550'.
- 8952 0117.00 There are stranded juvenile steelhead in this habitat unit.
- 11024 0138.00 There is an unknown salmonid. Salmonids have been observed throughout the habitat unit. This is the last observation of the survey.
- 11903 0150.00 The banks have collapsed at top of the habitat unit which has in turn lead to a rise in stream level.
- 11935 0150.00 End of survey.

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.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE Low Gradient Riffle High Gradient Riffle	(LGR) (HGR)	[1.1] [1.2]	{ 1} { 2}
CASCADE Cascade Bedrock Sheet	(CAS) (BRS)	[2.1] [2.2]	{ 3} {24}
FLATWATER Pocket Water Glide Run Step Run Edgewater	(POW) (GLD) (RUN) (SRN) (EDW)	[3.1] [3.2] [3.3] [3.4] [3.5]	{21} {14} {15} {16} {18}
MAIN CHANNEL POOLS Trench Pool Mid-Channel Pool Channel Confluence Pool Step Pool	(TRP) (MCP) (CCP) (STP)	[4.1] [4.2] [4.3] [4.4]	{ 8 } {17} {19} {23}
SCOUR POOLS Corner Pool Lateral Scour Pool - Log Enhanced Lateral Scour Pool - Root Wad Enhanced Lateral Scour Pool - Bedrock Formed Lateral Scour Pool - Boulder Formed Plunge Pool	(CRP) (LSL) (LSR) (LSBk) (LSBo) (PLP)	[5.1] [5.2] [5.3] [5.4] [5.5] [5.6]	<pre>{22} {10} {11} {11} {12} {20} { 9 }</pre>
BACKWATER POOLS Secondary Channel Pool Backwater Pool - Boulder Formed Backwater Pool - Root Wad Formed Backwater Pool - Log Formed Dammed Pool	(SCP) (BPB) (BPR) (BPL) (DPL)	[6.1] [6.2] [6.3] [6.4] [6.5]	{ 4 } { 5 } { 6 } { 7 } { 13 }
ADDITIONAL UNIT DESIGNATIONS Dry Culvert Not Surveyed Not Surveyed due to a marsh	(DRY) (CUL) (NS) (MAR)	[7.0] [8.0] [9.0] [9.1]	

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: SF Caspar Creek

Survey Dates: 8/10/2006 to 8/15/2006

Confluence Location: Quad: MENDOCINO Legal Description: T17NR17WS09 Latitude: 39:20:47.0N Longitude: 123:45:16.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max 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
4	0	DRY	2.7	41	164	1.4									0
55	8	FLATWATER	36.7	139	7632	66.1	6.4	0.5	0.9	518	28504	228	12553		27
2	0	NOSURVEY	1.3	195	390										
46	46	POOL	30.7	32	1494	12.9	10.3	1.1	1.9	376	17319	562	25863	451	72
43	4	RIFFLE	28.7	52	2255	19.5	5.0	0.2	0.3	167	7170	33	1434		3

LLID: 1237544393465

Drainage: Big River

Total	Total Units Fully	Total Length	Total Area	Total Volume	
Units	Measured	(ft.)	(sq.ft.)	(cu.ft.)	
150	58	11935	52992	39850	

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: SF Caspar Creek

LLID: 1237544393465 Drainage: Big River

Survey Dates: 8/10/2006 to 8/15/2006

Confluence Location: Quad: MENDOCINO Legal Description: T17NR17WS09 Latitude: 39:20:47.0N Longitude: 123:45:16.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max 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	Mean Canopy (%)
42	3	LGR	28.0	53	2243	19.4	5	0.2	0.3	203	8540	41	1708		3	93
1	1	BRS	0.7	12	12	0.1	5	0.2	0.3	57	57	11	11		0	100
10	2	RUN	6.7	49	488	4.2	6	0.5	1.1	225	2250	98	975		25	94
45	6	SRN	30.0	159	7144	61.9	6	0.5	1.3	616	27720	272	12232		28	89
34	34	MCP	22.7	27	926	8.0	10	1.1	3.3	313	10642	436	14838	366	63	87
1	1	CRP	0.7	28	28	0.2	10	1.7	3.2	280	280	560	560	476	120	96
7	7	LSL	4.7	30	209	1.8	11	0.9	2.2	308	2153	344	2409	285	89	93
2	2	LSR	1.3	19	38	0.3	7	1.1	2.2	139	278	181	362	157	165	94
1	1	LSBk	0.7	34	34	0.3	10	1.2	2.2	340	340	442	442	408	20	100
1	1	DPL	0.7	259	259	2.2	14	1.4	3.7	3626	3626	7252	7252	5076	60	90
4	0	DRY	2.7	41	164	1.4									0	92
2	0	NS	1.3	195	390											

Total Volume (cu.ft.) 40790

Table 3 - Summary of Pool Types

Stream Name: SF Caspar Creek

Survey Dates: 8/10/2006 to 8/15/2006

Confluence Location: Quad: MENDOCINO Legal Description: T17NR17WS09 Latitude: 39:20:47.0N Longitude: 123:45:16.0W

LLID: 1237544393465

Drainage: Big River

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating	
34	34	MAIN	74	27	926	62	10.4	1.1	313	10642	366	12457	63	
11	11	SCOUR	24	28	309	21	9.8	1.0	277	3051	290	3194	99	
1	1	BACKWATER	2	259	259	17	14.0	1.4	3626	3626	5076	5076	60	

Total	Total Units Fully	Total Length	Total Area	Total Volume	
Units	Measured	(ft.)	(sq.ft.)	(cu.ft.)	
46	46	1494	17318	20727	

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: SF Caspar Creek

LLID: 1237544393465 Drainage: Big River

Survey Dates: 8/10/2006 to 8/15/2006

Confluence Location: Quad: MENDOCINO Legal Description: T17NR17WS09 Latitude: 39:20:47.0N Longitude: 123:45:16.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
34	MCP	74	1	3	21	62	11	32	1	3	0	0
1	CRP	2	0	0	0	0	0	0	1	100	0	0
7	LSL	15	0	0	6	86	1	14	0	0	0	0
2	LSR	4	0	0	1	50	1	50	0	0	0	0
1	LSBk	2	0	0	0	0	1	100	0	0	0	0
1	DPL	2	0	0	0	0	0	0	1	100	0	0

Total	Total <	Total	Total	Total	Total	Total	Total	Total	Total	Total
Units	1 Foot Max	< 1 Foot	1< 2 Foot	1< 2 Foot	2< 3 Foot	2< 3 Foot	3< 4 Foot	3< 4 Foot	>= 4 Foot	>= 4 Foot
	Resid.	% Occurrence	Max Resid.	% Occurrence	Max Resid.	% Occurrence	Max Resid.	% Occurrence	Max Resid.	% Occurrence
	Depth		Depth		Depth		Depth		Depth	
46	1	2	28	61	14	30	3	7	0	0

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream I	Name: SF C	Caspar Creek					LLID: 12	37544393465	Drainage:	Big River	
Survey [Dates: 8/10	/2006 to 8/15/20	06	Dry L	Jnits: 4						
Confluer	nce Location	: Quad: MEN	IDOCINO	Lega	I Description:	T17NR17WS0	9 Latitude:	39:20:47.0N	Longitude:	123:45:16.0W	
Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
42	3	LGR	0	0	0	0	0	0	0	100	0
1	1	BRS	0	0	0	0	0	0	0	0	0
43	4	TOTAL RIFFLE	≣ 0	0	0	0	0	0	0	100	0
10	2	RUN	30	45	0	0	25	0	0	0	0
45	6	SRN	20	37	20	0	15	0	0	8	0
55	8	TOTAL FLAT	23	39	15	0	18	0	0	6	0
34	33	MCP	19	23	28	10	3	0	0	13	4
1	1	CRP	0	10	80	0	0	0	0	10	0
7	7	LSL	3	40	46	0	3	0	0	6	3
2	2	LSR	0	30	10	60	0	0	0	0	0
1	1	LSBk	10	0	0	0	0	0	0	0	90
1	1	DPL	10	30	30	0	30	0	0	0	0
46	45	TOTAL POOL	15	25	31	10	3	0	0	11	6
2	0	NS									
150	58	TOTAL	16	27	28	8	5	0	0	12	5

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream N	Name: SF Ca	spar Creek				LLID:	1237544393465	Drainage: B	ig River
Survey D	Dates: 8/10/2	006 to 8/15/2	2006	Dry Units:	4				
Confluer	ce Location:	Quad: MI	ENDOCINO	Legal Des	cription: T17N	R17WS09 Latitu	de: 39:20:47.0N	Longitude: 12	23:45:16.0W
Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
42	3	LGR	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	100
10	2	RUN	0	0	100	0	0	0	0
45	6	SRN	0	0	100	0	0	0	0
34	34	MCP	3	15	68	9	6	0	0
1	1	CRP	0	0	0	100	0	0	0
7	7	LSL	0	43	43	14	0	0	0
2	2	LSR	0	0	100	0	0	0	0
1	1	LSBk	0	0	0	100	0	0	0
1	1	DPL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name:	SF Caspar Cre	ek				LLID: 123	7544393465	Drainage:	Big River
Survey Dates:	8/10/2006 to 8/	15/2006							
Confluence Loc	ation: Quad:	MENDOCINO	Legal	Description:	T17NR17WS09	Latitude:	39:20:47.0N	Longitude:	123:45:16.0W
Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	: Mean Left Bank % Cover				
90	67	33	0	95	98				

Note: Mean percent conifer and hardwood 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:	SF Cas	spar Cree	ek				LLID: 12375	544393465	Drainage: B	ig River	
Survey Dates:	8/10/20	06 to 8/	15/2006	Survey Length (ft.):	11935	Main	Channel (ft.)	: 11935	Side Chann	el (ft.): 0	
Confluence Loc	cation:	Quad:	MENDOCINO	Legal Description:	T17NR17W	/S09	Latitude: 39	9:20:47.0N	Longitude:	123:45:16	3.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1		
Channel Type: F4	Canopy Density (%): 81.4	Pools by Stream Length (%): 29.8
Reach Length (ft.): 1882	Coniferous Component (%): 60.0	Pool Frequency (%): 34.5
Riffle/Flatwater Mean Width (ft.): 5.8	Hardwood Component (%): 40.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 40
Range (ft.): 14 to 22	Vegetative Cover (%): 96.8	2 to 2.9 Feet Deep: 40
Mean (ft.): 18	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 20
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 22	Mean Max Residual Pool Depth (ft.): 2.5
Water (F): 58 - 61 Air (F): 64 - 67	LWD per 100 ft.:	Mean Pool Shelter Rating: 76
Dry Channel (ft): 0	Riffles: 1	
	Pools: 3	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 10 Sand	d: 0 Gravel: 80 Sm Cobble: 10 Lg Cobble: 0	Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 30.0 2.	50.0 3. 0.0 4. 10.0 5. 10.0	
STREAM REACH: 2		

Channel Type: NA	Canopy Density (%):	Pools by Stream Length (%): 0.0			
Reach Length (ft.): 360	Coniferous Component (%):	Pool Frequency (%): 0.0			
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%):	Residual Pool Depth (%):			
BFW:	Dominant Bank Vegetation:	< 2 Feet Deep:			
Range (ft.): 22 to 22	Vegetative Cover (%): 0.0	2 to 2.9 Feet Deep:			
Mean (ft.): 22	Dominant Shelter:	3 to 3.9 Feet Deep:			
Std. Dev.: 0	Dominant Bank Substrate Type:	>= 4 Feet Deep:			
Base Flow (cfs.): 0.3	Occurrence of LWD (%):	Mean Max Residual Pool Depth (ft.):			
Water (F): 61 - 61 Air (F): 64 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating:			
Dry Channel (ft): 0					
	Pools:				
Flat:					
Pool Tail Substrate (%): Silt/Clay: Sand	d: Gravel: Sm Cobble: Lg Cobble:	Boulder: Bedrock:			
Embeddedness Values (%): 1. 2.	3. 4. 5. 0.0				

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3		
Channel Type: F4	Canopy Density (%): 92.2	Pools by Stream Length (%): 9.6
Reach Length (ft.): 9693	Coniferous Component (%): 68.5	Pool Frequency (%): 30.0
Riffle/Flatwater Mean Width (ft.): 6.0	Hardwood Component (%): 31.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 69
Range (ft.): 7 to 22	Vegetative Cover (%): 96.5	2 to 2.9 Feet Deep: 28
Mean (ft.): 11	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 3
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.3	Occurrence of LWD (%): 26	Mean Max Residual Pool Depth (ft.): 1.8
Water (F): 54 - 63 Air (F): 60 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 71
Dry Channel (ft): 164	Riffles: 0	
	Pools: 4	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 San	d: 6 Gravel: 75 Sm Cobble: 19 Lg Cobble: 0	Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 2.8 2.	44.4 3. 41.7 4. 5.6 5. 5.6	

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: SF Caspar Creek				LLID: 1237544393465		Drainage:	Big River		
Survey Dates:	8/10/20	06 to 8/′	15/2006						
Confluence Loc	ation:	Quad:	MENDOCINO	Legal Description:	T17NR17WS09	Latitude: 39:20):47.0N	Longitude:	123:45:16.0W

3

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	1	0	0.8
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	58	59	99.2

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	0	0	0.0
Hardwood Trees	15	19	28.8
Coniferous Trees	44	39	70.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: SF Caspar Creek

Drainage: Big River LLID: 1237544393465

Survey Dates: 8/10/2006 to 8/15/2006

Confluence Location: Quad: MENDOCINO

Legal Description: T17NR17WS09 Latitude: 39:20:47.0N Longitude: 123:45:16.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	23	15
SMALL WOODY DEBRIS (%)	0	39	25
LARGE WOODY DEBRIS (%)	0	15	31
ROOT MASS (%)	0	0	10
TERRESTRIAL VEGETATION (%)	0	18	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	100	6	11
BEDROCK LEDGES (%)	0	0	6

SF CASPAR CREEK 2006 HABITAT TYPES BY PERCENT OCCURRENCE



SF CASPAR CREEK 2006 HABITAT TYPES BY PERCENT TOTAL LENGTH



SF CASPAR CREEK 2006 HABITAT TYPES BY PERCENT OCCURRENCE



SF CASPAR CREEK 2006 POOL TYPES BY PERCENT OCCURRENCE



SF CASPAR CREEK 2006 MAXIMUM DEPTH IN POOLS



SF CASPAR CREEK 2006 PERCENT EMBEDDEDNESS



SF CASPAR CREEK 2006 MEAN PERCENT COVER TYPES IN POOLS



SF CASPAR CREEK 2006 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



SF CASPAR CREEK 2006 MEAN PERCENT CANOPY



SF CASPAR CREEK 2006 DOMINANT BANK COMPOSITION IN SURVEY REACH



SF CASPAR CREEK 2006 DOMINANT BANK VEGETATION IN SURVEY REACH



