

# **STREAM INVENTORY REPORT**

## **Caspar Creek**

### **INTRODUCTION**

A stream inventory was conducted from August 28 to September 7, 2006 on Caspar Creek. The survey began at the Pacific Ocean and extended upstream 4.2 miles, ending at the confluence with the unnamed tributary designated locally as South Fork Caspar Creek.

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

Caspar Creek drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Caspar Creek's legal description at the confluence with the Pacific Ocean is T17N R18W S01. Its location is 39.3616 degrees north latitude and 123.8166 degrees west longitude, LLID number 1238153393619. Caspar Creek is a first order stream and has approximately 7.9 miles of blue line stream according to the USGS Mendocino 7.5 minute quadrangle. Caspar Creek drains a watershed of approximately 8.5 square miles. Elevations range from about 0 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily located within the Jackson Demonstration State Forest and is managed for timber production and recreation. Vehicle access exists via Highway 1.

### **METHODS**

The habitat inventory conducted in 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.

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### 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 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". 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 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.

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### 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 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 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 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.

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### 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 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

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### HABITAT INVENTORY RESULTS

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

The habitat inventory of August 28 to September 7, 2006 was conducted by J. Caldwell and J. Beck (PSMFC). The total length of the stream surveyed was 21,867 feet with an additional 243 feet of side channel. The first 2,660 feet of stream were not surveyed. The data included in this report is for the 19,207 feet actually surveyed.

Stream flow was not measured on Caspar Creek.

Caspar Creek is an unknown channel type for 2,660 feet of the stream (Reach 1), an F5 channel type for 5,755 feet of the stream surveyed (Reach 2), and an F4 channel type for 13,452 feet of the stream surveyed (Reach 3). F5 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with sand-dominant substrates. 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 56 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 38% flatwater units, and 19% riffle units (Graph 1). Based on total length of Level II habitat types there were 52% flatwater units, 40% pool units, and 8% riffle units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 42%; run units, 24%; and low gradient riffle units, 19% (Graph 3). Based on percent total length, mid-channel pools made up 39%, step run units 30%, and run units 22%.

A total of 148 pools were identified (Table 3). Main channel pools were the most frequently encountered at 97% (Graph 4), and comprised 98% 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. One hundred seventeen of the 144 pools (81%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 121 pool tail-outs measured, 27 had a value of 1 (22.3%); 67 had a value of 2 (55.4%); 24 had a value of 3 (19.8%); 3 had a value of 4 (2.5%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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 12, flatwater habitat types had a mean shelter rating of 26, and pool habitats had a mean

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shelter rating of 39 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 60. Main channel pools had a mean shelter rating of 40. Scour pools had a mean shelter rating of 20 (Table 3).

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

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 84% of the pool tail-outs. Sand was the next most frequently observed dominant substrate type and occurred in 10% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Caspar Creek was 84%. Sixteen percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 72% and 28%, respectively. Graph 9 describes the mean percent canopy in Caspar Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant element composing the structure of the stream banks was sand/silt/clay. Fine sediment was the dominant element of 100% of the stream banks (Graph 10). Hardwood trees were the dominant vegetation type observed in 64% of the units surveyed. Additionally, 34% of the units surveyed had coniferous trees as the dominant vegetation type, and 2% had brush as the dominant vegetation type (Graph 11).

## DISCUSSION

Caspar Creek is an unknown channel type for the first 2,660 feet of stream, an F5 channel type for the next 5,755 feet and an F4 channel type for the remaining 13,452 feet. The suitability of F5 and F4 channel types for fish habitat improvement structures is as follows: F5 and 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 of August 28 to September 7, 2006 ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 66 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 52% of the total length of this survey, riffles 8%, and pools 40%. One hundred seventeen of the 144 (81%) 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.

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Ninety-four of the 121 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-seven of the pool tail-outs had embeddedness ratings of 3 or 4. None 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.

One hundred twenty-one of the 144 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 39. The shelter rating in the flatwater habitats is 26. 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 Caspar Creek. Large woody debris is the dominant cover type in pools followed by root mass. 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 84%. Reach 2 had a canopy density of 78%. Reach 3 had a canopy density of 85%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 99% and 99%, 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) 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.

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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	0001.00	Start of survey at the confluence with the Pacific Ocean. Stream habitat data was not collected for the first 2,660 feet of Caspar Creek (Reach 1).
2660	0002.00	Start of data collection at the U.S. Highway 1 crossing. The channel type is an F5 (start of Reach 2).
3823	0014.00	LDA #01 spans half of channel 10' into unit
4345	0018.00	LDA #02 contains 14 pieces of large woody debris (LWD) and measures 4' high x 35' wide x 20' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA. Several coho juveniles were observed.
5908	0033.00	LDA #03 contains six pieces of LWD and measures 5' high x 30' wide x 6' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
6507	0035.00	LDA #04 contains nine pieces of LWD and measures 5' high x 35' wide x 12' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
6909	0042.00	Tributary #01 enters on the left bank.
7095	0045.00	LDA #05 contains 14 pieces of LWD and measures 7' high x 20' wide x 15' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
7580	0051.00	LDA #06 contains 14 pieces of LWD and measures 4' high x 25' wide x 20' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
8228	0061.00	The channel changes from an F5 to an F4 (start of Reach 3).
10361	0097.00	LDA #07 contains six pieces of LWD and measures 5' high x 20' wide x 5' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
10406	0098.00	Right bank seep.



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10862	0107.00	Tributary #02 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes more than 5% of the flow to Caspar Creek. The water temperature downstream and upstream of the tributary is 59 degrees Fahrenheit. The estimated slope of the tributary is 2%. No fish were observed in the tributary.
11520	0117.00	LDA #08 contains eight pieces of LWD and measures 7' high x 17' wide x 18' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
12421	0135.00	LDA #09 contains 10 pieces of LWD and measures 8' high x 30' wide x 25' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
13494	0156.00	LDA #10 contains 20 pieces of LWD and measures 8' high x 35' wide x 20' long. Water flows through and there are no visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
13863	0166.00	Tributary #03 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes more than 5% of the flow to Caspar 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 estimated slope of the tributary is 2%. No fish were observed in the tributary.
14911	0189.00	A weir spans the channel.
15185	0194.00	Tributary #04 enters on the right bank. The estimated flow is 0.1 cfs, and it contributes to approximately 5% of Caspar's flow. The water temperature downstream of the tributary is 57 degrees Fahrenheit, the water temperature of the tributary is 56 degrees Fahrenheit, and the water temperature upstream of the confluence is 58 degrees Fahrenheit. The slope of the tributary is 10%. No fish were observed in the tributary.
15666	0203.00	LDA #11 contains six pieces of LWD and measures 3' high x 25' wide x 15' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
16648	0228.00	Tributary #05 enters on the right bank. The estimated flow is 0.1 cfs, and it contributes more than 5% of the flow to Caspar Creek. The water temperature downstream and upstream of the tributary is 58 degrees Fahrenheit, the water temperature of the tributary is 56 degrees

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Fahrenheit. The estimated slope of the tributary is 45%, making it inaccessible to fish.

18891	0278.01	A landslide on the right bank measures 15' x 30'.
19441	0293.00	Tributary #06 enters on the left bank. The estimated flow is 0.1 cfs, and it contributes to more than 5% of the flow to Caspar Creek. The water temperature downstream of the tributary is 57 degrees Fahrenheit, the water temperature of the tributary is 57 degrees Fahrenheit, and the water temperature upstream of the confluence is 58 degrees Fahrenheit. The estimated slope of the tributary is 4%. Fish were not observed in the tributary.
20383	0311.00	Tributary #07 enters on the right bank. The estimated flow is 0.1 cfs, and it contributes to approximately 5% of Caspar's flow. The water temperature downstream and upstream of the tributary is 57 degrees Fahrenheit; the water temperature of the tributary is 56 degrees Fahrenheit. The slope of the tributary is 2%.
20577	0314.00	LDA #12 contains five pieces of LWD and measures 8' high x 30' wide x 15' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
21214	0325.00	There is a road on the right bank.
21372	0327.00	LDA #13 contains 18 pieces of LWD and measures 5' high x 40' wide x 25' long. Water flows through and there are visible gaps. The LDA is not retaining sediment. Fish are present above the LDA.
21712	0333.00	A bridge with a culvert spans the channel.
21867	0334.00	End of survey at the confluence with South Fork Caspar Creek.

## 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.

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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]	

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

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0

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
127	18	FLATWATER	37.6			52.2	13.1	0.7	1.4	886	112547	673	85420		26
1	0	NOSURVEY		2660	2660										
148	148	POOL	43.8			39.8	18.4	1.3	2.6	979	144824	1702	245084	1413	39
63	9	RIFFLE	18.6			8.0	9.1	0.3	0.6	249	15694	77	4830		12
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
339	175				22204					273065			335335		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

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 (%)
63	9	LGR	18.6	25	1558	8.0	9	0.3	1	249	15694	77	4830		12	85
81	13	RUN	24.0	53	4313	22.1	12	0.7	2.2	715	57943	553	44777		30	85
46	5	SRN	13.6	128	5890	30.1	16	0.8	1.9	1330	61199	984	45268		16	84
143	143	MCP	42.3	53	7613	39.0	18	1.3	4.7	991	141765	1729	240386	1436	40	83
1	1	CCP	0.3	38	38	0.2	16	1.0	2	608	608	730	730	608	0	76
1	1	LSL	0.3	28	28	0.1	12	0.8	2.2	336	336	403	403	269	20	88
1	1	LSR	0.3	49	49	0.3	20	1.2	2.3	980	980	1470	1470	1176	10	88
1	1	PLP	0.3	26	26	0.1	18	0.7	1.5	468	468	562	562	328	30	67
1	1	DPL	0.3	29	29	0.1	23	2.1	3.8	667	667	1534	1534	1401	60	91
1	0	NS		2660	2660											

Total Units  
339

Total Units Fully Measured  
175

Total Length (ft.)  
22204

Total Area (sq.ft.)  
279660

Total Volume (cu.ft.)  
339959

**Table 3 - Summary of Pool Types**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

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
144	144	MAIN	97	53	7651	98	18.4	1.3	989	142373	1430	200247	40
3	3	SCOUR	2	34	103	1	16.7	0.9	595	1784	591	1772	20
1	1	BACKWATER	1	29	29	0	23.0	2.1	667	667	1401	1401	60
Total Units	Total Units Fully Measured			Total Length (ft.)				Total Area (sq.ft.)		Total Volume (cu.ft.)			
148	148			7783				144824		203421			

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

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

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
139	MCP	97	0	0	26	19	71	51	31	22	11	8
1	CCP	1	0	0	0	0	1	100	0	0	0	0
1	LSL	1	0	0	0	0	1	100	0	0	0	0
1	LSR	1	0	0	0	0	1	100	0	0	0	0
1	PLP	1	0	0	1	100	0	0	0	0	0	0
1	DPL	1	0	0	0	0	0	0	1	100	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
144	0	0	27	19	74	51	32	22	11	8

Mean Maximum Residual Pool Depth (ft.): 2.6

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Dry Units: 0

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

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
63	10	LGR	0	9	74	0	18	0	0	0	0
63	10	TOTAL RIFFLE	0	9	74	0	18	0	0	0	0
81	13	RUN	21	21	18	7	33	0	0	0	0
46	5	SRN	10	13	23	0	43	0	0	10	0
127	18	TOTAL FLAT	19	19	19	6	35	0	0	2	0
143	143	MCP	13	14	42	15	15	0	0	0	1
1	1	CCP	0	0	0	0	0	0	0	0	0
1	1	LSL	0	10	90	0	0	0	0	0	0
1	1	LSR	25	0	0	75	0	0	0	0	0
1	1	PLP	0	0	100	0	0	0	0	0	0
1	1	DPL	0	30	70	0	0	0	0	0	0
148	148	TOTAL POOL	13	14	43	15	14	0	0	0	1
1	0	NS									
339	176	TOTAL	13	14	42	14	16	0	0	1	1



**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Dry Units: 0

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

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
63	9	LGR	0	22	78	0	0	0	0
81	13	RUN	8	31	62	0	0	0	0
46	5	SRN	20	40	40	0	0	0	0
143	143	MCP	18	26	55	1	0	0	0
1	1	CCP	0	0	100	0	0	0	0
1	1	LSL	100	0	0	0	0	0	0
1	1	LSR	0	0	100	0	0	0	0
1	1	PLP	0	100	0	0	0	0	0
1	1	DPL	100	0	0	0	0	0	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
84	28	72	0	99	99

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: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Survey Length (ft.): 22204

Main Channel (ft.): 21961

Side Channel (ft.): 243

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: NA

Reach Length (ft.): 2660

Riffle/Flatwater Mean Width (ft.):

BFW:

Range (ft.): to

Mean (ft.):

Std. Dev.:

Base Flow (cfs.): 0.0

Water (F): 56 - 56

Air (F): 57 - 57

Dry Channel (ft): 0

Canopy Density (%):

Coniferous Component (%):

Hardwood Component (%):

Dominant Bank Vegetation:

Vegetative Cover (%): 0.0

Dominant Shelter:

Dominant Bank Substrate Type:

Occurrence of LWD (%):

LWD per 100 ft.:

Riffles:

Pools:

Flat:

Pools by Stream Length (%): 0.0

Pool Frequency (%): 0.0

Residual Pool Depth (%):

< 2 Feet Deep:

2 to 2.9 Feet Deep:

3 to 3.9 Feet Deep:

>= 4 Feet Deep:

Mean Max Residual Pool Depth (ft.):

Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay:

Sand:

Gravel:

Sm Cobble:

Lg Cobble:

Boulder:

Bedrock:

Embeddedness Values (%): 1.

2.

3.

4.

5.

0.0

STREAM REACH: 2

Channel Type: F5

Reach Length (ft.): 5755

Riffle/Flatwater Mean Width (ft.): 12.4

BFW:

Range (ft.): 25 to 27

Mean (ft.): 26

Std. Dev.: 1

Base Flow (cfs.): 0.1

Water (F): 55 - 59

Air (F): 57 - 61

Dry Channel (ft): 0

Canopy Density (%): 78.2

Coniferous Component (%): 17.6

Hardwood Component (%): 82.4

Dominant Bank Vegetation: Hardwood Trees

Vegetative Cover (%): 98.3

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 48

LWD per 100 ft.:

Riffles: 1

Pools: 6

Flat: 3

Pools by Stream Length (%): 18.9

Pool Frequency (%): 39.0

Residual Pool Depth (%):

< 2 Feet Deep: 22

2 to 2.9 Feet Deep: 57

3 to 3.9 Feet Deep: 17

>= 4 Feet Deep: 4

Mean Max Residual Pool Depth (ft.): 2.5

Mean Pool Shelter Rating: 43

Pool Tail Substrate (%): Silt/Clay: 17

Sand: 48

Gravel: 35

Sm Cobble: 0

Lg Cobble: 0

Boulder: 0

Bedrock: 0

Embeddedness Values (%): 1.

12.5

2.

75.0

3.

12.5

4.

0.0

5.

0.0

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 3

Channel Type: F4	Canopy Density (%): 84.9	Pools by Stream Length (%): 48.7
Reach Length (ft.): 13452	Coniferous Component (%): 30.5	Pool Frequency (%): 44.8
Riffle/Flatwater Mean Width (ft.): 11.6	Hardwood Component (%): 69.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 18
Range (ft.): 14 to 34	Vegetative Cover (%): 99.3	2 to 2.9 Feet Deep: 50
Mean (ft.): 25	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 23
Std. Dev.: 4	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 8
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 35	Mean Max Residual Pool Depth (ft.): 2.7
Water (F): 55 - 60 Air (F): 51 - 66	LWD per 100 ft.:	Mean Pool Shelter Rating: 39
Dry Channel (ft): 0	Riffles: 1	
	Pools: 4	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 4 Sand: 2 Gravel: 93 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 23.0 2. 54.0 3. 20.4 4. 2.7 5. 0.0		

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

Latitude: 39:21:13.0N

Longitude: 123:44:02.0W

**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	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	172	172	100.0

**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	3	4	2.0
Hardwood Trees	113	106	63.7
Coniferous Trees	55	62	34.0
No Vegetation	1	0	0.3

**Total Stream Cobble Embeddedness Values:**

2

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

StreamName: Caspar Creek

LLID: 1238153393619

Drainage: Big River

Survey Dates: 8/16/2006 to 8/28/2006

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS10

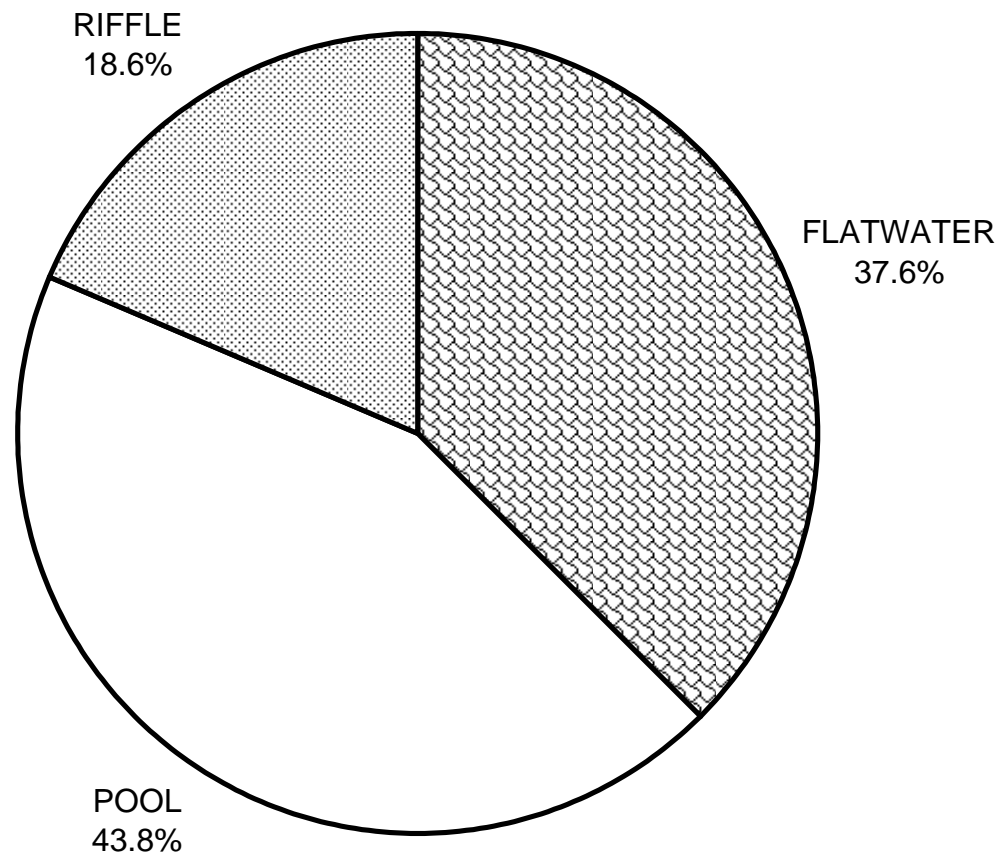
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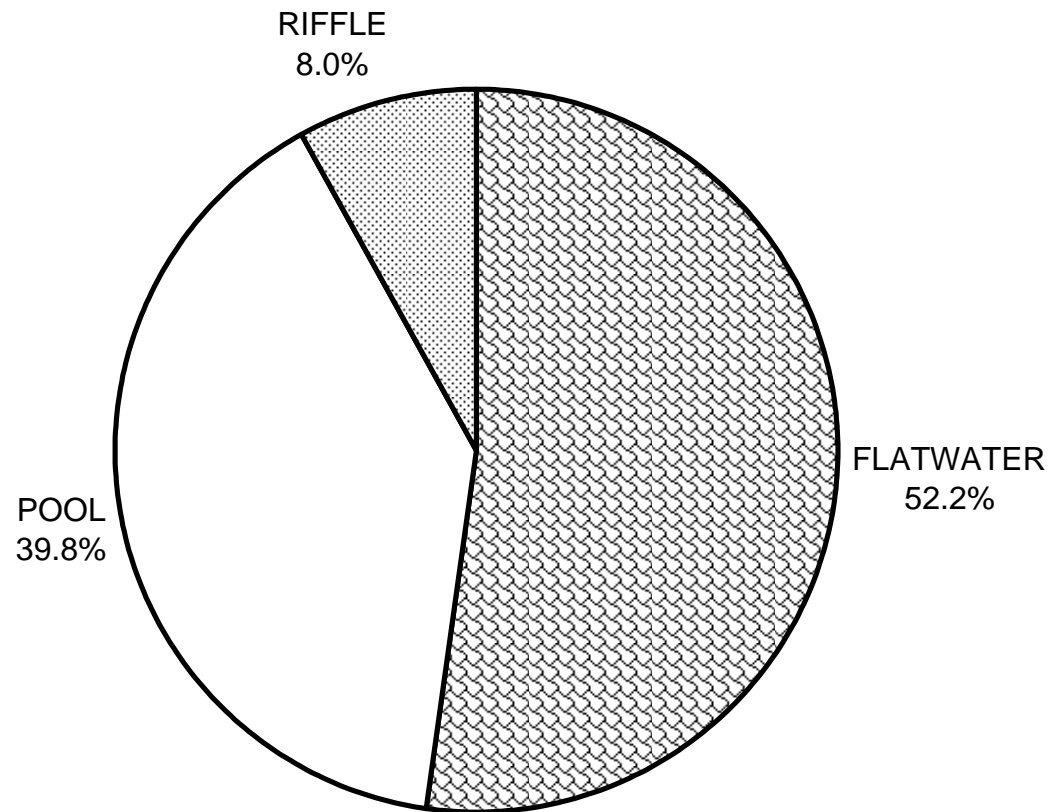
	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	0	19	13
SMALL WOODY DEBRIS (%)	9	19	14
LARGE WOODY DEBRIS (%)	74	19	43
ROOT MASS (%)	0	6	15
TERRESTRIAL VEGETATION (%)	18	35	14
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	2	0
BEDROCK LEDGES (%)	0	0	1

**CASPAR CREEK 2006**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

**CASPAR CREEK 2006  
HABITAT TYPES BY PERCENT TOTAL LENGTH**

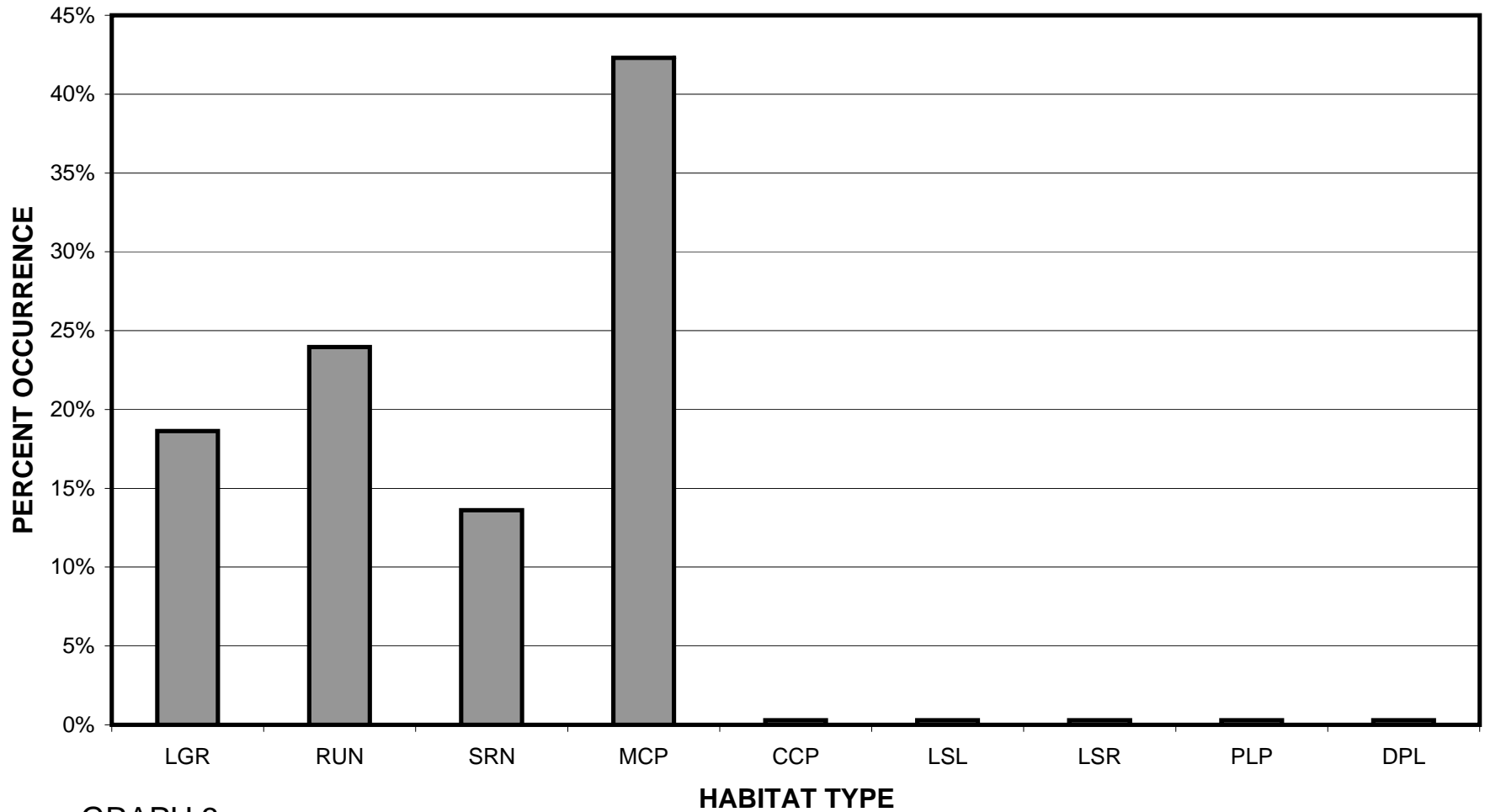


GRAPH 2



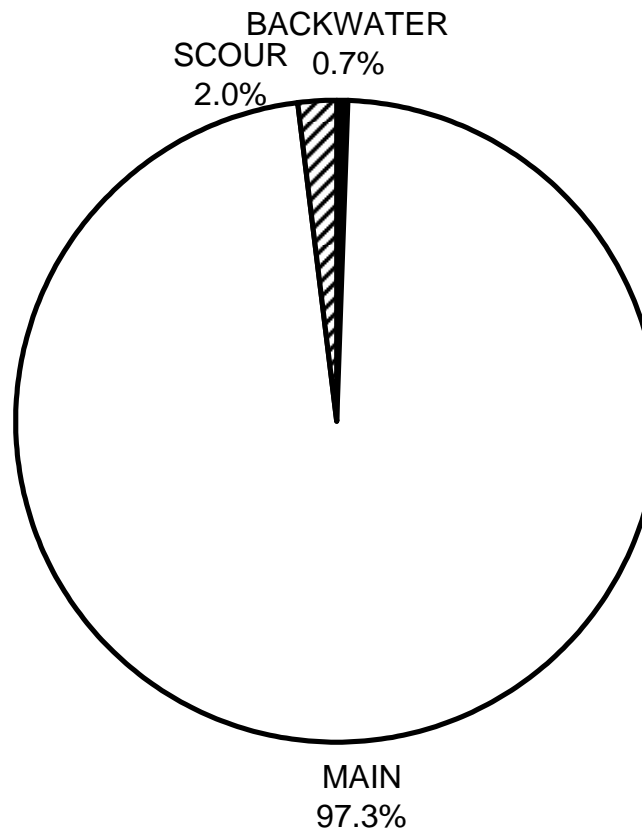
# CASPAR CREEK 2006

## HABITAT TYPES BY PERCENT OCCURRENCE



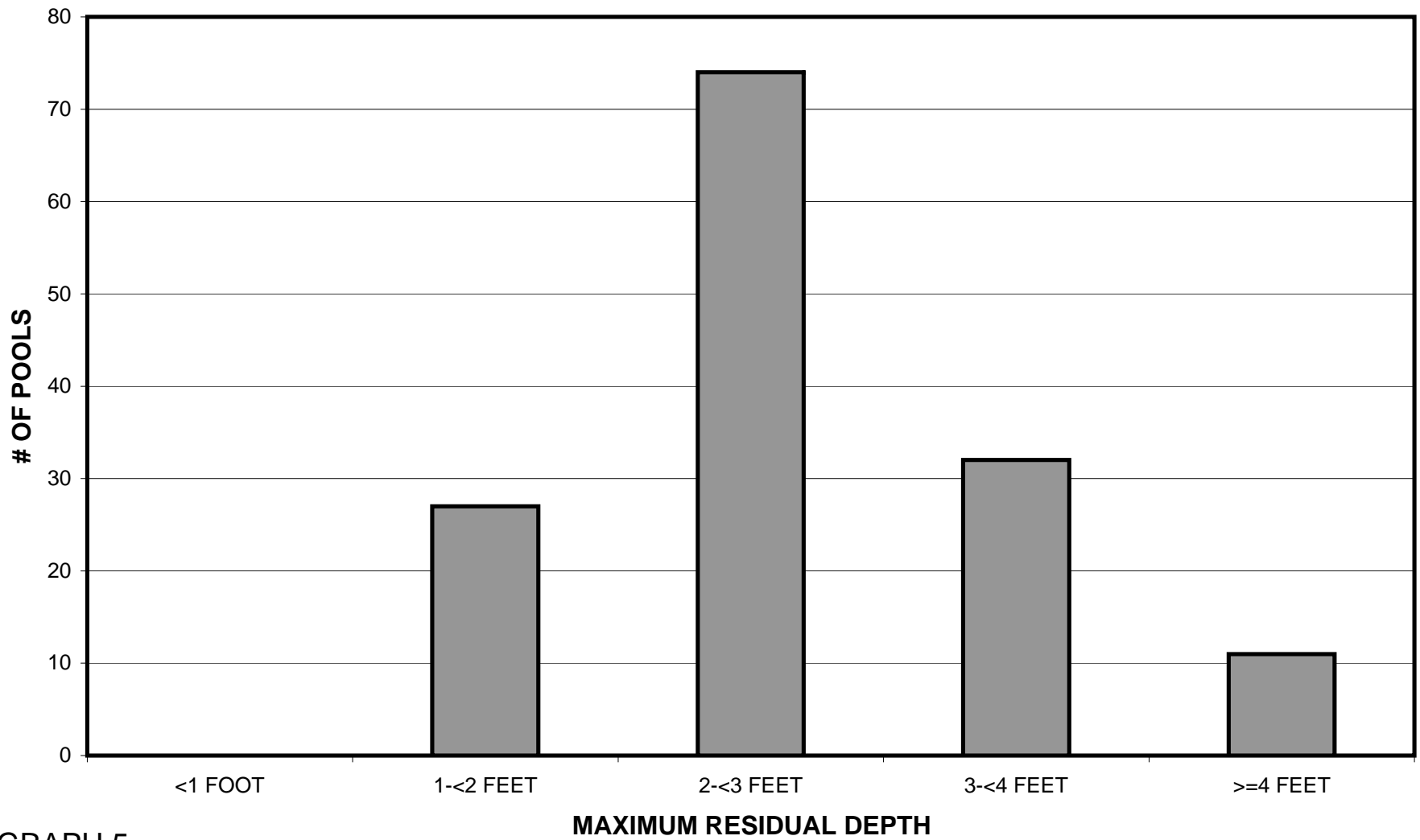
GRAPH 3

# CASPAR CREEK 2006 POOL TYPES BY PERCENT OCCURRENCE



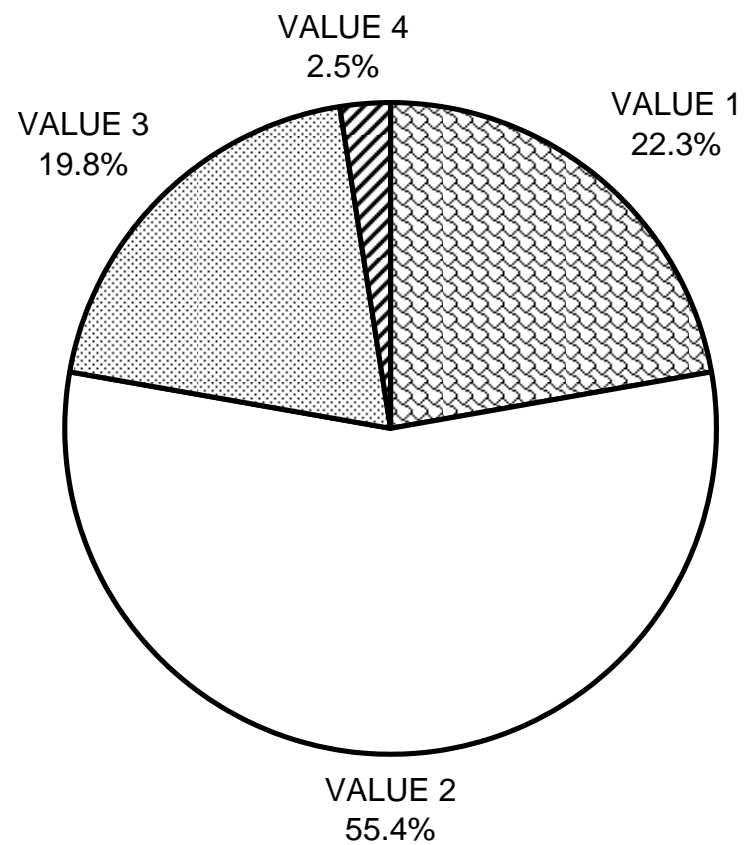
GRAPH 4

# CASPAR CREEK 2006 MAXIMUM DEPTH IN POOLS



GRAPH 5

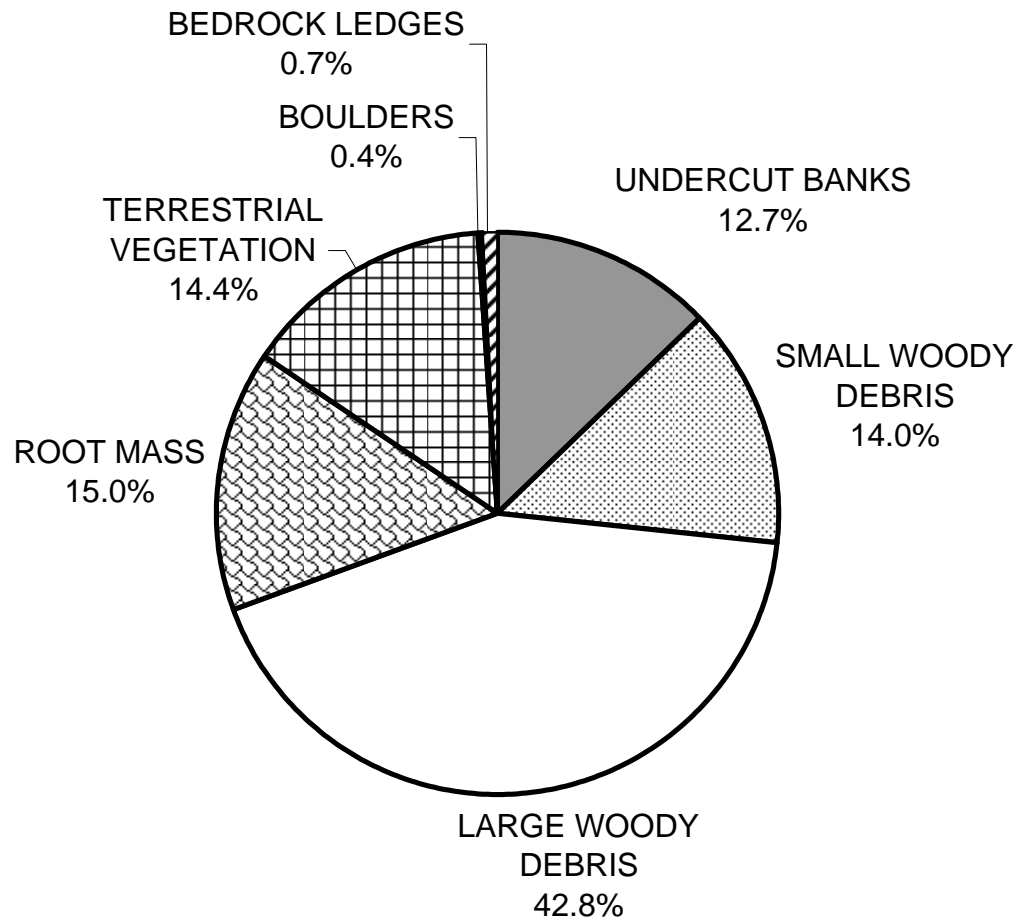
# CASPAR CREEK 2006 PERCENT EMBEDDEDNESS



GRAPH 6

# CASPAR CREEK 2006

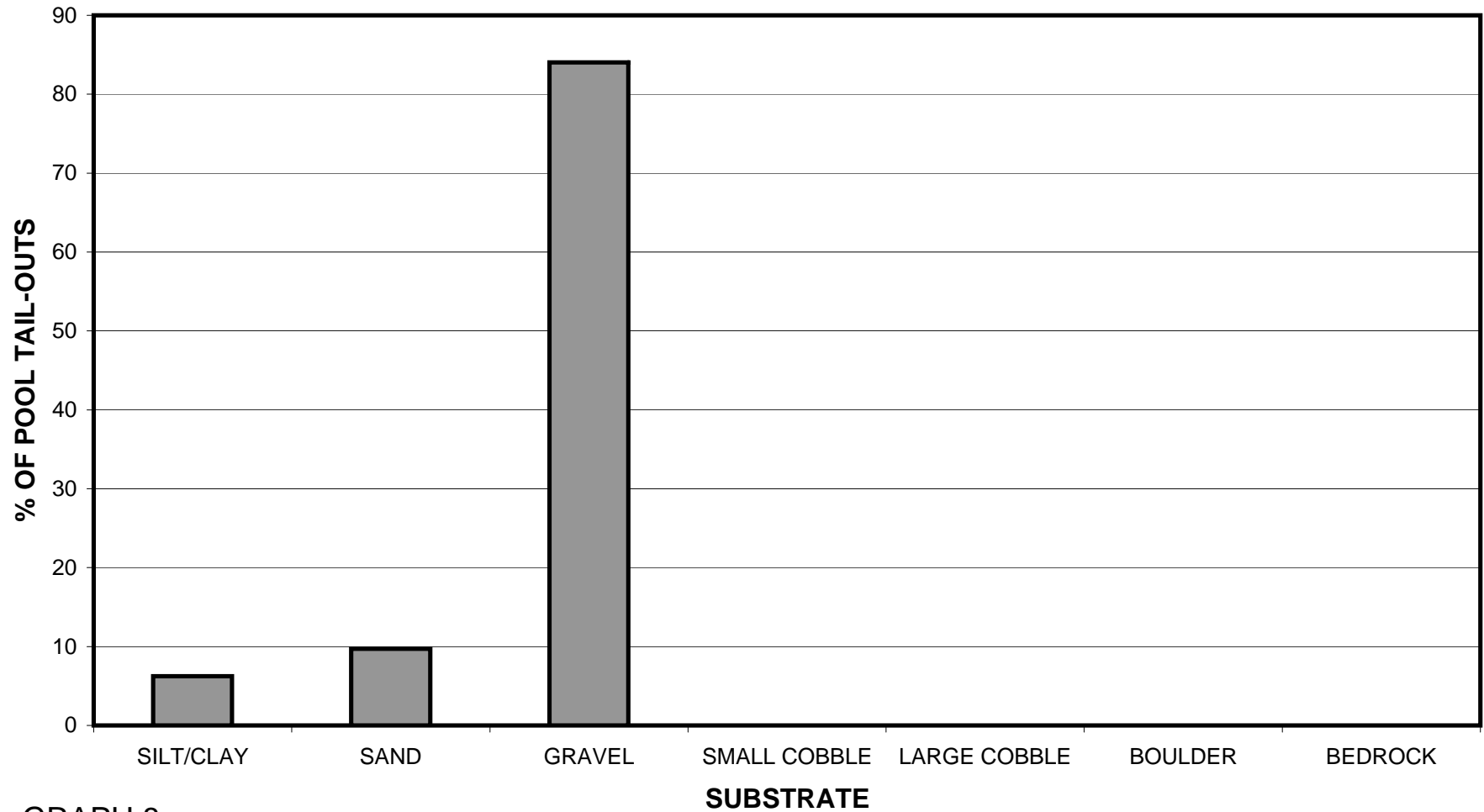
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

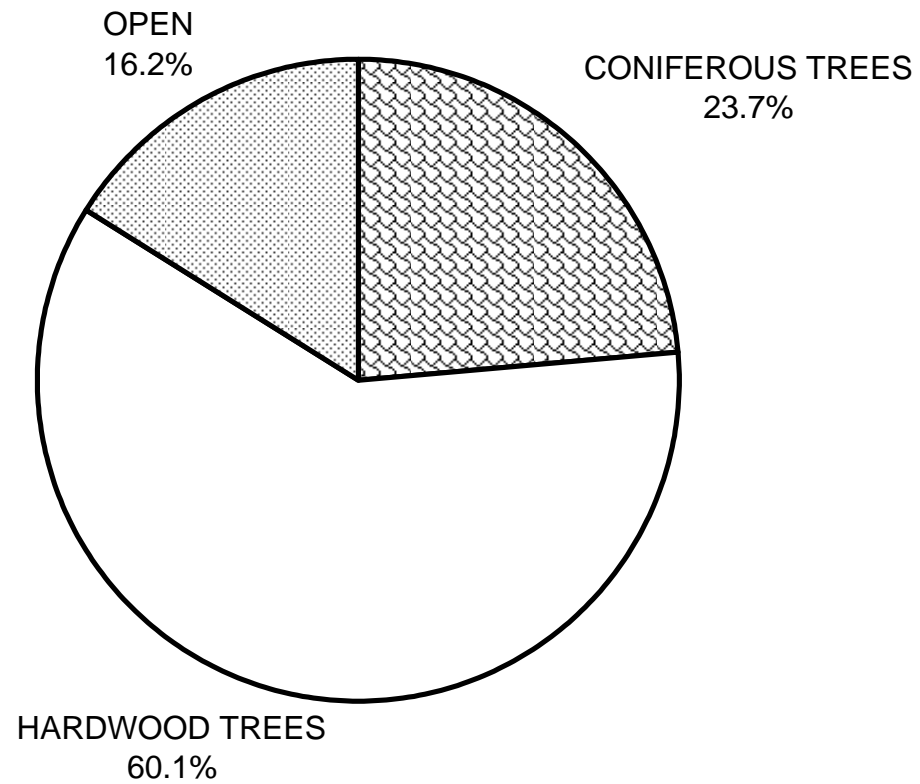
# CASPAR CREEK 2006

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



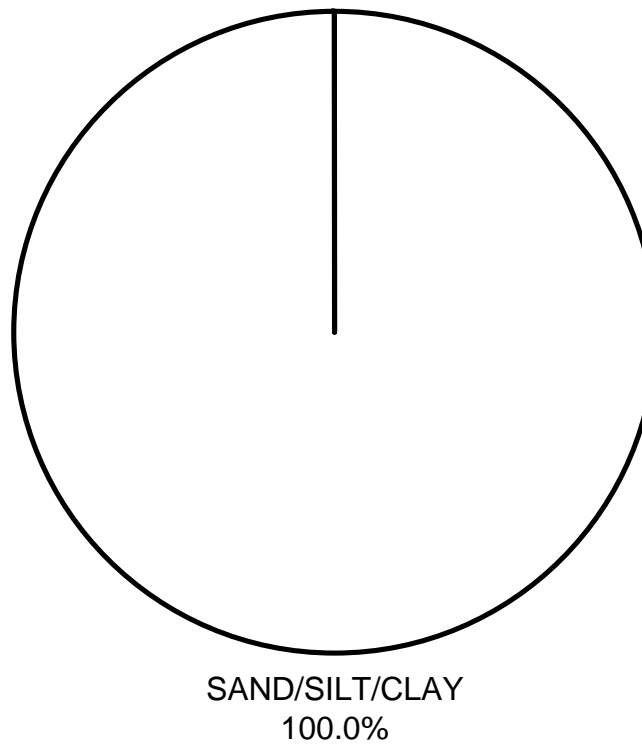
GRAPH 8

# CASPAR CREEK 2006 MEAN PERCENT CANOPY



GRAPH 9

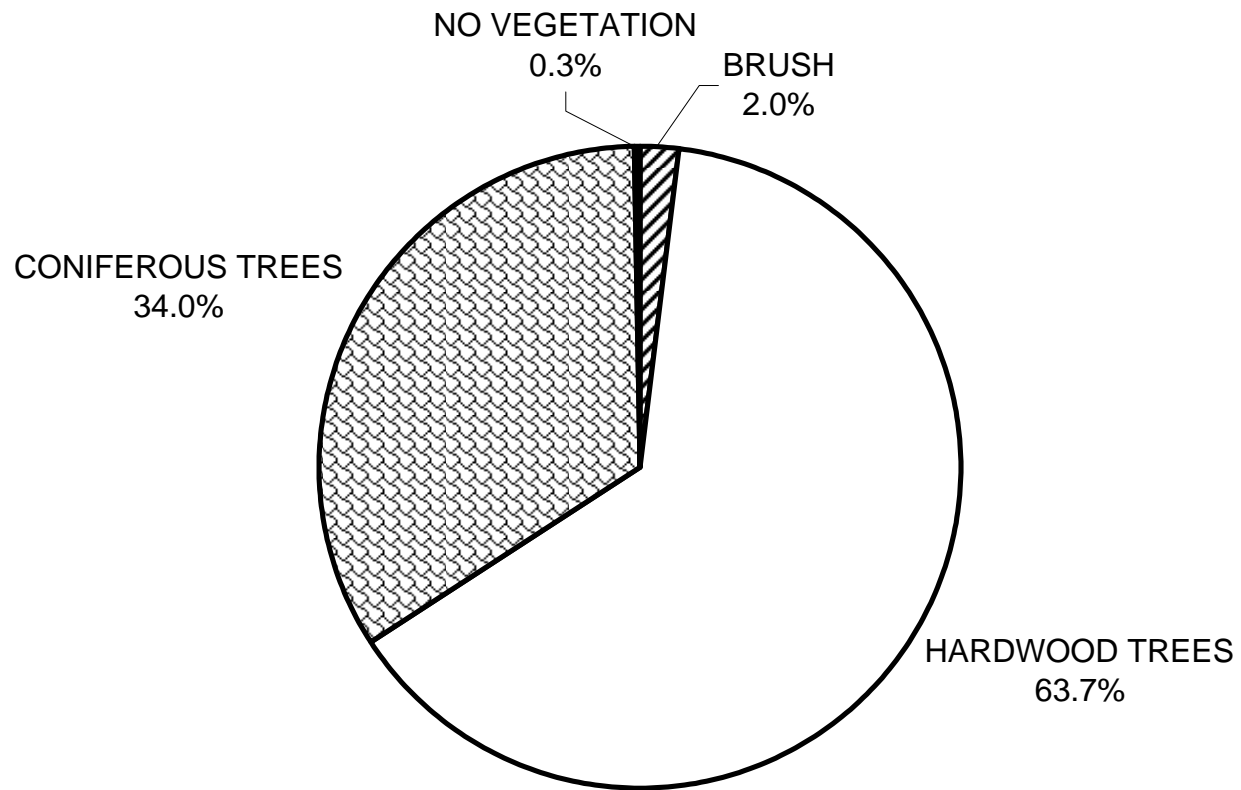
**CASPAR CREEK 2006**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

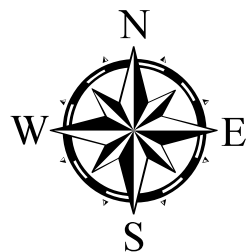
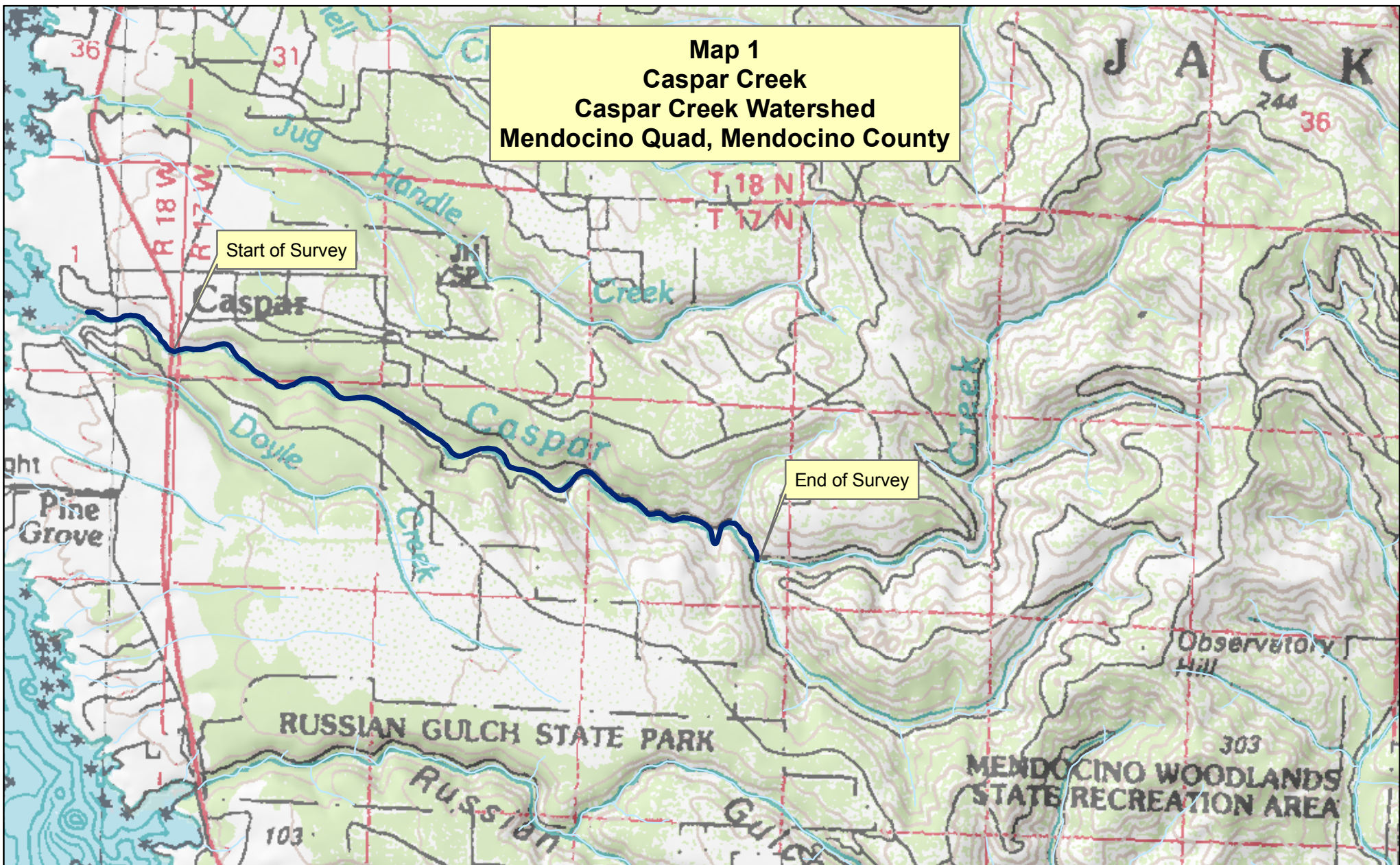


# CASPAR CREEK 2006 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1  
Caspar Creek  
Caspar Creek Watershed  
Mendocino Quad, Mendocino County



## Legend

— Caspar Creek Mainstem

0 2,500 5,000 Feet

