

# STREAM INVENTORY REPORT

## “Hatch Gulch”

### INTRODUCTION

A stream inventory was conducted from July 11 to July 19, 2011 on an unnamed tributary to Big River commonly known as, and herein after referred to, as Hatch Gulch. The survey began at the confluence with Big River and extended upstream 0.7 miles.

The Hatch Gulch 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 Hatch Gulch. 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

Hatch Gulch is a tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Hatch Gulch's legal description at the confluence with Big River is T17N R16W S25. Its location is 39.3118 degrees north latitude and 123.6009 degrees west longitude, LLID number 1235997393118. Hatch Gulch is a second order stream and has approximately 0.6 miles of blue line stream according to the USGS Comptche 7.5 minute quadrangle. Hatch Gulch drains a watershed of approximately 0.7 square miles. Elevations range from about 90 feet at the mouth of the creek to 660 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via State Route 20.

### METHODS

The habitat inventory conducted in Hatch Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game (DFG) personnel and the Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the 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

## **Hatch Gulch**

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 Hatch Gulch 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". Hatch Gulch 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.

## Hatch Gulch

### 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 Hatch Gulch, 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 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. In Hatch Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Next, 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. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Hatch Gulch, 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 Hatch Gulch, 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.

## **Hatch Gulch**

### 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 Hatch Gulch. In addition, underwater observations were made at 13 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## 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

## Hatch Gulch

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Hatch Gulch 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

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

The habitat inventory of July 11 to July 19, 2011 was conducted by E. Kantorski, J. Williams, and G. Goforth (WSP). The total length of the stream surveyed was 3,586 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.05 cfs on July 20, 2011.

Hatch Gulch is a B3 channel type for 845 feet of the stream surveyed (Reach 1), and an A4 channel type for 2,741 feet of the stream surveyed (Reach 2). B3 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and cobble-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

The water temperature taken during the survey period was 57 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 35% pool units, 33% flatwater units, 20% riffle units and 12% dry units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 23% pool units, 18% dry units, and 13% 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, 34%; step run units, 20%; and low gradient riffle units, 15% (Graph 3). Based on percent total length, step run units made up 34%, mid-channel pool units 22%, and dry units 18%.

## **Hatch Gulch**

A total of 43 pools were identified (Table 3). Main channel pools were the most frequently encountered at 98% (Graph 4), and comprised 97% 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. Three of the 43 pools (7%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 43 pool tail-outs measured, 18 had a value of 1 (41.9%); 23 had a value of 2 (53.5%); 2 had a value of 3 (4.7%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. 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 6, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 24 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 40. Main channel pools had a mean shelter rating of 24 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Hatch Gulch. Graph 7 describes the pool cover in Hatch Gulch. Small woody debris is the dominant pool cover type followed by undercut banks.

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 79% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 21% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Hatch Gulch was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 29% and 71%, respectively. Graph 9 describes the mean percent canopy in Hatch Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 93%. The mean percent left bank vegetated was 91%. The dominant elements composing the structure of the stream banks consisted of 95% sand/silt/clay, 3% bedrock, and 3% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 76% of the units surveyed. Additionally, 18% of the units surveyed had deciduous trees as the dominant vegetation type, and 6% had brush as the dominant vegetation type (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Survey teams conducted a snorkel survey at 13 sites for species composition and distribution in Hatch Gulch on July 20, 2011. Water temperatures taken during the survey period of 0800 hours

## Hatch Gulch

to 0855 hours ranged from 55 to 56 degrees Fahrenheit. Air temperatures ranged from 58 to 61 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 845 feet of stream, three sites were sampled. The reach sites yielded 16 young-of-the-year steelhead/rainbow trout (SH/RT).

In reach 2, nine sites were sampled starting approximately 990 feet from the confluence with Big River and continuing upstream 1,507 feet. The reach sites yielded 38 young-of-the-year SH/RT and one age 1+ SH/RT.

Additionally, one site was sampled in a tributary (Tributary #01) to Hatch Gulch. The confluence with the tributary is approximately 2,390 feet from the mouth of Hatch Gulch. No fish were observed.

The following chart displays the information yielded from these sites:

2011 Hatch Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: B3 Channel Type									
07/20/11	1	006	Pool	239	6	0	0	0	0
	2	008	Pool	269	3	0	0	0	0
	3	017	Pool	659	7	0	0	0	0
Reach 2: A4 Channel Type									
	4	032	Pool	1,019	5	0	0	0	0
	5	034	Pool	1,083	2	0	0	0	0
	6	035	Pool	1,114	11	0	0	0	0
	7	039	Pool	1,200	7	0	0	0	0
	8	051	Pool	1,659	5	0	0	0	0
	9	063	Pool	1,963	3	1	0	0	0
	10	073	Run	2,140	5	0	0	0	0
	11	078	Pool	2,300	0	0	0	0	0
	12	085	Pool	2,497	0	0	0	0	0
Tributary #01									
	13	--	Pool	2,390	0	0	0	0	0

## **Hatch Gulch**

### DISCUSSION

Hatch Gulch is a B3 channel type for the first 845 feet of stream surveyed and an A4 channel type for the remaining 2,741 feet. The suitability of B3 and A4 channel types for fish habitat improvement structures is as follows: B3 channels are excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing-deflectors, and log cover. A4 channels are generally not suitable for fish habitat improvement structures.

The water temperature recorded on the survey days July 11 to July 19, 2011 was 57 degrees Fahrenheit. Air temperatures ranged from 60 to 70 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 47% of the total length of this survey, riffles 13%, and pools 23%. Three of the 43 (7%) 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 for Reach 1.

Forty-one of the 43 pool tail-outs measured had embeddedness ratings of 1 or 2. Two 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.

All of the 43 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 24. The shelter rating in the flatwater habitats is 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Hatch Gulch. Small woody debris is the dominant cover type in pools followed by undercut banks. 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.

The mean percent canopy density for the stream was 97%. Reach 1 had a canopy density of 99% and Reach 2 had a canopy density of 97%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 93% and 91%, 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.



## Hatch Gulch

### RECOMMENDATIONS

- 1) Hatch Gulch 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 small woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

### 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 #:	Comment:
0	0001.00	Start of survey at the confluence with Big River. The first 82 feet of the stream are dry. The channel is a B3.
269	0009.00	A logging road crosses the channel. The crossing is a 16' wide x 29' long x 16' high wooden bridge.
742	0022.00	Log debris accumulation (LDA) #01 contains nine pieces of large woody debris (LWD) and measures 3' high x 10' wide x 19' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to boulders and measures 11' wide x 33' long x 5' deep. Fish are present above the LDA.
845	0028.00	The channel changes from a B3 to an A4.  LDA #02 contains eight pieces of LWD and measures 4' high x 13' wide x 12' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 50' long x 4' deep. Fish are present above the LDA.

## Hatch Gulch

902	0030.00	LDA #03 contains 10 pieces of LWD and measures 4' high x 15' wide x 25' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 40' long x 5' deep. Fish are present above the LDA.
1137	0037.00	LDA #04 contains six pieces of LWD and measures 7' high x 9' wide x 16' long. Water flows through the LDA and there no visible gaps in it. Retained sediment ranges from silt to cobble and measures 18' wide x 50' long x 7' deep. Fish are present above the LDA.
1561	0049.00	LDA #05 contains 11 pieces of LWD and measures 6' high x 16' wide x 20' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 13' wide x 30' long x 6' deep. Fish are present above the LDA.
1659	0052.00	LDA #06 contains four pieces of LWD and measures 1.5' high x 9' wide x 8' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 9' wide x 20' long x 2' deep. Fish are present above the LDA.
1884	0061.00	LDA #07 contains seven pieces of LWD and measures 3.7' high x 8' wide x 30' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 25' long x 4' deep. Fish are present above the LDA.
2372	0082.00	Tributary #01 enters on the right bank. It contributes approximately 45% to Hatch Gulch's flow. The water temperature downstream of the tributary is 57 degrees Fahrenheit, and the water temperature upstream of the confluence is 57 degrees Fahrenheit. The tributary is accessible to salmonids, but no fish were observed.
2390	0083.00	LDA #08 contains eight pieces of LWD and measures 3.5' high x 11' wide x 33' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to large cobble and measures 15' wide x 30' long x 4' deep. It is possible barrier to juvenile and adult salmonids. No fish were observed above the LDA.
2470	0085.00	LDA #09 contains six pieces of LWD and measures 4.5' high x 10' wide x 10.5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to large cobble and measures 8' wide x 30' long x 5' deep. It is a possible barrier to juvenile and adult salmonids.
2677	0096.00	LDA #10 contains one piece of LWD and measures 9' high x 17' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x

## Hatch Gulch

50' long x 7' deep. It is a possible barrier to juvenile and adult salmonids.

- |      |         |   |
|------|---------|---|
| 2917 | 0104.00 | LDA #11 contains one piece of LWD and measures 3' high x 8' wide x 2' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to large cobble and measures 5' wide x 8' long x 2' deep. It is a possible barrier to juvenile and adult salmonids. |
| 3446 | 0123.00 | End of survey due to diminished habitat. The creek is dry for over 140 feet and there is no defined channel. The stream bed is covered with vegetation.   |

## 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.

## Hatch Gulch

### 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: 1235997393118

LLID: 1235997393118 Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE Legal Description: T17NR16WS25 Latitude: 39:18:42.0N Longitude: 123:35:59.0

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
15	0	DRY	12.2	42	633	17.7									
41	11	FLATWATER	33.3	41	1672	46.6	4.1	0.4	0.7	149	6105	56	2299		5
43	43	POOL	35.0	19	825	23.0	6.8	0.6	1.3	124	5315	118	5068	82	24
24	7	RIFFLE	19.5	19	456	12.7	5.0	0.3	0.5	73	1745	26	622		6
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
123	61				3586					13165			7989		

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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

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 (%)
18	3	LGR	14.6	20	355	9.9	7	0.2	0.5	81	1454	19	344		3	97
2	1	HGR	1.6	12	24	0.7	2	0.2	0.4	16	32	3	6		30	98
2	1	CAS	1.6	19	38	1.1	6	0.6	1	114	228	68	137		0	100
2	2	BRS	1.6	20	39	1.1	3	0.3	0.8	68	136	26	52		0	99
17	5	RUN	13.8	26	443	12.4	4	0.3	0.8	66	1121	22	375		5	98
24	6	SRN	19.5	51	1229	34.3	4	0.4	0.9	218	5233	84	2026		6	99
42	42	MCP	34.1	19	802	22.4	7	0.6	2.7	122	5140	117	4894	81	24	97
1	1	PLP	0.8	23	23	0.6	8	0.6	1.3	175	175	175	175	105	40	91
15	0	DRY	12.2	42	633	17.7										90

Total Units  
123

Total Units Fully Measured  
61

Total Length (ft.)  
3586

Total Area (sq.ft.)  
13520

Total Volume (cu.ft.)  
8008

**Table 3 - Summary of Pool Types**

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

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
42	42	MAIN	98	19	802	97	6.8	0.6	122	5140	81	3341	24
1	1	SCOUR	2	23	23	3	8.0	0.6	175	175	105	105	40

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
43	43	825	5315	3446

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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

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
42	MCP	98	11	26	28	67	3	7	0	0	0	0
1	PLP	2	0	0	1	100	0	0	0	0	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
43	11	26	29	67	3	7	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3



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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Dry Units: 15

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

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
18	3	LGR	0	10	0	0	5	0	0	85	0
2	1	HGR	0	100	0	0	0	0	0	0	0
2	1	CAS	0	0	0	0	0	0	0	0	0
2	2	BRS	0	0	0	0	0	0	0	0	0
24	7	TOTAL RIFFLE	0	40	0	0	3	0	0	57	0
17	5	RUN	0	50	24	0	0	0	0	14	13
24	6	SRN	5	39	22	0	0	0	17	18	0
41	11	TOTAL FLAT	3	44	23	0	0	0	10	16	5
42	42	MCP	34	41	17	3	0	0	1	4	0
1	1	PLP	50	0	30	0	0	0	10	10	0
43	43	TOTAL POOL	35	40	17	3	0	0	1	4	0
123	61	TOTAL	27	41	17	2	0	0	3	9	1

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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Dry Units: 15

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

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
18	3	LGR	0	0	67	0	0	33	0
2	1	HGR	100	0	0	0	0	0	0
2	1	CAS	0	0	0	0	0	0	100
2	2	BRS	0	0	0	50	0	0	50
17	5	RUN	60	0	20	0	0	0	20
24	6	SRN	17	0	0	67	17	0	0
42	42	MCP	31	0	52	10	7	0	0
1	1	PLP	0	0	100	0	0	0	0

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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

---

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	71	29	0	93	91

---

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: 1235997393118 LLID: 1235997393118 Drainage: Big River  
 Survey Dates: 7/11/2011 to 7/19/2011 Survey Length (ft.): 3586 Main Channel (ft.): 3586 Side Channel (ft.): 0  
 Confluence Location: Quad: COMPTCHE Legal Description: T17NR16WS25 Latitude: 39:18:42.0N Longitude: 123:35:59.0W

**Summary of Fish Habitat Elements By Stream Reach**

**STREAM REACH: 1**

Channel Type: B3	Canopy Density (%): 98.8	Pools by Stream Length (%): 9.1
Reach Length (ft.): 845	Coniferous Component (%): 39.2	Pool Frequency (%): 18.5
Riffle/Flatwater Mean Width (ft.): 6.3	Hardwood Component (%): 60.8	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 100
Range (ft.): 6 to 8	Vegetative Cover (%): 88.4	2 to 2.9 Feet Deep: 0
Mean (ft.): 7	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 0
Std. Dev.: 1	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 0	Mean Max Residual Pool Depth (ft.): 1.0
Water (F): 57 - 57 Air (F): 61 - 67	LWD per 100 ft.:	Mean Pool Shelter Rating: 8
Dry Channel (ft): 82	Riffles: 5	
	Pools: 4	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 80 Sm Cobble: 20 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 40.0 2. 60.0 3. 0.0 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: A4	Canopy Density (%): 96.5	Pools by Stream Length (%): 27.3
Reach Length (ft.): 2741	Coniferous Component (%): 78.6	Pool Frequency (%): 39.6
Riffle/Flatwater Mean Width (ft.): 3.5	Hardwood Component (%): 21.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 92
Range (ft.): 5 to 12	Vegetative Cover (%): 92.7	2 to 2.9 Feet Deep: 8
Mean (ft.): 7	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 20	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 57 - 57 Air (F): 60 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 26
Dry Channel (ft): 551	Riffles: 2	
	Pools: 13	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 79 Sm Cobble: 21 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 42.1 2. 52.6 3. 5.3 4. 0.0 5. 0.0		

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

Stream Name: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

Longitude: 123:35:59.0W

**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	2	1	2.5
Boulder	0	0	0.0
Cobble / Gravel	2	1	2.5
Sand / Silt / Clay	57	59	95.1

**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	4	3	5.7
Hardwood Trees	12	10	18.0
Coniferous Trees	45	48	76.2
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: 1235997393118

LLID: 1235997393118

Drainage: Big River

Survey Dates: 7/11/2011 to 7/19/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR16WS25

Latitude: 39:18:42.0N

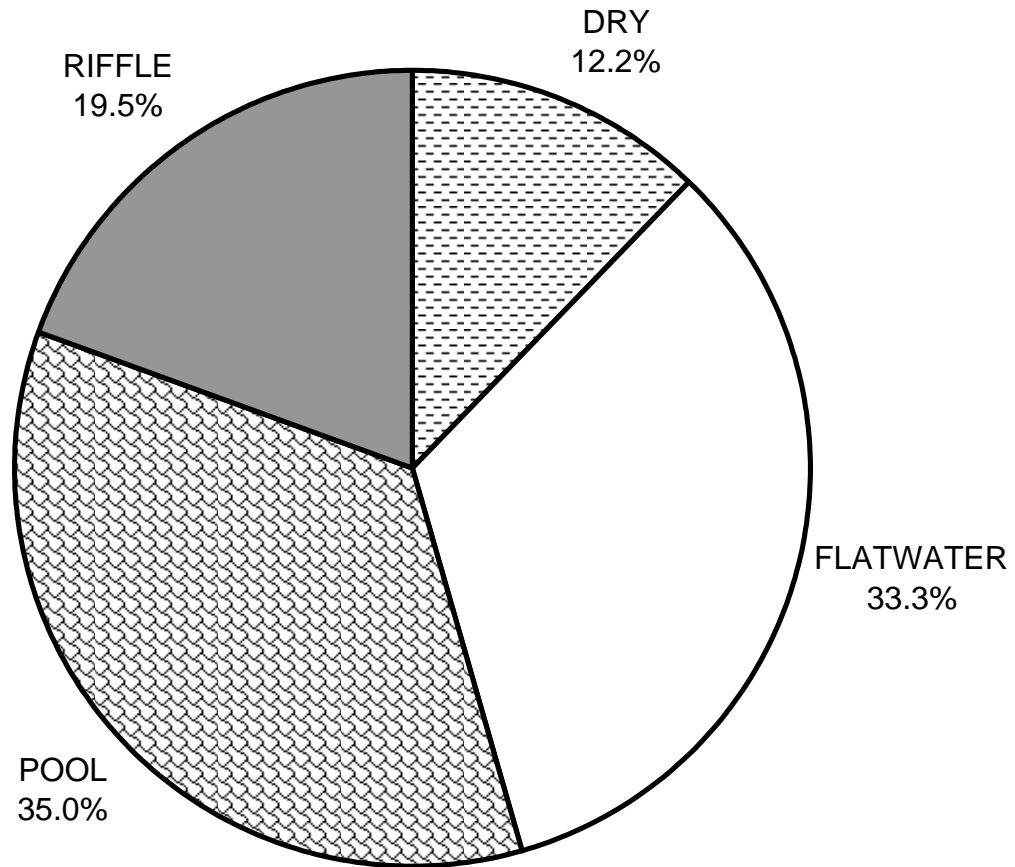
Longitude: 123:35:59.0W

---

	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	3	35
SMALL WOODY DEBRIS (%)	40	44	40
LARGE WOODY DEBRIS (%)	0	23	17
ROOT MASS (%)	0	0	3
TERRESTRIAL VEGETATION (%)	3	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	10	1
BOULDERS (%)	57	16	4
BEDROCK LEDGES (%)	0	5	0

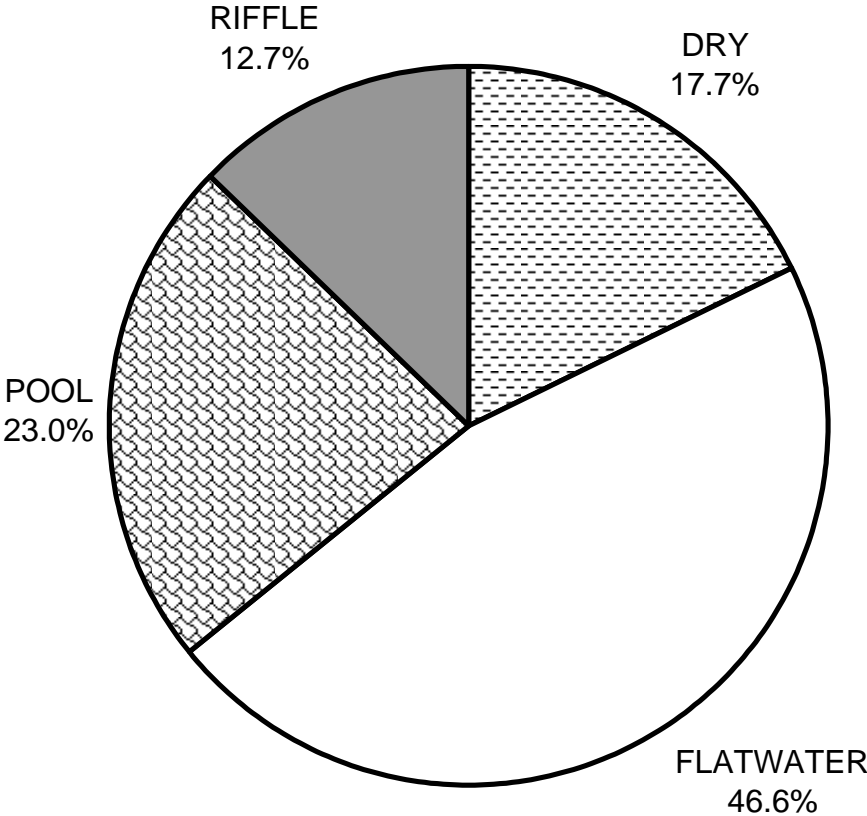
# Hatch Gulch 2011

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

**Hatch Gulch 2011**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**

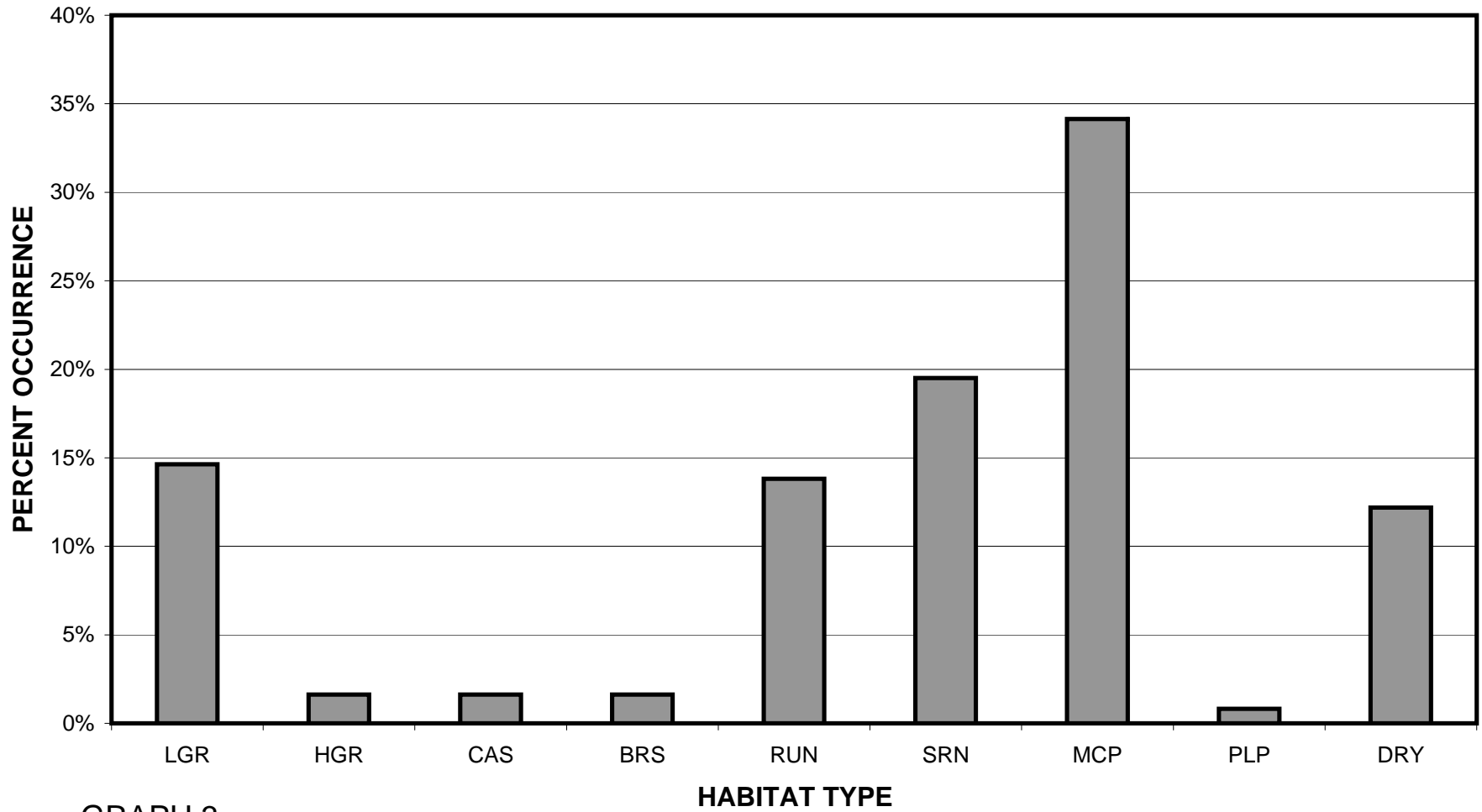


GRAPH 2



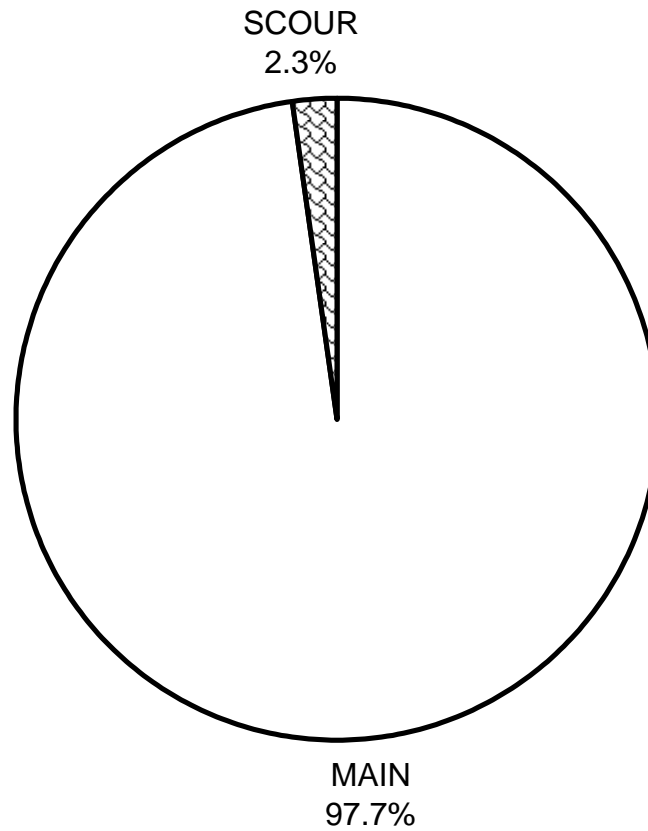
# Hatch Gulch 2011

## HABITAT TYPES BY PERCENT OCCURRENCE



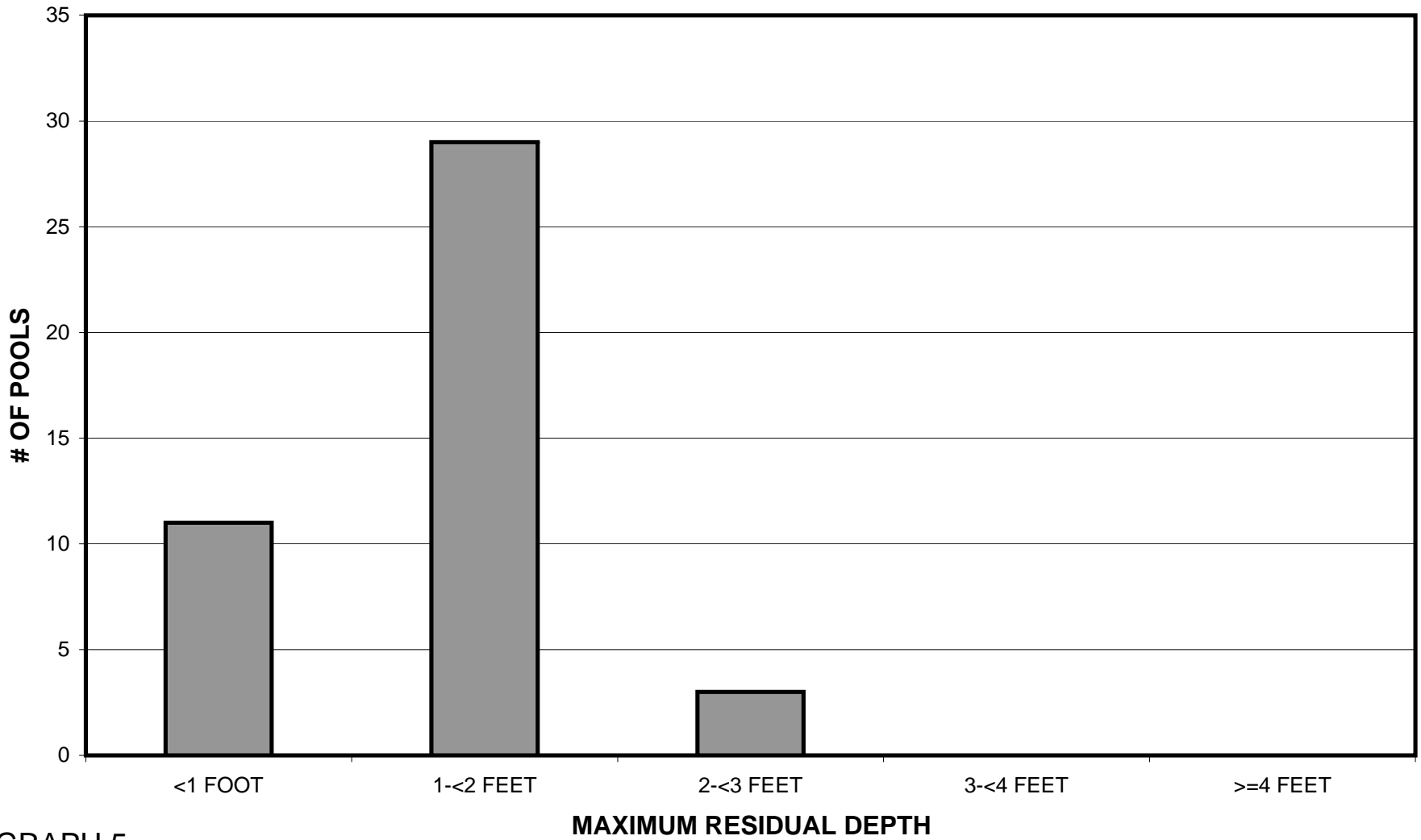
GRAPH 3

# Hatch Gulch 2011 POOL TYPES BY PERCENT OCCURRENCE



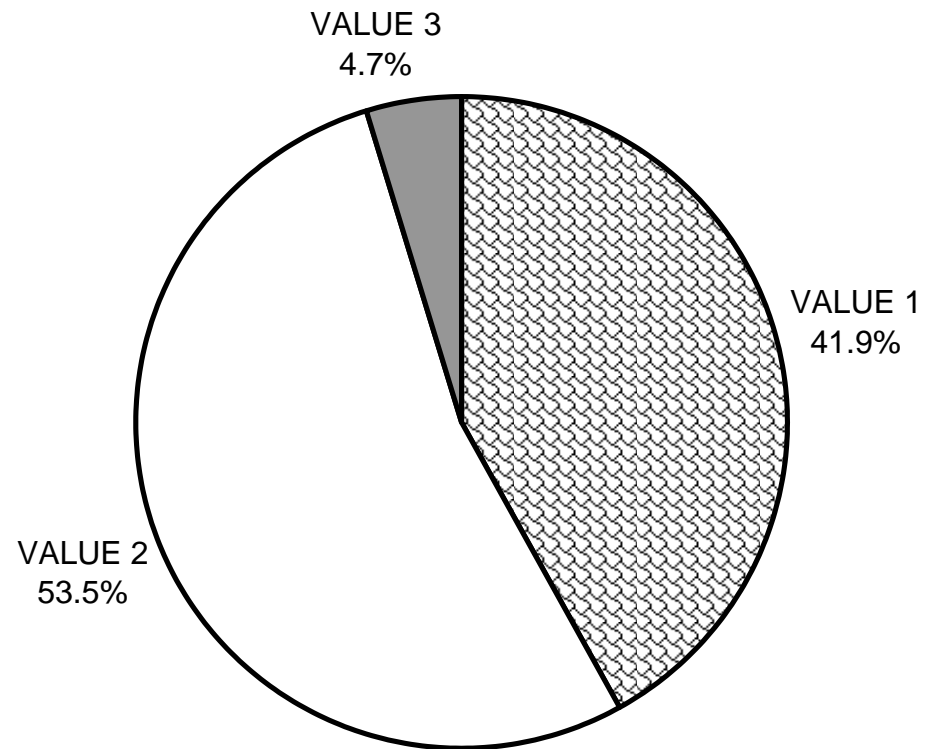
GRAPH 4

# Hatch Gulch 2011 MAXIMUM DEPTH IN POOLS



GRAPH 5

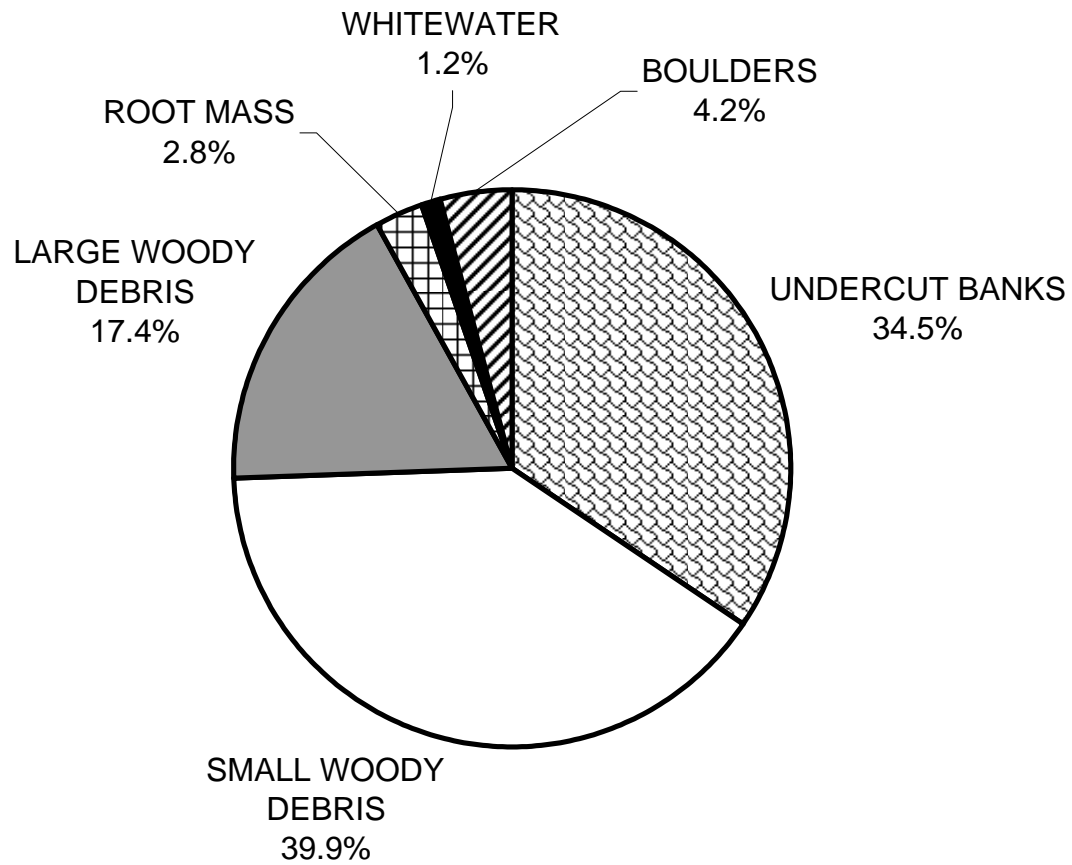
# Hatch Gulch 2011 PERCENT EMBEDDEDNESS



GRAPH 6

# Hatch Gulch 2011

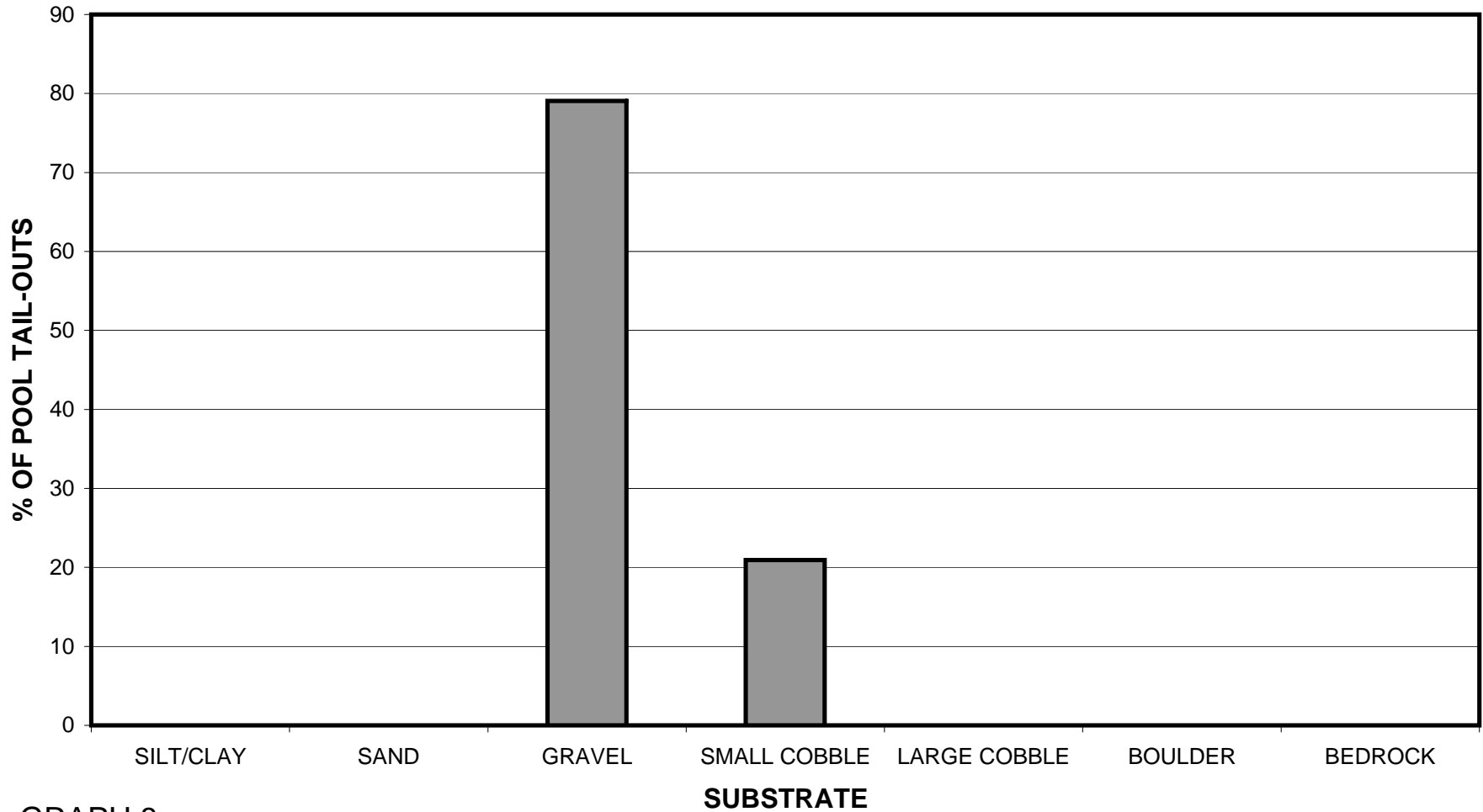
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

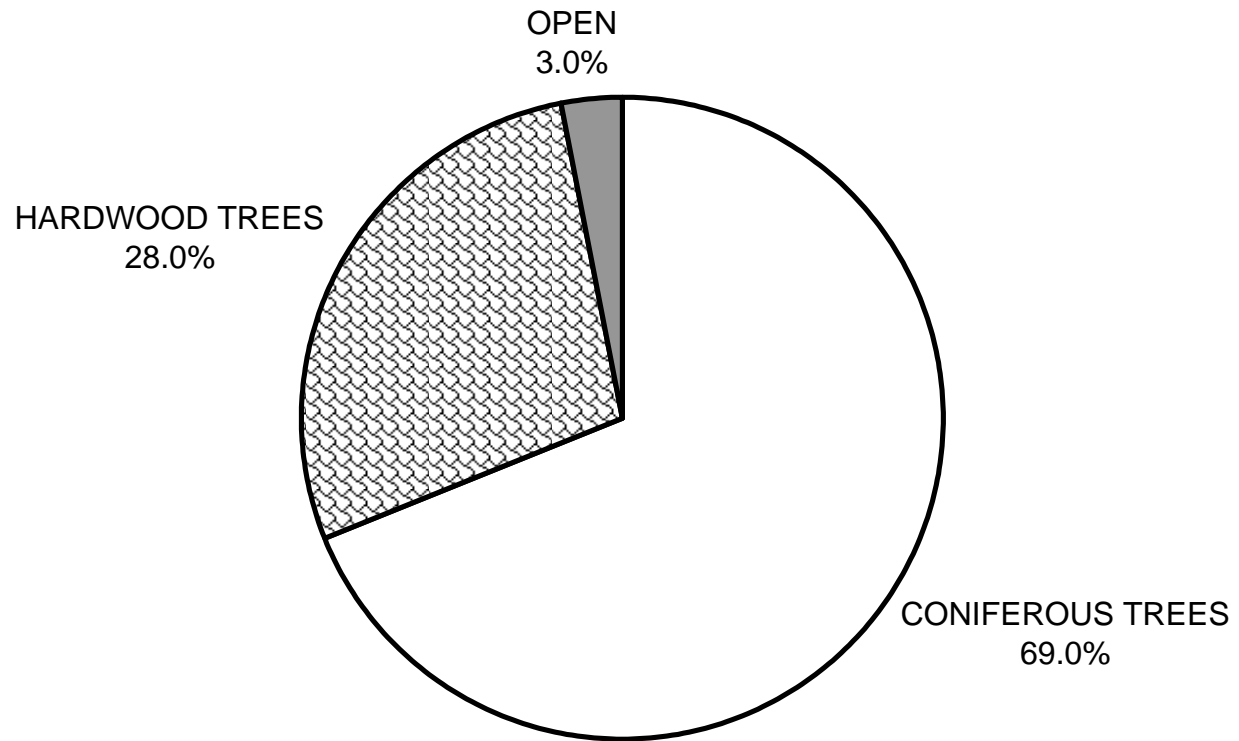
# Hatch Gulch 2011

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



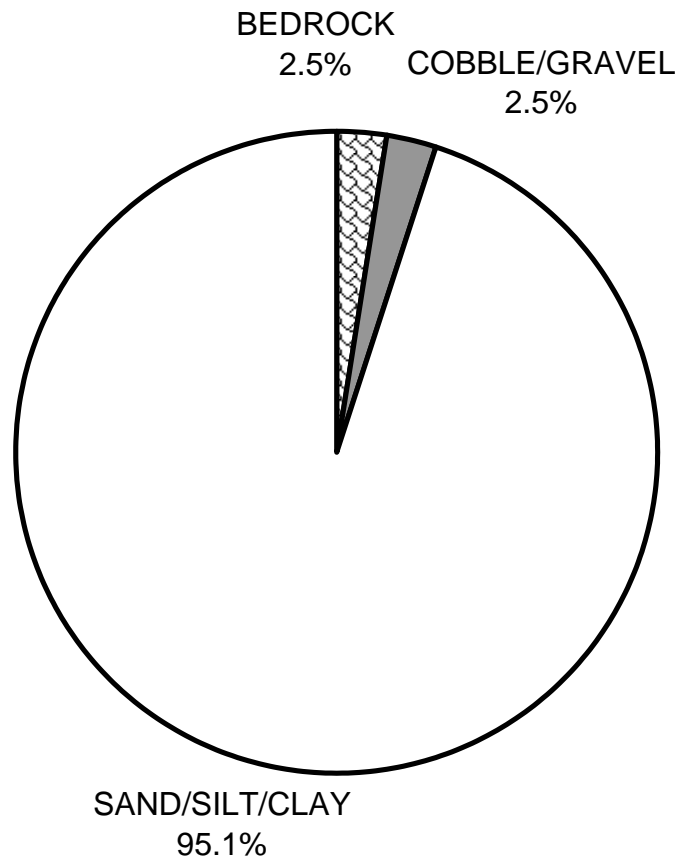
GRAPH 8

# Hatch Gulch 2011 MEAN PERCENT CANOPY



GRAPH 9

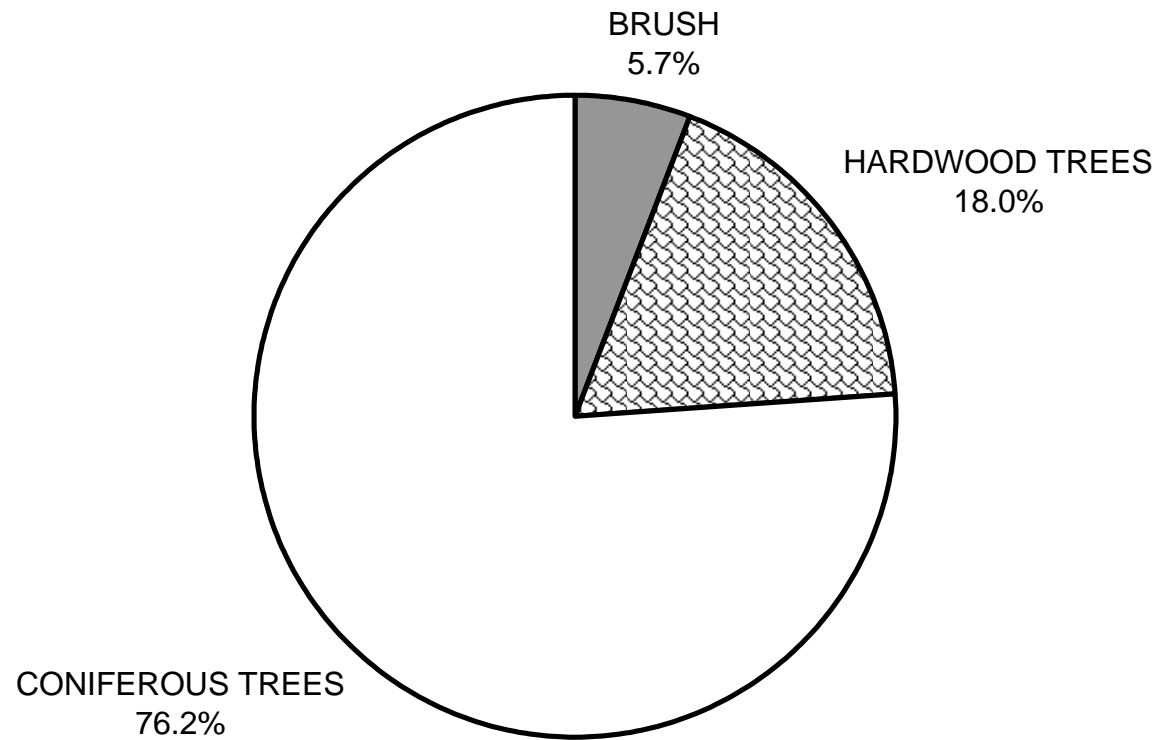
# Hatch Gulch 2011 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

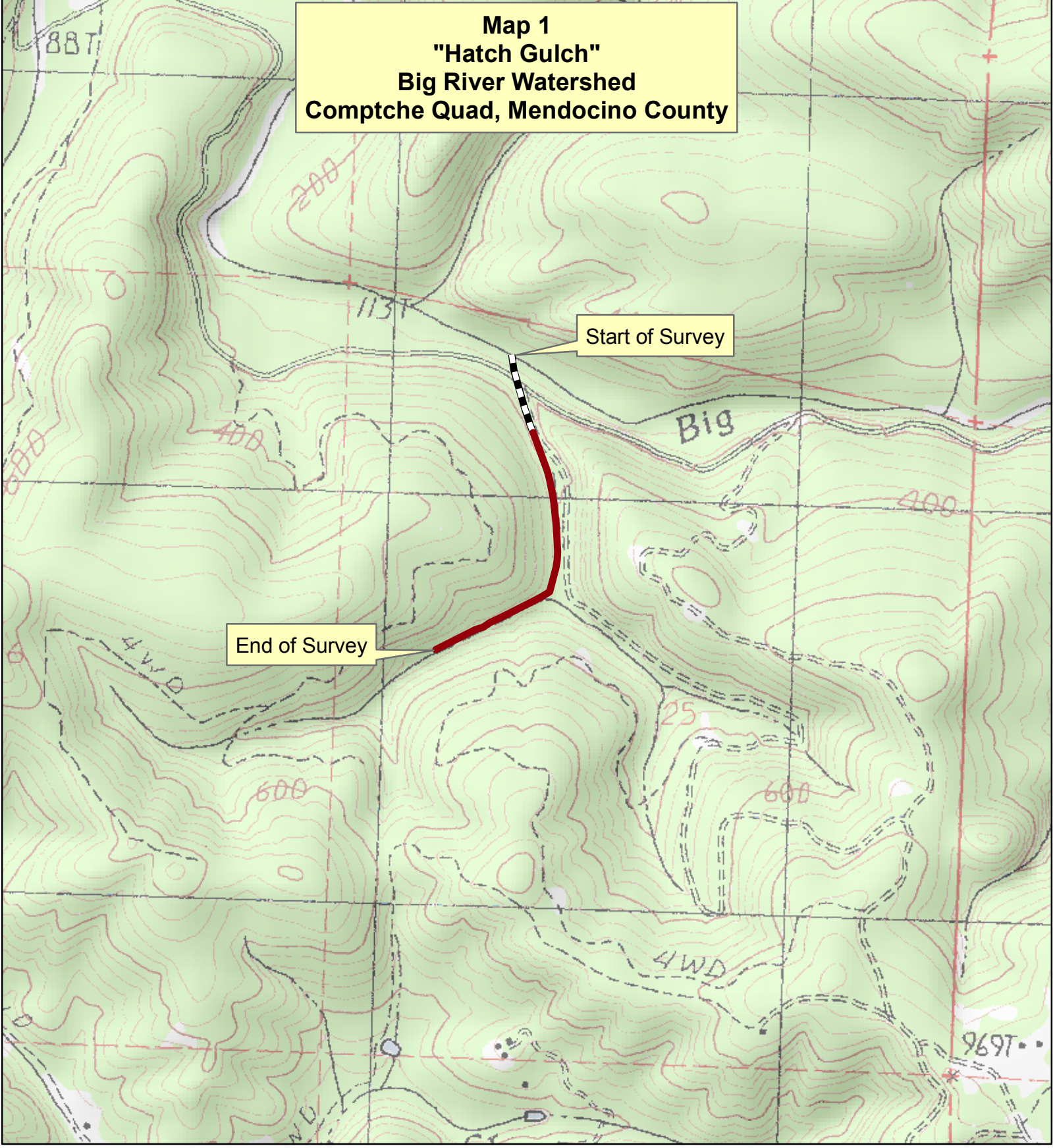


**Hatch Gulch 2011**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

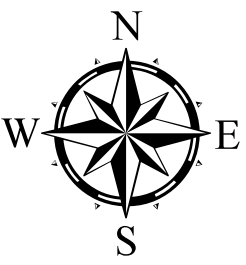
**Map 1**  
**"Hatch Gulch"**  
**Big River Watershed**  
**Comptche Quad, Mendocino County**





Start of Survey

End of Survey

**Legend**



-  Reach 1, B3 Channel Type
-  Reach 2, A4 Channel Type

