

# STREAM INVENTORY REPORT

## Hatchery Creek

### INTRODUCTION

A stream inventory was conducted from May 31 to June 2, 2011 on Hatchery Creek. The survey began at the confluence with North Fork Mad River and extended upstream 0.3 miles.

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

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, 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

Hatchery Creek is a tributary to North Fork Mad River, tributary to the Mad River, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Hatchery Creek's legal description at the confluence with North Fork Mad River is T06N R02E S28. Its location is 40.8746 degrees north latitude and 123.9525 degrees west longitude, LLID number 1239513408747. Hatchery Creek is an intermittent stream according to the USGS Korbelt 7.5 minute quadrangle. Hatchery Creek drains a watershed of approximately 0.9 square miles. Elevations range from about 100 feet at the mouth of the creek to 2,100 feet in the headwater areas. Mixed hardwood forest and redwood forest dominate the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Maple Creek Road, outside Korbelt, CA.

### METHODS

The habitat inventory conducted in Hatchery Creek 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 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

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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 Hatchery 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". Hatchery 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 Hatchery Creek, embeddedness was

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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 Hatchery 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. 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Hatchery 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 Hatchery 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

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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 Hatchery Creek. 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

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence

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- 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 May 31 to June 2, 2011 was conducted by M. McGowan, S. Cannon, and A. Blessing (WSP). The total length of the stream surveyed was 1,819 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.2 cfs on June 2, 2011.

Hatchery Creek is a B4 channel type for 1,006 feet of the stream surveyed (Reach 1) and an A2 channel type for 813 feet of the stream surveyed (Reach 2). B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates. A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 46 to 48 degrees Fahrenheit. Air temperatures ranged from 50 to 51 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% pool units, 31% flatwater units, 30% riffle units, and 2% culvert units (Graph 1). Based on total length of Level II habitat types there were 37% flatwater units, 31% riffle units, 30% pool units, and 2% culvert units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 21%; low gradient riffle units, 18%; and step run units 16% (Graph 3). Based on percent total length, step run units made up 22%, low gradient riffle units 19%, and mid-channel pool units 16%.

A total of 23 pools were identified (Table 3). Main channel pools were the most frequently encountered at 83% (Graph 4), and comprised 91% 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 of the 23 pools (4%) had a residual depth of two feet or greater (Graph 5).

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The depth of cobble embeddedness was estimated at pool tail-outs. Of the 23 pool tail-outs measured, six had a value of 1 (26.1%); five had a value of 2 (21.7%); two had a value of 3 (8.7%); one had a value of 4 (4.3%); nine had a value of 5 (39.1%) (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 5, flatwater habitat types had a mean shelter rating of 14, and pool habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 28. Main channel pools had a mean shelter rating of 11 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Hatchery Creek. Graph 7 describes the pool cover in Hatchery Creek. Whitewater is the dominant pool cover type followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 48% of the pool tail-outs. Boulders were the next most frequently observed dominant substrate type and occurred in 43% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Hatchery Creek was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 92% and 8%, respectively. Graph 9 describes the mean percent canopy in Hatchery Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 36% sand/silt/clay, 30% cobble/gravel, 26% boulder, and 8% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 47% of the units surveyed. Additionally, 40% of the units surveyed had brush as the dominant vegetation type, and 11% had coniferous trees 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 Hatchery Creek on August 3, 2011. The water temperature taken during the survey period of 1055 to 1200 was 55 degrees Fahrenheit. Air temperatures ranged from 59 to 64 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 1,006 feet of stream, six sites were sampled. The reach sites yielded 57 young-of-the-year steelhead/rainbow trout (SH/RT), one age 1+ SH/RT, and 15 young-of-the-year Chinook salmon.

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In reach 2, seven sites were sampled starting approximately 1,045 feet from the confluence with North Fork Mad River and continuing upstream 672 feet. The reach sites yielded 16 young-of-the-year SH/RT.

The following chart displays the information yielded from these sites:

2011 Hatchery Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Chinook	
					YOY	1+	2+	YOY	1+
Reach 1: B4 Channel Type									
08/03/11	1	009	Pool	269	5	0	0	2	0
08/03/11	2	012	Pool	328	9	0	0	11	0
08/03/11	3	017	Pool	522	16	0	0	0	0
08/03/11	4	019	Pool	603	14	0	0	0	0
08/03/11	5	022	Pool	688	9	0	0	0	0
08/03/11	6	029	Pool	1,006	4	1	0	2	0
Reach 2: A2 Channel Type									
08/03/11	7	031	Pool	1,077	5	0	0	0	0
08/03/11	8	033	Pool	1,138	4	0	0	0	0
08/03/11	9	039	Pool	1,284	7	0	0	0	0
08/03/11	10	044	Pool	1,460	0	0	0	0	0
08/03/11	11	045	Pool	1,468	0	0	0	0	0
08/03/11	12	051	Pool	1,607	0	0	0	0	0
08/03/11	13	055	Pool	1,717	0	0	0	0	0

## DISCUSSION

Hatchery Creek is a B4 channel type for the first 1,006 feet of stream surveyed and an A2 channel type for the remaining 813 feet. The suitability of B4 and A2 channels types for fish habitat improvement structures is as follows: B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. A2 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days May 31 to June 2, 2011, ranged from 46 to 48 degrees Fahrenheit. Air temperatures ranged from 50 to 51 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.

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Flatwater habitat types comprised 37% of the total length of this survey, riffles 31%, and pools 30%. One of the 23 (4%) 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.

Eleven of the 23 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. Nine 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.

Thirteen of the 23 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 14. The shelter rating in the flatwater habitats is 14. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Hatchery Creek. Whitewater is the dominant cover type in pools followed by boulders. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. Reach 1 had a canopy density of 93%, and Reach 2 had a canopy density of 94%. 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) Hatchery 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 whitewater. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Conduct fish passage assessments at the stream crossing at 328' and the concrete weir at 976'.



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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 #:	Comment:
0	0001.00	Start of survey at the confluence with North Fork Mad River. The channel is a B4.
328	0013.00	A road crosses the creek. The crossing is a 5' high x 4.6' wide x 40' corrugated metal culvert. There is no plunge at the outlet of the culvert and the maximum depth within 5' of the outlet is 2.3'. The slope of the culvert is approximately 2%.
913	0027.00	Left bank seep.
976	0029.00	An old concrete weir and an associated wooden footbridge span the channel. The bridge measures 3' wide x 4.8' high x 19' long. The concrete weir may be a barrier to juvenile salmonids.
1006	0030.00	The channel changes from a B4 to an A2.
1183	0036.00	Tributary #01 enters on the right bank. The water temperature of the tributary is 46 degrees Fahrenheit, the water temperature downstream of the tributary is 46 degrees Fahrenheit, and the water temperature upstream of the confluence is 48 degrees Fahrenheit. The slope of the tributary is approximately 12%. The tributary has too little flow and is too steep to be accessible to salmonids.
1265	0039.00	There is a 3' high plunge.
1740	0057.00	There is a 1.5' high plunge.
1802	0061.00	End of survey due to high gradient. The slope is 19% for more than 200 feet.

### 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: Hatchery Creek

LLID: 1239513408747 Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL Legal Description: T06NR02ES28 Latitude: 40:52:29.0N Longitude: 123:57:05.0

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
1	0	CULVERT	1.6	40	40	2.2									
19	8	FLATWATER	31.1	36	675	37.1	8.4	0.4	0.7	267	5082	126	2387		14
23	23	POOL	37.7	24	548	30.1	9.6	0.5	1.1	223	5119	210	4839	119	14
18	7	RIFFLE	29.5	31	556	30.6	9.1	0.5	0.8	203	3658	104	1872		5
<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>		
61	38				1819					13859			9099		

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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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 (%)
11	3	LGR	18.0	31	340	18.7	10	0.4	0.8	168	1844	58	641		2	95
4	2	HGR	6.6	33	131	7.2	8	0.5	1.2	185	738	73	292		5	98
3	2	CAS	4.9	28	85	4.7	9	0.7	1.2	275	826	204	611		10	93
9	3	RUN	14.8	31	280	15.4	7	0.4	0.7	157	1409	60	538		7	96
10	5	SRN	16.4	40	395	21.7	10	0.5	1.1	334	3341	165	1651		19	96
13	13	MCP	21.3	22	290	15.9	10	0.6	2.1	206	2672	197	2555	120	10	91
6	6	STP	9.8	34	206	11.3	11	0.4	1.3	340	2042	317	1901	147	13	91
1	1	CRP	1.6	23	23	1.3	8	0.8	1.5	173	173	224	224	138	5	100
1	1	LSBo	1.6	10	10	0.5	6	0.3	1	55	55	44	44	17	5	98
2	2	PLP	3.3	10	19	1.0	9	0.2	1.1	89	178	58	116	27	50	98
1	0	CUL	1.6	40	40	2.2										

Total Units  
61

Total Units Fully Measured  
38

Total Length (ft.)  
1819

Total Area (sq.ft.)  
13276

Total Volume (cu.ft.)  
8573

**Table 3 - Summary of Pool Types**

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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
19	19	MAIN	83	26	496	91	10.0	0.5	248	4714	128	2435	11
4	4	SCOUR	17	13	52	9	7.9	0.4	101	405	61	182	28

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
23	23	548	5119	2617

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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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
13	MCP	57	6	46	6	46	1	8	0	0	0	0
6	STP	26	2	33	4	67	0	0	0	0	0	0
1	CRP	4	0	0	1	100	0	0	0	0	0	0
1	LSBo	4	0	0	1	100	0	0	0	0	0	0
2	PLP	9	1	50	1	50	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
23	9	39	13	57	1	4	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.1

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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Dry Units: 0

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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
11	3	LGR	0	0	0	0	0	0	0	100	0
4	2	HGR	0	0	0	0	0	0	50	50	0
3	2	CAS	0	0	0	0	0	0	60	40	0
18	7	TOTAL RIFFLE	0	0	0	0	0	0	37	63	0
9	3	RUN	0	70	30	0	0	0	0	0	0
10	4	SRN	0	3	0	0	2	0	37	58	0
19	7	TOTAL FLAT	0	20	7	0	1	0	28	44	0
13	13	MCP	4	14	13	0	0	0	31	39	0
6	6	STP	0	0	1	0	1	0	48	50	0
1	1	CRP	0	0	50	0	0	0	0	0	50
1	1	LSBo	0	0	0	0	0	0	0	0	100
2	2	PLP	0	0	0	0	3	0	70	23	5
23	23	TOTAL POOL	1	6	9	0	1	0	38	36	9
1	0	CUL									
61	37	TOTAL	1	7	7	0	1	0	36	41	7

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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Dry Units: 0

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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
11	3	LGR	0	0	100	0	0	0	0
4	2	HGR	0	0	0	50	0	50	0
3	2	CAS	0	0	0	0	0	100	0
9	3	RUN	0	0	100	0	0	0	0
10	5	SRN	0	20	80	0	0	0	0
13	13	MCP	0	69	31	0	0	0	0
6	6	STP	0	0	83	17	0	0	0
1	1	CRP	0	100	0	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
2	2	PLP	0	0	100	0	0	0	0



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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	8	92	0	99	99

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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: Hatchery Creek LLID: 1239513408747 Drainage: Mad River - North Fork  
 Survey Dates: 5/31/2011 to 6/2/2011 Survey Length (ft.): 1819 Main Channel (ft.): 1819 Side Channel (ft.): 0  
 Confluence Location: Quad: KORBEL Legal Description: T06NR02ES28 Latitude: 40:52:29.0N Longitude: 123:57:05.0W

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

**STREAM REACH: 1**

Channel Type: B4	Canopy Density (%): 92.9	Pools by Stream Length (%): 17.1
Reach Length (ft.): 1006	Coniferous Component (%): 0.0	Pool Frequency (%): 24.1
Riffle/Flatwater Mean Width (ft.): 6.0	Hardwood Component (%): 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 86
Range (ft.): 9 to 11	Vegetative Cover (%): 98.1	2 to 2.9 Feet Deep: 14
Mean (ft.): 10	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 1	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 2.2	Occurrence of LWD (%): 5	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 48 - 48 Air (F): 50 - 51	LWD per 100 ft.:	Mean Pool Shelter Rating: 5
Dry Channel (ft): 0	Riffles: 1	
	Pools: 1	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 42.9 2. 42.9 3. 14.3 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: A2	Canopy Density (%): 93.8	Pools by Stream Length (%): 46.2
Reach Length (ft.): 813	Coniferous Component (%): 12.3	Pool Frequency (%): 50.0
Riffle/Flatwater Mean Width (ft.): 10.1	Hardwood Component (%): 87.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 100
Range (ft.): 9 to 11	Vegetative Cover (%): 99.3	2 to 2.9 Feet Deep: 0
Mean (ft.): 11	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 0	Dominant Bank Substrate Type: Boulder	>= 4 Feet Deep: 0
Base Flow (cfs.): 2.2	Occurrence of LWD (%): 5	Mean Max Residual Pool Depth (ft.): 1.1
Water (F): 46 - 48 Air (F): 50 - 50	LWD per 100 ft.:	Mean Pool Shelter Rating: 18
Dry Channel (ft): 0	Riffles: 3	
	Pools: 2	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 25 Sm Cobble: 13 Lg Cobble: 0 Boulder: 63 Bedrock: 0		
Embeddedness Values (%): 1. 18.8 2. 12.5 3. 6.3 4. 6.3 5. 56.3		

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

Stream Name: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

Latitude: 40:52:29.0N

Longitude: 123:57:05.0W

**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	4	2	7.9
Boulder	11	9	26.3
Cobble / Gravel	12	11	30.3
Sand / Silt / Clay	11	16	35.5

**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	1	1	2.6
Brush	16	14	39.5
Hardwood Trees	17	19	47.4
Coniferous Trees	4	4	10.5
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 3

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

StreamName: Hatchery Creek

LLID: 1239513408747

Drainage: Mad River - North Fork

Survey Dates: 5/31/2011 to 6/2/2011

Confluence Location: Quad: KORBEL

Legal Description: T06NR02ES28

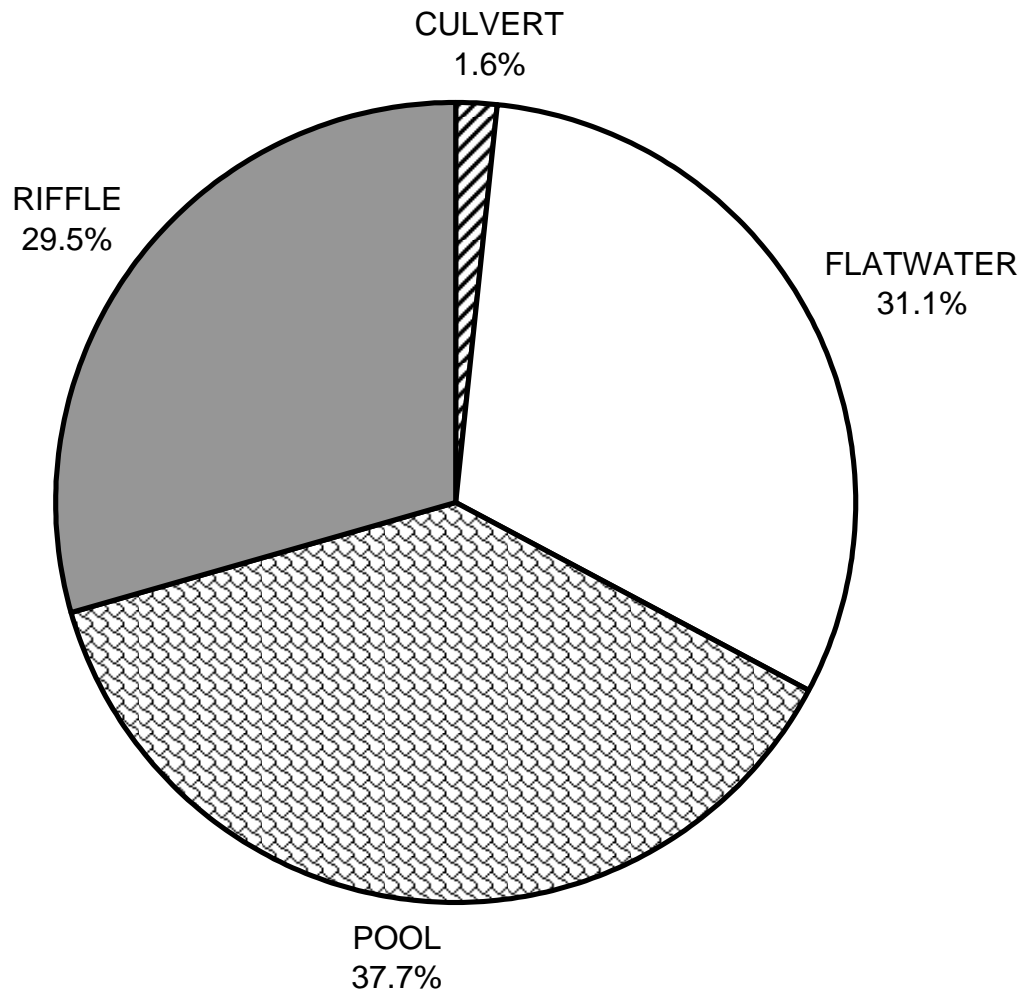
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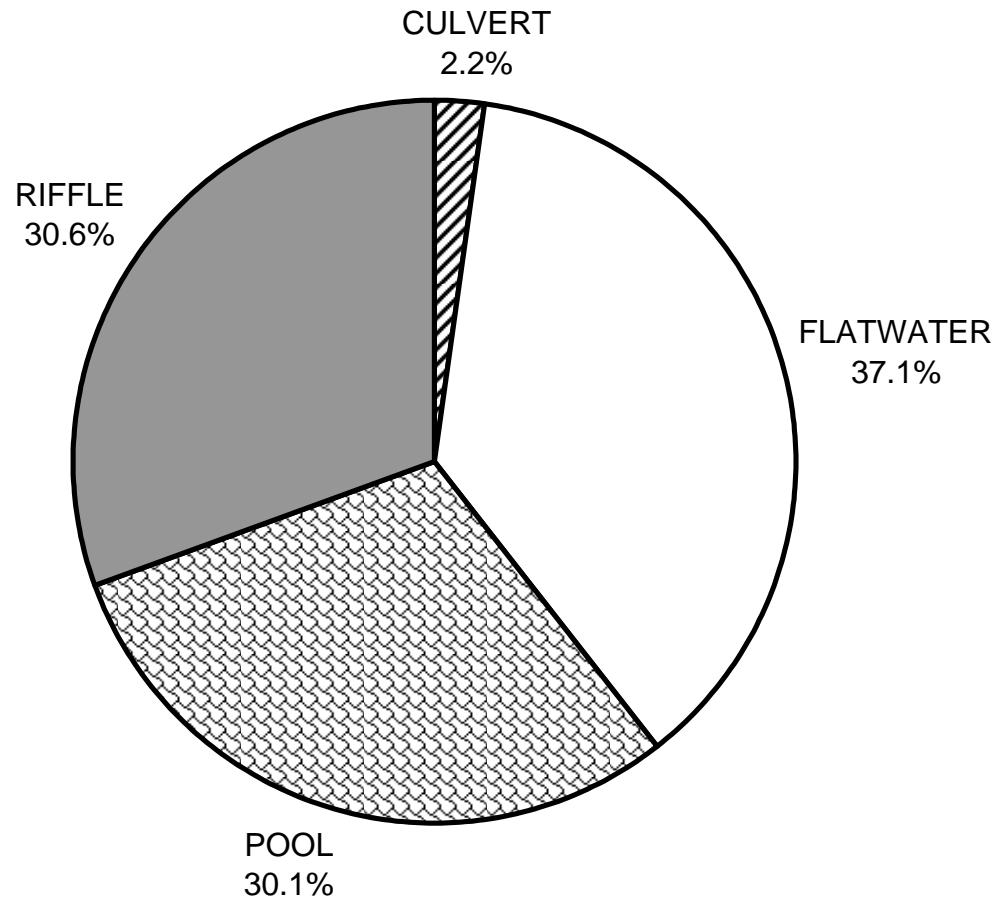
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	1
SMALL WOODY DEBRIS (%)	0	20	6
LARGE WOODY DEBRIS (%)	0	7	9
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	0	1	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	37	28	38
BOULDERS (%)	63	44	36
BEDROCK LEDGES (%)	0	0	9

# HATCHERY CREEK 2011 HABITAT TYPES BY PERCENT OCCURRENCE



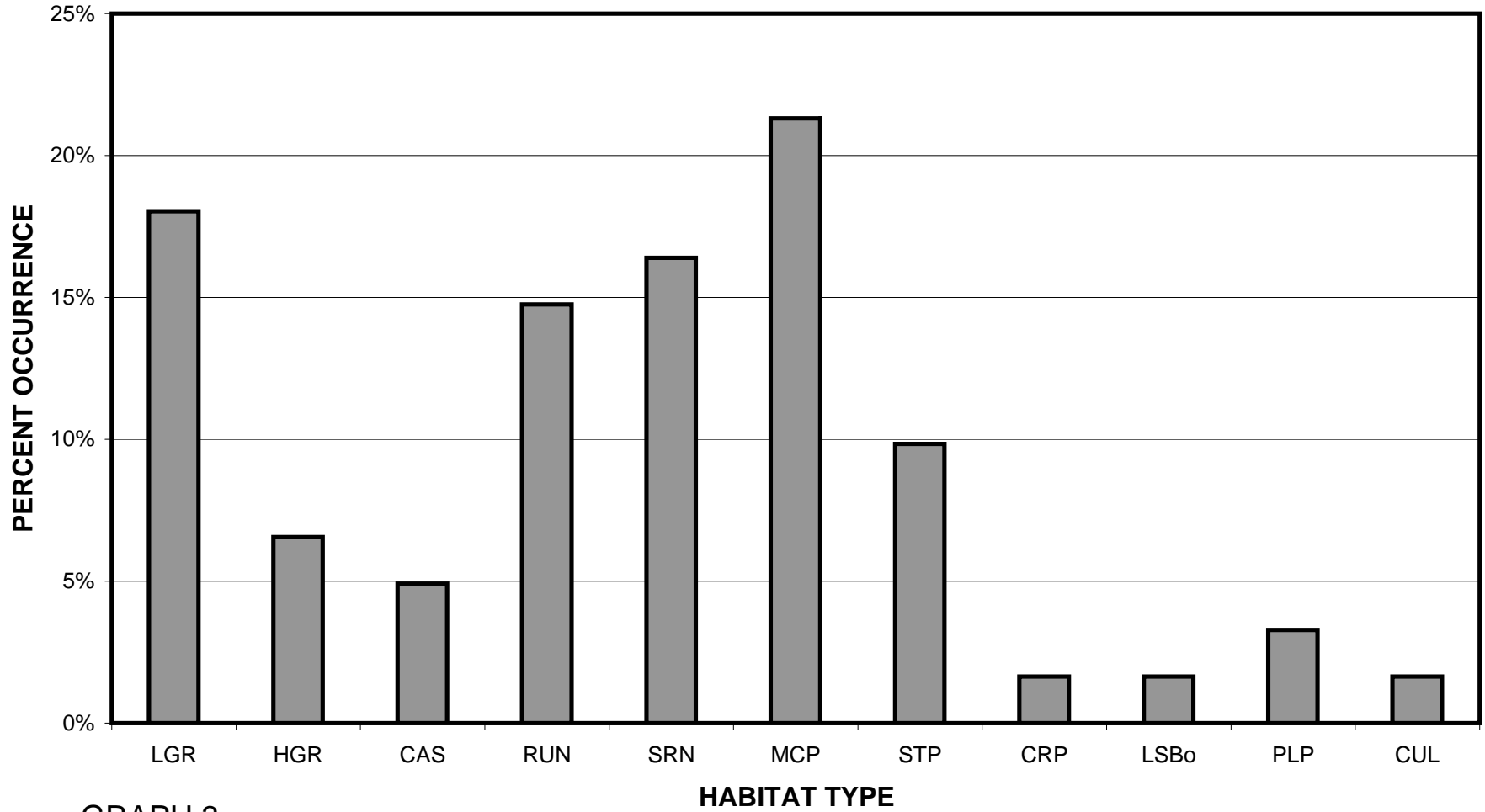
GRAPH 1

# HATCHERY CREEK 2011 HABITAT TYPES BY PERCENT TOTAL LENGTH



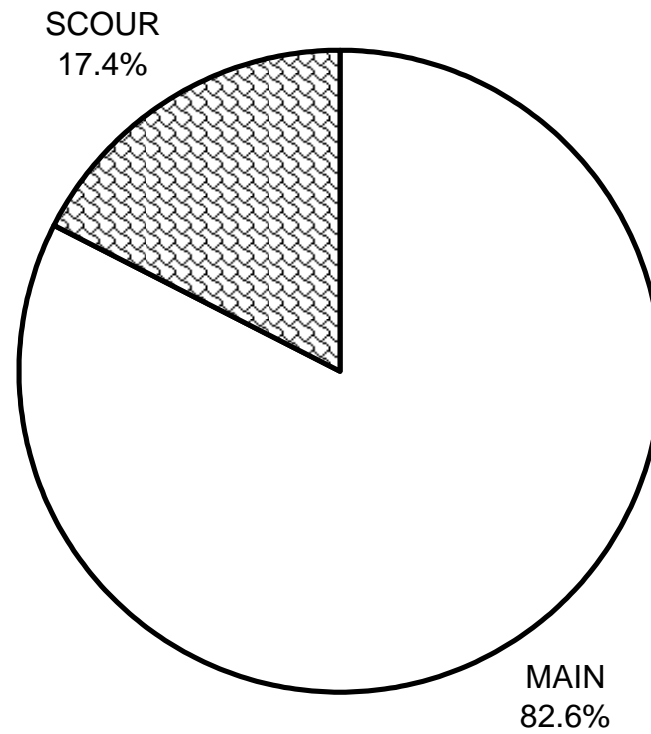
GRAPH 2

# HATCHERY CREEK 2011 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

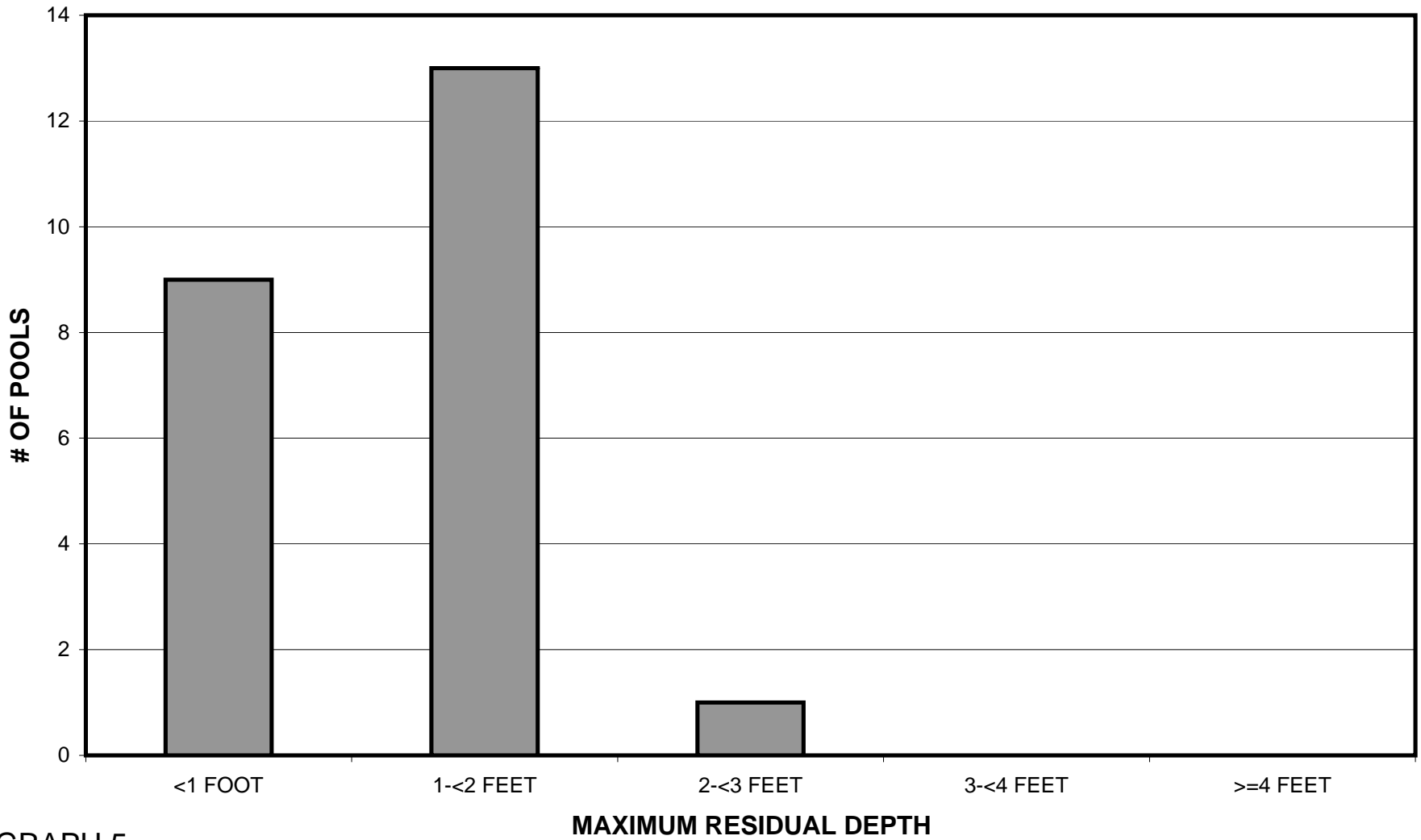
# HATCHERY CREEK 2011 POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

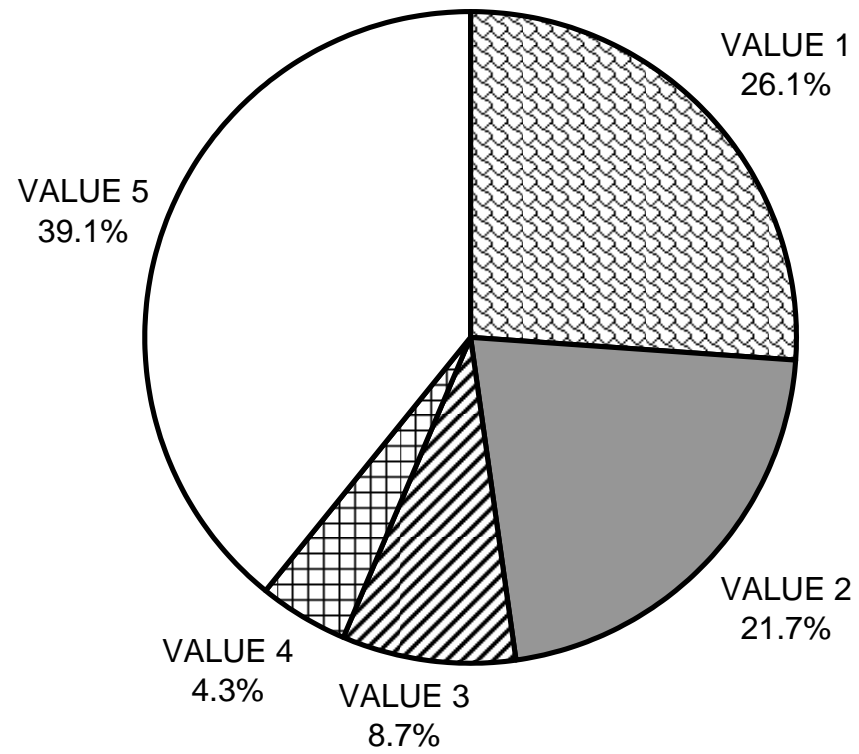


# HATCHERY CREEK 2011 MAXIMUM DEPTH IN POOLS



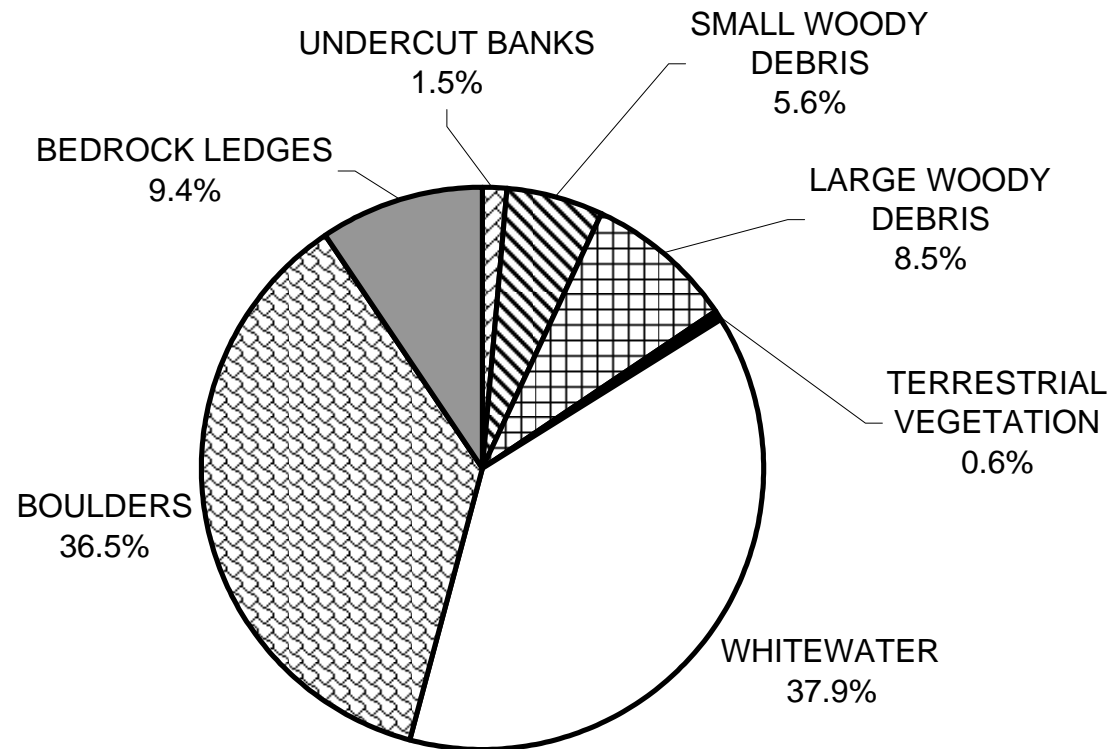
GRAPH 5

# HATCHERY CREEK 2011 PERCENT EMBEDDEDNESS



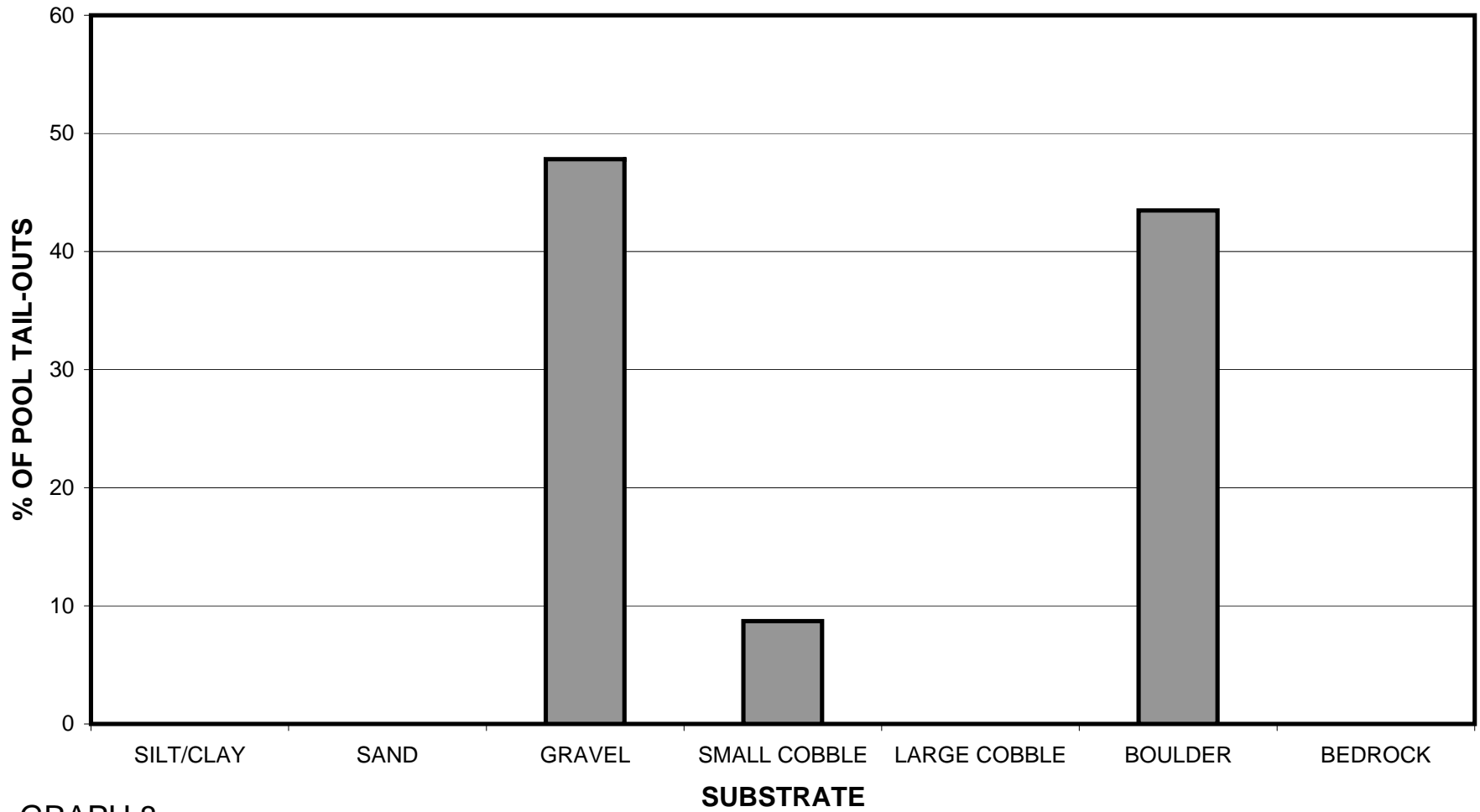
GRAPH 6

# HATCHERY CREEK 2011 MEAN PERCENT COVER TYPES IN POOLS



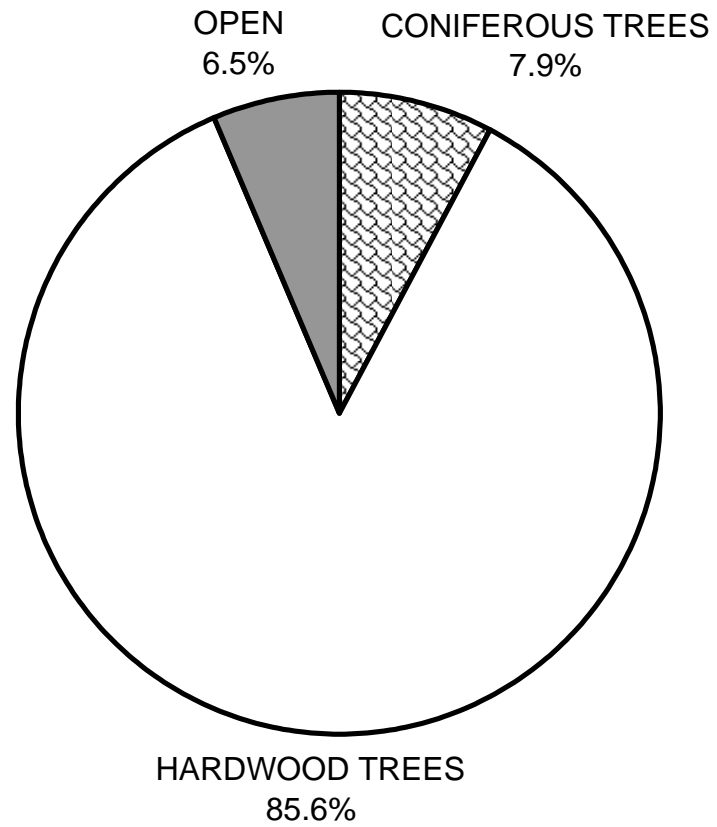
GRAPH 7

# HATCHERY CREEK 2011 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



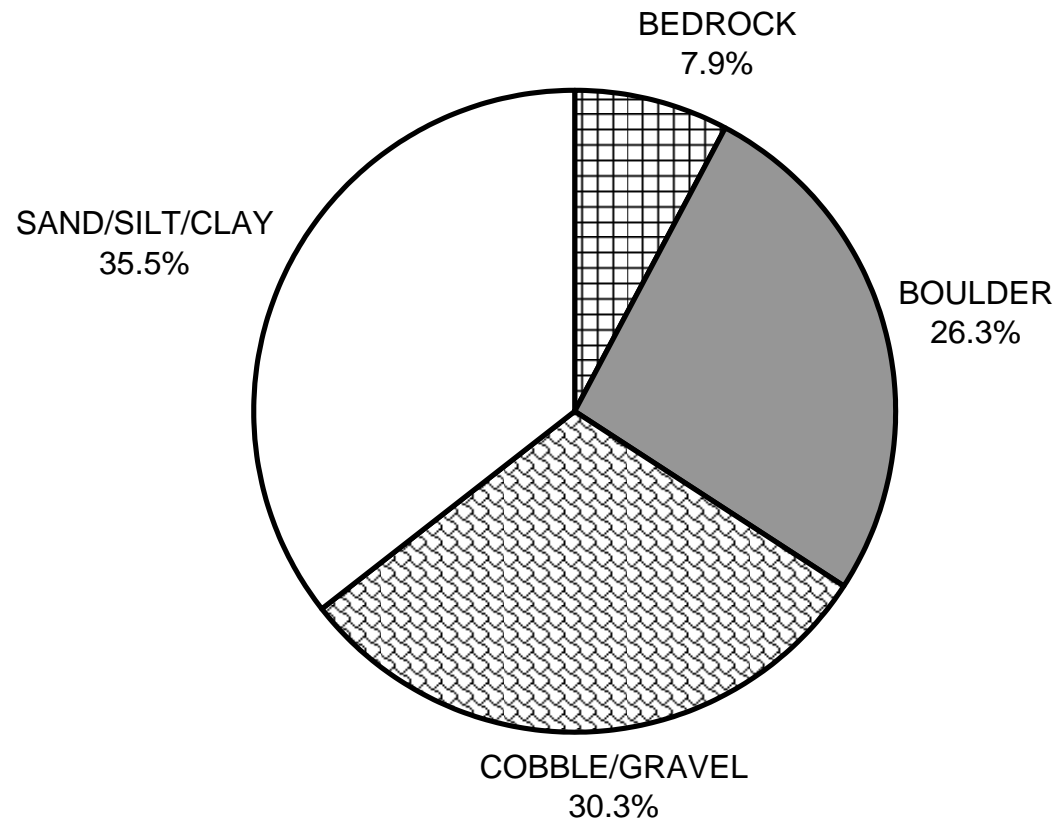
GRAPH 8

# HATCHERY CREEK 2011 MEAN PERCENT CANOPY



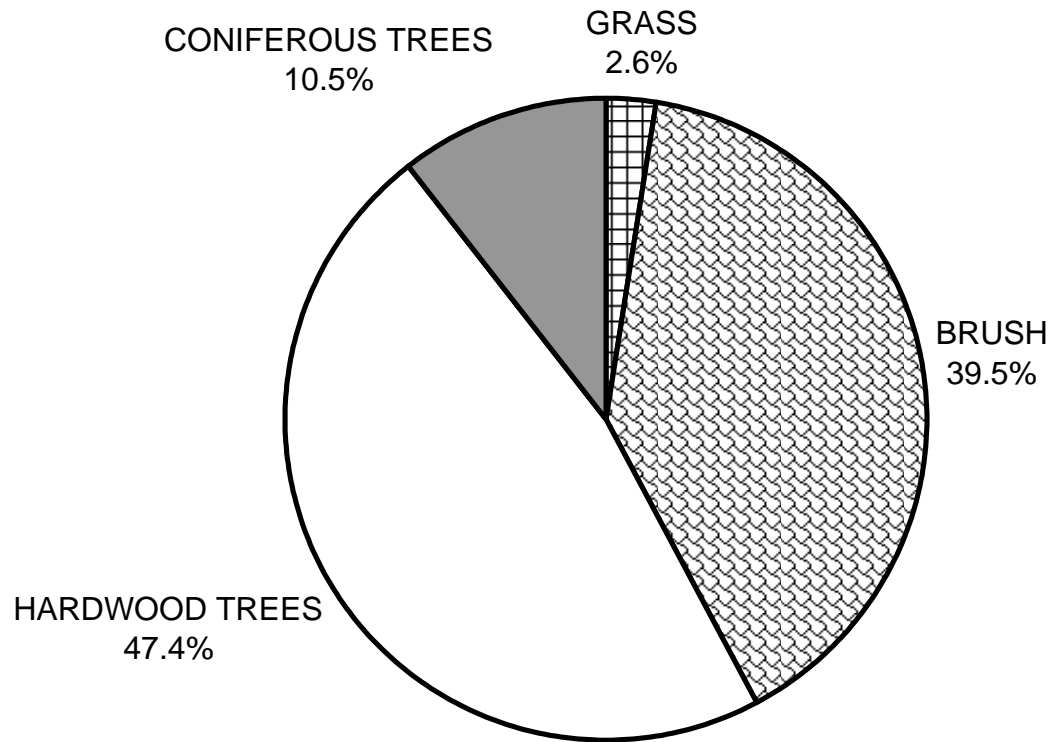
GRAPH 9

# HATCHERY CREEK 2011 DOMINANT BANK COMPOSITION IN SURVEY REACH



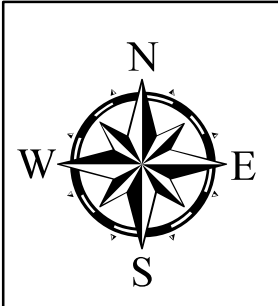
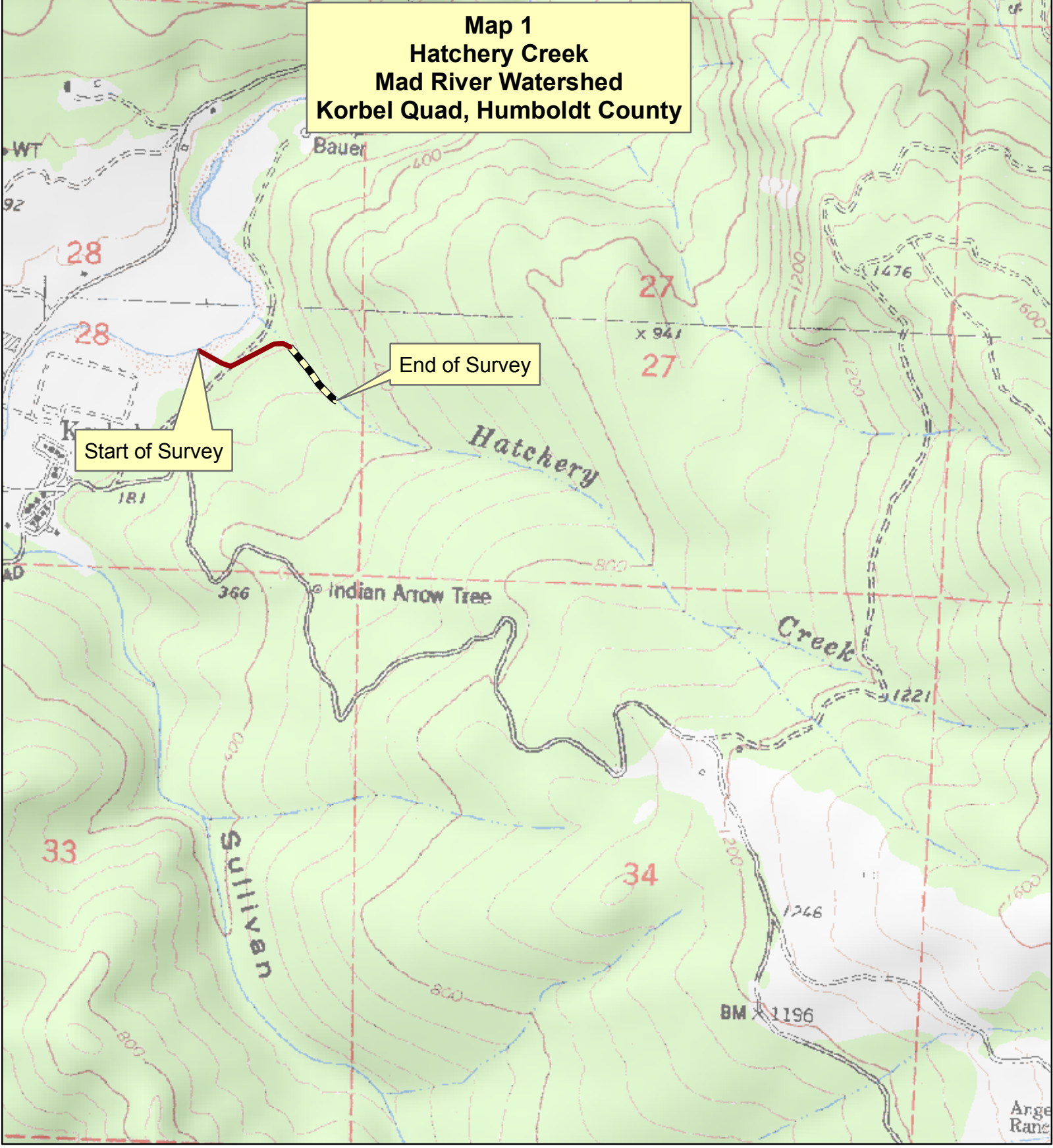
GRAPH 10

# HATCHERY CREEK 2011 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

**Map 1  
Hatchery Creek  
Mad River Watershed  
Korbel Quad, Humboldt County**



**Legend**

- Reach 1, B4 Channel Type
- ▬▬▬ Reach 2, A2 Channel Type

