

STREAM INVENTORY REPORT

Unnamed Tributary to Grizzly Creek 2006

INTRODUCTION

A stream inventory was conducted June 12, 2006 on an unnamed tributary to Grizzly Creek, LLID# 1239071404900. The survey began at the confluence with Grizzly Creek and extended upstream 1,007 feet.

The unnamed tributary 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 unnamed tributary. 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

Unnamed tributary is a tributary to Grizzly Creek, tributary to Van Duzen River, tributary to the Eel River which flows into the Pacific Ocean, located in Humboldt County, California (Map 1). The unnamed tributary's legal description at the confluence with Grizzly Creek is T01N R02E S01. Its location is 40°29'24" north latitude and 123°54'26" west longitude, LLID number 1239071404900. Unnamed tributary is a 2nd order stream and has approximately 2.55 miles of blue line stream according to the USGS Owl Creek 7.5 minute quadrangle. Unnamed tributary drains a watershed of approximately 2.3 square miles. Elevations range from about 390 feet at the mouth of the creek to 1,000 feet in the headwater areas (average elevation of headwaters, not highest point). Redwood forest dominates the watershed. The watershed is primarily privately and is managed for timber production. Vehicle access exists via Highway 36, left turn on private drive just before Grizzly State Park and onto Pacific Lumber Company private logging roads.

METHODS

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

SAMPLING STRATEGY

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

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in the unnamed tributary 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". Unnamed tributary 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 unnamed tributary, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In unnamed tributary, 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In unnamed tributary, 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 unnamed tributary, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

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 the unnamed tributary. In addition, 6 sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, 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 the unnamed tributary 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 June 12, 2006 was conducted by C. Pollastrini and S. McSmith (WSP). The total length of the stream surveyed was 1,007 feet with an additional 69 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.55 cfs on June 13, 2006.

Unnamed tributary is a B3 channel type for the 1,007 feet of the stream surveyed (Reach 1). B3 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and cobble dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 57 degrees Fahrenheit. Air temperatures ranged from 56 to 58 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% pool units, 37% riffle units, 17% flatwater units and 3% no survey units (Graph 1). Based on total length of Level II habitat types there were 36% riffle units, 32% pool units, 27% flatwater units and 5% no survey units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 33% low gradient riffle units, 17% mid-channel pool units and 17% plunge pool units (Graph 3). Based on percent total length 33% low gradient riffle units, 20% step run units and 12% step pool units.

A total of 13 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 62% (Graph 4), and comprised 71% 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. Four of the 13 pools (31%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 13 pool tail-outs measured, 2 had a value of 1 (15.4%); 3 had a value of 2 (23.1%); 2 had a value of 3 (15.4%); 6 had a value of 4 (46.2%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 8, flatwater habitat types had a mean shelter rating of 30, and pool habitats had a mean shelter rating of 44 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 26, scour pools had a mean shelter rating of 68 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in unnamed tributary. Graph 7 describes the pool cover in unnamed tributary. Boulders are the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 62% of pool tail-outs while boulders and bedrock were both observed in 15% of pool tail-outs.

The mean percent canopy density for the surveyed length of unnamed tributary was 79%. Twenty-one percent of the canopy was open. The mean percentages of hardwood and coniferous trees were 46% and 54%, respectively. Graph 9 describes the mean percent canopy in unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 86%. The mean percent left bank vegetated was 82%. The dominant elements composing the structure of the stream banks consisted of 81% sand/silt/clay, 16% boulder and 3% cobble/gravel (Graph 10). hardwood trees were the dominant vegetation type observed in 34.4% of the units surveyed. Additionally, 28.1% of the units surveyed had coniferous trees as the dominant vegetation type, and 28.1% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Six sites were electrofished for species composition and distribution in the unnamed tributary on June 22, 2006. Water temperatures taken during the electrofishing period (9:45am-12:30pm) remained 55 degrees Fahrenheit. The sites were sampled by E. Degenstein (WSP), E. Pope (DFG) and P. Divine (DFG).

In reach one, which comprised 1,007 feet of stream, 6 sites were sampled. The reach sites yielded 34 young-of-the-year steelhead/rainbow trout (SH/RT), 6 age 1+ SH/RT and no age 2+ SH/RT.

The following chart displays the information yielded from these sites:

2006 Unnamed Trib. LLID# 1239071404900 dive/e-fish observations.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
Reach 1 B3 Channel Type									
06/22/06	1	4-5	4.2,3.4	132	0	0	13	0	0
06/22/06	2	6	5.6	203	0	0	3	2	0
06/22/06	3	10	5.6	350	0	0	3	0	0
06/22/06	4	13	4.2	657	0	0	5	1	0
06/22/06	5	17-18	4.2,1.1	617	0	0	3	1	0
06/22/06	6	23	4.4	819	0	0	7	2	0

DISCUSSION

Unnamed tributary is a B3 channel type for the entire 1,007 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures are excellent for plunge weirs, boulder clusters, bank placed boulders, single as well as opposing wing deflectors and log cover.

The water temperatures recorded on the survey days June 12, 2006 ranged from 56 to 57 degrees Fahrenheit. Air temperatures ranged from 56 to 58 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 27% of the total length of this survey, riffles 36%, and pools 32%. The pools are relatively shallow, with only 4 of the 13 (31%) pools having 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 structures that will increase or deepen pool habitat is recommended.

Five of the 13 pool tail-outs measured had embeddedness ratings of 1 or 2. Eight 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. Sediment sources in unnamed tributary should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Nine of the 13 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 44. The shelter rating in the flatwater habitats was 30. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in unnamed tributary. Boulders are the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 79%. The percentage of right and left bank covered with vegetation was high at 86% and 82%, 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) The unnamed tributary 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 boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Where feasible, design and engineer pool enhancement structures to increase the number and depth of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 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.
- 6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

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	Begin survey at confluence with Grizzly Creek.
203	0006.00	Plunge of 1.2 feet.
331	0010.00	Plunge of 2.1 feet.
481	0014.00	Bridge 18' wide x 29' high x 87' long.
668	0020.00	Bank erosion 20' high x 20' long contributing silt and gravel to stream.
769	0021.00	Plunge of 2.2 feet.
800	0023.00	Log debris accumulation (LDA) #1; 4.3' high x 48' wide x 48' long with 31 pieces of large woody debris (LWD); water flows through; no visible gaps; sediment retention 34' wide x 59' long x 10.3' high; substrate composed of sand to large cobble; one-plus salmonids observed above but no young-of-the-year; possible barrier; right bank erosion, 50' high x 80' long.
895	0025.00	Plunge of 2.4 feet.
945	0027.00	Right bank erosion contributing sediment.
989	0028.00	Start of a series of log debris accumulations. LDA #2, 7.4' high; 42' to LDA #3, 5' high; 107' to LDA #4, 5.1' high; 94' to LDA #5, 9' high; 16' to LDA #6, 1.9' high; 90' to LDA #7, 7.4' high.
1007	0028.00	End of survey, no young of the year salmonids observed above LDA #1, no salmonids observed above LDA #2.

REFERENCES

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

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(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: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0

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
5	1	FLATWATER	16.7	59	293	27.2	9.0	0.7	1.3	511	2556	358	1789		30
1	0	NOSURVEY	3.3	50	50	4.6									
13	13	POOL	43.3	27	349	32.4	11.0	0.7	1.7	258	3349	301	3907	208	44
11	2	RIFFLE	36.7	35	384	35.7	8.5	0.4	0.7	255	2805	89	983		8
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
30	16				1076					8710			6680		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

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 (%)
10	2	LGR	33.3	36	356	33.1	8	0.4	0.8	255	2550	89	894		8	77
1	0	HGR	3.3	28	28	2.6										
2	0	RUN	6.7	38	77	7.2										
3	1	SRN	10.0	72	216	20.1	9	0.7	1.3	511	1534	358	1074		30	83
5	5	MCP	16.7	25	123	11.4	9	0.6	1.9	220	1101	260	1298	161	28	73
3	3	STP	10.0	42	126	11.7	10	0.6	2.4	361	1083	306	918	198	23	85
5	5	PLP	16.7	20	100	9.3	13	1.0	3.5	233	1165	338	1691	261	68	83
1	0	NS	3.3	50	50	4.6										73

Total Units
30

Total Units Fully Measured
16

Total Length (ft.)
1076

Total Area (sq.ft.)
7432

Total Volume (cu.ft.)
5875

Table 3 - Summary of Pool Types

Stream Name: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

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
8	8	MAIN	62	31	249	71	9.8	0.6	273	2184	175	1396	26
5	5	SCOUR	38	20	100	29	13.0	1.0	233	1165	261	1305	68

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
13	13	349	3349	2701

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

Stream Name: 1239071404900 LLID: 1239071404900 Drainage: Van Duzen River
 Survey Dates: 6/2/2006 to 6/12/2006
 Confluence Location: Quad: OWL CREEK Legal Description: T01NR02ES01 Latitude: 40:29:24.0N Longitude: 123:54:26.0W

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
5	MCP	38	0	0	5	100	0	0	0	0	0	0
3	STP	23	0	0	2	67	1	33	0	0	0	0
5	PLP	38	0	0	2	40	2	40	1	20	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
13	0	0	9	69	3	23	1	8	0	0

Mean Maximum Residual Pool Depth (ft.): 1.7

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Dry Units: 0

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

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
10	2	LGR	0	0	0	0	0	0	0	100	0
1	0	HGR									
11	2	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
2	0	RUN									
3	1	SRN	20	0	0	0	0	0	20	60	0
5	1	TOTAL FLAT	20	0	0	0	0	0	20	60	0
5	5	MCP	0	0	18	0	0	0	4	78	0
3	2	STP	0	0	0	0	0	0	10	90	0
5	5	PLP	26	4	12	4	3	0	15	36	0
13	12	TOTAL POOL	11	2	13	2	1	0	10	63	0
1	0	NS									
30	15	TOTAL	10	1	10	1	1	0	9	67	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1239071404900 LLID: 1239071404900 Drainage: Van Duzen River
 Survey Dates: 6/2/2006 to 6/12/2006 Dry Units: 0
 Confluence Location: Quad: OWL CREEK Legal Description: T01NR02ES01 Latitude: 40:29:24.0N Longitude: 123:54:26.0W

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
10	2	LGR	0	50	0	50	0	0	0
1	0	HGR	0	0	0	0	0	0	0
2	0	RUN	0	0	0	0	0	0	0
3	1	SRN	0	0	0	0	100	0	0
5	5	MCP	60	0	0	20	20	0	0
3	3	STP	67	0	33	0	0	0	0
5	5	PLP	20	40	0	20	0	0	20

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
79	54	46	0	86	83

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 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

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	2	3	15.6
Cobble / Gravel	1	0	3.1
Sand / Silt / Clay	13	13	81.3

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	5	4	28.1
Hardwood Trees	5	6	34.4
Coniferous Trees	5	4	28.1
No Vegetation	1	2	9.4

Total Stream Cobble Embeddedness Values: 3

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

StreamName: 1239071404900

LLID: 1239071404900

Drainage: Van Duzen River

Survey Dates: 6/2/2006 to 6/12/2006

Confluence Location: Quad: OWL CREEK

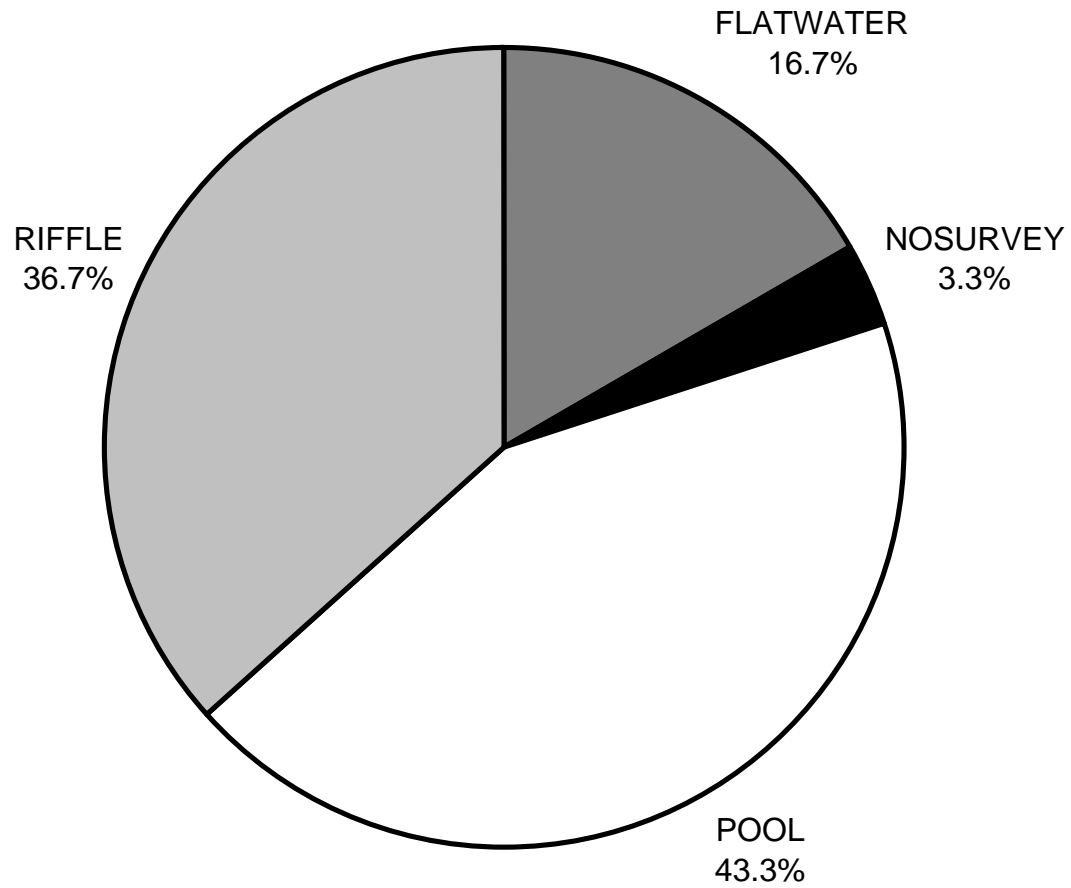
Legal Description: T01NR02ES01

Latitude: 40:29:24.0N

Longitude: 123:54:26.0W

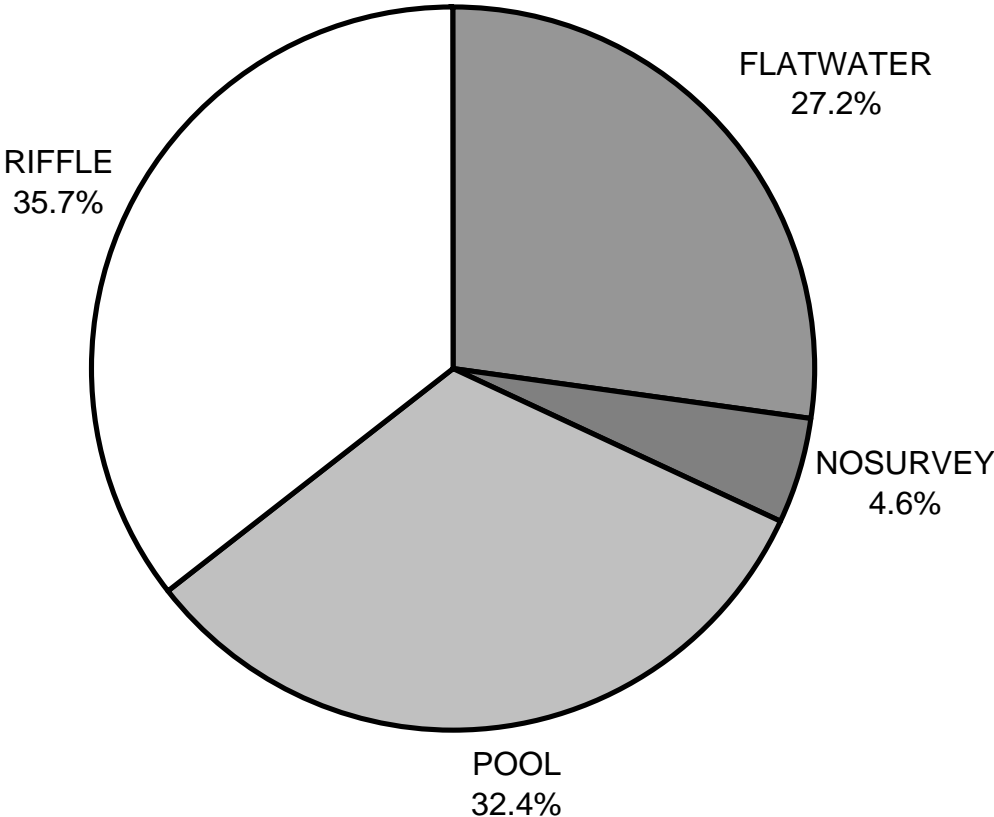
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	20	11
SMALL WOODY DEBRIS (%)	0	0	2
LARGE WOODY DEBRIS (%)	0	0	13
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	0	0	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	20	10
BOULDERS (%)	100	60	63
BEDROCK LEDGES (%)	0	0	0

1239071404900 2006
HABITAT TYPES BY PERCENT OCCURRENCE



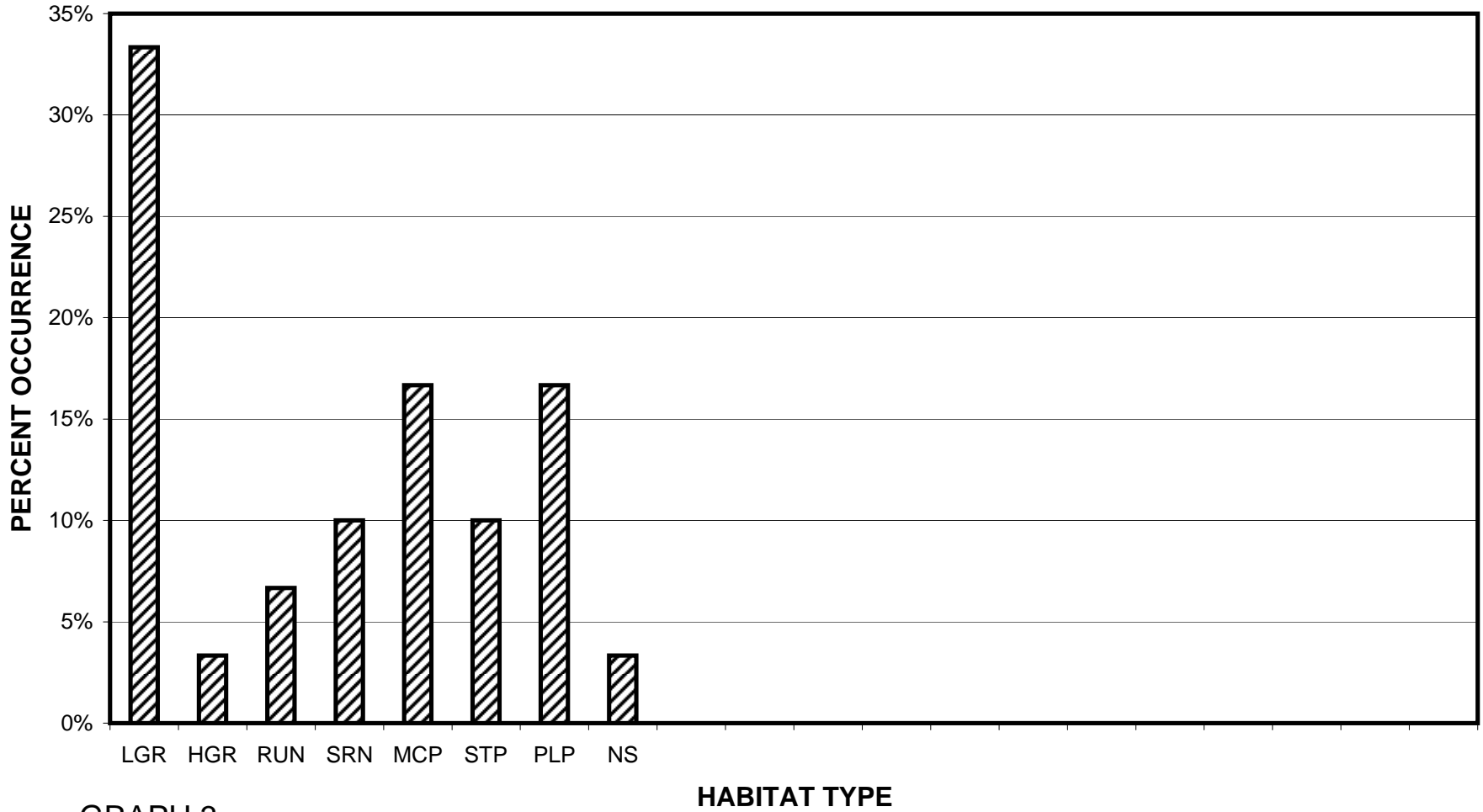
GRAPH 1

1239071404900 2006
HABITAT TYPES BY PERCENT TOTAL LENGTH



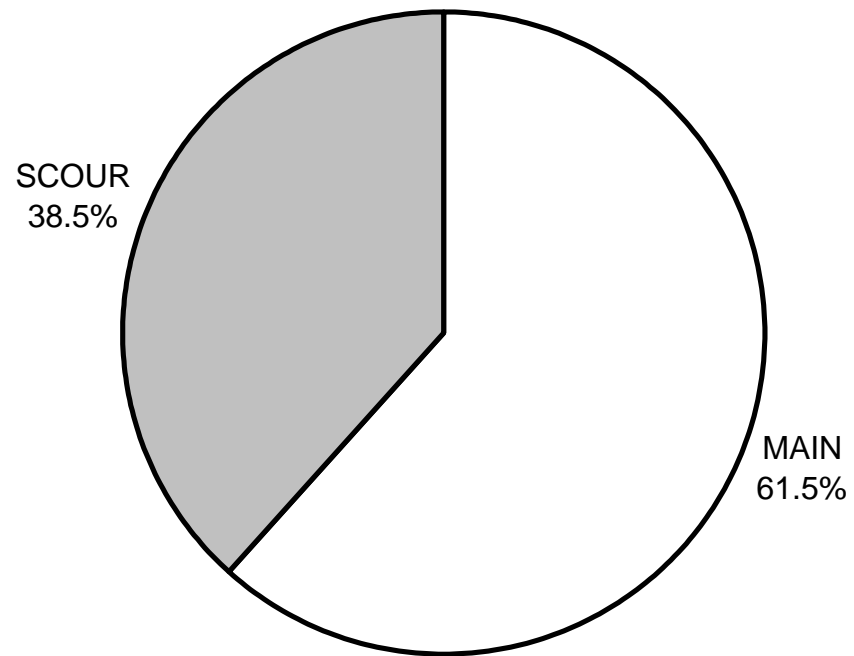
GRAPH 2

1239071404900 2006
HABITAT TYPES BY PERCENT OCCURRENCE



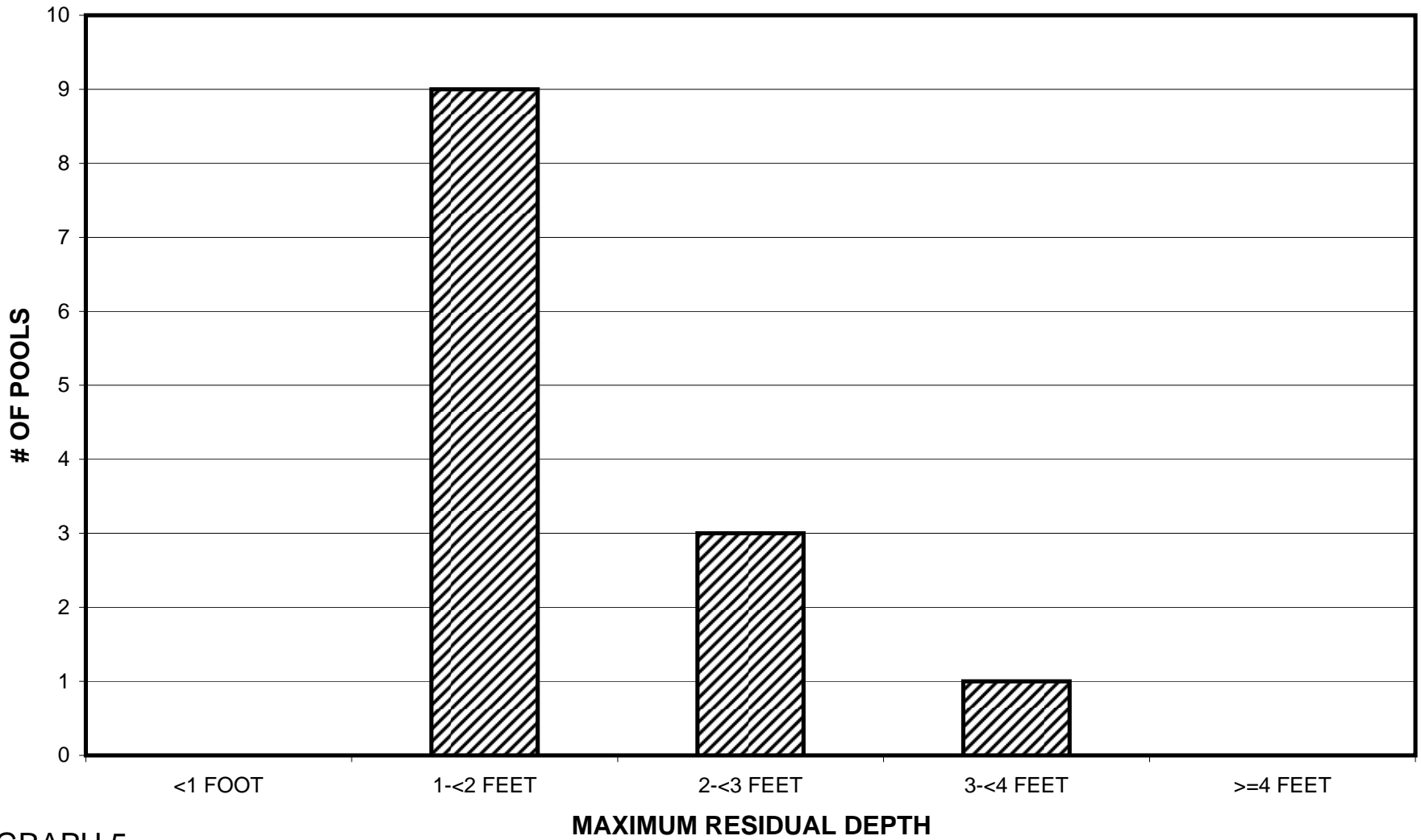
GRAPH 3

1239071404900 2006
POOL TYPES BY PERCENT OCCURRENCE



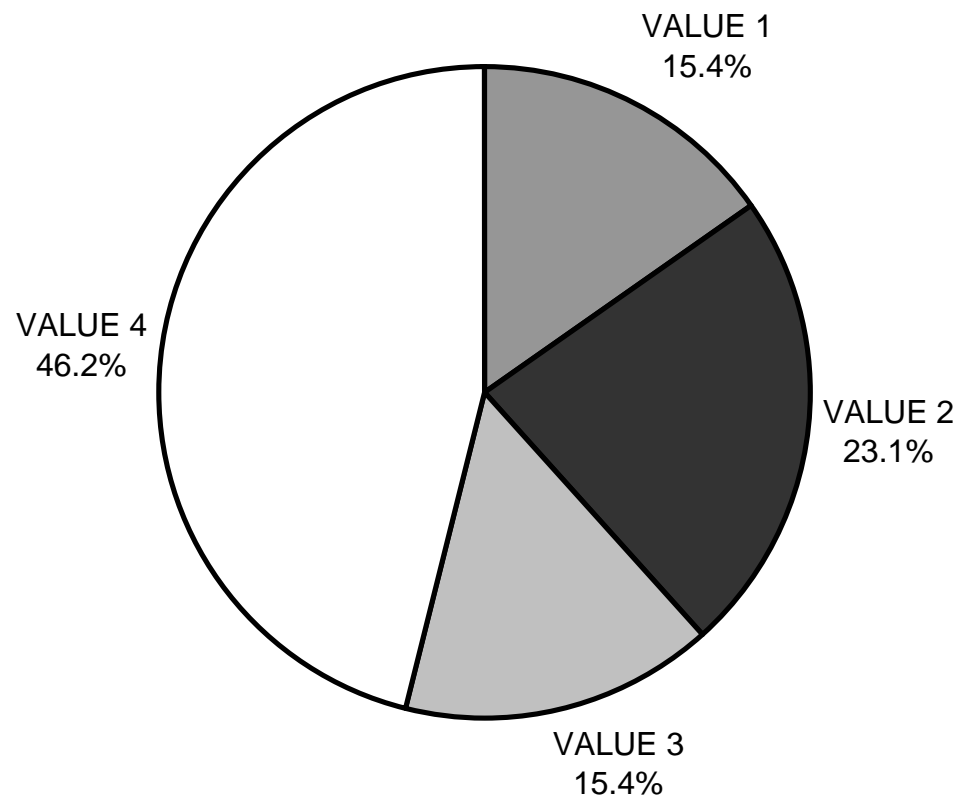
GRAPH 4

1239071404900 2006
MAXIMUM DEPTH IN POOLS



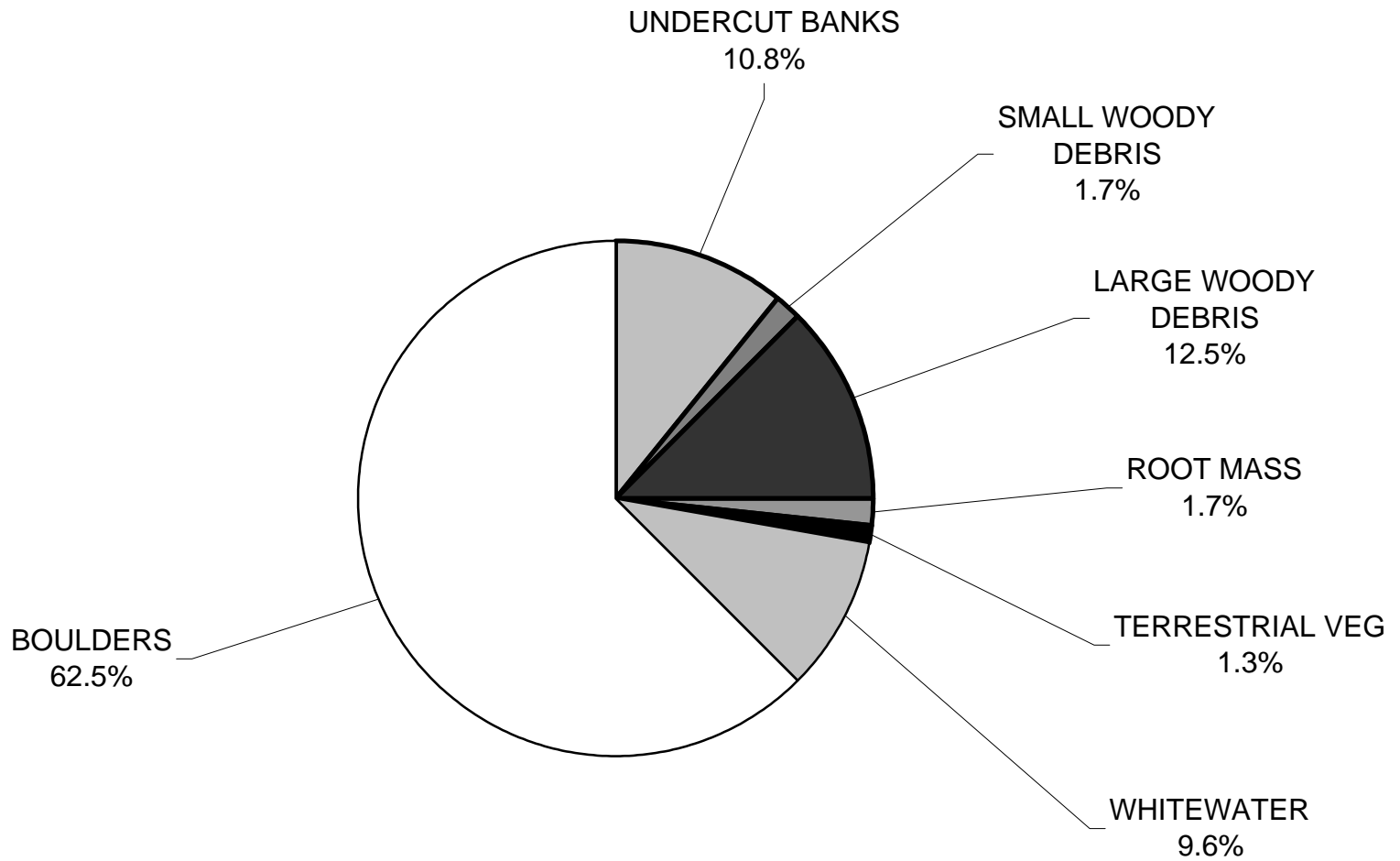
GRAPH 5

**1239071404900 2006
PERCENT EMBEDDEDNESS**



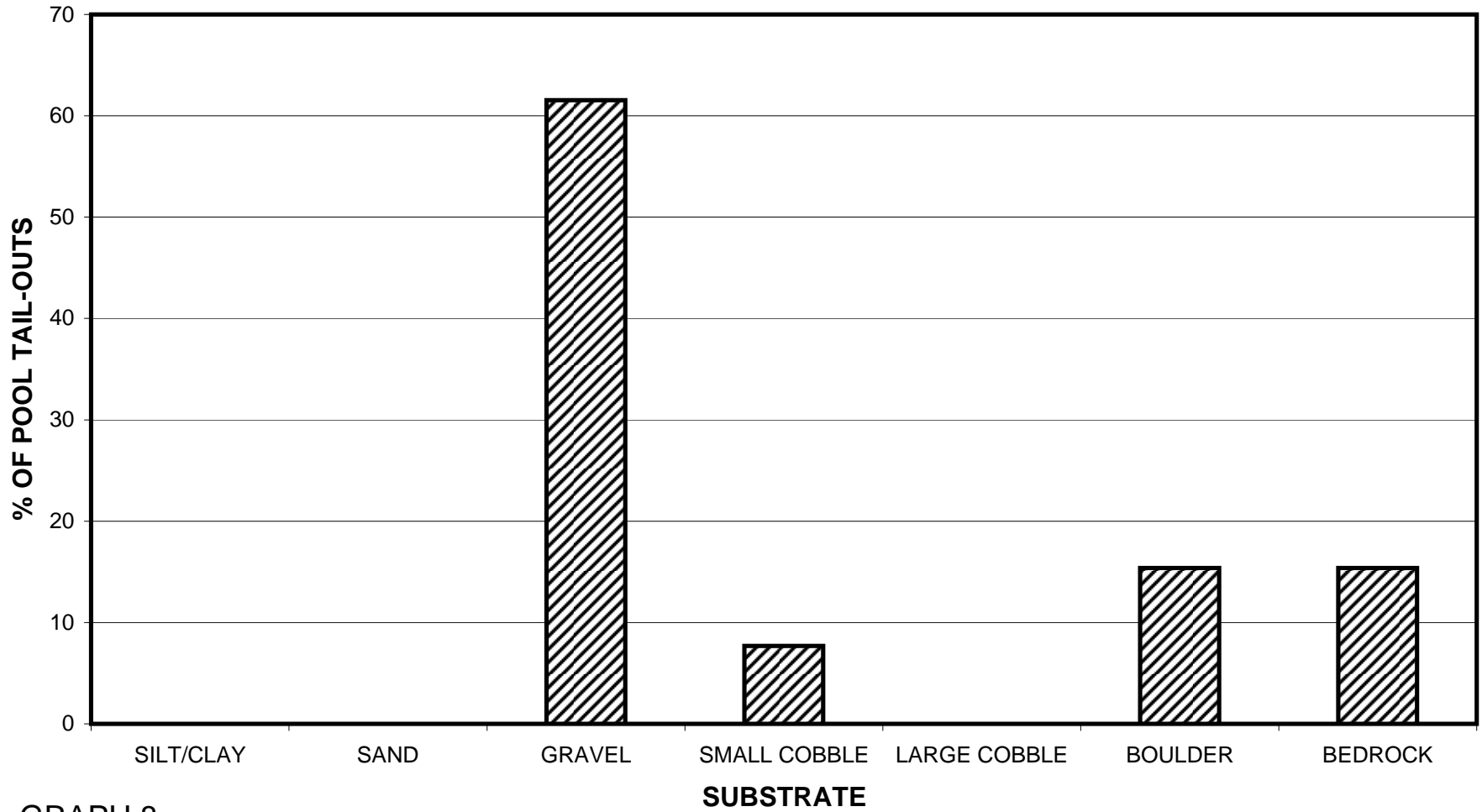
GRAPH 6

1239071404900 2006
MEAN PERCENT COVER TYPES IN POOLS



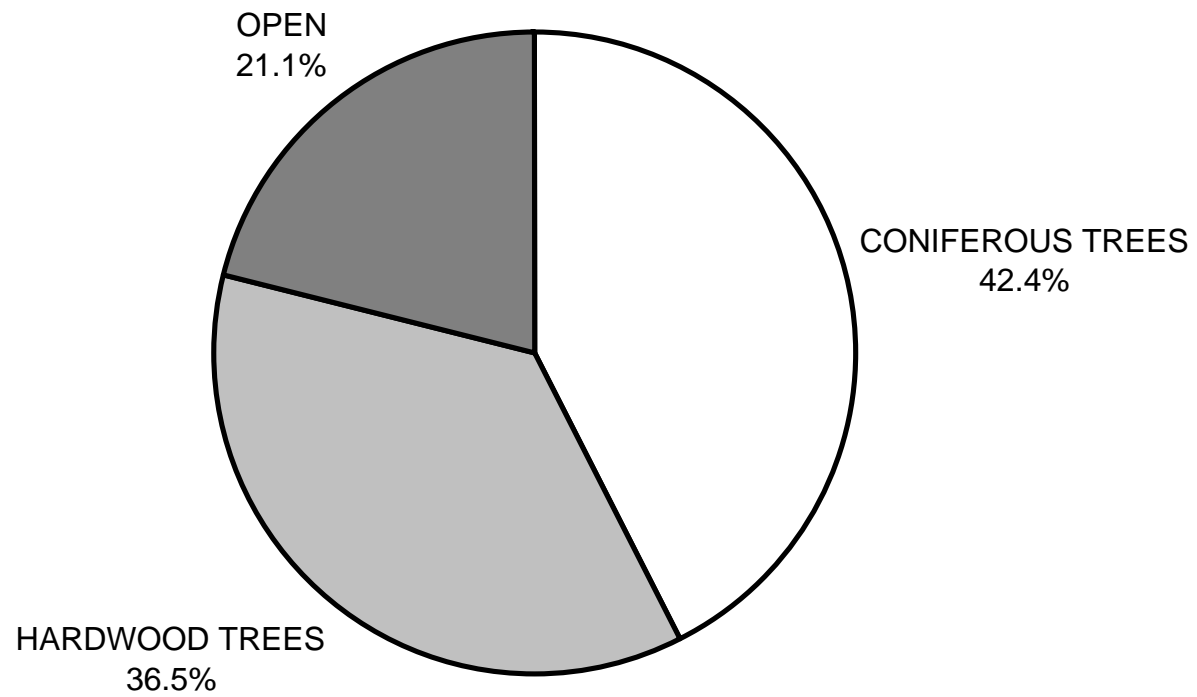
GRAPH 7

1239071404900 2006
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



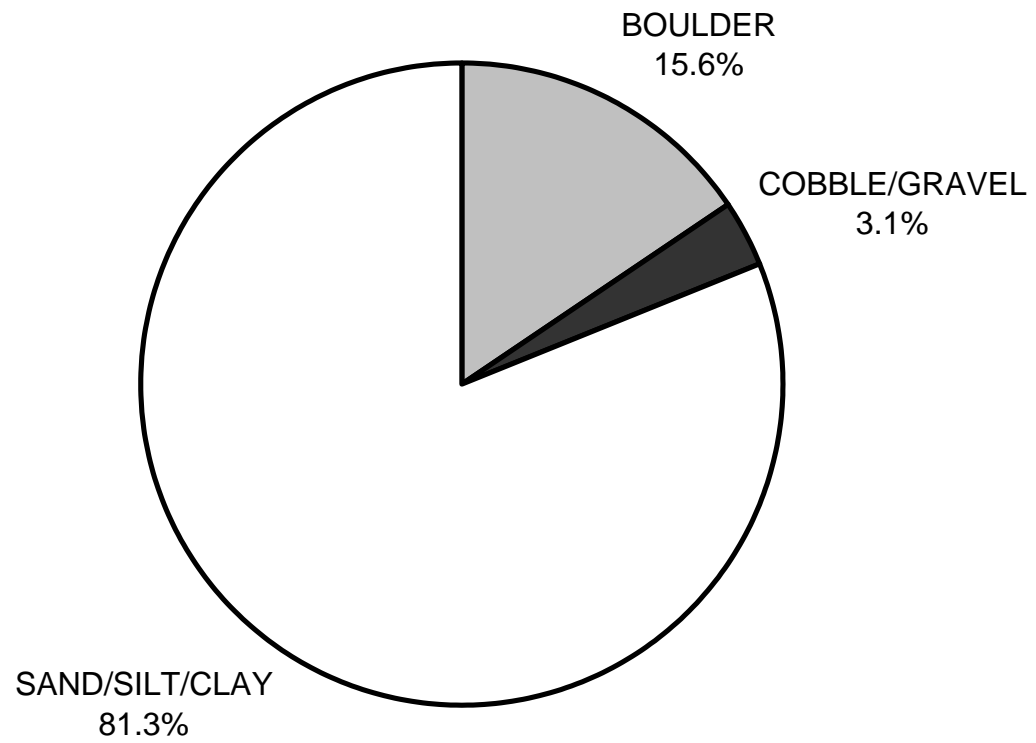
GRAPH 8

**1239071404900 2006
MEAN PERCENT CANOPY**



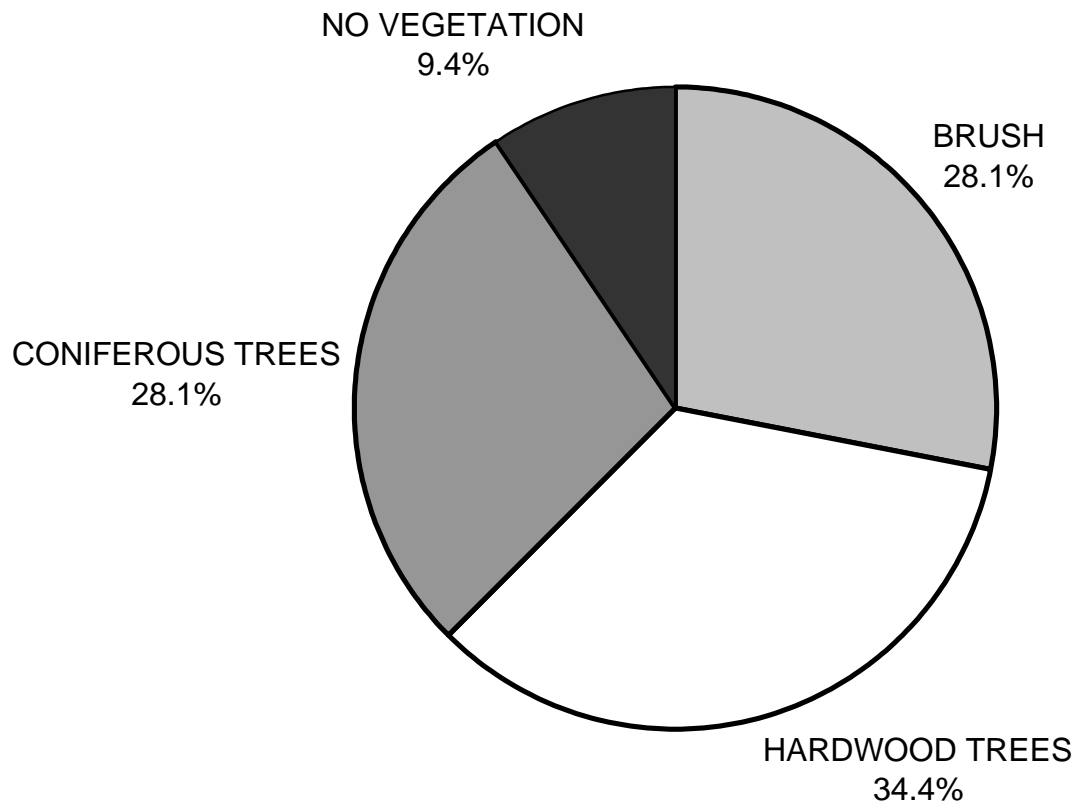
GRAPH 9

1239071404900 2006
DOMINANT BANK COMPOSITION IN SURVEY REACH

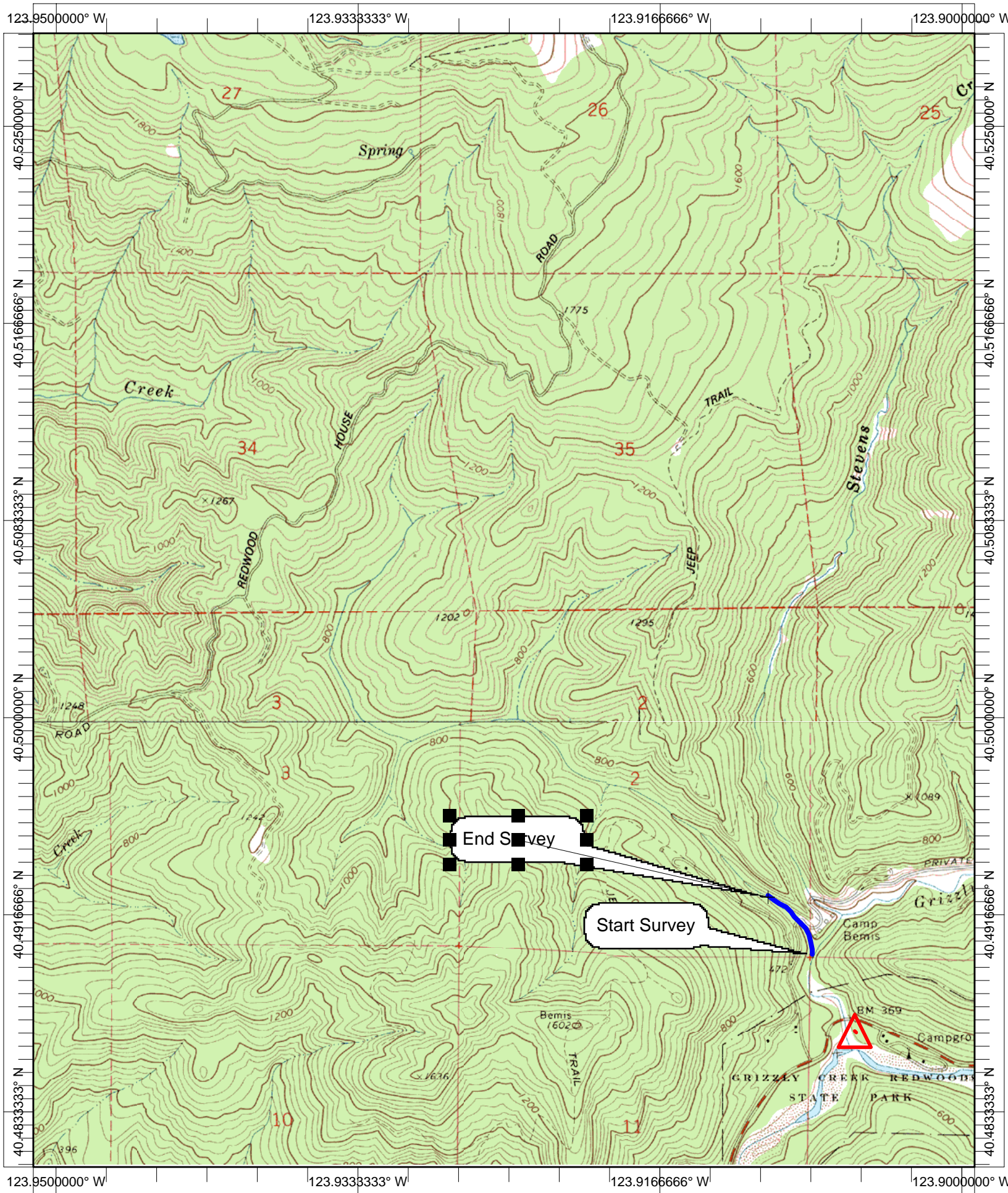


GRAPH 10

1239071404900 2006
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



Name: OWL CREEK
 Date: 8/10/2007
 Scale: 1 inch equals 1818 feet

Location: 040.5050061° N 123.9252948° W
 Caption: Unnamed Trib to Grizzly Ck aka False Steven or Little Stevens