STREAM INVENTORY REPORT

Unnamed Tributary to Dunn Creek

INTRODUCTION

A stream inventory was conducted from September 9 to September 10, 2008 on an unnamed tributary to Dunn Creek. The survey began at the confluence with Dunn Creek and extended upstream 0.6 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in the unnamed creek.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

The unnamed creek is a tributary to Dunn Creek, tributary to North Fork Cottaneva Creek, tributary to Cottaneva Creek, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). The unnamed creek's legal description at the confluence with Dunn Creek is T23N R18W S35. Its location is 39.8005° north latitude and 123.8211° west longitude, LLID number 1238212398006. The unnamed creek is a first order stream and has approximately 0.58 miles of blue line stream according to the USGS Hales Grove 7.5 minute quadrangle. The unnamed creek drains a watershed of approximately 0.9 square miles. Elevations range from about 350 feet at the mouth of the creek to 1,400 feet in the headwater areas (average elevation of headwaters, not highest point). Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 1 north of Rockport.

METHODS

The habitat inventory conducted in the unnamed creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The 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 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". The unnamed 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 the unnamed creek, embeddedness

was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In unnamed creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In the unnamed 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 the unnamed creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the

elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Detailed biological sampling (electrofishing and/or underwater observation) was not conducted on the unnamed tributary to Dunn Creek during the 2008 survey season. Fish presence was observed from the stream banks in the unnamed tributary. Bank observation techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, 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 creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of September 9 to September 10, 2008, was conducted by C. Chavez and B. Quaglieri, (WSP). The total length of the stream surveyed was 3,069 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.04 cfs on September 1, 2008.

The unnamed creek is a G3 channel type for 422 feet of the stream surveyed (Reach 1), and a G4 channel type for 2,647 feet of the stream surveyed (Reach 2). G3 channels are entrenched "gully" step-pool channels on moderate gradients with low width /depth ratios and cobble-dominant substrates. G4 channels are entrenched "gully" step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 59 degrees Fahrenheit. Air temperatures ranged from 50 to 58 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% pool units, 28% flatwater units, 16% riffle units, 8% dry units, and 2% culvert units (Graph 1). Based on total length of Level II habitat types there were 52% flatwater units, 22% pool units, 16% riffle units, 6% dry units, and 3% culvert units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 31%; step run units, 27%; and low gradient riffle units, 12% (Graph 3). Based on percent total length, step run units made up 52%, mid-channel pool units 13%, and low gradient riffle units 13%.

A total of 38 pools were identified (Table 3). Main channel pools were the most frequently encountered at 68% (Graph 4), and comprised 60% 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. Nine of the 38 pools (24%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 38 pool tail-outs measured, 14 had a value of 1 (36.8%); 22 had a value of 2 (57.9%); 2 had a value of 3 (5.3%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 0, 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 46. Backwater pools had a mean shelter rating of 24 and main channel pools had a mean shelter rating of 18 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in this unnamed creek. Graph 7 describes the pool cover in the unnamed creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 63% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 32% of the pool tail-outs.

The mean percent canopy density for the surveyed length of unnamed creek was 47%. Fifty-three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 27% and 73%, respectively. Graph 9 describes the mean percent canopy in unnamed creek.

For the stream reach surveyed, the mean percent right bank vegetated was 50%. The mean percent left bank vegetated was 50%. The dominant elements composing the structure of the stream banks consisted of 100% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 51.2% of the units surveyed. Additionally, 37.8% of the units surveyed had hardwood trees as the dominant vegetation type, and 11% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Biological sampling was conducted from the stream banks on the unnamed tributary to Dunn Creek.

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DISCUSSION

The unnamed creek is a G3 channel type for the first 422 feet of stream surveyed and a G4 channel type for the next 2,647 feet. The suitability of G3 and G4 channel types for fish habitat improvement structures is as follows: G3 and G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days September 9 to September 10, 2008, ranged from 58 to 59 degrees Fahrenheit. Air temperatures ranged from 50 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 52% of the total length of this survey, riffles 16%, and pools 22%. The pools are relatively shallow, with 9 of the 38 (24%) 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 large wood that will increase or deepen pool habitat is recommended.

Thirty-six of the 38 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. Sediment sources in the unnamed creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-six of the 38 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 24. The shelter rating in the flatwater habitats was 0. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in the unnamed creek. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 47%. Reach 1 had a canopy density of 73.9%, Reach 2 had a canopy density of 43.05%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 50% and 50%, 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.

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RECOMMENDATIONS

1) The unnamed tributary to Dunn 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 small woody debris. Adding high quality complexity with woody cover in the pools is desirable.

4) 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.

5) Increase the canopy on unnamed creek by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft.)	Habitat Unit #:	Comments:
0	0001.00	Start of survey at the confluence with Dunn Creek. The unnamed tributary has more flow than Dunn Creek. Young-of-the-year salmonids (YOY) are present.
293	0007.00	A salmonid greater than 1 year of age (1+) is present.
333	0009.00	This habitat unit is a plunge pool formed by the culvert.
352	0010.00	Culvert #01 has a diameter of 7.5' and is 40’ long. The plunge height of the culvert outlet is 0.9’ and the jump pool is 3’ deep. The culvert is made of metal which is rusting and it has a 2% slope. The culvert is probably a barrier to juvenile salmonids. There are salmonids upstream of the culvert.

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683	0017.00	There is a log debris accumulation (LDA #01) that measures 7' high x 14' wide x 10' long and consists of 4 pieces of large woody debris (LWD). Water does flow through and there are visible gaps. Stored sediment ranging from silt to small cobble measures 10’ wide x 8’ long x 3' deep. Fish were observed upstream.
2317	0056.00	LDA #02 is 4' high x 26' wide x 2.5' long; consisting of 1 piece of LWD. Water does not flow through and there are no visible gaps. Stored sediment ranging from silt to gravel measures 12’ wide x 9’ long x 4’ deep. There was 1 piece of LWD. Fish were observed upstream
2418	0062.00	Culvert #02 is 7’ in diameter and 60’ long. It is made of metal and is rusted. There is a 1.1’ plunge at the outlet and a 3’ jump pool. The culvert has a slope of approximately 1% and is a probable barrier to juvenile salmonids.
2538	0066.00	LDA #03 is 7' high x 22' wide x 16' long; consisting of 5 pieces of LWD. There were no gaps and water did not flow through. Stored sediment ranging from silt to gravel measures 19’ wide x 10’ long x 3' deep.
2613	0068.00	LDA #04 is 5.5’ high x 19’ wide x 12’ long; consisting of 6 pieces of LWD. There were no visible gaps, though water does flow through. Stored sediment ranging in size from silt to small cobble measures 19’ wide x 10’ long x 3’ deep. It appears to be a possible barrier to juvenile and adult fish.
2651	0071.00	Water flows subsurface.
2670	0072.00	Pool tailout goes subsurface
2680	0073.00	Tributary #01 contributes an estimated 30% of the flow. The temperature both downstream and upstream of the confluence is 58F while the tributary itself is 55F. There is clear passage for fish access for at least the first 200' that was checked. The slope measured by clinometer was 12%. There were no fish present.
2887	0078.00	Orange algae observed.
2949	0080.00	Orange algae dense in this unit. This is the last habitat unit that YOY and 1+ have been observed.
3039	0085.00	There is a bridge mid-unit that measures 18' wide x 26' long x 8' high.
3069	0085.00	End of survey due to diminishing habitat, increased gradient, repeated dry units and isolated pools.

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: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
2	2	CULVERT	2.4	50	100	3.3									0
7	7	DRY	8.2	26	180	5.9									0
24	22	FLATWATER	28.2	67	1604	52.3	4.0	0.5	1.0	466	11179	233	254		0
38	38	POOL	44.7	18	684	22.3	9.0	0.9	1.6	156	5913	176	6680	147	24
14	13	RIFFLE	16.5	36	501	16.3	4.0	0.2	0.4	80	1121	13	28		0

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
85	82	3069	18214	6962

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
10	9	LGR	11.8	41	409	13.3	0	0.2	0.4	11	108	19	22		1	12
4	4	HGR	4.7	23	92	3.0	1	0.1	0.4	16	63	6	6		0	24
1	1	RUN	1.2	16	16	0.5	0			0	0				0	0
23	21	SRN	27.1	69	1588	51.7	0	0.5	1	22	510	233	255		0	4
26	26	MCP	30.6	16	412	13.4	10	0.9	3.1	156	4067	186	4834	160	18	93
5	5	LSL	5.9	23	114	3.7	7	0.8	1.9	145	727	154	771	123	47	92
2	2	PLP	2.4	16	31	1.0	10	1.0	1.8	159	318	193	386	152	45	89
1	1	BPR	1.2	27	27	0.9	7	0.6	1.1	189	189	151	151	113	30	91
1	1	BPL	1.2	47	47	1.5	7	0.5	0.9	296	296	237	237	148	30	94
3	3	DPL	3.5	18	53	1.7	7	0.7	2	105	316	100	301	77	20	91
7	7	DRY	8.2	26	180	5.9	0			0	0				0	0
2	2	CUL	2.4	50	100	3.3	0			0	0				0	0

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
85	82	3069	6594	6963

Table 3 - Summary of Pool Types

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

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
26	26	MAIN	68	16	412	60	9.8	0.9	156	4067	160	4156	18
7	7	SCOUR	18	21	145	21	7.7	0.9	149	1045	131	919	46
5	5	BACKWATER	13	25	127	19	6.8	0.6	160	801	99	493	24

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
38	38	684	5913	5568

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

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
26	MCP	68	5	19	13	50	7	27	1	4	0	0
5	LSL	13	2	40	3	60	0	0	0	0	0	0
2	PLP	5	0	0	2	100	0	0	0	0	0	0
1	BPR	3	0	0	1	100	0	0	0	0	0	0
1	BPL	3	1	100	0	0	0	0	0	0	0	0
3	DPL	8	0	0	2	67	1	33	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
38	8	21	21	55	8	21	1	3	0	0

Mean Maximum Residual Pool Depth (ft.): 1.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008 Dry Units: 7

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
10	8	LGR	0	0	60	0	40	0	0	0	0
4	4	HGR	0	0	0	0	0	0	0	0	0
14	12	TOTAL RIFFLE	0	0	60	0	40	0	0	0	0
1	1	RUN	0	0	0	0	0	0	0	0	0
23	18	SRN	0	40	60	0	0	0	0	0	0
24	19	TOTAL FLAT	0	40	60	0	0	0	0	0	0
26	26	MCP	0	34	61	1	1	1	0	2	0
5	5	LSL	16	30	53	0	1	0	0	0	0
2	2	PLP	20	15	63	0	0	0	3	0	0
1	1	BPR	40	0	0	60	0	0	0	0	0
1	1	BPL	0	20	60	0	20	0	0	0	0
3	3	DPL	23	30	37	0	10	0	0	0	0
38	38	TOTAL POOL	6	31	57	2	2	1	0	1	0
2	1	CUL	0	0	0	0	0	0	0	0	0
85	77	TOTAL	6	30	57	2	3	1	0	1	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008 Dry Units: 7

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
10	1	LGR	0	100	0	0	0	0	0
4	1	HGR	0	0	100	0	0	0	0
1	0	RUN	0	0	0	0	0	0	0
23	1	SRN	0	100	0	0	0	0	0
26	26	MCP	73	23	4	0	0	0	0
5	5	LSL	40	60	0	0	0	0	0
2	2	PLP	50	50	0	0	0	0	0
1	1	BPR	0	100	0	0	0	0	0
1	1	BPL	100	0	0	0	0	0	0
3	3	DPL	67	33	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
47	73	27	49	50	50

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: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008 Survey Length (ft.): 3069 Main Channel (ft.): 3069 Side Channel (ft.): 0

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G3
Reach Length (ft.): 422
Riffle/Flatwater Mean Width (ft.): 3.5
BFW:
Range (ft.): 12 to 12
Mean (ft.): 12
Std. Dev.: 0
Base Flow (cfs.): 0.0
Water (F): 58 - 58 Air (F): 56 - 56
Dry Channel (ft): 0

Canopy Density (%): 73.9
Coniferous Component (%): 58.8
Hardwood Component (%): 41.3
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 80.0
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 61
LWD per 100 ft.:
Riffles: 2
Pools: 10
Flat: 1

Pools by Stream Length (%): 36.0
Pool Frequency (%): 54.5
Residual Pool Depth (%):
< 2 Feet Deep: 67
2 to 2.9 Feet Deep: 33
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 33

Pool Tail Substrate (%): Silt/Clay: 17 Sand: 0 Gravel: 33 Sm Cobble: 50 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 33.3 2. 50.0 3. 16.7 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: G4
Reach Length (ft.): 2647
Riffle/Flatwater Mean Width (ft.): 5.0
BFW:
Range (ft.): 11 to 13
Mean (ft.): 12
Std. Dev.: 0
Base Flow (cfs.): 0.0
Water (F): 58 - 59 Air (F): 50 - 58
Dry Channel (ft): 180

Canopy Density (%): 43.1
Coniferous Component (%): 77.0
Hardwood Component (%): 23.0
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 45.4
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 26
LWD per 100 ft.:
Riffles: 1
Pools: 20
Flat: 4

Pools by Stream Length (%): 20.1
Pool Frequency (%): 43.2
Residual Pool Depth (%):
< 2 Feet Deep: 78
2 to 2.9 Feet Deep: 19
3 to 3.9 Feet Deep: 3
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 22

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 69 Sm Cobble: 28 Lg Cobble: 0 Boulder: 3 Bedrock: 0

Embeddedness Values (%): 1. 37.5 2. 59.4 3. 3.1 4. 0.0 5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	41	41	100.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	2	7	11.0
Hardwood Trees	18	13	37.8
Coniferous Trees	21	21	51.2
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

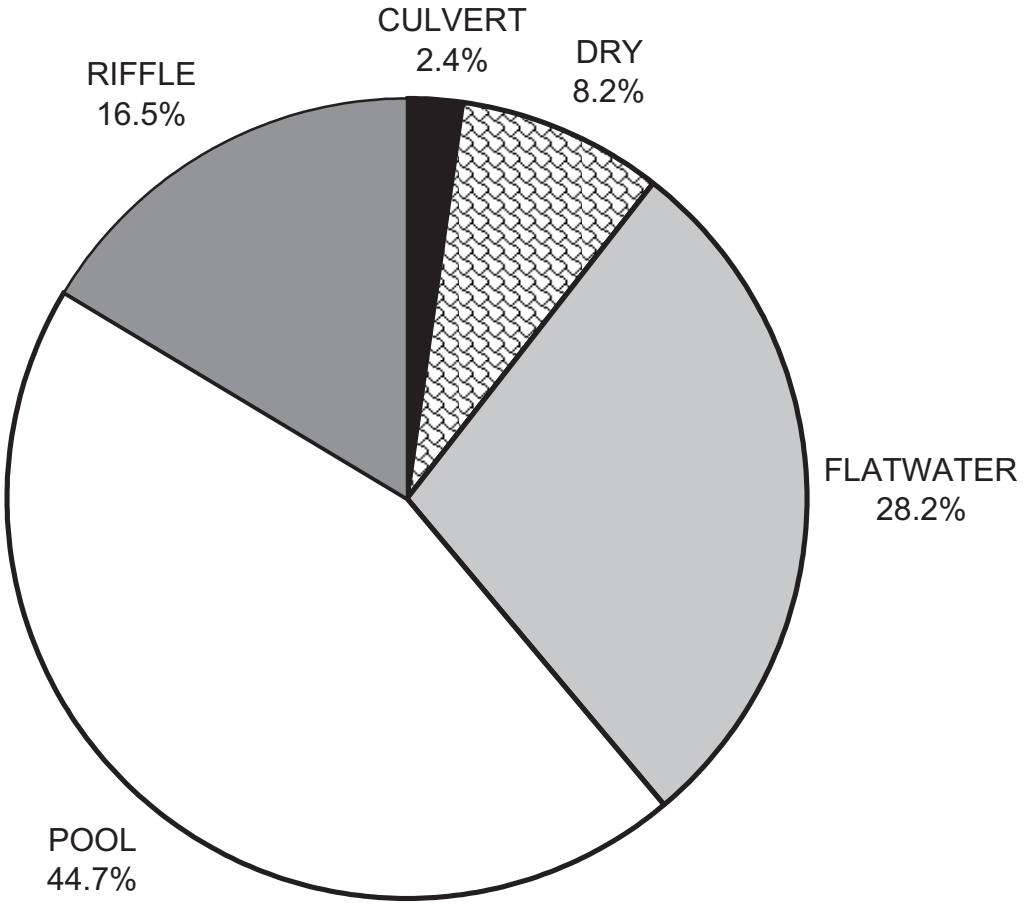
StreamName: 1238212398006 LLID: 1238212398006 Drainage: Rockport

Survey Dates: 9/9/2008 to 9/10/2008

Confluence Location: Quad: HALES GROVE Legal Description: T23NR18WS35 Latitude: 39:48:02.0N Longitude: 123:49:16.0W

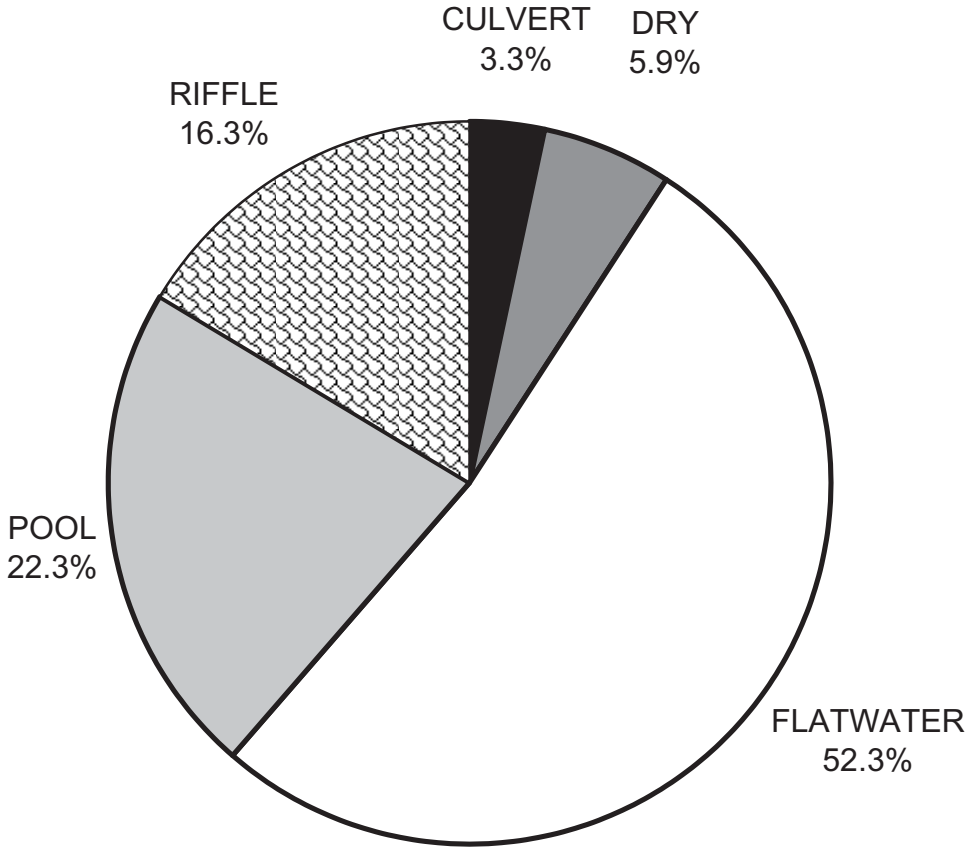
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	6
SMALL WOODY DEBRIS (%)	0	40	31
LARGE WOODY DEBRIS (%)	60	60	57
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	40	0	2
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	1
BEDROCK LEDGES (%)	0	0	0

1238212398006 2008
HABITAT TYPES BY PERCENT OCCURRENCE



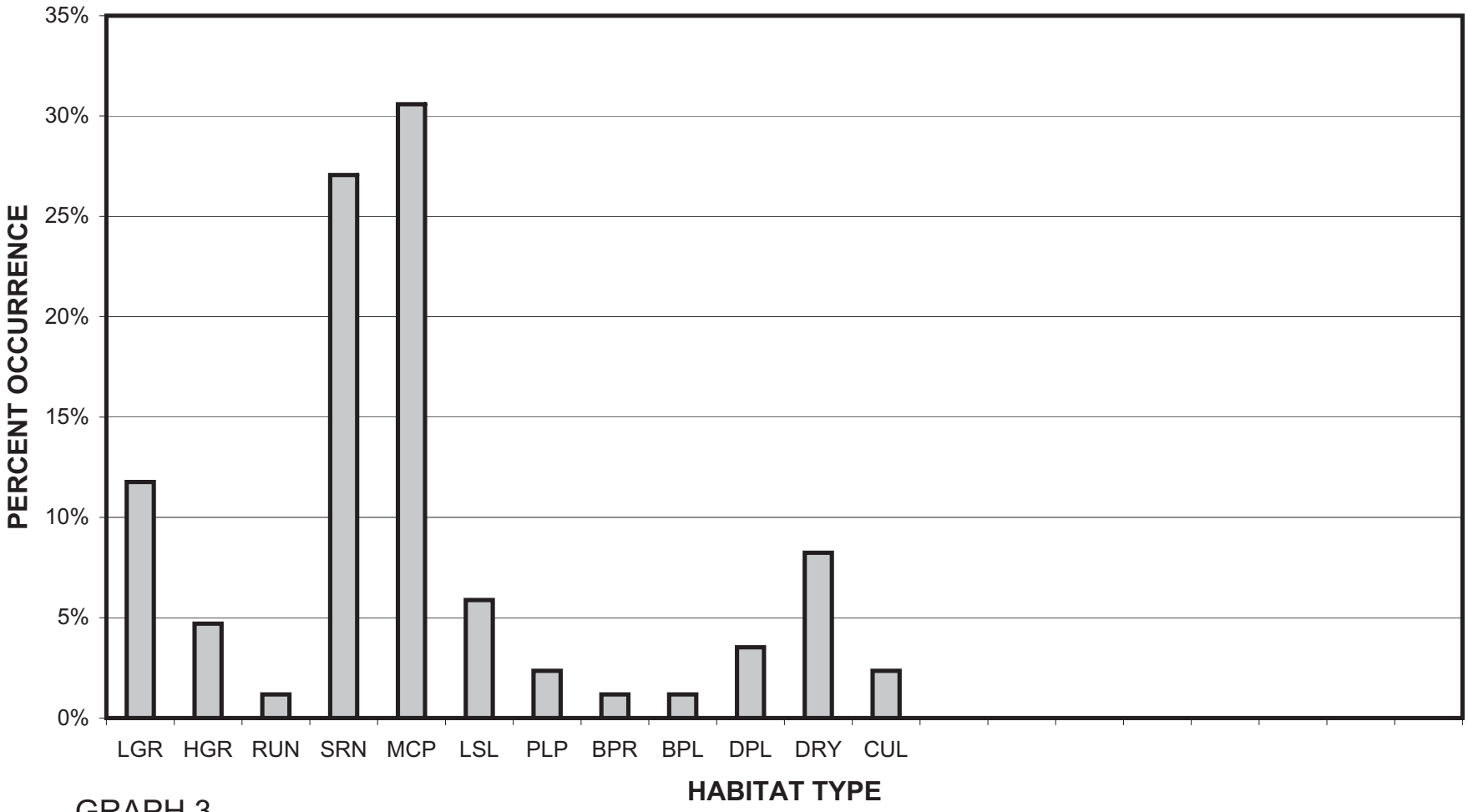
GRAPH 1

1238212398006 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH



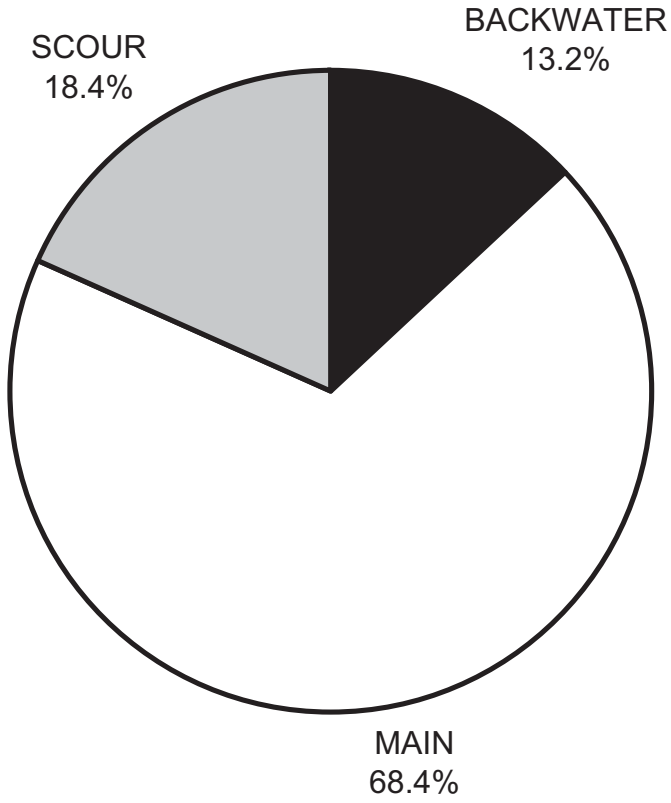
GRAPH 2

1238212398006 2008
HABITAT TYPES BY PERCENT OCCURRENCE



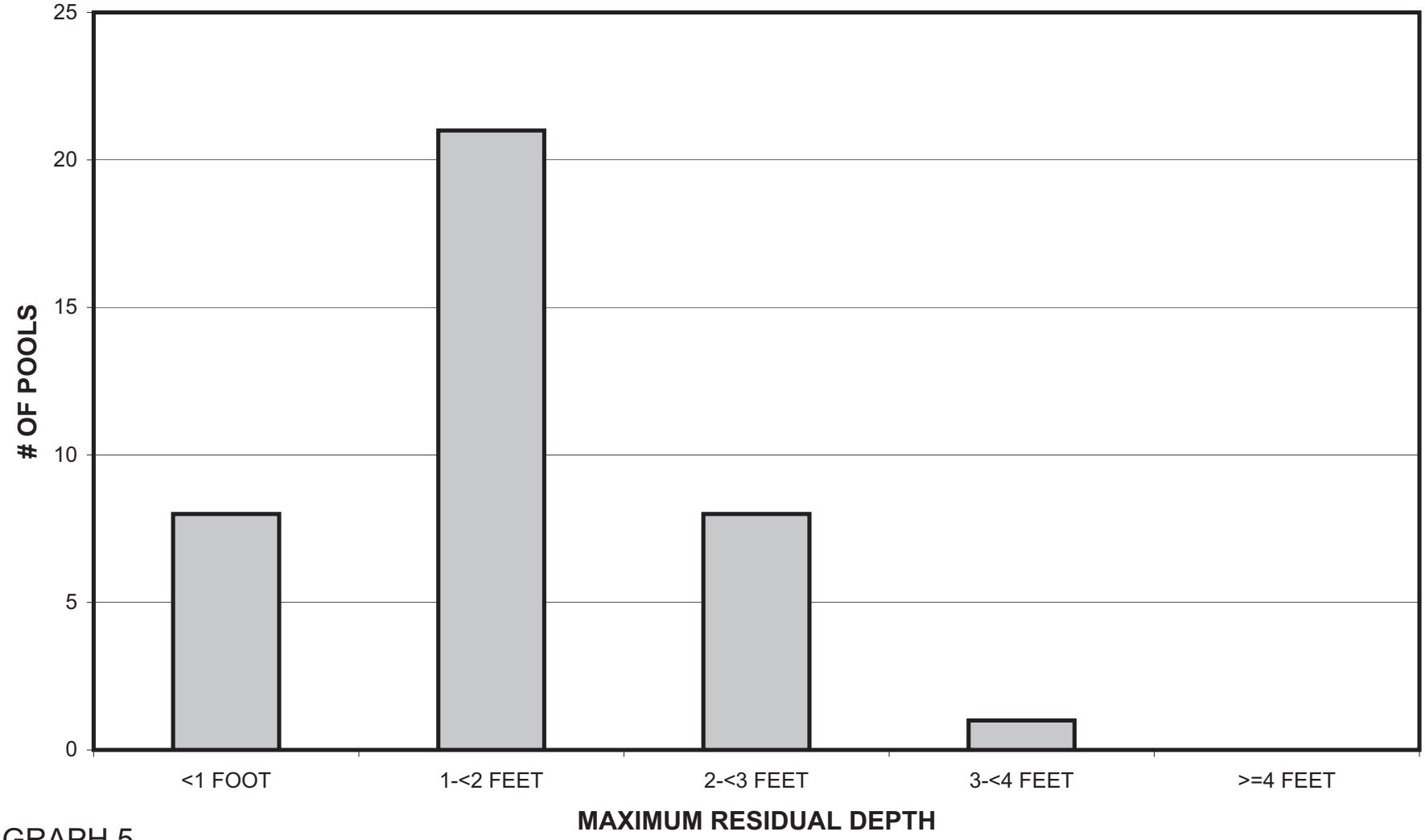
GRAPH 3

1238212398006 2008
POOL TYPES BY PERCENT OCCURRENCE



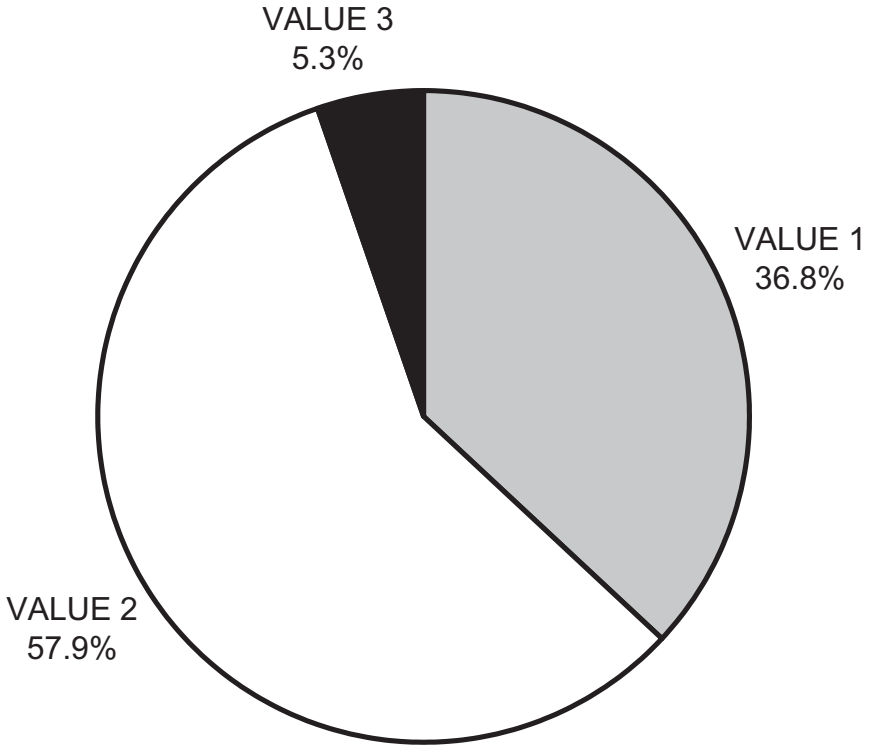
GRAPH 4

1238212398006 2008
MAXIMUM DEPTH IN POOLS



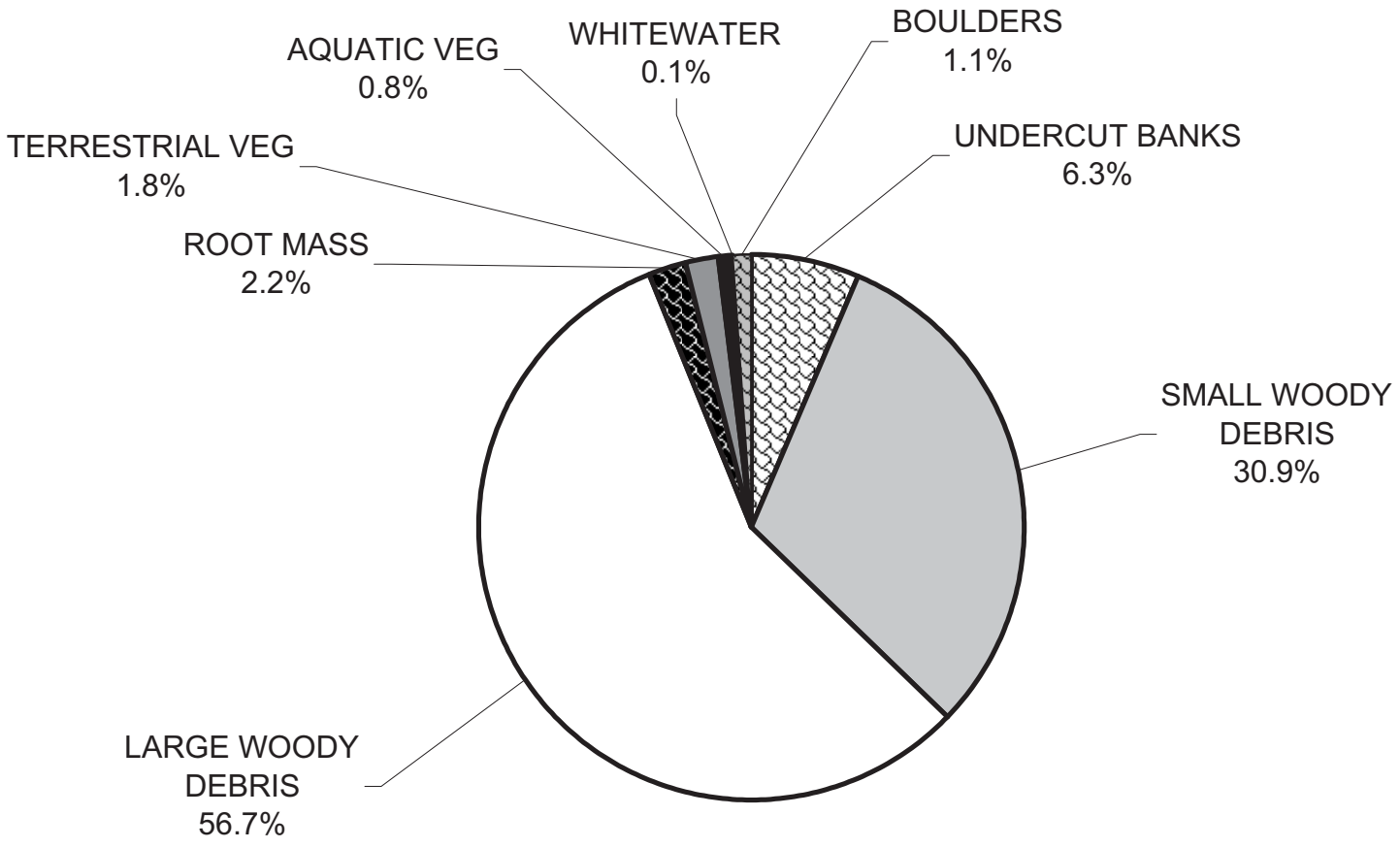
GRAPH 5

1238212398006 2008
PERCENT EMBEDDEDNESS



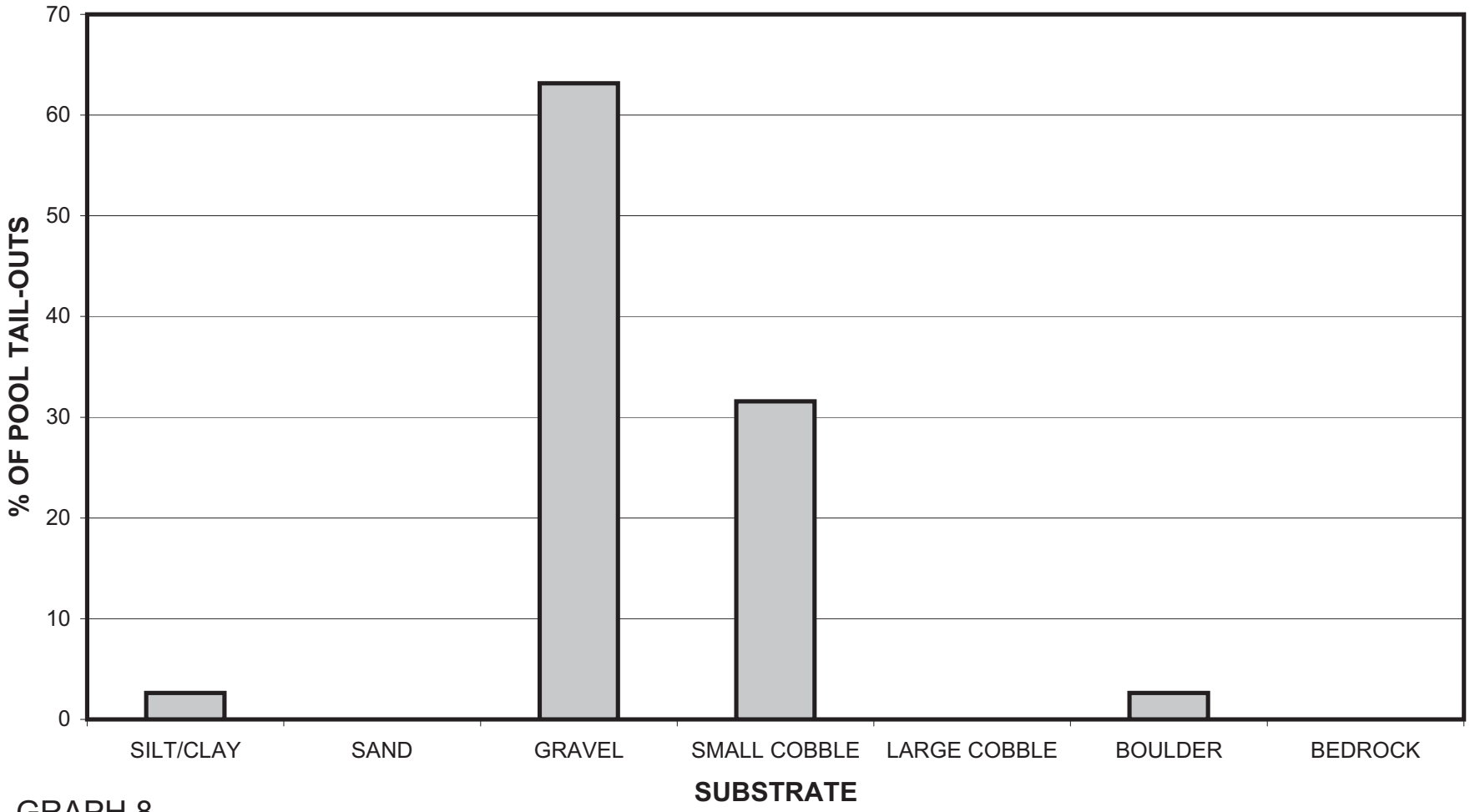
GRAPH 6

1238212398006 2008
MEAN PERCENT COVER TYPES IN POOLS



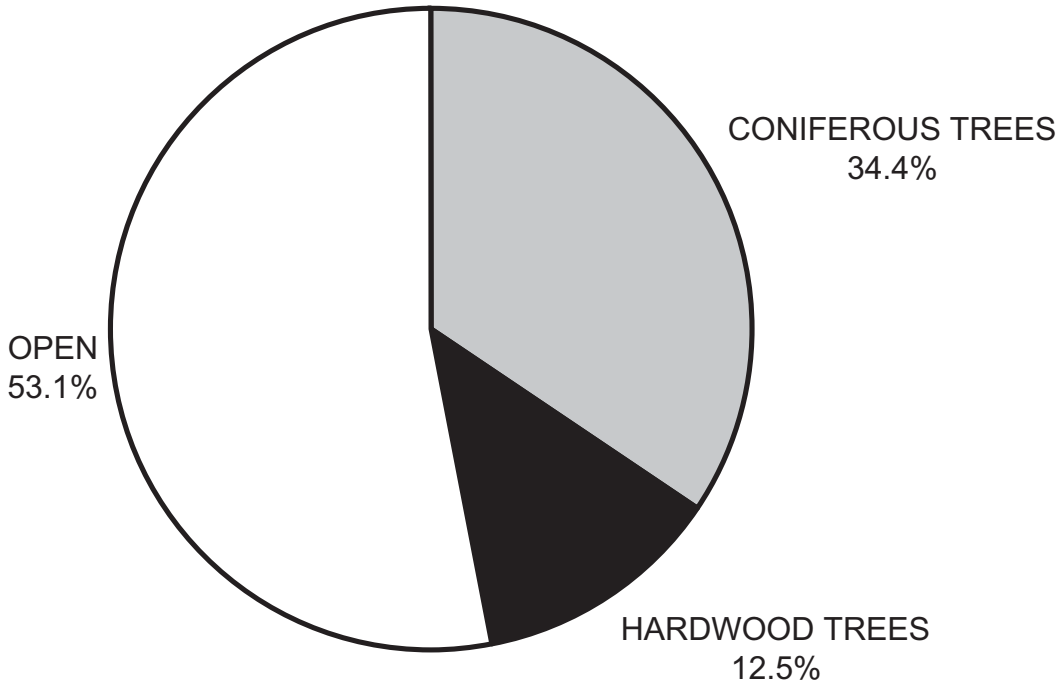
GRAPH 7

1238212398006 2008
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



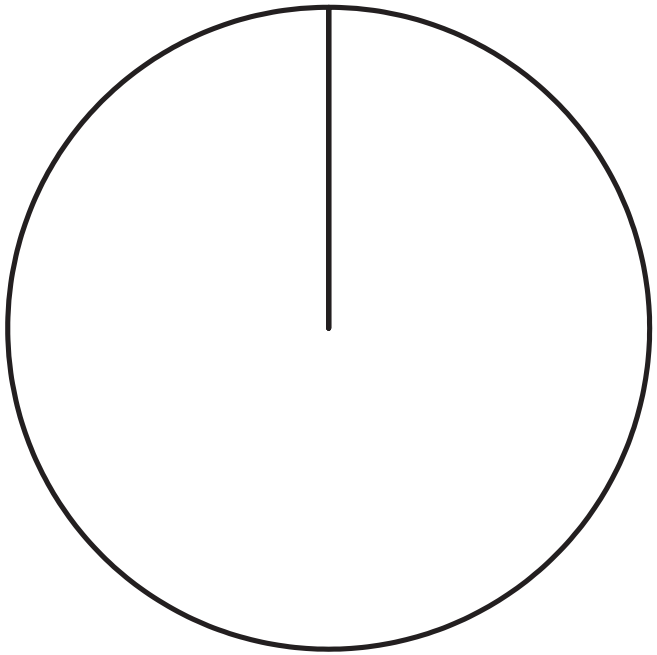
GRAPH 8

1238212398006 2008
MEAN PERCENT CANOPY



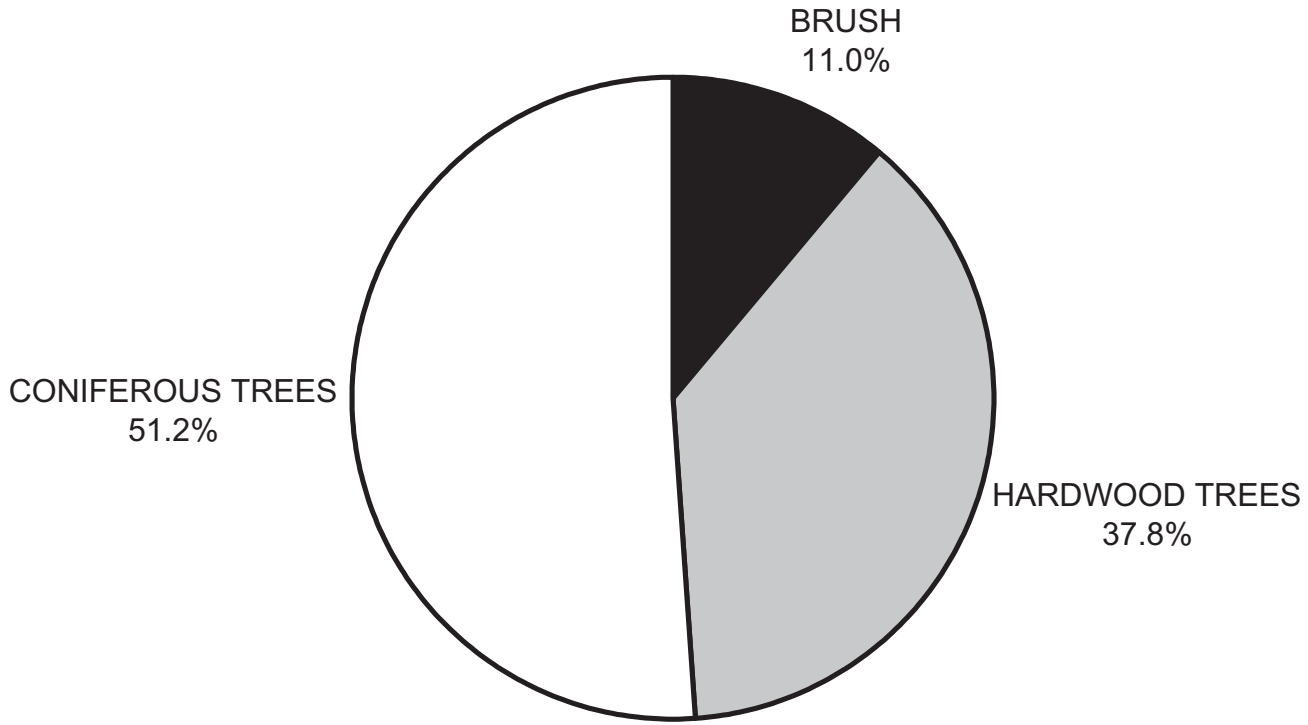
GRAPH 9

1238212398006 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH

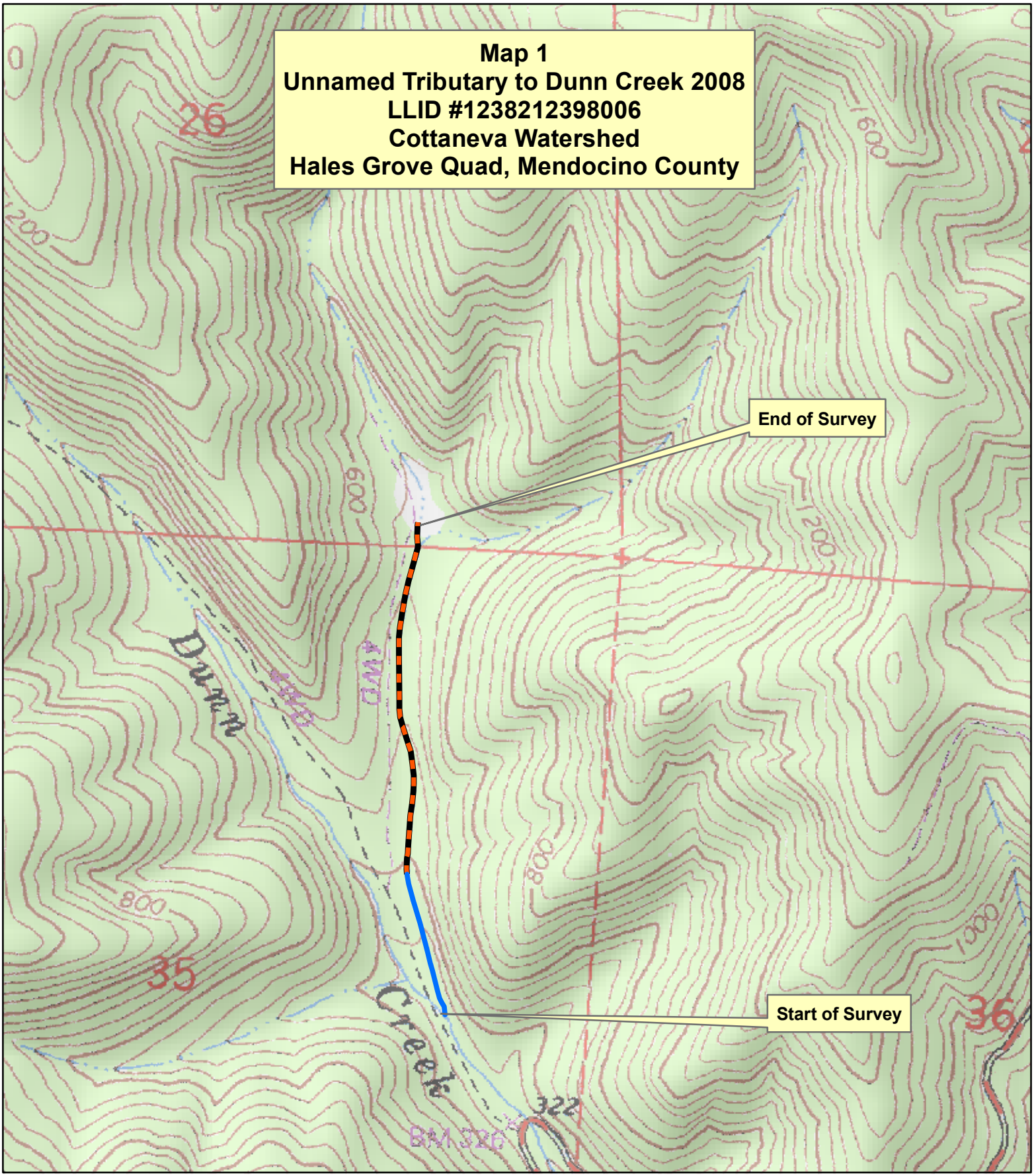


GRAPH 10

1238212398006 2008
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



N
W E
S

Legend

Reach 1, G3 Channel Type

Reach 2, G4 Channel Type

0 440 880 Feet

RESOURCES AGENCY
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DEPARTMENT
FISH & GAME