

STREAM INVENTORY REPORT

Unnamed Tributary to Water Gulch

INTRODUCTION

A stream inventory was conducted June 16 to June 22, 2011 on an unnamed tributary to Water Gulch. The survey began at the confluence with Water Gulch and extended upstream 0.5 miles.

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 the 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 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 tributary is a tributary to Water Gulch, a tributary to Chamberlain Creek, a tributary to North Fork Big River, a tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). The unnamed tributary's legal description at the confluence with Water Gulch is T17N R15W S06. Its location is 39.3601 degrees north latitude and 123.5774 degrees west longitude, LLID number 1235761393598. The unnamed tributary is an intermittent stream according to the USGS Comptche 7.5 minute quadrangle. The unnamed tributary drains a watershed of approximately 0.4 square miles. Elevations range from about 480 feet at the mouth of the creek to 970 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is in the Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via State Route 20.

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 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 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

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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". The 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.

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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 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 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. 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 the 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 the 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 the 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.

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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, underwater observations were made at six 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

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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 16 to June 22, 2011 was conducted by K. Christen, S. Cannon, K. Nystrom, and B. Schleifer (WSP). The total length of the stream surveyed was 2,666 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.4 cfs on June 22, 2011.

The unnamed tributary is an E6 channel type for 884 feet of the stream surveyed (Reach 1), and an A4 channel type for 1,782 feet of the stream surveyed (Reach 2). E6 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and silt-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 35% flatwater units, 23% riffle units, 3% no survey units, and 1% culvert units (Graph 1). Based on total length of Level II habitat types there were 54% flatwater units, 23% pool units, 18% riffle units, 4% no survey units, and 2% culvert units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 27%; plunge pool units, 19%; mid-channel pool units, 17%; and low gradient riffle units, 17% (Graph 3). Based on percent total length, step run units made up 49%, low gradient riffle units 13%, and mid-channel pool units 12%.

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A total of 42 pools were identified (Table 3). Main channel pools and scour pools were both encountered at 50% frequency (Graph 4). Main channel pools comprised 62% 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 42 pools (2%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 42 pool tail-outs measured, 13 had a value of 1 (31%); 18 had a value of 2 (42.9%); and 11 had a value of 3 (26.2%); (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 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 9, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 21 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 26. Main channel pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in the unnamed tributary. Graph 7 describes the pool cover in the unnamed tributary. 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 93% of the pool tail-outs. Sand was the next most frequently observed dominant substrate type and occurred in 5% of the pool tail-outs.

The mean percent canopy density for the surveyed length of the unnamed tributary was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 16% and 84%, respectively. Graph 9 describes the mean percent canopy in the unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 94%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 69% sand/silt/clay and 31% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 66% of the units surveyed. Additionally, 13% of the units surveyed had deciduous trees as the dominant vegetation type, and 13% had grass as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at six sites for species composition and distribution in the unnamed tributary on July 05, 2011. The water temperature taken during the survey period

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of 1645 hours to 1710 hours was 55 degrees Fahrenheit. The air temperature was 70 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 884 feet of stream, six sites were sampled. The reach sites yielded two age 1+ steelhead/rainbow trout (SH/RT).

The following chart displays the information yielded from these sites:

2011 Unnamed Tributary to Water Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: E6 Channel Type									
07/05/11	1	008	Pool	76	0	0	0	0	0
	2	010	Pool	112	0	0	0	0	0
	3	011	Pool	147	0	1	0	0	0
	4	012	Run	161	0	0	0	0	0
	5	015	Step-run	237	0	0	0	0	0
	6	016	Pool	252	0	1	0	0	0

DISCUSSION

The unnamed tributary is an E6 channel type for the first 884 feet of stream surveyed, and an A4 channel type for the remaining 1,782 feet. The suitability of E6 and A4 channel types for fish habitat improvement structures is as follows: E6 channels are good for bank-placed boulders and fair for opposing wing-deflectors. A4 channels are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days June 16 to June 22, 2011, ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 80 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 54% of the total length of this survey, riffles 18%, and pools 23%. One of the 42 (2%) 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 structures that will increase or deepen pool habitat is recommended in reach 1.

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Thirty-one of the 42 pool tail-outs measured had embeddedness ratings of 1 or 2. Eleven 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.

Forty of the 42 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 21. The shelter rating in the flatwater habitats is 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in the unnamed tributary. 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 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 94% 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 94% and 94%, 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 to Water Gulch should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Conduct a fish passage assessment at the road crossing located at 168 feet. If the crossing is not in compliance with DFG and NOAA fish passage criteria, replace the culvert with a structure that meets criteria.

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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 Water Gulch. The channel is an E6.
44	0005.00	There is a 1' high plunge.
69	0008.00	There is a 0.8' high plunge.
99	0010.00	There is a 0.8' high plunge.
168	0014.00	A road crosses the channel. The crossing is a 4' diameter x 40' long corrugated metal culvert. The culvert has a 1.3% slope. There is a 1' high plunge at the outlet and the maximum depth within five feet of the outlet is 0.3'. The bottom of the culvert has completely rusted out at the outlet; the water pours out 5' back from the original lip of the culvert. The inlet is also severely rusted.
303	0018.00	There is a 1.8' high plunge.
515	0027.00	There is a 1.1' high plunge.
569	0030.00	There is a 1.4' high plunge.
641	0033.00	Log debris accumulation (LDA) #03 contains five pieces of large woody debris (LWD) and measures 8' high x 6' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to large cobble and measures 16' wide x 23' long x 4' deep. It is a possible barrier to juvenile and adult salmonids. No fish were observed above the LDA.
884	0041.00	There is a 0.6' high plunge. The channel changes from an E6 to an A4.
927	0044.00	There is a 2.5' foot high plunge.
983	0046.00	There is a 2' high plunge.
1288	0057.00	Tributary #01 enters on the left bank. The tributary is dry at the mouth. The water temperature of the tributary is 53 degrees Fahrenheit; the

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water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit. The tributary is not accessible to salmonids.

LDA #02 contains three pieces of LWD and measures 2.5' high x 6' wide x 8' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 4' long x 1' deep. It is a possible barrier to juvenile and adult salmonids.

1517	0063.00	There is a 0.7' high plunge.
1557	0066.00	Landslide on left bank.
1696	0072.00	LDA #03 contains four pieces of LWD and measures 4' high x 11' wide x 11' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 6' wide x 12' long x 3' deep. It is a possible barrier to juvenile and adult salmonids.
1713	0074.00	There is a 2' high plunge.
1869	0080.00	LDA #04 contains two pieces of LWD and measures 5' high x 6' wide x 7' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 12' wide x 14' long x 3' deep. It is a possible barrier to juvenile and adult salmonids.
1925	0083.00	Left bank seep.
2026	0088.00	Left bank landslide. LDA #05 contains four pieces of LWD and measures 5' high x 8' wide x 13' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 6' wide x 5' long x 3' deep. It is a possible barrier to juvenile and adult salmonids.
2210	0094.00	There is a 2.3' high plunge.
2291	0096.00	There is a 1.6' high plunge.
2352	0098.00	There is a 1.8' high plunge.
2441	0101.00	There is a 2.5' high plunge.
2495	0104.00	There is a 3' high plunge.
2612	0109.00	End of survey. The creek dries up and the channel is choked with woody debris.

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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: 1235761393598

LLID: 1235761393598 Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS06 Latitude: 39:21:35.0N Longitude: 123:34:34.0

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	0.9	40	40	1.5									
38	8	FLATWATER	34.9	38	1433	53.8	3.8	0.4	0.9	137	5223	62	2363		6
3	0	NOSURVEY	2.8	37	111	4.2									
42	42	POOL	38.5	14	607	22.8	5.4	0.7	1.3	75	3138	62	2609	48	21
25	6	RIFFLE	22.9	19	475	17.8	4.5	0.4	0.6	89	2223	41	1035		9
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
109	56				2666					10584			6006		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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 (%)
19	3	LGR	17.4	19	355	13.3	4	0.2	0.3	105	1993	18	349		5	94
4	2	HGR	3.7	16	66	2.5	4	0.3	0.5	43	172	10	41		10	95
2	1	CAS	1.8	27	54	2.0	7	1.3	1.6	133	266	173	346		20	92
9	2	RUN	8.3	15	137	5.1	4	0.5	0.8	53	477	24	220		5	92
29	6	SRN	26.6	45	1296	48.6	4	0.4	1.1	166	4802	75	2168		6	95
19	19	MCP	17.4	16	313	11.7	5	0.6	1.6	84	1591	67	1270	48	16	93
2	2	STP	1.8	30	61	2.3	6	0.5	1	150	300	90	180	75	10	92
21	21	PLP	19.3	11	233	8.7	5	0.7	2.1	59	1248	55	1159	45	26	95
1	0	CUL	0.9	40	40	1.5										
3	0	NS	2.8	37	111	4.2										

Total Units
109

Total Units Fully Measured
56

Total Length (ft.)
2666

Total Area (sq.ft.)
10848

Total Volume (cu.ft.)
5732

Table 3 - Summary of Pool Types

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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
21	21	MAIN	50	18	374	62	5.5	0.6	90	1891	51	1064	15
21	21	SCOUR	50	11	233	38	5.3	0.7	59	1248	45	949	26

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
42	42	607	3138	2013

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

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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
19	MCP	45	4	21	15	79	0	0	0	0	0	0
2	STP	5	1	50	1	50	0	0	0	0	0	0
21	PLP	50	2	10	18	86	1	5	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
42	7	17	34	81	1	2	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Dry Units: 0

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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
19	3	LGR	33	5	28	0	33	0	0	0	0
4	2	HGR	0	35	15	0	0	0	50	0	0
2	1	CAS	0	30	45	0	0	0	10	15	0
25	6	TOTAL RIFFLE	17	19	27	0	17	0	18	3	0
9	2	RUN	0	85	0	0	15	0	0	0	0
29	6	SRN	10	49	26	0	15	0	0	0	0
38	8	TOTAL FLAT	8	58	19	0	15	0	0	0	0
19	19	MCP	9	40	40	4	6	0	0	0	0
2	2	STP	0	13	20	0	0	0	25	43	0
21	21	PLP	3	30	39	3	1	0	24	0	0
42	42	TOTAL POOL	6	34	39	3	3	0	13	2	0
1	0	CUL									
3	0	NS									
109	56	TOTAL	7	36	35	3	6	0	12	2	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Dry Units: 0

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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
19	3	LGR	0	0	100	0	0	0	0
4	2	HGR	0	0	100	0	0	0	0
2	1	CAS	0	0	100	0	0	0	0
9	2	RUN	50	0	50	0	0	0	0
29	6	SRN	17	0	67	17	0	0	0
19	19	MCP	53	0	47	0	0	0	0
2	2	STP	0	0	0	100	0	0	0
21	21	PLP	52	10	29	10	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	84	16	0	94	94

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: 1235761393598 LLID: 1235761393598 Drainage: Big River
 Survey Dates: 6/16/2011 to 6/22/2011 Survey Length (ft.): 2666 Main Channel (ft.): 2666 Side Channel (ft.): 0
 Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS06 Latitude: 39:21:35.0N Longitude: 123:34:34.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: E6	Canopy Density (%): 94.1	Pools by Stream Length (%): 32.5
Reach Length (ft.): 884	Coniferous Component (%): 89.4	Pool Frequency (%): 47.5
Riffle/Flatwater Mean Width (ft.): 3.5	Hardwood Component (%): 10.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 100
Range (ft.): 5 to 11	Vegetative Cover (%): 96.5	2 to 2.9 Feet Deep: 0
Mean (ft.): 8	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 22	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 54 - 54 Air (F): 49 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 15
Dry Channel (ft): 0	Riffles: 9	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 5 Gravel: 95 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 21.1 2. 57.9 3. 21.1 4. 0.0 5. 0.0		

STREAM REACH: 2

Channel Type: A4	Canopy Density (%): 93.5	Pools by Stream Length (%): 18.0
Reach Length (ft.): 1782	Coniferous Component (%): 79.7	Pool Frequency (%): 33.3
Riffle/Flatwater Mean Width (ft.): 4.5	Hardwood Component (%): 20.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 96
Range (ft.): 4 to 9	Vegetative Cover (%): 91.9	2 to 2.9 Feet Deep: 4
Mean (ft.): 7	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 45	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 52 - 54 Air (F): 60 - 80	LWD per 100 ft.:	Mean Pool Shelter Rating: 25
Dry Channel (ft): 0	Riffles: 9	
	Pools: 14	
	Flat: 6	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 4 Gravel: 91 Sm Cobble: 4 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 39.1 2. 30.4 3. 30.4 4. 0.0 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

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	17	18	31.3
Sand / Silt / Clay	39	38	68.8

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	7	8	13.4
Brush	3	5	7.1
Hardwood Trees	10	5	13.4
Coniferous Trees	36	38	66.1
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: 1235761393598

LLID: 1235761393598

Drainage: Big River

Survey Dates: 6/16/2011 to 6/22/2011

Confluence Location: Quad: COMPTCHE

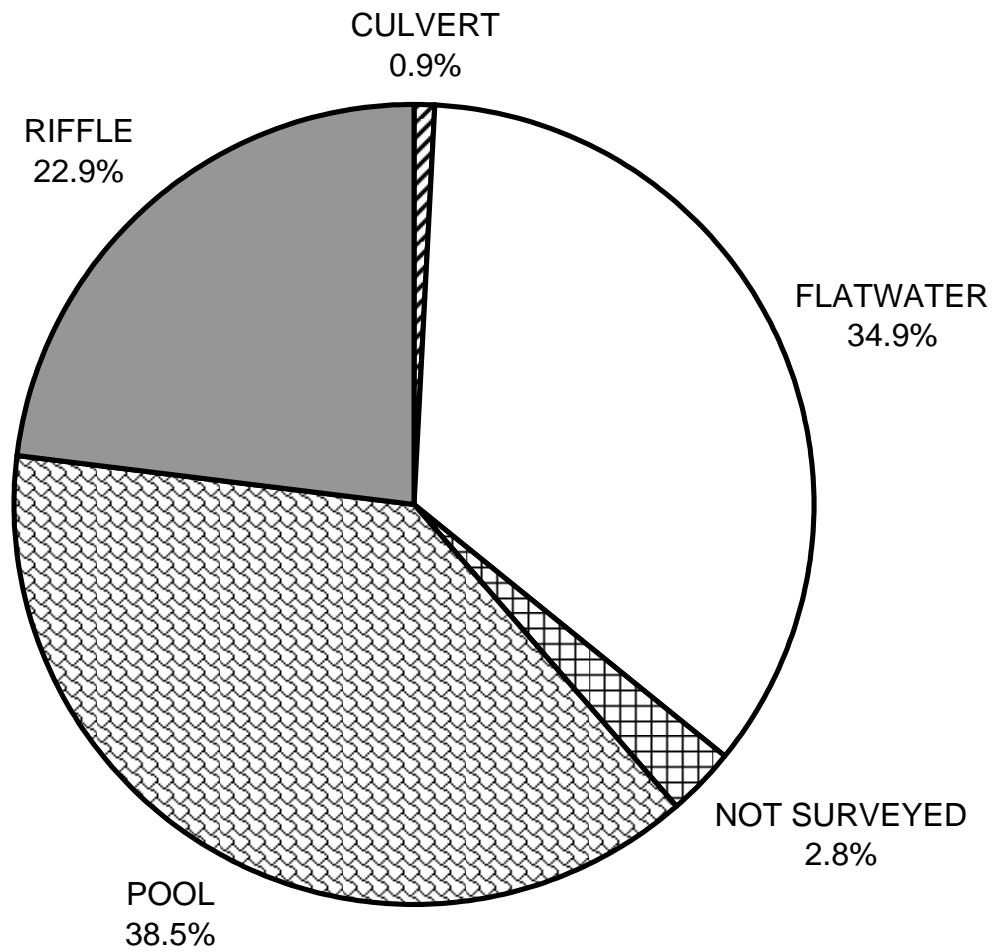
Legal Description: T17NR15WS06

Latitude: 39:21:35.0N

Longitude: 123:34:34.0W

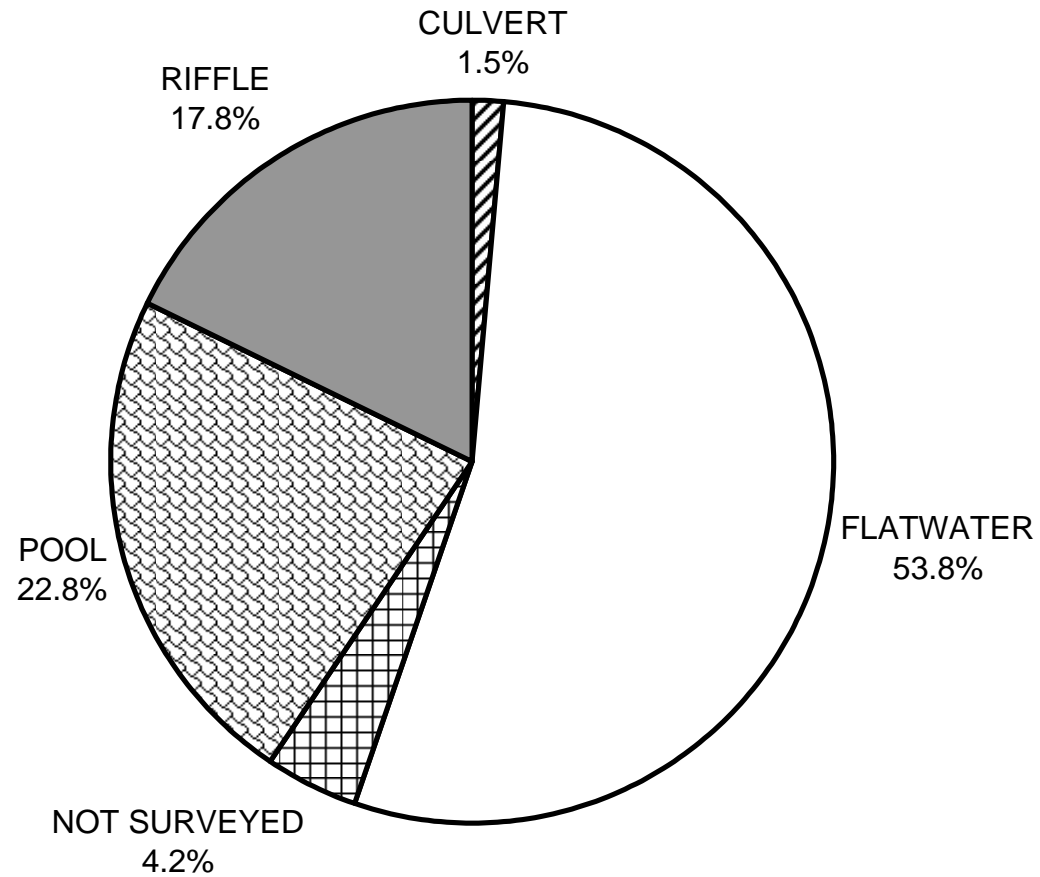
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	17	8	6
SMALL WOODY DEBRIS (%)	19	58	34
LARGE WOODY DEBRIS (%)	27	19	39
ROOT MASS (%)	0	0	3
TERRESTRIAL VEGETATION (%)	17	15	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	18	0	13
BOULDERS (%)	3	0	2
BEDROCK LEDGES (%)	0	0	0

Unnamed Tributary to Water Gulch 2011 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

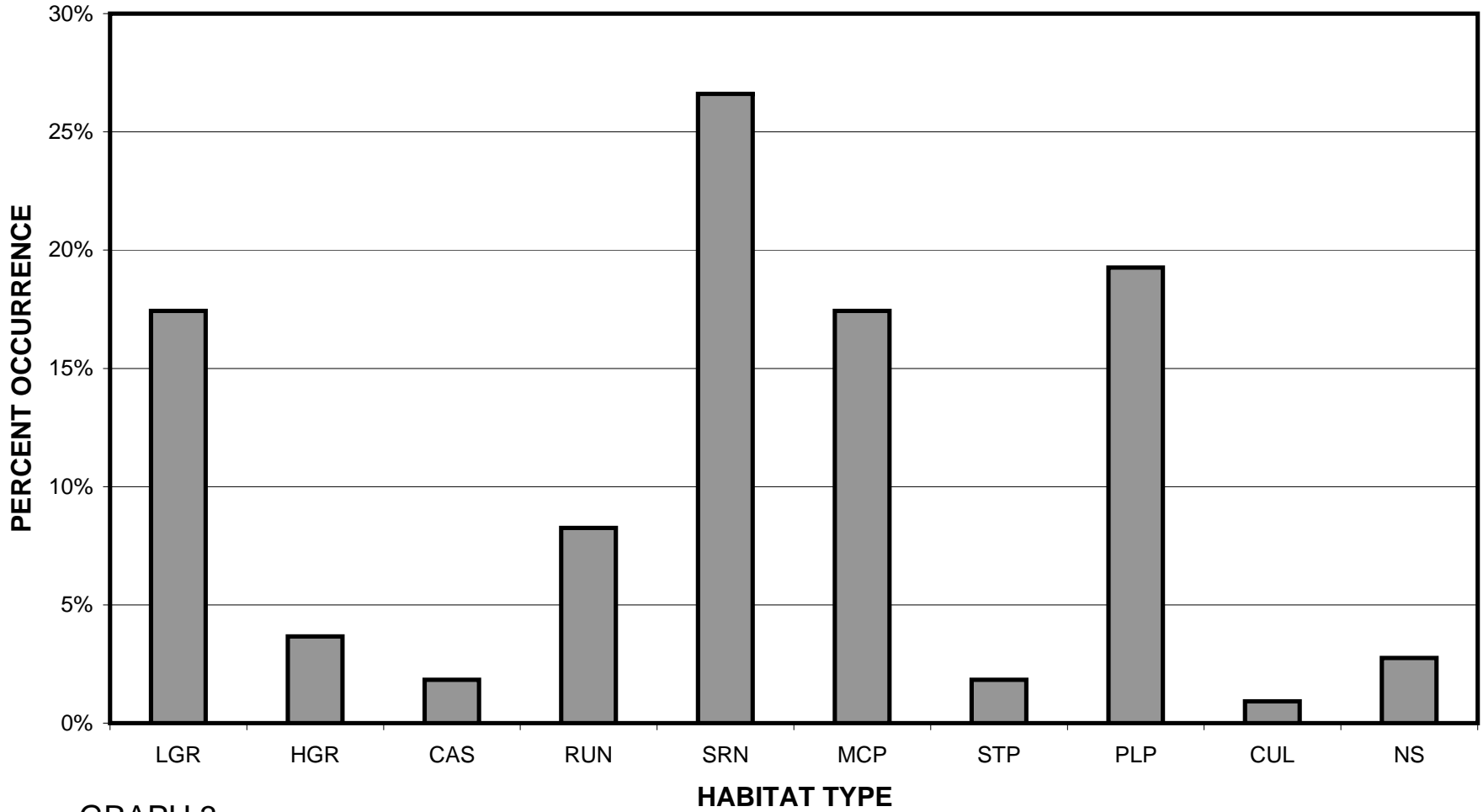
Unnamed Tributary to Water Gulch 2011 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

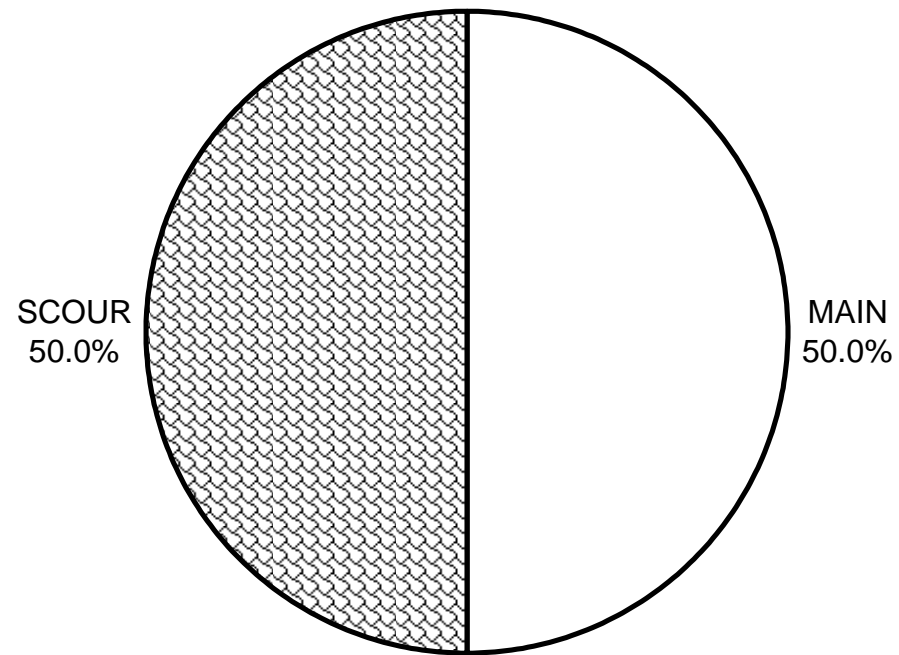
Unnamed Tributary to Water Gulch 2011

HABITAT TYPES BY PERCENT OCCURRENCE



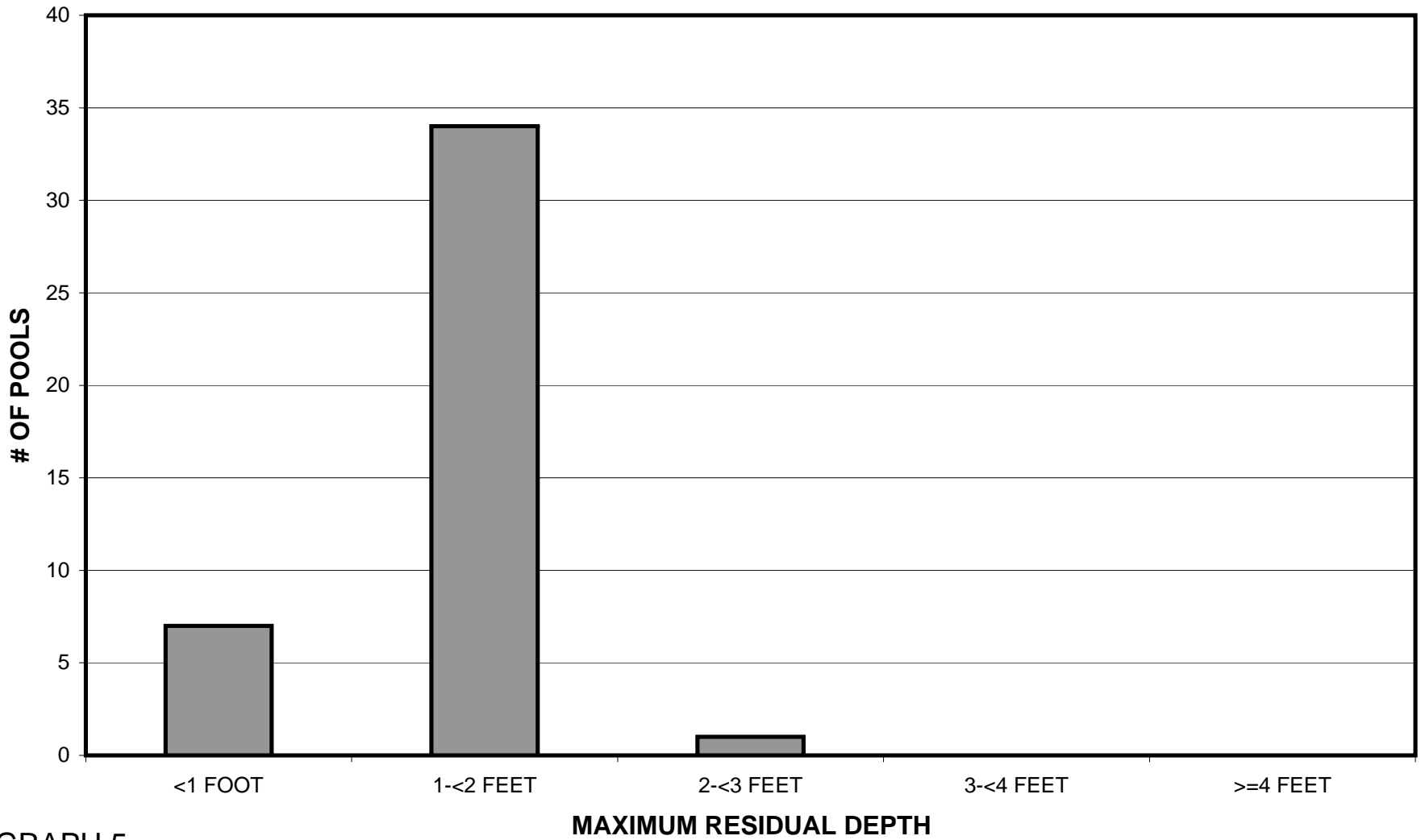
GRAPH 3

**Unnamed Tributary to Water Gulch 2011
POOL TYPES BY PERCENT OCCURRENCE**



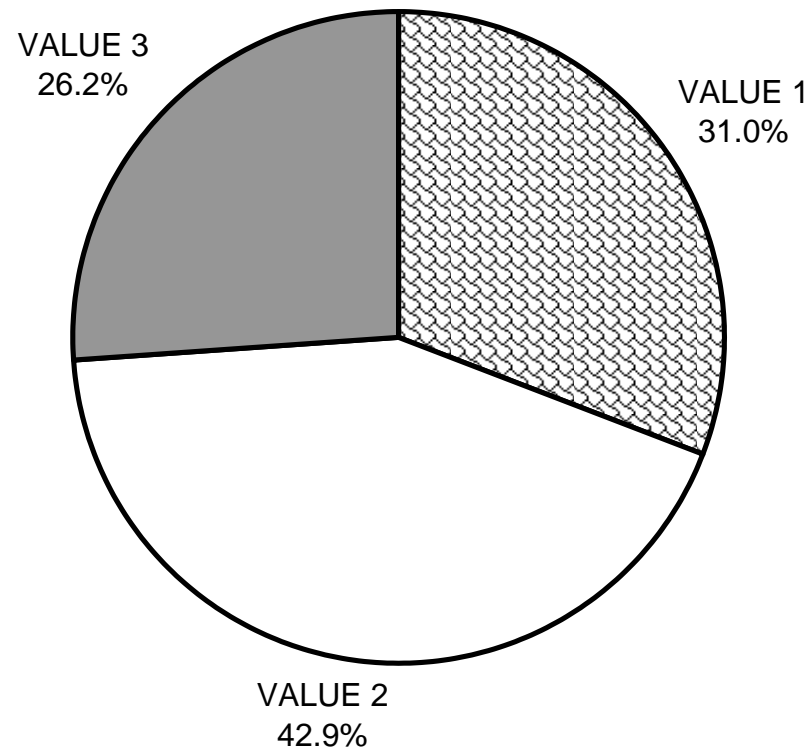
GRAPH 4

Unnamed Tributary to Water Gulch 2011 MAXIMUM DEPTH IN POOLS



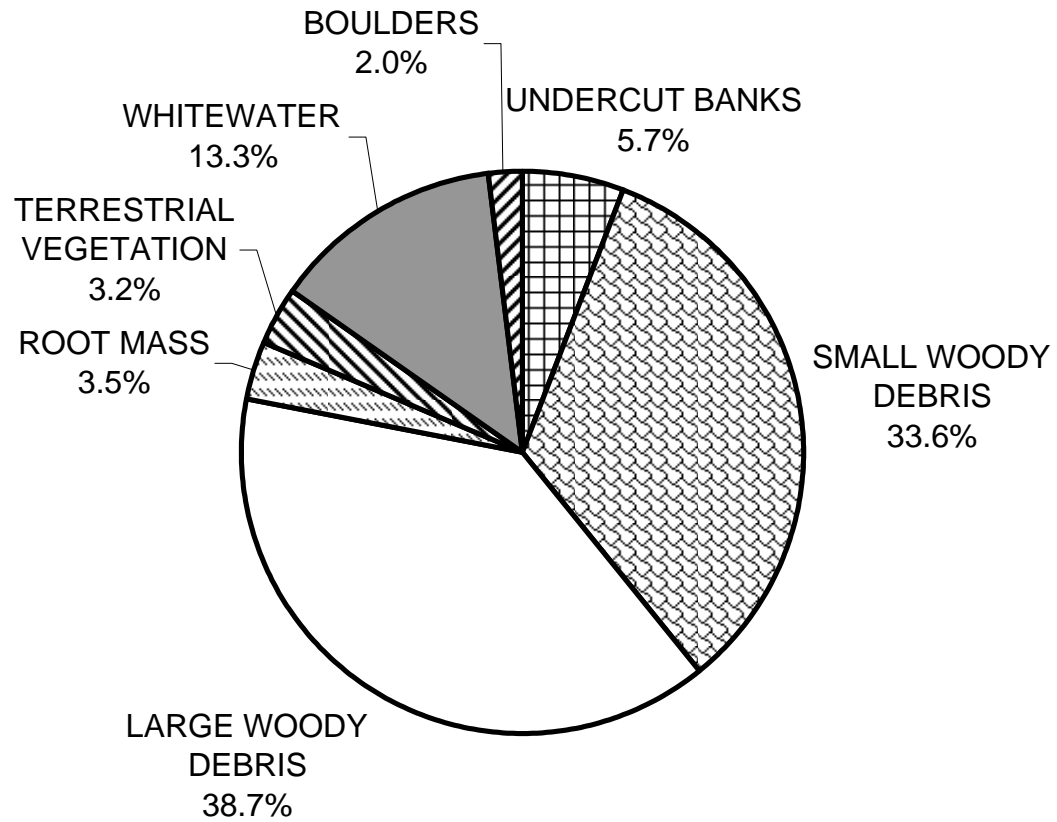
GRAPH 5

Unnamed Tributary to Water Gulch 2011 PERCENT EMBEDDEDNESS



GRAPH 6

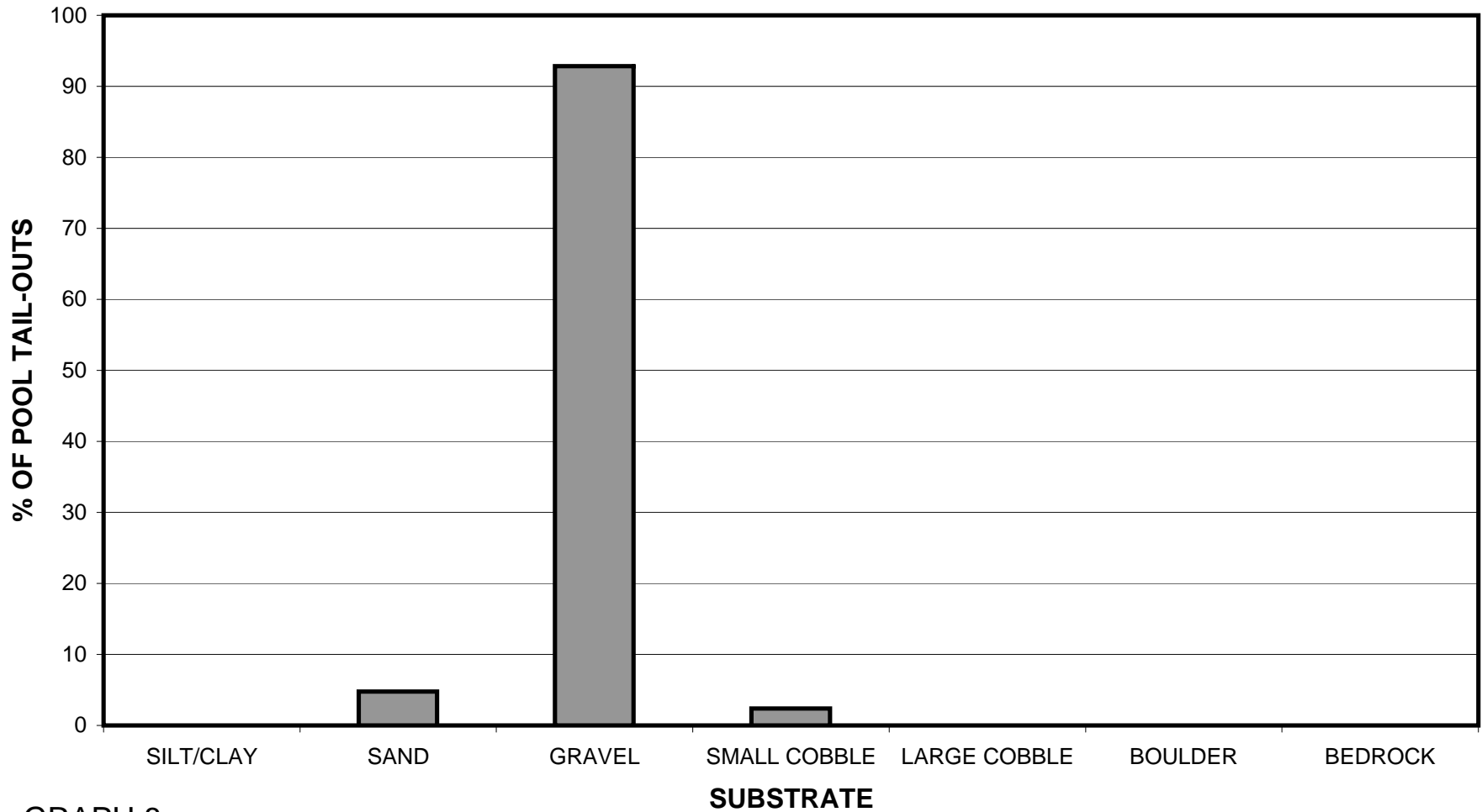
Unnamed Tributary to Water Gulch 2011 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

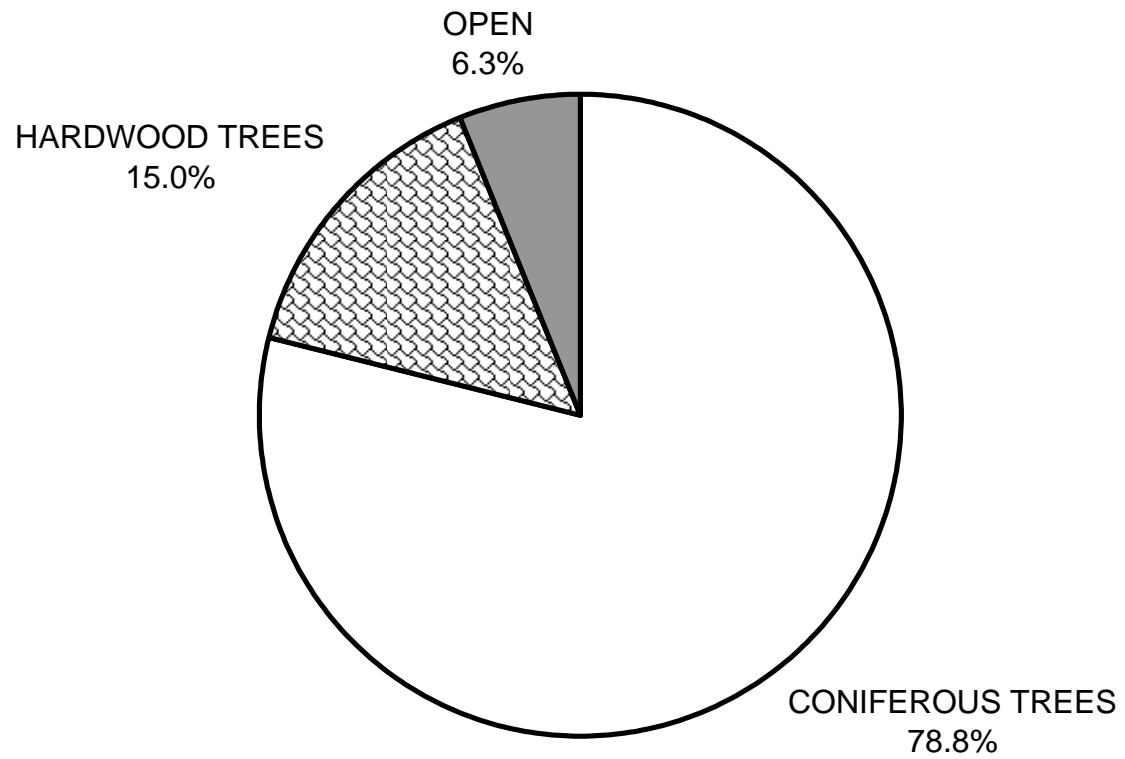
Unnamed Tributary to Water Gulch 2011

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



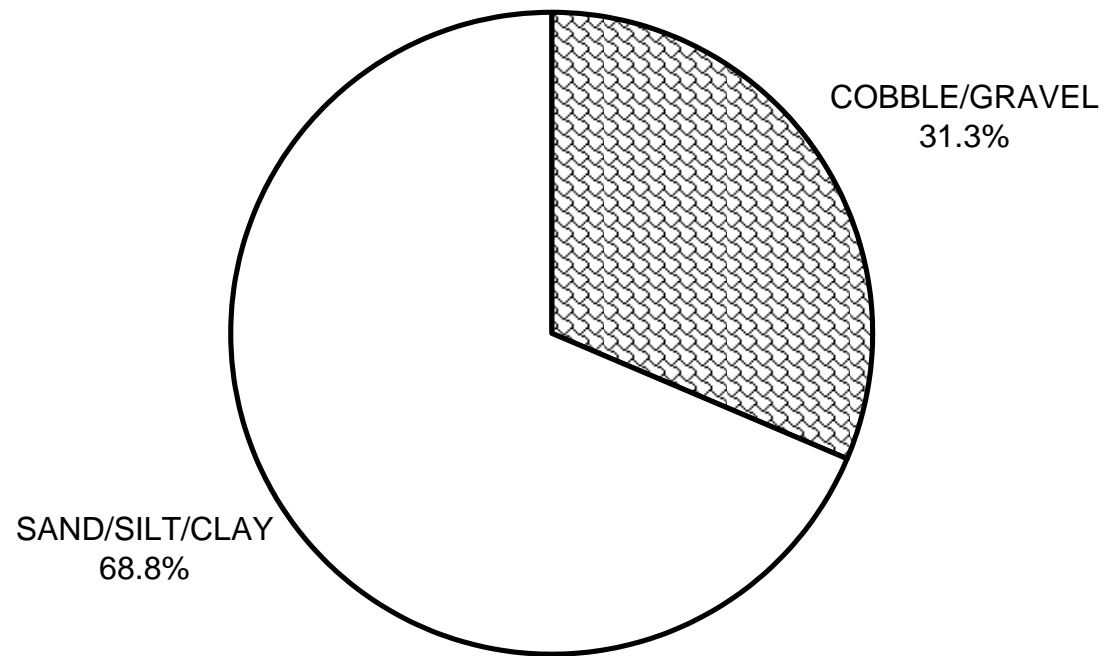
GRAPH 8

Unnamed Tributary to Water Gulch 2011 MEAN PERCENT CANOPY



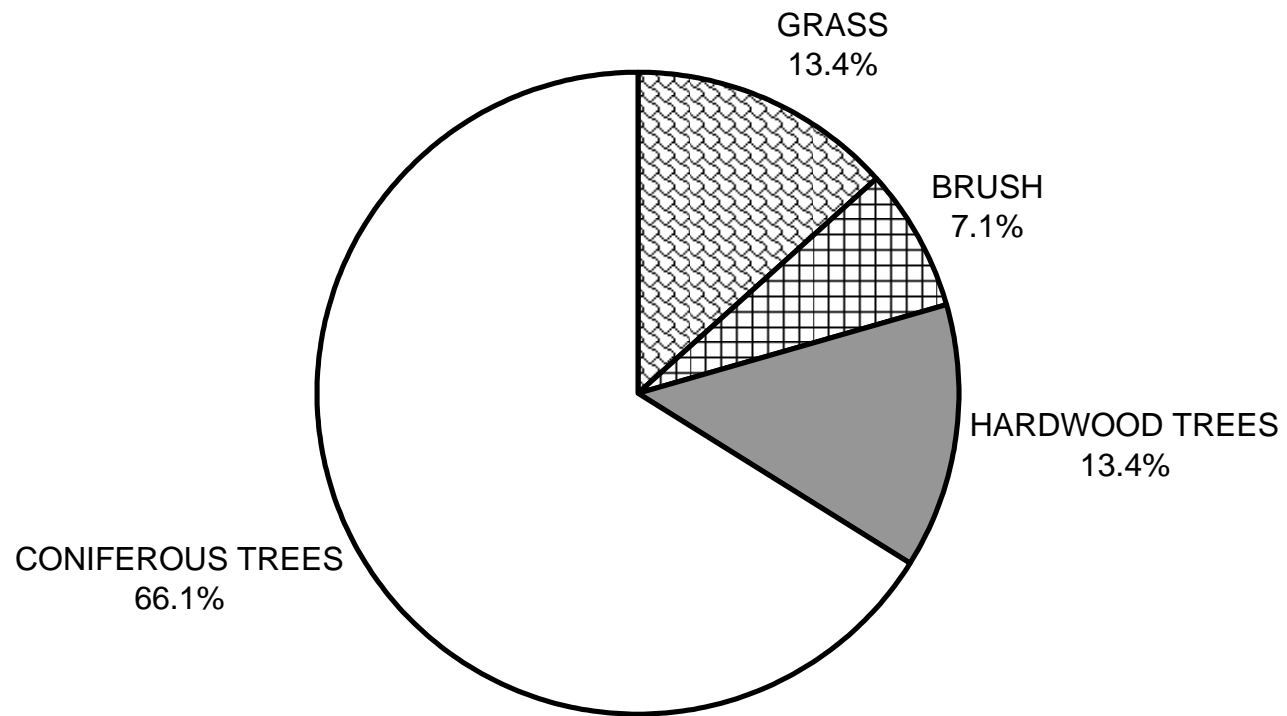
GRAPH 9

**Unnamed Tributary to Water Gulch 2011
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**Unnamed Tributary to Water Gulch 2011
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

