

STREAM INVENTORY REPORT

Unnamed tributary to the Mad River

INTRODUCTION

A stream inventory was conducted on June 30, 2011 on an unnamed tributary to the Mad River. The survey began at the confluence with the Mad River and extended upstream 0.3 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 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

The unnamed tributary is a tributary to the Mad River, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). The unnamed tributary's legal description at the confluence with the Mad River is T05N R02E S24. Its location is 40.7954 degrees north latitude and 123.8956 degrees west longitude, LLID number 1238944407955. The unnamed tributary is a first order stream and has approximately 0.7 miles of blue line stream according to the USGS Korbelt 7.5 minute quadrangle. The unnamed tributary drains a watershed of approximately one square mile. Elevations range from about 285 feet at the mouth of the creek to 600 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Maple Creek Road, south of the town of Korbelt.

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 that conducted the inventory were trained in standardized habitat inventory methods by the DFG. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and

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embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in 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.

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,

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embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. In 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. Next, using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In 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.

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

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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 16 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

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

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- 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 30, 2011 was conducted by I. Mikus and M. Groff (DFG). The total length of the stream surveyed was 1,625.

Stream flow was not measured on the unnamed tributary.

The unnamed tributary is a B4 channel type for 1,171 feet of the stream surveyed (Reach 1), and an A4 channel type for 454 feet of the stream surveyed (Reach 2). B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Then water temperature taken during the survey period was 55 degrees Fahrenheit. Air temperatures ranged from 58 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% pool units, 38% riffle units, and 25% flatwater units (Graph 1). Based on total length of Level II habitat types there were 47% riffle units, 27% flatwater units, and 25% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 25%; low gradient riffle units, 22%; and high-gradient riffle units, 16% (Graph 3). Based on percent total length, low gradient riffle units made up 31%, mid-channel pool units 20%, and step-run units 18%.

A total of 24 pools were identified (Table 3). Main channel pools were the most frequently encountered at 67% (Graph 4), and comprised 78% 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 24 pools (4%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 24 pool tail-outs measured, 11 had a value of 3 (45.8%); eight had a value of 4 (33.3%); five had a value of 5

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(20.8%); (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 0, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 21. Main channel pools had a mean shelter rating of 11 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the unnamed tributary. Graph 7 describes the pool cover in the unnamed tributary. Boulders are 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 50% of the pool tail-outs. Large cobble was the next most frequently observed dominant substrate type and occurred in 21% of the pool tail-outs.

The mean percent canopy density for the surveyed length of the unnamed tributary was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 95% and 5%, respectively. Graph 9 describes the mean percent canopy in the unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 72% sand/silt/clay, 15% cobble/gravel, and 13% boulder (Graph 10). Brush was the dominant vegetation type observed in 55% of the units surveyed. Additionally, 43% of the units surveyed had deciduous trees as the dominant vegetation type, and 2% had grass as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 16 sites for species composition and distribution in the unnamed tributary on June 27, 2011. The water temperature during the survey period of 1210 hours to 1330 hours was 55 degrees Fahrenheit. The air temperature was 72 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 1,171 feet of stream, 12 sites were sampled. The reach sites yielded 13 young-of-the-year steelhead/rainbow trout (SH/RT), four age 1+ SH/RT, two coho young-of-the-year (YOY), and five Chinook YOY.

In reach 2, four sites were sampled starting approximately 1,381 feet from the confluence with the Mad River and continuing upstream 244 feet. No fish were observed.

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The following chart displays the information yielded from these sites:

2011 Unnamed tributary to the Mad River underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: B4 Channel Type									
06/27/11	1	001	Pool	10	9	0	0	2	0
	2	004	Run	86	0	0	0	0	0
	3	008	Pool	182	1	0	0	0	0
	4	010	Pool	216	1	0	0	0	0
	5	012	Pool	267	0	1	0	0	0
	6	015	Pool	351	2	0	0	0	0
	7	019	Pool	486	0	1	0	0	0
	8	021	Pool	549	0	1	0	0	0
	9	026	Pool	720	0	0	0	0	0
	10	029	Pool	791	0	0	0	0	0
	11	032	Pool	884	0	0	0	0	0
	12	043	Pool	1,171	0	1	0	0	0
Reach 2: A4 Channel Type									
	13	055	Pool	1,381	0	0	0	0	0
	14	057	Pool	1,455	0	0	0	0	0
	15	061	Pool	1,564	0	0	0	0	0
	16	064	Pool	1,625	0	0	0	0	0

DISCUSSION

The unnamed tributary is a B4 channel type for the first 1,171 feet of stream surveyed and an A4 channel type for the remaining 454 feet. The suitability of B4 and A4 channel types for fish habitat improvement structures is as follows: B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. A4 channels are generally not suitable for fish habitat improvement structures.

The water temperature recorded on the survey day June 30, 2011 was 55 degrees Fahrenheit. Air temperatures ranged from 58 to 63 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

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Flatwater habitat types comprised 27% of the total length of this survey, riffles 47%, and pools 25%. One of the 24 (4%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing large wood structures that will increase or deepen pool habitat is recommended for Reach 1.

None of the 24 pool tail-outs measured had embeddedness ratings of 1 or 2. Nineteen of the pool tail-outs had embeddedness ratings of 3 or 4. Five 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 tributary should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twelve of the 24 pool tail-outs measured had gravel as the dominant substrate. This is generally considered fair for spawning salmonids.

The mean shelter rating for pools is 14. The shelter rating in the flatwater habitats is 2. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in the unnamed tributary. Boulders are 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 97%. Reach 1 had a canopy density of 97% and Reach 2 had a canopy density of 98%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 98% 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 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.

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- 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.

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 the Mad River. The channel is a B4. The first unit of the survey is within the bankfull width of the Mad River.
236	0012.00	A sediment accumulation on the left bank consists of silt and sand and measures approximately 20' long x 10' wide x 2' deep.
395	0018.00	Clay is sloughing off the right bank in chunks.
549	0022.00	There is a left bank tributary with very little flow. It is not accessible to fish.
590	0023.00	A landslide on the left bank measures approximately 25' long x 20' high and is contributing silt and sand to the channel.
791	0030.00	A landslide on the right bank measures approximately 40' long x 15' high. The slide is vegetated, but contributing silt to the channel.
1171	0044.00	The channel changes from a B4 to an A4.
1253	0050.00	Left bank seep.
1449	0057.00	A landslide on the left bank measures approximately 30' long x 15' high and is contributing silt and sand to the channel. There is a 2' high plunge over a log.
1455	0058.00	A 50' long series of plunges is a potential barrier to salmonids. The first plunge is 4' high with boulders above it. The next plunge is 2' high with a 6' long pool above. The final plunge is 3' high with boulders above. This section may be passable during high flows due to a series of smaller plunges on the right bank.

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|------|---------|--|
| 1564 | 0062.00 | There is a 3' high plunge through small woody debris with a 0.3' deep riffle above it. There is a 2' high plunge above the riffle. |
| 1607 | 0064.00 | End of survey due to a 4.3' high plunge onto woody debris and an 8' long boulder. The boulder below the plunge makes it impossible to have an adequate jump pool. This barrier may be impassable at all flows. Visual observations upstream of the end of survey point revealed pools. No fish were observed. No fish were observed above habitat unit #043. A landslide on the left bank measures approximately 60' long x 8' high and is contributing clay/silt to the channel. Parts of the slide are contributing a clay-like substrate into the creek. The creek was slightly turbid during biological sampling and habitat typing. |

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: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0

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
16	3	FLATWATER	25.0	28	444	27.3	7.7	0.4	0.8	313	5014	115	1848		2
24	24	POOL	37.5	17	413	25.4	10.1	0.7	1.4	142	3414	114	2735	92	14
24	3	RIFFLE	37.5	32	768	47.3	9.3	0.2	0.7	206	4954	46	1112		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
64	30				1625					13382			5694		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

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 (%)
14	1	LGR	21.9	35	496	30.5	12	0.2	0.8	295	4133	59	827		0	100
10	2	HGR	15.6	27	272	16.7	8	0.3	0.7	162	1620	40	400		0	99
8	1	RUN	12.5	19	153	9.4	6	0.4	0.7	150	1200	60	480		0	97
8	2	SRN	12.5	36	291	17.9	8	0.4	1	395	3160	143	1146		3	94
16	16	MCP	25.0	20	322	19.8	8	0.7	2.2	144	2299	116	1861	91	11	97
1	1	LSL	1.6	11	11	0.7	13	0.5	1.1	129	129	77	77	64	20	98
1	1	LSR	1.6	10	10	0.6	21	0.4	1.1	210	210	105	105	84	0	99
6	6	PLP	9.4	12	70	4.3	14	0.8	1.8	129	776	115	691	100	24	97

Total Units Fully Measured
64 30

Total Length (ft.)
1625

Total Area (sq.ft.)
13528

Total Volume (cu.ft.)
5586

Table 3 - Summary of Pool Types

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

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
16	16	MAIN	67	20	322	78	7.9	0.7	144	2299	91	1450	11
8	8	SCOUR	33	11	91	22	14.4	0.7	139	1115	94	750	21

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
24	24	413	3414	2201

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

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

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
16	MCP	67	3	19	12	75	1	6	0	0	0	0
1	LSL	4	0	0	1	100	0	0	0	0	0	0
1	LSR	4	0	0	1	100	0	0	0	0	0	0
6	PLP	25	0	0	6	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
24	3	12	20	83	1	4	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Dry Units: 0

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

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
14	1	LGR	0	0	0	0	0	0	0	0	0
10	2	HGR	0	0	0	0	0	0	0	0	0
24	3	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
8	1	RUN	0	0	0	0	0	0	0	0	0
8	2	SRN	0	50	0	0	0	0	0	50	0
16	3	TOTAL FLAT	0	50	0	0	0	0	0	50	0
16	16	MCP	16	34	18	9	8	0	0	16	0
1	1	LSL	0	40	60	0	0	0	0	0	0
1	1	LSR	0	0	0	0	0	0	0	0	0
6	6	PLP	12	7	22	1	0	0	2	58	0
24	24	TOTAL POOL	14	26	21	6	5	0	1	28	0
64	30	TOTAL	13	27	20	6	5	0	1	29	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1238944407955 LLID: 1238944407955 Drainage: Butler Valley
 Survey Dates: 6/30/2011 to 6/30/2011 Dry Units: 0
 Confluence Location: Quad: KORBEL Legal Description: T05NR02ES24 Latitude: 40:47:44.0N Longitude: 123:53:40.0W

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
14	1	LGR	0	0	100	0	0	0	0
10	2	HGR	0	0	50	0	50	0	0
8	1	RUN	0	0	100	0	0	0	0
8	2	SRN	0	0	100	0	0	0	0
16	16	MCP	6	25	50	0	6	13	0
1	1	LSL	0	0	100	0	0	0	0
1	1	LSR	0	0	100	0	0	0	0
6	6	PLP	17	50	17	0	0	17	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	5	95	0	98	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: 1238944407955 LLID: 1238944407955 Drainage: Butler Valley
 Survey Dates: 6/30/2011 to 6/30/2011 Survey Length (ft.): 1625 Main Channel (ft.): 1625 Side Channel (ft.): 0
 Confluence Location: Quad: KORBEL Legal Description: T05NR02ES24 Latitude: 40:47:44.0N Longitude: 123:53:40.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B4	Canopy Density (%): 96.7	Pools by Stream Length (%): 25.4
Reach Length (ft.): 1171	Coniferous Component (%): 3.9	Pool Frequency (%): 34.9
Riffle/Flatwater Mean Width (ft.): 8.8	Hardwood Component (%): 96.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 100
Range (ft.): 13 to 21	Vegetative Cover (%): 95.0	2 to 2.9 Feet Deep: 0
Mean (ft.): 16	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 18	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 55 - 55 Air (F): 58 - 63	LWD per 100 ft.:	Mean Pool Shelter Rating: 10
Dry Channel (ft): 0	Riffles: 2	
	Pools: 6	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 60 Sm Cobble: 20 Lg Cobble: 20 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 73.3 4. 20.0 5. 6.7		

STREAM REACH: 2

Channel Type: A4	Canopy Density (%): 97.6	Pools by Stream Length (%): 25.6
Reach Length (ft.): 454	Coniferous Component (%): 7.7	Pool Frequency (%): 42.9
Riffle/Flatwater Mean Width (ft.): 8.0	Hardwood Component (%): 92.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 89
Range (ft.): 16 to 16	Vegetative Cover (%): 97.7	2 to 2.9 Feet Deep: 11
Mean (ft.): 16	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 0	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 6	Mean Max Residual Pool Depth (ft.): 1.6
Water (F): 55 - 55 Air (F): 58 - 63	LWD per 100 ft.:	Mean Pool Shelter Rating: 21
Dry Channel (ft): 0	Riffles: 2	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 33 Sm Cobble: 0 Lg Cobble: 22 Boulder: 44 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 0.0 4. 55.6 5. 44.4		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

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	6	2	13.3
Cobble / Gravel	6	3	15.0
Sand / Silt / Clay	18	25	71.7

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	1	0	1.7
Brush	18	15	55.0
Hardwood Trees	11	15	43.3
Coniferous Trees	0	0	0.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 4

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

StreamName: 1238944407955

LLID: 1238944407955

Drainage: Butler Valley

Survey Dates: 6/30/2011 to 6/30/2011

Confluence Location: Quad: KORBEL

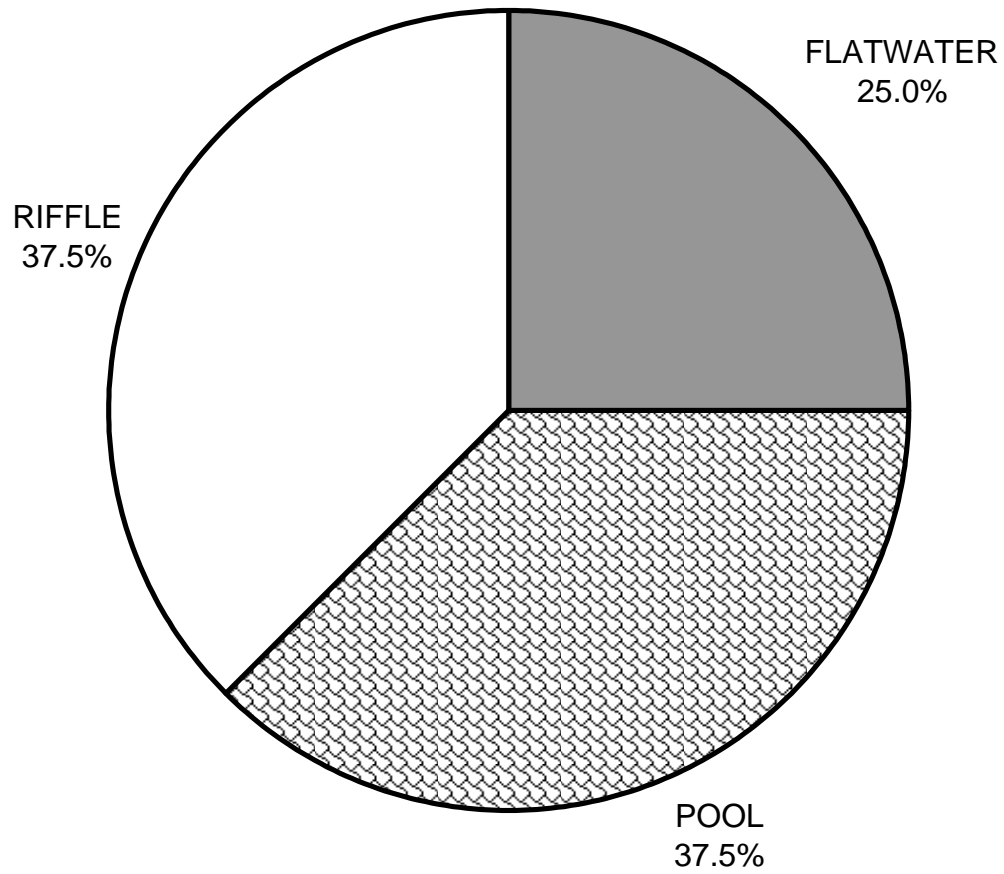
Legal Description: T05NR02ES24

Latitude: 40:47:44.0N

Longitude: 123:53:40.0W

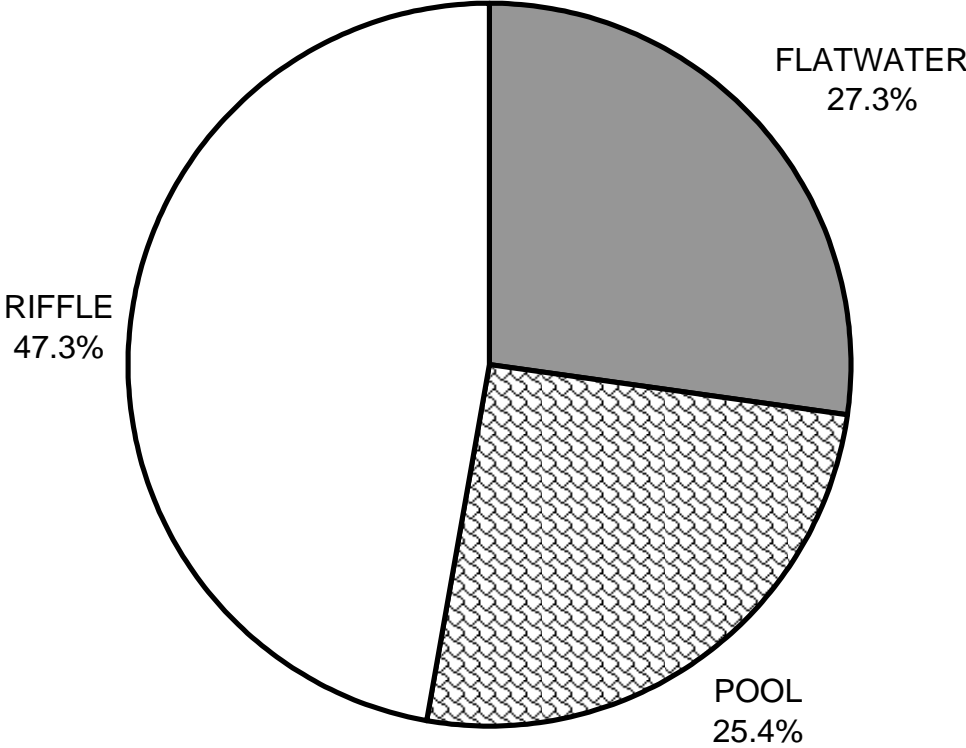
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	14
SMALL WOODY DEBRIS (%)	0	50	26
LARGE WOODY DEBRIS (%)	0	0	21
ROOT MASS (%)	0	0	6
TERRESTRIAL VEGETATION (%)	0	0	5
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	0	50	28
BEDROCK LEDGES (%)	0	0	0

1238944407955 2011
HABITAT TYPES BY PERCENT OCCURRENCE



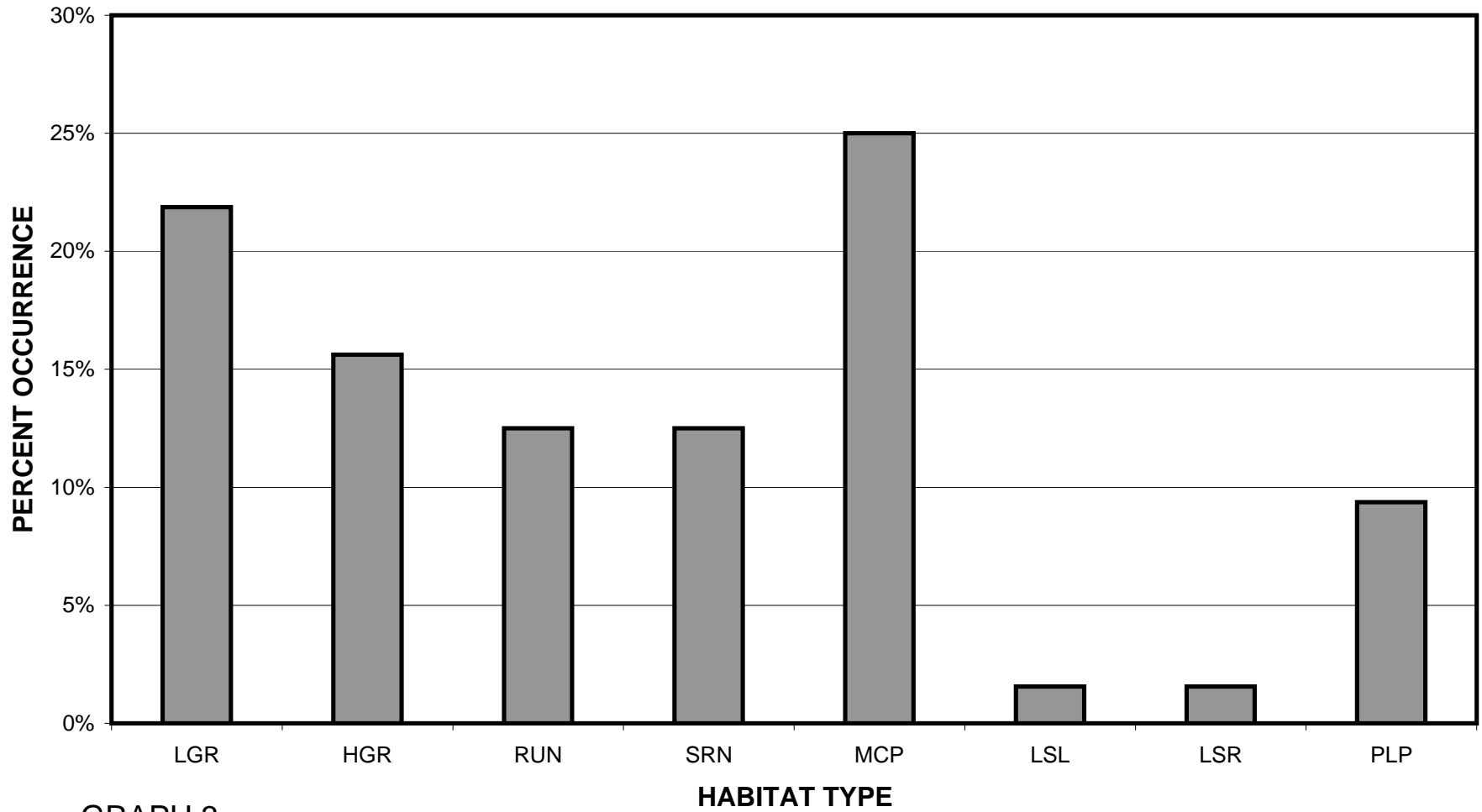
GRAPH 1

1238944407955 2011
HABITAT TYPES BY PERCENT TOTAL LENGTH



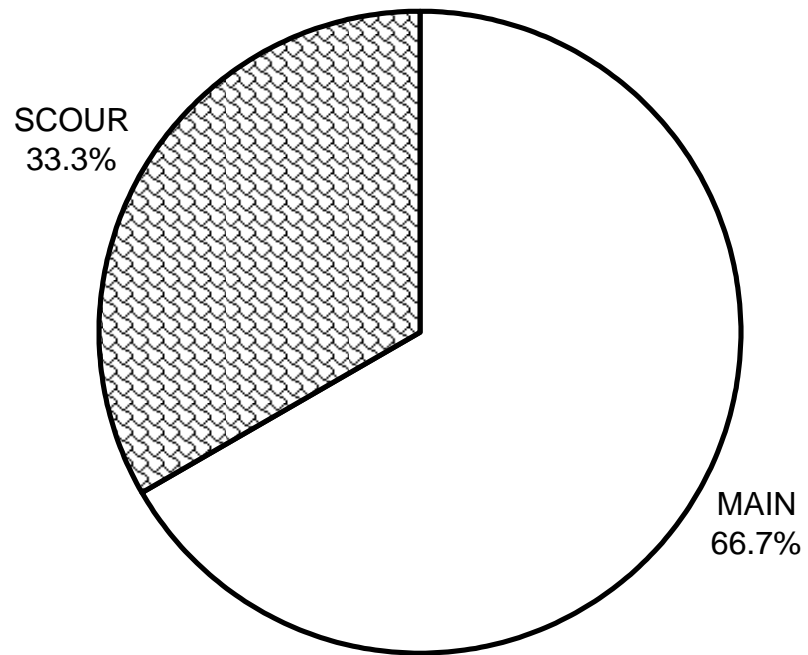
GRAPH 2

1238944407955 2011
HABITAT TYPES BY PERCENT OCCURRENCE



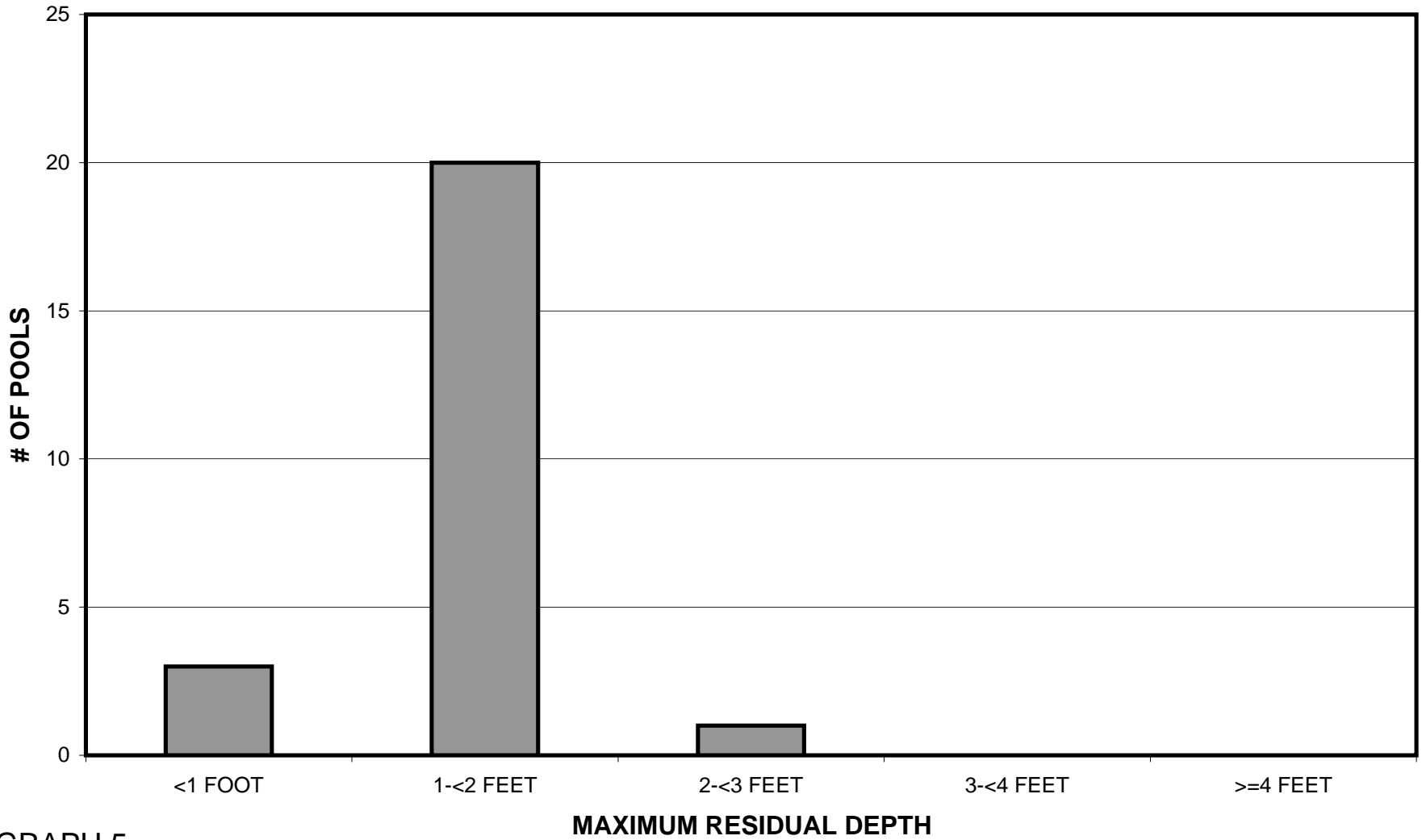
GRAPH 3

1238944407955 2011
POOL TYPES BY PERCENT OCCURRENCE



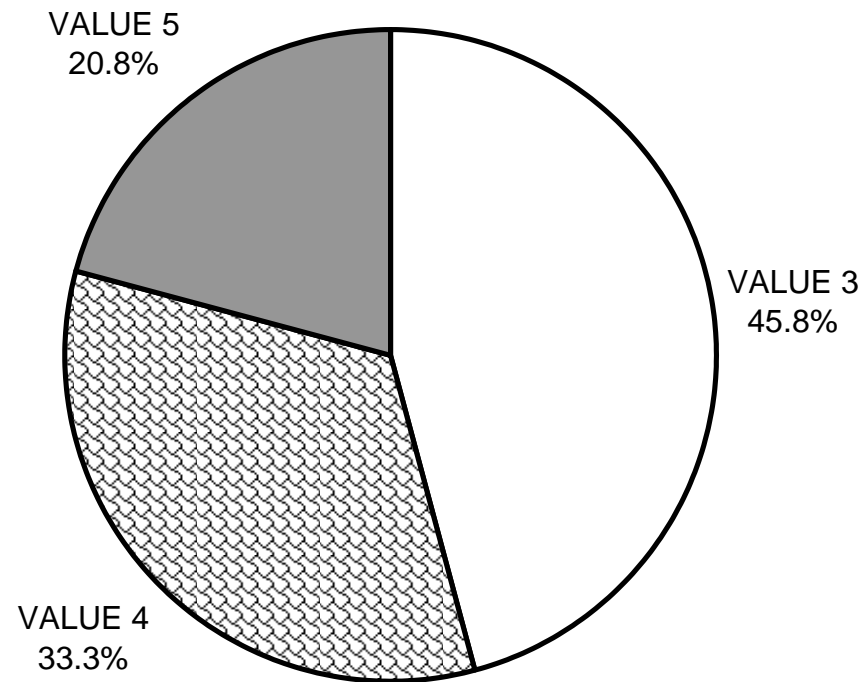
GRAPH 4

1238944407955 2011
MAXIMUM DEPTH IN POOLS



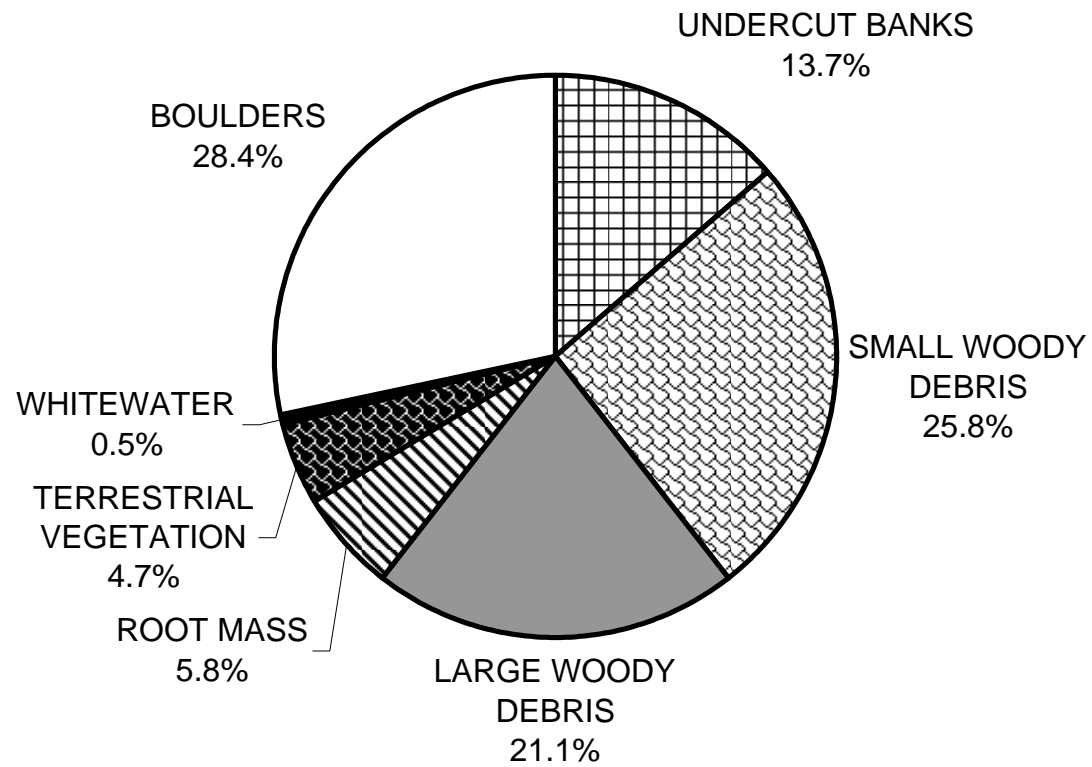
GRAPH 5

**1238944407955 2011
PERCENT EMBEDDEDNESS**



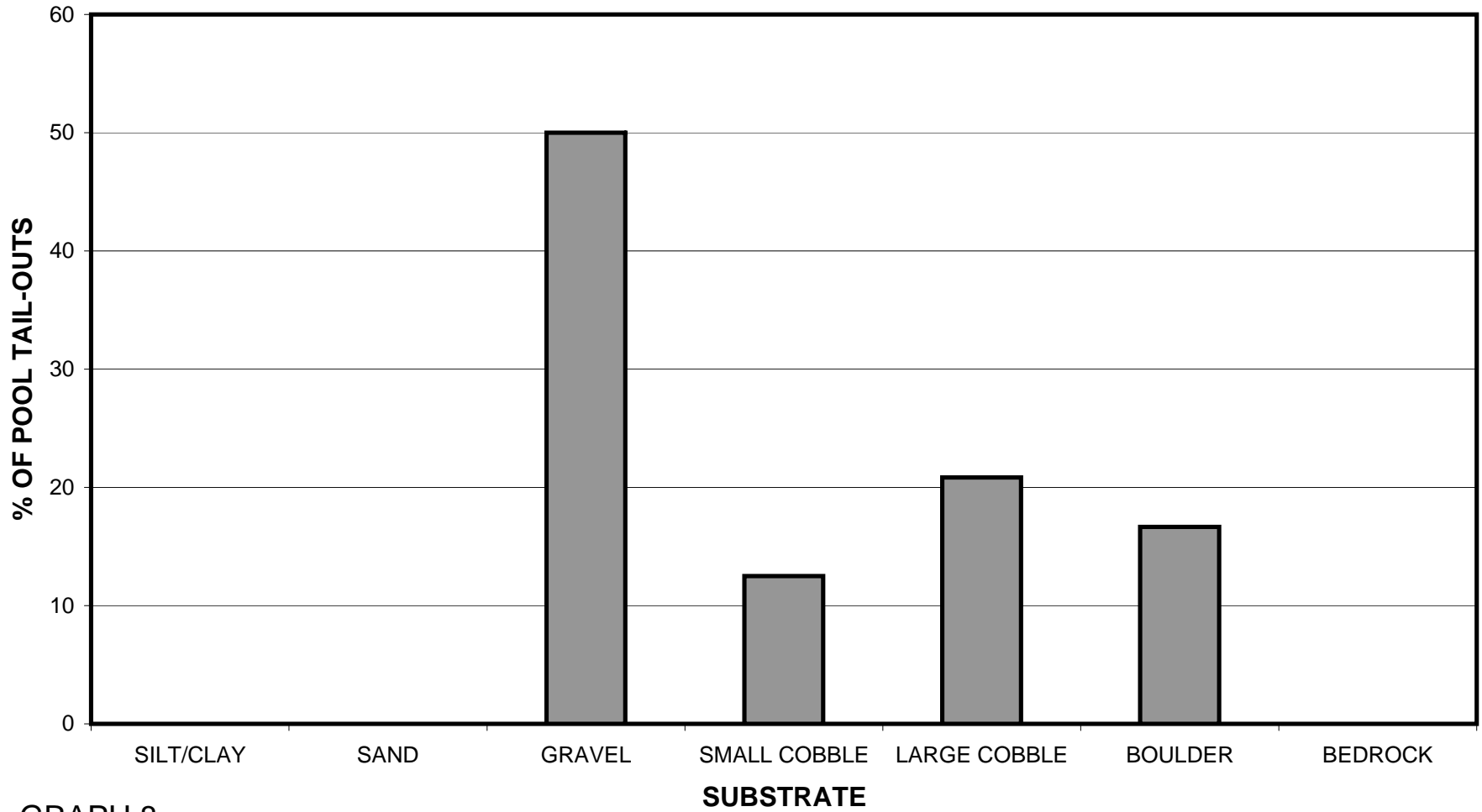
GRAPH 6

1238944407955 2011
MEAN PERCENT COVER TYPES IN POOLS



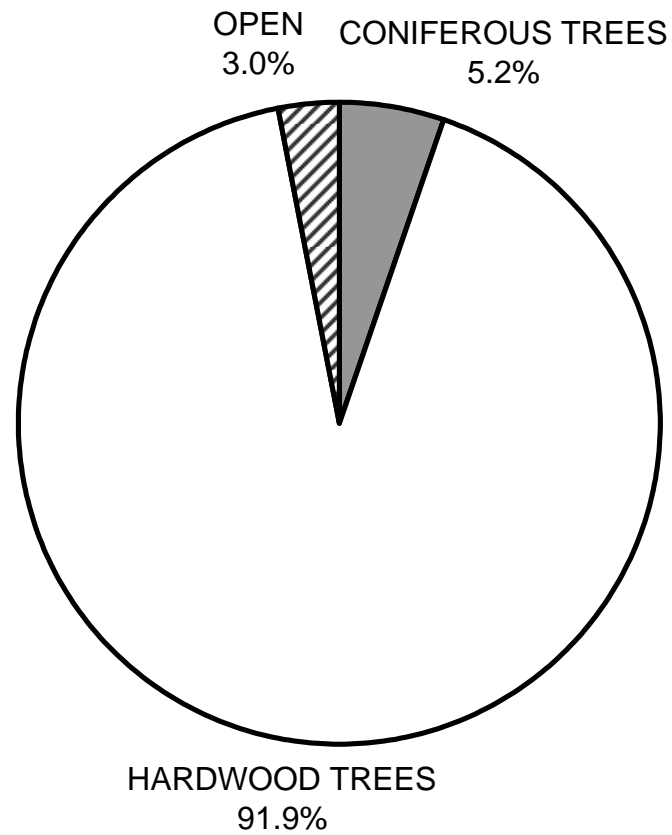
GRAPH 7

1238944407955 2011
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



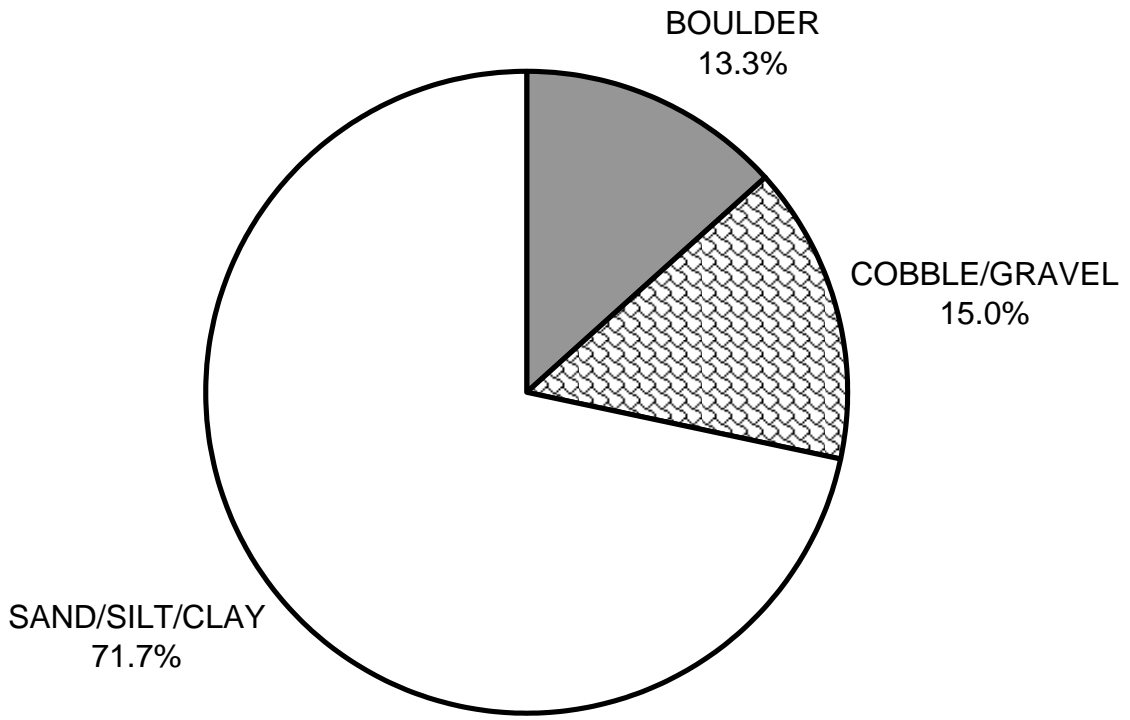
GRAPH 8

**1238944407955 2011
MEAN PERCENT CANOPY**



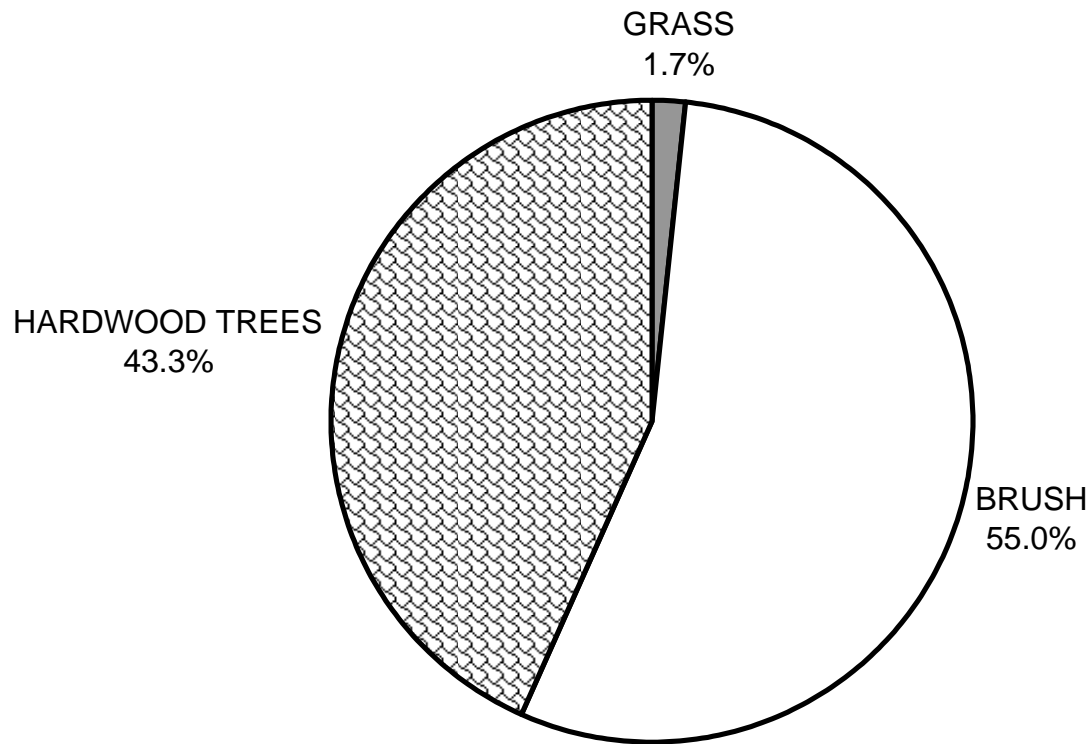
GRAPH 9

1238944407955 2011
DOMINANT BANK COMPOSITION IN SURVEY REACH



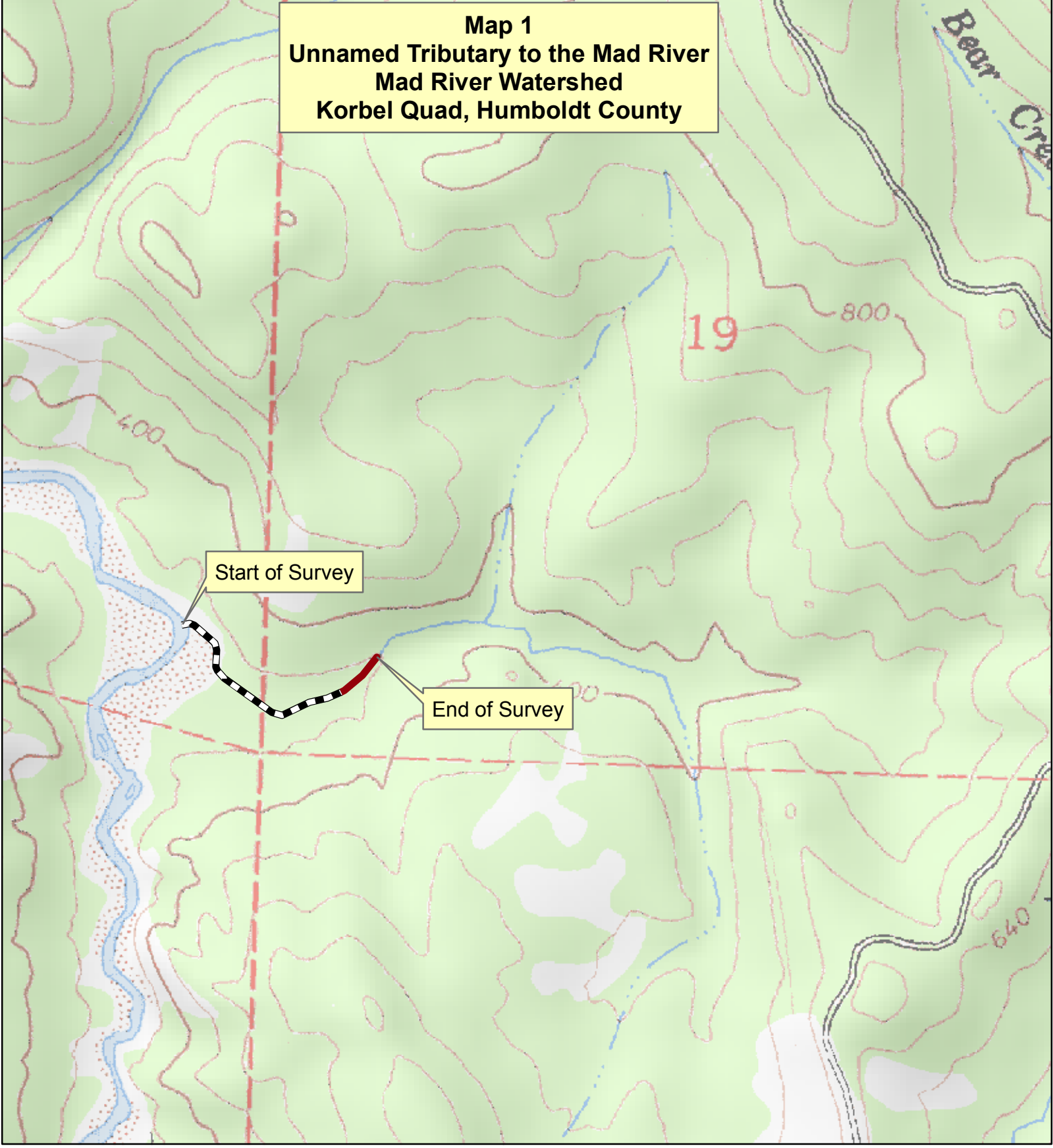
GRAPH 10

1238944407955 2011
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



Map 1
Unnamed Tributary to the Mad River
Mad River Watershed
Korbel Quad, Humboldt County



Start of Survey

End of Survey

Legend

-  Reach 1, B4 Channel Type
-  Reach 2, A4 Channel Type

