

STREAM INVENTORY REPORT

Usal Creek

INTRODUCTION

A stream inventory was conducted from August 2, 2006 to August 9, 2006 on Usal Creek. The survey began at the Pacific Ocean and extended upstream 3.3 miles. Stream inventories and reports or subsections to this report were also completed for eight tributaries to Usal Creek.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Usal 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

Usal Creek is a tributary to Pacific Ocean, located in Mendocino County, California (Map 1). Usal Creek's legal description at the confluence with Pacific Ocean is T23N R18W S22. Its location is 39.8325 north latitude and 123.8505 west longitude, LLID number 1238506398326. Usal Creek is a third order stream and has approximately 21.2 miles of blue line stream according to the USGS Hales Grove 7.5 minute quadrangle. Usal Creek drains a watershed of approximately 26.7 square miles. Elevations range from 0 feet at the mouth of the creek to approximately 1,800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production and recreation. The lowermost portion of the stream runs through Sinkyone Wilderness State Park. Vehicle access exists via Usal Road from State Route 1 west of Hales Grove.

METHODS

The habitat inventory conducted in Usal Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians 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

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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 Usal 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". Usal 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 Usal Creek, embeddedness was

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ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed 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 Usal 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 Usal 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 Usal 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.

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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.

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 Usal 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

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- 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 August 2, 2006 to August 9, 2006, was conducted by J. Caldwell and J. Beck (PSMFC). The total length of the stream surveyed was 17,207 feet with an additional 73 feet of side channel. A section from the Pacific Ocean upstream approximately 399 feet was not surveyed due to the influence of the Pacific Ocean. The 399 feet is included in the data for this report and is added to the total length of stream surveyed.

Stream flow was not measured on Usal Creek.

Usal Creek is a B4 channel type for 9,018 feet of the stream surveyed (Reach 1), and an F4 channel type for the remaining 8,189 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. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 69 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% flatwater units, 34% pool units, 15% riffle units, 12% dry units, and 1% no surveyed units (Graph 1). Based on total length of Level II habitat types there were 50% flatwater units, 21% dry units, 17% pool units, 10% riffle units, and 2% no survey units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 29%; run units, 28%; and low gradient riffle units, 15% (Graph 3). Based on percent total length, run units made up 31%, dry units 20%, and step run units 19%.

A total of 44 pools were identified (Table 3). Main channel pools were the most frequently encountered at 86% (Graph 4), and comprised 90% 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

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salmonids increases with depth. Twenty-two pools (54%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 41 pool tail-outs measured, 21 had a value of 1 (51.2%); 15 had a value of 2 (36.6%); 5 had a value of 3 (12.2%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 4, flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 30 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 32. Scour pools had a mean shelter rating of 18 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Usal Creek. Graph 7 describes the pool cover in Usal Creek. Root mass is the dominant pool cover type followed by terrestrial vegetation.

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 88% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 12% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Usal Creek was 69%. Thirty-one percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 88% and 12%, respectively. Graph 9 describes the mean percent canopy in Usal Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 88%. The mean percent left bank vegetated was 91%. The dominant elements composing the structure of the stream banks consisted of 96% sand/silt/clay and 4% cobble/gravel (Graph 10). Hardwood trees were the dominant vegetation type observed in 71.7% of the units surveyed. Additionally, 23.3% of the units surveyed had coniferous trees as the dominant vegetation type, and 3.3% had no vegetation (Graph 11).

DISCUSSION

Usal Creek is a B4 channel type for the first 9,018 feet of stream surveyed and an F4 channel type for the remaining 8,189 feet. The suitability of B4 and F4 channel types for fish habitat improvement structures is as follows: B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

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The water temperatures recorded on the survey days August 2, 2006 to August 9, 2006, ranged from 58 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 69 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 50% of the total length of this survey, riffles 10%, and pools 17%. Twenty-two of the 44 (50%) measured pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams maximum residual depth is at least three feet, a primary pool is defined to have a maximum residual depth of at least three 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.

Thirty-six of the 41 pool tail-outs measured had embeddedness ratings of 1 or 2. Five 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.

All of the 41 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 30. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by terrestrial vegetation in Usal Creek. Root mass is the dominant cover type in pools followed by terrestrial vegetation. 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 69%. Reach 1 had a canopy density of 57%, Reach 2 had a canopy density of 76%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 88% and 91%, 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) Usal 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.

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- 3) Reach 1 of Usal Creek is highly aggraded with large sections of dry or nearly dry channel with a few intermittent pools. An assessment should be conducted on this section of channel to determine the feasibility of reestablishing a more functional channel.
- 4) In Reach 2, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 5) In Reach 2, increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from root mass. Adding high quality complexity with woody cover in the pools is desirable.
- 6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 7) Increase the canopy on Usal 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. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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 Pacific Ocean. The first 399 feet was not surveyed due to beach.
400	0002.00	Begin fully sampling on inland side of seasonal berm.
1207	0004.00	Little or no flow.
1346	0005.00	Left bank tributary enters at top of unit; Shady Dell.
1896	0007.00	Little or no flow.
2281	0009.00	Little or no flow.
2331	0010.00	A few stagnant pools.

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2422	0011.00	Little or no flow.
2511	0012.00	There is no flow and pool tailout is dry.
3047	0016.00	Bridge crosses 70' feet into unit.
3570	0020.00	Right bank tributary enters 25' into unit; Hotel Gulch.
4023	0022.00	Little or no flow.
4209	0023.00	Little or no flow.
4859	0026.00	There is no flow and pool tailout is dry.
6229	0036.00	Channel becomes braided.
6261	0037.00	There is no flow and pool tailout is dry.
6341	0039.00	No flow.
6694	0041.00	No flow.
6772	0043.00	Little or no flow.
6786	0044.00	Channel appears to abandon main channel due to sediment load 190' into unit. Historic main channel appears to be filled with gravel to cobble-sized sediment.
7451	0045.00	There is no flow and pool tailout is dry.
8324	0050.00	There is no flow and pool tailout is dry.
8779	0054.00	Left bank tributary enters at 61' into unit. Tributary is identified as South Fork Usal (LLID 1238281398435).
8971	0057.00	Vehicle crossing at top of unit. Channel type changes to F4.
11487	0080.00	Left bank tributary enters at 39' into unit; Soldier Creek.
12575	0087.00	Fifty feet into unit a 1.5' culvert enters on left bank. Possible source of sediment.
15051	0111.00	Right bank tributary #5 enters at top of unit.
16661	0123.00	Left bank tributary enters at top of unit.

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17207 0130.00 End of survey upstream of Bear Creek.

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: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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
16	0	DRY	12.2	221	3541	20.5									
51	9	FLATWATER	38.9	170	8682	50.2	19.0	0.7	1.6	4540	231545	3160	161164		13
1	0	NOSURVEY	0.8	399	399	2.3									0
44	44	POOL	33.6	66	2911	16.8	19.8	1.6	3.3	1327	58395	2756	113011	2292	30
19	5	RIFFLE	14.5	92	1747	10.1	22.4	0.4	0.8	1226	23286	528	10036		4
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
131	58				17280					313226			284211		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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	5	LGR	14.5	92	1747	10.1	22	0.4	1.2	1226	23286	528	10036		4	56
37	4	RUN	28.2	146	5397	31.2	23	0.7	2.8	5611	207621	3918	144969		8	66
14	5	SRN	10.7	235	3285	19.0	16	0.7	1.8	3683	51563	2554	35751		17	66
38	38	MCP	29.0	69	2609	15.1	19	1.6	5.4	1355	51507	2882	100857	2399	32	72
2	2	LSR	1.5	68	135	0.8	22	1.3	3.3	1531	3062	2347	4694	1938	35	87
2	2	LSBk	1.5	53	106	0.6	25	1.8	5.8	1283	2566	2844	5689	2405	5	96
1	1	LSBo	0.8	34	34	0.2	20	0.9	2.3	612	612	734	734	551	5	100
1	1	PLP	0.8	27	27	0.2	24	1.2	2.6	648	648	1037	1037	778	20	91
16	0	DRY	12.2	221	3541	20.5										58
1	0	NS	0.8	399	399	2.3									0	
Total Units	Total Units Fully Measured					Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
131	58					17280					340865			303768		

Table 3 - Summary of Pool Types

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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
38	38	MAIN	86	69	2609	90	19.3	1.6	1355	51507	2399	83972	32
6	6	SCOUR	14	50	302	10	23.0	1.4	1148	6888	1669	10014	18
Total Units	Total Units Fully Measured				Total Length (ft.)				Total Area (sq.ft.)			Total Volume (cu.ft.)	
44	44				2911				58395			93986	

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

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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
35	MCP	85	0	0	2	6	14	40	11	31	8	23
2	LSR	5	0	0	0	0	0	0	2	100	0	0
2	LSBk	5	0	0	0	0	1	50	0	0	1	50
1	LSBo	2	0	0	0	0	1	100	0	0	0	0
1	PLP	2	0	0	0	0	1	100	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
41	0	0	2	5	17	41	13	32	9	22

Mean Maximum Residual Pool Depth (ft.): 3.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Dry Units: 16

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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	5	LGR	17	0	0	33	50	0	0	0	0
19	5	TOTAL RIFFLE	17	0	0	33	50	0	0	0	0
37	4	RUN	10	0	0	25	65	0	0	0	0
14	5	SRN	11	35	34	10	10	0	0	0	0
51	9	TOTAL FLAT	11	23	23	15	28	0	0	0	0
38	37	MCP	5	16	15	24	24	0	0	8	8
2	2	LSR	10	45	20	25	0	0	0	0	0
2	2	LSBk	0	0	0	0	0	0	0	0	100
1	1	LSBo	0	0	0	0	0	0	0	100	0
1	1	PLP	0	50	50	0	0	0	0	0	0
44	43	TOTAL POOL	5	17	15	22	21	0	0	10	12
1	1	NS	0	0	0	0	0	0	0	0	0
131	58	TOTAL	6	17	15	22	23	0	0	8	10

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Dry Units: 16

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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	5	LGR	0	0	20	80	0	0	0
37	5	RUN	0	20	80	0	0	0	0
14	5	SRN	0	0	0	100	0	0	0
38	38	MCP	3	24	55	18	0	0	0
2	2	LSR	0	0	100	0	0	0	0
2	2	LSBk	0	0	100	0	0	0	0
1	1	LSBo	0	0	0	100	0	0	0
1	1	PLP	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
69	12	88	5	89	91

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: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Survey Length (ft.): 17280

Main Channel (ft.): 17207

Side Channel (ft.): 73

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B4

Reach Length (ft.): 9018

Riffle/Flatwater Mean Width (ft.): 12.0

BFW:

Range (ft.): 60 to 80

Mean (ft.): 67

Std. Dev.: 7

Base Flow (cfs.):

Water (F): 58 - 62

Air (F): 59 - 65

Dry Channel (ft): 3541

Canopy Density (%): 57.5

Coniferous Component (%): 4.3

Hardwood Component (%): 95.7

Dominant Bank Vegetation: Hardwood Trees

Vegetative Cover (%): 82.7

Dominant Shelter: Terrestrial Veg.

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 11

LWD per 100 ft.:

Riffles: 0

Pools: 2

Flat: 1

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 0

Gravel: 100

Sm Cobble: 0

Lg Cobble: 0

Boulder: 0

Bedrock: 0

Embeddedness Values (%): 1. 61.5

2. 38.5

3. 0.0

4. 0.0

5. 0.0

Pools by Stream Length (%): 11.5

Pool Frequency (%): 28.1

Residual Pool Depth (%):

< 2 Feet Deep: 8

2 to 2.9 Feet Deep: 38

3 to 3.9 Feet Deep: 31

>= 4 Feet Deep: 23

Mean Max Residual Pool Depth (ft.): 3.3

Mean Pool Shelter Rating: 45

STREAM REACH: 2

Channel Type: F4

Reach Length (ft.): 8189

Riffle/Flatwater Mean Width (ft.): 23.5

BFW:

Range (ft.): 35 to 70

Mean (ft.): 46

Std. Dev.: 12

Base Flow (cfs.):

Water (F): 59 - 62

Air (F): 59 - 69

Dry Channel (ft): 0

Canopy Density (%): 76.3

Coniferous Component (%): 16.0

Hardwood Component (%): 84.0

Dominant Bank Vegetation: Hardwood Trees

Vegetative Cover (%): 93.8

Dominant Shelter: Root masses

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 16

LWD per 100 ft.:

Riffles: 0

Pools: 1

Flat: 0

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 0

Gravel: 82

Sm Cobble: 18

Lg Cobble: 0

Boulder: 0

Bedrock: 0

Embeddedness Values (%): 1. 46.4

2. 35.7

3. 17.9

4. 0.0

5. 0.0

Pools by Stream Length (%): 22.6

Pool Frequency (%): 37.8

Residual Pool Depth (%):

< 2 Feet Deep: 4

2 to 2.9 Feet Deep: 43

3 to 3.9 Feet Deep: 32

>= 4 Feet Deep: 21

Mean Max Residual Pool Depth (ft.): 3.3

Mean Pool Shelter Rating: 21

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

Latitude: 39:49:57.0N

Longitude: 123:51:02.0W

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	3	2	4.2
Sand / Silt / Clay	57	58	95.8

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	0	0	0.0
Brush	1	1	1.7
Hardwood Trees	40	46	71.7
Coniferous Trees	17	11	23.3
No Vegetation	2	2	3.3

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Usal Creek

LLID: 1238506398326

Drainage: Rockport

Survey Dates: 8/2/2006 to 8/9/2006

Confluence Location: Quad: PIERCY

Legal Description: T000R000S00

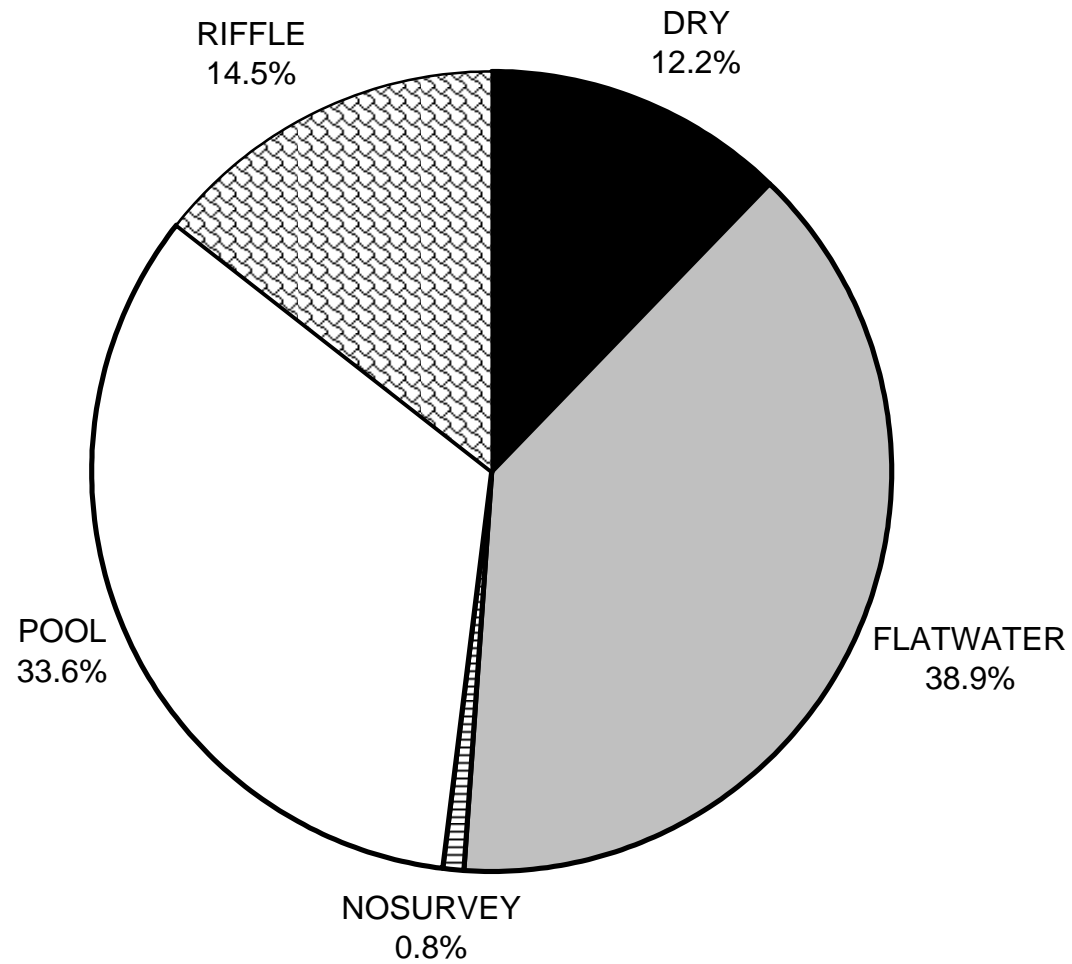
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Longitude: 123:51:02.0W

	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	17	11	5
SMALL WOODY DEBRIS (%)	0	23	17
LARGE WOODY DEBRIS (%)	0	23	15
ROOT MASS (%)	33	15	22
TERRESTRIAL VEGETATION (%)	50	28	21
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	10
BEDROCK LEDGES (%)	0	0	12

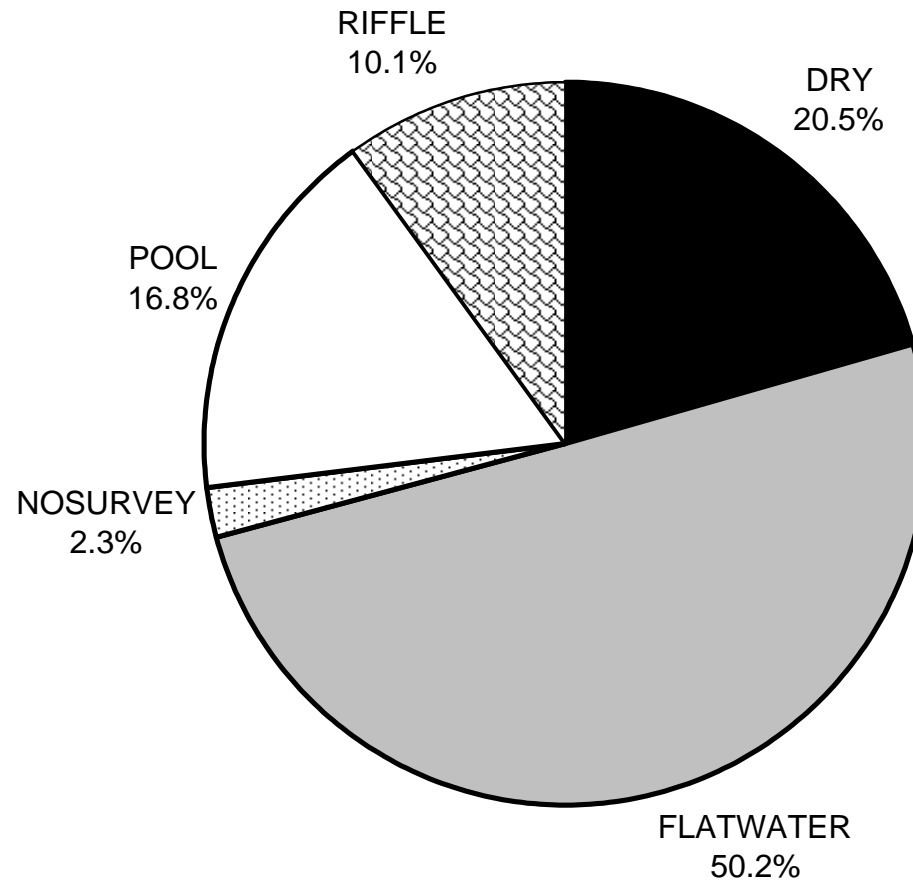
USAL CREEK 2006

HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

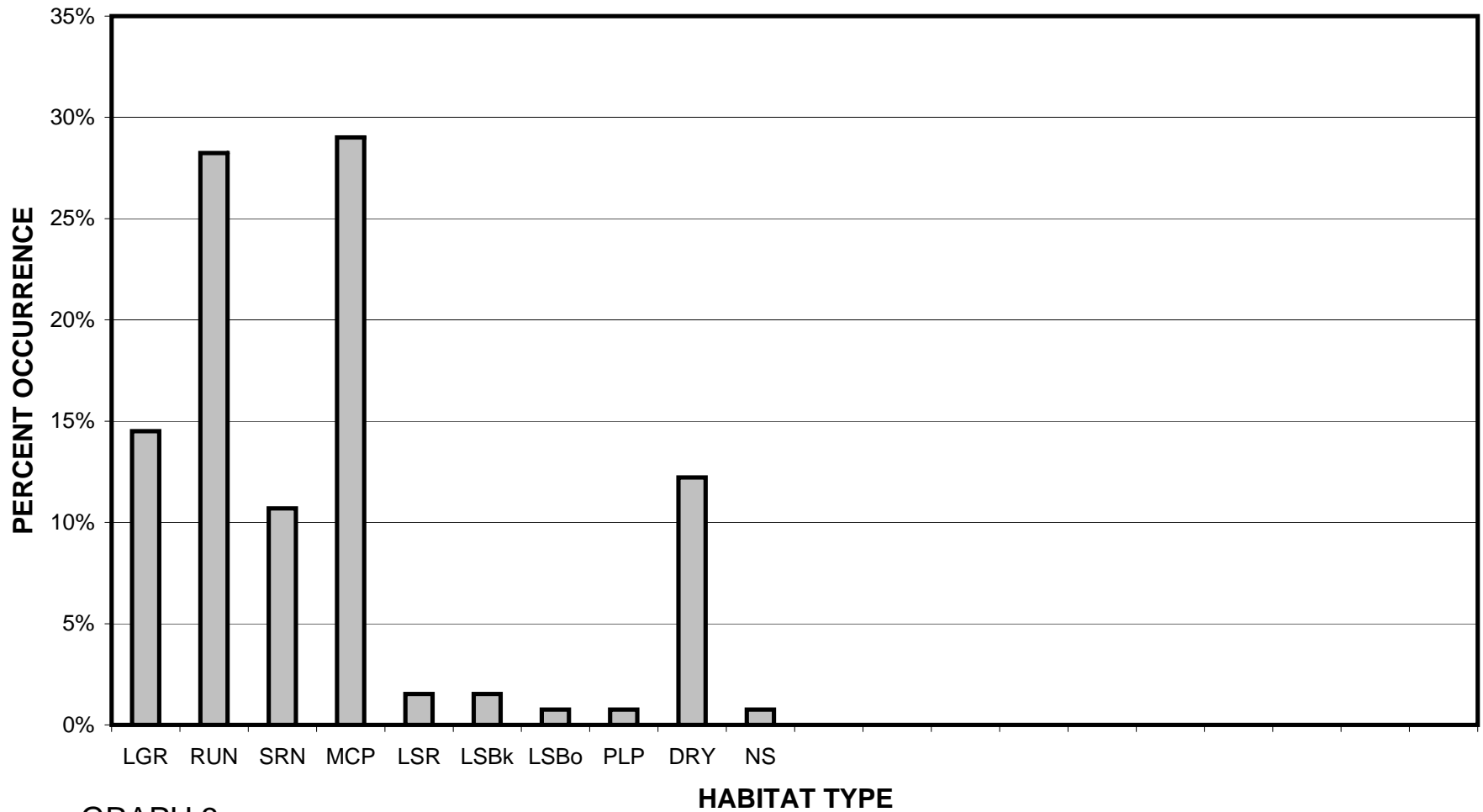
USAL CREEK 2006
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

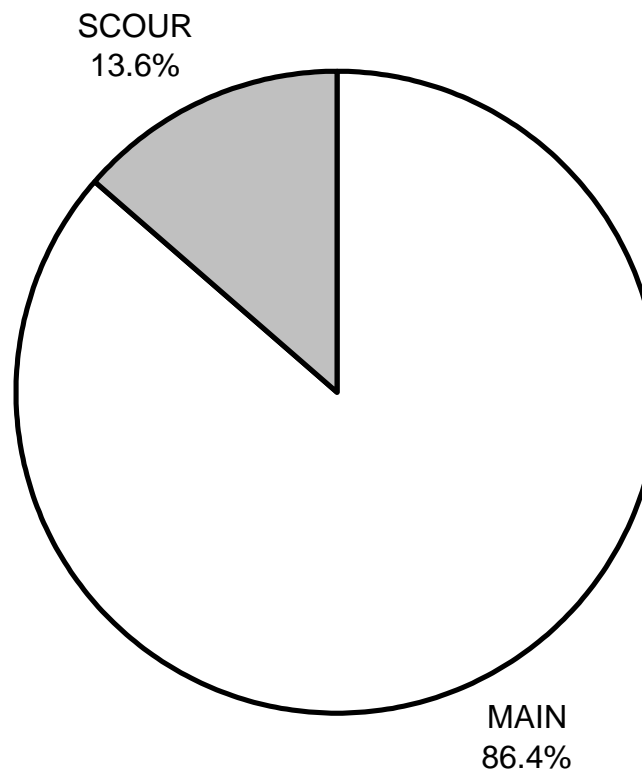
USAL CREEK 2006

HABITAT TYPES BY PERCENT OCCURRENCE



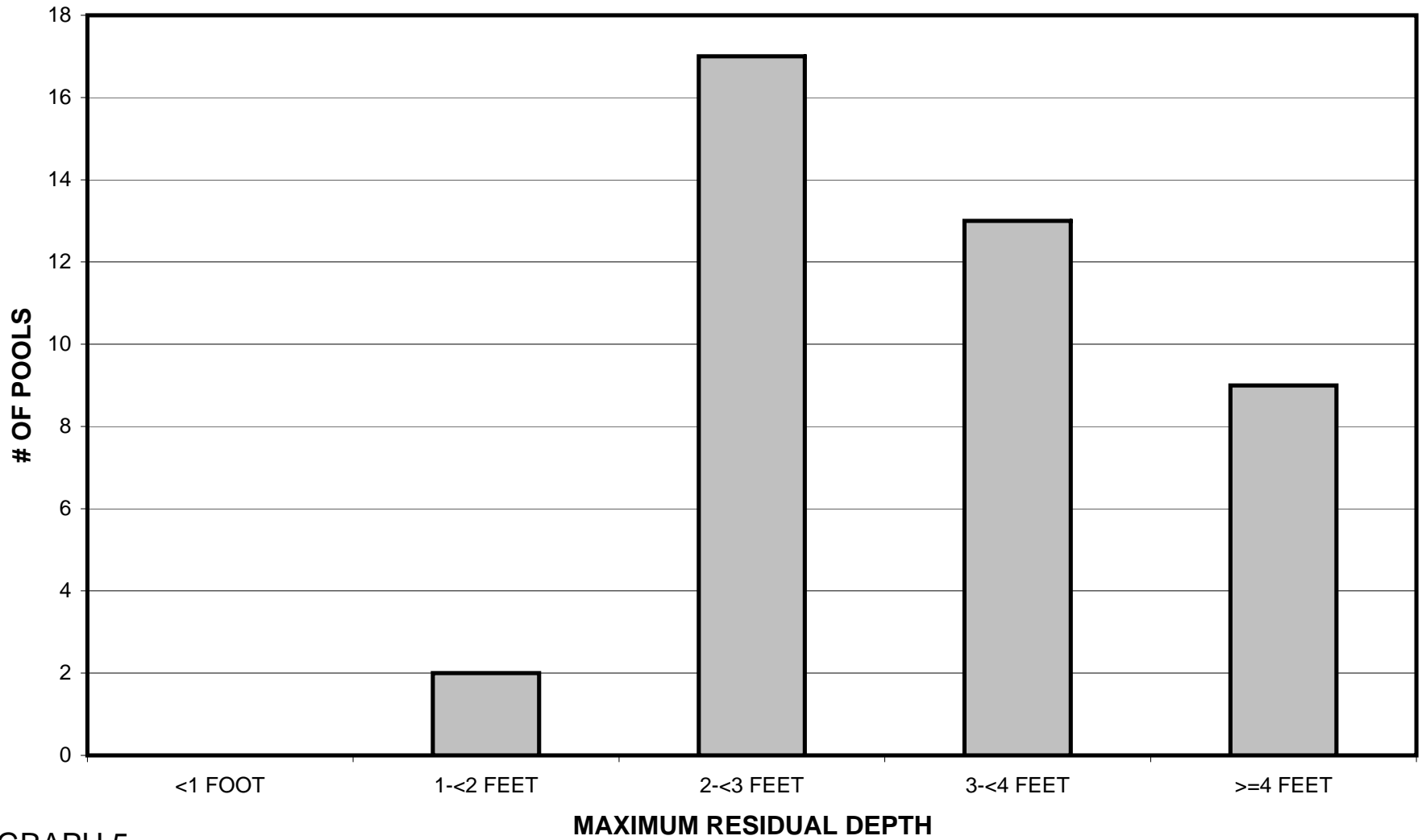
GRAPH 3

**USAL CREEK 2006
POOL TYPES BY PERCENT OCCURRENCE**



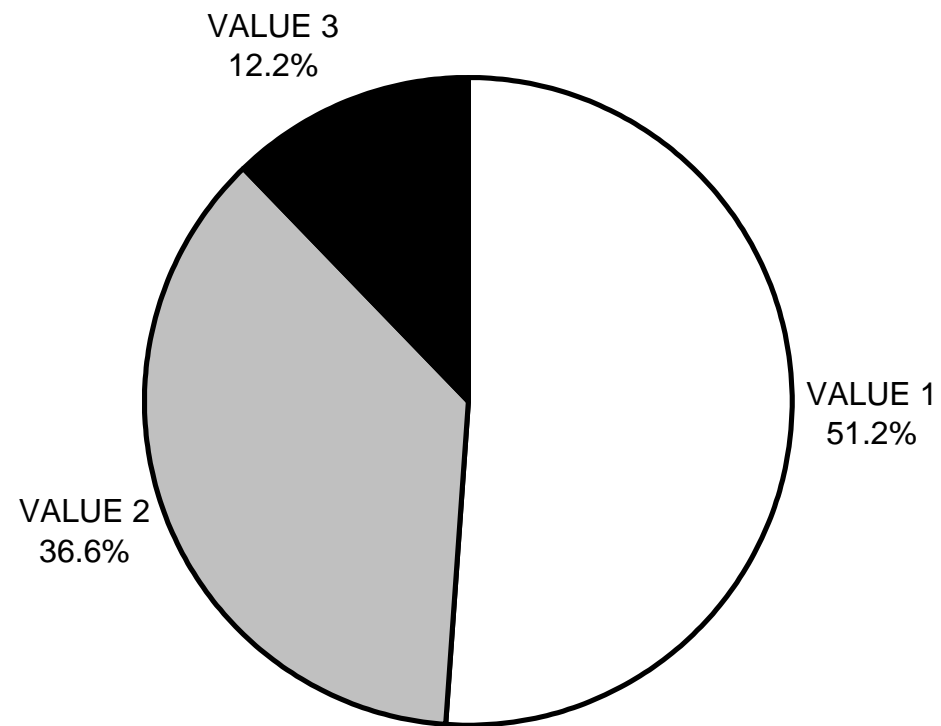
GRAPH 4

USAL CREEK 2006 MAXIMUM DEPTH IN POOLS



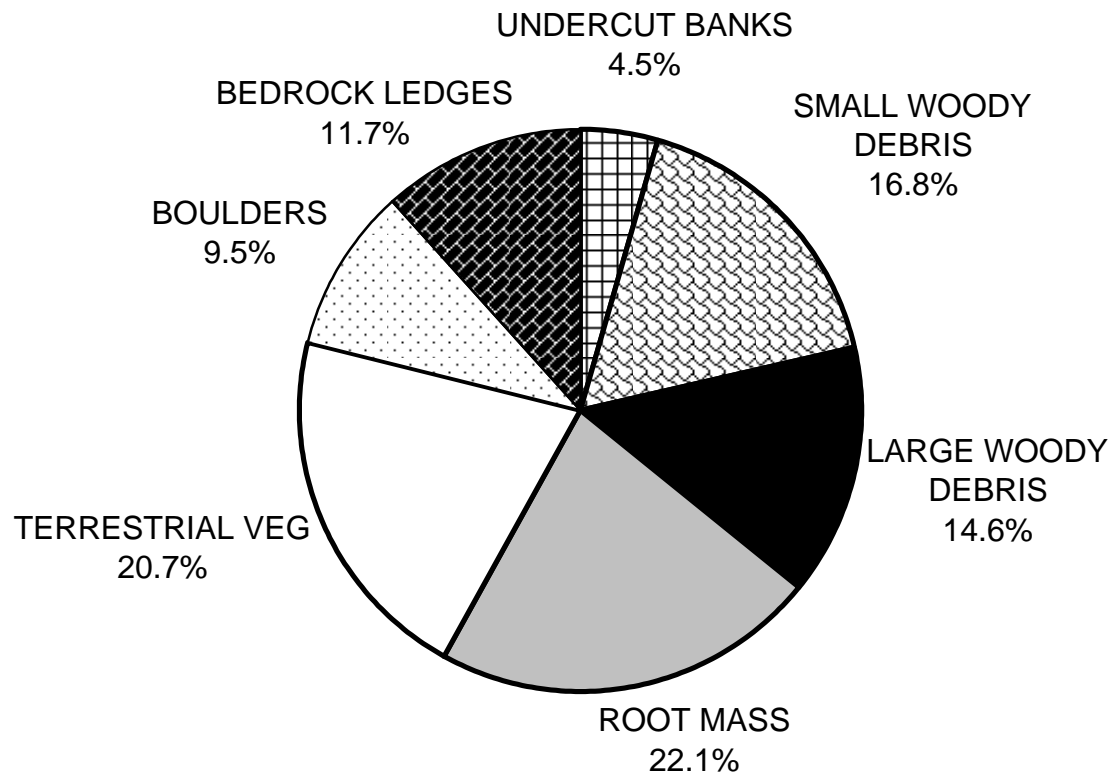
GRAPH 5

USAL CREEK 2006 PERCENT EMBEDDEDNESS



GRAPH 6

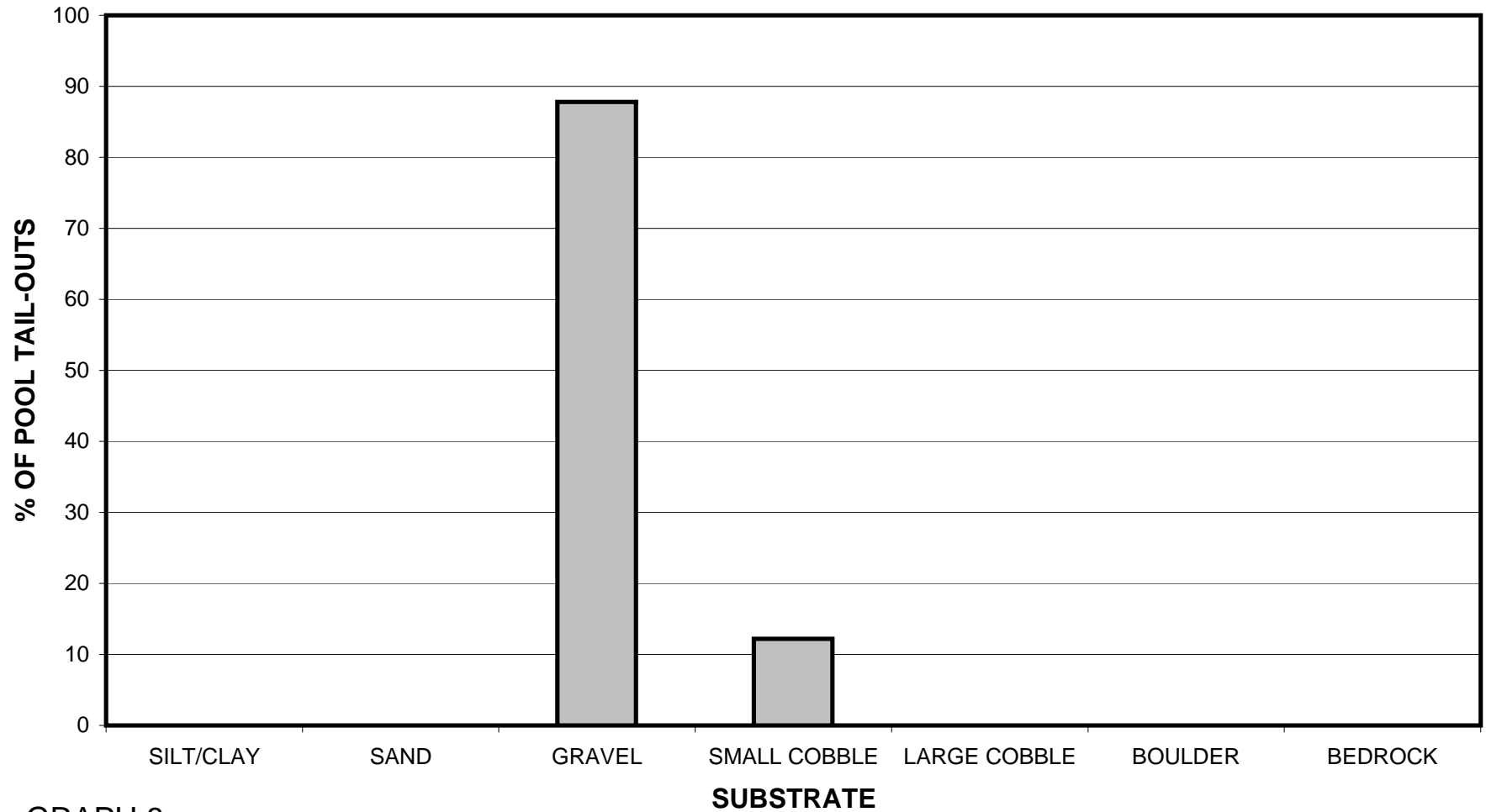
USAL CREEK 2006 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

USAL CREEK 2006

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



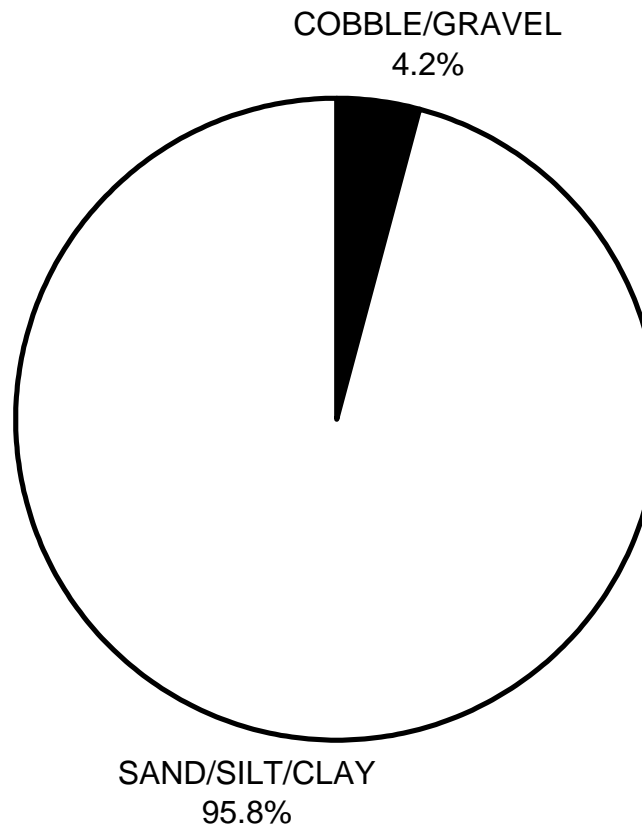
GRAPH 8

**USAL CREEK 2006
MEAN PERCENT CANOPY**



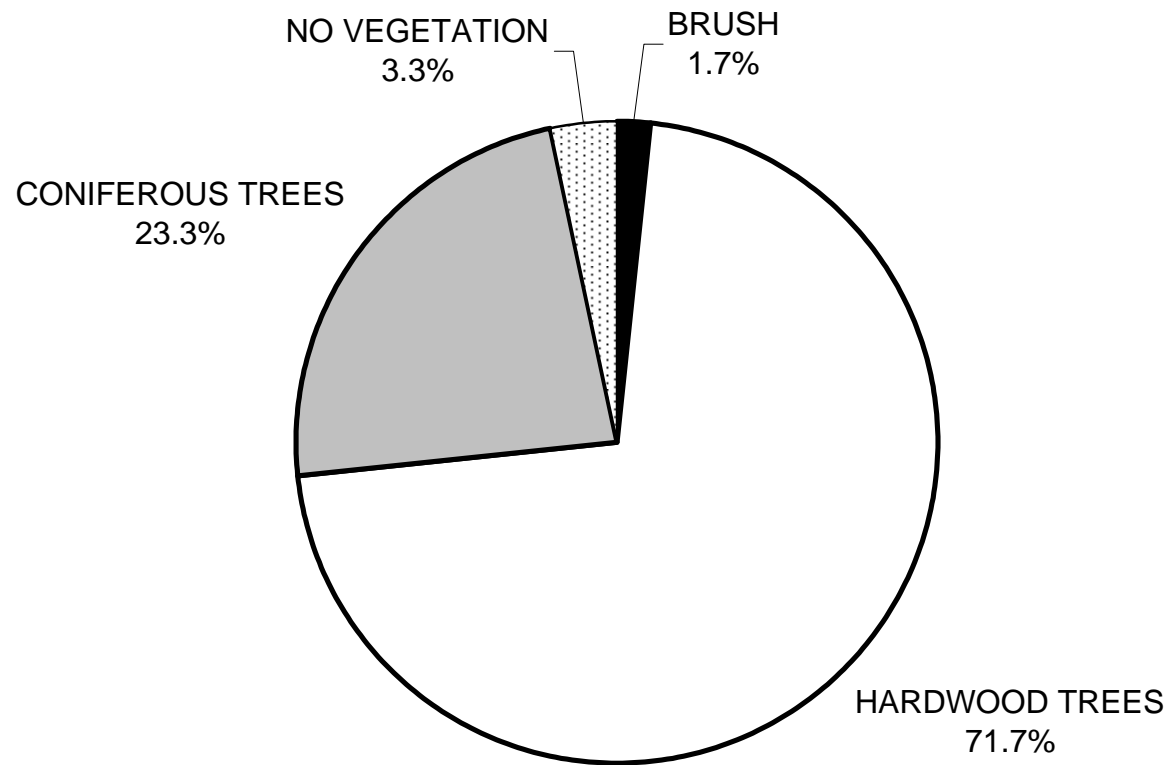
GRAPH 9

USAL CREEK 2006
DOMINANT BANK COMPOSITION IN SURVEY REACH



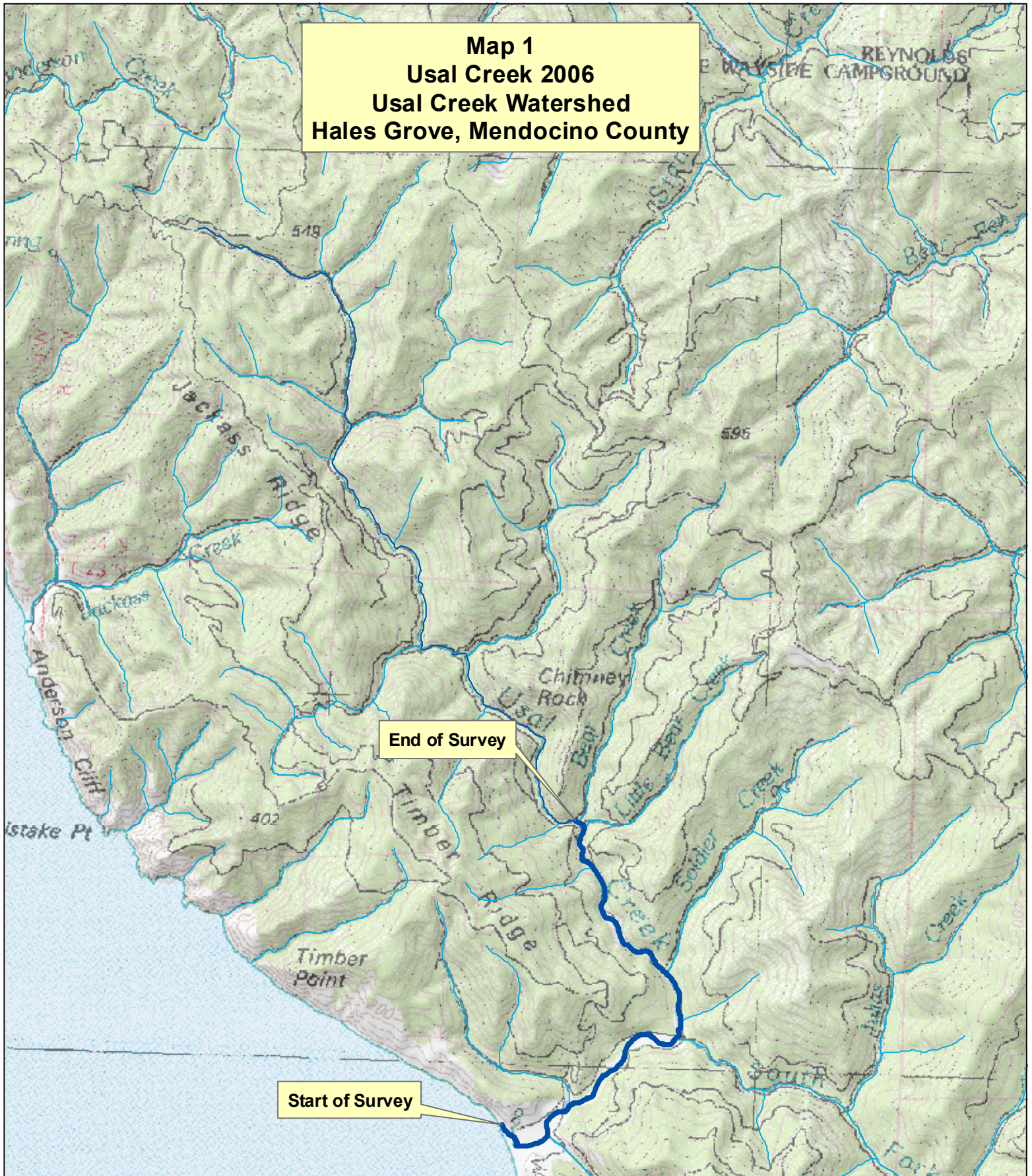
GRAPH 10

**USAL CREEK 2006
DOMINANT BANK VEGETATION IN SURVEY REACH**




GRAPH 11

Map 1
Usal Creek 2006
Usal Creek Watershed
Hales Grove, Mendocino County



Legend

 Usal Creek Survey

0 3,500 7,000 Feet

