

STREAM INVENTORY REPORT

Fish Creek

INTRODUCTION

A stream inventory was conducted from July 2 to July 5, 2012 on Fish Creek. The survey began at the confluence with Lawrence Creek and extended upstream 1.4 miles.

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

Fish Creek is a tributary to Lawrence Creek, a tributary to Yager Creek, a tributary to the Van Duzen River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Fish Creek's legal description at the confluence with Lawrence Creek is T03N R02E S19. Its location is 40.6320 degrees north latitude and 123.9926 degrees west longitude, LLID number 1239912406319. Fish Creek is a first order stream and has approximately 1.2 miles of blue line stream according to the USGS Iaqua Buttes 7.5 minute quadrangle. Fish Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 635 feet at the mouth of the creek to 1,300 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 Yager-Lawrence Mainline Road outside of Hydesville, CA.

METHODS

The habitat inventory conducted in Fish Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). 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 Fish 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". Fish 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.

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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 Fish Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In Fish 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. The shelter rating is then 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 Fish 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 Fish 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 Wildlife. 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 Fish 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

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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 July 2 to July 5, 2012 was conducted by A. Blessing, C. Tiffany, and R. Spencer (WSP). The total length of the stream surveyed was 7,250 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.25 cfs on July 2, 2012.

Fish Creek is a B4 channel type for 1,081 feet of the stream surveyed (Reach 1), a G4 channel type for 2,354 feet of the stream surveyed (Reach 2), and a B4 channel type for 3,815 feet of the stream surveyed (Reach 3). 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. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 54 degrees Fahrenheit. Air temperatures ranged from 55 to 62 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% riffle units, 35% pool units, 29% flatwater units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 39% flatwater units, 33% pool units, 28% riffle units, and 1% unsurveyed 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, 28%; low gradient riffle units, 27%; and step run units, 18% (Graph 3). Based on percent total length, step run units made up 30%, mid-channel pool units 25%, and low gradient riffle units 18%.

A total of 89 pools were identified (Table 3). Main channel pools were the most frequently encountered at 89% (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 salmonids increases with depth. Eleven of the 89 pools (12%) had a residual depth of two feet or greater (Graph 5).

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The depth of cobble embeddedness was estimated at pool tail-outs. Of the 89 pool tail-outs measured, 47 had a value of 1 (52.8%); 38 had a value of 2 (42.7%); four had a value of 3 (4.5%) (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 7, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 32 (Table 1). Of the pool types, the scour pools had the highest shelter rating at 43. Main channel pools had a mean shelter rating of 31 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Fish Creek. Graph 7 describes the pool cover in Fish Creek. Small woody debris is the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 76% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 24% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Fish Creek was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 42% and 58%, respectively. Graph 9 describes the mean percent canopy in Fish Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 53% cobble/gravel, 42% sand/silt/clay, 4% boulders, and 1% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 65% of the units surveyed. Additionally, 29% of the units surveyed had deciduous trees as the dominant vegetation type, and 6% had brush as the dominant vegetation type (Graph 11).

DISCUSSION

Fish Creek is a B4 channel type for the first 1,081 feet of stream surveyed, a G4 channel type for the next 2,354 feet, and a B4 channel type for the remaining 3,815 feet. The suitability of B4 and G4 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. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days July 2 to July 5, 2012 ranged from 51 to 54 degrees Fahrenheit. Air temperatures ranged from 55 to 62 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be

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monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 39% of the total length of this survey, riffles 28%, and pools 33%. Eleven of the 89 (12%) 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.

Eighty-five of the 89 pool tail-outs measured had embeddedness ratings of 1 or 2. Four 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 not suitable 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 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 32. The shelter rating in the flatwater habitats is 9. 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 Fish Creek. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover 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 99%. Reach 1 had a canopy density of 97%, Reach 2 had a canopy density of 99%, and Reach 3 had a canopy density of 99%. The percentage of right and left bank covered with vegetation was 98% and 99%, respectively.

RECOMMENDATIONS

- 1) Fish Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from small woody debris. Adding high quality complexity with woody cover in the pools is desirable.

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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 #:	Comments:
0	0001.00	Start of survey at the confluence with Lawrence Creek. The channel is a B4.
987	0034.00	The remnants of an old bridge span the channel. The bridge measures 6.6' wide x 27' long x 10' high and is made of rotting wood.
1081	0037.00	The channel changes from a B4 to a G4. A logging road crosses the channel. The crossing is a 25' wide x 24' long x 7' high railcar bridge.
2015	0068.00	Tributary #01 enters on the left bank. It contributes 2-3% to Fish Creek's flow. The water temperature of the tributary was 49 degrees Fahrenheit, the water temperature downstream of the tributary was 52 degrees Fahrenheit, and the water temperature upstream of the confluence was 51 degrees Fahrenheit. There is an 11' high plunge at the mouth of the tributary.
2187	0073.00	Log debris accumulation (LDA) #01 contains four pieces of large woody debris (LWD) and measures 4' high x 10' wide x 4' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 13' wide x 23' long x 2' deep. Fish were observed above the LDA.
2462	0082.00	LDA #02 contains two pieces of LWD and measures 5.5' high x 13' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 40' long x 3' deep. Fish were observed above the LDA.
3307	0109.00	There is a 2' high plunge over notched log.
3435	0114.00	The channel changes from a G4 to a B4. LDA #03 contains eight pieces of LWD and measures 8' high x 20' wide x 35' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 12' wide x 25' long x 2' deep. Fish were observed above the LDA.
3636	0123.00	LDA #04 contains 10 pieces of LWD and measures 8' high x 29' wide x 16' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x

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		50' long x 6' deep. There is an 8' high plunge over the LDA. Fish were observed above the LDA.
3830	0131.00	LDA #05 contains six pieces of LWD and measures 6' high x 24' wide x 14' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 30' wide x 50' long x 4' deep. Fish were observed above the LDA.
4918	0174.00	There is a 3' high plunge.
5090	0181.00	LDA #06 contains four pieces of LWD and measures 8' high x 18' wide x 10' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 25' wide x 40' long x 4' deep. Fish were observed above the LDA.
5377	0191.00	There is a 2' high plunge.
5474	0196.00	Tributary #02 enters on the right bank. It contributes 10%-15% to Fish Creek's flow. The water temperature of the tributary was 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 52 degrees Fahrenheit. The first 150' of the tributary are accessible to salmonids. One hundred fifty feet upstream from the mouth the slope of the tributary increases from 4% to 15%-20%.
5729	0209.00	Fish observed.
5906	0216.00	LDA #07 contains five pieces of LWD and measures 8' high x 19' wide x 10' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x 30' long x 4' deep. Fish were not observed above the LDA.
6129	0224.00	Tributary #03 contributes approximately 5% to Fish Creek's flow. The water temperature of the tributary was 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 52 degrees Fahrenheit. The slope of the tributary is approximately 8%. There is a 4' high waterfall near the mouth of the tributary.
7099	0258.00	End of survey. The channel splits in two directions. The right bank tributary continues upstream 200' to a 5' high plunge over a root wad and small woody debris. The channel is marshy above the plunge. The left bank tributary is full of LWD. The LWD creates a series of plunges interspersed with dry units. No fish were observed above HU# 215.

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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: Fish Creek

LLID: 1239912406319 Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY Legal Description: T03NR02ES19 Latitude: 40:37:55.0N Longitude: 123:59:28.0W

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
75	9	FLATWATER	29.1	38	2823	38.9	6.4	0.4	0.8	222	16674	91	6842		9
3	0	NOSURVEY	1.2	17	50	0.7									
89	89	POOL	34.5	27	2372	32.7	8.6	0.7	1.4	218	19420	204	18131	157	32
91	18	RIFFLE	35.3	22	2005	27.7	5.8	0.3	0.5	125	11366	36	3302		7
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
258	116				7250					47461			28275		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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 (%)
69	14	LGR	26.7	19	1305	18.0	6	0.2	0.7	98	6729	25	1691		5	99
19	3	HGR	7.4	34	638	8.8	5	0.3	0.6	231	4388	59	1121		10	99
3	1	CAS	1.2	21	62	0.9	10	0.7	1.2	190	570	133	399		20	100
28	5	RUN	10.9	23	646	8.9	7	0.4	1	205	5744	80	2246		7	98
47	4	SRN	18.2	46	2177	30.0	6	0.4	0.9	244	11458	105	4935		13	99
71	71	MCP	27.5	26	1821	25.1	9	0.6	3	213	15143	194	13807	149	31	99
1	1	CCP	0.4	26	26	0.4	6	0.6	0.9	153	153	123	123	92	5	100
7	7	STP	2.7	42	297	4.1	7	0.6	1.9	274	1915	229	1604	173	32	98
10	10	PLP	3.9	23	228	3.1	10	0.8	2.3	221	2209	260	2597	208	43	99
3	0	NS	1.2	17	50	0.7										

Total Units
258

Total Units Fully Measured
116

Total Length (ft.)
7250

Total Area (sq.ft.)
48310

Total Volume (cu.ft.)
28523

Table 3 - Summary of Pool Types

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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
79	79	MAIN	89	27	2144	90	8.4	0.6	218	17211	151	11910	31
10	10	SCOUR	11	23	228	10	10.0	0.8	221	2209	208	2081	43

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
89	89	2372	19420	13990

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

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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
71	MCP	80	17	24	44	62	9	13	1	1	0	0
1	CCP	1	1	100	0	0	0	0	0	0	0	0
7	STP	8	1	14	6	86	0	0	0	0	0	0
10	PLP	11	1	10	8	80	1	10	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
89	20	22	58	65	10	11	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Dry Units: 0

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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
69	14	LGR	3	9	13	3	0	0	6	65	0
19	3	HGR	0	10	0	0	0	0	0	90	0
3	1	CAS	0	0	0	0	0	0	30	70	0
91	18	TOTAL RIFFLE	2	9	9	2	0	0	6	71	0
28	5	RUN	1	40	18	1	0	0	0	40	0
47	4	SRN	1	41	41	0	0	0	8	9	0
75	9	TOTAL FLAT	1	41	28	1	0	0	3	26	0
71	71	MCP	11	36	25	4	0	0	2	21	0
1	1	CCP	0	60	0	0	0	0	0	40	0
7	7	STP	1	28	38	1	0	0	12	20	0
10	10	PLP	6	33	26	3	0	0	20	14	0
89	89	TOTAL POOL	10	36	26	3	0	0	4	20	0
3	0	NS									
258	116	TOTAL	8	33	24	3	0	0	5	27	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Dry Units: 0

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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
69	14	LGR	0	0	79	14	7	0	0
19	3	HGR	0	0	67	33	0	0	0
3	1	CAS	0	0	0	0	0	100	0
28	5	RUN	0	0	60	20	0	20	0
47	4	SRN	0	0	100	0	0	0	0
71	71	MCP	0	15	73	4	6	1	0
1	1	CCP	0	0	100	0	0	0	0
7	7	STP	0	0	71	14	0	14	0
10	10	PLP	0	10	60	0	0	30	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
99	58	42	0	98	99

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: Fish Creek LLID: 1239912406319 Drainage: Van Duzen River
 Survey Dates: 7/2/2012 to 7/5/2012 Survey Length (ft.): 7250 Main Channel (ft.): 7250 Side Channel (ft.): 0
 Confluence Location: Quad: MCWHINNEY Legal Description: T03NR02ES19 Latitude: 40:37:55.0N Longitude: 123:59:28.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B4	Canopy Density (%): 97.1	Pools by Stream Length (%): 31.8
Reach Length (ft.): 1081	Coniferous Component (%): 40.6	Pool Frequency (%): 30.6
Riffle/Flatwater Mean Width (ft.): 5.1	Hardwood Component (%): 59.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 73
Range (ft.): 11 to 15	Vegetative Cover (%): 99.7	2 to 2.9 Feet Deep: 27
Mean (ft.): 13	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.): 0.3	Occurrence of LWD (%): 18	Mean Max Residual Pool Depth (ft.): 1.8
Water (F): 53 - 54 Air (F): 60 - 60	LWD per 100 ft.:	Mean Pool Shelter Rating: 42
Dry Channel (ft): 0	Riffles: 0	
	Pools: 5	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 54.5 2. 45.5 3. 0.0 4. 0.0 5. 0.0		

STREAM REACH: 2

Channel Type: G4	Canopy Density (%): 99.2	Pools by Stream Length (%): 27.0
Reach Length (ft.): 2354	Coniferous Component (%): 93.2	Pool Frequency (%): 31.2
Riffle/Flatwater Mean Width (ft.): 6.4	Hardwood Component (%): 6.8	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 92
Range (ft.): 7 to 17	Vegetative Cover (%): 98.5	2 to 2.9 Feet Deep: 4
Mean (ft.): 10	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 4
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.3	Occurrence of LWD (%): 18	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 51 - 53 Air (F): 56 - 61	LWD per 100 ft.:	Mean Pool Shelter Rating: 33
Dry Channel (ft): 0	Riffles: 0	
	Pools: 8	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 75 Sm Cobble: 25 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 50.0 2. 45.8 3. 4.2 4. 0.0 5. 0.0		

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B4	Canopy Density (%): 98.8	Pools by Stream Length (%): 36.5
Reach Length (ft.): 3815	Coniferous Component (%): 44.9	Pool Frequency (%): 37.2
Riffle/Flatwater Mean Width (ft.): 6.1	Hardwood Component (%): 55.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 89
Range (ft.): 11 to 17	Vegetative Cover (%): 98.5	2 to 2.9 Feet Deep: 11
Mean (ft.): 14	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.3	Occurrence of LWD (%): 27	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 52 - 54	Air (F): 55 - 62	LWD per 100 ft.:
Dry Channel (ft): 0	Riffles: 3	Pools: 9
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0	Sand: 0	Gravel: 72
	Sm Cobble: 28	Lg Cobble: 0
	Boulder: 0	Bedrock: 0
Embeddedness Values (%): 1. 53.7	2. 40.7	3. 5.6
	4. 0.0	5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

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	2	0.9
Boulder	5	5	4.3
Cobble / Gravel	64	59	53.0
Sand / Silt / Clay	47	50	41.8

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	1	0	0.4
Brush	8	5	5.6
Hardwood Trees	36	32	29.3
Coniferous Trees	71	79	64.7
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Fish Creek

LLID: 1239912406319

Drainage: Van Duzen River

Survey Dates: 7/2/2012 to 7/5/2012

Confluence Location: Quad: MCWHINNEY

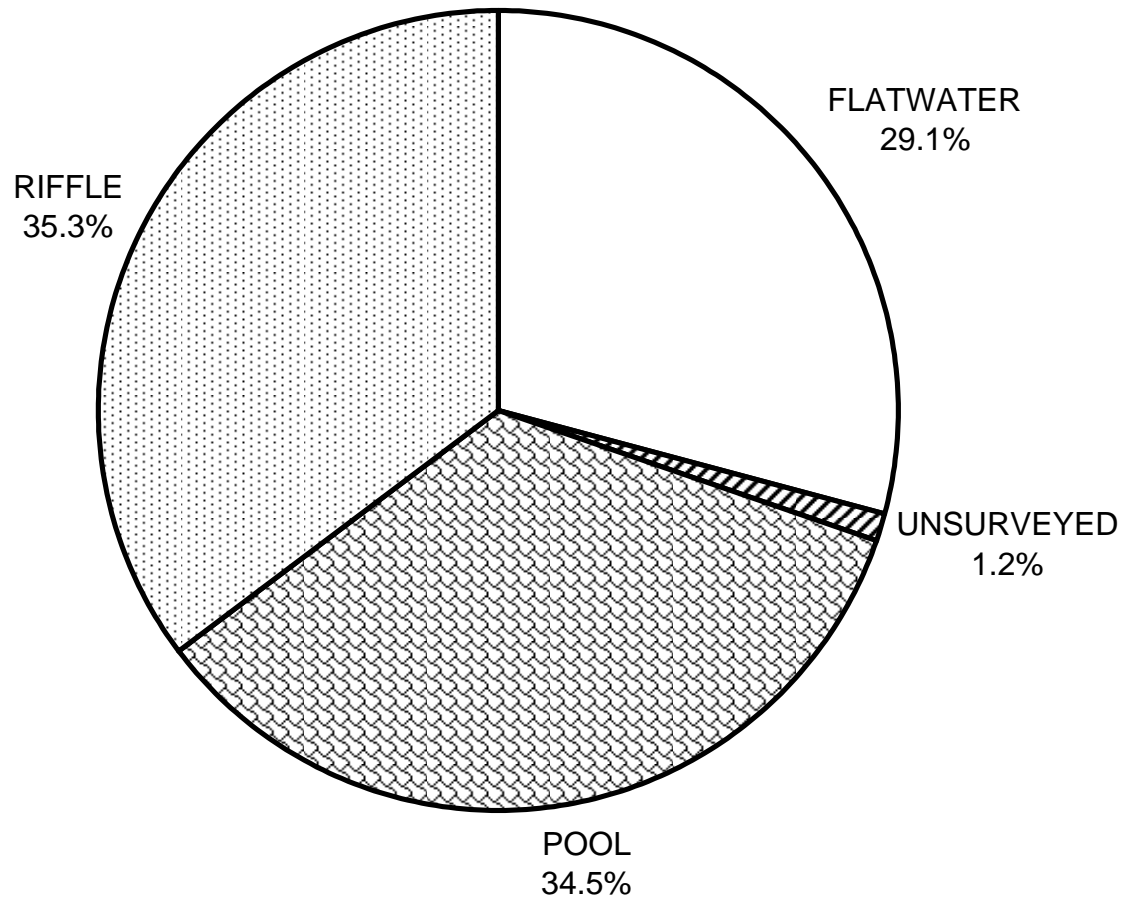
Legal Description: T03NR02ES19

Latitude: 40:37:55.0N

Longitude: 123:59:28.0W

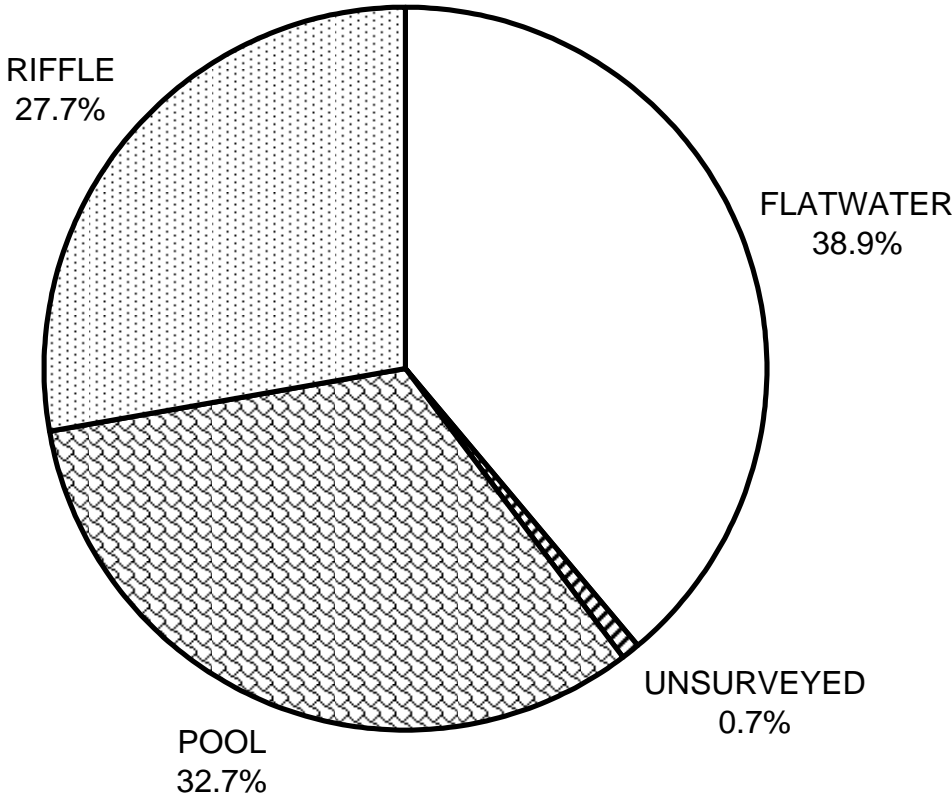
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	2	1	10
SMALL WOODY DEBRIS (%)	9	41	36
LARGE WOODY DEBRIS (%)	9	28	26
ROOT MASS (%)	2	1	3
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	6	3	4
BOULDERS (%)	71	26	20
BEDROCK LEDGES (%)	0	0	0

FISH CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

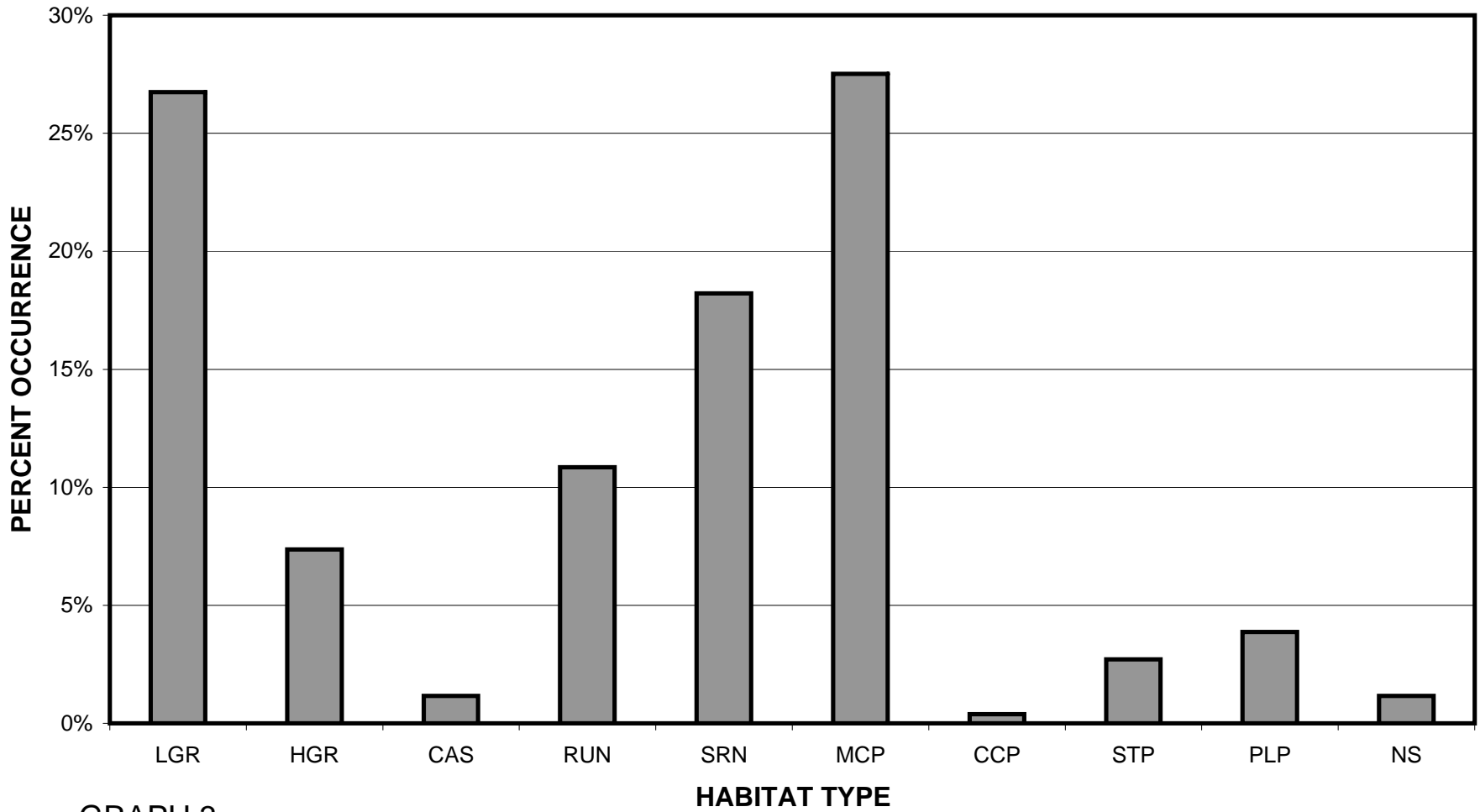
**FISH CREEK 2012
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

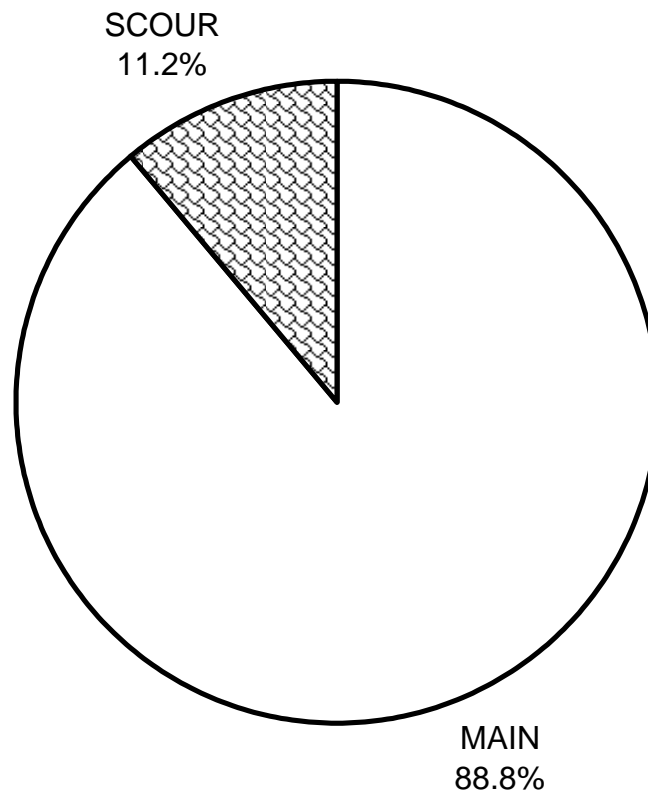
FISH CREEK 2012

HABITAT TYPES BY PERCENT OCCURRENCE



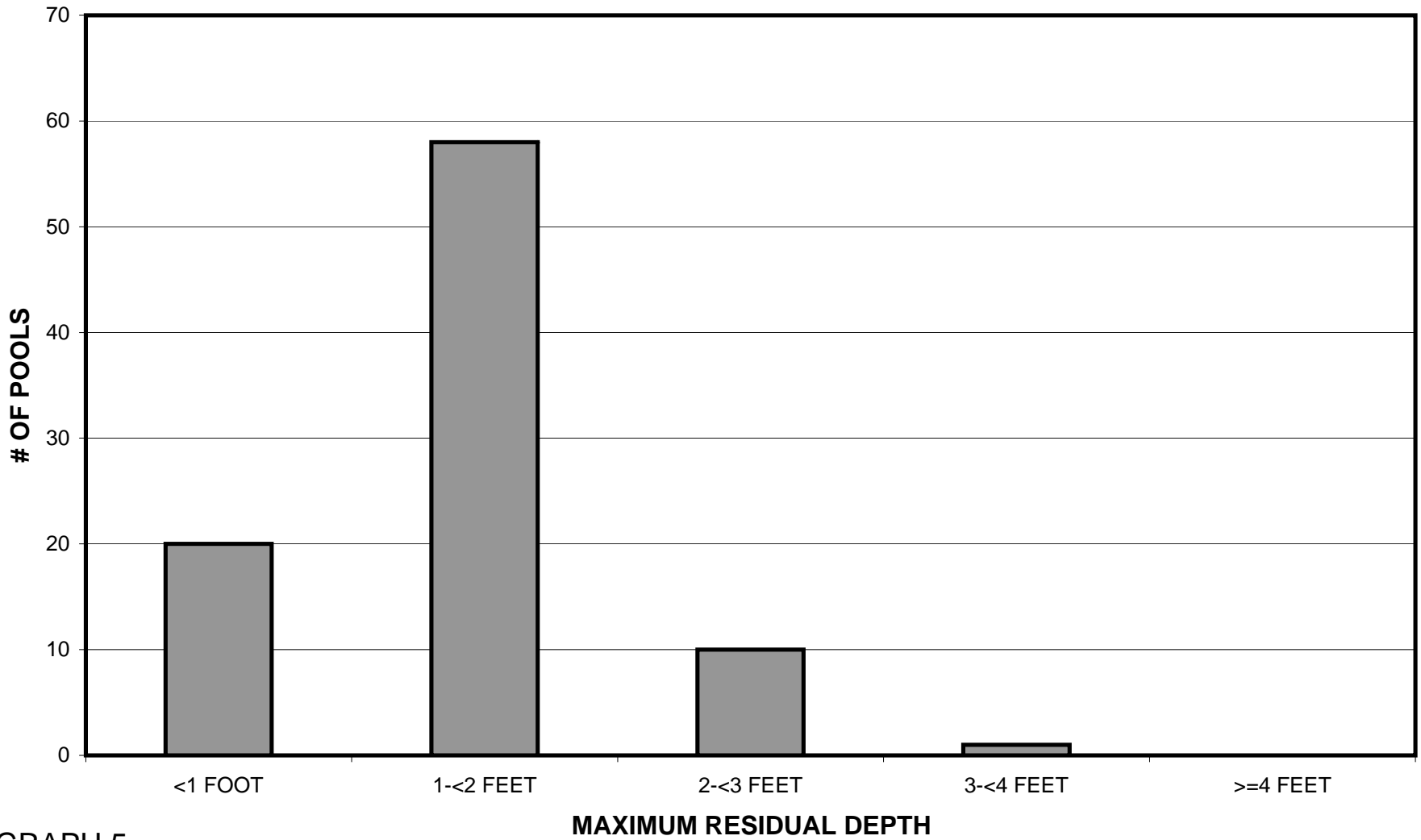
GRAPH 3

FISH CREEK 2012 POOL TYPES BY PERCENT OCCURRENCE



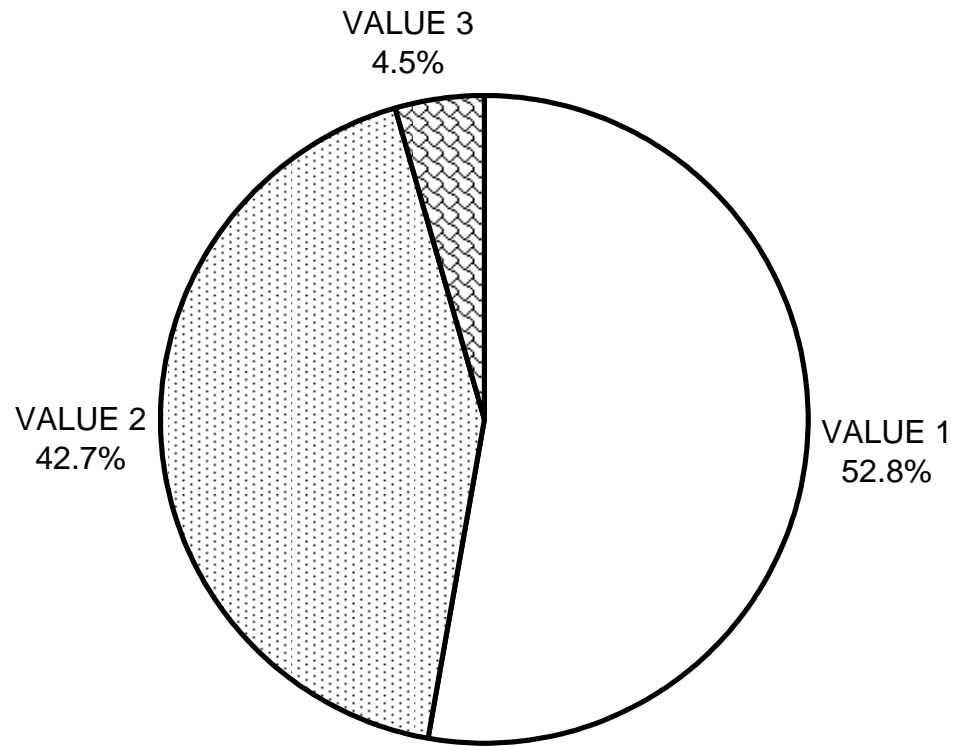
GRAPH 4

FISH CREEK 2012 MAXIMUM DEPTH IN POOLS



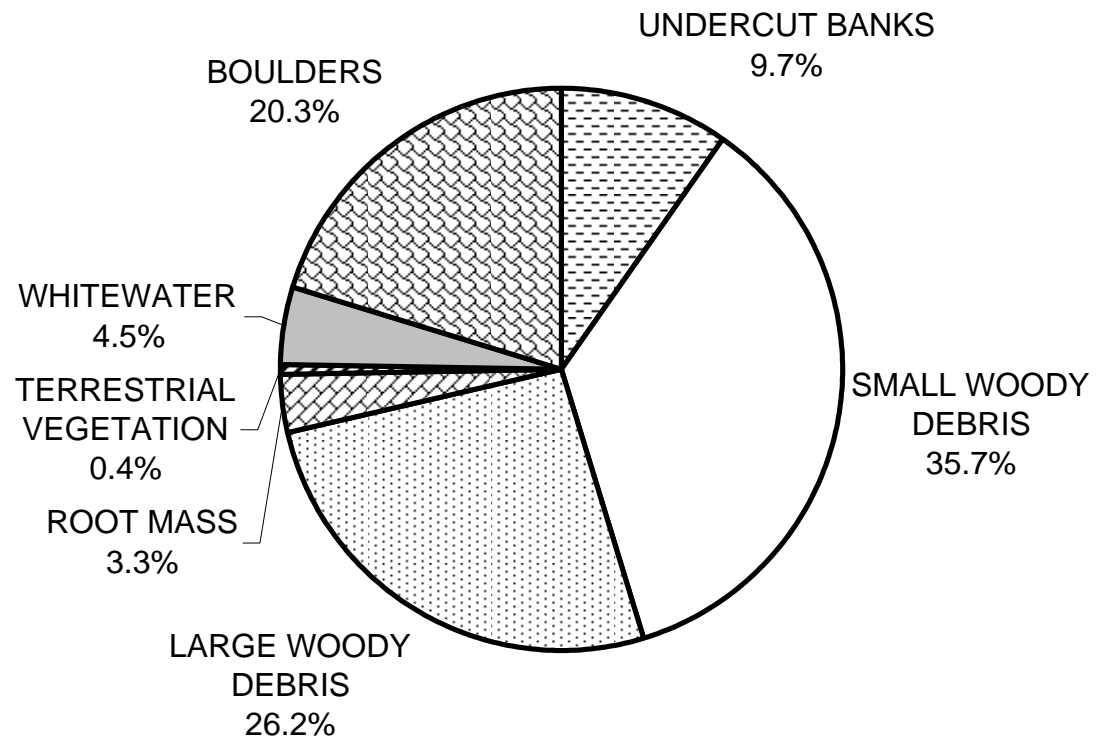
GRAPH 5

FISH CREEK 2012 PERCENT EMBEDDEDNESS



GRAPH 6

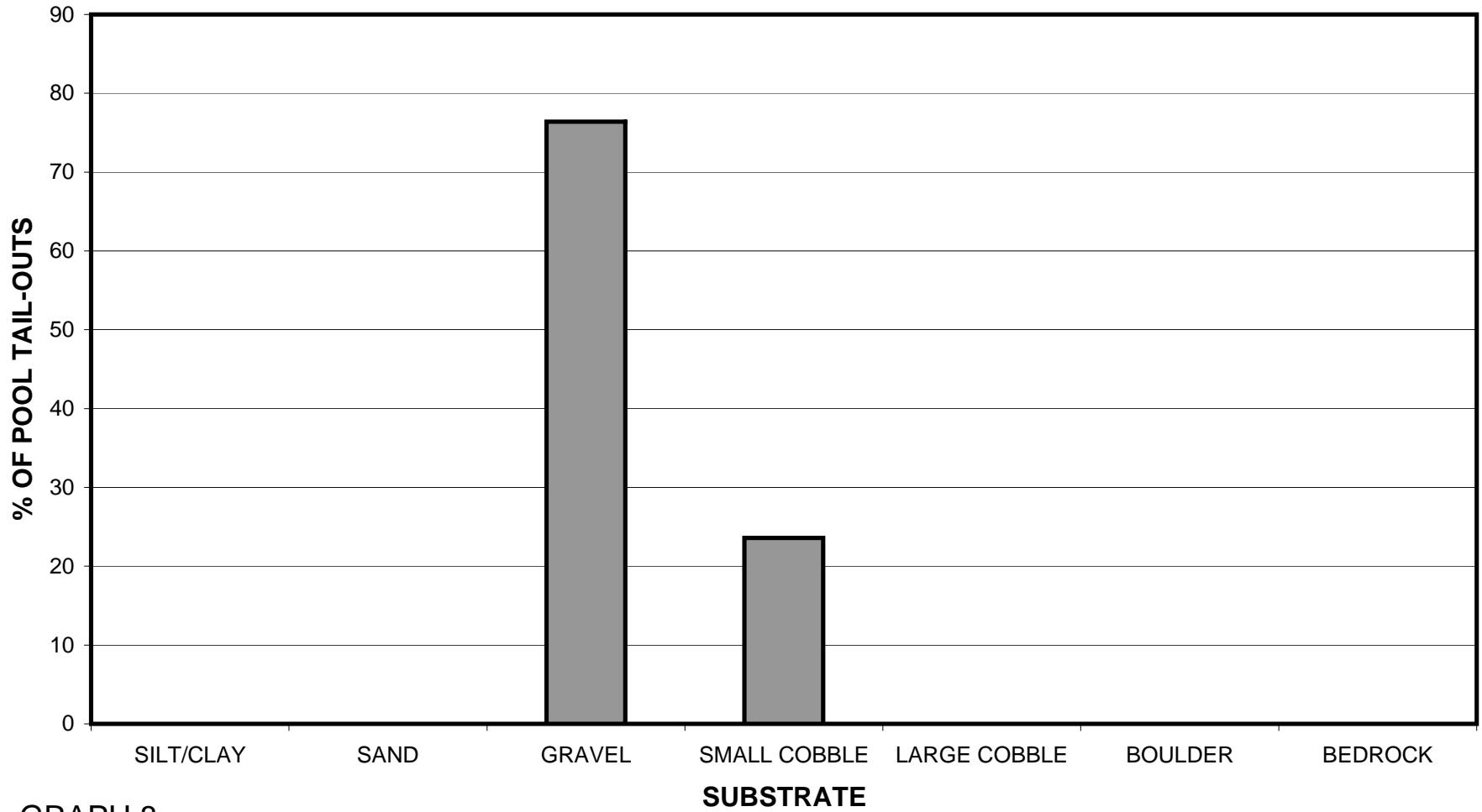
FISH CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

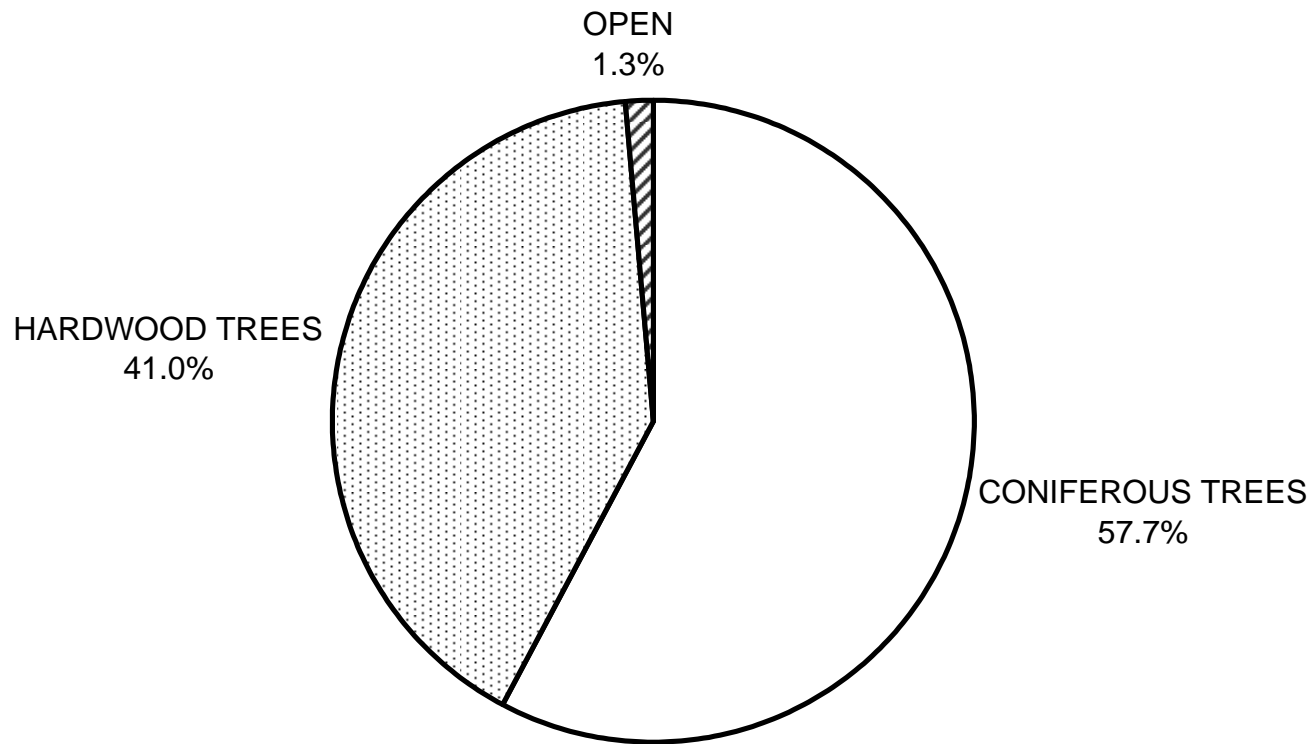
FISH CREEK 2012

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



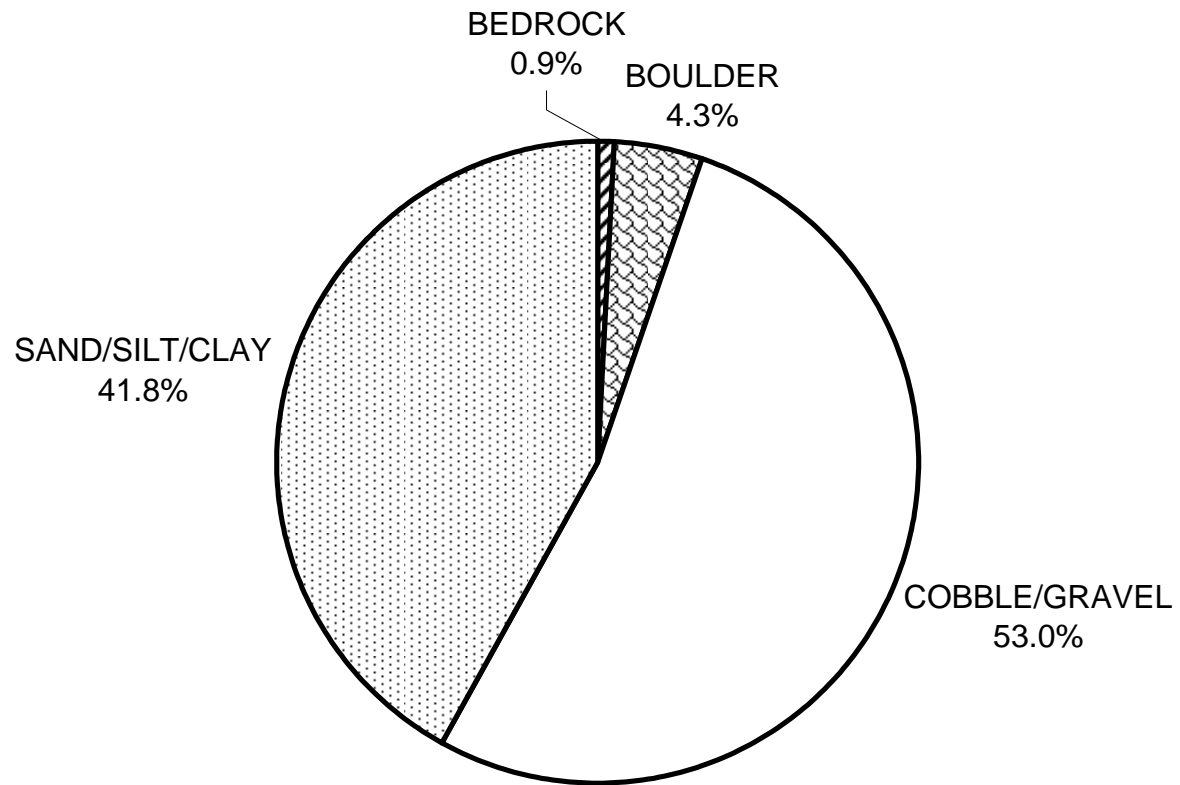
GRAPH 8

**FISH CREEK 2012
MEAN PERCENT CANOPY**



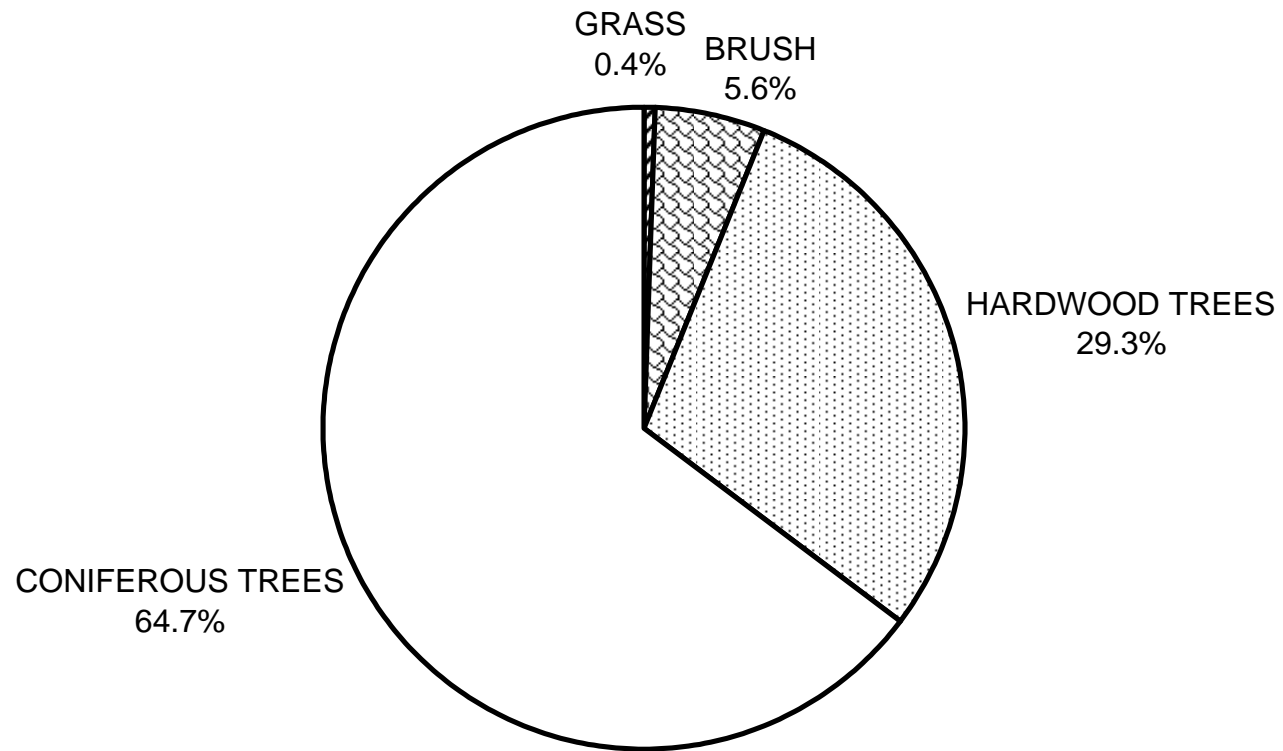
GRAPH 9

FISH CREEK 2012 DOMINANT BANK COMPOSITION IN SURVEY REACH



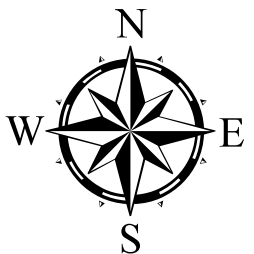
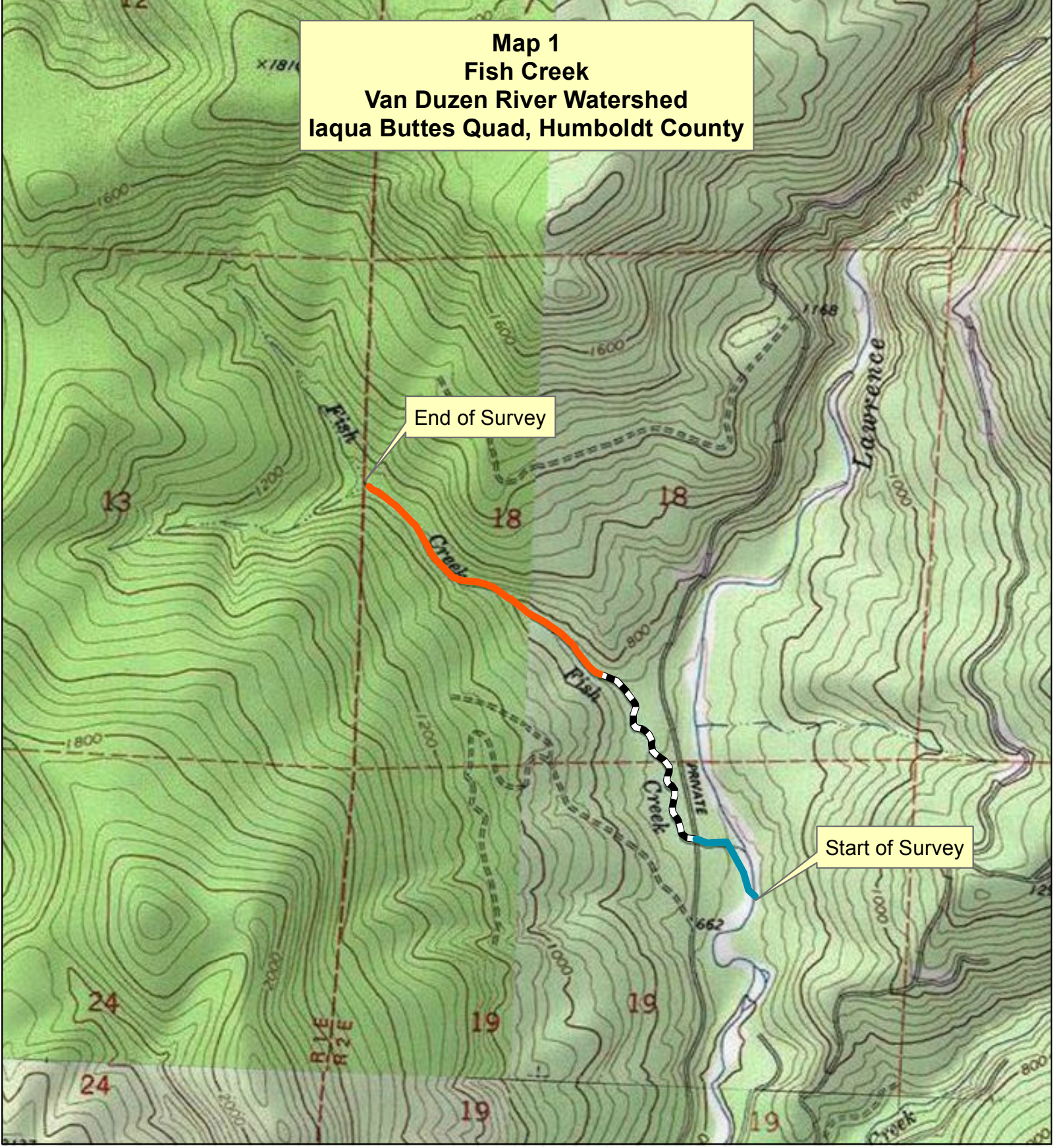
GRAPH 10




FISH CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1
Fish Creek
Van Duzen River Watershed
Iaqua Buttes Quad, Humboldt County



-  Reach 1, B4 Channel Type
-  Reach 2, G4 Channel Type
-  Reach 3, B4 Channel Type

