



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Stevens Creek

INTRODUCTION

A stream inventory was conducted October 11 to October 16, 2017 on Stevens Creek. The survey began at the confluence with Grizzly Creek and extended upstream 1.4 miles.

The Stevens Creek 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 Stevens Creek. 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 and 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

Stevens Creek, located in Humboldt County, is a tributary to Grizzly Creek, which is a tributary to Van Duzen River, which is a tributary to the Eel River which drains into the Pacific Ocean in northern California (Map 1). Stevens Creek's legal description at the confluence with Grizzly Creek is T01N R02E S01. Its location is 40.49167 degrees north latitude and 123.9056 degrees west longitude, LLID number 1239055404918. Stevens Creek is a first order stream and has approximately 2.53 miles of blue line stream according to the USGS Redcrest 7.5 minute quadrangle. Stevens Creek drains a watershed of approximately 5.4 square miles. Elevations range from about 390 feet at the mouth of the creek to 1,800 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via Highway 101 to Highway 36 east and then a left turn just before Grizzly Creek State Park and then onto Humboldt Redwood Company private roads.

METHODS

The habitat inventory conducted in Stevens Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel and Watershed Stewards Program/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the 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 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. Surveyors also take photos to document general habitat conditions, significant features (landslides, potential barriers, etc.), and end of survey (Appendix II).

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 Stevens 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". Stevens 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 Stevens 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. 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 Stevens 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 Stevens 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 Stevens Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

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

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Stevens Creek. In addition, underwater observations were made at 10 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 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 Stevens Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness

- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of October 11 to October 16, 2017 was conducted by Ryan Bernstein (CDFW) and Ted Masters (WSP). The total length of the stream surveyed was 7,481 feet.

Stream flow measurement of 0.27 cfs was recorded on October 17, 2017 near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter.

Stevens Creek is a F3 channel type for 5,346 feet of the stream surveyed (Reach 1), and an A3 channel type for 2,146 feet of the stream surveyed (Reach 2). F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 48° to 57° Fahrenheit. Air temperatures ranged from 52° to 64° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% pool units, 31% flatwater units, 21% riffle units, 14% dry units, and 1% no survey units (Graph 1). Based on total length of Level II habitat types there were 42% flatwater units, 27% pool units, 17% dry units, 13% riffle units, and 1% no survey units (Graph 2).

Five Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 33%, low gradient riffle units, 21%, and run units, 16% (Graph 3). Based on percent total length, step run units made up 29%, mid-channel pool units 27%, and run units 17%.

A total of 52 pools were identified (Table 3). Main channel pools were the most frequently encountered at 100% (Graph 4), and comprised 100% 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. Twenty-two of the 52 pools (42%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 52 pool tail-outs measured, 25 had a value of 1 (48.1%), 22 had a value of 2 (42.3%), 3 had a value of 3 (5.8%), and 2 had a value of 5 (3.8%) (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 6, flatwater habitat types had a mean shelter rating of 14, and pool habitats had a mean shelter rating of 37 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 37 (Table 3).

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

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 pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 40% of pool tail-outs.

The mean percent canopy density for the surveyed length of Stevens Creek was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 54% and 46%, respectively. Graph 9 describes the mean percent canopy in Stevens Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 82% sand/silt/clay, 12% bedrock, and 6% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 51% of the units surveyed. Additionally, 49% of the units surveyed had deciduous as the dominant vegetation type, and 1% had grass as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at ten sites (all mid-channel pools) for species composition and distribution in Stevens Creek on October 16, 2017 (Table A). The sites were sampled by Ryan Bernstein (CDFW) and Ted Masters (WSP). All snorkel surveys were conducted on the first reach of Stevens Creek.

In Reach 1, which comprised the first 5,346 feet of stream, ten sites were sampled. The reach sites yielded 46 young-of-the-year steelhead/rainbow trout (SH/RT), one age 1+ SH/RT, and one age 2+ SH/RT.

During the survey, the upstream-most observation of juvenile steelhead trout occurred at 40.50354° north latitude, -123.91018° west longitude, approximately 4,934 feet upstream from the confluence with Grizzly Creek (Map 1). No coho salmon were observed during the biological or habitat inventory.

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Table A. Summary of results for a fish composition and distribution survey within Stevens Creek, October 16, 2017.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 1: F3 Channel Type										
10/16/17	1	003	Pool	43	2	0	0	0	0	
	2	004	Pool	163	3	0	0	0	0	
	3	006	Pool	324	11	0	0	0	0	
	4	008	Pool	403	9	1	0	0	0	
	5	010	Pool	475	5	0	0	0	0	
	6	012	Pool	590	5	0	1	0	0	
	7	015	Pool	722	3	0	0	0	0	
	8	017	Pool	843	4	0	0	0	0	
	9	019	Pool	885	2	0	0	0	0	
	10	089	Run	4,934	2	0	0	0	0	

DISCUSSION

Stevens Creek is a F3 channel type for 5,346 feet of the stream surveyed (Reach 1) and an A3 channel type for 2,146 feet of the stream surveyed (Reach 2). The suitability of F3 and A3 channel types for fish habitat improvement structures is as follows: F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover; A3 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days October 11 to October 16, 2017, ranged from 48° to 57° Fahrenheit. Air temperatures ranged from 52° to 64° Fahrenheit. This is a good 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.

Flatwater habitat types comprised 42% of the total length of this survey, riffles 13%, and pools 27%. Twenty-two of the 52 (42%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Forty-seven of the 52 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. Two of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Forty-seven of the 52 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 37. The shelter rating in the flatwater habitats is 14. 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 Stevens Creek. Small woody debris is the dominant cover type in pools followed by boulders. Log and rootwad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. Reach 1 had a canopy density of 94%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 100% and 100%, 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

Stevens Creek should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in Stevens Creek. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

- 1) Where feasible, 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.
- 2) 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.
- 3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.
- 4) There are several log debris accumulations present on Stevens Creek that are retaining large quantities of fine sediment and potentially hindering fish passage. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

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 of Grizzly Creek. The channel type is a F3.
324	0007.00	The creek is out of the influence of the confluence with Grizzly Creek.
685	0015.00	There is riprap along the right bank.
722	0016.00	Bridge #1 is the crossing for an unnamed road, and is 30' high x 20' wide x 80' long. It is an automobile bridge made of steel and is not a barrier to salmonids. There is riprap on the left and right banks.
1758	0035.00	R.B Landslide 40'x 40'.
2410	0047.00	Log debris accumulation (LDA) #1 is 11.5' high, 71' wide, and 26' long and contains 14 pieces of large woody debris (LWD). Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 70' wide, 44' long and 2.4' deep. The sediment ranges in size from silt to gravel. The LDA is a not barrier to salmonids. Fish were observed above the LDA.
2826	0049.00	YOY.
2886	0051.00	There was heavy logging activity starting at habitat unit 051 and continuing up stream.
4852	0088.00	LDA #2 is 4.5' high, 23' wide, 5' long and contains 4 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 23' wide, 8' long and 1' deep. The sediment ranges in size from gravel to boulders. The LDA is not a possible barrier to. Fish were observed above the LDA.
4929	0090.00	LDA #3 is 11' high, 45' wide, 80' long and contains 20 pieces of LWD. Water does not flow through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 45' wide, 30' long and 5' deep. The sediment ranges in size from silt to gravel. The LDA is a possible barrier to juvenile salmonids as water does not flow through the LDA. The LDA is not a possible barrier to adult salmonids. Fish were observed above the LDA.
5039	0092.00	LDA #4 is 13' high, 45' wide, 11' long and contains 15 pieces of LWD. Water does not flow through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 45' wide, 15' long and 4' deep. The sediment ranges in size from silt to gravel. The

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LDA is a possible barrier to salmonids as it is 13' high. Fish were not observed above the LDA.

5474	0101.00	There is erosion on the right bank that measures 47' long and 20' high.
5535	0103.00	LDA #5 is 7.5' high, 24' wide, 12' long and contains 25 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 20' wide, 10' long and 1' deep. The sediment ranges in size from large cobble to boulders. The LDA is not a possible barrier to salmonids. Fish were not observed above the LDA.
5775	0112.00	LDA #6 is 5' high, 30' wide, 2' long and contains 1 pieces of LWD. Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 28' wide, 15' long and 0.5' deep. The sediment ranges in size from silt to gravel. The LDA is not a possible barrier to salmonids. Fish were not observed above the LDA.
6242	0123.00	There is erosion on the right bank that measures 40' long x 30' high.
6943	0148.00	LDA #7 is 8' high, 31' wide, 48' long and contains 30 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 27' wide, 18' long and 3' deep. The sediment ranges in size from sand to cobble. The LDA is not a possible barrier to salmonids. Fish were not observed above the LDA.

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.

REPORT CONTACT INFORMATION

California Department of Fish and Wildlife
Coastal Watershed Planning and Assessment Program
1487 Sandy Prairie ct., Suite A
Fortuna, CA 95540
www.coastalwatersheds.ca.gov

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 - Rootwad 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 }

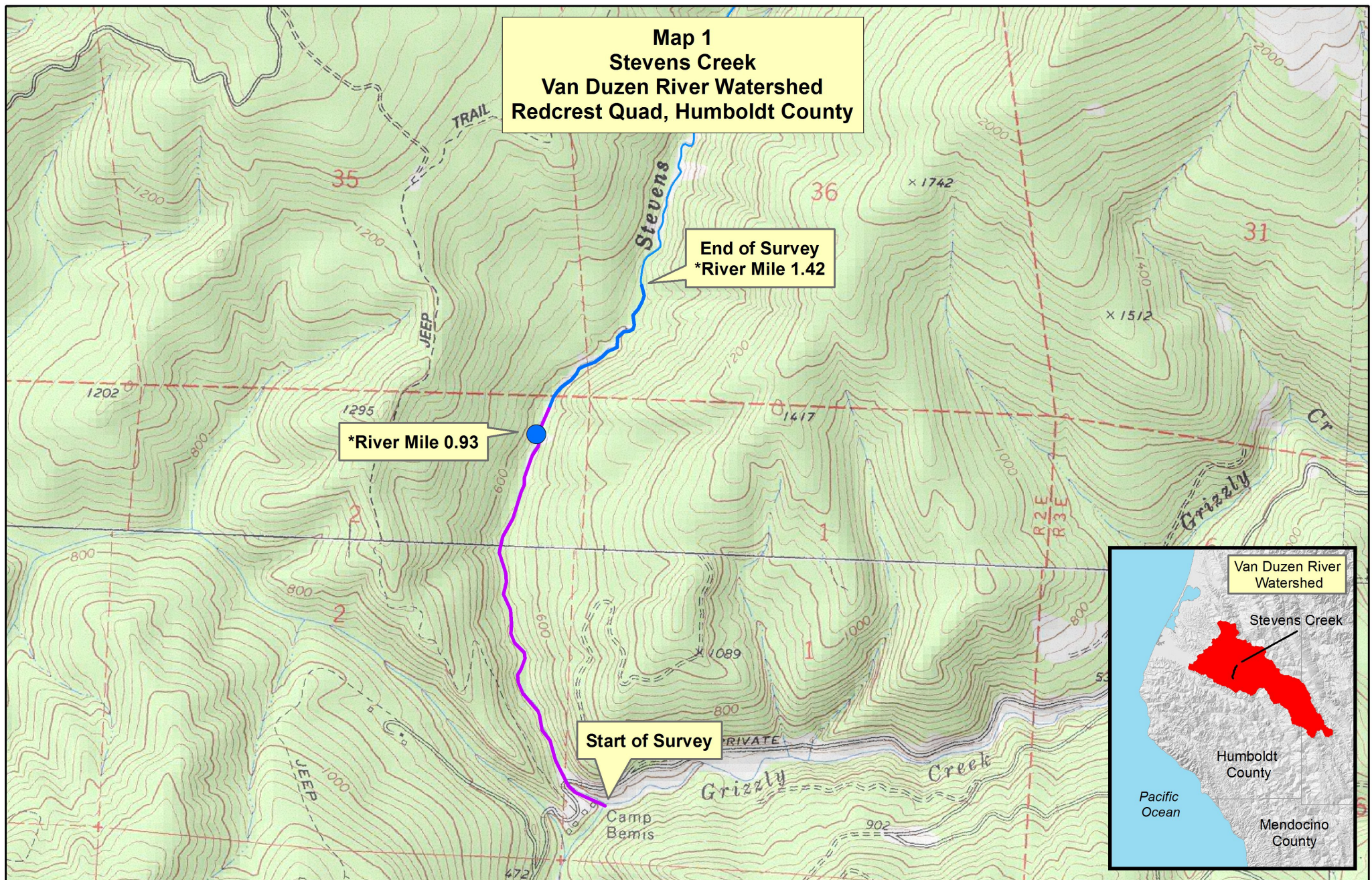
BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Rootwad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

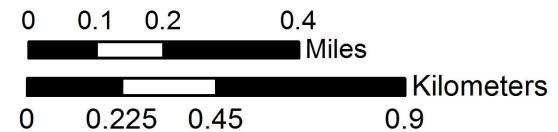
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

Map 1
Stevens Creek
Van Duzen River Watershed
Redcrest Quad, Humboldt County



- Reach 1: F3 Channel Type
- Reach 2: A3 Channel Type
- Stevens Creek

● Last observed juvenile steelhead trout



APPENDIX I

TABLES AND GRAPHS

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0

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
22	0	DRY	13.8	59	1302	17.4									
49	8	FLATWATER	30.6	64	3143	42.0	6.5	0.4	0.9	265	12994	119	5838		14
2	0	NOSURVEY	1.3	30	59	0.8									
53	52	POOL	33.1	38	2006	26.8	11.0	0.9	1.9	410	21728	514	26718	450	37
34	5	RIFFLE	21.3	29	971	13.0	4.6	0.2	0.4	79	2692	21	699		6
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
160	65				7481					37414			33254		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

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 (%)
34	5	LGR	21.3	29	971	13.0	5	0.2	0.6	79	2692	21	699		6	94
26	6	RUN	16.3	36	942	12.6	7	0.4	2	228	5932	103	2673		11	95
23	2	SRN	14.4	96	2201	29.4	5	0.5	0.9	376	8654	168	3867		25	99
53	52	MCP	33.1	38	2006	26.8	11	0.9	4.4	410	21728	514	26718	450	37	94
22	0	DRY	13.8	59	1302	17.4										
2	0	NS	1.3	30	59	0.8										

Total Units
160

Total Units Fully Measured
65

Total Length (ft.)
7481

Total Area (sq.ft.)
39006

Total Volume (cu.ft.)
33956

Table 3 - Summary of Pool Types

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

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
53	52	MAIN	100	38	2006	100	11.0	0.9	410	21728	450	23377	37

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
53	52	2006	21728	23377

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

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

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
52	MCP	100	3	6	27	52	16	31	4	8	2	4

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
52	3	6	27	52	16	31	4	8	2	4

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Stevens Creek				LLID: 1239055404918			Drainage: Van Duzen River				
Survey Dates: 10/11/2017 to 10/16/2017				Dry Units: 22							
Confluence Location:		Quad: OWL CREEK		Legal Description:		T01NR02ES01		Latitude: 40:29:30.0N		Longitude: 123:54:20.0W	
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
34	4	LGR	0	0	0	0	0	0	0	100	0
34	4	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
26	7	RUN	0	0	0	30	0	0	0	70	0
23	2	SRN	0	40	0	0	0	0	0	60	0
49	9	TOTAL FLAT	0	16	0	18	0	0	0	66	0
53	53	MCP	0	40	11	0	0	0	1	29	19
53	53	TOTAL POOL	0	40	11	0	0	0	1	29	19
2	0	NS	0	0	0	0	0	0	0	0	0
160	66	TOTAL	0	38	10	1	0	0	1	33	17

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Dry Units: 22

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

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
34	5	LGR	0	0	0	20	40	40	0
26	7	RUN	0	0	29	0	57	14	0
23	2	SRN	0	0	0	0	50	50	0
53	53	MCP	13	2	42	11	19	4	9

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	46	54	0	100	100

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: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Survey Length (ft.): 7481

Main Channel (ft.): 7481

Side Channel (ft.): 0

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01 Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

Summary of Fish Habitat Elements By Stream Reach**STREAM REACH: 1**

Channel Type: F3

Canopy Density (%): 94.1

Pools by Stream Length (%): 26.8

Reach Length (ft.): 7481

Coniferous Component (%): 45.6

Pool Frequency (%): 33.1

Riffle/Flatwater Mean Width (ft.): 5.8

Hardwood Component (%): 54.4

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Coniferous Trees

< 2 Feet Deep: 58

Range (ft.): 12 to 40

Vegetative Cover (%): 100.0

2 to 2.9 Feet Deep: 31

Mean (ft.): 24

Dominant Shelter: Small Woody Debris

3 to 3.9 Feet Deep: 8

Std. Dev.: 7

Dominant Bank Substrate Type: Sand/Silt/Clay

>= 4 Feet Deep: 4

Base Flow (cfs.): 0.3

Occurrence of LWD (%): 9

Mean Max Residual Pool Depth (ft.): 1.9

Water (F): 48 - 57 Air (F): 52 - 64

LWD per 100 ft.:

Mean Pool Shelter Rating: 37

Dry Channel (ft): 1302

Riffles: 1

Pools: 6

Flat: 2

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 50 Sm Cobble: 40 Lg Cobble: 4 Boulder: 4 Bedrock: 0

Embeddedness Values (%): 1. 48.1 2. 42.3 3. 5.8 4. 0.0 5. 3.8

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Stevens Creek

LLID: 1239055404918

Drainage: Van Duzen River

Survey Dates: 10/11/2017 to 10/16/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES01

Latitude: 40:29:30.0N

Longitude: 123:54:20.0W

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	7	9	11.9
Boulder	0	0	0.0
Cobble / Gravel	3	5	6.0
Sand / Silt / Clay	57	53	82.1

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	0.7
Brush	0	0	0.0
Hardwood Trees	33	32	48.5
Coniferous Trees	33	35	50.7
No Vegetation	0	0	0.0

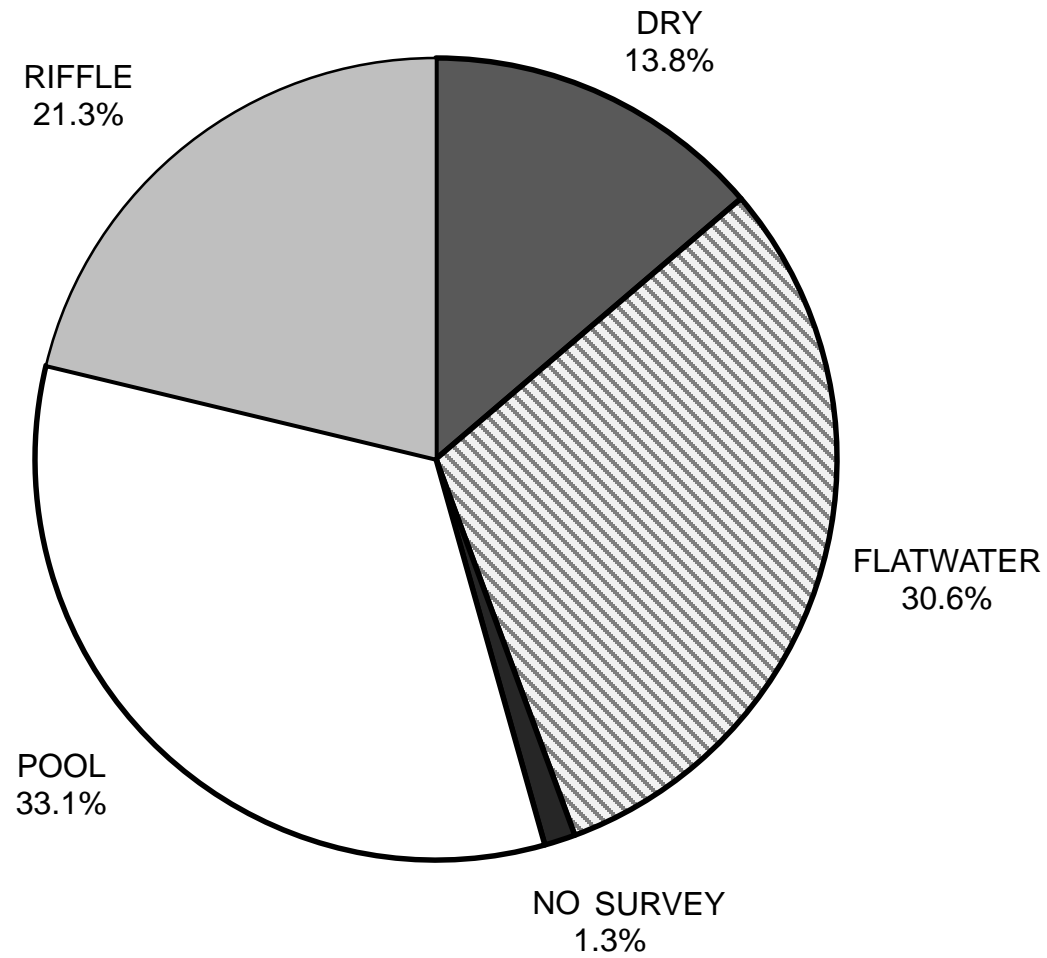
Total Stream Cobble Embeddedness Values: 2

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

StreamName: Stevens Creek LLID: 1239055404918 Drainage: Van Duzen River
Survey Dates: 10/11/2017 to 10/16/2017
Confluence Location: Quad: OWL CREEK Legal Description: T01NR02ES01 Latitude: 40:29:30.0N Longitude: 123:54:20.0W

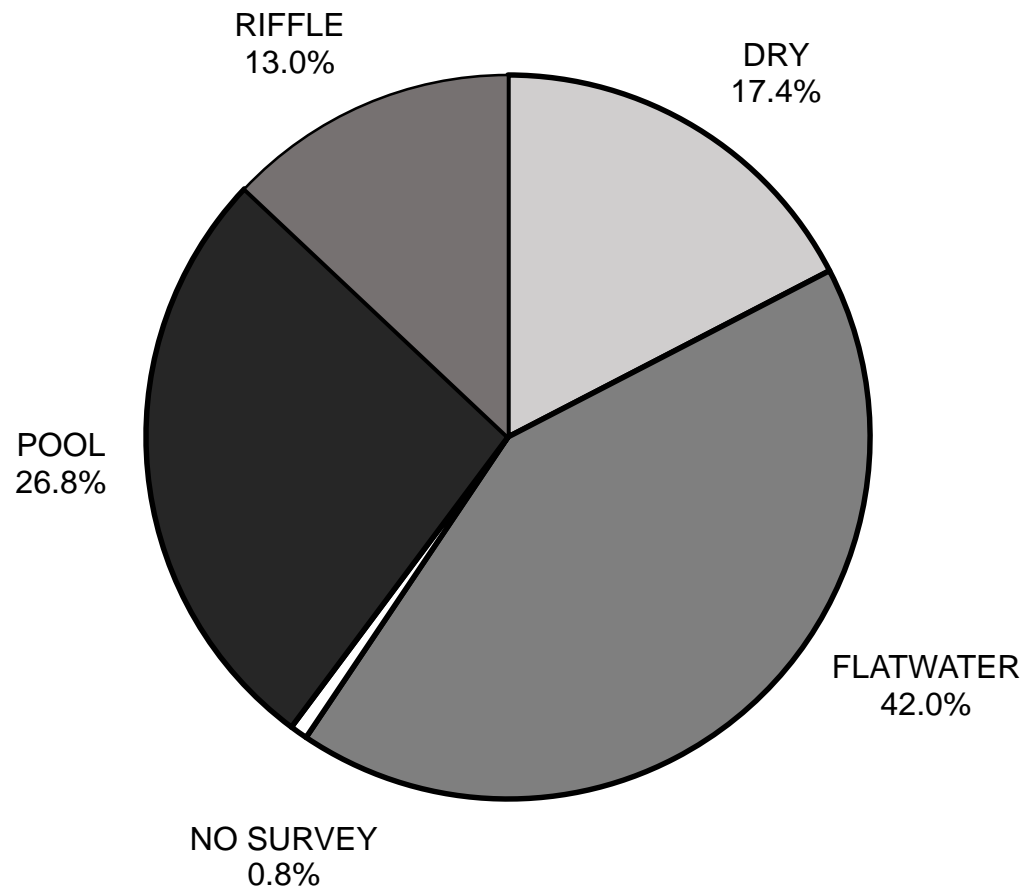
	Riffles	Flatwater	Pools
UNDERCUT BANKS(%)	0	0	0
SMALL WOODY DEBRIS (%)	0	16	40
LARGE WOODY DEBRIS (%)	0	0	11
ROOT MASS (%)	0	18	0
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	100	66	29
BEDROCK LEDGES (%)	0	0	19

STEVENS CREEK 2017 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

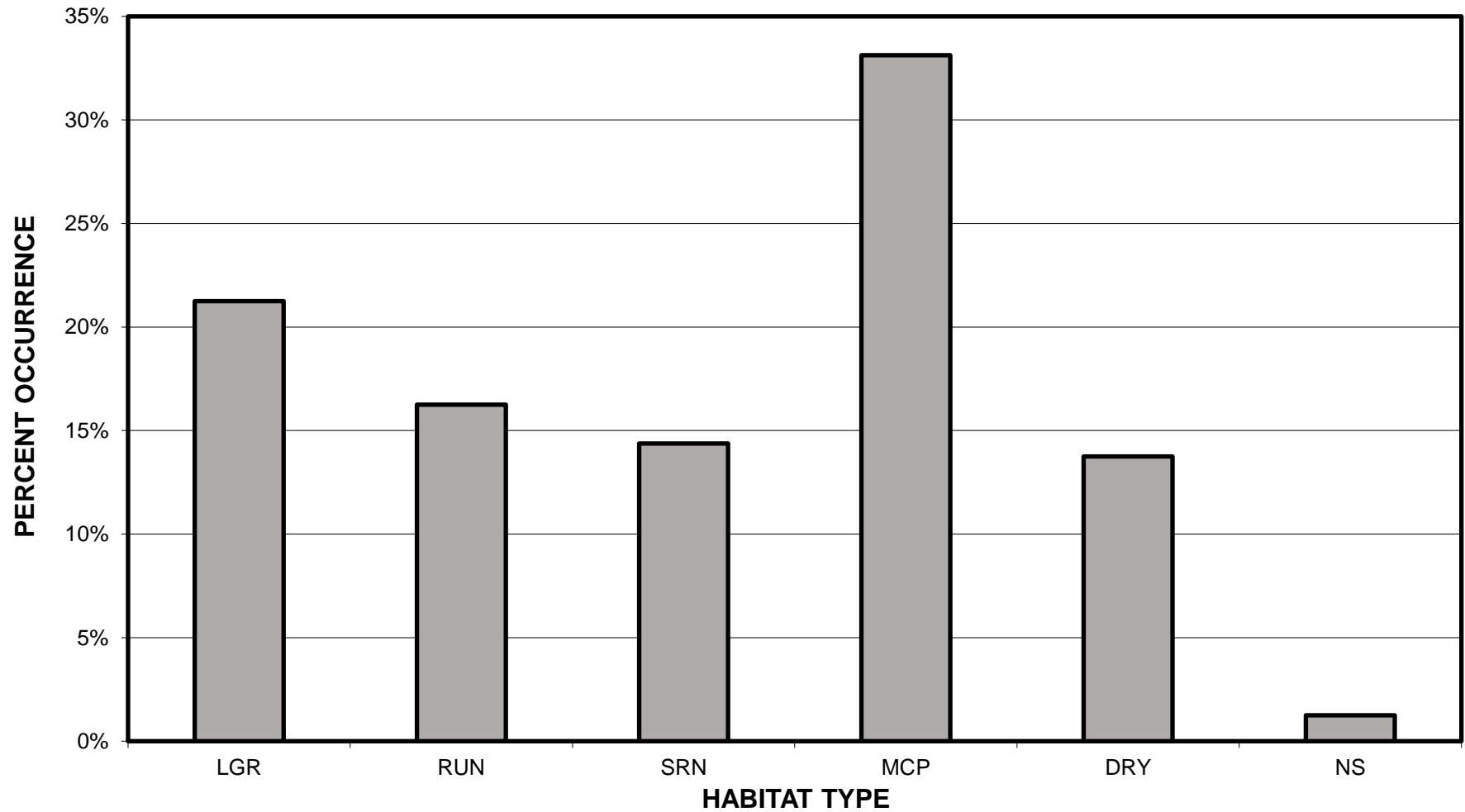
STEVENS CREEK 2017 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

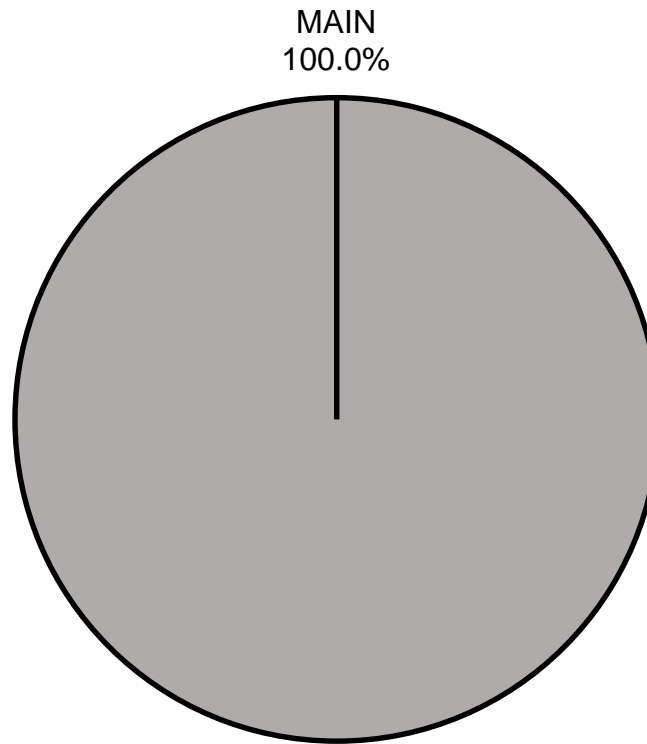
STEVENS CREEK 2017

HABITAT TYPES BY PERCENT OCCURRENCE



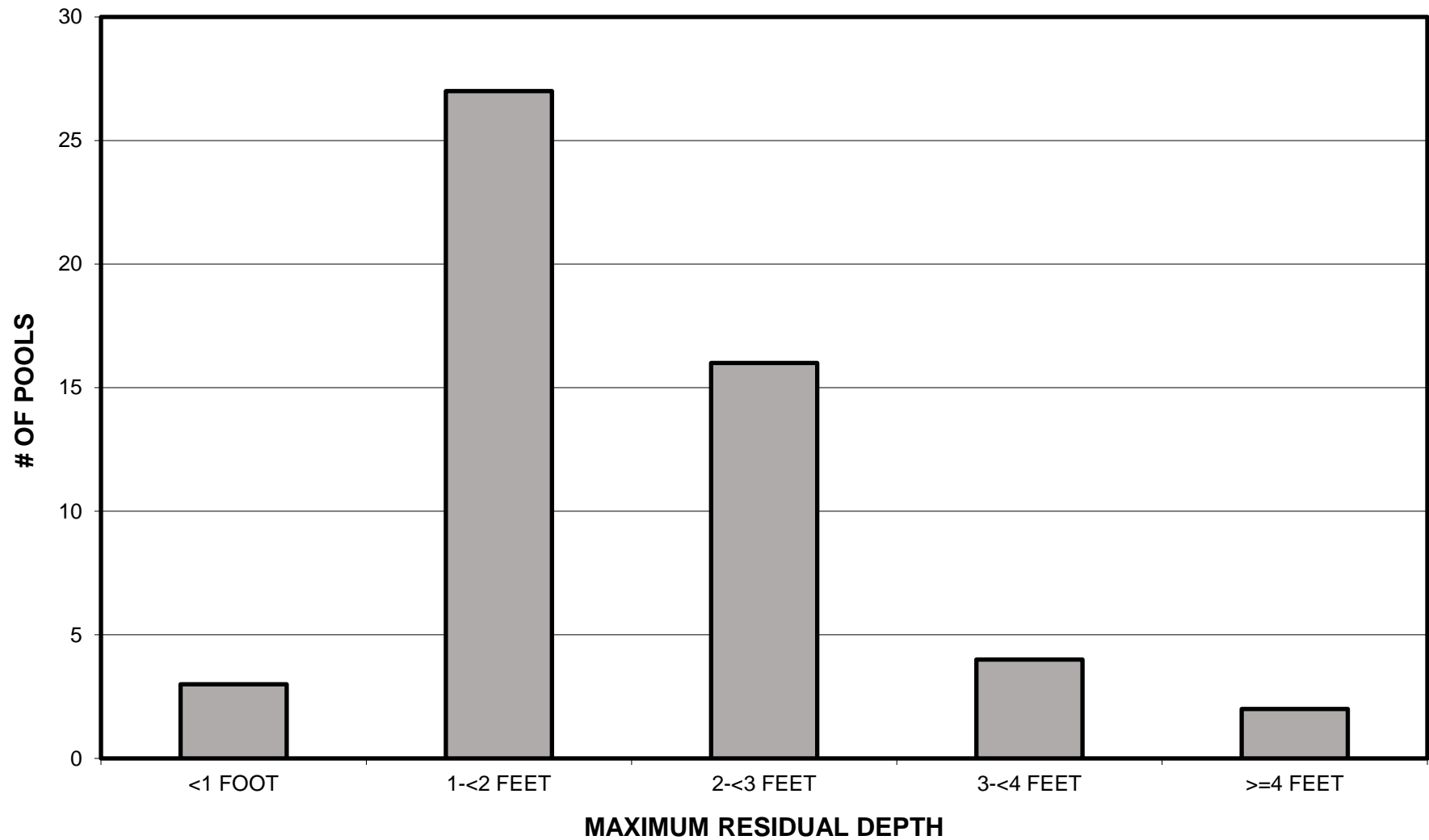
GRAPH 3

**STEVENS CREEK 2017
POOL TYPES BY PERCENT OCCURRENCE**



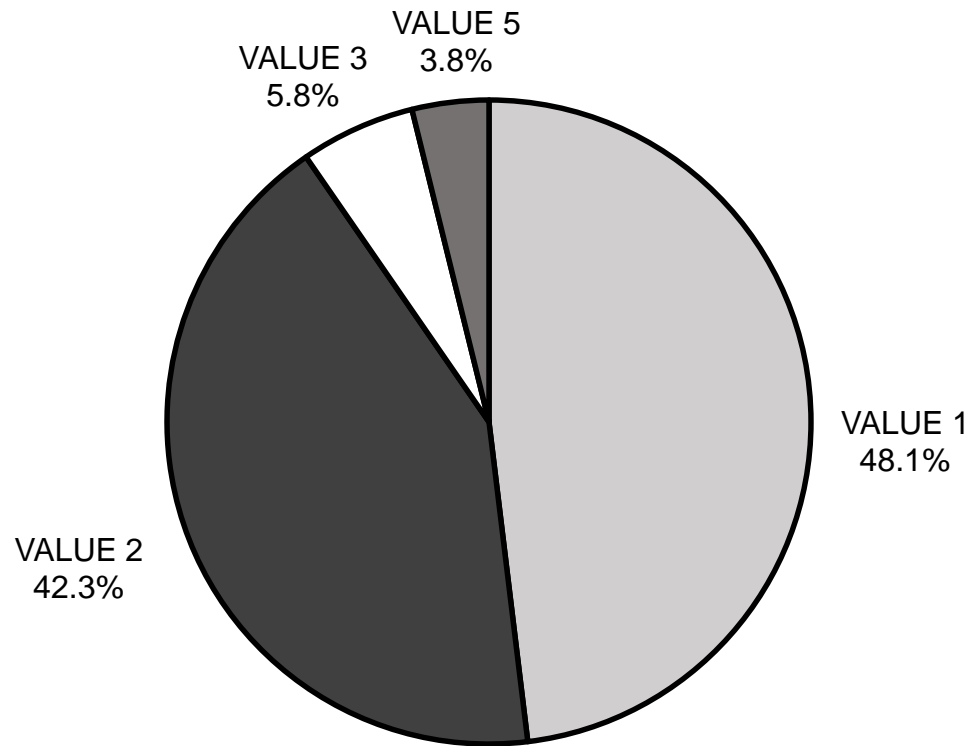
GRAPH 4

STEVENS CREEK 2017 MAXIMUM DEPTH IN POOLS



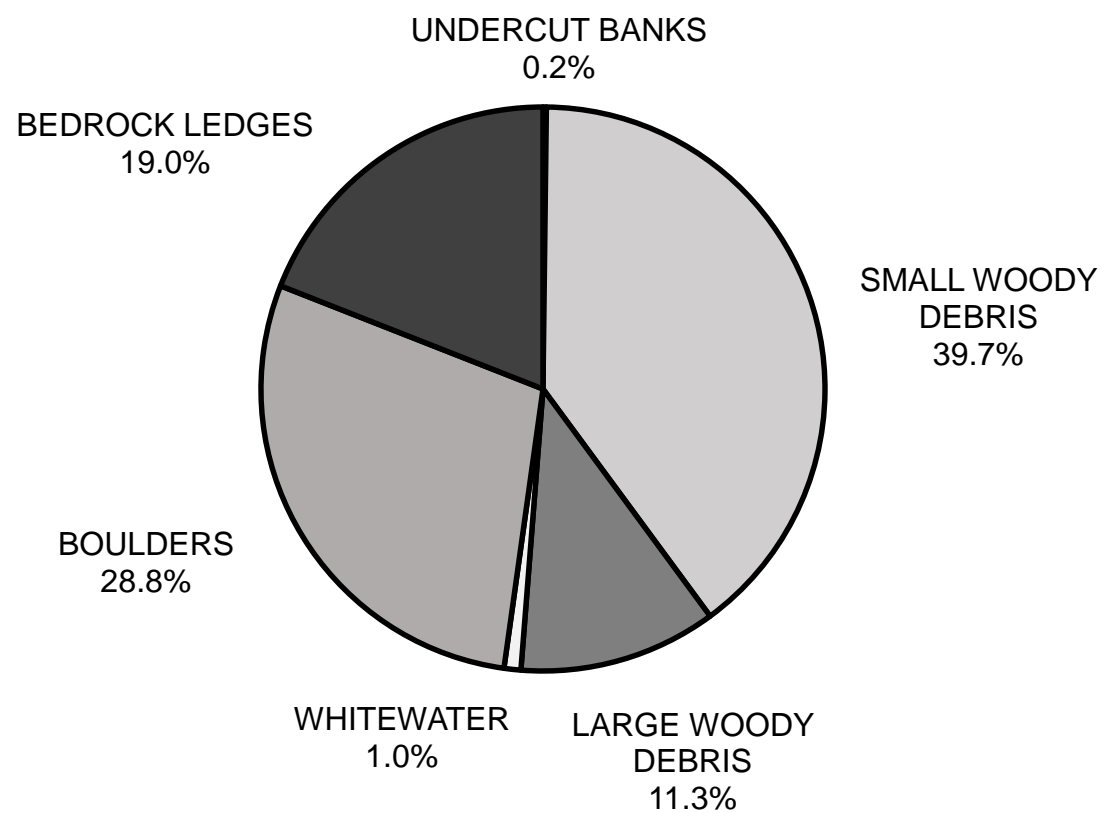
GRAPH 5

STEVENS CREEK 2017 PERCENT EMBEDDEDNESS



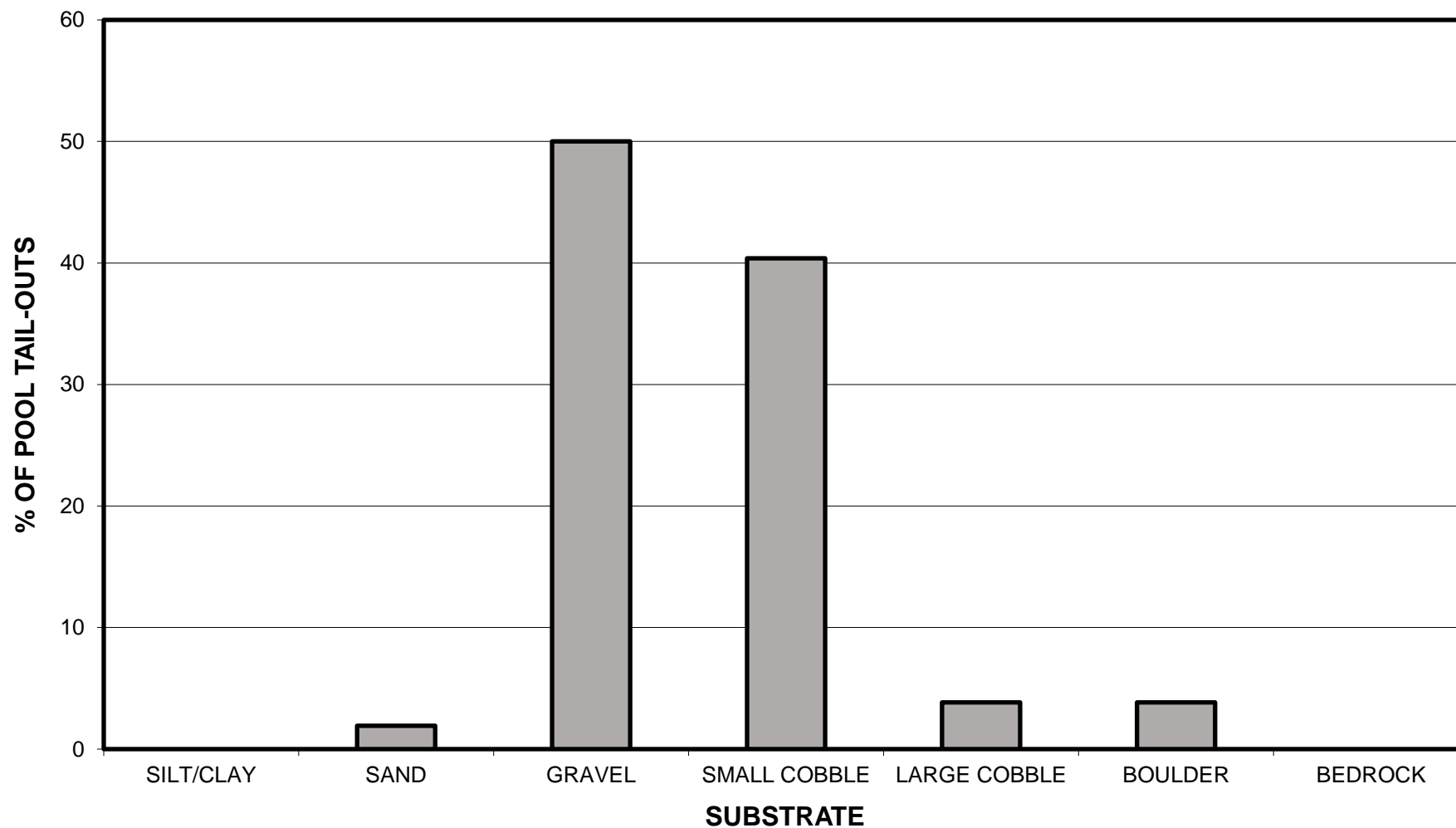
GRAPH 6

STEVENS CREEK 2017 MEAN PERCENT COVER TYPES IN POOLS



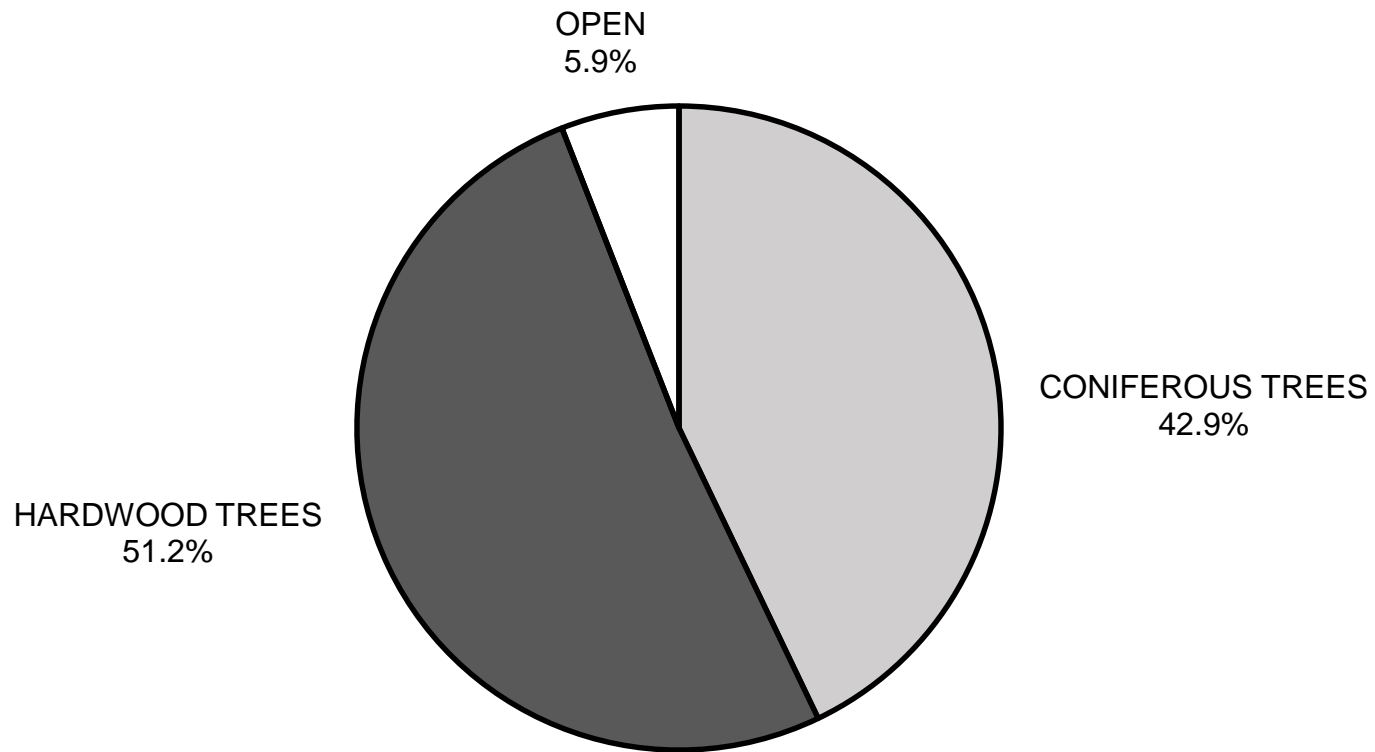
GRAPH 7

STEVENS CREEK 2017 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



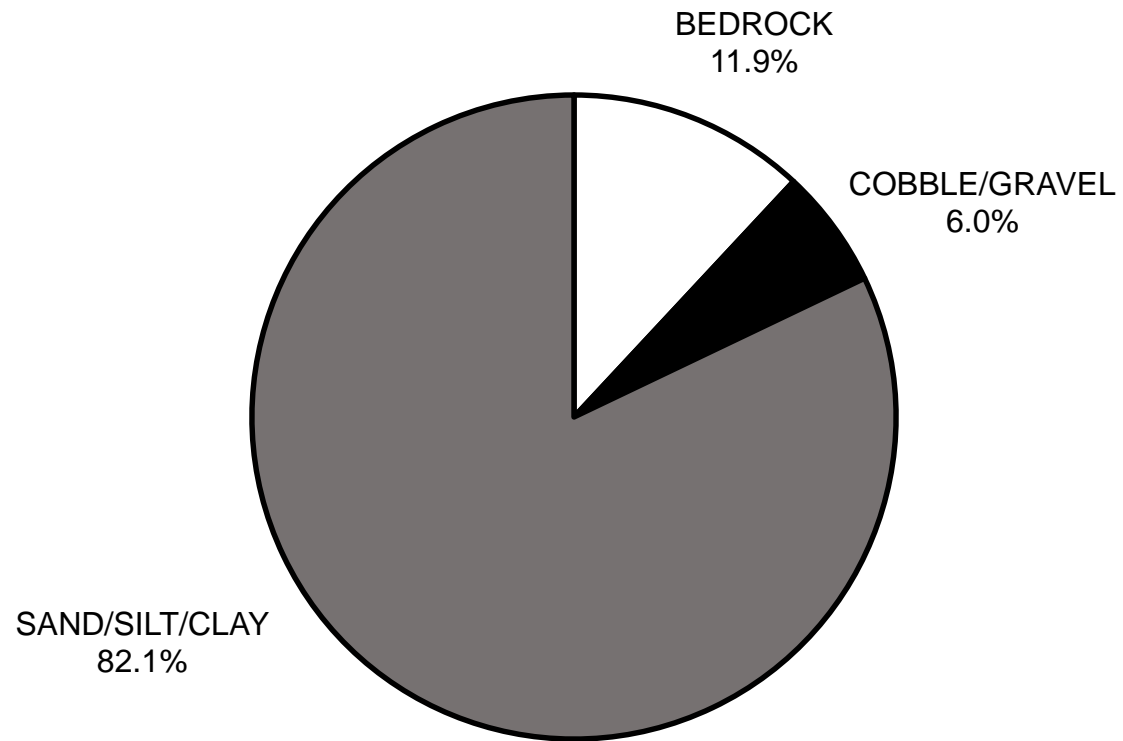
GRAPH 8

STEVENS CREEK 2017 MEAN PERCENT CANOPY



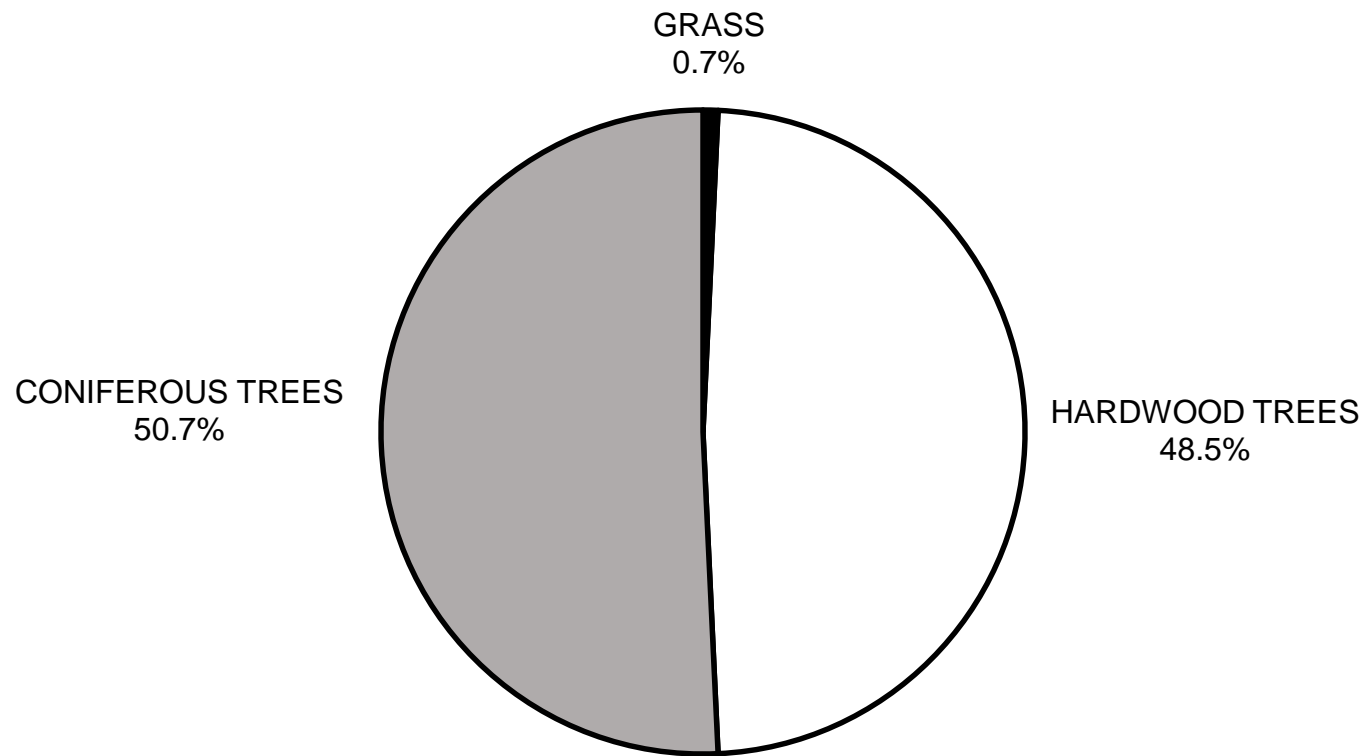
GRAPH 9

**STEVENS CREEK 2017
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

STEVENS CREEK 2017
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

APPENDIX II

STREAM INVENTORY PHOTOS



Photo 1: Start of survey at the mouth of Stevens Creek, facing upstream from the confluence with Grizzly Creek. (Photo taken 10/11/17)



Photo 2: Dry channel above large debris accumulation #1 at habitat unit #047, 2,440' upstream from start of survey. Facing upstream. (Photo taken 10/11/17)



Photo 3: Large debris accumulation #2 at habitat unit #088, 5,934' upstream from start of survey. Facing upstream. (Photo taken 10/11/17)