



## **CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE**

### **STREAM INVENTORY REPORT**

#### **Grizzly Creek**

#### INTRODUCTION

A stream inventory was conducted from October 10 to October 24, 2017 Grizzly Creek. The survey began at the confluence with Van Duzen River and extended upstream 3.2 miles.

The Grizzly 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 Grizzly 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. This report was finalized in April, 2018.

#### WATERSHED OVERVIEW

Grizzly Creek, located in Humboldt County, is a tributary to the Van Duzen River, which is a tributary to the Eel River, which is a tributary to the Pacific Ocean in northern California (Map 1). Grizzly Creek's legal description at the confluence with Van Duzen River is T01N R02E S12. Its location is 40.48611° north latitude and -123.90619° west longitude, LLID number 1239050404861. Grizzly Creek is a second order stream and has approximately 5.92 miles of blue line stream according to the USGS Redcrest 7.5 minute quadrangle. Grizzly Creek drains a watershed of approximately 19.1 square miles. Elevations range from about 350 feet at the mouth of the creek to 2,400 feet in the headwater areas. Redwood forest dominates the watershed. The lower watershed is in Grizzly Creek State Park while the remainder of the watershed is privately owned and managed for timber production. Vehicle access exists via a private road, as well as mouth access through Grizzly Creek State Park off Highway 36, approximately 17 miles east of the Highway 101 junction.

#### METHODS

The habitat inventory conducted in Grizzly Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Program (WSP) members and California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by 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 Grizzly 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 hand level, hip chain, tape measure, and a stadia rod.

### 3. Temperatures:

Water and air temperatures are measured and recorded at every tenth habitat unit using a hand-held thermometer. Both temperatures are taken in degrees (°) Fahrenheit and the time of the measurement is also recorded. Air temperatures are recorded within one foot of the water surface, while water temperatures are recorded (where possible) in flowing water within the habitat unit.

### 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". Grizzly 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 Grizzly 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 unsuitable 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 then classified according to a list of nine cover types. In Grizzly 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 by multiplying the qualitative shelter value by the percent of the unit covered. 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 Grizzly 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 Grizzly 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 Grizzly Creek. In addition, underwater mask and snorkel observations were made at ten 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 Grizzly 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 IN APPENDIX I \*

The habitat inventory of October 10 to October 24, 2017, was conducted by Nicole Bejar (CDFW), Ellen Hensel (WSP), and Ted Masters (WSP). The total length of the stream surveyed was 16,850 feet with an additional 140 feet of side channel.

Stream flow measurement of 0.36 cfs was recorded on October 16, 2017, near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter.

Grizzly Creek is a F4 channel type for the first 8,421 feet of the stream surveyed (Reach 1), a B2 channel type for next 7,295 feet of the stream surveyed (Reach 2), and an A2 channel type for the remaining 1,274 feet of the stream surveyed (Reach 3). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and boulder-dominant substrates. A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 44° to 53° Fahrenheit. Air temperatures ranged from 40° to 64° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 30% flatwater units, 27% riffle units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 41% pool units, 37% flatwater units, 17% riffle units, and 4% dry units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 24%, low gradient riffle units, 22%, and step run units, 19% (Graph 3). Based on percent total length, step run units made up 28%, mid-channel pool units 27%, and low-gradient riffle units 11%.

A total of 130 pools were identified (Table 3). Main channel pools were the most frequently encountered at 58% (Graph 4), and comprised 65% 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. Forty-eight of the 130 pools (37%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 129 pool tail-outs measured, 48 had a value of 1 (37.2%), 25 had a value of 2 (19.4%), 24 had a value of 3 (18.6%), 15 had a value of 4 (11.6%), and 17 had a value of 5 (13.2%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 0, and pool habitats had a mean shelter rating of 19 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 18, backwater pools had a mean shelter rating of 13, scour pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Grizzly Creek. Graph 7 describes the pool cover in Grizzly Creek. Boulders are 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 71% of pool tail-outs. Small cobble was the next most frequently observed dominant substrate and occurred in 10% of pool tail-outs.

The mean percent canopy density for the surveyed length of Grizzly Creek was 86%. Fourteen percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 66% and 34%, respectively. Graph 9 describes the mean percent canopy in Grizzly 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 68% sand/silt/clay, 21% bedrock, 7% boulder, and 4% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 31% of the units surveyed had brush as the dominant vegetation type, and 14% had coniferous trees 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 Grizzly Creek on October 18, 2017 (Table A). The sites were sampled by Ryan Bernstein (CDFW), and Ellen Hensel (WSP).

In Reach 1, which comprised the first 8,421 feet of stream, nine sites were sampled. The reach sites yielded 229 young-of-the-year (YOY) steelhead trout (SH), 37 age 1+ SH, 9 age 2+ SH, 75 Sacramento pikeminnow (SPM), and 1 lamprey (LP).

In Reach 3, which comprised the last 1,274 feet of stream, one site was sampled. The sample site yielded 2 young-of-the-year steelhead trout.

During the survey, the upstream-most observation of steelhead trout occurred at 40.50483° north latitude, -123.87223° west longitude, approximately 16,793 feet upstream from the confluence with Van Duzen River (Map 1). No coho salmon were observed during the biological inventory. While not denoted in Table A, one California roach was observed during the stream inventory survey (see Comments and Landmarks section for observations and corresponding locations).

Table A. Summary of results for a fish composition and distribution survey within Grizzly Creek, October, 18, 2017

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead Trout			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 1: F4 Channel Type										
10/18/17	1	11	4.2	668	65	15	3	0	0	50 SPM
	2	13	4.2	933	30	4	2	0	0	25 SPM
	3	14	4.2	1165	15	0	0	0	0	
	4	16	4.2	1318	25	0	0	0	0	
	5	17	4.2	1388	30	8	0	0	0	
	6	19	4.2	1458	4	1	0	0	0	1 LP
	7	23	4.2	1799	2	4	0	0	0	
	8	25	4.2	2037	28	5	4	0	0	
	9	27	4.2	2240	30	0	0	0	0	
Reach 3: A2 Channel Type										
10/18/17	10	302	4.2	16793	2	0	0	0	0	

Species abbreviations: SPM = Sacramento pikeminnow; LP= Lamprey

## DISCUSSION

Grizzly Creek is a F4 channel type for the first 8,421 feet of the stream surveyed (Reach 1), a B2 channel type for the next 7,295 feet of the stream surveyed (Reach 2), and an A2 channel type for the remaining 1,274 feet of the stream surveyed (Reach 3). The suitability of F4, B2, and A2 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; B2 channels are excellent for plunge weirs, single and opposing wing-deflectors, and log cover; and A2 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days October 10 to October 24, 2017, ranged from 44° to 53° Fahrenheit. Air temperatures ranged from 40° to 64° Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 37% of the total length of this survey, riffles 17%, and pools 41%. Forty-eight of the 130 (37%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Seventy-three of the 129 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-nine of the pool tail-outs had embeddedness ratings of 3 or 4. Seventeen 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.

One hundred five of the 129 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 19. The shelter rating in the flatwater habitats is 0. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Grizzly Creek. Boulders are the dominant cover type in pools followed by large woody debris. Log and rootwad 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 86%. Reach 1 had a canopy density of 90%, Reach 2 had a canopy density of 83%, and Reach 3 had a canopy density of 81%. 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.

## RECOMMENDATIONS

Grizzly 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 Grizzly 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 2) 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.

- 3) 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.
- 4) Suitable size spawning substrate on Grizzly Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 5) There are several log debris accumulations (particularly LDA at habitat unit # 250) present on Grizzly Creek that are retaining large quantities of fine sediment and may pose as a potential barrier to salmonid migration. The modification of these debris accumulations could be 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 with Van Duzen River. Channel type is a F4. Channel type cross-section location is at Habitat Unit (HU) #26.
258	0003.00	Salmonid young-of-the-year (YOY) present.
313	0004.00	Bridge #1 is the crossing for Highway 36, and is 12.5' high x 37' wide x 110' long. It is a vehicle bridge (made of cement) and is not a barrier to salmonids.
668	0011.00	California roach present.
855	0012.00	The creek is out of the influence of the confluence with Van Duzen River.
2031	0024.00	Tributary #1 enters on the right bank. It contributes to approximately 15% of Grizzly Creek's flow. The water temperature of the tributary was 46° Fahrenheit, the water temperature downstream of the confluence was 48° Fahrenheit, and the water temperature upstream of the confluence was 48° Fahrenheit. The slope of the tributary is 3%. The tributary is accessible to salmonids due to gentle slope and clear, accessible channel. Fish were observed in the tributary.
2271	0027.00	Restoration site with boulders and large woody debris (LWD).

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2624	0030.00	Tributary #2 enters on the right bank. It contributes to approximately less than 5% of Grizzly Creek's flow. The water temperature of the tributary was 46° Fahrenheit, the water temperature downstream of the confluence was 49° Fahrenheit, and the water temperature upstream of the confluence was 49° Fahrenheit. The slope of the tributary is ~1%. The tributary is accessible to salmonids due to a gentle slope and clear, open slightly entrenched channel. Fish were observed in the tributary.
2878	0033.00	Old rusted culvert in channel.
2945	0035.00	Rootwad on right bank.
2968	0036.00	Two rootwads on left bank and seven foot undercut.
3116	0039.00	Rootwad on right bank.
3553	0045.00	Rootwad on left bank.
3678	0047.00	Restoration project.
4701	0063.00	There is non-active erosion on the left bank, it measures 65' long x 10' high.
5191	0072.00	A dry tributary (#3) is on the right bank.
5533	0080.00	A dry tributary (#4) is on the right bank. There is left bank seepage.
6150	0090.00	Rootwad on left bank.
7653	0114.00	There is a landslide on the left bank, it measures 100' long x 40' high. It is depositing gravel.
8812	0134.00	Rootwad on left bank.
8875	0135.00	Channel type changes to a B2 at Habitat Unit (HU) #135. Channel type cross-section location is at HU#248.
9095	0139.00	There is a landslide on the left bank, it measures 50' long x 40' high. It is depositing bedrock chips.
9312	0146.00	There is a landslide on the right bank, it measures 100' long x 25' high. It is depositing bedrock chips.
9417	0147.00	Heavy equipment belt lying in channel.

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9610	0154.00	There is a landslide on the right bank, it measures 100' long x 35' high. It is depositing gravel, and is vegetated with brush.
10005	0161.00	Tributary #5 enters on the left bank. It contributes to approximately 10% of Grizzly Creek's flow. The water temperature of the tributary was 48° Fahrenheit, the water temperature downstream of the confluence was 48° Fahrenheit, and the water temperature upstream of the confluence was 48° Fahrenheit. The slope of the tributary is 1%. The tributary is accessible to salmonids due to gentle slope and open, clear channel. Fish were observed in the tributary.
10129	0164.00	Bridge #2 is the crossing for an unnamed road, and is 13.5' high x 20' wide x 58' long. It is a vehicle bridge (made of metal) and is not a barrier to salmonids.
10234	0165.00	There is a 2' boulder plunge into a 1.1' pool at the top of this unit. It is not a barrier to salmonids.
10922	0179.00	There is active erosion on the left bank, it measures 50' long x 20' high.
10947	0180.00	Small woody debris (SWD) pileup on right bank behind LWD.
11315	0189.00	Rootwad on left bank.
11340	0190.00	There is a landslide on the left bank, it measures 50' long x 30' high.
11702	0200.00	Rootwad on right bank.
11889	0204.00	There is active erosion on the right bank, it measures 100' long x 30' high. It is depositing gravel.
12152	0211.00	There is a landslide on the left bank, it measures 250' long x 35' high. It is depositing gravel, and is vegetated with brush.
12202	0212.00	Fallen 2nd growth trees and sediment from landslide block channel for length of unit creating possible barrier to salmonids.
12405	0215.00	There is active erosion on the left bank, it measures 45' long x 25' high. It is depositing gravel, and is vegetated with brush.
12808	0225.00	Log debris accumulation (LDA) #1 is 6.4' high, 43.5' wide, and 9' long and contains 9 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 43' wide, 12' long and 1.7' deep. The sediment ranges in

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size from silt to small cobble. The LDA is not a possible barrier to salmonids as creek has pushed a channel on the right bank around LDA. Fish were observed above the LDA.

13104	0232.00	Rootwad on right bank.
13338	0237.00	There is a landslide on the left bank, it measures 100' long x 70' high. It is depositing gravel, and is not vegetated. LDA #2 is 10' high, 60' wide, 123' long and contains 33 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 50' wide, 50' long and 2' deep. The sediment ranges in size from silt to small cobble. The LDA is a possible barrier to salmonids because of its length. Fish were observed above the LDA.
13703	0239.00	Rootwad on right bank.
14482	0249.00	Tributary #6 enters on the right bank. It contributes to approximately less than 1% of Grizzly Creek's flow. The water temperature of the tributary was 49° Fahrenheit, the water temperature downstream of the confluence was 50° Fahrenheit, and the water temperature upstream of the confluence was 52° Fahrenheit. The slope of the tributary is around 35%. The tributary is not accessible to salmonids due to very steep slope and entrenched channel with boulder substrate. Fish were not observed in the tributary.
14516	0250.00	LDA #3 is 16' high, 67.5' wide, 127' long and contains 34 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 67.5' wide, 100' long and 4' deep. The sediment ranges in size from silt to small cobble. The LDA is a possible barrier to salmonids because of the length. Fish were observed above the LDA.
15219	0256.00	Noticeably fewer salmonids.
15609	0267.00	There is active erosion on the left bank, it measures 75' long x 20' high. It is depositing gravel to small cobble, and is vegetated with brush.
15798	0273.00	Tributary #7 enters on the left bank. It contributes to approximately less than 1% of Grizzly Creek's flow. The water temperature of the tributary was 53° Fahrenheit, the water temperature downstream of the confluence was 50° Fahrenheit, and the water temperature upstream of the confluence was 49° Fahrenheit. The slope of the tributary is 10%. The tributary is not accessible to salmonids due to 18 foot plunge into

shallow pool which is 50 feet into tributary. Fish were not observed in the tributary.

15967	0278.00	Channel type changes to an A2 at Habitat Unit (HU) # 278.
16028	0279.00	There is a 4.2' boulder plunge into a 2.2' pool at the top of this unit. It is not a barrier to salmonids.
16087	0281.00	There is a 3.5' boulder plunge into a 2.4' pool at the top of this unit. It is not a barrier to salmonids.
16306	0288.03	There is a 1.5' bedrock plunge into a 2' pool at the top of this unit. It is not a barrier to salmonids.
16306	0288.04	There is a 4.8' boulder plunge into a 2.2' pool at the top of this unit. It is not a barrier to salmonids. There is a landslide on the left bank, it measures 50' long x 25' high. It is depositing gravel to small cobble, and is vegetated with brush.
16449	0294.00	There is a landslide on the left bank, it measures 50' long x 30' high. It is depositing gravel, and is vegetated with brush.
16508	0296.00	There is a 3.6' boulder plunge into a 3' pool at the top of this unit. It is not a barrier to salmonids.
16630	0300.00	There is a 7.5' boulder plunge into a 0.6' pool at the top of this unit. It is not a barrier to salmonids.
16850	0303.00	End of survey due to 18' waterfall plunge into shallow pool (<0.5') at top of unit. Plunge falls onto large boulders and large cobbles. Steep cascade for over 100' before waterfall. It is a barrier to salmonids.

#### 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

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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 - 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

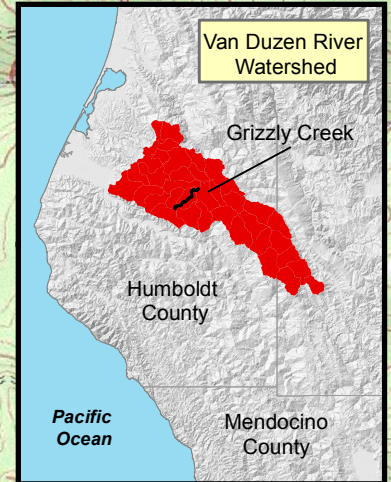
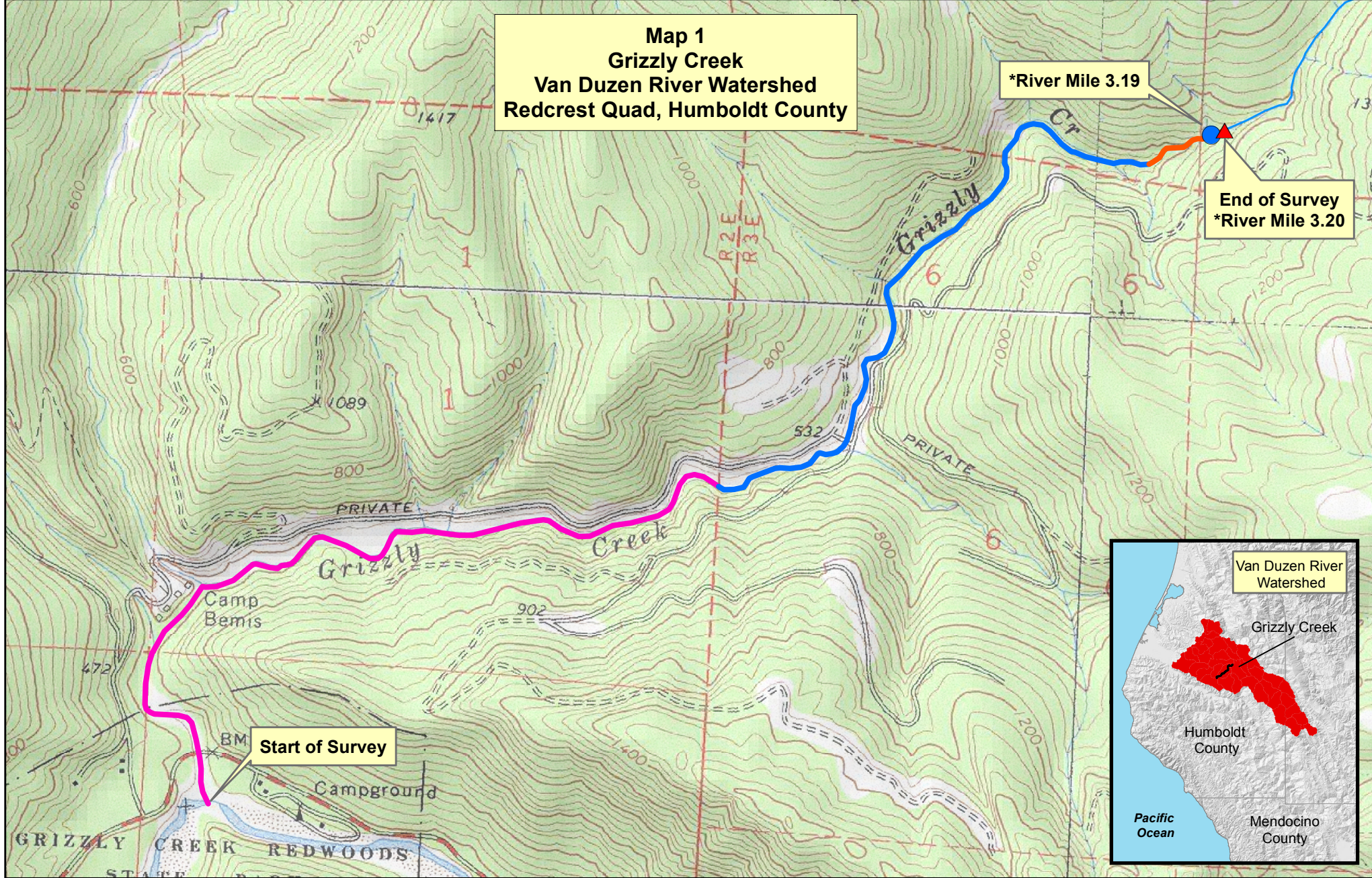
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Rootwad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

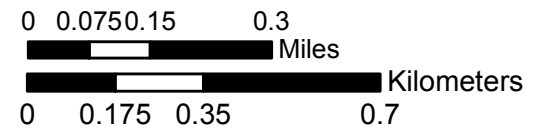
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	



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



- Reach 1: F4 Channel Type
- Reach 2: B2 Channel Type
- Reach 3: A2 Channel Type
- Grizzly Creek
- ▲ Total natural barrier
- Last observed juvenile steelhead trout





# **APPENDIX I**

## **TABLES AND GRAPHS**



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

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0

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
3	0	DRY	1.0	227	680	4.0									
94	10	FLATWATER	30.4	68	6354	37.4	13.5	0.5	0.9	591	55536	303	28439		0
130	130	POOL	42.1	54	7047	41.5	15.2	0.7	1.9	919	119445	1079	140290	738	19
82	7	RIFFLE	26.5	35	2909	17.1	12.1	0.3	0.6	176	14448	53	4372		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
309	147				16990					189430			173101		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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	7	LGR	22.3	28	1939	11.4	12	0.3	0.9	176	12158	53	3679		0	80
6	0	HGR	1.9	46	277	1.6										
7	0	CAS	2.3	99	693	4.1										
35	4	RUN	11.3	45	1567	9.2	13	0.6	1	462	16163	277	9698		0	88
59	6	SRN	19.1	81	4787	28.2	14	0.5	1.4	677	39933	320	18851		0	82
74	74	MCP	23.9	61	4537	26.7	16	0.7	4.6	1082	80054	1259	93202	845	18	86
1	1	CCP	0.3	33	33	0.2	10	0.3	0.9	330	330	231	231	99	20	97
4	4	CRP	1.3	50	200	1.2	15	0.4	2.2	803	3211	801	3205	451	13	93
8	8	LSL	2.6	39	310	1.8	17	1.0	3.6	697	5579	751	6010	506	36	83
5	5	LSR	1.6	57	285	1.7	14	0.9	3.3	798	3992	1044	5220	719	38	97
12	12	LSBk	3.9	78	933	5.5	16	0.8	4.5	1331	15975	1819	21825	1366	6	76
17	17	LSBo	5.5	28	482	2.8	14	0.7	4.1	332	5640	323	5493	226	20	85
6	6	PLP	1.9	20	123	0.7	10	0.9	2.8	206	1238	263	1578	204	21	90
1	1	BPB	0.3	10	10	0.1	12	1.0	2.2	120	120	144	144	120	10	100
1	1	BPR	0.3	108	108	0.6	27	0.6	2.4	2916	2916	2916	2916	1750	10	100
1	1	BPL	0.3	26	26	0.2	15	1.2	3.4	390	390	468	468	468	20	100
3	0	DRY	1.0	227	680	4.0										

Total Units  
309

Total Units Fully Measured  
147

Total Length (ft.)  
16990

Total Area (sq.ft.)  
187698

Total Volume (cu.ft.)  
172518

**Table 3 - Summary of Pool Types**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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
75	75	MAIN	58	61	4570	65	15.4	0.7	1072	80384	835	62654	18
52	52	SCOUR	40	45	2333	33	14.6	0.8	685	35635	594	30901	20
3	3	BACKWATER	2	48	144	2	18.0	0.9	1142	3426	779	2338	13
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)			Total Volume (cu.ft.)
130	130			7047						119445			95893

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

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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
74	MCP	57	8	11	42	57	19	26	3	4	2	3
1	CCP	1	1	100	0	0	0	0	0	0	0	0
4	CRP	3	2	50	1	25	1	25	0	0	0	0
8	LSL	6	0	0	3	38	4	50	1	13	0	0
5	LSR	4	0	0	2	40	1	20	2	40	0	0
12	LSBk	9	1	8	6	50	2	17	2	17	1	8
17	LSBo	13	2	12	11	65	3	18	0	0	1	6
6	PLP	5	1	17	2	33	3	50	0	0	0	0
1	BPB	1	0	0	0	0	1	100	0	0	0	0
1	BPR	1	0	0	0	0	1	100	0	0	0	0
1	BPL	1	0	0	0	0	0	0	1	100	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
130			15	12	67	52	35	27	9	7	4	3

Mean Maximum Residual Pool Depth (ft.): 1.9

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Dry Units: 3

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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	7	LGR	0	0	0	0	0	0	0	0	0
6	0	HGR									
7	0	CAS									
82	7	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
35	4	RUN	0	0	0	0	0	0	0	0	0
59	6	SRN	0	0	0	0	0	0	0	0	0
94	10	TOTAL FLAT	0	0	0	0	0	0	0	0	0
74	74	MCP	3	8	27	3	3	0	0	51	3
1	1	CCP	60	0	0	40	0	0	0	0	0
4	4	CRP	29	0	0	37	13	0	0	8	13
8	8	LSL	5	19	69	1	0	0	0	6	0
5	5	LSR	8	16	68	2	0	0	0	6	0
12	12	LSBk	0	4	9	0	4	0	0	43	39
17	17	LSBo	0	2	4	0	0	0	0	88	6
6	6	PLP	0	0	0	0	0	0	5	72	23
1	1	BPB	0	0	0	0	0	0	0	100	0
1	1	BPR	0	0	80	0	0	0	0	20	0
1	1	BPL	0	30	50	0	0	0	0	20	0
130	130	TOTAL POOL	4	8	24	3	2	0	0	50	8
309	147	TOTAL	4	8	25	4	3	0	0	50	8

**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Dry Units: 3

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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	7	LGR	0	0	14	14	14	57	0
6	0	HGR	0	0	0	0	0	0	0
7	0	CAS	0	0	0	0	0	0	0
35	4	RUN	0	0	50	0	25	25	0
59	6	SRN	0	0	17	0	17	33	33
74	74	MCP	0	23	50	1	1	22	3
1	1	CCP	0	0	100	0	0	0	0
4	4	CRP	0	0	50	0	25	25	0
8	8	LSL	0	50	38	0	13	0	0
5	5	LSR	0	20	80	0	0	0	0
12	12	LSBk	0	17	67	0	0	0	17
17	17	LSBo	0	6	24	0	6	65	0
6	6	PLP	0	0	33	0	0	67	0
1	1	BPB	0	100	0	0	0	0	0
1	1	BPR	0	0	100	0	0	0	0
1	1	BPL	0	0	0	0	0	100	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
86	34	66	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: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Survey Length (ft.): 16990

Main Channel (ft.): 16850

Side Channel (ft.): 140

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12 Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

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

Channel Type: F4

Canopy Density (%): 90.1

Pools by Stream Length (%): 46.5

Reach Length (ft.): 8421

Coniferous Component (%): 25.6

Pool Frequency (%): 39.2

Riffle/Flatwater Mean Width (ft.): 15.0

Hardwood Component (%): 74.4

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Hardwood Trees

&lt; 2 Feet Deep: 63

Range (ft.): 28 to 70

Vegetative Cover (%): 100.0

2 to 2.9 Feet Deep: 24

Mean (ft.): 39

Dominant Shelter: Large Woody Debris

3 to 3.9 Feet Deep: 10

Std. Dev.: 11

Dominant Bank Substrate Type: Sand/Silt/Clay

&gt;= 4 Feet Deep: 4

Base Flow (cfs.): 0.4

Occurrence of LWD (%): 26

Mean Max Residual Pool Depth (ft.): 1.9

Water (F): 44 - 49 Air (F): 40 - 52

LWD per 100 ft.:

Mean Pool Shelter Rating: 19

Dry Channel (ft): 0

Riffles: 1

Pools: 3

Flat: 1

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 80 Sm Cobble: 4 Lg Cobble: 12 Boulder: 0 Bedrock: 2

Embeddedness Values (%): 1. 16.0 2. 22.0 3. 36.0 4. 22.0 5. 4.0

**STREAM REACH: 2**

Channel Type: B2

Canopy Density (%): 83.0

Pools by Stream Length (%): 36.2

Reach Length (ft.): 7295

Coniferous Component (%): 39.5

Pool Frequency (%): 42.1

Riffle/Flatwater Mean Width (ft.): 11.6

Hardwood Component (%): 60.5

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Hardwood Trees

&lt; 2 Feet Deep: 68

Range (ft.): 22 to 58

Vegetative Cover (%): 99.5

2 to 2.9 Feet Deep: 25

Mean (ft.): 39

Dominant Shelter: Boulders

3 to 3.9 Feet Deep: 5

Std. Dev.: 10

Dominant Bank Substrate Type: Sand/Silt/Clay

&gt;= 4 Feet Deep: 2

Base Flow (cfs.): 0.4

Occurrence of LWD (%): 20

Mean Max Residual Pool Depth (ft.): 1.7

Water (F): 47 - 50 Air (F): 45 - 60

LWD per 100 ft.:

Mean Pool Shelter Rating: 18

Dry Channel (ft): 680

Riffles: 2

Pools: 4

Flat: 1

Pool Tail Substrate (%): Silt/Clay: 2 Sand: 2 Gravel: 69 Sm Cobble: 14 Lg Cobble: 0 Boulder: 7 Bedrock: 7

Embeddedness Values (%): 1. 47.5 2. 18.6 3. 10.2 4. 6.8 5. 16.9



## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 3

Channel Type: A2	Canopy Density (%): 80.9	Pools by Stream Length (%): 38.3
Reach Length (ft.): 1134	Coniferous Component (%): 40.7	Pool Frequency (%): 51.3
Riffle/Flatwater Mean Width (ft.): 3.0	Hardwood Component (%): 59.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 50
Range (ft.): 30 to 38	Vegetative Cover (%): 99.9	2 to 2.9 Feet Deep: 40
Mean (ft.): 33	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 5
Std. Dev.: 3	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 5
Base Flow (cfs.): 0.4	Occurrence of LWD (%): 0	Mean Max Residual Pool Depth (ft.): 2.2
Water (F): 50 - 53	Air (F): 55 - 64	Mean Pool Shelter Rating: 24
Dry Channel (ft): 0	LWD per 100 ft.:	
	Riffles: 2	
	Pools: 2	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0	Sand: 0	Gravel: 55
	Sm Cobble: 15	Lg Cobble: 5
	Boulder: 25	Bedrock: 0
Embeddedness Values (%): 1. 60.0	2. 15.0	3. 0.0
	4. 0.0	5. 25.0

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Grizzly Creek

LLID: 1239050404861

Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location: Quad: OWL CREEK

Legal Description: T01NR02ES12

Latitude: 40:29:10.0N

Longitude: 123:54:18.0W

**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	32	29	20.7
Boulder	9	12	7.1
Cobble / Gravel	4	7	3.7
Sand / Silt / Clay	102	99	68.4

**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	0.3
Brush	35	55	30.6
Hardwood Trees	89	72	54.8
Coniferous Trees	22	20	14.3
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Grizzly Creek

LLID: 1239050404861    Drainage: Van Duzen River

Survey Dates: 10/10/2017 to 10/24/2017

Confluence Location:    Quad: OWL CREEK

Legal Description: T01NR02ES12

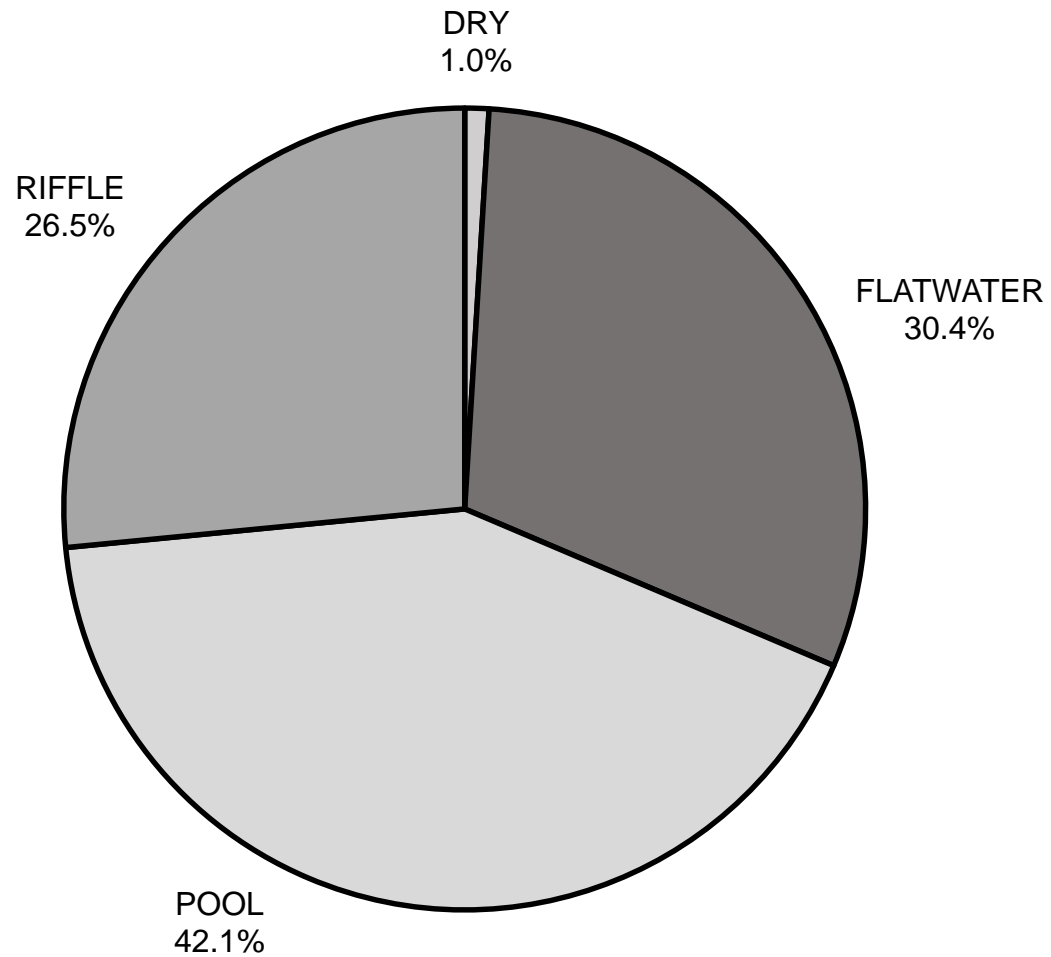
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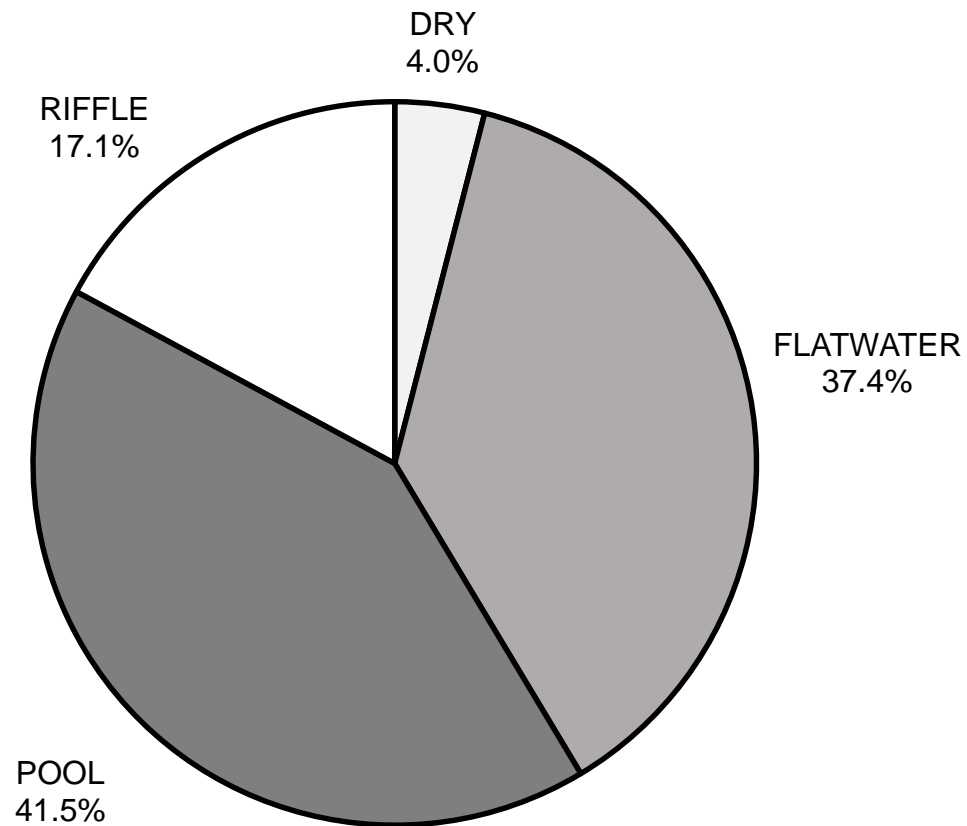
	Riffles	Flatwater	Pools
UNDERCUT BANKS(%)	0	0	4.5
SMALL WOODY DEBRIS (%)	0	0	8
LARGE WOODY DEBRIS (%)	0	0	24.5
ROOT MASS (%)	0	0	3
TERRESTRIAL VEGETATION (%)	0	0	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	50
BEDROCK LEDGES (%)	0	0	8

# GRIZZLY CREEK 2017 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

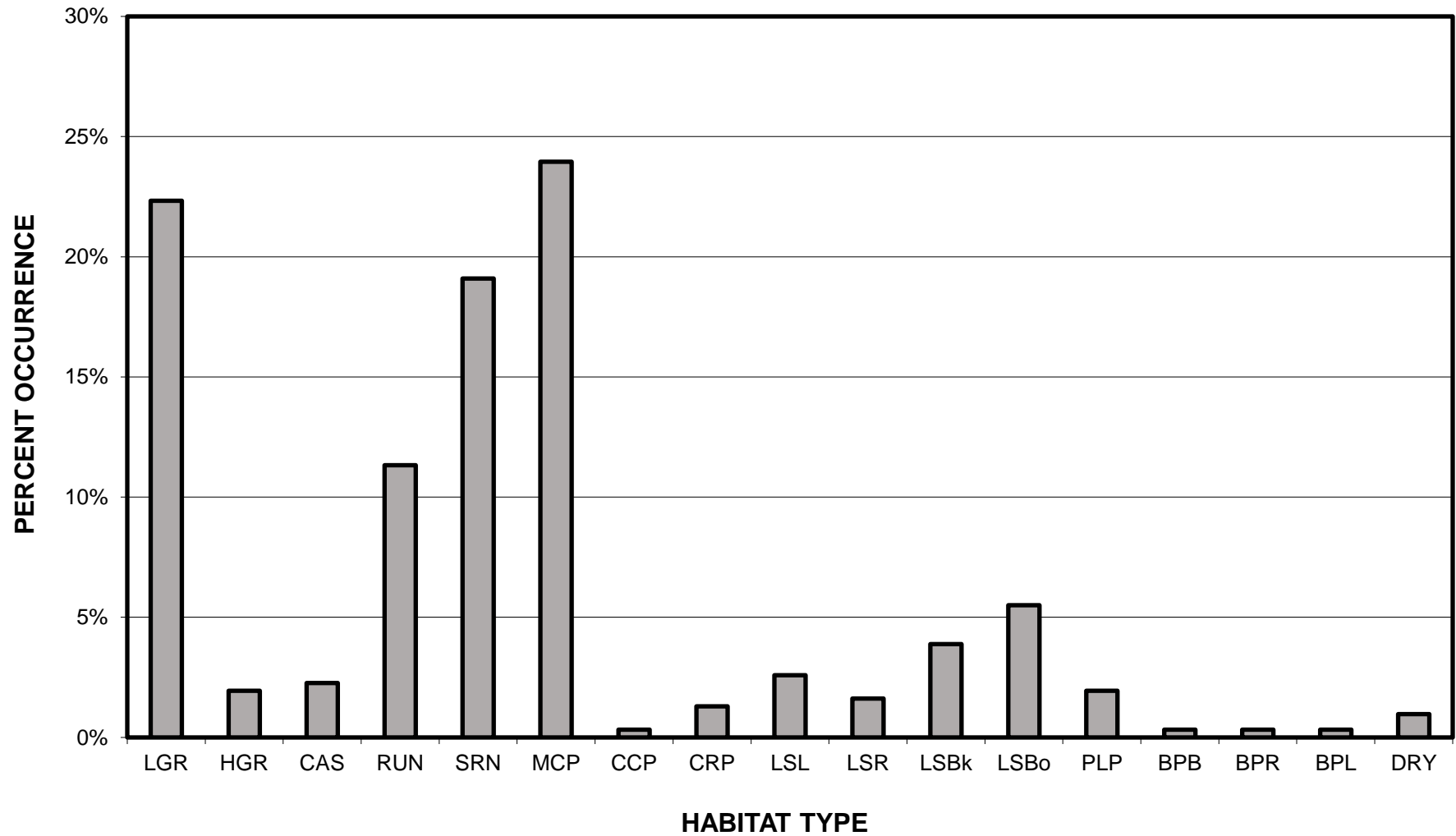
# GRIZZLY CREEK 2017 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

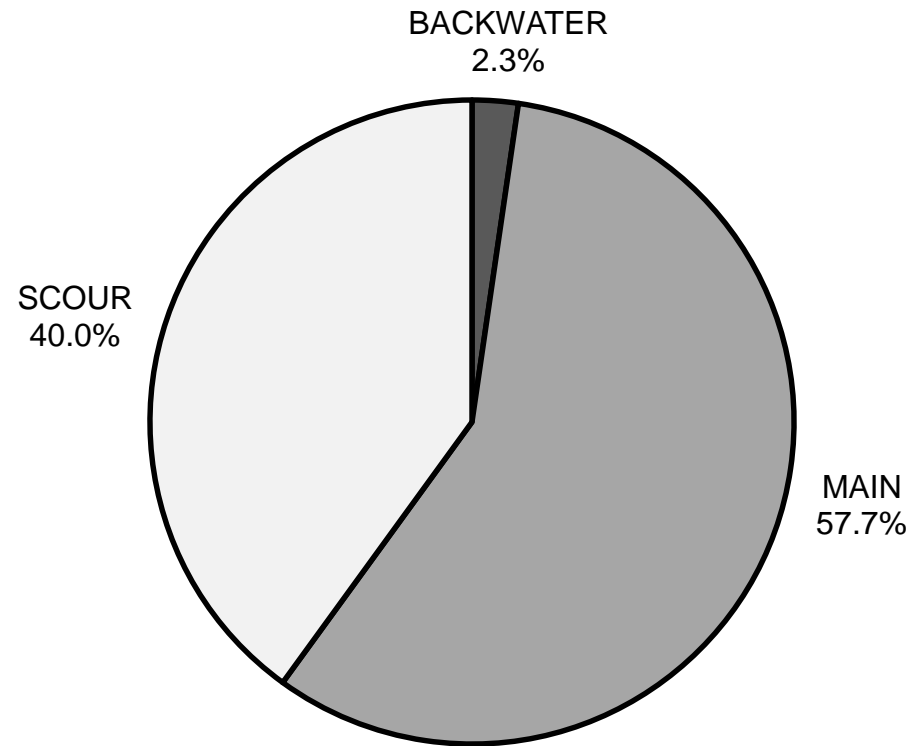
# GRIZZLY CREEK 2017

## HABITAT TYPES BY PERCENT OCCURRENCE



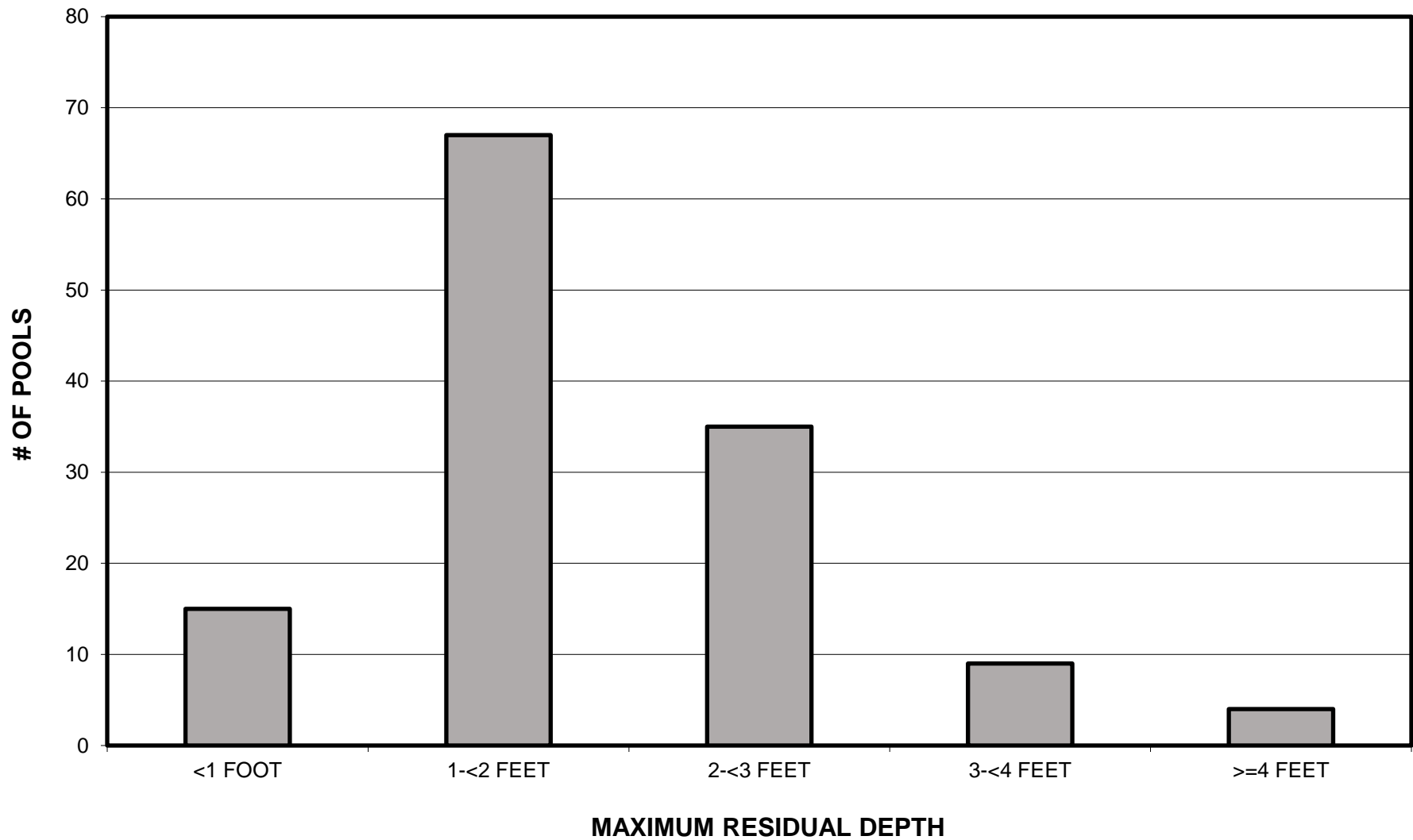
GRAPH 3

# GRIZZLY CREEK 2017 POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

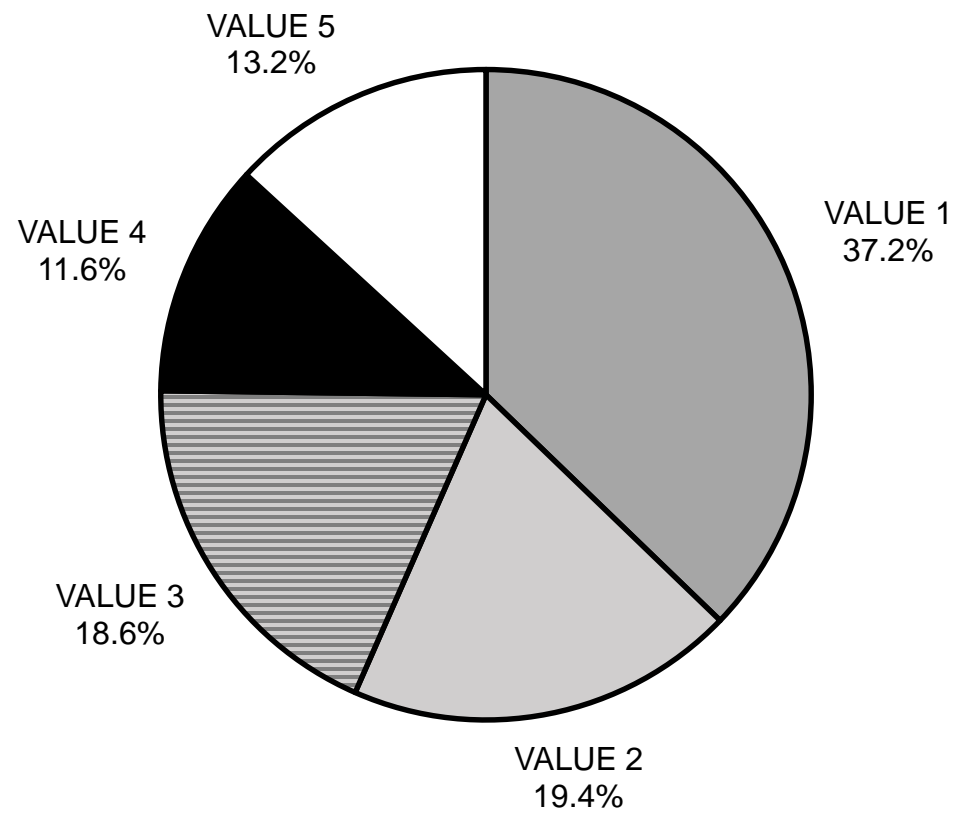
# GRIZZLY CREEK 2017 MAXIMUM DEPTH IN POOLS



GRAPH 5

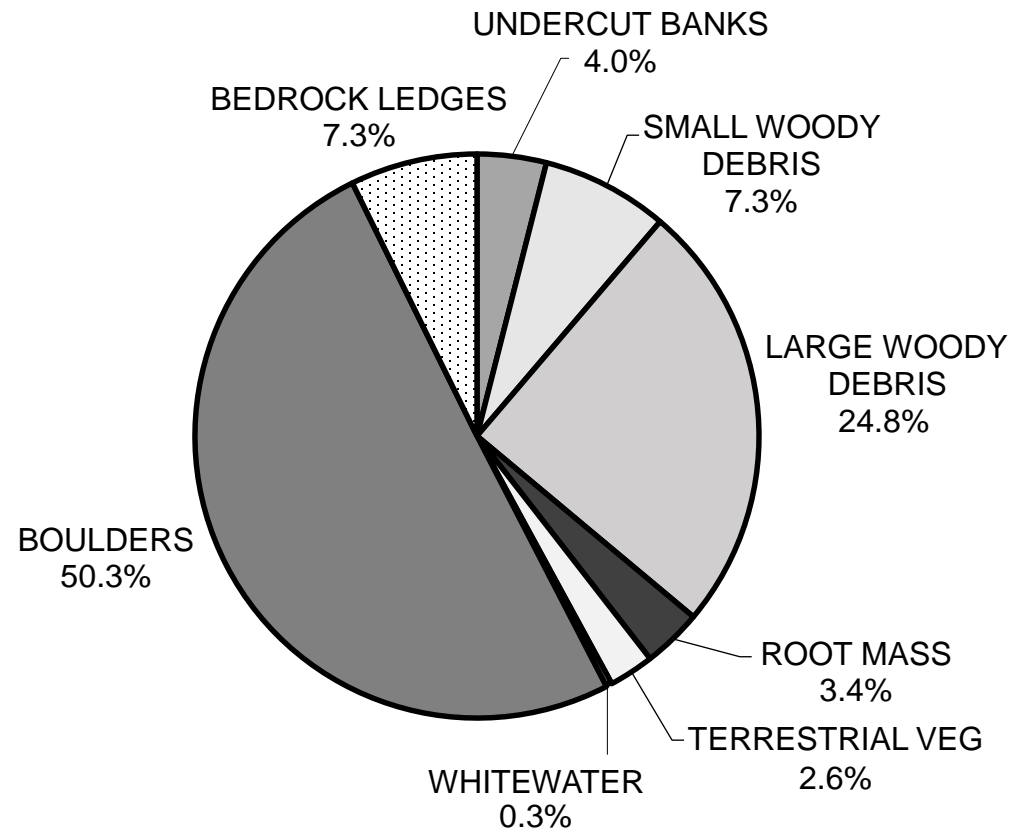


# GRIZZLY CREEK 2017 PERCENT EMBEDDEDNESS



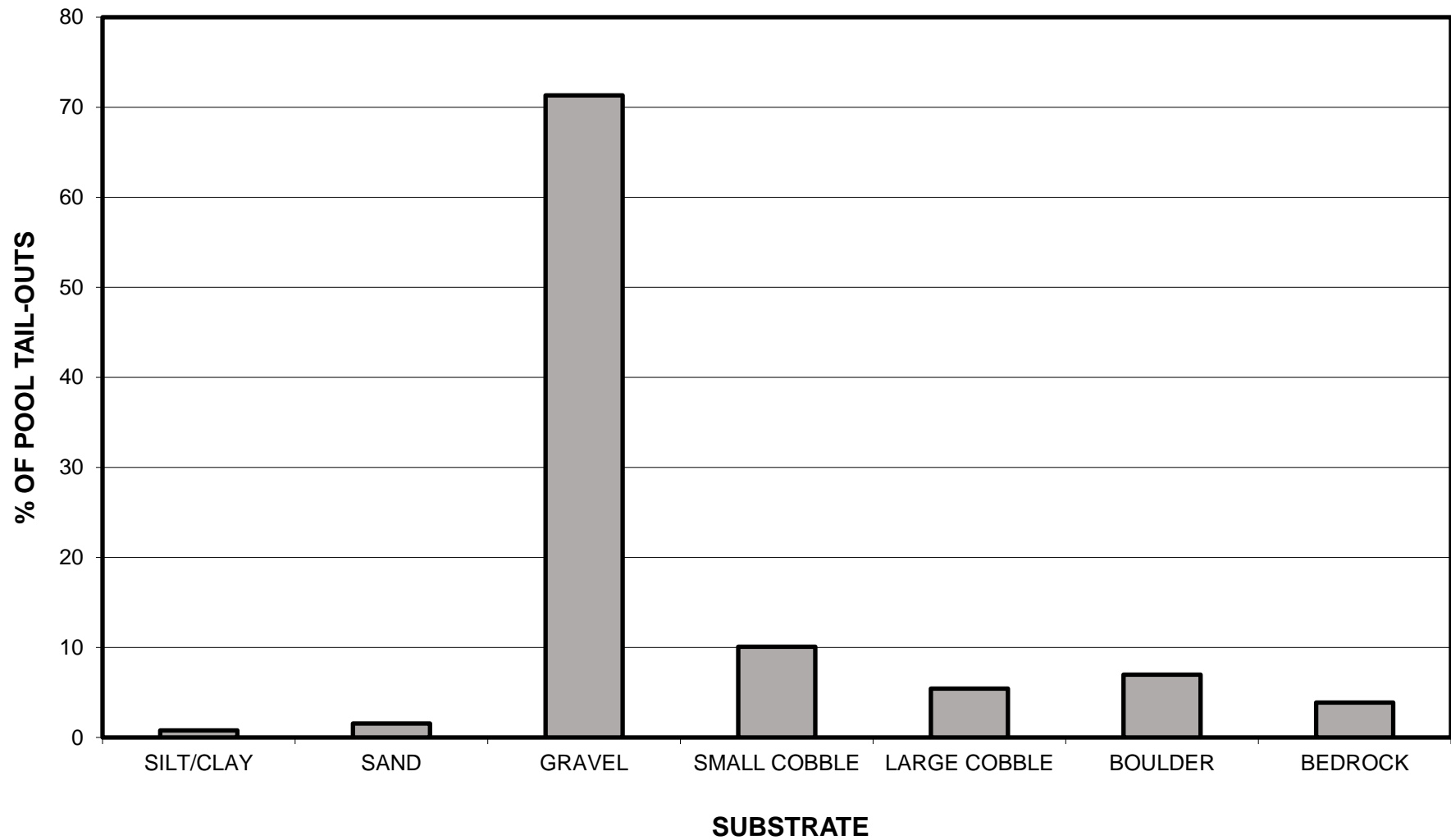
GRAPH 6

# GRIZZLY CREEK 2017 MEAN PERCENT COVER TYPES IN POOLS



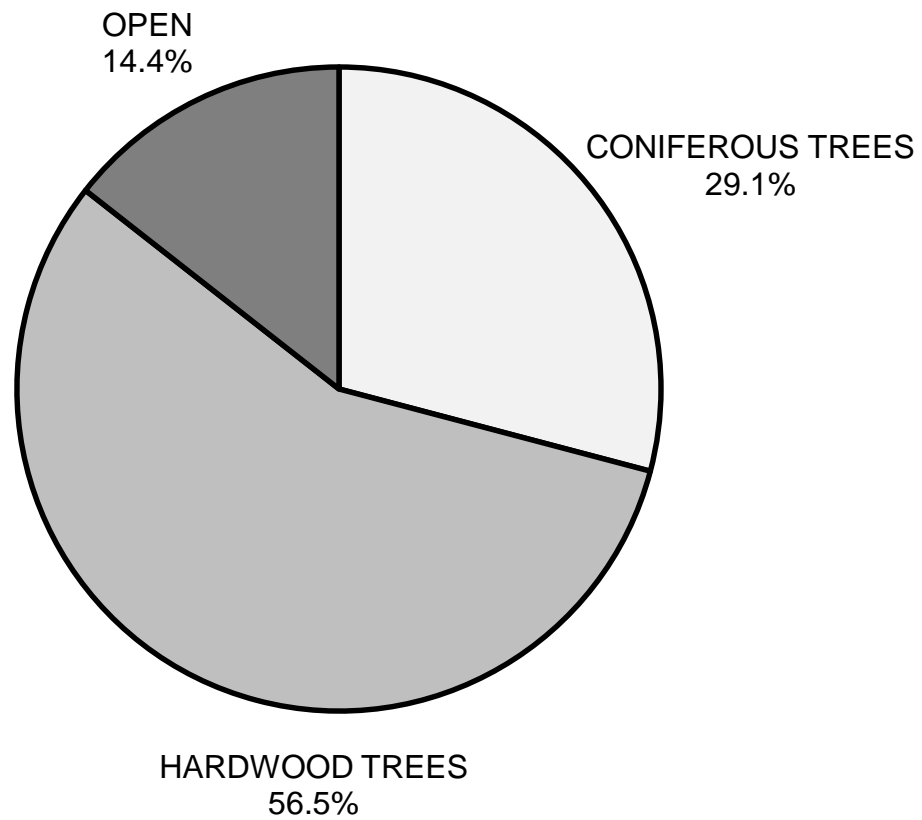
GRAPH 7

# GRIZZLY CREEK 2017 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



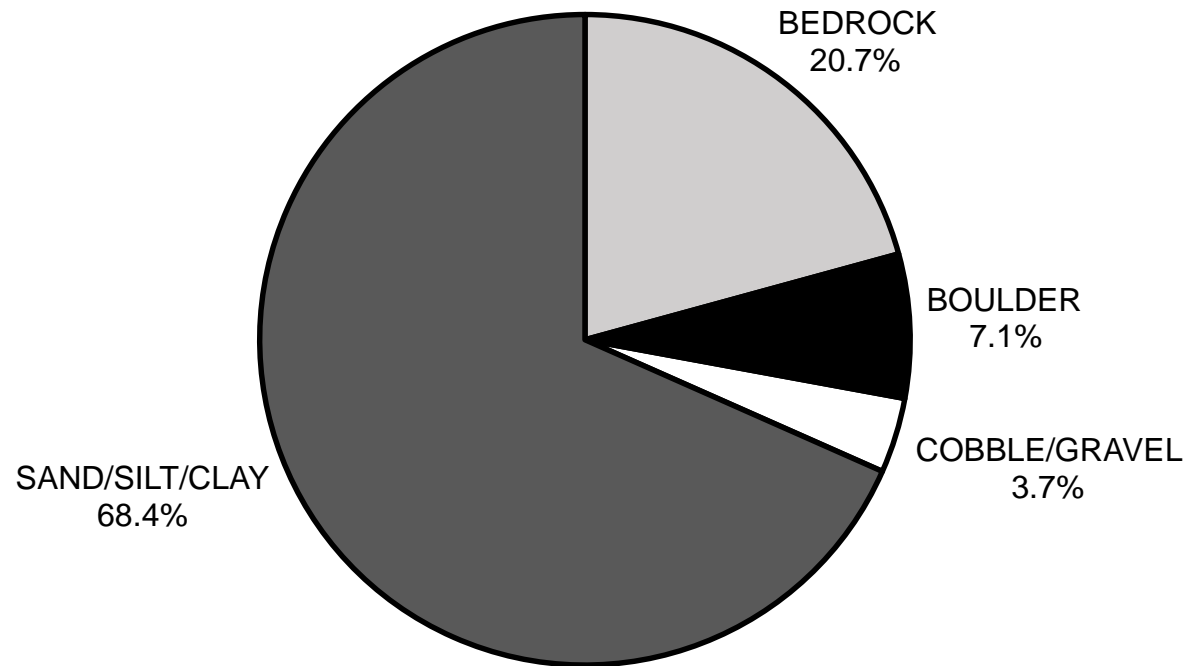
GRAPH 8

# GRIZZLY CREEK 2017 MEAN PERCENT CANOPY



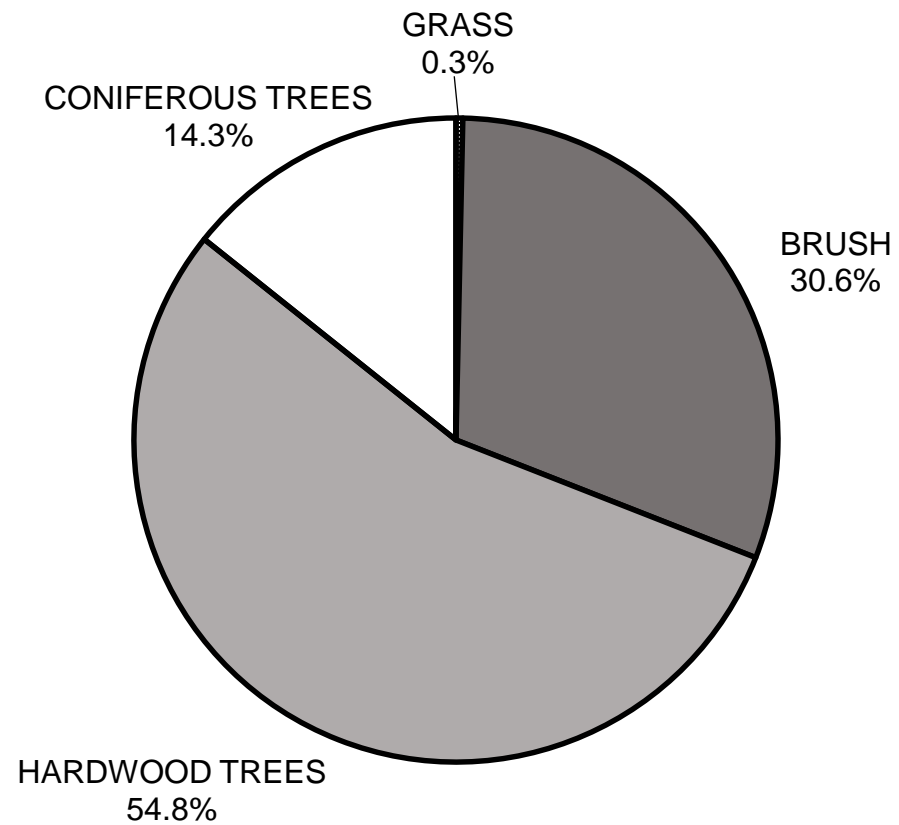
GRAPH 9

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



GRAPH 10

**GRIZZLY CREEK 2017  
DOMINANT BANK VEGETATION IN SURVEY REACH**



## **APPENDIX II**

# **STREAM INVENTORY PHOTOS**



Photo 1: Landslide on the right bank measuring approximately 35' high X 100' long at habitat unit 154, 9,568' upstream of the start of survey. (Photo taken 10/17/17)





Photo 2: Channel constricted by fallen trees and a left bank landslide at habitat unit #212, 12,111' upstream of the start of survey. The fallen trees and landslide are possible barriers to anadromy. Photo taken from midway up the left bank landslide, facing downward towards the channel and upstream.  
(Photo taken: 12/5/17)



Photo 3: LDA #2 and left bank landslide at habitat unit #237, 13,237' upstream of the start of survey. Photo taken facing upstream. (Photo taken: 10/24/17)





Photo 4: LDA #2 and left bank landslide at habitat unit #237, 13,237' upstream of the start of survey.  
Photo taken facing downstream. (Photo taken: 10/24/17)





Photo 5: 7.5' plunge over boulders with no pool below at habitat unit 300, 16,675' upstream of the start of survey. Pictured: Teddy Masters. (Photo taken 10/24/17)





Photo 6: The last pool with steelhead observed at habitat unit 302, 16,793' upstream of the start of survey.  
(Photo taken 10/24/17)





Photo 7: End of survey at habitat unit 303, 16,895' upstream of the start of survey. 18' waterfall over boulders with no pool beneath it. Pictured: Teddy Masters. (Photo taken 10/24/17)