



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Wilson Creek

INTRODUCTION

A stream inventory was conducted from August 18 to August 19, 2015 on Wilson Creek. The survey began at the confluence with Yager Creek and extended upstream 3.3 miles.

The Wilson 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 Wilson 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 salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Wilson Creek is 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). Wilson Creek's legal description at the confluence with Yager Creek is T02N R01E S28. Its location is 40.5302 degrees north latitude and 124.0682 degrees west longitude, LLID number 1240670405303. Wilson Creek is a second order stream and has approximately 2.4 miles of blue line stream according to the USGS Hydesville 7.5 minute quadrangle. Wilson Creek drains a watershed of approximately 2.1 square miles. Elevations range from about 110 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production, rangeland, and rural development. Vehicle access exists via Highway 36, east of Fortuna.

METHODS

The habitat inventory conducted in Wilson 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 that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. The 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.

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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 Wilson 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:

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". Wilson 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 Wilson 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

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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 Wilson 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Wilson 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 Wilson 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),

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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 Wilson Creek. In addition, underwater observations were made at 36 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 2.0.18, 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 Wilson 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of August 18 to August 19, 2015 was conducted by M. Groff and D. Lam (CDFW). The total length of the stream surveyed was 17,478 feet. The first 9,990 of Wilson Creek were dry and were not surveyed. The data presented in this report reflects only the length of stream actually surveyed.

Stream flow was not measured on Wilson Creek.

Wilson Creek was not surveyed for the first 9,990 feet and the channel type is unknown (Reach 1). Wilson Creek is then an F4 channel type for 4,977 feet of the stream surveyed (Reach 2) and an A3 channel type for 2,511 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. 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 51 to 58 degrees Fahrenheit. Air temperatures ranged from 55 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% riffle units, 36% flatwater units, 20% pool units, and 3% dry units (Graph 1). Based on total length of Level II habitat types there were 46% flatwater units, 38% riffle units, 13% pool units, 2% dry units, and 1% culvert units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffle units, 25%; step run units, 19%; and run units, 17% (Graph 3). Based on percent total length, step run units made up 35%, high gradient riffle units 23%, and low gradient riffle units 16%.

A total of 55 pools were identified (Table 3). Main channel pools were the most frequently encountered at 78% (Graph 4), and comprised 76% 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. Six of the 55 pools (11%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 55 pool tail-outs measured, 20 had a value of 1 (36.4%); 15 had a value of 2 (27.3%); 17 had a value of 3 (30.9%); one had a value of 4 (1.8%); two had a value of 5 (3.6%) (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 2, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean

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shelter rating of 12 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 21. Main channel pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Wilson Creek. Graph 7 describes the pool cover in Wilson 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 69% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Wilson Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 60% and 40%, respectively. Graph 9 describes the mean percent canopy in Wilson Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 91% sand/silt/clay, 4% cobble/gravel, 3% boulders, and 2% bedrock (Graph 10). Brush was the dominant vegetation type observed in 51% of the units surveyed. Additionally, 25% of the units surveyed had hardwood trees as the dominant vegetation type, and 24% had coniferous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

A survey team conducted a snorkel survey at 36 sites for species composition and distribution in Wilson Creek on August 17 and August 18, 2015 (Table A). The sites were sampled as part of the Pacific States Marine Fisheries Commission's (PSMFC) Juvenile Coho Salmon Spatial Structure Survey, thus site numbers do not correlate with habitat unit numbers. The sites were sampled by B. Starks and M. Fletcher (PSMFC).

The sample sites yielded 91 young-of-the-year (YOY) steelhead trout (SH), 29 age 1+ SH, 15 coastal/California giant salamanders (CGS), and one red-legged frog. No coho salmon were observed.

Table A. Summary of results for a fish composition and distribution survey within Wilson Creek, 2015.

Date	Survey Site #	Latitude	Longitude	Habitat Type	Steelhead Trout			Additional Aquatic Species Observed
					YOY	1+	2+	
08/17/15	1	40.5377	-124.0456	Pool	20	2	0	
08/17/15	2	40.5379	-124.0453	Pool	17	1	0	
08/17/15	3	40.5382	-124.0449	Pool	11	0	0	
08/17/15	4	40.5386	-124.0443	Pool	10	0	0	

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08/17/15	5	40.5398	-124.0441	Pool	16	0	0	
08/17/15	6	40.5398	-124.0438	Pool	3	1	0	
08/17/15	7	40.5399	-124.0435	Pool	0	0	0	CGS
08/17/15	8	40.5400	-124.0435	Pool	0	0	0	
08/17/15	9	40.5404	-124.0429	Pool	1	0	0	CGS
08/17/15	10	40.5404	-124.0427	Pool	0	1	0	CGS
08/17/15	11	40.5409	-124.0425	Pool	3	1	0	CGS
08/17/15	12	40.5409	-124.0424	Pool	2	0	0	
08/17/15	13	40.5412	-124.0422	Pool	4	0	0	
08/17/15	14	40.5412	-124.0419	Pool	0	1	0	
08/17/15	15	40.5414	-124.0418	Pool	1	1	0	
08/17/15	16	40.5417	-124.0415	Pool	0	1	0	
08/17/15	17	40.5417	-124.0412	Pool	0	0	0	CGS
08/17/15	18	40.5419	-124.0411	Pool	0	0	0	CGS
08/17/15	19	40.5423	-124.0407	Pool	0	0	0	CGS
08/17/15	20	40.5428	-124.0403	Pool	1	1	0	
08/17/15	21	40.5432	-124.0405	Pool	0	2	0	
08/17/15	22	40.5432	-124.0407	Pool	0	0	0	
08/17/15	23	40.5434	-124.0407	Pool	0	5	0	
08/17/15	24	40.5436	-124.0406	Pool	1	1	0	
08/17/15	25	40.5436	-124.0407	Pool	0	0	0	
08/17/15	26	40.5440	-124.0406	Pool	0	1	0	
08/18/15	27	40.5442	-124.0404	Pool	0	3	0	CGS
08/18/15	28	40.5447	-124.0403	Pool	0	1	0	
08/18/15	29	40.5449	-124.0402	Pool	0	1	0	
08/18/15	30	40.5452	-124.0400	Pool	0	1	0	
08/18/15	31	40.5456	-124.0400	Pool	0	0	0	
08/18/15	32	40.5457	-124.0398	Pool	1	1	0	
08/18/15	33	40.5460	-124.0395	Pool	0	0	0	RLF
08/18/15	34	40.5461	-124.0393	Pool	0	2	0	
08/18/15	35	40.5463	-124.0389	Pool	0	1	0	
08/18/15	36	40.5469	-124.0385	Pool	0	0	0	

Species Abbreviations: CGS=Coastal/California Giant Salamander; RLF=Red-legged frog.

DISCUSSION

Wilson Creek is an unknown channel type for the first 9,990 feet of stream surveyed, an F4 channel type for the next 4,977 feet, and an A3 channel type for the remaining 2,511 feet. The suitability of F4 and A3 channel types for fish habitat improvement structures is as follows: F4,

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F5 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. A-type channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days August 18 to August 19, 2015 ranged from 51 to 58 degrees Fahrenheit. Air temperatures ranged from 55 to 66 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 46% of the total length of this survey, riffles 38%, and pools 13%. Six of the 55 (11%) 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.

Thirty-five of the 55 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen 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. Sediment sources in Wilson Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fifty-two of the 55 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 12. The shelter rating in the flatwater habitats is 5. 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 Wilson 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 98%. Reach 2 had a canopy density of 98% and Reach 3 had a canopy density of 98%. The percentage of right and left bank covered with vegetation was 99% and 97%, respectively.

RECOMMENDATIONS

Wilson 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 Wilson Creek. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land

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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 small woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 2) Pools are disconnected or sections of the stream are dry/subsurface. Streamflow should be monitored and treatment options should be investigated the streamflow should be monitored to determine if it is limiting for salmonids.
- 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) 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 three to five years.

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 Yager Creek. The first 9,990 feet of Wilson Creek were not surveyed because they were dry. The channel type is unknown in this section.
9990	0002.00	Start of first wet unit; start of measurements. The channel is an F4.
10297	0018.00	A private road crosses the channel. The crossing is a 7.1' high railcar bridge.
10532	0028.00	Barbed wire fence spans the channel.
10567	0030.00	Wood and wire fence spans the channel.
10590	0031.00	Wood and wire fence spans the channel.
10917	0037.00	There is a 2' high plunge over boulders.
10945	0039.00	A private road crosses the channel. The crossing is an 8.2' high concrete bridge.

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11234	0050.00	Right bank scarp measures approximately 100' long x 8' high and is contributing fine sediment to the channel.
11293	0053.00	Left bank scarp measures approximately 100' long x 12' high and is contributing fine sediment to the channel.
11567	0061.00	Left bank scarp measures approximately 80' long x 20' high and is contributing fine sediment.
11754	0067.00	Left bank scarp measures approximately 160' long x 15' high and is contributing fine sediment to the channel. It is partially revegetated.
12783	0099.00	There is a 3' high plunge over woody debris and rootmass retaining sediment.
13330	0120.00	Left bank seep.
13908	0141.00	Log debris accumulation (LDA) #01 contains one piece of large woody debris (LWD) and measures approximately 4' high x 17' wide x 3' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures approximately 10' wide x 80' long x 3' deep. There is a 4' high plunge over the LDA. Fish were observed above it.
14493	0163.00	LDA #02 contains 12 pieces of LWD and measures approximately 6' high x 13' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to sand and measures approximately 2' wide x 5' long x 1.5' deep. Fish were observed above the LDA.
14834	0174.00	There is a 2.5' high plunge over woody debris.
14854	0175.00	Dry right bank tributary.
14967	0176.00	The channel changes from an F4 to an A3.
15085	0179.00	There is a 1.7' high plunge over woody debris.
15275	0188.00	LDA #03 contains one piece of LWD and measures approximately 3.5' high x 13' wide x 2.5' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures approximately 5' wide x 20' long x 2' deep. There is a 3.5' high plunge over the LDA. Fish were observed above it.
15374	0193.00	Left bank seep.

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16068	0214.00	There is a 2.2' high plunge over boulders and woody debris.
16105	0216.00	LDA #04 contains three pieces of LWD and measures approximately 4' high x 19' wide x 3.5' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to large cobble and measures approximately 10' wide x 20' long x 2' deep. There is a 4' high plunge over the LDA. Fish were observed above it.
16172	0221.00	Last young-of-the-year salmonid observed.
16198	0223.00	There is a 2.2' high plunge over woody debris.
16321	0230.00	A logging road crosses the channel. The crossing is a 6' diameter x 80' long corrugated metal culvert. The slope of the culvert is 2.5% and there is a 3.5' high plunge at the outlet. The maximum water depth within 5' feet of the outlet is 2.6'. The culvert is starting to rust through at the outlet and roots are growing in to the culvert at the inlet.
16441	0233.00	Tributary #01 enters on the left bank. It contributes approximately 40% to Wilson Creek's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 56 degrees Fahrenheit. The slope of the tributary is 6-10%. The channel was intermittently dry.
16773	0245.00	Flow partially subsurface.
16882	0248.00	LDA #05 contains four pieces of LWD and measures approximately 3.7' high x 8' wide x 4' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures approximately 5' wide x 10' long x 1.5' deep. There is a 3.7' high plunge over the LDA.
17089	0259.00	LDA #06 contains four pieces of LWD and measures approximately 3' high x 6' wide x 3' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures approximately 5' wide x 50' long x 2' deep. There is a 3' high plunge over the LDA.
17166	0260.00	There is a 4.8' high plunge over woody debris and rootmass, retaining sediment.
17398	0272.00	LDA #07 contains 17 pieces of LWD and measures approximately 9' high x 13' wide x 20' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and

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measures approximately 8' wide x 30' long x 3' deep. There are multiple plunges over the LDA.

17470 0275.00 End of survey at LDA #08. LDA #08 consists of a single old growth log lying parallel to the channel and retaining sediment to its top. On top of the log a live redwood is growing across the channel, directly in the middle, blocking access upstream. The tree is large, approximately 3.5' diameter. The channel upstream of the channel is completely filled in by a sediment plug. Water appears to flow around the tree at highest flows along the right bank, but it is probably not accessible to fish due to the 5' high plunge over LDA #08 and roots upstream retaining sediment blocking the channel. Above the culvert at HU#230 there is little habitat and the slope increases to over 7.6%. No fish were observed above the culvert.

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]	

Map 1
Wilson Creek
Van Duzen River Watershed
Hydesville Quad, Humboldt County

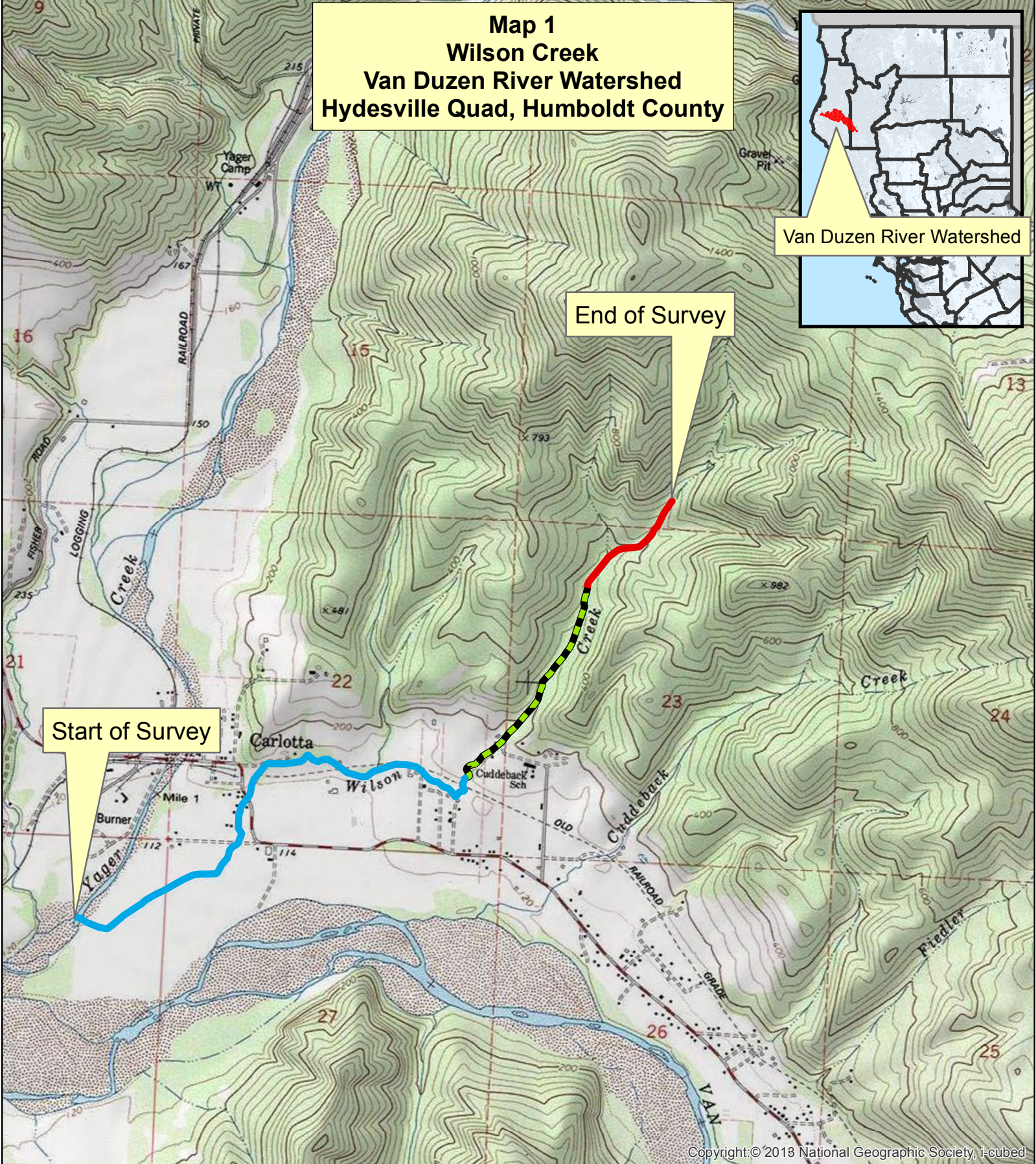


Van Duzen River Watershed

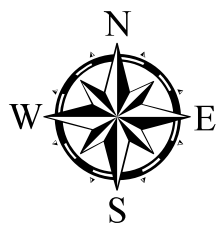





End of Survey

Start of Survey



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-  Reach 1: Unserved Section
-  Reach 2: F4 Channel Type
-  Reach 3: A3 Channel Type

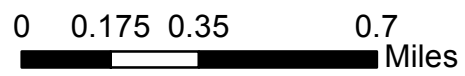


Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0

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
1	0	CULVERT	0.4	80	80	1.1									
9	0	DRY	3.3	14	129	1.7									
99	13	FLATWATER	36.1	35	3447	46.0	4.3	0.2	0.5	160	15861	40	3947		5
1	0	NOSURVEY		9990	9990										
55	55	POOL	20.1	18	971	13.0	6.6	0.7	1.4	114	6277	94	5175	83	12
110	15	RIFFLE	40.1	26	2861	38.2	3.9	0.1	0.3	67	7329	11	1229		2
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)			
275	83			17478						29467		10351			

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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 (%)
42	8	LGR	15.3	28	1158	15.5	4	0.1	0.9	78	3291	12	495		1	98
68	7	HGR	24.8	25	1703	22.7	4	0.2	0.9	53	3618	10	712		4	98
47	7	RUN	17.2	18	854	11.4	4	0.3	1	100	4711	35	1668		7	99
52	6	SRN	19.0	50	2593	34.6	4	0.2	0.6	230	11970	45	2339		3	98
43	43	MCP	15.7	17	742	9.9	7	0.7	2.7	116	4969	95	4071	83	10	98
3	3	CRP	1.1	18	53	0.7	5	0.7	1.9	85	254	74	223	66	15	99
1	1	LSL	0.4	21	21	0.3	4	0.6	1.3	95	95	66	66	57	10	99
3	3	LSR	1.1	16	49	0.7	6	0.7	1.5	100	300	74	223	64	23	99
1	1	LSBk	0.4	25	25	0.3	4	0.4	0.9	100	100	50	50	40	0	99
4	4	PLP	1.5	20	81	1.1	7	0.9	2.6	140	560	135	542	118	31	99
9	0	DRY	3.3	14	129	1.7										99
1	0	CUL	0.4	80	80	1.1										
1	0	NS		9990	9990											

Total Units
275

Total Units Fully Measured
83

Total Length (ft.)
17478

Total Area (sq.ft.)
29867

Total Volume (cu.ft.)
10389

Table 3 - Summary of Pool Types

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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
43	43	MAIN	78	17	742	76	6.9	0.7	116	4969	83	3580	10
12	12	SCOUR	22	19	229	24	5.6	0.7	109	1308	80	961	21
Total Units 55	Total Units Fully Measured 55				Total Length (ft.) 971					Total Area (sq.ft.) 6277		Total Volume (cu.ft.) 4540	

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

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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
43	MCP	78	5	12	33	77	5	12	0	0	0	0
3	CRP	5	0	0	3	100	0	0	0	0	0	0
1	LSL	2	0	0	1	100	0	0	0	0	0	0
3	LSR	5	0	0	3	100	0	0	0	0	0	0
1	LSBk	2	1	100	0	0	0	0	0	0	0	0
4	PLP	7	0	0	3	75	1	25	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
55	6	11	43	78	6	11	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Dry Units: 9

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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
42	8	LGR	50	50	0	0	0	0	0	0	0
68	7	HGR	85	10	0	5	0	0	0	0	0
110	15	TOTAL RIFFLE	67	30	0	3	0	0	0	0	0
47	7	RUN	20	30	10	20	20	0	0	0	0
52	6	SRN	0	67	0	0	33	0	0	0	0
99	13	TOTAL FLAT	12	44	6	12	25	0	0	0	0
43	43	MCP	22	27	28	8	3	0	0	12	0
3	3	CRP	60	33	0	7	0	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0	0	0
3	3	LSR	7	63	17	13	0	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	0	0	0
4	4	PLP	13	23	45	3	0	0	5	0	13
55	55	TOTAL POOL	22	29	28	7	3	0	1	9	1
1	0	CUL									
1	0	NS									
275	83	TOTAL	22	32	24	8	6	0	0	7	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Dry Units: 9

Confluence Location: Quad: HYDEVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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
42	8	LGR	0	0	100	0	0	0	0
68	7	HGR	0	0	57	29	0	14	0
47	7	RUN	0	43	57	0	0	0	0
52	6	SRN	0	0	100	0	0	0	0
43	43	MCP	23	30	40	0	2	5	0
3	3	CRP	0	0	100	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0
3	3	LSR	0	33	67	0	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
4	4	PLP	50	25	25	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	40	60	0	99	97

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: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Survey Length (ft.): 17478

Main Channel (ft.): 17478

Side Channel (ft.): 0

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1									
Channel Type: NA		Canopy Density (%):				Pools by Stream Length (%): 0.0			
Reach Length (ft.): 9990		Coniferous Component (%):				Pool Frequency (%): 0.0			
Riffle/Flatwater Mean Width (ft.):		Hardwood Component (%):				Residual Pool Depth (%):			
BFW:		Dominant Bank Vegetation:				< 2 Feet Deep:			
Range (ft.): 14 to 14		Vegetative Cover (%): 0.0				2 to 2.9 Feet Deep:			
Mean (ft.): 14		Dominant Shelter:				3 to 3.9 Feet Deep:			
Std. Dev.: 0		Dominant Bank Substrate Type:				>= 4 Feet Deep:			
Base Flow (cfs.): 0.0		Occurrence of LWD (%):				Mean Max Residual Pool Depth (ft.):			
Water (F): 51 - 51		Air (F): 55 - 55		LWD per 100 ft.:		Mean Pool Shelter Rating:			
Dry Channel (ft): 0		Riffles:		Pools:					
		Flat:							
Pool Tail Substrate (%): Silt/Clay:		Sand:	Gravel:	Sm Cobble:	Lg Cobble:	Boulder:	Bedrock:		
Embeddedness Values (%): 1.		2.	3.	4.	5.	0.0			

STREAM REACH: 2										
Channel Type: F4		Canopy Density (%): 98.3				Pools by Stream Length (%): 14.5				
Reach Length (ft.): 4977		Coniferous Component (%): 34.1				Pool Frequency (%): 21.8				
Riffle/Flatwater Mean Width (ft.): 4.3		Hardwood Component (%): 65.9				Residual Pool Depth (%):				
BFW:		Dominant Bank Vegetation: Brush				< 2 Feet Deep: 95				
Range (ft.): 6 to 17		Vegetative Cover (%): 96.9				2 to 2.9 Feet Deep: 5				
Mean (ft.): 11		Dominant Shelter: Small Woody Debris				3 to 3.9 Feet Deep: 0				
Std. Dev.: 3		Dominant Bank Substrate Type: Sand/Silt/Clay				>= 4 Feet Deep: 0				
Base Flow (cfs.): 0.0		Occurrence of LWD (%): 13				Mean Max Residual Pool Depth (ft.): 1.4				
Water (F): 51 - 58		Air (F): 55 - 65		LWD per 100 ft.:		Mean Pool Shelter Rating: 13				
Dry Channel (ft): 71		Riffles: 1		Pools: 7						
		Flat: 3								
Pool Tail Substrate (%): Silt/Clay: 0		Sand: 0	Gravel: 76	Sm Cobble: 24	Lg Cobble: 0	Boulder: 0	Bedrock: 0			
Embeddedness Values (%): 1.		44.7	2.	31.6	3.	23.7	4.	0.0	5.	0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: A3	Canopy Density (%): 98.4	Pools by Stream Length (%): 9.9
Reach Length (ft.): 2511	Coniferous Component (%): 50.3	Pool Frequency (%): 17.0
Riffle/Flatwater Mean Width (ft.): 3.8	Hardwood Component (%): 49.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 76
Range (ft.): 7 to 13	Vegetative Cover (%): 99.1	2 to 2.9 Feet Deep: 24
Mean (ft.): 9	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.): 0.0	Occurrence of LWD (%): 16	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 56 - 58 Air (F): 55 - 66	LWD per 100 ft.:	Mean Pool Shelter Rating: 11
Dry Channel (ft): 58	Riffles: 8	
	Pools: 10	
	Flat: 6	
Pool Tail Substrate (%): Silt/Clay: 6 Sand: 6 Gravel: 53 Sm Cobble: 29 Lg Cobble: 0 Boulder: 6 Bedrock: 0		
Embeddedness Values (%): 1. 17.6 2. 17.6 3. 47.1 4. 5.9 5. 11.8		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

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	2	1	1.8
Boulder	2	3	3.0
Cobble / Gravel	2	5	4.2
Sand / Silt / Clay	77	74	91.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	1	0.6
Brush	42	42	50.6
Hardwood Trees	25	17	25.3
Coniferous Trees	16	23	23.5
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Wilson Creek

LLID: 1240670405303

Drainage: Van Duzen River

Survey Dates: 8/18/2015 to 8/19/2015

Confluence Location: Quad: HYDESVILLE

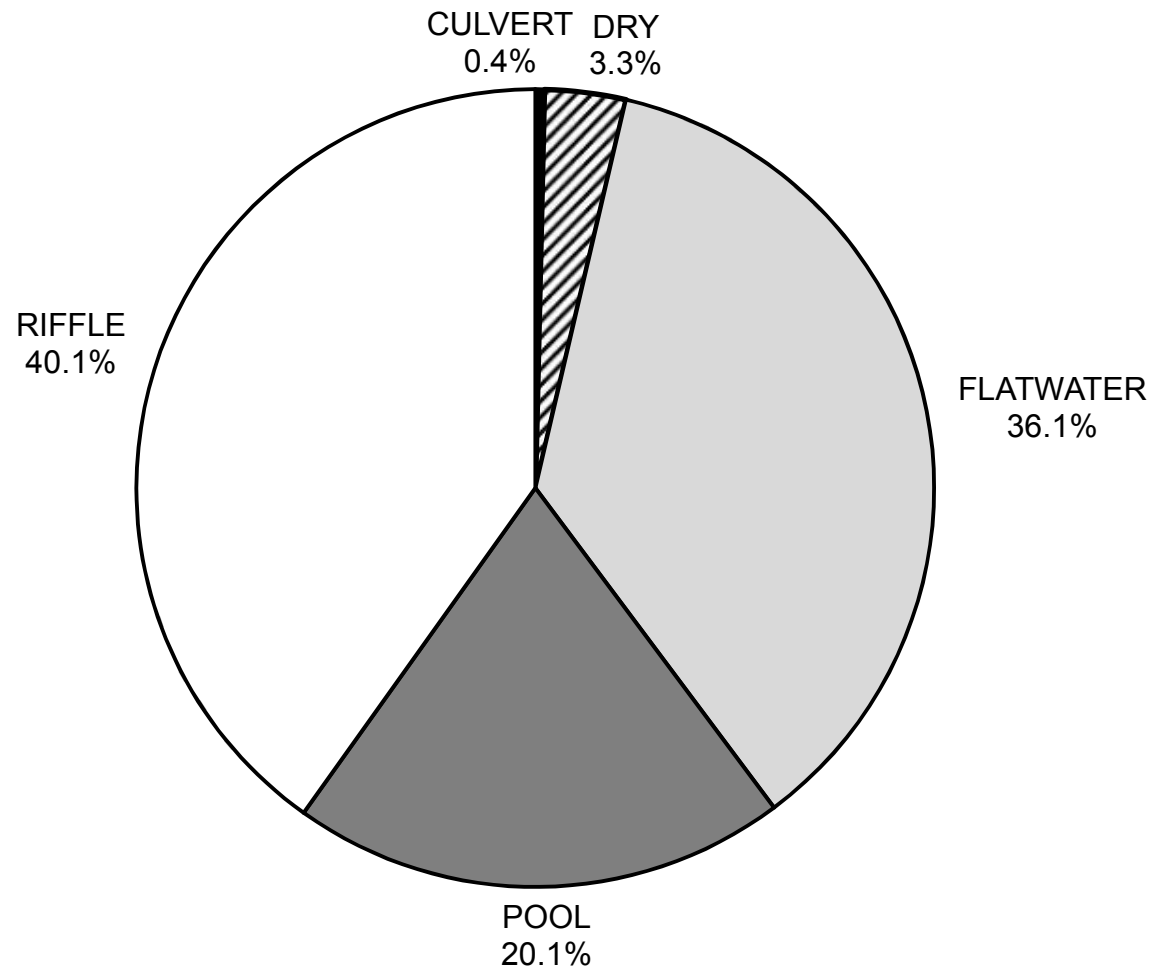
Legal Description: T02NR01ES28

Latitude: 40:31:49.0N

Longitude: 124:04:01.0W

	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	67	12	22
SMALL WOODY DEBRIS (%)	30	44	29
LARGE WOODY DEBRIS (%)	0	6	28
ROOT MASS (%)	3	12	7
TERRESTRIAL VEGETATION (%)	0	25	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	0	0	9
BEDROCK LEDGES (%)	0	0	1

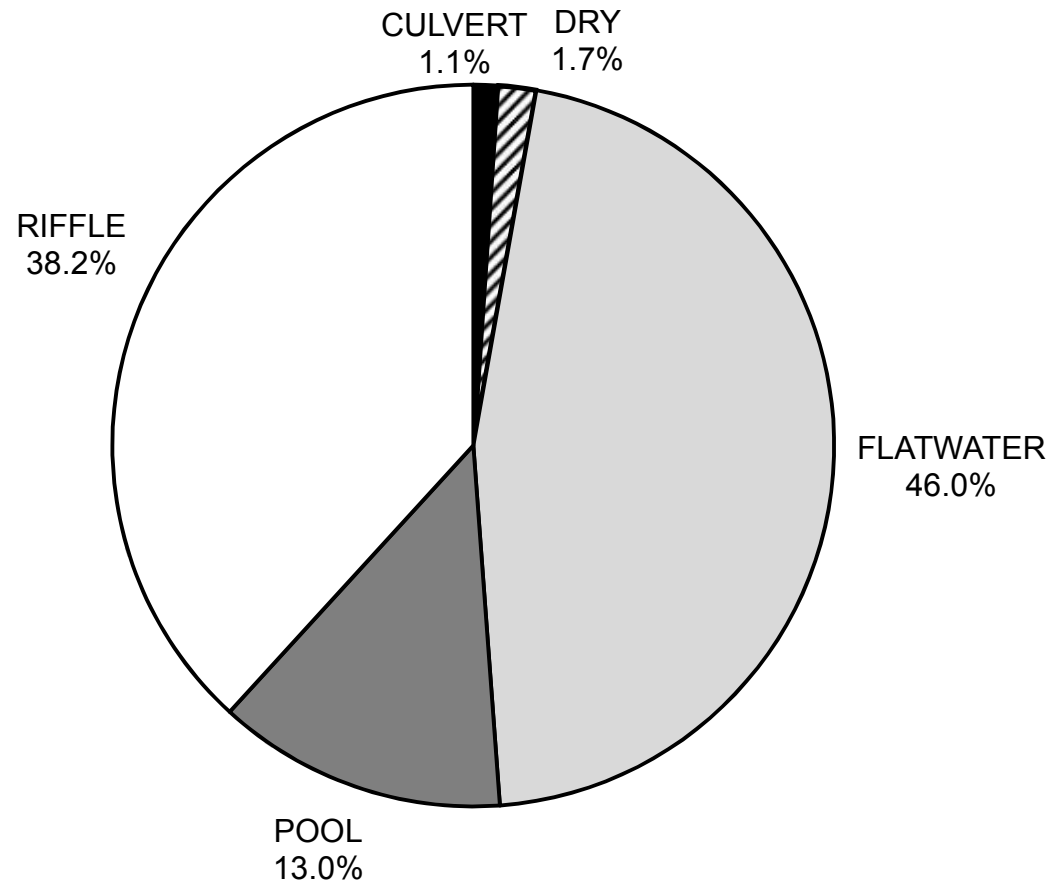
WILSON CREEK 2015 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

WILSON CREEK 2015

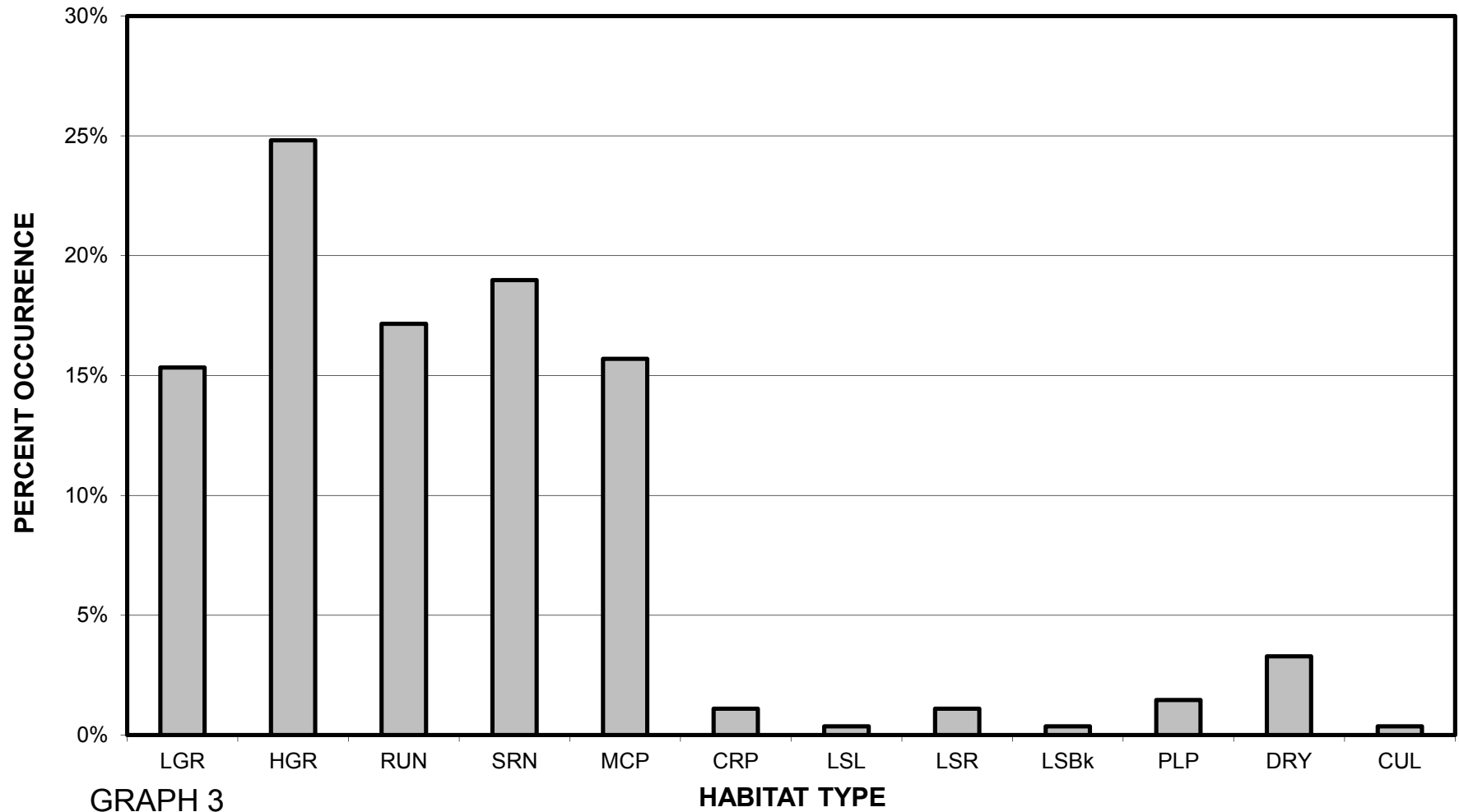
HABITAT TYPES BY PERCENT TOTAL LENGTH



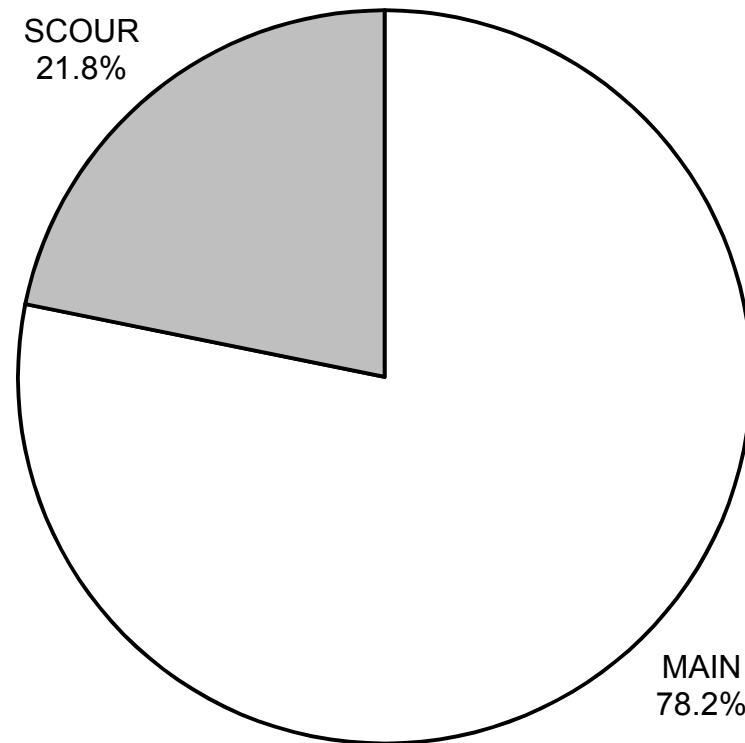
GRAPH 2

WILSON CREEK 2015

HABITAT TYPES BY PERCENT OCCURRENCE

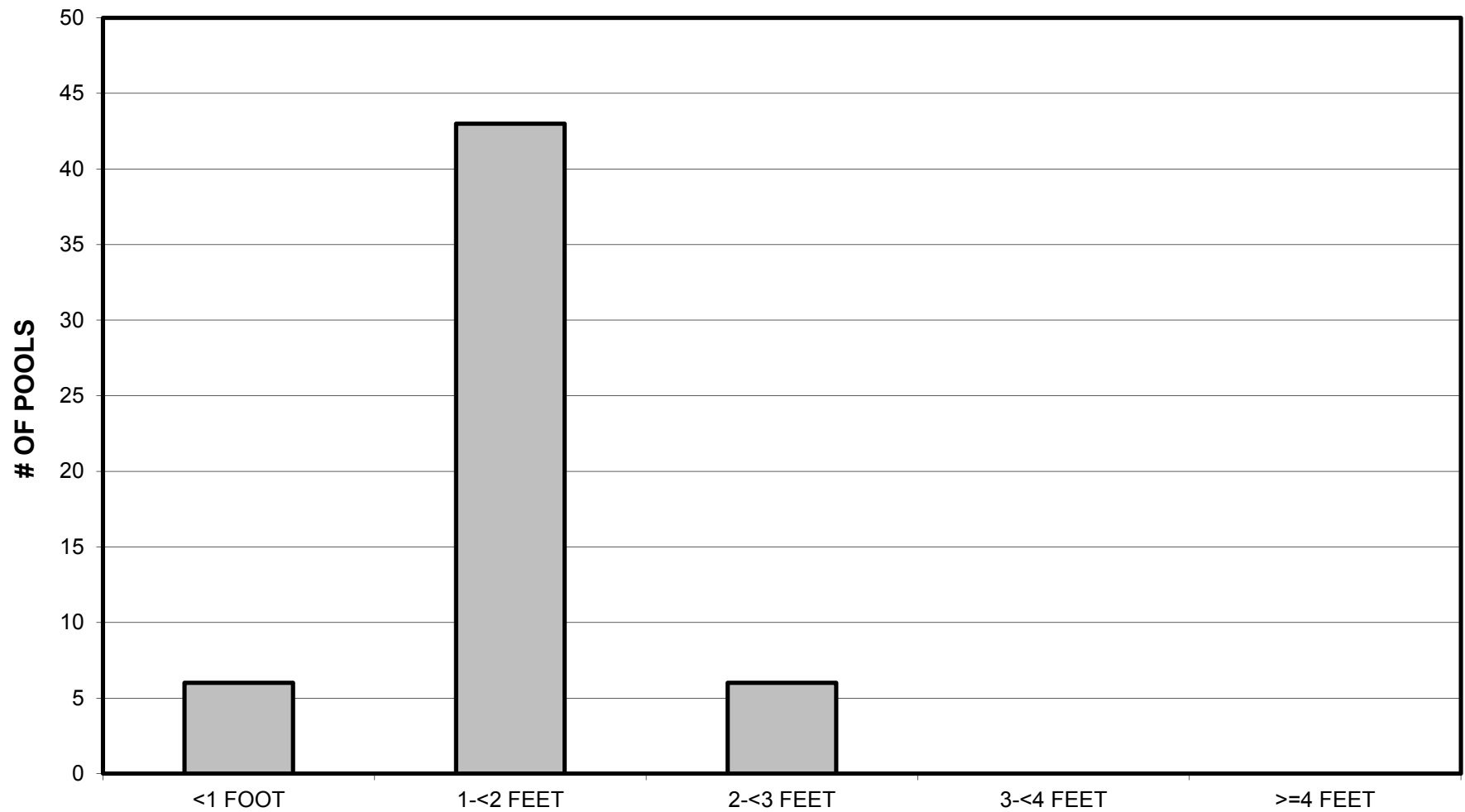


**WILSON CREEK 2015
POOL TYPES BY PERCENT OCCURRENCE**



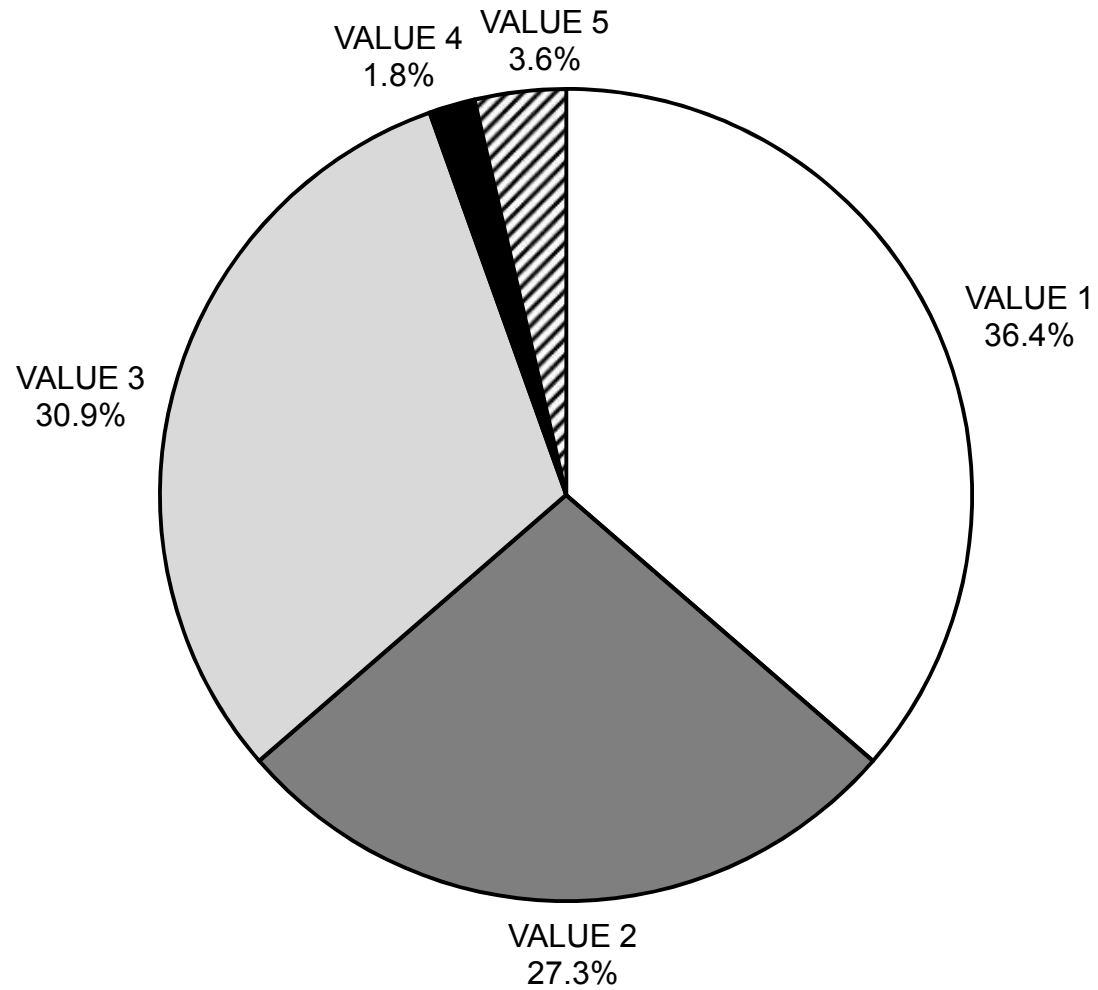
GRAPH 4

WILSON CREEK 2015 MAXIMUM DEPTH IN POOLS



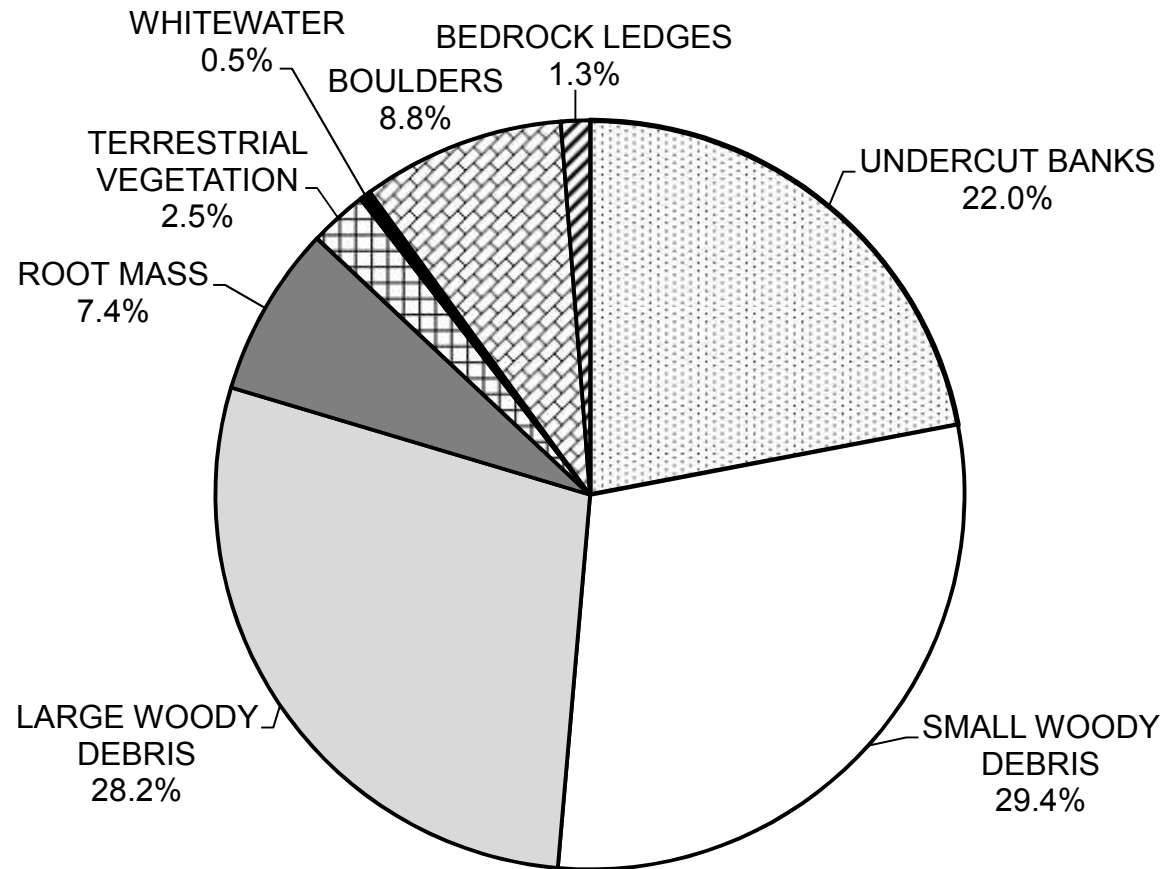
GRAPH 5

WILSON CREEK 2015 PERCENT EMBEDDEDNESS



GRAPH 6

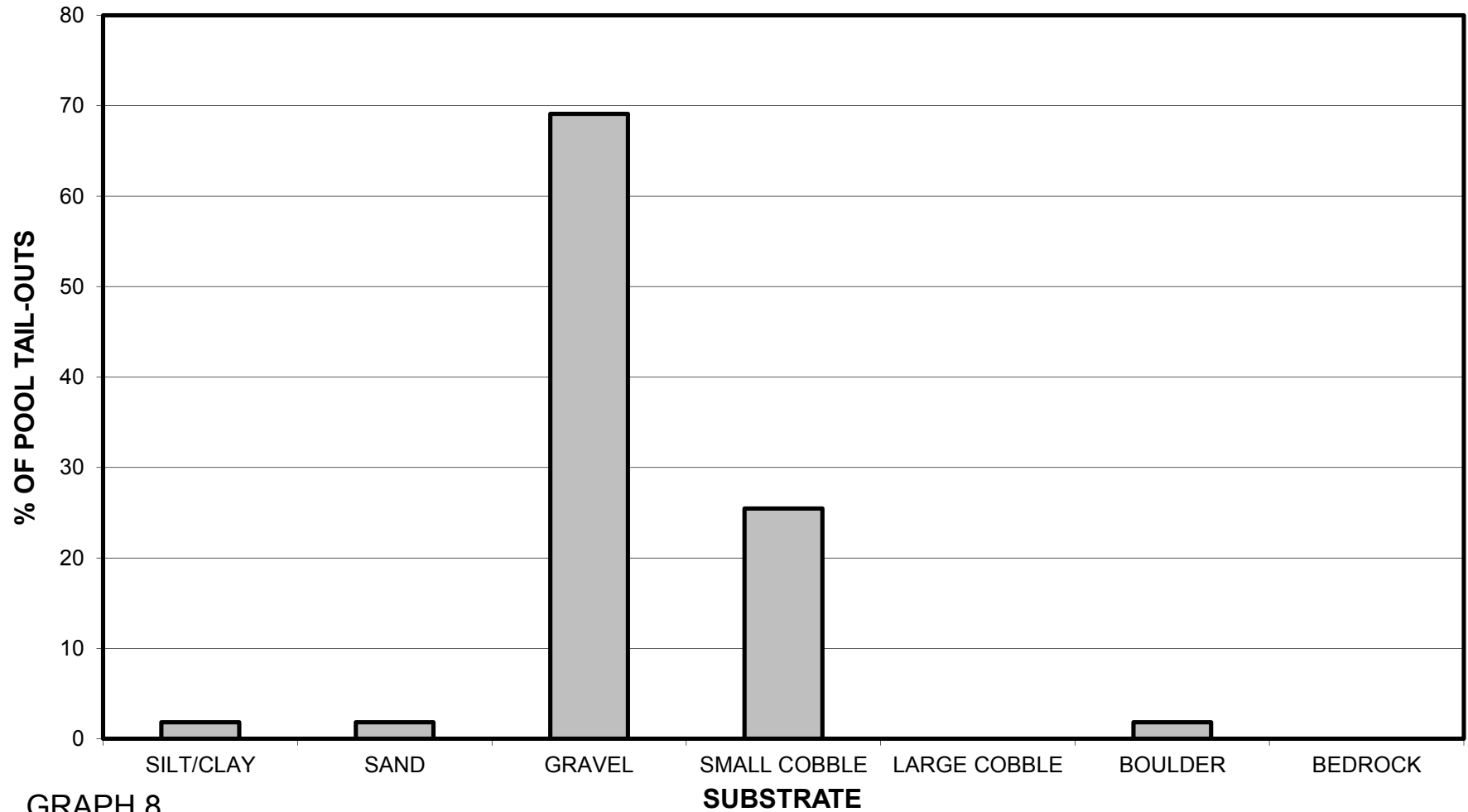
WILSON CREEK 2015 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

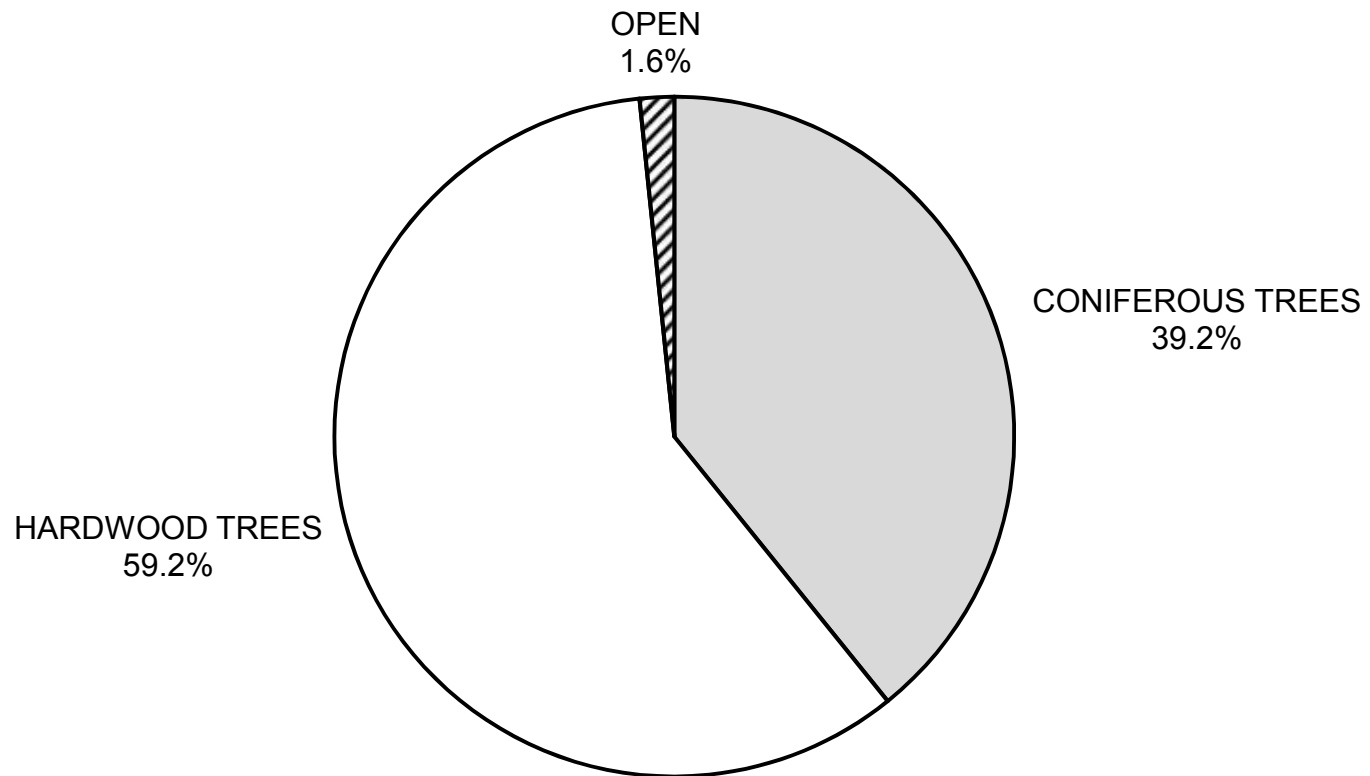
WILSON CREEK 2015

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



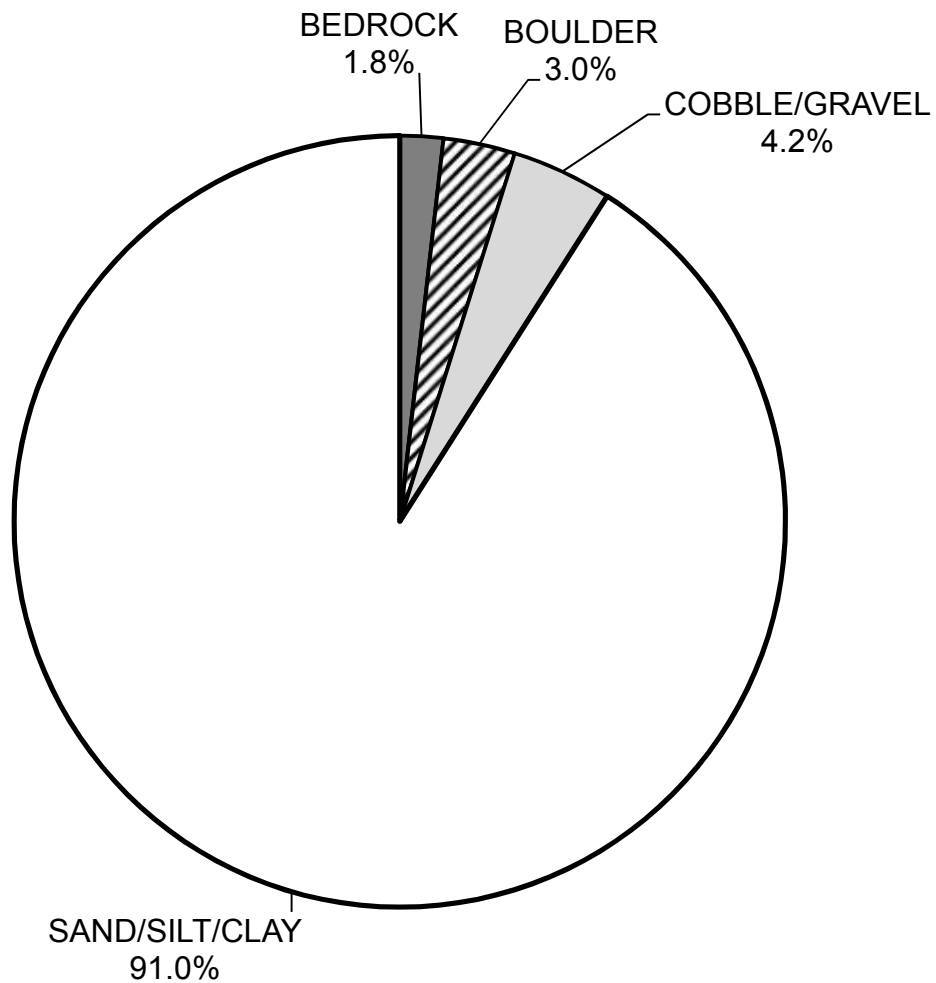
GRAPH 8

WILSON CREEK 2015 MEAN PERCENT CANOPY



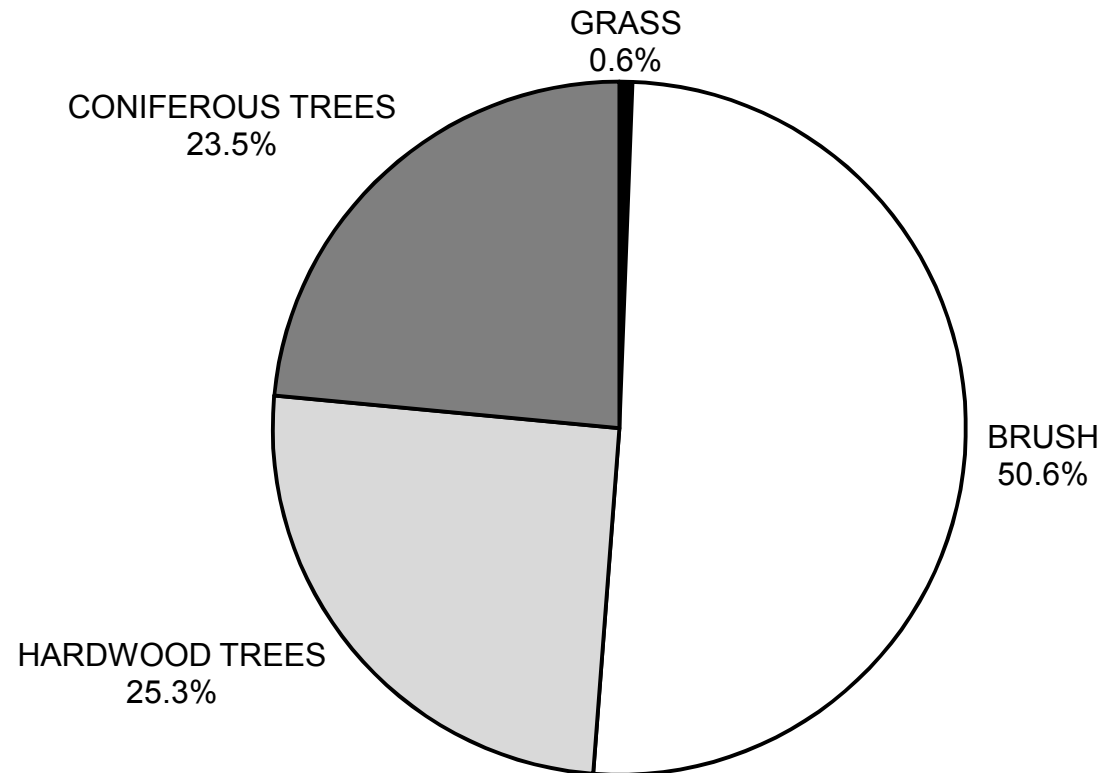
GRAPH 9

WILSON CREEK 2015
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

WILSON CREEK 2015
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11