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DEPARTMENT OF FISH AND WILDLIFE
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CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

CONNICK CREEK

INTRODUCTION

A stream inventory was conducted from September 21 to October 23, 2017 on Connick Creek. The survey began at the confluence with South Fork Eel River and extended upstream 2.6 miles.

The Connick 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 Connick 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 March, 2018.

WATERSHED OVERVIEW

Connick Creek, located in southern Humboldt County, is a tributary to South Fork Eel River, which is a tributary to the Eel River, which drains into the Pacific Ocean in northern California (Map 1). Connick Creek's legal description at the confluence with South Fork Eel River is T04S R03E S24. Its location is 40.0954° north latitude and -123.8048° west longitude, LLID number 1238038400956. Connick Creek is a first order stream and has approximately 2.2 miles of blue line stream according to the USGS Garberville 7.5 minute quadrangle. Connick Creek drains a watershed of approximately 2.6 square miles. Elevations range from about 310 feet at the mouth of the creek to 1,300 feet in the headwater areas. Grassland, oak woodland, and Douglas fir forest dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Connick Creek Road.

METHODS

The habitat inventory conducted in Connick Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project (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 Connick 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 (º) 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". Connick 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 Connick 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 Connick 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 Connick 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 Connick 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 Connick Creek. In addition, underwater mask and snorkel observations were made at 10 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, 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 Connick 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 September 21 to October 3, 2017 was conducted by Nicole Bejar (CDFW) and Chris Tevini (CCC). The total length of the stream surveyed was 13,785 feet.

A stream flow measurement of 0.0621 cfs was recorded on October 2, 2017 near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter.

Connick Creek is an F1 channel type. F1 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with bedrock-dominant substrates.

Water temperatures taken during the survey period ranged from 52° to 60° Fahrenheit. Air temperatures ranged from 51° to 74° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% pool units, 35% flatwater units, 24% dry units, and 1% riffle units (Graph 1). Based on total length of Level II habitat types there were 41% dry units, 36% flatwater units, and 22% pool units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were dry units (24%), step run units (22%), and mid-channel pool units (20%) (Graph 3). Based on percent total length, dry units made up 41%, step run units 31%, and mid-channel pools 12%.

A total of 83 pools were identified (Table 3). Main channel pools were the most frequently encountered at 53% (Graph 4), and comprised 54% 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. Eight of the 83 pools (10%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 83 pool tail-outs measured, 48 had a value of 1 (57.8%), 21 had a value of 2 (25.3%), 1 had a value of 3 (1.2%), and 13 had a value of 5 (15.7%) (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 , flatwater habitat types had a mean shelter rating of 0, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, scour pools had the highest mean shelter rating at 24. Main channel pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Bedrock ledges are the dominant cover type in Connick Creek. Graph 7 describes the pool cover in Connick Creek. Bedrock ledges 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 most dominant substrate, observed in 73% of pool tail-outs. Bedrock was the next most frequently observed dominant substrate type, occurring in 12% of pool tail-outs.

The mean percent canopy density for the surveyed length of Connick Creek was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 70% and 30%, respectively. Graph 9 describes the mean percent canopy in Connick Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 38% bedrock, 61% sand/silt/clay, and 1% cobble/gravel (Graph 10). Brush was the dominant vegetation type observed in 67% of the units surveyed. Additionally, 24% of the units surveyed had hardwood trees as the dominant vegetation type, and 9% had coniferous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at 10 sites for species composition and distribution in Connick Creek on October 3, 2017 (Table A). The sites were sampled by Nicole Bejar and Ryan Bernstein (CDFW).

The survey yielded 29 young-of-the-year (YOY) steelhead trout (SH), 4 age 1+ SH, and 65 California Roach (RCH).

During the survey, the upstream-most observation of juvenile steelhead trout occurred at 40.0911° north latitude, -123.8160° west longitude, approximately 12,704 feet upstream from the confluence with South Fork Eel River (Map 1).

Table A. Summary of results for a fish composition and distribution survey within Connick Creek, October 3, 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+	
10/03/17	1	062	Pool	6,112	0	0	0	0	0	RCH
	2	064	Pool	6,237	0	0	0	0	0	RCH
	3	066	Pool	6,348	3	0	0	0	0	
	4	068	Pool	6,425	3	0	0	0	0	RCH
	5	113	Pool	8,881	2	2	0	0	0	
	6	146	Pool	10,634	4	1	0	0	0	
	7	149	Pool	10,820	3	0	0	0	0	
	8	181	Pool	12,294	4	0	0	0	0	
	9	184	Pool	12,643	7	1	0	0	0	
	10	188	Run	12,704	3	0	0	0	0	

Species abbreviations: RCH = California roach

DISCUSSION

Connick Creek is an F1. The suitability of F1 channel types for fish habitat improvement structures is as follows: F1 channels are good for bank-placed boulders and fair for single wing-deflectors and log cover.

The water temperatures recorded on the survey days September 21 to October 3, 2017 ranged from 52° to 60° Fahrenheit. Air temperatures ranged from 51° to 74° 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 36% of the total length of this survey, riffles 0%, pools 22%, and 41% dry units. Eight of the 83 (10%) 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.

Sixty-nine of the 83 pool tail-outs measured had embeddedness ratings of 1 or 2. One of the pool tail-outs had embeddedness ratings of 3 or 4. Thirteen 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.

Seventy of the 83 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Thirteen of the 83 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools is 22. 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 bedrock ledges in Connick Creek. Bedrock ledges 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 92%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 99% and 99%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

Connick 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 Connick 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 Bedrock ledges. Adding high quality complexity with woody cover in the pools is desirable.

2) Pools are disconnected and sections of the stream are dry/subsurface. Streamflow should be monitored to determine if it is limiting for salmonids and treatment options should be investigated.

3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

4) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

5) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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 South Fork Eel River. Channel type is a F1. Channel type cross-section location is at Habitat Unit (HU) #21. Creek is dry for first 2,600'.
2600	0002.00	The creek is out of the influence of the confluence with South Fork Eel River. Survey resumes here after dry channel.
2958	0011.00	There is an old landslide on the left bank, it measures 111' long x 30' high. It is not depositing sediment.
3184	0016.00	There is active erosion on the right bank, it measures 39' long x 50' high. It is depositing gravel.
3246	0019.00	Tributary #1 enters into Connick Creek on the right bank. The slope of the tributary is estimated to be 25%. The tributary is not accessible to salmonids due to a dry channel. In high flows, it is a steep step-run channel with a lot of debris. Fish were not observed in the tributary.
3795	0029.00	Bedrock gulch/canyon.
4233	0034.00	Tributary #2 enters on the right bank. The slope of the tributary is estimated to be 50%. The tributary is not accessible to salmonids due to a high slope, large amount of debris from landslide, and dry channel bed. In high flows, the channel is incised and steep. Fish were not observed in the tributary.
4281	0036.00	15 California Roach (RCH) present.
4841	0041.00	Tributary #3 enters on the left bank. The slope of the tributary is estimated to be 20%. The tributary is not accessible to salmonids. It is a very incised gulch with debris from a landslide lying in the channel. Fish were not observed in the tributary.
5485	0052.00	40 (RCH) present. There is left bank seepage.
5753	0057.00	There is an old landslide on the right bank, it measures 25' long x 50' high. It is depositing gravel.

5894	0059.00	There is active erosion caused by road on the right bank, it measures 25' long x 50' high. It is depositing gravel.
5941	0061.00	Tributary #4 enters on the left bank. The slope of the tributary is estimated to be 15%. The tributary is not accessible to salmonids due to dry channel bed. Fish were not observed in the tributary. It is incised and there is debris and vegetation in the channel. Within 100 feet of the mouth there are two culverts and a 16 foot high plunge over concrete onto bedrock and concrete.
6060	0061.00	Bridge #1 is the crossing for Connick Creek Road, and is 30' high x 50' wide x 20' long. It is an automobile bridge (made of wood and metal) and is not a barrier to salmonids.
6176	0064.00	There is a California Conservation Corps (CCC) LWD restoration project.
6237	0065.00	There is a CCC LWD restoration project.
6327	0066.00	There is a CCC LWD restoration project.
6401	0068.00	There is a CCC LWD restoration project.
7027	0078.00	Log debris accumulation (LDA) #1 is 6' high x 28' wide x 10' long and contains 4 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 9' wide, 11' long and 2.5' deep. The sediment ranges in size from silt to cobble. The LDA is not a possible barrier to salmonids. Juveniles can swim through the bottom, but there were dry units before and after the LDA. Fish were observed above the LDA.
7120	0080.00	Tributary #5 enters on the right bank. The slope of the tributary is estimated to be 10%. The tributary is not accessible to salmonids due to dry channel. There is also vegetation growing in the creek and debris. It is an incised, bedrock channel. Fish were not observed in the tributary.
7364	0084.00	There is a landslide on the left bank, it measures120’ long x 20’ high. It is depositing gravel.

7514	0090.00	There is a landslide on the left bank, it measures 210' long x 40' high. It is depositing 6' of gravel. There are trees spanning and blocking the channel.
7743	0094.00	There is active erosion on the right bank, it measures 60' long x 35' high. SWD is piled up.
7798	0095.00	There is an old landslide on the left bank, it measures 88' long x 30' high. Vegetation has almost all grown back. Decaying mossy hardwoods lying over channel.
8755	0110.00	There is active erosion on the left bank, it measures 30' long x 50' high. It is depositing fine gravel.
9098	0115.00	There is a 3' LWD plunge into a 3' pool at the top of this unit. It is not a barrier to salmonids. LDA #2 is 7' high, 31' wide, 12' long and contains 6 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 6' wide, 8' long and 4.5' deep. The sediment ranges in size from sand to cobble. The LDA is a possible barrier to juveniles as it is dry above the LDA. In higher flows juveniles can swim below the LDA and adults can jump over. Fish were observed above the LDA.
9182	0117.00	There is active erosion on the right bank, it measures 80' long x 40' high. It is depositing gravel.
9227	0119.00	Salmonid young-of-the-year (YOY) present.
9272	0121.00	LDA #3 is 10' high, 28.5' wide, 11' long and contains 6 pieces of LWD. Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 20' wide, 23' long and 2.5' deep. The sediment ranges in size from silt to cobble. The LDA is a possible barrier to juveniles. It is dry above the LDA. In high flows, juveniles can swim down and adults can jump over. Fish were observed above the LDA.
10061	0136.00	LDA #4 is 9.5' high, 34' wide, 30' 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 13' wide, 12' long and 7.5' deep. The sediment ranges in size from silt to cobble. The LDA is a possible barrier to juvenile salmonids. There is a dry unit below and above the LDA. In high flows, juveniles would not be able to swim down and adults could potentially jump over the top. Fish were observed above the LDA.

10089	0137.00	Tributary #6 enters on the right bank. The slope of the tributary is an estimated 10%. The tributary is not accessible to salmonids due to a dry channel. It is a bedrock, incised, step-run channel. There is debris and downed trees lying in channel. Fish were not observed in the tributary.
10397	0141.00	There is active erosion on the left bank, it measures 49' long x 8' high. It is depositing fine sediment.
10580	0146.00	Old growth rootwad.
10684	0148.00	There is an old landslide on both banks, it measures 100' long x 40' high. It is depositing fines.
10776	0149.00	Tributary #7 enters on the left bank. It contributes to approximately <1% of Connick Creek's flow. The water temperature of the tributary was 53° Fahrenheit, the water temperature downstream of the confluence was 56° Fahrenheit, and the water temperature upstream of the confluence was 56° Fahrenheit. The slope of the tributary is estimated at 5%. The tributary is accessible to salmonids. It is an entrenched, gully-like creek. There are fallen trees lying in the channel. It runs dry after 100 feet. Fish were not observed in the tributary.
11107	0154.00	SWD pile up.
11128	0155.00	Bridge #2 is the crossing for an unnamed road, and is 21' high x 11.5' wide x 49' long. It is an automobile bridge (made of wood and metal) and is not a barrier to salmonids.
11289	0159.00	There is a 3' plunge over bedrock into a 2' deep pool. There is a 3.5' plunge over LWD into a 1.5 foot deep pool. It is not a barrier to salmonids.
11561	0161.00	There is active erosion on the bank, it measures 41' long x 20' high. It is depositing fines.
11592	0162.00	There is a 2.5' LWD plunge into a 1.6' pool at the top of this unit. It is not a barrier to salmonids.
11626	0165.00	There is a 1.4' plunge over LWD into 2.2 foot deep pool. It is not a barrier to salmonids.
11837	0173.00	There is a 2.3' plunge over LWD into 1.9' deep pool. It is not a barrier to salmonids.

12014	0178.00	LDA #5 is 7' high, 28' wide, 19' 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 9.5' wide, 14' long and 4' deep. The sediment ranges in size from silt to cobble. The LDA is a possible barrier to juvenile salmonids. It is dry below and above the LDA. In high flows, juveniles would not be able to swim underneath and adults would be able to jump over.
12251	0179.00	YOY trout observed.
12274	0181.00	There is active erosion on the right bank, it measures 30' long x 15' high. It is depositing gravel. There is a 5.7' plunge over LWD into 2.3' deep pool. It is not a barrier to salmonids.
13430	0206.00	LDA #6 is 8' high, 15' wide, 29' long and contains 6 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 8' wide x 15' long x 8' deep. The sediment ranges in size from silt to gravel. The LDA is a possible barrier to juvenile and adult salmonids. It is dry above and below the LDA. In high flows adults may be able to jump over, but the channel is steep and very incised with a lot of debris. Fish were not observed above the LDA.
13597	0208.00	There is a landslide on the left bank, it measures 50' long x 25' high. Dead trees spanning channel for 48' making it challenging to salmonids to swim through in high flows.
13615	0209.00	End of survey and end of anadromy. End of survey due to increasing slope, dry channel and 12' plunge at the top of the unit. Two large boulders at the top of the unit create plunge. Since the fork in the creek at HU #205 there are no significant pools and the slope steadily increases. Channel becomes more incised with SWD and LWD lying in channel and blocking it in multiple spots. Channel is dry 500 feet upstream.

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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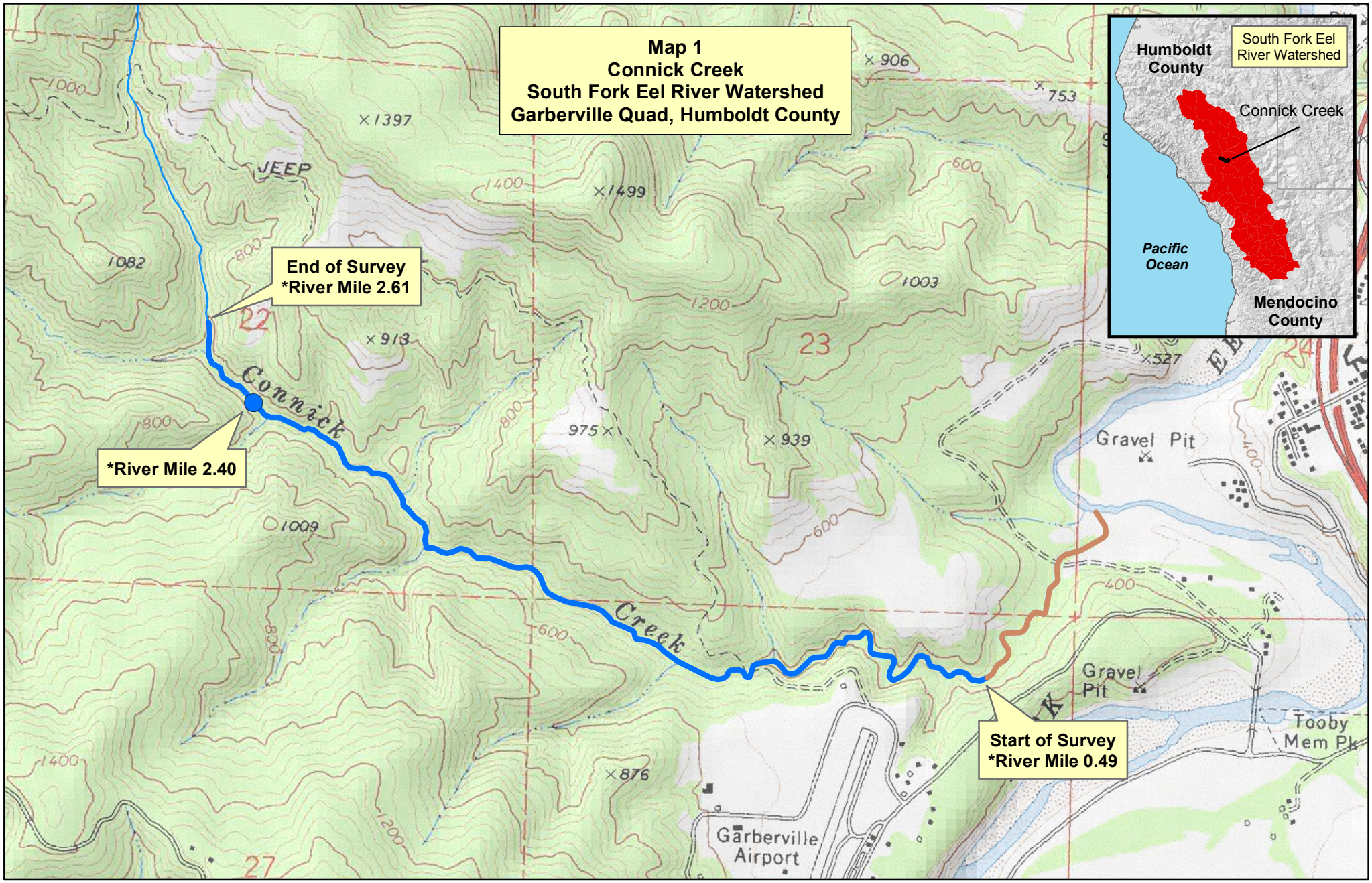
LEVEL III and LEVEL IV HABITAT TYPES

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]	



N
W E
S

Reach 1: F1 Channel Type

Dry channel

Connick Creek

Last observed juvenile steelhead trout

0 0.075 0.15 0.3 Miles

0 0.175 0.35 0.7 Kilometers

Coordinate System: NAD 1983 California Teale Albers
Data Sources: CDFW, USGS, CalWater 2.21, CDF 24k

*River Mile indicates distance from confluence with South Fork Eel River

APPENDIX I

TABLES AND GRAPHS

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

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0

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
50	0	DRY	23.9	113	5670	41.1									
74	7	FLATWATER	35.4	67	4991	36.2	3.4	0.4	0.7	100	7407	48	3570		0
83	83	POOL	39.7	37	3085	22.4	7.6	0.7	1.4	280	23213	265	21196	213	22
2	1	RIFFLE	1.0	20	39	0.3	1.0	0.1	0.2	7	13	1	1		

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
209	91	13785	30633	24767

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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 (%)
2	1	LGR	1.0	20	39	0.3	1	0.1	0.2	7	13	1	1			97
28	4	RUN	13.4	27	757	5.5	4	0.5	1	84	2348	41	1161		0	89
46	3	SRN	22.0	92	4234	30.7	3	0.4	0.7	122	5601	57	2636		0	83
42	42	MCP	20.1	38	1592	11.5	8	0.7	2.2	295	12402	277	11065	219	20	91
1	1	CCP	0.5	44	44	0.3	8	1.2	1.9	330	330	396	396	396	10	98
1	1	STP	0.5	22	22	0.2	6		2	143	143				20	98
1	1	CRP	0.5	26	26	0.2	7	0.6	1.6	182	182	146	146	109	20	79
6	6	LSL	2.9	21	124	0.9	7	0.7	1.9	145	872	125	750	107	78	96
1	1	LSR	0.5	54	54	0.4	10	1.1	1.7	567	567	624	624	624	90	94
22	22	LSBk	10.5	48	1047	7.6	7	0.7	2.5	325	7156	298	6546	229	4	92
3	3	LSBo	1.4	29	86	0.6	8	0.5	1.4	245	734	179	537	135	10	95
6	6	PLP	2.9	15	90	0.7	9	1.2	2.7	138	827	189	1132	175	42	100
50	0	DRY	23.9	113	5670	41.1										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
209	91	13785	31175	24994

Table 3 - Summary of Pool Types

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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
44	44	MAIN	53	38	1658	54	7.6	0.7	293	12875	223	9160	20
39	39	SCOUR	47	37	1427	46	7.6	0.7	265	10338	202	7872	24

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
83	83	3085	23213	17032

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

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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
42	MCP	51	7	17	34	81	1	2	0	0	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
1	STP	1	0	0	0	0	1	100	0	0	0	0
1	CRP	1	0	0	1	100	0	0	0	0	0	0
6	LSL	7	1	17	5	83	0	0	0	0	0	0
1	LSR	1	0	0	1	100	0	0	0	0	0	0
22	LSBk	27	6	27	13	59	3	14	0	0	0	0
3	LSBo	4	0	0	3	100	0	0	0	0	0	0
6	PLP	7	0	0	3	50	3	50	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
83	14	17	61	73	8	10	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River-South Fork

Survey Dates: 9/21/2017 to 10/3/2017 Dry Units: 50

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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
2	0	LGR									
2	0	TOTAL RIFFLE									
28	4	RUN	0	0	0	0	0	0	0	0	0
46	3	SRN	0	0	0	0	0	0	0	0	0
74	7	TOTAL FLAT	0	0	0	0	0	0	0	0	0
42	42	MCP	9	13	21	6	3	0	0	16	31
1	1	CCP	30	0	0	20	0	0	0	0	50
1	1	STP	30	10	40	20	0	0	0	0	0
1	1	CRP	40	20	0	30	10	0	0	0	0
6	6	LSL	3	40	53	2	0	0	0	2	0
1	1	LSR	30	20	50	0	0	0	0	0	0
22	22	LSBk	0	3	0	0	0	0	0	28	69
3	3	LSBo	7	10	0	3	0	0	0	80	0
6	6	PLP	10	18	67	5	0	0	0	0	0
83	83	TOTAL POOL	8	14	23	4	1	0	0	18	32
209	90	TOTAL	8	14	23	5	2	0	0	18	32

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017 Dry Units: 50

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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
2	1	LGR	0	0	0	0	100	0	0
28	4	RUN	0	25	75	0	0	0	0
46	3	SRN	0	0	67	0	0	0	33
42	42	MCP	7	12	76	0	0	0	5
1	1	CCP	0	0	100	0	0	0	0
1	1	STP	0	0	100	0	0	0	0
1	1	CRP	0	0	100	0	0	0	0
6	6	LSL	0	17	83	0	0	0	0
1	1	LSR	100	0	0	0	0	0	0
22	22	LSBk	0	0	59	0	5	0	36
3	3	LSBo	0	0	100	0	0	0	0
6	6	PLP	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	30	70	0	99	99

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Connick Creek | LLID: 1238038400956 | Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017 | Survey Length (ft.): 13785 | Main Channel (ft.): 13785 | Side Channel (ft.): 0

Confluence Location: Quad: GARBERVILLE | Legal Description: T04SR03ES24 | Latitude: 40:05:44.0N | Longitude: 123:48:14.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F1

Reach Length (ft.): 13785

Riffle/Flatwater Mean Width (ft.): 3.1

BFW:

Range (ft.): 10 to 27

Mean (ft.): 18

Std. Dev.: 5

Base Flow (cfs.): 0.1

Water (F): 52 - 60 Air (F): 51 - 74

Dry Channel (ft): 5670

Canopy Density (%): 92.1

Coniferous Component (%): 30.2

Hardwood Component (%): 69.8

Dominant Bank Vegetation: Brush

Vegetative Cover (%): 99.2

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 15

LWD per 100 ft.:

Riffles: 0

Pools: 4

Flat: 1

Pools by Stream Length (%): 22.4

Pool Frequency (%): 39.7

Residual Pool Depth (%):

< 2 Feet Deep: 90

2 to 2.9 Feet Deep: 10

3 to 3.9 Feet Deep: 0

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 1.4

Mean Pool Shelter Rating: 22

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 73 Sm Cobble: 11 Lg Cobble: 0 Boulder: 1 Bedrock: 12

Embeddedness Values (%): 1. 57.8 2. 25.3 3. 1.2 4. 0.0 5. 15.7

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Connick Creek LLID: 1238038400956 Drainage: Eel River - South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

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	35	34	37.9
Boulder	0	0	0.0
Cobble / Gravel	0	2	1.1
Sand / Silt / Clay	56	55	61.0

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	0	0.0
Brush	69	53	67.0
Hardwood Trees	16	27	23.6
Coniferous Trees	6	11	9.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

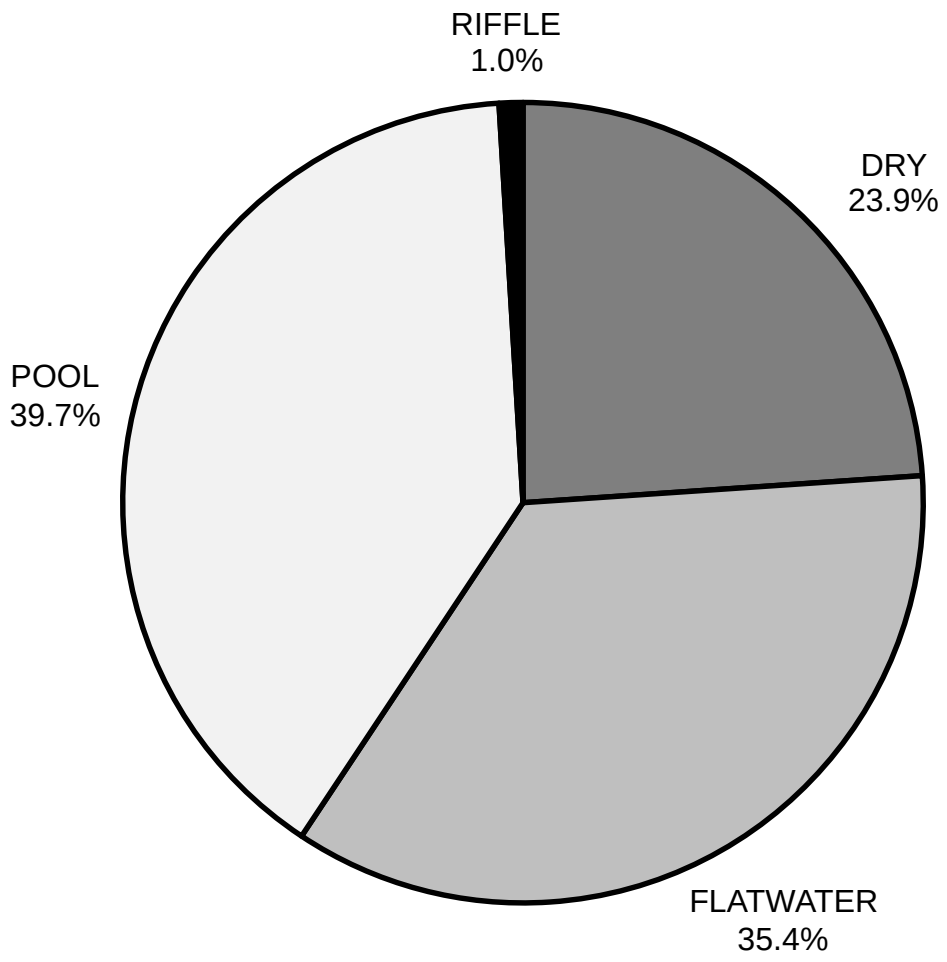
StreamName: Connick Creek LLID: 1238038400956 Drainage: Eel River-South Fork

Survey Dates: 9/21/2017 to 10/3/2017

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:05:44.0N Longitude: 123:48:14.0W

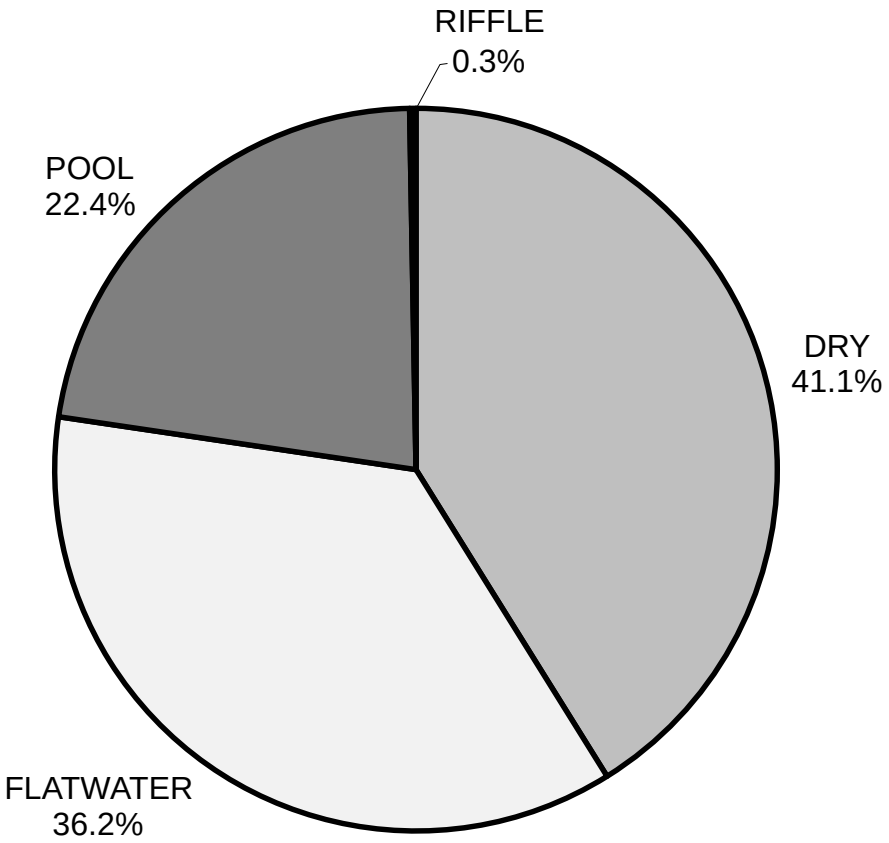
	Riffles	Flatwater	Pools
UNDERCUT BANKS(%)		0	8
SMALL WOODY DEBRIS (%)		0	14
LARGE WOODY DEBRIS (%)		0	23
ROOT MASS (%)		0	4
TERRESTRIAL VEGETATION (%)		0	1
AQUATIC VEGETATION (%)		0	0
WHITEWATER (%)		0	0
BOULDERS (%)		0	18
BEDROCK LEDGES (%)		0	32

CONNICK CREEK 2017
HABITAT TYPES BY PERCENT OCCURRENCE



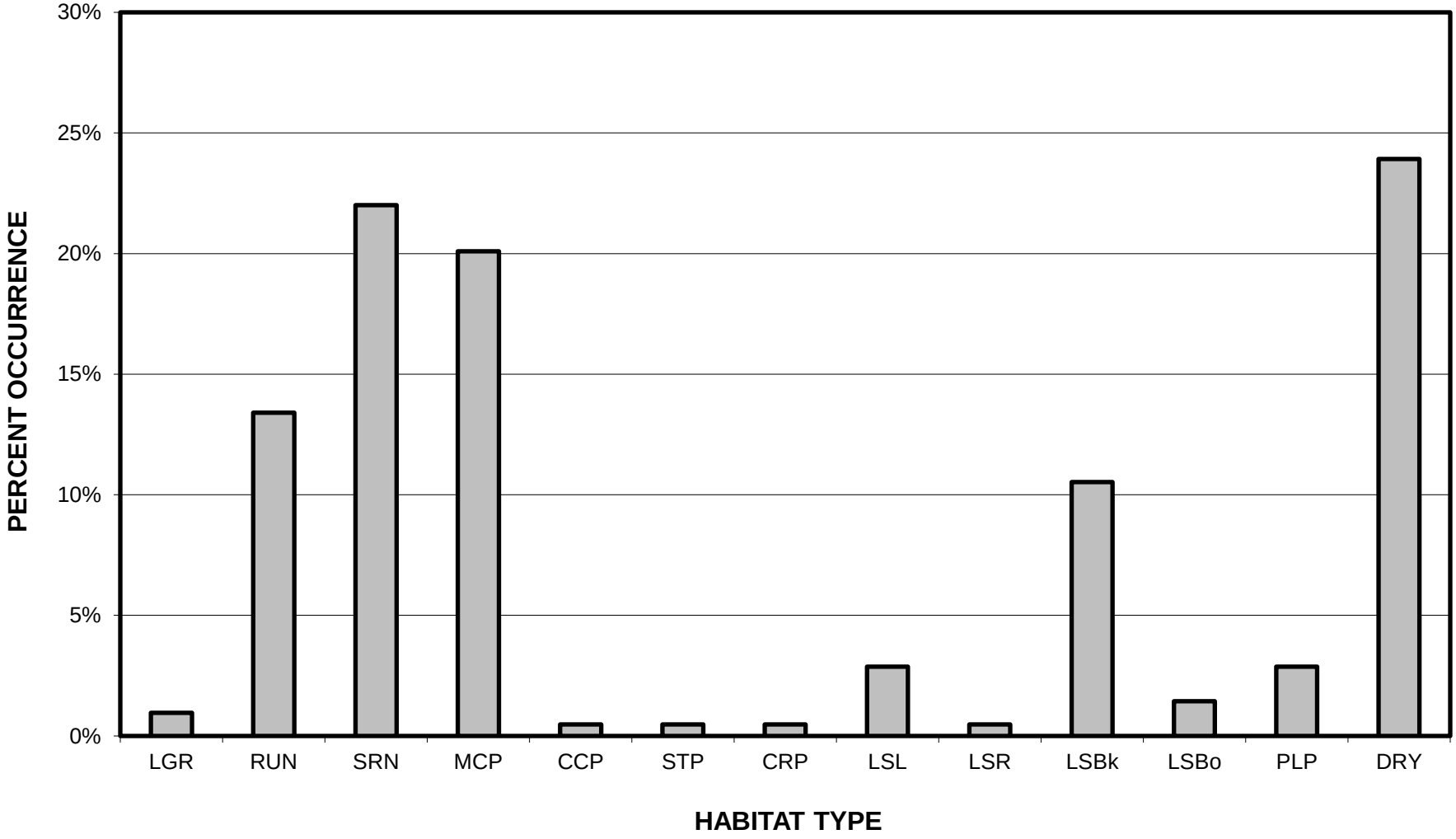
GRAPH 1

CONNICK CREEK 2017
HABITAT TYPES BY PERCENT TOTAL LENGTH



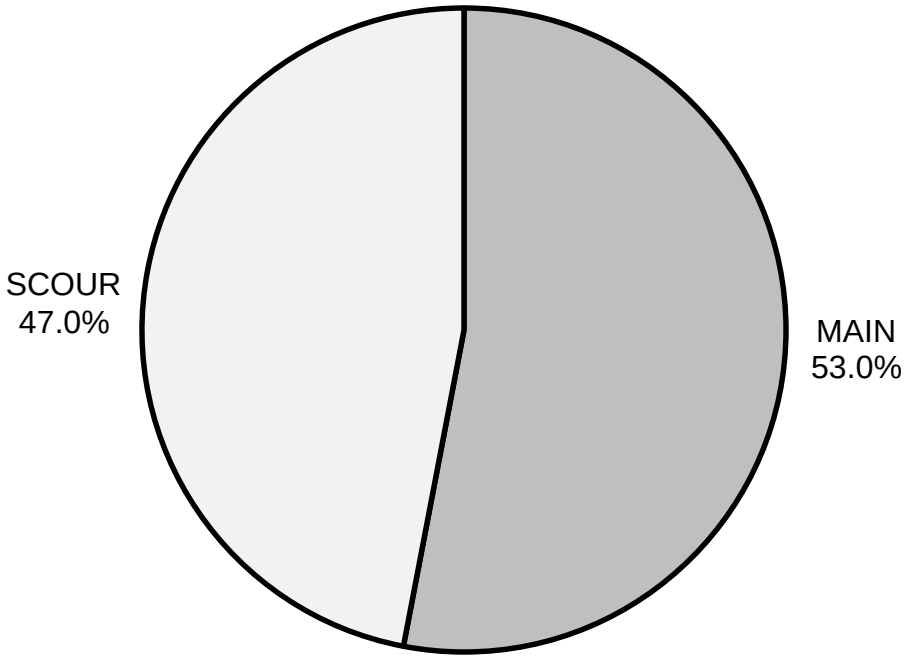
GRAPH 2

CONNICK CREEK 2017
HABITAT TYPES BY PERCENT OCCURRENCE



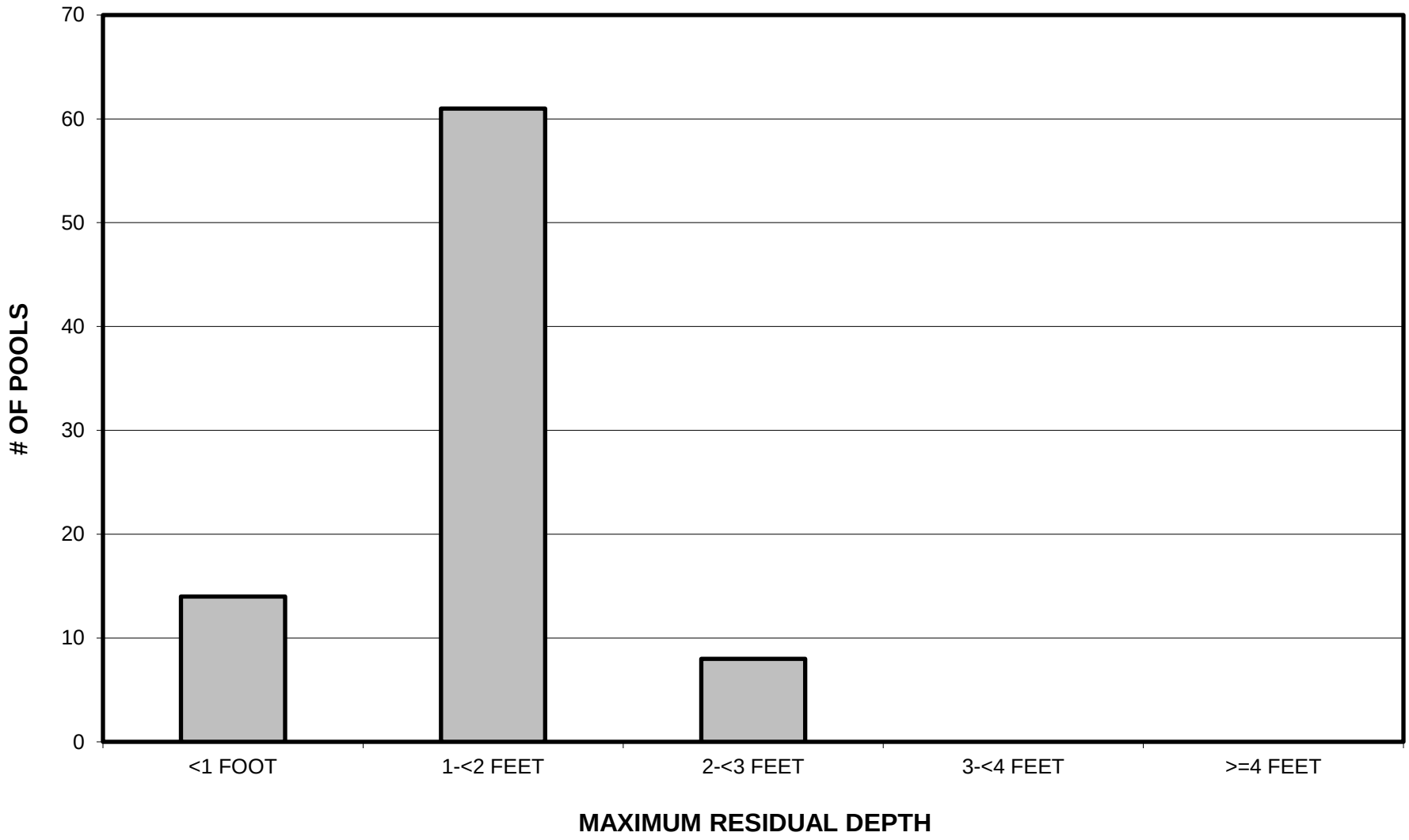
GRAPH 3

CONNICK CREEK 2017
POOL TYPES BY PERCENT OCCURRENCE



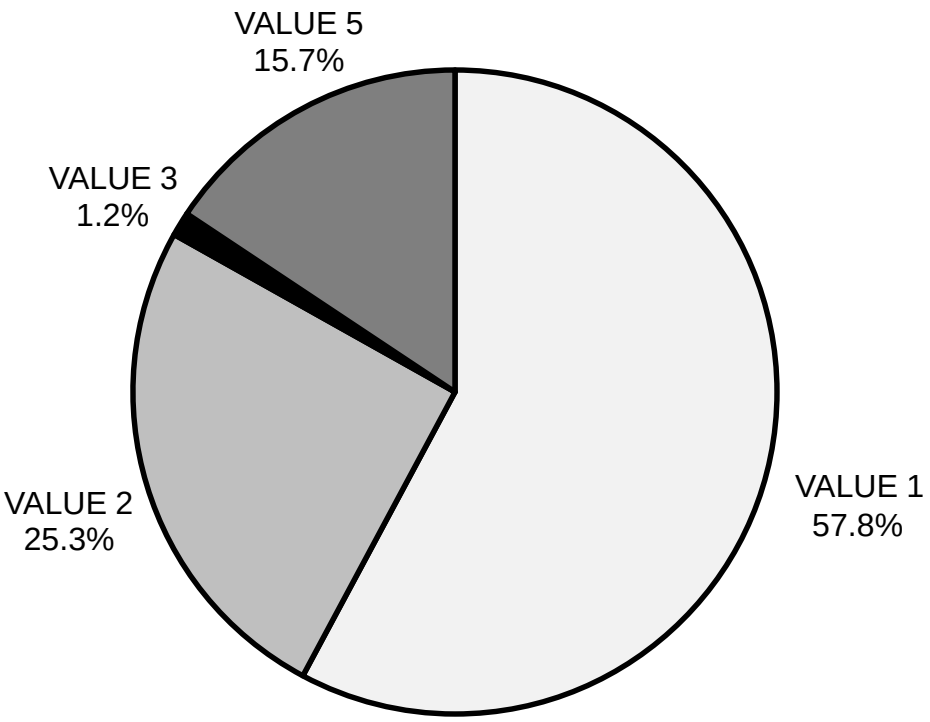
GRAPH 4

CONNICK CREEK 2017
MAXIMUM DEPTH IN POOLS



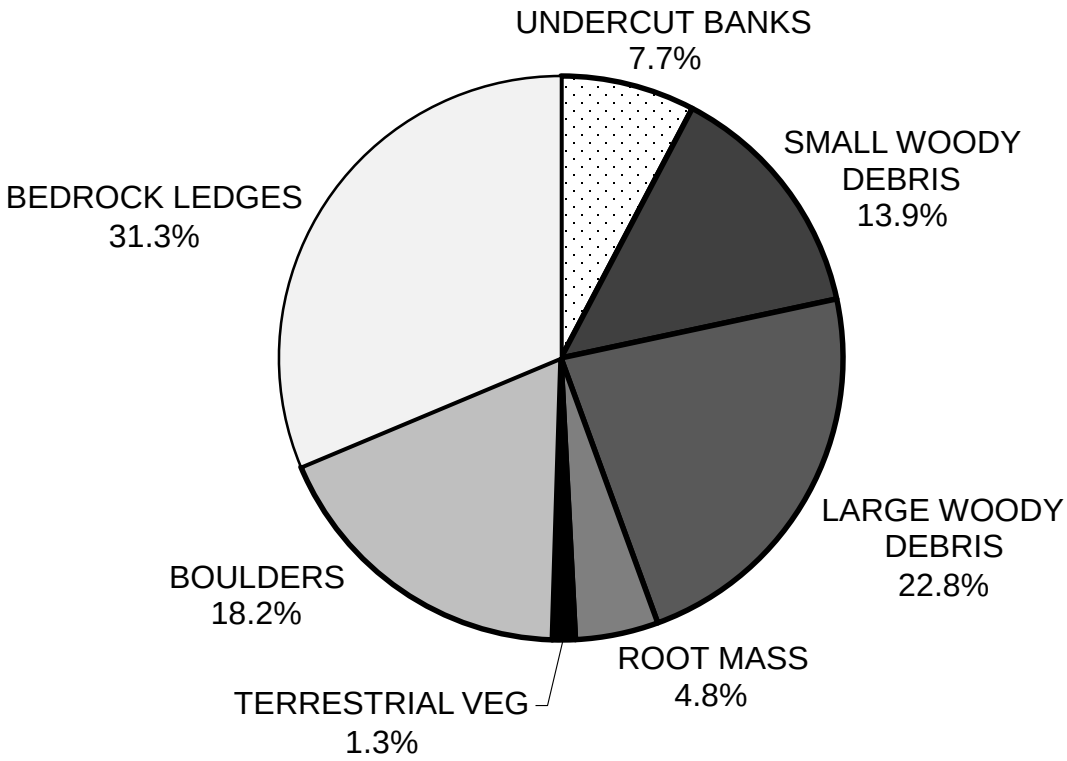
GRAPH 5

CONNICK CREEK 2017
PERCENT EMBEDDEDNESS



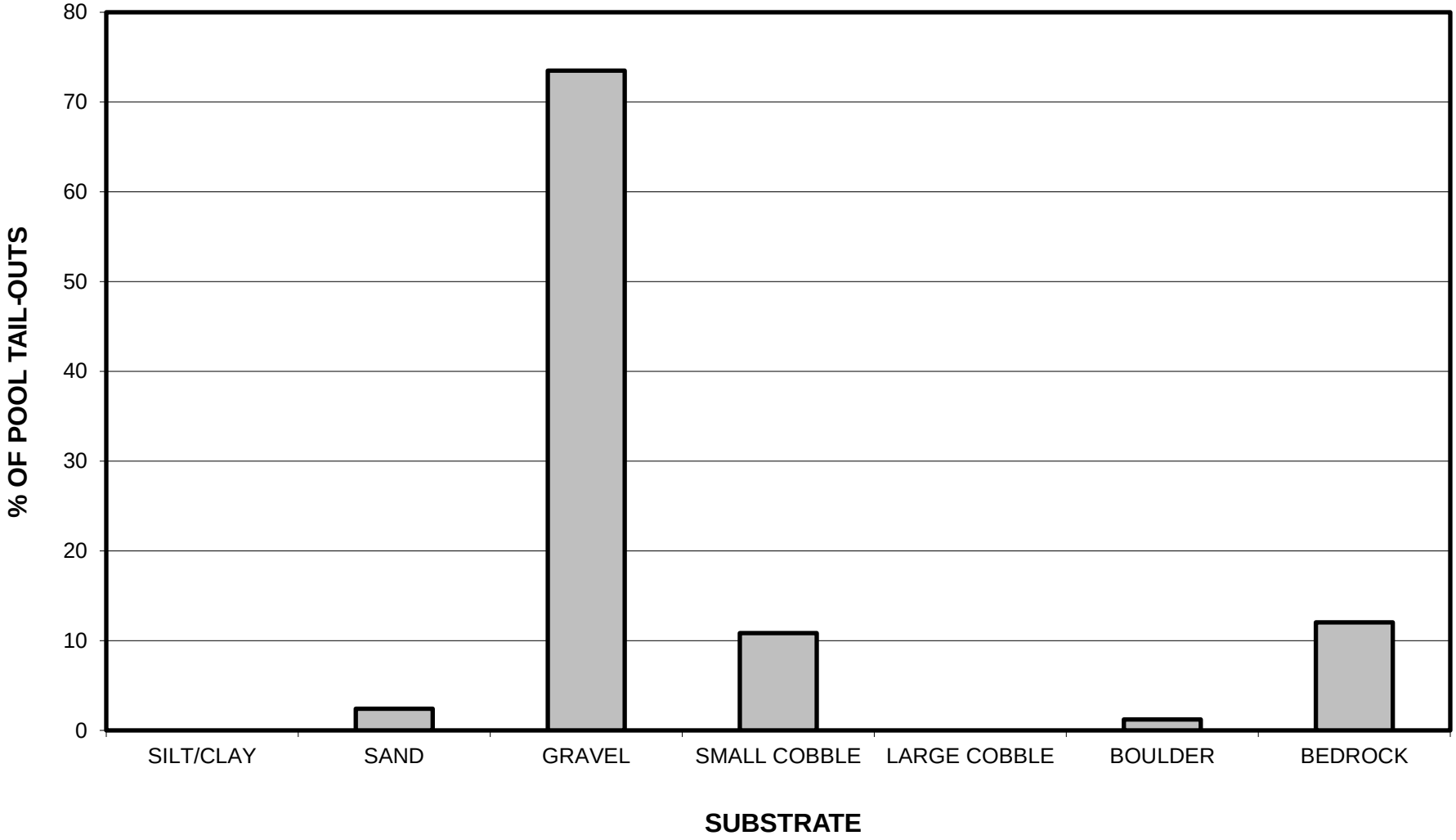
GRAPH 6

CONNICK CREEK 2017
MEAN PERCENT COVER TYPES IN POOLS



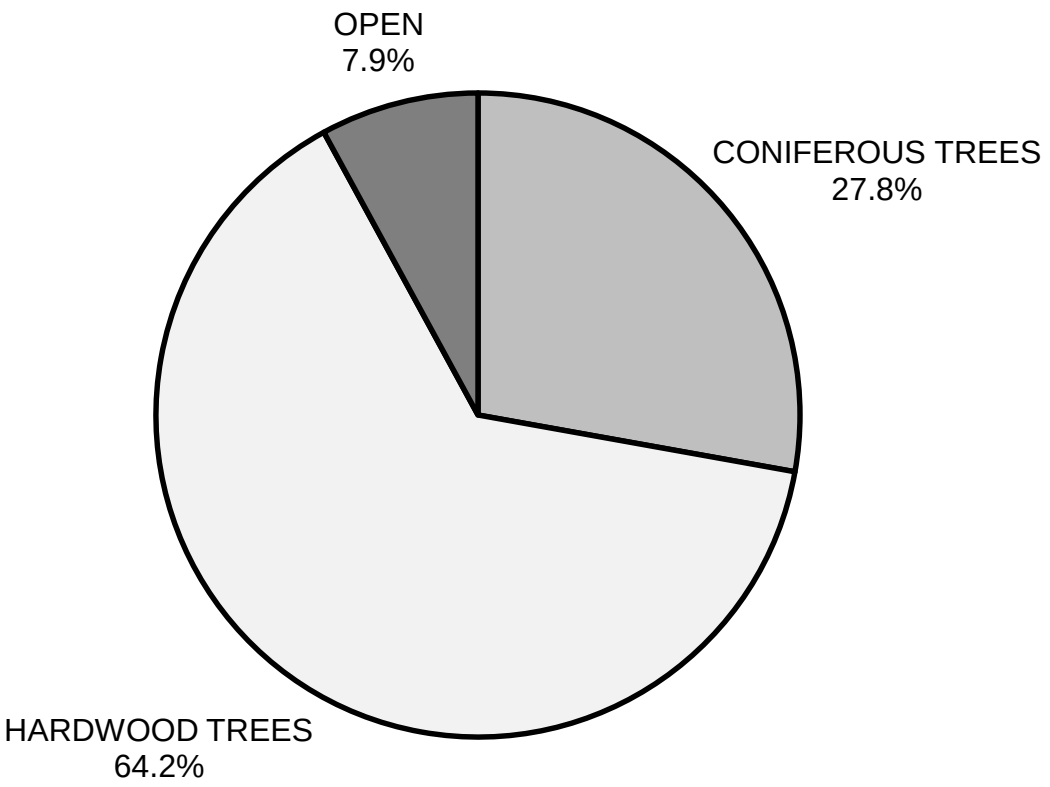
GRAPH 7

CONNICK CREEK 2017
SUBSTRATE COMPOSITION IN POOL TAIL- OUTS



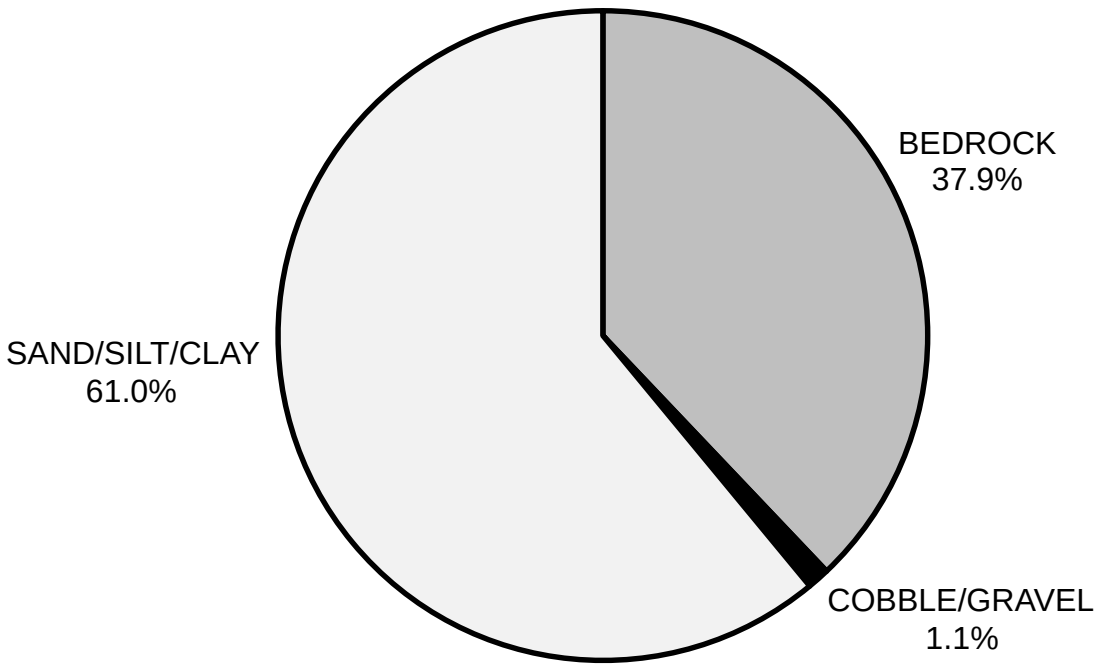
GRAPH 8

CONNICK CREEK 2017
MEAN PERCENT CANOPY



GRAPH 9

CONNICK CREEK 2017
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

CONNICK CREEK 2017
DOMINANT BANK VEGETATION IN SURVEY REACH

GRAPH 11

APPENDIX II

STREAM INVENTORY PHOTOS

Photo 1: LDA #1 at habitat unit #078, 7,072' upstream from start of survey. Looking upstream. (Photo taken: 9/25/17)

Photo 2: Land slide on right bank at habitat unit #117, 9,200' upstream from start of survey. Pictured: Nicole Bejar. (Photo taken: 9/26/17)

Photo 3: End of survey due to dry creek bed, 13,785’ upstream from start of survey. Looking upstream. (Photo taken: 10/3/17)