



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Dutch Charlie Creek

INTRODUCTION

A stream inventory was conducted from June 6, 2018 to June 20, 2018 on Dutch Charlie Creek. Due to landowner access issues, the survey began at the confluence with Thompson Creek as opposed to its confluence with the South Fork Eel River and extended upstream 4.1 miles. Reconnaissance-level biological inventories were completed on August 1, 2018, and an associated CDFW field report was produced for the three tributaries to Dutch Charlie Creek: Thompson Creek, Eagle Creek, and Unnamed Right Bank Tributary to Dutch Charlie Creek.

The Dutch Charlie 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 Dutch Charlie 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. 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 June 2019.

WATERSHED OVERVIEW

Dutch Charlie Creek, located in Mendocino County, is a tributary to the upper South Fork Eel River, which drains to the Pacific Ocean, located in northern California (Map 1). Dutch Charlie Creek's legal description at the confluence with the South Fork Eel River is T21N R17W S02 (Mendocino County). Its location is 31.6922° north latitude and -123.6555° west longitude, LLID number 1236555396922. Dutch Charlie Creek is a second order stream and has approximately 6.5 miles of blue line stream according to the USGS Lincoln Ridge 7.5 minute quadrangle. Dutch Charlie Creek drains a watershed of approximately 4.3 square miles. Elevations range from about 1,440 feet at the mouth of the creek to 2,000 feet in the headwater areas. Douglas fir and redwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists from Highway 101 in Laytonville to Highway 271/Branscomb Road, west through Branscomb to Wilderness Lodge Road. Wilderness Lodge Road crosses Dutch Charlie Creek at mile one.

METHODS

The habitat inventory conducted in Dutch Charlie 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 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 (Appendix II) to document general habitat conditions, significant features (landslides, potential fish passage barrier, etc.) and end of survey.

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 Dutch Charlie Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Dutch Charlie 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 Dutch Charlie 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 Dutch Charlie Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. The shelter rating is then calculated by multiplying the qualitative shelter value by the percent of the unit covered. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Dutch Charlie 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 Dutch Charlie 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 Dutch Charlie Creek. In addition, underwater mask and snorkel observations were made at 20 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered in to 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 Dutch Charlie 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 June 5, 2018 to June 20, 2018 was conducted by Joshua Gruver and Kori Roberts (CDFW). The total length of the stream surveyed was 21,818 feet with an additional 202 feet of side channel.

Stream flow measurement of 0.82 cfs was recorded on June 27, 2018 near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter.

Dutch Charlie Creek is an F4 channel type for 1,427 feet of the stream surveyed (Reach 1), a B2 channel type for 685 feet of the stream surveyed (Reach 2), and an F4 channel type for 19,706 feet of the stream surveyed (Reach 3). B2 channel types have a very stable plan and profile with stable banks and are boulder-dominant substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and are gravel-dominant substrates.

Water temperatures taken using hand-held thermometers during the survey period ranged from 50° to 54° Fahrenheit. Air temperatures ranged from 44° to 67° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 51% pool units, 38% flatwater units, 9% riffle units, and 2% dry units (Graph 1). Based on total length of Level II habitat types there were 47% pool units, 41% flatwater units, 9% dry units, and 3% riffle units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 50% mid-channel pool units, 27% run units, and 11% step run units (Graph 3). Based on percent total length, 46% mid-channel pool units, 20% run units, and 20% step run units.

A total of 244 pools were identified (Table 3). Main channel pools were the most frequently encountered at 100% (Graph 4) and comprised 100% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eighty-one of the 244 pools (33%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 244 pool tail-outs measured, 161 had a value of 1 (65.4%); 63 had a value of 2 (25.6%); 5 had a value of 3 (2%); 17 had a value of 5 (6.9%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 16 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 16 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Dutch Charlie Creek. Graph 7 describes the pool cover in Dutch Charlie Creek. Undercut Banks are the dominant pool cover type followed by small 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 74% of pool tail-outs. Small Cobble was the next most frequently observed in 8% of pool tail-outs.

The mean percent canopy density for the surveyed length of Dutch Charlie Creek was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 63% and 37%, respectively. Graph 9 describes the mean percent canopy in Dutch Charlie Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 95% sand/silt/clay, 3% bedrock, 2% boulder, and 1% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 42% of the units surveyed had deciduous trees as the dominant vegetation type, and 3% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at 20 sites for species composition and distribution in Dutch Charlie Creek on June 21, 2018 (Table A). Water temperatures taken during the survey period of 0930 to 1028 and 1044 to 1132 ranged from 49° to 50° Fahrenheit. Air temperatures ranged from 48° to 51° Fahrenheit. The survey was conducted by Kori Roberts and Joshua Gruver (CDFW).

The survey yielded 42 young-of-the-year (YOY) coho salmon, 4 YOY steelhead trout (SH), 14 age 1+ SH, 9 age 2+ SH, and 1 Pacific giant salamander (SAL).

During the survey, the upstream-most observation of coho salmon occurred at 39.6855° north latitude, -123.7051° west longitude, approximately 11,145 feet upstream from the confluence with South Fork Eel River (Map 1).

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During the survey, the upstream-most observation of Rainbow Trout/steelhead occurred at 39.68444° north latitude, -123.70176° west longitude, approximately 9,993 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 Dutch Charlie Creek, June 21, 2018.

| Date | Survey Site # | Habitat Unit # | Habitat Type | Approx. Dist. from Mouth (ft.) | Steelhead Trout | | | Coho Salmon | | Additional Aquatic Species Observed |
|--------------------------|---------------|----------------|--------------|--------------------------------|-----------------|----|----|-------------|----|-------------------------------------|
| | | | | | YOY | 1+ | 2+ | YOY | 1+ | |
| Reach 3: F4 Channel Type | | | | | | | | | | |
| 06/21/18 | 001 | 210 | Pool | 9,706 | 1 | 2 | 2 | 13 | 0 | |
| 06/21/18 | 002 | 214 | Pool | 9,788 | 1 | 1 | 0 | 21 | 0 | |
| 06/21/18 | 003 | 216 | Pool | 9,941 | 2 | 0 | 1 | 7 | 0 | |
| 06/21/18 | 004 | 217 | Pool | 9,966 | 0 | 0 | 1 | 0 | 0 | |
| 06/21/18 | 005 | 242 | Pool | 11,145 | 0 | 0 | 0 | 1 | 0 | |
| 06/21/18 | 006 | 244 | Pool | 11,206 | 0 | 0 | 0 | 0 | 0 | |
| 06/21/18 | 007 | 247 | Pool | 11,388 | 0 | 1 | 0 | 0 | 0 | |
| 06/21/18 | 008 | 250 | Pool | 11,496 | 0 | 1 | 1 | 0 | 0 | |
| 06/21/18 | 009 | 251 | Pool | 11,507 | 0 | 3 | 2 | 0 | 0 | |
| 06/21/18 | 010 | 253 | Pool | 11,514 | 0 | 0 | 0 | 0 | 0 | |
| 06/21/18 | 011 | 255 | Pool | 11,554 | 0 | 2 | 0 | 0 | 0 | |
| 06/21/18 | 012 | 257 | Pool | 11,618 | 0 | 1 | 0 | 0 | 0 | |
| 06/21/18 | 013 | 259 | Pool | 11,674 | 0 | 0 | 0 | 0 | 0 | 1 SAL |
| 06/21/18 | 014 | 261 | Pool | 11,730 | 0 | 1 | 0 | 0 | 0 | |
| 06/21/18 | 015 | 262 | Pool | 11,756 | 0 | 2 | 0 | 0 | 0 | |
| 06/21/18 | 016 | 285 | Pool | 12,769 | 0 | 0 | 1 | 0 | 0 | |
| 06/21/18 | 017 | 293 | Pool | 12,983 | 0 | 0 | 0 | 0 | 0 | |
| 06/21/18 | 018 | 295 | Pool | 13,099 | 0 | 0 | 0 | 0 | 0 | |
| 06/21/18 | 019 | 296 | Pool | 13,126 | 0 | 0 | 0 | 0 | 0 | |
| 06/21/18 | 020 | 298 | Pool | 13,177 | 0 | 0 | 1 | 0 | 0 | |

Abbreviations: SAL= Salamander (species unidentified)

DISCUSSION

Dutch Charlie Creek is an F4 channel type for the first 1,427 feet of stream surveyed, a B2 channel type for the next 685 feet, and an F4 channel type for the next 19,908 feet. The suitability of B2 and F4 channel types for fish habitat improvement structures is as follows: B2 channels excellent for plunge weirs, single and opposing wing-deflectors, and log cover. F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-

deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days of June 5, 2018 to June 20, 2018, ranged from 50° to 54° Fahrenheit, and air temperatures ranged from 44° to 67° Fahrenheit. This is a suitable water temperature range for salmonids. However, to make any further conclusions, temperature data loggers would need to be deployed and temperatures monitored throughout the warm summer months. More extensive biological sampling would also be required to better understand salmonid distribution and population densities throughout Dutch Charlie Creek.

Flatwater habitat types comprised 41% of the total length of this survey, riffles 3%, and pools 47%. Eighty-one of the 244 (33%) 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.

Two hundred twenty-four of the 244 pool tail-outs measured had embeddedness ratings of 1 or 2. Five of the pool tail-outs had embeddedness ratings of 3 or 4. Seventeen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Two hundred one of the 244 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 16. The shelter rating in the flatwater habitats is 2. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Dutch Charlie Creek. Undercut banks are the dominant cover type in pools followed by small woody debris. Log and root wad 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 99%. Reach 1 had a canopy density of 97%, Reach 2 had a canopy density of 99%, and Reach 3 had a canopy density of 99%. In general, revegetation projects are considered when canopy density is less than 80%. The percentage of right and left bank covered with vegetation was 100% and 100%, respectively.

RECOMMENDATIONS

Dutch Charlie 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 Dutch Charlie 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) Based on the results of the Dutch Charlie Creek stream habitat inventory, stream habitat structures should be installed to increase pool frequency and residual depth, increase shelter ratings, increase aggradation leading to floodplain connectivity, and increase velocity and temperature refugia.
- 2) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from undercut banks. Adding high quality complexity with woody cover in the pools is desirable.
- 3) Pools are disconnected, or 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.
- 4) There are several log debris accumulations present on Dutch Charlie Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

| Position (ft): | Habitat unit #: | Comments: |
|-------------------|--------------------|---|
| 0 | 001 | Start of survey at the confluence with Thompson Creek. Young-of-the-year (YOY) salmonid present. Tributary # 1 (Thompson Creek) enters on the left bank. It contributes to approximately 5% of Dutch Charlie Creek's flow. The water temperature of the tributary was 50° F, the water temperature downstream of the confluence was 50° F, and the water temperature upstream of the confluence was 50° F. The slope of the tributary is 2%. The tributary is accessible to salmonids. Fish were observed in the tributary. |
| 2057 | 049 | Channel changes to a F4. |
| 2464 | 058 | There is an old downed bridge. |
| 5602 | 116 | Tributary # 4, (Eagle Creek) enters on the left bank. It contributes to approximately 5% of Dutch Charlie Creek's flow. The water temperature |

of the tributary was 52° F, the water temperature downstream of the confluence was 51° F, and the water temperature upstream of the confluence was 51° F. The tributary is accessible to salmonids. Fish were observed in the tributary.

| | | |
|-------|-----|--|
| 5652 | 117 | Bridge # 1 is the crossing for an unnamed road, and is 18' high x 4' wide x 27' long. It is an automobile bridge made of wood and is not a barrier to salmonids. Lamprey red observed in habitat unit 117. Multiple lamprey redds observed throughout the lower portion of Dutch Charlie Creek. |
| 9505 | 207 | Bridge # 2 is the crossing for Wilderness Lodge Road and is 12' high x 15' wide x 50' long. It is an automobile bridge made of metal. |
| 9552 | 208 | Bridge # 2 is the crossing for an unnamed road and is 12' high x 15' wide x 50' long. It is an automobile bridge made of metal. |
| 11462 | 250 | Log debris accumulation (LDA) # 1 is 5.7' high x 30' wide x 7' long and contains 6 pieces of large woody debris (LWD). Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 30' wide x 27' long x 6' high. |
| 11486 | 251 | Bedrock cascade is a seasonal barrier. Only 1+ steelhead were observed beyond this habitat unit. |
| 11497 | 252 | Habitat units 252 and 253 are separated by a 2' bedrock sheet. |
| 11533 | 254 | LDA #2 is 5' high, 18' wide, 13' long and contains 4 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 18' wide, 13' long and 3' deep. The sediment ranges in size from sand to gravel. Fish were observed above the LDA. |
| 11820 | 265 | LDA # 3 is 6' high, 19.5' wide, 11' long and contains 3 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 17' wide, 25' long and 4' deep. The sediment ranges in size from sand to gravel. Fish were not observed above the LDA. |
| 13305 | 306 | This habitat unit is an isolated pool. |
| 14761 | 348 | LDA #4 is 8.5' high, 19.5' wide, 11' long and contains 7 pieces of large woody debris (LWD). Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 20' wide, 25' long and 7.5' deep. The sediment ranges in |

size from sand to gravel. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA.

| | | |
|-------|-----|---|
| 15086 | 357 | Bridge # 3 is the crossing for Wilderness Ridge Rd., and is 11' high x 17' wide x 40' long. It is an automobile bridge made of metal and is not a barrier to salmonids. |
| 16350 | 392 | LDA # 5 is 5.5' high, 19.5' wide, 11' long and contains 2 pieces of large woody debris (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 19' wide, 22' long and 5.5' deep. The sediment ranges in size from sand to gravel. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA. |
| 16448 | 397 | LDA # 6 is 3.5' high, 17' wide, 5' long and contains 1 piece of large woody debris (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 13' wide, 10' long and 3' deep. The sediment ranges in size from sand to gravel. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA. |
| 18655 | 451 | LDA #7 is 6' high, 11' wide, 13' long and contains 5 pieces of large woody debris (LWD). Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 11' wide, 18' long and 4' deep. The sediment ranges in size from sand to gravel. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA. |
| 18731 | 454 | LDA # 8 is 7' high, 22' wide, 9' long and contains 8 pieces of large woody debris (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 21' wide, 25' long and 8' deep. The sediment ranges in size from sand to gravel. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA. |
| 18871 | 455 | LDA # 9 is 3.5' high, 13' wide, 15' long and contains 4 pieces of large woody debris (LWD). Water does not flow through the LDA and there are no visible gaps in it. The LDA is a possible barrier to juvenile salmonids, but not adult salmonids. Fish were not observed above the LDA. |

19173 458 LDA # 10 is 4.5' high, 15' wide, 16' long and contains 4 pieces of large woody debris (LWD). Water does not flow through the LDA and there are no visible gaps in it. Fish were not observed above the LDA.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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

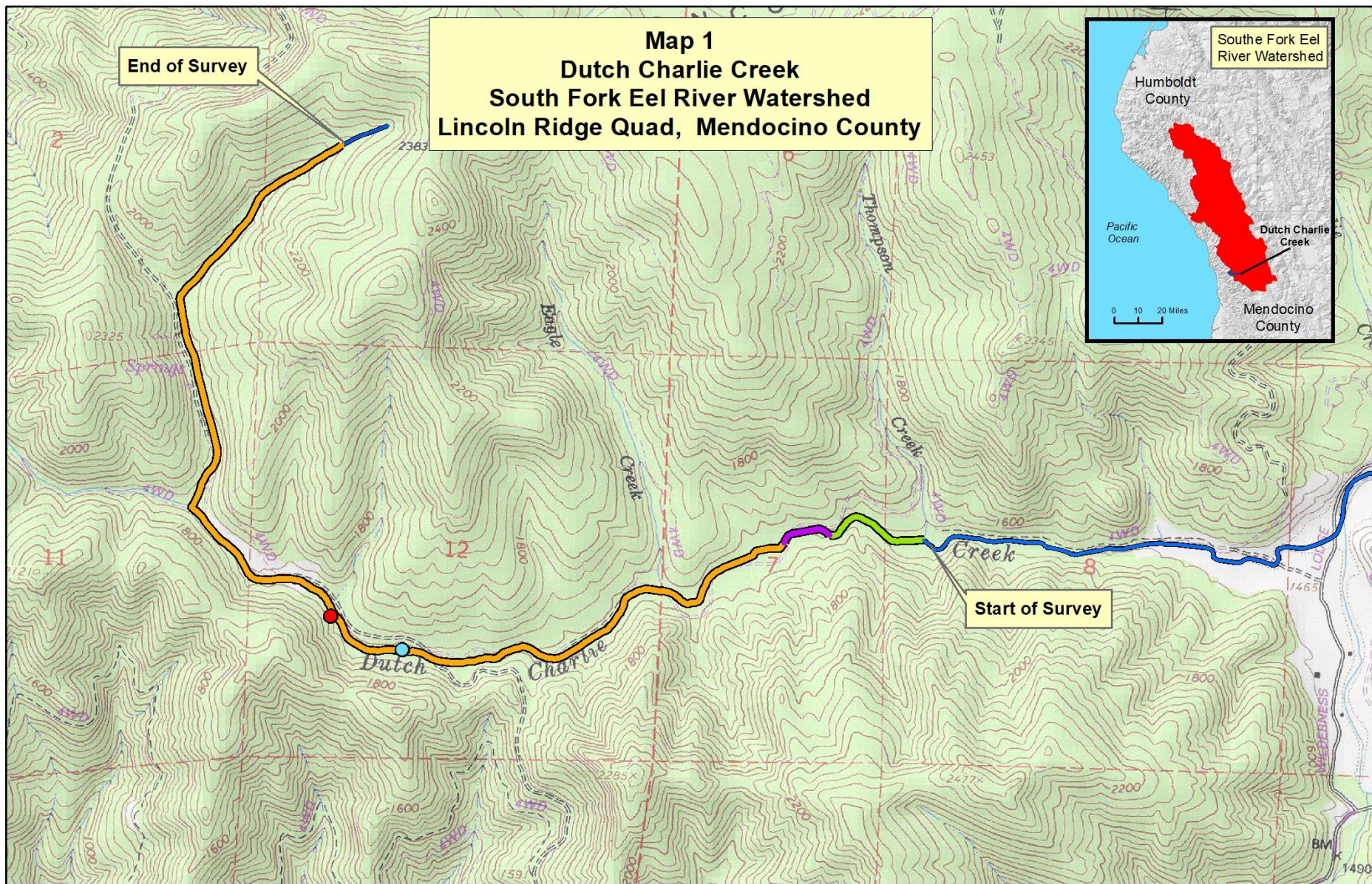
| | | | |
|--|--------|-------|-------|
| Corner Pool | (CRP) | [5.1] | {22} |
| Lateral Scour Pool - Log Enhanced | (LSL) | [5.2] | {10} |
| Lateral Scour Pool - Root Wad Enhanced | (LSR) | [5.3] | {11} |
| Lateral Scour Pool - Bedrock Formed | (LSBk) | [5.4] | {12} |
| Lateral Scour Pool - Boulder Formed | (LSBo) | [5.5] | {20} |
| Plunge Pool | (PLP) | [5.6] | { 9 } |

BACKWATER POOLS

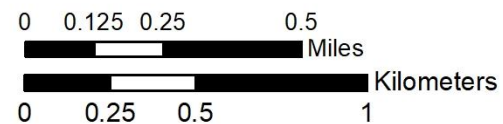
| | | | |
|----------------------------------|-------|-------|-------|
| Secondary Channel Pool | (SCP) | [6.1] | { 4 } |
| Backwater Pool - Boulder Formed | (BPB) | [6.2] | { 5 } |
| Backwater Pool - Root Wad Formed | (BPR) | [6.3] | { 6 } |
| Backwater Pool - Log Formed | (BPL) | [6.4] | { 7 } |
| 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] | |



- Last observed juvenile coho
- Last observed juvenile rainbow trout/steelhead
- Reach 1: F4 Channel Type
- Reach 2: B2 Channel Type
- Reach 3: F4 Channel Type
- Not surveyed



APPENDIX I

TABLES AND GRAPHS

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

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0

| Habitat Units | Units Fully Measured | Habitat Type | Habitat Occurrence (%) | Mean Length (ft.) | Total Length (ft.) | Total Length (%) | Mean Width (ft.) | Mean Depth (ft.) | Mean Max Depth (ft.) | Mean Area (sq.ft.) | Estimated Total Area (sq.ft.) | Mean Volume (cu.ft.) | Estimated Total Volume (cu.ft.) | Mean Residual Pool Vol (cu.ft.) | Mean Shelter Rating |
|---------------|----------------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|----------------------|---------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|
| 8 | 0 | DRY | 1.7 | 251 | 2007 | 9.1 | | | | | | | | | |
| 184 | 20 | FLATWATER | 38.3 | 49 | 8949 | 40.6 | 7.0 | 0.3 | 0.6 | 259 | 47731 | 98 | 17956 | | 3 |
| 2 | 0 | NOSURVEY | 0.4 | 9 | 18 | 0.1 | | | | | | | | | |
| 244 | 244 | POOL | 50.7 | 43 | 10391 | 47.2 | 9.6 | 0.7 | 1.9 | 442 | 107943 | 485 | 118443 | 381 | 16 |
| 43 | 7 | RIFFLE | 8.9 | 15 | 655 | 3.0 | 9.9 | 0.2 | 0.5 | 135 | 5799 | 25 | 1067 | | 0 |
| Total Units | Total Units Fully Measured | | | | Total Length (ft.) | | | | | Total Area (sq.ft.) | | | Total Volume (cu.ft.) | | |
| 481 | 271 | | | | 22020 | | | | | 161472 | | | 137466 | | |

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Habitat Units | Units Fully Measured | Habitat Type | Habitat Occurrence (%) | Mean Length (ft.) | Total Length (ft.) | Total Length (%) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Mean Area (sq.ft.) | Estimated Total Area (sq.ft.) | Mean Volume (cu.ft.) | Estimated Total Volume (cu.ft.) | Mean Residual Pool Vol (cu.ft.) | Mean Shelter Rating | Mean Canopy (%) |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|-----------------|--------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|-----------------|
| 32 | 4 | LGR | 6.7 | 14 | 450 | 2.0 | 12 | 0.2 | 0.4 | 193 | 6170 | 33 | 1047 | | 0 | 99 |
| 1 | 0 | CAS | 0.2 | 33 | 33 | 0.1 | | | | | | | | | | 100 |
| 10 | 3 | BRS | 2.1 | 17 | 172 | 0.8 | 7 | 0.3 | 1.4 | 58 | 576 | 14 | 142 | | 0 | 99 |
| 1 | 0 | POW | 0.2 | 140 | 140 | 0.6 | | | | | | | | | | |
| 130 | 15 | RUN | 27.0 | 34 | 4416 | 20.1 | 7 | 0.3 | 1.1 | 166 | 21635 | 67 | 8726 | | 1 | 99 |
| 53 | 5 | SRN | 11.0 | 83 | 4393 | 20.0 | 7 | 0.3 | 1 | 538 | 28532 | 189 | 10016 | | 6 | 100 |
| 240 | 240 | MCP | 49.9 | 43 | 10212 | 46.4 | 10 | 0.7 | 5 | 439 | 105427 | 481 | 115493 | 377 | 16 | 99 |
| 4 | 4 | STP | 0.8 | 45 | 179 | 0.8 | 13 | 0.8 | 3.5 | 629 | 2516 | 738 | 2950 | 606 | 41 | 100 |
| 8 | 0 | DRY | 1.7 | 251 | 2007 | 9.1 | | | | | | | | | | |
| 2 | 0 | NS | 0.4 | 9 | 18 | 0.1 | | | | | | | | | | |

Total Units
481

Total Units Fully Measured
271

Total Length (ft.)
22020

Total Area (sq.ft.)
164856

Total Volume (cu.ft.)
138375

Table 3 - Summary of Pool Types

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Habitat Units | Units Fully Measured | Habitat Type | Habitat Occurrence (%) | Mean Length (ft.) | Total Length (ft.) | Total Length (%) | Mean Width (ft.) | Mean Residual Depth (ft.) | Mean Area (sq.ft.) | Estimated Total Area (sq.ft.) | Mean Residual Pool Vol (cu.ft.) | Estimated Total Resid.Vol. (cu.ft.) | Mean Shelter Rating |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|---------------------------|--------------------|-------------------------------|---------------------------------|-------------------------------------|---------------------|
| 244 | 244 | MAIN | 100 | 43 | 10391 | 100 | 9.6 | 0.7 | 442 | 107943 | 381 | 92537 | 16 |

| | | | | |
|-------------|----------------------------|--------------------|---------------------|-----------------------|
| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
| 244 | 244 | 10391 | 107943 | 92537 |

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

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Habitat Units | Habitat Type | Habitat Occurrence (%) | < 1 Foot Maximum Residual Depth | < 1 Foot Percent Occurrence | 1 < 2 Feet Maximum Residual Depth | 1 < 2 Feet Percent Occurrence | 2 < 3 Feet Maximum Residual Depth | 2 < 3 Feet Percent Occurrence | 3 < 4 Feet Maximum Residual Depth | 3 < 4 Feet Percent Occurrence | >= 4 Feet Maximum Residual Depth | >= 4 Feet Percent Occurrence |
|---------------|--------------|------------------------|---------------------------------|-----------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|----------------------------------|------------------------------|
| 240 | MCP | 98 | 13 | 5 | 148 | 62 | 46 | 19 | 23 | 10 | 10 | 4 |
| 4 | STP | 2 | 0 | 0 | 2 | 50 | 0 | 0 | 2 | 50 | 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 |
|-------------|---------------------------------|-----------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|
| 244 | 13 | 5 | 150 | 61 | 46 | 19 | 25 | 10 | 10 | 4 |

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Dry Units: 8

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Habitat Units | Units Fully Measured | Habitat Type | Mean % Undercut Banks | Mean % SWD | Mean % LWD | Mean % Root Mass | Mean % Terr. Vegetation | Mean % Aquatic Vegetation | Mean % White Water | Mean % Boulders | Mean % Bedrock Ledges |
|---------------|----------------------|--------------|-----------------------|------------|------------|------------------|-------------------------|---------------------------|--------------------|-----------------|-----------------------|
| 32 | 4 | LGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | CAS | | | | | | | | | |
| 10 | 3 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 7 | TOTAL RIFFLE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | POW | | | | | | | | | |
| 130 | 15 | RUN | 75 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 53 | 5 | SRN | 63 | 17 | 18 | 2 | 0 | 0 | 0 | 0 | 0 |
| 184 | 20 | TOTAL FLAT | 67 | 16 | 17 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240 | 239 | MCP | 58 | 19 | 11 | 3 | 1 | 0 | 1 | 1 | 6 |
| 4 | 4 | STP | 24 | 0 | 0 | 0 | 0 | 0 | 26 | 9 | 41 |
| 244 | 243 | TOTAL POOL | 58 | 19 | 11 | 3 | 1 | 0 | 2 | 2 | 4 |
| 2 | 0 | NS | | | | | | | | | |
| 481 | 270 | TOTAL | 57 | 19 | 10 | 3 | 1 | 0 | 2 | 2 | 6 |

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Dry Units: 8

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Habitat Units | Units Fully Measured | Habitat Type | % Total Silt/Clay Dominant | % Total Sand Dominant | % Total Gravel Dominant | % Total Small Cobble Dominant | % Total Large Cobble Dominant | % Total Boulder Dominant | % Total Bedrock Dominant |
|---------------|----------------------|--------------|----------------------------|-----------------------|-------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------|
| 32 | 4 | LGR | 0 | 0 | 0 | 75 | 0 | 25 | 0 |
| 1 | 0 | CAS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 3 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 1 | 0 | POW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130 | 15 | RUN | 0 | 7 | 80 | 13 | 0 | 0 | 0 |
| 53 | 5 | SRN | 0 | 0 | 40 | 40 | 20 | 0 | 0 |
| 240 | 240 | MCP | 0 | 8 | 66 | 12 | 7 | 3 | 5 |
| 4 | 4 | STP | 0 | 0 | 25 | 0 | 0 | 25 | 50 |

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Hardwood | Mean Percent Open Units | Mean Right Bank % Cover | Mean Left Bank % Cover |
|---------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|------------------------------|
| 99 | 37 | 63 | 0 | 100 | 100 |

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Dutch Charlie Creek LLID: 1236555396922 Drainage: Eel River - South Fork
 Survey Dates: 6/5/2018 to 6/20/2018 Survey Length (ft.): 22020 Main Channel (ft.): 21818 Side Channel (ft.): 202
 Confluence Location: Quad: LINCOLN RIDGE Legal Description: T21NR17WS02 Latitude: 39:41:32.0N Longitude: 123:39:20.0W

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

| | | |
|--|--|---|
| Channel Type: F4 | Canopy Density (%): 97.0 | Pools by Stream Length (%): 66.5 |
| Reach Length (ft.): 1427 | Coniferous Component (%): 30.8 | Pool Frequency (%): 42.9 |
| Riffle/Flatwater Mean Width (ft.): 11.0 | Hardwood Component (%): 69.3 | Residual Pool Depth (%): |
| BFW: | Dominant Bank Vegetation: Hardwood Trees | < 2 Feet Deep: 67 |
| Range (ft.): 13 to 18 | Vegetative Cover (%): 100.0 | 2 to 2.9 Feet Deep: 27 |
| Mean (ft.): 15 | Dominant Shelter: Undercut Banks | 3 to 3.9 Feet Deep: 0 |
| Std. Dev.: 2 | Dominant Bank Substrate Type: Sand/Silt/Clay | >= 4 Feet Deep: 7 |
| Base Flow (cfs.): 0.8 | Occurrence of LWD (%): 1 | Mean Max Residual Pool Depth (ft.): 1.8 |
| Water (F): 50 - 52 Air (F): 44 - 56 | LWD per 100 ft.: | Mean Pool Shelter Rating: 12 |
| Dry Channel (ft): 0 | Riffles: 0 | |
| | Pools: 0 | |
| | Flat: 0 | |
| Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 33 Sm Cobble: 0 Lg Cobble: 47 Boulder: 20 Bedrock: 0 | | |
| Embeddedness Values (%): 1. 0.0 2. 73.3 3. 26.7 4. 0.0 5. 0.0 | | |

STREAM REACH: 2

| | | |
|---|--|---|
| Channel Type: B2 | Canopy Density (%): 99.0 | Pools by Stream Length (%): 31.7 |
| Reach Length (ft.): 685 | Coniferous Component (%): 13.0 | Pool Frequency (%): 53.3 |
| Riffle/Flatwater Mean Width (ft.): 5.0 | Hardwood Component (%): 87.0 | Residual Pool Depth (%): |
| BFW: | Dominant Bank Vegetation: Hardwood Trees | < 2 Feet Deep: 88 |
| Range (ft.): 13 to 18 | Vegetative Cover (%): 99.4 | 2 to 2.9 Feet Deep: 0 |
| Mean (ft.): 16 | Dominant Shelter: Small Woody Debris | 3 to 3.9 Feet Deep: 13 |
| Std. Dev.: 2 | Dominant Bank Substrate Type: Boulder | >= 4 Feet Deep: 0 |
| Base Flow (cfs.): 0.8 | Occurrence of LWD (%): 0 | Mean Max Residual Pool Depth (ft.): 1.8 |
| Water (F): 51 - 52 Air (F): 56 - 56 | LWD per 100 ft.: | Mean Pool Shelter Rating: 24 |
| Dry Channel (ft): 0 | Riffles: 0 | |
| | Pools: 1 | |
| | Flat: 0 | |
| Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 13 Sm Cobble: 13 Lg Cobble: 13 Boulder: 63 Bedrock: 0 | | |
| Embeddedness Values (%): 1. 12.5 2. 75.0 3. 12.5 4. 0.0 5. 0.0 | | |

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

| | | |
|--|--|---|
| Channel Type: F4 | Canopy Density (%): 98.9 | Pools by Stream Length (%): 46.3 |
| Reach Length (ft.): 19706 | Coniferous Component (%): 38.0 | Pool Frequency (%): 51.3 |
| Riffle/Flatwater Mean Width (ft.): 7.1 | Hardwood Component (%): 62.0 | Residual Pool Depth (%): |
| BFW: | Dominant Bank Vegetation: Coniferous Trees | < 2 Feet Deep: 66 |
| Range (ft.): 5 to 52 | Vegetative Cover (%): 99.9 | 2 to 2.9 Feet Deep: 19 |
| Mean (ft.): 11 | Dominant Shelter: Undercut Banks | 3 to 3.9 Feet Deep: 11 |
| Std. Dev.: 7 | Dominant Bank Substrate Type: Sand/Silt/Clay | >= 4 Feet Deep: 4 |
| Base Flow (cfs.): 0.8 | Occurrence of LWD (%): 10 | Mean Max Residual Pool Depth (ft.): 1.9 |
| Water (F): 50 - 54 Air (F): 53 - 67 | LWD per 100 ft.: | Mean Pool Shelter Rating: 16 |
| Dry Channel (ft): 2007 | Riffles: 0 | |
| | Pools: 1 | |
| | Flat: 1 | |
| Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 79 Sm Cobble: 9 Lg Cobble: 5 Boulder: 0 Bedrock: 7 | | |
| Embeddedness Values (%): 1. 71.7 2. 20.6 3. 0.0 4. 0.0 5. 7.6 | | |

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

Mean Percentage of Dominant Stream Bank Substrate

| Dominant Class of Substrate | Number of Units Right Bank | Number of Units Left Bank | Total Mean Percent (%) |
|--------------------------------|-------------------------------|------------------------------|---------------------------|
| Bedrock | 5 | 9 | 2.6 |
| Boulder | 6 | 5 | 2.0 |
| Cobble / Gravel | 1 | 2 | 0.6 |
| Sand / Silt / Clay | 259 | 254 | 94.6 |

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 | 3 | 0 | 0.6 |
| Brush | 6 | 9 | 2.8 |
| Hardwood Trees | 110 | 116 | 41.7 |
| Coniferous Trees | 152 | 145 | 54.8 |
| No Vegetation | 0 | 0 | 0.0 |

Total Stream Cobble Embeddedness Values:

2

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

StreamName: Dutch Charlie Creek

LLID: 1236555396922

Drainage: Eel River - South Fork

Survey Dates: 6/5/2018 to 6/20/2018

Confluence Location: Quad: LINCOLN RIDGE

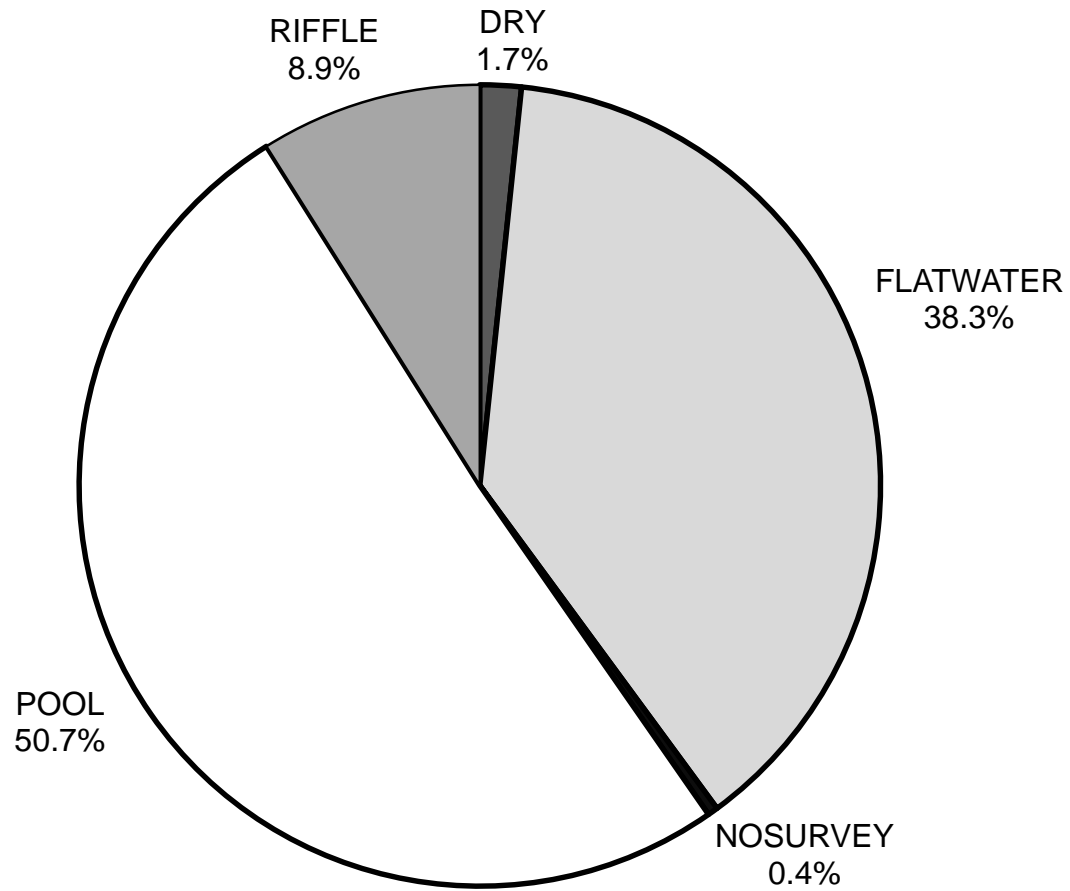
Legal Description: T21NR17WS02

Latitude: 39:41:32.0N

Longitude: 123:39:20.0W

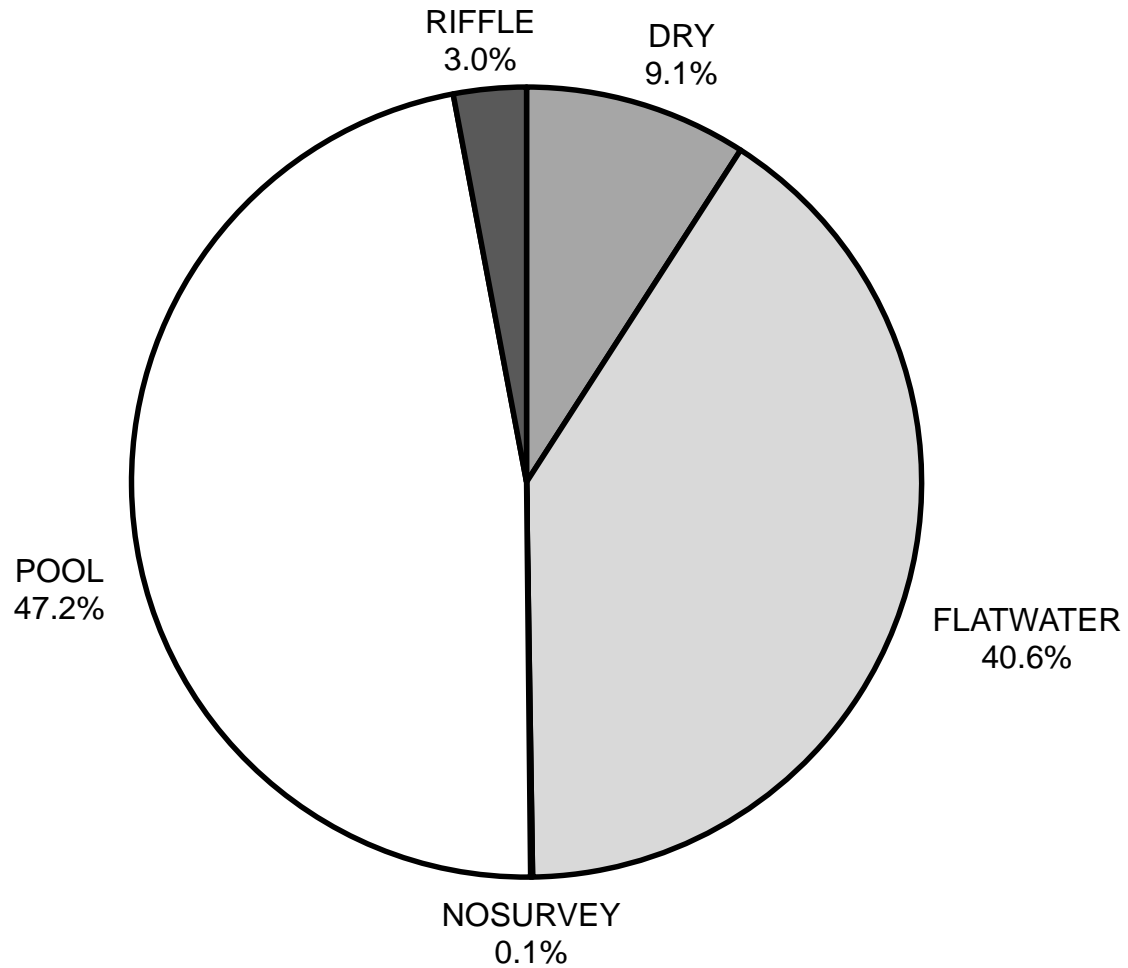
| | Riffles | Flatwater | Pools |
|----------------------------|----------------|------------------|--------------|
| <hr/> | | | |
| UNDERCUT BANKS (%) | 0 | 68 | 56 |
| SMALL WOODY DEBRIS (%) | 0 | 16 | 19 |
| LARGE WOODY DEBRIS (%) | 0 | 16 | 11 |
| ROOT MASS (%) | 0 | 0 | 4 |
| TERRESTRIAL VEGETATION (%) | 0 | 0 | 1 |
| AQUATIC VEGETATION (%) | 0 | 0 | 0 |
| WHITEWATER (%) | 0 | 0 | 1 |
| BOULDERS (%) | 0 | 0 | 1 |
| BEDROCK LEDGES (%) | 0 | 0 | 7 |

DUTCH CHARLIE CREEK 2018 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

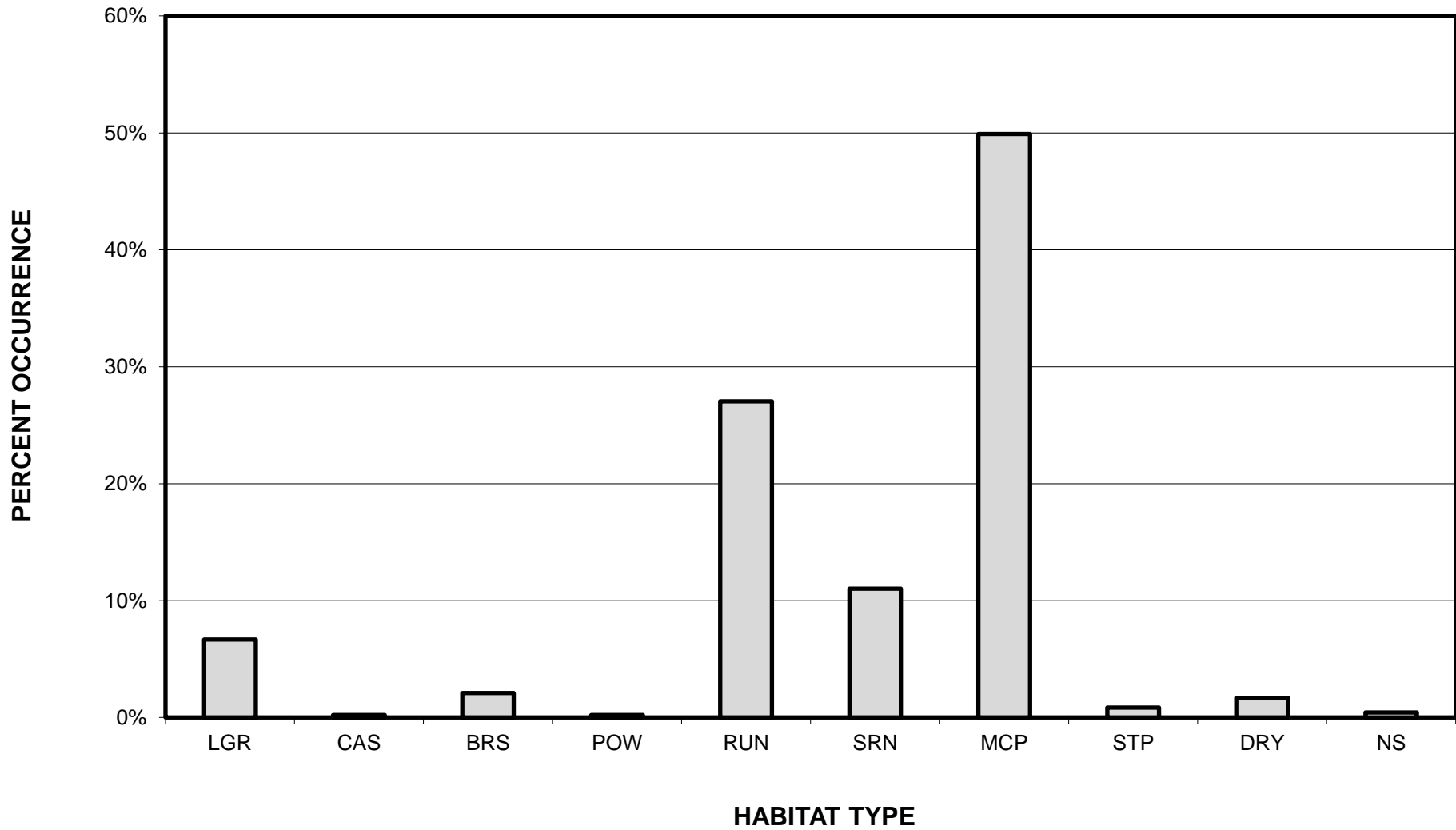
DUTCH CHARLIE CREEK 2018 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

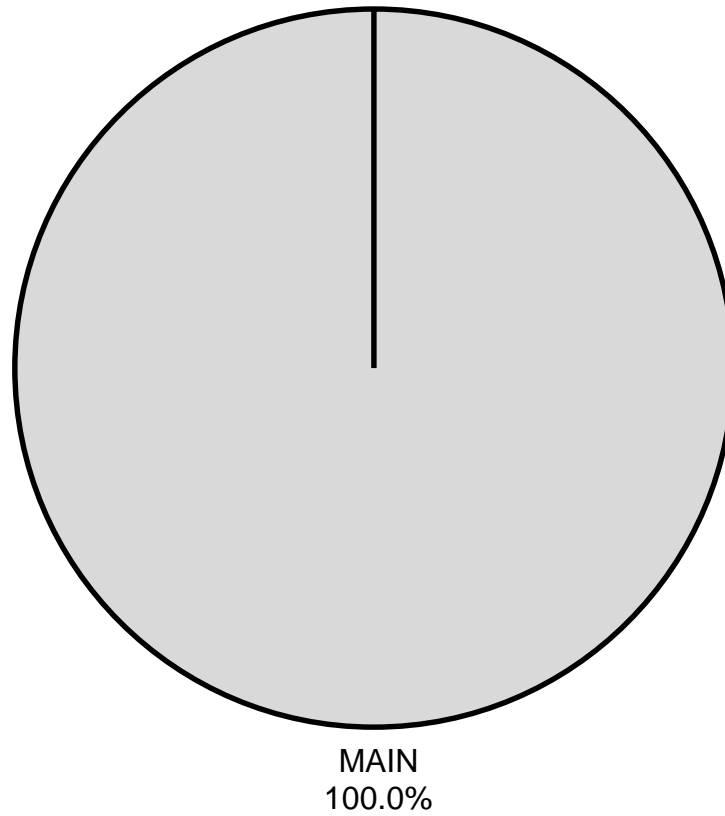
DUTCH CHARLIE CREEK 2018

HABITAT TYPES BY PERCENT OCCURRENCE



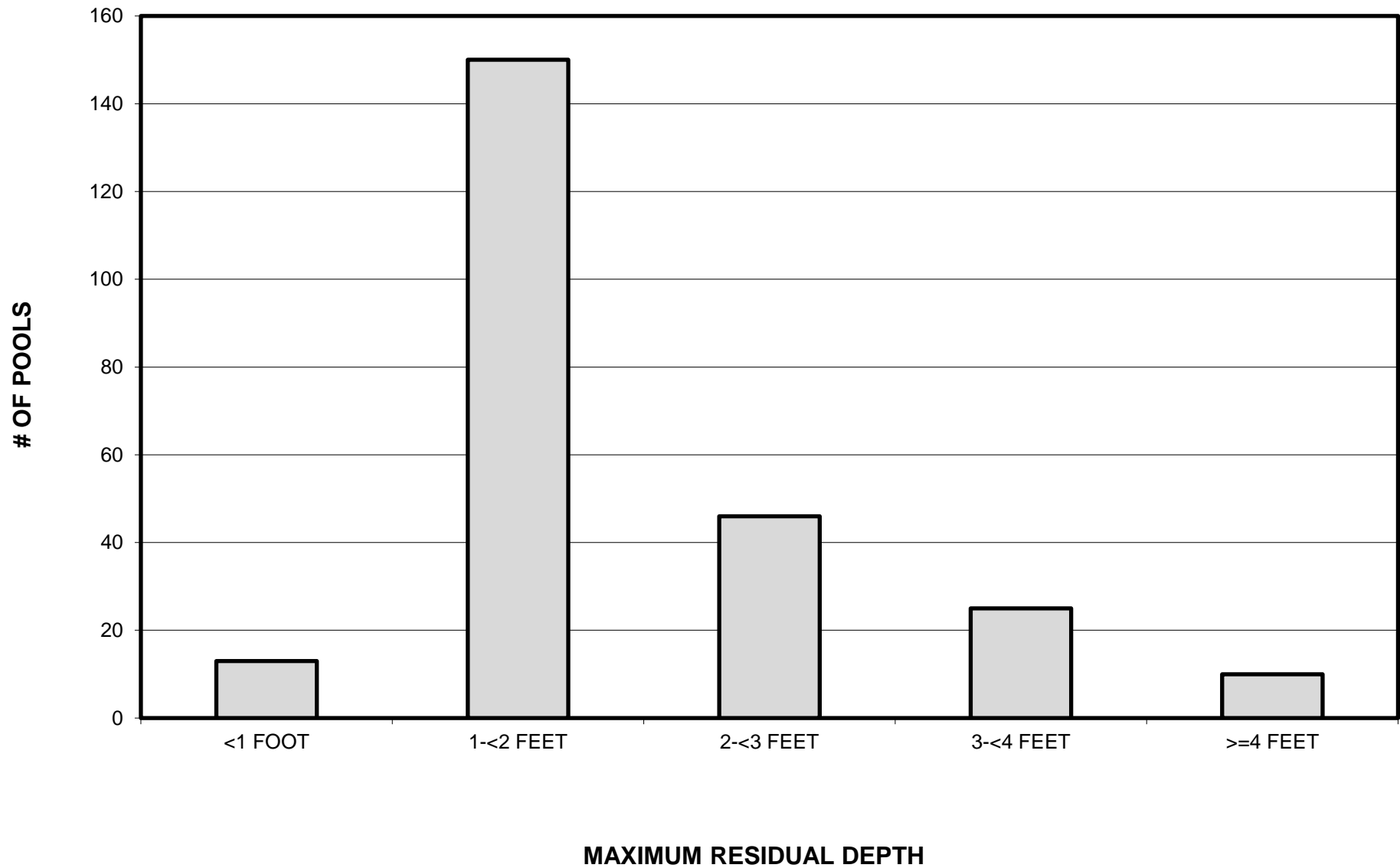
GRAPH 3

**DUTCH CHARLIE CREEK 2018
POOL TYPES BY PERCENT OCCURRENCE**



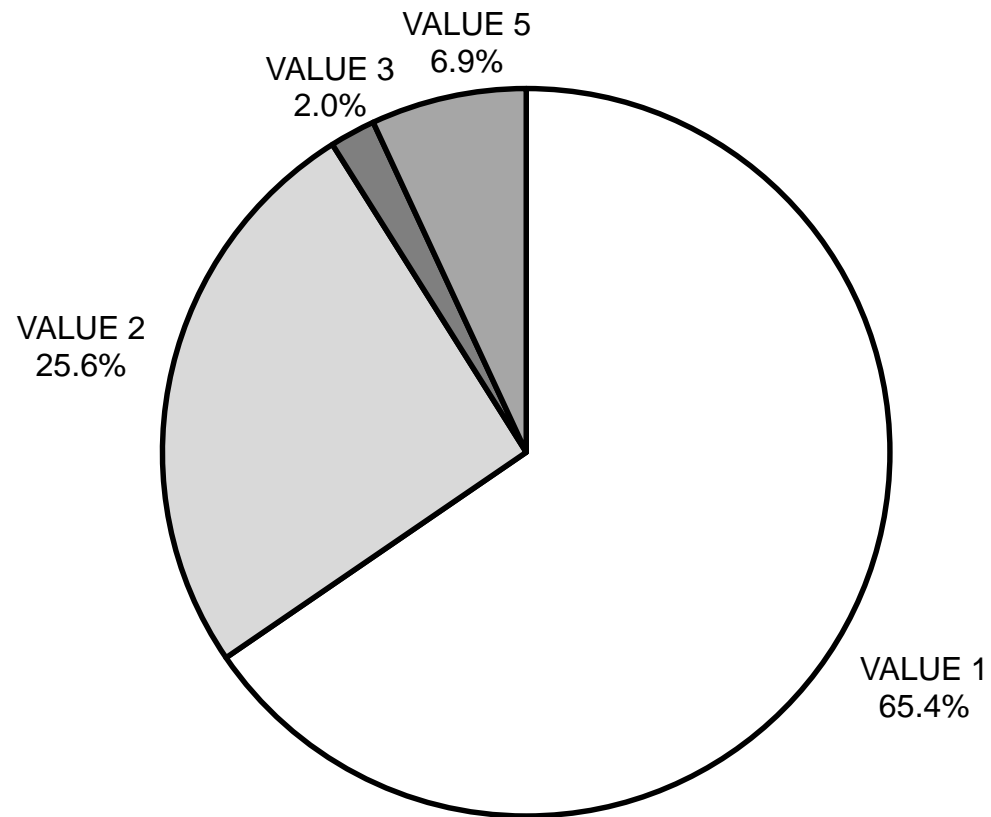
GRAPH 4

DUTCH CHARLIE CREEK 2018 MAXIMUM DEPTH IN POOLS



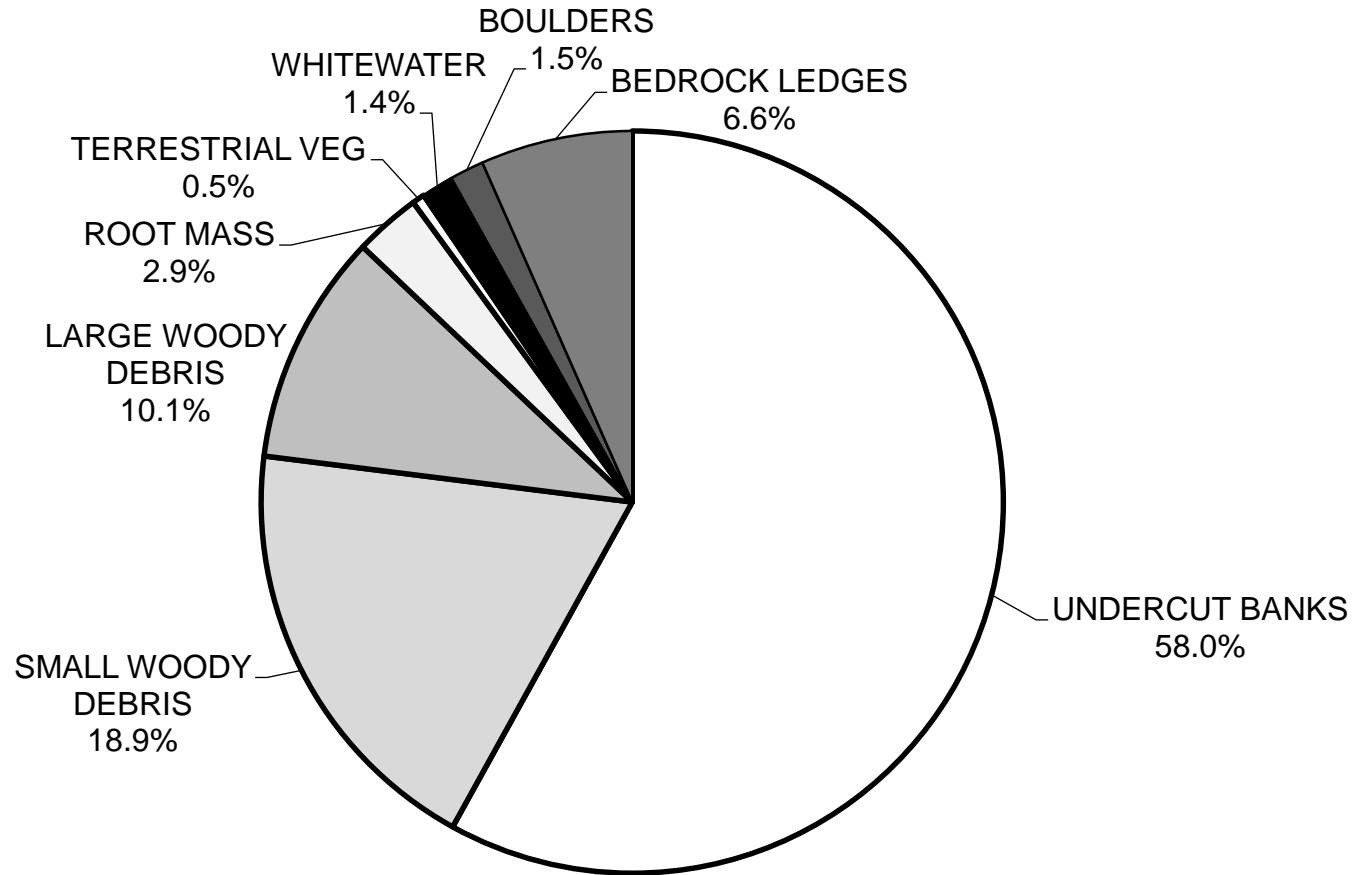
GRAPH 5

DUTCH CHARLIE CREEK 2018 PERCENT EMBEDDEDNESS



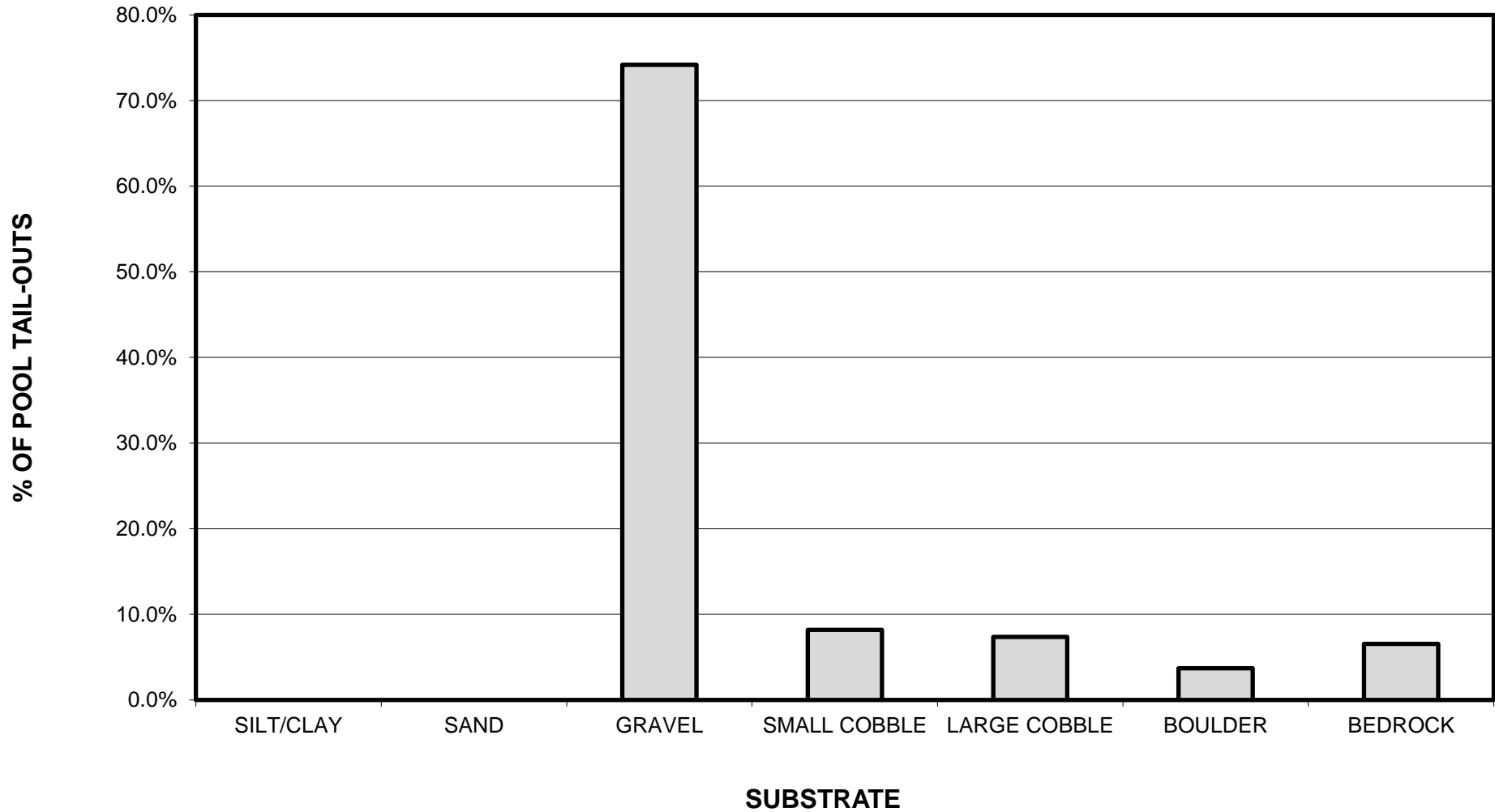
GRAPH 6

DUTCH CHARLIE CREEK 2018 MEAN PERCENT COVER TYPES IN POOLS



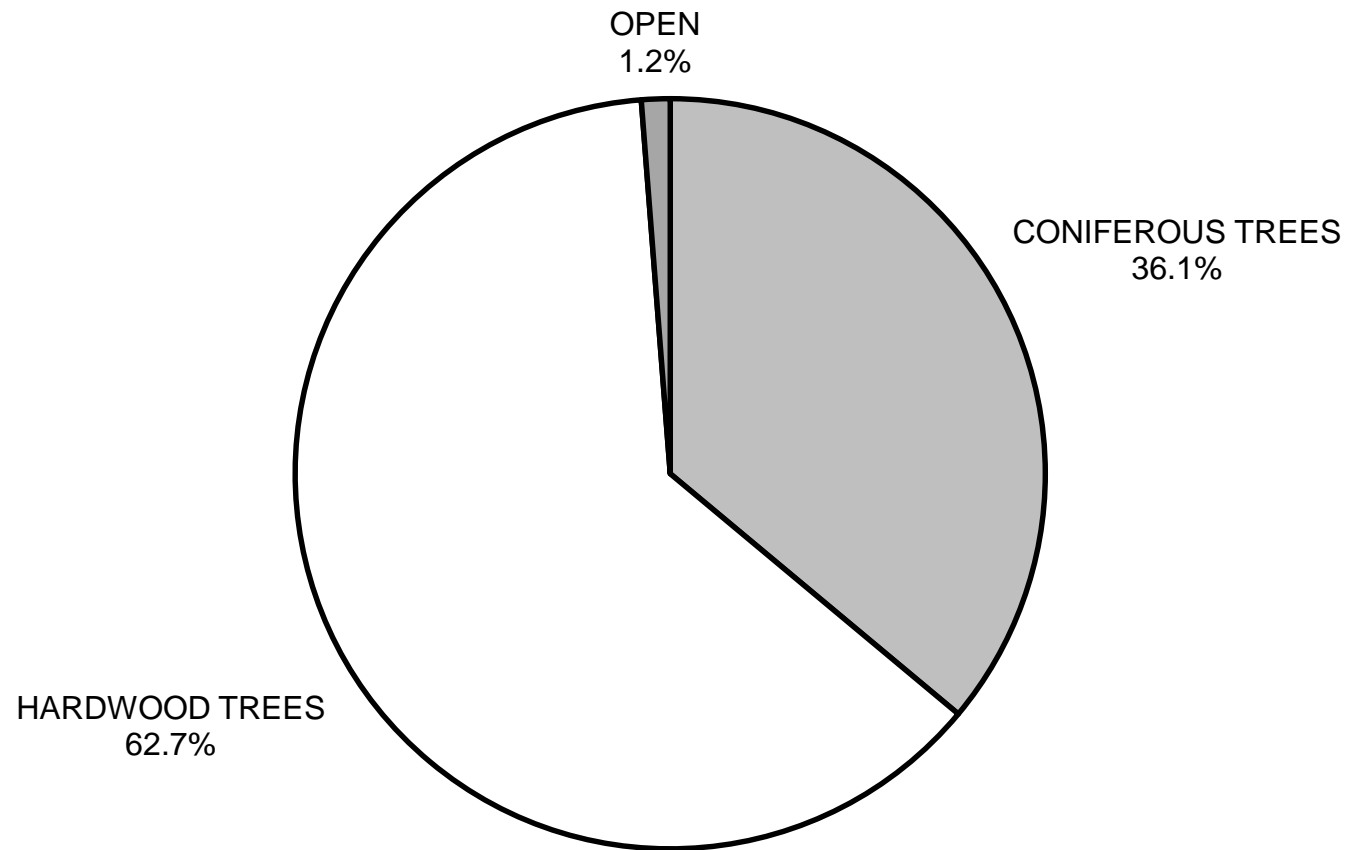
GRAPH 7

DUTCH CHARLIE CREEK 2018 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



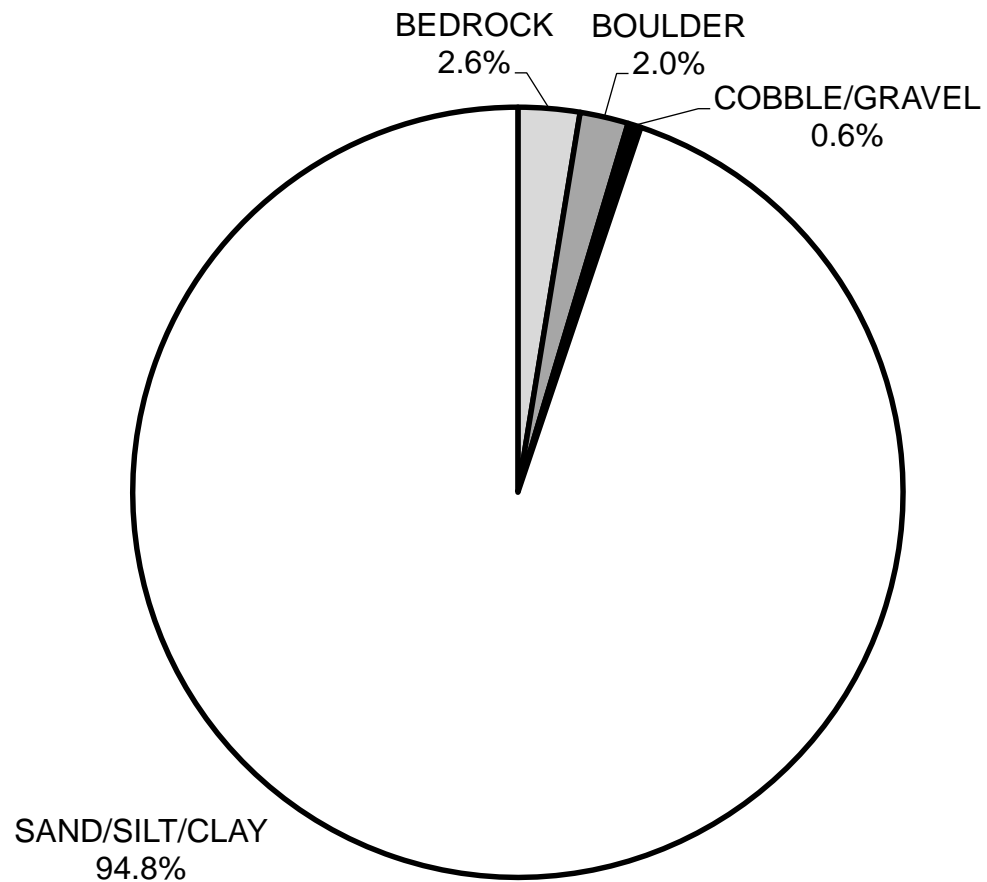
GRAPH 8

DUTCH CHARLIE CREEK 2018 MEAN PERCENT CANOPY



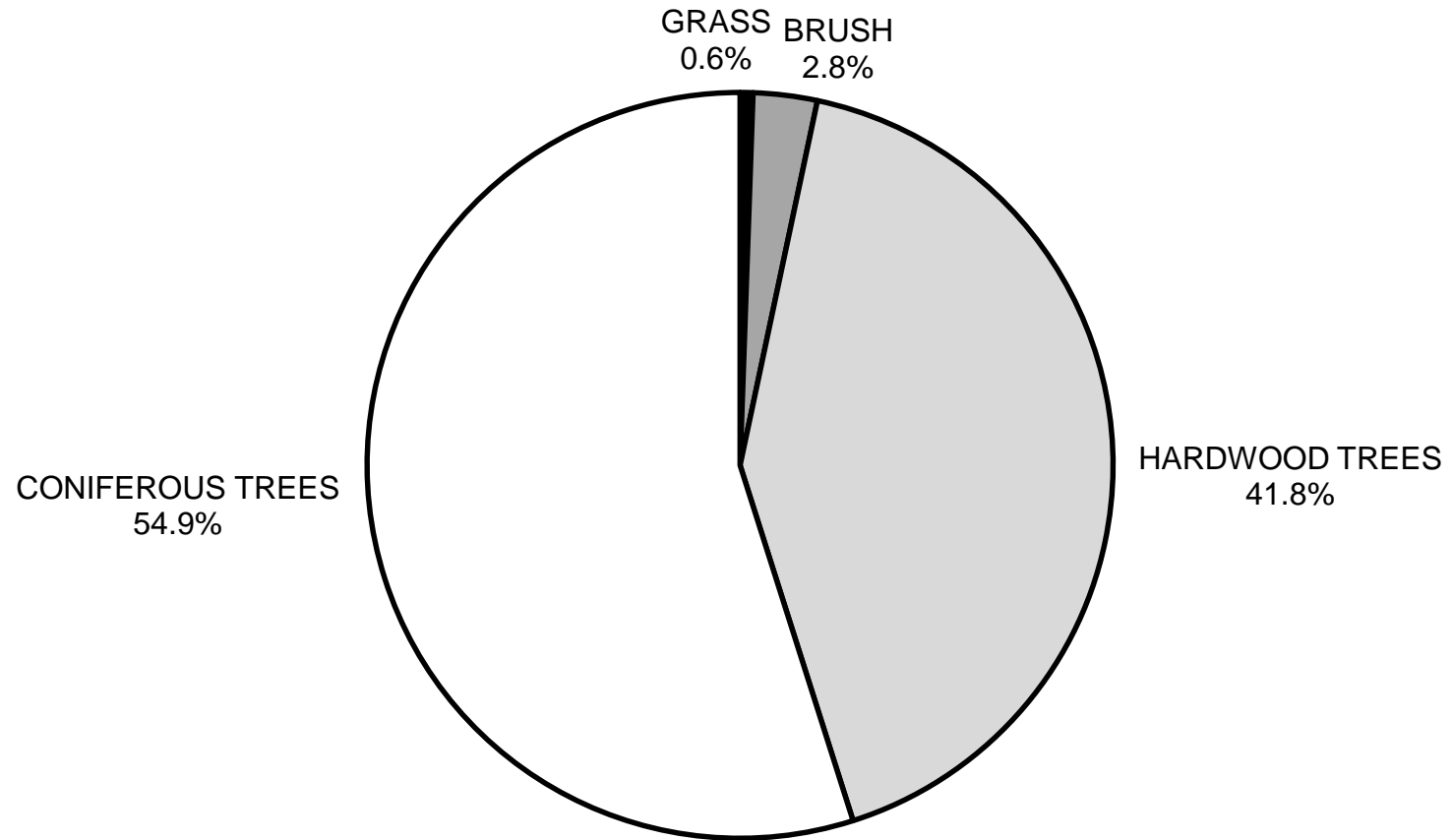
GRAPH 9

**DUTCH CHARLIE CREEK 2018
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

DUTCH CHARLIE CREEK 2018 DOMINANT BANK VEGETATION IN SURVEY REACH



APPENDIX II

STREAM INVENTORY PHOTOS



Photo 1. Culvert at Habitat Unit 245, 11,424 feet upstream from start of survey.
Photo taken 6/13/2018

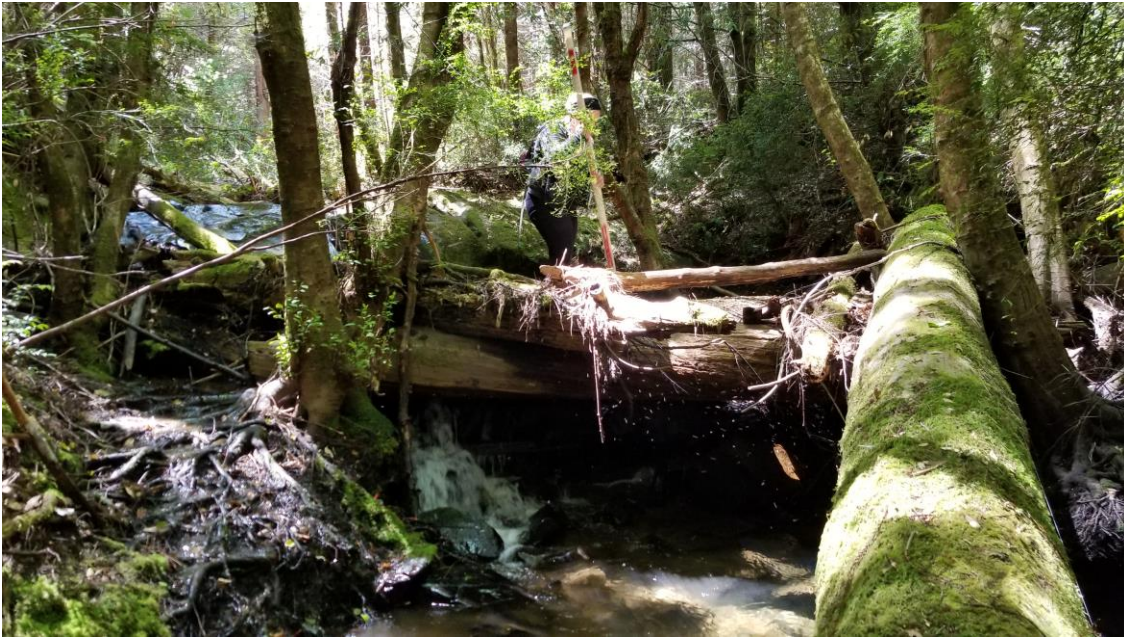


Photo 2. Habitat Unit 250, 11,496 feet upstream of start of survey. Photo taken 6/13/2018



Photo 3. Habitat Unit 282, 12,610 feet upstream start of survey. Photo taken 6/14/2018



Photo 4. Habitat Unit 477, End of survey, 21,959 feet upstream start of survey.
Photo taken on 6/14/2018.