STREAM INVENTORY REPORT

Mud Creek

INTRODUCTION

A stream inventory was conducted during August 8, 2007 to August 29, 2007 on Mud Creek. The survey began at the confluence with the South Fork Eel River and extended upstream 4.3 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Mud Creek.

A biological survey of Mud Creek was last conducted in 1996 to document the presence of juvenile salmonid species. Findings from that survey will also be included in this report.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Mud Creek is a tributary to the South Fork Eel River, tributary to the Eel River which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Mud Creek's legal description at the confluence with the South Fork Eel River is T21N R16W S26. Its location is 39.6446 north latitude and 123.6163 west longitude, LLID number 1236151396447. Mud Creek is a second order stream and has approximately 5.8 miles of blue line stream according to the USGS Cahto Peak 7.5 minute quadrangle. Mud Creek drains a watershed of approximately 4.9 square miles. Elevations range from about 1,590 feet at the mouth of the creek to 2,200 feet in the headwater areas. Mixed conifer and hardwood forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production, grazing and rural subdivision. Vehicle access exists via Branscomb Road from the town of Laytonville. Drive west from Laytonville approximately 13 miles to the Admiral Standley State Recreation Area. Then park at the Mud Creek Bridge and walk downstream to the mouth of Mud Creek. Further stream access may be found off of Mud Creek Road.

METHODS

The habitat inventory conducted in Mud Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

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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.

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

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Mud 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 Mud 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 unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Mud Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Mud 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 Mud 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 is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks during habitat typing in Mud Creek. Detailed biological sampling (electrofishing and/or underwater observation) was not conducted on Mud Creek during the 2007 survey. Data from an August 13, 1996 backpack electrofishing survey is listed in the Biological Inventory Results section of this report. Electrofishing sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. 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 Mud Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 8, 2007 to August 29, 2007, was conducted by T. Chapple and R. Marsh (WSP). The total length of the stream was 22,452 feet with an additional 1,281 feet of side channel. A section of Mud Creek from 5,559 feet upstream of the confluence to 10,793 feet was not surveyed due to lack of landowner access permission. The data included in this report is for the 17,218 feet actually surveyed.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.27 cfs on October 10, 2007.

Mud Creek is a B3 channel type for 5,558 feet of the stream surveyed (Reach 1), an undetermined channel type for the next 5,234 feet of the stream surveyed (Reach 2), a B2 channel type for 1,391 feet of the stream surveyed (Reach 3), a D4 channel type for 3,269 feet of the stream surveyed (Reach 4), and a B3 channel type for 7,000 feet of the stream surveyed (Reach 5).

B3 channels are moderately entrenched with a moderate gradient and riffle dominated streams consisting of infrequently spaced pools, a very stable plan and profile with stable banks and cobble-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated streams consisting of infrequently spaced pools, a very stable plan and profile with stable banks and boulder-dominant substrates. D4 channels multiple channels with longitudinal

and transverse bars. D4 channel types are also very wide channels with eroding banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 68 degrees Fahrenheit. Air temperatures ranged from 52 to 87 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% riffle units, 37% flatwater units, 15% pool units and 7% dry units (Graph 1). Based on total length of Level II habitat types there were 38% riffle units, 34% flatwater units, 14% pool units and 14% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 26% run units, 25% high gradient riffle units and 15% low gradient riffle units (Graph 3). Based on percent total length of surveyed stream, high gradient riffle units made up 21%, run units 20%, and low gradient riffles 16%.

A total of 70 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 93% (Graph 4), and comprised 97% 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. Thirty-one of the 70 pools (44%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 70 pool tail-outs measured, 5 had a value of 1 (7.1%); 22 had a value of 2 (31.4%); 16 had a value of 3 (22.9%); 5 had a value of 4 (7.1%); 22 had a value of 5 (31.4%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited 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 18, flatwater habitat types had a mean shelter rating of 12, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 23, scour pools had a mean shelter rating of 13 and backwater pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Mud Creek. Graph 7 describes the pool cover in Mud Creek. Boulders are the dominant pool cover type followed by root mass.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Large cobble was observed in 31% of pool tail-outs and boulders were observed in 27% of pool tail-outs.

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The mean percent canopy density for the surveyed length of Mud Creek was 89% (Table 7). Eleven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 82% and 18%, respectively (Table 7). Graph 9 describes the mean percent canopy in Mud Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98% (Table 7). The dominant elements composing the structure of the stream banks consisted of 34% boulder, 32% cobble/gravel, 25% sand/silt/clay and 9% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 77% of the units surveyed. Additionally, 16% of the units surveyed had coniferous trees as the dominant vegetation type, 4% had grass as the dominant vegetation type and 2% had brush as the dominant type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Mud Creek was biologically sampled on August 13, 1996, by R. Goodfield (DFG) and T. Kraemer (WSP) for fish presence and identification. Two sites were sampled using an electrofisher. The first site was located approximately 187 feet from the confluence and yielded five young-of-the-year (YOY) steelhead/rainbow trout. The second site was located approximately 14,144 feet above the confluence and yielded five YOY steelhead/rainbow trout.

DISCUSSION

Mud Creek is a B3 channel type for the first 5,558 feet of stream surveyed (Reach 1), undetermined for the next 5,234 feet (Reach 2), a B2 channel type for the next 1,391 feet of stream surveyed (Reach 3), a D4 channel type for the next 3,269 feet of stream surveyed (Reach 4) and a B3 channel type for the remaining 7,000 feet of the stream surveyed (Reach 5). The suitability of B3, B2 and D4 channel types for fish habitat improvement structures are as follows: B3 channels are excellent for plunge weirs, boulder clusters and bank placed boulders, single and opposing wing deflectors and log cover. The undetermined channel type was not surveyed due to a lack of landowner permission and private property access. B2 channel types are excellent for plunge weirs, single and opposing wing-deflectors and log cover. D4 channel types are fair for bank-placed boulders, single and opposing wing-deflectors and channel constrictors.

The water temperatures recorded on the survey days August 8, 2007 to August 29, 2007, ranged from 51 to 68 degrees Fahrenheit. Air temperatures ranged from 52 to 87 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 34% of the total length of this survey, riffles 38%, dry units 14%, and pools 14%. The pools are relatively shallow, with only 31 of the 70 (44%) pools having 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.

Twenty-five of the 66 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-one of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Mud Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-six of the 70 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 was 22. The shelter rating in the flatwater habitats was 12. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Mud Creek. Boulders are the dominant cover type in pools followed by root mass. 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 89%. Reach 1 had a canopy density of 87%, Reach 3 had a canopy density of 81%, Reach 4 had a canopy density of 92% and Reach 5 had a canopy density of 90%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 97% and 98%, 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

1) Mud Creek should be managed as an anadromous, natural production stream.

2) 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.

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

4) Suitable size spawning substrate on Mud Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

5) 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.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) 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.

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 the South Fork Eel River. Habitat units 001-006 were under the influence of the South Fork Eel River causing turbidity in Mud Creek. The water appeared to be slate colored and the visibility was approximately 0.5" deep due to suspended sediments.
243	0006.00	Vehicle bridge #1 was located on Branscomb Road and measured at 25’ wide x 20.1’ high x 17.5’ long.
316	0007.00	Out of the influence of the South Fork Eel River.
499	0013.00	There was right bank erosion through habitat units 013-016 estimated at 12' high x 100' long that was contributing fine sediments-large cobbles.
1207	0031.00	The visibility throughout habitat units 031-031.3 was 1.5' due to suspended sediments.
1354	0034.00	At the top of the side channel there was a log debris accumulation (LDA) that measured at 8’ high x 57’ wide x 62’ long which contained about 17 pieces of large woody debris (LWD). There were visible gaps and water was flowing through the LDA. There was a lack of sediment retention and the LDA was not considered a possible barrier to salmonids as fish were seen above it.

1443	0037.00	Young-of-the-year (YOY) and 1+ salmonids were observed throughout habitat units 037-039 and 043.
1936	0046.00	Throughout habitat units 046-049 the visibility was 0.5 feet.
2067	0048.00	There was erosion sites observed throughout habitat units 048-050, located on the right bank estimated at 75' long, which contributed fine sediments-boulder substrates.
2644	0059.00	There was a footbridge constructed of steel and a wooden surface (rusty with unstable supports). The bridge was measured at 4.5’ wide x 10.7’ high x 71’ long.
3444	0072.00	There was a ford crossing measured at 13' wide x 22' long.
3706	0076.00	Throughout habitat units 076-078 the visibility was 0.4’ due to suspended sediments.
4211	0085.00	A dry tributary entered from the right bank. It was accessible to fish (when flowing) and the slope was measured with a clinometer at 10%. The surveyors checked upstream for about 100’ and no fish were observed. The streambed substrates were mainly composed of silt.
4358	0086.00	There was a dry tributary on the left bank.
4536	0090.00	There was a ford crossing at the bottom of the habitat unit that measured 26' wide x 71' long.
4756	0093.00	Erosion was observed on the left bank in habitat units 093-094, estimated at 300' long, which contributed fine sediments-large cobble substrates.
5288	0100.00	Erosion was observed on the right bank in habitat units 100-101, estimated at 100' high, which contributed fine sediments-boulder substrates.
5491	0104.00	A dry tributary entered from the right bank. It was inaccessible to fish due to increasingly steep gradient and large woody debris which blocked the mouth. The surveyors checked upstream about 150' and no fish were observed. The slope was measured with a clinometer at 14%.
5522	0105.00	There was a section of unsurveyable stream due to a lack of landowner permission (identified as Reach 2)

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10792	0107.00	The survey was restarted (Identified as Reach 3). Throughout habitat units 107-110 the visibility was 0.3' due to suspended sediments.
10879	0111.00	Tributary #3 “Grape Vine Creek” entered from the right bank. The flow was estimated at 0.5cfs and it contributed 10% the downstream flow. The temperature of the tributary was 57 degrees Fahrenheit. Both downstream and upstream of the tributary the temperature was 58 degrees Fahrenheit. The tributary was accessible to fish and the surveyors checked 75’ upstream and salmonids were observed. The slope was measured with a clinometer at 6%.
11000	0114.00	The stream channel was braided.
11043	0115.00	Throughout habitat units 115-121 vegetation was choking the stream channel.
11352	0125.00	Throughout habitat units 125-127 the visibility was 0.3' due to suspended sediments.
11418	0127.00	Throughout habitat units 127-129, there was erosion estimated at 100' long x 30' high, that was contributing fine sediments-boulder substrates.
11968	0147.00	There was a dry tributary on the right bank.
13146	0181.00	Throughout habitat units 181-185 the visibility was 1" due to suspended sediments and fluvial erosion processes. Tributary #4 entered from the left bank. It was inaccessible to fish due to an increasingly steep gradient and boulder cascade. The surveyors checked upstream about 50' and no fish were observed. The slope was measured with a clinometer at 25%.
13275	0185.00	Tributary #5 “Mud Springs” entered from the right bank. The flow was estimated at 0.01cfs and it was contributing an estimated <0.1% to the downstream flow. The temperature of the tributary was 62 degrees Fahrenheit. The temperature downstream of the tributary was 56 degrees Fahrenheit. The temperature upstream of the tributary was 54 degrees Fahrenheit. It was inaccessible to fish due to increasingly steep gradient, silty substrates (mud) and no fish were observed. The slope was measured with a clinometer at 35%. Tributary #5 was contributing high levels of silt to the downstream flow and entered at a confluence pool filled with dense silt/clay. The silt/clay originated from several mud springs about 100' uphill. These springs were responsible for the stream color and turbid visibility due to the fine suspended sediments. Upstream of the confluence pool, Mud Creek’s visibility increased, as the turbidity decreased, allowing the water to run clear.

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13978	0205.00	There was a ford crossing measured at 11' wide x 60' long.
14080	0209.00	There was erosion on the left bank throughout habitat units 209-211, that contributed fine sediment-cobble substrates, estimated at 40' high x 70' long.
14907	0227.00	There was a slide on the left bank observed throughout habitat units 227-228, estimated at 30' high x 70' long, contributing fine sediments-gravel substrates.
15452	0237.00	There was erosion on the left bank, estimated at 60' long x 20' high.
15753	0240.00	There was a slide on the right bank throughout habitat units 240-241, estimated at 75' long x 150' high, contributing fine sediments-boulder substrates.
16017	0246.00	There was a slide on the left bank estimated at 100' long x 25' high, contributing fine sediments-boulder substrates.
16269	0251.00	Tributary #6 entered from the left bank. The flow was estimated at less than 2 cfs and it was contributing 50% to the downstream flow. The temperature of the tributary, and the temperature of Mud Creek downstream and upstream of the tributary was 61 degrees Fahrenheit. The tributary was accessible to fish and salmonids were observed when the surveyors checked upstream for about 200'. The slope was measured with a clinometer at 9% and increased to 12%.
16368	0255.00	Left bank erosion was observed throughout habitat units 255-261 and was estimated at 30' high. The erosion site was contributing fine sediments-boulder substrates.
16757	0265.00	Right bank erosion was observed throughout habitat units 265-266 and was estimated at 50' long x 30' high. The erosion site was contributing gravel-boulder substrates.
17434	0285.00	There was a ford crossing measured at 35' long x 13' wide and was not a barrier to salmonids.
17994	0296.00	Left bank erosion estimated at 100' long x 20' high and was contributing fine sediments-boulder substrates. There was also a dry tributary on the right bank.
18088	0299.00	The slope was measured with a clinometer at 16%.
18117	0301.00	There was a 3.5' plunge preceding a jump pool 1.7' deep.

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18170	0304.00	There was a 1.1' plunge measured.
18714	0317.00	There a right bank slide estimated at 150' high x 100' long that was contributing fine sediments-gravel substrates.
19052	0332.01	The slope of the streambed was measured with a clinometer at 12%.
19052	0333.00	Throughout habitat units 333-334 the slope of the streambed was measured with a clinometer at 20%.
19677	0355.00	Four foot drop into the pool, where the jump could be impaired by boulders.
19787	0358.00	Throughout habitat units 358, 360, 364 and 367, YOY were observed.
20103	0368.00	Approximately 130' upstream of habitat unit 368, there was a 4.8' drop over very large boulders.
20367	0371.00	Tributary #7 entered from the left bank and was not flowing. It was accessible to fish, although no fish were observed when the surveyors checked upstream of the tributary for about 100'. The slope was measured with a clinometer at 18%.
20795	0385.00	Throughout habitat units 385-387, there was a slide on the left bank estimated at 200' high x 100' long, that contributed fine sediments-cobble substrates.
20900	0391.00	The stream gradient was measured at 18%.
20914	0392.00	Tributary #8 entered from the left bank. The flow was estimated at less than 0.1 cfs, however the main channel was not flowing. The temperature of the tributary was 61 degrees Fahrenheit. The tributary was inaccessible to fish and no fish were observed when the surveyors checked upstream about 75’. The slope was measured with a clinometer at 19%.
20914	0392.00	The slope was measured with a clinometer at 27% for about 220'-260'.
22013	0410.00	The stream was no longer flowing.
22021	0411.00	Throughout habitat units 411-413, there was a slide on the right bank estimated at 100' high by 30' long, that was contributing gravel-boulder substrates.
22116	0419.00	Throughout habitat units 419-420 the slope was measured with a clinometer at 18%.

22313	0430.00	The slope was measured with a clinometer at 27% and was measured at 45% for the first 15' of habitat unit 430.
22452	0434.00	End of survey due to a bedrock sheet waterfall measured at 35' High with a 50% slope for about 50' upstream. YOY salmonids were consistently observed throughout the stream survey until habitat unit 388. After habitat unit 388, only 1+ salmonids were observed.

REFERENCES

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

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

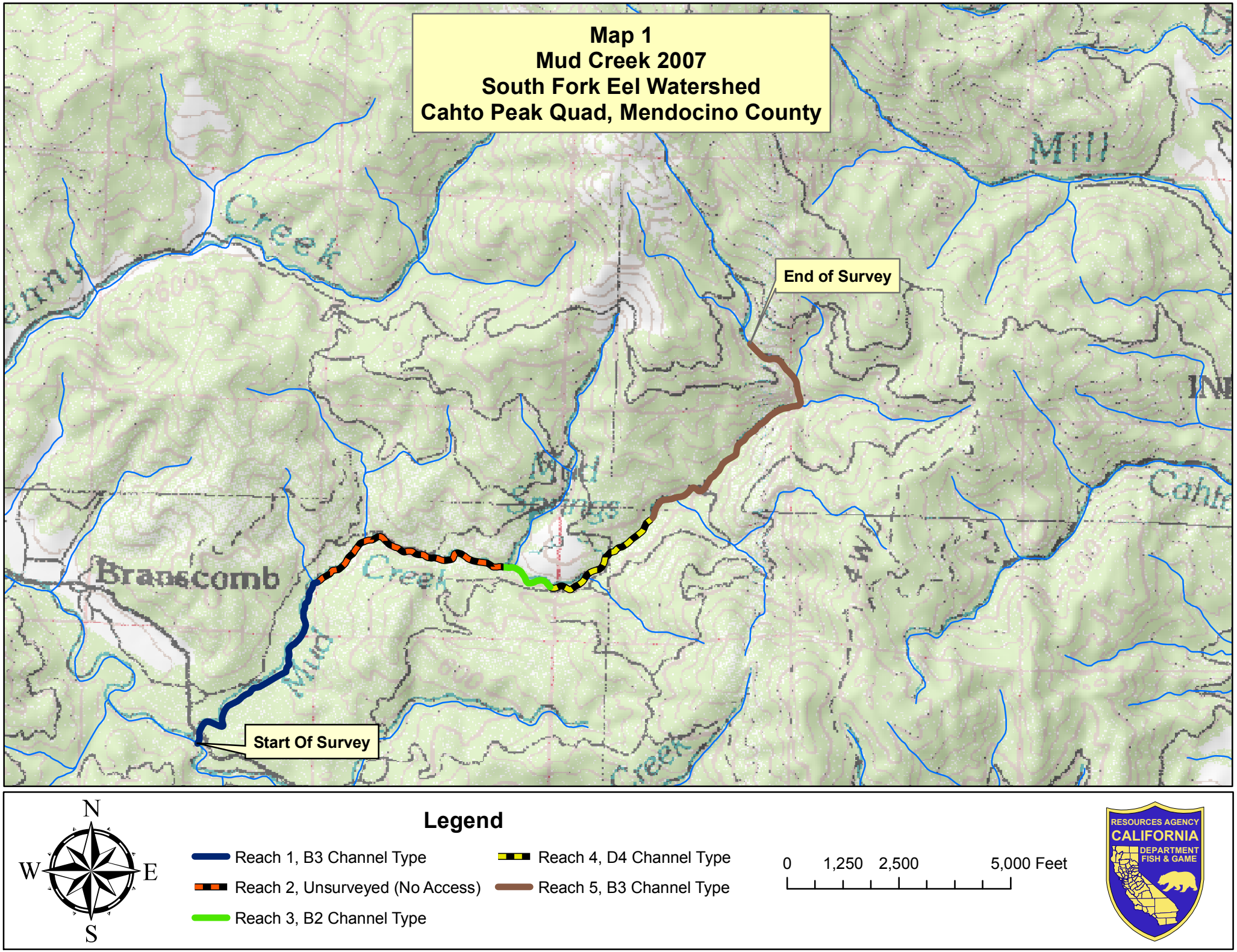

Map 1
Mud Creek 2007
South Fork Eel Watershed
Cahto Peak Quad, Mendocino County
End of Survey
Start Of Survey
Branscomb
Mill
Creek
N
S
E
W
Legend
Reach 1, B3 Channel Type
Reach 2, Unsurveyed (No Access)
Reach 3, B2 Channel Type
Reach 4, D4 Channel Type
Reach 5, B3 Channel Type
0
1,250
2,500
5,000 Feet
RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME

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

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0

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
34	0	DRY	7.3	74	2530	13.7									
171	39	FLATWATER	36.6	37	6351	34.3	9.8	0.6	1.1	359	61351	247	42304		12
1	0	NOSURVEY	0.2	5234	5234										
70	70	POOL	15.0	37	2585	14.0	13.0	1.1	2.1	516	36145	866	60593	712	22
191	21	RIFFLE	40.9	37	7033	38.0	9.5	0.4	0.7	210	40197	98	18765		18

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
467	130	23733	137693	121662

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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 (%)
68	5	LGR	14.6	44	2972	16.1	10	0.4	1	360	24466	161	10978		8	90
115	13	HGR	24.6	34	3927	21.2	11	0.4	1.5	199	22879	96	11000		16	87
8	3	CAS	1.7	17	134	0.7	3	0.4	0.7	11	91	4	33		45	84
2	2	GLD	0.4	47	94	0.5	14	0.9	1.7	689	1378	538	1075		5	83
123	28	RUN	26.3	30	3676	19.9	10	0.6	1.6	245	30164	177	21776		12	91
46	9	SRN	9.9	56	2581	14.0	10	0.7	1.5	639	29376	402	18480		12	87
64	64	MCP	13.7	38	2456	13.3	13	1.1	5.3	533	34132	893	57151	732	23	89
1	1	CCP	0.2	43	43	0.2	12	1.6	2.8	516	516	1032	1032	826	5	85
4	4	PLP	0.9	18	72	0.4	17	1.2	3.4	299	1197	490	1961	428	13	89
1	1	BPL	0.2	14	14	0.1	22	1.5	2.3	299	299	449	449	449	10	92
34	0	DRY	7.3	74	2530	13.7										90
1	0	NS	0.2	5234	5234											

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
467	130	23733	144500	123936

Table 3 - Summary of Pool Types

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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
65	65	MAIN	93	38	2499	97	12.6	1.1	533	34648	734	47680	23
4	4	SCOUR	6	18	72	3	17.0	1.2	299	1197	428	1712	13
1	1	BACKWATER	1	14	14	1	22.5	1.5	299	299	449	449	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
70	70	2585	36145	49841

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

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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
64	MCP	91	0	0	37	58	18	28	8	13	1	2
1	CCP	1	0	0	0	0	1	100	0	0	0	0
4	PLP	6	0	0	2	50	1	25	1	25	0	0
1	BPL	1	0	0	0	0	1	100	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
70	0	0	39	56	21	30	9	13	1	1

Mean Maximum Residual Pool Depth (ft.): 2.1

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007 Dry Units: 34

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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
68	5	LGR	7	10	0	13	9	0	10	51	0
115	12	HGR	0	15	0	1	11	0	13	61	0
8	3	CAS	0	0	0	0	0	0	40	60	0
191	20	TOTAL RIFFLE	2	11	0	4	9	0	16	58	0
2	1	GLD	25	50	0	0	0	0	0	25	0
123	28	RUN	1	7	4	5	3	0	1	78	0
46	9	SRN	1	9	0	8	16	1	9	56	1
171	38	TOTAL FLAT	2	9	3	6	6	0	3	71	0
64	64	MCP	10	9	8	13	7	1	0	46	7
1	1	CCP	40	0	0	0	60	0	0	0	0
4	4	PLP	0	5	25	5	3	0	0	45	18
1	1	BPL	0	0	60	40	0	0	0	0	0
70	70	TOTAL POOL	10	8	10	13	7	1	0	44	7
1	0	NS									
467	128	TOTAL	6	9	6	9	7	0	3	55	4

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007 Dry Units: 34

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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
68	5	LGR	0	0	40	20	0	40	0
115	13	HGR	15	0	8	8	8	62	0
8	3	CAS	0	0	0	0	0	100	0
2	2	GLD	50	50	0	0	0	0	0
123	28	RUN	0	0	21	7	18	54	0
46	9	SRN	11	0	44	11	0	33	0
64	64	MCP	11	2	36	6	11	33	2
1	1	CCP	100	0	0	0	0	0	0
4	4	PLP	0	0	25	25	0	25	25
1	1	BPL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
89	18	82	0	97	98

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: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007 Survey Length (ft.): 23733 Main Channel (ft.): 22452 Side Channel (ft.): 1281

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B3
Reach Length (ft.): 5558
Riffle/Flatwater Mean Width (ft.): 12.7
BFW:
Range (ft.): 21 to 57
Mean (ft.): 31
Std. Dev.: 12
Base Flow (cfs.): 0.3
Water (F): 51 - 58 Air (F): 52 - 70
Dry Channel (ft): 0

Canopy Density (%): 87.4
Coniferous Component (%): 36.3
Hardwood Component (%): 63.7
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 95.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 17
LWD per 100 ft.:
Riffles: 1
Pools: 4
Flat: 2

Pools by Stream Length (%): 27.4
Pool Frequency (%): 28.2
Residual Pool Depth (%):
< 2 Feet Deep: 29
2 to 2.9 Feet Deep: 45
3 to 3.9 Feet Deep: 23
>= 4 Feet Deep: 3
Mean Max Residual Pool Depth (ft.): 2.5
Mean Pool Shelter Rating: 22

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 23 Sm Cobble: 23 Lg Cobble: 52 Boulder: 0 Bedrock: 3

Embeddedness Values (%): 1. 9.7 2. 41.9 3. 38.7 4. 6.5 5. 3.2

STREAM REACH: 2

Channel Type: NA
Reach Length (ft.): 5234
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 29 to 29
Mean (ft.): 29
Std. Dev.: 0
Base Flow (cfs.): 0.3
Water (F): 57 - 57 Air (F): 77 - 77
Dry Channel (ft): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component (%):
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth (ft.):
Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:

Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B2
Reach Length (ft.): 1391
Riffle/Flatwater Mean Width (ft.): 11.5
BFW:
Range (ft.): 16 to 29
Mean (ft.): 22
Std. Dev.: 4
Base Flow (cfs.): 0.3
Water (F): 52 - 58 Air (F): 63 - 77
Dry Channel (ft): 0

Canopy Density (%): 80.5
Coniferous Component (%): 3.5
Hardwood Component (%): 96.5
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 99.3
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 2
LWD per 100 ft.:
Riffles: 2
Pools: 2
Flat: 2

Pools by Stream Length (%): 15.4
Pool Frequency (%): 12.2
Residual Pool Depth (%):
< 2 Feet Deep: 83
2 to 2.9 Feet Deep: 17
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 21

Pool Tail Substrate (%): Silt/Clay: 17 Sand: 0 Gravel: 17 Sm Cobble: 17 Lg Cobble: 0 Boulder: 50 Bedrock: 0
Embeddedness Values (%): 1. 16.7 2. 0.0 3. 0.0 4. 16.7 5. 66.7

STREAM REACH: 4

Channel Type: D4
Reach Length (ft.): 3269
Riffle/Flatwater Mean Width (ft.): 8.7
BFW:
Range (ft.): 12 to 31
Mean (ft.): 22
Std. Dev.: 6
Base Flow (cfs.): 0.3
Water (F): 53 - 60 Air (F): 64 - 78
Dry Channel (ft): 240

Canopy Density (%): 92.4
Coniferous Component (%): 1.2
Hardwood Component (%): 98.8
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 100.0
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 1

Pools by Stream Length (%): 7.2
Pool Frequency (%): 8.0
Residual Pool Depth (%):
< 2 Feet Deep: 75
2 to 2.9 Feet Deep: 13
3 to 3.9 Feet Deep: 13
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 14

Pool Tail Substrate (%): Silt/Clay: 13 Sand: 0 Gravel: 38 Sm Cobble: 0 Lg Cobble: 25 Boulder: 25 Bedrock: 0
Embeddedness Values (%): 1. 12.5 2. 50.0 3. 0.0 4. 0.0 5. 37.5

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: B3
Reach Length (ft.): 7000
Riffle/Flatwater Mean Width (ft.): 7.8
BFW:
Range (ft.): 9 to 26
Mean (ft.): 19
Std. Dev.: 4
Base Flow (cfs.): 0.3
Water (F): 57 - 68 Air (F): 71 - 87
Dry Channel (ft): 2290

Canopy Density (%): 90.4
Coniferous Component (%): 17.9
Hardwood Component (%): 82.1
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 98.9
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0
LWD per 100 ft.:
Riffles: 1
Pools: 0
Flat: 1

Pools by Stream Length (%): 6.9
Pool Frequency (%): 12.1
Residual Pool Depth (%):
< 2 Feet Deep: 76
2 to 2.9 Feet Deep: 20
3 to 3.9 Feet Deep: 4
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.7
Mean Pool Shelter Rating: 25

Pool Tail Substrate (%): Silt/Clay: 4 Sand: 0 Gravel: 12 Sm Cobble: 8 Lg Cobble: 16 Boulder: 56 Bedrock: 4

Embeddedness Values (%): 1. 0.0 2. 20.0 3. 16.0 4. 8.0 5. 56.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

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	13	10	8.8
Boulder	43	46	34.2
Cobble / Gravel	43	39	31.5
Sand / Silt / Clay	31	35	25.4

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	10	1	4.2
Brush	2	4	2.3
Hardwood Trees	99	102	77.3
Coniferous Trees	19	23	16.2
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 3

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

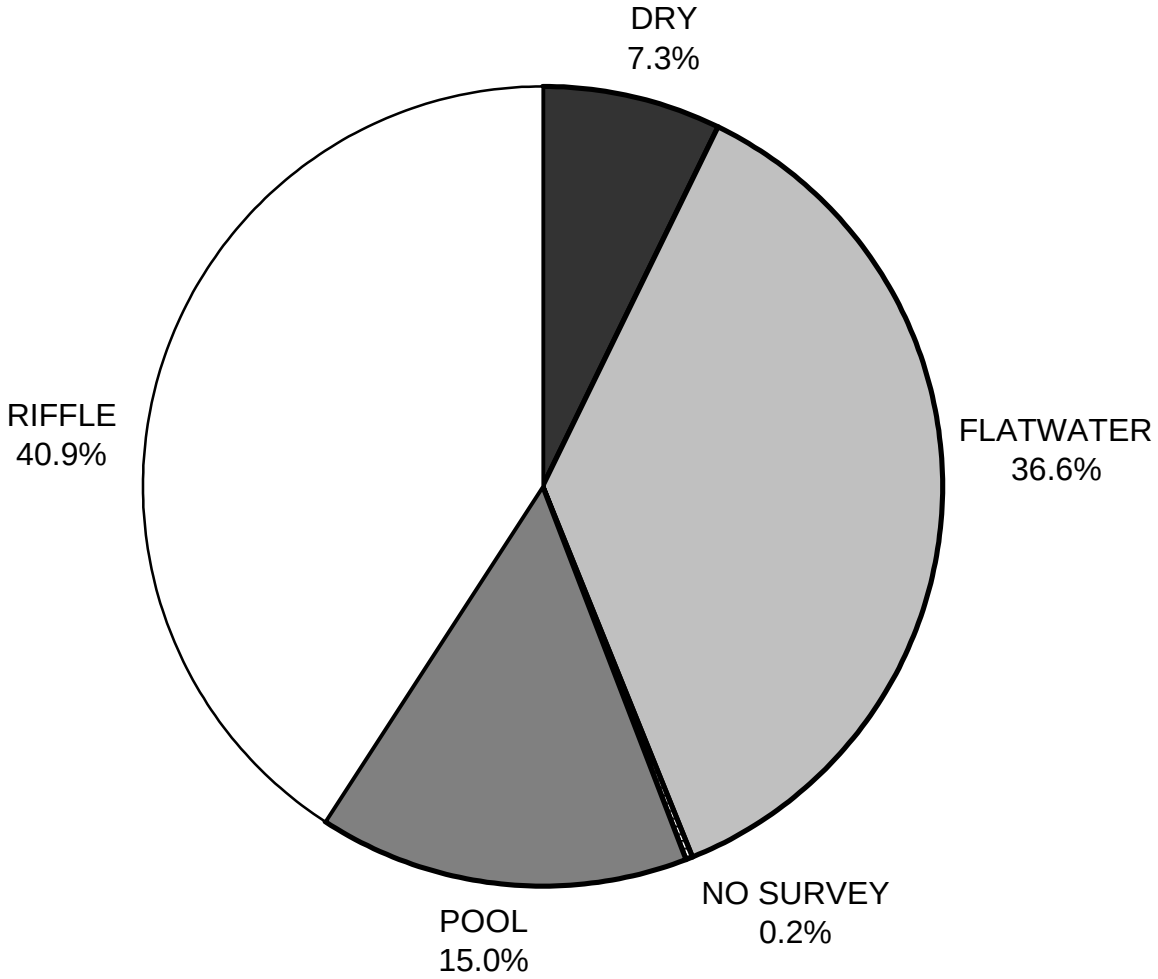
StreamName: Mud Creek LLID: 1236151396447 Drainage: Eel River - South Fork

Survey Dates: 8/8/2007 to 8/29/2007

Confluence Location: Quad: CAHTO PEAK Legal Description: T21NR16WS26 Latitude: 39:38:41.0N Longitude: 123:36:54.0W

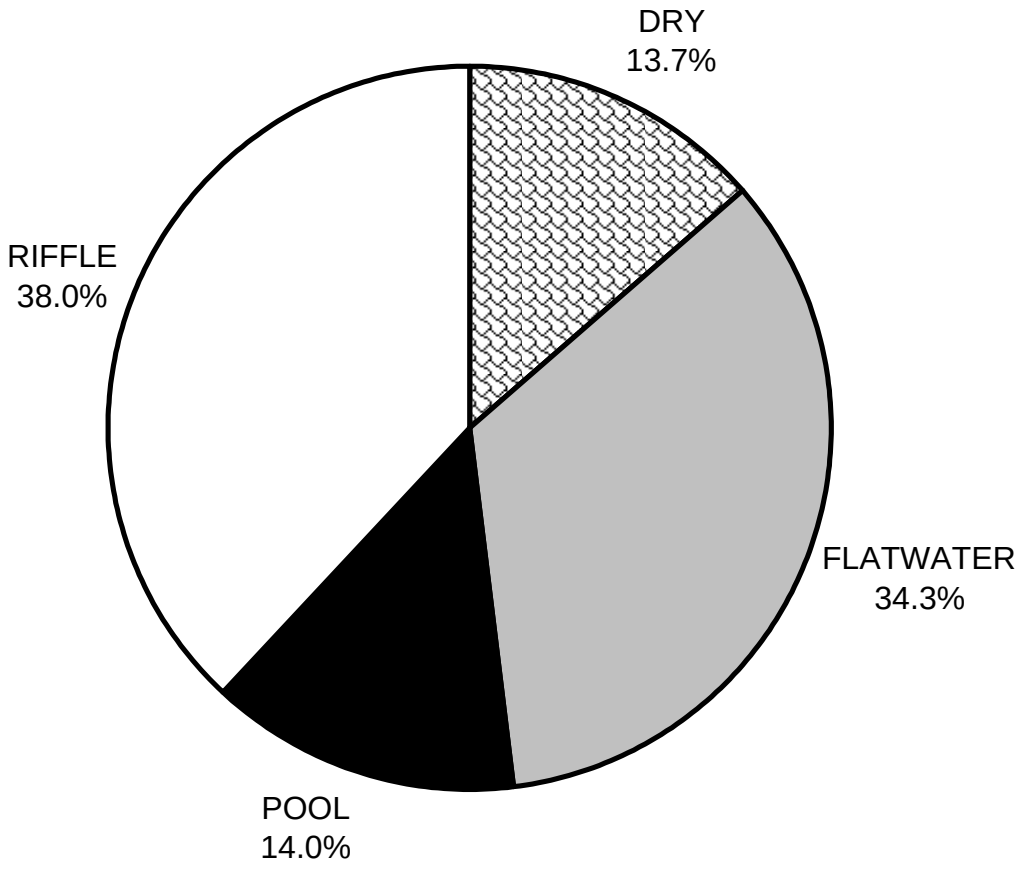
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	2	2	10
SMALL WOODY DEBRIS (%)	11	9	8
LARGE WOODY DEBRIS (%)	0	3	10
ROOT MASS (%)	4	6	13
TERRESTRIAL VEGETATION (%)	9	6	7
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	16	3	0
BOULDERS (%)	58	71	44
BEDROCK LEDGES (%)	0	0	7

MUD CREEK 2007
HABITAT TYPES BY PERCENT OCCURRENCE



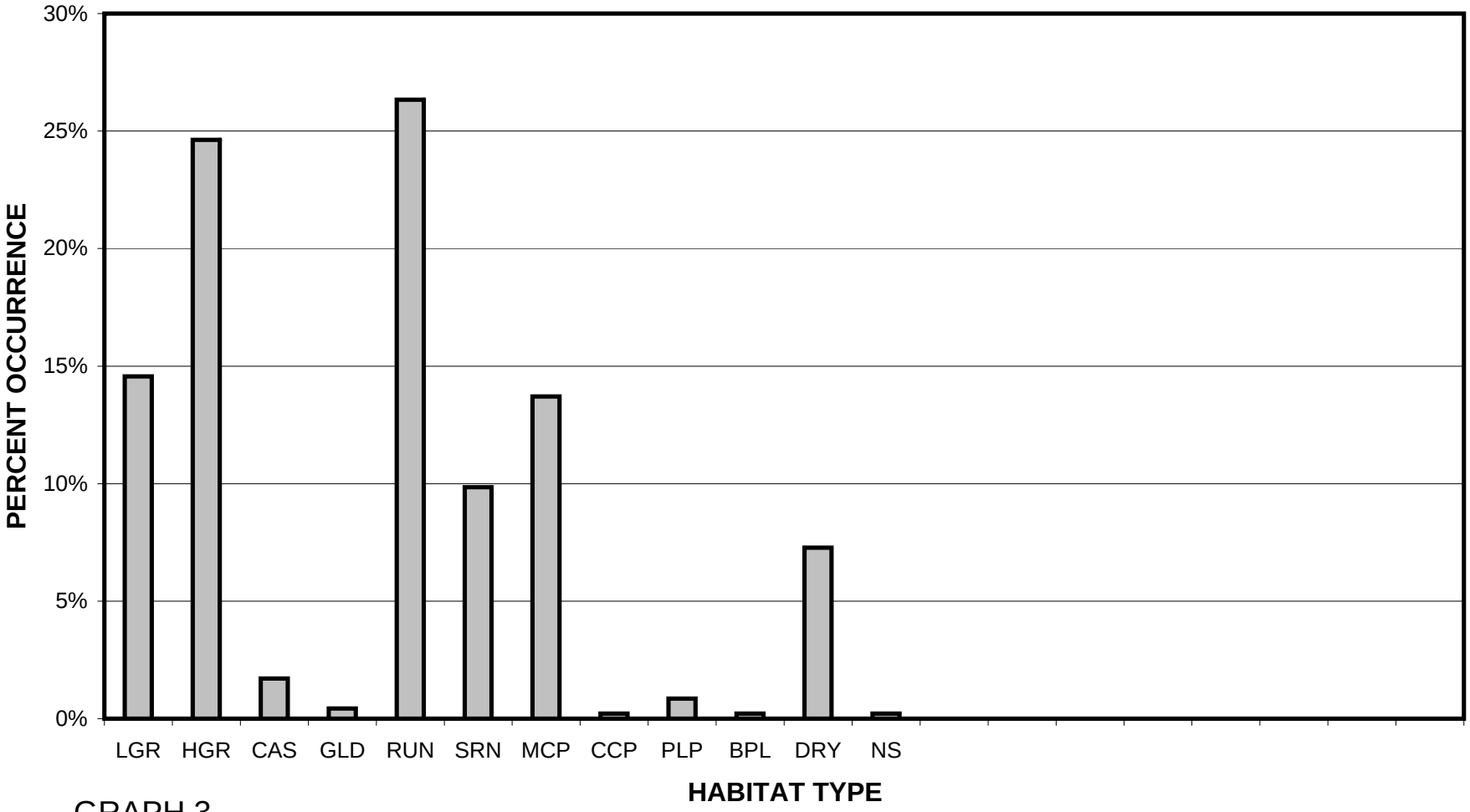
GRAPH 1

MUD CREEK 2007
HABITAT TYPES BY PERCENT TOTAL LENGTH



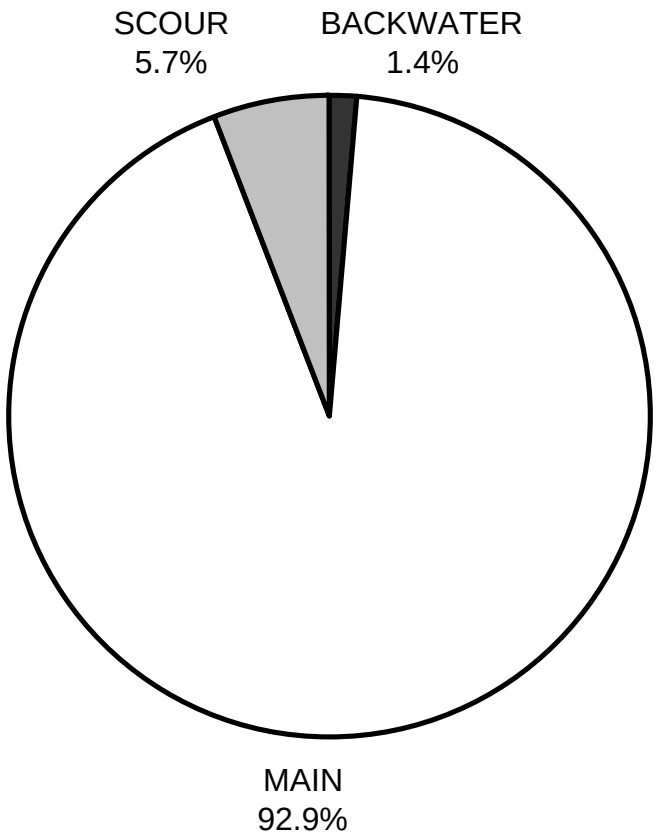
GRAPH 2

MUD CREEK 2007
HABITAT TYPES BY PERCENT OCCURRENCE



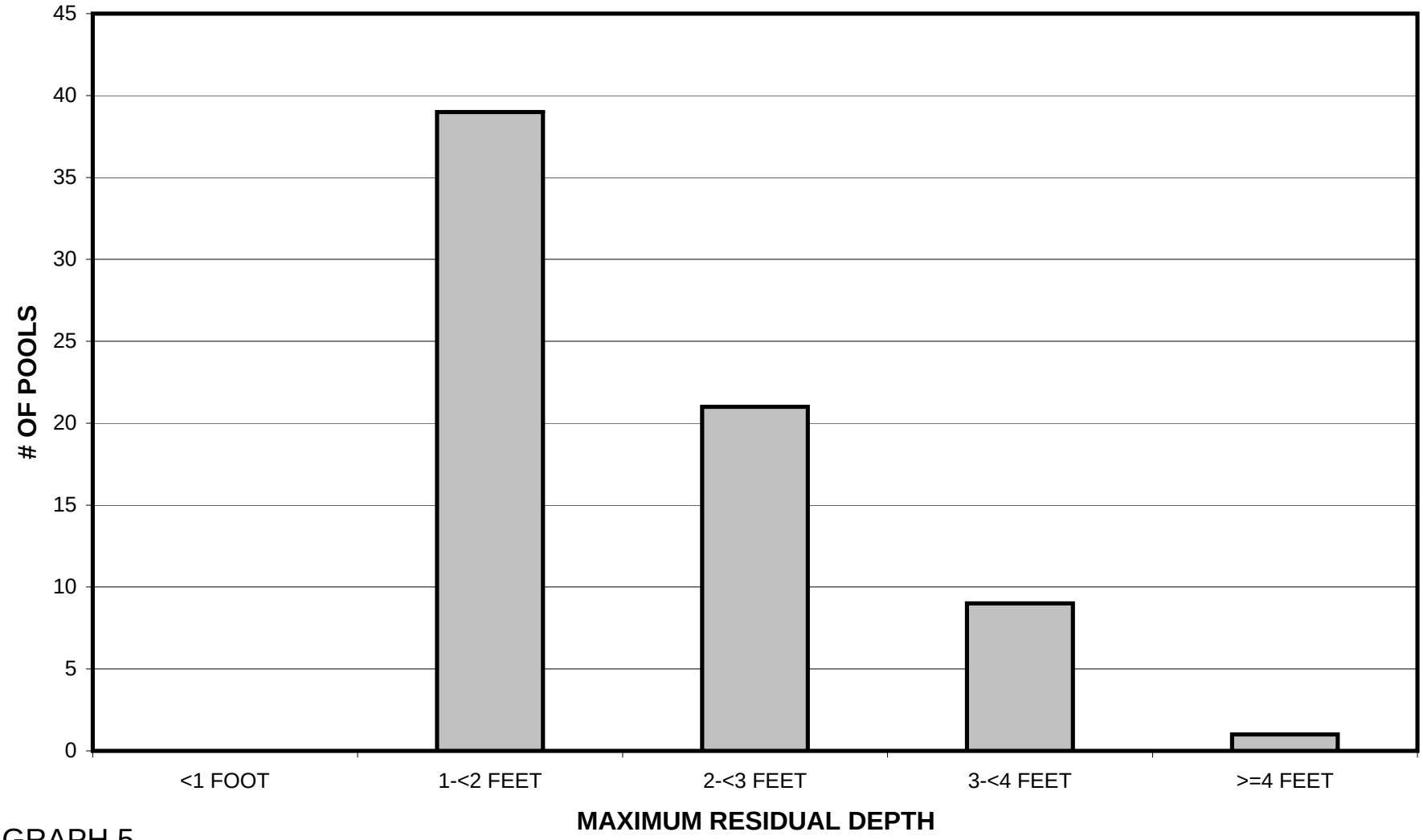
GRAPH 3

MUD CREEK 2007
POOL TYPES BY PERCENT OCCURRENCE



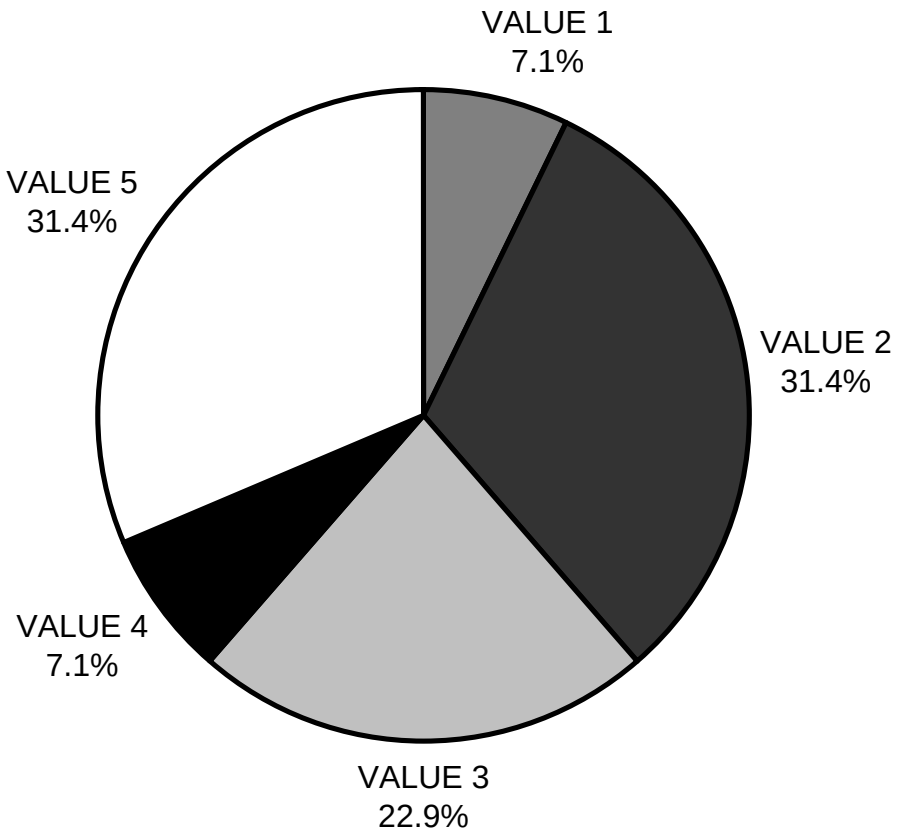
GRAPH 4

MUD CREEK 2007
MAXIMUM DEPTH IN POOLS



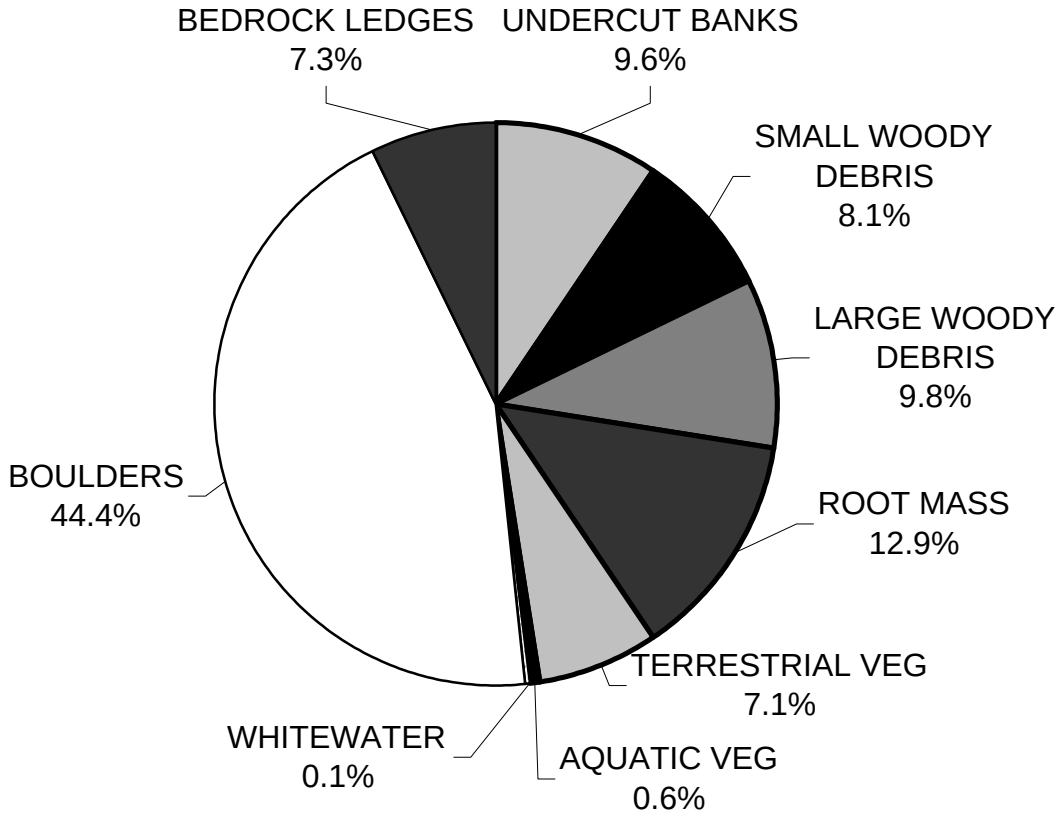
GRAPH 5

MUD CREEK 2007
PERCENT EMBEDDEDNESS



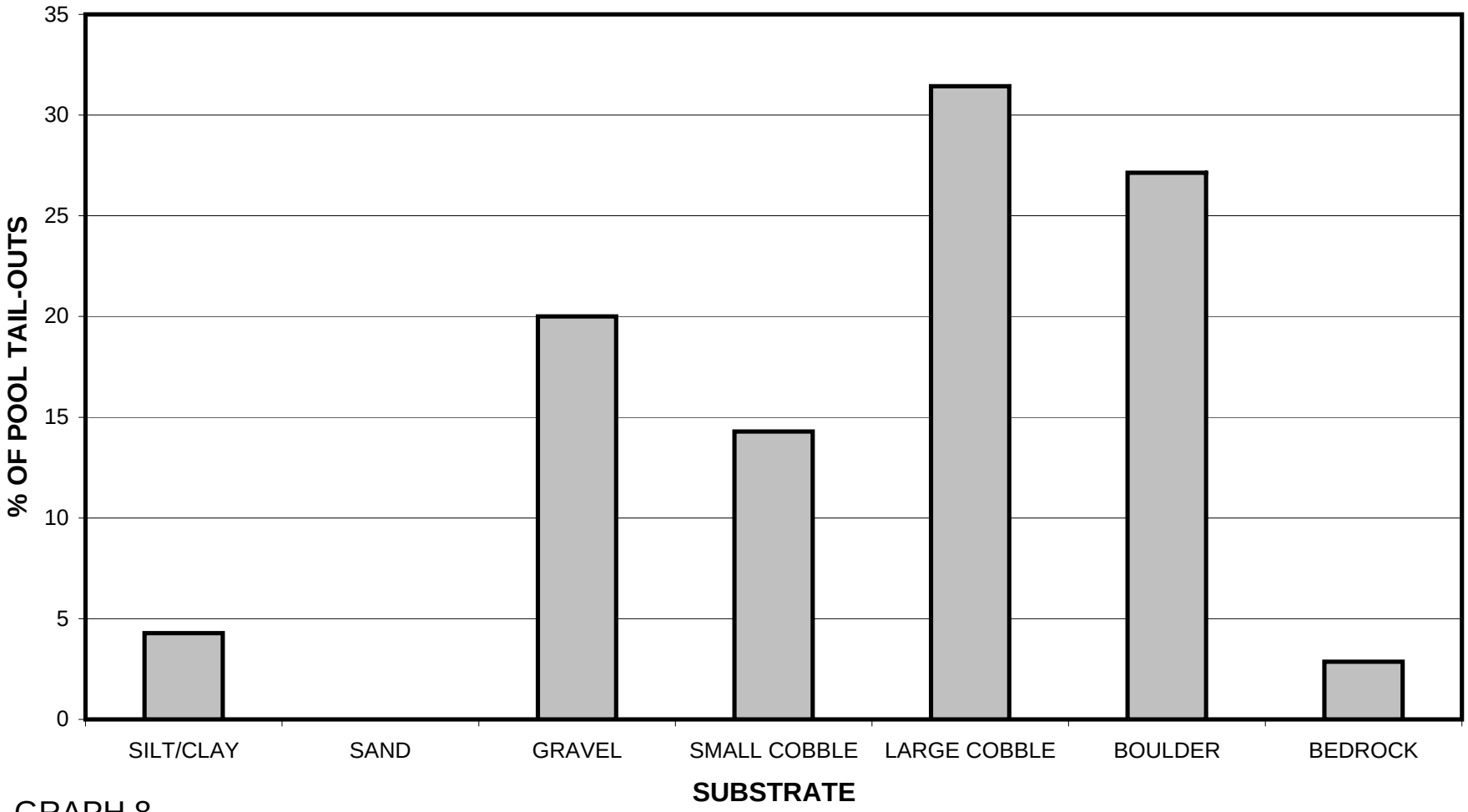
GRAPH 6

MUD CREEK 2007
MEAN PERCENT COVER TYPES IN POOLS



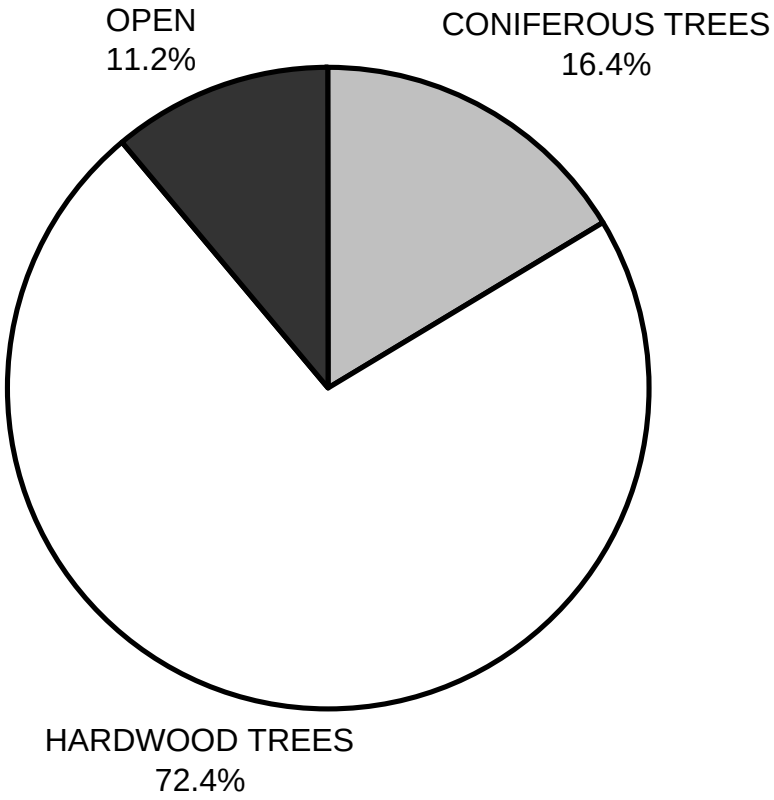
GRAPH 7

MUD CREEK 2007
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



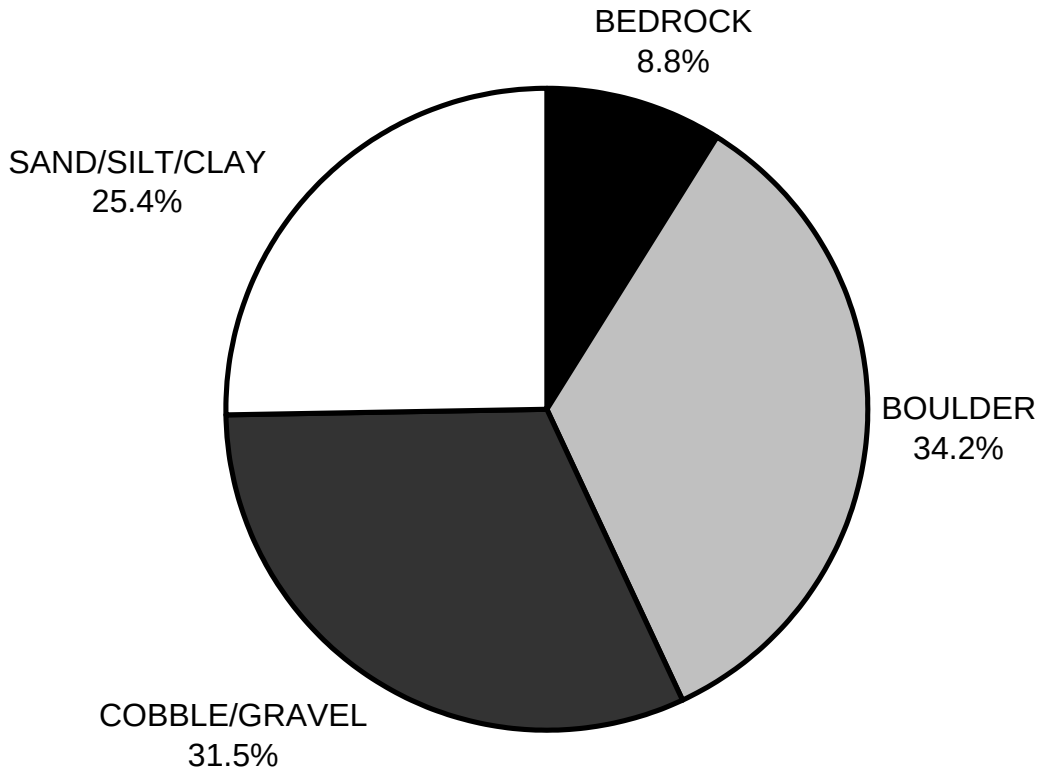
GRAPH 8

MUD CREEK 2007
MEAN PERCENT CANOPY



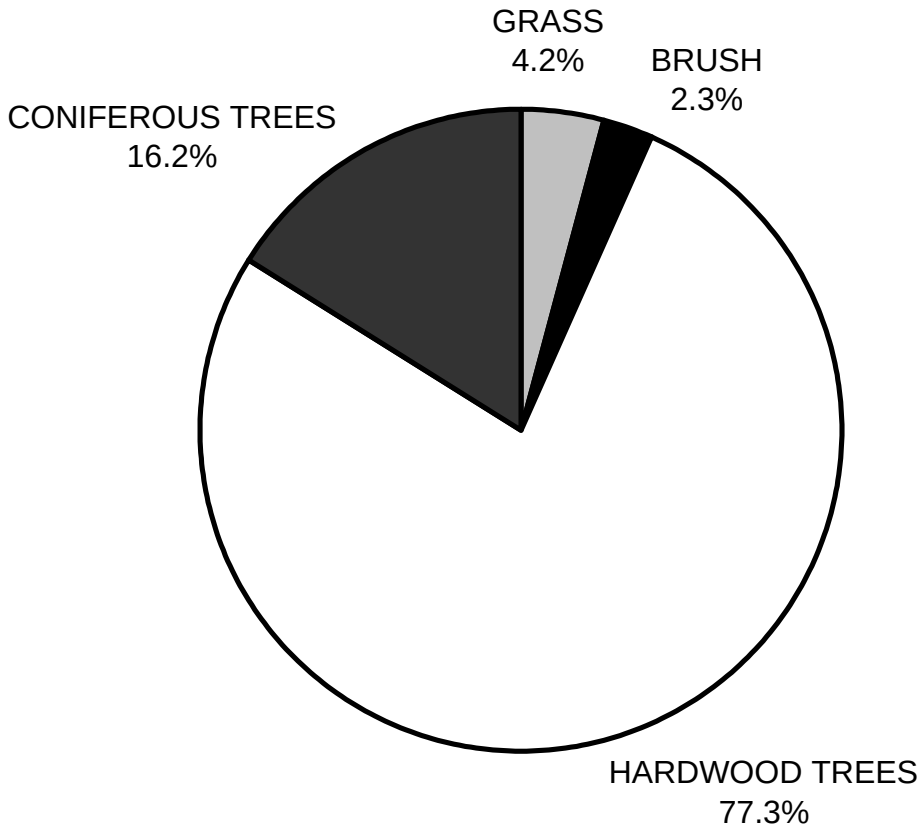
GRAPH 9

MUD CREEK 2007
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

MUD CREEK 2007
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11