NORTH COAST WATERSHED AND FISHERY IMPROVEMENT PROGRAM

STREAM INVENTORY REPORT

Dark Gulch, South Fork Big River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Northern California-North Coast Region

STREAM INVENTORY REPORT

Dark Gulch

INTRODUCTION

A stream inventory was conducted beginning August 21 and ending August 26, 2002 on Dark Gulch. The survey began at the confluence with South Fork Big River and extended upstream 1.42 miles.

The Dark Gulch 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 Dark Gulch. 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 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

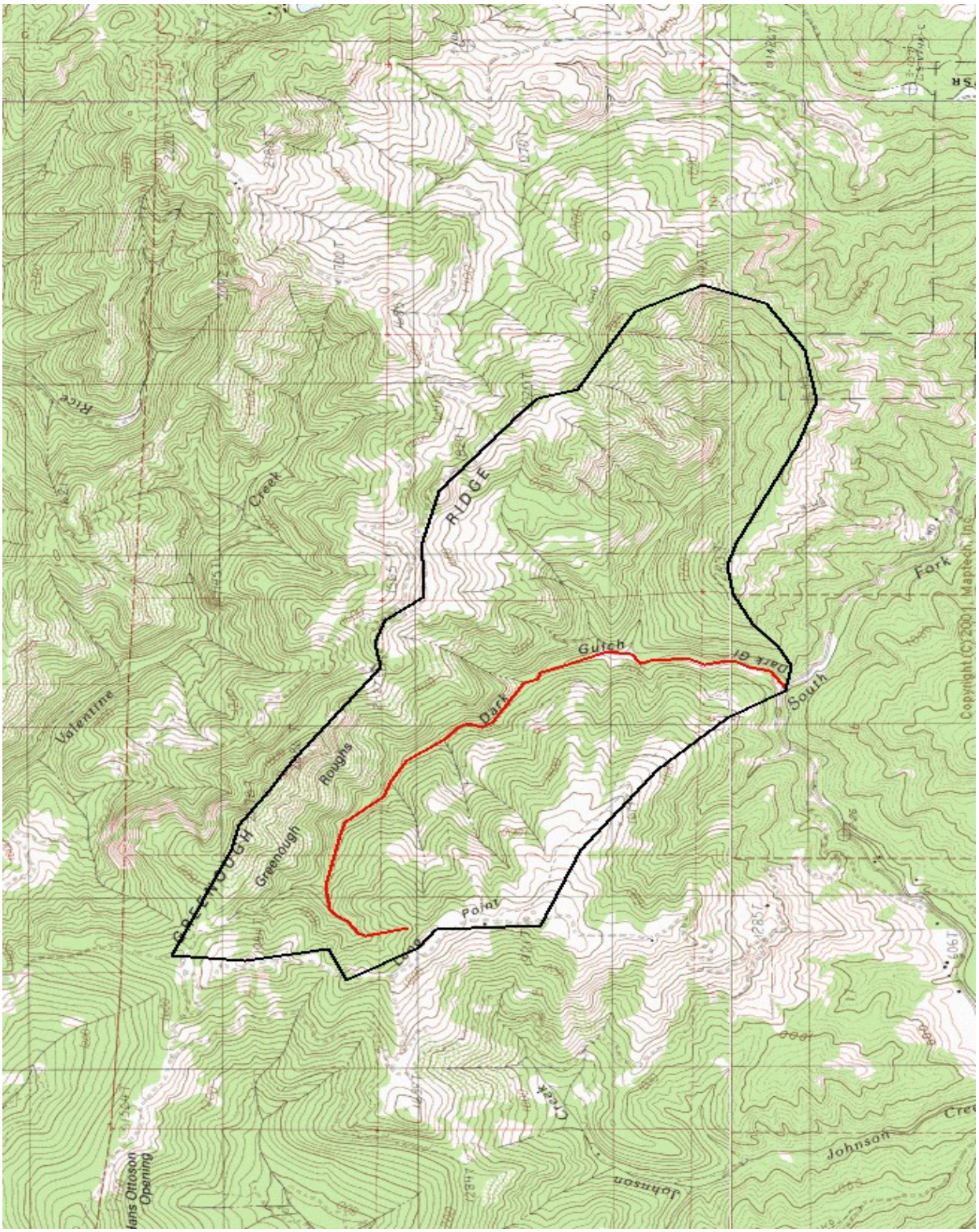
Dark Gulch is a tributary to the South Fork Big River, a tributary to the Big River, located in Mendocino County, California (Map 1). Dark Gulch's legal description at the confluence with South Fork Big River is T16N R14W S16. Its location is 39°29′56″ North latitude and 123°53′ 26″ West longitude. Dark Gulch is a first order stream and has approximately 0.42 miles of solid blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Dark Gulch drains a watershed of approximately 2.4 square miles. Elevations range from about 640 feet at the mouth of the creek to 1760 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Orr Springs Road at the confluence with South Fork Big River.

A reconnaissance survey was conducted on Dark Gulch by CDFG in 1958 (California Department of Fish and Game 1958). No salmonids were seen in the 1958 survey.

Electrofishing sampling was conducted on Dark Gulch by CDFG on 9/19/02; young of year and one plus steelhead were found, as well as 2 coho young of year (CDFG file data).

METHODS

The habitat inventory conducted in Dark Gulch follows the methodology presented in the



MAP 1. DARK GULCH.

California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). The California Department of Fish and Game Scientific Aids (DFG) and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) 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.

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 Dark Gulch to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at 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 (1985 rev. 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 (1988). 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". Dark Gulch 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 Dark Gulch, 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 particle size, bedrock, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide 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. 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 Dark Gulch, 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 Dark Gulch, 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 deciduous 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 Dark Gulch, 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.

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 Dark Gulch. In addition, three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Excel. Graphics developed for Dark Gulch include:

- Riffle, flatwater, pool habitats by percent occurrence

- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- 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 21, through 26, 2002, was conducted by Scott Monday and Kristi Knecthle (DFG). The total length of the stream surveyed was 7,504 feet.

Stream flow was not measured on Dark Gulch.

Dark Gulch is a B3 channel type for the entire 7,504 feet of the stream surveyed. B3 channels are moderately entrenched, moderate gradient, rifle dominated channels with frequently spaced pools, very stable plan and profile, stable banks and cobble-dominated substrates.

Water temperatures taken during the survey period ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 54 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% pool units, 22% riffle units, 21% flatwater units, 21% dry units, and 1% culvert (Graph 1). Based on total length of Level II habitat types there were 38% dry units, 34% flatwater units, 15% riffle units, 11% pool units, and 1% culvert (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 22%; dry channel, 21%; mid-channel pools, 21%, and step runs, 17% (Graph 3). Based on percent total length, dry channels made up 38%, step runs 32%, low gradient riffles 15%, and mid-channel pools 6%.

A total of 44 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 59%, and comprised 56% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids

increases with depth. Twelve of the 44 pools (27%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 44 pool tail-outs measured, 7 had a value of 1 (16%); 17 had a value of 2 (39%); 6 had a value of 3 (14%); 0 had a value of 4 (0%); and 14 had a value of 5 (32%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 19, and pool habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 27. Main channel pools had a mean shelter rating of 26 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Dark Gulch. Graph 7 describes the pool cover in Dark Gulch. Large woody debris is the dominant pool cover type followed by boulders.

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 32% of pool tail-outs while large cobble was the next most frequently observed substrate type, at 29%.

The mean percent canopy density for the surveyed length of Dark Gulch was 77%. The mean percentages of deciduous and coniferous trees were 8% and 92%, respectively. Graph 9 describes the mean percent canopy in Dark Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 49%. The mean percent left bank vegetated was 50%. The dominant elements composing the structure of the stream banks consisted of 8% bedrock, 0% boulder, 19% cobble/gravel, and 72% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 53% of the units surveyed. Additionally, 36% of the units surveyed had brush as the dominant vegetation type, and 11% had deciduous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in Dark Gulch on September 19, 2002. Water temperatures taken during the electrofishing period ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 60 to 65 degrees Fahrenheit. The sites were sampled by Scott Monday and Kristi Knechtle (DFG).

The first site sampled included habitat unit 001, a plunge pool approximately 30 feet from the confluence with South Fork Big River. The site yielded 3 steelhead yoy and 2 coho yoy.

The second site included habitat units 005, a mid-channel pool located approximately 300 feet above the creek mouth. The site yielded 2, 1+ steelhead.

The third site sampled included habitat units 010, a plunge pool located approximately 520 feet above the creek mouth. The site yielded 3, 1+ steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Salmonid YOY	1+	2+
9/19/02	1	20	001	4.2	1	B3	5	0	0
9/19/02	2	300	006	4.2	1	B3	0	2	0
9/19/02	3	350	011	4.2	1	B3	0	3	0

DISCUSSION

Dark Gulch is a B3 channel type for the entire 7,504 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures is as follows: Excellent for low-stage plunge weirs, boulder clusters and bank placed boulders, single and opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days August 21 through 26, 2002 ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 54 to 81 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° F, if sustained, is near the threshold stress level for salmonids. 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 15%, pools 11%, and dry channels 38%. The pools are relatively shallow, with only 12 of the 44 (27%) pools having a maximum 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 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 for locations where their installation will not be threatened by high stream energy, or where their

installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Twenty-four of the 44 pool tail-outs measured had embeddedness ratings of 1 or 2. Six of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen 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 Dark Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twenty-three of the 44 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 was 26. The shelter rating in the flatwater habitats was 19. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, boulders contribute a small amount. Increased 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 77%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 49% and 50%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Dark Gulch should be managed as an anadromous, natural production stream.

2) 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.

3) 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.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from large woody debris. Adding high quality complexity with log and root wad cover is desirable.

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) Increase the canopy on Dark Gulch by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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

9) There are several log debris accumulations present on Dark Gulch 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.

10) Due to the perched stream culvert at the confluence of South Fork Big River, access for migrating salmonids is an ongoing potential problem. Good water temperature exists in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

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.

0'	BEGIN SURVEY ABOUT 37 FEET FROM THE CONFLUENCE WITH SOUTH FORK OF BIG RIVER. THE CHANNEL TYPE IS A B3. THERE IS AN 8 FOOT CULVERT PLUNGING INTO THE POOL. 3 FOOT JUMP TO THE CULVERT. BOULDER RESTORATION WORK AT THE BOTTOM OF THE UNIT. BOTH COHO AND STEELHEAD SEEN.

22' CULVERT IS 8 FEET BY 8 FEET WITH A CEMENT BOTTOM. POTENTIAL PROBLEM FOR OUT MIGRATING FISH. VERY LITTLE WATER CURRENTLY FLOWING FROM CULVERT.

254' OLD TRESSEL BRIDGE OVER UNIT. NO LONGER IN USE.

312' 2 PIECES OF LARGE WOODY DEBRIS (LWD) WITH SOME SMALL WOODY DEBRIS(SWD) AND A BIG ROOT WAD PROVIDING SHELTER.

363' ROOTWADS AND LWD PILED ON BOTH SIDES OF POOL. LOGS CABLED TO BEDROCK. HOBO TEMP IN POOL. STEELHEAD YEARLING IN POOL.

388' MORE CABLED LOGS ON RIGHT BANK.

432' CHOPPED WOOD PILED ON THE RIGHT BANK, POSSIBLE RESTORATION.

457' PLUNGE OVER LOG WEIR ABOUT 1 FOOT HIGH. 4 FOOT UNDERCUT UNDER THE LOG WEIR. STEELHEAD YEARLING AND NEWTS IN POOL.

525' RIGHT BANK EROSION 30 FEET HIGH AND 30 FEET LONG CONTRIBUTING FINES TO STREAM. RUNS ARE STAGNENT.

791' LWD PILE THAT IS 6 FEET TALL, 20 FEET WIDE, AND 30 FEET LONG. MORE CHOPPED WOOD ON THE LEFT BANK.

1206' DRY RIGHT BANK TRIB.

1261' POSSIBLE OLD CHANNEL/WET CROSSING.

1335' RESTORATION WOOD PILE CABLED TOGETHER. ABOUT 6 PIECES OF LWD. CREATED A HUGE LWD PILE UPSTREAM 30 FEET WIDE, 30 FEET LONG, AND 4 FEET HIGH.

1389' STEELHEAD, 2 YEAR + AND TADPOLES.

1664' LAYER OF SEDIMENT THROUGHOUT THE CHANNEL.

1811' LAYER OF SEDIMENT COVERING THE SUBSTRATE. RIGHT BANK EROSION. 6 PIECES OF LWD WITH SOME SWD.

2032' THICK LAYER OF ALGAE ON BOTTOM AND TOP OF POOL.

2417' POOL CREATED BY BEDROCK SCOUR THAT IS GREATER THAN 60%. DRY BEDROCK SHEET AT THE TOP OF THE POOL. NEWTS.

2431' RIGHT BANK TRIB WITH LITTLE WATER FLOWING.

2720' RIGHT BANK EROSION DUMPING SUBSTRATE INTO CHANNEL. LOOKS LIKE AN OLD ROAD.

2753' 3 YEARLING PLUS STEELHEAD OR RESIDENT TROUT.

2914' 2 STEELHEAD YOY. LEFT BANK TRIB AT THE TOP OF THE UNIT WITH LITTLE FLOWING WATER.

2944' OLD STREAM CROSSING. APPEARS THAT THE BRIDGE HAS BEEN REMOVED. 2 STEELHEAD YOY.

3019' 3 TO 4 STEELHEAD YOY.

3072' RIGHT BANK TRIB.

3153' OLD LOGGING CABLE TANGLED IN POOL.

3190' STEELHEAD YOY.

3205' DRY RIGHT BANK TRIB.

3324' LWD PILE AT TOP OF UNIT. 6 FEET HIGH, 12 FEET WIDE, AND 6 FEET LONG. LWD PILE ON THE LEFT BANK. DRIED LEFT BANK TRIB.

3336' LWD PILE ON THE LEFT BANK. 10 FEET HIGH, 40 FEET LONG. GRADIENT BEGINNING TO INCREASE.

3640' 48 FEET INTO UNIT THERE IS A LWD PILE 4 FEET HIGH, 15 FEET WIDE, AND 15 FEET LONG. STEELHEAD YEARLING AND STEELHEAD YOY.

3854' 3 PIECES OF LWD ASSOCIATED WITH SWD.

4323' 13 FEET OF LWD PILE BACKING UP SEDIMENT.

4408' 40 FOOT LOG RUNNING LENGTH WISE IN STREAM ACCUMULATION OTHER LWD AND SEDIMENT.

4462' LARGE BOULDERS AND LOGS WITHIN STREAM, SMALL POOLS IN BETWEEN DRY CHANNEL WITH SALAMANDERS.

4537' SUBSTRATE IN POOL IS COVERED WITH SEDIMENT. LARGE AMOUNT OF BOULDERS IN POOL.

4547' LWD PILE THAT IS 10 FEET WIDE AND 35 FEET LONG. LWD PILE IS BACKING UP SEDIMENT AND SUBSTRATE.

4635' SMALL DRY RIGHT BANK TRIB.

4706' DRY RIGHT BANK TRIB. A LARGE TREE FELL ACROSS THE TOP OF THE POOL, BLOCKING SEDIMENT AND CREATING A PLUNGE POOL. 3 TO 5 FOOT JUMP.

4963' DRY LEFT BANK TRIB.

5516' NO FISH NOTED.

5639' SMALL TRIB WITH LITTLE FLOW
.

5832' DRY RIGHT BANK TRIB
.

6190' 4 FOOT JUMP FROM POOL TO THE TOP OF PLUNGE.

6204' LWD PILE BACKING SUBSTRATE/SEDIMENT ABOVE.

6445' ROAD ALONG THE RIGHT BANK WITH VERY RECENT WORK DONE. RIGHT BANK WAS FRESHLY GRADED ALL THE WAY DOWN TO THE STREAM. DIRT NOT COMPACTED AT ALL. NO SHELTER ON BANK.

6555' ROAD WORK CONTINUES. THE STREAM HAS BEEN FILLED IN WITH RIP-RAP AND DIRT TO CREATE A WET CROSSING. AT LEAST A 2 TO 3 FOOT ELEVATION CHANGE BETWEEN THE BOTTOM OF THE CHANNEL TO THE TOP OF THE RIP-RAP/WET CROSSING.

6784' 3 TO 4 LARGE FROGS IN POOL.

6799' END OF SURVEY. DRY LEFT BANK TRIB. DRY RIGHT BANK TRIB. ANOTHER WET CROSSING AROUND 350 FEET INTO THE UNIT. CROSSED OVER MULTIPLE POTENTIAL MIGRATING BARRIERS TO YOY AND YEARLING FISH. FISH HAVE NOT BEEN OBSERVED SINCE 3,640 FOOT MARK.

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]	

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: DARK GULCH
SAMPLE DATES: 08/21/02 to 08/26/02
STREAM LENGTH: 7504 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: BAILEY RID — Latitude: 39°29'56"
Legal Description: T16NR14WS16 — Longitude: 123°53'26"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B3	Canopy Density: 77%
Channel Length: 7504 ft.	Coniferous Component: 92%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 8%
Total Pool Mean Depth: 0.9 ft.	Pools by Stream Length: 11%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 7%
Water: 055- 064°F Air: 054-081°F	Mean Pool Shelter Rtn: 26
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Large Woody Debris
Vegetative Cover: 49%	Occurrence of LOD: 29%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 2853 ft.

Embeddness Value: 1. 16% 2.39% 3. 14% 4. 0% 5. 32%

DARK GULCH — Drainage: SOUTH FORK BIG

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN 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
28	2	RIFFLE	22	41	1154	15	6.5	0.3	192	5376	49	1378	0	18
26	6	FLATWATER	21	99	2575	34	4.8	0.4	238	6177	85	2207	0	19
44	44	POOL	35	19	846	11	7.9	0.9	155	6814	162	7117	126	26
27	0	DRY	21	106	2853	38	0.0	0.0	0	0	0	0	0	0
1	0	CULVERT	1	76	76	1	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
126	52	7504	18367	10702

DARK GULCH — Drainage: SOUTH FORK BIG

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
28	2	LGR	22	41	1154	15	7	0.3	0.7	192	5376	49	1378	0	18	84
5	2	RUN	4	30	152	2	6	0.4	1.1	168	840	76	382	0	8	55
21	4	SRN	17	115	2423	32	4	0.4	1.1	272	5720	89	1872	0	25	78
26	26	MCP	21	18	475	6	8	0.8	5.0	152	3942	149	3877	122	26	77
1	1	CRP	1	20	20	0	4	0.6	1.0	80	80	48	48	24	40	50
5	5	LSL	4	26	130	2	7	0.7	1.6	191	955	141	703	89	25	68
3	3	LSBk	2	28	85	1	5	0.9	2.1	166	498	175	526	140	23	82
2	2	LSBo	2	9	17	0	5	0.6	1.5	41	82	23	45	17	15	100
7	7	PLP	6	17	119	2	10	1.2	3.6	180	1257	274	1919	210	31	75
27	0	DRY	21	106	2853	38	0	0.0	0.0	0	0	0	0	0	0	79
1	0	CUL	1	76	76	1	0	0.0	0.0	0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
126	52	7504	18750	10749

DARK GULCH

Drainage: SOUTH FORK BIG

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
26	26	MAIN	59	18	475	56	8.3	0.8	152	3942	149	3877	122	26
18	18	SCOUR	41	21	371	44	7.4	0.9	160	2872	180	3240	133	27

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
44	44	846	6814	7117

DARK GULCH Drainage: SOUTH FORK BIG

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
26	MCP	59	1	4	20	77	3	12	1	4	1	4
1	CRP	2	0	0	1	100	0	0	0	0	0	0
5	LSL	11	1	20	4	80	0	0	0	0	0	0
3	LSBk	7	0	0	1	33	2	67	0	0	0	0
2	LSBo	5	0	0	2	100	0	0	0	0	0	0
7	PLP	16	0	0	2	29	4	57	1	14	0	0

TOTAL UNITS
44

DARK GULCH

Drainage: SOUTH FORK BIG

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

UNITS MEASURED	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
28	2	LGR	0	15	40	0	5	0	0	40	0
5	2	RUN	0	10	40	0	0	10	0	40	0
21	4	SRN	13	18	15	3	15	10	0	28	0
26	26	MCP	15	12	28	1	4	12	0	21	8
1	1	CRP	0	20	60	0	10	0	0	10	0
5	5	LSL	4	11	60	0	8	0	0	16	1
3	3	LSBk	3	7	23	0	0	0	0	17	50
2	2	LSBo	25	0	0	0	0	0	0	45	30
7	7	PLP	3	11	20	4	0	0	0	59	3
27	0	DRY	0	0	0	0	0	0	0	0	0
1	0	CUL	0	0	0	0	0	0	0	0	0

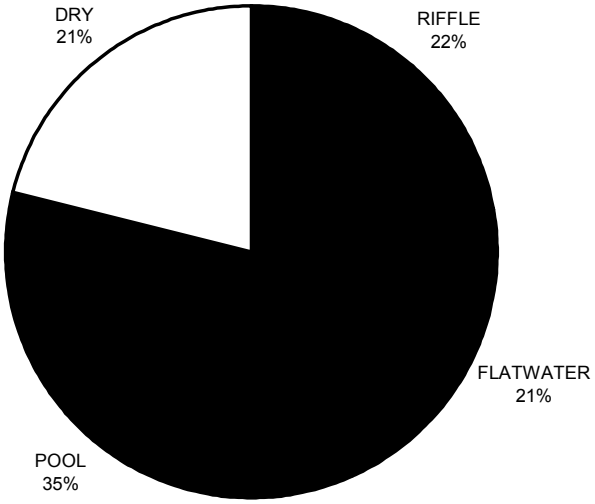
DARK GULCH Drainage: SOUTH FORK BIG

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 08/21/02 to 08/26/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS16 LATITUDE:39°29'56" LONGITUDE:123°53'26"

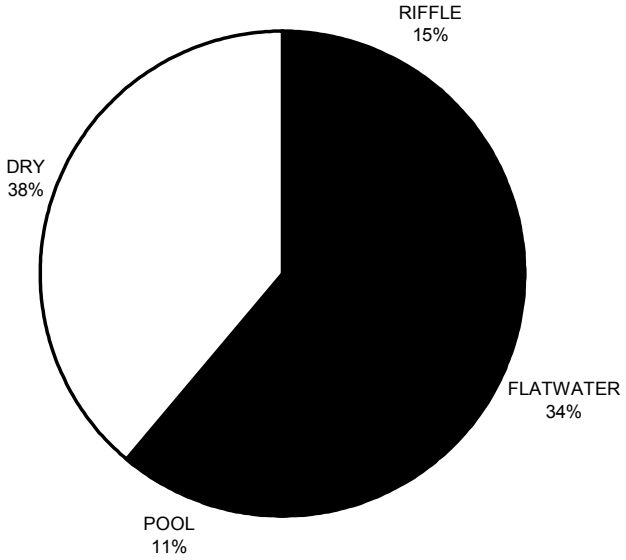
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
28	2	LGR	0	0	0	0	100	0	0
5	2	RUN	0	0	50	50	0	0	0
21	4	SRN	0	0	25	75	0	0	0
26	6	MCP	0	67	33	0	0	0	0
1	1	CRP	0	100	0	0	0	0	0
5	1	LSL	0	0	0	100	0	0	0
3	1	LSBk	0	0	0	0	0	100	0
2	0	LSBo	0	0	0	0	0	0	0
7	1	PLP	0	0	0	100	0	0	0
27	0	DRY	0	0	0	0	0	0	0
1	0	CUL	0	0	0	0	0	0	0

DARK GULCH
HABITAT TYPES BY PERCENT OCCURENCE



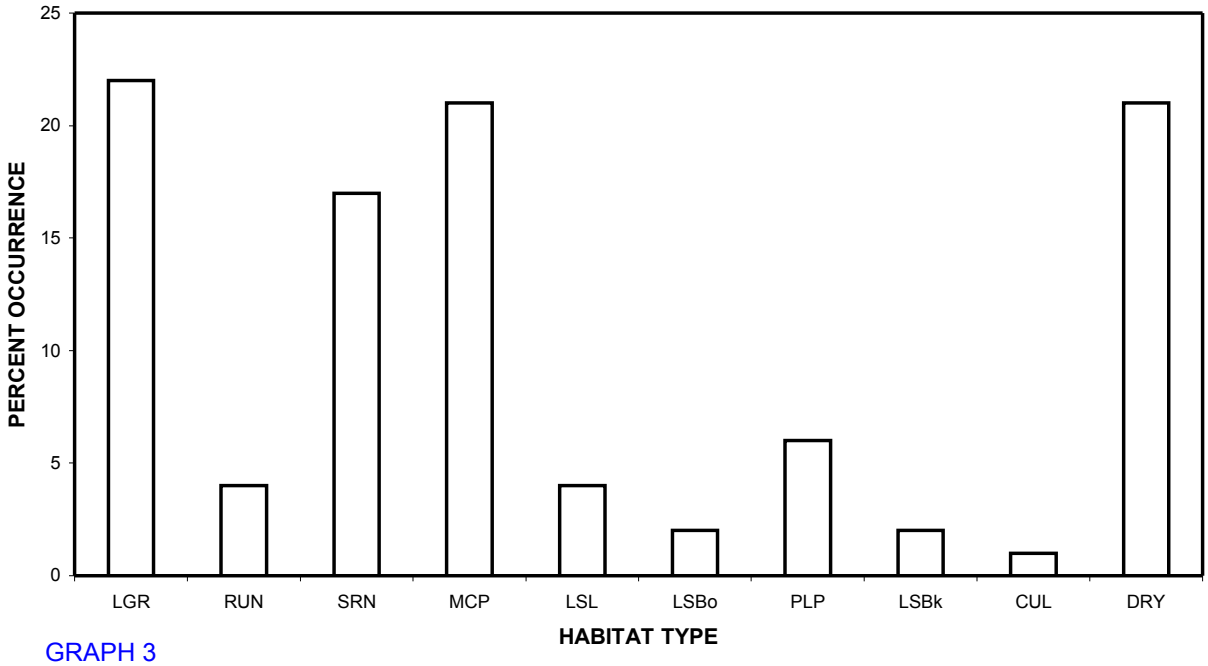
GRAPH 1

DARK GULCH
HABITAT TYPES BY PERCENT TOTAL LENGTH



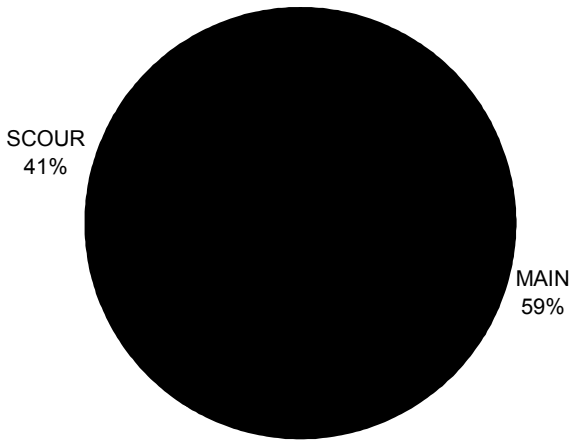
GRAPH 2

DARK GULCH
HABITAT TYPES BY PERCENT OCCURRENCE



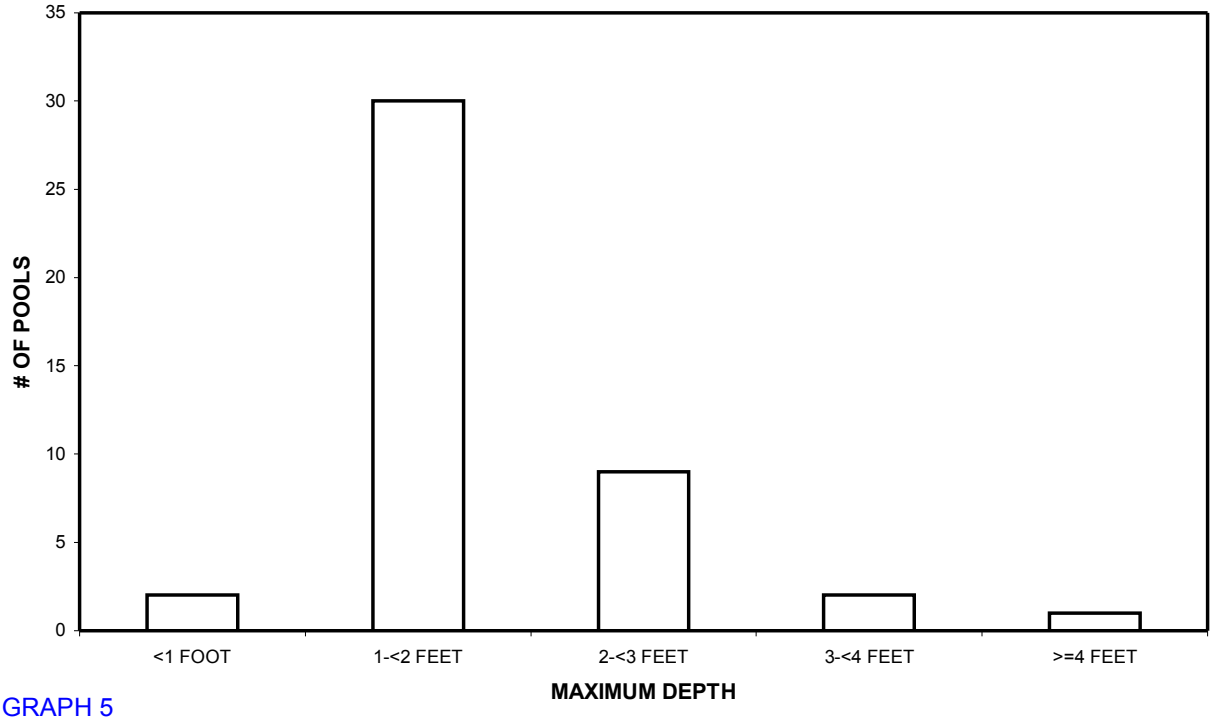
GRAPH 3

DARK GULCH
POOL HABITAT TYPES BY PERCENT OCCURRENCE



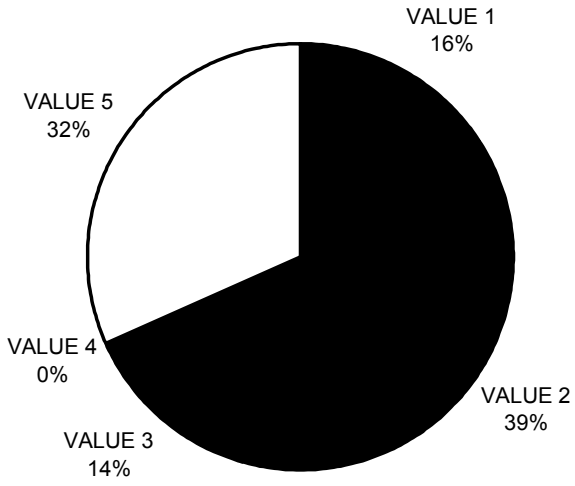
GRAPH 4

DARK GULCH
MAXIMUM DEPTH IN POOLS



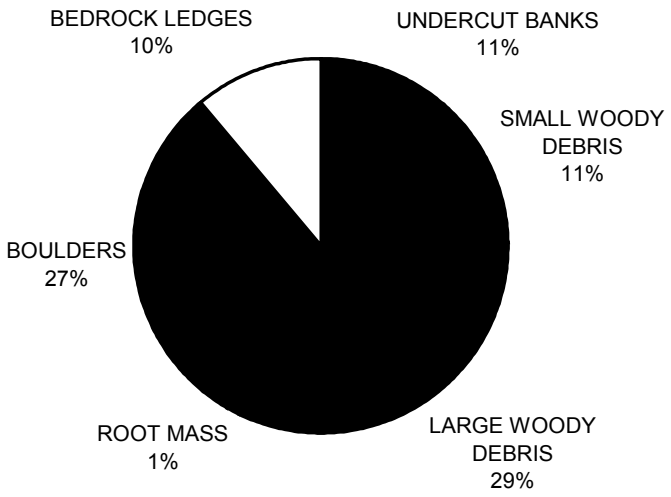
GRAPH 5

DARK GULCH
PERCENT EMBEDDEDNESS



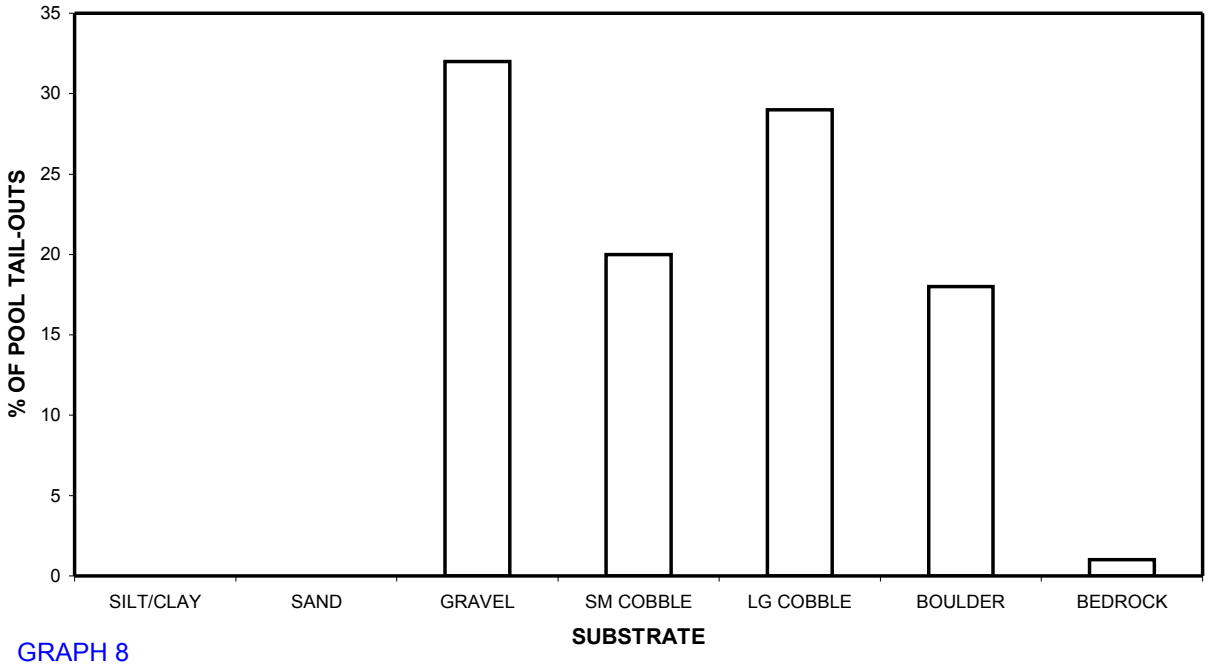
GRAPH 6

DARK GULCH
MEAN PERCENT COVER TYPES IN POOLS



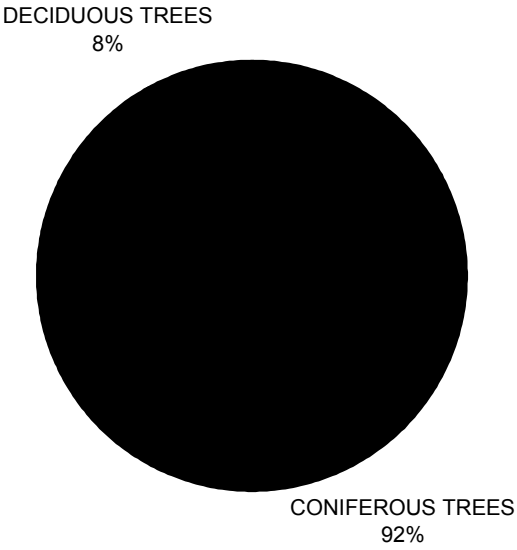
GRAPH 7

DARK GULCH
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



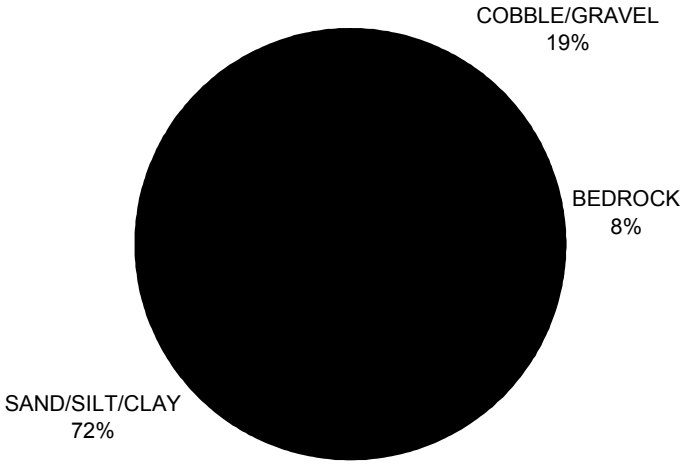
GRAPH 8

DARK GULCH
MEAN PERCENT CANOPY



GRAPH 9

DARK GULCH
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

DARK GULCH
DOMINANT BANK VEGETATION IN SURVEY REACH

GRAPH 11