NORTH COAST WATERSHED AND FISHERY IMPROVEMENT PROGRAM

STREAM INVENTORY REPORT

Montgomery Creek, South Fork Big River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Northern California-North Coast Region

STREAM INVENTORY REPORT

Montgomery Creek

INTRODUCTION

A stream inventory was conducted from July 8 to July 9, 2002 on Montgomery Creek. The
survey began at the confluence with South Fork Big River and extended upstream 0.63 miles.

The Montgomery 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 Montgomery 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 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

Montgomery Creek is a tributary to the South Fork Big River, a tributary to the Big River,
located in Mendocino County, California (Map 1). Montgomery Creek's legal description at the
confluence with South Fork Big River is T16N R14W S22. Its location is 39°23′49″ North
latitude and 123°39′51″ West longitude. Montgomery Creek is a first order stream for 1.8 miles
of solid blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle.
Montgomery Creek drains a watershed of approximately 1.64 square miles. Elevations range
from about 720 feet at the mouth of the creek to 1940 feet in the headwater areas. Mixed conifer
forest dominates the watershed. The majority of the watershed is owned by the State of
California, with the remaining being privately owned for residential. Vehicle access exists via
Comptche Ukiah Road to the confluence of Montgomery Creek and South Fork Big River.

METHODS

The habitat inventory conducted in Montgomery Creek follows the methodology presented in the
California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). The California
Department of Fish and Game Scientific Aids 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.
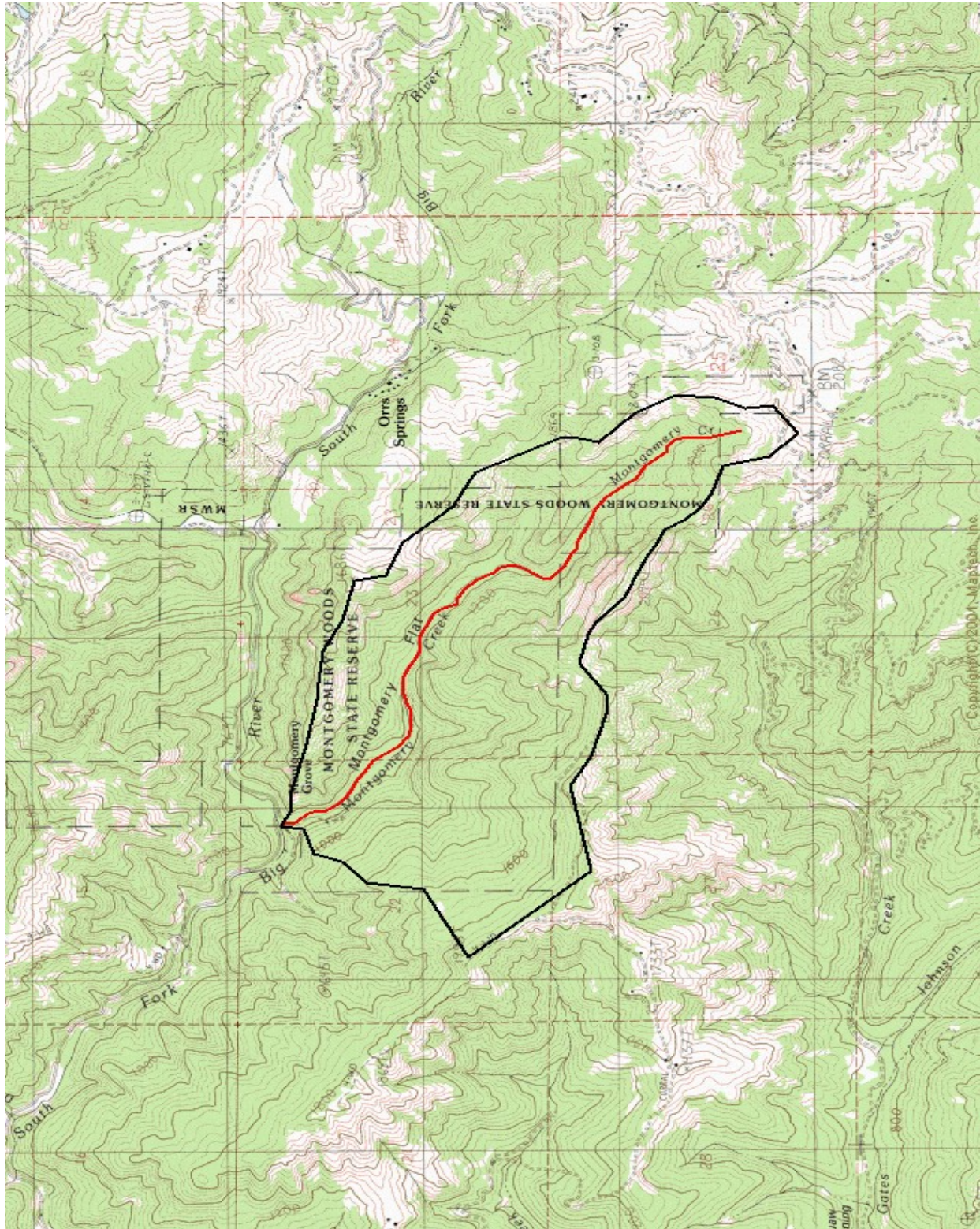
MAP 1.   MONTGOMERY CREEK.

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 Montgomery Creek 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". Montgomery 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 Montgomery 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 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 Montgomery 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 Montgomery 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 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 Montgomery 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.

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 Montgomery Creek. This sampling technique is 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 Montgomery Creek 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 July 8 through July 9, 2002, was conducted by Beth Wood and Kate Grossman (WSP). The total length of the stream surveyed was 3,304 feet.

Stream flow was not measured on Montgomery Creek.

Montgomery Creek is an F2 channel type for 951 feet and B2 for channel type for 334 feet, and an F6 for 2,019 feet of the stream surveyed. F2 channel types are entrenched meandering riffle/pool channel on low gradients with a high width and depth, and boulder-dominated substrate. B2 channel types are a moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks, and boulder-dominated substrate. F6 channel types are entrenched meandering riffle/pool channels on low gradients with a high width and depth ratio, sand dominated substrate.

Water temperatures taken during the survey period ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 55 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% pool units, 26% riffle units, 19% flatwater units, and 14% dry units (Graph 1). Based on total length of Level II habitat types there were 42% dry units, 23% flatwater units, 23% pool units, and 12% riffle units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid channel pools, 24%; step runs, 14%; and dry, 14% (Graph 3). Based on percent total length, dry channels made up 42%, step runs made up 20%, and mid channel pools made up 15%.

A total of 17 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 94%, and comprised 98% 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. Ten of the 17 pools (59%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 17 pool tail-outs measured, 2 had a value of 1 (12%); 3 had a value of 2 (18%); 3 had a value of 3 (18%); 7 had

a value of 4 (41%); and 2 had a value of 5 (12%) (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 6, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 19 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 20. Scour pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Montgomery Creek. Graph 7 describes the pool cover in Montgomery Creek. Boulders are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel and boulders were the dominant substrates, each observed in 29% of pool tail-outs while equal amounts of small and large cobble, and bedrock were the next most frequently observed substrate type, at 12% each.

The mean percent canopy density for the surveyed length of Montgomery Creek was 80%. The mean percentages of deciduous and coniferous trees were 10% and 90%, respectively. Graph 9 describes the mean percent canopy in Montgomery Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 18%. The mean percent left bank vegetated was 25%. The dominant elements composing the structure of the stream banks consisted of 15% bedrock, 47% boulder, 3% cobble/gravel, and 35% sand/silt/clay Graph 10). Coniferous trees were the dominant vegetation type observed in 74% of the units surveyed. Additionally, 12% of the units surveyed had grass as the dominant vegetation type, and 6% had brush and 6% had no vegetation as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Salmonids were detected using streambank observation techniques during the Montgomery Creek stream survey.

DISCUSSION

Montgomery Creek is an F2 channel type for 951 feet, a B2 for channel type for 334 feet, and an F6 for 2,019 feet of the stream surveyed. The suitability of F2, B2 and F6 channel types for fish habitat improvement structures are as follows: F2 channels are fair for plunge weirs, single and opposing wing-deflectors and log cover. B2 channels are excellent for plunge weirs, single and opposing wing-deflectors and log cover. F6 channels are good for bank-placed boulders, fair for

plunge weirs, boulder clusters, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days July 8, through July 9, 2002, ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 63 to 74 degrees Fahrenheit. This is a good 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.

Dry channels comprised 42% of the total length of this survey, flatwater habitat types 23%, riffles 12%, and pools 23%. The pools are relatively shallow, with 10 of the 17 (59%) 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.

Five of the 17 pool tail-outs measured had embeddedness ratings of 1 or 2. Ten of the pool tail-outs had embeddedness ratings of 3 or 4. Two of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Montgomery Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Ten of the 17 pool tail-outs had silt or 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 19. The shelter rating in the flatwater habitats was 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, undercut banks contribute a small amount. 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 80%. Reach 1 had a canopy density of 77% while Reaches 2 and 3 had canopy densities of 83% and 85%, respectively. 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 18% and 25%, 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)   Montgomery Creek should be managed as an anadromous, natural production stream.

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

5)   Increase woody cover in the pools and flatwater habitat units. Much of the existing cover is from boulders. Adding high quality complexity with log and root mass cover is desirable.

6)   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.

7)   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.

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

9)   Due to the high gradient of the stream at the confluence with South Fork Big River, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist 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 18 FEET FROM THE CONFLUENCE WITH THE SOUTH FORK OF BIG RIVER. HOBO TEMPERTURE MONITOR . CHANNEL TYPE IS AN F2.

42'   BRIDGE.

61' WALKING TRAIL ON THE RIGHT BANK. WATER SWITCHES BACK ACROSS BEDROCK IN SMALL CHANNELS.

115' FROGS PRESENT. FOOT BRIDGE CROSSES STREAM .

400' OLD FOOTBRIDGE CROSSES STREAM; NO LONGER IN USE

438' FROGS PRESENT. STATE PICNIC AREA ON LEFT BANK

727' 3 POOLS. FIRST POOL IS LOG ENHANCED FROM LARGE WOODY DEBRIS (LWD), SECOND IS CAUSED BY SMALL WOODY DEBRIS(SWD), AND THIRD IS CAUSED BY A LOG JAM AT THE TOP OF UNIT. 5.5 FEET HIGH, COMPLETELY CUTTING OFF THE CHANNEL. WATER TRICKLES

822' DRY LEFT BANK TRIBUTARY. GRADIENT IS GREATLY INCREASING. FLOW IS VERY LOW BUT DURING HIGHER FLOW WOULD BE A RIFFLE. ABOUT 8 REDWOODS ARE DOWN, SOME ACROSS THE CHANNEL, SOME PERCHED ON BANKS; HUGE BOULDERS DOMINATE THE AREA.

935' HABITAT IS DIMINISHING. NO SALMONIDS OBSERVED.

951' WATER FLOWS UNDERGROUND.

983' BOULDER JAMS WITH SWD - POTENTIAL BARRIER.

1027' 8 INCH SALAMANDER. POOL FORMED FROM VERY LARGE BOULDERS DEEPLY EMBEDDED, BEDROCK WALLS.

1092' 3 PIECES OF LWD PERCHED ON BANKS - STEEP BEDROCK BANKS.

1144' LARGE BOULDERS THROUGHOUT CHANNEL, FLOW IS DECREASING. MID UNIT THERE IS A LOG JAM PRIMARILY MADE UP OF MANY PIECES OF SWD TRAPPED BEHIND BOULDERS THAT ARE ALREADY CONSTRICTING THE CHANNEL. 4 TO 5 OLD LOGS DEAD AND DOWN IN CHANNEL AND PERCHED.

1206' LOG JAM NOT SCOURING OR RETAINING GRAVEL. 2 TO 3 PIECES OF LWD WITH MANY PIECES OF SWD.

1285' BEGINNING OF OLD GROWTH GROVE. .

1315' LOG JAM, 3 FEET HIGH, 3 FEET WIDE WITH SEVERAL PIECES OF SMALL WOOD IN THE ENTRENCHED CHANNEL.

1333' 5 FEET OF DRY CHANNEL.

1361' ROOT MASS AND SWD, ABOVE THE PILE IS DRY AND PART OF THE TRAIL
FOR THE PARK.

1378' BANKS FLATTEN OUT AND CHANNEL BECOMES DRY.

1622' FROG. SEDIMENT BUILT UP IN 2' POOL. WATER IS NOT MOVING AND IS A
CLOUDED GRAY-WHITE COLOR. WATER STOPS.

1927' SINGLE PIECE OF LWD LYING ACROSS THE CHANNEL. WATER IS NOT
MOVING IN POOL AND HAS SEDIMENT BUILT UP BEHIND IT.

2050' 2 POOLS WITH ONE LWD LOG JAM AT THE END. 6 FEET WIDE AND 20 FEET
LONG.

2248' END OF SURVEY. NO SALMONIDS WERE OBSERVED DURING THE SURVEY.
STREAM CHANNEL BECAME BRAIDED AND OBSCURED. ENDED SURVEY
DUE TO LACK OF SUITABLE SPAWNING HABITAT, NO CLEAR CHANNEL,
AND WATER IS EITHER STAGNANT OR NOT PRESENT AT ALL.

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: MONTGOMERY CREEK
SAMPLE DATES: 07/08/02 to 07/09/02
STREAM LENGTH: 3304 ft.
LOCATION OF STREAM MOUTH:
  USGS Quad Map: BAILY RIDG   Latitude: 39°23'49"
  Legal Description: T16NR14WS22   Longitude: 123°39'51"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01
  Channel Type: F2   Canopy Density: 77%
  Channel Length: 951 ft.   Coniferous Component: 83%
  Riffle/flatwater Mean Width: 4 ft. Deciduous Component: 17%
  Total Pool Mean Depth: 0.8 ft.   Pools by Stream Length: 17%
  Base Flow: 0.0 cfs   Pools >=3 ft.deep: 0%
  Water: 056- 057°F Air: 063-069°F Mean Pool Shelter Rtn: 24
  Dom. Bank Veg.: Coniferous Trees Dom. Shelter: Boulders
  Vegetative Cover: 15%   Occurrence of LOD: 10%
  Dom. Bank Substrate: Boulder   Dry Channel: 60 ft.

  Embeddness Value: 1. 25%   2.0%   3. 13% 4. 38%   5. 25%

STREAM REACH 02
  Channel Type: B2   Canopy Density: 83%
  Channel Length: 334 ft.   Coniferous Component: 96%
  Riffle/flatwater Mean Width: 4 ft. Deciduous Component: 4%
  Total Pool Mean Depth: 0.9 ft.   Pools by Stream Length: 20%
  Base Flow: 0.0 cfs   Pools >=3 ft.deep: 25%
  Water: 059- 059°F Air: 069-069°F Mean Pool Shelter Rtn: 13
  Dom. Bank Veg.: Coniferous Trees Dom. Shelter: Boulders
  Vegetative Cover: 60%   Occurrence of LOD: 5%
  Dom. Bank Substrate: Boulder   Dry Channel: 32 ft.

  Embeddness Value: 1. 0%   2.25%   3. 25% 4. 50%   5. 0%

STREAM REACH 03
  Channel Type: F6   Canopy Density: 85%
  Channel Length: 2019 ft.   Coniferous Component: 100%
  Riffle/flatwater Mean Width: 3 ft. Deciduous Component: 0%
  Total Pool Mean Depth: 1.5 ft.   Pools by Stream Length: 26%
  Base Flow: 0.0 cfs   Pools >=3 ft.deep: 40%
  Water: 055- 055°F Air: 055-074°F Mean Pool Shelter Rtn: 21
  Dom. Bank Veg.: Coniferous Trees Dom. Shelter: Undercut Banks
  Vegetative Cover: 27%   Occurrence of LOD: 21%
  Dom. Bank Substrate: Boulder   Dry Channel: 1302 ft.

  Embeddness Value: 1. 0%   2.40%   3. 20% 4. 40%   5. 0%

MONTGOMERY CREEK

Drainage: SF BIG RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES   Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22   LATITUDE:39°23'49" LONGITUDE:123°39'51"

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
11	5	RIFFLE	26	35	390	12	4.3	0.3	105	1153	40	444	0	6
8	4	FLATWATER	19	96	771	23	3.3	0.3	123	983	49	389	0	11
17	17	POOL	40	44	749	23	7.6	1.0	250	4255	299	5088	274	19
6	0	DRY	14	232	1394	42	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.)		
42	26			3304						6391		5921		

MONTGOMERY CREEK

Drainage: SF BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22 LATITUDE:39°23'49" LONGITUDE:123°39'51"

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 sq.ft.	MEAN VOLUME EST. cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
3	2	LGR	7	53	158	5	6	0.4	0.9	237	710	95	284	0	13	84
4	1	HGR	10	28	113	3	4	0.2	1.3	8	32	2	6	0	5	65
3	1	CAS	7	35	105	3	4	0.2	0.3	22	66	4	13	0	0	80
1	1	BRS	2	14	14	0	3	0.3	0.7	21	21	6	6	0	0	85
2	2	RUN	5	57	113	3	3	0.4	1.5	146	292	72	144	0	15	76
6	2	SRN	14	110	658	20	4	0.3	0.5	100	597	26	154	0	8	76
2	2	TRP	5	17	34	1	5	1.7	2.4	76	152	134	267	121	25	79
10	10	MCP	24	50	502	15	9	1.0	3.9	252	2524	301	3010	281	12	83
4	4	STP	10	50	201	6	8	0.9	2.4	386	1543	446	1782	395	38	79
1	1	LSBo	2	12	12	0	3	0.8	1.9	36	36	29	29	22	10	83
6	0	DRY	14	232	1394	42	0	0.0	0.0	0	0	0	0	0	0	86

TOTAL UNITS	TOTAL UNITS
42	26

LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
3304	5974	5695

MONTGOMERY CREEK

Drainage: SF BIG RIVER

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22 LATITUDE:39°23'49" LONGITUDE:123°39'51"

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
16	16	MAIN	94	46	737	98	7.9	1.1	264	4219	316	5059	289	20
1	1	SCOUR	6	12	12	2	3.0	0.8	36	36	29	29	22	10

TOTAL UNITS	TOTAL UNITS		TOTAL LENGTH (ft.)						TOTAL AREA (sq.ft.)		TOTAL VOL. (cu.ft.)			
17	17		749						4255		5088			

MONTGOMERY CRBEK

Drainage: SF BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES   Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22 LATITUDE:39°23'49" LONGITUDE:123°39'51"

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
2	TRP	12	0	0	1	50	1	50	0	0	0	0
10	MCP	59	0	0	3	30	4	40	3	30	0	0
4	STP	24	0	0	2	50	2	50	0	0	0	0
1	LSBo	6	0	0	1	100	0	0	0	0	0	0

TOTAL
UNITS
17

MONTGOMERY CREEK

Drainage: SF BIG RIVER
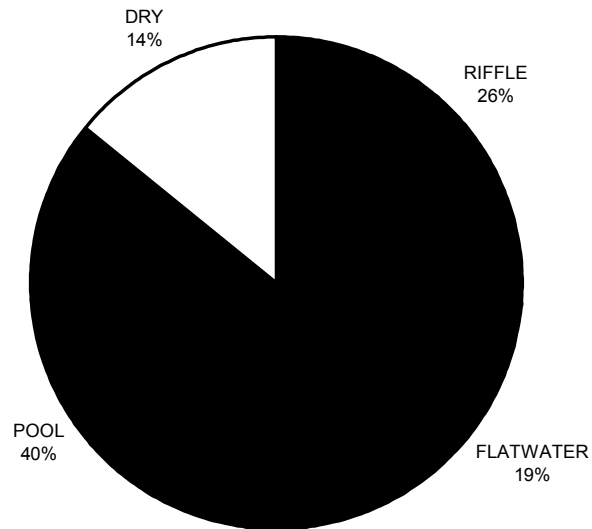
Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22 LATITUDE:39°23'49" LONGITUDE:123°39'51"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS VEGETATION	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
3	2	LGR	5	20	10	0	0	0	10	50	5
4	1	HGR	0	20	40	15	0	0	0	25	0
3	0	CAS	0	0	0	0	0	0	0	0	0
1	0	BRS	0	0	0	0	0	0	0	0	0
2	1	RUN	20	15	35	20	10	0	0	0	0
6	2	SRN	3	35	10	0	3	0	0	45	5
2	1	TRP	85	15	0	0	0	0	0	0	0
10	10	MCP	19	14	10	11	0	0	2	39	6
4	4	STP	20	21	5	0	0	10	3	39	3
1	1	LSBo	0	20	40	15	0	0	0	25	0
6	0	DRY	0	0	0	0	0	0	0	0	0

MONTGOMERY CREEK

Drainage: SF BIG RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE   Survey Dates: 07/08/02 to 07/09/02

Confluence Location: QUAD: BAILY RIDG LEGAL DESCRIPTION: T16NR14WS22 LATITUDE:39°23'49" LONGITUDE:123°39'51"

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 BDROCK DOMINANT
3	2	LGR	0	0	0	0	50	50	0
4	1	HGR	0	0	0	0	0	100	0
3	1	CAS	0	0	0	0	0	0	100
1	1	BRS	0	0	0	0	0	0	100
2	2	RUN	50	0	50	0	0	0	0
6	2	SRN	0	0	50	0	0	50	0
2	2	TRP	0	0	50	0	0	0	50
10	4	MCP	25	0	50	0	0	25	0
4	1	STP	0	0	0	0	0	100	0
1	1	LSBo	0	0	0	0	0	100	0
6	1	DRY	0	0	0	0	0	100	0

MONTGOMERY CREEK
HABITAT TYPES BY PERCENT OCCURENCE

DRY
14%

RIFFLE
26%

POOL
40%

FLATWATER
19%

GRAPH 1

MONTGOMERY CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH

RIFFLE
12%

DRY
42%

FLATWATER
23%
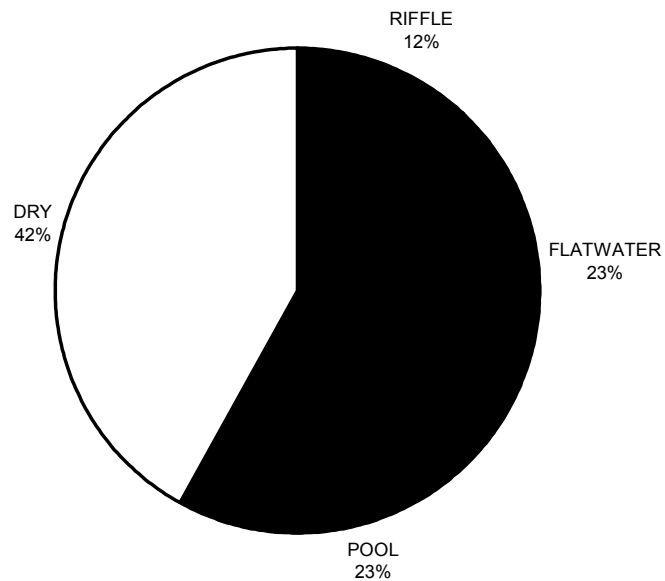
POOL
23%
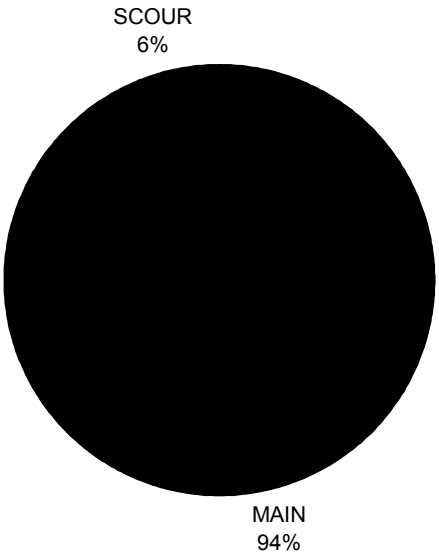
GRAPH 2

MONTGOMERY CREEK
HABITAT TYPES BY PERCENT OCCURRENCE
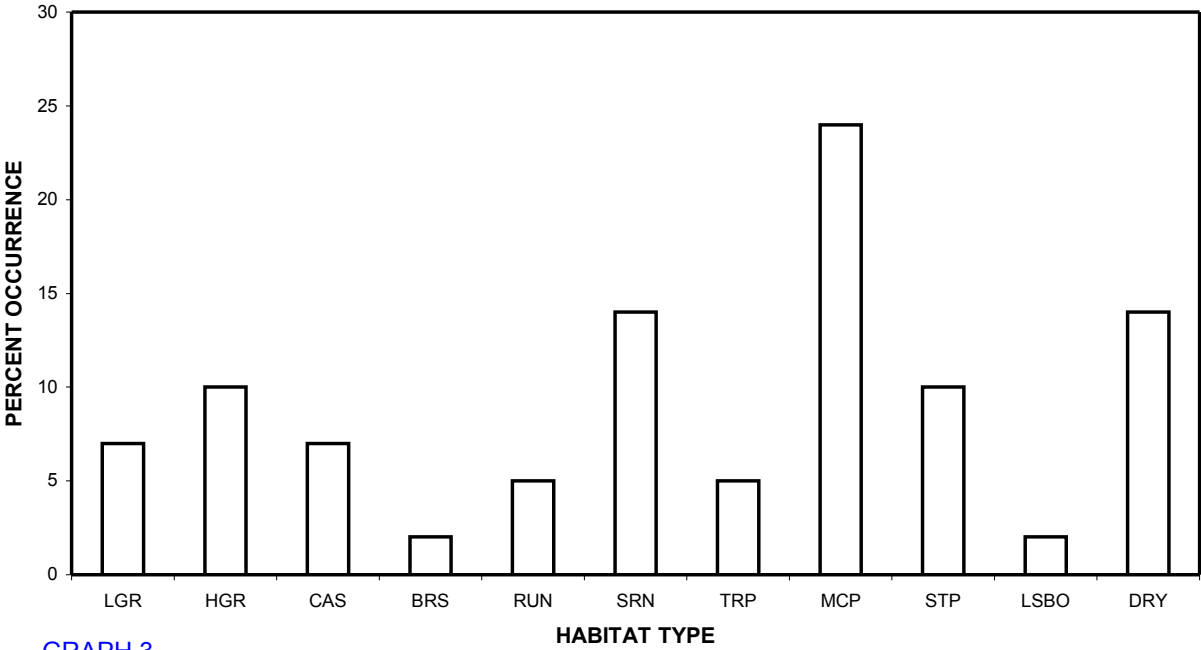
GRAPH 3

MONTGOMERY CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE
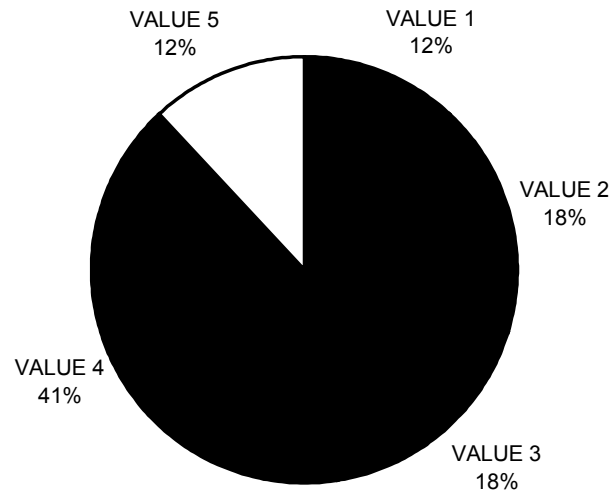

SCOUR
6%

MAIN
94%

GRAPH 4

MONTGOMERY CREEK
MAXIMUM DEPTH IN POOLS
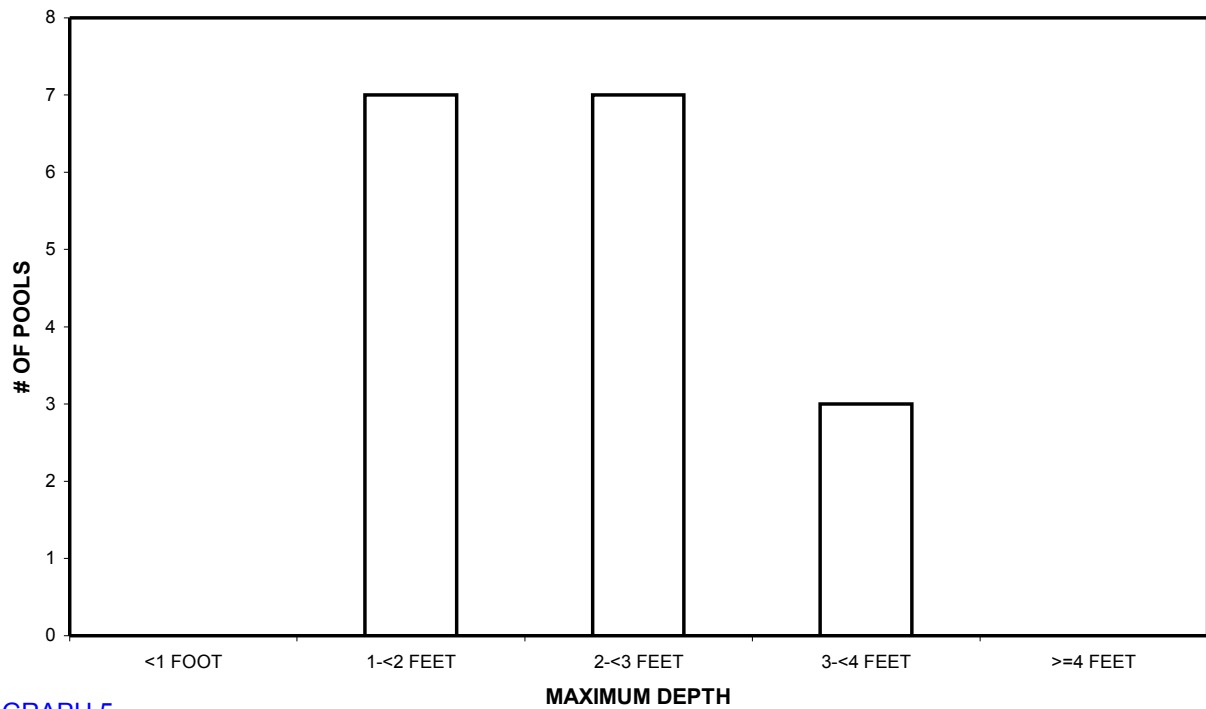
GRAPH 5

MONTGOMERY CREEK
PERCENT EMBEDDEDNESS

GRAPH 6

MONTGOMERY CREEK
MEAN PERCENT COVER TYPES IN POOLS

BEDROCK LEDGES
4%

UNDERCUT BANKS
22%

BOULDERS
36%

SMALL WOODY
DEBRIS
16%

ROOT MASS
8%

LARGE WOODY
DEBRIS
7%
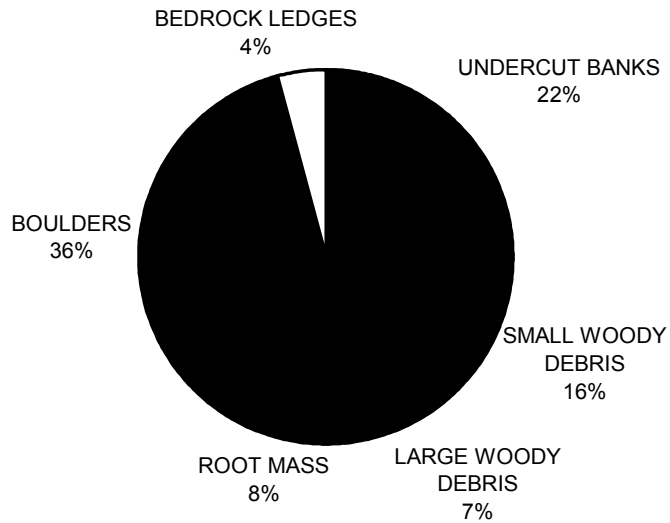
GRAPH 7

MONTGOMERY CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

Bar chart with y-axis labeled "% OF POOL TAIL-OUTS" ranging from 0 to 35, and x-axis labeled "SUBSTRATE" with categories: SILT/CLAY (0), SAND (6), GRAVEL (29), SM COBBLE (12), LG COBBLE (12), BOULDER (29), BEDROCK (12)
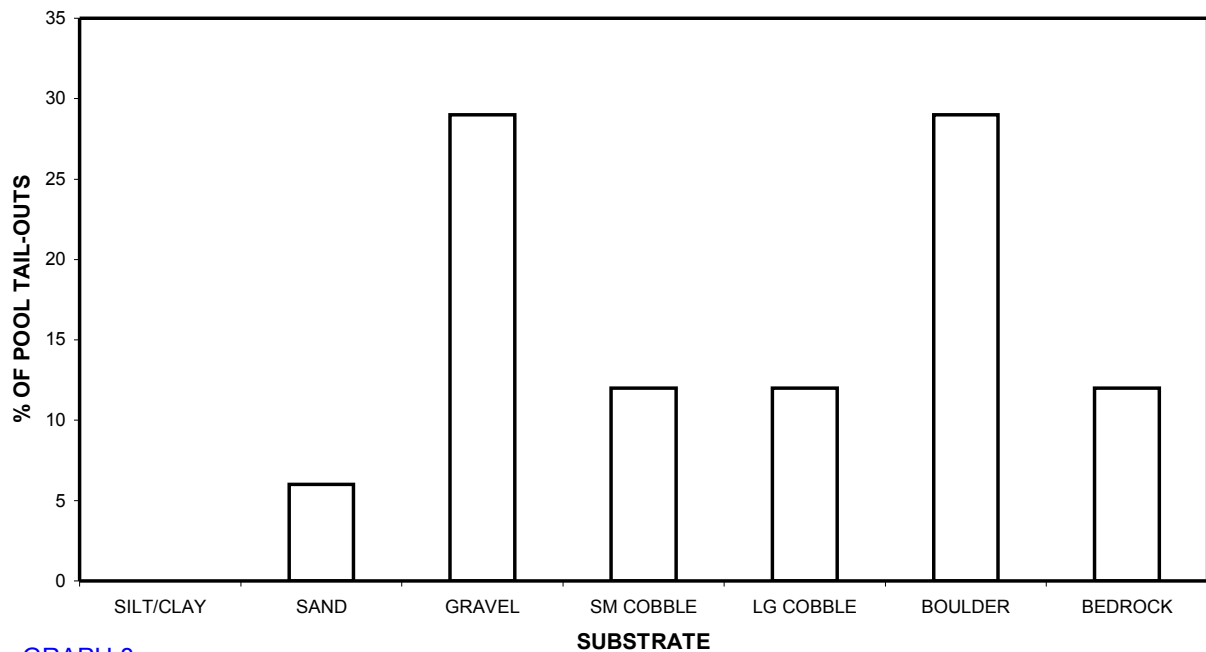
GRAPH 8

MONTGOMERY CREEK
MEAN PERCENT CANOPY

DECIDUOUS TREES
10%

CONIFEROUS TREES
90%

GRAPH 9

MONTGOMERY CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH

SAND/SILT/CLAY
35%

BOULDER
47%

BEDROCK
15%

COBBLE/GRAVEL
3%
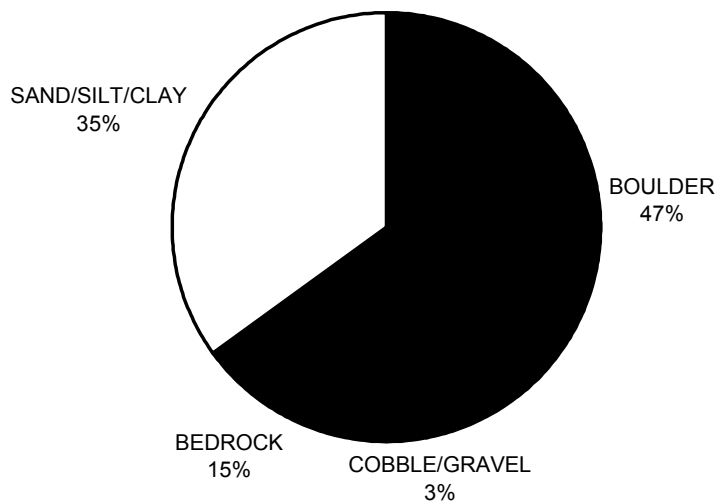
GRAPH 10

MONTGOMERY CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH

NO VEGETATION
6%

BRUSH
6%

DECIDUOUS TREES
3%

GRASS
12%

CONIFEROUS TREES
74%

GRAPH 11