

NORTH COAST WATERSHED AND FISHERY IMPROVEMENT PROGRAM

STREAM INVENTORY REPORT

Left Bank Tributary to Martin Creek, Big River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Northern California-North Coast Region

## STREAM INVENTORY REPORT

### Left Bank Tributary Martin Creek

#### INTRODUCTION

A stream inventory was conducted beginning July 18 and ending July 23, 2002 on Left Bank Tributary to Martin Creek. The survey began at the confluence with Martin Creek and extended upstream 0.56 miles.

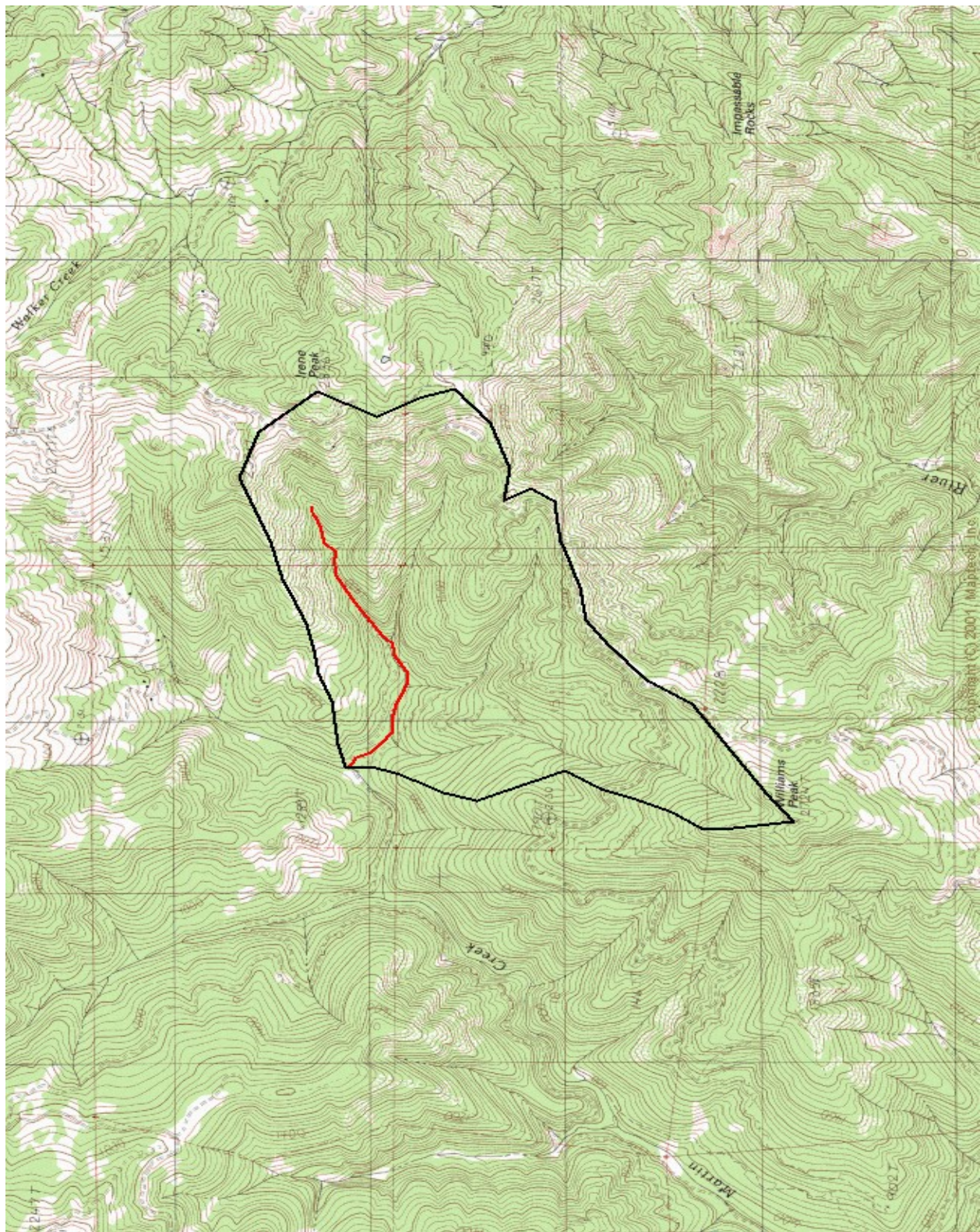
The Left Bank Tributary to Martin Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Left Bank Tributary to Martin Creek. The objective of the biological inventory 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

Left Bank Tributary is a tributary to Martin Creek, a tributary to the Big River, located in Mendocino County, California (Map 1). Left Bank Tributary to Martin Creek's legal description at the confluence with Martin Creek is T17N R14W S10. Its location is 39°20'15" North latitude and 123°24'32" West longitude. Left Bank Tributary to Martin Creek is a first order stream and has approximately 0.09 miles of solid blue line stream according to the USGS Greenough Ridge 7.5 minute quadrangle. Left Bank Tributary to Martin Creek drains a watershed of approximately 1.5 square miles. Elevations range from about 990 feet at the mouth of the creek to 1920 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 Highway 20 at mile marker 27. Pioneer Resources logging roads were used to reach the tributary.

A reconnaissance survey was conducted on the Left Bank Tributary to Martin Creek by CDFG in 1959 (California Department of Fish and Game 1959). This stream was given the title East Fork Martin Creek at the time. Only steelhead were seen in the 1958 survey.



MAP 1. LEFT BANK TRIBUTARY TO MARTIN CREEK.



## METHODS

The habitat inventory conducted in Left Bank Tributary to Martin 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 (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 Left Bank Tributary to Martin Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Martin Creek report.

## 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 Left Bank Tributary to Martin Creek. 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 Left Bank Tributary to Martin 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 18 through 23, 2002, was conducted by Scott Monday and Kristi Knechtle (DFG). The total length of the stream surveyed was 2,950 feet.

Stream flow was not measured on Left Bank Tributary to Martin Creek.

Left Bank Tributary to Martin Creek is a B3 channel type for the entire 2,950 feet of stream surveyed. B3 channel types are classified as moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks, and cobble-dominated substrate.

Water temperatures taken during the survey period ranged from 55 to 60 degrees Fahrenheit. Air temperatures ranged from 65 to 85 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 28% flatwater units, 23% riffle units, and 5% dry units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 24% riffle units, 19% pool units, and 10% dry units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 38%; step runs, 27%; and low gradient riffles, 23% (Graph 3). Based on percent total length, step runs made up 45%, low gradient riffles 24%, mid channel pools 15%, and dry 10%.

A total of 28 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 86%, and comprised 78% 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. Eight of the 28 pools (29%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 28 pool tail-outs measured, 0 had a value of 1 (0%); 6 had a value of 2 (21%); 3 had a value of 3 (11%); 1 had a value of 4 (4%); and 18 had a value of 5 (64%) (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. Flatwater habitat types had a mean shelter rating of 29, pool habitats had a mean shelter rating of 25, and riffle habitat types had a mean shelter rating of 5 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 26. Scour pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Left Bank Tributary to Martin Creek. Graph 7 describes the pool cover in Left Bank Tributary to Martin Creek. Boulders are the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Boulders were the dominant substrate observed in 46% of pool tail-outs while gravel was the next most frequently observed substrate type, at 36%.

The mean percent canopy density for the surveyed length of Left Bank Tributary to Martin Creek was 90%. The mean percentages of deciduous and coniferous trees were 1% and 99%, respectively. Graph 9 describes the mean percent canopy in Left Bank Tributary to Martin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 58%. The mean percent left bank vegetated was 65%. The dominant elements composing the structure of the stream banks consisted of 71% sand/silt/clay, 14% cobble/gravel, 11% bedrock, and 4% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 86% of the units surveyed. Additionally, 14% of the units surveyed had brush as the dominant vegetation type (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Young of year salmonids were detected using streambank observation techniques during the Left Bank Tributary to Martin Creek stream survey.

## DISCUSSION

Left Bank Tributary to Martin Creek is a B3 channel type for the entire 2,950 feet of stream surveyed. The suitability of B3 channel type for fish habitat improvement structures is as follows: B3 channel types are excellent for plunge weirs, boulder clusters and bank placed boulders, single and opposing wing deflectors, and log cover

The water temperatures recorded on the survey day July 18, through July 23, 2002 ranged from 55 to 60 degrees Fahrenheit. Air temperatures ranged from 65 to 85 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 47% of the total length of this survey, riffles 24%, pools 19%, and dry 10%. The pools are relatively shallow, with 8 of the 28 (29%) 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.

Six of the 28 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Eighteen 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 Left Bank Tributary to Martin Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twenty-four of the 28 pool tail-outs measured had sand/silt/clay, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 25. The shelter rating in the flatwater habitats was 29. 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, large woody debris contributes 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 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 moderate at 58% and 65%, 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) Left Bank Tributary to Martin Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within 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.
- 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. Much of the existing cover is from boulders. 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 Left Bank Tributary to Martin Creek 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 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 Left Bank Tributary to Martin Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.
- 10) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazer and developed if possible.
- 11) Due to the high gradient of the stream, 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 45 FEET UP FROM THE CONFLUENCE WITH MARTIN CREEK. THE CHANNEL TYPE IS A B3. STEELHEAD YOUNG OF YEAR (YOY). |
| 288'  | NEWTS AND STEELHEAD YOY.  |
| 620'  | STEELHEAD YEARLING.   |
| 858'  | OLD LOG STRUCTURE ON THE LEFT BANK. POSSIBLY OLD HUMBOLDT CROSSING?   |
| 1001' | FLOWING LEFT BANK TRIBUTARY. 3 PIECES OF LWD AT THE TOP OF THE POOL TRAPPING SEDIMENT AT TOP OF LOGS.                   |
| 1114' | RIGHT BANK EROSION CONTRIBUTING FINE SEDIMENT TO CHANNEL.   |
| 1284' | STEELHEAD YEARLING  |
| 1307' | DRY LEFT BANK TRIBUTARY.  |
| 1453' | STREAM IS SUBSURFACE FOR 2 FEET THEN CONTINUES TO FLOW.   |
| 1501' | SLIDE, LEFT BANK. LOOSE DIRT CONTRIBUTING FINE SEDIMENT. BUNDLE OF CABLE ON THE BANK AND IN THE STREAM.                 |
| 1690' | DRY RIGHT BANK TRIBUTARY.   |
| 1805' | LWD PILE. 20 X 10 X 10 FEET. STREAM IS FLOWING SUBSURFACE THE LAST 5 FEET OF LWD PILE.                                  |
| 2017' | FLOWING LEFT BANK TRIBUTARY. NO FISH OBSERVED.  |

2114' LWD IN STREAM. 10 X 4 X 4 FEET WITH SEDIMENT BUILT UP BEHIND PILE.

2230' 3 FOOT JUMP OUT OF POOL INTO BOULDERS.

2408' SLIDE ON RIGHT BANK. 50 FEET HIGH DUMPED TREES AND BOULDERS INTO STREAM. POSSIBLE WOODEN STRUCTURE AT TOP OF SLIDE.

2604' 2 STEELHEAD YOY IN POOL.

2612' 10 FEET OF SUBSURFACE FLOW AT THE BEGINNING OF UNIT.

2682' DRY CHANNEL END OF SURVEY AT ROAD CROSSING. WALKED AN ADDITIONAL 300 FEET OF DRY CHANNEL. BELIEVED TO HAVE REACHED END OF ANADROMY.

## 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: LEFT BK TRIB MARTIN CREEK  
 SAMPLE DATES: 07/18/02 to 07/23/02  
 STREAM LENGTH: 2950 ft.  
 LOCATION OF STREAM MOUTH:  
     USGS Quad Map: GREENOUGH                      Latitude: 39°20'15"  
     Legal Description: T17NR14WS10                Longitude: 123°24'32"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01  
     Channel Type: B3                                      Canopy Density: 90%  
     Channel Length: 2950 ft.                            Coniferous Component: 99%  
     Riffle/flatwater Mean Width: 5 ft.                Deciduous Component: 1%  
     Total Pool Mean Depth: 1.0 ft.                   Pools by Stream Length: 19%  
     Base Flow: 0.0 cfs                                  Pools >=3 ft.deep: 7%  
     Water: 055- 060°F    Air: 065-085°F              Mean Pool Shelter Rtn: 26  
     Dom. Bank Veg.: Coniferous Trees                 Dom. Shelter: Boulders  
     Vegetative Cover: 61%                              Occurrence of LOD: 14%  
     Dom. Bank Substrate: Silt/Clay/Sand              Dry Channel: 300 ft.

Embeddness Value: 1. 0%    2.21%    3. 11%    4. 4%    5. 64%

LEFT BK TRIB MARTIN CREEK

Drainage: SF BIG RIVER

Table 1 - SUMMARY OF RIPPLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 07/18/02 to 07/23/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17N R14W S10 LATITUDE: 39°20'15" LONGITUDE: 123°24'32"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	MEAN ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
15	3	RIFFLE	23	47	710	24	5.7	0.3	149	2228	49	735	0	5
18	4	FLATWATER	28	77	1377	47	5.0	0.6	264	4760	157	2817	0	29
28	28	POOL	44	20	563	19	6.6	1.0	139	3899	143	4015	109	25
3	0	DRY	5	100	300	10	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.)		
64	35			2950					10886			7567		

LEFT BK TRIB MARTIN CREEK

Drainage: SF BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/18/02 to 07/23/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17N14WS10 LATITUDE:39°20'15" LONGITUDE:123°24'32"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	ft.	%	TOTAL LENGTH	ft.	MEAN WIDTH	ft.	MEAN DEPTH	MEAN MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL VOLUME	MEAN SHELTER RATING	MEAN CANOPY
#			%	ft.		%	ft.		ft.		ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
15	3	LGR	23	47		24	710		6	0.3	0.6	149	2228	49	735	0	5	93	
1	1	RUN	2	47		2	47		6	0.6	1.1	268	268	161	161	0	5	90	
17	3	SRN	27	78		45	1330		5	0.6	1.1	263	4476	155	2637	0	37	87	
24	24	MCP	38	18		15	440		6	1.0	3.1	122	2919	114	2740	83	26	91	
1	1	CRP	2	40		1	40		8	1.2	1.9	320	320	384	384	288	30	95	
1	1	LSR	2	34		1	34		10	1.8	3.0	340	340	612	612	544	40	95	
2	2	LSBk	3	25		2	49		7	0.9	2.3	160	320	139	279	110	5	95	
3	0	DRY	5	100		10	300		0	0.0	0.0	0	0	0	0	0	0	85	



LEFT BK TRIB MARTIN CREEK

Drainage: SF BIG RIVER

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/18/02 to 07/23/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17N R14W S10 LATITUDE: 39°20'15" LONGITUDE: 123°24'32"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH {ft.}	TOTAL PERCENT LENGTH {ft.}	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
24	24	MAIN	86	18	440	78	6.4	1.0	122	2919	114	2740	83
4	4	SCOUR	14	31	123	22	7.8	1.2	245	980	319	1275	20
TOTAL UNITS	TOTAL UNITS			TOTAL LENGTH {ft.}					TOTAL AREA {sq.ft.}		TOTAL VOL. {cu.ft.}		
28	28			563					3899		4015		

LEFT BK TRIB MARTIN CREEK

Drainage: SF BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 07/18/02 to 07/23/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17N14WS10 LATITUDE: 39°20'15" LONGITUDE: 123°24'32"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT		1-<2 FT.		2-<3 FT.		3-<4 FT.		3-<4 FOOT		>=4 FOOT		>=4 FEET	
			MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE	MAXIMUM DEPTH OCCURRENCE	PERCENT OCCURRENCE
24	MCP	86	0	0	0	18	75	5	21	1	4	0	0	0	0	0
1	CRP	4	0	0	0	1	100	0	0	0	0	0	0	0	0	0
1	LSR	4	0	0	0	0	0	0	0	1	100	0	0	0	0	0
2	LSBK	7	0	0	0	1	50	1	50	0	0	0	0	0	0	0

TOTAL  
UNITS  
28

## Drainage: SF BIG RIVER

Survey Dates: 07/18/02 to 07/23/02

LATITUDE: 39° 20' 15" LONGITUDE: 123° 24' 32"

[illegible]

LEPT BK TRIB MARTIN CREEK

Drainage: SF BIG RIVER

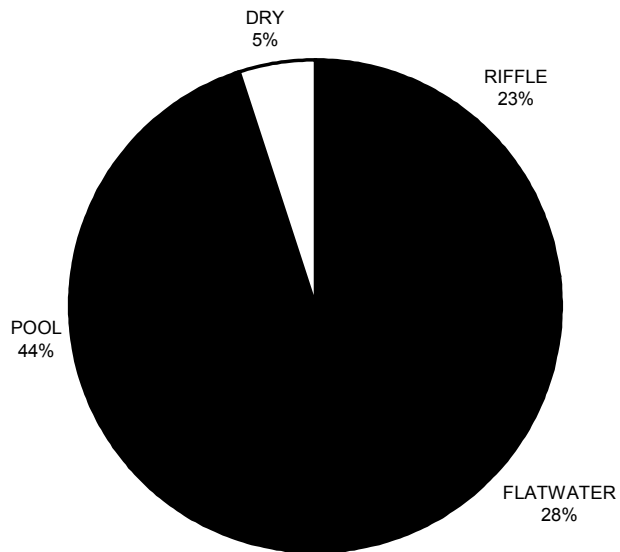
Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/18/02 to 07/23/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS10 LATITUDE:39°20'15" LONGITUDE:123°24'32"

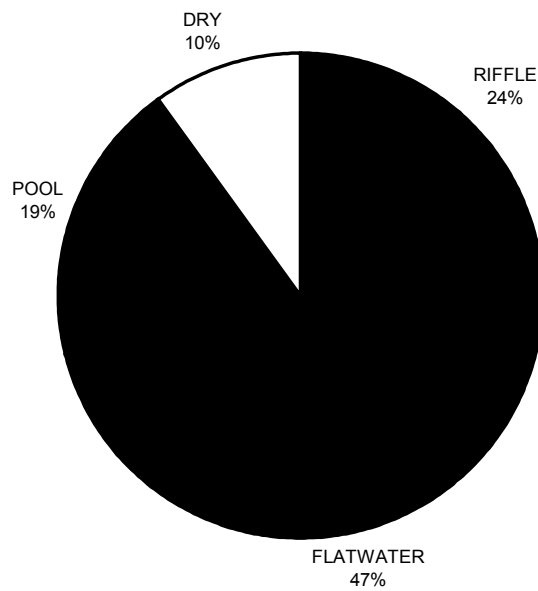
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
15	3	LGR	0	0	33	33	33	0	0
1	1	RUN	0	0	0	100	0	0	0
17	3	SRN	0	0	0	33	67	0	0
24	3	MCP	0	33	33	0	0	0	33
1	1	CRP	0	0	100	0	0	0	0
1	1	LSR	0	100	0	0	0	0	0
2	2	LSBK	0	0	50	0	50	0	0
3	0	DRY	0	0	0	0	0	0	0

## LEFT BANK TRIBUTARY MARTIN CREEK HABITAT TYPES BY PERCENT OCCURENCE



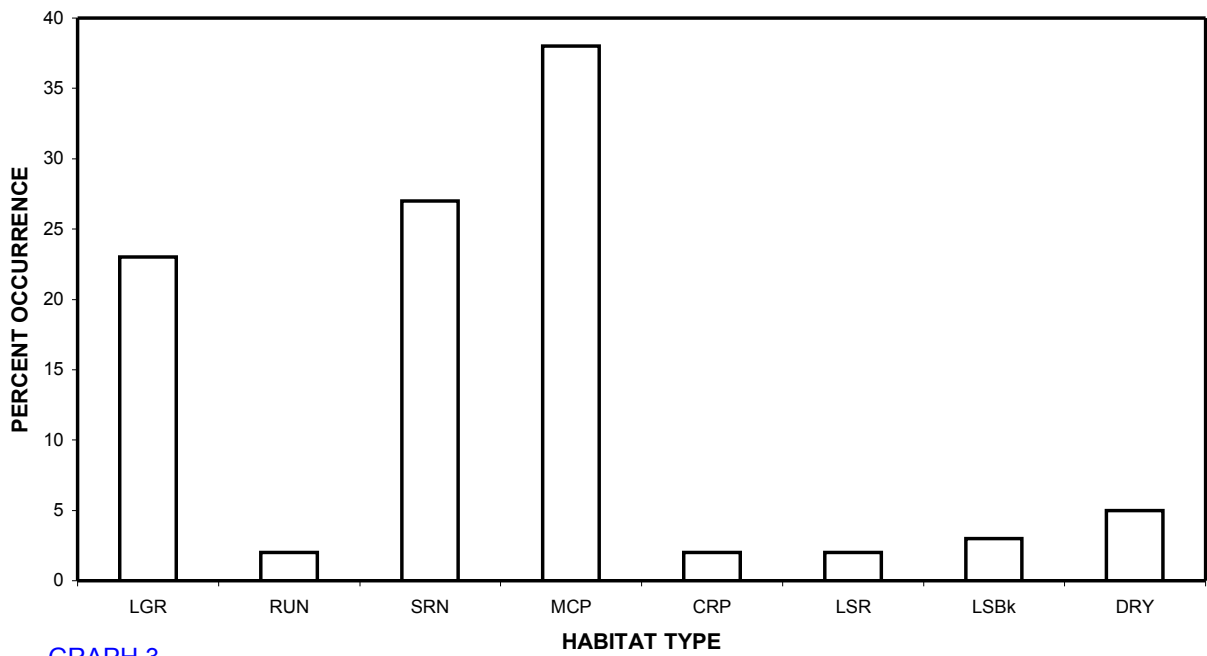
GRAPH 1

## LEFT BANK TRIBUTARY MARTIN CREEK HABITAT TYPES BY PERCENT TOTAL LENGTH



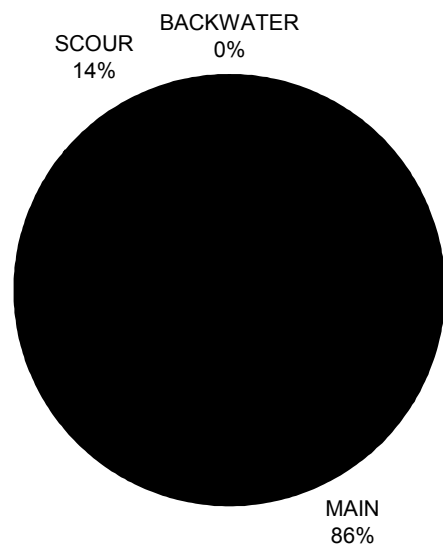
GRAPH 2

**LEFT BANK TRIBUTARY MARTIN CREEK**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 3

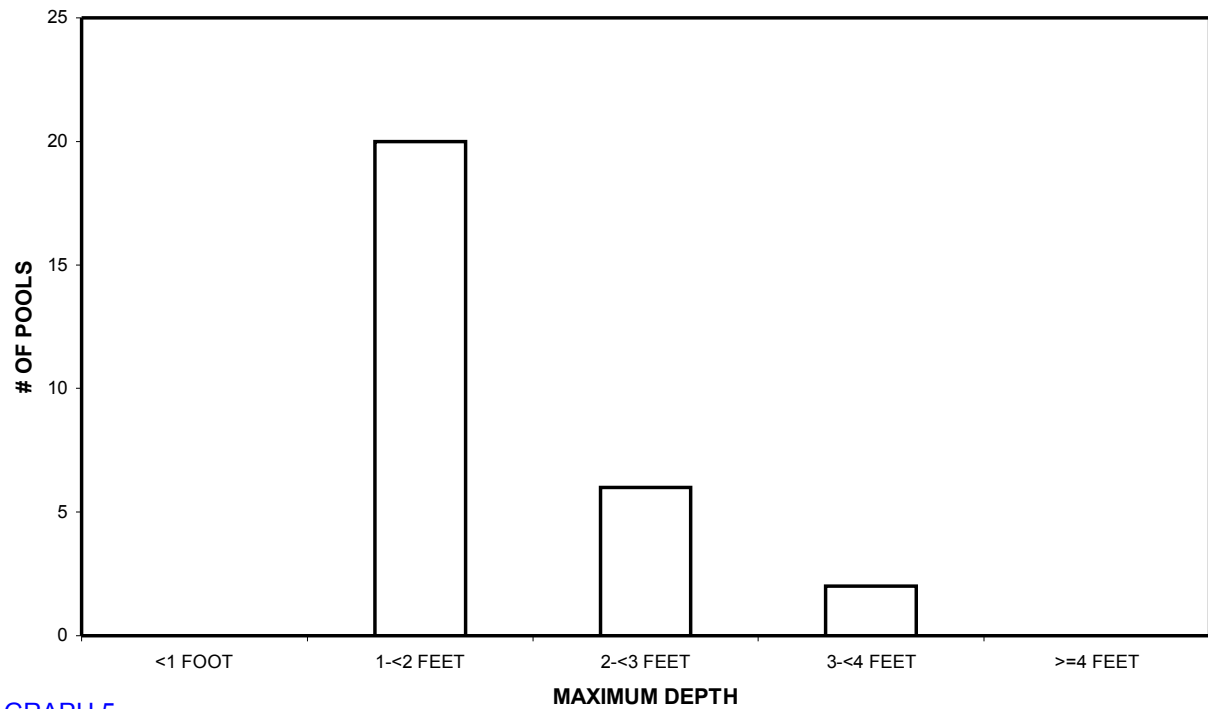
**LEFT BANK TRIBUTARY MARTIN CREEK**  
**POOL HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 4

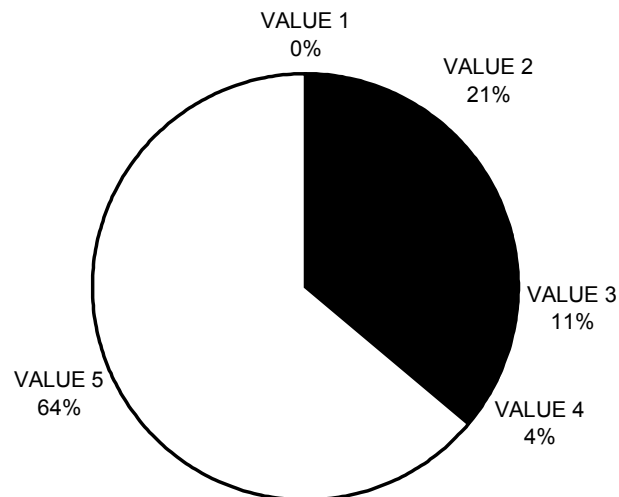


## LEFT BANK TRIBUTARY MARTIN CREEK MAXIMUM DEPTH IN POOLS



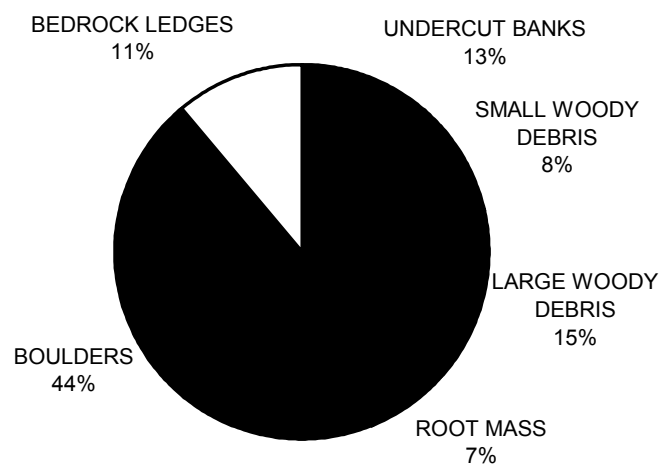
GRAPH 5

## LEFT BANK TRIBUTARY MARTIN CREEK PERCENT EMBEDDEDNESS



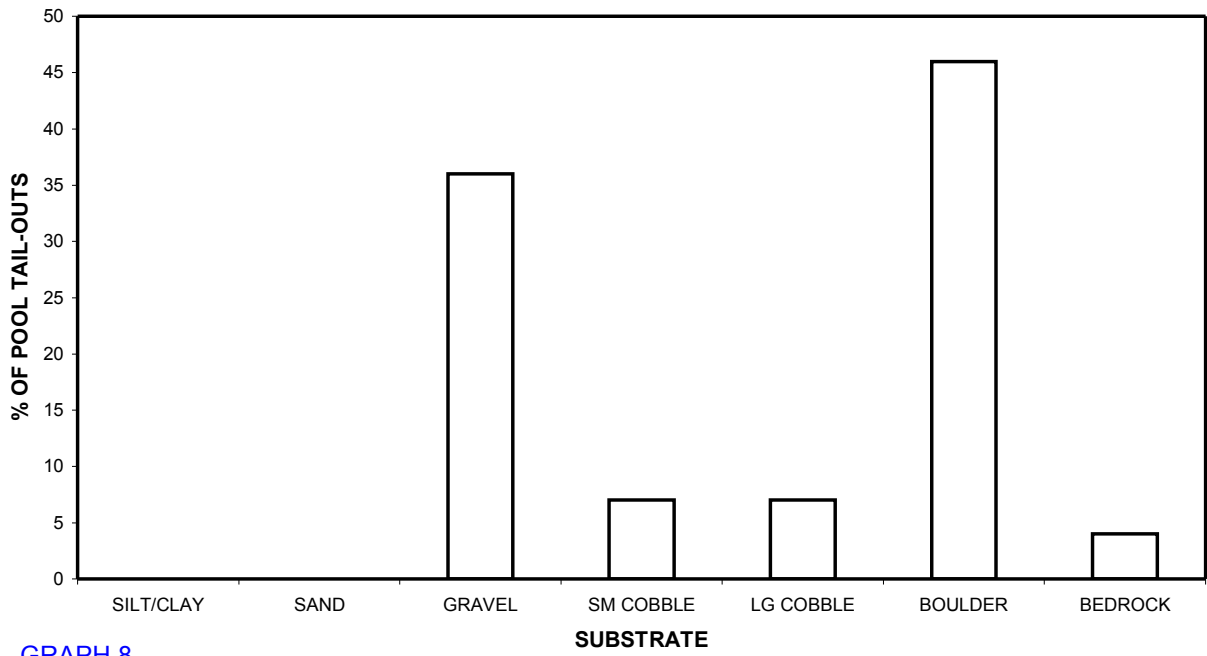
GRAPH 6

**LEFT BANK TRIBUTARY MARTIN CREEK**  
**MEAN PERCENT COVER TYPES IN POOLS**



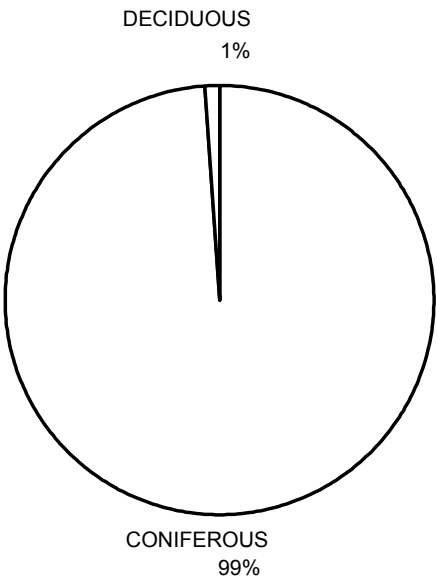
GRAPH 7

**LEFT BANK TRIBUTARY MARTIN CREEK**  
**SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



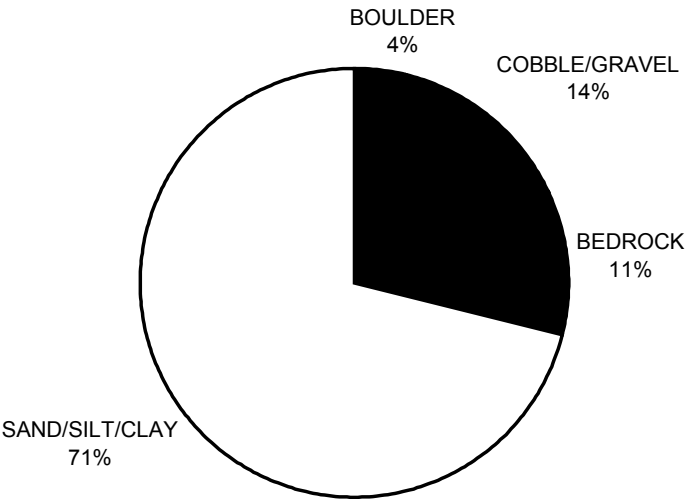
GRAPH 8

**LEFT BANK TRIBUTARY MARTIN CREEK  
MEAN PERCENT CANOPY**



GRAPH 9

**LEFT BANK TRIBUTARY MARTIN CREEK  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**LEFT BANK TRIBUTARY MARTIN CREEK**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11