

SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

**Panther Creek, South Fork Eel River, 1998**

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

1998

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## NORTH COAST WATERSHED PLANNING and COORDINATION PROJECT

The North Coast Watershed Planning and Coordination Project (NCWPCP), formerly the Basin Planning Project (BPP), was begun in 1991 to develop salmon and steelhead restoration and enhancement programs in North Coast watersheds for the Department of Fish and Game (DFG). The objectives of the project conform with the goals of California's Salmon and Steelhead Restoration and Enhancement Program of 1988. The Restoration Program strives to enhance the status of anadromous salmonid populations and improve the fishing experience for Californians. The program intends to achieve a doubling of the population of salmon and steelhead by the year 2000. The project is supported by the Sport Fish Restoration Act, which uses sport fishermen's funds to improve sport fisheries.

The NCWPCP conducts stream and habitat inventories according to the standard methodologies discussed in the *California Salmonid Stream Habitat Restoration Manual*, (Flosi et.al., 1998). Biological sampling is conducted using electrofishing and direct observation to determine species presence and distribution; selected streams are electrofished for population estimates. Some streams are also sampled for sediment composition. Collected information is used for base-line data, public cooperation development, restoration program planning, specific project design and implementation, and for project evaluation.

The Eel River system was identified as the initial basin for project planning activities. Most anadromous tributaries to the Van Duzen, South Fork Eel, Mainstem Eel, Middle Fork Eel, and the North Fork Eel rivers have been inventoried since 1991. Initial field inventory of the Eel River system should be essentially complete in 1996. NCWPCP personnel have also worked in cooperation with the DFG Salmon Restoration Project's staff to inventory streams on the Mattole River, Mendocino Coast, and Humboldt Bay.



## STREAM INVENTORY REPORT

### PANTHER CREEK

#### INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Panther Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Panther Creek.

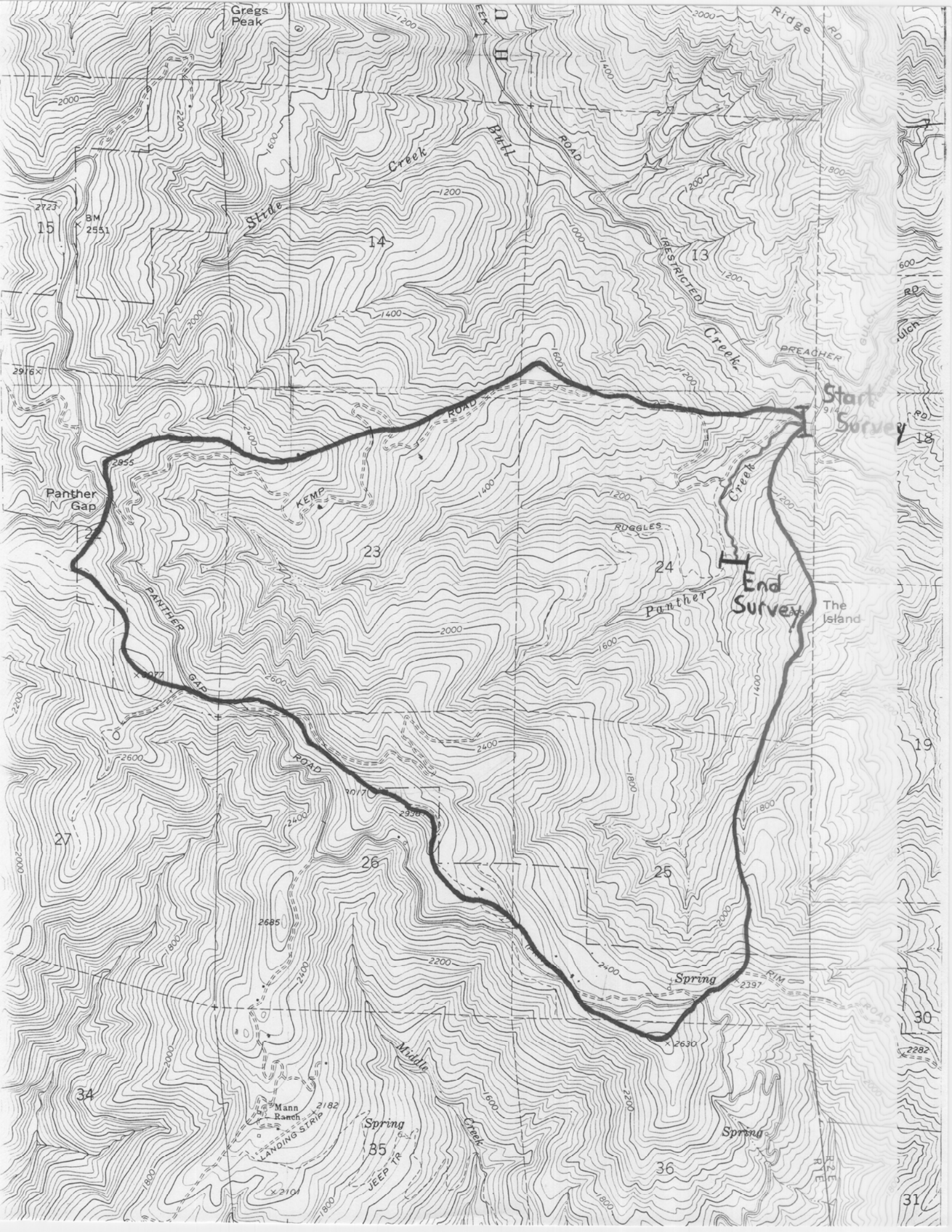
The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids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

#### WATERSHED OVERVIEW

Panther Creek is tributary to Bull Creek, tributary to the South Fork Eel River, located in Humboldt County, California. Panther Creek's legal description at the confluence with Bull Creek is T02S R01E S24. Its location is 40°17'24" North latitude and 124°00'33" West longitude. Panther Creek is a second order stream and has approximately 1.6 miles of blue line stream according to the USGS Bull Creek 7.5 minute quadrangle. Panther Creek drains a watershed of approximately 3.2 square miles. Elevations range from about 910 feet at the mouth of the creek to 2,800 feet in the headwater areas. Douglas fir and hardwood forests dominate the watershed. The watershed is owned by the State of California and is managed as part of Humboldt Redwood State Parks. Vehicle access exists via Highway 101 at Dyerville, via Bull Creek-Mattole Road.

#### METHODS

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





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### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further 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 Panther 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 standard flow measuring equipment, if available. In some cases flows are estimated.

#### 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.

#### 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.



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### **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". Panther 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

### **5. Embeddedness:**

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Panther 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, having a bedrock tail-out, 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 Panther 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.

## **Panther Creek**

### **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 Panther 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 Panther 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 was estimated and recorded.

## **BIOLOGICAL INVENTORY**

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Panther Creek fish presence was observed from the stream banks. Sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## **DATA ANALYSIS**

Data from the habitat inventory form are entered into Habitat, 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

## **Panther Creek**

Graphics are produced from the tables using Quattro Pro. Graphics developed for Panther 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 the pool tail outs
- 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 October 28, 1998, was conducted by John Wooster and Michelle Anderson (WSP). The total length of the stream surveyed was 3,676 feet.

Flow was measured at the mouth of Panther Creek with a Marsh-McBirney Model 2000 flowmeter at 0.9 cfs on November 2, 1998.

Panther Creek is a B4 channel type for the first 696 feet of the stream survey reach, and an A2 for the remaining 2,980 feet of the stream surveyed. B4 channel type are moderately entrenched, moderate gradient, riffle-dominated gravel channels with infrequently spaced pools, with very stable plan and profile, and stable banks. A2 channels are steep, narrow, cascading, step-pool streams, with high energy/debris transport associated with depositional soils, and a boulder channel.

Water temperatures taken during the survey period ranged from 50° to 54° F. Air temperatures ranged from 54° to 62° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 38% flatwater units, and 25% pool units (Graph 1). Based on total length of Level II habitat types there were 30% riffle units, 59% flatwater units, and 11% pool units (Graph 2).



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Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run, 37%; low gradient riffles, 17%; mid-channel pool and cascade both represented 15% (Graph 3). Based on percent total length, step run made up 59%, low gradient riffles 17%, cascade 11%, and mid-channel pool 5%.

A total of fifteen pools were identified (Table 3). Main channel pools were most frequently encountered at 93% and comprised 95% 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. Eleven of the fifteen pools (73%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the fifteen pool tail-outs measured, zero had a value of 1; nine had a value of 2 (60%); three had a value of 3 (20%); zero had a value of 4; and three had a value of 5 (20%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning.

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 21, flatwater habitat types had a mean shelter rating of 18, and pool habitats had a mean shelter rating of 30 (Table 1). Of the pool types, both main channel and scour pools had a mean shelter rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Panther Creek. Large woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Panther Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulders were the dominant substrate observed in 6 of the 15 (40%) pool tail-outs measured. Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 56%. The mean percentages of deciduous and coniferous trees were 90% and 10%, respectively. Graph 9 describes the canopy in Panther Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 59.1%. The mean percent left bank vegetated was 67.7%. The dominant elements composing the structure of the stream banks consisted of 9.1% bedrock, 40.9% boulder, and 50% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 81.9% of the units surveyed. Additionally, 9.1% of the units surveyed had brush as the dominant vegetation type, and 4.5%

## **Panther Creek**

had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Biological inventory sampling was not conducted on Panther Creek. The habitat inventory crew observed salmonids from the stream banks during the survey period.

## DISCUSSION

Panther Creek is a B4 channel type for the first 696 feet of stream surveyed and an A2 for the remaining 2,980 feet. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. A2 channel types are high energy streams with stable stream banks but poor gravel retention capabilities; therefore they are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days October 28, 1998, ranged from 50° to 54° F. Air temperatures ranged from 54° to 62° F. This is an good water temperature range for salmonids. However, 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 59% of the total length of this survey, riffles 30%, and pools 11%. The pools are relatively deep, with 11 of the 15 (73.3%) pools having a maximum depth greater than 2 feet. 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. Primary pool comprise 8% of the total length of the habitat surveyed. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

None of the fifteen pool tail-outs measured had an embeddedness rating of 1, 60% had a rating of 2, 20% had ratings of 3 or 4, and 20% had a rating of 5 and were considered unsuitable for spawning. All of the three pool-tail outs with a rating of 5 were unsuitable for spawning due to the dominant substrate being bedrock or boulders. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

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The mean shelter rating for pools was 30. The shelter rating in the flatwater habitats was 18. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, small woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

Seven of the fifteen (46%) pool tail-outs measured had gravel or small cobble as the dominant substrate. Suitable size spawning substrate in the A4 channel reach is limited.

The mean percent canopy density for the stream was 56%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 59.1% and 67.7%, 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) Panther Creek 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) Increase the canopy and bank vegetation on Panther Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy or bank coverage is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
- 4) 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.



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- 5) Primary pools comprise 8% of the total stream length surveyed. Within the B4 channel reach, 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.
- 6) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

## 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 at confluence with Bull Creek. Channel type is B4.
- 20' Out of the hydrologic influence of the receiving stream and its flood prone zone. Begin 100% sampling for habitat types by first occurrence.
- 751' Unnamed tributary enters from right bank.
- 819' Channel type changes from B4 to A2.
- 843' Right bank erosion, 141' long x 30' high.
- 1,002' Right bank erosion, 217' long x 50' high.
- 1,270' Right bank erosion, 115' long x 20' high.
- 1,364' Left bank erosion, 216' long x 20' high.
- 2,164' Left bank erosion, 197' long x 20' high.
- 2,774' Young of the year (YOY) salmonids observed in pool.
- 3,052' Juvenile steelhead rainbow trout observed.
- 3,076' Right bank slide, 150' long x 50' wide x 180' high.
- 3,208' Left bank erosion, 245' long x 25' high.
- 3,241' Right bank slide, 80' long x 100' wide x 150' high.
- 3,348' Right bank slide, 120' long x 50' wide x 75' high.
- 3,592' Right bank slide, 50' long x 200' long x 200' high.
- 3,645' End of survey. Right bank slide 500' long x 80' wide x 100' high has completely buried the creek in debris.

## **Panther Creek**

### **REFERENCES**

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

# LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5



Panther Creek

Drainage: SF Eel River

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

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

HABITAT UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH (ft.)	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
22	4	RIFLE	37	50	1108	30	10.5	0.7	291	6399	177	3900	0	21
23	2	FLATWATER	38	95	2177	59	11.0	0.7	924	21252	698	16063	0	18
15	5	POOL	25	26	391	11	10.0	1.2	258	3873	317	4748	214	30
TOTAL UNITS 60	TOTAL UNITS 11				TOTAL LENGTH (ft.) 3676				TOTAL AREA (sq. ft.) 31523			TOTAL VOL. (cu. ft.) 24711		

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
#			%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
10	1	LGR	17	64	644	18	9	0.4	0.7	573	5733	229	2293	0	5	11
9	2	CAS	15	43	383	10	9	0.6	1.4	151	1359	82	734	0	30	69
3	1	BRS	5	27	81	2	16	1.1	2.0	288	864	317	950	0	20	15
1	0	RUN	2	20	20	1	0	0.0	0.0	0	0	0	0	0	0	0
22	2	SRN	37	98	2157	59	11	0.7	1.7	924	20328	698	15365	0	18	69
9	2	MCP	15	19	173	5	10	1.4	3.2	185	1665	251	2262	188	30	66
5	2	STP	8	40	200	5	10	1.2	2.5	381	1906	445	2225	292	30	53
1	1	PLP	2	18	18	0	11	1.2	2.5	158	158	190	190	111	30	95
TOTAL UNITS 60	TOTAL UNITS 11			LENGTH (ft.) 3676						AREA (sq.ft.) 32014		TOTAL VOL. (cu.ft.) 24018				

Panther Creek

Drainage: SF Eel River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

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
14	4	MAIN	93	27	373	95	9.8	1.3	283	3964	348	4873	240	30
1	1	SCOUR	7	18	18	5	11.0	1.2	158	158	190	190	111	30
TOTAL UNITS 15	TOTAL UNITS 5			TOTAL LENGTH (ft.)	391				TOTAL AREA (sq.ft.)	4122		TOTAL VOL. (cu.ft.)	5064	



Panther Creek

Drainage: Sf Eel River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

UNITS MEASURED	HABITAT TYPE	HABITAT		<1 FOOT		<1 FOOT		1-<2 FT.		1-<2 FOOT		2-<3 FT.		2-<3 FOOT		3-<4 FT.		3-<4 FOOT		>=4 FEET		>=4 FEET	
		PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH
9	MCP	60	0	0	0	4	44	4	44	1	11	0	0	0	0	0	0	0	0	0	0	0	0
5	STP	33	0	0	0	0	0	5	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	PLP	7	0	0	0	0	0	1	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL  
UNITS  
15

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SMD	MEAN % LMD	MEAN % ROOT MASS VEGETATION	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
10	1	LGR	0	20	0	0	0	0	0	80	0
9	2	CAS	0	5	0	0	0	0	33	63	0
3	1	BRS	0	20	0	0	15	0	25	40	0
1	0	RUN	0	0	0	0	0	0	0	0	0
22	2	SRN	0	18	0	10	0	0	10	63	0
9	2	MCP	0	20	0	0	15	3	8	48	8
5	2	STP	0	25	0	0	5	0	23	38	10
1	1	PLP	0	20	0	0	0	0	20	60	0

Panther Creek

Drainage: Sf Eel River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 10/28/98

Confluence Location: QUAD: Bull Creek LEGAL DESCRIPTION: T02SR01ES24 LATITUDE: 40°17'24" LONGITUDE: 124°0'33"

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
10	1	LGR	0	0	100	0	0	0	0
9	2	CAS	0	0	0	0	50	50	0
3	1	BRS	0	0	0	0	0	100	0
1	0	RUN	0	0	0	0	0	0	0
22	2	SRN	0	0	100	0	0	0	0
9	2	MCP	0	0	50	0	0	50	0
5	2	STP	0	0	0	0	0	50	50
1	1	PLP	0	0	0	0	0	100	0



Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Deciduous	Mean Percent Open units	Mean Right bank % Cover	Mean Left Bank % Cover
56	10	90	4	59.1	67.7

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

Open units represent habitat units with zero canopy cover.

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Panther Creek  
 SAMPLE DATES:  
 STREAM LENGTH: 3676 ft.  
 LOCATION OF STREAM MOUTH:  
 USGS Quad Map: Bull Creek  
 Legal Description: T02SR01ES24

Latitude: 40°17'24"  
 Longitude: 124°0'33"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B4	Canopy Density: 6%
Channel Length: 696 ft.	Coniferous Component: 20%
Riffle/flatwater Mean Width: 10 ft.	Deciduous Component: 80%
Total Pool Mean Depth: 1.3 ft.	Pools by Stream Length: 9%
Base Flow: 0.9 cfs	Pools >=3 ft.deep: 0%
Water: 50 - 54 °F Air: 61 -62 °F	Mean Pool Shelter Rtn: 20
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 48%	Occurrence of LOD: 0%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2.33% 3. 67% 4. 0% 5. 0%

STREAM REACH 02

Channel Type: A2	Canopy Density: 73%
Channel Length: 2980 ft.	Coniferous Component: 6%
Riffle/flatwater Mean Width: 11 ft.	Deciduous Component: 94%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 11%
Base Flow: 0.3 cfs	Pools >=3 ft.deep: 8%
Water: 51 - 54 °F Air: 54 -61 °F	Mean Pool Shelter Rtn: 33
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 73%	Occurrence of LOD: 0%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2.67% 3. 8% 4. 0% 5. 25%

# Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	1	1	9.1
Boulder	5	4	40.9
Cobble/Gravel	5	6	50
Silt/clay	0	0	0

# Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	1	0	4.5
Brush	2	0	9.1
Decid. Trees	8	10	81.8
Conif. Trees	0	1	4.5
No Vegetation	0	0	0

Total stream average embeddedness value for pool

3.4



TABLE 10. MEAN PERCENT OF SHELTER COVER TYPES FOR ENTIRE STREAM

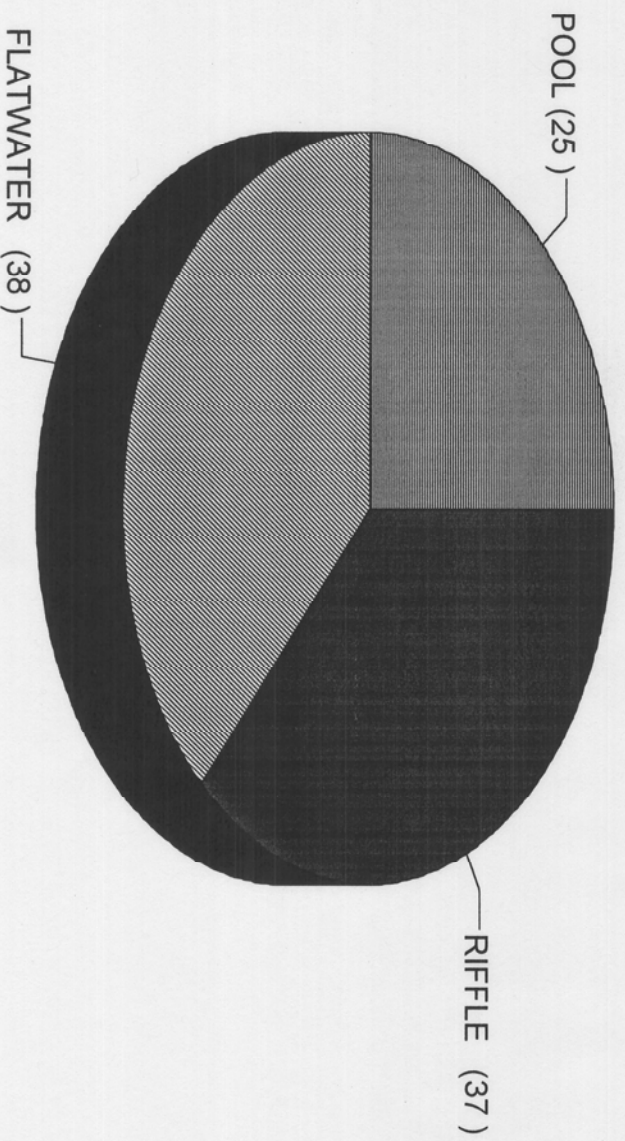
Stream: Panther Creek

Drainage: Bull Creek

Survey Date: 10/28/98

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	0	0	0
SMALL WOODY DEBRIS	17.7	17.5	22
LARGE WOODY DEBRIS	0	0	0
ROOTS	1.8	10	0
TERRESTRIAL VEG	5	0	8
AQUATIC VEG	0.5	0	1
WHITewater	17.3	10	16
BOULDERS	54.5	62.5	46
BEDROCK LEDGES	3.2	0	7

# PANTHER CREEK, SF EEL RIVER HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

# PANTHER CREEK, SF EEL RIVER HABITAT TYPES BY PERCENT TOTAL LENGTH

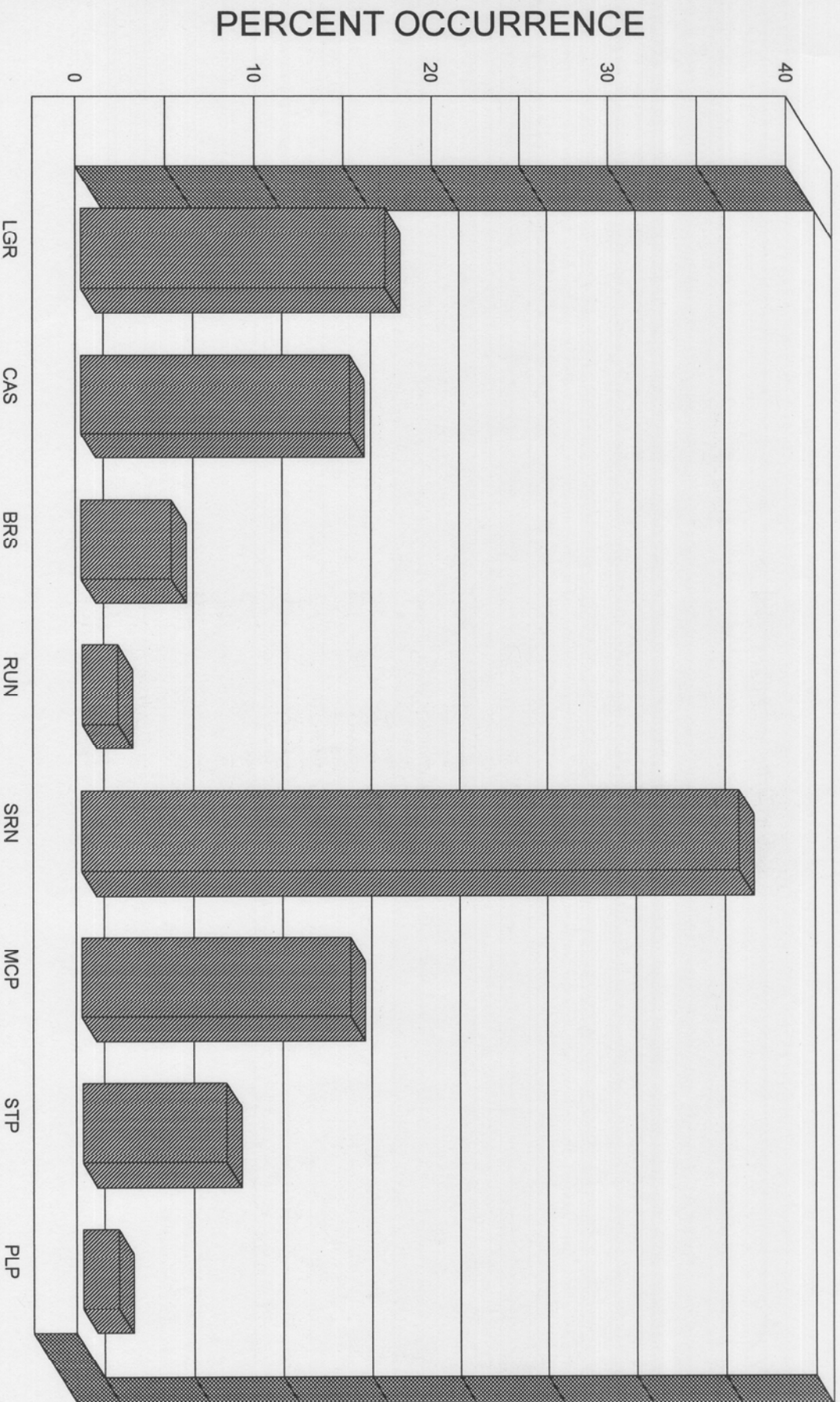


GRAPH 2



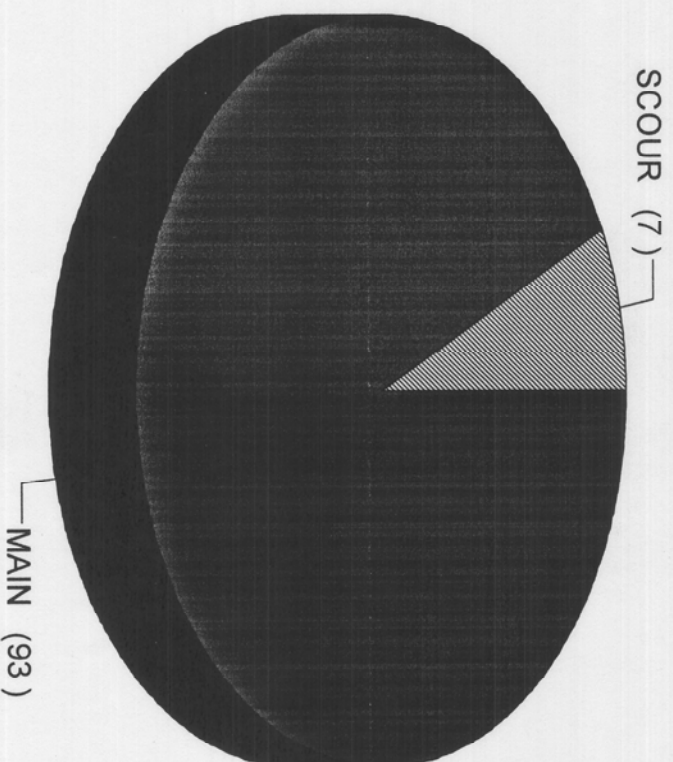
# PANTHER CREEK, SF EEL RIVER

## HABITAT TYPES BY PERCENT OCCURRENCE



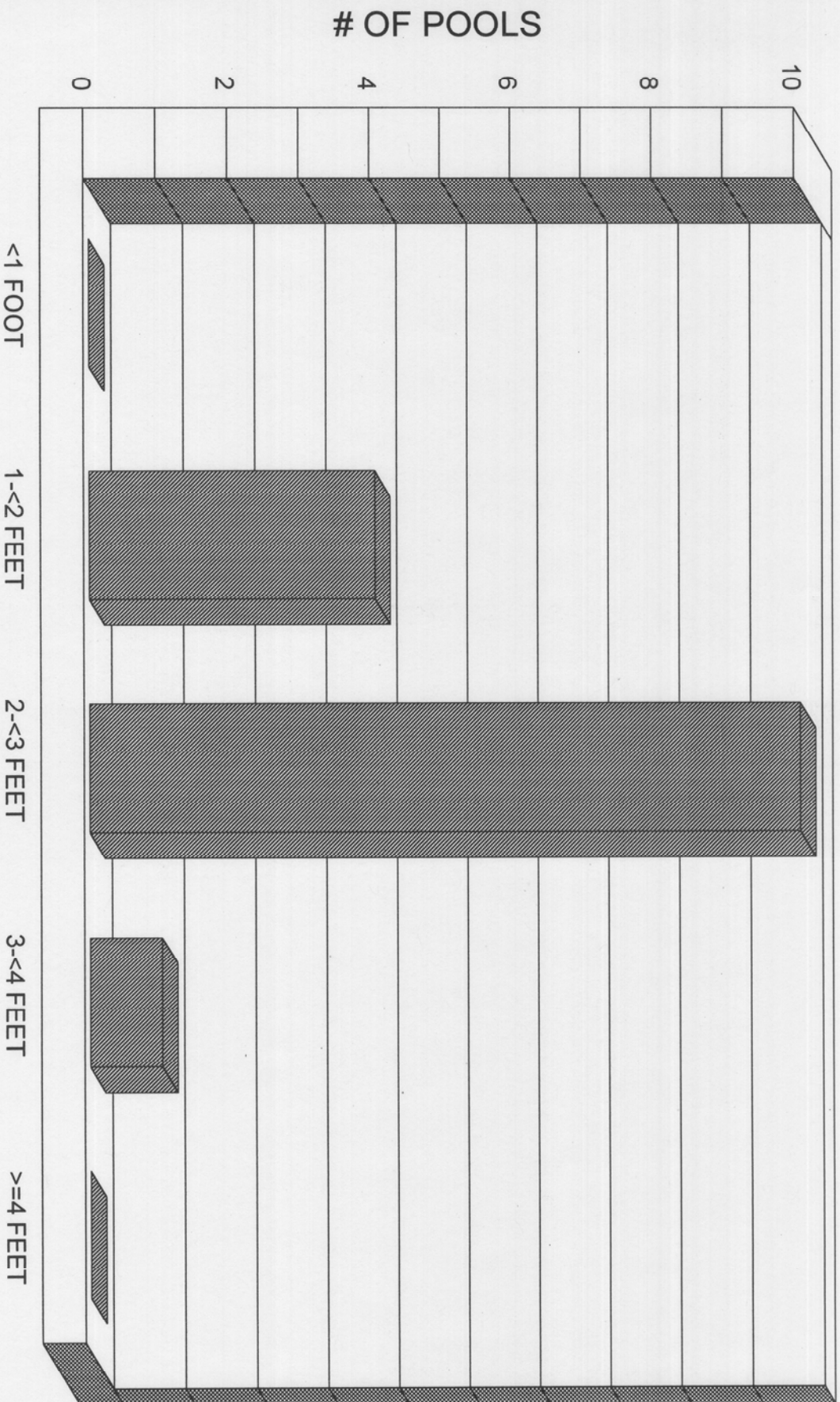
GRAPH 3

# PANTHER CREEK, SF EEL RIVER POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

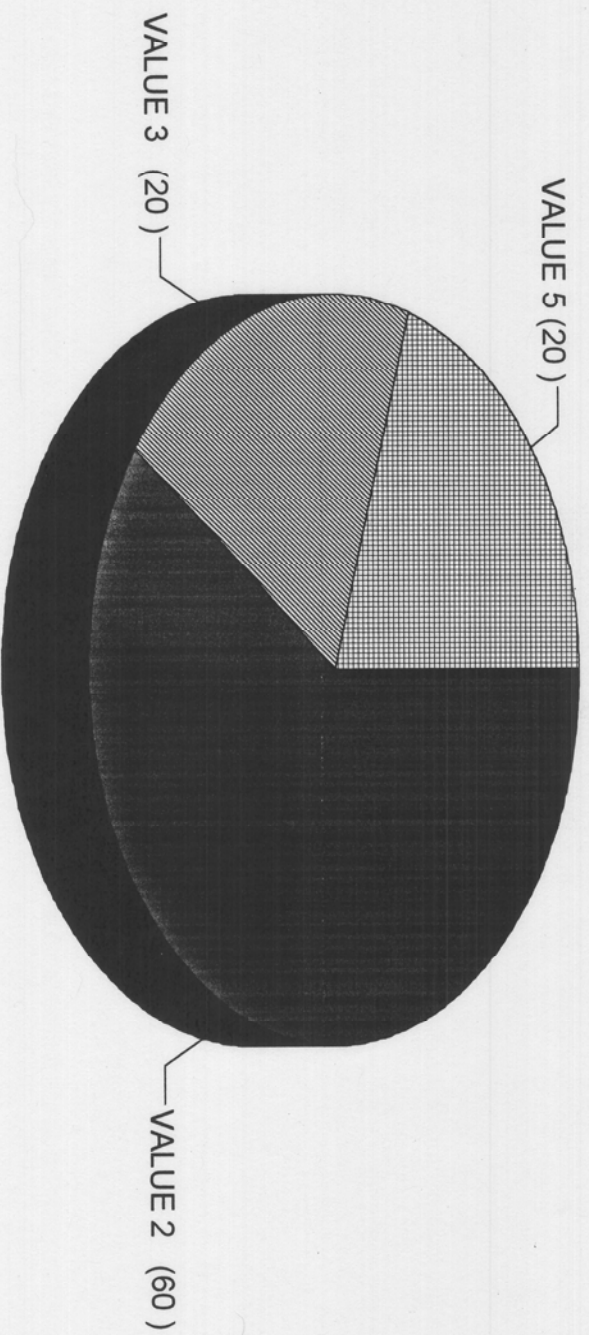
# PANTHER CREEK, SF EEL RIVER MAXIMUM POOL DEPTHS



GRAPH 5



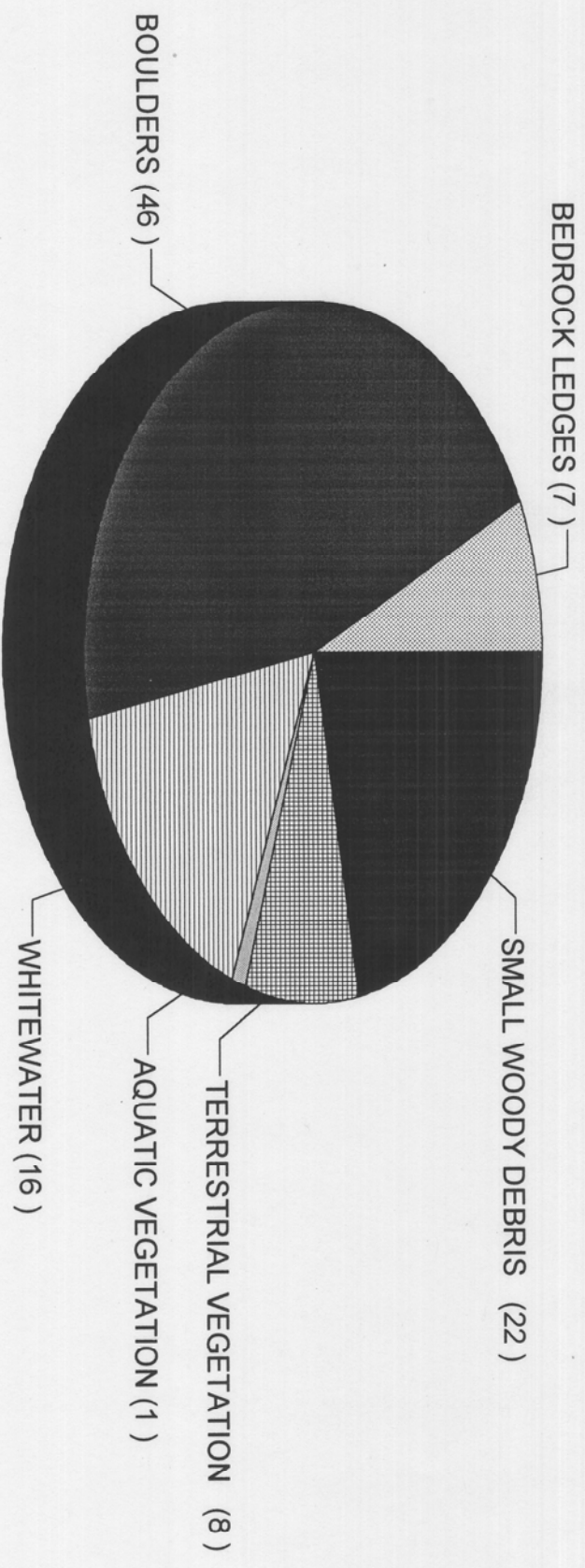
# PANTHER CREEK, SF EEL RIVER PERCENT EMBEDDEDNESS



GRAPH 6

# PANTHER CREEK, SF EEL RIVER

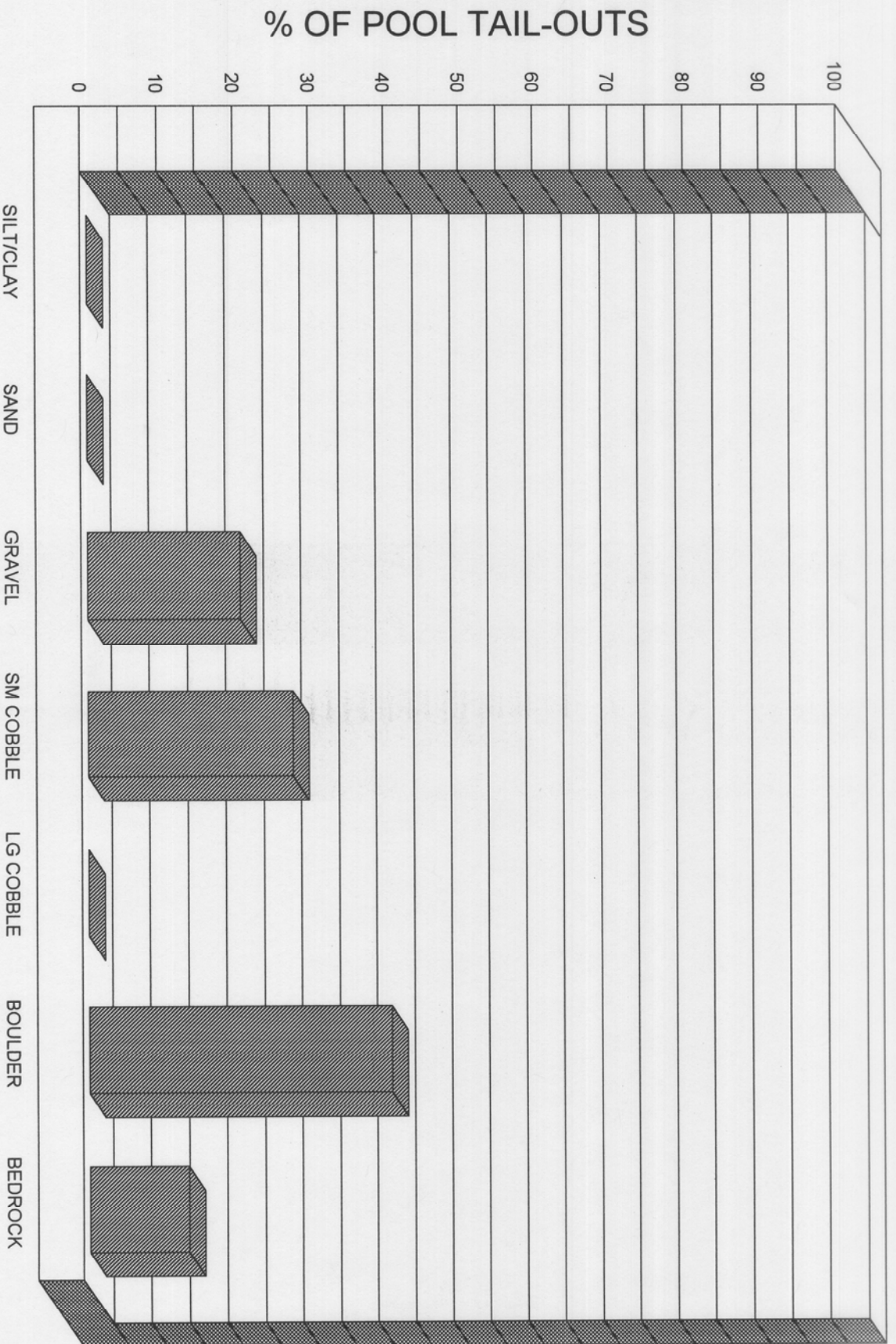
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

# PANTHER CREEK, SF EEL RIVER

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

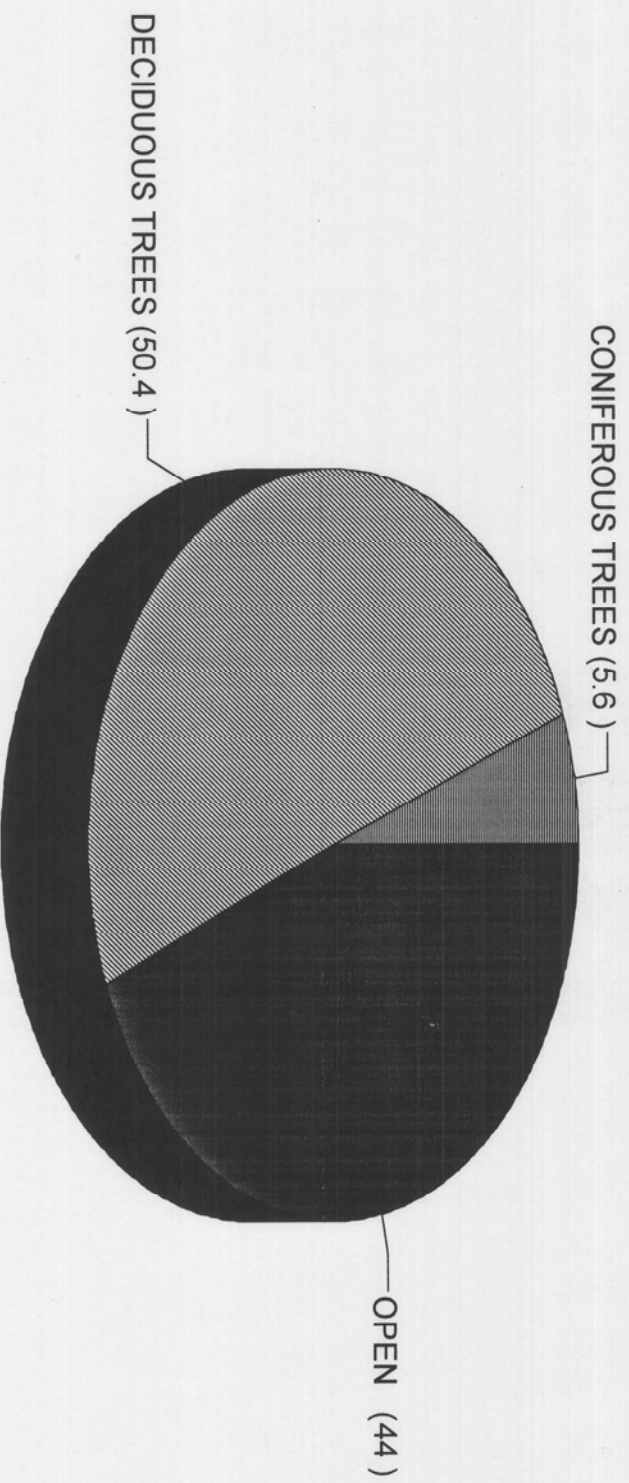


GRAPH 8

SUBSTRATE

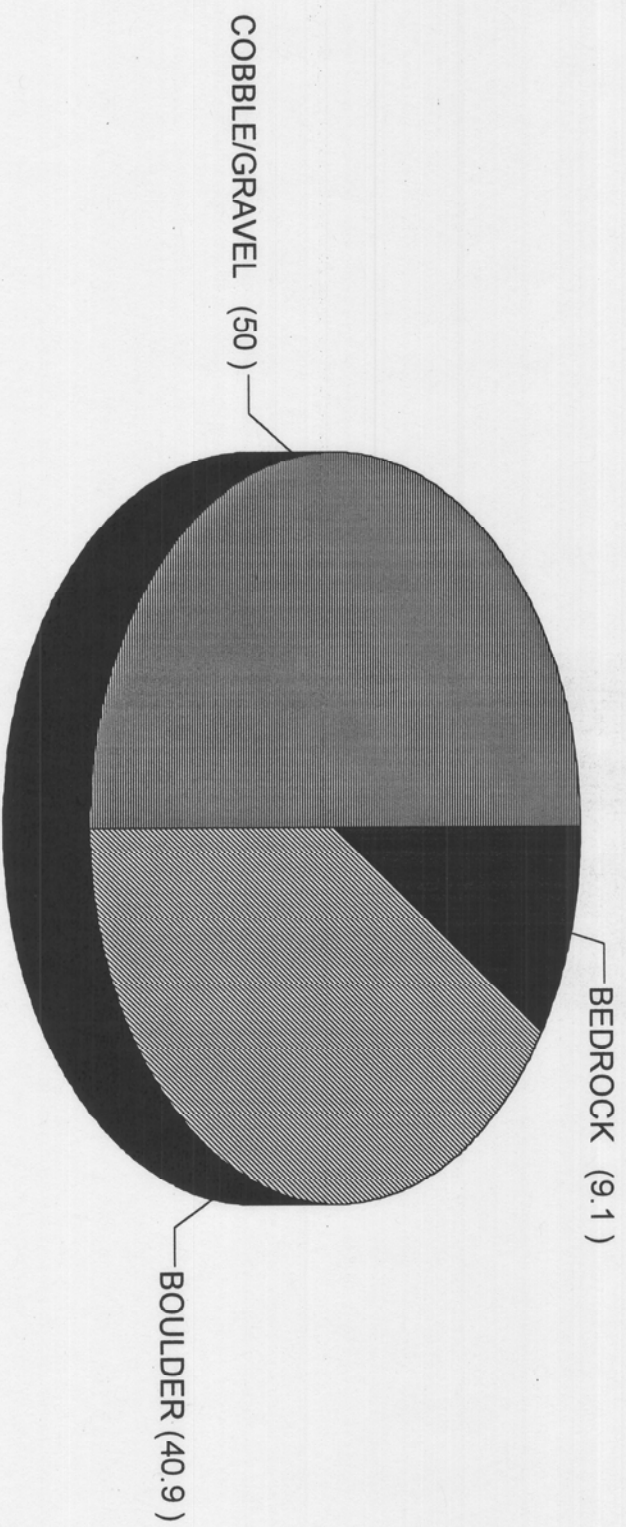


# PANTHER CREEK, SF EEL RIVER PERCENT CANOPY



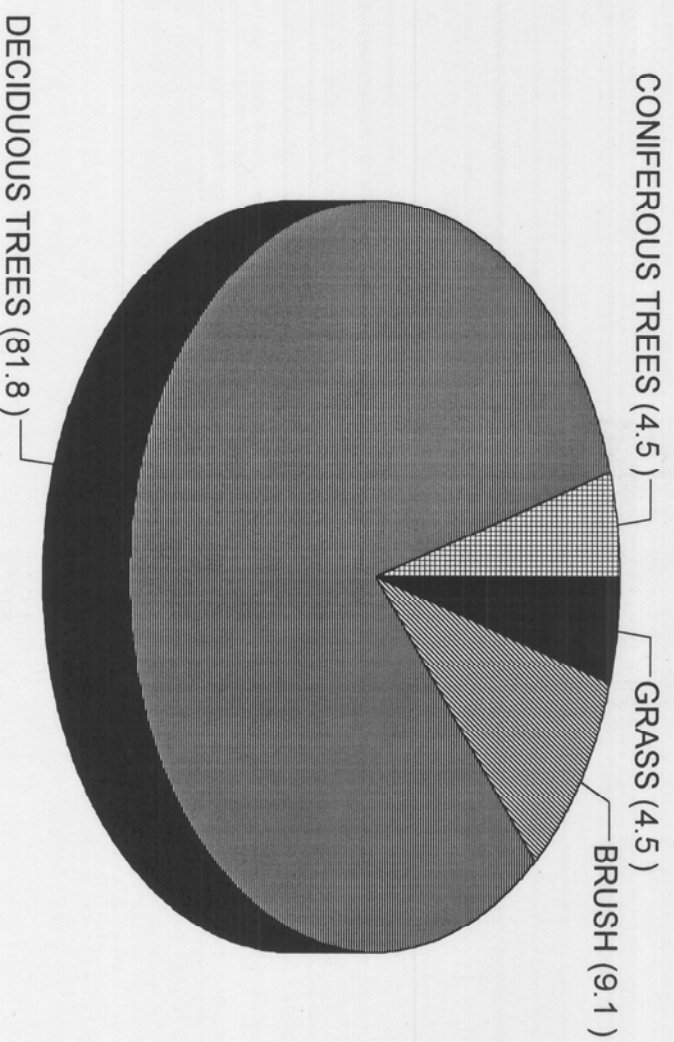
GRAPH 9

# PANTHER CREEK, SF EEL RIVER DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

# PANTHER CREEK, SF EEL RIVER DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11