

CALIFORNIA DEPARTMENT OF FISH AND GAME  
STREAM INVENTORY REPORT

**Foss Creek**

*Report Completed March 20, 2007*

*Assessment Completed 2006*

INTRODUCTION

A stream inventory was conducted during 8/1/2006 to 8/8/2006 on Foss Creek. The survey began at the confluence with West Slough and extended upstream 1.6 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Foss 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

Foss Creek is a tributary to West Slough, a tributary to Dry Creek, a tributary to the Russian River, a tributary to the Pacific Ocean, located in Sonoma County, California (Map 1). Foss Creek's legal description at the confluence with West Slough is T09N R09W S28. Its location is 38°36'48" north latitude and 122°52'17" west longitude, LLID number 1228715386133. Foss Creek is a second order stream and has approximately 1.7 miles of blue line stream according to the USGS Jimtown 7.5 minute quadrangle. Foss Creek drains a watershed of approximately 8.4 square miles. Elevations range from about 100 feet at the mouth of the creek to 130 feet in the headwater areas. Urban developments with deciduous tree forested sections dominate the watershed. The watershed is entirely privately owned and is mostly urban. Vehicle access exists off Highway 101 in Healdsburg.

METHODS

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

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

### 1. Flow:

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

### 2. Channel Type:

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

### 3. Temperatures:

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

### 4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Foss 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 Foss Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Foss 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Foss Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Foss Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

## 11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

## BIOLOGICAL INVENTORY

Biological sampling 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 Foss Creek. In addition, One site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Foss Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools

## *Foss Creek 2006*

- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

## HABITAT INVENTORY RESULTS

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

The habitat inventory of 8/1/2006 to 8/8/2006, was conducted by H. Fett (DF&G), M. Terry, K. MacIntosh (TU), and R. Spangler (WSP). The total length of the stream surveyed was 8,516-feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.14 cfs on 8/15/06.

Foss Creek is a B6 channel type for the entire 8,516 feet of the stream surveyed (Reach 1).

B6 channels are moderately entrenched riffle dominated channels with infrequently spaced pools. Other characteristics are: very stable plan and profile, stable banks on moderate gradients, and silt/clay dominant substrates.

Water temperatures taken during the survey period ranged from 60 to 66 degrees Fahrenheit. Air temperatures ranged from 58 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 28% riffle units, 8% culvert units, 48% flatwater units, 9% nosurvey units, 6% pool units, (Graph 1). Based on total length of Level II habitat types there were 7% riffle units, 12% culvert units, 69% flatwater units, 10% nosurvey units, and 2% pool units (Graph 2).

Six Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 27% Low Gradient Riffle units, 41% Glide units and 9% Not Surveyed units (Graph 3). Based on percent total length the most frequent habitat types were 12% Culvert units, 66% Glide units and 10% Not Surveyed units

A total of 4 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 75%, and comprised 75% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Two of the 4 pools (50%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 4 pool tail-outs measured, 2 had a value of 2 (50%); 2 had a value of 4 (50%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 2, flatwater habitat types had a mean shelter rating of 20, and pool habitats had a mean shelter rating of 48 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 40, Scour pools had a mean shelter rating of 70 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial Vegetation is the dominant cover type in Foss Creek. Graph 7 describes the pool cover in Foss Creek. Terrestrial Vegetation is the dominant pool cover type followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 50% of pool tail-outs, whereas boulders and silt/clay were observed in 25% of pool tail-outs.

The mean percent canopy density for the surveyed length of Foss Creek was 64%. The mean percentages of hardwood and coniferous trees were 100% and 0%, respectively. Thirty-six percent of the canopy was open. Graph 9 describes the mean percent canopy in Foss Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 77%. The mean percent left bank vegetated was 69%. The dominant elements composing the structure of the stream banks consisted of 13% bedrock, 13% boulder, and 75% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 38% of the units surveyed. Additionally, 33% of the units surveyed had brush as the dominant vegetation type, and 29% had grass as the dominant vegetation (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

One site was electrofished for species composition and distribution in Foss Creek on September 28, 2006. The site was located between the Mill and North Street culverts. Water temperatures taken during the electrofishing period 10:00 – 11:15 ranged from 58 to 58 degrees Fahrenheit. Air temperatures ranged from 52 to 53 degrees Fahrenheit. The sites were sampled by Mitsuko Terry (DFG) and Henning Fett (DFG).

Table 1. Biological sampling data for Foss Creek.

<u>Species</u>	<u>Minimum Number Observed</u>
Steelhead (1+)	2
roach	264
sculpin	74
Sacramento sucker	4
crayfish	70

DISCUSSION

Foss Creek is a B6 channel type for the entire 8,516 feet of stream surveyed. The suitability of B6 channel types for fish habitat improvement structures is as follows: excellent for bank placed boulders and log cover; good for plunge weirs, single and opposing wing deflectors and channel constrictors; and fair for boulder clusters.

The water temperatures recorded on the survey days 8/1/2006 to 8/8/2006, ranged from 60 to 66 degrees Fahrenheit. Air temperatures ranged from 58 to 81 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 69% of the total length of this survey, riffles 7% and pools 2%. The pools are mixed with 2 of the 4 (50%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended 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.

Two of the 4 pool tail-outs measured had embeddedness ratings of 2. Two of the pool tail-outs had embeddedness ratings of 4. None 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 Foss Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Two of the 4 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 48. The shelter rating in the flatwater habitats was 20. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Terrestrial Vegetation in Foss Creek. Terrestrial Vegetation is the dominant cover type in pools followed by boulders. 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 64%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 77% and 69%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

GENERAL MANAGEMENT RECOMMENDATIONS

Foss Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

1. Access for migrating salmonids should be assessed at all road crossings and culverts. Where needed crossings and culverts should be replaced or modified to improve fish passage. The concrete circular culvert on Foss Creek behind the dog park should be evaluated for fish passage.
2. Foss Creek would benefit from utilizing bio-technical vegetative techniques for bank stabilization and to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.
3. Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
4. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Terrestrial Vegetation. Adding high quality complexity with woody cover in the pools is desirable.
5. Increase the canopy on Foss Creek by planting appropriate native vegetation like 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.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position	Habitat Unit #	Comments
0	0001.00	Start of Survey:
0	0001.00	General Comment: Started about 40' from confluence



*Foss Creek 2006*

Position	Habitat Unit #	Comments
34	0002.00	General Comment: Culvert #1, Highway 101 H7 W10 L220, double box Down cutting, 0.7 feet from water to sill
280	0004.00	General Comment: Too deep to measure max., channelized Right bank - 2 culverts at 4' diameter at end of unit
1175	0006.00	Structures: Bridge #1 H8 W15 L80 No down cutting Not retaining gravel
	0007.00	Culvert #2, Mill Street H8 W16 L360, double box No Down cutting, retaining gravel
	0009.00	Culvert #3, Matheson Street H5 W9 L310 No Down cutting, Not retaining gravel
2777	0015.00	Structures: Bridge #2, North Street H7 W15 L50 No down cutting
3585	0017.00	Structures: Bridge #3, Grant Street H8 W15 L25 0.5' from water to sill
6274	0035.00	N38.61966, W122.87256 Picture taken from top of bridge
6274	0035.00	Structures: Bridge #4, Rail Road
6362	0037.00	General Comment: Concrete chunks in creek on left bank
6425	0038.00	General Comment: Riffle created by broken pieces of broken concreted
7199	0049.00	Structures: Culvert #4, Dog Park 7-foot diameter concrete pipe 1 or 2 sections separating, downstream end broken 6-foot jump from water surface to culvert
7247	0050.00	General Comment: Riprap on left bank top of unit is confluence of Foss and Norton
	0054.00	Culvert #5, Healdsburg Avenue W9.5 H4.5
7970	0058.00	General Comment: concrete slab and wall on left bank
8516	0064.00	End of Survey: Creek overgrown, then goes into culvert under residential neighborhood, length unknown EOS

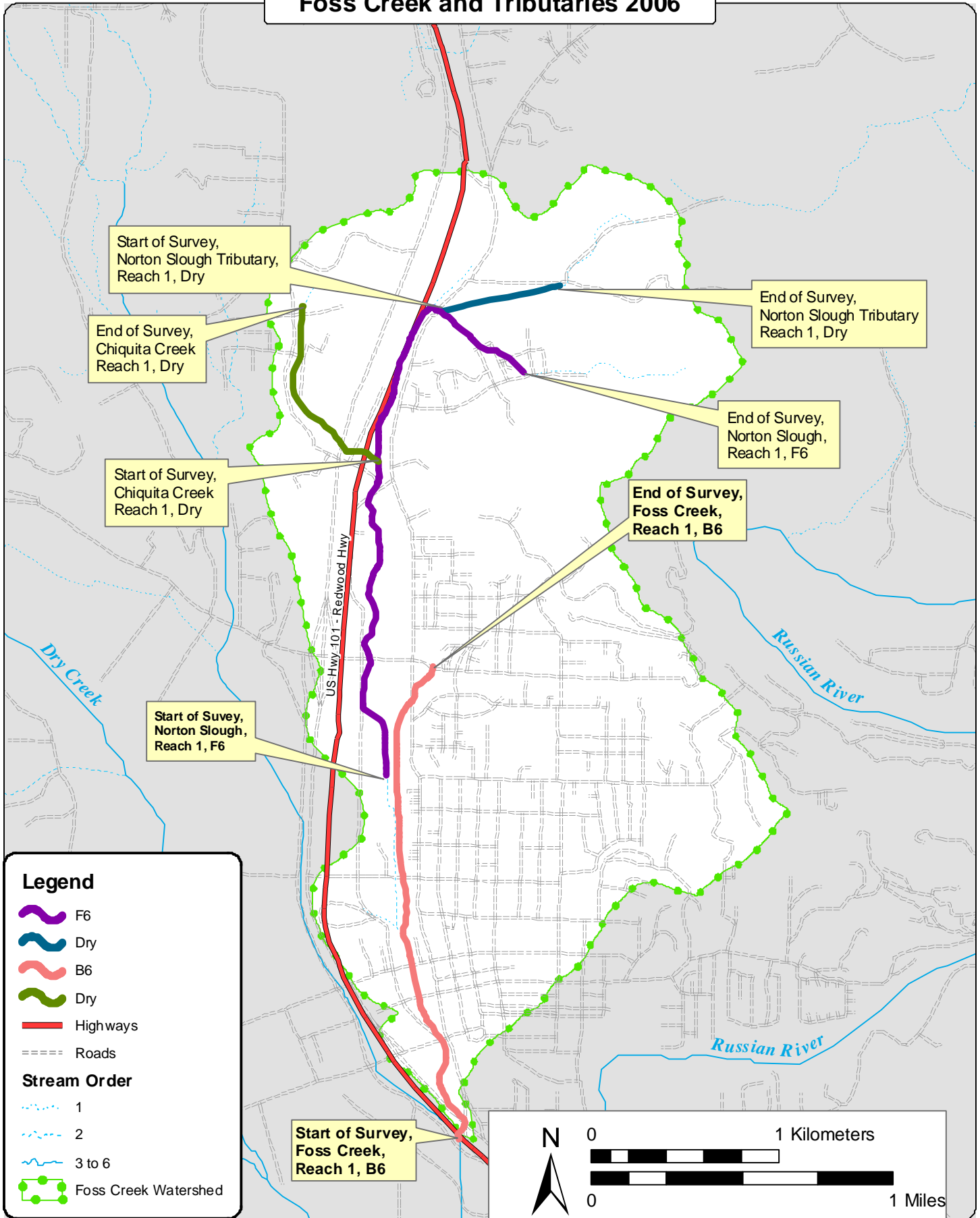
REFERENCES

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.

McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

# Foss Creek and Tributaries 2006



Start of Survey,  
Norton Slough Tributary,  
Reach 1, Dry

End of Survey,  
Chiquita Creek  
Reach 1, Dry

End of Survey,  
Norton Slough Tributary  
Reach 1, Dry

End of Survey,  
Norton Slough,  
Reach 1, F6

Start of Survey,  
Chiquita Creek  
Reach 1, Dry

End of Survey,  
Foss Creek,  
Reach 1, B6

Start of Suvey,  
Norton Slough,  
Reach 1, F6

Start of Survey,  
Foss Creek,  
Reach 1, B6

## Legend

- F6
- Dry
- B6
- Dry
- Highways
- Roads

## Stream Order

- 1
- 2
- 3 to 6
- Foss Creek Watershed



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

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
5	3	CULVERT	7.8	208	1039	12.2	6.7	0.5	1.0	1268	6340	474	2371		
31	30	FLATWATER	48.4	190	5895	69.2	8.3	1.2	1.8	2198	68151	4349	134806		20
6	0	NOSURVEY	9.4	136	813	9.5									
4	4	POOL	6.3	40	159	1.9	13.3	1.5	2.5	563	2253	1154	4617	971	48
18	18	RIFFLE	28.1	34	610	7.2	4.4	0.3	0.7	140	2522	51	915		2

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T000R000S00

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
64	55	8516	79266	142709

**Table 2 - Summary of Habitat Types and Measured Parameters**

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
17	17	LGR	26.6	34	583	6.8	4.0	0.3	1.6	139	2360	53	899		3	66
1	1	BRS	1.6	27	27	0.3	12.0	0.1	0.1	162	162	16	16		0	70
26	25	GLD	40.6	217	5633	66.1	8.0	1.3	5.2	2553	66375	5179	134650		25	64
5	5	RUN	7.8	52	262	3.1	8.0	0.5	1.1	426	2131	197	987		10	70
3	3	MCP	4.7	40	119	1.4	15.0	1.7	3.7	644	1933	1368	4105	1177	40	45
1	1	LSL	1.6	40	40	0.5	8.0	1.1	1.8	320	320	512	512	352	70	86
5	3	CUL	7.8	208	1039	12.2	7.0	0.5	1.8	1268	6340	474	2371			
6	0	NS	9.4	136	813	9.5										
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>			
64	55				8516					79621			143539			

**Table 3 - Summary of Pool Types**

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid. Vol (cu.ft.)	Mean Shelter Rating
3	3	MAIN	75	40	119	75	15.0	1.7	644	1933	1177	3530	40
1	1	SCOUR	25	40	40	25	8.0	1.1	320	320	352	352	70
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>		<b>Total Volume (cu.ft.)</b>	
4	4				159					2253		3882	

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

**Stream Name:** Foss Creek **LLID:** 1228715386133 **Drainage:** Russian River - Middle  
**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN **Legal Description:** T09N R09W S28 **Latitude:** 38:36:48.0N **Longitude:** 122:52:17.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
3	MCP	75	0	0	1	33	1	33	1	33	0	0
1	LSL	25	0	0	1	100	0	0	0	0	0	0
Total Units			Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Feet Max Resid. Depth	Total 1< 2 Feet % Occurrence	Total 2< 3 Feet Max Resid. Depth	Total 2< 3 Feet % Occurrence	Total 3< 4 Feet Max Resid. Depth	Total 3< 4 Feet % Occurrence	Total >= 4 Feet Max Resid. Depth	Total >= 4 Feet % Occurrence
4			0	0	2	50	1	25	1	25	0	0
Mean Maximum Residual Pool Depth (ft.):			2									



**Table 5 - Summary of Mean Percent Cover By Habitat Type**

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
17	4	LGR	0	25	0	0	0	0	0	25	0
1	1	BRS	0	0	0	0	0	0	0	0	0
26	2	GLD	0	0	0	0	90	0	0	5	5
5	1	RUN	0	0	0	0	0	100	0	0	0
3	3	MCP	27	0	0	2	35	0	5	32	0
1	1	LSL	0	0	0	0	100	0	0	0	0
5	0	CUL									
6	0	NS									

**Table 6 - Summary of Dominant Substrates By Habitat Type**

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28 **Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
17	4	LGR	50	0	0	0	0	25	25
1	1	BRS	0	0	0	0	0	0	100
26	3	GLD	67	0	0	0	0	33	0
5	1	RUN	0	0	0	0	0	100	0
3	3	MCP	33	67	0	0	0	0	0
1	1	LSL	100	0	0	0	0	0	0
5	0	CUL	0	0	0	0	0	0	0
6	0	NS	0	0	0	0	0	0	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

Habitat Units	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
64	0	100	0	77	69

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

Open units represent habitat units with zero canopy cover.

### Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Foss Creek LLID: 1228715386133 Drainage: Russian River - Middle  
 Survey Dates: 8/1/2006 to 8/8/2006 Survey Length (ft.): 8516 Main Channel (ft.): 8516 Side Channel (ft.): 0  
 Confluence Location: Quad: JIMTOWN Legal Description: T09N R09W S28 Latitude: 38:36:48.0N Longitude: 122:52:17.0W

#### Summary of Fish Habitat Elements By Stream Reach

##### STREAM REACH: 1

Channel Type: B6	Canopy Density (%): 64.4	Pools by Stream Length (%): 1.9
Reach Length (ft.): 8516	Coniferous Component (%): 0.0	Pool Frequency (%): 6.3
Riffle/Flatwater Mean Width (ft.): 6.8	Hardwood Component (%): 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 50.0
Range (ft.): to	Vegetative Cover (%): 72.7	2 to 2.9 Feet Deep: 25.0
Mean (ft.):	Dominant Shelter: Terrestrial Veg.	3 to 3.9 Feet Deep: 25.0
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0.14	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 2.475
Water (F): 60 - 66 Air (F): 58 - 81	LWD per 100 ft.:	Mean Pool Shelter Rating: 48
Dry Channel (ft.): 0	Riffles: 0	
	Pools: 0	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: 25.0 Sand: 0.0 Gravel: 50.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 25.0 Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0 2. 50.0 3. 0.0 4. 50.0 5. 0.0		

**Table 9 -Mean Percentage of Dominant Substrate and Vegetation**

**Stream Name:** Foss Creek **LLID:** 1228715386133 **Drainage:** Russian River - Middle  
**Survey Dates:** 8/1/2006 to 8/8/2006  
**Confluence Location: Quad:** JIMTOWN **Legal Description:** T09N R09W S28 **Latitude:** 38:36:48.0N **Longitude:** 122:52:17.0W

**Mean Percentage of Dominant Stream Bank**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage (%)
Bedrock	2	1	12.5
Boulder	1	2	12.5
Cobble/Gravel	0	0	0.0
Sand/Silt/Clay	9	9	75.0

**Mean Percentage of Dominant Stream Bank**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage (%)
Grass	5	2	29.2
Brush	4	4	33.3
Hardwood Trees	3	6	37.5
Coniferous Trees	0	0	0.0
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness** 3

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

**Stream Name:** Foss Creek

**LLID:** 1228715386133

**Drainage:** Russian River - Middle

**Survey Dates:** 8/1/2006 to 8/8/2006

**Confluence Location: Quad:** JIMTOWN

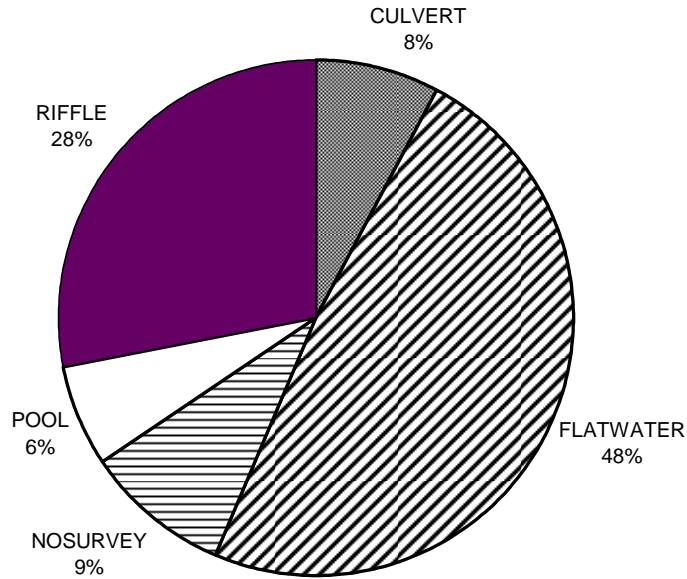
**Legal Description:** T09N R09W S28

**Latitude:** 38:36:48.0N

**Longitude:** 122:52:17.0W

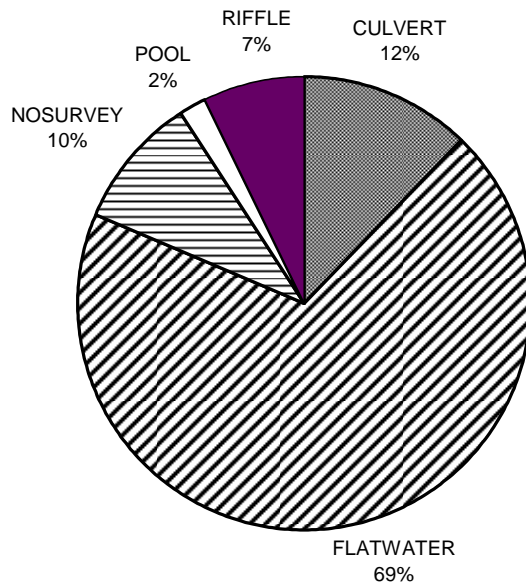
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	20
SMALL WOODY DEBRIS (%)	20	0	0
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	0	60	51
AQUATIC VEGETATION (%)	0	33	0
WHITEWATER (%)	0	0	4
BOULDERS (%)	20	3	24
BEDROCK LEDGES (%)	0	3	0

**FOSS CREEK 2006  
HABITAT TYPES BY PERCENT OCCURRENCE**



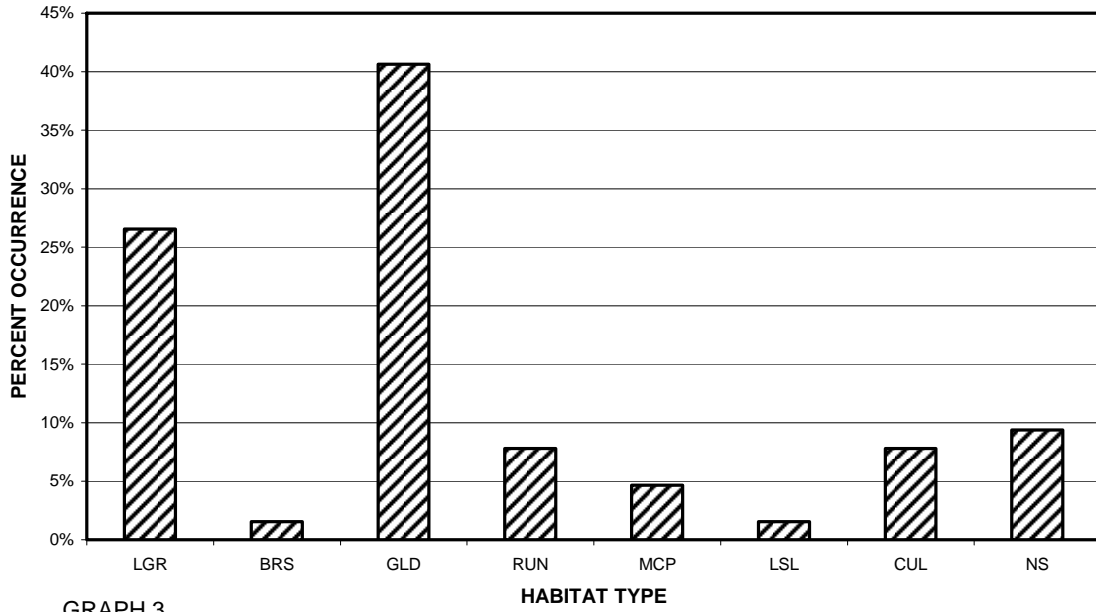
GRAPH 1

**FOSS CREEK 2006  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



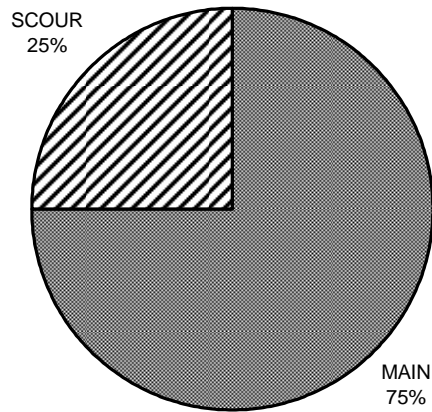
GRAPH 2

**FOSS CREEK 2006  
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 3

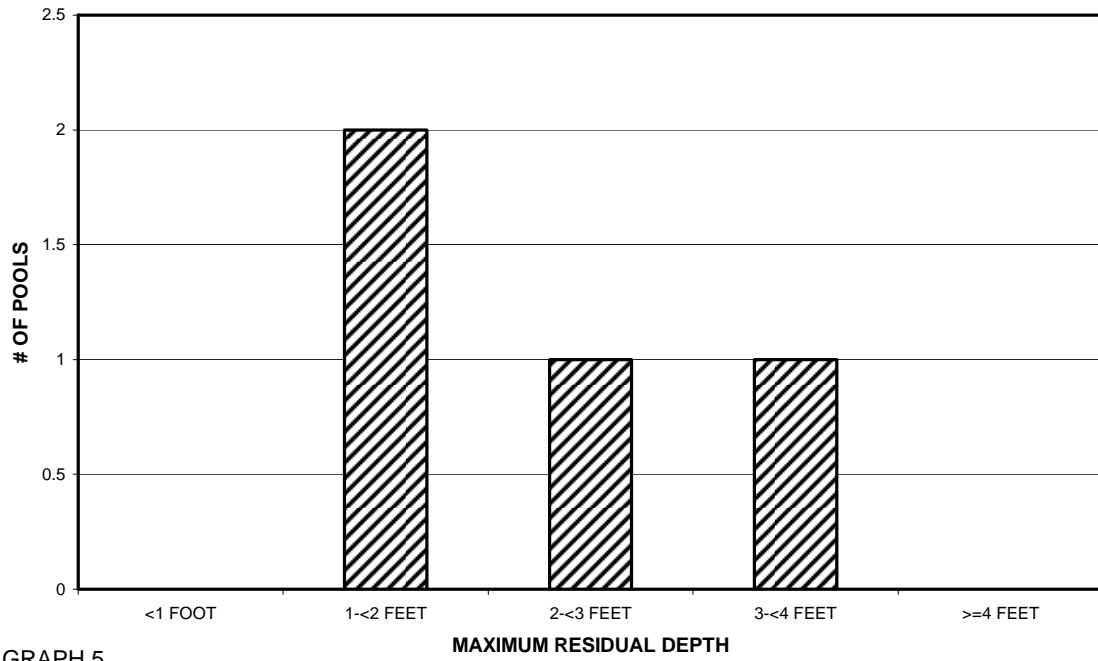
**FOSS CREEK 2006  
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

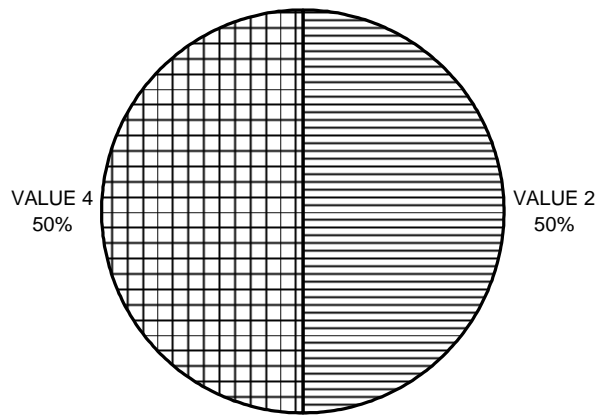


### FOSS CREEK 2006 MAXIMUM DEPTH IN POOLS



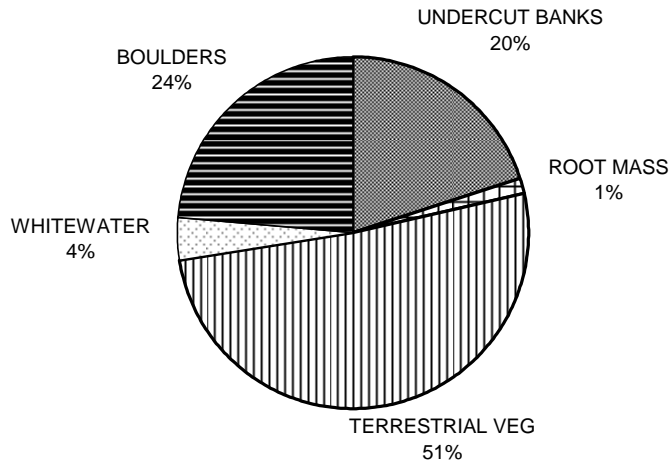
GRAPH 5

### FOSS CREEK 2006 PERCENT EMBEDDEDNESS



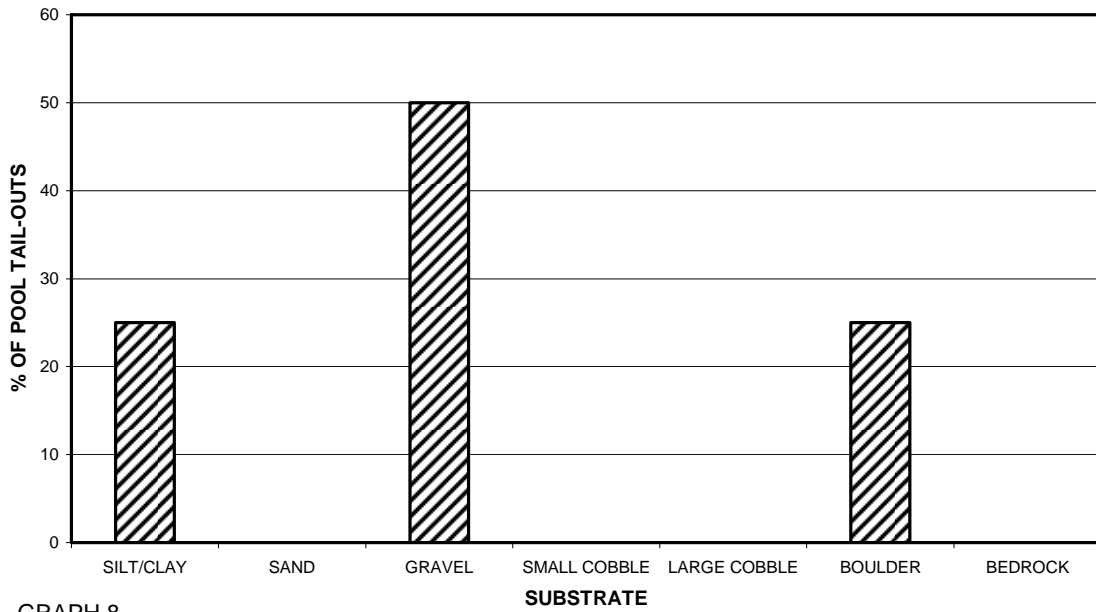
GRAPH 6

### FOSS CREEK 2006 MEAN PERCENT COVER TYPES IN POOLS



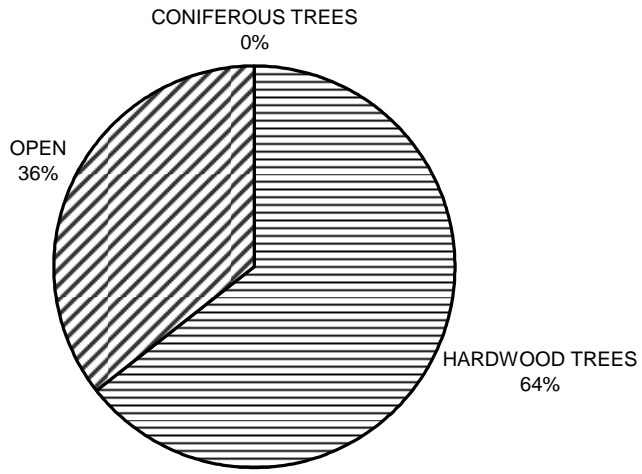
GRAPH 7

### FOSS CREEK 2006 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



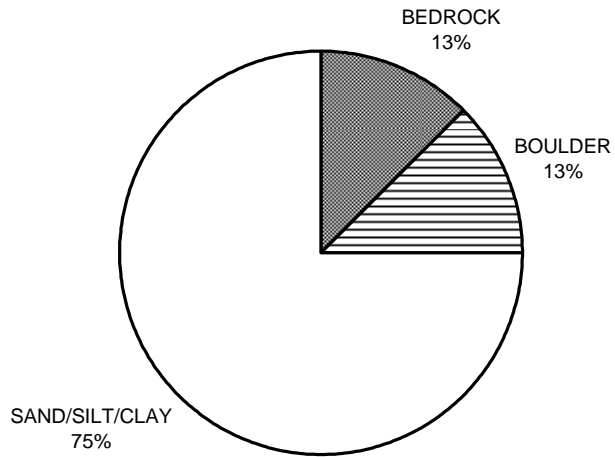
GRAPH 8

**FOSS CREEK 2006  
MEAN PERCENT CANOPY**



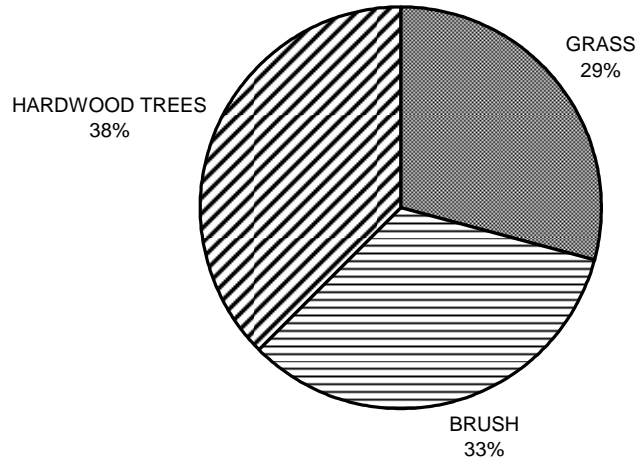
GRAPH 9

**FOSS CREEK 2006  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**FOSS CREEK 2006  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11