

CALIFORNIA DEPARTMENT OF FISH AND GAME  
STREAM INVENTORY REPORT  
**West Slough**  
*Report Completed March 20, 2007*  
*Assessment Completed 2006*

## INTRODUCTION

A stream inventory was conducted during 8/9/2006 to 8/21/2006 on West Slough. The survey began at the confluence with Dry Creek and extended upstream 3.6 miles. Subsections to this report were also completed for one tributary to West Slough. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in West Slough.

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

West Slough is a tributary to Dry Creek, a tributary to Russian River, a tributary to Pacific Ocean, located in Sonoma County, California (Map 1). West Slough's legal description at the confluence with Dry Creek is T09N R09W S33. Its location is 38°35'23.0" north latitude and 122°51'51.0" west longitude, and its LLID number is 1228643385897. According to the USGS Healdsburg 7.5 minute quadrangle, West Slough is a third order stream and has approximately 3.8 miles of blue line stream, except for a 1.3 mile section in the middle that runs intermittently. West Slough drains a watershed of approximately 12 square miles. Elevations range from about 78 feet at the mouth of the creek to 130 feet in the headwater areas. Mixed hardwood forest is the dominant vegetation surrounding the watershed. The watershed is located primarily on privately owned land. Vehicle access exists via Hwy 101 to Magnolia Drive in Healdsburg.

## METHODS

The habitat inventory conducted in West Slough 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.

## 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 West Slough 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". West Slough 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 West Slough, 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 West Slough, 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 West Slough, 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 West Slough, 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 West Slough. 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 West Slough 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

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- Mean Percent Cover Types in Pools
- 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 8/9/2006 to 8/21/2006, was conducted by Henning Fett, Kent Macintosh, Mitsuko Terry, and Russell Spangler (WSP). The total length of the stream surveyed was 19,238 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.10 cfs on 8/15/06.

West Slough is an F6 channel type for all 19,238 feet of the stream surveyed (Reach 1). F6 channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and whose substrate is predominantly silt or sand.

Water temperatures taken during the survey period ranged from 61 to 75 degrees Fahrenheit. Air temperatures ranged from 57 to 92 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% flatwater units, 18% dry units, 20% riffle units, 3% nosurvey\_marsh units, 2% pool units, 17% culvert units, 3% nosurvey units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 34% dry units, 2% riffle units, 0.5% nosurvey\_marsh units, 1% pool units, 1.5% culvert units, 14% nosurvey units (Graph 2).

Five Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 34% Glide units, 18% Dry units, and 20% Low Gradient Riffle units (Graph 3). Based on percent total length, the most frequent habitat types were 46% Glide units, 34% Dry units, and 14% Not Surveyed units.

One pool was identified in West Slough (Table 3). The pool was a Main Channel pool and comprised 100% 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. The identified pool did not have a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. The pool tail-out measured had a value of 3 (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

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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 0, flatwater habitat types had a mean shelter rating of 46, and pool habitats had a mean shelter rating of 120 (Table 1). The Main Channel pools observed had a mean shelter rating of 120 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Aquatic Vegetation is the dominant cover type in West Slough. Graph 7 describes the pool cover in West Slough. Aquatic Vegetation is the dominant pool cover type followed by terrestrial vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Sand was observed in all pool tail-outs.

The mean percent canopy density for the surveyed length of West Slough was 51%. The mean percentages of hardwood and coniferous trees were 100% and 0%, respectively (Table 7). Forty-nine percent of the canopy was open. Graph 9 describes the mean percent canopy in West Slough.

For the stream reach surveyed, the mean percent right bank vegetated was 75%. The mean percent left bank vegetated was 64% (Table 7). The dominant elements composing the structure of the stream banks consisted of 38% cobble/gravel and 62% sand/silt/clay (Graph 10). Hardwood trees were the dominant vegetation type observed in 38% of the units surveyed. Additionally, 31% of the units surveyed had brush as the dominant vegetation type, and 12% had grass as the dominant vegetation. Coniferous trees were observed at 0% (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

One site was electrofished for species composition and distribution in West Slough on September 27, 2006. The site was located above the Magnolia Drive bridge. Water temperatures taken during the electrofishing period 12:20 – 13:30 ranged from 64 to N/A degrees Fahrenheit. Air temperatures ranged from 70 to N/A degrees Fahrenheit. The sites were sampled by Mitsuko Terry (DFG) and Henning Fett (DFG).

Table 1. Biological sampling data for West Slough.

<u>Species</u>	<u>Minimum Number Observed</u>
steelhead (1+)	1
steelhead (3+)	1
roach	140
stickleback	60
sculpin	44
Sacramento sucker	25
Bluegill sunfish	10

DISCUSSION

West Slough is an F6 channel type for the entire 19,238 feet of stream surveyed. According to the California Salmonid Stream Habitat Restoration Manual, the suitability of F6 channel types for fish habitat improvement structures is graded good for bank-placed boulders. F6 channel types are also graded fair for plunge weirs, boulder clusters, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days 8/9/2006 to 8/21/2006, ranged from 61 to 75 degrees Fahrenheit. Air temperatures ranged from 57 to 92 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 47% of the total length of this survey, riffles 2%, and pools 1%. The pools are relatively shallow, with the lone observed pool (100%) having a maximum residual depth less than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth of at least three 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.

No pool tail-outs measured had embeddedness ratings of 1 or 2. The one pool tail-out measured had an embeddedness rating of 3. Likewise, no 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 West Slough should be mapped and rated according to their potential sediment yields, and control measures should be taken. The 1 pool tail-out measured had silt as the dominant substrate, which is generally considered unsuitable for spawning salmonids.

The shelter rating for the pool was 120. The shelter rating in the flatwater habitats was 46. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by aquatic vegetation in West Slough. Aquatic vegetation is the dominant cover type in pools followed by terrestrial vegetation. 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 51%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high to moderate at 75% and 64%, 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

West Slough 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. West Slough would benefit from utilizing bio-technical vegetative techniques 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.
2. Increase the canopy on West Slough by planting appropriate native vegetation like willow, alder, cottonwood and oak 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.
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 Aquatic Vegetation. Adding high quality complexity with woody cover in the pools is desirable.
5. 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.
6. The limited water temperature data available suggest that maximum temperatures are within/above 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.
7. 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.



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 (ft.)	Habitat #	Unit	Comments
0	0001.00		Start of Survey: Within the influence of Dry Creek
235	0003.00		General Comment: All glides are separated by very small dry spots
267	0004.00		Structures: Bridge # 1 Magnolia Road H 19.6 W85.0 L29.0 No down cutting Not retaining gravel
3247	0023.00		General Comment: Right bank rip rap in middle of unit
4838	0027.00		Structures: Bridge # 2 Unit # 27 H13 W10 L46 No down cutting Not retaining gravel Some erosion on left bank under footing
5998	0028.00		General Comment: About 200 feet of erosion on Kinley Drive on right bank
7464	0035.00		Structures: Bridge # 3 Westside Road H13 W78 L44 No down cutting Not retaining gravel
11636	0041.00		Structures: Kinley Drive Box Culvert L W10 H7 Down cutting yes HT. 0.2 Not Retaining Gravel No maintenance required
11696	0042.00		Structures: Bridge #4, Private H3.5 W28 L8 No down cutting Not retaining gravel
12646	0043.00		General Comment: WP 047 Re-start survey

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Position (ft.)	Habitat Unit #	Comments
14896	0044.00	Structures: Culvert WP 047
14915	0045.00	General Comment: End of access WP 048
15665	0046.00	General Comment: Re-start survey WP 049
16102	0047.00	Structures: Culvert WP 049
16516	0049.00	Structures: Culvert WP 050 L19 W3 H2.2 No down cutting Not retaining gravel
16559	0051.00	Structures: Culvert WP 051 L11 W2.5 H2 No down cutting Not retaining gravel
16577	0053.00	Structures: Culvert WP 052 L20 W3 H2.2 No down cutting Not retaining gravel Needs maintenance: Bottom rusted out
17367	0055.00	Structures: Culvert WP 053 L22 W3 H2.5 No down cutting Not retaining gravel
17510	0057.00	Structures: Culvert WP 054 L20 W3 H2.5 No down cutting Not retaining gravel
17530	0058.00	General Comment: Canopy on right bank only

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Position (ft.)	Habitat #	Unit	Comments
17937	0060.00	Structures: Culvert WP 055 L31 W3 H2.1 No down cutting Not retaining gravel	
18177	0062.00	Structures: Culvert WP 056 L20 W2 H2 No down cutting Not retaining gravel	
18813	0064.00	Structures: Culvert WP 057 L30 W2 H2 No down cutting Not retaining gravel	
19238	0065.00	End of Survey: End of Survey WP 058 No water/ no creek	

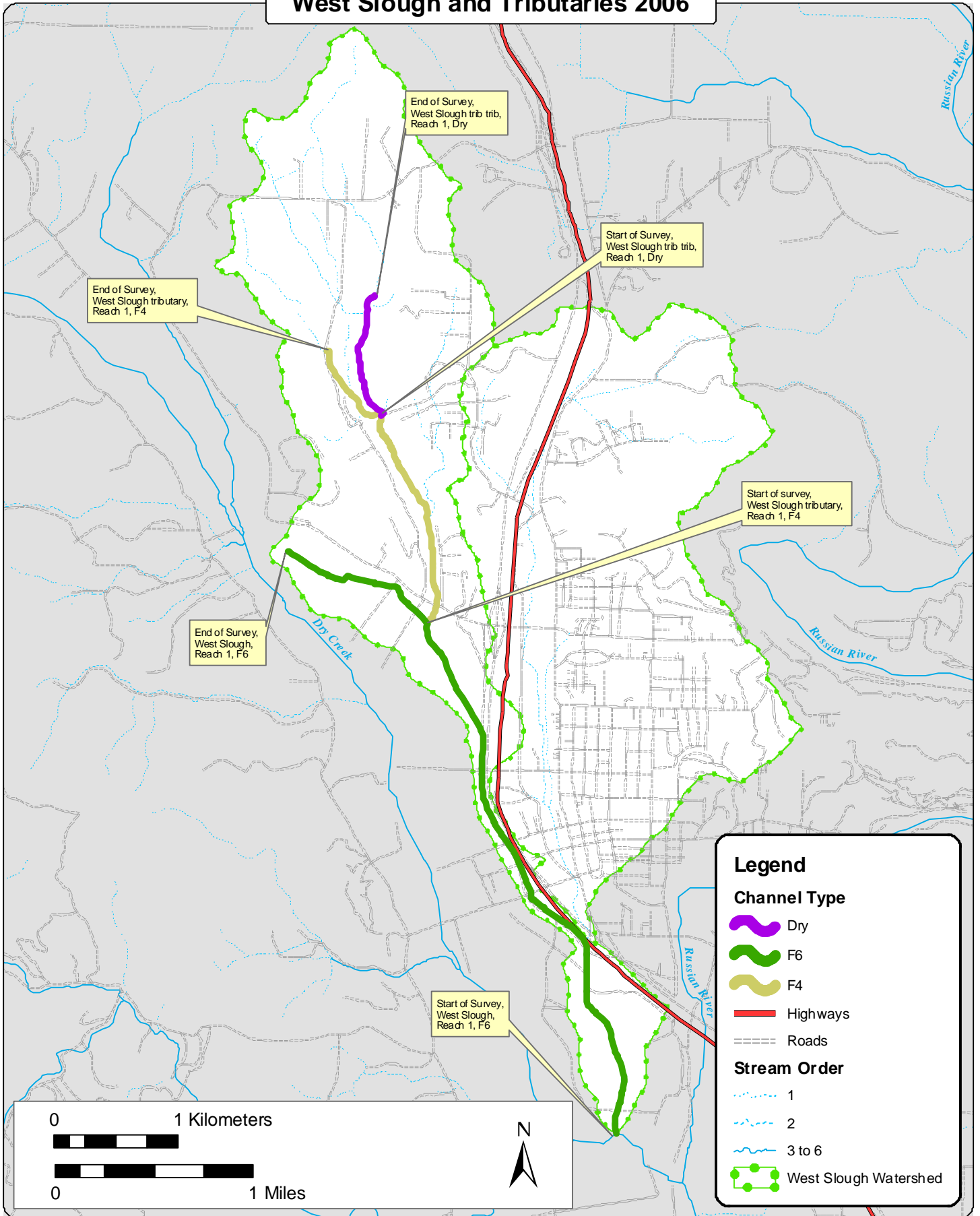
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McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.






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# West Slough and Tributaries 2006







## Legend

### Channel Type

-  Dry
-  F6
-  F4
-  Highways
-  Roads

### Stream Order

-  1
-  2
-  3 to 6
-  West Slough Watershed

0 1 Kilometers



0 1 Miles



## Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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
11	9	CULVERT	16.9	26	289	1.5	3.6	0.4	0.3	121	1336	27	98		
12	0	DRY	18.5	546	6550	34.0									0
24	20	FLATWATER	36.9	378	9065	47.1	10.7	1.2	2.0	4875	116993	7042	169003		46
2	0	NOSURVEY	3.1	1344	2687	14.0									
2	1	NOSURVEY_MARSH	3.1	50	100	0.5	14.0			420	840				
1	1	POOL	1.5	160	160	0.8	14.0	1.8	2.7	2240	2240	5824	5824	4032	120
13	13	RIFFLE	20.0	30	387	2.0	5.3	0.2	0.4	153	1991	25	327		0
<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>		
65	44				19238						123400		175252		

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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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 (%)
13	13	LGR	20.0	30	387	2.0	5.0	0.2	0.7	153	1991	25	327		0	60
22	18	GLD	33.8	405	8919	46.4	12.0	1.3	6.2	5398	118748	7820	172034		60	59
2	2	RUN	3.1	73	146	0.8	3.0	0.4	1.8	169	337	41	81		5	5
1	1	MCP	1.5	160	160	0.8	14.0	1.8	2.7	2240	2240	5824	5824	4032	120	60
12	0	DRY	18.5	546	6550	34.0									0	0
11	9	CUL	16.9	26	289	1.5	4.0	0.4	0.5	121	1336	27	98			
2	0	NS	3.1	1344	2687	14.0										
2	1	MAR	3.1	50	100	0.5	14.0			420	840					0
<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>			
65	44				19238						125491		178364			

**Table 3 - Summary of Pool Types**

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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
1	1	MAIN	100	160	160	100	14.0	1.8	2240	2240	4032	4032	120
<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>	
1	1				160					2240		4032	

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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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
1	MCP	100	0	0	0	0	1	100	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
1			0	0	0	0	1	100	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 3



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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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
13	2	LGR	0	0	0	0	0	0	0	0	0
22	3	GLD	0	27	27	7	7	0	0	0	0
2	1	RUN	0	0	0	0	0	100	0	0	0
1	1	MCP	0	0	0	0	10	90	0	0	0
11	0	CUL									
2	0	NS									
2	0	MAR									

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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33 **Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

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
13	2	LGR	0	0	50	0	0	50	0
22	3	GLD	100	0	0	0	0	0	0
2	1	RUN	100	0	0	0	0	0	0
1	1	MCP	100	0	0	0	0	0	0
11	0	CUL	0	0	0	0	0	0	0
2	0	NS	0	0	0	0	0	0	0
2	0	MAR	0	0	0	0	0	0	0

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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

Habitat Units	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
51	0	100	15	75	64

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: West Slough LLID: 1228643385897 Drainage: Russian River - Middle  
 Survey Dates: 8/9/2006 to 8/21/2006 Survey Length (ft.): 19238 Main Channel (ft.): 19238 Side Channel (ft.): 0  
 Confluence Location: Quad: GEYSERVILLE Legal Description: T09N R09W S33 Latitude: 38:35:23.0N Longitude: 122:51:51.0W

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

**STREAM REACH: 1**

Channel Type: F6	Canopy Density (%): 50.8	Pools by Stream Length (%): 0.8
Reach Length (ft.): 19238	Coniferous Component (%): 0.0	Pool Frequency (%): 1.5
Riffle/Flatwater Mean Width (ft.): 8.5	Hardwood Component (%): 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 0.0
Range (ft.): 4 to 75	Vegetative Cover (%): 69.7	2 to 2.9 Feet Deep: 100.0
Mean (ft.): 31	Dominant Shelter: Aquatic Vegetation	3 to 3.9 Feet Deep: 0.0
Std. Dev.: 31.8014674713815	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0.1	Occurrence of LWD (%): 10.0	Mean Max Residual Pool Depth (ft.): 2.7
Water (F): 61 - 75 Air (F): 57 - 92	LWD per 100 ft.:	Mean Pool Shelter Rating: 120
Dry Channel (ft.): 6550	Riffles: 0	
	Pools: 0	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 100. Gravel: 0.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 100.0 4. 0.0 5. 0.0		

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

**Stream Name:** West Slough **LLID:** 1228643385897 **Drainage:** Russian River - Middle  
**Survey Dates:** 8/9/2006 to 8/21/2006  
**Confluence Location: Quad:** GEYSERVILLE **Legal Description:** T09N R09W S33 **Latitude:** 38:35:23.0N **Longitude:** 122:51:51.0W

**Mean Percentage of Dominant Stream Bank**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage (%)
Bedrock	0	0	0.0
Boulder	0	0	0.0
Cobble/Gravel	3	3	37.5
Sand/Silt/Clay	5	5	62.5

**Mean Percentage of Dominant Stream Bank**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage (%)
Grass	1	1	12.5
Brush	2	3	31.3
Hardwood Trees	4	2	37.5
Coniferous Trees	0	0	0.0
No Vegetation	1	2	18.8

**Total Stream Cobble Embeddedness** 3

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

**Stream Name:** West Slough

**LLID:** 1228643385897

**Drainage:** Russian River - Middle

**Survey Dates:** 8/9/2006 to 8/21/2006

**Confluence Location: Quad:** GEYSERVILLE

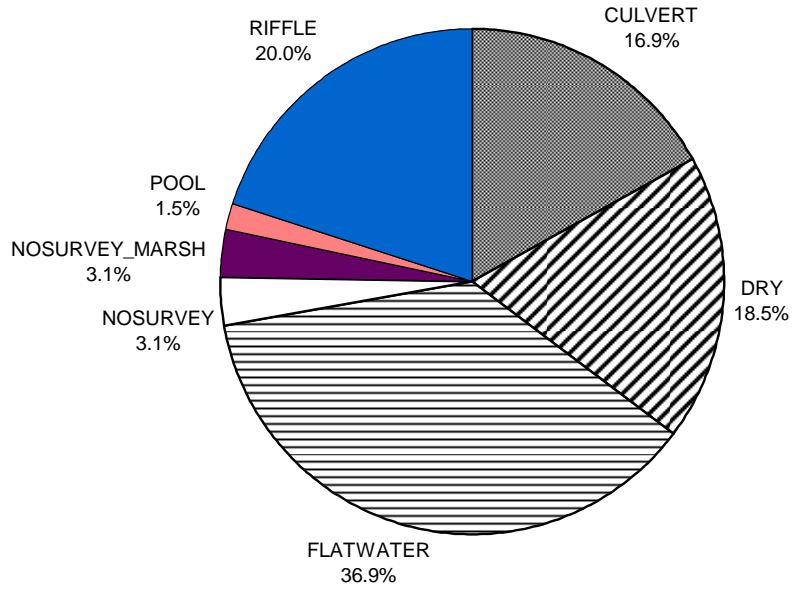
**Legal Description:** T09N R09W S33

**Latitude:** 38:35:23.0N

**Longitude:** 122:51:51.0W

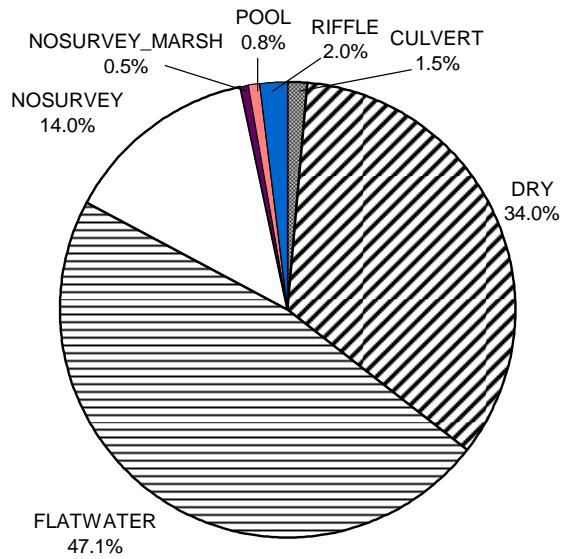
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	20	0
LARGE WOODY DEBRIS (%)	0	20	0
ROOT MASS (%)	0	5	0
TERRESTRIAL VEGETATION (%)	0	5	10
AQUATIC VEGETATION (%)	0	25	90
WHITewater (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

**WEST SLOUGH 2006  
HABITAT TYPES BY PERCENT OCCURRENCE**



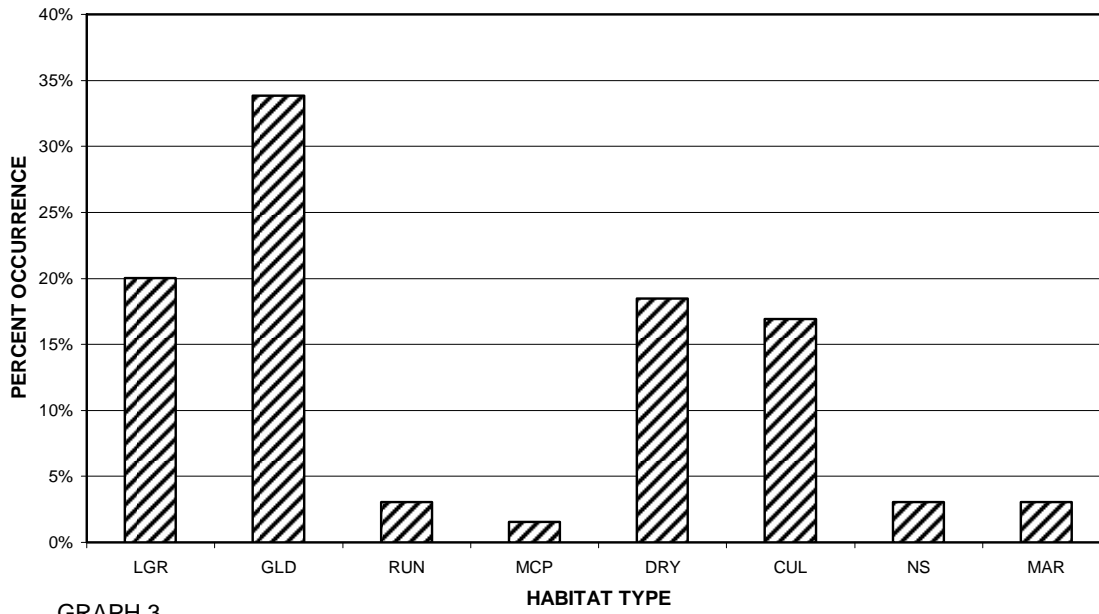
GRAPH 1

**WEST SLOUGH 2006  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



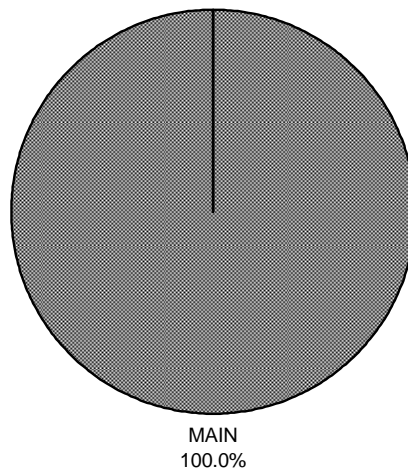
GRAPH 2

**WEST SLOUGH 2006  
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 3

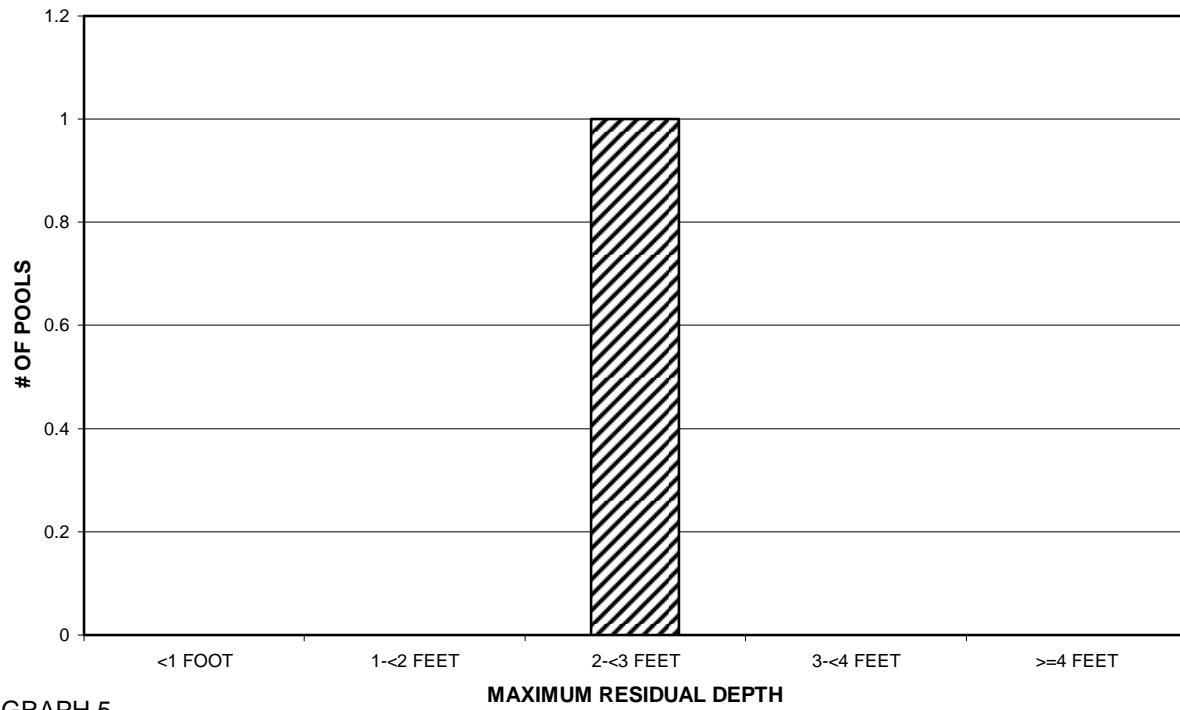
**WEST SLOUGH 2006  
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

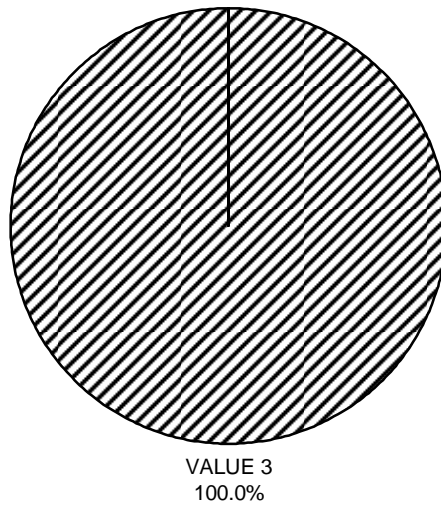


### WEST SLOUGH 2006 MAXIMUM DEPTH IN POOLS



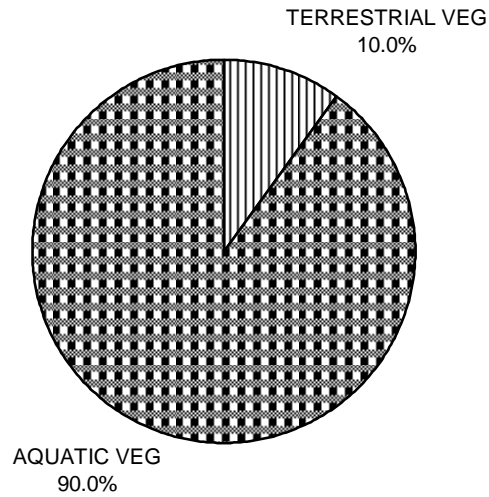
GRAPH 5

### WEST SLOUGH 2006 PERCENT EMBEDDEDNESS



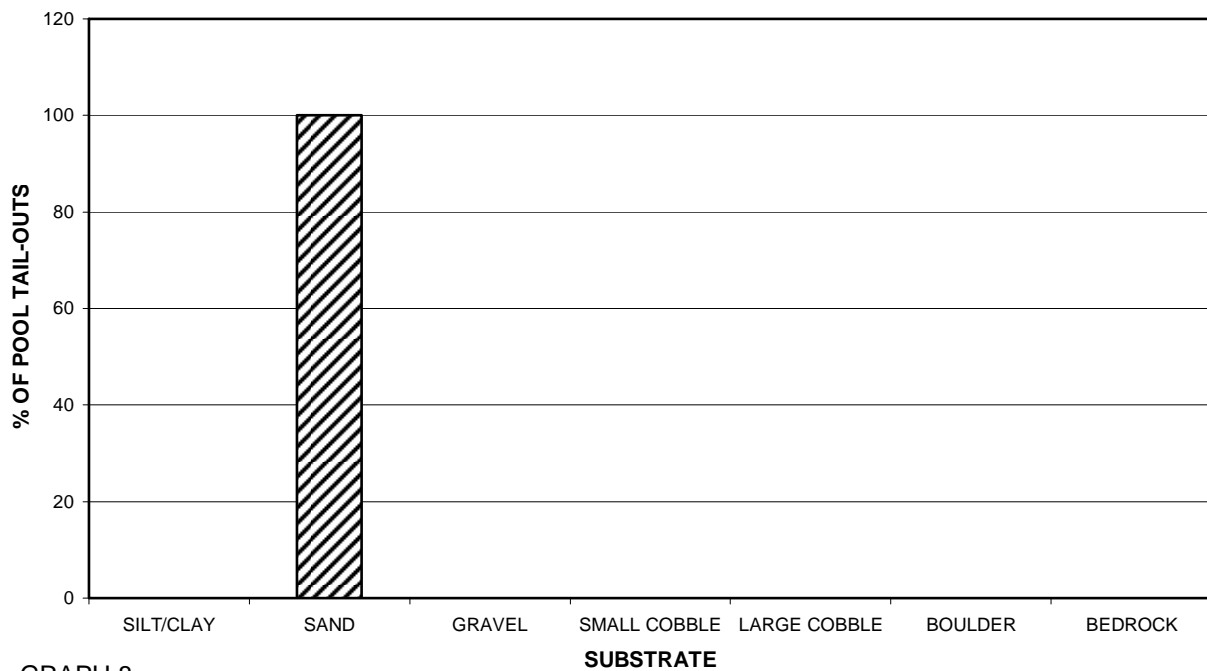
GRAPH 6

### WEST SLOUGH 2006 MEAN PERCENT COVER TYPES IN POOLS



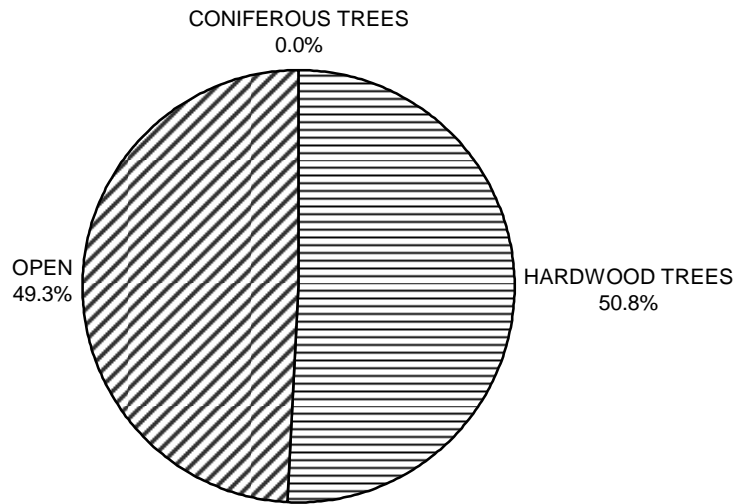
GRAPH 7

### WEST SLOUGH 2006 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



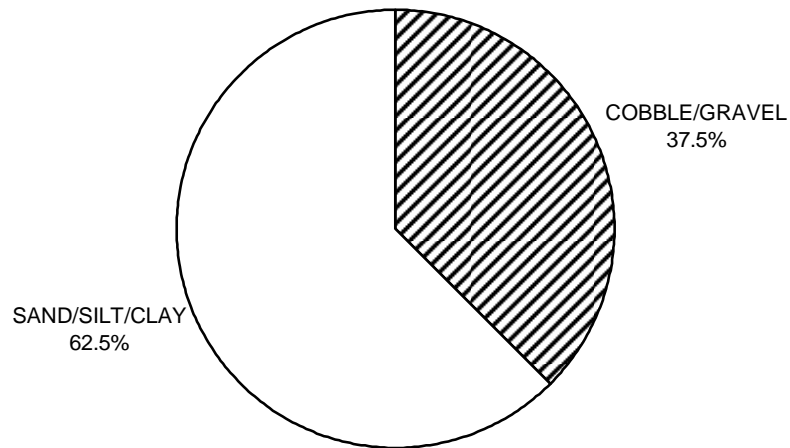
GRAPH 8

**WEST SLOUGH 2006  
MEAN PERCENT CANOPY**



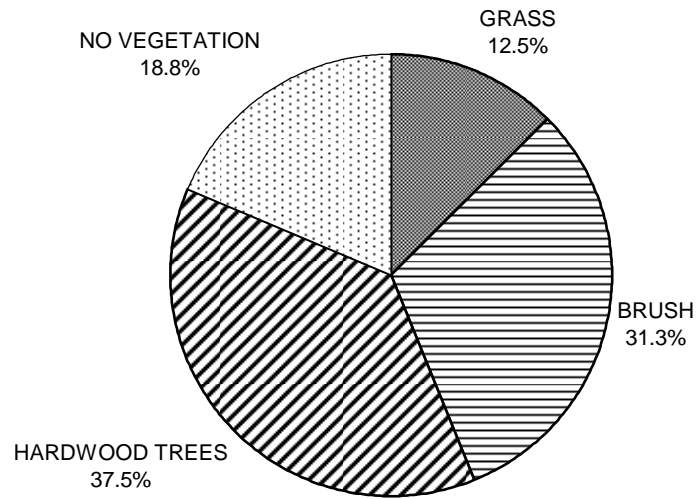
GRAPH 9

**WEST SLOUGH 2006  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**WEST SLOUGH 2006  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

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]	