

**CALIFORNIA DEPARTMENT OF FISH AND GAME  
STREAM INVENTORY REPORT**

Wood Creek

*Report Revised April 14, 2006*

*Report Completed 2005*

*Assessment Completed 2001*

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Wood Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids in Wood Creek. The objective of the biological inventory was to document the presence and distribution of salmonids and other aquatic species.

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

Wood Creek is a tributary a tributary of the Russian River, located in Sonoma County, California (see Wood Creek map, Appendix A). The legal description at the confluence with the Russian River is T10N, R9W S18 in the Rincon De Musalacon. Its location is 38.717268098327 N. latitude and 122.900292485953 W. longitude, LLID: 1229002387172. Year round vehicle access exists from Highway 101 to Rt. 128 to River Lane.

Wood Creek and its tributaries drain a basin of approximately 1.57 square miles. Wood Creek is a second order stream and has approximately 2.75 miles of blue line stream, according to the USGS Geyserville 7.5 minute quadrangles. There are no major tributaries to this creek. Summer flow was not measured. Elevations range from about 200 feet at the mouth of the creek to 778 feet in the headwaters. Oak woodland, along with non-native brush species, dominates the lower reach, where it is not being used for agricultural purposes. The mid-upper watershed is dominated by deciduous hardwood forest, including oaks, with a mix of coniferous species, including grey pines, interspersed. The watershed is owned primarily by the private landowners and is managed for vineyard development and rural living. There are no sensitive plants listed from the CNPS Inventory and DFG's Natural Diversity Database within the Wood Creek watershed. However, there were northwestern pond turtles (*Emys (=Clemmys) marmorata marmorata*) found within the watershed.

## METHODS

The habitat inventory conducted in Wood Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

## 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 (1998). This form was used in Wood Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition

### 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. Flows are also measured or estimated at major tributary confluences.

### 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 (1998). 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:

Water and air temperatures, and time, are measured by crew members with hand-held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote temperature recorders which log temperature at set intervals, 24 hours/day.

### 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. De-watered units are labeled "DRY". Wood 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 unit lengths were measured. The first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (Length, Mean Width, Mean Depth, Maximum Depth and Pool Tail Crest Depth). All measurements are 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 Wood Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). "Not suitable" (value 5) is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, absence of particulate substrate (e.g. bedrock), or other considerations.

#### 6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Wood Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

#### 7. Substrate Composition:

In all fully measured habitat units, dominant and sub-dominant substrate elements are visually estimated using a list of seven size classes: Silt/Clay, Sand, Gravel, Small Cobble, Large Cobble, Boulder, and Bedrock.

#### 8. Canopy:

Stream canopy density is estimated using modified handheld spherical densimeters as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Wood 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. Finally, the total canopy over each habitat unit is visually divided into evergreen and deciduous, and the estimated percentages are recorded.

#### 9. Bank Composition and Vegetation:

Banks may be composed primarily of (1) Bedrock, (2) Boulders, (3) Cobble/Gravel, or (4) Silt/Clay/Sand, and may be covered predominantly with (5) Grass, (6) Brush, (7) Deciduous Trees, (8) Coniferous Trees, or (9) No Vegetation at all. These factors influence the ability of stream banks to withstand winter flows. For each fully measured habitat unit in Wood Creek, the dominant Bank Composition Type and Vegetation Type of both the right and left banks were chosen from the options above. Additionally, the percentage of vegetal coverage was estimated and recorded for each bank.

## BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species present and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, and 3) electro-fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual (1998).

## DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

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

## HISTORICAL STREAM SURVEYS:

There is no record of stream surveys conducted by the Department of Fish and Game on Wood

Creek prior to this year.

## HABITAT INVENTORY RESULTS

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

The habitat inventory of Wood Creek, July 18, 2001, was conducted by L. MacTague, and J. Facendini, with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with the Russian River and extended up Wood Creek 7617 to the forks, where lack of water, poor habitat and lack of fish determined the end of the survey. The total length of stream surveyed was 7617 feet, with no length of side channel.

Flows were not measured on Wood Creek due to low flows this season.

This section of Wood Creek has three reaches with three distinct channel types: from the mouth to 3647 feet a F6, 1072 feet a B5 and 2898 feet a F4.

F6 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly silt/clay substrate.

B5 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly sand substrate.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate.

Water temperatures ranged from 54°F to 55°F. Air temperatures ranged from 60°F to 75°F.

Summer temperatures were also measured using a remote temperature recorder placed in a dammed pool (see Temperature Summary graphs at end of report). A recorder in Reach 3 (adjacent to 130 Rossi Rd.) logged temperatures every two hours from July 12, 2001 - October 28, 2001. The highest temperature recorded was 62°F in August and the lowest was 55°F in October. The mean of the daily highs was 60.4°F for the month of July, 60.9°F for the month of August, 60.1°F for the month of September and 58.7°F for the month of October.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 27.4% Pool units, 27.4% Flatwater units, 24.2% Dry units and 21.0% Riffle units (Graph 1). Based on total *length* there were 70.3% Dry units, 16.9% Flatwater units, 7.2% Riffle units and 5.6% Pool units (Graph 2).

Sixty-two habitat units were measured and 29% were completely sampled. Eight Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent *occurrence* were Glide at 26%, Dry at 24%, Low Gradient Riffle at 21%, Plunge Pool at 11% and Mid-Channel Pool at 8%.(Graph 3). By percent total *length*, Dry at 70%, Glide at 15% and Low Gradient Riffle at 7%.

Seventeen pools were identified (Table 3). Plunge Pool pools were most often encountered at 11% (Table 2), and comprised 33% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth.

Nine of the 17 pools (53%) had a depth of two feet or greater (Graph 5). These deeper pools comprised 48% of the total length of stream habitat.

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. Pools rated 40, Riffles rated 35 and Flatwater units rated 35 (Table 2). Of the pool types, Mid-Channel Pool rated 53, Plunge Pool rated 45, Lateral Scour Pool - Root Wad Enhanced rated 30 and Corner Pool rated 10 (Table 2).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Undercut Banks at 49%, Root Mass at 21%, Terrestrial Vegetation at 11% and Boulders at 10% (Graph 7).

Table 6 summarizes the dominant substrate by habitat type. Of the four (out of 13) Low-Gradient Riffles surveyed, the dominant substrate was: Small Cobble in one riffles, Silt & Clay in one riffles, Sand in one riffles and Gravel in one riffles.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 16 pool tail-outs measured, one had a value of 1 (6%), nine had a value of 2 (56%) and four had a value of 3 (25%). Two (13%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of 1 is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 93%. The mean percentages of deciduous and evergreen trees were 76% and 21%, respectively (Table 7). Graph 9 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 69% and the mean percent left bank vegetated was 71% (Table 7). For the habitat units measured, the dominant vegetation types for the stream banks were: 78% Brush, 11% Grass and 11% Deciduous Trees (Table 9, Graph 11). The dominant substrate for the stream banks were: 94% Silt, Clay & Sand, 3% Boulder and 3% Bedrock (Table 9, Graph 10).

## BIOLOGICAL INVENTORY

### JUVENILE SURVEYS:

Only one fish, a 6" Steelhead Trout, was observed in this creek in 2001. It was seen in Reach 2. However, this was a visual observation only. No fish were found in the subsequent electro-fishing survey.

On October 22, 2001, a biological inventory was conducted in Wood Creek to document the fish species composition and distribution. The one site surveyed was single-pass electro-fished using one Smith Root Model 12 electro-fisher. No fish were found. Air temperatures ranged from 75° to 81°F and water temperatures ranged from 58° to 59°F.

The inventory of Site 1 started at habitat unit 018 and ended approximately 396 feet upstream. In run, pool and scour pool habitats, no steelhead or fish of any kind were observed but two salamanders were seen.

During the habitat inventory, no salmonids/anadromous salmonids were observed upstream of unit 014, 4183 feet above the confluence with the Russian River. The lack of salmonids is not associated with any barriers or impediments to passage

A summary of historical and recent data collected appears in the table below.

Table 1. Species Observed in Historical and Recent Surveys			
YEARS	SPECIES	SOURCE	Native/Introduced
2001	Steelhead	DFG	N
2001	Pacific Giant Salamander	DFG	N
2001	Crayfish	DFG	N

Historical records reflect that hatchery raised steelhead fingerlings were stocked in Woods Creek in 1983 (Table 1).

Table 1. Summary of fish hatchery stocking into Woods Creek				
YEAR	SOURCE	SPECIES	#	SIZE
1983	Warm Springs	SH	3,040	FING

Warm Springs = Warm Springs Hatchery (Geyserville)

SH = steelhead

FING = fingerling

**ADULT SURVEYS:**

No carcass or spawning information exists in DFG for Wood Creek.

## DISCUSSION

Wood Creek has three reaches: 3647 feet a F6, 1072 feet a B5 and 2898 feet a F4.

According to the DFG Salmonid Stream Habitat Restoration Manual, F6 channel types are good for bank-placed boulders and fair for low-stage weirs, boulder clusters, single and opposing wing deflectors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

B5 channel types are excellent for bank-placed boulders and log cover. They are also good for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey day July 18, 2001 ranged from 54°F to 55°F. Air temperatures ranged from 60°F to 75°F. The warmest water temperatures were recorded in Reach 3. This temperature regime is favorable to salmonids.

Summer temperatures measured using remote temperature recorders placed in a pool ranged from 55° to 62°F for Reach 3. The Temperature Summary graph shows that for much of the summer (July through October) the low/mid watershed exhibited temperatures at the optimal for salmonids.

It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and/or more extensive biological sampling conducted.

Pools comprised 6% of the total length of this survey. 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. In Wood Creek, the pools are relatively deep with 53% having a maximum depth of at least two feet. These pools comprised 48% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 40. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by Undercut Banks at 55%, Root Mass at 25%, Terrestrial Vegetation at 11% and Boulders at 5%. Log



and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Two of the four low gradient riffles measured (50%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Twenty-five percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 6% had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead. In a reach comparison, Reaches 2 and 3 had the best ratings and Reach 1 had the poorest ratings.

The mean percent canopy for the survey was 93%. This is a very good percentage of canopy, since 80 percent is generally considered desirable.

### GENERAL MANAGEMENT RECOMMENDATIONS

Wood 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.

### PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

- 1) Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.
- 2) In Wood Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 3) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.
- 4) Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

- 5) There are several log debris accumulations present on Wood Creek that have the potential for causing bank erosion. The modification of these debris accumulations is not recommended at this time, but they should be monitored. If modification becomes necessary, it must be done carefully to preserve existing habitat provided by the woody debris.

**WOOD CREEK 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.

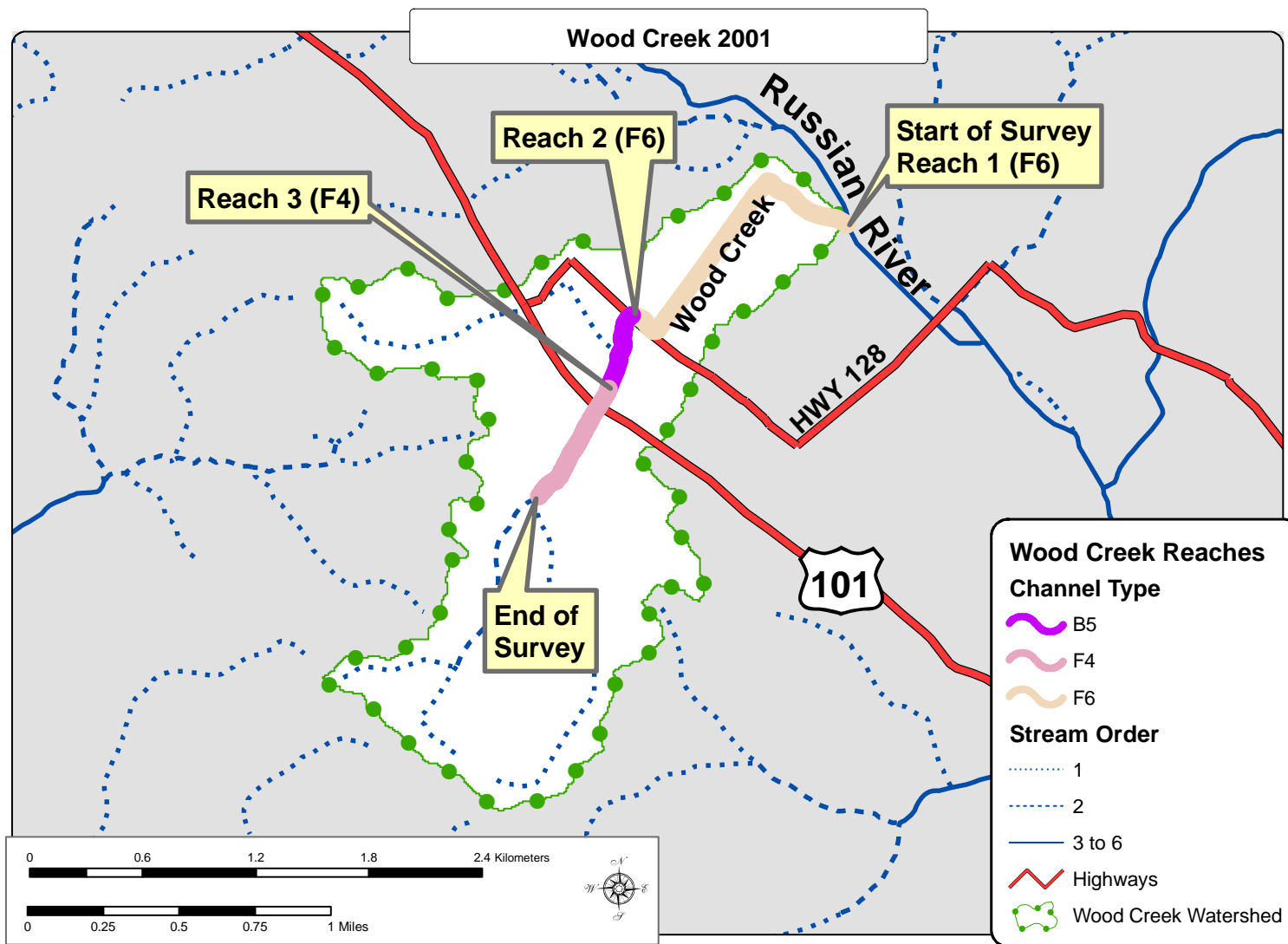
Wood Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	0' RB <i>Arundo</i> . Mainstream full of <i>Arundo</i> . 60' RB Himalayan Blackberries; RB <i>Arundo</i> ends. 67' LB <i>Arundo</i> . 100' LB <i>Arundo</i> ends. 114' RB blackberry ends. 129' Instream washing machine. All sorts of garbage intermittently in stream over entire reach. RB begins rip rap. 275' begin OV use crossing creek and instream. 278' Rip rap ends on RB. 280-290' Dirt car crossing. 366' OV use ends 566' some native blackberries. 716' RB acacia tree. 750' begin burned area. 768' RB Junipers (not T. calif) 782' LB. <i>Arundo</i> patch. 871, 885 LB <i>Arundo</i> , RB non-native pines. 1066' end burned area. RB non-native cactus. 1100' RB telephone pole line begins. 1290' channel totally blocked by blackberries. 1400' Debris accumulation-SEE FORM; blackberry bushes and lots of sand. 1445' Begin trenched channel. 1648' LB 2' culvert-appears not to have a flow. 1729' LB 1' culvert as above. 2000' RB 1' satellite dish on power pole. 2012'-2113' LB plum trees. 2252-2324' S-Culvert crossing for train tracks- SEE FORM. 2354' RB Alternative housing in oak. SEE PHOTO. ALSO, begin gravel substrate. 2518' LB <i>Arundo</i> patch. 2800' Himalayan Blackberries on both banks here to HWY 128. Good canopy from here to HWY 128. 2927'-2995' RB rip rap 4' culvert @ 2977'; Damp. 3125' LB- This corner eroding away toward vineyard. 3718-34' LB all erosion. SEE PHOTO. Mostly shored up w/ bed springs and concrete. 3588' culvert-like concrete bridge for 128'-SEE FORM. 3647' 4" chest high pipe crossing creek. End of access. Unit continues dry through private property.

3647	0002.00	59'-115' <i>Arundo</i> ; Here to FWY is back yards/non-native species, etc; Begin unit at willow, 210' upstream from <i>Arundo</i> patch; 38°42'42.5"/122°54'50.2"; WP062
3762	0003.00	<i>Arundo</i> and lots of non-natives. RB supported by 2x4s and sheet metal
3984.9	0010.00	WP 063; 38°92'39.4"/122°54'49.9"
4155.5	0014.00	Crawfish/Steelhead(6"); RB concrete bag bank @15'
4183	0015.00	Culvert top of unit. SEE FORM
4202	0016.00	500' is culvert. Flow is from LB well, 50' up slope
4719.2	0017.00	Channel Type Change; Himalayan Blackberries from culvert on
5289.2	0018.00	Bridge at top-SEE FORM; 38°42'27.3"/122°54'56.1"
5377.2	0020.00	Paved Rd. (Ross Rd.) on left bank up WP 067/38°42'26.3"/122°54'59.2"
5545.2	0024.00	LB Rip Rap into bed
5568.2	0026.00	LB culvert @ 105' (D.T.)
5814.9	0030.00	WP 068; 38°42'22.5"/122°54'59.1"; RB Rip Rap filled dry gully @ 7' up river Structures 10' up slope. LB tiny culvert and gully, seeping @ 28'
5851.7	0031.00	LB Rip Rap and slash @ top of unit
5873.9	0032.00	RB beginning of retaining wall for bridge @ 38'; LB Rip Rap @ 38'
5938.6	0034.00	Bridge-SEE FORM Rip Rap from bridge to end of unit
5988.6	0035.00	RB house. Rip rap continues. Structure right on bank

6024.7	0036.00	RB Rip Rap @41'. Restraining wall @ 62.5'-105'
6169	0038.00	RSP Weir @ 48'
6289.9	0040.00	WP 070; 38`42'19.2"/122`55'02.0"
6342	0042.00	LB all Rip Rap and slash
6541.2	0050.00	WP 071/38`42'18.8"/12`55'2.4"
6564	0051.00	Breezewood Rd. begins LB; culverted road crossing bottom of unit SEE FORM
6707.1	0053.00	Oily layer actually provides 90% coverage
7200.6	0056.00	LB minor erosion from RB @ 10'
7233.7	0057.00	Accumulation: SEE FORM-(A/2.5/15/B/6)
7259.4	0058.00	RB dry gully @ 11'; LB dry gully leading to culvert @ 51'
7420.6	0059.00	Foul water, erosion from road
7437.6	0060.00	WP 73/38`42'15.1"/122`55'5.8"; power lines cross creek here; Accumulation at bottom of unit-SEE FORM(BA/1/10/B/6)
7528.5	0062.00	Stopped @ Confluence. Dry beyond both channels; END OF SURVEY; Habitat, without water; WP 074/38`42'14.1"/122`55'7.3"

APPENDIX A: MAP



L:\mondo3\data\stream-maps\WoodCreek2001.mxd

Prepared by: Celeste Dodge and Colin Brooks, March 23, 2005

## APPENDIX B: TABLES

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

Stream Name: Wood Creek

LLID:

1229002387172

Drainage:

Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Confluence Location:

Quad: GEYSERVILLE

Legal Description:

T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

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
15	1	DRY	24.2	357	5358.1	70.3	7.0								0
17	3	FLATWATER	27.4	76	1286.7	16.9	7.0	0.7	1.3	460	7820	424	7211		35
17	16	POOL	27.4	25	424.6	5.6	12.7	0.9	1.9	270	4584	279	4442	267	40
13	4	RIFFLE	21.0	42	548.1	7.2	4.0	0.2	0.4	137	1782	27	355		35
<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>		
62	24				7617.5					14186			12008		

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

Stream Name: Wood Creek

LLID:

1229002387172

Drainage: Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Confluence Location: Quad: GEYSERVILLE

Legal Description: T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	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	4	LGR	21.0	42	548	7.2	4	0.2	0.5	137	1782	27	355		35	91
16	2	GLD	25.8	73	1172	15.4	6	0.5	1.1	276	4416	140	2232		10	99
1	1	RUN	1.6	115	115	1.5	8	1.2	2.3	828	828	994	994		60	95
5	4	MCP	8.1	28	139	1.8	7	0.9	2.1	151	755	151	755	138	53	96
3	3	CRP	4.8	30	89	1.2	5	0.8	2	152	457	131	392	126	10	95
2	2	LSR	3.2	28	56	0.7	49	0.8	1.8	1001	2003	957	1915	943	30	100
7	7	PLP	11.3	20	142	1.9	9	1.0	2.7	179	1250	212	1270	198	45	97
15	1	DRY	24.2	357	5358	70.3	7			0	0				0	82

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
62	24	7617.5	11491	7912

**Table 3 - Summary of Pool Types**

Stream Name: Wood Creek

LLID:

1229002387172

Drainage:

Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Confluence Location: Quad: GEYSERVILLE

Legal Description: T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

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
5	4	MAIN	29	28	139	33	6.8	0.9	151	755	138	689	53
12	12	SCOUR	71	24	286	67	14.7	0.9	309	3710	314	3451	33
<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>	
17	16				424.6					4465		4141	



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

Stream Name: Wood Creek

LLID:

1229002387172

Drainage: Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Confluence Location:

Quad: GEYSERVILLE

Legal Description:

T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

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
4	MCP	25	0	0	3	75	1	25	0	0	0	0
3	CRP	19	0	0	2	67	1	33	0	0	0	0
2	LSR	13	0	0	2	100	0	0	0	0	0	0
7	PLP	44	0	0	3	43	4	57	0	0	0	0

Total Units

	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Foot Max Resid. Depth	Total 1 < 2 Foot % Occurrence	Total 2 < 3 Foot Max Resid. Depth	Total 2 < 3 Foot % Occurrence	Total 3 < 4 Foot Max Resid. Depth	Total 3 < 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
16	0	0	10	62	6	38	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.9

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

Stream Name: Wood Creek LLID: 1229002387172 Drainage: Russian River - Middle  
 Survey Dates: 7/18/2001 to 7/18/2001 Dry Units: 15  
 Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:43:02.0N Longitude: 122:54:01.0W

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	4	LGR	0	13	0	0	63	0	0	0	0
13	4	TOTAL RIFFLE	0	13	0	0	63	0	0	0	0
16	1	GLD	30	20	0	50	0	0	0	0	0
1	1	RUN	0	0	0	0	100	0	0	0	0
17	2	TOTAL FLAT	15	10	0	25	50	0	0	0	0
5	5	MCP	43	0	0	15	24	0	0	16	0
3	3	CRP	67	3	30	0	0	0	0	0	0
2	1	LSR	10	0	0	85	5	0	0	0	0
7	6	PLP	53	1	0	27	8	0	0	11	2
17	15	TOTAL POOL	49	1	6	21	11	0	0	10	1
62	22	TOTAL	35	4	4	17	24	0	0	7	0

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

Stream Name: Wood Creek

LLID:

1229002387172

Drainage: Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Dry Units: 15

Confluence Location: Quad:

GEYSERVILLE

Legal Description: T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

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	4	LGR	25	25	25	25	0	0	0
16	2	GLD	0	100	0	0	0	0	0
1	1	RUN	100	0	0	0	0	0	0
5	2	MCP	50	50	0	0	0	0	0
3	1	CRP	0	0	100	0	0	0	0
2	1	LSR	0	0	100	0	0	0	0
7	4	PLP	25	75	0	0	0	0	0

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

Stream Name: Wood Creek LLID: 1229002387172 Drainage: Russian River - Middle  
 Survey Dates: 7/18/2001 to 7/18/2001  
 Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:43:02.0N Longitude: 122:54:01.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
93	21	76	0	69	71

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 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Wood Creek

LLID:

1229002387172

Drainage: Russian River - Middle

Survey Dates: 7/18/2001 to 7/18/2001

Confluence Location:

Quad: GEYSERVILLE

Legal Description:

T000R000S00

Latitude: 38:43:02.0N

Longitude: 122:54:01.0W

**Mean Percentage of Dominant Stream Bank Substrate**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	1	0	2.8
Boulder	1	0	2.8
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	16	18	94.4

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	1	3	11.1
Brush	14	14	77.8
Hardwood Trees	3	1	11.1
Coniferous Trees	0	0	0.0
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:**

3

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

StreamName: Wood Creek LLID: 1229002387172 Drainage: Russian River - Middle  
 Survey Dates: 7/18/2001 to 7/18/2001  
 Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:43:02.0N Longitude: 122:54:01.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	15	49
SMALL WOODY DEBRIS (%)	13	10	1
LARGE WOODY DEBRIS (%)	0	0	6
ROOT MASS (%)	0	25	21
TERRESTRIAL VEGETATION (%)	63	50	11
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	10
BEDROCK LEDGES (%)	0	0	1

## APPENDIX C

**Table 8 - Fish Habitat Inventory Data Summary**

Stream Name: Wood Creek	LLID: 1229002387172	Drainage:
Russian River -		
Survey Dates: 7/18/2001 to 7/18/2001	Survey Length (ft.): 7617.5	Main Channel (ft.): 7617.5 Side Channel
(ft.): 0		
Confluence Location: Quad: GEYSERVILLE	Legal Description: T000R000S00	Latitude: 38:43:02.0N Longitude: 122:54:01.0W

### Summary of Fish Habitat Elements By Stream Reach

**STREAM REACH: 1**

Channel Type: F6	Canopy Density (%): 5.0	Pools by Stream Length
(%): 0.0		
Reach Length (ft.): 3647	Coniferous Component (%): 20.0	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%): 80.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Grass	< 2 Feet Deep:
Range (ft.): to	Vegetative Cover (%): 90.0	2 to 2.9 Feet Deep:
Mean (ft.):	Dominant Shelter:	3 to 3.9 Feet Deep:
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep:
Base Flow (cfs):	Occurrence of LWD (%):	Mean Max Residual Pool
Depth (ft.):		
Water (F): 0 - 0 Air (F): 69 - 69	LWD per 100 ft.:	Mean Pool Shelter Rating:
Dry Channel (ft.): 3647	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: Bedrock:	Sand: Gravel: Sm Cobble: Lg Cobble: Boulder:	
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0		

**STREAM REACH: 2**

Channel Type: B5	Canopy Density (%): 98.9	Pools by Stream Length
(%): 12.7		
Reach Length (ft.): 1072.2	Coniferous Component (%): 0.0	Pool Frequency (%):
33.3		
Riffle/Flatwater Mean Width (ft.): 5.5	Hardwood Component (%): 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 80.0
Range (ft.): to	Vegetative Cover (%): 81.7	2 to 2.9 Feet Deep: 20.0
Mean (ft.):	Dominant Shelter: Terrestrial Veg.	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool
Depth (ft.): 1.66		
Water (F): 54 - 54 Air (F): 60 - 65	LWD per 100 ft.:	Mean Pool Shelter Rating: 68
Dry Channel (ft.): 0	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 40.0 Sand: 0.0 Gravel: 60.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0		
Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0 2. 20.0 3. 40.0 4. 0.0 5. 40.0		

### Summary of Fish Habitat Elements By Stream Reach

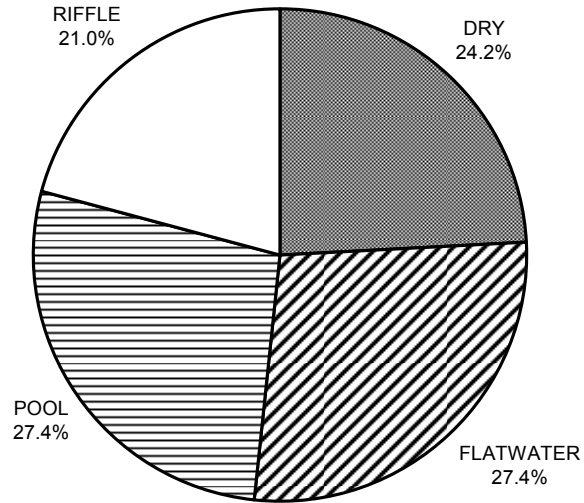
**STREAM REACH: 3**

Channel Type: F4 (%): 10.0	Canopy Density (%): 94.0	Pools by Stream Length
Reach Length (ft.): 2898.3 26.1	Coniferous Component (%): 29.8	Pool Frequency (%):
Riffle/Flatwater Mean Width (ft.): 5.0	Hardwood Component (%): 70.2	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 54.5
Range (ft.):           to	Vegetative Cover (%): 60.8	2 to 2.9 Feet Deep: 45.5
Mean (ft.):	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 5.6	Mean Max Residual Pool
Depth (ft.): 1.94	LWD per 100 ft.:	Mean Pool Shelter Rating: 26
Water (F): 54 - 55   Air (F): 60 - 75	Riffles:	
Dry Channel (ft.): 1711.1	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0   Sand: 0.0   Gravel: 45.5   Sm Cobble: 54.5   Lg Cobble: 0.0   Boulder: 0.0		
Bedrock: 0.0		
Embeddedness Values (%): 1. 9.1   2. 72.7   3. 18.2   4. 0.0   5. 0.0		



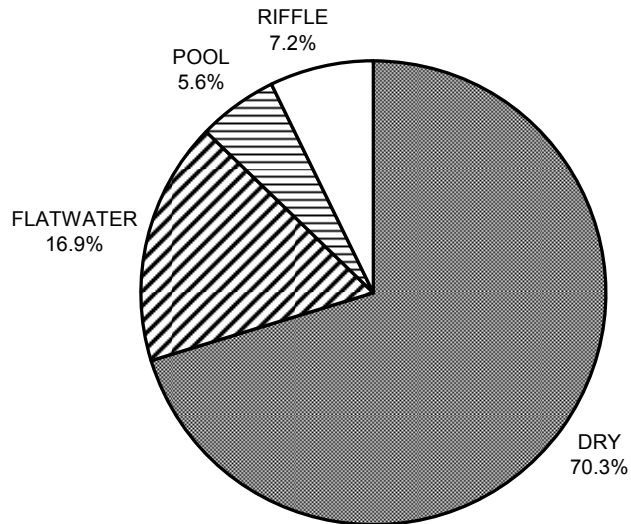
APPENDIX D: GRAPHS

**WOOD CREEK 2001  
HABITAT TYPES BY PERCENT OCCURRENCE**



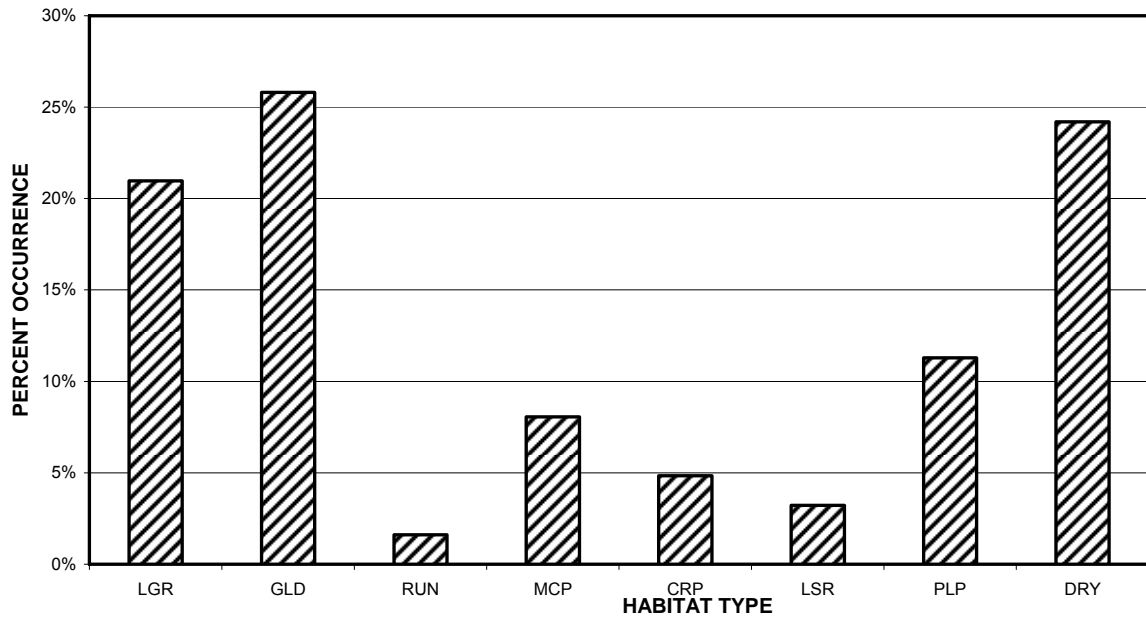
GRAPH 1 Level II habitat types by percent occurrence

**WOOD CREEK 2001  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



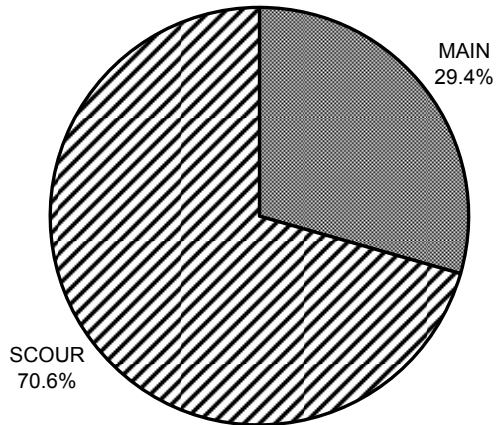
GRAPH 2 Level II habitat types by percent total length

**WOOD CREEK 2001  
HABITAT TYPES BY PERCENT OCCURRENCE**



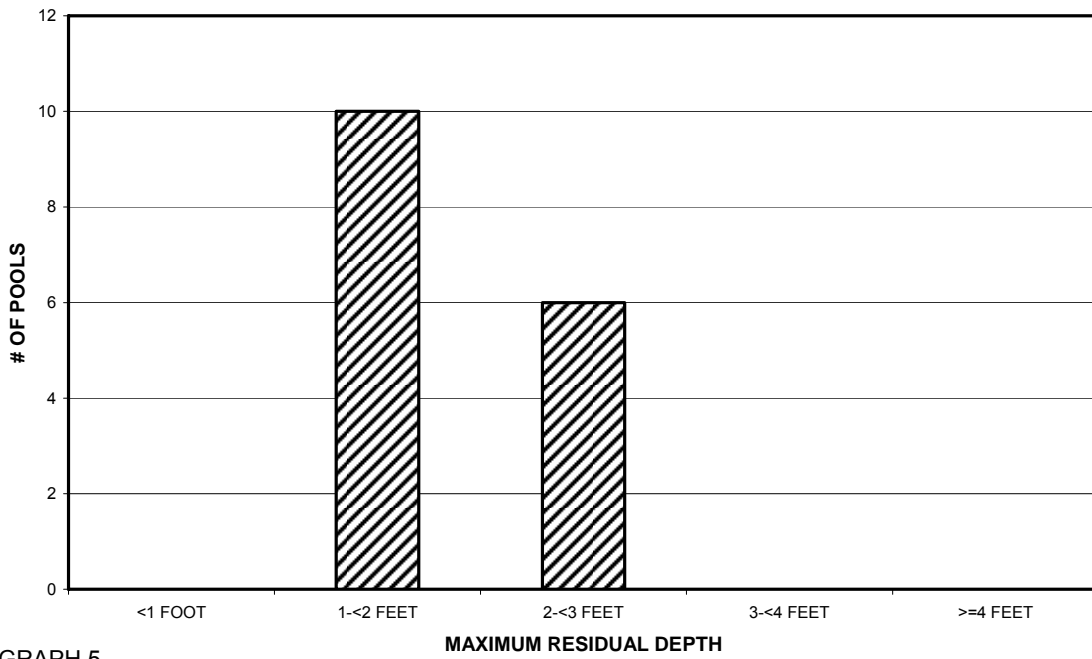
GRAPH 3 Level IV habitat types by percent occurrence

**WOOD CREEK 2001  
POOL TYPES BY PERCENT OCCURRENCE**



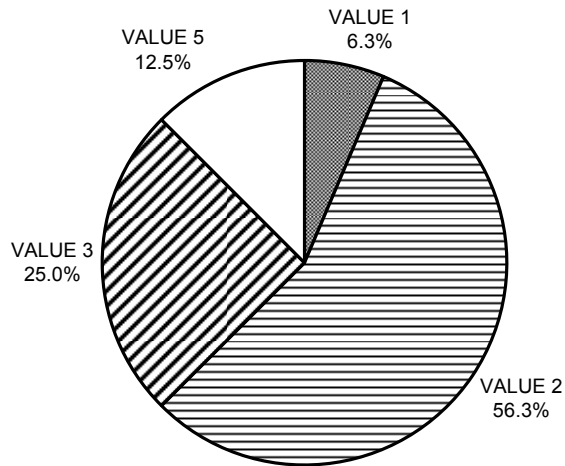
GRAPH 4 Level I pool types by percent occurrence

**WOOD CREEK 2001  
MAXIMUM DEPTH IN POOLS**



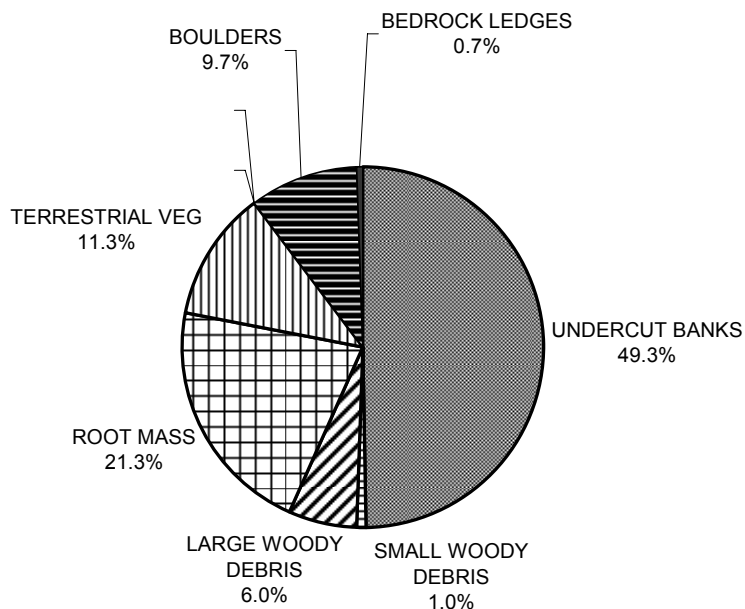
GRAPH 5

**WOOD CREEK 2001  
PERCENT EMBEDDEDNESS**



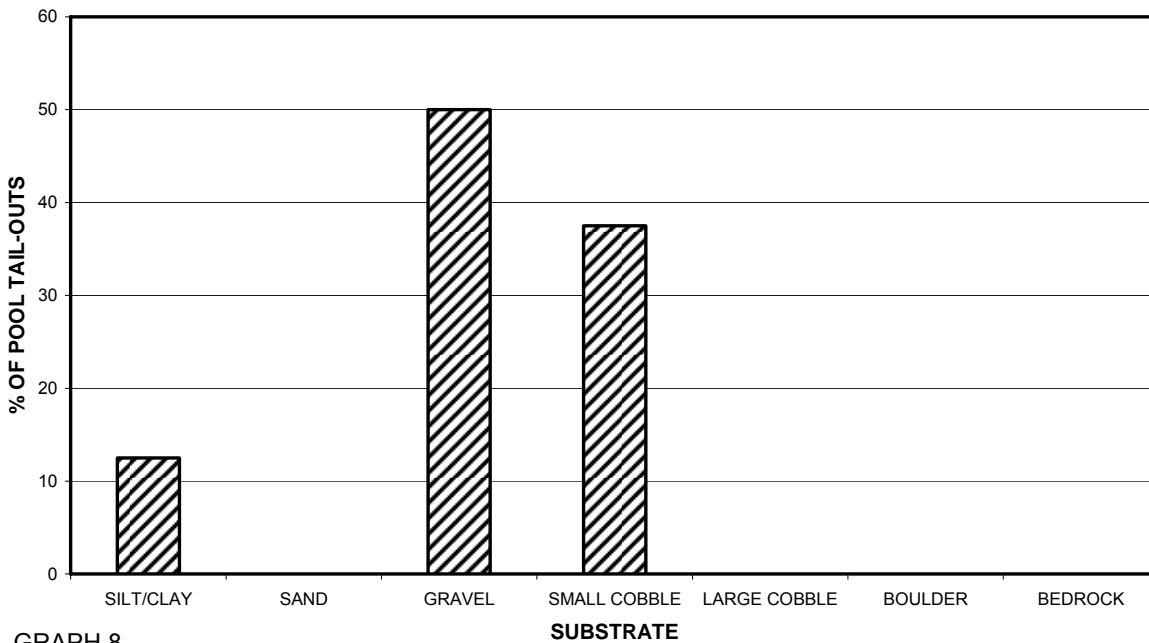
GRAPH 6

**WOOD CREEK 2001  
MEAN PERCENT COVER TYPES IN POOLS**



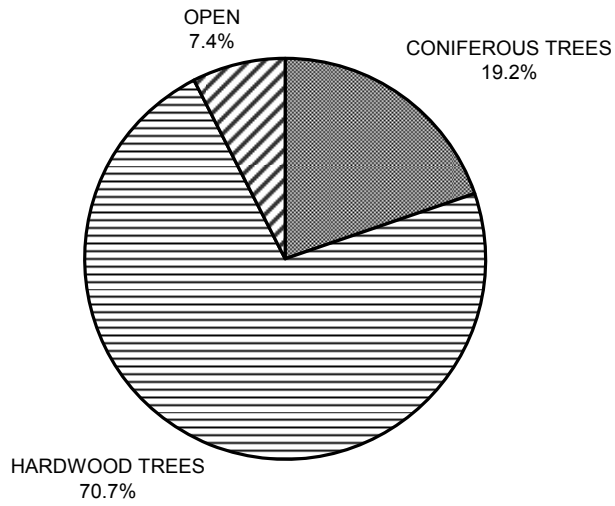
GRAPH 7

**WOOD CREEK 2001  
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



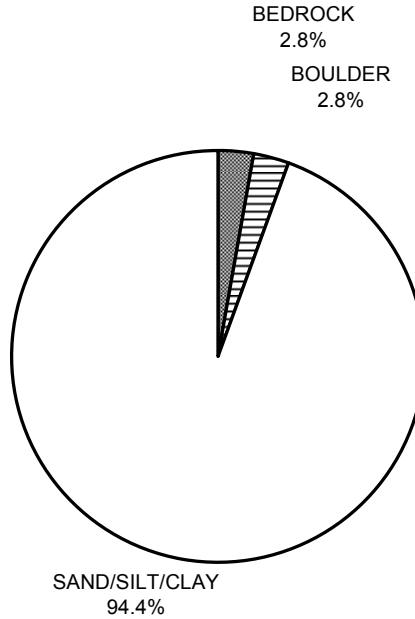
GRAPH 8

**WOOD CREEK 2001  
MEAN PERCENT CANOPY**



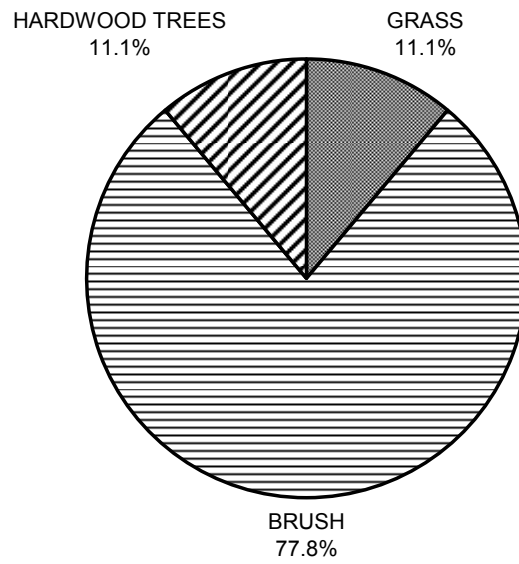
GRAPH 9

**WOOD CREEK 2001  
DOMINANT BANK COMPOSITION**



GRAPH 10

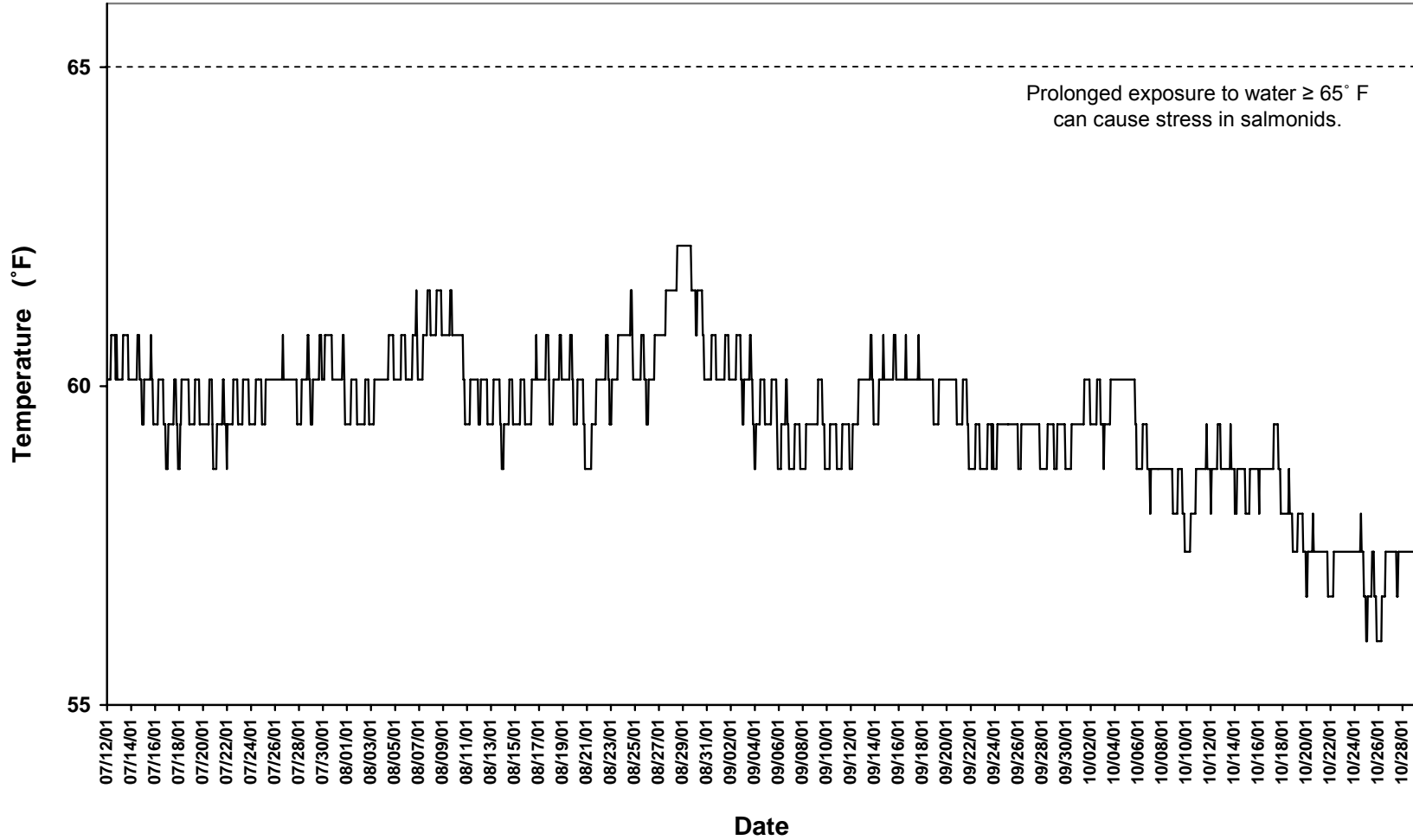
**WOOD CREEK 2001  
DOMINANT BANK VEGETATION**



GRAPH 11

APPENDIX E

Wood Creek Water Temperatures



**Hydrologic Sub-Areas covered by the watershed:**

**Tributary to** Russian River  
**Tributary to**  
**Tributary to**

**Name:** Wood Creek      **LLId: (1:24k)** 1229002387172      **County:** Sonoma  
**Location:**    **T:** 10N    **R:** 9W    **S:** 18    **Latitude:** 38.7172680983272    **Longitude** 122.900292485953

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

<b>Stream Order:</b> <u>  2  </u>	<b>Total Length:</b> 2.75 Miles	Note: Length is for the USGS blue-line 1:24,000 stream.
Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nhydro1" 1:24k streams layer.	4.43 Km	

<b>Drainage Area:</b>	409 Hectares
	1010 Acres
	1.57 sq. mi.

<b>Elevations:</b>	Mouth: <u>  200  </u> feet
	Headwaters: <u>  778  </u> feet
	Note: Headwaters elevation is the highest elevation found in the watershed.

**Lakes in Watershed:**    Number: 0                      Surface area: 0                      sq. mi.  
 Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

**Fish Species (as indicated by historical salmonid streams layer created by Bob Coey):**    None

**Ownership, for the watershed, in acres (and % of total watershed):**

Federal:	State:	Local:	Private:
0.0            acres	0.0	6.6	1003.4
0.00        %	0.00        %	0.65        %	99.35        %

Note: Source for ownership data is 2002 DFG-CCR "ccr\_public\_lands.shp" GIS layer.

**Major Land Uses in the Watershed, in acres (and % of total watershed)**

<b>Mixed hardwood/conifer:</b>	<b>Hardwood:</b>	<b>Conifer:</b>	<b>Agriculture:</b>	<b>Urban:</b>
226.25    acres	434.44	19.45	159.38	99.76
22.3     %	42.9    %	1.9     %	15.7    %	9.8     %
<b>Shrub:</b>	<b>Herbaceous:</b>	<b>Barren/rock:</b>	<b>Water:</b>	
0.00	63.78	9.26	0.00	
0.0     %	6.3     %	0.9     %	0.0     %	

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.



## USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
GEYSERVILLE	38122F8

## Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version )

Scientific Name	Common Name
Emys (=Clemmys) marmorata marmorat	northwestern pond turtle

## Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Warm Springs	111424	Middle Russian River	1.51
Geyserville	111425	Middle Russian River	98.49