CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Woods Creek

Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Woods 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 Woods Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

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

Woods Creek is a tributary to Pena Creek, which flows into Dry Creek, a tributary of the Russian River, located in Sonoma County, California (see Woods Creek map, page 2). The legal description at the confluence with Pena Creek is T9N, R11W, S12. Its location is 38°38'25" N. latitude and 123°2'5" W. longitude. Year round vehicle access exists from Highway 101 near Healdsburg, via Mill Creek Road.

Woods Creek and its tributaries drain a basin of approximately 3.7 square miles. Woods Creek is a second order stream and has approximately 3.2 miles of blue line stream, according to the USGS Warm Springs Dam and Cazadero 7.5 minute quadrangles. Major tributaries include several unnamed tributaries, one of which ("Woods Creek Tributary") was inventoried and is included in this report. Summer flow was measured as approximately 3.6 cfs at 40 feet upstream of the confluence with Pena Creek on November 5, 1998. Elevations range from about 440 feet at the mouth of the creek to 1800 feet in the headwaters. No sensitive plants or animals were listed in the DFG's Natural Diversity Database as occurring within the Woods Creek watershed.

METHODS

The habitat inventory conducted in Woods 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. This form was used in Woods 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 were 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. 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 every two hours, 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. Dewatered units are labeled "DRY". Woods 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, additionally, 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 were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Woods 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), 76 - 100% (value 4) or "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. 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 Woods 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:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Woods 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 evergreen or deciduous trees.

9. Bank Composition:

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 Woods Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

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

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed 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 pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Woods Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

No historical surveys exist for Woods Creek.

HABITAT INVENTORY RESULTS FOR WOODS CREEK

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

The habitat inventory of November 5 - 10, 1998 was conducted by Paul Retherford and Chris Ramsey (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with Pena Creek and extended up Woods Creek 15335 feet to the end of the wetted channel. 1107 feet of an unnamed right bank tributary was also surveyed.

A flow of 3.6 cfs was measured November 5, 1998 at habitat unit #002, 40' above survey start with a Marsh-McBirney Model 2000 flowmeter.

This section of Woods Creek has five channel types: from the mouth to 2622 feet a B4; next 1241 feet a B3; next 6812 feet an F3; next 4036 feet a B4 and the upper 624 feet an A3.

B4 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 gravel substrate. B3 channel types are similar but have a predominantly cobble substrate.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

A3 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly cobble substrate.

Water temperatures ranged from 50°F to 54°F. Air temperatures ranged from 56°F to 65°F. Summer temperatures were also measured using a remote temperature recorder placed in a pool (see Temperature Summary graphs at end of report). A recorder placed approximately 30 feet upstream from the mouth in Reach 1 logged temperatures every 2 hours from July 14 - September 23, 1998. The highest temperature recorded was 75°F in July and the lowest was 55°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39% flatwater units, 30% riffle units, and 30% pool units. Based on total **length** there were 56% flatwater units, 24% pool units, and 20% riffle units (Graph 1).

Two hundred-eighty four habitat units were measured and 21% were completely sampled. Fourteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles at 29%, runs 23%, step runs 17% and mid-channel pools 14% (Graph 2). By percent total **length**, step runs made up 32%, runs 23%, low gradient riffles 19%, and mid-channel pools 12%.

Eighty-six pools were identified (Table 3). Scour pools were most often encountered at 51%, and comprised 47% 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. Seventy-two of the 86 pools (84%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 21% 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. Pool types had the highest shelter rating at 47. Riffle had the lowest rating with 4 and flatwater rated 10 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 49 and scour pools rated 46 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were undercut banks at 27%, large woody debris 21%, bedrock ledges 19%, and root masses 13%. Graph 5 describes the pool shelter in Woods Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 5 of the 14 low gradient riffles measured. Small cobble was dominant in 7 of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 86 pool tail-outs measured, 7 had a value of 1 (8%); 35 had a value of 2 (41%); 37 had a value of 3 (43%); and 1 had a value of 4 (1%). Six (7%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. **Cobble** was the dominant substrate observed at pool tail-outs in Woods Creek and the right bank tributary. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 70%. The mean percentages of deciduous and evergreen trees were 79% and 20%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 42% and the mean percent left bank vegetated was 48%. For the habitat units measured, the dominant vegetation types for the stream banks were: 44% deciduous trees, 28% bare soil, 14% brush, 8% evergreen trees and 7% grass. The dominant substrate for the stream banks were: 55% silt/clay/sand, 24% cobble/gravel, 20% bedrock and 1% boulder (Graph 10).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY ("WOODS CREEK TRIBUTARY")

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

The habitat inventory of November 18, 1998 was conducted by Paul Retherford and Chris Ramsey (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with Woods Creek and extended up Woods Creek Tributary to the end of the wetted channel. The total length of the stream surveyed was 1107 feet.

Flows were not measured on Woods Creek Tributary.

This section of Woods Creek Tributary has one channel type, a G3.

G3 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly cobble substrate.

Water temperature was 50 ℉. Air temperature was 60 ℉.

Based on frequency of ***occurrence*** *there were 38% flatwater units, 31% pool units, 23% riffle units, and 8% dry streambed units. Based on total* ***length*** *there were 84% flatwater units, 10% riffle units, 4% pool units, and 2% dry streambed units.*

Thirteen habitat units were measured and 38% were completely sampled. The most frequent habitat types by percent ***occurrence*** *were step runs at 38%, mid-channel pools 31%, low gradient riffles 23% and dry streambed 8%. By percent total* ***length****, step runs made up 84%, low gradient riffles 10%, mid-channel pools 4%, and dry streambed 2%.*

Four pools were identified. Main Channel pools were most often encountered at 100%, and comprised 100% of the total length of pools.

Pool quality for salmonids increases with depth. One of the four pools (25%) had a depth of two feet or greater. These deeper pools comprised 1% 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. Flatwater types had the highest shelter rating at 5. Riffle had the lowest rating with 0 and pool rated 5. Of the pool types, the main channel pools had the highest mean shelter rating at 5.

By percent area, the dominant pool shelter types were root masses at 51%, boulders 36%, and undercut banks 13%.

Small cobble was dominant in two of the low gradient riffles.

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the four pool tail-outs measured, two had a value of 2 (50%), and two had a value of 3 (50%). No riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. ***Cobble*** *was the dominant substrate observed at pool tail-outs.*

The mean percent canopy density for the stream reach surveyed was 94%. The mean percentages of deciduous and evergreen trees were 51% and 49%, respectively.

For the entire stream reach surveyed, the mean percent right bank vegetated was 41% and the mean percent left bank vegetated was 52%. For the habitat units measured, the dominant vegetation types for the stream banks were: 50% evergreen trees, 30% deciduous trees and 20% bare soil. The

dominant substrate for the stream banks were: 100% silt/clay/sand.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

No electrofishing surveys were conducted in 1998/1999. However, 0+, 1+, and 2+ salmonids were observed in Woods Creek during the habitat inventory. Salmonids were also observed in the Woods Creek Tributary during the habitat inventory.

ADULT SURVEYS:

No spawning/carcass survey was conducted in 1998/1999.

DISCUSSION FOR WOODS CREEK

Woods Creek has 4 channel types within five reaches: B4 (2622 ft.), B3 (1241 ft.), F3 (6812 ft.), B4 (4036 ft.) and A3 (624 ft.).

There are 7899 feet of B4 and B3 channel types, which constitute Reaches 1, 2, and 4. According to the DFG Salmonid Stream Habitat Restoration Manual, B3 and B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs.

Reach 3 is a F3 channel type. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

For B and F channel types of Reaches 1-4, many site specific projects can be designed within these channel types, especially to increase pool frequency, volume and shelter.

Reach 5 is an A3 channel type. A3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days November 5 - 10, 1998 ranged from 50°F to 54°F. Air temperatures ranged from 56°F to 65°F. The warmer water temperatures were recorded in Reach 1.

Summer temperatures measured using a remote temperature recorder placed in a pool ranged from 55° to 75°F for Reach 1. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures above 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 24% 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 Woods Creek, the pools are relatively shallow with 84% having a maximum depth of at least 2 feet. These pools comprised 21% 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 47. However, a pool shelter rating of approximately 80 is desirable. The relatively moderate amount of pool shelter that now exists is being provided primarily by undercut banks (27%), large woody debris (21%), bedrock ledges (19%), and root masses (13%). 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.

Twelve of the fourteen low gradient riffles measured (86%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Forty-four percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 8% 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 5 had the best ratings and Reaches 3 and 4 had the poorest ratings.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Woods Creek Reaches 1, 3 and 4, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 70%.

This is a low percentage of canopy, since 80 percent is generally considered desirable. Reaches 1-3 had canopies of 67%, 58%, and 67%, respectively, with numerous bank erosion problems. Other areas with bank erosion could benefit from bio-technical revegetation techniques using native species.

DISCUSSION FOR UNNAMED TRIBUTARY ("WOODS CREEK TRIBUTARY")

Woods Creek Tributary has one channel type, a G3.

There are 1107 feet of G3 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, G3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey day November 18, 1998 were 50°F. Air temperatures

were 60°F. This temperature regime is favorable to salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the upper\lower, cooler sample sites. 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 4% 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 Woods Creek Tributary, the pools are relatively shallow with 25% having a maximum depth of at least 2 feet. These pools comprised 1% 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 5. 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 root masses (51%), boulders (36%), and undercut banks (13%). 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.

Both of the gradient riffles measured (100%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Fifty percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. None 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.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Woods Creek Tributary, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 94%.

This is very good, since 80 percent is generally considered desirable.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Recent winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. 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) There are several log debris accumulations present on Woods Creek that have the potential for causing bank erosion. The modification of these debris accumulations may be recommended at this time, and/but they should be evaluated. **If modification becomes necessary, it must be done carefully to preserve existing habitat provided by the woody debris.**

2) Increase the canopy on Woods Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (portions of Reaches 1,2 and 3). The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) 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.

4) Woods Creek 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.

5) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation, undercut banks, and boulders. 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.

6) 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.

PROBLEM SITES AND LANDMARKS - WOODS CREEK SURVEY COMMENTS

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

Habitat Unit #	Stream Length(ft)	Comments
REACH 1		
1.00	10	Begin survey at confluence with Pena Creek.
2.00	37	Salmonids observed.
5.00	161	Salmonids observed (2+, 1+ and YOY).
13.00	758	At 10' right bank failure 30'L x 50'H.
14.00	796	Salmonids observed.
27.00	1474	Salmonids observed.
34.00	1914	At 48' right bank dry steep tributary not accessible to fish.
39.00	2315	Large debris accumulation at 20': 12'L x 15'W x 7'H.
REACH 2		
44.00	2693	Channel change to B3.
54.00	3175	Right bank erosion at 5', 60'L x 15'H.
56.00	3237	Left bank erosion 70'L x 10'H.
60.00	3427	Left bank typable tributary at 30', 52*F.
62.00	3707	Large debris accumulation at 106', passable for fish, 20'w x 5'H x 20'L.
REACH 3		
67.00	3930	Channel type change to F3.
68.00	3951	At 51' left bank erosion 40'L x 30'H.
74.00	4137	Salmonids observed.
75.00	4253	Right bank erosion at 39', 100'L x 80'H contributing fines.
86.00	4723	Salmonids observed.
88.00	4780	Right bank road along creek for 50'.
92.00	4979	Right bank tributary not flowing, no fish observed, not typable.
93.00	4996	Right bank road going up bank.
103.00	5420	Salmonids observed.
104.00	5458	Frog observed.
105.00	5502	Salmonids observed (1+).
110.00	5759	Left bank road crosses creek at 35'.
114.00	6178	Salmonids observed (2+, 1+ and young of the year). Good possible electrofishing spot.
118.00	6479	Left bank dry steep tributary not accessible to fish enters.
119.00	6516	Right bank dry tributary, not accessible to fish enters. At 15' right bank

		road up bank.
121.00	6605	Begin road 15' above creek up the bank.
130.00	6909	Salmonids observed and end of parallel road up the bank.
132.00	6967	Nice possible electrofishing site.
137.00	7118	Recreational road crossing.
138.00	7279	Salmonids observed.
141.00	7400	Left bank road 10' up bank.
145.00	7623	Road crossing at 46'.
146.00	7687	Left bank dry tributary not accessible to fish.
150.00	7887	Road crossing.
151.00	7929	Left bank road 15' up bank begins.
155.00	8223	End left bank road 15' up bank.
156.00	8261	Left bank road 50' up bank.
162.00	8517	Large debris accumulation 15'L x 40'W x 6'H passable for salmonids.
167.00	8693	Salmonids observed.
176.00	8941	Large debris accumulation at 15', 20'L x 45'W x 15'H. Passable for salmonids 10' of gravel retained with no jump pool.
178.00	8987	Salmonids observed.
187.00	9333	Salmonids observed.
196.00	9781	Road crossing at 20'.
203.00	10047	Left bank dry bedrock tributary not accessible to fish.
205.00	10145	Salmonids observed.
208.00	10249	Road crossing at 20 feet.
217.00	10675	Left bank tributary steep, not accessible to fish at 20'.
REACH 4		
218.00	10689	Channel change to B4.
223.00	11129	Salmonids observed.
241.00	11938	Salmonids observed.
246.00	12131	Left bank dry tributary not accessible to fish at 25 feet.
251.00	12388	Large debris accumulation at 15', 10'L x 15'W x 5' H.
261.00	12949	Left bank old road.
262.00	12974	Right bank dry tributary not accessible to salmonids.
266.00	13146	Salmonids observed.
271.00	13480	Continue left bank road now 30' up the bank.
272.00	13673	Salmonids observed.
274.00	13974	At 157', right bank dry tributary not accessible to fish.
279.00	14439	Right bank dry steep tributary not accessible to fish at 75'.
280.00	14471	End of road beside creek.
REACH 5		
283.00	15325	Salmonids observed. Typeable tributary at 268'. Left bank dry tributary not accessible to fish at 470'. Channel change to A3.
284.00	15335	End of survey. Creek keeps climbing, becoming an A channel midway through habitat unit # 283. Very steep and no water.

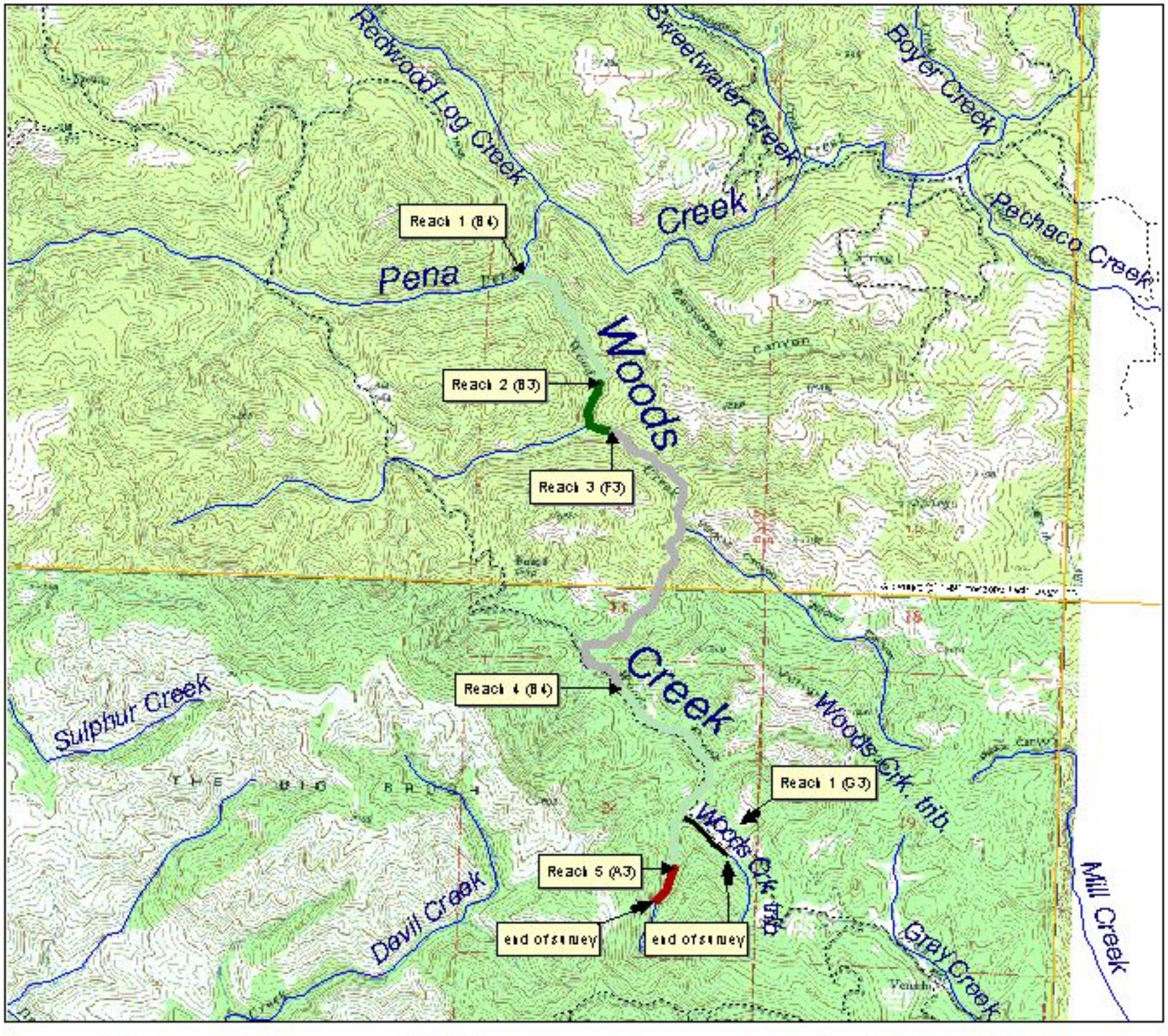
END OF SURVEY

PROBLEM SITES AND LANDMARKS - WOODS CREEK TRIBUTARY SURVEY COMMENTS

Habitat Unit #	*Stream Length(ft)*	*Comments*
1.00	*128*	*Begin survey at confluence with Woods Creek.*
2.00	*137*	*Salmonids observed.*
9.00	*879*	*Large debris accumulation at 280' 10'L x 15'W x 8'H. 10'jump with no pool.*
12.00	*1007*	*Salmonids observed.*
13.00	*1107*	*End of survey. Creek becomes an A channel and dries up. Becomes very pinched and no fish observed above Habitat Unit #12.*

END OF SURVEY

Woods Creek and surveyed tributary



Map by E.Heaton & C.Brooks, March 2, 2001
L:/mondo3/data/stream-projects/woods.apr

N
W E
S

Woods Creek channel type
- A3
- B3
- B4
- F3
- G3

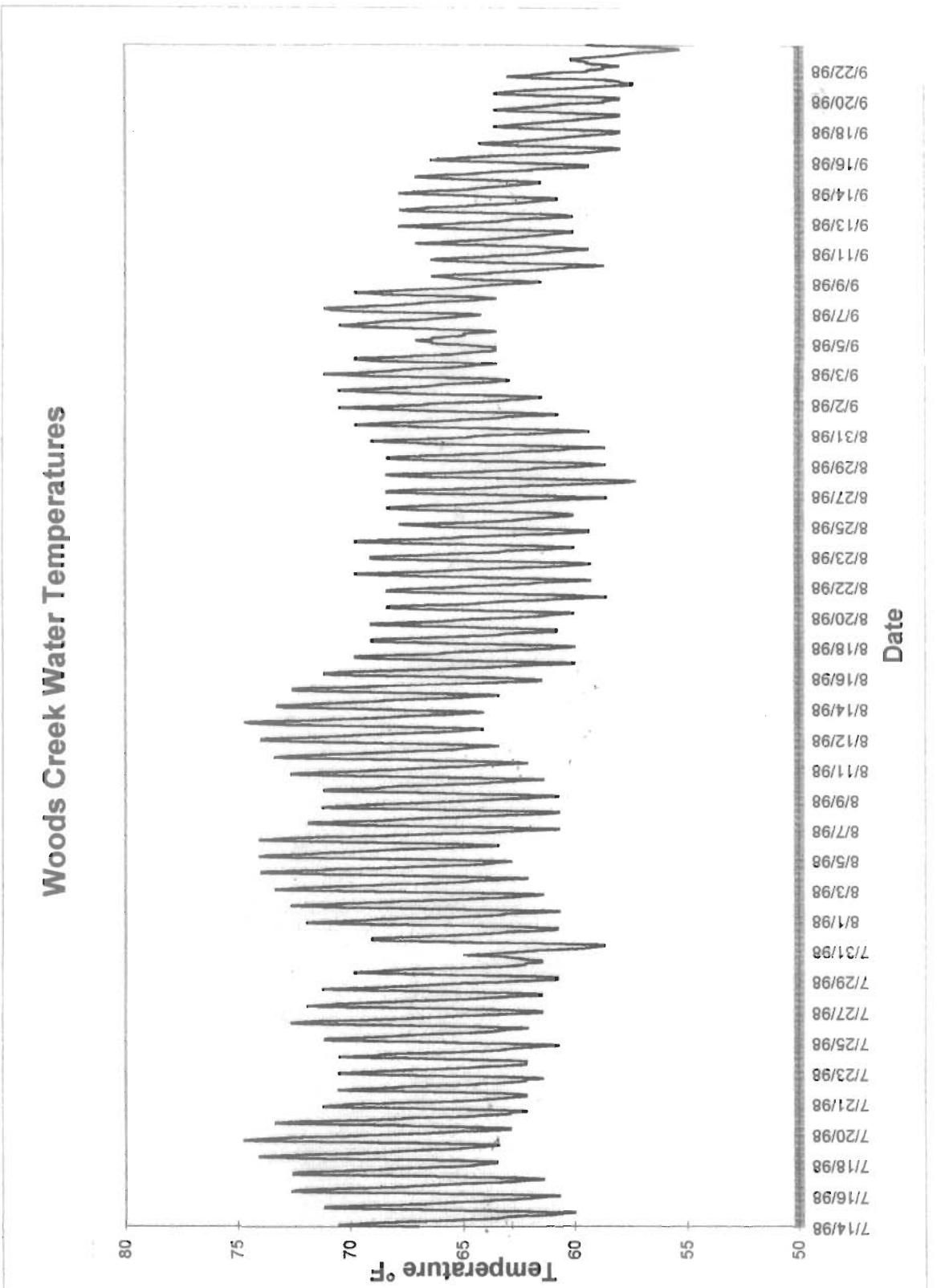
Woods Creek tributary channel type
- G3
- Roads
- 7.5' quad outlines (quad75)
- Streams

0.5 0 0.5 1 1.5 Miles

1 0 1 2 Kilometers

Scale = 1:36,000

Central Coast Region
CA Department of Fish and Game


Woods Creek Water Temperatures
Temperature °F
80
75
70
65
60
55
50
Date
7/14/98
7/16/98
7/18/98
7/20/98
7/21/98
7/23/98
7/25/98
7/27/98
7/29/98
7/31/98
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9/20/98
9/22/98

Woods Creek

Drainage: Pena Creek, Dry Creek, Russian River

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

Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
86	17	RIFFLE	30	36	3091	20	6.9	0.3	139	11963	48	4098	0	4
112	15	FLATWATER	39	77	8621	56	26.1	1.7	2210	247481	3301	369673	0	10
86	27	POOL	30	42	3623	24	11.7	1.9	463	39811	992	85290	814	47

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
284	59	15335	299255	459060

Woods Creek Drainage: Pena Creek, Dry Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
82	14	LGR	29	36	2955	19	7	0.3	0.7	137	11201	36	2970	0	3	67
1	1	MGR	0	43	43	0	6	0.5	1.1	155	155	77	77	0	10	52
3	2	BRS	1	31	93	1	6	0.8	2.1	149	446	113	338	0	5	48
1	1	GLD	0	86	86	1	11	0.6	1.0	946	946	568	568	0	5	71
64	7	RUN	23	56	3583	23	21	2.7	1.5	890	56954	5803	371413	0	9	74
47	7	SRN	17	105	4952	32	32	0.5	1.9	3524	165618	473	22248	0	11	71
1	1	TRP	0	63	63	0	13	1.6	2.3	778	778	1245	1245	1012	10	63
40	10	MCP	14	45	1811	12	14	2.4	30.0	486	19423	1481	59233	1226	57	67
1	1	CCP	0	30	30	0	12	1.8	2.4	360	360	648	648	576	5	83
7	3	LSL	2	38	267	2	8	1.3	3.5	294	2060	360	2521	293	60	75
25	4	LSR	9	36	905	6	10	1.5	3.4	443	11075	739	18465	616	64	71
8	4	LSBk	3	51	406	3	9	1.5	3.7	540	4322	774	6189	618	29	77
1	1	LSBo	0	50	50	0	12	0.9	2.3	570	570	513	513	228	15	75
3	3	PLP	1	30	91	1	12	2.1	3.5	358	1074	811	2433	701	40	91

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
284	59	15335	274982	488861

Woods Creek Tables Graphs Map
Assessment Completed 1998
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Woods Creek

Drainage: Pena Creek, Dry Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
42	12	MAIN	49	45	1904	53	13.8	2.3	498	20895	1392	58454	1154	49
44	15	SCOUR	51	39	1719	47	9.8	1.5	431	18948	672	29556	543	46

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
86	27	3623	39844	88010

Woods Creek

Drainage: Pena Creek, Dry Creek, Russian River

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

Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
1	TRP	1	0	0	0	0	1	100	0	0	0	0
40	MCP	47	0	0	7	18	20	50	7	18	6	15
1	CCP	1	0	0	0	0	1	100	0	0	0	0
7	LSL	8	0	0	1	14	5	71	1	14	0	0
25	LSR	29	0	0	6	24	16	64	3	12	0	0
8	LSBk	9	0	0	0	0	6	75	2	25	0	0
1	LSBo	1	0	0	0	0	1	100	0	0	0	0
3	PLP	3	0	0	0	0	1	33	2	67	0	0

TOTAL UNITS
86

Woods Creek | Drainage: Pena Creek, Dry Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
82	14	LGR	0	0	0	0	0	0	0	100	0
1	1	HGR	0	0	0	0	0	0	0	100	0
3	2	BRS	0	0	0	0	0	0	0	10	90
1	1	GLD	0	0	0	0	0	0	0	100	0
64	7	RUN	2	1	24	0	5	0	0	62	6
47	7	SRN	11	8	25	0	10	0	0	46	0
1	1	TRP	50	0	0	0	0	0	0	50	0
40	10	MCP	38	8	27	11	0	0	0	0	15
1	1	CCP	0	0	0	0	0	0	0	100	0
7	3	LSL	35	0	45	20	0	0	0	0	0
25	4	LSR	21	14	14	32	15	4	0	0	0
8	4	LSBk	0	13	14	7	0	0	2	6	58
1	1	LSBo	0	0	0	0	0	0	0	100	0
3	3	PLP	7	0	0	0	0	0	22	24	48
ALL 284 HABITAT TYPES	59		20	7	20	8	4	0	1	27	13
POOLS ONLY 86	27		27	8	21	13	2	1	2	9	19

Woods Creek Drainage: Pena Creek, Dry Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 11/05/98 to 11/10/98

Confluence Location: QUAD: WrmSprngDm LEGAL DESCRIPTION: T09NR11WS12 LATITUDE: 38°38'25" LONGITUDE: 123°2'5"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
82	14	LGR	0	0	36	50	14	0	0
1	1	HGR	0	0	0	0	100	0	0
3	2	BRS	0	0	0	0	0	0	100
1	1	GLD	0	0	0	0	100	0	0
64	7	RUN	0	0	86	14	0	0	0
47	7	SRN	0	0	29	29	43	0	0
1	1	TRP	0	0	0	100	0	0	0
40	10	MCP	10	40	50	0	0	0	0
1	1	CCP	0	0	0	100	0	0	0
7	3	LSL	0	67	33	0	0	0	0
25	4	LSR	0	75	25	0	0	0	0
8	4	LSBk	50	25	25	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
3	3	PLP	0	33	0	0	0	0	67

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Woods Creek

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
69.75	20.25	78.93	41.61	48.19

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	9	15	20.34
Boulder	0	1	0.85
Cobble/Gravel	20	8	23.73
Silt/clay	30	35	55.08

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	5	3	6.78
Brush	5	11	13.56
Deciduous Trees	25	27	44.07
Evergreen Trees	3	6	7.63
No Vegetation	21	12	27.97

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Woods Creek
SAMPLE DATES: 11/05/98 to 11/10/98
SURVEY LENGTH:
MAIN CHANNEL: 15293 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: WrmSprngDm Latitude: 38°38'25"
Legal Description: T09NR11WS12 Longitude: 123°2'5"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-43)

Channel Type: B4	Mean Canopy Density: 67%
Main Channel Length: 2622 ft.	Evergreen Component: 13%
Side Channel Length: 0 ft.	Deciduous Component: 87%
Riffle/Flatwater Mean Width: 10.7 ft.	Pools by Stream Length: 22%
Pool Mean Depth: 3.5 ft.	Pools >=2 ft. Deep: 82%
Base Flow: 3.6 cfs	Pools >=3 ft. Deep: 55%
Water: 052-054°F Air: 058-064°F	Mean Pool Shelter Rtn: 49
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 47%	Occurrence of LOD: 45%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 27% 2. 27% 3. 27% 4. 0% 5. 18%

STREAM REACH 2 (Units 44-66)

Channel Type: B3	Mean Canopy Density: 58%
Main Channel Length: 1241 ft.	Evergreen Component: 6%
Side Channel Length: 0 ft.	Deciduous Component: 94%
Riffle/Flatwater Mean Width: 11.0 ft.	Pools by Stream Length: 36%
Pool Mean Depth: 1.4 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 3.6 cfs	Pools >=3 ft. Deep: 13%
Water: 052-053°F Air: 060-064°F	Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 42%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 25% 2. 50% 3. 25% 4. 0% 5. 0%

STREAM REACH 3 (Units 67-217)

Channel Type: F3	Mean Canopy Density: 67%
Main Channel Length: 6770 ft.	Evergreen Component: 12%
Side Channel Length: 0 ft.	Deciduous Component: 87%
Riffle/Flatwater Mean Width: 13.1 ft.	Pools by Stream Length: 30%
Pool Mean Depth: 1.5 ft.	Pools >=2 ft. Deep: 87%
Base Flow: 3.6 cfs	Pools >=3 ft. Deep: 21%
Water: 050-054°F Air: 056-065°F	Mean Pool Shelter Rtn: 52
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Bedrock Ledges
Bank Vegetative Cover: 44%	Occurrence of LOD: 27%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 4% 2. 45% 3. 43% 4. 0% 5. 9%

STREAM REACH 4 (Units 218-282)

Channel Type: B4	Mean Canopy Density: 85%
Main Channel Length: 4036 ft.	Evergreen Component: 53%
Side Channel Length: 0 ft.	Deciduous Component: 47%
Riffle/Flatwater Mean Width: 43.7 ft.	Pools by Stream Length: 14%
Pool Mean Depth: 1.3 ft.	Pools >=2 ft. Deep: 68%
Base Flow: 3.6 cfs	Pools >=3 ft. Deep: 21%
Water: 050-051°F Air: 060-061°F	Mean Pool Shelter Rtn: 55
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Large Woody Debris
Bank Vegetative Cover: 47%	Occurrence of LOD: 50%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 32% 3. 63% 4. 5% 5. 0%

STREAM REACH 5 (Units 283-284)

Channel Type: A3	Mean Canopy Density: 93%
Main Channel Length: 624 ft.	Evergreen Component: 80%
Side Channel Length: 0 ft.	Deciduous Component: 20%
Riffle/Flatwater Mean Width: 5.0 ft.	Pools by Stream Length: 2%
Pool Mean Depth: 0.0 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 3.6 cfs	Pools >=3 ft. Deep: 0%
Water: 050-050°F Air: 061-061°F	Mean Pool Shelter Rtn: 0
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Large Woody Debris
Bank Vegetative Cover: 60%	Occurrence of LOD: 80%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 100% 3. 0% 4. 0% 5. 0%