

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

Mark West Creek Tributaries  
*Report Revised April 14, 2006*  
*Report Completed 2000*  
*Assessment Completed 1997*

**INTRODUCTION**

A stream inventory was conducted during the summer of 1997 on the following Mark West Creek Tributaries: Horse Hill Creek, Mill Creek, Weeks Creek, and Van Buren 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 the Mark West Creek Tributaries. 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 FOR HORSE HILL CREEK**

Horse Hill Creek is a tributary to Mark West Creek which flows into the Russian River, located in Sonoma County, California (see Mark West Creek Tributaries map, page 2). The legal description at the confluence with Mark West Creek is T08N, R08W, S11. Its location is 38°32'58" N. latitude and 122°43'17" W. longitude. Year round vehicle access exists from Highway 101 near Santa Rosa, via Mark West Springs Road, via Porter Creek Road.

Horse Hill Creek and its tributaries drain a basin of approximately 2.7 square miles. Horse Hill Creek is a first order stream and has approximately 3.4 miles of blue line stream, according to the USGS Mark West 7.5 minute quadrangles. Summer flow was not measured during the survey. Elevations range from about 440 feet at the mouth of the creek to 1400 feet in the headwaters. redwood forest dominates the watershed. The northwestern pond turtle (*Clemmys marmorata marmorata*) is listed with a federal status of species of concern in the CDFG's Natural Diversity Database as occurring within the Horse Hill Creek watershed.

**WATERSHED OVERVIEW FOR MILL CREEK**

Mill Creek is a tributary to Mark West Creek which flows into the Russian River, located in Sonoma County, California (see Mark West Creek Tributaries map, page 2). The legal description at the confluence with Mark West Creek is T08N, R08W, S13. Its location is 38°32'49" N. latitude and 122°41'51" W. longitude. Year round vehicle access exists from Highway 101 near Santa Rosa, via Mark West Springs Road, via private roads.

Mill Creek and its tributaries drain a basin of approximately 2.8 square miles. Mill Creek is a first order stream and has approximately 2.3 miles of blue line stream, according to the USGS Mark West Springs 7.5 minute quadrangles. Summer flow was not measured during the survey. Elevations range from about 470 feet at the mouth of the creek to 1400 feet in the headwaters. No sensitive plants or animals were listed in the CDFG's Natural Diversity Database as occurring within the Mill Creek watershed.

#### WATERSHED OVERVIEW FOR WEEKS CREEK

Weeks Creek is a tributary to Mark West Creek which flows into the Russian River, located in Sonoma County, California (see Mark West Creek Tributaries map, page 2). The legal description at the confluence with Mark West Creek is T08N, R07W, S29. Its location is 38°30'32" N. latitude and 122°38'53" W. longitude. Year round vehicle access exists from Highway 101 near Santa Rosa, via Highway 12, via Calistoga Road.

Weeks Creek and its tributaries drain a basin of approximately 1.8 square miles. Weeks Creek is a second order stream and has approximately 3.4 miles of blue line stream, according to the USGS Mark West Springs 7.5 minute quadrangle. Summer flow was not measured during the survey. Elevations range from about 670 feet at the mouth of the creek to 1800 feet in the headwaters. The Foothill yellow-legged frog (*Rana boylei*) is listed with a federal status of species of concern and the Clara Hunt's milk-vetch (*Astragalus clarianus*) is listed with a federal status of endangered and a California status of threatened in the CDFG's Natural Diversity Database as occurring within the Weeks Creek watershed.

#### WATERSHED OVERVIEW FOR VAN BUREN CREEK

Van Buren Creek is a tributary to Mark West Creek which flows into the Russian River, located in Sonoma County, California (see Mark West Creek Tributaries map, page 2). The legal description at the confluence with Mark West Creek is T08N, R07W, S28. Its location is 38°30'44" N. latitude and 122°38'17" W. longitude. Year round vehicle access exists from Highway 101 near Santa Rosa, via Highway 12, via Calistoga Road, via St. Helena Road.

Van Buren Creek and its tributaries drain a basin of approximately 1.4 square miles. Van Buren Creek is a first order stream and has approximately 3.0 miles of blue line stream, according to the USGS Mark West Springs 7.5 minute quadrangle. Summer flow was not measured during the survey. Elevations range from about 800 feet at the mouth of the creek to 1600 feet in the headwaters. The Foothill yellow-legged frog (*Rana Boylei*) is listed with a federal status of species of concern and the Northern spotted owl (*Strix occidentalis caurina*) is listed with a federal status of threatened in the CDFG's Natural Diversity Database as occurring within the Van Buren Creek watershed.

## METHODS

The habitat inventory conducted in Sample 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 the Mark West Tributaries 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. 1996). 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". The Mark West

Creek tributaries 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 the Mark West Creek tributaries, 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). Additionally, a rating of "not suitable" (NS) 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 the Mark West Creek tributaries, 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 visually 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, 1994. Canopy density relates to the amount of stream shaded from the sun. In the Mark West Creek tributaries, 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 visually 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 the Mark West Creek tributaries, 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 the Mark West Creek tributaries 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 stream surveys exist for any of these Mark West Creek tributaries.

### HABITAT INVENTORY RESULTS FOR HORSE HILL CREEK

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

The habitat inventory of July 24, 1997 was conducted by Joyce Ambrosius and Leigh Miles (Sonoma County Water Agency) with supervision and analysis by CDFG. The survey began at the confluence with Mark West Creek and extended up Horse Hill Creek to the end of the wetted channel. The total length of the stream surveyed was 2871 feet, with no additional feet of side channel.

Flows were not measured on Horse Hill Creek.

This section of Horse Hill Creek has one channel type, from the mouth to 2871 feet a B4.

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.

Water temperature was not taken. Air temperature was 89°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 80% dry streambed units and 20% pool units. Based on total **length** there were 99% dry streambed units and 1% pool units (Graph 1).

Five habitat units were measured and 20% were completely sampled. Two Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were dry streambed at 80% and root wad scour pools 20% (Graph 2). By percent total **length**, dry streambed made up 99% and root wad scour pools 1%.

One pool was identified, which was a scour pool (Table 3) (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. The one pool identified had a depth less than two feet (Graph 4).

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 were the only habitat type with shelter, and had a mean shelter rating of 10 (Table 1). Of the pool types, the scour pool had the highest mean shelter

rating at 10 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter type was root mass at 100%; no undercut banks, small woody debris, or large woody debris were observed to provide shelter.

Table 6 summarizes the dominant substrate by habitat type.

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. The one pool tail-out measured had a value of 3. On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 58%. The mean percentages of deciduous and evergreen trees were 45% and 55%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 95% and the mean percent left bank vegetated was 80%. For the habitat units measured, the dominant vegetation types for the stream banks were: 50% brush and 50% deciduous trees. The dominant substrate for the stream banks were: 100% silt/clay/sand (Graph 10).

### HABITAT INVENTORY RESULTS FOR MILL CREEK

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

The habitat inventory of July 29 - 30, 1997 was conducted by Joyce Ambrosius and Miles (Sonoma County Water Agency) with supervision and analysis by CDFG. The survey began at the confluence with Mark West Creek and extended up Mill Creek to a dam which marked the end of the wetted channel. The total length of the stream surveyed was 7157 feet, with no additional feet of side channel.

Flows were not measured on Mill Creek.

This section of Mill Creek has four channel types: from the mouth to 4019 feet an F2; next 1524 feet an A4; next 105 feet a B1 and the upper 1509 feet an A4.

F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly boulder substrate.

A4 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly gravel substrate.

B1 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 bedrock substrate.

Water temperatures ranged from 60°F to 64°F. Air temperatures ranged from 66°F to 75°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 32% flatwater units, 29% dry streambed units, 28% pool units, and 10% riffle units. Based on total **length** there were 65% dry streambed units, 22% flatwater units, 10% pool units, and 3% riffle units (Graph 1).

Seventy-eight habitat units were measured and 26% were completely sampled. Ten Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were dry streambed at 29%, runs 26%, root wad scour pools 18% and low gradient riffles 8% (Graph 2). By percent total **length**, dry streambed made up 65%, runs 20%, root wad scour pools 6%, and low gradient riffles 3%.

Twenty-two pools were identified (Table 3). Scour pools were most often encountered at 91%, and comprised 84% 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. Six of the 22 pools (27%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 3% 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 24. Flatwater had the lowest rating with 2 and riffle rated 10 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 26 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were root masses at 38%, boulders 34%, undercut banks 12%, and small woody debris 7%. Graph 5 describes the pool shelter in Mill Creek.

Table 6 summarizes the dominant substrate by habitat type.

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the nineteen pool tail-outs measured, seven had a value of 2 (37%); eight had a value of 3 (42%); and four had a value of 4 (21%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 82%. The mean percentages of deciduous and evergreen trees were 26% and 74%, respectively. Graph 8 describes the canopy for the entire survey.



For the entire stream reach surveyed, the mean percent right bank vegetated was 91% and the mean percent left bank vegetated was 91%. For the habitat units measured, the dominant vegetation types for the stream banks were: 88% evergreen trees, 4% brush, 4% deciduous trees, and 4% bare soil. The dominant substrate for the stream banks were: 44% cobble/gravel, 28% boulder, 20% bedrock and 8% silt/clay/sand (Graph 10).

## HABITAT INVENTORY RESULTS FOR WEEKS CREEK

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

The habitat inventory of July 31, 1997 was conducted by Joyce Ambrosius and Miles (Sonoma County Water Agency) with supervision and analysis by CDFG. The survey began at the confluence with Mark West Creek and extended up Weeks Creek to the end of the wetted channel. The total length of the stream surveyed was 6263 feet, with no additional feet of side channel.

Flows were not measured on Weeks Creek.

This section of Weeks Creek has one channel type, from the mouth to 6263 feet an F4. 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 temperature was 60°F. Air temperatures ranged from 75°F to 82°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 40% dry streambed units, 33% pool units, 13% flatwater units, and 7% riffle units. Based on total **length** there were 54% dry streambed units, 3% pool units, 2% flatwater units, and 1% riffle units (Graph 1).

Fifteen habitat units were measured and 40% were completely sampled. Seven Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were dry streambed at 40%, root wad scour pools 20%, low gradient riffles 7% and glides 7% (Graph 2). By percent total **length**, dry streambed made up 54%, root wad scour pools 2%, glides 1%, and runs 1%.

Five pools were identified (Table 3). Scour pools were most often encountered at 100%, and comprised 100% 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. One of the 5 pools (20%) had a depth of two feet or greater (Graph 4). 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. Pool types had the highest shelter rating at 52. Flatwater and riffle had the lowest rating with 0 (Table 1). Of the pool types, the scour pools had the

highest mean shelter rating at 52 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 43%, root masses 28%, undercut banks 9%, and large woody debris 9%. Graph 5 describes the pool shelter in Weeks Creek.

Table 6 summarizes the dominant substrate by habitat type.

No mechanical gravel sampling was conducted in 1997 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 5 pool tail-outs measured, 3 had a value of 3 (60%), and 2 had a value of 4 (40%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 73%. The mean percentages of deciduous and evergreen trees were 58% and 43%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 88% and the mean percent left bank vegetated was 79%. For the habitat units measured, the dominant vegetation types for the stream banks were: 57% brush, 21% deciduous trees, 14% evergreen trees, and 7% grass. The dominant substrate for the stream banks were: 57% cobble/gravel, 36% silt/clay/sand, and 7% bedrock (Graph 10).

#### HABITAT INVENTORY RESULTS FOR VAN BUREN CREEK

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

The habitat inventory of August 5 - 7, 1997 was conducted by Joyce Ambrosius, Parsens and Miles (Sonoma County Water Agency) with supervision and analysis by CDFG. The survey began at the confluence with Mark West Creek and extended up Van Buren Creek to the end of landowner access permission. The total length of the stream surveyed was 13852 feet, with an additional 198 feet of side channel.

Flows were not measured on Van Buren Creek.

This section of Van Buren Creek has three channel types: from the mouth to 2284 feet a B2; next 10433 feet an F2 and the upper 1135 feet an F4.

B2 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 boulder substrate.

F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high

width/depth ratio and a predominantly boulder substrate. F4 channel types are similar but have a predominately gravel substrate.

Water temperatures ranged from 62°F to 70°F. Air temperatures ranged from 76°F to 88°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 35% flatwater units, 34% pool units, 18% dry streambed units, and 12% riffle units. Based on total **length** there were 22% flatwater units, 20% dry streambed units, 8% pool units, and 3% riffle units (Graph 1).

One hundred-thirty one habitat units were measured and 18% were completely sampled. Thirteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were runs at 26%, dry streambed 18%, boulder scour pools 14% and low gradient riffles 11% (Graph 2). By percent total **length**, dry streambed made up 20%, runs 17%, step runs 4%, and low gradient riffles 3%.

Forty-five pools were identified (Table 3). Scour pools were most often encountered at 87%, and comprised 74% 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. Five of the 45 pools (11%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 2% 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 27. Riffle had the lowest rating with 0 and flatwater rated 3 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 90, scour pools rated 27, and main channel pools rated 18 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 60%, bedrock ledges 21%, root masses 14%, and undercut banks 2%. Graph 5 describes the pool shelter in Van Buren Creek.

Table 6 summarizes the dominant substrate by habitat type.

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 44 pool tail-outs measured, 14 had a value of 3 (32%), and 30 had a value of 4 (68%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and evergreen trees were 23% and 77%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 92% and the mean percent left bank vegetated was 92%. For the habitat units measured, the dominant vegetation types for the stream banks were: 85% evergreen trees, 8% deciduous trees, and 7% brush. The dominant substrate for the stream banks were: 37% cobble/gravel, 31% bedrock, 24% boulder and 8% silt/clay/sand (Graph 10).

## BIOLOGICAL INVENTORY

### JUVENILE SURVEYS:

Biological surveys were not conducted in any of these tributaries in 1997 or 1998 due to inadequate staffing levels. However, during the habitat inventory, the crews observed steelhead, sculpin, and California newts in Mill Creek and steelhead and roach in Van Buren Creek. No fish were observed in Weeks Creek or Horse Hill Creek.

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

Table 1. Species Observed in Recent Surveys on Mark West Tributaries			
YEARS	SPECIES	SOURCE	Native/Introduced
1997	Steelhead*	SCWA	N
1997	Sculpin*	SCWA	N
1997	Roach*	SCWA	N
1997	California Newt*	SCWA	N

\* = Van Buren Creek, Mill Creek

Historical records reflect that no hatchery plants, transfers, or known fish rescue operations have occurred in any of these Mark West Creek tributaries, however planting has occurred in Mark West Creek (see Mark West Creek Report for data).

### ADULT SURVEYS:

Spawning/carcass surveys were not conducted in any of these tributaries in 1997 or 1998 due to inadequate staffing levels.

## DISCUSSION FOR HORSE HILL CREEK

Horse Hill Creek has one channel type, a B4 (2871 ft.).

There are 2871 feet of B4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, 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.

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.

No water temperature was taken. Air temperature was 89°F. To make conclusions about temperature conditions on Horse Hill Creek for salmonid survival, temperatures need to be taken and monitored in pools through the critical summer months, and/or biological sampling conducted.

Pools comprised 1% 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 Horse Hill Creek, the pools are relatively shallow, and none have a maximum depth of at least 2 feet. However, 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 10. 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. Additional 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.

No low gradient riffles were observed, which typically provide the gravel and/or small cobble dominant substrates which are ideal for salmonid spawning habitat (Graph 6).

One-hundred percent of the pool tail-outs measured had embeddedness ratings of 3. 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 Horse Hill Creek Reach 1, 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 58%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in Horse Hill Creek. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

However, the riparian buffer is thin or nearly absent in areas with livestock, agriculture, and urban development. Riparian removal, intensive grazing, and vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

### DISCUSSION FOR MILL CREEK

Mill Creek has four channel types: F2, A4, B1 and A4.

There are 4019 feet of F2 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 1524 feet of A4 channel type in Reach 2, and 1509 feet of A4 channel type in Reach 4. A4 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

There are 105 feet of B1 channel type in Reach 3. B1 channel types are excellent for bank-placed boulders and bank cover and good for log cover.

Many site specific projects can be designed within B and F channel types, especially to increase pool frequency, volume and shelter.

The water temperatures recorded on the survey days July 29 - 30, 1997 ranged from 60°F to 64°F. Air temperatures ranged from 66°F to 75°F. The warmer water temperatures were recorded in Reach 1. This temperature regime is adequate 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 10% 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 Mill Creek, the pools are relatively shallow with 27% having a maximum depth of at least 2 feet. These pools comprised 3% of the total length of stream habitat.

The mean shelter rating for pools was 24. 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 (38%), boulders (34%), undercut banks (12%), and small woody debris (7%). None of the 2 low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

Sixty-three percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 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, Reach 1 had better embeddedness ratings than Reach 2, which had ratings of 4 for all of the pool tail-outs measured. Reaches 3 and 4 had no cobble embeddedness ratings, since there were no pool habitat types in these reaches.

The mean percent canopy for the survey was 82%. This is good, since 80 percent is generally considered desirable.

### DISCUSSION FOR WEEKS CREEK

Weeks Creek has one channel type, a F4 (6263 ft.).

There are 6263 feet of F4 channel type in Reach 1. According to the DFG Habitat Restoration Manual, 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.

Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperature recorded on the survey day July 31, 1997 was 60°F. Air temperatures ranged from 75°F to 82°F. This temperature regime is favorable to 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 3% 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 Weeks Creek, the pools are relatively shallow with 20% having a maximum depth of at least 2 feet. These pools comprised 1% of the total length of stream habitat.

The only low gradient riffle measured had small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

One-hundred percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The mean percent canopy for the survey was 73%.

## DISCUSSION FOR VAN BUREN CREEK

Van Buren Creek has three channel types: B2 , F2 and F4.

There are 2284 feet of B2 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

There are 10433 feet of F2 channel type in Reach 2. F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 1135 feet of F4 channel type in Reach 3. 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 B and F channel types, especially to increase pool frequency, volume and shelter.

The water temperatures recorded on the survey days August 5 - 7, 1997 ranged from 62°F to 70°F. Air temperatures ranged from 76°F to 88°F. The warmer water temperatures were recorded in Reach 2. These temperatures, if sustained, are above the threshold stress level (65°F) 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 8% 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 Van Buren Creek, the pools are relatively shallow with 11% having a maximum depth of at least 2 feet.

The mean shelter rating for pools was 27. 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 boulders (60%), bedrock ledges (21%), root masses (14%), and undercut banks (2%).

One of the 3 low gradient riffles measured (33%) had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

One-hundred percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. 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, Reach 3 had the poorest ratings, however, all reaches



had poor embeddedness values.

The mean percent canopy for the survey was 90%. This is very good, since 80 percent is generally considered desirable.

## SUMMARY

The surveys of 1997 documented the presence of salmonids in Mill and Van Buren Creeks, however none were observed in Horse Hill and Weeks Creeks. It is likely that low stream flow dictates the distribution of salmonids in the Mark West Tributaries, and thus biological sampling is necessary to verify the absence of salmonids in Horse Hill and Weeks Creeks.

Both Horse Hill and Weeks Creeks suffer from low flow, lack of deep pools, low canopy, and an elevated degree of embeddedness. Mill and Van Buren Creeks have higher shading due to higher canopy, however temperatures are nonetheless elevated. All four creeks have the following similar ailments, namely: flow is limited, rearing habitat (i.e. number of pools) is limited, spawning gravels are in short supply, and substrates are embedded.

Sediment transported downstream in the winter also impacts fair quality spawning gravel downstream. However, many opportunities and alternatives exist for habitat improvement due to the more stable channel types (i.e. gravel retention structures). Many site specific projects can be designed within Mill and Van Buren Creeks, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for unstable banks and high stream velocities.

## GENERAL MANAGEMENT RECOMMENDATIONS

Mill, Horse Hill, Weeks and Van Buren Creeks should be managed as an anadromous, natural production streams.

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) Access for migrating salmonids is a potential problem in Van Buren Creek, therefore fish passage should be monitored, and improved where possible. Baffles should be installed in culverts to facilitate easier fish access. The road culvert on St. Helena Road is undermining and is a fish barrier. Eventually this culvert will have to be replaced. Future design should include improved passage of gravel as a second priority and fish passage first.

- 2) Increase the canopy on Horse Hill and Weeks Creeks by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above the survey sections 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. In the Mark West Tributaries, 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 streams.
- 4) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from root masses and boulders. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and additional 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.
- 5) 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.
- 6) Spawning gravels in these tributaries are limited to relatively few reaches. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream.

#### PROBLEM SITES AND LANDMARKS - HORSE HILL 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.

HabitatStream

<u>Unit #</u>	<u>Length(ft)</u>	<u>Comments</u>
1.00	416	Dry at mouth.
2.00	450	Isolated pool in dry creek bed.
3.00	2206	800' in-trib on left. 1000'-rd. Culvert on rt.. 1675' conf on rt. (trib)
5.00	2871	Stop at 1st. bridge crossing.

## PROBLEM SITES AND LANDMARKS - MILL CREEK SURVEY COMMENTS

HabitatStream

<u>Unit #</u>	<u>Length(ft)</u>	<u>Comments</u>
---------------	-------------------	-----------------

### Reach 1

1.00	1445	Dry- Confluence with Mark West-start
2.00	1482	Isolated pocket of water.
4.00	1619	Water temp taken at 004@ 11:00, 1st water.
7.00	1820	SHD present
9.00	1917	SHD present.
13.00	2219	4" SHD
17.00	2398	4" SHD
28.00	2852	Trib on right bank.
31.00	3010	Intermittent dry.
32.00	3036	Sculpin, no SHD
38.00	3267	Oily layer on top of pool
42.00	3421	Road crossing
43.00	3468	No SHD
45.00	3576	Sculpin, newt.
48.00	3857	CA newt

### Reach 2

53.00	4602	317'- trib on left. Dry road crossing
54.00	4813	Trib on lf bank.
55.00	4829	SHD present
56.00	4883	Dry rd crossing
63.00	5101	5" SHD.
70.00	5544	End at Poulsen's, no access.

### Reach 3

71.00	5554	Channel change, Start above Poulsen's
75.00	5649	Bedrock chute, channel change

### Reach 4

76.00	5653	Cement dam with water pipe.
77.00	6890	Channel change, dry above dam.
78.00	7157	End of survey-dry above dam to rd. Culvert, Foothill Rd. 1237' to confluence at Foothill Ranch Rd.

## PROBLEM SITES AND LANDMARKS - WEEKS CREEK SURVEY COMMENTS

HabitatStream

<u>Unit #</u>	<u>Length(ft)</u>	<u>Comments</u>
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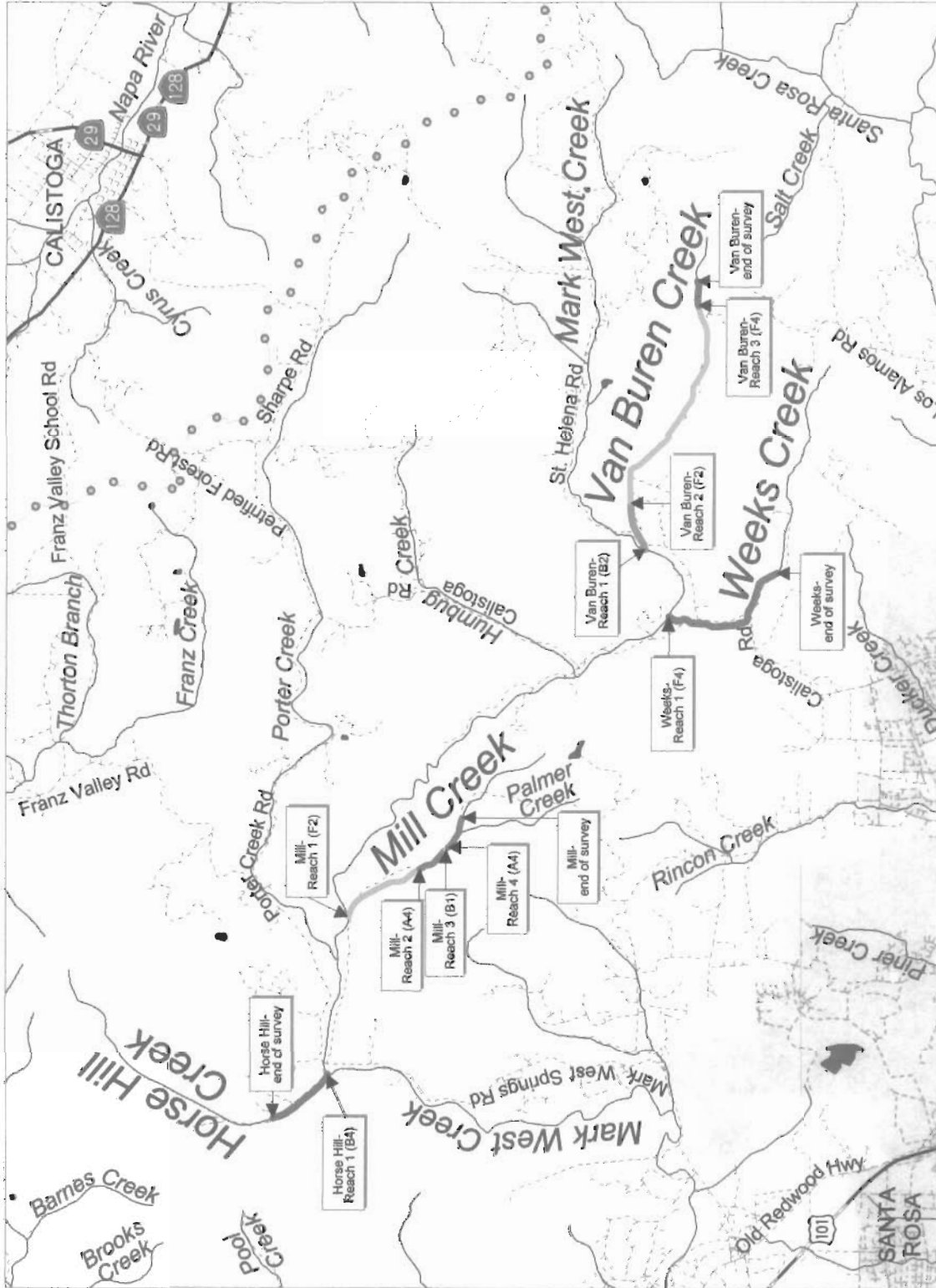
1.00	1412	End of Calistoga Rd. bldg. Dry creek bed. Started at confluence of Mark West.
2.00	3904	NO ACCESS
3.00	3952	Start at bridge Calistoga RD u/s Millberg's. Large root wad.

7.00	4165	Trib on LB
13.00	4936	230' trib comin' on left
15.00	6265	400' Dry RD crossing, bulldozed creek bed. 1000' trib.End of survey: Dry creek bed.

PROBLEM SITES AND LANDMARKS - VAN BUREN CREEK SURVEY COMMENTS

<u>Habitat</u>	<u>Stream</u>	
<u>Unit #</u>	<u>Length(ft)</u>	<u>Comments</u>
Reach 1		
1.00	362	Start at confluence of Mark West-dry
2.00	651	4' drop from culvert bridge culvert St. Helena Rd.
6.00	1071	1st water, no fish
12.00	1381	1 roach
14.00	1464	SHD
16.00	1588	SHD and roach 4" SHD
29.00	1986	Flies, caddis larvae
30.00	2005	SHD, hundreds
35.00	2124	SHD-lots
36.00	2285	Huge boulders extended
Reach 2		
39.00	2986	Rd crossing
43.00	3458	no fish
45.00	3658	Roach
51.00	4005	2-3" roach
54.00	4086	4" roach
57.00	4257	frog, roach
58.00	4299	End of survey, no access
58.00	10899	No Access
59.00	10939	Start at 3rd bridge, Becker Property.
69.00	11210	SHD
71.00	11281	SHD
72.00	11465	Springs, at edge of creek.
78.00	11789	SHD 1.5 to 2"
85.00	12097	Log jam with large boulders
94.00	12341	Trib on right bank
104.00	12682	Trib on LB (large)
105.00	12717	Channel change
Reach 3		
107.00	12861	Trib on RB (small)
122.00	13298	Trib on RB
123.00	13543	Sinuous, narrow channel, level gradient.
128.00	13855	***End of survey, no access***

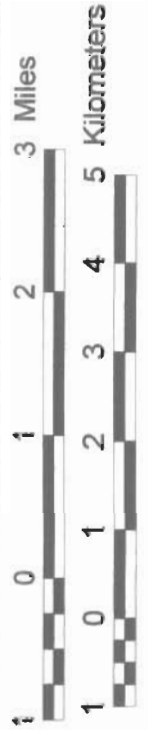
# Mark West Tributaries- Horse Hill Creek, Mill Creek, Weeks Creek, Van Buren Creek



Mill Creek Tables Graphs Map  
 Assessment Completed 1997  
 Page 1 of 10

Waterbodies  
 Roads  
 Santa Rosa city limits (2000)

Central Coast Region  
 Department of Fish and Game



Scale = 1:85,000

Mill Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/29/97 to 07/30/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS13 LATITUDE: 38°32'49" LONGITUDE: 122°41'51"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL PERCENT	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
8	3	RIFFLE	10	27	213	3	4.2	0.4	103	822	97	778	0	10
25	9	FLATWATER	32	63	1582	22	5.1	0.3	258	6444	82	2048	0	2
22	7	POOL	28	32	694	10	9.3	0.7	284	6241	261	5739	310	24
23	1	DRY	29	203	4669	65	11.5	0.0	0	0	0	0	0	0
TOTAL UNITS	78				TOTAL LENGTH (ft.) 7157				TOTAL AREA (sq. ft.) 13507			TOTAL VOL. (cu. ft.) 8565		

Drainage: Mark West Creek, Russian River

Survey Dates: 07/29/97 to 07/30/97

LONGITUDE: 122°41'51"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH		TOTAL LENGTH		MEAN WIDTH		MEAN DEPTH		MAXIMUM DEPTH		MEAN AREA		TOTAL AREA		MEAN VOLUME		TOTAL VOLUME		MEAN RESIDUAL		MEAN SHELTER		MEAN CANOPY
				%	ft.	ft.	%	ft.	ft.	%	ft.	ft.	sq.ft.	sq.ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.	cu.ft.	cu.ft.	cu.ft.	cu.ft.	
6	2	LGR	8	31	186	3	5	0.5	3.4	142	853	136	816	0	15	83										
2	1	HGR	3	13	26	0	1	0.1	0.4	4	8	0	1	0	0	88										
5	4	GLD	6	35	173	2	5	0.5	1.1	95	474	45	224	0	0	81										
20	5	RUN	26	70	1409	20	5	0.3	1.3	301	6013	92	1834	0	3	86										
1	0	TRP	1	54	54	1	5	0.5	1.1	202	202	101	101	0	0	85										
1	1	MCP	1	58	58	1	7	1.1	2.0	426	426	468	468	0	0	70										
14	3	LSR	18	32	446	6	10	0.8	3.9	333	4657	329	4608	428	30	83										
4	2	LSBk	5	24	96	1	7	0.6	2.0	151	606	105	422	52	13	85										
2	1	LSBo	3	19	39	1	11	0.4	1.1	175	351	70	140	23	18	95										
23	1	DRY	29	203	4669	65	12	0.0	0.0	0	0	0	0	0	0	79										

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
78	20	7157	13589	8614

Mill Creek

Drainage: Mark West Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/29/97 to 07/30/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08N08W13 LATITUDE: 38°32'49" LONGITUDE: 122°41'51"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	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
2	1	MAIN	9	56	113	16	0.8	314	627	285	569	0	0
20	6	SCOUR	91	29	581	84	0.7	281	5614	259	5170	310	26
TOTAL UNITS	22				TOTAL LENGTH (ft.) 694				TOTAL AREA (sq.ft.) 6241		TOTAL VOL. (cu.ft.) 5739		



Mill Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/29/97 to 07/30/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS13 LATITUDE: 38°32'49" LONGITUDE: 122°41'51"

UNITS	HABITAT	HABITAT	<1 FOOT	<1 FOOT	1-<2 FT.	1-<2 FT.	2-<3 FT.	2-<3 FT.	3-<4 FT.	3-<4 FT.	>=4 FEET	>=4 FEET
MAX DPTH	TYPE	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT
MEASURED		OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE
1	TRP	5	0	0	1	100	0	0	0	0	0	0
1	MCP	5	0	0	0	0	1	100	0	0	0	0
14	LSR	64	2	14	8	57	2	14	2	14	0	0
4	LSBK	18	0	0	3	75	1	25	0	0	0	0
2	LSB0	9	1	50	1	50	0	0	0	0	0	0

TOTAL  
UNITS  
22

Mill Creek

Drainage: Mark West Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/29/97 to 07/30/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS13 LATITUDE: 38°32'49" LONGITUDE: 122°41'51"

UNITS MEASURED	HABITAT TYPE	% TOTAL UNDERCUT	% TOTAL BANKS	% TOTAL SMD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
6	4 LGR	0	0	20	0	60	0	0	0	20	0
2	2 HGR	0	0	0	0	0	0	0	0	0	0
5	4 GLD	0	0	0	0	0	0	0	0	0	0
20	6 RUN	0	0	0	0	20	0	0	0	80	0
1	1 TRP	0	0	0	0	0	0	0	0	0	0
1	1 MCP	0	0	0	0	0	0	0	0	0	0
14	14 LSR	13	8	5	44	0	0	0	0	28	2
4	3 LSBk	0	4	0	0	0	0	7	0	49	40
2	2 LSBo	0	0	0	5	0	0	0	0	95	0
23	5 DRY	0	0	0	0	0	0	0	0	0	0
78	42	10	7	4	38	0	0	0	0	37	3
22	21	12	7	5	38	0	0	0	0	34	4

Mill Creek

Drainage: Mark West Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/29/97 to 07/30/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS13 LATITUDE: 38°32'49" LONGITUDE: 122°41'51"

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
6	2	LGR	0	0	0	0	50	50	0
2	1	HGR	0	0	0	0	0	0	100
5	4	GLD	0	0	25	0	0	25	50
20	5	RUN	0	0	0	0	60	20	20
1	0	TRP	0	0	0	0	0	0	0
1	1	MCP	0	0	0	100	0	0	0
4	3	LSR	0	0	0	0	67	0	33
4	2	LSBK	0	0	0	50	0	50	0
2	1	LSBO	0	0	0	0	100	0	0
3	5	DRY	0	0	0	0	60	40	0

Mill 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
82.44	74.27	25.73	90.80	91.04

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	5	5	20
Boulder	9	5	28
Cobble/Gravel	10	12	44
Silt/clay	1	3	8

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	2	4
Deciduous Trees	0	2	4
Evergreen Trees	25	19	88
No Vegetation	0	2	4

# APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Mill Creek

SAMPLE DATES: 07/29/97 to 07/30/97

SURVEY LENGTH:

MAIN CHANNEL: 7157 ft.

SIDE CHANNEL: 0 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: Mark West Sprgs

Latitude: 38°32'49"

Legal Description: T08NR08WS13

Longitude: 122°41'51"

## SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

### STREAM REACH 1 (Units 1-50)

Channel Type: F2

Main Channel Length: 4019 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 6.0 ft.

Pool Mean Depth: 0.8 ft.

Base Flow: 0.0 cfs

Water: 60-64°F Air: 68-74°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 88%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 0% 2. 47% 3. 53% 4. 0% 5. 0%

Mean Canopy Density: 79%

Evergreen Component: 72%

Deciduous Component: 28%

Pools by Stream Length: 14%

Pools >=2 ft. Deep: 35%

Pools >=3 ft. Deep: 12%

Mean Pool Shelter Rtn: 25

Dom. Shelter: Boulders

Occurrence of LOD: 57%

Dry Channel: 2482 ft.

### STREAM REACH 2 (Units 51-70)

Channel Type: A4

Main Channel Length: 1524 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 3.8 ft.

Pool Mean Depth: 0.6 ft.

Base Flow: 0.0 cfs

Water: 64-64°F Air: 72-75°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 95%

Dom. Bank Substrate: Cobble/Gravel

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

Mean Canopy Density: 91%

Evergreen Component: 87%

Deciduous Component: 14%

Pools by Stream Length: 9%

Pools >=2 ft. Deep: 0%

Pools >=3 ft. Deep: 0%

Mean Pool Shelter Rtn: 19

Dom. Shelter: Boulders

Occurrence of LOD: 0%

Dry Channel: 683 ft.

### STREAM REACH 3 (Units 71-75)

Channel Type: B1

Main Channel Length: 105 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 3.4 ft.

Pool Mean Depth: 0.0 ft.

Base Flow: 0.0 cfs

Water: 62-62°F Air: 66-66°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 94%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 2. 3. 4. 5.

Mean Canopy Density: 84%

Evergreen Component: 60%

Deciduous Component: 40%

Pools by Stream Length: 0%

Pools >=2 ft. Deep: \*\*\*\*\*%

Pools >=3 ft. Deep: \*\*\*\*\*%

Mean Pool Shelter Rtn: 0

Dom. Shelter: Undercut Banks

Occurrence of LOD: 0%

Dry Channel: 0 ft.

STREAM REACH 4 (Units 76-78)

Channel Type: A4

Main Channel Length: 1509 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 0.8 ft.

Pool Mean Depth: 0.0 ft.

Base Flow: 0.0 cfs

Water: 62-62°F Air: 66-66°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 90%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 2. 3.

Mean Canopy Density: 83%

Evergreen Component: 65%

Deciduous Component: 35%

Pools by Stream Length: 0%

Pools >=2 ft. Deep: \*\*\*\*\*%

Pools >=3 ft. Deep: \*\*\*\*\*%

Mean Pool Shelter Rtn: 0

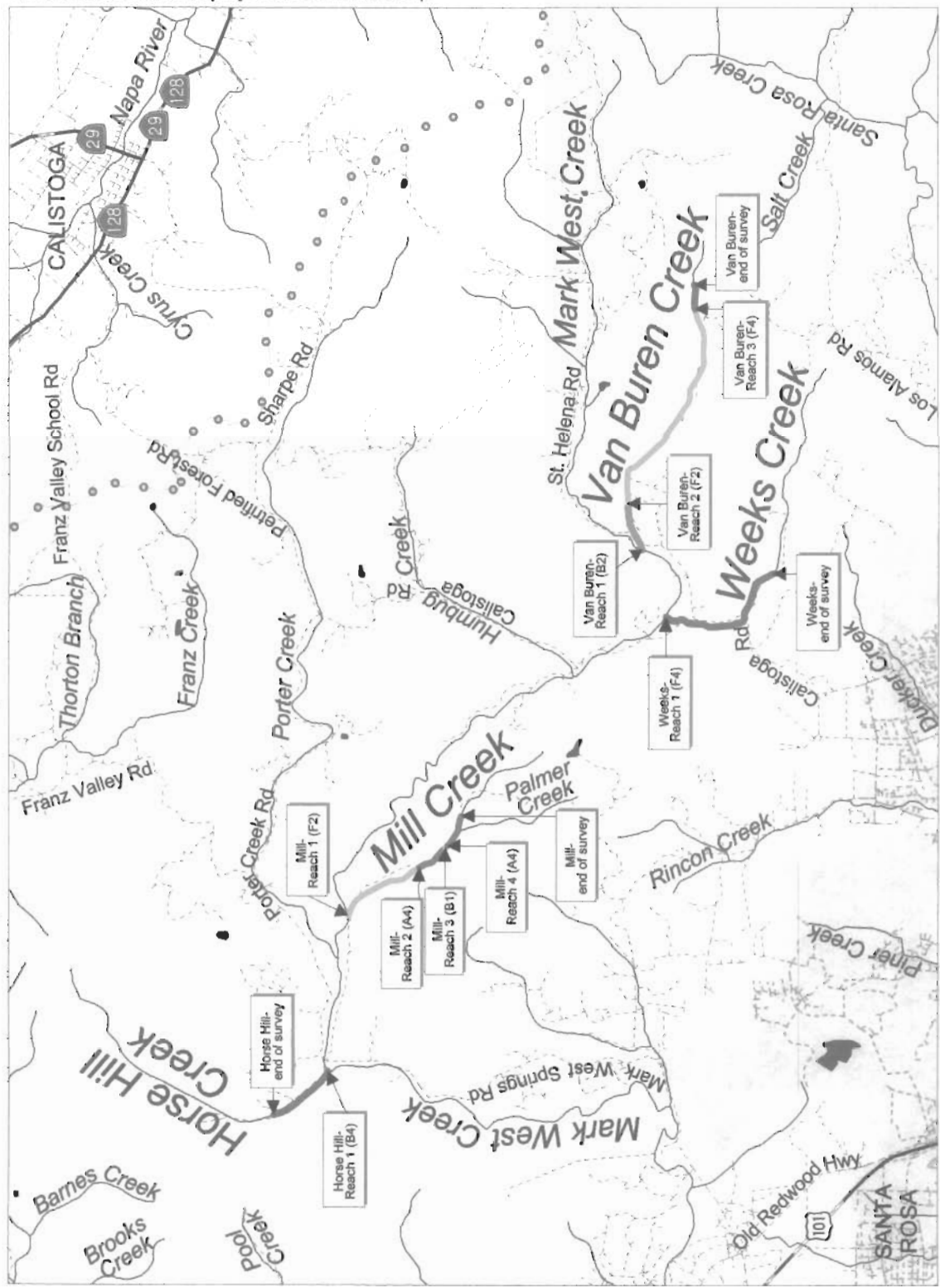
Dom. Shelter: Undercut Banks

Occurrence of LOD: 0%

Dry Channel: 1504 ft.

4. 5.

# Mark West Tributaries- Horse Hill Creek, Mill Creek, Weeks Creek, Van Buren Creek



Central Coast Region  
 Department of Fish and Game



Scale = 1:85,000



- Russian River
- boundary
- streams
- channel types
- waterbodies
- Roads
- Santa Rosa
- city limits (2000)

Horse Hill Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08N08W511 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

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
1	1	POOL	20	34	34	1	7.5	0.4	216	216	86	86	0	10
4	0	DRY	80	709	2837	99	0.0	0.0	0	0	0	0	0	0
TOTAL UNITS	5				TOTAL LENGTH (ft.) 2871				TOTAL AREA (sq. ft.) 216		TOTAL VOL. (cu. ft.) 86			



Horse Hill Creek

Drainage: Mark West Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS11 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	%	ft.	TOTAL LENGTH	%	ft.	MEAN WIDTH	ft.	MEAN DEPTH	ft.	MEAN DEPTH	ft.	MAXIMUM DEPTH	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	EST. POOL VOL	RATING	MEAN SHELTER	MEAN CANOPY
1	1	LSR	20	34	34	1	8	0.4	0.7	216	216	86	0	0	0	0	0	0	0	0	0	0	0	0	85
4	0	DRY	80	709	2837	99	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
5	1	2871	216	86

Horse Hill Creek

Drainage: Mark West Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS11 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT 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
1	1	SCOUR	100	34	34	34	100	7.5	0.4	216	216	86	86	0	10

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOLUME (cu.ft.)
1	1	34	216	86

Horse Hill Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: TOSNR08WS11 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT		<1 FOOT		<1 FOOT		1-<2 FT.		1-<2 FT.		2-<3 FT.		2-<3 FT.		3-<4 FT.		3-<4 FT.		>=4 FEET		>=4 FEET	
		PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH
1	LSR	100		1		100		0		0		0		0		0		0		0		0	

TOTAL  
UNITS  
1

Horse Hill Creek

Drainage: Mark West Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprags LEGAL DESCRIPTION: TOBNR08WS11 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

UNITS MEASURED	SHelter TYPE	HABITAT TYPE	% UNDERCUT	% BANKS	% SMD	% LWD	% ROOT	% TERR.	% AQUATIC	% WHITE	% BOULDERS	% BEDROCK	% LEDGES
1	1	LSR	0	0	0	0	100	0	0	0	0	0	0
4	0	DRY	0	0	0	0	0	0	0	0	0	0	0
5	1		0	0	0	0	100	0	0	0	0	0	0
1	1		0	0	0	0	100	0	0	0	0	0	0

Horse Hill Creek

Drainage: Mark West Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/24/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR08WS11 LATITUDE: 38°32'58" LONGITUDE: 122°43'17"

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
1	LSR		0	0	0	0	100	0	0
0	DRY		0	0	0	0	0	0	0

Horse Hill 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
57.50	55.00	45.00	95.00	80.00

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	1	1	100

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	1	0	50
Deciduous Trees	0	1	50
Evergreen Trees	0	0	0
No Vegetation	0	0	0

# APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Horse Hill Creek

SAMPLE DATES:

SURVEY LENGTH:

MAIN CHANNEL: 2871 ft.

SIDE CHANNEL: 0 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: Mark West Sprgs

Latitude: 38°32'58"

Legal Description: T08NR08WS11

Longitude: 122°43'17"

## SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

### STREAM REACH 1 (Units 1-5)

Channel Type: B4

Mean Canopy Density: 58%

Main Channel Length: 2871 ft.

Evergreen Component: 55%

Side Channel Length: 0 ft.

Deciduous Component: 45%

Riffle/Flatwater Mean Width: 0.0 ft.

Pools by Stream Length: 1%

Pool Mean Depth: 0.4 ft.

Pools >=2 ft. Deep: 0%

Base Flow: 0.0 cfs

Pools >=3 ft. Deep: 0%

Water: -°F Air: 89-89°F

Mean Pool Shelter Rtn: 10

Dom. Bank Veg.: Brush

Dom. Shelter: Root masses

Bank Vegetative Cover: 88%

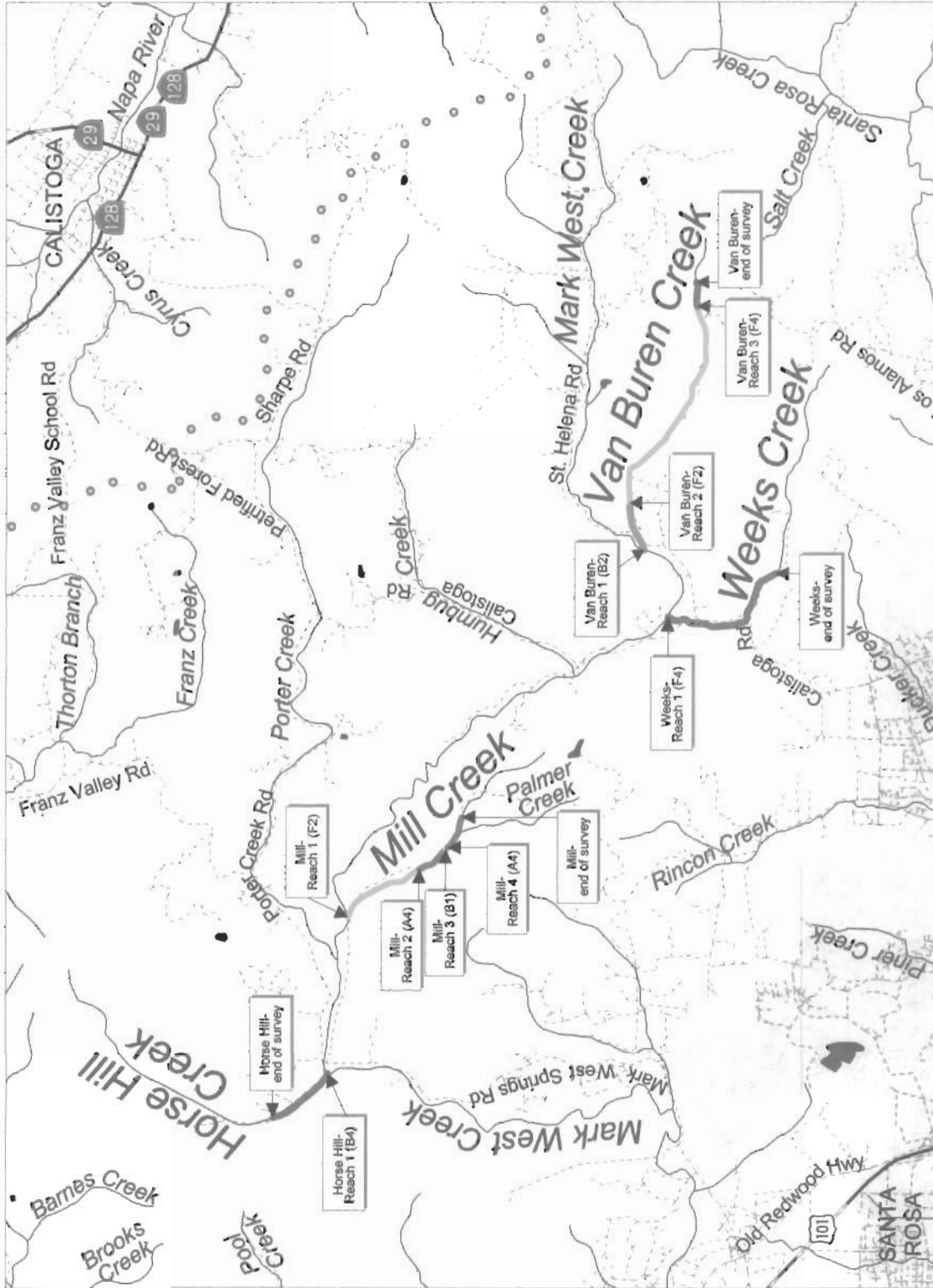
Occurrence of LOD: 0%

Dom. Bank Substrate: Silt/Clay/Sand

Dry Channel: 2837 ft.

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

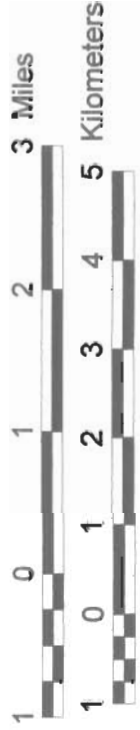
# Mark West Tributaries- Horse Hill Creek, Mill Creek, Weeks Creek, Van Buren Creek



Weeks Creek Tables Graphs Map  
 Assessment Completed 1997  
 Page 1 of 9

Legend:  
 Russian River main boundary  
 Streams  
 City types  
 Waterbodies  
 Roads  
 Santa Rosa city limits (2000)

Central Coast Region  
 Department of Fish and Game



Scale = 1:85,000



Weeks Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR7JS29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL PERCENT	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
1	1	RIFFLE	7	44	44	1	4.2	0.1	37	37	4	4	0	0
2	2	FLATWATER	13	52	103	2	5.4	0.5	185	371	107	215	0	0
5	3	POOL	33	43	213	3	11.7	1.0	470	2352	517	2584	906	52
6	0	DRY	40	569	3411	54	0.0	0.0	0	0	0	0	0	0
1	0	NOT SURVE	7	2492	2492	40	0.0	0.0	0	0	0	0	0	0
TOTAL UNITS	15				TOTAL LENGTH (ft.)					TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)		
	6				6263					2760		2802		

Weeks Creek

Drainage: Mark West Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR74S29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	%	ft.	ft.	ft.	MEAN DEPTH	MEAN MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	sq.ft.	sq.ft.	cu.ft.	EST. POOL VOL	MEAN RESIDUAL	SHELTER RATING	MEAN CANOPY	%
1	1	LGR	7	44	44	1	4	0.1	0.2	37	37	281	197	4	0	0	4	0	0	0	90
1	1	GLD	7	55	55	1	5	0.7	1.3	281	281	89	18	197	0	0	197	0	0	0	35
1	1	RUN	7	48	48	1	5	0.2	0.4	89	89	625	750	18	0	0	18	0	0	0	90
3	1	LSR	20	51	152	2	13	1.1	3.8	625	1876	127	89	2250	906	53	89	0	2	100	75
1	1	LSBK	7	22	22	0	6	0.7	1.1	127	127	349	245	0	0	0	245	0	0	0	15
1	1	LSBO	7	40	40	1	15	0.7	1.6	0	0	0	0	0	0	0	0	0	0	0	95
6	0	DRY	40	569	3411	54	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	90
1	0	NS	7	2492	2492	40	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0

Weeks Creek T

TOTAL UNITS	15	TOTAL LENGTH (ft.)	6263	AREA (sq.ft)	2760	TOTAL VOL. (cu.ft)	2802
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Weeks Creek

Drainage: Mark West Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR7WS29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT 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
5	3	SCOUR	100	43	213	100	11.7	1.0	470	2352	517	2584	906	52

TOTAL UNITS	5	TOTAL LENGTH (ft.)	213	TOTAL AREA (sq.ft.)	2352	TOTAL VOLUME (cu.ft.)	2584
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Weeks Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR7WS29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

UNITS	HABITAT	HABITAT	<1 FOOT	<1 FOOT	1-2 FT.	1-2 FOOT	2-3 FT.	2-3 FOOT	3-4 FT.	3-4 FOOT	>4 FEET	>4 FEET
MAX DPTH	TYPE	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT
MEASURED		OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE
3	LSR	60	0	0	0	2	67	0	1	33	0	0
1	LSBk	20	0	0	0	1	100	0	0	0	0	0
1	LSBa	20	0	0	0	1	100	0	0	0	0	0

TOTAL  
UNITS

5

Weeks Creek

Drainage: Mark West Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR7WS29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

UNITS MEASURED	SHelter TYPE	HABITAT	% UNDERCUT	% TOTAL SMD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
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1	1	LGR	0	0	0	0	0	0	0	0	0
1	0	GLD	0	0	0	0	0	0	0	0	0
1	1	RUN	0	0	0	0	0	0	0	0	0
3	3	LSR	14	4	14	45	0	7	0	15	0
1	1	LSBK	0	0	0	0	0	0	0	0	100
1	1	LSBO	0	0	0	0	0	10	0	90	0
6	3	DRY	0	0	0	0	0	0	0	0	0
1	0	NS	0	0	0	0	0	0	0	0	0

15	10		9	2	9	28	0	8	0	43	0
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HA BITAT  
TYPES  
POOLS  
ONLY

5	5		9	2	9	28	0	8	0	43	0
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Weeks Creek

Drainage: Mark West Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/31/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T8NR7WS29 LATITUDE: 38°30'32" LONGITUDE: 122°38'53"

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
1	1	LGR	0	0	0	100	0	0	0
1	1	GLD	0	0	100	0	0	0	0
1	1	RUN	0	0	0	100	0	0	0
1	1	LSR	0	100	0	0	0	0	0
1	1	LSBK	0	0	100	0	0	0	0
1	1	LSBQ	0	0	0	0	100	0	0
1	1	DRY	0	0	0	100	0	0	0
0	0	NS	0	0	0	0	0	0	0

Weeks 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
72.50	42.50	57.50	87.86	79.29

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	1	0	7.14
Boulder	0	0	0
Cobble/Gravel	3	5	57.14
Silt/clay	3	2	35.71

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	1	0	7.14
Brush	6	2	57.14
Deciduous Trees	0	3	21.43
Evergreen Trees	0	2	14.29
No Vegetation	0	0	0

# APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Weeks Creek

SAMPLE DATES:

SURVEY LENGTH:

MAIN CHANNEL: 6263 ft.

SIDE CHANNEL: 0 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: Mark West Sprgs

Latitude: 38°30'32"

Legal Description: T8NR7WS29

Longitude: 122°38'53"

## SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

### STREAM REACH 1 (Units 1-15)

Channel Type: F4

Mean Canopy Density: 73%

Main Channel Length: 6263 ft.

Evergreen Component: 43%

Side Channel Length: 0 ft.

Deciduous Component: 58%

Riffle/Flatwater Mean Width: 5.0 ft.

Pools by Stream Length: 3%

Pool Mean Depth: 1.0 ft.

Pools >=2 ft. Deep: 20%

Base Flow: 0.0 cfs

Pools >=3 ft. Deep: 20%

Water: - 60°F Air: 75-82°F

Mean Pool Shelter Rtn: 52

Dom. Bank Veg.: Brush

Dom. Shelter: Boulders

Bank Vegetative Cover: 84%

Occurrence of LOD: 20%

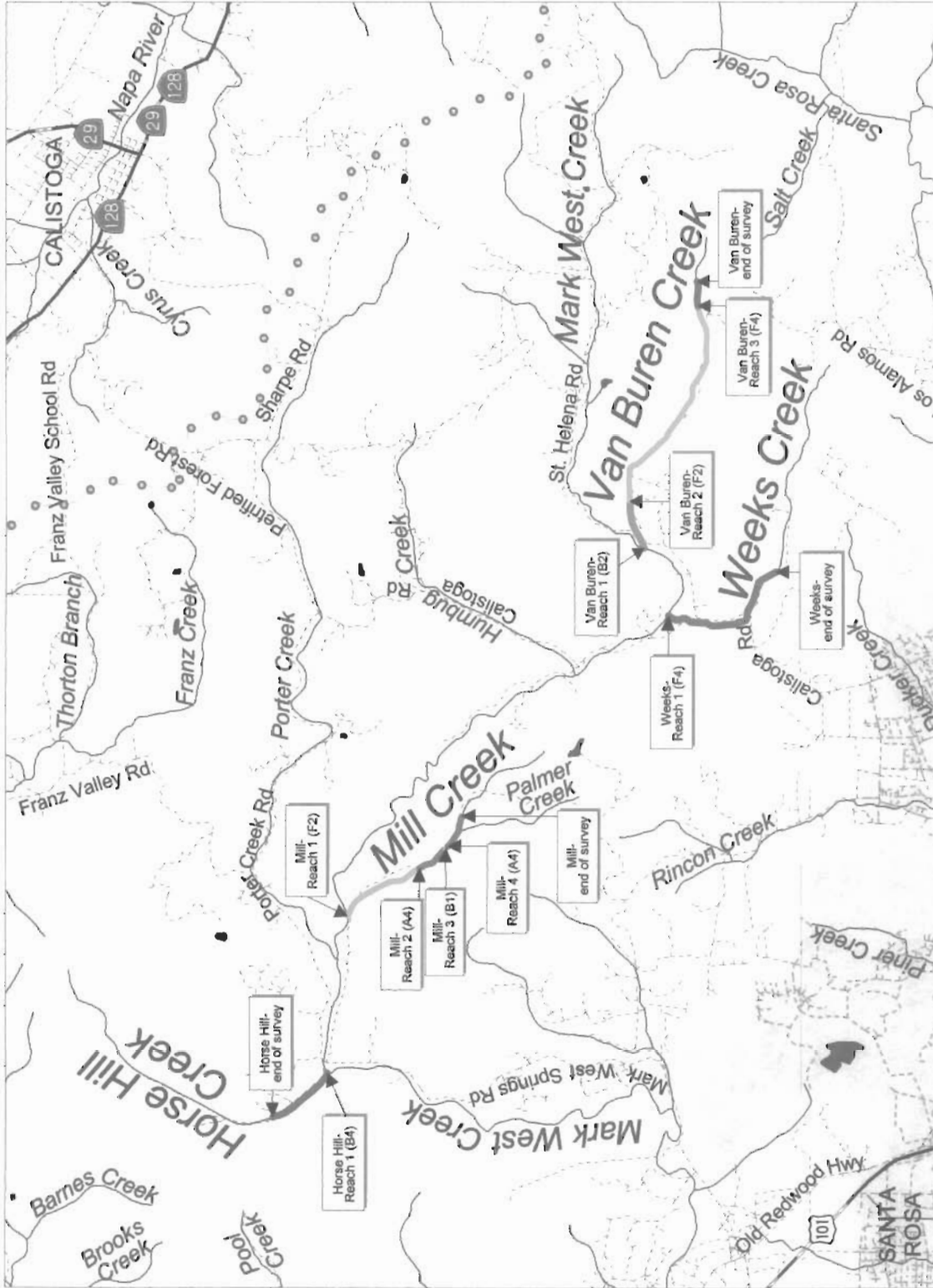
Dom. Bank Substrate: Cobble/Gravel

Dry Channel: 3411 ft.

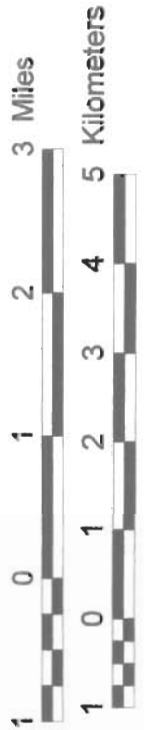
Embeddness Value: 1. 0% 2. 0% 3. 60% 4. 40% 5. 0%



# Mark West Tributaries- Horse Hill Creek, Mill Creek, Weeks Creek, Van Buren Creek



Central Coast Region  
 Department of Fish and Game



Scale = 1:85,000



Van Buren Creek Tables Graphs Map  
 Assessment Completed 1997  
 Page 1 of 9

Van Buren Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR07WS28 LATITUDE: 38°30'44" LONGITUDE: 122°38'17"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL PERCENT	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
16	4	RIFLE	12	28	444	3	3.3	0.2	77	1228	17	271	0	0
46	10	FLATWATER	35	68	3113	22	4.7	0.3	274	12624	82	3776	0	3
45	10	POOL	34	24	1100	8	7.0	0.7	174	7840	151	6797	123	27
23	0	DRY	18	121	2793	20	0.0	0.0	0	0	0	0	0	0
1	0	NOT SURVE	1	6600	6600	47	0.0	0.0	0	0	0	0	0	0
TOTAL UNITS	24				TOTAL LENGTH (ft.)				TOTAL AREA (sq. ft.)			TOTAL VOL. (cu. ft.)		
131					14050				21691			10843		

Van Buren Creek

Drainage: Mark West Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08N07W528 LATITUDE: 38°30'44" LONGITUDE: 122°38'17"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	%	ft.	TOTAL LENGTH	%	ft.	MEAN DEPTH	ft.	MEAN MAXIMUM DEPTH	ft.	MEAN AREA	TOTAL AREA	sq.ft.	MEAN VOLUME	TOTAL VOLUME	cu.ft.	MEAN RESIDUAL EST. POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
14	3	LGR	11	27	377	3	3	0.2	0.8	81	1141	18	252	0	0	0	0	0	0	0	0	92
2	1	HGR	2	34	67	0	2	0.3	0.6	44	87	9	18	0	0	0	0	0	0	0	0	95
1	1	POW	1	39	39	0	6	0.5	0.9	137	137	69	69	0	40	0	0	0	0	0	0	90
2	2	GLD	2	26	52	0	6	0.4	0.7	149	298	55	110	0	0	0	0	0	0	0	0	93
34	6	RUN	26	72	2455	17	5	0.3	1.0	303	10295	88	2984	0	0	0	0	0	0	0	0	87
9	1	SRN	7	63	567	4	5	0.3	1.1	214	1922	69	619	0	0	0	0	0	0	0	0	93
2	1	MCP	2	37	75	1	9	1.1	2.5	321	642	358	715	276	15	0	0	0	0	0	0	93
3	1	STP	2	60	179	1	7	0.7	2.0	391	1173	280	840	167	20	0	0	0	0	0	0	90
7	2	LSR	5	27	186	1	8	0.8	2.0	204	1430	196	1371	204	61	0	0	0	0	0	0	95
14	4	LSBK	11	23	324	2	7	0.8	2.5	165	2306	163	2285	136	14	0	0	0	0	0	0	89
18	2	LSBo	14	17	306	2	6	0.6	1.5	112	2020	73	1316	56	28	0	0	0	0	0	0	90
1	0	BPR	1	30	30	0	9	1.0	1.5	270	270	270	270	0	90	0	0	0	0	0	0	95
23	0	DRY	18	121	2793	20	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	90
1	0	NS	1	6600	6600	47	0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL UNITS	TOTAL UNITS			LENGTH (ft.)			AREA (sq.ft.)							TOTAL VOL. (cu.ft.)								
131	24			14050			21720							10849								

Van Buren Creek

Drainage: Mark West Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR07WS28 LATITUDE: 38°30'44" LONGITUDE: 122°38'17"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL PERCENT 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
5	2	MAIN	11	51	254	23	7.5	0.8	363	1814	311	1556	221	18
39	8	SCOUR	87	21	816	74	6.9	0.7	148	5756	127	4972	109	27
1	0	BACKWATER	2	30	30	3	8.9	1.0	270	270	270	270	0	90
TOTAL UNITS 45	TOTAL UNITS 10			TOTAL LENGTH (ft.) 1100					TOTAL AREA (sq. ft.) 7840			TOTAL VOL. (cu. ft.) 6797		

Van Buren Creek

Drainage: Mark West Creek, Russian River

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

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR07WS28 LATITUDE: 38°30'44" LONGITUDE: 122°38'17"

UNITS	HABITAT	HABITAT	<1 FOOT	<1 FOOT	1-<2 FOOT	1-<2 FOOT	2-<3 FOOT	2-<3 FOOT	3-<4 FOOT	3-<4 FOOT	>=4 FOOT	>=4 FOOT
MAX DPTH	TYPE	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT	MAXIMUM	PERCENT
MEASURED		OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE	DEPTH	OCCURRENCE
2	MCP	4	0	0	1	50	1	50	0	0	0	0
3	STP	7	0	0	2	67	1	33	0	0	0	0
7	LSR	16	0	0	6	86	1	14	0	0	0	0
14	LSBK	31	1	7	11	79	2	14	0	0	0	0
18	LSBd	40	4	22	14	78	0	0	0	0	0	0
1	BPR	2	0	0	1	100	0	0	0	0	0	0

TOTAL  
UNITS  
45

**Drainage: Mark West Creek, Russian River**

Survey Dates: 08/05/97 to 08/07/97

LONGITUDE: 122°38'17"

[illegible]

063 19

Map

0 60 21

Van Buren Creek

Drainage: Mark West Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: Mark West Sprgs LEGAL DESCRIPTION: T08NR07WS28 LATITUDE: 38°30'44" LONGITUDE: 122°38'17"

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
3		LGR	0	0	0	33	67	0	0
1		HGR	0	0	0	0	0	100	0
1		POW	0	0	0	0	100	0	0
2		GLD	0	50	50	0	0	0	0
6		RUN	0	0	0	0	67	33	0
1		SRN	0	0	0	0	0	0	100
1		MCP	0	100	0	0	0	0	0
1		STP	0	0	0	0	0	0	100
2		LSR	0	50	50	0	0	0	0
4		LSBK	0	0	0	0	0	0	100
2		LSBo	0	100	0	0	0	0	0
0		BPR	0	0	0	0	0	0	0
6		DRY	0	0	50	0	0	50	0
0		NS	0	0	0	0	0	0	0

Van Buren 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
90.16	76.69	23.31	92.03	92.07

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	11	7	30.51
Boulder	7	7	23.73
Cobble/Gravel	11	11	37.29
Silt/clay	1	4	8.47

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	2	2	6.78
Deciduous Trees	4	1	8.47
Evergreen Trees	24	26	84.75
No Vegetation	0	0	0



# APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Van Buren Creek

SAMPLE DATES: 08/05/97 to 08/07/97

SURVEY LENGTH:

MAIN CHANNEL: 13852 ft.

SIDE CHANNEL: 198 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: Mark West Sprgs

Latitude: 38°30'44"

Legal Description: T08NR07WS28

Longitude: 122°38'17"

## SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

### STREAM REACH 1 (Units 1-36)

Channel Type: B2

Main Channel Length: 2284 ft.

Side Channel Length: 198 ft.

Riffle/Flatwater Mean Width: 3.7 ft.

Pool Mean Depth: 0.7 ft.

Base Flow: 0.0 cfs

Water: -64°F Air: 76-83°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 95%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 0% 2. 0% 3. 42% 4. 58% 5. 0%

Mean Canopy Density: 88%

Evergreen Component: 68%

Deciduous Component: 32%

Pools by Stream Length: 8%

Pools >=2 ft. Deep: 0%

Pools >=3 ft. Deep: 0%

Mean Pool Shelter Rtn: 28

Dom. Shelter: Boulders

Occurrence of LOD: 0%

Dry Channel: 1377 ft.

### STREAM REACH 2 (Units 37-105)

Channel Type: F2

Main Channel Length: 10433 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 4.6 ft.

Pool Mean Depth: 0.8 ft.

Base Flow: 0.0 cfs

Water: 62-70°F Air: 78-88°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 92%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 0% 2. 0% 3. 32% 4. 68% 5. 0%

Mean Canopy Density: 90%

Evergreen Component: 78%

Deciduous Component: 22%

Pools by Stream Length: 7%

Pools >=2 ft. Deep: 19%

Pools >=3 ft. Deep: 0%

Mean Pool Shelter Rtn: 23

Dom. Shelter: Boulders

Occurrence of LOD: 20%

Dry Channel: 998 ft.

### STREAM REACH 3 (Units 106-128)

Channel Type: F4

Main Channel Length: 1135 ft.

Side Channel Length: 0 ft.

Riffle/Flatwater Mean Width: 4.2 ft.

Pool Mean Depth: 0.7 ft.

Base Flow: 0.0 cfs

Water: 64-66°F Air: 82-84°F

Dom. Bank Veg.: Evergreen Trees

Bank Vegetative Cover: 89%

Dom. Bank Substrate: Cobble/Gravel

Embeddness Value: 1. 0% 2. 0% 3. 14% 4. 86% 5. 0%

Mean Canopy Density: 93%

Evergreen Component: 85%

Deciduous Component: 15%

Pools by Stream Length: 11%

Pools >=2 ft. Deep: 0%

Pools >=3 ft. Deep: 0%

Mean Pool Shelter Rtn: 62

Dom. Shelter: Boulders

Occurrence of LOD: 25%

Dry Channel: 220 ft.