CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Crane Creek
Report Completed 2005
Assessment Completed 1999

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Crane 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 Crane Creek. The objective of the biological inventory was to document the presence and distribution of salmonid and other aquatic species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEWS

Crane Creek is a tributary to Dry Creek, which is in turn a tributary to the Russian River, located in Sonoma County, California (see Crane Creek map, Appendix A). The legal description at the confluence with Dry Creek is T9N R10W S1. Its location is 38º 38' 58" North latitude and 122º 55' 31" West longitude. Year round vehicle access exists from Highway 101 via Westside Road and West Dry Creek Road.

Crane Creek and its tributaries drain a basin of approximately 2.47 square miles. Crane Creek is a second order stream and has approximately 3.12 miles of blue line stream, according to the USGS Geyserville 7.5 minute quadrangle. Dorman Creek is a major tributary and is described in this stream report. Summer flow was measured as approximately 0.1 cfs, 160 feet upstream of the confluence with Dry Creek. Elevations range from approximately 121 feet at the mouth of the creek to 1466 feet in the headwaters. Hardwood and mixed hardwood/conifer forest dominates the watershed, but there are zones of grassland and oak-woodland in the watershed. The watershed is entirely privately owned and only four percent is managed for agricultural use.

Sensitive plants listed from the California Native Plant Society Inventory and Department of Fish and Game's Natural Diversity Database within the Crane Creek watershed are: Rincon Ridge Ceanothus (*Ceanothus confusus*), a federal species of concern; and Rincon Manzanita (*Arctostaphylos stanfordiana Ssp decumbens*), which does not have state or federal special status, but was previously presumed to be extant.

Salmonid fish species historically present include steelhead trout (*Oncorhynchus mykiss*). Salmonid fish species currently present include steelhead trout (*Oncorhynchus mykiss*) which is listed as threatened on the federal endangered species list.

METHODS

The habitat inventory conducted in Crane Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The survey was conducted by AmeriCorps Volunteers, 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 Crane 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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

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 temperatures every 1.5 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. Crane Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements were in feet to the nearest tenth. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a hip chain and a stadia rod.

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 Crane Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "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 Crane 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 visually estimated using a list of seven size classes which are defined in the California Salmonid Stream Habitat Restoration Manual.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual. Canopy density relates to the amount of stream shaded from the sun. In Crane Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the top 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 and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Crane 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, including downed trees, logs and rootwads, 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 for data storage and analysis. Habitat is a Visual Basic extension to Microsoft Access, developed by Zebulon Young, University of California, Berkeley. This program processes and summarizes the data, and produces the following tables and appendices:

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

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

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs

- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HISTORICAL STREAM SURVEYS:

There are no historical records of surveys conducted on Crane Creek or its tributaries by the Department of Fish and Game.

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 6, 1999 through July 16, 1999 was conducted by Morgan Knechtle, Gary N., and Aaron Fairbrook (DFG) with supervision and analysis by CDFG. The survey began at the confluence with Dry Creek and extended up Crane Creek beyond the seven foot vertical falls. The total length of the stream surveyed was 13850 feet, with an additional 135 feet of side channel.

Flow was estimated to be 0.1 cfs during the survey period.

This section of Crane Creek has three channel types: from the mouth to 10866 feet an F4; next 959 feet a B4 and the upper 2025 feet a G4.

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

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.

G4 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 gravel substrate.

Water temperatures ranged from 52ºF to 67ºF. Air temperatures ranged from 62ºF to 82ºF. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs, Appendix E). A recorder in Reach 1, 800 feet upstream of West Dry Creek Road, logged temperatures every two hours from June 30 to September 28, 1999. The highest temperature recorded was 67.7ºF and the lowest was 56.7ºF. The mean of the daily highs was 63.7ºF for the month of July, 62.3ºF for August and 59.3ºF for September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% pool units, 29% riffle units, 27% flatwater units, and 4% dry streambed units. Based on total length there were 38% flatwater units, 30% riffle units, 20% pool units, and 11% dry streambed units (Graph 1).

Two hundred seventy six habitat units were measured and 96% were completely sampled. Eighteen 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 22%, glides 12%, root wad scour pools 11% and runs 8% (Graph 2). By percent total length, low gradient riffles made up 21%, step runs 14%, glides 12%, and runs 12%.

One hundred and ten pools were identified (Table 3). Scour pools were most often encountered at 69%, and comprised 66% 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. Thirty-five of the 103 pools (34%) had a depth of two feet or greater. These deeper pools comprised 10% 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 31. Riffle had the lowest rating with eight and flatwater rated 10 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 53, scour pools rated 32, and main channel pools rated 27 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were undercut banks at 21%, root masses 20%, small woody debris 9%, and large woody debris 8%. Graph 7 and Table 10 describe pool shelter in Crane Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in five of the twelve low gradient riffles measured. Small cobble was dominant in three of the low gradient riffles.

No mechanical gravel sampling was conducted in 1999 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 99 pool tail-outs measured, 23 had a value of 1 (23%); 36 had a value of 2 (36%); 34 had a value of 3 (34%); and one had a value of 4 (1%). Five (5%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and evergreen trees were 46% and 54%, respectively. Table 7 describes the canopy for the entire survey.

The mean percent right bank vegetated was 67% and the mean percent left bank vegetated was 56%. For the habitat units measured, the dominant vegetation types for the stream banks were:

35% evergreen trees, 34% deciduous trees, 20% brush, 10% grass and 1% bare soil (Graph 11). The dominant substrate for the stream banks were: 71% silt/clay/sand, 14% bedrock, 10% cobble/gravel and 5% boulder (Graph 10).

HABITAT INVENTORY RESULTS FOR DORMAN CANYON CREEK

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

The habitat inventory of Dorman Canyon on 07/13/99, 07/14/99, 07/15/99 was conducted by Morgan K. Gary N. Aaron F. (Americorps/Volunteer/Intern) with supervision and analysis by CDFG. The survey began at the confluence with Crane Creek and extended 5,273 feet up Dorman Canyon Creek to the forks/end of landowner access permission/end of survey.

Flow was estimated to be 0.02 cfs during the survey period.

This section of Dorman Canyon Creek has three channel types: from the mouth to 399 feet a G3; next 666 feet an A5 and the upper 4208 feet a G4.

Water temperatures ranged from 54 ℉ to 63 ℉. Air temperatures ranged from 55 ℉ to 80 ℉.

Table 1b summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** *there were 40% pool units, 24% riffle units, 21% flatwater units, and 14% dry streambed units. Based on total* ***length*** *there were 36% riffle units, 26% flatwater units, 23% dry streambed units, and 14% pool units (Graph 1b).*

One hundred forty habitat units were measured and 84% were completely sampled. Fifteen Level IV habitat types were identified. The data is summarized in Table 2b. The most frequent habitat types by percent ***occurrence*** *were low gradient riffles at 19%, dry streambed 14%, mid-channel pools 12% and plunge pools 12% (Table 2b). By percent total* ***length****, low gradient riffles made up 29%, dry streambed 23%, step runs 16%, and high gradient riffles 7%.*

Fifty-six pools were identified (Table 3b). Scour pools were most often encountered at 57%, and comprised 46% of the total length of pools (Graph 3b).

Table 4b is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Six of the 56 pools (11%) had a depth of two feet or greater (Graph 5b). 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 51. Riffle had the lowest rating with 2 and flatwater rated 9. Of the pool types, the main channel pools had the highest mean shelter rating at 64, scour pools rated 47, and backwater pools rated 5).

Table 5b summarizes fish shelter by habitat type. By percent area, the dominant pool shelter

types were undercut banks at 35%, boulders 22%, large woody debris 17%, and small woody debris 15%. Graph 7b describes the pool shelter in Dorman Canyon Creek.

Table 6b summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in four of the six low gradient riffles measured. Small cobble was dominant in one of the six low gradient riffles (Graph 6b).

No mechanical gravel sampling was conducted in 1999 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, four had a value of 1 (9%); twenty had a value of 2 (43%); twenty had a value of 3 (43%); and one had a value of 4 (2%). One (2%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Sand/silt/gravel/cobble was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 92%. The mean percentages of deciduous and evergreen trees were 15% and 85%, respectively. Graph 8b describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 47% and the mean percent left bank vegetated was 36%. For the habitat units measured, the dominant vegetation types for the stream banks were: 53% evergreen trees, 33% brush, 11% deciduous trees, 3% bare soil (Graph 11). The dominant substrate for the stream banks were: 91% silt/clay/sand, 3% bedrock, 3% boulder and 3% cobble/gravel (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 28, 1999 a biological inventory was conducted at four sites along Crane Creek to document the fish species composition and distribution at several locations. Each site was single pass electro-fished in Crane Creek using one Smith Root Model 12 electro-fisher. Fish from each site were counted by species, and returned to the stream. A random sample of fish was selected from each reach and tissues were taken for genetic analysis. The air temperature ranged from 54° to 58°F and the water temperature was consistently 54°F. The observers were Bryan Freele, Morgan Knechtle and Sarah Nossaman (DFG).

The inventory of the first site began at the mouth of Crane Creek and ended approximately 500 feet upstream. In run and pool habitat types, twelve steelhead (ranging 50-175mm) were observed, along with twenty-one sculpin.

The inventory of the second site began 420 feet above the confluence with Dry Creek and ended approximately 50 feet upstream. In pool habitat, four steelhead (ranging 130-180mm) were observed, along with one sculpin and six yellow-legged frogs.

The inventory of the third site began at habitat unit number 301, 6,960 feet above the confluence with Dry Creek. In run and pool habitat types twelve steelhead (ranging 50-130mm) were observed, along with two Pacific Giant Salamanders.

The inventory of the fourth site began at habitat unit number 382, 10629 feet above the confluence. In run and pool habitat types, 88 steelhead (ranging 35-170mm) were observed.

During the habitat inventory, no salmonids were observed upstream of habitat unit number 425, 12,688 feet above the confluence with Dry Creek, where a seven foot verticle falls appears to impede further passage. *Oncorhynchus mykiss* were not observed above the falls.

A biological inventory was not conducted on Dorman Canyon Creek, but steelhead are known to inhabit the stream.

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

Table 2. Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1957, 1964-5, 1973-4, 2000	Steelhead	DFG	N
1957,	Sculpin	DFG	N
1999	Pacific Giant Salamander	DFG	N
1999	Yellow-legged Frog	DFG	N

There is no record of hatchery stocking or fish rescue/transfer operations in Crane Creek.

ADULT SURVEYS:

There are no historical records of spawning/carcass surveys conducted by the Department of Fish and Game on Crane Creek or its tributaries.

DISCUSSION

Crane Creek has 3 channel types: F4 (10866 ft.), B4 (959 ft.) and G4 (2025 ft.).

There are 10866 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream 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. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 959 feet of B4 channel type in Reach 2. 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. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

There are 2025 feet of G4 channel type in Reach 3. G4 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 July 6, 1999 to July 16, 1999 ranged from 52 °F to 67 °F. Air temperatures ranged from 62 °F to 82 °F. The warmer water temperatures were recorded in Reach 1. These temperatures, if sustained, are above the threshold stress level (65 °F) for salmonids.

Summer temperatures measured using remote temperature recorders ranged from 56.7°F to 67.7°F for Reach 1. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures near optimal for salmonids.

Pools comprised 20% 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 Crane Creek, the pools are relatively shallow with 47% having a maximum depth of at least 2 feet. These pools comprised 10% 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 31. However, a pool shelter rating of approximately 80 is desirable. The relatively small/moderate/large amount of pool shelter that now exists is being provided primarily by undercut banks (24%), root masses (18%), small woody debris (17%), and large woody debris (16%).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.

Eight of the twelve low gradient riffles measured (67%) had either gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

Thirty five of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 23% 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

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

DISCUSSION FOR DORMAN CANYON CREEK

Dorman Canyon Creek has 3 channel types: G3 (399 ft.), A5 (666 ft.) and G4 (4208 ft.).

There are 399 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.

There are 666 feet of A5 channel type in Reach 2. The high energy, steep gradient A5 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

There are 4,208 feet of G4 channel type in Reach 3. G4 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 07/13/99 to 07/15/99 ranged from 54°F to 63°F. Air temperatures ranged from 55°F to 80°F. The warmer water temperatures were recorded in Reach 1.

This temperature regime is favorable to salmonids. It is unknown if this thermal regime is typical, and to make any further conclusions, temperatures need to be monitored for a period of time through the critical summer months, and\or biological sampling conducted.

Pools comprised 14% 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 Dorman Canyon Creek, the pools are relatively shallow with only 18% having a maximum depth of at least 2 feet. These pools comprised 3% 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 51. 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 (37%), boulders (21%), large woody debris (16%), and small

woody debris (14%). 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.

Five of the six low gradient riffles measured (83%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Forty-six of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 9% 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 Dorman Canyon Creek 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 92%. This is very good, since 80 percent is generally considered desirable.

GENERAL MANAGEMENT RECOMMENDATIONS

Crane 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. Efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. 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) In Crane Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

2) 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.

3) Crane Creek would benefit from the 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.

4) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

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.

CRANE 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 #	DISTANCE UPSTREAM	COMMENTS
1	22	Gravel bar @ mouth
2	87	Tire riprap
5	191	Water leaking from left bank- saturated
6	260	Bedrock bottom- no spawning habitat
7	380	RB slight erosion
9	467	Dry drainage ditch RB
12	545	Great habitat
17	667	Debris accumulation
19	776	6" pipe crossing stream
21	846	Lots of small wood unit #21-29
36	1272	Dry trib RB
40	1428	Dry trib RB
46	2574	Water going subsurface
47	2614	Water temp 59F
49	2711	Pump station on RB
51	2813	Hobo Temp location; grapevine accumulation
54	2959	Grapevine cluster; abandoned H20 pipe
56	3034	Potential debris accumulation
59	3170	Rough skinned newt; 5' diameter redwood

74.1	3917	Side channel at lower flows, fed now by a sulphur spring
93	4655	*Arundo*- owner says this 4 ft patch has not spread in 20 years
103	5524	Small spring LB
106	5703	Spring LB
107	5763	Spring LB
116	6470	Spring LB
124	6836	Culvert #1; survey continues with Habitat Unit #300
305	7075	Rough-skin newt
308	7155	Left bank has dripping water
316	7560	Bedrock "toilet bowl"
317	7628	12" culvert RB
323	7878	Washed out fence crossing creek
324	7923	12 6" fish
328	8163	Confluence with an unmarked trib- dry here but wet upstream
336	8530	Rough-skin newt
339	8718	2 PVC water pipes; rough-skin newt
340	8729	6 rough-skin newts (2 mature)
347	9103	Dry drainage ditch RB
357	9503	Scotch broom covers LB
362	9697	Unstable LB
365	9847	Small wood accumulation @ pool tail crest
369	9948	Dry trib LB
373	10173	Survey stakes RB
374	10206	Mouth of Dorman Creek
375	10220	Culvert
377	10282	Plunge pool below flashboard dam
385.1	10646	Secondary channel formed as a result of a debris accumulation
386	10695	Dry side channel LB
387	10721	Timber harvest up RB slope
390	10804	Skid trail through unit
392	10866	Small sluff LB (15'W)
393	10965	Possible channel change
395	11051	Fence crossing
398	11154	Wet trib RB- HT later
400	11374	Channel type
402	11472	Dry trib LB
406	11700	Slump LB
411	11825	Dry trib RB; timber harvest boundary

412	11873	Possible channel change
419	12188	Dry trib LB
420	12264	Timber harvest end
421	12369	Dry trib RB
425	12589	7 ft. vertical ledge jump- no fish observed upstream
428	12712	Slump LB; 2 5" pacific giant salamanders
436	12980	Slump LB
437	13254	Road access LB
445	13749	Gully RB
448	13850	END OF SURVEY

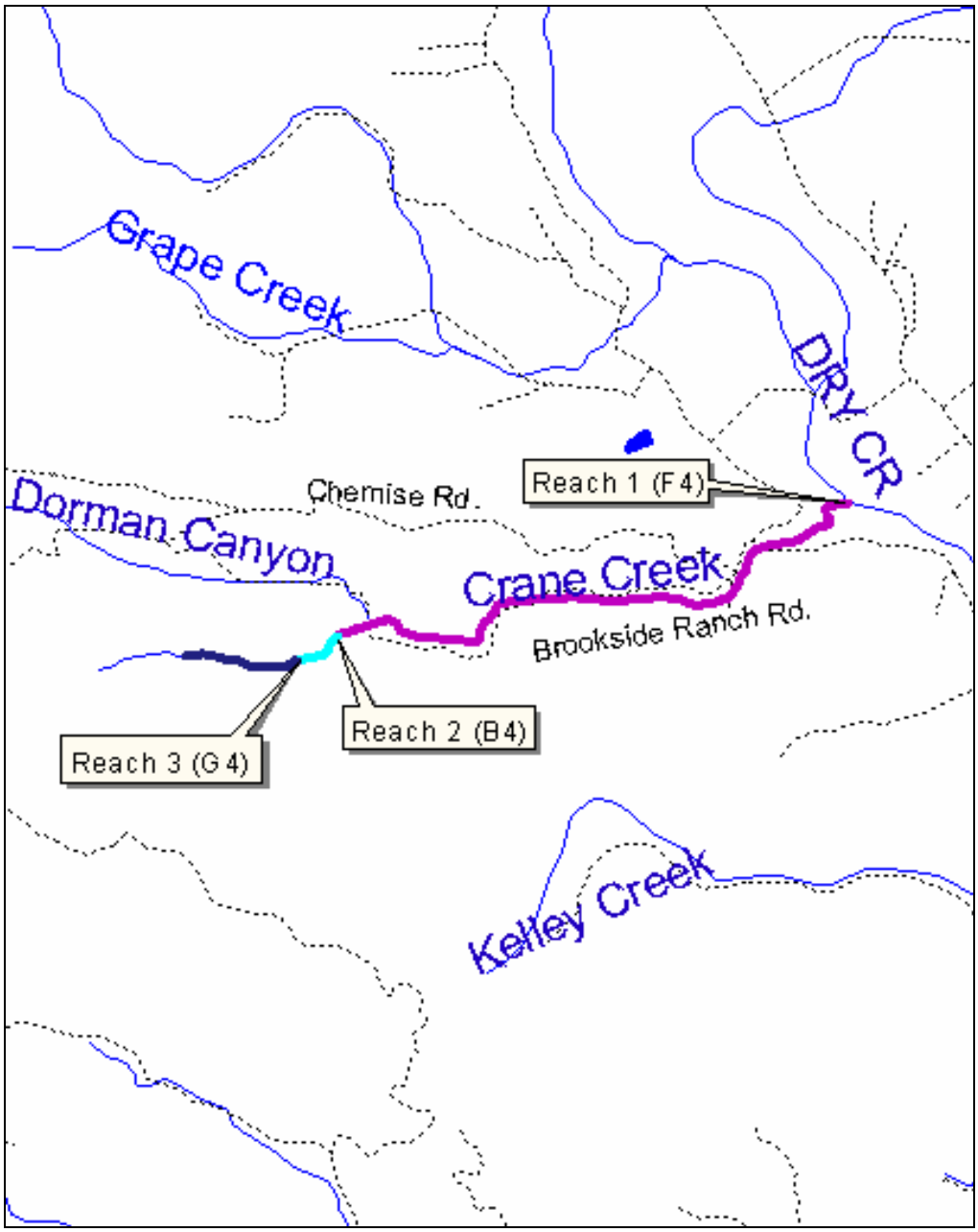
SURVEY COMMENTS FOR DORMAN CANYON

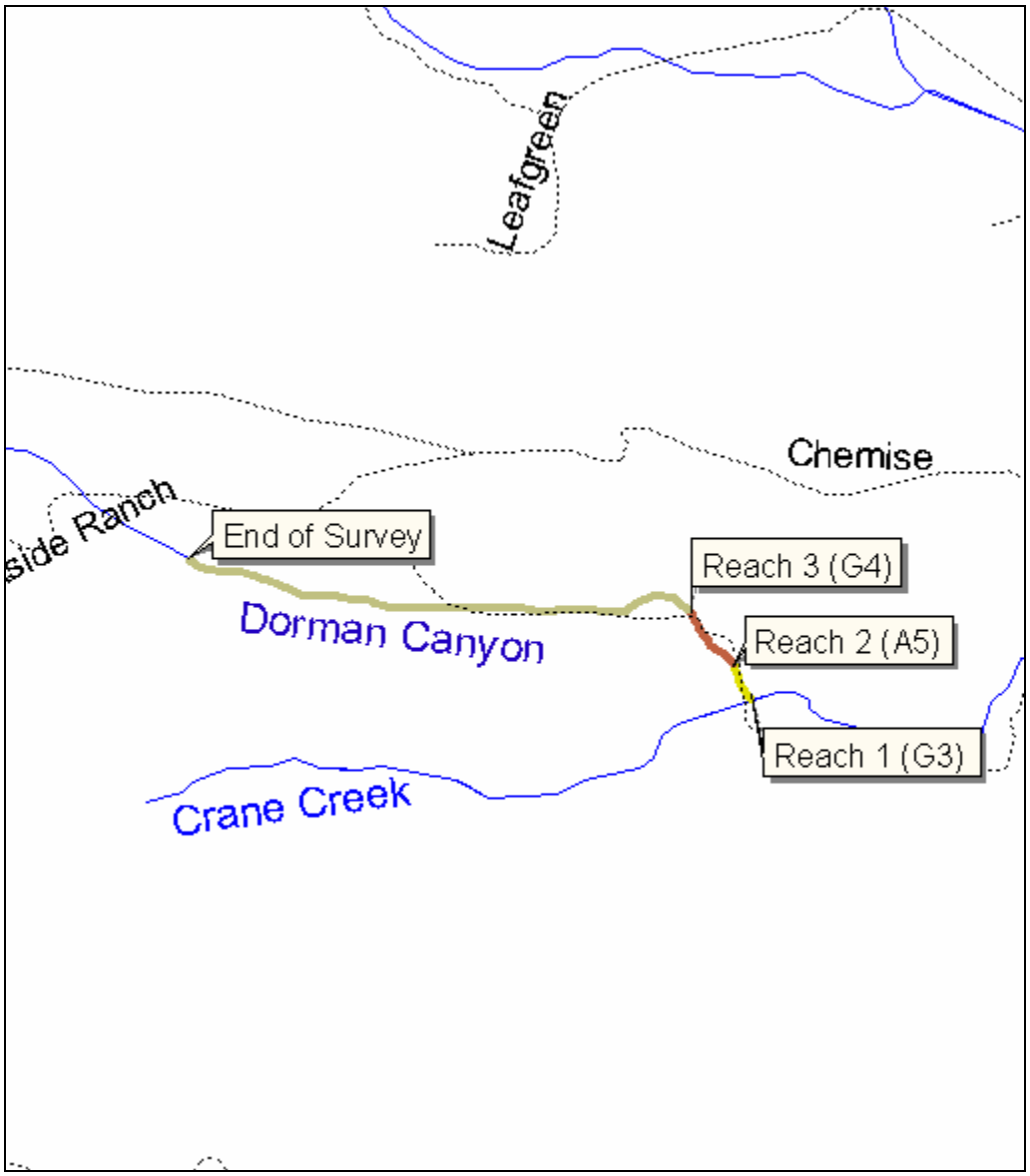
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	*DISTANCE UPSTREAM*	*COMMENTS*
1	*19*	*2 pieces of large wood over 10' long- log accumulation*
2	*62*	*Pacific giant salamander (PGS) 5"long*
4	*108*	*Lg. tire; algae blanket over pool*
5	*136*	*Culvert*
7	*174*	*Nice tree over pool*
14	*486*	*Channel change*
18	*608*	*Possible log accumulation, may cause plunge pool below*
21	*838*	*Possible historic dam 6' tall; 50' fence down on RB*
22	*846*	*Lg wood, debris on bank*
28	*1065*	*Possible channel change at culvert*
29	*1123*	*Wet trib LB; dry ditch and new road LB*
32	*1406*	*Possible debris accumulation due to grape vines- needs to be removed; Dry trib LB*
47	*1921*	*Eroding banks; lots of poison oak*
51	*2101*	*Timber harvest boundary*
53	*2270*	*Dry trib LB; debris accumulation*
55	*2297*	*PGS; frogs*
60	*2416*	*PGS*
61	*2426*	*Water is not flowing over the logs*
63	*2495*	*No plunging*
65	*2572*	*Slump LB; debris accumulation*
68	*2668*	*Dry trib LB*
69	*2676*	*PGS*

75	*2836*	*Not plunging*
77	*2879*	*PGS; step is made of wood*
79	*2961*	*Logging equipment crossed here- put hay down*
83	*3025*	*Not plunging*
85	*3116*	*Possible brush check dam site- narrow trench for channel*
86	*3122*	*Erosion control riprap RB- 5' from road*
87	*3148*	*5' waterfall; 2.5' log accumulation on top*
88	*3186*	*Stream crossing*
90	*3211*	*Fence down in creek- lots of small wood causing dams*
93	*3310*	*Drainage road pipe RB*
95	*3444*	*Dry trib LB; old logging road LB*
96	*3559*	*Fence over creek*
97	*3599*	*Drainage pipe RB*
98	*3607*	*Relief ditch RB; dry trib*
100	*3633*	*Large slump LB- 40' across*
106	*3919*	*Dry trib LB*
111	*4006*	*Deeply entrenched creek*
112	*4022*	*Small slump LB*
115	*4095*	*Retaining structure- fish enhancement*
119	*4386*	*Crossing; house RB*
122	*4543*	*Dry trib LB*
123	*4554*	*Dry trib LB*
127	*4672*	*4" PGS*
140	*5273*	****END OF SURVEY due to steep gradient, multiple log debris accumulation, and no fish observed*

APPENDIX A: MAP




Leafgreen
Chemise
side Ranch
End of Survey
Reach 3 (G4)
Dorman Canyon
Reach 2 (A5)
Reach 1 (G3)
Crane Creek

APPENDIX B: TABLES

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

Stream Name: Crane Creek

LLID: 1229251386494

Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
3	2	CULVERT	1.1	16	49	0.4	1.5	0.1	0.1	27	81	3	8		
10	0	DRY	3.6	160	1598	11.5									
74	74	FLATWATER	26.7	71	5290	38.0	7.1	0.5	1.1	470	34779	264	19573		16
110	110	POOL	39.7	26	2855	20.5	8.4	0.9	1.7	221	24313	255	26314	204	36
79	79	RIFFLE	28.5	52	4130	29.7	6.1	0.3	0.6	295	23331	83	6462		19

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
276	265	13922	82504	52357

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Crane Creek

LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
60	60	LGR	21.7	48	2871	20.6	6	0.2	1.7	278	16698	72	4230		23	87
18	18	HGR	6.5	69	1241	8.9	6	0.3	1	367	6613	124	2230		10	95
1	1	BRS	0.4	18	18	0.1	11	0.1	0.3	20	20	2	2			65
33	33	GLD	11.9	51	1679	12.1	8	0.6	2.7	397	13091	262	8641		19	85
22	22	RUN	7.9	75	1642	11.8	7	0.5	1.5	505	11108	267	5869		22	90
19	19	SRN	6.9	104	1969	14.1	6	0.5	1.2	557	10580	267	5064		10	96
22	22	MCP	7.9	20	442	3.2	9	0.8	3.8	207	4553	284	5971	223	35	91
1	1	CCP	0.4	10	10	0.1	7	0.7	1.4	70	70	70	70	49	5	95
7	7	STP	2.5	64	447	3.2	7	0.5	2	402	2815	287	1720	198	16	97
11	11	CRP	4.0	35	385	2.8	8	1.0	2.9	288	3171	398	3979	338	21	89
8	8	LSL	2.9	24	193	1.4	9	1.2	3.5	211	1689	279	2235	249	63	85
31	31	LSR	11.2	27	823	5.9	9	0.8	2.7	247	7657	248	7184	195	37	94
14	14	LSBk	5.1	23	318	2.3	8	1.0	3.8	179	2508	241	3136	197	17	96
2	2	LSBo	0.7	14	28	0.2	6	0.6	1.9	70	139	47	93	36	10	98
10	10	PLP	3.6	14	137	1.0	9	1.2	4.4	124	1238	175	1747	133	56	86
3	3	SCP	1.1	20	61	0.4	7	0.5	1.6	134	403	68	136	40	105	92

Table 2 (cont) - Summary of Habitat Types and Measured Parameters

Stream Name: Crane Creek

LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)		Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
1	1	BPB	0.4	11	11	0.1	7	0.6	0.8	69	69	42	42	42			85
10	0	DRY	3.6	160	1598	11.5											90
3	2	CUL	1.1	16	49	0.4	2	0.1	0.1	27	81	3	8				100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
276	265	13922	82504	52357

Table 3 - Summary of Pool Types

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
30	30	MAIN	27	30	899	31	8.5	0.8	248	7438	211	5915	29
76	76	SCOUR	69	25	1884	66	8.4	0.9	216	16403	208	14998	37
4	4	BACKWATER	4	18	72	3	6.8	0.5	118	472	40	121	105

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
110	110	2855	24313	21034

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

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
21	MCP	20	2	10	13	62	5	24	1	5	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
6	STP	6	0	0	5	83	1	17	0	0	0	0
10	CRP	10	0	0	4	40	6	60	0	0	0	0
8	LSL	8	0	0	3	38	3	38	2	25	0	0
29	LSR	28	5	17	16	55	8	28	0	0	0	0

Table 4 (cont) - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Crane Creek

LLID: 1229251386494

Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
13	LSBk	13	0	0	8	62	4	31	1	8	0	0
2	LSBo	2	1	50	1	50	0	0	0	0	0	0
10	PLP	10	0	0	6	60	3	30	0	0	1	10
1	BPB	1	1	100	0	0	0	0	0	0	0	0
2	SCP	2	0	0	2	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
103	9	9	59	57	30	29	4	4	1	1

Mean Maximum Residual Pool Depth (ft.): 1.7

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999 Dry Units: 10

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
60	22	LGR	15	5	14	11	4	34	0	18	0
18	12	HGR	2	4	0	0	2	6	0	86	0
1	0	BRS									
79	34	TOTAL RIFFLE	10	5	9	7	3	24	0	42	0
33	17	GLD	11	1	8	21	3	19	3	22	6
22	13	RUN	11	25	12	13	0	15	0	25	0
19	16	SRN	17	1	6	0	1	3	0	70	2
74	46	TOTAL FLAT	13	8	8	11	2	12	1	40	3
22	20	MCP	13	9	12	7	4	0	0	46	10
1	1	CCP	0	0	0	0	0	0	0	100	0
7	7	STP	0	6	7	0	0	0	0	53	34
11	9	CRP	55	6	3	22	0	3	0	11	0
8	8	LSL	11	34	28	11	5	0	0	10	0

Table 5 (cont) - Summary of Mean Percent Cover By Habitat Type

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999 Dry Units: 10

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
31	26	LSR	35	9	1	49	0	0	0	5	0
14	11	LSBk	7	2	9	4	7	11	0	39	22
2	2	LSBo	50	0	0	0	0	0	0	50	0
10	10	PLP	2	4	11	7	0	5	3	54	15
3	2	SCP	50	0	0	50	0	0	0	0	0
1	0	BPB									
110	96	TOTAL POOL	21	9	8	20	2	2	0	29	8
3	0	CUL									
276	176	TOTAL	17	8	8	15	2	9	0	34	5

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999 Dry Units: 10

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
60	12	LGR	8	8	42	25	17	0	0
18	5	HGR	0	0	20	20	40	20	0
1	0	BRS	0	0	0	0	0	0	0
33	8	GLD	13	25	13	50	0	0	0
22	7	RUN	0	0	29	29	14	14	14
19	3	SRN	0	0	33	33	33	0	0
22	7	MCP	0	14	14	0	29	43	0
1	1	CCP	0	0	0	0	0	0	100
7	5	STP	0	0	20	0	0	20	60
11	4	CRP	0	50	50	0	0	0	0
8	4	LSL	0	50	25	0	25	0	0
31	7	LSR	0	14	29	29	0	14	14
14	6	LSBk	0	17	17	33	0	17	17
2	2	LSBo	0	0	50	0	50	0	0
10	4	PLP	0	25	25	0	0	50	0
3	3	SCP	33	0	67	0	0	0	0
1	1	BPB	0	0	0	0	0	0	100

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
90	53	46	0	67	56

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

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	6	18	13.6
Boulder	7	2	5.1
Cobble / Gravel	8	10	10.2
Sand / Silt / Clay	67	58	71.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	1	16	9.7
Brush	18	18	20.5
Hardwood Trees	33	27	34.1
Coniferous Trees	34	27	34.7
No Vegetation	2	0	1.1

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Crane Creek LLID: 1229251386494 Drainage: Russian River - Middle

Survey Dates: 7/6/1999 to 7/16/1999

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	10	13	21
SMALL WOODY DEBRIS (%)	5	8	9
LARGE WOODY DEBRIS (%)	9	8	8
ROOT MASS (%)	7	11	20
TERRESTRIAL VEGETATION (%)	3	2	2
AQUATIC VEGETATION (%)	24	12	2
WHITEWATER (%)	0	1	0
BOULDERS (%)	42	40	29
BEDROCK LEDGES (%)	0	3	8

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

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
2	2	CULVERT	1.4	24	48	0.9	3.0	0.1	0.1	66	132	4	4		
20	0	DRY	14.3	60	1195	22.7									
29	28	FLATWATER	20.7	47	1377	26.1	4.0	0.4	0.7	195	5658	67	1951		22
56	54	POOL	40.0	13	745	14.1	6.1	0.7	1.3	80	4492	73	3643	62	58
33	33	RIFFLE	23.6	58	1908	36.2	3.9	0.2	0.5	222	7331	54	1783		11

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
140	117	5273	17613	7381

Table 2b - Summary of Habitat Types and Measured Parameters

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
27	27	LGR	19.3	56	1519	28.8	4	0.2	0.9	211	5695	43	1154		12	93
6	6	HGR	4.3	65	389	7.4	5	0.3	0.8	273	1636	105	629		5	97
10	10	GLD	7.1	35	347	6.6	4	0.4	1	142	1420	59	587		23	92
5	4	RUN	3.6	35	174	3.3	3	0.3	1	126	629	36	178		15	100
14	14	SRN	10.0	61	856	16.2	4	0.3	1	253	3540	82	1155		23	95
17	15	MCP	12.1	12	204	3.9	6	0.9	2.1	75	1274	83	1218	73	76	89
4	4	STP	2.9	42	170	3.2	6	0.7	2.8	252	1009	198	793	163	41	90
3	3	CRP	2.1	15	44	0.8	4	0.4	1.2	58	173	41	123	25	58	90
6	6	LSL	4.3	13	77	1.5	5	0.5	1.6	63	375	36	218	30	49	93
3	3	LSR	2.1	12	35	0.7	6	0.5	1.4	68	204	47	142	37	85	98
1	1	LSBk	0.7	13	13	0.2	6	0.7	1	78	78	78	78	55	60	95
2	2	LSBo	1.4	12	23	0.4	5	0.5	0.9	56	111	31	63	22	5	93
17	17	PLP	12.1	9	150	2.8	7	0.7	2.6	62	1051	64	829	54	59	90
3	3	DPL	2.1	10	29	0.5	7	0.8	1.4	68	205	64	193	61	10	
20	0	DRY	14.3	60	1195	22.7										89
2	2	CUL	1.4	24	48	0.9	3	0.1	0.1	66	132	4	4			100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
140	117	5273	17533	7363

Table 3b - Summary of Pool Types

Stream Name: Dorman Canyon *LLID: 1229491386439* *Drainage: Russian River - Middle*

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: Quad: GEYSERVILLE *Legal Description: T09NR10WS10* *Latitude: 38:38:38.0N* *Longitude: 122:56:57.0W*

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
21	19	MAIN	38	18	374	50	6.4	0.8	112	2358	94	1775	68
32	32	SCOUR	57	11	342	46	5.9	0.6	62	1993	42	1167	54
3	3	BACKWATER	5	10	29	4	7.0	0.8	68	205	61	183	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
56	54	745	4556	3125

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

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
14	MCP	29	1	7	10	71	3	21	0	0	0	0
4	STP	8	0	0	3	75	1	25	0	0	0	0
3	CRP	6	1	33	2	67	0	0	0	0	0	0
6	LSL	12	3	50	3	50	0	0	0	0	0	0
3	LSR	6	2	67	1	33	0	0	0	0	0	0
1	LSBk	2	0	0	1	100	0	0	0	0	0	0
2	LSBo	4	2	100	0	0	0	0	0	0	0	0
13	PLP	27	2	15	9	69	2	15	0	0	0	0
3	DPL	6	0	0	3	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
49	11	22	32	65	6	12	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

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

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999 *Dry Units:* 20

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
27	5	LGR	20	4	20	39	8	0	0	9	0
6	1	HGR	0	0	0	0	0	0	0	100	0
33	6	TOTAL RIFFLE	17	3	17	33	7	0	0	24	0
10	5	GLD	65	5	20	0	10	0	0	0	0
5	1	RUN	15	85	0	0	0	0	0	0	0
14	5	SRN	52	2	20	24	0	0	0	2	0
29	11	TOTAL FLAT	55	11	18	11	5	0	0	1	0
17	12	MCP	32	21	12	10	3	0	0	23	0
4	4	STP	44	15	10	0	0	0	0	31	0
3	2	CRP	90	10	0	0	0	0	0	0	0
6	6	LSL	25	17	54	0	4	0	0	0	0
3	2	LSR	0	10	0	90	0	0	0	0	0
1	1	LSBk	0	50	0	50	0	0	0	0	0

Table 5b (cont) - Summary of Mean Percent Cover By Habitat Type

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999 *Dry Units:* 20

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
2	2	LSBo	0	0	0	0	0	0	0	100	0
17	13	PLP	39	11	15	8	0	0	0	27	0
3	1	DPL	100	0	0	0	0	0	0	0	0
56	43	TOTAL POOL	35	15	16	10	2	0	0	22	0
2	0	CUL									
140	60	TOTAL	37	13	17	13	3	0	0	18	0

Table 6b - Summary of Dominant Substrates By Habitat Type

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999 *Dry Units:* 20

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
27	6	LGR	0	0	0	83	17	0	0
6	2	HGR	0	0	50	0	50	0	0
10	2	GLD	0	50	50	0	0	0	0
5	1	RUN	0	0	0	0	0	100	0
14	1	SRN	0	100	0	0	0	0	0
17	3	MCP	33	0	67	0	0	0	0
4	3	STP	67	0	0	0	0	33	0
3	1	CRP	0	0	0	0	100	0	0
6	3	LSL	0	33	33	33	0	0	0
3	2	LSR	0	0	100	0	0	0	0
1	1	LSBk	0	0	0	100	0	0	0
2	2	LSBo	0	0	50	0	50	0	0
17	3	PLP	0	0	33	0	0	33	33
3	0	DPL	0	0	0	0	0	0	0

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

Stream Name: *Dorman Canyon* *LLID:* *1229491386439* *Drainage:* *Russian River - Middle*

Survey Dates: *7/13/1999 to 7/15/1999*

Confluence Location: *Quad:* *GEYSERVILLE* *Legal Description:* *T09NR10WS10* *Latitude:* *38:38:38.0N* *Longitude:* *122:56:57.0W*

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	84	15	0	47	36

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

Open units represent habitat units with zero canopy cover.

Table 9b - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Dorman Canyon *LLID:* 1229491386439 *Drainage:* Russian River - Middle

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: *Quad:* GEYSERVILLE *Legal Description:* T09NR10WS10 *Latitude:* 38:38:38.0N *Longitude:* 122:56:57.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	1	1	3.1
Boulder	0	2	3.1
Cobble / Gravel	0	2	3.1
Sand / Silt / Clay	31	27	90.6

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	12	9	32.8
Hardwood Trees	3	4	10.9
Coniferous Trees	17	17	53.1
No Vegetation	0	2	3.1

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Dorman Canyon *LLID: 1229491386439* *Drainage: Russian River - Middle*

Survey Dates: 7/13/1999 to 7/15/1999

Confluence Location: Quad: GEYSERVILLE *Legal Description: T09NR10WS10* *Latitude: 38:38:38.0N* *Longitude: 122:56:57.0W*

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	17	55	35
SMALL WOODY DEBRIS (%)	3	11	15
LARGE WOODY DEBRIS (%)	17	18	16
ROOT MASS (%)	33	11	10
TERRESTRIAL VEGETATION (%)	7	5	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	24	1	22
BEDROCK LEDGES (%)	0	0	0

Appendix C - Fish Habitat Inventory Data Summary

Stream Name: Crane Creek LLID: 1229251386494 Drainage: Russian River -
Survey Dates: 7/6/1999 to 7/16/1999 Survey Length (ft.): 13985 Main Channel (ft.): 13850 Side Channel (ft.): 135
Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:38:58.0N Longitude: 122:55:30.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 10866
Riffle/Flatwater Mean Width (ft.): 6.9
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.1
Water (F): 53 - 67 Air (F): 65 - 82
Dry Channel (ft.): 1598

Canopy Density (%): 89.2
Coniferous Component (%): 47.6
Hardwood Component (%): 52.4
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 66.4
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 5.4
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 20.8
Pool Frequency (%): 38.0
Residual Pool Depth (%):
< 2 Feet Deep: 59.2
2 to 2.9 Feet Deep: 34.2
3 to 3.9 Feet Deep: 5.3
>= 4 Feet Deep: 1.3
Mean Max Residual Pool Depth (ft.): 1.85
Mean Pool Shelter Rating: 37

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 5.5 Gravel: 57.5 Sm Cobble: 23.3 Lg Cobble: 6.8 Boulder: 2.7 Bedrock: 4.1
Embeddedness Values (%): 1. 21.9 2. 42.5 3. 27.4 4. 1.4 5. 6.8

STREAM REACH: 2

Channel Type: B4
Reach Length (ft.): 959
Riffle/Flatwater Mean Width (ft.): 4.4
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.1
Water (F): 52 - 62 Air (F): 62 - 70
Dry Channel (ft.): 0

Canopy Density (%): 95.4
Coniferous Component (%): 78.3
Hardwood Component (%): 21.7
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 50.0
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 13.7
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 17.9
Pool Frequency (%): 47.4
Residual Pool Depth (%):
< 2 Feet Deep: 77.8
2 to 2.9 Feet Deep: 22.2
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.5
Mean Pool Shelter Rating: 22

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 66.7 Sm Cobble: 33.3 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 33.3 2. 22.2 3. 44.4 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: G4
Reach Length (ft.): 2025
Riffle/Flatwater Mean Width (ft.): 5.5
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.1
Water (F): 57 - 60 Air (F): 70 - 74
Dry Channel (ft.): 0

Canopy Density (%): 92.7
Coniferous Component (%): 71.5
Hardwood Component (%): 28.5
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 52.7
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 2.4
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 17.1
Pool Frequency (%): 40.5
Residual Pool Depth (%):
< 2 Feet Deep: 86.7
2 to 2.9 Feet Deep: 13.3
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.41
Mean Pool Shelter Rating: 30

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 28.6 Sm Cobble: 50.0 Lg Cobble: 21.4 Boulder: 0.0 Bedrock: 0.0

Embeddedness Values (%): 1. 21.4 2. 21.4 3. 57.1 4. 0.0 5. 0.0

Appendix 2C - Fish Habitat Inventory Data Summary

Stream Name: Dorman Canyon *LLID: 1229491386439* *Drainage: Russian River -*
Survey Dates: 7/13/1999 to 7/15/1999 *Survey Length (ft.): 5273* *Main Channel (ft.): 5273* *Side Channel (ft.): 0*
Confluence Location: Quad: GEYSERVILLE *Legal Description: T09NR10WS10* *Latitude: 38:38:38.0N* *Longitude: 122:56:57.0W*

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G3
Reach Length (ft.): 399
Riffle/Flatwater Mean Width (ft.): 4.0
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.02
Water (F): 60 - 63 Air (F): 60 - 79
Dry Channel (ft.): 0

Canopy Density (%): 91.5
Coniferous Component (%): 62.8
Hardwood Component (%): 37.2
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 59.3
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 18.5
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 13.0
Pool Frequency (%): 30.8
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 0.96
Mean Pool Shelter Rating: 40

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 100. Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 33.3 2. 0.0 3. 33.3 4. 33.3 5. 0.0

STREAM REACH: 2

Channel Type: A5
Reach Length (ft.): 666
Riffle/Flatwater Mean Width (ft.): 5.3
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.02
Water (F): 60 - 60 Air (F): 60 - 71
Dry Channel (ft.): 0

Canopy Density (%): 95.7
Coniferous Component (%): 91.4
Hardwood Component (%): 8.6
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 28.3
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 1.3
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 28.7
Pool Frequency (%): 40.0
Residual Pool Depth (%):
< 2 Feet Deep: 66.7
2 to 2.9 Feet Deep: 33.3
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.66
Mean Pool Shelter Rating: 23

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 40.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 60.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 40.0 3. 60.0 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: G4
Reach Length (ft.): 4208
Riffle/Flatwater Mean Width (ft.): 3.7
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.02
Water (F): 54 - 63 Air (F): 55 - 80
Dry Channel (ft.): 1195

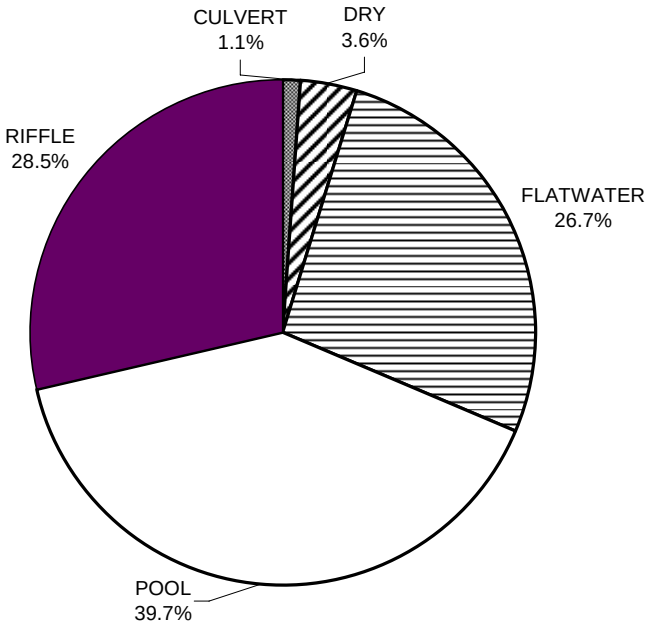
Canopy Density (%): 91.5
Coniferous Component (%): 87.5
Hardwood Component (%): 12.5
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 37.6
Dominant Shelter: Undercut Banks
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 7.7
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 11.9
Pool Frequency (%): 41.1
Residual Pool Depth (%):
< 2 Feet Deep: 90.0
2 to 2.9 Feet Deep: 10.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.29
Mean Pool Shelter Rating: 64

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 76.3 Sm Cobble: 18.4 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 5.3
Embeddedness Values (%): 1. 7.9 2. 47.4 3. 42.1 4. 0.0 5. 2.6

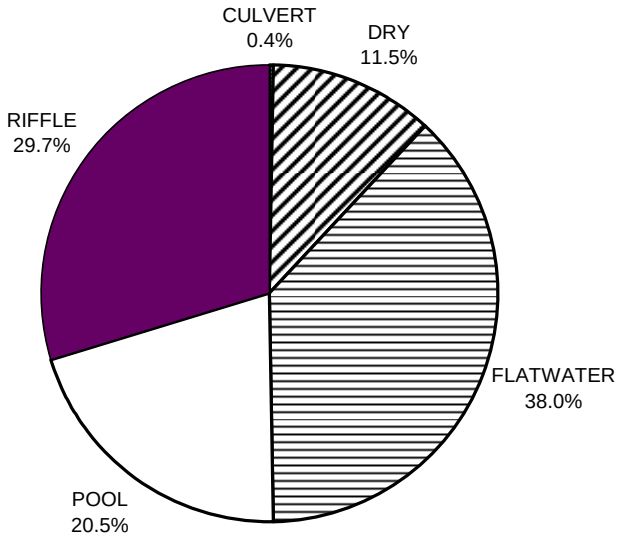
APPENDIX D: GRAPHS

CRANE CREEK 1999
HABITAT TYPES BY PERCENT OCCURRENCE



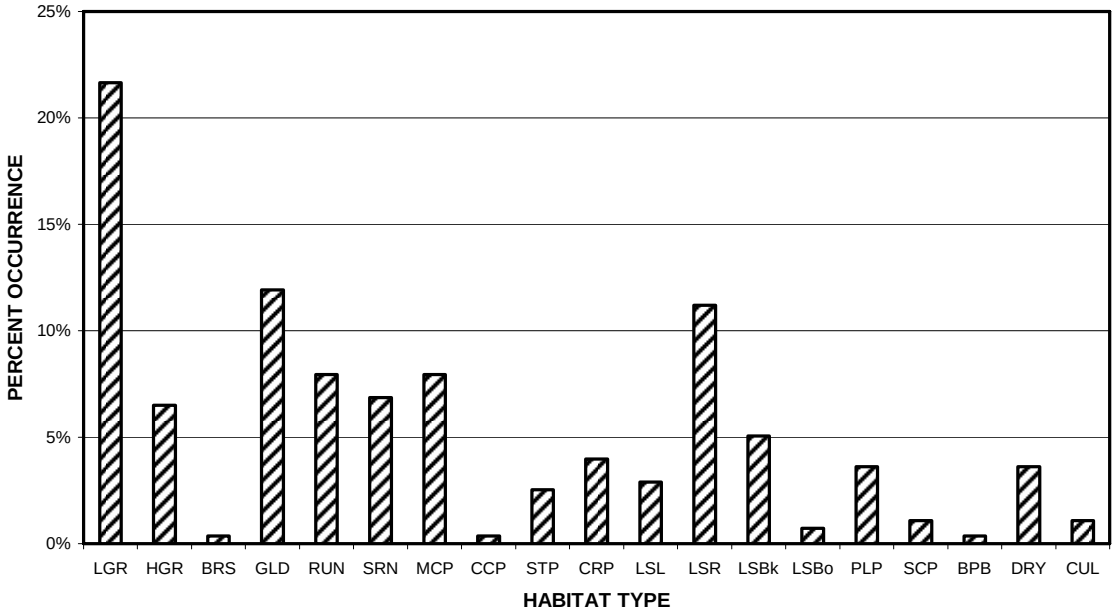
GRAPH 1: Level II habitat types by percent occurrence

CRANE CREEK 1999
HABITAT TYPES BY PERCENT TOTAL LENGTH



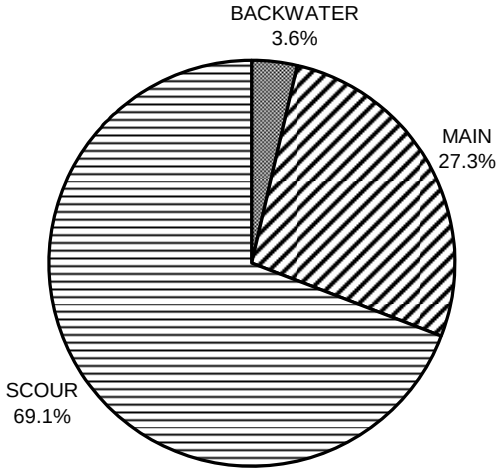
GRAPH 2: Level II habitat types by percent total length

CRANE CREEK 1999
HABITAT TYPES BY PERCENT OCCURRENCE



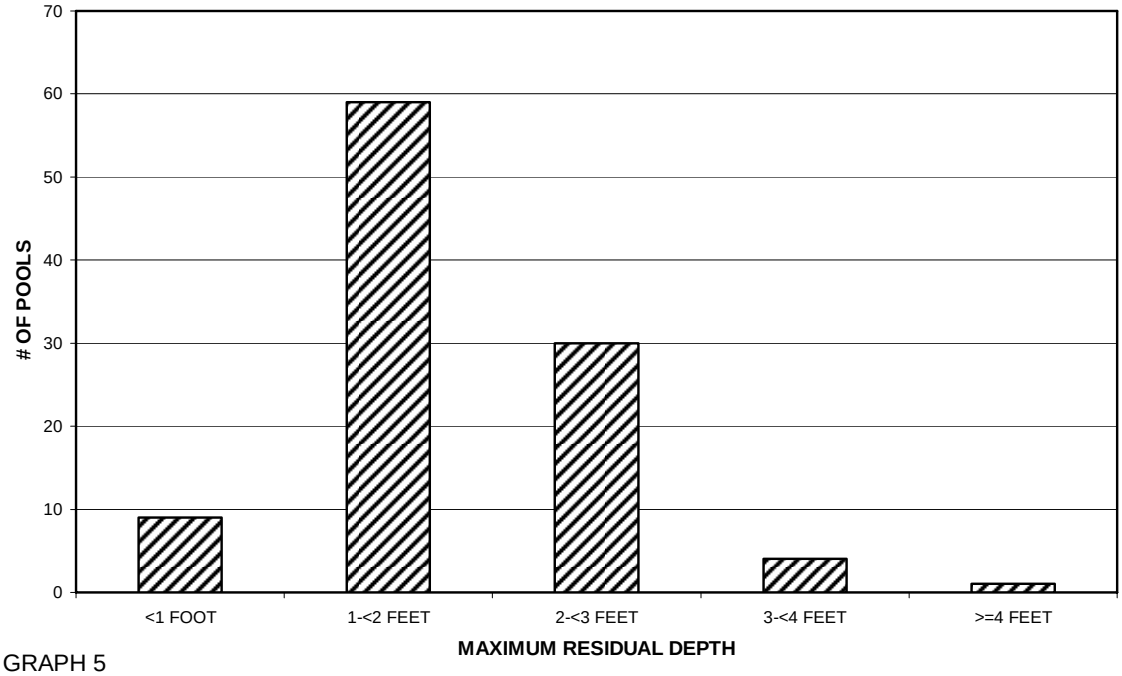
GRAPH 3: Level IV habitat types by percent occurrence

CRANE CREEK 1999
POOL TYPES BY PERCENT OCCURRENCE



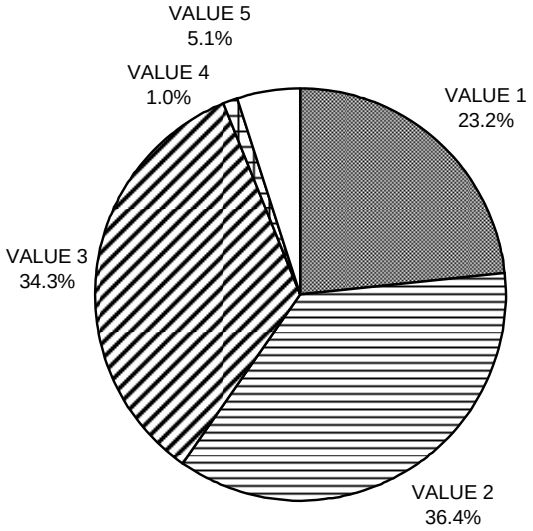
GRAPH 4: Level I pool types by perecent occurrence

CRANE CREEK 1999
MAXIMUM DEPTH IN POOLS



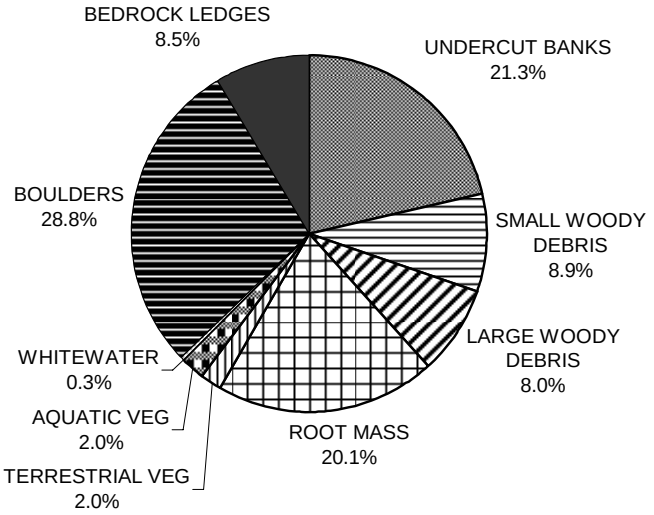
GRAPH 5

CRANE CREEK 1999
PERCENT EMBEDDEDNESS



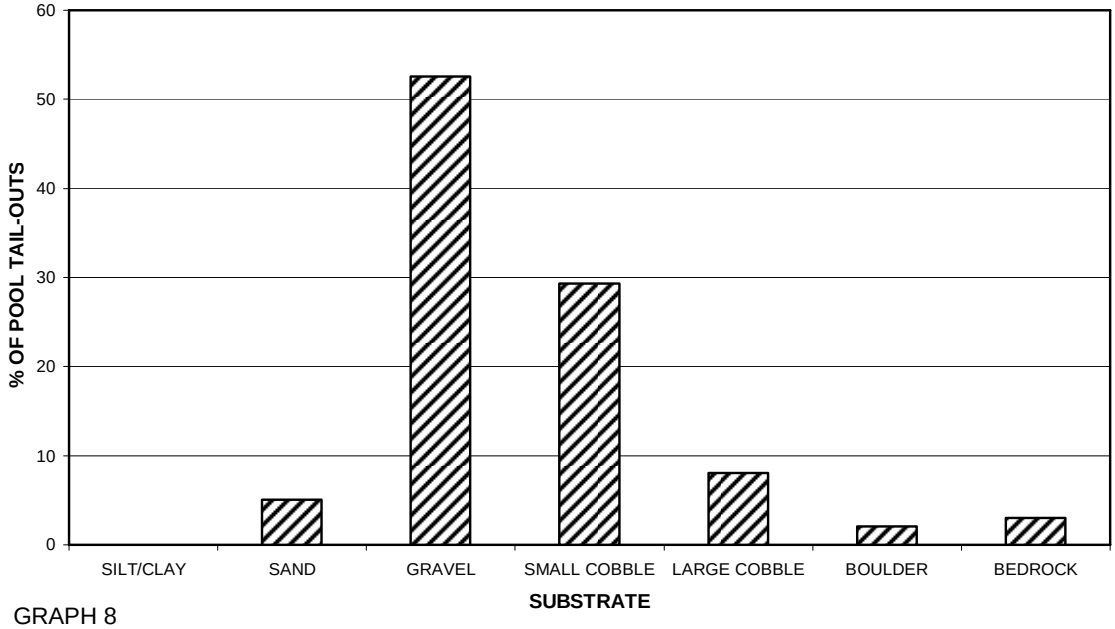
GRAPH 6

CRANE CREEK 1999
MEAN PERCENT COVER TYPES IN POOLS



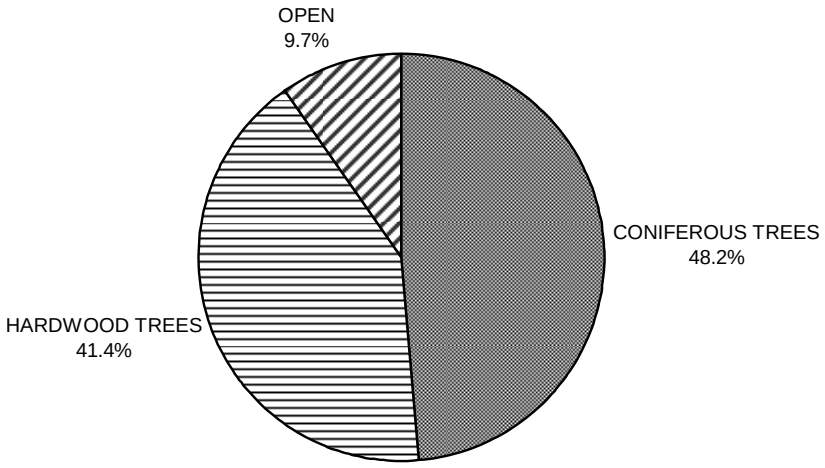
GRAPH 7

CRANE CREEK 1999
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



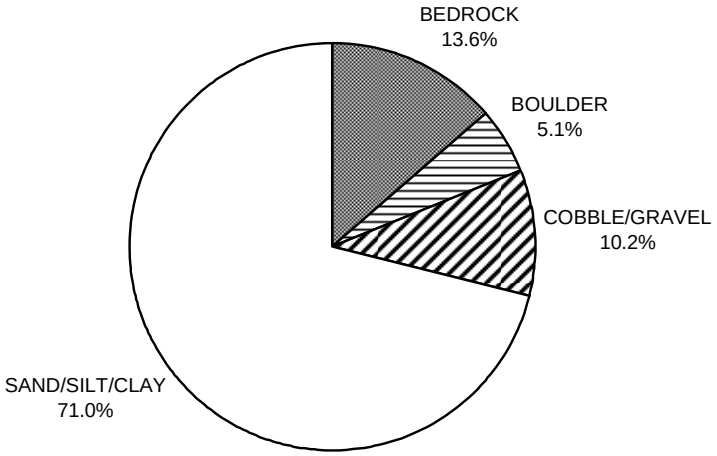
GRAPH 8

CRANE CREEK 1999
MEAN PERCENT CANOPY



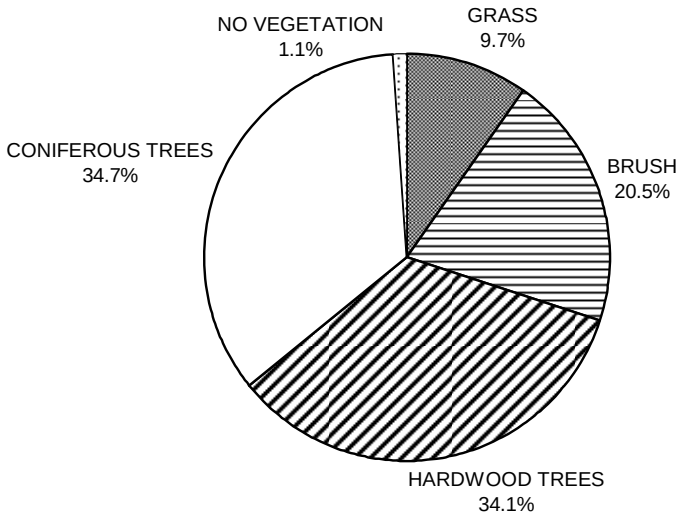
GRAPH 9

CRANE CREEK 1999
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

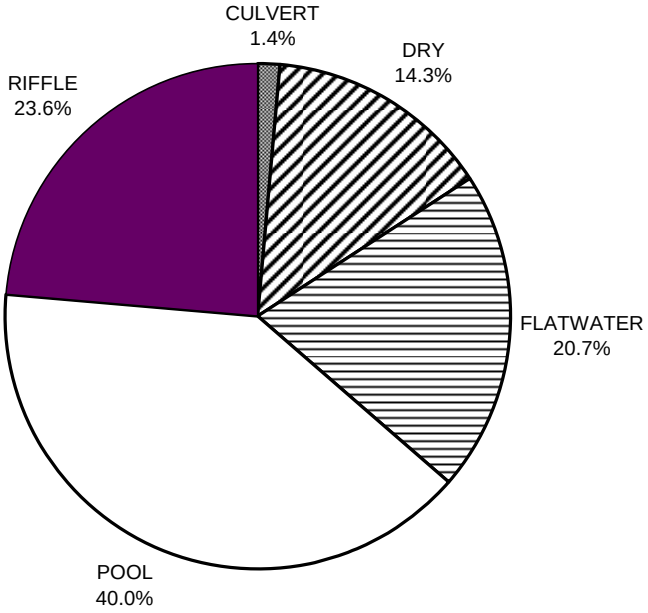
CRANE CREEK 1999
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

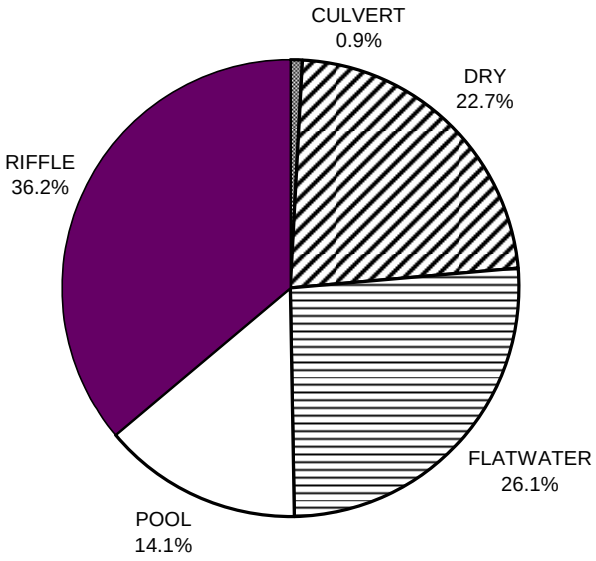
APPENDIX 2D: DORMAN CANYON GRAPHS

DORMAN CANYON 1999
HABITAT TYPES BY PERCENT OCCURRENCE



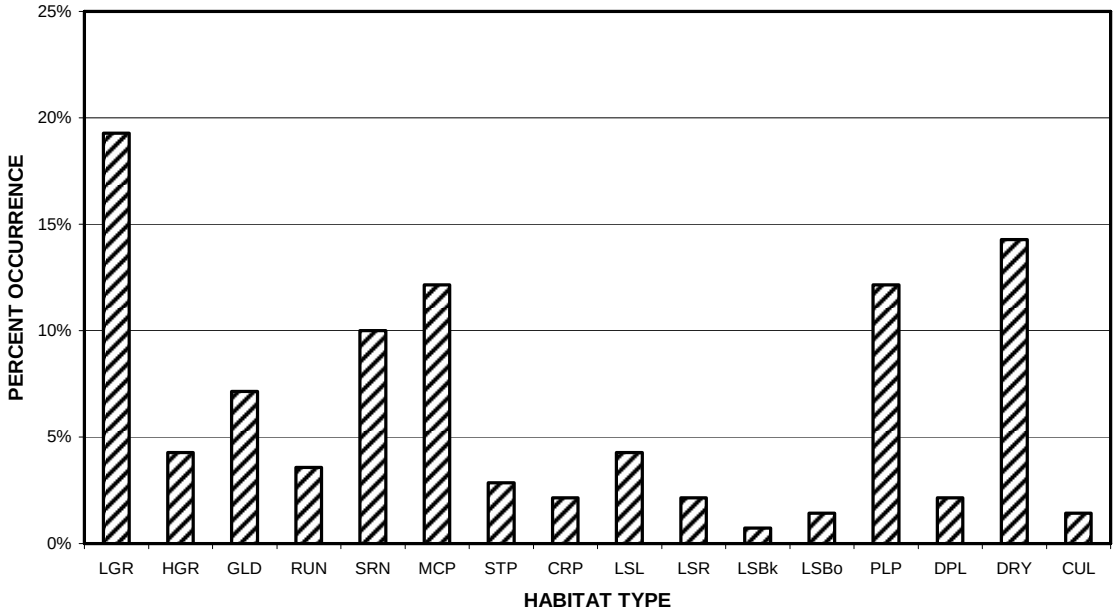
GRAPH 1: Level II habitat types by percent occurrence

DORMAN CANYON 1999
HABITAT TYPES BY PERCENT TOTAL LENGTH



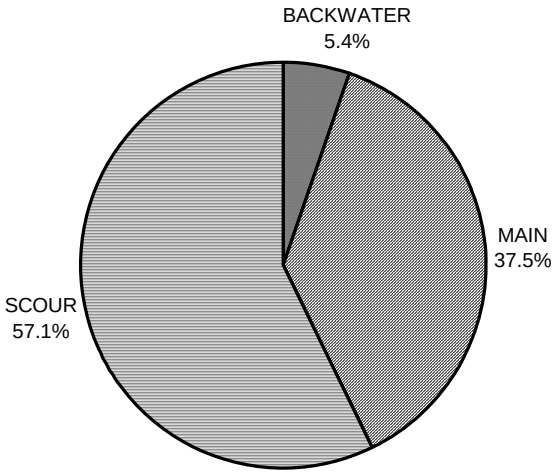
GRAPH 2: Level II habitat types by percent total length

DORMAN CANYON 1999
HABITAT TYPES BY PERCENT OCCURRENCE



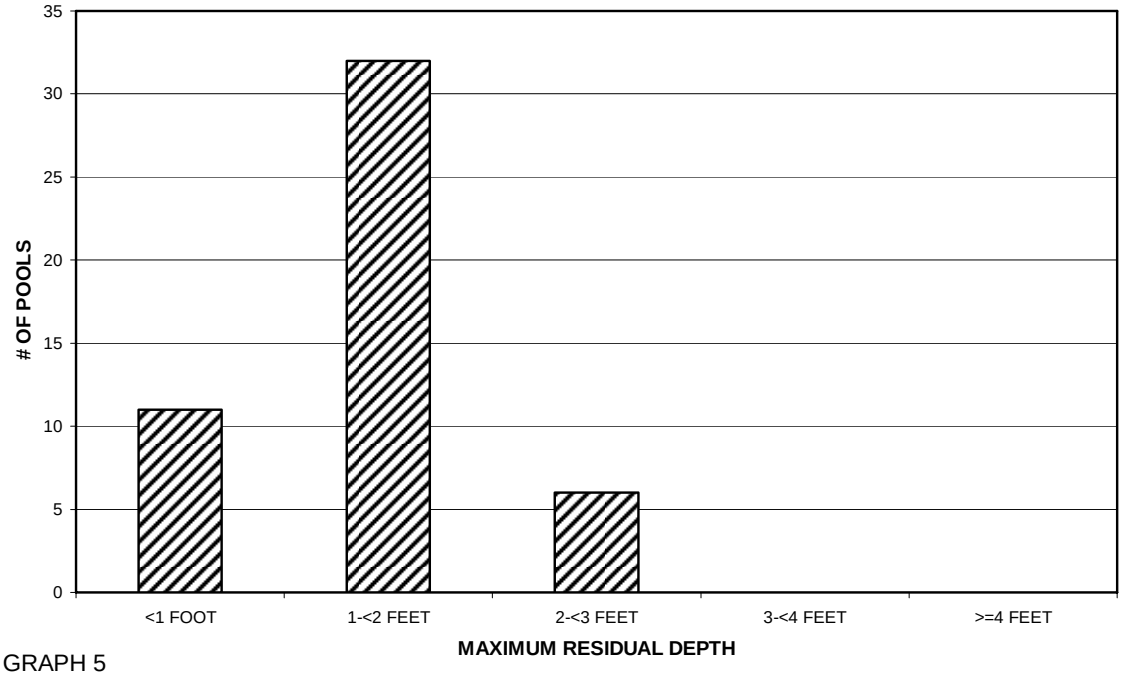
GRAPH 3: Level IV habitat types by percent occurrence

DORMAN CANYON 1999
POOL TYPES BY PERCENT OCCURRENCE



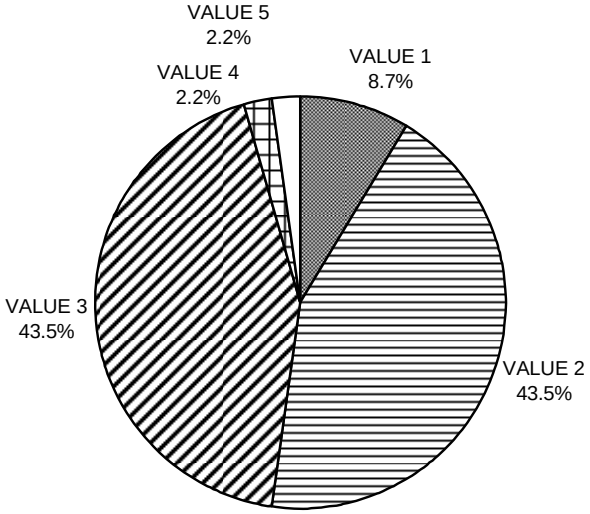
GRAPH 4: Level I pool types by percent occurrence

DORMAN CANYON 1999
MAXIMUM DEPTH IN POOLS



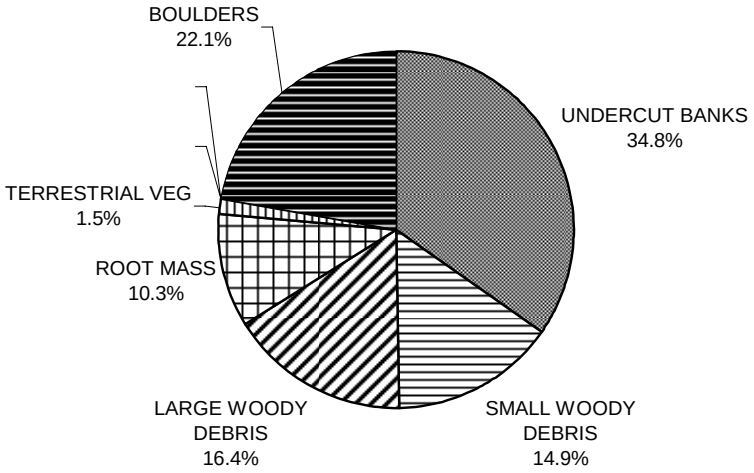
GRAPH 5

DORMAN CANYON 1999
PERCENT EMBEDDEDNESS



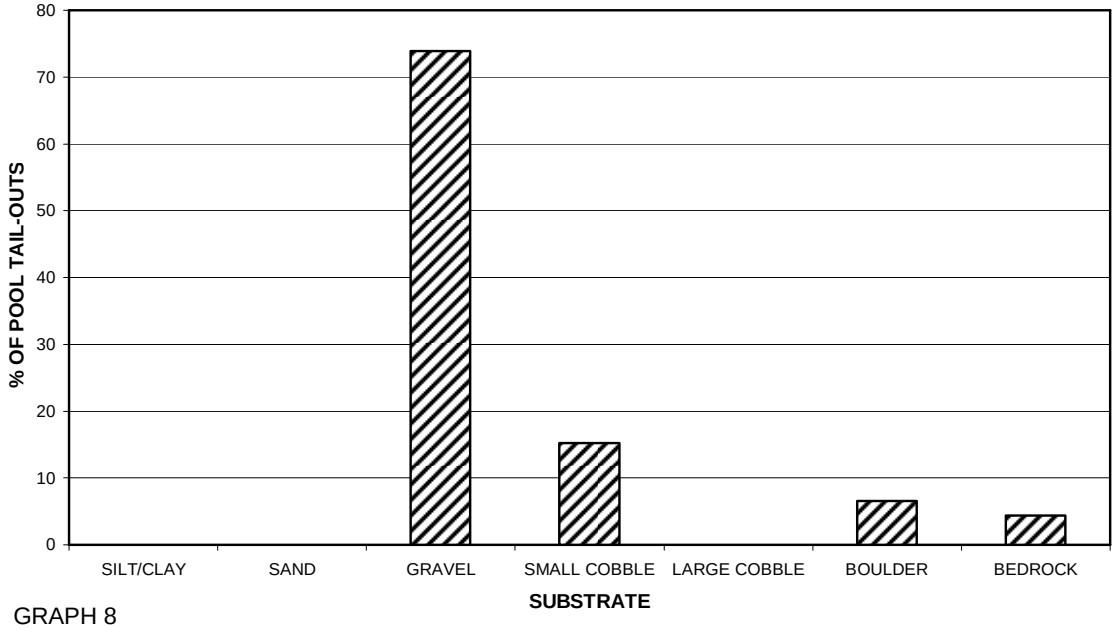
GRAPH 6

DORMAN CANYON 1999
MEAN PERCENT COVER TYPES IN POOLS



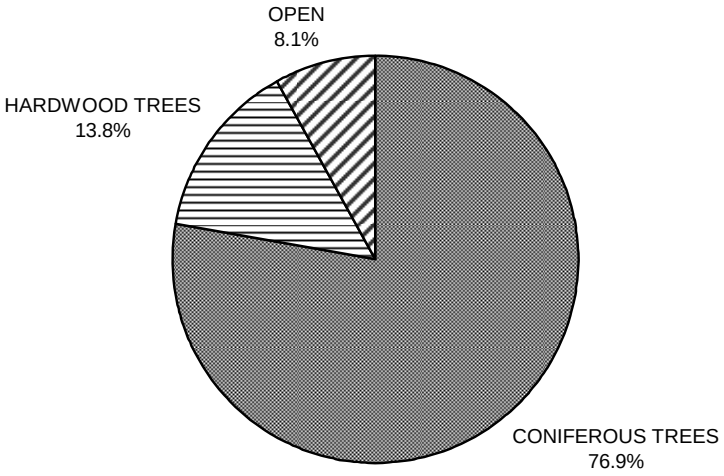
GRAPH 7

DORMAN CANYON 1999
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



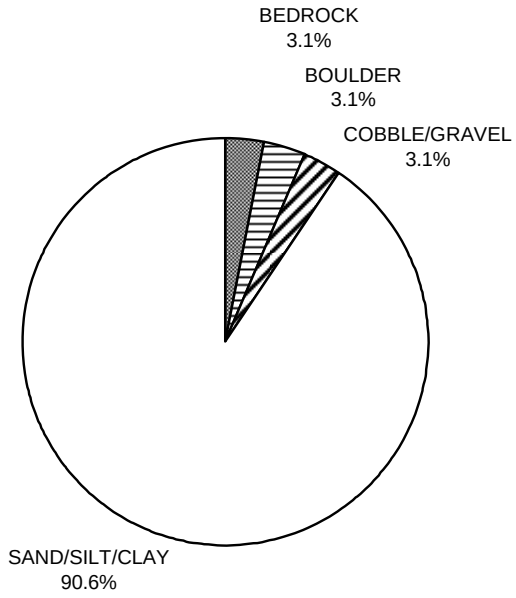
GRAPH 8

DORMAN CANYON 1999
MEAN PERCENT CANOPY



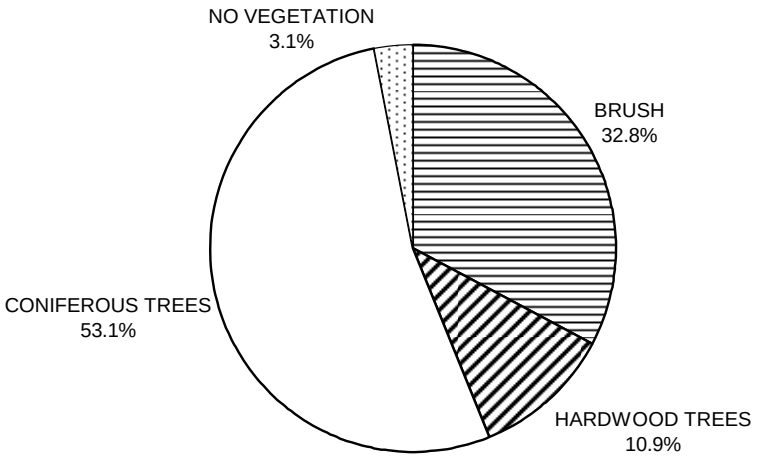
GRAPH 9

DORMAN CANYON 1999
DOMINANT BANK COMPOSITION IN SURVEY REACH



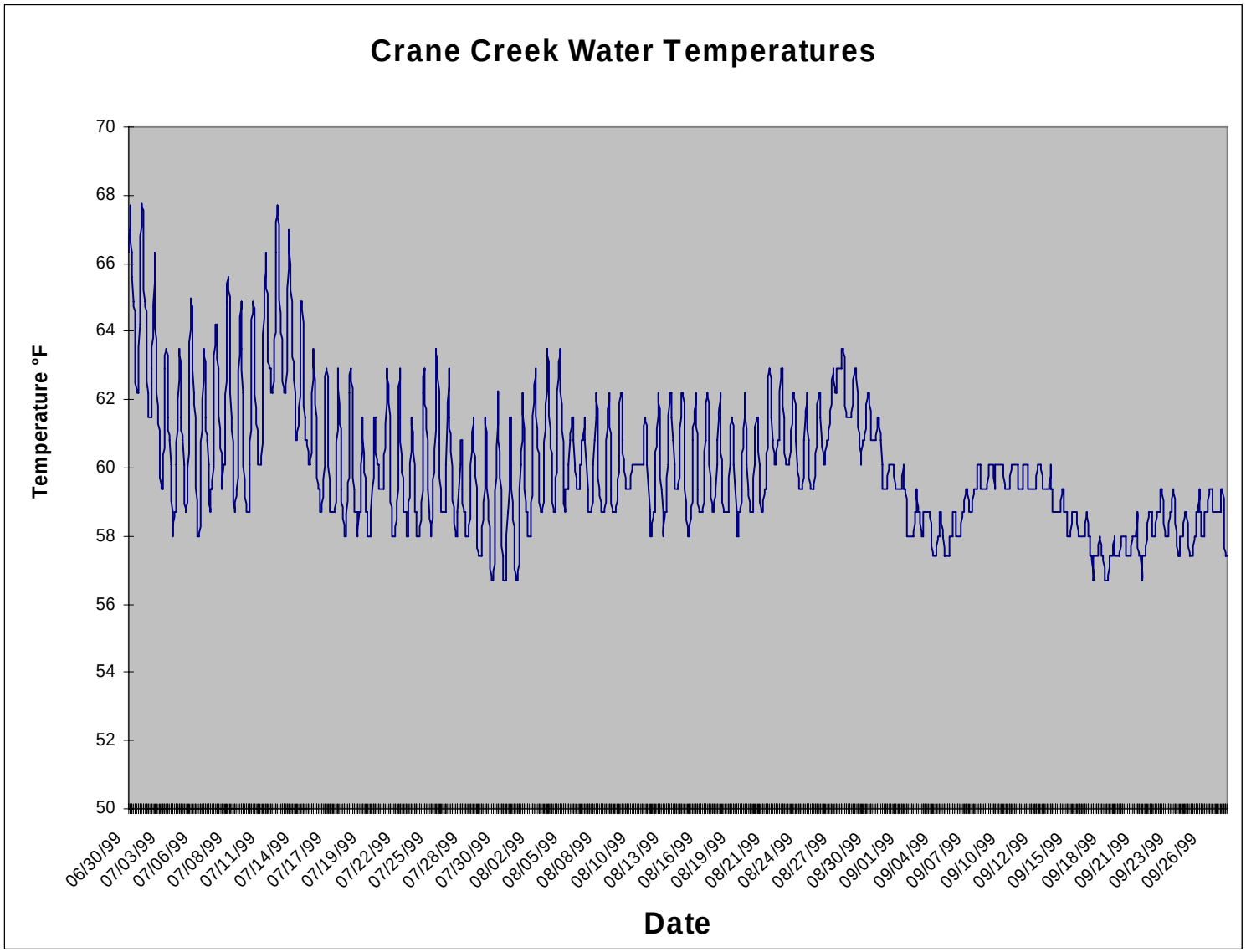
GRAPH 10

DORMAN CANYON 1999
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Appendix E:


Crane Creek Water Temperatures
Temperature °F
70
68
66
64
62
60
58
56
54
52
50
06/30/99
07/03/99
07/06/99
07/08/99
07/11/99
07/14/99
07/17/99
07/19/99
07/22/99
07/25/99
07/28/99
07/30/99
08/02/99
08/05/99
08/08/99
08/10/99
08/13/99
08/16/99
08/19/99
08/21/99
08/24/99
08/27/99
08/30/99
09/01/99
09/04/99
09/07/99
09/10/99
09/12/99
09/15/99
09/18/99
09/21/99
09/23/99
09/26/99
Date

Watershed Hydroid **412** Crane Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	**LLId: (1:24k)**	**County:**
Crane Creek	1229251386494	Sonoma

Tributary to Dry Creek
Tributary to Russian River
Tributary to

Location: **T:** 09N **R:** 10W **S:** 1 **Latitude:** 38.649470683949 **Longitude** 122.925122743055

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

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

Stream Order: 2

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Total Length: 3.12 Miles / 5.04 Km

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 640 Hectares / 1583 Acres / 2.47 sq. mi.

Elevations: Mouth: 121 feet; Headwaters: 1486 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): Steelhead

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

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	1582.5
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

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

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
423.32 acres	903.78	49.88	65.17	0.00
26.7 %	57.1 %	3.1 %	4.1 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
89.57	46.94	0.00	4.63
5.6 %	2.9 %	0.0 %	0.3 %

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

Watershed Hydroid **412** Crane Creek

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

Quad Name	USGS Code
GEYSERVILLE	38122F8

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

Scientific Name	Common Name
Arctostaphylos stanfordiana ssp. decumb	Rincon manzanita
Ceanothus confusus	Rincon Ridge ceanothus
Arctostaphylos stanfordiana ssp. decumb	Rincon manzanita
Brodiaea californica var. leptandra	narrow-anthered California brodiaea

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Warm Springs	111424	Middle Russian River	100

Watershed Hydroid **415** Dorman Canyon Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	**LLId: (1:24k)**	**County:**
Dorman Canyon Creek	1229491386439	Sonoma

Tributary to Crane
Tributary to Dry Creek
Tributary to Russian River

Location: **T:** 9N **R:** 10W **S:** 10 **Latitude:** 38.6439892950625 **Longitude** 122.949160565181

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

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

Stream Order: 1 **Total Length:** 1.24 Miles / 2.00 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 116 Hectares / 286 Acres / 0.44 sq. mi.

Elevations: Mouth: 302 feet; Headwaters: 1483 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

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

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

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	286.4
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

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

Mixed hardwood/conifer:	**Hardwood:**	**Conifer:**	**Agriculture:**	**Urban:**
16.37 acres	145.48	26.25	0.00	0.00
5.7 %	50.6 %	9.1 %	0.0 %	0.0 %

Shrub:	**Herbaceous:**	**Barren/rock:**	**Water:**
70.11	24.55	0.00	4.63
24.4 %	8.5 %	0.0 %	1.6 %

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

Watershed Hydroid **415** Dorman Canyon Creek

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

Quad Name	USGS Code
GEYSERVILLE	38122F8

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

Scientific Name	Common Name
Arctostaphylos stanfordiana ssp. decumb	Rincon manzanita
Ceanothus confusus	Rincon Ridge ceanothus
Arctostaphylos stanfordiana ssp. decumb	Rincon manzanita
Brodiaea californica var. leptandra	narrow-anthered California brodiaea

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Warm Springs	111424	Middle Russian River	100