CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Clear Creek
Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted beginning July 13 and ending July16, 2001 on Clear Creek. The survey began at the confluence with Kidd Creek and extended upstream 3,715 feet.

The Clear Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Clear Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

WATERSHED OVERVIEW

Clear Creek is a tributary to Kidd Creek, a tributary to Austin Creek, a tributary to the Russian River, a tributary to the Pacific Ocean, located in Sonoma County, California (Map 1). Clear Creek's legal description at the confluence with Kidd Creek is T8N R11W S33. Its location is 38.499128880584° north latitude and 123.084812697452° west longitude. Clear Creek is a third order stream and has approximately 1.44 miles of solid blue line stream according to the USGS Duncan Mills 7.5 minute quadrangle. Clear Creek drains a watershed of approximately 0.97 square miles. Elevations range from about 92 feet at the mouth of the creek to 1,768 feet in the headwater areas. Mixed hardwood/conifer forest dominates the watershed. The watershed is entirely privately owned. Vehicle access exists via Highway 1 to Highway 116 near Jenner. Follow Highway 116 approximately 4.7 miles east, to Cazadero Road. Follow Cazadero Road approximately 2.7 miles north, to Kidd Creek. Follow the first unnamed road past Kidd Creek one mile to the mouth of Clear Creek.

METHODS

The habitat inventory conducted in Clear Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The California Department of Fish and Game field crew that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Clear Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (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:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (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". Clear 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 are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Clear 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, bedrock, or other considerations.

6. Shelter Rating:

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

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Clear Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated 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 Clear Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Clear Creek. 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 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of mean percent cover by habitat type
- Summary of dominant substrates by habitat type
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Clear 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 13 to 17, 2001, was conducted by J. Facendini and L. MacTague (DFG). The total length of the stream surveyed was 3,715 feet with an additional 75 feet of side channel.

Stream flow was not measured on Clear Creek.

Clear Creek is an F3 channel type for 465 feet, an A2 for 1,741 feet, and an F4 for 1,509 feet of the stream surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A2 channels are steep, narrow, cascading, step-pool streams, with high energy/debris transport associated with depositional soils and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 58 degrees Fahrenheit. Air temperatures ranged from 50 to 68 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** there were 35% riffle units, 32% flatwater units, 31% pool units, and 3% dry units (Graph 1). Based on total ***length*** of Level II habitat types there were 38% riffle units, 46% flatwater units, 11% pool units, and 6% dry units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent ***occurrence*** were step runs, 19%; low-gradient riffles, 17%; and plunge pools, 14% (Graph 3). Based on percent total ***length***, step runs made up 28%, low-gradient riffles 22%, and runs 15%.

A total of 24 pools were identified (Table 3). Scour pools were the most frequently encountered, at 58%, and comprised 49% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eight of the 24 measured pools (33%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 24 pool tail-outs measured, twelve had a value of 1 (50%); seven had a value of 2 (29%); one had a value of 3 (4%); none had a value of 4; and four had a value of 5 (17%), (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 7, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 17. Main-channel and backwater pools each had a mean shelter rating of 5 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Clear Creek. Graph 7 describes the pool cover in Clear Creek. Boulders are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Small cobble was the dominant substrate observed in 38% of pool tail-outs while gravel was the next most frequently observed substrate type, at 29%.

The mean percent canopy density for the surveyed length of Clear Creek was 90%. The mean percentages of evergreen and deciduous trees were 78% and 12%, respectively. Ten percent of the canopy was open. Graph 9 describes the mean percent canopy in Clear Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 36%. The mean percent left bank vegetated was 35%. The dominant elements composing the structure of the stream banks consisted of 28% bedrock, 19% boulder, 7% cobble/gravel, and 44% sand/silt/clay (Graph 10). Brush and evergreen trees were the dominant vegetation types, each observed in 31% of the units surveyed. Additionally, 11% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Due to inadequate staffing levels, biological inventory surveys were not conducted in Clear Creek in 2001.

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

DISCUSSION

Clear Creek is an F3 channel type for 465 feet, an A2 for 1,714 feet, and an F4 for 1,509 feet of stream surveyed. The suitability of F3, F4, and A2 channel types for fish habitat improvement structures are as follows: F3 channel types are good for bank-placed boulders and single and opposing wing-deflectors; fair for plunge weirs, boulder clusters, channel constrictors, and log cover. F4 channel types are good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; poor for boulder clusters. A2 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days July 13 to 16, 2001, were within the suitable range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 46% of the total length of this survey, riffle 38%, and pool 11%. The pools are relatively shallow, with only eight of the 24 (33%) measured pools having a maximum depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Nineteen of the 24 pool tail-outs measured had embeddedness ratings of 1 or 2. One of the pool tail-outs had embeddedness ratings of 3 or 4. Four of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Clear Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Sixteen of the 24 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter for flatwater was 5. The mean shelter rating for pools was 12. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, small woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 90%. Reach 1 had a canopy density of 82% while Reaches 2, 3, and 4 had canopy densities of 92%, 87%, and 100% respectively. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 36% and 35%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic trees species, in conjunction with bank stabilization, is recommended.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

1) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

2) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with log and root wad cover is desirable.

3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

4) There are several log debris accumulations present on Clear Creek that are retaining large quantities of fine sediment. These structures should be monitored for fish passage. If it is determined that these structures prevent salmonid migration then modification should be evaluated. Large wood structure modifications must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

COMMENTS AND LANDMARKS

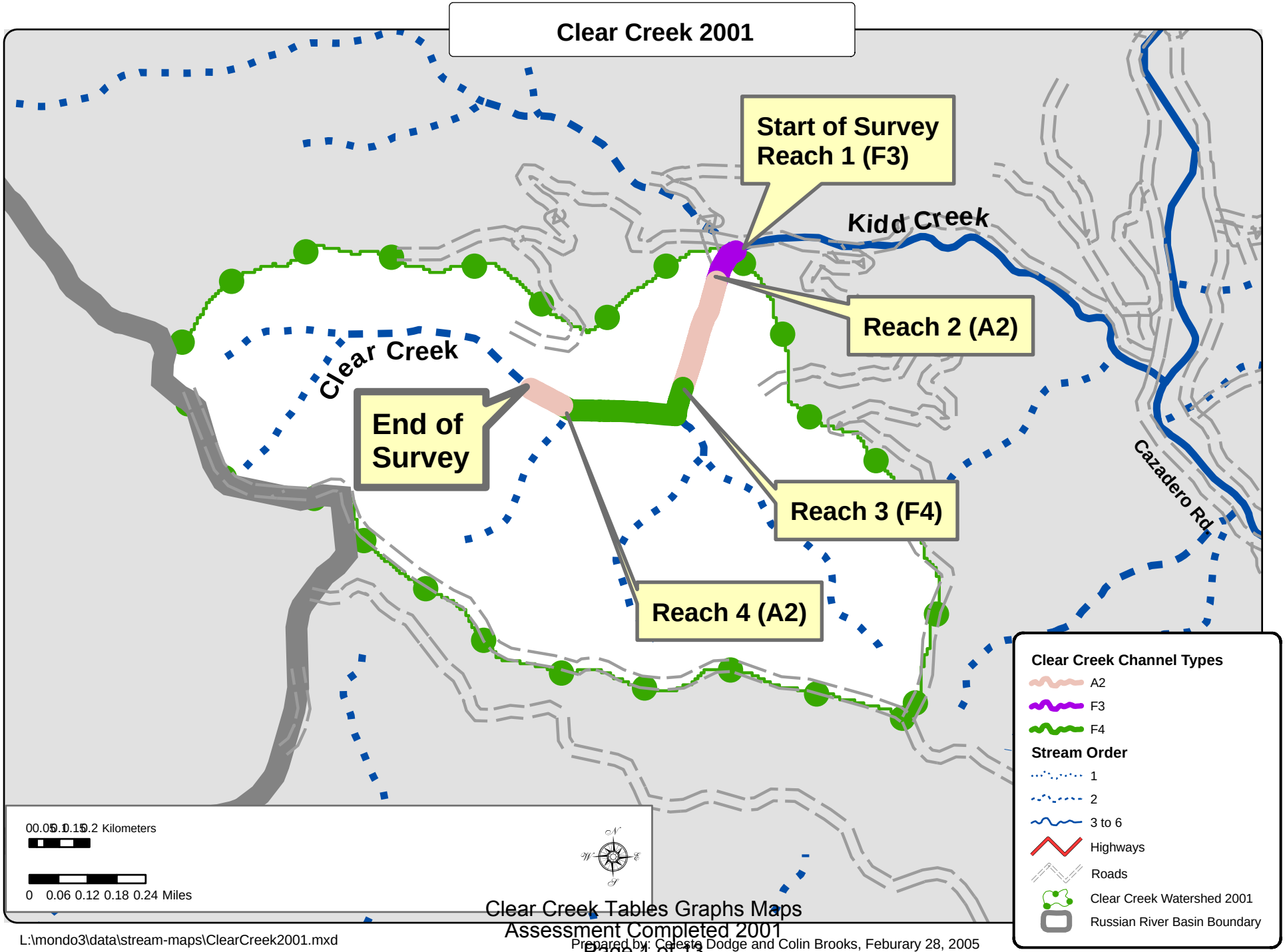
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey.

0'	Begin survey at confluence with Kidd Creek. Many non-native vegetation; LB lodge; RB pond upslope w/rainbow trout. Relief pipes emptying to creek. Armored, vegetated bank. All looks stable. Run-off from pond at 41'.
57'	Foot bridge-SEE FORM; LB lodge foundation forms bank. More non-natives.
136'	Water pipe crossing creek
465'	Rotted pipe in creek; Channel Type Change (F3 to A2)
563'	Rusty pipe in creek
614'	Still operable diversion pipe to pond in creek
658'	Cable and rotting pipe
673'	RB dry gully at 60'
747'	LB secondary channel at 45'
880'	Pacific Giant Salamander (PGSL); 2+ SH; LB massive upslope erosion at 20/; Accumulation at bottom of unit-SEE FORM; LWD PROTOCOL (RW/1.5/10/C/3); 15' Fountain (Broken pipe) at 40'

980'	LB upslope about 100' on about 10’ wall of downed trees supported by standing trees; operable pipe is 4"; RSN; Logging road above LB
1136'	Big Erosion Gully at 40'-SEE FORM; Logging road continues above LB
1223'	Rough Skinned Newt (RSN).
1238'	WP 055(F4)/N38°29'47.2"/W123°05'11.1"
1293'	RB seep at bottom of unit. Gully spring.
1391'	Boulders cause dam
1404'	LWD PROTOCOL (RW/1.5/6/C/3); Accumulation at 25'-SEE FORM
1457'	WP 056(F4)/N38°29'45.1"/W123°05'10.8"; RSN; SH
1508'	Intake for Cazanoma Lodge Pipe at 8'-SEE PHOTO; Accumulation at 36'-SEE FORM; LWD PROTOCOL (RW/3/6/C/6)
1569'	PGSL
1604'	LB seep at 18'
1667'	LWD PROTOCOL (RW/1.5/10/C/3); Accumulation at bottom-SEE FORM
1719'	LB still logging road-Now about 50' upslope; WP 052/N38°29'43.2"/W123°05'12.3"
1831'	LWD PROTOCOL (RW/3/20/C/10); Accumulation at 25'-SEE FORM; CHANNEL TYPE CHANGE (A2 to F4)
2007'	Logging road crossing (DEFUNCT) at 90'
2106'	1, 1+ SH; RSN
2140'	Channel is narrower: Like a scaled down (1/2) version of before the 4.3
2458'	WP 05(F4)-NO READING
2702'	YOY
2740'	LWD PROTOCOL (AL/.5/6/B/3): Accumulation - SEE FORM; YOY
2757'	PGSL, YOY; RB Dry gully at top of unit
2846'	Old logging crossing at 20'
2886'	THP boundary marker at 24'; another flag ahead below Accumulation
2939'	Accumulation at 55'-SEE FORM---LWD PROTOCOL (DF/1.5/10/B/6)
3019'	Another THP flag at top of unit
3090'	Accumulation at 22'--SEE FORM; LWD PROTOCOL (RW/1/15/C/6)
3174'	PGSL; Accumulation at Top of unit-SEE FORM; LWD PROTOCOL (RW/2.5/6/C/6)
3192'	Waterfall about 50' up Trib; THP flag here; PGSL; RB Wet Trib at top of unit (52°); Accumulation at 70'-SEE FORM; LWD PROTOCOL (RW/2.0/10/C/3)
3340'	CHANNEL TYPE CHANGE (F4 to A2); PGSL
3407'	Very narrow and steep-Rd. Accumulation at 95'-SEE FORM; LWD Protocol (RW/2.5/15/C/10)
3525'	PGSL; RSN; Accumulation at 21'-SEE FORM; LWD Protocol (RW/2.0/6/B/6)
3631'	END OF SURVEY Accumulation at Bottom of unit-SEE FORM; LWD Protocol (RW/2.0/10/B/6); RSN

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.



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Prepared by: Celeste Dodge and Colin Brooks, Feburary 28, 2005

Clear Creek — Drainage: RUSSIAN RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T8NR11WS33 LATITUDE:38°29'56" LONGITUDE:123°5'6"

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
27	12	RIFFLE	35	53	1430	38	5.1	0.4	318	8597	127	3418	0	7
25	10	FLATWATER	32	69	1725	46	6.1	0.6	356	8908	184	4596	0	5
24	24	POOL	31	17	417	11	8.1	0.9	140	3369	136	3264	108	12
2	0	DRY	3	109	218	6	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
78	46	3790	20875	11278

Clear Creek — Drainage: RUSSIAN RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T8NR11WS33 LATITUDE:38°29'56" LONGITUDE:123°5'6"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
13	5	LGR	17	63	821	22	6	0.3	1.0	513	6675	176	2292	0	6	87
7	3	HGR	9	50	349	9	6	0.4	1.0	202	1417	80	561	0	10	96
2	1	CAS	3	63	127	3	3	0.7	1.4	272	544	190	381	0	20	100
5	3	BRS	6	27	133	4	3	0.4	1.4	125	624	69	345	0	0	96
2	2	GLD	3	37	74	2	6	0.7	1.5	204	408	143	286	0	0	80
8	4	RUN	10	72	579	15	6	0.6	1.7	306	2444	175	1398	0	3	87
15	4	SRN	19	71	1072	28	7	0.5	1.1	483	7250	213	3201	0	10	92
3	3	TRP	4	23	68	2	6	1.8	4.2	127	380	246	739	221	5	85
5	5	MCP	6	20	98	3	8	0.8	1.4	159	796	122	610	96	5	90
1	1	CCP	1	34	34	1	11	0.9	2.3	371	371	334	334	260	5	85
1	1	CRP	1	14	14	0	8	0.7	1.6	97	97	68	68	58	30	100
2	2	LSBk	3	17	35	1	8	0.7	1.5	131	262	88	177	75	8	65
11	11	PLP	14	14	156	4	8	0.9	2.8	121	1333	112	1233	83	17	94
1	1	DPL	1	13	13	0	10	0.8	1.3	130	130	104	104	65	5	100
2	0	DRY	3	109	218	6	0	0.0	0.0	0	0	0	0	0	0	100

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
78	46	3790	22731	11728

Clear Creek — Drainage: RUSSIAN RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T8NR11WS33 LATITUDE:38°29'56" LONGITUDE:123°5'6"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
9	9	MAIN	38	22	199	48	7.7	1.1	172	1547	187	1683	156	5
14	14	SCOUR	58	15	204	49	8.3	0.8	121	1692	106	1478	80	17
1	1	BACKWATER	4	13	13	3	10.0	0.8	130	130	104	104	65	5

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
24	24	417	3369	3264

Clear Creek — Drainage: RUSSIAN RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T8NR11WS33 LATITUDE:38°29'56" LONGITUDE:123°5'6"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
3	TRP	13	0	0	0	0	2	67	0	0	1	33
5	MCP	21	0	0	5	100	0	0	0	0	0	0
1	CCP	4	0	0	0	0	1	100	0	0	0	0
1	CRP	4	0	0	1	100	0	0	0	0	0	0
2	LSBk	8	0	0	2	100	0	0	0	0	0	0
11	PLP	46	0	0	7	64	4	36	0	0	0	0
1	DPL	4	0	0	1	100	0	0	0	0	0	0

TOTAL UNITS
24

Clear Creek — Drainage: RUSSIAN RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T8NR11WS33 LATITUDE:38°29'56" LONGITUDE:123°5'6"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
13	3	LGR	0	33	0	0	35	10	0	22	0
7	3	HGR	0	0	0	0	0	0	0	100	0
2	1	CAS	0	0	0	0	0	0	0	100	0
5	0	BRS	0	0	0	0	0	0	0	0	0
2	0	GLD	0	0	0	0	0	0	0	0	0
8	2	RUN	0	45	0	0	0	0	0	55	0
15	3	SRN	0	7	0	0	0	0	0	93	0
3	2	TRP	0	25	0	50	0	0	0	0	25
5	4	MCP	0	3	0	0	0	0	0	88	10
1	1	CCP	0	0	0	10	0	0	0	90	0
1	1	CRP	60	25	15	0	0	0	0	0	0
2	2	LSBk	25	0	25	0	0	0	0	50	0
11	10	PLP	5	3	2	2	2	0	0	86	1
1	1	DPL	0	0	0	0	0	0	0	50	50
2	0	DRY	0	0	0	0	0	0	0	0	0

Clear Creek — Drainage: RUSSIAN RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 07/13/01 to 07/16/01

Confluence Location: QUAD: DUNCANMILL LEGAL DESCRIPTION: T6NR11WS33 — LATITUDE:38°29'56" LONGITUDE:123°5'6"

TOTAL HABITAT UNITS	UNITS FULLY 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
13	5	LGR	0	0	60	0	40	0	0
7	3	HGR	0	0	0	33	0	67	0
2	1	CAS	0	0	0	0	0	100	0
5	3	BRS	0	33	0	0	0	0	67
2	2	GLD	0	0	100	0	0	0	0
8	4	RUN	0	0	50	25	25	0	0
15	4	SRN	0	0	50	25	0	25	0
3	2	TRP	0	0	0	0	0	0	100
5	2	MCP	0	50	50	0	0	0	0
1	1	CCP	0	0	100	0	0	0	0
1	1	CRP	0	0	100	0	0	0	0
2	1	LSBk	0	100	0	0	0	0	0
11	6	PLP	0	33	33	17	0	17	0
1	1	DPL	0	0	100	0	0	0	0
2	0	DRY	0	0	0	0	0	0	0

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Clear Creek
SAMPLE DATES: 07/13/01 to 07/16/01
STREAM LENGTH: 3715 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: DUNCANMILL — Latitude: 38°29'56"
Legal Description: T8NR11WS33 — Longitude: 123°5'6"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F3	Canopy Density: 82%
Channel Length: 465 ft.	Coniferous Component: 98%
Riffle/flatwater Mean Width: 8 ft.	Deciduous Component: 2%
Total Pool Mean Depth: 1.3 ft.	Pools by Stream Length: 5%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: 52 - 52 °F Air: 50 -50 °F	Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Brush	Dom. Shelter: Boulders
Vegetative Cover: 59%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 100% 2.0% 3. 0% 4. 0% 5. 0%

STREAM REACH 2

Channel Type: A2	Canopy Density: 92%
Channel Length: 1366 ft.	Coniferous Component: 81%
Riffle/flatwater Mean Width: 6 ft.	Deciduous Component: 19%
Total Pool Mean Depth: 1.0 ft.	Pools by Stream Length: 14%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 8%
Water: 52 - 54 °F Air: 50 -56 °F	Mean Pool Shelter Rtn: 6
Dom. Bank Veg.: Brush	Dom. Shelter: Boulders
Vegetative Cover: 25%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 33% 2.42% 3. 0% 4. 0% 5. 25%

STREAM REACH 3

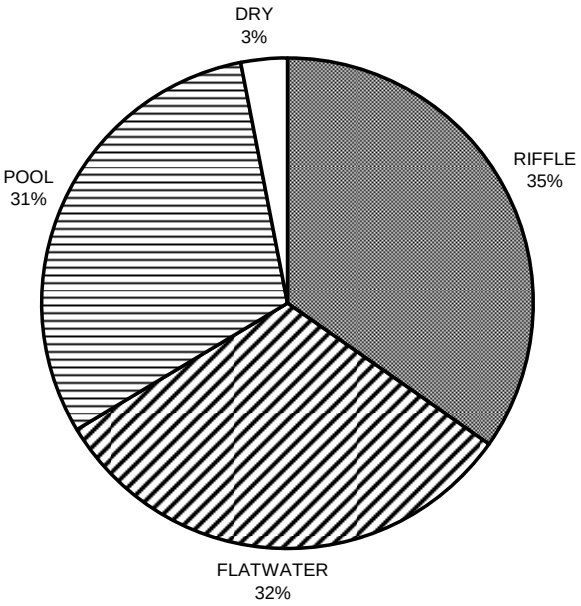
Channel Type: F4	Canopy Density: 87%
Channel Length: 1509 ft.	Coniferous Component: 88%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 14%
Total Pool Mean Depth: 0.8 ft.	Pools by Stream Length: 11%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: 52 - 58 °F Air: 56 -68 °F	Mean Pool Shelter Rtn: 17
Dom. Bank Veg.: Brush	Dom. Shelter: Boulders
Vegetative Cover: 38%	Occurrence of LOD: 7%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 143 ft.

Embeddness Value: 1. 67% 2.11% 3. 11% 4. 0% 5. 11%

STREAM REACH 4

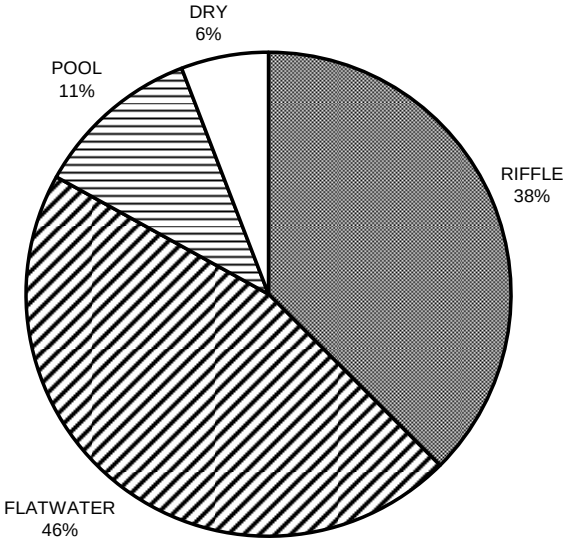
Channel Type: A2	Canopy Density: 100%
Channel Length: 375 ft.	Coniferous Component: 93%
Riffle/flatwater Mean Width: 4 ft.	Deciduous Component: 7%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 7%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: 52 - 52 °F Air: 62 -62 °F	Mean Pool Shelter Rtn: 28
Dom. Bank Veg.: Brush	Dom. Shelter: Boulders

CLEAR CREEK
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



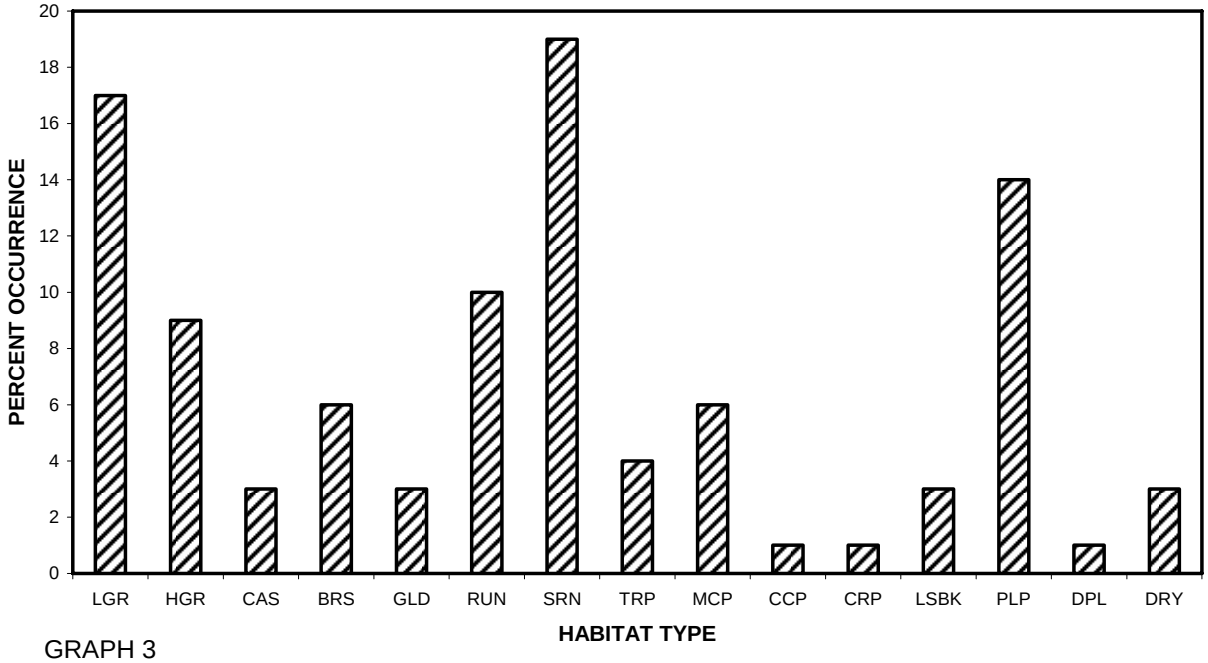
GRAPH 1

CLEAR CREEK
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



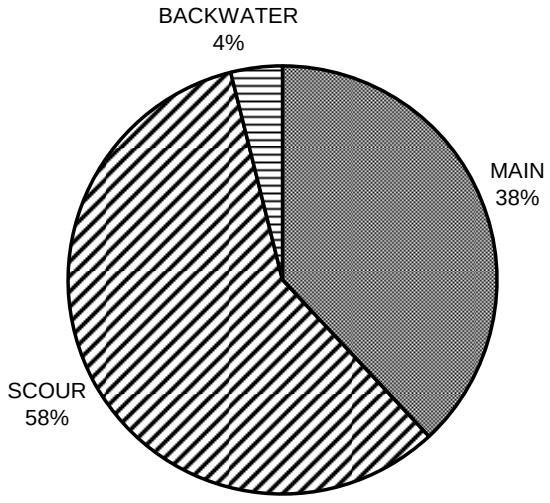
GRAPH 2

CLEAR CREEK
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



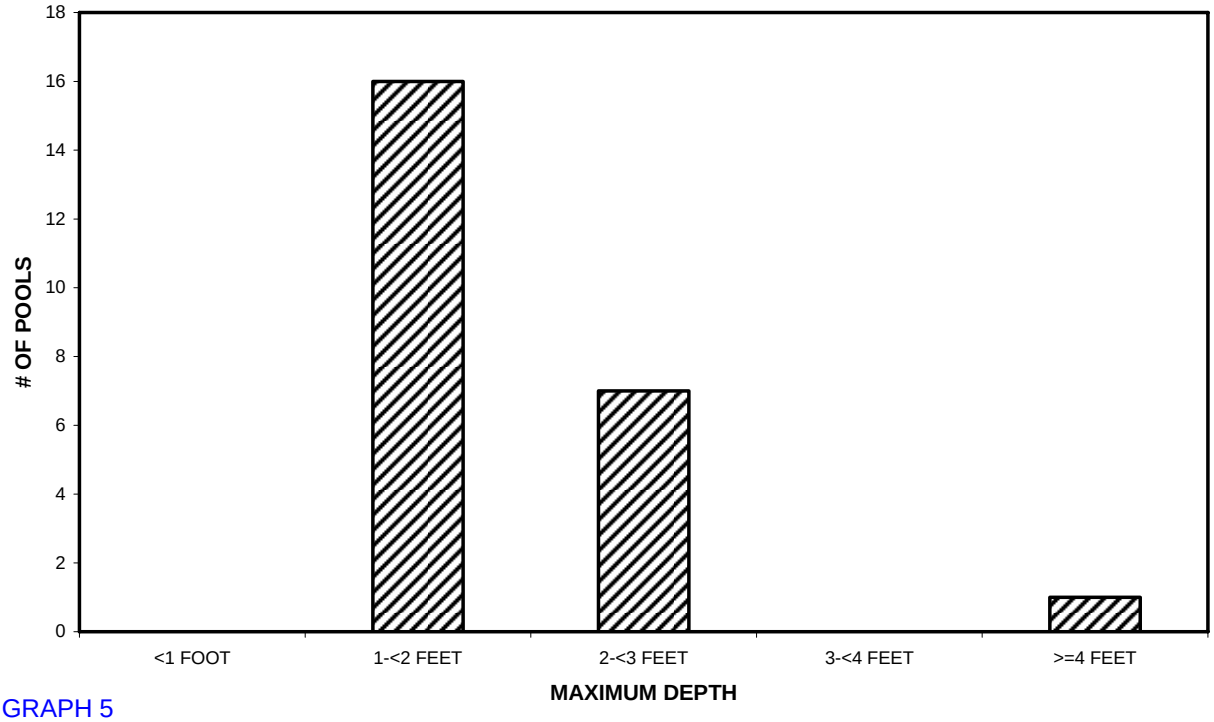
GRAPH 3

CLEAR CREEK
LEVEL I POOL HABITAT TYPES BY PERCENT OCCURRENCE



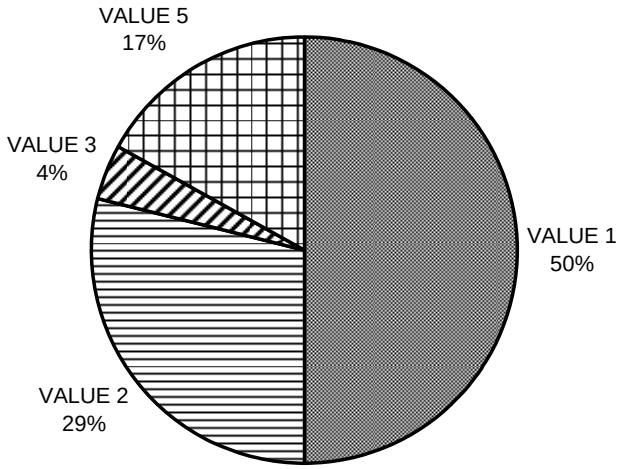
GRAPH 4

CLEAR CREEK
MAXIMUM DEPTH IN POOLS



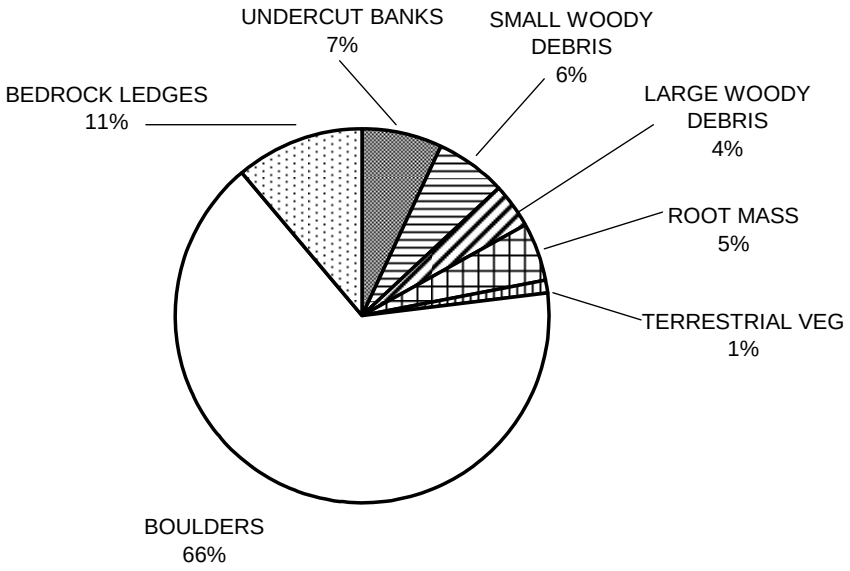
GRAPH 5

CLEAR CREEK
PERCENT EMBEDDEDNESS



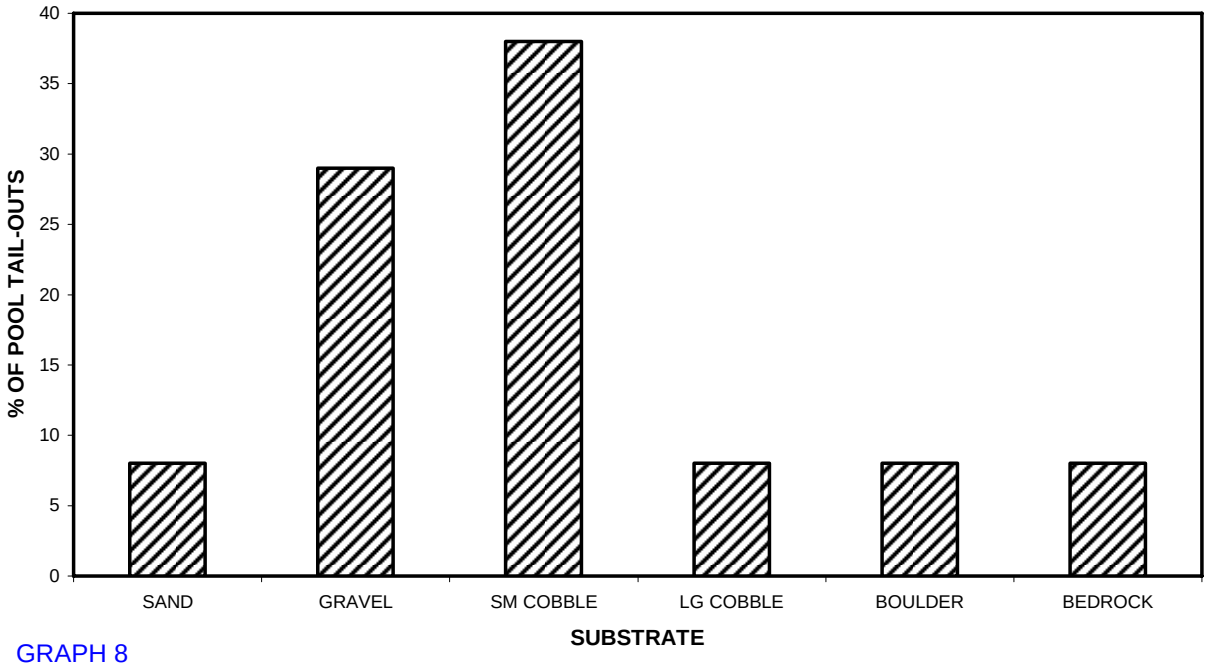
GRAPH 6

CLEAR CREEK
MEAN PERCENT COVER TYPES IN POOLS



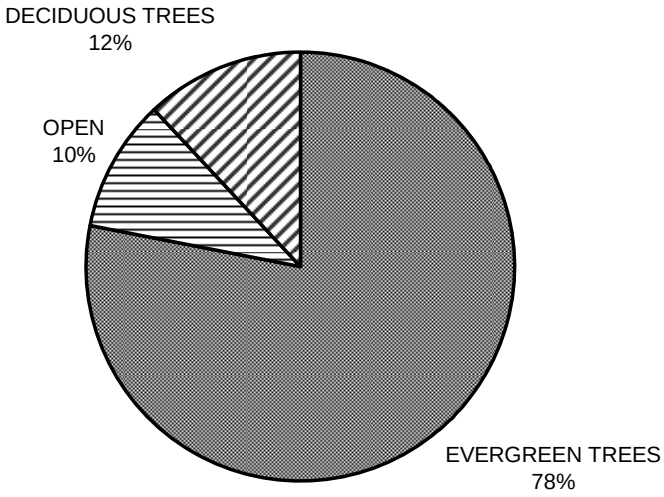
GRAPH 7

CLEAR CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



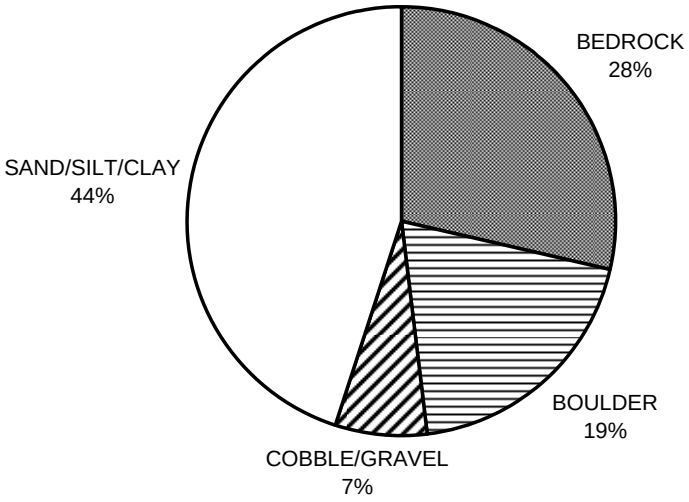
GRAPH 8

CLEAR CREEK
MEAN PERCENT CANOPY



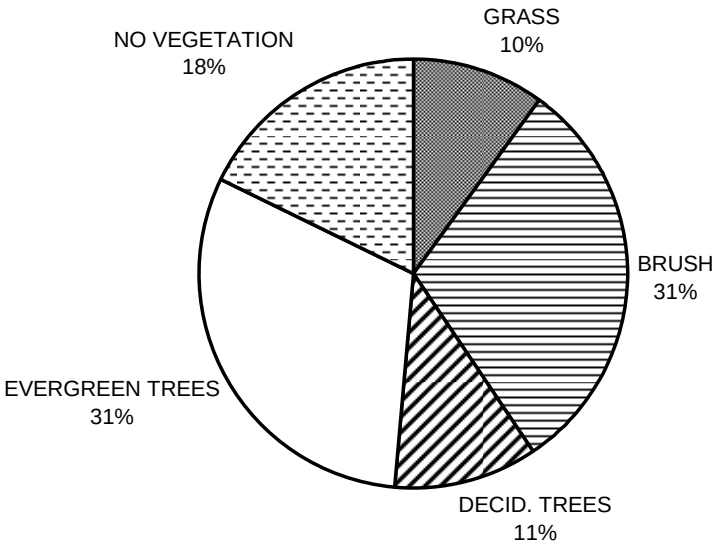
GRAPH 9

CLEAR CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

CLEAR CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Watershed Hydroid **409** Clear Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Clear Creek	1230847384991	Sonoma

Tributary to Kidd Creek
Tributary to Austin Creek
Tributary to Russian River

Location: **T:** 8N **R:** 11W **S:** 33 **Latitude:** 38.499128880584 **Longitude** 123.084812697452

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: 3 **Total Length:** 1.44 Miles 2.33 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: 254 Hectares; 627 Acres; 0.97 sq. mi.

Elevations: Mouth: 92 feet; Headwaters: 1768 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	626.9
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:
390.11 acres	169.26	66.56	0.00	0.00
62.3 %	27.1 %	10.6 %	0.0 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
0.00	0.30	0.00	0.00
0.0 %	0.1 %	0.0 %	0.0 %

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

Watershed HydroId **409** Clear Creek

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

Quad Name	USGS Code
DUNCAN MILLS	38123D1

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

Scientific Name	Common Name
Arborimus pomo	red tree vole

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Russian Gulch	111390	Russian Gulch	0.09
Guerneville	111411	Lower Russian River	99.91