CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Smith Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

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

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

WATERSHED OVERVIEW

Smith Creek is a tributary to the Russian River, located in Sonoma County, California (see Smith Creek map, page 2). The legal description at the confluence with the Russian River is T7N, R10W, S5. Its location is 38°28'29" N. latitude and 122°59'25" W. longitude. Year round vehicle access exists from Highway 101 via Highway 116 west to Guernewood Park.

Smith Creek and its tributaries drain a basin of approximately 1.9 square miles. Smith Creek is a first order stream and has approximately 2.6 miles of blue line stream, according to the USGS Camp Meeker 7.5 minute quadrangle. Summer flow was measured as approximately .85 cfs at the first footbridge at habitat unit #006 on June 16, 1998. Elevations range from about 0 feet at the mouth of the creek to 720 feet in the headwaters. The watershed is primarily privately owned. The Northern spotted owl (*Strix occidentalis caurina*) is listed with a federal status of threatened and the red tree vole (*Arborimus pomo*)is listed with a federal status of species of concern in the DFG's Natural Diversity Database as occurring within the Smith Creek watershed.

METHODS

The habitat inventory conducted in Smith Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Smith Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

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". Smith Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Smith 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.

8. Canopy:

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

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

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1)

stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

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

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

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

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

HISTORICAL STREAM SURVEYS:

No historical stream surveys exist for Smith Creek

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 16 - July 2, 1998 was conducted by Dez Mikkelsen, Danielle Lefer, Shamli Tarbell, and Simone Watts (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with the Russian River and extended up Smith Creek to the end of landowner access permission. The total length of the stream surveyed was 4800 feet, with no

additional feet of side channel.

Flow was estimated to be .85 cfs at the first footbridge at habitat unit #006 on June 16, 1998 with a Marsh-McBirney Model 2000 flowmeter.

This section of Smith Creek has 4 channel types: from the mouth to 392 feet an F4; next 399 feet an A2; next 3420 feet an F3 and the upper 589 feet an A3.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate. F3 channel types are similar but have predominately cobble substrate.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate. A3 channel types are similar but have predominately cobble substrate.

Water temperatures ranged from 54°F to 60°F. Air temperatures ranged from 54°F to 74°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 46% pool units, 35% riffle units, and 14% flatwater units. Based on total **length** there were 48% riffle units, 25% pool units, and 21% flatwater units.

Eighty-five habitat units were measured and 47% were completely sampled. Thirteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles at 35%, root wad scour pools 11%, step runs 8% and mid-channel pools 7% (Graph 2). By percent total **length**, low gradient riffles made up 48%, step runs 15%, step pools 7%, and glides 5%.

Thirty-nine pools were identified (Table 3). Scour pools were most often encountered at 62%, and comprised 52% 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. Eighteen of the 39 pools (46%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 12% 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 36. Riffle had the lowest rating with 2 and flatwater rated 13 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 39, main channel pools rated 37, and backwater pools rated 0 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were undercut banks at 27%, large woody debris 22%, root masses 21%, and boulders 13%. Graph 5 describes the pool shelter in Smith Creek.

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

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 37 pool tail-outs measured, 13 had a value of 1 (35%); 14 had a value of 2 (38%); five had a value of 3 (14%); and four had a value of 4 (11%). One (3%) riffle 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 94%. The mean percentages of deciduous and evergreen trees were 19% and 81%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 65% and the mean percent left bank vegetated was 73%. For the habitat units measured, the dominant vegetation types for the stream banks were: 74% evergreen trees, 13% deciduous trees, 8% grass, 2% brush and 2% bare soil. The dominant substrate for the stream banks were: 81% silt/clay/sand, 16% bedrock, 2% cobble/gravel and 1% boulder (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On September 2, 1998 a recent biological inventory was conducted in two sites of Smith Creek to document the fish species composition and distribution at several locations. Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream. The observers were Simone Watts (AmeriCorps) and Bob Coey (DFG).

The inventory of Reach 1 started at the mouth and continued for approximately 650 feet upstream. In riffle, run, and pool habitat types 29 0+, one 1+, and one 2+ steelhead were observed along with 4 sculpin and 8 pacific giant salamanders.
The inventory of Reach 3 started approximately 80 feet above the bedrock waterfall (habitat unit #013) and continued for approximately 300 feet. In pool and run habitat types one yellow-legged frog and many pacific giant salamanders were observed. No fish were observed.

During the habitat inventory, no salmonids were observed upstream of habitat unit #013, where a bedrock falls (16' high) appears to impede further passage. Resident rainbow trout were not observed above this site. It was also noted during the electrofishing survey that it is possible that the area below the falls could be dry in most years.

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

Table 1. Species Observed in Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1998	Steelhead	DFG	N
1998	Sculpin	DFG	N
1998	Pacific Giant Salamander	DFG	N
1998	Yellow-legged Frog	DFG	N

No introduced fish species were observed during the survey. Historical records reflect that no hatchery stocking, transfers, or rescues have occurred in the Smith Creek watershed.

ADULT SURVEYS:

No spawning/carcass survey was conducted.

DISCUSSION

Smith Creek has four channel types: F4, A2, F3 and A3.

There are 392 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.

There are 399 feet of A2 channel type in Reach 2. The high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

There are 3420 feet of F3 channel type in Reach 3. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

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

There are 589 feet of A3 channel type in Reach 4. A3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days June 16 to July 2, 1998 ranged from 54°F to 60°F. Air temperatures ranged from 54°F to 74°F. The warmer water temperatures were recorded in Reach 2. This temperature regime is favorable to salmonids.

Pools comprised 25% 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 Smith Creek, the pools are relatively shallow with 46% having a maximum depth of at least 2 feet. These pools comprised 12% 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 36. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by undercut banks (27%), large woody debris (22%), root masses (21%), and boulders (13%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Five of the seven low gradient riffles measured (71%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Twenty-four percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 35% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reach 3 and Reach 1 had the poorest ratings.

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

The mean percent canopy for the survey was 94%. This is very good, since 80 percent is generally considered desirable.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. Steelhead were documented consistently during each past survey year. Overall, good numbers were observed during the1998surveys. The 1998 fall survey documented many 0+ fish indicating successful spawning in the lower reaches of Smith Creek. However, few 1+ fish were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. Habitat conditions upstream of our survey reach are suitable for

steelhead, however access for salmonids is prevented by a falls in Reach 2. Overall, habitat conditions for both steelhead and coho have declined over time.

In Reach 4 bank protection and riparian planting is recommended.

Reaches 1 and 3 are excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within these channel types, especially to increase pool frequency, volume and shelter.

GENERAL MANAGEMENT RECOMMENDATIONS

Smith Creek should be managed as an anadromous, natural production stream, and evaluated for supplemental stocking with native steelhead above the falls.

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

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Access for migrating salmonids is impossible at a 16 foot bedrock waterfall in Reach 2. Ths prevents steelhead from accessing upper Smith Creek. No other work should be undertaken until Smith creek is evaluated for supplemental stocking. Suitable habitat exists.

2) There are several log debris accumulations present on Smith Creek. These debris accumulations should be monitored. If modification becomes necessary, it must be done carefully to preserve existing habitat provided by the woody debris.

3) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff. In Smith 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.

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 (Reaches 1 and 3) or in conjunction with stream bank armor to prevent erosion (Reaches 1 and 3). In some areas the material is at hand.

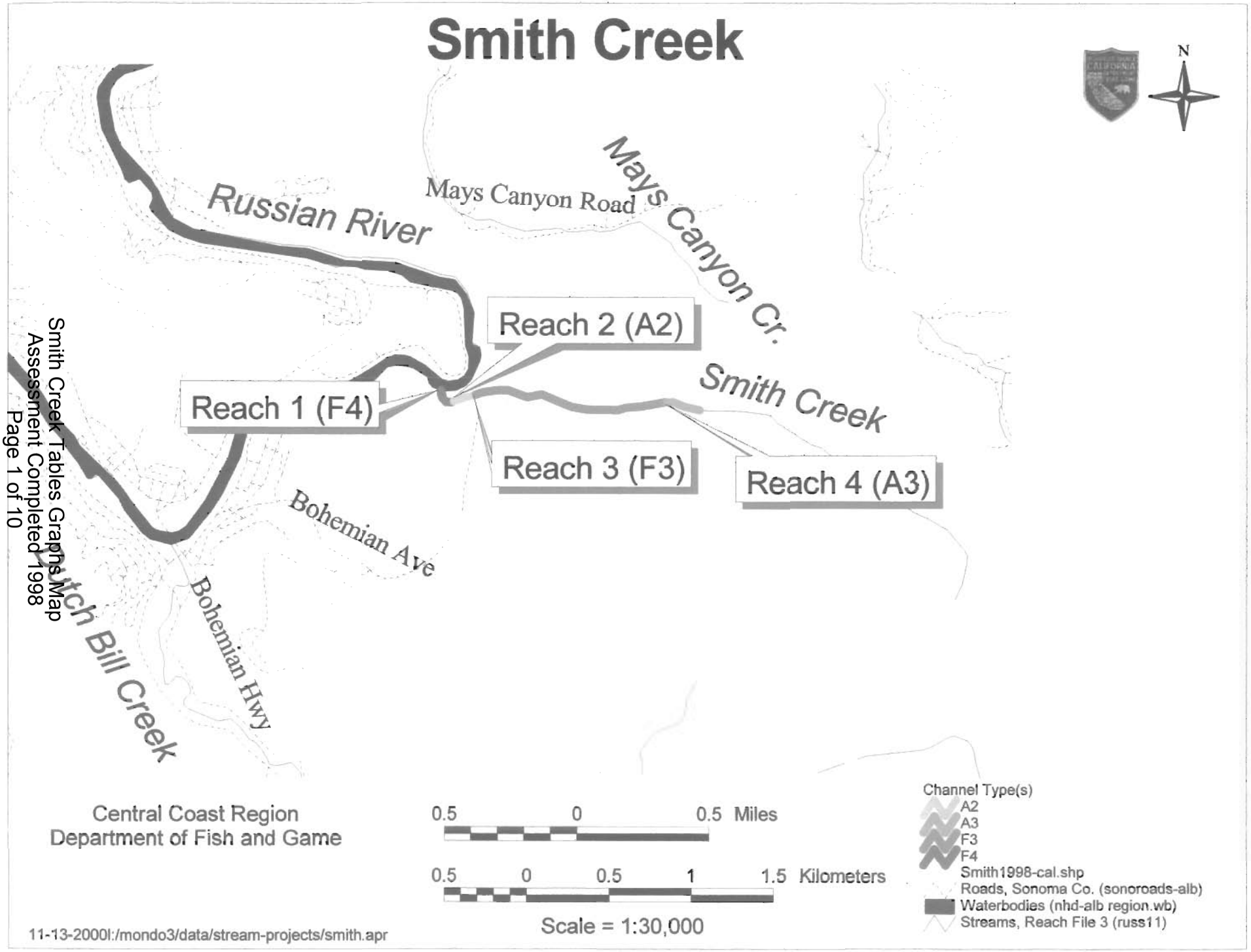
PROBLEM SITES AND LANDMARKS - SMITH CREEK SURVEY COMMENTS

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

	Habitat Unit #	Stream Length(ft)	Comments
Reach 1	1.00	122	Otter playing in Russian River. Creek runs through beach, channel recently graded by tractor. May not be natural area of flow.
	2.00	128	Water spigot on left bank.
	4.00	203	Person made step pools with logs.
	5.00	231	Footbridge #1. Concrete bridge foundation.
	6.00	297	Small spring like trib LB, 35' into unit.
	7.00	314	Steep bank, trees falling down, erosion:30'HX30WX35'D.
	8.00	361	Channel typed at this unit.
Reach 2	12.00	647	Slide at top of unit RB: 60'H X 30'W X 10' D.
	13.00	732	At top of unit bedrock Waterfall approximately 16'.
Reach 3	15.00	924	Channel change to F3, much flatter, no boulders. Water or fuel storage LB.
	23.00	1216	Blown out road crossing.
	27.00	1411	lizard in water.
	30.00	1657	Road on LB since unit 15 (30'').
	33.00	1769	Dry trib with culvert under road, LB.
	35.00	1839	Road right bank
	36.00	2021	RD RB
	37.00	2053	ROAD RB
	38.00	2083	CULVERT #1
	40.00	2398	ROAD 10 M FROM RB. JUVENILE PGS
	41.00	2421	OLD ROAD ON SIDE OF CREEK. OLD RIP-RAP ON NORTH SIDE
	46.00	2656	NICE POOL, NO SHELTER
	53.00	2801	SIDE TRIB AT LB (EPHEMERAL)
	60.00	3262	EROSIONAL DEPOSITION AT RB OLD ROAD NEXT TO CREEK. CULVERT ROAD 40' UP BANK.
	61.00	3262	BEDROCK IN STREAM, DOESN'T CONTINUE UP BANK.
	65.00	3496	HUGE LWD PILE CREATING SCOUR, BUT NOT AS YET DEFINABLE AS A POOL

	66.00	3726	LARGE LANDSLIDE @ LB. 2'CULVERT UPSLOPE INADEQUATE FOR AMOUNT OF WATER IN DRAINAGE SEDIMENT SOURCE INVENTORY WOULD BE BENEFICIAL FOR BG. MORE BANK SLIPPING TO BE EXPECTED. 3 HUGE ROOTBALLS INSTREAM.
	67.00	3770	SAME AS UNIT 66
	69.00	3848	POSSIBLE CHANNEL CHANGE PACIFIC GIANT SALAMANDER
	72.00	4173	CONFLUENCE ON LB (DRIES UP ABOUT 150' UP)
Reach 4	74.00	4251	CULVERT #2; channel change to A3
	77.00	4540	Pacific giant salamander
	83.00	4761	ROAD ON RB.
	84.00	4800	LB WITH 20' x 20' EROSION. 3 REDWOODS MIGHT COME DOWN. END OF SURVEY DUE TO END OF PERMITTED TIME AT SITE.

END OF SURVEY


Smith Creek
N
Russian River
Mays Canyon Road
Mays Canyon Cr.
Reach 2 (A2)
Smith Creek
Reach 1 (F4)
Reach 3 (F3)
Reach 4 (A3)
Bohemian Ave
Bohemian Hwy
Dutch Bill Creek
Central Coast Region
Department of Fish and Game
0.5 0 0.5 Miles
0.5 0 0.5 1 1.5 Kilometers
Scale = 1:30,000
Channel Type(s)
A2
A3
F3
F4
Smith1998-cal.shp
Roads, Sonoma Co. (sonoroads-alb)
Waterbodies (nhd-alb region.wb)
Streams, Reach File 3 (russ11)
11-13-2000I:/mondo3/data/stream-projects/smith.apr

Smith Creek Drainage: Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

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
4	3		5	81	322	6	6.7	0.9	230	920	203	811	165	12
30	3	RIFFLE	35	81	2433	48	7.1	0.5	592	17754	317	9502	0	2
12	3	FLATWATER	14	91	1095	21	6.6	0.6	549	6588	340	4085	0	13
39	31	POOL	46	33	1272	25	7.8	1.1	229	8941	294	11484	213	36

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
85	40	5122	34202	25883

Smith Creek Tables Graphs Map
Assessment Completed 1998

Smith Creek Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

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 %
4	3		5	81	322	6	7	0.9	3.0	230	920	203	811	165	12	99
30	3	LGR	35	81	2433	48	7	0.5	1.9	592	17754	317	9502	0	2	89
4	1	GLD	5	70	280	5	5	0.3	1.5	219	877	77	308	0	0	92
1	0	RUN	1	40	40	1	0	0.0	0.0	0	0	0	0	0	0	0
7	2	SRN	8	111	775	15	8	0.7	1.2	714	4997	472	3305	0	20	96
6	6	MCP	7	35	208	4	10	1.6	6.0	318	1908	738	4426	554	27	94
6	4	STP	7	58	347	7	8	0.9	3.8	366	2195	335	2011	258	57	100
3	3	LSL	4	35	105	2	9	1.1	3.5	286	857	293	880	227	77	97
9	6	LSR	11	29	258	5	7	0.9	2.4	189	1701	165	1481	97	39	94
6	5	LSBk	7	29	173	3	6	1.0	2.7	163	979	148	887	84	2	97
1	1	LSBo	1	25	25	0	6	1.0	1.8	143	143	143	143	114	5	95
5	4	PLP	6	19	97	2	8	1.3	3.0	167	836	209	1047	148	57	96
2	2	BPB	2	19	37	1	8	1.8	3.9	141	282	237	474	163	0	90
1	0	BPR	1	22	22	0	8	1.0	2.2	176	176	176	176	158	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
85	40	5122	33624	25451

Smith Creek | Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES | Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

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
4	3		9	81	322	20	6.7	0.9	230	920	203	811	165	12
12	10	MAIN	28	46	555	35	9.1	1.3	340	4077	555	6657	435	37
24	19	SCOUR	56	27	658	41	7.2	1.0	188	4516	185	4437	122	39
3	2	BACKWATER	7	20	59	4	7.7	1.5	153	458	217	650	161	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
43	34	1594	9971	12556

Smith Creek

Drainage: Russian River

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

Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
3		7	0	0	0	0	2	67	1	33	0	0
6	MCP	14	0	0	2	33	3	50	0	0	1	17
4	STP	9	0	0	1	25	2	50	1	25	0	0
3	LSL	7	0	0	1	33	0	0	2	67	0	0
9	LSR	21	0	0	8	89	1	11	0	0	0	0
6	LSBk	14	0	0	3	50	3	50	0	0	0	0
1	LSBo	2	0	0	1	100	0	0	0	0	0	0
5	PLP	12	0	0	2	40	2	40	1	20	0	0
2	BPB	5	0	0	1	50	0	0	1	50	0	0
1	BPR	2	0	0	0	0	1	100	0	0	0	0

TOTAL UNITS
40

Smith Creek | Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
4	3		91	9	0	0	0	0	0	0	0
30	3	LGR	100	0	0	0	0	0	0	0	0
4	1	GLD	0	0	0	0	0	0	0	0	0
1	0	RUN	0	0	0	0	0	0	0	0	0
7	2	SRN	59	0	0	2	0	0	16	23	0
6	6	MCP	74	0	0	23	0	0	0	1	2
6	3	STP	0	0	13	0	0	0	42	45	0
3	3	LSL	7	0	84	6	0	0	0	3	0
9	9	LSR	29	4	1	66	0	0	0	0	0
6	5	LSBk	100	0	0	0	0	0	0	0	0
1	1	LSBo	0	0	0	0	0	0	0	100	0
5	5	PLP	17	31	38	0	0	0	3	11	0
2	2	BPB	0	0	0	0	0	0	0	0	0
1	0	BPR	0	0	0	0	0	0	0	0	0
85	43	ALL HABITAT TYPES	35	5	19	18	0	0	10	13	0
39	34	POOLS ONLY	27	6	22	21	0	0	10	13	0

Smith Creek Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 06/16/98 to 07/02/98

Confluence Location: QUAD: Camp Meeker LEGAL DESCRIPTION: T07NR10WS05 LATITUDE: 38°28'29" LONGITUDE: 122°59'25"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
4	3		0	33	67	0	0	0	0
75	7	LGR	0	0	43	29	14	14	0
5	2	GLD	0	50	0	0	0	0	50
0	0	RUN	0	0	0	0	0	0	0
3	3	SRN	0	33	0	0	0	67	0
6	6	MCP	0	67	17	0	0	0	17
5	5	STP	0	20	40	0	0	20	20
3	3	LSL	33	33	33	0	0	0	0
8	8	LSR	13	38	50	0	0	0	0
6	6	LSBk	0	67	17	0	17	0	0
1	1	LSBo	0	100	0	0	0	0	0
5	5	PLP	0	40	40	20	0	0	0
2	2	BPB	0	50	50	0	0	0	0
1	1	BPR	0	100	0	0	0	0	0

Smith Creek

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
94.18	81.34	18.66	64.80	72.76

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	8	8	16.33
Boulder	1	0	1.02
Cobble/Gravel	0	2	2.04
Silt/clay	40	39	80.61

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	4	4	8.16
Brush	2	0	2.04
Deciduous Trees	6	7	13.27
Evergreen Trees	36	37	74.49
No Vegetation	1	1	2.04

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Smith Creek
SAMPLE DATES: 06/16/98 to 07/02/98
SURVEY LENGTH:
MAIN CHANNEL: 5122 ft. SIDE CHANNEL: 322 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Camp Meeker Latitude: 38°28'29"
Legal Description: T07NR10WS05 Longitude: 122°59'25"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-9)

Channel Type: F4	Mean Canopy Density: 88%
Main Channel Length: 392 ft.	Evergreen Component: 88%
Side Channel Length: 0 ft.	Deciduous Component: 12%
Riffle/Flatwater Mean Width: 3.9 ft.	Pools by Stream Length: 23%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 25%
Base Flow: 0.9 cfs	Pools >=3 ft. Deep: 0%
Water: 58-58°F Air: 64-64°F	Mean Pool Shelter Rtn: 28
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Whitewater
Bank Vegetative Cover: 19%	Occurrence of LOD: 35%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

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

STREAM REACH 2 (Units 10-14)

Channel Type: A2	Mean Canopy Density: 98%
Main Channel Length: 399 ft.	Evergreen Component: 64%
Side Channel Length: 0 ft.	Deciduous Component: 36%
Riffle/Flatwater Mean Width: 7.0 ft.	Pools by Stream Length: 43%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 0.9 cfs	Pools >=3 ft. Deep: 33%
Water: 58-60°F Air: 64-74°F	Mean Pool Shelter Rtn: 55
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 53%	Occurrence of LOD: 20%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 33% 2. 33% 3. 0% 4. 0% 5. 33%

STREAM REACH 3 (Units 15-73)

Channel Type: F3	Mean Canopy Density: 94%
Main Channel Length: 3742 ft.	Evergreen Component: 80%
Side Channel Length: 322 ft.	Deciduous Component: 20%
Riffle/Flatwater Mean Width: 7.5 ft.	Pools by Stream Length: 20%
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 42%
Base Flow: 0.9 cfs	Pools >=3 ft. Deep: 13%
Water: 56-60°F Air: 60-70°F	Mean Pool Shelter Rtn: 36
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 80%	Occurrence of LOD: 57%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 38% 2. 42% 3. 8% 4. 13% 5. 0%

STREAM REACH 4 (Units 74-84)

Channel Type: A3	Mean Canopy Density: 96%
Main Channel Length: 589 ft.	Evergreen Component: 91%
Side Channel Length: 0 ft.	Deciduous Component: 9%
Riffle/Flatwater Mean Width: 6.0 ft.	Pools by Stream Length: 44%
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 50%
Base Flow: 0.9 cfs	Pools >=3 ft. Deep: 25%
Water: 54-60°F Air: 54-70°F	Mean Pool Shelter Rtn: 31
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 70%	Occurrence of LOD: 45%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 33% 2. 33% 3. 17% 4. 17% 5. 0%