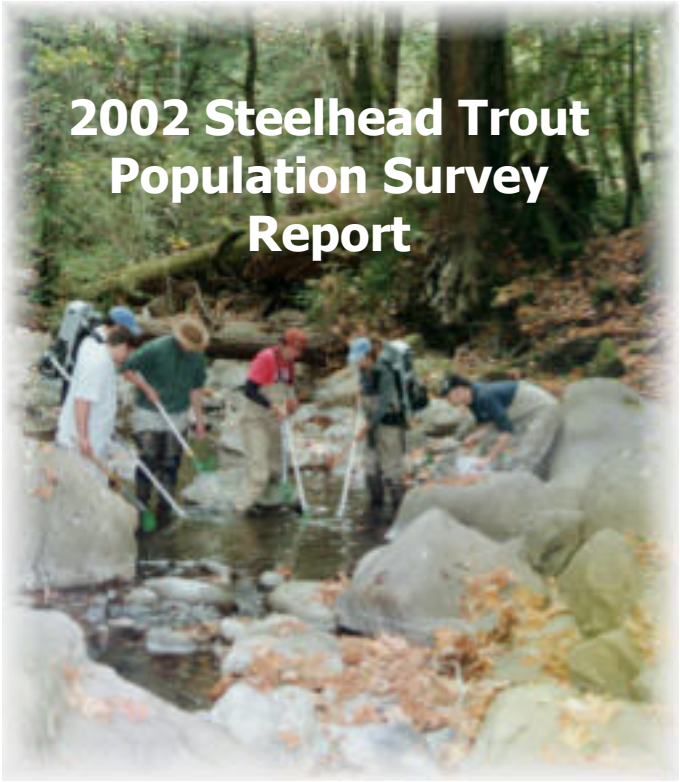
Soquel Demonstration State Forest



by

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5/2/03

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Introduction

A fish population survey was conducted by the California Department of Forestry and Fire Protection (CDF) in Soquel Demonstration State Forest (SDSF) with the assistance of the National Marine Fisheries Service (NMFS) during September 2002. Electrofishing (steelhead population sampling) was completed at four sites: three on the East Branch of Soquel Creek and one on Amaya Creek. (See Map 1.) These sites were revisited in October 2002 to assess their dynamic habitat values.

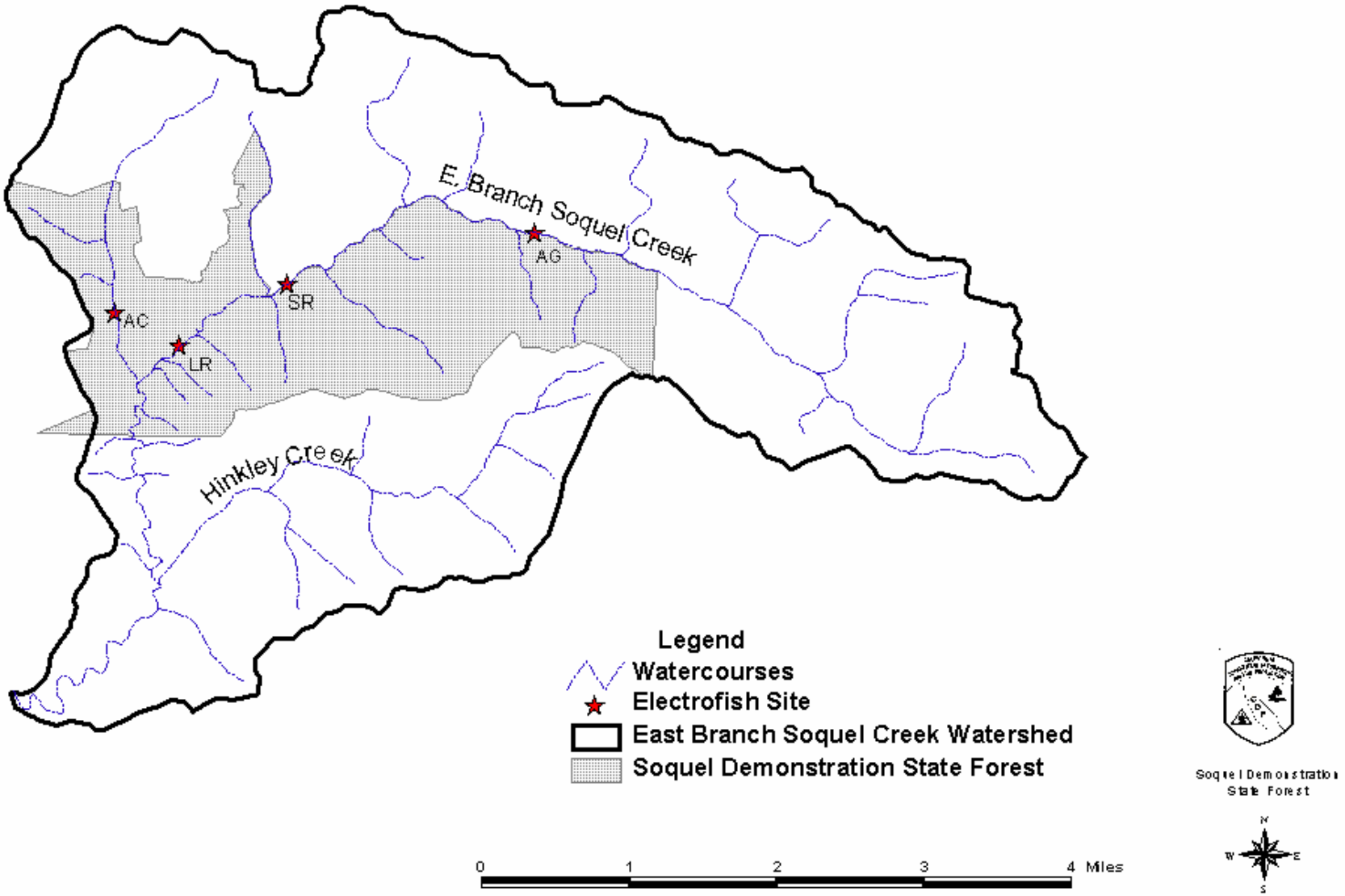
The purpose of this study was to add to previously accumulated baseline data of fish populations in the significant fish bearing creeks that run through SDSF. This is the ninth year of monitoring by CDF. (No independent monitoring by CDF occurred in 2000, as State Forest staff assisted with monitoring conducted by the Soquel Creek Water District.) The participants in this year's study were: Thom Sutfin, Ed Orre, Jessica Malan, and Andy Morse (who are all with CDF); Sue Sogard, Thomas Williams, Peter Adams, Heidi Fish, Brycen Swart, and Eric Sturm (NMFS); and volunteers Anne Weidlich, Trevor Arnold, Charlotte Smothers, Ron and Patricia Marland, Steve Berekly, Peggy Kirby, Joe Anderson, Jessie Lockwood, and Ben Sams. Jennifer Nelson (California Department of Fish and Game (DFG)) evaluated habitat characteristics within the survey reaches on October 24, 2002, independently of the electrofishing sampling.

Methodology

Quantitative electrofishing surveys were completed at four sites: one on Amaya Creek (AC) and three on the East Branch of Soquel Creek, at Longridge Road Crossing (LR), Spanish Ranch Trail Crossing (SR), and approximately three-quarters of a mile above Ashbury Gulch (AG). The sites used were the same as in the previous eight quantitative surveys (1993 – 1999, 2001), and only relatively small changes were made to the methodology used in the study.

Each electrofishing station was roughly 100 yards long and enclosed at both ends by seine nets. The nets were placed at stream channel habitat boundaries, resulting in a slight variation between station lengths. However, individual station lengths are fairly consistent from year to year because they are semi-permanently marked. The main difference between this year’s sampling methodology and the methodology used in past years is that all stations were sampled in three passes in 2002. In the past, stations were sampled with a third pass only when the second pass indicated that the rate of population depletion wasn’t high enough. Most of the time, this meant that only two passes were made in any given reach. This sampling protocol is based on the depletion method described by Seber and Le Cren (1967). Electrofishing was completed in one day per station, being greatly facilitated by the simultaneous operation of two shocking units at the Longridge, Spanish Ranch, and Ashbury Gulch locations. (Heidi Fish and Brycen Swart each operated their own electroshock unit.) Amaya Creek electroshocking was performed by one unit operated by Heidi Fish. Electrofishing devices utilized DC power, generated by gasoline-powered backpack generator units. Fish were scooped out of the water by “netters” using both small aquarium-type nets (approximately 3 inches by 2 inches) and medium-sized nets (approximately 6 inches by 4 inches). In addition, a large number of fish were removed from the water using the nets strung across the ring at the end of the electrofishing anodes. Once fish were pulled from the water, they were placed into buckets carried by those people working alongside the electrofishing device(s).

Map 1
Electrofishing Station Locations



The total number of seconds spent electroshocking and time for each pass were also monitored and recorded to ensure that effort was comparable between passes (see Appendix A). A considerable attempt was made to collect amphibians, including Pacific giant salamanders, yellow-legged frogs, and newts. Estimated fish populations and confidence intervals were calculated for each site using MicroFish software (Van Deventer and Platts, 1985). MicroFish outputs can be found in Appendix B.

The number of fish by species, individual fish fork lengths (nose to tail fork), and individual fish weights were recorded for each pass. In addition, scale samples were taken from about 13% of the fish collected, ranging from a minimum of 23 fish sampled for scales at the Longridge Road Crossing station, up to a maximum of 62 fish sampled for scales at the Ashbury Gulch station. These scale samples will be used by NMFS for research independent of the electrofishing sampling addressed in this report. For the collection of scale samples and the weighing and measuring of the fish, they were briefly anesthetized by being placed in a bucket of water to which Alka-Seltzer Gold® was added. This product is preferred over regular Alka-Seltzer® because it does not contain aspirin. The aspirin in regular Alka-Seltzer® probably unnecessarily disorients the fish.

Water temperatures were taken at all stations on the day each was sampled. Habitat inventory data, in accordance with the methods outlined by the California Salmonid Stream Habitat Restoration Manual (Flossi and Reynolds, 1994), was collected several weeks later. Due to the subjective nature of certain habitat attributes, habitat evaluation has been conducted by the same evaluator, Jennifer Nelson (DFG), for the past several years. Stream flow was measured during habitat analysis on Amaya Creek and Soquel Creek, using the centroid method. Habitat analysis data can be found in Appendix C.

Results

Total electroshocking time, time per pass, and volt settings are displayed in Appendix A. Estimated fish populations (as calculated by MicroFish) for each site are shown in Table 1 below. (See also Appendix B.)

Table 1. Estimated Steelhead Trout Population for 2002

Station	Number of Fish Caught			Total Fish Caught	**Estimated Population**
	Pass 1	Pass 2	Pass 3		
AC	27	10	3	40	**41**
LR	487	68	20	575	**577**
SR	325	76	11	412	**415**
AG	83	2	0	85	**85**

As described above, prior to the sampling that occurred in 2002, electrofishing by SDSF staff in Soquel Creek and Amaya Creek was done using the depletion method described by Seber and Le Cren (1967). In practice, this usually meant that only two passes were necessary. This year, however, the standard methodology for NMFS required three passes at all stations, without regard for second pass depletion. If the depletion method had been applied in 2002, no stations would have required a third pass, based on rates of depletion. For this reason, we ran MicroFish analyses for all stations after two passes and again after three

passes, to compare differences in population estimates. The results of that process are displayed in Table 2 below. (See also Appendix B.)

Table 2. Comparison of MicroFish Outputs for Two and Three Pass Sampling

Station	Two pass population estimate	Three pass population estimate
AC	41	41
LR	565	577
SR	423	415
AG	85	85

Although the population estimates do not differ a great deal in absolute numbers, the three pass method did yield smaller standard errors and therefore greater accuracy in predicting the population of any given index reach that was sampled. For this reason, the three pass population estimates will be used throughout this report as the 2002 estimates of population.

Amaya Creek

The Amaya Creek station was electrofished on September 24, 2002. All fish collected were steelhead trout (*Oncorhynchus mykiss*). Amphibians collected included six rough-skinned newts (*Taricha granulosa*) and six Pacific giant salamanders (*Dicamptodon ensatus*). Steelhead mortality was two fish, or about 5%. (All deceased fish were retained by NMFS for research purposes). Fish lengths ranged from 66 mm to 172 mm with a median of 86.5 mm, and weight ranged from 3.6 grams to 51.4 grams with a median of 8.25 grams.

The structural habitat features of this area included two step run segments, two plunge pool segments, and a riffle, a pocket, and a step pool segment. The most common features at this station were the two step run segments, accounting for almost 40% of the length of the Amaya Creek station. The deepest water was found in a 25 foot by 10 foot plunge pool, with an average depth of 1.4 feet and a maximum depth of 2.3 feet. Large woody debris plays an important role here, as it covers 60% of one plunge pool and 100% of the other. From early June to late October, the water temperature in Amaya Creek downstream from the electrofishing station ranged from a low of 48°F to a high of 66°F. On the day of sampling, water temperature was 59°F. Stream flow velocity at this station was 0.57 cubic feet per second (cfs) on October 24, 2002, when habitat type and flow measurement data were collected.

Longridge Road Crossing

The Longridge Road Crossing station was electrofished on September 26, 2002. The most common fish caught were steelhead trout, although thirty-four Pacific lamprey (*Lampetra tridentata*), six sculpin (*Cottus* spp.), and one Sacramento sucker (*Catostomus occidentalis*) were also collected at this location. In addition to fish, thirty-two Pacific giant salamanders (*Dicamptodon ensatus*), twenty-one foothill yellow-legged frogs (*Rana boylii*), four rough-skinned newts (*Taricha granulosa*), and one signal crayfish (*Pacifastacus leniusculus*) were found at this station. Steelhead lengths ranged from 33 mm to 151 mm with a median of 54.5

mm, and weights ranged from 0.4 grams to 41.1 grams with a median of 1.9 grams. Steelhead mortality was 34 fish, or nearly 6%. The majority of the fish captured were suffering from black spot disease, a disorder evidenced by spots resulting from an infestation of young flukes of the larval trematode *Neascus*.

Habitat here was comprised of side-by-side root pools, a run, a glide, a riffle, and a step run segment. The glide and the root pools each make up more than one quarter of the length of this unit. Depth may be a limiting factor here, as the maximum was 1.5 feet and the mean was closer to six inches. Instream cover is mostly boulders, with no large woody debris and a minimum amount of small woody debris and root coverage. Canopy is also relatively sparse, with a maximum of 40% coverage at one point and a mean canopy coverage closer to 20% for the length of this reach. One positive habitat attribute of this station is the substrate components, which are primarily small cobbles, boulders, and gravel. From early June to late October, the water temperature ranged from a low of 53°F to a high of 61°F in the vicinity of this electrofishing station. On the day of sampling, water temperature was 59°F. Stream flow velocity was 0.49 cfs on October 24, 2002, when habitat type and flow measurement data were collected. (It is unknown why the flow in Soquel Creek was measured as less than the flow in Amaya Creek.)

Spanish Ranch

The Spanish Ranch station was electrofished on September 25, 2002. The only fish caught in addition to steelhead were four Pacific lampreys. Six Pacific giant salamanders, one rough-skinned newt, one signal crayfish and one foothill yellow-legged frog were also collected. Steelhead lengths had a median of 54 mm and a range of 37 mm to 145 mm. Weights ranged from 0.4 grams to 33.0 grams with a median of 1.8 grams. Steelhead mortality was about 4%, or 18 fish.

The habitat types at this site included a step run segment, a root pool, and a step pool segment. The majority of the Spanish Ranch station is made up of step pools. This habitat type is not only the widest and deepest found here, but it also occupies nearly 75% of the length. Instream cover is only 40%, but canopy is more plentiful, ranging from 65% to 95%. The root pool is covered by a large rootwad (from a clump of standing redwoods), exposed by a significantly undercut bank. Gravel was the most common substrate material found at this station. From early June to late October, the water temperature at Spanish Ranch ranged from a low of 50°F to a high of 69°F. The water temperature during sampling was 61°F at this station, and air temperature was 70°F at 3 p.m. Stream flow velocity was not measured at this station.

Ashbury Gulch

The Ashbury Gulch station was electrofished on September 27, 2002. All of the fish encountered here were steelhead trout. Fifteen Pacific giant salamanders, two signal crayfish, and two rough-skinned newts were also caught. Steelhead lengths ranged from 56 mm to 186 mm with a median of 101 mm, and weights ranged from 2.2 grams to 74.9 grams with a median of 10.8 grams. No steelhead mortality occurred at this station.

Two riffles, one run, a plunge pool, a step run segment, and a step pool were the six habitat types found here. Like the Spanish Ranch station, the majority of this reach is comprised of step pools. Nearly 50% of the length, or two-thirds of the surface area of the Ashbury Gulch reach make up this habitat type. The deepest points in this station were 1.4

feet deep, both in the plunge pool and the step run. The single most noticeable feature at this station is the prevalence of boulders. These are the primary substrate and cover components in all but one riffle segment of this sampling reach. On the day of sampling, water temperature was 56°F. Stream flow velocity was not measured at this station.

Fish length distribution for each station is displayed graphically in Figures 1 through 4 below.

Figure 1: Amaya Creek 2002 Fish Length Distribution

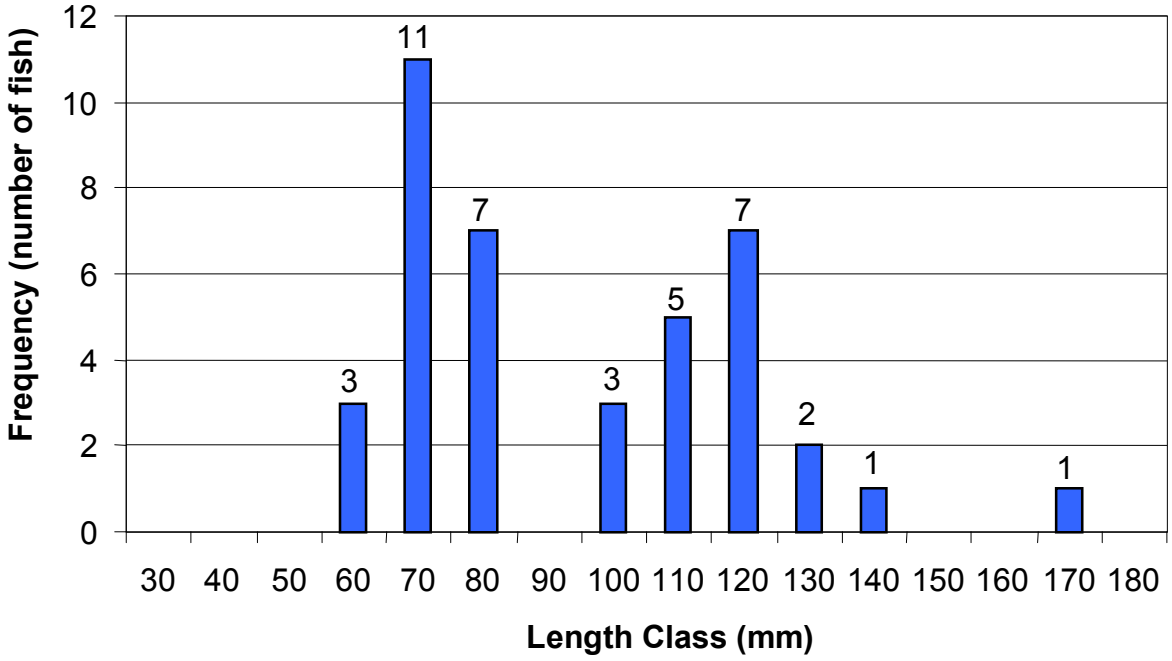


Figure 2: Longridge 2002 Fish Length Distribution

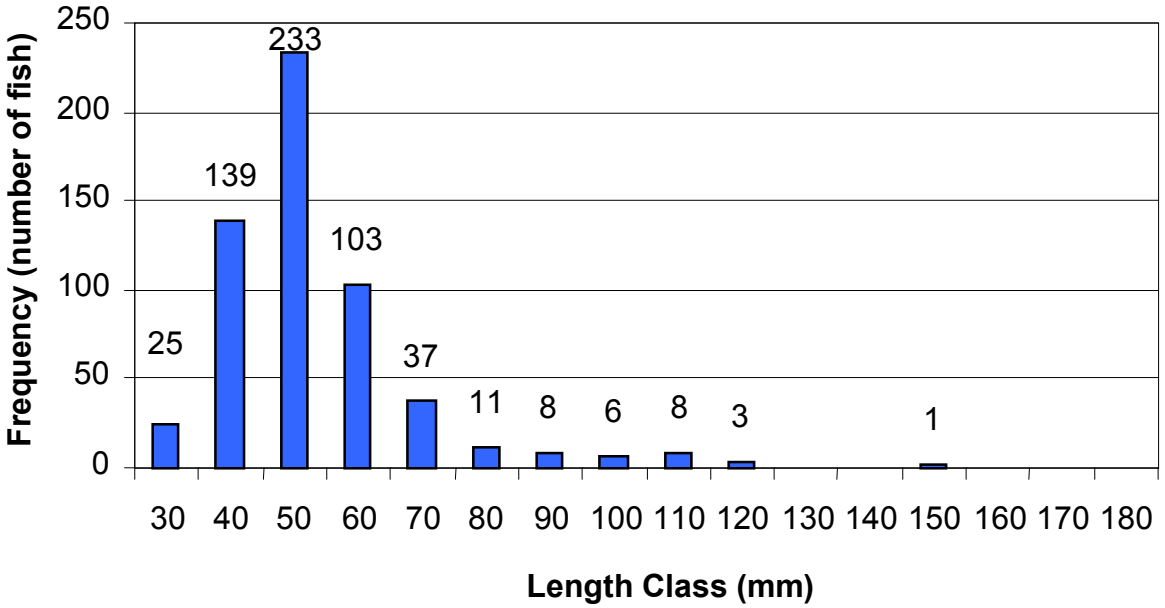


Figure 3: Spanish Ranch 2002 Fish Length Distribution

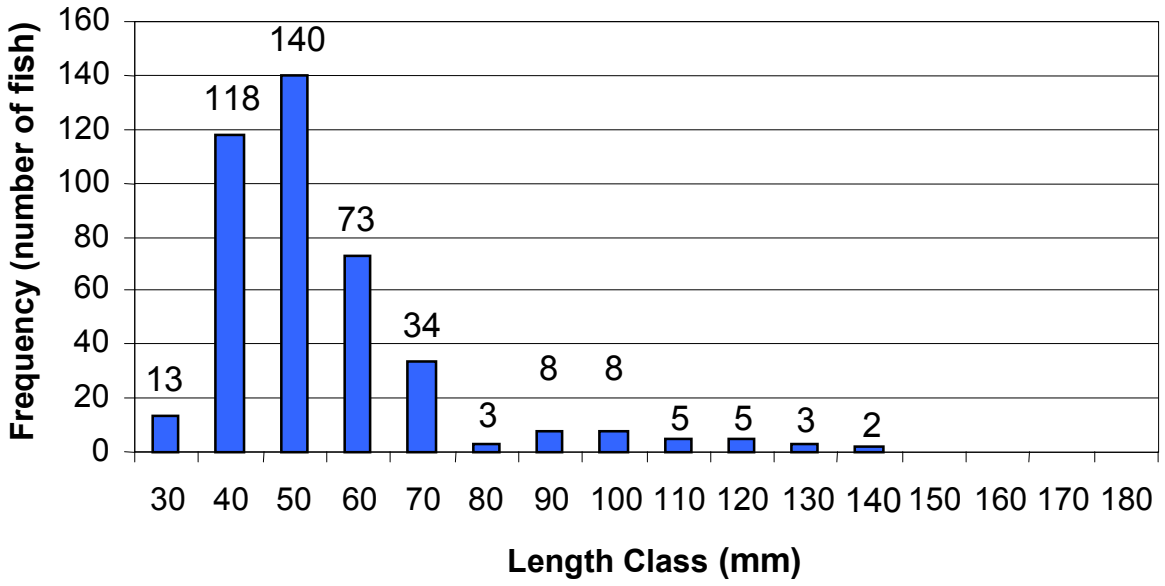
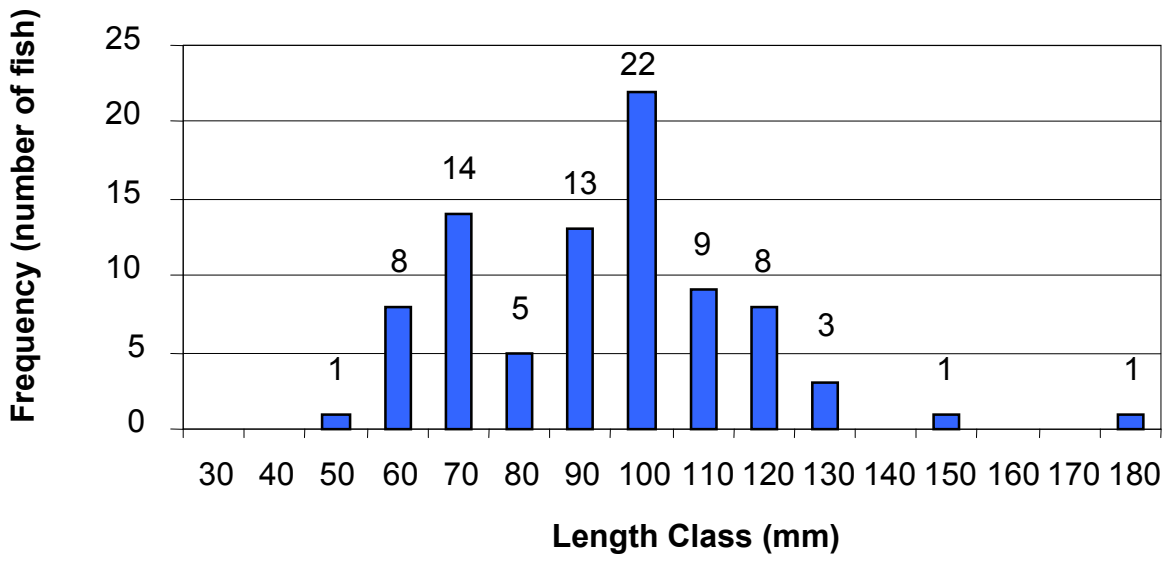


Figure 4: Ashbury Gulch 2002 Fish Length Distribution



Discussion

According to Flossi and Reynolds (1994), fish less than 80mm are young-of-the-year (YOY), fish between 80mm and 160mm are one year old, and fish greater than 160mm are two years of age or older. Based on this formula, tables 3 through 6 show the relative age distribution for each station in the 2002, 2001, 1999, 1998, and 1997 catches.

Table 3. Age Distribution of Amaya Creek Catch

Year	YOY	1 Year	2+ Years	% YOY	% 1 year	% 2+ year
2002	14	25	1	35.0	62.5	2.5
2001	0	30	1	0.0	96.8	3.2
1999	66	15	3	78.6	17.8	3.6
1998	2	28	0	6.7	93.3	0.0
1997	43	20	1	67.2	31.2	1.6

Table 4. Age Distribution of Longridge Catch

Year	YOY	1 Year	2+ Years	% YOY	% 1 year	% 2+ year
2002	537	37	0	93.6	6.4	0.0
2001	430	58	1	87.9	11.9	0.2
1999	690	32	0	95.6	4.4	0.0
1998	374	58	1	86.4	13.4	0.2
1997	370	34	1	91.4	8.4	0.2

Table 5. Age Distribution of Spanish Ranch Catch

Year	YOY	1 Year	2+ Years	% YOY	% 1 year	% 2+ year
2002	378	34	0	91.7	8.3	0.0
2001	358	35	0	91.1	8.9	0.0
1999	395	35	0	91.9	8.1	0.0
1998	199	44	0	81.9	18.1	0.0
1997	308	22	1	93.1	6.6	0.3

Table 6. Age Distribution of Ashbury Gulch Catch

Year	YOY	1 Year	2+ Years	% YOY	% 1 year	% 2+ year
2002	23	61	1	27.1	71.8	1.2
2001	135	59	0	69.6	30.4	0.0
1999	94	50	1	64.8	34.5	0.7
1998	49	39	0	55.7	44.3	0.0
1997	98	46	2	67.1	31.5	1.4

It is important to emphasize the scope of this report. This section will only attempt to present general trends in fish populations, their age distribution, and the environmental conditions at each sampling location. As stated in previous reports, it is difficult to make definitive conclusions about causality and influence of environmental characteristics relative to population trends because of the limited number of sampling years. Furthermore, any forest-wide extrapolation of steelhead population estimates would be inappropriate due to the variability of habitat throughout the area. The index reaches used are only intended to give us an idea of population trends and demographics.

Although non-continuous habitat altering events (e.g., landslides, floods, removal or addition of fish barriers, etc.) may have an important and ongoing effect on steelhead populations, these factors have not been addressed in this report if they occurred prior to the 2001 SDSF Steelhead Trout Population Survey. For a discussion of these events and the impact that they may continue to exert on current population conditions, please refer to previous SDSF Steelhead Trout Population Survey Reports.

Amaya Creek

The 2002 estimated population of 41 steelhead at the Amaya Creek sampling station is an increase of 32% over 2001's estimate of 31 steelhead. This is still less than half the estimated 86 fish in 1999, but nonetheless above the average of 37 for all years sampled since 1994. The 1999 estimate of 86 was the highest since sampling began in Amaya Creek in 1994.

The 2001 survey found no fish that were considered young-of-the-year (YOY), which led to speculation that perhaps fish were unable to migrate past a debris jam downstream during the winter of 2000-2001. This potential fish barrier was first identified in the 1999 report, and was said to be located about 2,000 feet upstream from the confluence of Amaya Creek and Soquel Creek, or approximately 800 feet downstream from the AC electrofishing station. This year, however, 35% of the fish captured were considered YOY (see Table 3). This year's data suggests that either the debris jam was washed out over the winter of 2001-2002 prior to migration, or that this debris jam is only a barrier to migration during low flow winters. The 10% increase in rainfall in 2002 over 2001 may have been enough to raise water levels to passable heights, or the periodicity of storms may have accomplished the same. Alternatively, the existing fish may have begun to spawn without first going to the ocean and in doing so, have taken on the behavior of resident rainbow trout. Nevertheless, this year's data, both in terms of age classes and sheer numbers, is encouraging about the present and future viability of the steelhead population in Amaya Creek.

Longridge

The 2002 estimated population of 577 steelhead at the Longridge station was up 8% from last year's estimate of 535, though still far below the high in 1999 of 829 fish. Further, this population estimate is about 13% above the average of 511 for all the years since 1993 that sampling has taken place at Longridge. Age distribution at this station has been fairly consistent since estimates of that attribute began in 1997. Young-of-the-year have always dominated this station, comprising between 86% and 96% of the population. The 2002 sampling was no different, with just over 93% of the population considered YOY.

The fish captured were generally smaller (shorter, less massive) in 2002. This trend was only seen at one other station, so it is unlikely that a climatic event (such as a change in rainfall frequency or amount) was the cause. Possible explanations could be a change in food availability at this particular station, or an increased presence of black spot disease.

Up to 80% of the fish collected had signs of black spot disease, which is caused by an infestation of a parasitic fluke. The 2001 Steelhead Trout Population Survey Report was the first to mention black spot disease, so it is difficult to know when it first became such a widespread problem at this station or what its effects will be. During the 2001 electrofishing effort, black spot disease was observed in "over half" of the fish captured. However, because no formal sampling scheme was used to look for signs of this parasite it is difficult to know whether the disease is spreading, or at what rate.

A relatively high rate of mortality occurred (6% or 34 steelhead). This is the second year that mortality has been 6% at this site, and it far exceeds the goal of no more than 1% mortality. Several possible reasons for this high number have been identified. One possibility is that the low water level at Longridge made getting to the fish more difficult. Another possibility is that the fish were kept in shock too long. Electrofishing "Unit B" malfunctioned on pass number two, and the anode had to be replaced. Up to the time that the malfunction was

noticed, the device may have been overshocking fish. Also, the time spent repairing the electrofishing device surely lengthened the time that the fish had to remain in the buckets and out of the creek. A final possibility is that the smaller fish that were collected this year were simply less resilient, and so the stress caused by the electrofishing process overwhelmed them.

Spanish Ranch

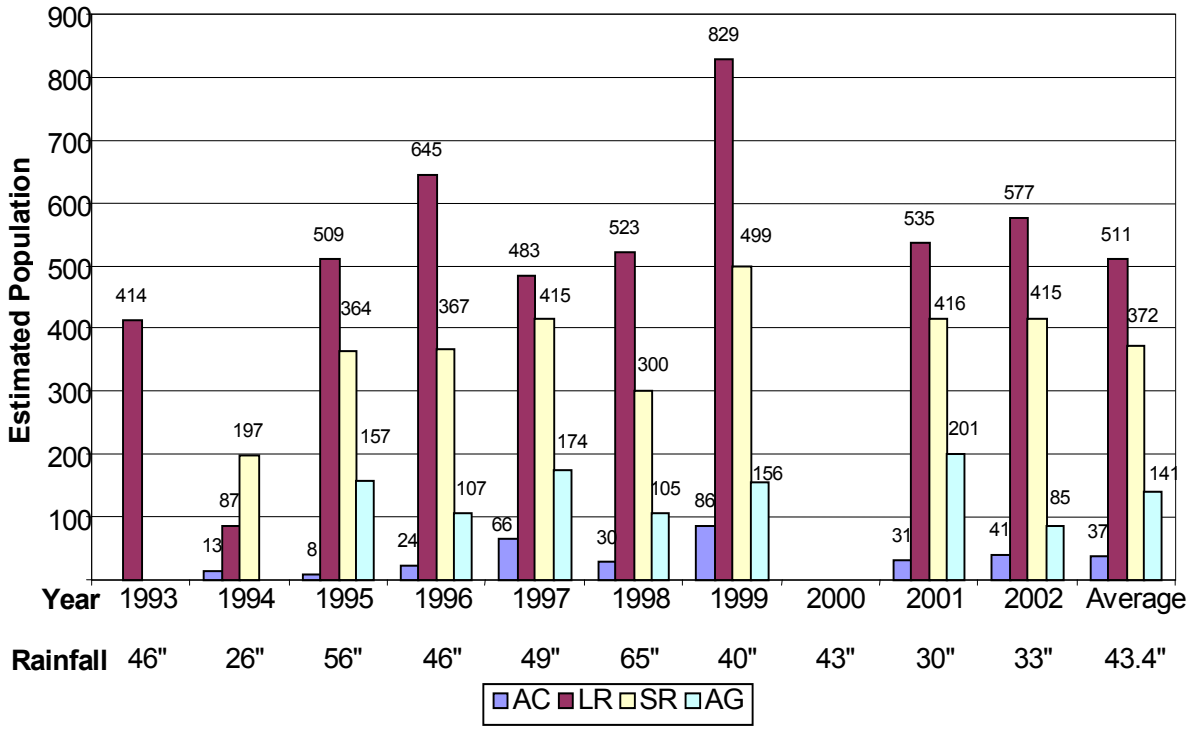
The estimated steelhead population of 415 at Spanish Ranch in 2002 was almost identical to the estimate for 2001. This year's total is about 12% higher than the average of predicted populations since electrofishing first began at Spanish Ranch in 1994. Age distribution (based on approximation by fish length) has changed very little at this station in the last several years (Table 5).

This station was again the site of two Hobo Temp data loggers that recorded air and water temperatures from early June to late October 2002. (Refer to the 2002 Instream Temperature Monitoring Report.)

Ashbury Gulch

The 2002 fish population estimate at the Ashbury Gulch station once again resisted the trends, and fell almost 58% to its lowest level in the history of the study. One year olds made up about 72% of the population - the first year that this group has been the majority at this station. (In all past survey years YOY were the most prevalent.) This may once again give credence to the sometimes-suggested notion that fish passage is at least occasionally blocked all winter by some downstream structure. This would explain why very few one year olds have left and why only a small group of fish were born here. Until 1989, a 12- to 15-foot waterfall that served as a fish barrier was located downstream from the electrofishing station. This was blasted by DFG in 1989, but the ensuing drought years probably caused this area to continue to be a barrier to upstream migration, meaning that fish found there through 1994 were part of a resident rainbow trout population. Starting in 1995, the former falls began to be passable as high flows and the reshaping of the substrate left only a cascade for migratory steelhead to negotiate. Last year's study made clear the assertion that adult steelhead were returning to this part of Soquel Creek to spawn. This idea must once again be questioned based on the results seen in 2002.

Figure 5: Estimated Steelhead Population Comparison
Soquel Demonstration State Forest
1993-2002



Rainfall

At the bottom of Figure 5 is the total rainfall for each corresponding year measured at Soquel Fire Station.

Mortality

Steelhead mortality did not occur at the Ashbury Gulch station. Mortality at Spanish Ranch was 4%, at Amaya Creek about 5%, and at Longridge nearly 6%. Total mortality for the study was up seven-tenths of a percent to 4.9%.

Watershed Land Use/Events

There were no particularly noteworthy watershed or land use events in 2002. The winter of 2001-2002 had approximately three-quarters of average rainfall for recent years. There were no significant storm events.

Land use events prior to the 2001 steelhead survey are described in previous Population Survey Reports.

Suggestions for Future Surveys

1. One of the biggest improvements made during the 2002 sampling effort was the addition of the "Fishmaster" position. Performed by Forest Manager Thom Sutfin, this person had the responsibility, and the flexibility, to coordinate all of the activities associated with the sampling effort once we left the office. This included

ensuring that sufficient amounts of the appropriate equipment were loaded into the vehicles. The job's more important tasks had to do with the moving of buckets full of fish; the "working-up," or measuring and recording, of fish; the return of fish to the creek in a timely fashion; and the efficient distribution of labor. The Fishmaster also touched-up the flagging and paint that marks the top and bottom of each station, for future ease in finding all stations.

2. Have enough people working at all stations (especially Longridge and Spanish Ranch) so that fish can be quickly caught, moved to the scales, processed, and placed in instream “live cars.” Approximately 9 people are a good number at Longridge, Spanish Ranch, and Ashbury Gulch. Amaya requires 5 to 6 people.

3. Establish a minimum amount of water in collectors’ buckets and a maximum length of time that one bucket is used for collection so that the water in the buckets doesn’t warm up to the point of causing oxygen stress for the fish.

4. Continue to record the presence of black spot disease at all stations, especially Longridge, to begin to understand the effects of this larval fluke on State Forest steelhead populations. Carefully train data collectors on the identification of black spot disease.

5. Check the passability of Ashbury Falls and Amaya Creek each winter, if possible, to determine whether fish barriers exist that may influence migration and, therefore, age distribution at stations AG and AC.

6. Set survey dates and inform volunteers of these dates as far in advance as possible to facilitate obtaining adequate help each day.

7. Establish an amphibian collection protocol.

8. Continue to have Mr. Bubbles® present for use in aerating water in holding buckets. Make sure that only Alka-Seltzer Gold® is used for anesthetizing fish for measurement, as opposed to regular Alka-Seltzer®.

9. Spend a few minutes clearing floating leaves from the sampling reach, especially at the Ashbury Gulch station, so that they don’t obstruct views of shocked fish. This was performed in 2002 at AG, and it may have been one reason that depletion at this station was so rapid, and no mortality occurred.

10. Standardize the sampling dates each year. New information suggests differences in the dates that the electrofishing occurs from year to year can be a significant factor in fish sample estimates. Fish populations are declining over the fall months and as little as one to two weeks can result in a marked change. To minimize seasonal population variations, it is recommended that sampling occur during the last full week of September each year.

11. Collect habitat type and stream flow information as close to the fish sampling dates as possible.

APPENDIX A

AMAYA CREEK

Air Temperature	Water Temperature
No record	15 C

Unit settings for Pass 1 (P1), Pass 2 (P2), and Pass 3 (P3)		Unit A (H. Fish) 200V
Electroshocking Time (sec.)	P1	2007
	P2	2218
	P3	1755
	Total	5980
Total Time (min.)	P1	45
	P2	44
	P3	35
	Total	124
Number of Fish (combined)	P1	27
	P2	10
	P3	3
	Total	40

LONGRIDGE

Air Temperature	Water Temperature
No Record	15 C

Unit settings for Pass 1 (P1), Pass 2 (P2), and Pass 3 (P3)		Unit A (H. Fish) Voltage not specified	Unit B (B. Swart) Voltage not specified
Electroshocking Time (sec.)	P1	5955	5676
	P2	5676	4436
	P3	3932	3478
	Total	15563	13590
Total Time (min.)	P1	154	
	P2	60	
	P3	78	
	Total	292	
Number of Fish (combined)	P1	487	
	P2	68	
	P3	20	
	Total	575	

SPANISH RANCH

Air Temperature	Water Temperature
21 C at 1500hrs.	16 C

Unit settings for Pass 1 (P1), Pass 2 (P2), and Pass 3 (P3)		Unit A (H. Fish) 200V		Unit B (B. Swart) 200V
Electroshocking Time (sec.)	P1	4036	P1	2800
	P2	3864	P2	2728
	P3	3362	P3	1966
	Total	11262	Total	7494

Total Time (min.)	P1	117
	P2	105
	P3	68
	Total	290
Number of Fish (combined)	P1	325
	P2	76
	P3	11
	Total	412

ASHBURY GULCH

Air Temperature	Water Temperature
No Record	13.5 C

Unit settings for Pass 1 (P1), Pass 2 (P2), and Pass 3 (P3)		Unit A (H. Fish) 200V		Unit B (B. Swart) 200V
Electroshocking Time (sec.)	P1	2450	P1	2864
	P2	2469	P2	2319
	P3	2522	P3	2322
	Total	7441	Total	7505

Total Time (min.)	P1	74
	P2	60
	P3	60
	Total	194
Number of Fish (combined)	P1	83
	P2	2
	P3	0
	Total	85

APPENDIX B

Station: Amaya Creek
Species: Steelhead

Removal Pattern:	27	10	
Total Catch		=	37
Population Estimate		=	41
Chi Square		=	0.121
Pop Est Standard Error		=	4.375
Lower Confidence Interval		=	37.000*
Upper Confidence Interval		=	49.843
Capture Probability		=	0.673
Capt Prob Standard Error		=	0.125
Lower Confidence Interval		=	0.419
Upper Confidence Interval		=	0.926

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 32.1572.

Removal Pattern:	27	10	3
Total Catch		=	40
Population Estimate		=	41
Chi Square		=	0.154
Pop Est Standard Error		=	1.618
Lower Confidence Interval		=	40.000*
Upper Confidence Interval		=	44.271
Capture Probability		=	0.678
Capt Prob Standard Error		=	0.083
Lower Confidence Interval		=	0.510
Upper Confidence Interval		=	0.846

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 37.72921.

Station: Longridge
Species: Steelhead

Removal Pattern:	487	68	
Total Catch		=	555
Population Estimate		=	565
Chi Square		=	0.025
Pop Est Standard Error		=	4.325
Lower Confidence Interval		=	556.522
Upper Confidence Interval		=	573.478
Capture Probability		=	0.863
Capt Prob Standard Error		=	0.018
Lower Confidence Interval		=	0.828
Upper Confidence Interval		=	0.898

Removal Pattern:	487	68	20
Total Catch		=	575
Population Estimate		=	577
Chi Square		=	5.299
Pop Est Standard Error		=	1.782
Lower Confidence Interval		=	575.000*
Upper Confidence Interval		=	580.493
Capture Probability		=	0.835
Capt Prob Standard Error		=	0.016
Lower Confidence Interval		=	0.804
Upper Confidence Interval		=	0.865

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 573.5074.

APPENDIX B (continued)

Station: Spanish Ranch
Species: Steelhead

Removal Pattern:	325	76	
Total Catch		=	401
Population Estimate		=	423
Chi Square		=	0.015
Pop Est Standard Error		=	7.782
Lower Confidence Interval		=	407.670
Upper Confidence Interval		=	438.330
Capture Probability		=	0.770
Capt Prob Standard Error		=	0.030
Lower Confidence Interval		=	0.712
Upper Confidence Interval		=	0.828

Removal Pattern:	325	76	11
Total Catch		=	412
Population Estimate		=	415
Chi Square		=	1.666
Pop Est Standard Error		=	2.205
Lower Confidence Interval		=	412.000
Upper Confidence Interval		=	419.344
Capture Probability		=	0.794
Capt Prob Standard Error		=	0.020
Lower Confidence Interval		=	0.754
Upper Confidence Interval		=	0.834

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 410.6564.

Station: Ashbury Gulch
Species: Steelhead

Removal Pattern:	83	2	
Total Catch		=	85
Population Estimate		=	85
Chi Square		=	0.004
Pop Est Standard Error		=	0.222
Lower Confidence Interval		=	85.000
Upper Confidence Interval		=	85.442
Capture Probability		=	0.977
Capt Prob Standard Error		=	0.017
Lower Confidence Interval		=	0.944
Upper Confidence Interval		=	1.010

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 84.55849.

Removal Pattern:	83	2	0
Total Catch		=	85
Population Estimate		=	85
Chi Square		=	0.048
Pop Est Standard Error		=	0.032
Lower Confidence Interval		=	85.000
Upper Confidence Interval		=	85.064
Capture Probability		=	0.977
Capt Prob Standard Error		=	0.016
Lower Confidence Interval		=	0.945
Upper Confidence Interval		=	1.009

*The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 84.93594.

APPENDIX C

Location: Amaya Creek

Hab. Num.	1	2	3	4	5	6	7
Hab. Type	PLP	RIFFLE	STEP RUN	POCKET	STEPRUN	PLP	STP
Length	21	13	74	42	53	25	95
Width	8	2	4	7.5	4	10	5
Avg. Depth	1.1	0.1	0.3	0.3	0.3	1.4	0.3
Max. Depth	1.2	0.2	0.5	0.5	0.5	2.3	0.6
Crest Sub.	Sm. Cob.					Boulder	
% Embed	75%					50%	
% Cover	10%	5%	5%	<5%	15%	25%	20%
Boulders	40%	100%	95%	100%	95%		80%
Terr. Veg.					5%		10%
Aqua. Veg.							
WhiteWater			5%				
SWD							10%
LWD	60%					100%	
Roots							
Undercut							
1 Substrate	Silt	LgCob	LgCob	SmCob	SmCob	Silt	LgCob
2 Substrate	Boulder	Boulders	Boulders	Silt	Boulder	LgCob	Boulder
Canopy	35%	60%	40%	0	30%	<5%	10%

Location: Longridge

Hab. Num.	1	2	3	4	4.1	5
Hab. Type	RUN	GLIDE	STEPRUN	ROOTPOOL	ROOTPOOL	RIFFLE
Length	29	71	50	74	74	54
Width	17	14	9	7	3.5	6
Avg. Depth	0.5	0.7	0.4	0.8	0.2	0.3
Max. Depth	0.9	1	0.7	1.5	0.3	0.5
Crest Sub.				Boulder		
% Embed				50%		
% Cover	20%	<5%	15%	30%	60%	15%
Boulders	80%	90%	95%	70%	30%	80%
Terr. Veg.	20%	10%	5%	20%	60%	20%
Aqua. Veg.						
WhiteWater						
SWD					10%	
LWD						
Roots				10%		
Undercut						
1 Substrate	SmCob	Gravel	SmCob	Boulder	Gravel	SmCob
2 Substrate	Boulder	Silt	Boulder	SmCob	Sand	Boulder
Canopy	5%	25%	5%	40%	25%	30%

Unit 4.1 is a side channel with approx. one-fifth total flow.

Location: Spanish Ranch

Hab. Num.	1	2	3
Hab. Type	STEPRUN	ROOTPOOL	STEPPOOL
Length	48	35	214
Width	7	7.5	13
Avg. Depth	0.5	0.8	0.6
Max. Depth	0.7	1.2	1.3
Crest Sub.		GR/Sand	
% Embed		25%	
% Cover	20%	5%	40%
Boulders	75%		70%
Terr. Veg.	25%	10%	30%
Aqua. Veg.			
WhiteWater			
SWD			
LWD			
Roots			
Undercut		90%	
1 Substrate	LgCob	Gravel	Boulder
2 Substrate	Gravel	SmCob	Gravel
Canopy	75%	95%	65%

Unit 003: Exposed Substrate approx. 40%
Air:56
Water:52
Time:1310

Location: Ashbury Falls

Hab. Num.	1	2	3	4	5	6
Hab. Type	RUN	PLP	RIFFLE	STP	RIFFLE	STEPRUN
Length	28	26	52	136	10	55
Width	5	8	4	18.5	3.5	12
Avg. Depth	0.7	1.2	0.4	0.6	0.4	0.9
Max. Depth	1	1.4	0.9	1.2	0.5	1.4
Crest Sub.		LgCob				
% Embed		75%				
% Cover	15%	20%	<5%	10%	15%	15%
Boulders	80%	100%	90%	75%	90%	85%
Terr. Veg.	10%			20%	5%	15%
Aqua. Veg.						
WhiteWater	10%			5%	5%	
SWD			10%			
LWD						
Roots						
Undercut						
1 Substrate	Boulders	Boulder	Gravel	Boulder	Boulder	Boulder
2 Substrate	Sand	Sand	SmCob	Gravel	LgCob	LgCob
Canopy	60%	50%	65%	80%	85%	90%

AIR:58 Time 1200
Water:52

*Unit 003: Split channel-Right Bank, STP 25 feet long, 5 feet wide, ave.depth .4, max. depth .7 cover 10% Boulder 75%, terrestrial veg. 25%, small cobble primary, boulder secondary