STREAM INVENTORY REPORT

JACOBY CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Jacoby Creek (Starting 1,058 feet downstream of the Jacoby Creek Bridge on Old Arcata/Bayside Road). The 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 Jacoby 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 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

Jacoby Creek is a tributary to Humboldt Bay, located in Humboldt County, California (Map 1). Jacoby Creek 's legal description at the confluence with Humboldt Bay is T05N R01E S04. Its location is 40°50′37″ north latitude and 124°04′53″ west longitude. Jacoby Creek is a third order stream and has approximately ten miles of blue line stream according to the USGS Arcata South 7.5 minute quadrangle. Jacoby Creek drains a watershed of approximately 16.6 square miles. Elevations range from 0 feet at the mouth of the creek to 1,940 feet in the headwater areas. Mixed hardwood and conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for residential use, grazing and timber production. Vehicle access exists via Highway 101 where it crosses near the mouth of Jacoby Creek, from Old Arcata Road where it crosses over Jacoby Creek, or from Jacoby Creek Road which runs parallel to the creek.

METHODS

The habitat inventory conducted in Jacoby Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Northwest Emergency Assistance Program (NEAP), Watershed Stewards Project/ AmeriCorps (WSP/AmeriCorps) Members, Humboldt Fish Action Council (HFAC) and Pacific Coast Fish, Wildlife, and Wetlands Restoration Association (PCFWWRA) 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 all of the habitat units within the survey reach (Hopelain, 1994). 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, and embeddedness. Habitat unit types are further measured for all the parameters and characteristics on the field form.

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 Jacoby 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 standard flow measuring equipment, if available. In some cases flows are estimated.

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:

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". Jacoby 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length. Pool tail crest depth at each pool unit was measured in the thalweg. 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 Jacoby Creek, embeddedness was ocularly 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, 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. The shelter rating is calculated for each 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 Jacoby 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

8. Canopy:

Stream canopy density was estimated using modified hand held 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 Jacoby Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every unit. In addition, the area of canopy was estimated ocularly into percentages of coniferous 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 Jacoby Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each 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. In Jacoby Creek fish presence was observed from the stream banks, and four sites were electrofished using a Smith-Root Model 12 electrofisher. 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 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:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Jacoby Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 19 to September 2, 1996, was conducted by Jan Duncan-Vaughn (WSP\AmeriCorps), Hugh Holt (HFAC) and Jan Friedrichsen and Rick Abbey (NEAP). The

total length of the stream surveyed was 27,865 feet with an additional 3,714 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.28 cfs on September 23, 1996.

Jacoby Creek is an F4 channel type for 11,291 feet. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. It then changes to an F2 channel type for 15,035 feet. F2 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and boulder channels. It then changes to an A2 channel type for 1,569 feet. A2 channels are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and very stable bedrock channels.

Water temperatures taken during the survey period ranged from 55 to 66 degrees Fahrenheit. Air temperatures ranged from 53 to 69 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 15% riffle units, 40% flatwater units, 42% pool units and 3% dry units (Graph 1). Based on total length of Level II habitat types there were 11% riffle units, 48% flatwater units, 37% pool units and 4% dry units (Table 1).

Twenty Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 22%; low gradient riffles, 14%; and glides, 12% (Graph 3). Based on percent total length, runs made up 25%, glides, 12%, and step runs, 11%.

A total of 233 pools were identified (Table 3). Scour pools were most frequently encountered at 55% and comprised 58% 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. Fifty-two of the 233 pools (22%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 233 pool tail-outs measured, 0 had a value of 1 (0.0%); 71 had a value of 2 (31%); 110 had a value of 3 (47%); 41 had a value of 4 (18%) and 1 had a value of 5 (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 29, flatwater habitat types had a mean shelter rating of 21, and pool habitats had a mean shelter rating of 47 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 62. Scour pools had a mean shelter rating of 47 and main channel pools had a mean shelter rating of 40 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small and large woody debris are the

dominant cover type in Jacoby Creek. Graph 7 describes the pool cover in Jacoby Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 41% of the 75 low gradient riffles measured. Gravel was the dominant substrate in 27% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 63%. The mean percentages of deciduous and coniferous trees were 86% and 14%, respectively. Graph 9 describes the canopy in Jacoby Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 69.0%. The mean percent left bank vegetated was 64.9%. The dominant elements composing the structure of the stream banks consisted of 8.6% bedrock, 14.0% boulder, 23.6% cobble/gravel, and 53.8% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 54% of the units surveyed. Additionally, 24% of the units surveyed had deciduous trees as the dominant vegetation type, and 13% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on September 23, 1996, in Jacoby Creek. The sites were sampled by Hugh Holt (NEAP) and Kevin McKernan (WSP\AmeriCorps).

The first site sampled included habitat units 51 and 52, a reach approximately 1250 feet upstream from the bridge over Jacoby Creek on Old Arcata Road. The site yielded 2 steelhead, 3 coho, 1 sculpin, 32 stickleback, and 5 Pacific lamprey amnocetes.

The second site included habitat units 211 and 212, a reach located approximately 250 feet upstream of the covered bridge across Jacoby Creek on Brookwood Road. The site yielded 47 steelhead, 34 coho, 4 sculpin, 17 stickleback, 1 Pacific lamprey ammocete, and 1 Pacific giant salamander.

The third site sampled included habitat unit 363, a reach located approximately opposite the end of South Quarry Road open to public traffic. The site yielded 111 steelhead, 26 coho, and 1 sculpin.

The fourth site sampled included habitat unit 448. The site yielded 29 steelhead, and 1 Pacific giant salamander.

DISCUSSION

Jacoby Creek is a F4 channel type for the first 11,291 feet of stream surveyed, a F2 channel type for 15,035 feet, and an A2 for the remaining 1,569 feet. The suitability of F2 channel types for

fish habitat improvement structures is as follows: Fair for low-stage weir, single and opposing wing-deflectors, and log cover; and poor for medium stage weir. F4 channel types are good for bank-placed boulders; fair for low-stage weir, single and opposing wing-deflectors, channel constrictors, and log cover; and poor for medium-stage weir, and boulder clusters. A2 channel types are generally not suitable, since they are high energy streams with stable stream banks, and poor gravel retention capabilities.

The water temperatures recorded on the survey days August 19 to September 2, 1996, ranged from 55 to 66 degrees Fahrenheit. Air temperatures ranged from 53 to 69 degrees Fahrenheit. This is a suitable water temperature 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 48% of the total length of this survey, riffles 11%, and pools 37%. The pools are relatively shallow, with 52 of the 233 (22%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three 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 deepen pool habitat is recommended.

One-hundred-fifteen of the 233 pool tail-outs measured had embeddedness ratings of 3, 4 or 5. None had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Jacoby Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 47. The shelter rating in the flatwater habitats was lower at 21. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small and large woody debris in all habitat types. Additionally, terrestrial vegetation contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

Fifty-one of the 75 low gradient riffles measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 63%. This is a moderate percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of left and right bank covered with vegetation was moderate at 65% and 69%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Jacoby Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Where feasible, design and engineer pool enhancement structures to deepen the existing pool habitats. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from woody debris and terrestrial vegetation. Adding high quality complexity with woody cover is desirable.

5) 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.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) Increase the canopy on Jacoby Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

8) There are sections where the stream is being impacted from livestock trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

COMMENTS AND LANDMARKS

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

0' Begin survey 1058' downstream of the Jacoby Creek Bridge on Old Arcata Road. The channel type is an F4. There is a fence down on the left bank with cattle

	entering the stream here. Intertidal zone fish were observed here.
53'	Fence down on the left bank. Cattle accessing the creek.
93'	Fence down on the left bank. Cattle in the creek. Stream bank unstable.
150'	Fence down on the left bank. Cattle in the creek.
295'	Fence partially down, allowing cattle in the creek. Dry side channel.
317'	Concrete slabs used as bank revetment on the left bank.
389'	Concrete blocks used as bank revetment on the left bank.
907'	Left bank erosion.
931'	Left bank erosion.
958'	Jacoby Creek Bridge on Old Arcata Road.
1,088'	Rip rap on the right bank.
1,165'	Eroded bank. Willow used as revetment.
1,276'	Boulder revetment on the right bank.
1,498'	Bank slumped. Willow dumped into creek. Appears to be stable.
1,541'	Small slump on the right bank. Rock revetment above the slump, enhanced by large woody debris.
1,709'	Deflector on the left bank.
1,938'	Rock revetment on the left bank. Left bank erosion continues above the rock revetment.
2,178'	Rip rap on the left bank with a diversion.
2,216'	Rip rap on the left bank.
2,358'	Large fir tree on the right bank, partially in the stream creating a nice scour pool.
2,423'	Series of scour pools caused by multiple trees falling into the creek on the left bank.

2,511'	Rip rap and large wood on right bank.
2,637'	First electrofishing site.
2,921'	Septic tank failure on the left bank evidenced by toilet paper in the water. The end of a pipe sticking out from a diversion pump.
2,958'	Cement poured for bank stabilization on the left bank, over 8' high. Residence on the left bank.
3,096'	Left bank failure with a large amount of gravel getting deposited into the creek.
3,118'	Right bank failure behind rip rap, causing significant erosion of the pasture. Cattle fence needs repair.
3,474'	Rip rap on the left bank.
3,544'	Rip rap on the left bank.
3,592'	Private bridge over creek via Graham Road.
3,644'	Rip rap on the left bank armoring a large alder tree.
3,832'	Rip rap.
3,917'	Left bank erosion.
4,042'	Right bank erosion.
4,207'	Livestock access on the left bank. Field not fenced. Right bank unstable.
4,281'	Unfenced field on the left bank.
4,433'	Rip rap on the left bank.
4,500'	End of the unfenced field on the left bank.
4,501'	Private bridge over creek via Graham Road.
4,644'	Rip rap on the left bank.
4,749'	Electric fence (not in service) crossing the creek.
4,931'	Non-functional fence on left bank.

5,189'	Rip rap on the left bank. Non-functional electric fence across creek.
5,271'	Rip rap on the left bank. Salmonid sighted, 3" long.
5,329'	Right and left bank erosion.
5,519'	Left bank erosion.
5,770'	Electric fence across the creek.
6,125'	The right bank used for cattle access.
6,302'	Water pump on the left bank. Electric fence on the right bank.
6,418'	Multiple rolls of old barb wire on the right bank and in the creek.
6,937'	Rock work on the left bank.
7,080'	Heavily vegetated across the creek with cattle access on the left bank.
7,108'	Cattle access on the left bank.
7,164'	Cattle access on the left bank.
7,197'	Stream densely vegetated, across the creek.
7,322'	Pool enhanced with large wood. Log debris accumulation (LDA) 20' long x 16' wide, not a barrier to fish.
7,388'	Trail on the right bank.
7,690'	Water pump on the left bank. Culvert outlet on the right bank.
7,886'	Landowner access to the creek.
8,006'	Pool enhanced with a large wood structure on the left bank.
8,135'	Human-made pond (100' x 200') on the left bank. Several springs diverted to fill it. Culvert used for the overflow.
8,547'	LDA, (12' x 18'). Not a fish barrier.
8,653'	Rip rap on the left bank with a pipe sticking out of it, possible connection for a water pump.

8,886'	Rip rap.
9,172'	Rip rap on the right bank.
9,493'	Channel dry, except for 3 very small pools.
9,641'	Confluence of Golf Course Creek on the right bank. Temperature 59° Fahrenheit. Wetted width 3 feet. Heavily vegetated with berry vines on both banks just above the confluence.
9,777'	Steelhead observed.
10,196'	Cement block used for rip rap on the left bank.
10,228'	Rip rap on the left bank.
10,283'	Rip rap on the left bank. Frog observed.
10,629'	Large amount of aquatic vegetation. Many aquatic insect egg cases observed on the rocks.
10,769'	Water pump on the left bank.
11,291'	Covered bridge on Brookwood Drive. Channel type changes to a F2.
11,517'	Water pump in the creek on the left bank.
11,792'	Large woody debris on the left bank (mostly downed alders).
12,018'	Downed fence on the left bank, no sign of use by livestock.
12,086'	Instream structure on the left bank.
12,108'	Instream structure on the left bank.
12,152'	Pool is silted in. Instream structure secured to the left bank.
12,192'	Creek crossing.
12,552'	Sheep accessing the creek.
12,552'	Remains of an instream structure on the left bank.
12,796'	Instream structure secured to the left bank. Sheep accessing the creek.
12,861'	Fifty foot long structure log on the right bank. Rip rap on the right bank.

12,945'	Rip rap on the right bank.
13,030'	Rip rap has formed a pool on right bank that is enhanced with large wood.
13,158'	Structure is secured to the left bank.
13,347'	Septic tank failure on the right bank. Sewage leaking between bedrock and cobble layer above it.
13,415'	Second electrofishing site.
13,659'	Small spring entering into a long dry channel on the right bank. Very little flow. Temperature 57° Fahrenheit. No fish observed.
14,484'	Root wad structures on the right bank, one intact and one blown out.
14,626'	Human-made weir back-flooding a riffle. Small seep on the left bank.
14,783'	Oil spill on the right bank and into the creek.
14,876'	South Quarry Road bridge.
14,936'	Rip rap on the right bank by bridge abutment. Water line crosses over the creek.
15,085'	Jacoby Creek Road on the right bank.
15,138'	Pipe with a foot valve on the right bank.
15,194'	Human-made weir 0.5' high.
15,915'	Undercut bank goes back at lease 5 feet. Numerous salmonids observed.
16,021'	Old pump house on the right bank, may fall into creek. Galvanized pipe present.
16,481'	Confluence of Morrison Gulch (Cascade Creek) on the left bank. Twelve feet wide and 0.6" deep.
17,615'	Backwater pool created by a very large redwood log, silted in. Two foot valves in the creek on the right bank.
18,161'	PG&E line crosses creek.
18,600'	Foot valve in creek on the right bank.

19,152'	Root wad 12' across standing in creek on the left bank. Foot valve in the creek on the right bank.
19,426'	Revetted bank on the right.
20,037'	Twelve inch steelhead sighted. A downed willow creating excellent cover.
20,117'	Willow is thick across the creek creating a tunnel.
20,463'	Eight foot high log jam on the right bank.
20,569'	Root wad cover structure secured to the left bank.
20,660'	Root wad cover structure secured to the right bank.
20,824'	Large number of fish observed in the pool.
20,894'	Channel gradient equal to 9%
21,223'	Flow taken was 0.82 cfs.
21,359'	Third electrofishing site.
21,452'	Old cement bridge abutment on the left bank.
21,818'	Four foot cascade caused by a large root mass, dropping on the left side of the pool.
21,963'	Channel gradient is equal to 8%.
22,093'	Boulder weir across the channel. Numerous fish observed. Left bank failure for 500 feet.
22,443'	Slide on the left bank has caused 5 trees to enter the stream, enhancing cover.
22,824'	Slide on the left bank.
23,378'	Channel gradient 4%.
24,276'	Channel becoming deeply incised.
24,529'	Fifteen percent gradient. Very deeply incised. Boulder based, vegetation topped, point bar rising 7' above unit.

24,696'	Fifteen foot high boulder on the right bank.
24,724'	Dry channel, 12' LDA.
24,724'	Failed root wad structure on the right bank.
24,957'	No flow and dry tail.
24,946'	“Blue Goo” (Franciscan greywacke) slide on the right bank.
25,070'	Large boulder on the left bank. Log crossing the channel 6' above the stream.
25,775'	Small side channel contains small fish and caddis flies.
26,285'	Channel gradient 10%.
26,326'	Channel type changes to an A2.
26,365'	Channel gradient 13%.
26,703'	Franciscan greywacke slide on the left bank with substantial delivery to the stream.
26,732'	Slide on the left bank. Fourth electrofishing site.
26,892'	LDA on the left bank.
27,037'	Flow goes subsurface in several places. Two LDA's.
27,171'	Small slide on the left bank. Flood prone width is 90% boulder.
27,254'	High gradient, low flow. Deep seated landslide on the left bank.
27,284'	No fish observed beyond this point. Seven pools with 6' cascade at the bottom of the unit. Active slide on the right bank.
27,405'	Slide continues on the left bank.
27,423'	Franciscan greywacke slide on the right bank 90% slope.
27,574'	Active bank failure on the left with leaning trees.
27,597'	Several downed trees in the channel on the left bank. Product of active slide.
27,673'	Four foot cascade. Slide continues on the left bank.

27,732' Steep slide on the left bank.

27,776' Slide on the left bank.

27,865' End of anadromy. Base of 15' falls. No fish sighted above the falls.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5