STREAM INVENTORY REPORT

Price Creek

INTRODUCTION

A stream inventory was conducted during the autumn of 1999 on Price Creek. 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 Price Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

WATERSHED OVERVIEW

Price Creek is a tributary to the mainstem Eel River, located in Humboldt County, California (Map 1). Price Creek's legal description at the confluence with the mainstem Eel River is T2N R1W S27. Its location is 40°31′43″ north latitude and 124°9′39″ west longitude. Price Creek is a second order stream and has approximately 8.5 miles of blue line stream according to the USGS Fortuna, Capetown, Taylor Peak, Ferndale 7.5 minute quadrangles. Price Creek drains a watershed of approximately 10.3 square miles. Elevations range from about 35 feet at the mouth of the creek to 1,180 feet in the headwater areas. Redwood, mixed conifer, and oak grassland dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via the Price Creek Road.

METHODS

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

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the

survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory methodology and data sheet have been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This protocol was used in Price Creek to record measurements and observations. There are nine components to the inventory data sheet.

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". Price 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; additionally, the first occurrence of each

unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form. 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 Price 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 fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Price Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Price 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 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 Price Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Price Creek, sites were electrofished in all four reaches 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 Price 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 the pool tail outs
- 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 September 15, October 18-20 and 25-26, and November 2-3, 1999 was conducted by Donn Rehberg and Paul Ferns (WSP\AmeriCorps). The total length of the stream surveyed was 36,301 feet with an additional 78 feet of side channel.

Flows were not measured on Price Creek.

Price Creek is an F3 channel type for the first 10,235 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble dominated substrates. Price Creek is a G4 channel for the next 12,895 feet. G4 channels are entrenched "gully" step-pool channels with low width/depth ratio on moderate gradients with gravel dominated substrates. The next 6,094 feet of channel is a B6. B6 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools with a very stable plan and profile. They have stable banks, a silt/clay channel, and a predominately silt/clay substrate. The last 7,077 feet surveyed was a B4 channel. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks, and a gravel dominated substrate.

Water temperatures taken during the survey period ranged from 45° to 59° F. Air temperatures ranged from 47° to 67° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% riffle units, 33% flatwater units, and 22% pool units (Graph 1). Based on total length of Level II habitat types there were 57% riffle units, 30% flatwater units, and 12% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 44%; runs, 31%; and mid-channel pools, 19% (Graph 3). Based on percent total length, low gradient riffle made up 57%, run 27%, and mid-channel pools 11% (Table 2).
A total of 119 pools were identified (Table 3). Mid-channel pools were most frequently encountered at 91% (Graph 4) and comprised 91% of the total length of all pools (Table 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-one of the 119 pools (34%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 114 pool tail-outs measured, 13 had a value of 1 (12%); 43 had a value of 2 (38%); 29 had a value of 3 (25%); 23

had a value of 4 (20%) and 6 had a value of 5 (5%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning.

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 10, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 45 (Table 1). Of the pool types, the mid-channel pools had the highest mean shelter rating at 47. Backwater pools had a mean shelter rating of 40 while scour pools had a rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Price Creek and are extensive. Large and small woody debris are lacking in some habitat types. Graph 7 describes the pool cover in Price Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 74 of the 111 pool tail substrates sampled (67%). Small cobble was the next most frequently observed dominant substrate type and occurred in 23% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reaches surveyed was 48%. The mean percentages of deciduous and coniferous trees were 82% and 18%, respectively (Table 7). Graph 9 displays the canopy compositions in Price Creek.

For the stream reaches surveyed, the mean percent right bank vegetated was 70%. The mean percent left bank vegetated was 75%. The dominant elements composing the structure of the stream banks consisted of 6.3% bedrock, 4.9% boulder, 30.6% cobble/gravel, and 58.3% sand/silt/clay (Graph 10). Deciduous trees were the dominant bank vegetation type observed in 75.7% of the units surveyed. Additionally, 11.1% of the units surveyed had grasses as the dominant bank vegetation type, and 2.8% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on Price Creek. Site 1 was sampled on July 27, 1999 by Glenn Yoshioka (DFG), and Paul Ferns and Donn Rehberg (WSP\AmeriCorps). Sites 2 and 3a were sampled on October 29, 1999 by Glenn Yoshioka, Paul Ferns and Chris Glenney (WSP\AmeriCorps), and Steve Hackett (local landowner). Sites 3b and 4 were sampled on October 30, 1999 by Glenn Yoshioka, Steve Hackett, and Conner Hackett (local resident).

The first sample, located in the first stream reach surveyed, began at the Grizzly Bluff Road bridge, 610 feet upstream from the confluence with the mainstem Eel River. An upper section, starting 7,168 feet above the mouth, was also sampled within this reach. In all, one low gradient riffle, two runs, and four pools were sampled in this F3 reach. The site yielded 102 juvenile

steelhead rainbow trout, 36 California roach, 22 threespine stickleback, 3 Sacramento suckers, 3 Sacramento pike minnow, and 27 sculpin (*Cottus* sp.) . Based upon visually estimated lengths, the probable breakdown of steelhead age classes was 56 age 0+, 38 age 1+, 7 age 2+, and 1 age 3+ juveniles.

The second sample, located in the second stream reach began approximately 10,506 feet above the creek mouth. One low gradient riffle, one run, and ten mid-channel pools were sampled in this G4 reach. The site yielded 41 juvenile steelhead trout, 22 Sacramento suckers, 9 sculpin (*Cottus* sp.), 9 Sacramento pike minnow, and 5 California roach. Based upon visually estimated lengths, the probable breakdown of steelhead age classes was 32 age 0+, 5 age 1+, and 4 age 2+ juveniles.

The third sample, located in third reach, was sampled in two sections. Sampling began approximately 23,648 feet above the creek mouth. One low gradient riffle, one run, and eleven mid-channel pools were sampled in this B6 reach. A total of 238 juvenile steelhead, 3 Sacramento suckers, 5 sculpin (*Cottus* sp.), 30 Sacramento pike minnow, were sampled for both sections combined. Based upon visually estimated lengths, the probable breakdown of steelhead age classes was 66 age 0+, 15 age 1+, 8 age 2+, and 3 age 3+ in the section (3a) sampled on 10/29/99 and the breakdown was 133 age 0+, 3 age 1+, 8 age 2+, and 2 age 3+ in the section (3b) sampled on 10/30/99.

The fourth sample, in the fourth reach, was located approximately 30,000 feet above the creek mouth. Three mid-channel pools were sampled in this B4 reach. The site yielded 236 juvenile steelhead. Based upon visually estimated lengths, the probable breakdown of steelhead age classes was 226 age 0+, 8 age 1+, and 2 age 2+ juveniles.

These data can be summarized as follows:

	SHRT Age 0+	SHRT Age 1+	SHRT Age 2+	SHRT Age 3+	SCP	SKR	STBK	RCH	SQ-S
Site 1	**56**	**38**	**7**	**1**	27	3	22	36	3
Site 2	**32**	**5**	**4**	**0**	9	22	0	5	9
Site 3a	**66**	**15**	**8**	**3**	5	3	0	2	30
Site 3b	**133**	**3**	**8**	**2**	0	0	0	0	0
Site 4	**226**	**8**	**2**	**0**	0	0	0	0	0

DISCUSSION

Price Creek is a F3 channel type for the first 10,235 feet of stream surveyed, a G4 channel type for the next 12,895 feet, a B6 channel type for the following 6,094 feet and a B4 channel type for the remaining 7,077 feet. The suitability of these channel types for fish habitat improvement structures is as follows: F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and are fair for plunge weirs, boulder clusters, channel constrictors, and log cover. G4 channels are good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; and poor for boulder clusters and single wing-deflectors. B6 channels are excellent for bank-placed boulders and log clusters; good for plunge weirs, single and opposing wing-deflectors, and channel constrictors; and fair for boulder clusters. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days September 15, October 18-20 and 25-26, and November 2-3, 1999, ranged from 45° to 59° F. Air temperatures ranged from 47° to 67° F. This is an good water temperature range for salmonids. While Price Creek seems to have temperatures favorable to salmonids, summer peak water temperatures were not available. Therefore, 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 30% of the total length of this survey, riffles 57%, and pools 12%. The pools are relatively shallow, with only 41 of the 114 (36%) 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 first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Thirteen of the 114 (11%) pool tail-outs measured had an embeddedness rating of 1, 38% had a rating of 2, 46% had ratings of 3 or 4, and 5% had a rating of 5 and were considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Price Creek and are extensive. Large and small woody debris are lacking in some habitat types. Graph 7 describes the pool cover in Price Creek.

The mean shelter rating for pools was 45. The shelter rating in the flatwater habitats 6. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in most habitat types. Additionally, large and small woody debris contribute a small amount overall though small woody debris provides a majority of the cover in a few pools. 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.

One hundred of the 111 (90%) pool tail-out substrates 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 48%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 70% and 75%, 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.

The survey crew observed heavy algae growth in the stream and numerous instances of cow dung in the channel or on the banks. Excessive nutrient input from the cow dung or disturbed soil may result in blooms of filamentous algae and/or biological oxygen demand (BOD) problems during the warm summer months. If BOD is very high, then fish may die from insufficient dissolved oxygen in the water, particularly if they are confined to isolated pools. Given the abundance of juvenile steelhead sampled during electrofishing, if there is any BOD problem, it has not reached levels lethal to fish. However, it may be prudent to check the creek during the summer for filamentous algae blooms and to measure nocturnal BOD, particularly during years of extended drought.

RECOMMENDATIONS

1) Price 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) The average canopy density was only 48%. Increase the canopy and bank vegetation on Price Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy or bank cover 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.

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

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) Primary pools only comprised 4% of the total stream length. Where feasible, design and engineer pool enhancement structures to increase the number of pools or deepen existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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

9) There are several temporary small rock dams that have been constructed to facilitate water diversion. These dams would block upstream and downstream migration by juvenile salmonids at observed flows. These dams should be maintained to allow free passage upstream and downstream by juvenile salmonids. Furthermore, if the material forming the dams is too large, then it may impede salmonid spawning by covering pool tail-outs with particles that are either too large to be used as spawning substrate or are too large to be removed by typical autumn streamflows prior to the upstream migration by adult salmon. Informing landowners of the potential adverse impacts of these structures and developing a cooperative approach to solutions or alternatives that avoid adverse impacts is recommended. Spots checks in late November or early December are recommended to check to see if these rock dams still present a potential problem at that time.

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' Began survey at confluence with a backwater section of the mainstem Eel River. The starting point is at the confluence with the backwater and not with the main channel of the Eel River, which is approximately 200 yards away. Flow is very low. Air and water temperatures were 56° and 58.5° F, respectively. Channel type is an F3.

203' Main channel of Price Creek begins 203' above the starting point. Substrate is wetted but flow is subsurface for about 30 feet.

573'	Cyprinids observed. Rip rap banks.
626'	Grizzly Bluff Road bridge. First 10 feet of bank slope is rip rap.
810'	Cyprinids observed, possibly Sacramento pike minnow.
916'	Right bank rip rap along the entire unit.
1,353'	End of hydraulic influence of the Eel River.
1,386'	Lamprey redd observed on left margin of pool.
1,431'	Sacramento pike minnow observed in pool.
2,097'	Bridge.
2,129'	Rock dam 1.2 feet high, 3 feet thick, 20 feet wide.
2,168'	Two salmonids observed, as well as pike minnow and roach.
3,156'	Left bank rip rap with trees growing from within it.
3,219'	Left bank rip rap.
3,454'	Barbed wire fence extends across the entire channel.
3,694'	Water heavily laden with algae. Low flow.
3,782'	Extensive deposition of cow dung.
4,224'	Cattle hoof prints along right bank. Evidence of heavy cattle traffic in stream.
4,589'	Dammed pool. On right bank, clay soil is exposed 40 feet upslope. Cattle use pool for water.
4,942'	Flow subsurface for 63 feet up to a large berm blocking the entire stream. A small outlet has broken through along the left bank but was dry.
5,005'	Berm across stream, 5.5 feet high, 5 feet deep, and 47 feet wide. Pump system, on the right bank.
5,277'	Road crossing. Algae almost black; water possibly anaerobic.
5,413'	Cow dung present in channel and along the banks.

6,230'	Channel wide with rip rap banks. Lacks canopy cover.
6,991'	Barbed wire fence crosses the stream.
7,168'	Bridge, 26 feet wide. YOY fish observed. Biological sample site #1 begins.
7,615'	Channel type measurements taken.
7,658'	Road crossing. Extensive deposits of cow dung in channel and on banks.
9,670'	Cattle traffic in stream and banks. Hoof prints in channel and on the banks. Cow dung deposits extensive.
9,748'	Small human made rock dam. Siphon hose in pool. End of biological sampling site #1.
9,955'	On right bank, clay soil is exposed 20 feet upslope with erosion of material into creek.
10,171'	On left bank, clay (wall) extends upslope approximately 60 feet.
10,236'	Channel type change to G4; begin second reach.
10,507'	Start of biological sampling site #2.
10,577'	On left bank, clay soil extends 60 feet upslope.
10,746'	Bridge.
11,733'	Rip rap extends up left bank 45 feet at a 60° angle with a road at the top.
11,850'	Two salmonids observed.
12,553'	On right bank, clay wall extends upslope 40 feet. A tributary enters on the right bank at the top of the unit but is dry.
13,956'	Bridge.
14,283'	Rip rap along the right bank.
14,711'	Barbed wire fence extends across creek at top of the unit.
14,889'	Siphon hose in creek.

15,032'	Road crosses creek.
15,032'	Left bank tributary enters at start of this unit. An orange colored pool at terminus of the tributary. Tributary goes subsurface as it encounters a gravel accumulation at its mouth, preventing surface flow into Price Creek.
15,070'	Dammed pool at the start of this unit. Siphon hose in pool.
15,103'	Log footbridge provides access to a house on the left bank side of creek.
15,856'	Road crossing. Cow dung observed in creek.
15,933'	Siphon hose in creek.
16,414'	Salmonids observed.
17,018'	Rip rap begins along the right bank. The county road is 8 feet above the creek.
17,030'	Right bank culvert, 3' diameter plastic, located about 4 feet above the streambed and halfway between the road surface and the streambed.
17,146'	Right bank culvert, 4' diameter plastic, located 4 feet above the creek.
17,456'	Remains of an old bridge, with old bridge struts still standing on both banks and 2 concrete slabs on the left bank.
18,057'	Suckers and cyprinids observed.
18,484'	Right bank culvert, with a 4' diameter.
20,705'	County road parallels the right bank.
20,929'	Road crossing.
21,952'	Confluence with Sweet Creek.
22,207'	Log bridge.
22,253'	Road parallels creek 5 feet above the left bank. Road turns from paved to dirt.
23,131'	Channel type changes to B6; third reach begins.
23,490'	Road crossing.

23,648'	Pump house on left bank with hose in creek. Stream is eroding foundation of pump house. Rip rap has been placed in front of pump house to protect it. Pump house itself is 12 feet above the stream. Pump is running intermittently: 30 seconds on, then 1 minute off. Four cattle observed in the creek.
24,236'	Unnamed tributary enters on left bank. Water temperature 54°F.
24,486'	Left bank denuded, cattle use area for stream access.
25,364'	Cattle use area as a stream crossing.
25,553'	Beginning of biological sampling site #3.
25,576'	On left bank, erosion of clay soil extending up 40 feet.
25,895'	Bridge (old railcar flatbed) not currently in use.
25,936'	Road crossing.
26,105'	Large cobble dam forming a dammed pool.
26,317'	Right bank tributary at the top of the unit, but flow goes subsurface before meeting Price Creek.
26,508'	Road crossing.
27,182'	Large failure on right bank. Landslide with toe in the creek.
27,694'	Log debris accumulation (LDA) composed of a tangle of downed alders, which are still alive, with small woody debris entangled throughout. There is a 7' drop in the creek bed.
28,057'	Debris accumulation at the head of the pool; an alder log creating a 2' increase in streambed elevation.
28,082'	LDA retaining sediment.
28,139'	Right bank slide has downed a cluster of maple trees over the creek.
28,628'	Right bank slide enters the creek.
28,749'	LDA, trees in the stream.

28,757'	LDA stops surface flow; water resurfaces below the LDA.
28,872'	Heavy algae growth noted.
29,027'	LDA.
29,046'	Right bank failure; conglomerate material enters creek.
29,125'	Bottom of the creek is very silty.
29,194'	Cattle trails along the banks. LDA at top of the pool is 7 feet high and spans the entire channel.
29,225'	Channel narrows. Channel type changes to B4; fourth reach begins. Heavy algae and silt continues.
29,294'	Salmonid observed. Slides occur on both banks.
29,378'	Right bank failure. Cattle tracks all over the slide.
29,569'	Right bank slope failure. Sandy soil enters creek along the right bank. Cattle tracks on the slide.
29,776'	Cow dung observed in the creek.
29,903'	Right bank eroding into creek.
29,927'	On left bank, a silty wall extending 20 feet upslope is slowing eroding. Perched wood will be delivered to creek when banks are undercut.
30,035'	Left bank tributary enters at top of the unit. Flow is just a trickle. Location of biological sampling site #4.
30,079'	Right bank slope is failure.
30,187'	Cattle trampling along the right bank.
30,287'	Left bank tributary, flow is just a trickle.
30,722'	LDA. Downed willows over pool's entire length. Debris has collected 6' above the channel and covers the entire width.
30,909'	Road crosses creek.

31,053'	Human made rock wall forms dammed pool.
31,454'	Salmonids observed.
31,489'	Pool is covered by large woody debris, 8' high and 50' wide (the entire width of the channel).
31,736'	Extensive left bank erosion extending 50' up 45-60° slope of clay soil for the entire length of the erosion. Trees, alders, and willows have fallen into the channel and blanket the stream. Heavy cattle traffic with widespread hoof prints and cow dung in channel and on the banks.
31,822'	LDA, 100' wide x 55' long x 12' high, retaining gravel and cobble and supporting plant growth. The flow percolates down through the debris jam.
31,964'	Woody debris a regular occurrence.
32,231'	Creek becoming less silty and more complex.
33,140'	Cow observed in the stream.
33,824'	Right bank tributary enters but is currently dry. Road access ends.
33,973'	LDA.
34,159'	LDA with a 2' drop is retaining gravel.
34,321'	LDA with a 3' drop is retaining gravel.
34,576'	Salmonids observed. Left bank slope is eroding clay wall extending upslope 35'.
35,161'	Left bank slide extends up the slope 100 feet at about a 50° angle. Cow dung observed in the creek.
35,565'	Right bank slide, 60' wide x 40' high.
35,767'	LDA, with associated left bank slide.
35,829'	Left bank slide toppled numerous trees into stream; slide is held back by fallen tree roots, a 3' jump.
35,857'	Cattle tracks noted in channel bed.

36,301' End of survey. Left bank slide, 40' high x 65' wide. Survey crew walked 400-500' upstream of the end of this unit, did not observe any fish, and came upon a massive debris pile covering the entire width of the channel. Looking upstream, the debris continued about 300'. The LDA is approximately 15' high.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California salmonid stream habitat restoration manual, 3rd 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