STREAM INVENTORY REPORT

SHAW CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Shaw Creek to evaluate conditions for anadromous salmonids. The inventory began at the confluence of Shaw Creek with Lawrence Creek and extended approximately 3.5 miles upstream. The inventory was conducted in three parts: 1) habitat inventory, 2) biological inventory, 3) substrate sampling. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Shaw Creek. The objective of the biological inventory was to determine population and distribution by species. The objective of the substrate sampling was to determine the percentage of fine sediment in likely spawning reaches. During all survey activities, potential problems and noteworthy landmarks were mapped and recorded for closer review. After analysis of the information and data, stream restoration and enhancement recommendations were made.

WATERSHED OVERVIEW

Shaw Creek is a tributary to Lawrence Creek, tributary to Yager Creek, tributary to the Van Duzen River, tributary to the Eel River, in Humboldt County, California (Figure 1). The legal description at the confluence of Shaw and Lawrence Creeks is T03N R02E Sec. 30. Its location is 40°37'12" N. latitude and 123 °59'26" W. longitude. Shaw Creek is a second order stream. The total length of blue line stream, according to the USGS Scotia quadrangle, is 6 miles. There are presently 3.4 miles of anadromous fish habitat available to salmonids in Shaw Creek and its tributaries.

Shaw Creek drains a watershed of approximately 5.4 square miles. On October 23, 1991, prior to seasonal rainfall, a discharge of 0.16 CFS was measured 900 feet above the mouth at gravel sample site # 3. Water temperature was 50 F. Elevations range from 580 feet at the stream's mouth, to about 2,400 feet at the headwaters. Average annual precipitation in the basin is 65". Peak winter storm events can exceed 10" inches daily. The moderate to steep watershed slopes are underlain by the Franciscan and Yager geologic formations. Approximately eighty percent of the basin is composed of the Hugo soil series. It is typically a well drained, loamy to clay soil up to 5 feet deep. Redwood forest dominates the watershed and is primarily owned by The Pacific Lumber Company (PALCO). The property is managed for timber production and cattle ranching. Year round vehicle access exists from State Highway 36 near Carlotta, via Fisher Road, to Pacific Lumber Company's Yager Camp. The main Yager-Lawrence Haul Road leads to Road Nine and Shaw Creek, 9 miles from Yager Camp.

METHODS

The habitat inventory conducted in Shaw Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and contract seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Shaw Creek personnel were trained in MAY, 1991, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team.

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 Shaw 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. Flows should also be measured or estimated at major tributary confluences.

2. Channel Typing:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded.

Both temperatures are taken in fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Shaw 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken 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 Shaw 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); 76 - 100% (value 4).

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 Shaw 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.

8. Canopy:

Stream canopy is estimated using hand-held spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Shaw Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Shaw Creek, the dominant composition type in both the right and left banks was selected from a list of eight options on the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Shaw Creek to document the fish species composition and distribution. Three sites were electrofished in Shaw Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Substrate sampling is conducted using either a 6 or 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Individual samples at the sample sites are triangulated for later reference using the "two-pin" method as described in the California Salmonid Stream Restoration Manual. Location pin numbers and individual samples are numbered from the most downstream pin or sample at the site (i.e. Site 1, Sample 3: 38' from Pin 1 and 46' from pin 2).

Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37 and 0.85mm). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field note form (a timesaving option is to settle that portion of the sample for 15 minutes and apply a correction factor during laboratory analysis). The remainder of the sample is sealed in plastic bags with an identification and information ribbon and taken to the laboratory for final processing.

In the laboratory, the samples are wet sieved using standard Tyler screens. All particles greater than 0.85mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results (adjusted with correction factors if the 15 minute settling time was used at the sample site. Correction factors are derived from noting the volume differences between the 15 minute settled volumes and the 1 hour settled volumes).

In Shaw Creek, four substrate samples were taken at Site 1, about 6,000 feet above the mouth; six were taken at Site 2, at 5,200 feet; and four were taken at Site 3, at 750 feet. There are two large slides, and a barrier to migration, between Sites 1 and 2 (Figure 1). Samples were taken at points known to have been used for past spawning, or upon judgment that the location appeared appropriate and salmonids would likely select it for spawning. A standard six-inch McNeil sampler was used for all samples. Fine sediment suspended in the liquid portion of each sample was settled onsite in Imhoff cones for one hour, measured, and recorded on a standard field note form. The remainder of each sample was sealed in a plastic bag and taken to the laboratory for further analysis.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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 cover by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Shaw 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
- Pool cover by cover type
- Embeddedness
- Substrate composition in low gradient riffles
- Total canopy by canopy type
- Bank composition by composition types

HABITAT INVENTORY RESULTS

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

The habitat inventory of May 28, 29, 30, 31, June 3, 4, 5, 6, 7, 10, and 11, 1991, was conducted by Craig Mesman, Chris Coyle and John Crittenden; Greg Moody and Steve Liebhardt (CCC) also helped. The total length of the stream surveyed was 17,235 feet.

A flow of 0.16 cfs was measured 900' above the confluence with Lawrence Creek on October 23, 1991 using a Marsh-McBirney Model 2000 flowmeter.

The surveyed section of Shaw Creek has five channel types: from the mouth to 897 feet a B5; next 1,519 feet a B3; next 4,670 feet a B2; next 9,843 feet a B3; and the upper 747 feet an A3. B5 channels are moderate gradient (1.5-4.0%), well confined, silt/clay streambeds, susceptible to slump-earthflow erosional processes. B3 channels are similar to B5 channels, except their dominant substrate is cobble/gravel and their banks are also unstable. B2 channels are also cobble/gravel channels, with moderately confined, stable stream banks. A3 channels are steep gradient (4-10%), very well confined streams, with unstable slopes.

Water temperatures ranged from 49 to 56 degrees fahrenheit. Air temperatures ranged from 53 to 74 degrees fahrenheit.

Table 2A summarizes the level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 39.7%, flatwater types were 29.4%, and pools 30.6%. Riffles made up 45.7% of the total survey **length**, flatwater habitat types were 31.3%, and pools 22.8% (Graphs 1 and 2).

Eighteen level IV habitat types were identified. The data are summarized in Table 1A. The most frequent habitat types by percent **occurrence** were low gradient riffles, 28.0%; runs, 20.9%; and mid-channel pools, 18.3% (Graph 3). By percent total **length**, low gradient riffles made up 30.1%, runs made up 27.7%, and main-channel pools made up 12.8%.

One-hundred-twenty-nine pools were identified (Table 3A). Main-channel pools were most often encountered at 64.3 %, and comprised 69.7 % of the total length of all pools (Graph 4).

Table 4A (Graph 5) is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Ninety-one of the 129 pools (70.5 %) had a depth of two feet or greater (Graph 5). This level indicates a good quality of pool habitat in Shaw Creek.

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 129 pool tail-outs, 10 had a value of 1 (7.7 %); 54 had a value of 2 (41.9 %); 61 had a value of 3 (47.3 %); and 4 had a value of 4 (3.1 %). On this scale, a value of one is the best for fisheries (Graph 6).

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool types had the highest shelter rating at 62.5 (Table 2A). Of the pool types, backwater pools had the highest mean shelter rating at 82.2, scour pools had a mean shelter rating of 61.4, and main channel pools had a rating of 60.3 (Table 3A).

Table 6A summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Shaw Creek and is extensive. Boulders are the next most common cover type. Graph 7 describes the pool cover in Shaw Creek.

Table 5A describes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 52 of the 118 low gradient riffles (44.1 %). Gravel was the next most frequently observed dominant substrate type, and occurred in 27.1% of the low gradient riffles (Graph 8).

Nearly 39% of Shaw Creek lacked shade canopy. Of the 61% of the stream that was covered with canopy, 73% was composed of deciduous trees, and 27% was composed of coniferous trees. Graph 9 describes the canopy in Shaw Creek.

Table 1A summarizes the mean percent of the right and left stream banks covered with vegetation by habitat unit type. For the stream reach surveyed, the mean percent right bank vegetated was 56.2%. The mean percent left bank vegetated was 54.8%. The elements composing the structure of the stream banks consisted of 3.1% bedrock, 7.4% boulder, 24.2% cobble/gravel, 2.1% bare soil. Additionally, 55.9% of the banks were covered with deciduous trees, and 7.2% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on July 29-30, 1991 in Shaw Creek. The units were sampled by Greg Moody and Gary Flosi (CCC). All measurements are fork lengths unless noted otherwise.

The first site, Shaw Creek habitat unit #119, was sampled on July 29, 1991 by Greg Moody, Scott Downie, and Gary Flosi. Air temperature was 74 F and water temperature was 60 F. Site one is 6141' above the mouth of the stream and is located about 500' above the 1991 stream enhancement work sites which included modifying a suspected barrier. The unit surface area is 1100 sq ft with a length of 79'. Only one fish was sampled at site one. A steelhead 146 mm was found on the first pass. Subsequent passes produced nothing.

The second site, Shaw Creek habitat unit #100, was sampled on July 29, 1991 by a team led by Greg Moody. Air temperature was 80 F and water temperature was 62 F. This site is 5200' above the mouth of the stream, and 500' below the barrier to migration. The unit surface area is 750 sq ft with a length of 74'. The combined total of all fish for all passes was 14 steelhead, 2 coho, 1 pacific lamprey. Also in the sample were 15 roughskin newts.

LENGTHS SITE TWO (Millimeters):

Steelhead: 123,116,113,113,79,64,64,61,61,60,54,54,54,53.
Coho: 69,68.
Pacific Lamprey: 131.

The third site, Shaw Creek habitat unit #012, was sampled on July 30, 1991 by a team led by Greg Moody. Air temperature was 73 F and water temperature 59 F. This site is 700' above the mouth of the stream and 5000' below the barrier to migration. The unit surface area is 750 sq ft with a length of 50'. The combined total of all fish for all passes was 18 steelhead, 2 coho, 1 pacific lamprey.

LENGTHS SITE THREE (Millimeters):
SH/RBT: 123,120,72,71,64,62,52,51,50,47,45,44,43,43,42,39,38,33.
Coho: 40,28.
Pacific Lamprey: 135.

GRAVEL SAMPLING RESULTS

McNeil sediment samples were taken by Greg Moody, Scott Downie, and Gary Flosi at electrofishing sample sites 1, 2, and 3 on July 29 and 30, 1991. The 14 samples from the three sites on Shaw Creek had a combined mean of 42.2 % for fine sediments < 4.7mm. The combined mean of sediments < 0.86mm in the samples is 25.6 %. These are above threshold levels for optimum salmonid egg and embryo incubation. Table 7 describes the percentage of fines in the McNeil sediment samples by sample and particle size. The last column describes the total percentage of all fines < 4.7mm.

DISCUSSION

Shaw Creek has four channel types: A-3, B-2, B-3, and B-5. The high energy and steep gradient A-3 channel type is generally not suitable for instream enhancement structures. The B-2 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 4,670 feet of this type of channel in Shaw Creek, along with a plenitude of LOD either in or nearby the stream. Many site specific projects can be designed within this channel type, especially to increase pool frequency and volume. B-3 and B-5 channel types have suitable project gradients, but have unstable banks, and therefore are not especially good for instream enhancement structures. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded during the survey ranged from a minimum of 49 F to a maximum of 56 F. This is an excellent temperature regime for salmonids. It was recorded during a period of mild air temperatures with a maximum of 74 F. By the end of July, when electrofishing was conducted, air temperatures had increased to a high of 80 F and water temperatures to a maximum of 62 F. This temperature, if sustained, is near the threshold stress level for salmonids. However, this does not seem to be the case here, and Shaw Creek appears to have a very favorable temperature regime. To make any further conclusions, temperatures would need to be sampled throughout the warm summer months when cool water is critical to rearing salmonids.

Flatwater habitat types make up 31.3% of the total length of the Shaw Creek, riffles 45.7%, and pools 22.8%. The pools are relatively deep with 91 of the 129 pools having a maximum depth greater than 2 feet. However, in coastal coho and steelhead streams, it is generally desirable to have pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase pool habitat is recommended in this stream. There is a wealth of large organic debris (LOD) in suitable reaches of the stream available for use in this effort.

Sixty-five of the 129 pool tail-outs have an embeddedness rating of 3 or 4. Only ten had a 1 rating. This relatively high degree of embeddedness is not surprising considering the results of the McNeil samples. The combined sample mean for fine sediment <4.7mm from 14 sediment samples is 42.2 %. This condition has probably been influenced by the lack of flushing flows in the past several years, along with an elevated rate of sediment yield generated from naturally occurring streamside erosion sources, as well as from an extensive road system within the drainage. High risk potential sediment sources have been identified along the road system, and PALCO intends to remove them, and prevent new ones, through a watershed restoration program begun in 1991.

The majority of the cover in Shaw Creek is being provided by large and small woody debris, which is generally desirable. This type of cover provides salmonids with protection from predators, increases the frequency and quality of micro-habitats, and spatially separates territorial units to reduce density related competition. However, the mean shelter rating for the 129 pools is low to moderate with a rating of 62.4. The shelter rating in the 123 flatwater units is 49.3. A minimum shelter rating of 100 is desirable. Fortunately, there is a lot of large and small woody debris in or near the stream that can be used to increase cover, and improve both summer and winter fish habitat.

Small cobble is the most common dominant substrate occurring on Shaw Creek's low gradient riffles. It is dominant on fifty-two of the 118 LGR units. Small cobble is generally acceptable to spawning salmonids as long as the substrate has not been overly infiltrated with fine sediments. The McNeil sediment samples indicate the presence of fines in the substrate at a level not uncommon to streams along the North Coast. Here, a basin wide program to control sediment yield has been initiated, and it should increase the quality of spawning gravels in Shaw Creek.

The mean percent canopy for the Shaw Creek was 61.5%. An accepted optimum percentage for stream canopy is 80%. This high percentage of canopy is generally desirable to keep the water cool while allowing enough solar radiation to stimulate primary production.

There are numerous log debris accumulations present on Shaw Creek. Some of them are likely to be preventing fish passage, but many are also retaining large quantities of sediments. Modification of these barriers should be conducted to facilitate fish migration. However, the work must be accomplished over a period of years to avoid the release of surplus sediment that could fill pools and initiate major channel adjustments. These sites should be treated working upstream. The first, at 5702', was modified in 1991. Others are marked with an asterisk (*) on the Problem Sites list.

RECOMMENDATIONS

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

2) Design and install instream pool forming and maintenance structures at sites in appropriate stream reaches that will increase the frequency and quality of pool units.

3) Modify the log debris accumulations to provide fish passage. This may need to be completed in stages over a number of years to prevent the fine sediments being retained by the LDA's from impacting the habitat downstream. In some cases, gravel trapping structures may need to be constructed below barrier modification sites prior to modification.

4) Stabilize stream bank erosion sources to reduce the amount of fine sediments entering the stream. In areas where access is available, heavy equipment should by used; where access is a problem, hand crews must be used. Generally, work should begin in the upper reaches, by priority based upon potential sediment yield.

5) Increase woody cover in the pools and flatwater habitat units. Although the majority of the cover is composed of large and small woody debris, increasing the complexity and amount of woody cover is desirable.

6) Increase the canopy in Shaw Creek by planting willow, alder, and redwood along the stream where shade canopy is not at acceptable levels. In many instances, these sites will also be bank stabilization project sites. Obviously, conduct instream or bank stabilization work prior to planting in order to avoid the destruction of the new

plantings.

7) Carry out the plan for control of the mapped sediment sources related to the road system in the watershed. The road system must be continually monitored for drainage problems before they develop or occur.

8) Shaw Creek should be stocked with natal chinook and steelhead produced at the Yager Camp Hatchery to accelerate usage of the expanded and enhanced habitats.

9) Continue to monitor the electrofishing and gravel index sites over time to evaluate the physical and biological responses to these restoration projects.

10) The inventory on Shaw Creek should be up-dated within three years of the completion of recommended project work, if flows of bankfull discharge have occurred.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach. Asterisks (*) indicate probable barriers.

574' Bridge crosses Shaw Creek, 38' wide X 33' long X 6.5' above the channel. Right bank has dirt piled up (10' wide X 20' long) from a gap and resultant hole in the stringers. Partial collapse of the compacted fill from the bridge is falling directly into the stream.

700' Shaw Creek Index section (gravel monitoring, biological sampling) site # 3.

750' Left bank erosion 100' long X 40' high, contributing sand and fines into the channel.

1030' Right bank erosion, 12' high X 24' long, contributing sand and gravel into the channel.

1618' Right bank erosion, 7' high X 15' long, contributing fines into the channel.

1940' Right bank erosion, 15' high X 40' long, contributing silts and gravel into the channel.

1957' Right bank erosion, 10' high X 25' long, contributing fines into the channel.

2087' Debris slide on the right bank, 70' long X 40' wide contributing fines into the channel.

2952' Right bank erosion, 2' high X 25' long, contributing gravel and fines into the channel.

3456' Left bank erosion, 10' high X 50' long, contributing gravel and fines into the channel.

3882' Right bank erosion, 8' high X 40' long.

3946' Left bank erosion, 40' high X 60' long.

4074' CCC work site # 20 8/8/86

4107' Log and debris accumulation 24' wide X 15' long X 8' high. Accumulation continues along the left bank of the channel.

4192' Right bank erosion, 4' high X 33' long contributing fines into the channel.

4559' Left bank erosion, 15' high X 100' long.

4866' Log and debris accumulation, 20' wide X 150' long.

5382' Tributary enters from the left bank, 1' wide X 1" deep.

5429' Shaw Creek Index section (gravel monitoring, biological sampling) site # 2.

5702' Log and debris accumulation, 10' high X width of channel - 18' X 25' long. Barrier to anadromous fish. 1991 Shaw Creek enhancement work site.

5807' Right bank erosion, 100' long X 100' high contributing fines into the channel. 1991 Shaw Creek enhancement work site.

5861' Left bank erosion, 40' long X 25' high, contributing fines into the channel. 1991 Shaw Creek enhancement work site.

6141' Shaw Creek Index section (gravel monitoring, biological sampling) site # 1.

6362' Log and debris accumulation, 35' long X 15' wide x 3' high.

6716' Right bank erosion, 8' high X 25' long, contributing sand and gravel into the channel.

6916' Right bank erosion, 4' high X 20' long contributing gravel and fines.

7034' Left bank erosion, 5' high X 70' long, contributing gravel and fines into the channel. Site of 1991 Shaw Creek enhancement work site.

7188' Right bank erosion, 3' high X 5' long, contributing fines into the channel.

7263' Log and debris accumulation, 15' wide X 75' long. Gravel is retained behind the accumulation.

7704' Left bank erosion, 30' high X 50' long, contributing fines into the channel.

7749' Log and debris accumulation, 100' long X 30' wide X 8' high. Gravel accumulation behind jam 8' high X 30' wide. Associated right bank erosion from the downstream end of the accumulation, extends 100' upstream.

7819' Log and debris slide form the left bank. Unit created by downed timber crossing the channel, with gravel accumulated behind.

7975' Accumulation continues from the above mentioned unit. Right bank erosion, 30' high X 60' long, contributes fines into the channel. Some gravel retention upstream of logs that create 2' plunges.

8012' Log and debris accumulation continues. Associated left bank erosion, 30' high X 50' high, contributing fines into the channel. Stream percolates through a small side channel on the right bank.

9384' Tributary enters from the right bank, approximately 2' wide at the mouth.

9256' Tributary enters form the left bank, approximately 10" wide at the mouth.

10312' Log and debris accumulation, 20' long X 22' wide. Associated right bank erosion 80' high X 100' long, contributing fines into the channel.

10713' Small tributary enters Shaw Creek from the left bank. Tributary has a steep gradient with predominantly short bedrock boulder step runs. Spawning substrate is poor and is limited to about 100 yards above confluence. Two logs and bedrock form a barrier 6' high. The barrier appears to be impassable to anadromous salmonids.

10755' Left bank erosion, 10' high X 20' long, contributing fines into the channel.

10973' Right bank erosion, 100' high X 150' long, contributing fines into the channel.

12516' Left bank erosion, 30' high X 60' long, contributing fines into the channel.

12532' Log and debris accumulation, 50' long X 20' wide X 10' high. Gravel accumulation behind accumulation 7' high. Probable barrier.

12729' Right bank erosion, 30' high X 60' long.

12812' Possible barrier formed from a three foot high plunge over log/bedrock accumulation.

12859' Right bank erosion, 30' high X 70' long, contributing fines into the channel.

13693' One log down over the unit creating a 4' falls with gravel accumulation upstream. Probable barrier.

14041' Left bank erosion, 30' high X 30' long, contributing fines into the channel.

14206' Log and debris accumulation, 20' wide X 35' long X 10' high. Gravel 6' high X 90' long X 20' wide, is retained behind the accumulation. Associated right bank erosion 30' high X 60' long, contributes fines into the channel. Probable barrier to anadromous fish.

14314' Log and debris accumulation, 30' wide X 15' long X 6' high. Gravel retention behind the accumulation is 6' high X 100' long X 30' wide at the base. Probable barrier to anadromous fish.

14892' Left bank erosion, 15' high X 30' long, contributing gravel into the stream.

14900' Log and debris accumulation 7' high X 23' long X 35' wide, retaining gravel 4' deep above the accumulation.

14965' Right bank erosion, 6' high X 30' long, contributing fines into the channel.

15206' Right bank erosion, 70' high X 100' long.

15279' Log and debris accumulation, 10' long X 40' wide X 6' high. Slight gravel retention.

15578' Right bank erosion, 50' high X 70' long.

15882' Right bank erosion, 60' high X 100' long contributing gravel and fines into the channel.

15934' Two 3' diameter redwood trees span the channel, forming a debris accumulation, 20' long X 30' wide X 4' high. No gravel retention. Associated right bank erosion, 20' high X 40' long contributing fines into the channel.

16871' Old left bank erosion, partially revegetated, but contributing fines into the channel. Tributary enters from the right bank.

17216' Forks of Shaw Creek.

17384' Log and debris accumulation, 35' long X 15' wide X 6' high. Gravel retention is 5' high X 15' wide X 100' long. Barrier to anadromous salmonids.

17451' Tributary enters from the left bank.