STREAM INVENTORY REPORT

Miller Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Miller Creek to assess habitat conditions for anadromous salmonids. 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 Miller Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Miller Creek. 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.

WATERSHED OVERVIEW

Miller Creek is tributary to Redwood Creek, tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California. Miller Creek's legal description at the confluence with Redwood Creek is T4S R3E S19. Its location is 40°06'11" N. latitude and 123°54'06" W. longitude. Miller Creek is a third order stream and has approximately 4.5 miles of blue line stream, according to the USGS Briceland and Ettersburg 7.5 minute quadrangles. Miller Creek drains a watershed of approximately 3.7 square miles. Summer base runoff is approximately 0.5 cfs at the mouth. Elevations range from about 550 feet at the mouth of the creek to 1,800 feet in the headwater areas. Grasslands, and Douglas fir/oak forest dominate the watershed. The watershed is privately owned, subdivided, and provides private residences for several families. Vehicle access exists west from Redway via the Shelter Cove Road to Briceland. Miller Creek is .2 miles west of Briceland, and is crossed by the county road approximately 1700 feet above the stream's mouth.

METHODS

The habitat inventory conducted in Miller Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The AmeriCorps volunteers of the Watershed Stewards Project that conducted the inventory were trained in standardized habitat inventory methods

by the California Department of Fish and Game (DFG). Miller Creek personnel were trained in May, 1995, by 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 Miller 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 Type:

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 measured 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". Miller 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 Miller 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 Miller 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 handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Miller 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 Miller 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.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. 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).

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. 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 Lotus 1,2,3. Graphics developed for Miller Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence

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- 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of May 31 to June 15, 1995, was conducted by Jeffrey Jahn and Kyra Short (WSP/AmeriCorps). The total length of the stream surveyed was 22,444 feet, with an additional 490 feet of side channel.

Flow was estimated at 0.9 cfs during the survey period.

Miller Creek is an F3 channel type for the entire 22,411 feet of stream reach surveyed. F3 channels are entrenched, meandering, low gradient streams, with predominantly cobble substrate.

Water temperatures ranged from 51 to 61 degrees Fahrenheit. Air temperatures ranged from 51 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 54%, flatwater types 21%, and riffles 19% (Graph 1). Flatwater habitat types made up 45% of the total survey **length**, riffles 23%, and pools 32% (Graph 2).

Twelve Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 33%; runs, 30%; and mid-channel pools, 28% (Graph 3). By percent total **length**, runs made up 42%, mid-channel pools 27%, and low gradient riffles 23%.

Two hundred pools were identified (Table 3). Main-channel pools were most often encountered at 83%, and comprised 87% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. One hundred thirty-four of the 200 pools (67%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs.

Of the 200 pool tail-outs measured, 4 had a value of 1 (2%); 96 had a value of 2 (48%); 96 had a value of 3 (48%); and 4 had a value of 4 (2%). 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 habitat types had the highest shelter rating at 54. Flatwater habitats followed with a rating of 21 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 60, and main-channel pools rated 56 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Miller Creek. Graph 7 describes the pool cover in Miller Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 80 of the 190 low gradient riffles (42%). Gravel was the next most frequently observed dominant substrate type, and occurred in 36% of the low gradient riffles (Graph 8).

Twelve percent of the survey reach lacked shade canopy. Of the 88% of the stream covered with canopy, 91% was composed of deciduous trees, and 9% was composed of coniferous trees. Graph 9 describes the canopy in Miller Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 74.1%. The mean percent left bank vegetated was 69.6%. The dominant elements composing the structure of the stream banks consisted of 3.6% bedrock, 13.5% cobble/gravel, 82.3% bare soil. Additionally, the banks were vegetated with 6.2% grass, 24% brush, 67.1% deciduous trees, and 1.7% with coniferous trees, including downed trees, logs, and root wads, and 1% unvegetated (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on August 16, 1995 in Miller Creek. The units were sampled by Jeffrey Jahn and Kyra Short (CCC). All measurements are fork lengths (FL) unless noted otherwise.

The first site sampled was habitat unit 037, a run, approximately 1,419 feet from the confluence with Redwood Creek. This site had an area of 210 sq ft, and a volume of 84 cu ft. The unit yielded

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3 steelhead, ranging from 40 to 80mm FL.

The second site was habitat unit 269, a step-run, located approximately 983 feet above the second Miller Creek road bridge. This site had an area of 250 sq ft, and a volume of 75 cu ft. Six steelhead were sampled. They ranged from 40 to 70mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Miller Creek.

DISCUSSION

The F3 channel type is generally well suited for fish habitat improvement structures. F3 channels are found in entrenched, meandering, low gradient stream reaches. They have channels dominated by cobble, and have stable stream banks. The F3 channel type is good for bank-placed boulders and wing deflectors. They are fair for boulder clusters, log cover structures, and channel constrictors. They are rated as poor for medium-stage weirs.

The water temperatures recorded on the survey days May 31 to June 15, 1995 ranged from 51° F to 61° F. Air temperatures ranged from 51° F to 81° F. This is a very good water temperature regime for salmonids. Miller Creek seems to have temperatures favorable to salmonids. Residents report that the stream loses flow later in the summer. To make any further conclusions, flow and water temperatures should be monitored during the later, hot summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 45% of the total **length** of this survey, riffles 23%, and pools 32%. The pools are relatively deep with 134 of the 200 pools having a maximum depth greater than 2 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total 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.

One hundred of the 200 pool tail-outs measured had embeddedness ratings of 3 or 4. Only four had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In Miller Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was moderate with a rating of 54. The shelter rating in the flatwater habitats was slightly lower at 21. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large and small woody debris contribute 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.

One hundred and forty-eight of the 190 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 88%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.
In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Flow and water temperatures should be monitored in the late, hot summer months to assess the impact on coldwater fish.

3) 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 and in some areas the material is at hand.

4) 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.

5) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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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.

0' Begin survey at confluence with Redwood Creek. Channel type is an F3 for the entire 22,441' of stream survey.

113' Young-of-the-year (YOY) salmonids observed.

324' Flow for Miller Creek measured here at 0.9 cfs.

1419' Bioinventory site #1.

1698' Briceland Road bridge crosses Miller Creek. It looks like water is beginning to undercut the headwall on the right bank.

2109' Large debris accumulation (LDA), approximately 5' long x 31' wide x 5' high. Not a barrier to migration.

4702' Miller Creek Road bridge crosses creek. Good access spot to creek.

6274' Small tributary enters from left bank (LB).

10429' Small, steep tributary enters from right bank (RB).

11031' Slide on RB, approximately 150' long x 50' high. Five downed trees ready for delivery into stream. Slide contributing fines directly into the stream.

11062' Small tributary enters from RB.

12327' Second bridge on Miller Creek Road crosses creek. Good spot to access creek.

12725' LDA observed, approximately 6' long x 25' wide x 8' high.

13310' Bioinventory site #2 - YOY observed.

13391' Small tributary enters from LB.

13796' Small slide on LB is bringing small Alder trees into stream.

13836' LDA, approximately 50' long x 75' wide x 7' high. Not a barrier to migration.

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14698'Small tributary enters from right bank.

14819'Small spring on RB.

15055'Approximately 14 California roach observed.

15590'Small railroad car bridge crosses the creek.

15930'YOY salmonids observed.

16586' LDA, approximately 6' long x 20' wide x 6' high. Not a barrier to migration.

17240'Small spring on RB.

18194'Buck Gulch enters creek from LB. Good spot to access stream.

19639'Small footbridge crosses creek. Good access point - be sure to contact landowner.

20057'Small tributary enters from RB.

20145'Slide on LB, approximately 15' long x 50' wide x 8' high - retaining gravels. Not a barrier to migration.

22172'Slide on LB, approximately 300' long x 100' high.

21169'Small tributary enters from RB.

21481'Slide on RB, approximately 300' long x 150' high.

21651'Stream splits into two branches. Topo map displays the East branch as a blue-line stream. Water is flowing from the West branch only. Survey continues up the branch containing flowing water.

22389'Small tributary enters from RB. Very little flowing water in stream. YOY observed throughout survey. End of survey.

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