STREAM INVENTORY REPORT

Mule Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on the Mule 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 the Mule 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 the Mule 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

The Mule Creek is tributary to Hollow Tree Creek, tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California (Figure 1). The Mule Creek's legal description at the confluence with Hollow Tree Creek is T23N R17W S29. Its location is 39°49'00" N. latitude and 123°45'49" W. longitude. The Mule Creek is a second order stream and has approximately 0.8 miles of blue line stream, according to the USGS Hales Grove 7.5 minute quadrangle. The Mule Creek drains a watershed of approximately 3.3 square miles. Summer base runoff is approximately 2- cfs at the mouth, but over 5,--- cfs is not unusual during winter storms. Elevations range from about 1,000 feet at the mouth of the creek to 1,500 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the Louisiana-Pacific Corporation and is managed for timber production. Vehicle access exists from State Highway 1 at Hales Grove, via Westside Road. This road accesses the mouth of Mule Creek approximately 0.8 miles east of State Highway 1.

METHODS

The habitat inventory conducted in the Mule 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). Mule Creek personnel were trained in May and June, 1992, 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 Mule Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used, see the Hollow Tree Creek report.

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 the Mule Creek to document the fish species composition and distribution. ---- sites were electrofished in the Mule 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.

DATA ANALYSIS

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

The Runtime program produces the following summary 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 the Mule 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 9, 1992, was conducted by Erick Elliot and Jason Cleckler (CCC). The total length of the stream surveyed was 1,317 feet, with an additional 22 feet of side channel.

Flow was ESTIMATED to be 2-3 cfs during the survey period. OR: Flow was MEASURED at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2-3 cfs on Aug. 20, 1990.

The Mule Creek is a B1-1 channel type for the entire 1,317 feet of stream reach surveyed. B1-1 channels are moderate gradient (1.5-4.0%), moderately confined, bedrock controlled channels.

Water temperatures ranged from 57 to 58 degrees fahrenheit. Air temperatures ranged from 66 to 73 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 36.4%, pools 34.1%, and flatwater habitats 29.6% (Graph 1). Riffles made up 37.0% of the total survey **length**, flatwater habitats 33.0%, and pools 30.0% (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, 27.3%; and runs, 18.2% (Graph 3). By percent total **length**, low gradient riffles made up 32.4%, and runs 19.9% (Table 2).

Fifteen pools were identified (Table 3). Scour pools were most often encountered at 60.0%, and comprised 58.1% of the total length of pools (Graph 4).

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Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Eleven of the 15 pools (73.3%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 15 pool tail-outs measured, one had a value of 1 (6.7%); 2 had a value of 2 (13.3%); 9 had a value of 3 (60.0%); and 3 had a value of 4 (20.0%). 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. Pools had the highest shelter rating at 56.0. Riffle habitats followed with a rating of 27.8 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 64.4, main channel pools had a rating of 50.0, and backwater pools rated 10.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the Mule Creek and are extensive. Bedrock ledges are the next most common cover type. Graph 7 describes the pool cover in the Mule Creek.

Table 6 summarizes the dominant substrate by habitat type. Large cobble was the dominant substrate observed in 5 of the 12 low gradient riffles (41.7%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 33.3% of the low gradient riffles (Graph 8).

Thirty-three percent of the survey reach lacked shade canopy. Of the 67% of the stream covered with canopy, 77% was composed of deciduous trees, and 23% was composed of coniferous trees. Graph 9 describes the canopy in Mule 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 71.8%. The mean percent left bank vegetated was 56.9%. The dominant elements composing the structure of the stream banks consisted of 54.6% bedrock, 2.3% cobble/gravel, 4.6% bare soil, 27.3% grass, 1.1% brush. Additionally, 5.7% of the banks were covered with deciduous trees, and 4.6% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

----- electrofishing sites were sampled on the Mule Creek. The objective was to identify fish species and distribution. The

units were sampled on SEPTEMBER --, 199- by E---k E----t, B---n H------y, and S--a M----e (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. T---e passes were conducted at each site, fork lengths (FL) measured and recorded, and the fish returned to the stream.

The first site sampled was habitat unit 0-0, a MID-CHANNEL POOL, approximately --- feet from the confluence with the V-- D---- River. This site had an area of --- sq ft, and a volume of --- cu ft. The unit yielded 2- steelhead, ranging from 3- to 11- mm FL.

The second site was habitat unit 0-0, a MID-CHANNEL POOL, located below a CATTLE CROSSING approximately 2--- feet above the creek mouth. This site had an area of 2-- sq ft, and a volume of 1-- cu ft. Ni----en steelhead were sampled. They ranged from 5-to 1-- mm FL.

The third site sampled was habitat unit 0-0, a CORNER POOL, located approximately 5--- feet above the creek mouth. This site is 2-- feet from the A--------- Road. The site had an area of 5- sq ft, and a volume of 7- cu ft. ELEVEN steelhead were sampled, ranging from 5- to 7- mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on the Mule Creek.

DISCUSSION

B1-1 channels are generally not suitable for fish habitat improvement structures. However, bank placed boulders, shelter structures, bank cover, log cover, and spawning weirs are often appropriate in these reaches.

The water temperatures recorded on the survey day July 9, 1992, ranged from 57° F to 58° F. Air temperatures ranged from 66° F to 73° F. This is a very good water temperature regime for salmonids. However, to make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Riffles comprised 37.0% of the total **length** of this survey, flatwater habitats 33.0%, and pools 30.0%. The pools are relatively deep with 11 of the 15 pools having a maximum depth of two feet or greater. However, in coastal coho and steelhead

streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat.

Twelve of the 15 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In the Mule 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 56.0. The shelter rating in the flatwater habitats was lower at 20.0. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders and bedrock ledges in all habitat types. 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.

Only five of the 12 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy for the stream was 67%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

RECOMMENDATIONS

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

2) 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.

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

4) There are several log debris accumulations present on the Mule Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully over time to avoid

excessive sediment loading in downstream reaches.

5) 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.

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 Hollow Tree Creek. Channel type is a B1-1 for the entire survey reach.

190' Log and debris accumulation (LDA) 11' long x 20' wide x 5' high; no apparent barrier.

506' Left bank erosion 40' high x 7' long, contributing silt and gravel into the channel.

614' Young of the year steelhead (YOY) observed.

657' Channel is braided due to an LDA.

703' LDA 10' long x 18' wide x 5' high; no apparent barrier.

973' Numerous YOY observed.

1072' Concrete weir 4' high across the channel with flood gates removed.

1140' 9' high plunge.

1163' 4' high plunge from bedrock.

1172' 4' high plunge.

1245' 50+ YOY observed.

1317' 30-35' high plunge from bedrock. End of survey.