STREAM INVENTORY REPORT

MOWRY CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Mowry 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 Mowry 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 Mowry 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

Mowry Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California. Mowry Creek's legal description at the confluence with the South Fork Eel River is T2S R2E S13. Its location is 40°17'49" N. latitude and 123°53'43" W. longitude. Mowry Creek is a first order stream and has approximately 1.3 miles of blue line stream, according to the USGS Weott and Myers Flat 7.5 minute quadrangles. Mowry Creek drains a watershed of approximately 0.8 square miles. Summer base runoff is approximately 0.9 cfs at the mouth. Elevations range from about 160 feet at the mouth of the creek to 1,400 feet in the headwater areas. Redwood forest dominates the watershed. The lower 0.6 miles of Mowry Creek is owned by the State of California and is managed by Humboldt Redwoods State Parks. The remainder of the watershed is privately owned and is managed for timber production. Vehicle access exists from U.S. Highway 101 at Weott south via the Avenue of the Giants. This road crosses near the mouth of Mowry Creek approximately 2.5 miles south of Weott.

METHODS

The habitat inventory conducted in Mowry Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) Technical Advisors that conducted the

inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Mowry Creek personnel were trained in May, 1993, 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 Mowry 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". Mowry 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 Mowry 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 Mowry 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 Mowry 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 Mowry 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 Mowry Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length

Mowry Creek

- 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 REPORT *

The habitat inventory of June 29, 1993, was conducted by Warren Mitchell and Ruth Goodfield (CCC). The total length of the stream surveyed was 2,524 feet.

Flow was measured 600 feet downstream of the Avenue of the Giants crossing with a Marsh-McBirney Model 2000 flowmeter at 0.9 cfs on June 29, 1993.

Mowry Creek is an C3 channel type for the first 2,281 feet of stream reach surveyed, then it changes to an A3 channel type for the remaining 243 feet of the survey. C3 channels are low gradient, meandering gravel bed streams. A3 channels are high gradient, well confined streams, with a high sediment supply.

Water temperatures ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 64 to 71 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 49.2%, pools 30.6%, and flatwater 19.4% (Graph 1). Riffle habitat types made up 73.8% of the total survey **length**, flatwater 16.2%, and pools 7.1% (Graph 2).

Ten 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, 44.4%; and step runs, 11.11% (Graph 3). By percent total **length**, low gradient riffles made up 73.2%, and step runs 12.8%.

Eleven pools were identified (Table 3). Scour pools were most often encountered at 63.6%, and comprised 55.6% 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. Eight of the 11

pools (73%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 9 pool tail-outs measured, 1 had a value of 1 (11.1%); 5 had a value of 2 (55.6%); 3 had a value of 3 (33.3%); and zero had a value of 4 (00.0%). 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. Pool habitat types had the highest shelter rating at 35.5. Flatwater habitats followed with a rating of 21.4 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 36.3, and scour pools rated 35.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Mowry Creek. Root wads and small woody debris are the next most common cover types (Graph 7).

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 14 of the 16 low gradient riffles (87.5%). Graph 8 describes the substrate in Mowry Creek.

Nineteen percent of the survey reach lacked shade canopy. Of the 81% of the stream covered with canopy, 16% was composed of deciduous trees, and 84% was composed of coniferous trees. Graph 9 describes the canopy in Mowry 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 45.9%. The mean percent left bank vegetated was 50.1%. The dominant elements composing the structure of the stream banks consisted of 9.4% cobble/gravel, 6.2% bare soil, 34.4% grass, 6.2% brush. Additionally, 9.4% of the banks were covered with deciduous trees, and 34.4% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on June 29, 1993 in Mowry Creek. The unit was sampled by Ruth Goodfield and Warren Mitchell (CCC). All measurements are fork lengths (FL) unless noted otherwise.

The site sampled was habitat unit 016, a plunge pool located at the base of the Avenue of the Giants culvert, approximately 1,042

feet from the confluence with the South Fork Eel River. This site had an area of 187 sq ft, and a volume of 206 cu ft. No fish were found.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Mowry Creek.

DISCUSSION

The surveyed reach of Mowry Creek has two channel types: A3 and C3. The steep gradient and unstable stream banks of the A3 channel type are generally not suitable for instream enhancement structures. C3 channels are meandering stream types on noncohesive gravel beds which have poorly consolidated and unstable stream banks. They are also generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey day June 29, 1993 ranged from 56° F to 58° F. Air temperatures ranged from 64° F to 71° 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.

Riffle habitat types comprised 73.8% of the total **length** of this survey, flatwater 16.2%, and pools 7.0%. The pools are relatively shallow with only 3 of the 11 pools having a maximum depth greater than 2 feet. However, 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. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy or cause streambank erosion.

Three of the 9 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one 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 Mowry 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 35.5. The shelter rating in the flatwater habitats was lower at 21.4. However, 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 all habitat types. Additionally, root wads 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.

Fourteen of the 16 low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 81%. 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) Mowry 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. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

4) Due to the high gradient of the upper reach, access for migrating salmonids is an ongoing potential problem. Fish passage should be monitored, and improved where possible.

Mowry Creek

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 South Fork Eel River. Channel type is a C3 for the first 2,281' of stream surveyed.

1042' Bioinventory sampling site.

1060' Avenue of the Giants concrete boxed culvert 5' wide x 3' high x 30' long; no baffles.

2281' Highway 101 culvert. Channel type changes to an A3 for the remaining 243' of stream surveyed.

2524' Left bank (LB) slide 100' high x 100' long. Log and debris accumulation. Survey crew hiked an additional 300 yards upstream and encountered high gradient terrain and log jams. No fish seen throughout entire survey. End of survey reach.

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