STREAM INVENTORY REPORT

MONUMENT CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Monument 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 Monument 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.

An adult carcass survey was conducted in Monument Creek on January 25, 1988. No fish were found during this survey. 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

Monument Creek is tributary to the Eel River, located in Humboldt County, California. Monument Creek's legal description at the confluence with the Eel River is T1N R1E S18. Its location is 40°28'29" N. latitude and 124°06'32" W. longitude. Monument Creek is a first order stream and has approximately 2.2 miles of blue line stream, according to the USGS Scotia and Taylor Peak 7.5 minute quadrangles. Monument Creek drains a watershed of approximately 5.4 square miles. Elevations range from about 80 feet at the mouth of the creek to 2,400 feet in the headwater areas. Second growth redwood forest dominates the watershed. The watershed is owned by the Pacific Lumber Company and is managed for timber production. Vehicle access exists by driving behind the Pacific Lumber Company Mill in Scotia and parking on the gravel bar. Access to the confluence of Monument Creek is by walking across the Eel River.

METHODS

The habitat inventory conducted in Monument Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) Technical Advisors and the contract seasonals that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Monument Creek personnel were trained in May, 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 Monument 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". Monument 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.

Monument Creek

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 Monument 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 Monument 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 Monument 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 Monument 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 Monument Creek to document the fish species composition and distribution. Five sites were electrofished in Monument 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 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 shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Monument 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 REPORT *

The habitat inventory of June 11, 12, 16, and 17, 1992, was conducted by Brian Humphrey and Judah Sanders (CCC and contract seasonal). The total length of the stream surveyed was 7,682 feet, with an additional 1,052 feet of side channel.

Flows were not measured on Monument Creek.

Monument Creek is a B1 channel type for the first 5,765 feet of the stream reach surveyed, then it changes to an A2 channel type for the next 784 feet, then it changes to a B3 channel type for the remaining 1,133 feet of the survey. B1 channels are moderate gradient (2.5-4.0%), moderately confined, with stable stream banks. A2 channels are steep (4-10% gradient), very well confined streams, with stable stream banks. B3 channels are moderate gradient (1.5-4.0%), well confined, with unstable stream banks.

Water temperatures ranged from 56 to 59 degrees fahrenheit. Air temperatures ranged from 58 to 75 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 43.1%, pool types 34.3%, and flatwater 21.6% (Graph 1). Riffle habitat types made up 46.5% of the total survey **length**, flatwater 27.6%, and pools 24.8% (Graph 2).

Thirteen 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, 21.6%; high gradient riffles, 19.1%; and mid-channel pools, 12.7% (Graph 3). By percent total **length**, low gradient riffles made up 21.9%, high gradient riffles 20.6%, and step runs 13.3%.

Seventy pools were identified (Table 3). Main channel pools were most often encountered at 52.9%, and comprised 64.6% 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. Thirty-two of the 70 pools (46%) had a depth of two feet or greater (Graph 5). The depth of cobble embeddedness was estimated at pool tail-outs. Of the 58 pool tail-outs measured, 4 had a value of 1 (6.9%); 10 had a value of 2 (17.2%); 34 had a value of 3 (58.6%); and 10 had a value of 4 (17.2%). 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 83.5. Riffle habitats followed with a rating of 38.1, and flatwater habitats rated 32.5 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 106.2, and main channel pools rated 63.2 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Monument Creek and are extensive. Large woody debris is the next most common cover type. Graph 7 describes the pool cover in Monument Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 23 of the 44 low gradient riffles (52.3%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 34.1% of the low gradient riffles (Graph 8).

Thirty-one percent of the survey reach lacked shade canopy. Of the 69% of the stream covered with canopy, 64% was composed of deciduous trees, and 36% was composed of coniferous trees. Graph 9 describes the canopy in Monument 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 24.5%. The mean percent left bank vegetated was 23.2%. The dominant elements composing the structure of the stream banks consisted of 2.0% boulder, 24.3% cobble/gravel, 18.4% bare soil, 12.5% grass, 22.8% brush. Additionally, 17.2% of the banks were covered with deciduous trees, and 2.2% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Five sites were electrofished on July 2 and 6, 1992 in Monument Creek. The units were sampled by Craig Mesman and Chris Coyle (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was a run/pool sequence, located directly under a log bridge in the headwaters of Monument Creek. The site was approximately 50' long x 2' wide x 2-6" deep. No fish were found.

The second site was a riffle/pool/run sequence, located beyond the survey reach near a log deck access on the main Pacific Lumber Company road. Fifteen steelhead were sampled. They ranged from 35 to 146mm FL.

The third site sampled included habitat units 137-138, a step run and mid-channel pool, located approximately 6,309 feet above the creek mouth. The site had an area of 341 sq ft, and a volume

of 407 cu ft. Nineteen steelhead were sampled, ranging from 44 to 161mm FL.

The fourth site sampled included habitat units 108-109, a run and plunge pool, located approximately 5,220 feet from the confluence with the Eel River. The site had an area of 519 sq ft, and a volume of 485 cu ft. Forty-five steelhead were sampled. They ranged from 38 to 102mm FL.

The fifth site included habitat units 014-016, a mid-channel pool/low gradient riffle/mid-channel pool sequence, located 732 feet above the creek mouth. The site had an area of 830 sq ft, and a volume of 645 cu ft. The sample yielded 25 steelhead, ranging from 39 to 143mm FL, 6 sculpin, ranging from 64 to 121mm FL, and 23 prickly sculpin, ranging from 72 to 136mm FL.

DISCUSSION

The surveyed reach of Monument Creek has three channel types: A2, B1, and B3. The high energy and steep gradient of the A2 channel type is generally not suitable for instream enhancement structures. The B3 channel type is also unsuitable for enhancement structures due to its unstable stream banks.

The B1 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 5,765 feet of this type of channel in Monument Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days June 11-17, 1992 ranged from 56° F to 59° F. Air temperatures ranged from 58° F to 75° 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 46.5% of the total **length** of this survey, flatwater 27.6%, and pools 24.8%. The pools are relatively shallow with only 32 of the 70 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. 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.

Forty-four of the 58 pool tail-outs measured had embeddedness ratings of 3 or 4. Only four had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Monument 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 relatively high with a rating of 83.5. The shelter rating in the flatwater habitats was lower at 32.5. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders and large woody debris in all habitat types. Log and root wad cover structures in the 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.

Thirty-eight of the 44 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 69%. 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) Monument 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 flatwater habitat units. Most of the existing cover is from boulders and large woody debris. Adding high quality complexity with additional woody cover is desirable.

4) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 5983', should then be treated to reduce the amount of fine sediments entering the stream.

5) There are several log debris accumulations present on Monument 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.

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 the Eel River. Channel type is a B1 (reach #1).

1533' Numerous young-of-the-year (YOY) salmonids observed.

1902' Large woody debris (LWD) and root wad accumulation; no apparent barrier. Left bank erosion 40' high x 60' long, depositing gravel into the channel.

2642' Right bank erosion, depositing clay into the channel.

3207' Log and debris accumulation (LDA) 12' long x 7' high; possible barrier. CCC site #8.

3421' Road crosses the channel.

5018' Cattle crossing. YOY observed.

5298' Old road crossing.

5407' Bridge crossing 20' long x 30' wide x 10' high.

5692' Right bank erosion.

5765' Channel type changes from a B1 to an A2 (reach #2).

5983' Major right bank slide 250' long.

6484' Small tributary enters from the left bank.

6549' Channel type changes from an A2 to a B3 (reach #3).

6564' Channel is braided. YOY observed.

6635' LDA retaining cobble 4' high; possible barrier.

6846' Massive LDA 25' long x 30' wide x 12' high with water percolating through; possible barrier.

6912' LDA 3.5' high, retaining cobble 3' high.

7006' Log and boulder jam 7' high, retaining gravel 6' high.

7077' LDA 11' long x 40' wide x 6' high, retaining cobble/gravel 5' high.

7540' YOY observed.

7669' LDA 20' long x 40' wide x 7' high, retaining gravel 9' long.

7682' End of survey. Channel was walked approximately 1/2 mile beyond this point. This section contained 8 large LDAs and large woody debris was observed throughout the channel.

Monument Creek

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