STREAM INVENTORY REPORT

Bloody Run Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Bloody Run 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 Bloody Run 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 Bloody Run 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

Bloody Run Creek is tributary to the Outlet Creek, tributary to the Mainstem Eel River, located in Mendocino County, California. Bloody Run Creek's legal description at the confluence with Outlet Creek is T20N R14W S01. Its location is 39°37'02" N. latitude and 123°21'24" W. longitude. Bloody Run Creek is a second order stream and has approximately 3.1 miles of blue line stream according to the USGS Willis Ridge and Longvale 7.5 minute quadrangles. Bloody Run Creek drains a watershed of approximately 9.5 square miles. Elevations range from about 1,080 feet at the mouth of the creek to 2,500 feet in the headwater areas. Mixed conifer forest dominates the watershed, with hardwoods as a secondary component. The watershed is entirely privately owned and is managed for rangeland and private residence. Vehicle access exists via Highway 162 to mile marker 6.68.

METHODS

The habitat inventory conducted in Bloody Run Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and

Watershed Stewards Project/AmeriCorps members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Bloody Run Creek personnel were trained in May, 1995, by Scott Downie and Gary Flosi. 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 Bloody Run 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 and revised by David Rosgen (1985 rev. 1994). 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 five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

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 degrees 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". Bloody Run 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were measured for mean width, mean depth, and maximum depth (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). 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 Bloody Run 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). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

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 fully-described 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 Bloody Run 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 fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

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 Bloody Run Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results were recorded.

9. Bank Composition and Vegetation:

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 Bloody Run Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described unit were selected from 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, or 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 0.85 mm)(*Stream Substrate Quality for Salmonids: Guidelines for Sampling, Processing, and Analysis*, Valentine, 1995).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat7.2, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, 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 Bloody Run 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of September 6 to 13, 1995, was conducted by Brie Darr and Jennifer Terwilliger (AmeriCorps). The total length of the stream surveyed was 13,729 feet with an additional 392 feet of side channel.

Flows were not measured on Bloody Run Creek.

Bloody Run Creek is a B3 channel type for the entire 13,729 feet of stream reach surveyed. B3 channels are moderate gradient(2-4%), moderately entrenched streams, with stable stream banks and predominantly cobble substrate.

Water temperatures ranged from 54 to 77 degrees Fahrenheit. Air temperatures ranged from 52 to 91 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 33%, flatwater types 31%, and riffles 28% (Graph 1). Pool habitat types made up 31% of the total survey **length**, flatwater 29%, and dewatered (dry) units 25% (Graph 2).

Nine Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by

percent **occurrence** were mid-channel pools 31%; runs, 24%; and low gradient riffles, 16% (Graph 3). By percent total **length**, mid-channel pools made up 30%, dewatered units 25%, and runs 18%.

One hundred eighty-two pools were identified (Table 3). Main channel pools were most often encountered at 95% and comprised 95% 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. Sixty-nine of the 182 pools (38%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 182 pool tail-outs measured, 16 had a value of 1 (9%); 89 had a value of 2 (49%); 26 had a value of 3 (14%); and 51 had a value of 4 (28%). On this scale, a value of 1 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. Flatwater habitat types had the highest shelter rating at 23. Riffle habitats followed with a rating of 22 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 19, and scour pools rated 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Bloody Run Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Bloody Run Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in seven of the 15 low gradient riffles measured (47%). Large cobble was the next most frequently observed dominant substrate type and occurred in 27% of the low gradient riffles (Graph 8).

The mean percent canopy for the stream reach surveyed was 37%. At this time, a riparian survey has not been conducted on Bloody Run Creek, so the mean percentages of deciduous and coniferous trees has not yet been determined. Graph 9 describes the canopy in Bloody Run Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 12%. The mean percent left bank vegetated was 14%. The dominant elements composing the structure of the stream banks consisted of 6.4% bedrock, 2.4% boulder, and 19.3% cobble/gravel (Graph 10). An additional 4% of the banks was vegetated by brush, 1.3% by grass, and the remaining 21.9% was vegetated by deciduous trees, including down trees, logs, and

root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological inventory was conducted on Bloody Run Creek during the 1995 field season.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Bloody Run Creek.

DISCUSSION

Bloody Run Creek is a B3 channel type for the entire 13,729 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters and log cover structures. B3 channel types are also good for medium-stage plunge weirs.

The water temperatures recorded on the survey days September 6 to 13, 1995, ranged from 54 to 77 degrees Fahrenheit. Air temperatures ranged from 52 to 91 degrees Fahrenheit. This is a fair water temperature range for salmonids. However, these higher temperatures, if sustained, are at or near the threshold stress level for salmonids. This does seem to be the case here and Bloody Run Creek seems to have temperatures favorable to salmonids. To make any further conclusions, temperatures should be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 29% of the total **length** of this survey, riffles 14%, and pools 31%. The pools are relatively shallow, with only 69 of the 182 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Seventy-seven of the 182 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 16 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 Bloody Run Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 19. The shelter rating in the flatwater habitats was slightly better at 23. 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, terrestrial vegetation and bedrock ledges 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.

Eight of the 15 low gradient riffles measured 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 37%. This is a relatively low percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

The percentage of right and left bank covered with vegetation was low at 12% and 14%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Temperatures in this section of Bloody Run Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) Increase the canopy on Bloody Run Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) Increase the 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.

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.

6) There are at least two sections where the stream is being impacted from cattle trampling the riparian zone and defecating in the water. Alternatives should be explored with the grazier and developed if possible.

7) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield.

8) 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 distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with Outlet Creek. Channel type is a B3 for entire 13,729 feet of stream survey.
263'	Begin fractional survey at railroad bridge.
515'	Highway 162 crosses creek. Exclusionary fence across the stream.
639'	Approximately 50 squawfish observed.
950'	Old Humboldt crossing.
970'	Ford crosses stream.
1221'	Channel type taken here.
1788'	One 2+ and 20 young-of-the-year (YOY) steelhead/rainbow trout observed.
3152'	Road access from the right bank (RB).

3369' Road on RB.

3639' Ford crosses stream.

3776' Ford crosses stream - tire tracks evident in stream for the next 350 feet.

4027' Evidence of cattle trampling and grazing on riparian vegetation.

4144' Road on left bank (LB).

4376' Dry tributary enters RB.

4847' Evidence of cattle in stream.

5910' Large debris accumulation (LDA) on LB. Not a barrier to migration.

6456' Dry tributary enters from RB.

6654' Dry tributary enters from LB.

6916' Dry tributary enters from LB.

7016' Road on LB.

7442' Small tributary enters from LB.

7611' Small tributary enters from RB.

8318' Dry tributary enters from LB.

8921' Large woody debris piled on truck-sized boulder. Retaining some cobble. Not a barrier.

9665' Small slide on RB.

9841' Dry tributary enters from RB.

12416' Stream ford. Unnamed tributary on RB. A survey was conducted on this stream and a report is available.

13000' Car bridge.

13017' No fish observed since fork in stream at 12416'. Road on RB.

13601' LDA across the creek, approximately 12' long x 30' wide

x 7' high - not a barrier.

13729' No fish observed in the last 1300'. No more running water in streambed. End of survey.

SEE NEXT PAGE FOR HABITAT TYPE KEY

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