STREAM INVENTORY REPORT

Manly Gulch

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Manly Gulch. 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 Manly Gulch. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Manly Gulch is tributary to Little North Fork Big River, tributary to Big River, tributary to the Pacific Ocean, and is located in Mendocino County, California (Map 1). Manly Gulch's legal description at the confluence with Little North Fork Big River is T17N R17W S13. Its location is 39°20’03" north latitude and 123°42'0" west longitude. Manly Gulch is a first order stream and has approximately 3.5 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. Manly Gulch drains a watershed of approximately 0.48 square miles. Elevations range from about 40 feet at the mouth of the creek to 600 feet in the headwater areas. The watershed is dominantly mixed conifer forest. The upper reach of the watershed is located in and managed by Jackson Demonstration State Forest, primarily for timber harvest. The lower reach is located in Mendocino Woodlands State Park. Vehicle access exists via State Route 20 to Road 730.

METHODS

The habitat inventory conducted in Manly Gulch 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 (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth,

depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Manly Gulch 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.

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 every tenth habitat unit. 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". Manly Gulch 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 sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 Manly Gulch, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 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 Manly Gulch, 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. In addition the dominant substrate composing the pool tail outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Manly Gulch, 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. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

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 Manly Gulch, the dominant composition type and the dominant vegetation type 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. In Manly Gulch fish presence was observed from the stream banks, and one site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, 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 Quattro Pro. Graphics developed for Manly Gulch 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 the pool tail outs
- 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 June 4 and 5, 1997, was conducted by Craig Mesman and Tara Cooper (CCC). The total length of the stream surveyed was 3,563 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.03 cfs on June 11, 1997.

Manly Gulch is a G4 channel type for the entire 3,563 feet of stream reach surveyed. G4 channels are highly entrenched with low width/depth ratios on a low gradient. G4 channels have gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 53 to 64 degrees Fahrenheit. Air temperatures ranged from 54 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 15% riffle units, 35% flatwater units, and 38% pool units (Graph 1). Based on total **length** of Level II habitat types there were 5% riffle units, 55% flatwater units, 19% pool units, and 20% of the units were dry (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 32%; mid-channel pools, 18%; and low gradient riffles, 15% (Graph 3). Based on percent total **length**, step runs made up 51%, mid-channel pools 7%, and low gradient riffles 5%.

A total of 30 pools were identified (Table 3). Main channel pools were most frequently encountered at 67% and comprised 74% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Six of the 30 pools (20%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 30 pool tail-outs measured, 7 had a value of 1 (23.3%); 13 had a value of 2 (43.3%); 2 had a value of 3 (6.6%); 0 had a value of 4; and 8 had a value of 5 (26.6%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In Manly Gulch, 6 of the 8 pool tail-outs which were valued at 5 had sand/silt/clay as the substrate.

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. Riffle habitat types had a mean shelter rating of 30, flatwater habitat types had a mean shelter rating of 14, and pool habitats had a mean shelter rating of 18 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 23. Main channel pools had a mean shelter rating of 16 (Table 3).
Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Manly Gulch. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Manly Gulch.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate in the one low gradient riffle that was fully sampled. Gravel was also the dominant substrate observed in 23 of the 30 pool tail outs measured (76%). Silt and clay was the next most

frequently observed dominant substrate type and occurred in 16.6% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 92%. The mean percentages of deciduous and coniferous trees were 2% and 98%, respectively. Graph 9 describes the canopy in Manly Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 77%. The mean percent left bank vegetated was 81%. The dominant elements composing the structure of the stream banks consisted of 28.6% cobble/gravel and 71.4% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 42.9% of the units surveyed. Additionally, 32% of the units surveyed had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on June 11, 1997, in Manly Gulch. The site was sampled by Tara Cooper and Craig Mesman.

The site sampled included isolated pools between habitat units 29-50, approximately 1,652 feet from the confluence with Little North Fork Big River. The site yielded 5 salamanders and 1 frog. No fish were observed during the biological inventory, but the water level has decreased approximately 2-3 times since the habitat inventory was taken on June 4, 1997. Habitat inventory memos report a 2" long unidentified fish at habitat unit #29 on June 4, 1997, and three young-of-the-year salmonids were observed on June 11, 1997, in habitat unit #2.

DISCUSSION

Manly Gulch is a G4 channel type for the entire 3,563 feet of stream surveyed. The suitability of G4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders; fair for low stage weirs, opposing wing deflectors, and log cover; and poor for medium stage weirs, boulder clusters, and single wing deflectors.

The water temperatures recorded on the survey days, June 4 and 5, 1997, ranged from 53 to 64 degrees Fahrenheit. Air temperatures ranged from 54 to 74 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 55% of the total **length** of this survey, riffles 5%, and pools 19%. The pools are relatively shallow, with only 6 of the 30 (20%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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. Adding large wood for structure that will increase or deepen pool habitat is recommended.
Seven of the 30 pool tail-outs measured had an embeddedness rating of 1. Two of the pool tail-outs had embeddedness ratings of 3 or 4. Eight of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. Six of the eight were unsuitable for spawning due to the dominant substrate being silt, sand or clay. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Manly Gulch, 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 18. The shelter rating in the flatwater habitats was slightly lower at 14. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by terrestrial vegetation in most habitat types. Additionally, small woody debris and root wads 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.

Twenty-three of the 30 pool tail outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 92%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 77% and 80% 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) Manly Gulch should be managed as an anadromous, natural production stream.

2) Create a channel under the main road to connect Manly Gulch to Little North Fork Big River. Winter access problems for adult fish at the non-existent channel at Camp Three may be what is stopping this stream from being utilized for habitat by salmonids. The available habitat is sufficient for use by steelhead and coho.

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

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) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
00'	Begin survey at confluence with Little North Fork Big River. Channel type is a G4.
10'	Two young-of-the-year salmonids observed.
25'	Old, embedded log bridge with surface approximately 1.5' above the water surface.
317'	Stream borders west side of the road.
453'	Sign reading “Camp Three” on left bank. Stream runs along the road to Camp Three. Artificial channel ends.
622'	Stream leaves parking lot and becomes a “real stream”.
1148'	Road on the left bank.
1177'	Road on the left bank.
1207'	Road on the left bank. Channel is extremely entrenched (6 to 7 feet).
1616'	Unidentified 2" fish observed.
1663'	Extremely entrenched channel. Eight feet high on both sides. Bank sloughing is contributing wood and sediment.
1841'	Channel type taken, G4.

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1982'	Log stringer bridge, 15' long x 13' wide x 6' high.
2251'	Log foot bridge, 10' long x 5' wide x 6' high.
2256'	Three foot high jump.
2487'	Jump 3.5' high.
2799'	Beginning of Oxen Road. Parallel logs in channel, 19' long.
3074'	Trail on right bank. Jump 3.5' high, retaining 3.5' of sediment.
3530'	Log debris accumulation, 25' long x 13' wide x 9' high, retaining 9-10' of gravel. Possible barrier to anadromous fish.
3563'	End of survey. Foot bridge constructed of railroad irons and 2' x 10' boards, 3' long x 15' high x 1.5' wide. Dry channel continues 200 feet upstream. Intermittent stream continues up to significant, but dry, right bank tributary. Little to no summer rearing habitat was observed up to this right bank tributary. Channel is shallow with moss encroaching on channel sides. Only one 2" fish was observed in this stream above Camp Three.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

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