STREAM INVENTORY REPORT

Park Gulch

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Park 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 Park 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

Park Gulch is tributary to the Chamberlain Creek, tributary to the North Fork Big River, tributary to big river, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Park Gulch's legal description at the confluence with Chamberlain Creek is T17N R15W S05. Its location is 39°21′35″ north latitude and 123°33′13″ west longitude. Park Gulch is a first order stream and has approximately 1.3 miles of blue line stream according to the USGS Comptche 7.5 minute quadrangle. Park Gulch drains a watershed of approximately 1.14 square miles. Elevations range from about 350 feet at the mouth of the creek to 1700 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely within Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via State Route 20 to Jackson Demonstration State Forest Road 200.

METHODS

The habitat inventory conducted in Park 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 Park 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". Park 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 Park 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 Park 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 Park 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 Park 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 Park 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 Park 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 20 through 26, 1997, was conducted by Lisa Campbell (WSP) and Tara Cooper (CCC). The total length of the stream surveyed was 5,502 feet with an additional 60 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.12 cfs on June 19, 1997.

Park Gulch is an F4 channel type for the entire 5,502 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 53 to 56 degrees Fahrenheit. Air temperatures ranged from 52 to 71 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 28% riffle units, 31% flatwater units, and 40% pool units (Graph 1). Based on total **length** of Level II habitat types there were 21% riffle units, 47% flatwater units, and 32% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 29%; low gradient riffles, 26%; and step runs, 17% (Graph 3). Based on percent total **length**, mid-channel pools made up 24%, low gradient riffles, 20%, and step runs 34%.

A total of 109 pools were identified (Table 3). Main channel pools were most frequently encountered at 71% and comprised 76% 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. Sixteen of the 109 pools (14.7%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 109 pool tail-outs measured, 7 had a value of 1 (6.4%); 52 had a value of 2 (47.7%); 26 had a value of 3 (23.9%); 12 had a value of 4 (11%) and 12 had a value of 5 (11%) (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 Park Gulch, 2 of the 12 pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. The other tail-outs were unsuitable for spawning due to the tail-outs being comprised of large cobble, boulder, bedrock or wood.

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 35, flatwater habitat types had a mean shelter rating of 12, and pool habitats had a mean shelter rating of 64 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 66. Scour pools had a mean shelter rating of 65 and backwater pools had a rating of 50 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Park Gulch. Graph 7 describes the pool cover in Park Gulch.

Table 6 summarizes the dominant substrate by habitat type. Of the eight low gradient riffles fully measured, six had gravel as the dominant substrate. Gravel was the dominant substrate observed in 62 of the 109 pool tail-outs measured (60%). Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 97%. The mean percentages of deciduous and coniferous trees were 10% and 90%, respectively. Graph 9 describes the canopy in Park Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 58.8%. The mean percent left bank vegetated was 65%. The dominant elements composing the structure of the stream banks consisted of 14.5% bedrock, 29% cobble/gravel, and 56.6% sand/silt/clay (Graph 10). Coniferous trees, including downed logs, were the dominant vegetation type observed in 82.9% of the units surveyed. Additionally, 17.1% of the units surveyed had deciduous trees as the dominant vegetation type.

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on August 22, 1997, in Park Gulch. The site was sampled by Craig Mesman and Tara Cooper (CCC).

The site sampled included habitat units 2 through 20, a series of habitat types consisting of eight mid-channel pools, six step runs, three runs, one low gradient riffle, one bedrock sheet and one lateral scour pool - bedrock formed. The beginning of the site was approximately 28 feet from the confluence with Chamberlain Creek. The site yielded two steelhead, 17 sculpin and 11 salamanders.

DISCUSSION

Park Gulch is an F4 channel type for the entire 5,502 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders; fair for weirs, single and opposing wing deflectors, channel constrictors and log cover;

poor for boulder clusters.

The water temperatures recorded on the survey days June 20 through 26, 1997, ranged from 53 to 56 degrees Fahrenheit. Air temperatures ranged from 52 to 71 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 47% of the total **length** of this survey, riffles 21%, and pools 32%. The pools are relatively shallow, with only 16 of the 109 (14.7%) 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. Installing structures that will deepen pool habitat is recommended.

Seven of the 109 pool tail-outs measured had an embeddedness rating of 1. Thirty-eight of the pool tail-outs had embeddedness ratings of 3 or 4. Twelve of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. Two of the 12 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or gravel being too small to be suitable. 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 Park 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 64. The shelter rating in the flatwater habitats was 12. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, boulders and undercut banks contribute a small amount. Log and root wad cover structure 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.

Ninety-one of the 109 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 97%. 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 59% and 65%, 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) Park Gulch should be managed as an anadromous, natural production stream.

2) 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.

3) Increase woody cover in the pools and flatwater habitat units. 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.

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.

0'	Begin survey at confluence with Chamberlain Creek. Channel type is an F4.
28'	Electrofishing site.
117'	Bridge, 15' long x 25' wide x 25' high.
257'	Right bank culvert, 2' diameter, 25' up the bank on a dry tributary.
613'	Log debris accumulation (LDA), 4' long x 10' wide x 3' high, retaining 3' of sediment.
792'	LDA, 10' long x 10' wide x 4' high, retaining 4' of sediment.
976'	LDA, 6' long x 15' wide x 5' high, retaining 4' of sediment.
1,118'	LDA, 4' long x 11' wide x 2' high.
1,297'	LDA, 3' long x 4' wide x 11' high, retaining 9' of sediment.
1,765'	LDA, 7' long x 15' wide x 4' high, retaining 4' of sediment which is causing a split in the channel.
1,874'	LDA, 7' long x 10' wide x 3' high, retaining 3' of sediment.

1,943'	Right bank tributary, flow of <0.02cfs. Channel is steep, narrow, silt dominated and not accessible to fish. A culvert 1 foot in diameter is located 200' up the tributary that has a 15' vertical jump.
2,039'	Bedrock sheet with a waterfall, 8' long x 15' wide x 8' high, not a barrier. The bedrock sheet is pocketed with small pools up to 1.5' deep.
2,194'	LDA, 25' long x 7' wide x 5' high, not a barrier.
2,430'	LDA, 40' long x 7' wide, possible barrier.
2,521'	LDA, 4' long x 9' wide x 3' high, possible barrier.
3,086'	Right bank tributary leads to a 3' diameter culvert with a 5' vertical jump. The culvert is 31' long with no baffles. The channel is narrow and entrenched, with a silt/boulderdominated substrate. Not accessible to fish.
3,347'	LDA, 6' long x 20' wide x 5' high, retaining 4' of sediment.
3,467'	Road 10' from right bank.
3,663'	LDA, 12' long x 15' wide x 5' high, retaining 4' of sediment.
3,700'	LDA, 26' long x 20' wide x 12' high, retaining 10' of sediment.
3,841'	Right bank tributary. Channel is steep and narrow, not accessible to fish.
3,881'	Road along right bank is now 20' from the creek.
3,993'	Left bank tributary, dry.
4,035'	Left bank tributary, dry.
4,112'	LDA, 57' long x 25' wide x 11' high, retaining 10' of sediment, possible barrier.
4,397'	Right bank tributary, dry.
4,513'	LDA, 3' long x 7' wide x 5' high.
4,541'	Left bank erosion, 45' long x 20' high.
4,687'	LDA, 20' long x 8' wide x 6' high.
4,942'	Left bank tributary with a LDA 20' up the channel, 8' long x 10' wide x 10' high,

probable barrier.

4,973'	LDA, 8' long x 8' wide x 4' high.
5,070'	Left bank erosion, 15' long x 20' high.
5,111'	LDA, 30' long x 10' wide x 7' high, retaining trash, appliances, tires, and boots.
5,162'	Left bank tributary, not accessible to fish.
5,197'	Right bank tributary, steep and narrow with a clay dominated substrate. One hundred feet up the tributary is open marsh and braided stream for an unknown distance. Not accessible to fish.
5,282'	Channel becomes steep and very entrenched.
5,433'	Right bank tributary, dry. Clay and boulder are the dominate substrate. There is a 5' high jump into the tributary.
5,435'	A living tree and root wad form a LDA, 15' long x 4' wide x 8' high. The stream funnels through the root mass.
5,458'	LDA, 15' long x 11' wide x 8' high, probable barrier.
5,560'	End of survey. The LDA at 5,458' appears to be a complete barrier to fish passage. The channel upstream continues through more LDA's and has a silt dominant substrate. The flow is stagnant. No fish were observed during the entire survey.

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