STREAM INVENTORY REPORT

Gates Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Gates 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 Gates 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 Gates Creek. Electrofishing conducted in October of 1988 by the Department of Fish and Game found steelhead and coho salmon. 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

Gates Creek is tributary to Daugherty Creek a tributary to the South Fork Big River, located in Mendocino County, California. Gates Creek's legal description at the confluence with Daugherty Creek is T16N R14W S32. Its location is 39°12'21" N. latitude and 123°26'03" W. longitude. Gates Creek is a second order stream and has approximately 2.7 miles of blue line stream, according to the USGS Baily Ridge and Orrs Springs 7.5 minute quadrangles. Gates Creek drains a watershed of approximately 5.3 square miles. Elevations range from about 680 feet at the mouth of the creek to 2,000 feet in the headwater areas. Redwood and Douglas fir forest dominate the watershed. The watershed is owned primarily by the Louisiana-Pacific Corporation and is managed for timber production. Vehicle access exists via Masonite Road.

METHODS

The habitat inventory conducted in Gates 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). Gates Creek personnel were trained in May, 1993, by Gary Flosi and Scott Dwwnie. This inventory was conducted by a two person team.

HABITAT INVENTORY COMPONENTS

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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 Gates Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Daugherty Creek report.

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 Gates Creek to document the fish species composition and distribution. Three sites were electrofished in Gates 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. 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 Gates 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

The habitat inventory of August 11, 16, 17 and 18, 1993, was conducted by Brian Humphrey and Charles Patton (CCC). The total length of the stream surveyed was 13,138 feet, with an additional 382 feet of side channel.

Flows were not measured on Gates Creek.

Gates Creek is an B1-1 channel type for the entire 13,138 feet of stream reach surveyed. B1-1 channels are moderate gradient, bedrock controlled channels.

Water temperatures ranged from 57 to 66 degrees fahrenheit. Air temperatures ranged from 60 to 79 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37.1%, flatwater types 33.0%, and pools 29.2% (Graph 1). Flatwater habitat types made up 43.6% of the total survey **length**, riffles 37.8%, and pools 18.5% (Graph 2).

Fifteen 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 36.1%; step runs, 17.2%; and runs, 12.4% (Graph 3). By percent total **length**, low gradient riffles 37.2% and step runs 31.6%.

Eighty-five pools were identified (Table 3). Scour pools were most often encountered at 65.9%, and comprised 69.4% 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. Forty-eight of the 85 pools (56%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 84 pool tail-outs measured, five had a value of 1 (6.0%); 30 had a value of 2 (35.7%); 26 had a value of 3 (31.0%); and 23 had a value of 4 (27.4%). 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 28.3. Flatwater habitats followed with a rating of 14.1 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 31.0, and main channel pools rated 22.9 (Table 3).

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

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Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 72 of the 105 low gradient riffles (68.6%). Large cobble was the next most frequently observed dominant substrate types, and occurred in 14.3% of the low gradient riffles (Graph 8).

Twenty-three percent of the survey reach lacked shade canopy. Of the 77% of the stream covered with canopy, 22% was composed of deciduous trees, and 78% was composed of coniferous trees. Graph 9 describes the canopy in Gates 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 60.6%. The mean percent left bank vegetated was 67.0%. The dominant elements composing the structure of the stream banks consisted of 12.5% bedrock, 1.0% boulder, 3.8% cobble/gravel, 12.7% bare soil, 7.2% grass, 6.4% brush. Additionally, 4.5% of the banks were covered with deciduous trees, and 51.9% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on August 24, 1993 in Gates Creek. The units were sampled by Craig Mesman and Charles Patton (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat units 3 and 4, a low gradient riffle and lateral scour pool - bedrock, approximately 112 feet from the confluence with Daugherty Creek. This site had an area of 623 sq ft, and a volume of 576 cu ft. The unit yielded 21 steelhead, ranging from 50 to 118mm; two sculpin; one amnocete; and one adult pacific lamprey.

The second site was habitat unit 243, a mid-channel pool, located approximately 10,958 feet above the creek mouth. This site had an area of 264 sq ft, and a volume of 370 cu ft. Seven steelhead were sampled. They ranged from 74 to 83mm.

The third site sampled was just above habitat unit 280, a step run and a mid-channel pool, located approximately 14,000 feet above the creek mouth. Fourteen sculpin were sampled.

DISCUSSION

The B1-1 channel type is generally not suitable for channel aggrading structures. The B1-1 channel is good for log and/or root wad cover structures, boulder placement, and opposing deflectors in straight reaches.

The water temperatures recorded on the survey days August 11-18, 1993 ranged from 57° F to 66° F. Air temperatures ranged from 60° F to 79° F. This is a good water temperature regime for salmonids. However, 66° F, if sustained, is near the threshold stress level for salmonids. To

make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 43.6% of the total **length** of this survey, riffles 37.8%, and pools 18.5%. The pools are relatively deep with 48 of the 85 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 where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Forty-nine of the 84 pool tail-outs measured had embeddedness ratings of 3 or 4. Only five 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 Gates 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 low with a rating of 28.3. The shelter rating in the flatwater habitats was 14.1. 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, large 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.

Eighty-four of the 105 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 77%. 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) Soda Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Soda 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) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, should then be treated to reduce the amount of fine sediments entering the stream.

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) 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) 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.

7) There are several log debris accumulations present on Gates 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.

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:
0'	Begin survey at confluence with Daugherty Creek. Gates Creek is a B1 channel type.
343'	Left bank erosion, 70' high x 70' long contributing a small amount of fines into the channel.
984'	Trees fallen in the stream, covering the entire wetted width of the stream, 50' long x 10' wide.
1603'	Tributary enters from the right bank.
2224'	Spring enters from the left bank.
2574'	Left bank erosion 70' high x 40' long, contributing fines into the channel.

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3004'	Small tributary enters from the right bank.
4219'	Log debris accumulation (LDA), 15' long x 20' wide x 6' high.
4440'	Dry tributary enters from the right bank.
5210'	Road crossing.
5239'	Right bank erosion 15' high x 20' long.
5353'	LDA 5' high x 18' long x 30' wide.
5895'	Right bank erosion 10' high.
6146'	LDA, 40' long x 10' wide x 7' high.
6639'	Left bank erosion 10' high.
6794'	LDA, 10' long x 5' high x 10' wide.
7227'	Right bank erosion 9' high.
8225'	Railroad car bridge, 6' high.
8700'	Right bank erosion 12' high x 50' long.
8824'	Johnson Creek enters from the right bank.
8933'	Road crossing.
9163'	Right bank erosion 12' high x 50' long.
9535'	Bank erosion 10' high, contributing fines into the channel.
9748'	Left bank erosion 10' high x 60' long.
10038'	Tributary entering from the right bank.
10178'	Left bank erosion 14' high x 40' long.
10309'	LDA, 15' long x 27' wide, 5' high.
10606'	LDA, 6' high x 24' wide x 20' long, retaining silt and sand. Possible barrier.
10958'	Right bank erosion, 90' long x 70' high, contributing fines into the channel.

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10982'	Left bank erosion, 60' long x 60' high, contributing fines into the channel.
10997'	LDA, 30' wide x 6.5' high x 8' long, retaining gravel.
11866'	Railroad car bridge, 7' high.
12033'	LDA, 6' high x 18' wide x 10' long, retaining gravel.
12167'	Right bank erosion, 30' high x 40' long, contributing fines.
12953'	LDA, 20' wide x 7' high x 15' long.
13073'	LDA, 48' long x 48' wide x 9' high. End of survey reach due to multiple LDA's. Approximately 500' upstream is a LDA 80' long x 40' wide x 10' high, retaining gravel 10' high.

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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

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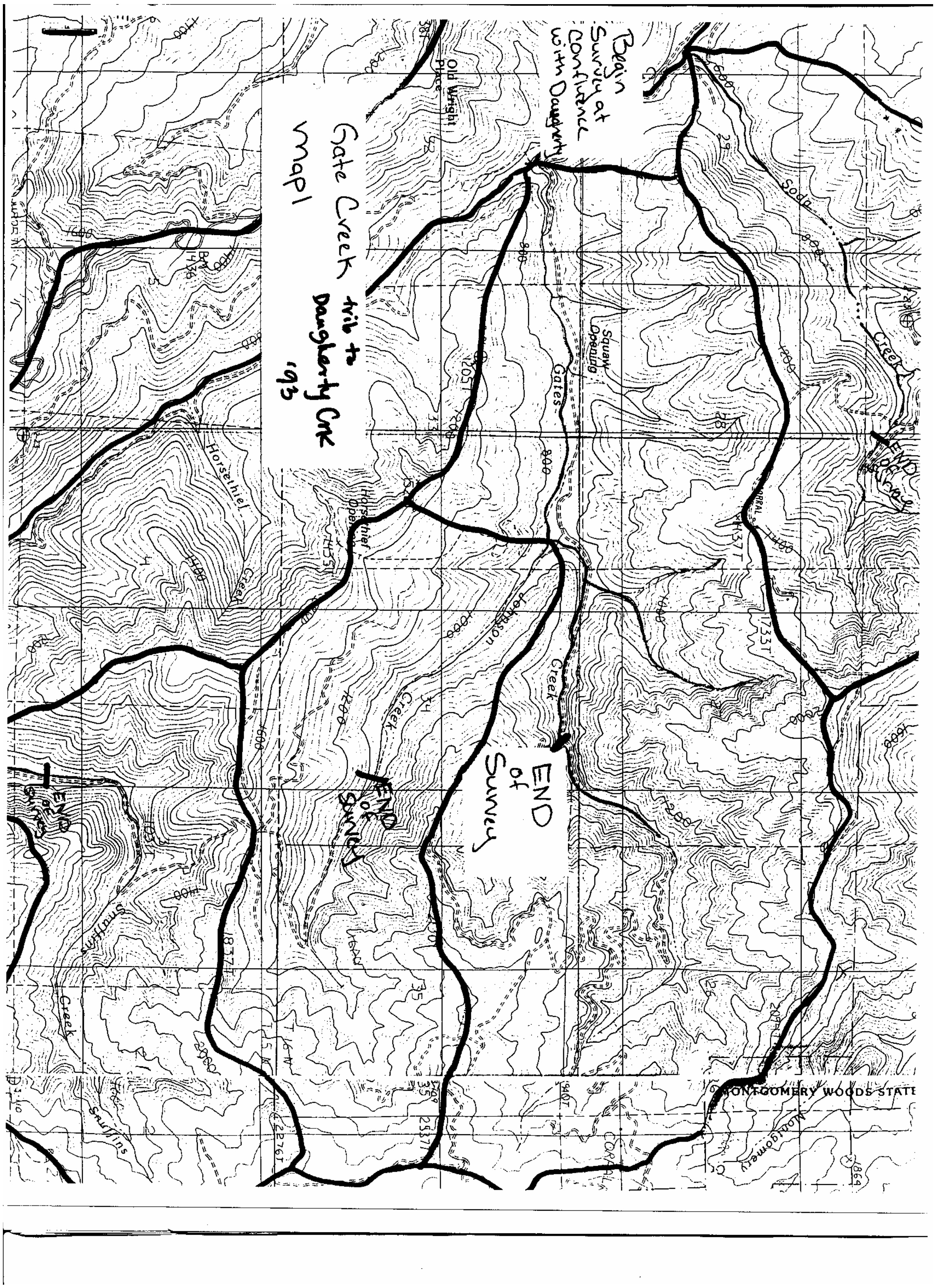
Begin Survey at Confluence with Daugherty
Gate Creek map 1
trib to Daugherty Crk '93
END of Survey
Gates
Squaw Opening
Horsethief
Soda Creek
Old Wright Place
MONTGOMERY WOODS STATE