STREAM INVENTORY REPORT

Little North Fork Gualala River

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Little North Fork Gualala River. The survey began at the confluence with the North Fork Gualala River and extended upstream 3.9 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Little North Fork Gualala River.

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

Little North Fork Gualala River is a tributary to the North Fork Gualala River, a tributary to the Gualala River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Little North Fork Gualala River's legal description at the confluence with the North Fork Gualala River is T11N R15W S23. Its location is 38.7911 degrees north latitude and 123.50987 degrees west longitude. Little North Fork Gualala River is a second order stream and has approximately 4.2 miles of blue line stream according to the USGS Gualala 7.5 minute quadrangle. Little North Fork Gualala River drains a watershed of approximately 6.6 square miles. Elevations range from about 190 feet at the mouth of the creek to 1,020 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 1 south to the town of Gualala and then travel east along the Gualala River to the North Fork of the Gualala and travel north along the North Fork Gualala River to the mouth of the Little North Fork Gualala River.

METHODS

The habitat inventory conducted in Little North Fork Gualala River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) personnel 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. 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 (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 Little North Fork Gualala River 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 a Marsh-McBirney Model 2000 flow meter.

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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

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". Little North Fork Gualala River 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Little North Fork Gualala River, 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 not suitable for spawning due to inappropriate substrate particle size, bedrock, 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 Little North Fork Gualala River, 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 Little North Fork Gualala River, 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 Little North Fork Gualala River, 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 (including downed trees, logs, and rootwads) was estimated and recorded.

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 Little North Fork Gualala River 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
- Mean 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 to August 2, 2001 was conducted by A. Palacios and K. VandenBranden (PSMFC). The total length of the stream surveyed was 20,806 feet with an additional 1,404 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.1 cfs on June 20, 2001.

Little North Fork Gualala River

Little North Fork Gualala River is an F4 channel type for the first 9,796 feet of the stream surveyed, a B4 channel type for the next 7,514 feet of stream surveyed and a B3 channel type for the remaining 3,496 feet of stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B4 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel dominant channel. B3 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and cobble dominant channel.

Water temperatures taken during the survey period ranged from 56 degrees Fahrenheit to 64 degrees Fahrenheit. Air temperatures ranged from 50 degrees Fahrenheit to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% pool units, 30% flatwater units, and 19% riffle units (Graph 1). Based on total length of Level II habitat types there were 44% flatwater units, 42% pool units, and 13% riffle units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 32%; low-gradient riffles, 19%; and runs, 18% (Graph 3). Based on percent total length, mid-channel pools made up 27%, step-runs 24%, and runs 19%.

A total of 301 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 65%, and comprised 65% 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. One hundred ten of the 301 pools (36.5%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 292 pool tail-outs measured, 116 had a value of 1 (39.7%); 144 had a value of 2 (49.3%); 25 had a value of 3 (8.6%); one had a value of 4 (0.3%); and six had a value of 5 (2.1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the six pool tail-outs that had a embeddedness value of 5 were as follows: 67% silt/clay, 33% large cobble.

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 18, flatwater habitat types had a mean shelter rating of 19, and pool habitats had a mean shelter rating of 44 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 79. Scour pools had a mean shelter rating of 43 and main channel pools had a mean shelter rating of 35 (Table 3).

Little North Fork Gualala River

Table 5 summarizes mean percent cover by habitat type. Root mass are the dominant cover types in Little North Fork Gualala River. Graph 7 describes the pool cover in Little North Fork Gualala River. Root mass is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 77% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 20%.

The mean percent canopy density for the surveyed length of Little North Fork Gualala River was 92%. The mean percentages of deciduous and coniferous trees were 54% and 46%, respectively. Graph 9 describes the mean percent canopy in Little North Fork Gualala River.

For the stream reach surveyed, the mean percent right bank vegetated was 70%. The mean percent left bank vegetated was 73%. The dominant elements composing the structure of the stream banks consisted of 42% cobble/gravel, 38% sand/silt/clay, and 20% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 68% of the units surveyed. Additionally, 27% of the units surveyed had deciduous trees as the dominant vegetation type, and 2% had brush as the dominant vegetation (Graph 11).

DISCUSSION

Little North Fork Gualala River is an F4 channel type for the first 9,796 feet of stream surveyed, a B4 channel type for the next 7,514 feet and a B3 channel type for the remaining 3,496 feet. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors and log cover; poor for boulder clusters. The suitability of B4 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing-deflectors and log cover. The suitability of B3 channel types for fish habitat improvement structures is as follows: excellent for plunge weirs, boulder clusters and ban placed boulder, single and opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days June 20 to August 2, 2001 ranged from 56 degrees Fahrenheit to 64 degrees Fahrenheit. Air temperatures ranged from 50 degrees Fahrenheit to 76 degrees Fahrenheit. This is a suitable 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 44% of the total length of this survey, riffles 13%, and pools 42%. The pools are relatively shallow, with 110 of the 301 (37%) 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 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.

Two hundred sixty of the 292 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-six of the pool tail-outs had embeddedness ratings of 3 or 4. Six of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Four of the six tail-outs were not suitable for spawning due to the dominant substrate being silt/clay. The remainder of pool tail-outs with embeddedness values of 5 were dominated by large cobble. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Little North Fork Gualala River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Two hundred eighty-two of the 292 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 44. The shelter rating in the flatwater habitats was 19. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by root mass in all habitat types. Additionally, small woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 92%. Reach 1 had a canopy density of 93% while Reaches 2 and 3 had canopy densities of 90% and 94%, respectively. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 70% and 73%, 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) Little North Fork Gualala River 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) 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.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from root mass. Adding high quality complexity with woody cover is desirable.

5) 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.

6) 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.
to be coordinated to follow bank stabilization or upslope erosion control projects.

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'	Start of survey at confluence with North Fork Gualala River. Channel type is F4.
292'	Bridge crosses over Little North Fork Gualala River and is approximately 10’ above channel and measures 60’ long.
370'	Dry right bank tributary.
637'	Dry right bank tributary.
2,110'	Log debris accumulation (LDA) consists of eight large pieces of large woody debris (LWD).
2,955'	LDA consists of 18 pieces of LWD.
3,330'	LDA consists of six pieces of LWD.
3,483'	Tributary enters on the left bank.
4,432'	Culvert (not corrugated) on left bank with a diameter of 2.2’ and a length of 26.5’. Culvert is caved in along entire length.
5,180'	Tributary enters on the left bank.

Little North Fork Gualala River

9,013' Tributary enters on the left bank.

9,463' Tributary enters on the right bank. The water temperature of the tributary was 62 degrees Fahrenheit.

9,805' Dry right bank tributary.

18,003' Tributary enters on the left bank.

18,385' Tributary enters on the left bank.

19,317' An erosion site on the right bank measures approximately 21’ long x 18’ high.

20,200' Dry left bank tributary.

20,635' Dry right bank tributary.

20,806' End of survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

Little North Fork Gualala River

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	