STREAM INVENTORY REPORT

NORTH FORK MATTOLE RIVER

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on the North Fork Mattole River. The survey began at the confluence with the Mattole River and extended upstream 3.0 miles. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in the North Fork Mattole River.

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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

The North Fork Mattole River is a tributary to the Mattole River, located in Humboldt County, California (Map 1). The North Fork Mattole River's legal description at the confluence with the Mattole River is T02S R02W S04. Its location is 40°19′15″ North latitude and 124°17′05″ West longitude. The North Fork Mattole River is a third order stream and has approximately 13.3 miles of blue line stream according to the USGS Petrolia 7.5 minute quadrangle. The North Fork Mattole River drains a watershed of approximately 38.0 square miles. Elevations range from about 65 feet at the mouth of the creek to 2,920 feet in the headwater areas. Mixed conifer and hardwood forest with areas of grassland dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland.

METHODS

The habitat inventory conducted in the North Fork Mattole River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Eel River Watershed Improvement Group (ERWIG) member and 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 the North Fork Mattole 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". The North Fork Mattole 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 the North Fork Mattole 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 unsuited 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 The North Fork Mattole 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 the North Fork Mattole 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 the North Fork Mattole 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 the North Fork Mattole 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 11 and 12, 2002, was conducted by Ruth Goodfield (ERWIG) and Dave Kajtaniak (PSMFC). The total length of the stream surveyed was 15,767 feet with an additional 2,121 feet of side channel.

Stream flow was not measured on the North Fork Mattole River.

The North Fork Mattole River is a C3 channel type for the first 13,720 feet of the stream surveyed, and a B3 channel type for the remaining 2,047 feet. C3 channels are low gradient, meandering, point/bar, alluvial channels with broad, well-defined floodplain with cobble

streambeds. B3 channels are moderately entrenched, moderate gradient, riffle dominated with infrequently spaced pools. Generally, they have stable banks and cobble channels.

Water temperatures taken during the survey period ranged from 67 to 82 degrees Fahrenheit. Air temperatures ranged from 57 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 36% riffle units, 35% flatwater units, and 29% pool units (Graph 1). Based on total length of Level II habitat types there were 38% riffle units, 45% flatwater units, and 17% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 36%; runs, 35%;and mid-channel pools, 18% (Graph 3). Based on percent total length, runs made up 45%, low gradient riffles 38%, and mid-channel pools 10%.

A total of 40 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 65%, and comprised 61% 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. Thirty-five of the 40 pools (87.5%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs tallied, none had a value of 1 (0.0%); 21 had a value of 2 (58.3%); 15 had a value of 3 (41.6%); none had a value of 4 (0.0%); none had a value of 5 (0.0%); and 4 (10%) were not determined (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning 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 5, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 34 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 81. Main channel pools had a mean shelter rating of 31 and Scour pools 22 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in the North Fork Mattole River. Large woody debris is lacking in nearly all habitat types. Graph 7 describes the pool cover in the North Fork Mattole River. Terrestrial vegetation is the dominant pool cover type followed by boulders and 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 62.5% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 27.5%.

The mean percent canopy density for the surveyed length of the North Fork Mattole River was

42%. The mean percentages of deciduous and coniferous trees were 41% and 1%, respectively. Graph 9 describes the mean percent canopy in the North Fork Mattole River.

For the stream reach surveyed, the mean percent right bank vegetated was 50.8%. The mean percent left bank vegetated was 57.4%. The dominant elements composing the structure of the stream banks consisted of 80.4% cobble/gravel, 16% sand/silt/clay and 3.6% bedrock(Graph 10). Deciduous trees were the dominant vegetation type observed in 72.8% of the units surveyed. Additionally, 14.4% of the units surveyed had no vegetation as the dominant vegetation type, and 8.2% had grass as the dominant vegetation (Graph 11).

DISCUSSION

The North Fork Mattole River is a C3 channel type for the first 13,720 feet of the stream surveyed, and a B3 channel type for the remaining 2,047 feet. The suitability of C3 channel types for fish habitat improvement structures is as follows: excellent for bank-placed boulders; good for plunge weirs, boulder clusters, 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 bank placed boulder; single and opposing wing-deflectors; log cover.

The water temperatures recorded on the survey days June 11 and 12, 2002, ranged from 67 to 82 degrees Fahrenheit. Air temperatures ranged from 57 to 81 degrees Fahrenheit. This water temperature range exceeds 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 would need to be conducted.

Flatwater habitat types comprised 45% of the total length of this survey, riffles 38%, and pools 17%. The pools are relatively deep, with 35 of the 40 (87.5) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third order streams, a primary pool is defined to have a maximum depth of at least three 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 in the B3 channel reach.

Twenty-one of the 36 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifteen of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. None of the 40 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or small gravel. 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 he North Fork Mattole River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

All 36 of the 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 34. The shelter rating in the flatwater habitats was 8. 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. Additionally, boulders and small woody debris contribute 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 structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 42%. Reach 1 had a canopy density of 44% while Reach 2 had a canopy density of 33%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 51% and 57%, 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) The North Fork Mattole River should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are above 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) In the B3 channel reach, 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 terrestrial vegetation. 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.

7) Increase canopy on the North Fork Mattole River by planting willow, white alder, 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.

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 the Mattole River. Channel type is C3.
1,996'	Left bank tributary - dry.
3,984'	Bridge (Mattole Road).
4,185'	North Fork Road on right bank. Bank erosion on the right bank.
5,272'	End of right bank erosion.
7,238'	Concrete riprap on right bank.
12,481'	Right bank dry tributary.
13,379'	Grizzly Creek enters from right bank.
13,522'	Channel type changes from C3 to B3.
15,767'	Right bank tributary, 62° F. Flow approximately 0.5 cfs. End of survey due to lack of landowner permission any further upstream.

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.

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]	