STREAM INVENTORY REPORT

Little North Fork

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Little North Fork. The survey begat at the confluence with the South Fork Albion River.

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

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 is tributary to the South Fork Albion River, tributary to the Albion River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Little North Fork's legal description at the confluence with the South Fork Albion River is T16N R16W S21. Its location is 39°13′56″ north latitude and 123°38′46″ west longitude. Little North Fork is a first order stream and has approximately 1.21 miles of blue line stream according to the USGS Elk 7.5 minute quadrangle. Little North Fork drains a watershed of approximately 1.2 square miles. Elevations range from about 170 feet at the mouth of the creek to 1,000 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 128 to Flynn Creek Road.

METHODS

The habitat inventory conducted in Little North Fork follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). 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. 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 Little North Fork 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". Little North Fork 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 Little North Fork , 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 Little North Fork , 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 , 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, 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.

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 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

The habitat inventory of July 14 and 15, 1998, was conducted by Lisa Campbell (WSP) and Kevin McKernan (CCC). The total length of the stream surveyed was 2,000 feet.

Flow was not measured on Little North Fork.

Little North Fork is an F4 channel type for the entire 2,000 feet of stream 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 58 to 63 degrees Fahrenheit. Air temperatures ranged from 58 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 32% riffle units, 43% flatwater units, 18% pool units, 5% dry units, and 2% culvert units (Graph 1). Based on total length of Level II habitat types there were 15% riffle

units, 54% flatwater units, 10% pool units, 17% dry units and 4% culvert units (Graph 2).

Four Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 32%; step run units, 27%; and mid-channel pool units, 18% (Graph 3). Based on percent total length, step run units made up 45%, dry units 17%, and low gradient riffle units, 15%.

A total of 11 pools were identified (Table 3). Main channel pools were most frequently encountered at 100% and comprised 100% 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. Four of the 11 pools (36%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 11 pool tail-outs measured, 7 had a value of 3 (77%); 4 had a value of 4 (36.4%) (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 22, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 128 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 128 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 91% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 9% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 95%. Of the canopy present, the mean percentages of deciduous and coniferous trees were 10% and 90%, respectively. Graph 9 describes the canopy in Little North Fork.

For the stream reach surveyed, the mean percent right bank vegetated was 82%. The mean percent left bank vegetated was 82%. The dominant elements composing the structure of the stream banks consisted of 50% sand/silt/clay, 45% cobble/gravel, and 5% bedrock, (Graph 10). Coniferous trees were the dominant vegetation type observed in 75% of the units surveyed. Additionally, 10% of the units surveyed had grass as the dominant vegetation type, and 10% had brush as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

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DISCUSSION

Little North Fork is an F4 channel type for the entire 2,000 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days July 14 and 15 1998, ranged from 58 to 63 degrees Fahrenheit. Air temperatures ranged from 58 to 76 degrees Fahrenheit. This is a moderate 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 54% of the total length of this survey, riffles 15%, pools 10%, dry units 17%, and culverts 4%. The pools are relatively shallow, with only 4 of the 11 (36.4%) 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.

None of the 11 pool tail-outs measured had an embeddedness rating of 1 or 2. Eleven of the pool tail-outs had embeddedness ratings of 3 or 4. 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 Little North Fork, 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 128. The shelter rating in the flatwater habitats was 6. A pool shelter rating of approximately 100 is desirable. The relatively moderate amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, aquatic vegetation contributes 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.

All eleven 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 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 82% and 82%, respectively.

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RECOMMENDATIONS

1) Little North Fork 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) Active and potential sediment sources related to stream bank erosion and 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.

Position (ft):	Comments:
0'	Begin survey at confluence with South Fork Albion River. Channel type is F4.
77'	Culvert 20' long. Floor of culvert broken in spots, sediment free.
251'	Dry unit has numerous puddles less than 0.4' deep, one of which contained three young-of-the-year salmonids.
880'	Right bank road located 75' upslope with a ditch relief culvert creating a gully.
1,286'	Right bank road failure, vegetated and recovering 100' long x 30' high.
1,628'	Left bank tributary, 57 degrees Fahrenheit.
1,799'	Log debris accumulation with 4' jump, not a barrier.
1,980'	Right bank erosion.
2,000'	End of survey. Salamanders observed. No fish have been observed since the tributary at 1,628'. Gradient increases from <1% to >4%. Last unit characterized by large wood blocking any probable fish passage.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., Collins, B., 1998. California salmonid stream habitat restoration manual, 3rd edition. California Department of Fish and Game, Sacramento, California.

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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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