STREAM INVENTORY REPORT

Stover Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Stover Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Stover Creek.

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

Stover Creek is tributary to the Redwood Creek, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Stover Creek's legal description at the confluence with Redwood Creek is T08N R03E S30. Its location is 41.0489 degrees north latitude and 123.8717 degrees west longitude. Stover Creek is a first order stream and has approximately 0.9 miles of blue line stream according to the USGS Hupa Mountain 7.5 minute quadrangle. Stover Creek drains a watershed of approximately 0.8 square miles. Elevations range from about 560 feet at the mouth of the creek to 2,800 feet in the headwater areas. Redwood forest and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists via Highway 299 to Redwood Valley Road.

METHODS

The habitat inventory conducted in Stover Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The NEAP fisherpersons 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.

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 Stover Creek to record measurements and observations. There are nine components to the inventory form.

Stover Creek

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". Stover Creek 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, tape measures, and stadia rods. 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 Stover Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed not suitable 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.

Stover Creek

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 Stover Creek, 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 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.

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 Stover Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the end of every unit. 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 Stover Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each 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

Stover Creek

Graphics are produced from the tables using Quattro Pro. Graphics developed for Stover 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of August 10 and September 7, 1995 was conducted by Nancy Pearson and Mike Devlin. The total length of the stream surveyed was 770 feet with an additional 41 feet of side channel.

Flows were too low to measure in September 1995 on Stover Creek.

Stover Creek is an A3 channel type for the entire 770 feet of stream reach surveyed. A3 channels are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and are cobble dominant.

The water temperature taken during the survey period was 56 degrees Fahrenheit. The air temperature was 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, pool, dry, and culvert habitat types. Based on frequency of occurrence there were 38% pool units, 28% flatwater units, 22% riffle units, 10% dry units, and 2% culvert units (Graph 1). Based on total length of Level II habitat types there were 34% flatwater units, 32% pool units, 17% riffle units, 9% culvert units, and 8% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step runs, 22%; high gradient riffles, 14%; step pools, 12%; and boulder formed lateral scour pools, 12% (Graph 3). Based on percent total length, step runs made up 28%, step pools 18%, and high gradient riffles 10%.

A total of nineteen pools were identified (Table 3). Scour pools were most frequently encountered at 58% and comprised 38% of the total length of all pools. Main channel pools occurred 32% of the time and comprised 57% of the total length (Graph 4).

Stover Creek

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. None of the nineteen pools (0%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the nineteen pool tail-outs measured, four had a value of 2 (21%); seven had a value of 3 (37%); two had a value of 4 (11%); and six had a value of 5 (32%); (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 34, flatwater habitats had a mean shelter rating of 36, and pool habitats had a mean shelter rating of 21 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 28. Scour pools had a mean shelter rating of 19 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Stover Creek. Graph 7 describes the pool cover in Stover Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was observed in two of the four low gradient riffles (50%) and small cobble was equally observed in two of the four low gradient riffles measured (50%); (Graph 8).

The mean percent canopy density for the stream reach surveyed was 95%. The mean percentages of deciduous and coniferous trees were 89% and 11%, respectively. Graph 9 describes the canopy in Stover Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 35%. The mean percent left bank vegetated was 36%. The dominant elements composing the structure of the stream banks consisted of 59% boulders, 20% sand/silt/clay, 16% cobble/gravel, and 1% bedrock (Graph 10). Grass was the dominant vegetation type observed in 57% of the units surveyed. Additionally, 81% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Stover Creek is an A3 channel type for the entire 770 feet of stream surveyed. The suitability of A3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders, fair for low-stage weirs, opposing wing-deflectors and log cover, and poor for medium-stage weirs, boulder clusters, single wing-deflectors, and log cover.

The water temperatures recorded on the survey days August 10 and September 7, 1995 remained a constant 56 degrees Fahrenheit. The air temperature was 65 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 34% of the total length of this survey, riffles 17%, and pools 32%. The pools are relatively shallow, with none of the 19 pools having a maximum depth greater than two 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 for locations where their installation will not be threatened by high stream energy.

Fifteen of the nineteen pool tail-outs measured had embeddedness ratings of 3, 4 or 5. None of the pool tail-outs had an embeddedness rating of 1. 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 Stover Creek, 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 low with a rating of 21. The shelter rating in the flatwater habitats was slightly better at 36. 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, terrestrial 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 structures provide rearing fry with protection from predation, rest from water velocity, and divide territorial units to reduce density related competition.

All of the low gradient riffles 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%. 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 low at 35% and 36%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Stover Creek should be managed as an anadromous, natural production stream.

2) The county road culvert at 123' from the confluence is a probable barrier to salmonids. Currently the water drops 6 feet from the culvert. Solutions to the fish passage problem should be pursued with DFG.

3) 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 locally available.

4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield.

5) 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.

6) 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.

7) Where feasible, design and engineer pool enhancement structures to deepen existing pools. Although A3 channel types are generally not suitable for pool enhancement structures there may be specific appropriate sites on Stover Creek. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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 the confluence with Redwood Creek. The channel is an A3.
17'	Banks are rip-rap.
123'	County road culvert measures 9' long x 8' wide. Water drops 6'. Very low flow, and no fish observed.
218'	Log suspended over creek.
368'	Log suspended over creek.
388'	Unstable right bank contributing to deposition of silt on channel bed. Slide originates 100 feet up right bank.
422'	Bank still unstable.
494'	Log along right bank.

Stover Creek

590' Log jam across top of unit, retaining gravel.

650' Log overhead spans entire stream bed.

678' No fish observed.

736' Log suspended over top of pool.

749' Suspended log.

770' Heavy erosion on both banks. Dry bankfull above survey 20 feet wide, then returned to 10-12' wide to for another 100' step-run.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

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