STREAM INVENTORY REPORT

STREETER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Streeter 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 Streeter 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.

Three adult carcass surveys were conducted in Streeter Creek during the 1988-89 spawning season. In Dec. 1988, three live chinook salmon, as well as 24 chinook carcasses, five redds and 1 coho salmon were found in the first mile of the stream. In January, 1989, a total of 61 chinook carcasses were found in the same stream section. No other carcass surveys have been conducted on Streeter Creek. The purpose 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

Streeter Creek is tributary to Ten Mile Creek, tributary to the South Fork Eel River, located in Mendocino County, California. Streeter Creek's legal description at the confluence with Ten Mile Creek is T22N R15W S22. Its location is 39°44'48" N. latitude and 123°31'39" W. longitude. Streeter Creek is a second order stream and has approximately 3.6 miles of blue line stream, according to the USGS Cahto Peak 7.5 minute quadrangle. Streeter Creek drains a watershed of approximately 5 square miles. Summer base runoff is approximately 1.3 cfs at the mouth. Elevations range from about 1,460 feet at the mouth of the creek to 3,500 feet in the headwater areas. Oak grasslands dominates the watershed, with pine and Douglas fir forests as a secondary component. The watershed is privately owned and is managed for rural residence and rangeland. Vehicle access exists via Black Oak Ranch Road, approximately 2 miles north of Laytonville on Highway 101. Foot access is available approximately 0.2 miles north from Black Oak Ranch headquarters.

METHODS

The habitat inventory conducted in Streeter 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). Streeter Creek personnel were trained in May, 1994, by Gary Flosi and Scott Downie. 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 Streeter Creek 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. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are measured and recorded at each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in 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". Streeter 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, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken 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 Streeter 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).

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 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 Streeter 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.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Streeter Creek, an estimate of the percentage of

the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition:

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 Streeter Creek, the dominant composition type in both the right and left banks was selected from a list of eight options on the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

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 Streeter Creek to document the fish species composition and distribution. Four sites were electrofished in Streeter 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.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85mm).

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 Streeter 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

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 15 through July 6, 1994, was conducted by Will Abel and Ruth Goodfield (CCC). The total length of the stream surveyed was 16,778 feet, with an additional 1,414 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.3 cfs on June 15, 1994.

Streeter Creek is a B4 channel type for the first 11,971 feet of stream reach surveyed. The remaining 4,807 feet of stream included in the survey is classified as a B3 channel. B channel types are moderate gradient (2-4% gradient), moderately confined streams, with stable stream banks.

Water temperatures ranged from 59 to 76 degrees Fahrenheit. Air temperatures ranged from 62 to 94 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 39%, flatwater types 36%, and pools 25% (Graph 1). Flatwater habitat types made up 41% of the total survey **length**, riffles 30%, and pools 29% (Graph 2).

Twenty 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, 38%; runs, 32%; and mid-channel pools, 13% (Graph 3). By percent total **length**, low gradient riffles were 30%, runs 35%, and mid-channel pools 17%.

One hundred twenty-seven pools were identified (Table 3). Main-channel pools were most often encountered at 54%, and comprised 61% 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. Eighty three of the 127 pools (65%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 127 pool tail-outs measured, zero had a value of 1; 31 had a value of 2 (24.5%); 91 had a value of 3 (71.5%); and 5 had a value of 4 (4.0%). 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. Backwater pool habitat types had the highest shelter rating at 175. Scour pool habitats followed with a rating of 78 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Streeter Creek. Large woody debris is lacking in nearly all habitat types. Graph 7 describes the pool cover in Streeter Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 114 of the 192 low gradient riffles (59%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 42% of the low gradient riffles (Graph 8).

Thirty-four percent of the survey reach lacked shade canopy. Of the 66% of the stream covered with canopy, 97% was composed of deciduous trees, and 3% was composed of coniferous trees. Graph 9 describes the canopy in Streeter 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 53.8%. The mean percent left bank vegetated was 57.5%. The dominant elements composing the structure of the stream banks consisted of 7.1% bedrock, 17.7% boulder, 53.9% cobble/gravel, 21.4% bare soil. Additionally, 44.2% of the banks were covered

with deciduous trees, and 4% with coniferous trees, including downed trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished in June and July of 1994 in Streeter Creek. The units were sampled by Will Abel and Ruth Goodfield (CCC). All measurements are fork lengths (FL) unless noted otherwise.

The first site sampled was habitat unit 007, a low gradient riffle, approximately 170 feet from the confluence with Ten Mile Creek. This site had an area of 105 sq ft, and a volume of 52.5 cu ft. The unit yielded 19 steelhead, ranging from 38 to 135mm FL.

The second site was habitat unit 271, a mid-channel pool, located approximately 10,889 feet above the creek mouth. This site had an area of 250 sq ft, and a volume of 350 cu ft. Forty-four steelhead were sampled. They ranged from 31 to 113mm FL.

The third site sampled was habitat unit 279, a run, located approximately 11,134 feet above the creek mouth. The site had an area of 126 sq ft, and a volume of 50.4 cu ft. Ten steelhead were sampled, ranging from 34 to 108mm FL.

The fourth site was habitat unit 439, a channel confluence pool, located approximately 16,627 feet above the creek mouth. This site had an area of 220 sq ft, and a volume of 154 cu ft. Fifty-one steelhead were sampled. They ranged from 32 to 159mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Streeter Creek.

DISCUSSION

The B4 channel type is generally suitable for fish habitat improvement structures. B4 channels are found in moderate gradient streams, with stable stream banks. Usually within the B4 channel there are stable areas where structures can be installed. This seems to be the case in Streeter Creek, but any structure sites must be selected with care because of the fine-grained stream beds which can create problems with stream bank erosion and structure stability.

The water temperatures recorded on the survey days June 15 through July 7, 1994 ranged from 59° F to 76° F. Air temperatures ranged from 62° F to 94° F. This is a poor water temperature regime for salmonids. These temperatures, if sustained, are near the threshold stress level for salmonids. This seems to be the case here, and Streeter Creek appears to have summer temperatures problematic to 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 41% of the total **length** of this survey, riffles 30%, and pools 29%. The pools are relatively deep with 83 of the 127 pools having a maximum depth greater than 2 feet. 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, cause streambank erosion, or conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Ninety-six of the 127 pool tail-outs measured had embeddedness ratings of 3 or 4. None 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 Streeter 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 fair with a rating of 80. The shelter rating in the flatwater habitats was slightly lower at 55. However, a pool shelter rating of approximately 100 is desirable. The majority of cover that now exists is being provided primarily by boulders and small woody debris in all habitat types. Additionally, terrestrial and aquatic vegetation 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.

One hundred thirty-six of the 192 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 66%. This is a moderate percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. However, the lower reaches of Streeter Creek have a much lower percentage of canopy than the upper reaches. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Temperatures in this section of Streeter 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) Increase the canopy on Streeter Creek by planting willow and alder 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.

4) 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.

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) Two sites were observed where the stream is being impacted from cattle trampling the riparian zone and defecating in the water. Alternatives should be explored with the grazier, and developed if possible.

7) 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.

8) 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.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with Ten Mile Creek. Reach #1 is a B4 channel type. Evidence of cattle grazing and trampling. No migration barrier observed at mouth.
170'	Bioinventory site #1.
1846'	Culvert: 3' diameter x 21' long.
5828'	Railroad car bridge crossing. Landowner has observed salmon spawning throughout this reach in past years.
10889'	Bioinventory site #2.
11134'	Bioinventory site #3.
11769'	Road fords stream; not in active use.
11805'	Tributary entering from right bank (RB).
11971'	Channel type change. Reach #2 is a B3 channel type.
12355'	Small tributary enters from RB.
14093'	Tributary enters from RB.
16627'	Bioinventory site #4. Streeter Creek flow becomes intermittent. Tributary enters from right bank (RB) and has < .10 cfs approximate flow. Survey continues up the tributary.
16778'	End of permitted access. Flow becomes intermittent. End of survey.

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