STREAM INVENTORY REPORT

DINNER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Dinner 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 Dinner 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.

There is no known record of adult spawning surveys having been conducted on Dinner Creek. 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.

WATERSHED OVERVIEW

Dinner Creek is tributary to China Creek, tributary to the Redwood Creek, tributary the South Fork Eel River, located in Humboldt County, California. Dinner Creek's legal description at the confluence with China Creek is T4S R2E S23. Its location is 40°06'18" N. latitude and 123°55'35" W. longitude. Dinner Creek is a first order stream and has approximately 1.5 miles of blue line stream, according to the USGS Briceland 7.5 minute quadrangle. Dinner Creek drains a watershed of approximately 1.5 square miles. Elevations range from about 660 feet at the mouth of the creek to 1,200 feet in the headwater areas. Grass, oak and Douglas fir forest dominate the watershed. The watershed is privately owned and managed as residential. Vehicle access exists from State HWY 101 to Briceland via Redwood Drive, Redway. The mouth of Dinner Creek is located approximately 65 feet from Briceland Road, three miles from the town of Briceland.

METHODS

The habitat inventory conducted in Dinner Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991). The contract seasonals that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Dinner Creek personnel were trained in June, 1993, 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 Dinner 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". Dinner 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 Dinner 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 Dinner 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 Dinner 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 Dinner 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 Dinner Creek to document the fish species composition and distribution. Two sites were electrofished in Dinner 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 Dinner 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 August 24 and September 7 & 8, 1993, was conducted by Warren Mitchell and Ruth Goodfield (contract seasonals). The total length of the stream surveyed was 9,948 feet, with an additional 233 feet of side channel.

Flows were not measured on Dinner Creek.

Dinner Creek has three channel types; from the mouth to 693 feet a B2; the next 751 feet a B1-1; and from 1,444 to 9,948 feet a C3. B2 channels are moderate gradient (1.0-2.5%), stable streams, with large cobble/ coarse gravel substrate. B1-1 types are moderate gradient (1.5-4.0%), bedrock controlled channels with shallow channel entrenchment. C3 channel types are low gradient (0.5-1.0%), meandering streams with unconsolidated, noncohesive beds, and unstable stream banks.

Water temperatures ranged from 53 to 63 degrees Fahrenheit. Air temperatures ranged from 51 to 83 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 41.7%, flatwater types 30.3%, and riffles 26.1% (Graph 1). Flatwater habitat types made up 42.4% of the total survey **length**, pools 33.8%, and riffles 13.6% (Graph 2).

Thirteen 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, 25.4%; runs, 16.9%; and corner pools, 14.0% (Graph 3). By percent total **length**, step runs made up 27.6%, runs 14.8%, and low gradient riffles 13.2%.

One-hundred-twenty-eight pools were identified (Table 3). Scour pools were most often encountered at 70.3%, and comprised 72.4% 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. Forty-three the 128 pools (34%) 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, none had a value of 1 (0.0%); 3 had a value of 2 (2.3%); 76 had a value of 3 (59.8%); and 48 had a value of 4 (37.8%). 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. Pool habitat types had the highest shelter rating at 25.2. Flatwater habitats followed with a rating of 12.5 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 30.0, and scour pools rated 25.8 (Table

3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Dinner Creek and is extensive. Root Mass and large woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Dinner Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 72 of the 78 low gradient riffles (92.2%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 2.6% of the low gradient riffles (Graph 8).

Eight percent of the survey reach lacked shade canopy. Of the 92% of the stream covered with canopy, 88% was composed of deciduous trees, and 9.6% was composed of coniferous trees. Graph 9 describes the canopy in Dinner 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 64.3%. The mean percent left bank vegetated was 64.5%. The dominant elements composing the structure of the stream banks consisted of 1.1% bedrock, 3.1% boulder, 2.3% cobble/gravel, 11.7% bare soil, 1.5% grass, 62.7% brush. Additionally, 16.5% of the banks were covered with deciduous trees, and 1.1% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on Sept. 1, 1993 in Dinner Creek. The units were sampled by Ruth Goodfield and Warren Mitchell (contract seasonals). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 10, a mid-channel pool, approximately 558 feet from the confluence with the China Creek. This site had an area of 168 sq ft, and a volume of 134 cu ft. The unit yielded 7 steelhead, ranging from 58 to 145mm FL and 25 coho ranging from 55 to 75mm FL.

The second site was habitat unit 49, a corner pool, located immediately above a small left bank tributary approximately 1,989 feet above the creek mouth. This site had an area of 126 sq ft, and a volume of 139 cu ft. Two steelhead were sampled; 72 and 78mm FL. In addition, 19 coho were sampled. They ranged from 71 to 85mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Dinner Creek.

DISCUSSION

Dinner Creek has three channel types: B2, B1-1, and C3. The low gradient, meandering gravel beds, and unstable stream banks of the C3 channel are generally not suitable for most instream habitat improvement structures. However, bank placed boulders, overhead log cover, and submerged shelters in straight reaches can provide some shelters without promoting bank erosion. There are 8,504 feet of this channel type in Dinner Creek.

The B1-1 and B2 channel types are excellent for many types of low stage plunge weirs, in-channel and bank boulder placement, single and double wing deflectors, channel constrictors, and bank cover structures. In Dinner Creek there are 1,444 feet of these channel types.

The water temperatures recorded on the survey days August 8, and September, 7 & 8, 1993 ranged from 53° F to 63° F. Air temperatures ranged from 51° F to 83° F. This is a very good water temperature regime for 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 30.1% of the total **length** of this survey, riffles 26.1%, and pools 41.7%. The pools are relatively shallow with only 43 of the 128 pools having a maximum depth greater than 2 feet. However, 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 threatened the unstable stream banks of the C3 channel type.

One-hundred-twenty-four of the 128 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 Dinner 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 low with a rating of 25.2. The shelter rating in the flatwater habitats was slightly less at 12.5. However, a pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large woody debris and boulders 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.

Seventy-four of the 78 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 92%. This is a high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) 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.

3) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 1264', should then be treated to reduce the amount of fine sediments entering the stream.

4) 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.

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 China Creek. Channel type is a B2 for first 693' of survey.
348'	Concrete culvert 35' long x 7' diameter.
694'	Channel type changes from a B2 to a B1-1 for the next 751' of stream surveyed.
1264'	Right bank (RB) failure 42' long x 11' high, contributing fines directly into the stream.
1444'	Channel type changes from a B1-1 to a C3 for remaining 8,504' of stream surveyed.
1967'	Small tributary entering from left bank (LB).

2178'	Flow becomes intermittent over next 10 units. No fish observed.
6049'	Corrugated metal culvert with baffles 91' long x 7' diameter.
7648'	Failure on LB causing trees and other debris to fall into channel.
8064'	Dry tributary enters from LB.
8387'	Dry tributary enters from RB.
8578'	Small dry tributary enters from RB.
8693'	RB failure contributing fines and woody debris directly into stream.
8734'	Small tributary entering from RB.
8934'	Small log debris accumulation (LDA) spanning channel. Not a fish barrier.
9502'	Dry tributary enters from RB.
9519'	Small LDA; retaining fines and gravel. Not a fish barrier.
9948'	Intermittent tributary entering from LB. Tributary flows through metal culvert under Briceland Road to a 5' plunge. Main stem continues approximately 130. Gradient increases, flow decreases, no fish observed. 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