# STREAM INVENTORY REPORT

# HORSE CREEK

## INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Horse 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 Horse 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 Horse 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

Horse Creek is tributary to Butte Creek, tributary to the Little Van Duzen River, tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Horse Creek's legal description at the confluence with Butte Creek is T1N R4E S25. Its location is 40°25'58" N. latitude and 123°40'55" W. longitude. Horse Creek is a first order stream and has approximately 3.6 miles of blue line stream, according to the USGS Larabee Valley 7.5 minute quadrangle. Horse Creek drains a watershed of approximately 4.2 square miles. Elevations range from about 2,400 feet at the mouth of the creek to 4,000 feet in the headwater areas. Grass, oak, and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for rangeland and timber production. Vehicle access exists from State Highway 36, approximately 31 miles east from Alton and Highway 101, via Butte Creek Road.

## METHODS

The habitat inventory conducted in Horse 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). Horse Creek personnel were trained in May, 1992, 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 Horse Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used, see the Butte Creek report.

## 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 Horse Creek to document the fish species composition and distribution. Two sites were electrofished in Horse 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.

## 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 (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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 Horse 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 18-20, 1992, was conducted by Michelle Rose and Jason Cleckler (contract seasonals). The total length of the stream surveyed was 5,861 feet.

Flows were not measured on Horse Creek.

Horse Creek is a B2 channel type for the entire 5,861 feet of stream reach surveyed. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable stream banks.

Water temperatures ranged from 55 to 59 degrees fahrenheit. Air temperatures ranged from 60 to 86 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 33.7%, flatwater types 22.5%, and riffles 11.2% (Graph 1). Flatwater habitat types made up 37.3% of the total survey **length**, pools 28.5%, riffles 10.9%, and 23.3% was dry (Graph 2).

Ten Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by

percent **occurrence** were mid-channel pools, 25.8%; runs, 13.5%; and low gradient riffles 10.1% (Graph 3). By percent total **length**, mid-channel pools made up 22.6%, runs 16.3%, and step runs 16.1%. At the time of the survey, 23.3% of the length of the survey reach was dry.

Thirty pools were identified (Table 3). Main channel pools were most often encountered at 83.3%, and comprised 87.6% 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. Nineteen of the 30 pools (63%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 27 pool tail-outs measured, zero had a value of 1 (0.0%); 9 had a value of 2 (33.3%); 17 had a value of 3 (63.0%); and 1 had a value of 4 (3.7%). 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 49.5. Flatwater habitats followed with a rating of 29.0 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 67.0, and main channel pools rated 46.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Horse Creek and are extensive. Undercut banks are the next most common cover type. Graph 7 describes the pool cover in Horse Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in three of the nine low gradient riffles (33.3%). Small cobble was also the dominant substrate in 33.3% of the low gradient riffles (Graph 8).

Thirty-six percent of the survey reach lacked shade canopy. Of the 64% of the stream covered with canopy, 83% was composed of deciduous trees, and 17% was composed of coniferous trees. Graph 9 describes the canopy in Horse Creek.

Horse 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 38.3%. The mean percent left bank vegetated was 40.8%. The dominant elements composing the structure of the stream banks consisted of 9.4% bedrock, 10.0% boulder, 29.4% cobble/gravel, 5.0% bare soil, 7.5% grass, 1.2% brush. Additionally, 30.3% of the banks were covered with deciduous trees, and 3.4% with coniferous trees, including downed trees, logs, and root wads.

## BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on August 19, 1992 in Horse Creek. The units were sampled by Jason Cleckler, Aaron Nadig, and Michelle Rose (contract seasonals). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 017, a mid-channel pool, approximately 899 feet from the confluence with Butte Creek. This site had an area of 1,479 sq ft, and a volume of 1,923 cu ft. The unit yielded 10 steelhead/rainbow trout, ranging from 110 to 200mm FL. Ten Pacific lamprey ammocetes were also sampled, but not measured.

The second site was habitat unit 027, a mid-channel pool, located approximately 1,324 feet above the creek mouth. This site had an area of 776 sq ft, and a volume of 931 cu ft. Four steelhead/rainbow trout were sampled in two passes. They ranged from 80 to 150mm FL. One Pacific lamprey ammocete was also sampled, but not measured.

## DISCUSSION

The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days August 18-20, 1992 ranged from 50° F to 59° F. Air temperatures ranged from 60° F to 86° F. This is a very good water temperature regime for

salmonids. However, 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 37.3% of the total **length** of this survey, pools 28.5%, and riffles 10.9%. The pools are relatively deep with 19 of the 30 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.

Eighteen of the 27 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Horse 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 moderate with a rating of 49.5. The shelter rating in the flatwater habitats was lower at 29.0. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, undercut banks contribute a small amount. Log and root wad cover structures in the 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.

Six of the 9 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 64%. This is a relatively 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) Horse Creek should be managed as an anadromous, natural production stream.

2) Increase woody cover in the pool habitat units. Most of the existing cover is from boulders and undercut banks. 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 812', 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.

5) Increase the canopy on Horse Creek by planting willow, 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.

## 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.

Horse Creek

| | |
|---|---|
| 0' | Begin survey at confluence with Butte Creek. Channel type is a B2 for the entire survey reach. There is a Jeep trail that crosses the stream here. |
| 812' | Bank erosion 200' high x 100' long. |
| 1055' | Numerous 1+ steelhead observed. |
| 2132' | Log and debris accumulation (LDA); no apparent barrier. |
| 3879' | Dirt road crossing. |
| 3997' | LDA 15' long x 25' wide x 8' high; no apparent barrier. |
| 5408' | YOY and 1+ steelhead/rainbow trout observed. |
| 5861' | Gradient increases and large boulders dominate the channel, with 3-7' plunges. 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 |