# STREAM INVENTORY REPORT

# WILSON CREEK

## INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Wilson 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 Wilson 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 Wilson Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

## WATERSHED OVERVIEW

Wilson Creek is tributary to Yager Creek, tributary to the Van Duzen River, located in Humboldt County, California. The legal description at the confluence with Yager Creek is T02N R01E S28. Its location is 40°31'49" N. latitude and 124°04'00" W. longitude. Wilson Creek is a second order stream. The total length of blue line stream, according to the USGS Hydesville quadrangle is 2.0 miles.

Wilson Creek drains a watershed of approximately 1.99 square miles. Redwood forest dominates the watershed. The watershed is owned by the Simpson Timber Company and other private interests and is managed for timber production. Vehicle access exists from State Highway 36, which crosses Wilson Creek in the town of Carlotta, approximately one-half mile above the stream's mouth.

## METHODS

The habitat inventory conducted in Wilson Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The inventory was conducted by a two person team. The California Conservation Corps (CCC), Technical Advisors conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Wilson Creek personnel were trained in May and June, 1991, by Gary Flosi and

Scott Downie.

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 Wilson 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 was 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 operations 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 each tenth unit typed. The time of the measurement is also recorded. 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 used 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". Wilson 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 measurements were accomplished using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the pool tail crest at each pool habitat unit was measured at the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

Wilson Creek

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 Wilson 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 Wilson 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 Wilson Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

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 Wilson 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 Wilson Creek to document the salmonid species composition and distribution. Three sites were electrofished using one Smith Root Model 12 electrofisher. 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.

## 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 Wilson 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 September 3, 1991, was conducted by Shea Monroe and Jerry Suissa (CCC). The total length of the stream surveyed was 2,481 feet.

Wilson Creek is a C5 channel type for the first 716 feet from the confluence with Yager Creek, then it changes to a B2 channel type for the remaining 1,765 feet of the stream reach surveyed. C5 channels are low gradient (< 1%), meandering, non-confined streams, with predominantly stable stream banks. B2 channels have a moderate gradient (1.0 - 2.5%), and are moderately confined and stable.

Water temperatures ranged from 62 to 64 degrees fahrenheit. Air temperatures ranged from 82 to 88 degrees fahrenheit.

Table 1 summarizes the riffle, flatwater, and pool habitat types. By percent occurrence, riffles made up 50.0%, flatwater types were 31.3%, and pools 18.8% (Graph 1). Riffles made up 86.1% of the total length, flatwater habitats were 9.7%, and pools 4.2% (Graph 2).

Five habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 50.0%; and glides, 21.8% (Graph 3). By percent total **length**, low gradient riffles made up 86.1%, and glides were 7.4%.

Table 3 summarizes the pool habitat types. Of these pools, 50.0% were main channel pools. These main channel pool types comprised 45.7% of the total length for all pools (Graph 4).

Table 4 (Graph 5) is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. The maximum depth for five of the six pools (83.3%) was less than two feet. This level indicates a poor quality of pool habitat in Wilson Creek.

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 6 pool tail-outs, zero had a value of 1; 1 had a

value of 2 (16.6%); 1 had a value of 3 16.6%); and 4 had a value of 4 (66.6%). Graph 6 describes embeddedness.

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 types had the highest mean shelter rating at 54.69 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 31.7, and main channel pools had a rating of 21.7 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Wilson Creek. Terrestrial vegetation is the next most common cover type. Graph 7 describes the pool cover in Wilson Creek.

Table 6 (Graph 8) describes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 75.0% of the low gradient riffles. Small cobble was the next most frequently observed dominant substrate type, and occurred in 18.8% of the 16 low gradient riffles.

Nearly 21% of Wilson Creek lacked shade canopy. Of the 79.5% of the stream that was covered with canopy, 66.2% was composed of deciduous trees, and 13.3% was composed of coniferous trees. Graph 9 describes the canopy in Wilson Creek.

Table 2 summarizes the mean percent of the right and left stream banks covered with vegetation by habitat unit type. For the stream reach surveyed, the mean percent right bank vegetated was 75.6%. The mean percent left bank vegetated was 73.4%. The elements composing the structure of the stream banks consisted of 3.1% cobble/gravel, 12.5% bare soil, 40.6% grass, 31.3% brush. Additionally, 9.4% of the banks were composed of deciduous trees, and 3.1% of coniferous trees, including downed trees, logs, and root wads (Graph 10).

## BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Wilson Creek, September 6, 1991 by Erick Elliot and Brian Humphrey (CCC). A total of five steelhead were sampled for all sites.

The first unit sampled was habitat unit 4, a corner pool, approximately 541' upstream of the confluence with Yager Creek. The unit had an area of 192 sq ft and a volume of 172.8 cubic feet. Four stickleback were sampled, ranging from 39 to 74 mm fork length. No steelhead were found.
The second unit was habitat unit 19, a mid-channel pool, approximately 1,603' from the confluence with Yager Creek. The

unit had an area of 160 sq ft and a volume of 96 cubic feet. Five steelhead were sampled. They ranged from 71 to 305 mm fork length.

The third unit sampled was habitat unit 29, a mid-channel pool, approximately 2,062' from the confluence with Yager Creek. The unit had a area of 90 sq ft and a volume of 54 cubic feet. No fish were sampled.

## GRAVEL SAMPLING RESULTS

No gravel sampling was conducted on Wilson Creek.

## DISCUSSION

Wilson Creek has two channel types: C5 and B2. The lower 716' of the survey reach is a C5 channel. C5 channels are meandering steam types on cohesive, silt/clay beds. They are generally not suitable for instream enhancement structures. However, bank placed boulders, overhead log cover, and shelter structures in straight reaches are often appropriate. The B2 channel type is suitable for many stream enhancement structures. For the most part B2 channels are found in stable, low gradient stream reaches. Well placed and engineered structures that constrict the channel to form pool habitat or cover structures are usually appropriate and have a good chance of success in these channel types.

The water temperatures recorded on the survey days ranged from 62° F to 64° F. Air temperatures ranged from 82° F to 88° F. These temperatures, if sustained, are near the threshold stress level 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 9.7% of the total **length** of this survey, riffles 86.1%, and pools only 4.2%. The pools are relatively shallow with only one of the six 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. Therefore, installing structures that will increase or deepen pool habitat is recommended.

Five of the six pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish

habitat. In Wilson 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 26.7. The shelter rating in the flatwater habitats was 28.0. 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 and terrestrial vegetation in all habitat types. 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.

Twelve of the sixteen low gradient riffles had gravel as the dominant substrate. Gravel is defined as 0.08 to 2.5" in diameter. This is generally on the low end of the size substrate considered desirable for spawning salmonids.

The mean percent canopy for the stream was 79.5%. This high percentage of canopy is generally desirable.

## RECOMMENDATIONS

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

2) Temperatures in this section of Wilson 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) 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.

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) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from small woody debris and terrestrial vegetation. Adding high quality complexity with additional woody cover is desirable. Combination cover/scour structures constructed with

boulders and woody debris would be effective in many flatwater and pool locations.

6) Discuss the operation of the off-channel fish pond to see if flows can be restored to the dewatered stream section.

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' Survey begins approximately 4,000' above the confluence with Yager Creek at a point approximately 400' above the Highway 36 bridge. Reach #1 channel type is C5. Stream is dry at this point and below here.

220' Stream crossing.

425' Old concrete bridge. The creek to this point has been completely covered with blackberry vines. Both banks are impacted by cattle, and are contributing high levels of sediment to the stream. Cattle dung in stream. The stream is dewatered to this point. Young of the year (YOY) and juvenile salmonid fry observed in first pool with water.

443' Collapsed 4' diameter culvert lying length-wise in stream causing some gravel retention.

525' Left bank erosion contributing silt into the channel.

541' Right bank eroding and contains an old car.

716' Bridge construction, area very disrupted. Channel type changes from a C5 to a B2 (reach #2). Salmonid fry observed below construction site.

1583' A drainage pipe from a private fish pond enters stream from the left bank. The intake that delivers water to the fish pond is 200' upstream. Wilson Creek is dry or ponded between the intake and outlet to the pond. There is also severe bank failure in this area. Landowner is trying to armor with bricks and concrete blocks, but with little apparent success.

1603' Juvenile steelhead observed. Estimated 10 - 12 inches in length. See biological sample results.

Wilson Creek

1787' Road crossing 4' high x 20' long x 10' wide, concrete sides and bottom. Left bank erosion 80' long x 20' high.

1895' Right bank erosion 50' long x 15' high, contributing gravel and trees into the channel.

1944' Left bank erosion 50' long x 25' high.

2481' Increase in gradient and the beginning of many large log and debris accumulations.

End of survey.