# STREAM INVENTORY REPORT

## Unnamed Tributary to Gilham Creek

### INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Unnamed Tributary to Gilham Creek. 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 Unnamed Tributary to Gilham Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

### WATERSHED OVERVIEW

Unnamed Tributary to Gilham Creek is tributary to Gilham Creek, tributary to the Mattole River, located in Humboldt County, California (Map 1). Unnamed Tributary to Gilham Creek's legal description at the confluence with Gilham Creek River is T03S R01E S13. Its location is 40°12′56.2″ North latitude and 124°01′27.7″ West longitude. Unnamed Tributary to Gilham Creek is a first order stream and has approximately 2.04 miles of intermittent stream according to the USGS Honeydew 7.5 minute quadrangle. Unnamed Tributary to Gilham Creek drains a watershed of approximately 1.04 square miles. Elevations range from about 720 feet at the mouth of the creek to 2760 feet in the headwater areas. Douglas fir, oak and mixed hardwood forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. See Gilham Creek watershed overview for vehicle access.

### METHODS

The habitat inventory conducted in Unnamed Tributary to Gilham Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi, et. al., 1998). The AmeriCorps Watershed Stewards Project (WSP) members 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.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1995). All habitat units included in the survey are classified according

to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

## HABITAT INVENTORY COMPONENTS

A standardized habitat inventory methodology and data-sheet have been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This protocol was used in Unnamed Tributary to Gilham Creek to record measurements and observations. There are nine components to the inventory.

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". Unnamed Tributary to Gilham 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (Hopelain, 1995). 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 Unnamed Tributary to Gilham 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited 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. 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 Unnamed Tributary to Gilham 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 fully-described 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. In addition the dominant substrate composing the pool tail outs is recorded for each pool.

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 Unnamed Tributary to Gilham Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

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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 Unnamed Tributary to Gilham Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from 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. In Unnamed Tributary to Gilham Creek fish presence was observed from the stream banks. This sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## 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 0.85 mm)(Valentine, 1995).

## 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

Graphics are produced from the tables using Quattro Pro. Graphics developed for Unnamed Tributary to Gilham Creek include:

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- 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 the pool tail outs
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 25, 1998, was conducted by Stu McMorrow and John Wooster (WSP). The total length of the stream surveyed was 3,051 feet with no side channel.

Flows were not measured on Unnamed Tributary to Gilham Creek.

Unnamed Tributary to Gilham Creek is a B4 channel type for the entire 3,051 feet of stream reach surveyed. B4 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable floodplain and profile; stable banks; and gravel dominated channel.

Water temperatures taken during the survey period ranged from 62°- 63° F. Air temperatures ranged from 69°- 73° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 29% riffle units, 40% flatwater units, 24% pool units, and 7% dry units (Graph 1). Based on total length of Level II habitat types there were 22% riffle units, 71% flatwater units, 5% pool units, and 2% dry units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run, 33%; low gradient riffle, 29%; and mid-channel pool, 13% (Graph 3). Based on percent total length, step run made up 68%, low gradient riffle 22%, and run 4%.

A total of eleven pools were identified (Table 3). Main channel pools were most frequently encountered at 55% and comprised 61% of the total length of all pools (Graph 4).

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Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Four of the 11 pools (36%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 10 pool tail-outs measured, zero had a value of 1 (0%); four had a value of 2 (40%); four had a value of 3 (40%); zero had a value of 4 (0%) and two had a value of 5 (20%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning.

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 10, flatwater habitat types had a mean shelter rating of 20, and pool habitats had a mean shelter rating of 27 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 35. Main pools had a mean shelter rating of 22 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders and bedrock are the dominant cover type in the unnamed tributary to Gilham Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in the unnamed tributary to Gilham Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in six of the 10 pool tail outs measured (60%). Large cobble was the next most frequent dominant substrate type and occurred in 30% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 74%. The mean percentages of conifer and deciduous trees were 22% and 78%, respectively. Graph 9 and Table 8 describe the canopy in the unnamed tributary to Gilham Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 75.6%. The mean percent left bank vegetated was 84.4%. The dominant elements composing the structure of the stream banks consisted of 18.75% bedrock, 6.25% boulder, 75% cobble/gravel, and 0% sand/silt/clay (Graph 10). Deciduous trees were the dominant bank vegetation type observed in 75% of the units surveyed. Additionally, 75% of the units surveyed had deciduous trees as the dominant bank vegetation, and 18.75% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Young-of-the-year and juvenile salmonids were seen using streambank observation during the course of the survey on Unnamed Tributary to Gilham Creek.

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GRAVEL SAMPLING RESULTS

No gravel samples were taken on the unnamed tributary to Gilham Creek.

DISCUSSION

The unnamed tributary to Gilham Creek is a B4 channel type for the entire 3,051 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: Excellent for low-stage plunge weirs; boulder clusters; bank placed boulders; single and opposing wing-deflectors; log cover.

The water temperatures recorded on the survey day, August 25, 1999, ranged from 62° - 63° F. Air temperatures ranged from 69°- 73° F. This is a good water temperature range for salmonids. However, 63°F, if sustained, is near the threshold stress level for salmonids. This does not seem to be the case here, and the unnamed tributary to Gilham Creek seems to have temperatures favorable to salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 71% of the total length of this survey, riffles 22%, and pools 5%. The pools are relatively shallow, with only 4 of the 11 (36.3%) pools having a maximum depth greater than 2 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 increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of log debris accumulations (LDA's) in the stream.

Zero of the 10 pool tail-outs measured had an embeddedness rating of 1. Four of the pool tail-outs had ratings of 3 or 4. Two of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. The two units were unsuitable for spawning due to the dominant substrate being too large. 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 Unnamed Tributary to Gilham Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken where possible.

The mean shelter rating for pools was low with a rating of 27. The shelter rating in the flatwater habitats was slightly lower at 20. A pool shelter rating of approximately 100 is desirable. The fair amount of cover that now exists is being provided primarily by boulders and bedrock in all habitat types. Additionally, terrestrial vegetation contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would improve both summer and winter

salmonid habitat. Instream cover created by small and large woody debris provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Six of the 10 pool tail outs 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 74%. 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 moderate to good at 75.6% and 84.4%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting native species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

## RECOMMENDATIONS

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

2) 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.

3) 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.

4) 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

5) 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.

6) Suitable size spawning substrate on Gilham Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

7) Increase the canopy on Gilham Creek by planting willow, alder, redwood, 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.

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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.

0' The survey begins at the confluence with Gilham Creek. Channel type is a B4.

244' Young of the year salmonids observed.

341' A right bank slide is 35' long and 85' high.

719' A left bank slide is 100' long and 100' high.

757' A left bank slide is 60' long and 25' high.

982' Young-of-the-year fry, and a larger juvenile salmonid were observed.

1053' An active blue goo slide is 40' long and 60' high.

1253' A left bank slide 200' long and 100' high is causing the creek to run subsurface.

1307' There is a 5' plunge into this pool.

1783' A dry tributary enters from the right bank at the top of the unit.

1819' Young of the year steelhead/rainbow trout were observed in this unit.

1838' An old skid trail crosses the creek in this unit.

2253' A left bank slide is 80' long and 85' high.

3051' There is an active right bank slide 50' long and 150' high. The gradient of the creek has increased and no more fish have been observed. End of the survey.

REFERENCES

Flosi, G., and F. Reynolds. 1998. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, California.

# 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 |