STREAM INVENTORY REPORT

Gilham Creek, Mattole River

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on 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 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

Gilham Creek is tributary to the Mattole River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Gilham Creek's legal description at the confluence with Mattole River is T03S R01E S--. Its location is 40°12′46″ north latitude and 124°02′46″ west longitude. Gilham Creek is a second order stream and has approximately 2.5 miles of blue line stream according to the USGS Honeydew 7.5 minute quadrangle. Gilham Creek drains a watershed of approximately 3.09 square miles. Elevations range from about 480 feet at the mouth of the creek to 2400 feet in the headwater areas. Douglas fir, oak, and mixed hardwood forest dominates the watershed. The watershed is primarily privately owned, with about 10% of the upper watershed owned by the Bureau of Land Management. The watershed is managed for timber production and rangeland. Vehicle access exists via Mattole Road to Honeydew. From Honeydew take the Wilder Ridge Road. Follow the Wilder Ridge Road for 3.5 miles, then take the Jeep trail to Pringle Ridge. After Pringle Ridge the Jeep trail will fork, take the right fork. Follow the Jeep trail to the Mattole River. Once you arrive at the river, hike upstream and stay to the right. On the river's left will be the confluence of Gilham Creek with the Mattole River.

METHODS

The habitat inventory conducted in Gilham Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi, et. al., 1998). The AmeriCorps Watershed Stewards Project 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 Gilham Creek to record measurements and observations. There are nine components to the inventory data-sheet.

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". 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 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 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 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.

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 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 Gilham Creek fish presence was observed from the stream banks, and sites were electrofished using a Smith-Root Model 12 electrofisher. These 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 Gilham 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 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 24, 25, and 26, 1998, was conducted by Stu McMorow and John Wooster, AmeriCorps/Watershed Stewards Project (WSP). The total length of the stream surveyed was 13,780 feet with an additional 112 feet of side channel.

Flows were measured at 0.89 cfs August 27, 1998 on Gilham Creek.

Gilham Creek is a B4 channel type for the first 9,992 feet and a A3 channel type for the remaining 3,788 feet of the stream reach surveyed. B4 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable plan and profile; stable banks; gravel channel. A3 channel types are steep, narrow, cascading, step-pool streams; high energy/debris transport associated with depositional soils; cobble channel. Water temperatures taken during the survey period ranged from 59° - 65° F. Air temperatures ranged from 63° - 86° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 30% riffle units, 36% flatwater units, and 33% pool units (Graph 1). Based on total length of Level II habitat types there were 31% riffle units, 58% flatwater units, and 11% pool units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 27%; step run, 26%; and mid channel pool, 19% (Graph 3). Based on percent total length, step run, 49%; low gradient riffle 29%, and run 09%.

Seventy-four pools were identified (Table 3). Main channel pools were most frequently encountered at 58% occurrence and comprised 63% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-two of the 74 pools (43%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the seventy-four pool tail-outs measured, One had a value of 1 (1.4%); twenty had a value of 2 (27%); thirty-eight had a value of 3 (51.4%); one had a value of 4 (1.4%) and fourteen had a value of 5 (18.91%) (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 14, flatwater habitat types had a mean shelter rating of 15, and pool habitats had a mean shelter rating of 28 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 31. Scour pools had a mean shelter rating of 26 (Table 3).

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

Table 6 summarizes the dominant substrate in pool habitat types. Large cobble was the dominant substrate observed in 33 of the 123 pool tail outs measured (27%). Gravel was the next most frequently observed dominant substrate type and occurred in 20% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 72%. The mean percentages of conifer and deciduous trees were 18% and 54%, respectively. Graph 9 describes the canopy in Gilham Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 64.6%. The mean percent left bank vegetated was 71.8%. The dominant elements composing the structure of the stream banks consisted of 15.9% bedrock, 20.7% boulder, 61% cobble/gravel, and 2.4% sand/silt/clay (Graph 10). Of the units surveyed, 61% had deciduous trees as the dominant bank vegetation, and 19.5% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

A biological inventory was preformed on Gilham Creek on September 3, 1998 by Scott Downie, Ruth Goodfield, Stu McMorrow, and John Wooster. The sample site was located approximately 100' above the confluence with the Mattole River. Twenty-three steelhead were sampled; three within the normal range of 2+ juveniles; three within the normal range of 1+ juveniles; and 17 within the normal range of 0+ fingerlings. No other fish were sampled.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Gilham Creek.

DISCUSSION

Gilham Creek is a B4 channel type for the first 9,992 feet of stream surveyed and a A3 for the remaining 3,788 feet. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs; boulder clusters; bank placed boulders; single and opposing wing-deflectors; log cover. However, the suitability of A3 channel types for fish habitat improvement structures is good for bank-placed boulders, fair for plunge weirs; opposing wing-deflectors; and log cover. It is poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days August 24, 25, and 26, 1999, ranged from 59 ° - 65°F. Air temperatures ranged from 63° - 86°F. This is a good water temperature range for salmonids. 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 36% of the total length of this survey, riffles 30%, and pools 33%. The pools are relatively deep, with 32 of the 74 (43%) 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 any needed modification of the log debris accumulations (LDA's) in the stream. Some of the LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

One of the 74 pool tail-outs measured had an embeddedness rating of 1. Thirty-nine of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. All of the 14 were unsuitable for spawning due to the dominant substrate being boulders and cobble too large for spawning salmonids to use. 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 Gilham 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 28. The shelter rating in the flatwater habitats was slightly lower at 15. A pool shelter rating of approximately 100 is desirable. The relatively large amount of cover that now exists is being provided primarily by boulders in the habitat types. Additionally, terrestrial vegetation contributes 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.

Fifty-two of the 123 pool tail outs had large cobble or boulders as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy density for the stream was 72%. This is a relatively good 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 at 64.6% and 71.8%, 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) 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.

6) 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.

7) There are several log debris accumulations present on Gilham Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time to meter needed gravel downstream to spawning sites.

8) 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.

9) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

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 began at the confluence of Gilham Creek and the Mattole River. A road crossing located 258' into the unit is 11' long, and 18' wide. Channel type is a B4.

288' Young of the year salmonids observed.

2484' A slide on the right bank is 150' high and 180' long.

3139' A log debris accumulation partially spanning the channel is causing high flow to scour a right bank failure. The right bank slide is 80' long and 40' high.

5340' An active right bank failure is 80' long and 20' high.

5820' A left bank slide is 80' long and 50' high.

6490' A skid trail 20' wide crosses the creek 56' into the unit.

6758' A right bank tributary enters at the top of the unit.

6905' A log debris accumulation is 10' long, 40' wide, and 6' high.

7105' A log debris accumulation is 20' long, 25' wide, and 5' high, retaining gravel.

7318' A left bank slide that is beginning to revegetate is 75' long and 60' high.

7598' A log retaining gravel forms a 5' plunge.

7609' A left bank slide is 60' long and 50' high.

7693' A tributary enters from the left bank at 65' into the unit.

8220' A right bank slide is 60' long and 40' high.

8456' There are slides on both banks 60' long and 45' high.

8604' There is a slide on the right bank 250' long and 200' high.

8887' A log debris accumulation is 20' long, 25' wide, 6'high, and retaining gravel.

9195' A log debris accumulation is 40' long and 35' wide.

9460' The creek enters the pool from a 6' drop over a steep bedrock sheet.

9480' A tributary enters from the left bank. A log debris accumulation 10' long, 20' wide, and 5' high is located at the tributary confluence.

9822' The pool is in a narrow bedrock gorge.

9855' A right bank tributary enters from a 10' waterfall at 61' into the unit. A left bank tributary enters from a 6' waterfall at 89' into the unit.

9992' Channel type changes to an A3.

10614' Stream gradient has increased to 7%.

11219' A left bank tributary enters from a 7' waterfall.

12497' A left bank tributary enters at the bottom of the unit.

13317' A left bank slide is 100' long and 100' high.

13780' END OF SURVEY. Sustained > 7% gradient for 3,000'.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California salmonid stream habitat restoration manual, 3rd 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
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5