STREAM INVENTORY REPORT

Stanley Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Stanley Creek, a tributary to the Mattole River. 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 Stanley 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 anadromous salmonids, including steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Stanley Creek is tributary to the Mattole River, located in Humboldt County, California (Map 1). Stanley Creek's legal description at the confluence with Mattole River is T5S R2E S--. Its location is 40°01′01″ north latitude and 123°26′07″ west longitude. Stanley Creek is a first order stream and has approximately 2.03 miles of blue line stream according to the USGS Briceland 7.5 minute quadrangle. Stanley Creek drains a watershed of approximately 0.86 square miles. Elevations range from about 1020 feet at the mouth of the creek to 1400 feet in the headwater areas. Redwood and Douglas fir forest dominate the watershed. The watershed is primarily privately owned and is managed for timber production and recreation. Vehicle access exists from U.S. Highway 101 at Redway via the Briceland Road to Thorn Junction. From Thorn Junction to Whitethorn, the creek is under the first bridge past the Whitethorn School.

METHODS

The habitat inventory conducted in Stanley 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 Stanley 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". Stanley 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 Stanley 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 Stanley 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 Stanley 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 Stanley 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 Stanley Creek fish presence was observed from the stream banks, and one site was 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 Stanley 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 June 14 and 15, 1999, was conducted by Donn Rehberg and Greg Larson (AmeriCorps/WSP). The total length of the stream surveyed was 5,076 feet with an additional 0 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.1 cfs on July 6, 1999.

Stanley Creek is an F4 channel type for the entire 5,076 feet of stream reach surveyed. F4 types are entrenched meandering riffle/pool gravel channels on low gradients with high width/depth ratio.

Water temperatures taken during the survey period ranged from 52° to 54° F. Air temperatures ranged from 52° to 70° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 30% riffle units, 30% flatwater units, and 37% pool units (Graph 1). Based on total length of Level II habitat types there were 25% riffle units, 40% flatwater units, and 32% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 33%; low gradient riffles, 30%; and runs, 27% (Graph 3). Based on percent total length, runs made up 33%, mid-channel pools, 29%, and low gradient riffles, 25% (Table 2).

A total of 54 pools were identified (Table 3). Main channel pools were most frequently encountered at 89% (Graph 4) and comprised 90% of the total length of all pools (Table 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. 39 of the 54 pools (72%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 54 pool tail-outs measured, 3 had a value of 1 (5.6%); 23 had a value of 2 (42.6%); 10 had a value of 3 (18.5%); 6 had a value of 4 (11.1%) and 12 had a value of 5 (22.2%) (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 75, flatwater habitat types had a mean shelter rating of 4, and pool habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 18. Scour pools had a mean shelter rating of 8 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Stanley Creek. Large and small woody debris are lacking in most habitat types. Graph 7 describes the pool cover in Stanley Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in 42 of the 54 pool tail outs measured (78%). Bedrock was the next most frequently observed dominant substrate type and occurred in 13% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 94%. The mean percentages of conifer and deciduous trees were 22% and 78%, respectively. Graph 9 describes the canopy in Stanley Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 87.1%. The mean percent left bank vegetated was 86.7%. The dominant elements composing the structure of the stream banks consisted of 11.9% bedrock, 0% boulder, 0% cobble/gravel, and 88.1% sand/silt/clay (Graph 10). Deciduous trees are the dominant bank vegetation type observed in 76.2% of the units surveyed. Additionally, 76.2% of the units surveyed had deciduous trees as the dominant bank vegetation, and 11.9% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on October 1, 1999 in Stanley Creek. The site was sampled by Glenn Yoshioka and Paul Ferns (CDFG and AmeriCorps/WSP). The electrofishing crew started at the mouth and progressed upstream. The lower portion of the creek was intermittent on the day of

the sampling. In this section, most of the channel was dry, with scattered pools. Eleven mid-channel pools were sampled, starting at the lower end of the this F4 reach. These pools yielded 38 steelhead rainbow trout. Based on visually estimated lengths, the probable breakdown of steelhead age classes was 30 age 0+, 7 age 1+, and one age 2+ juveniles.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Stanley Creek.

DISCUSSION

Stanley Creek is a F4 channel type for the entire 5,076 feet of stream surveyed. The suitability of F4 channels for fish habitat improvement structures is: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; and poor for boulder clusters.

The water temperatures recorded on the survey days June 14-15, 1999, ranged from 52° to 54° F. Air temperatures ranged from 52° to 70° F. This is an excellent water temperature range for salmonids. Stanley 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 40% of the total length of this survey, riffles 25%, and pools 32%. The pools are relatively deep, with 39 of the 54 (72%) 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 log debris accumulations (LDA's) in the stream. The LDA's in the system may be 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.

Three of the 54 (5.6%) pool tail-outs measured had an embeddedness rating of 1, 42.6% had a rating of 2, 29.6% had ratings of 3 or 4, and 22.2% had a rating of 5 and were considered unsuitable for spawning. 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 Stanley Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 14. The shelter rating in the flatwater habitats was even lower at 4. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by undercut in several habitat types. Additionally, small and large woody debris as well as 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.

Forty-two of the 54 (78%) 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 94%. 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 high at 87% and 87%, 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) Stanley Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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) 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.

5) Primary pools comprise 23% of the total stream length. 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from undercut banks. Adding high quality complexity with woody cover is desirable.

7) The potential for fish passage problems should be further evaluated in this creek. In its first 100 yards, the stream flows in a bedrock channel. The bottom of a culvert near the mouth is rusting out. There are numerous large debris accumulations in the stream. Fish passage should be monitored and improved if necesssary.

8) There are numerous log debris accumulations present on Stanley Creek that may be retaining sediment. The modification of these debris accumulations may be desirable, but must be done carefully, over time, to meter gravel downstream to spawning sites

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' Begin survey at the confluence with the Mattole River. Channel type is a F4. One structure at the mouth of the creek. Two long logs stacked on top of one another at criss crossing angles.

24' Undercut from old structure. Culvert has caused the pool.

227' Rust line on culvert at 2 feet, diameter is 10.5 feet. At 56 feet into the unit, the culvert bottom becomes rusted out, stepped through bottom on two different occasions. Entrance to the culvert is above water level. Stream has begun to flow under culvert entering the pipe 6 feet into the culvert through the rust hole.

311' Bedrock channel dominates the stream from the mouth to the culvert.

385' Out of influence of culvert, start 100% occurrence.

460' LDA at end of pool.

483' Stream under LDA.

982' YOY observed.

1586' Tailouts in this stream commonly a thin layer of gravel over sand, “armored.”

1773' Pool covered by debris accumulation.

2423' Debris accumulation 3 feet high, 14 feet wide.

2513' Debris accumulation.

2736' Debris accumulation at top of pool.

3255' LDA

3477' LDA covers stream

3626' LDA at top of pool.

3663' LDA forms another pool.

3815' Woody debris separates pools.

4186' Three 2ft. diameter culverts, “private road”.

4522' YOY observed.

4633' Not surveyed -overgrown with blackberries (listed 3.3 in Data)

4798' Debris accumulation.

5076' End Of Survey. Stream flows subsurface for 25 ft. Terrestrial vegetation is extremely dense, making survey difficult. Flow is insufficient to clear any debris from channel, unit type thus difficult to distinguish at this point.

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**