# STREAM INVENTORY REPORT

## Blue Slide Creek

## INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Blue Slide Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Blue Slide 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

## WATERSHED OVERVIEW

Blue Slide Creek is tributary to the Mattole River, located in Humboldt County, California (Map 1). Blue Slide Creek's legal description at the confluence with the Mattole River is T4S R2E S06. Its location is 40°08′37″ north latitude and 123°59′24″ west longitude. Blue Slide Creek is a third order stream and has approximately 15.9 miles of blue line stream according to the USGS Ettersburg and Briceland 7.5 minute quadrangles. Blue Slide Creek drains a watershed of approximately 9.6 square miles. Elevations range from about 690 feet at the mouth of the creek to 1,800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately and is managed for rural residence. Vehicle access to the mouth of Blue Slide Creek exists via the Ettersburg Road, approximately 0.2 miles north of Ettersburg.

## METHODS

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

1. Flow:

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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". Blue Slide 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. 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 Blue Slide 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 Blue Slide 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.

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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 Blue Slide 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 Blue Slide 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.

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## BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Blue Slide Creek fish presence was observed from the stream banks. This sampling techniques is discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## 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 Blue Slide Creek include:

- Riffle, flatwater, pool habitats by percent occurrence

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- 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 July 15 to 20, 1998, was conducted by Stew McMorrow and Kelley Turner (WSP/AmeriCorps). The total length of the stream surveyed was 33,416 feet with an additional 203 feet of side channel.

Flow was estimated to be 1.5 cfs during the survey period.

Blue Slide Creek is an F4 channel type for the entire 33,416 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 60 to 79 degrees Fahrenheit. Air temperatures ranged from 64 to 89 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 33% riffle units, 35% flatwater units, and 32% pool units (Graph 1). Based on total **length** of Level II habitat types there were 33% riffle units, 45% flatwater units, and 22% pool units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 32%; runs, 23%; and mid-channel pools, 20% (Graph 3). Based on percent total **length**, low gradient riffles made up 33%, runs 24%, and step runs 21%.

A total of one-hundred-thirty-six pools were identified (Table 3). Main channel pools were most frequently encountered at 67% and comprised 65% 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. Fifty-two of the 136 pools (38%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 133 pool tail-outs measured, none had a value of 1; thirty-one had a value of 2 (23%); sixty-seven had a value of 3 (50%); twenty-one had a value of 4 (16%) and fourteen had a value of 5 (12%) (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. In Blue Slide Creek, ten of the fourteen pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. The other tail-outs were unsuitable for spawning due to the tail-outs being comprised of large cobble, boulder, bedrock or wood.

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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 six, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 21 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 28. Main channel pools had a mean shelter rating of 18 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 109 of the 133 pool tail outs measured (82%). Cobble was the next most frequently observed dominant substrate type and occurred in 6% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 46%. The mean percentages of deciduous and coniferous trees were 94% and 6%, respectively. Graph 9 describes the canopy in Blue Slide Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 72%. The mean percent left bank vegetated was 78%. The dominant elements composing the structure of the stream banks consisted of 27.8% bedrock, 9.3% boulder, 49.4% cobble/gravel, and 13.6% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 25% of the units surveyed. Additionally, 61.1% of the units surveyed had deciduous trees as the dominant vegetation type, and 0.6% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

No sites were electrofished during the July, 1998 survey in Blue Slide Creek. Juvenile salmonids were observed from the streambanks by the surveyors throughout the length of the survey.

DISCUSSION

Blue Slide Creek is an F4 channel type for the entire 33,416 feet of stream surveyed. The suitability of F4 channel types 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 July 15 to 20, 1998, ranged from 60 to 79 degrees Fahrenheit. Air temperatures ranged from 64 to 89 degrees Fahrenheit. Temperatures over, 65 degrees Fahrenheit, if sustained, are near the threshold stress level for 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 45% of the total **length** of this survey, riffles 33%, and pools 22%. The pools are relatively deep, with 52 of the 133 (38%) 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 third order streams, a primary pool is defined to have a maximum depth of at least three 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.

None of the 133 pool tail-outs measured had an embeddedness rating of 1. Eighty-eight 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. Ten of the 14 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or gravel being too small to be suitable. 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 Blue Slide 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 21. The shelter rating in the flatwater habitats was 11. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, terrestrial vegetation contribute a small amount. 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.

One-hundred-seventeen of the 133 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

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The mean percent canopy density for the stream was 46%. 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 72% and 78%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

## RECOMMENDATIONS

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

2) The limited water temperature data available suggest that maximum temperatures are above 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) 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 the canopy on Blue Slide Creek by planting willow, alder, redwood, and other native riparian trees 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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5) 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.

6) 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.

7) 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.

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 confluence with the Mattole River. Channel type is an F4. |
| 464' | Blue Slide Creek Road bridge crosses stream; 12' wide x 30' high. |
| 1,309' | Numerous young-of-the-year (YOY) salmonids observed. |
| 4,386' | Old slide on right bank, 300' long x 200' high. Mostly revegetated. |

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| | |
|---|---|
| 5,007' | Landmark; 'Old Briceland Ranch bend'. |
| 6,182' | Road fords stream. |
| 6,855' | Tributary enters stream from right bank, almost no flow. |
| 7,788' | Tributary enters from left bank. |
| 9,309' | Slope failure on left bank, 120' long x 200' high. Contributing fines to the stream channel. |
| 10,573' | Tributary enters from left bank. |
| 10,830' | Twin bridges above confluence with left bank tributary (Fish Creek). |
| 10,908' | Active right bank slide; 100' long x 50' high, contributing fines to stream. |
| 11,620' | Numerous YOY salmonids observed. |
| 12,269' | Lamprey Eel carcass, approximately 18" long, observed in bottom of pool. |
| 12,689' | Left bank slide; 200' long x 80' high. Concrete abutment walls in creek as well. |
| 13,417' | Dry tributary enters from right bank. |
| 14,123' | Tributary enters from left bank. Temperature is 58 degrees Fahrenheit. |

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There is a 60' waterfall approximately 100' up the tributary.

14,501' Slide on left bank; 70' long x 100' high. Contributing fines to the stream.

15,090' Tributary enters from left bank.

16,048' Eight foot high plunge pool. Salmonids observed upstream.

16,606' Slide on right bank; 200' long X 50' high. Not a barrier to fish.

18,527' Log debris accumulation (LDA); 25' wide X 10' long X 3' high. Not a barrier to fish.

19,745' Slide on right bank; 35' high X 60' long.

19,924' Slide on left bank; 50' long X 30' high.

20,280' Slide on right bank; 150' long X 50' high.

20,514' Tributary enters from right bank.

24,875' Railroad flatcar bridge over creek (Blue Slide Creek Road); seven feet high.

25,072' Slide on left bank; 60' long X 30' high.

27,277' Juvenile and one-plus salmonids observed by surveyors.

29,221' Tributary enters from right bank through 18" culvert. Culvert is aggraded and there is a 3' plunge at the outfall.

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| | |
|---|---|
| 29,374' | Flatcar bridge crosses stream; eight feet high. |
| 29,609' | Slide on left bank; 140' long X 50' high. |
| 30,055' | Slide on right bank; 200' long X 50' high. |
| 30,770' | Slide on right bank; 90' long X 50' high. |
| 32,175' | Tributary enters from left bank; water temperature 63 degrees. |
| 32,448' | Tributary enters from right bank. Fish are observed in tributary for about 300' then water dries up. |
| 33,110' | Stream gradient increases. |
| 33,192' | LDA; 30' wide X 10' long X 4' high, retaining sediment. |
| 33,416' | End of survey. Stream gradient is rapidly increasing. Fish have not been observed for 1000'. |

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, 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 |