

## **STREAM INVENTORY REPORT**

### **Little Grindstone Creek, Mattole River**

#### INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Little Grindstone Creek, a stream in the Mattole River basin. 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 Little Grindstone 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

Little Grindstone Creek is tributary to the Mattole River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Little Grindstone Creek's legal description at the confluence with Mattole River is T03S R01E S25. Its location is 40°10'32" north latitude and 124°00'28" west longitude. Little Grindstone Creek is a first order stream and has approximately 0.6 miles of intermittent stream according to the USGS Honeydew 7.5 minute quadrangle. However, during the survey, the creek had 3.000 feet of flowing stream. Little Grindstone Creek drains a watershed of approximately 0.6 square miles. Elevations range from about 550 feet at the mouth of the creek to 1,560 feet in the headwater areas. Douglas fir forest and hardwood forest dominate the watershed. The watershed is primarily privately and is managed for timber production and rangeland. Vehicle access exists via Mattole Road to Honeydew. From Honeydew take the Wilder Ridge Road. After passing the turnoff for Horse Mountain Road, continue along the Wilder Ridge Road eastward and then turn left on the second unimproved dirt road. Follow it until it crosses the Mattole River. Little Grindstone Creek will be the second creek on right bank (facing downstream) that enters the Mattole River upstream from the crossing. The first creek is Grindstone Creek and enters the Mattole River from the north while Little Grindstone Creek enters the Mattole River from the east and due south of the knolls of Grindstone Openings.

#### METHODS

The habitat inventory conducted in Little Grindstone Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The

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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 Little Grindstone 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.

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### 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". Little Grindstone 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 Little Grindstone 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 Little Grindstone 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.

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### 8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Little Grindstone 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 Little Grindstone 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 Little Grindstone Creek fish presence was observed from the stream banks. 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:

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- 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 Little Grindstone 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 September 9, 1998, was conducted by John Wooster and Caroline Jerzierski (AmeriCorps/WSP). The total length of the stream surveyed was 2,991 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.13 cfs on September 9, 1998.

Little Grindstone Creek is a B4 channel type for the entire 2,991 feet of 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 and gravel channels.

Water temperatures taken during the survey period ranged from 59° to 62° F. Air temperatures ranged from 64° to 74° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% riffle units, 39% flatwater units, and 20% pool units (Graph 1).

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Based on total length of Level II habitat types there were 30% riffle units, 58% flatwater units, and 6% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run, 33%; low gradient riffle, 33%; and mid-channel pool, 17% (Graph 3). Based on percent total length, step run made up 55%, low gradient riffle 30%, and mid-channel pool 6%.

A total of fourteen pools were identified (Table 3). Main channel pools were the most frequently encountered at 86% and comprised 89% 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. Four of the 14 pools (29%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the fourteen pool tail-outs measured, one had a value of 1 (17%); six had a value of 2 (43%); seven had a value of 3 (50%); zero had a value of 4 (0%) and zero had a value of 5 (0%) (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 9, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 25. Main channel pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Little Grindstone Creek. Large woody debris is lacking in nearly all habitat types. Small woody debris occurs in small quantities in most habitat types. Graph 7 describes the pool cover in Little Grindstone Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in 14 of the 14 (100%) pool tail outs measured (Graph 8).

The mean percent canopy density for the stream reach surveyed was 88%. The mean percentages of conifer and deciduous trees were 83.6% and 4.4%, respectively. Graph 9 describes the canopy in Little Grindstone Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 48.8%. The mean percent left bank vegetated was 55.8%. The dominant elements composing the structure of the stream banks consisted of 8.33% bedrock, 0% boulder, 91.67% cobble/gravel, and 0% sand/silt/clay (Graph 10). Deciduous trees were the dominant bank vegetation type observed in

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79.16% of the units surveyed. Additionally, 79.16% of the units surveyed had deciduous trees as the dominant bank vegetation, and 4.17% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

### BIOLOGICAL INVENTORY RESULTS

There was no carcass survey or electrofishing conducted for Little Grindstone Creek. However, Young of the Year and juvenile steelhead rainbow trout (SHRT) were observed by the surveyors from the bank.

### GRAVEL SAMPLING RESULTS

No gravel samples were taken on Little Grindstone Creek.

### DISCUSSION

Little Grindstone Creek is a B4 channel type for the entire 2,991 feet of stream surveyed. The suitability of B4 channels for fish habitat improvement structures is: excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey day of September 9, 1998, ranged from 59 to 62° F. Air temperatures ranged from 64 to 74° F. This is an acceptable water temperature range for salmonids. Little Grindstone 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 58% of the total length of this survey, riffles 30%, and pools 6%. The pools are relatively shallow, with only 4 of the 14 (29%) 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. One LDA in the system is retaining gravel. Any necessary modifications to LDAs 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.

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One of the 14 (17%) pool tail-outs measured had an embeddedness rating of 1, 43% had a rating of 2, 50% had ratings of 3 or 4, and 0 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 Little Grindstone 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 20. The shelter rating in the flatwater habitats was lower at 9. 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 most habitat types. Additionally, small woody debris 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.

Fourteen of the 14 (100%) 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 88%. 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 at 49% and 56%, 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) Little Grindstone 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) 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.
- 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.



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- 5) 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.
- 6) 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.
- 7) Increase riparian vegetation on Little Grindstone Creek by planting willow, alder, redwood, and Douglas fir along the stream where bank vegetation and 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.
- 8) There is a log debris accumulation present on Little Grindstone Creek that is retaining gravel. The modification of this debris accumulation 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' This survey began at the confluence of Little Grindstone Creek and the Mattole River. The channel type is a B4.
- 860' A juvenile steelhead/rainbow trout was observed in this unit.
- 2457' A log debris accumulation (LDA) is covering this unit and retaining gravel.
- 2720' A right bank slide 80' long, 70' wide, and 80' high has covered the creek, causing flow to run subsurface.
- 2991' The survey ended at the fork in the creek on the USGS Honeydew quadrangle. Each fork was carrying only a trickle of water. No fish have been observed for 800'.

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### 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
<b>RIFFLE</b>		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
<b>CASCADE</b>		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
<b>FLATWATER</b>		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
<b>MAIN CHANNEL POOLS</b>		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
<b>SCOUR POOLS</b>		
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
<b>BACKWATER POOLS</b>		
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  
Dammed Pool**

**[BPL]**

**6.4**

**[DPL]**

**6.5**