

## STREAM INVENTORY REPORT

### **Vanauken Creek**

#### INTRODUCTION

An adult carcass survey was conducted in Vanauken Creek on January 4, 1994. No carcasses, live adults, or redds were found, although steelhead fry were sampled during 1996 summer electrofishing (DFG file data). The objective of this report is to document the current habitat conditions, and recommend options for the potential improvement of habitat for chinook salmon, coho salmon and steelhead trout.

#### WATERSHED OVERVIEW

Vanauken Creek is tributary to the Mattole River, located in Humboldt County, California. Vanauken Creek's legal description at the confluence with the Mattole River is T05S R02E S--. Its location is 40°03'07" North latitude and 124°57'20" West longitude. Vanauken Creek is a second order stream and has approximately 2.6 miles of blue line stream according to the USGS Briceland 7.5 minute quadrangle. Vanauken Creek drains a watershed of approximately 1.7 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over 10 cfs is not unusual during winter storms. Elevations range from about 940 feet at the mouth of the creek to 1,600 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via Briceland Road to Whitethorn Junction. Proceed south from Whitethorn Junction to a gated dirt road on the left just beyond the Whitethorn CDF station. This road parallels the stream. Park at the beginning of the gate and walk downstream approximately 200 feet to the mouth of Vanauken Creek.

#### METHODS

The habitat inventory conducted in Vanauken Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Pacific Coast Fisheries, Wildlife, and Wetlands Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Vanauken Creek personnel were

trained in May, 1996, by Scott Downie and Ruth Goodfield. 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, 1994). 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. 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 Vanauken Creek to record measurements and observations. There are nine components to the inventory form.

#### 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 taken 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". Vanauken 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 taken 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 Vanauken 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), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) 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 Vanauken 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.

### 8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Vanauken 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 Vanauken Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) 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 Vanauken Creek fish presence was observed from the stream banks, and two sites were electrofished using one 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

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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 Lotus 1,2,3. Graphics developed for Vanauken 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 low gradient riffles
- 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 10, 11, and 12, 1996, was conducted by Dave Smith and Dylan Brown (PCFWWRA). The total length of the stream surveyed was 7,456 feet with an additional 579 feet of side channel.

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Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.6 cfs on June 26, 1996.

Vanauken Creek is an F4 channel type for the first 7,456 feet of stream reach surveyed, and a G4 channel type for the remaining 579 feet of stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. G4 channels are entrenched "gully" step-pool types with low width/depth ratio on a moderate gradient.

Water temperatures taken during the survey period ranged from 50 to 55 degrees Fahrenheit. Air temperatures ranged from 50 to 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 41% pool units, 32% riffle units, and 26% flatwater units (Graph 1). Based on total **length** of Level II habitat types there were 38% flatwater units, 34% pool units, and 27% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 32%; mid-channel pools, 28%; and step runs, 16% (Graph 3). Based on percent total **length**, low gradient riffles made up 27%, step runs 27%, and mid-channel pools 24%.

A total of eighty-seven pools were identified (Table 3). Main channel pools were most frequently encountered at 75% and comprised 79% 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. Forty-four of the 87 pools (51%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs.

Of the 87 pool tail-outs measured, four had a value of 1 (5%); 16 had a value of 2 (18%); 64 had a value of 3 (74%); and one had a value of 4 (1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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. Pool habitat types had a mean shelter

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rating of 61, and flatwater 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 63. Scour pools had a mean shelter rating of 58 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Bedrock ledges are the dominant cover type in Vanauken Creek and are extensive. Large and small woody debris are found in nearly all habitat types (Graph 7).

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 63 of the 67 low gradient riffles measured (94%). Bedrock was the next most frequently observed dominant substrate type and occurred in 6% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 92%. The mean percentages of deciduous and coniferous trees were 84% and 16%, respectively. Graph 9 describes the canopy in Vanauken Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 92%. The mean percent left bank vegetated was 91%.

The dominant elements composing the structure of the stream banks consisted of 23.5% bedrock, 0% boulder, 1% cobble/gravel, and 75.6% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 4% of the units surveyed.

Additionally, 80.8% of the units surveyed had deciduous trees as the dominant vegetation type, and 12.3% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on June 26, 1996, in Vanauken Creek.

The sites were sampled by Kelley Garrett and Todd Kraemer (WSP/AmeriCorps).

The first site sampled included habitat units 0087-0089, a riffle/run/pool sequence approximately 3,382 feet from the confluence with the Mattole River. This site had an area of 800 sq ft and a volume of 640 cu ft. The site yielded one young-of-the-year (YOY) steelhead rainbow trout and one 1+ steelhead rainbow trout.

The second site included habitat units 0095-0097, a

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riffle/run/pool sequence located approximately 3,620 feet above the creek mouth. This site had an area of 600 sq ft and a volume of 480 cu ft. The site yielded two YOY steelhead rainbow trout.

### GRAVEL SAMPLING RESULTS

No gravel samples were taken on Vanauken Creek.

### DISCUSSION

Vanauken Creek is an F4 channel type for the first 7,456 feet of stream surveyed and a G4 for the remaining 579 feet. The suitability of both F4 and G4 channel types for fish habitat improvement structures is good for bank-placed boulders; fair for low-stage weirs and channel constrictors; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days June 10, 11, and 12, 1996, ranged from 50 to 55 degrees Fahrenheit. Air temperatures ranged from 50 to 65 degrees Fahrenheit. This is a good water temperature range for salmonids. Vanauken 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 38% of the total **length** of this survey, riffles 27%, and pools 34%. The pools are relatively deep, with 44 of the 87 (51%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

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



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gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Sixty-five of the 87 pool tail-outs measured had embeddedness ratings of 3 or 4. Only four had a 1 rating. 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 Vanauken 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 moderate with a rating of 61. The shelter rating in the flatwater habitats was lower at 28. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by bedrock ledges in all habitat types. Additionally, large and small woody debris 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.

Sixty-three of the 67 low gradient riffles 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 92%. This is a relatively high percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 92% and 91%, 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) Vanauken Creek should be managed as an anadromous, natural production stream.
- 2) Where feasible, design and engineer pool enhancement

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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.

- 3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 4672', should then be treated to reduce the amount of fine sediments entering the stream.
- 4) There are several log debris accumulations present on Vanauken 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 avoid excessive sediment loading in downstream reaches.
- 5) Inventory and map erosion sources related to the watershed's road system or other land uses. Prioritize them according to present and potential sediment yield. Identified sites should then be scheduled for treatment.

### PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and measured from the beginning of the survey reach.

- |       |                                                                                                                                   |
|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| 0'    | Begin survey at confluence with the Mattole River. Channel type is an F4 for the first 7,456' of stream surveyed.                 |
| 26'   | Whitethorn Road bridge crosses stream.                                                                                            |
| 795'  | Tributary enters creek from right bank (RB). Temperature is 52°F.                                                                 |
| 2692' | South Fork Vanauken enters from left bank (LB). Temperature is 52°F. South Fork Vanauken Creek is full of LDAs; no fish observed. |
| 3382' | Bioinventory site #1.                                                                                                             |
| 3480' | Corrugated metal pipe (CMP), 7' diameter, in stream channel. Appears to be in fair condition.                                     |

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- 3620' Bioinventory site #2.
- 3986' Old CCC worksite flag. No project visible.
- 4672' Small tributary enters from RB. Temperature is 54°F.
- 4861' Large debris accumulation (LDA) in stream channel. Does not appear to be a barrier to migrating adult salmonids.
- 4963' Spring on RB - 52°F.
- 5751' LDA in stream channel - 40'L x 30'W. Slope failure on RB. Possible seasonal barrier.
- 5789' YOY salmonids observed from the stream banks by surveyors.
- 6064' Spring on RB - 52°F.
- 6831' YOY and 1+ salmonids observed by surveyors.
- 7046' Spring on RB - 53°F.
- 7456' Channel type changes to a G4 for the remaining 579' of stream surveyed.
- 7922' Right bank dirt road is showing evidence of washing-out into the creek during winter storms. This would be a good candidate for bank armoring and stabilization project.
- 8016' Spring on RB - 53°F.
- 8035' Stream is running out of water. End of survey.

## References

- Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.
- Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

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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	[BPL]	6.4
Dammed Pool	[DPL]	6.5