STREAM INVENTORY REPORT

LITTLE VAN DUZEN RIVER

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on the Little Van Duzen River to assess habitat conditions for anadromous salmonids. 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 the Little Van Duzen River. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

The Department of Fish and Game (DFG) has conducted summer surveys since 1979 in portions of the lower 3 miles of the Little Van Duzen River to monitor the presence of adult spring run steelhead. The entire stream was also surveyed in July, 1965, and again in July, 1973. These surveys have documented a small number of summering adults using the Little Van Duzen. Other surveys to monitor the presence of adult salmon and steelhead during fall and winter spawning periods have not been conducted. 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.

WATERSHED OVERVIEW

The Little Van Duzen River is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California. The legal description at the confluence with the Van Duzen River is T1N R5E S07. Its location is 40°28'56" N. latitude and 123°39'42" W. longitude. The Little Van Duzen River is a fourth order stream and has approximately 19.8 miles of blue line stream, according to the USGS Larabee Valley 15 minute quadrangle. The Little Van Duzen River and its tributaries drain a basin of approximately 60.3 square miles. The tributary system has a total of 44.5 miles of blue line stream. Elevations range from about 2,000 feet at the mouth of the river to 4,500 feet in the headwater areas. Grass, oak, and Douglas fir forest dominate the watershed. The lower 9.9 miles of the stream are in private ownerships and are managed primarily for rangeland and timber

production. The upper 9.9 miles of the stream are federally owned and are managed for multiple use by Six Rivers National Forest, Mad River Ranger District. Vehicle access exists from State Highway 36, approximately 36 miles east of Alton and Highway 101 via a road controlled by the Cottrell Ranch. Access to the upper watershed is provided via Forest Service roads near Mad River Station and Dinsmores.

METHODS

The habitat inventory conducted in the Little Van Duzen River follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and contract seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Little Van Duzen River personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by two person teams.

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 the Little Van Duzen River 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. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are measured and recorded at each tenth unit typed. The time of the measurement is also recorded. Temperatures are taken in 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". Little Van Duzen River 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. 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 the Little Van Duzen River, 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).

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 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 the Little Van Duzen River, 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In the Little Van Duzen River, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition:

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 the Little Van Duzen River, the dominant composition type in both the right and left banks was selected from a list of eight options on 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. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in the Little Van Duzen River

to document the fish species composition and distribution. One sites was electrofished in the Little Van Duzen River using one Smith Root Model 12 electrofisher. The site was end-blocked with nets to contain the fish within the sample reach. Fish from the site were counted by species, measured, and returned to the stream.

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). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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 the Little Van Duzen River include:

Little Van Duzen River

- 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

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of August 3-26, and September 8-10, 15-17, 1992 was conducted by Warren Mitchell, Judah Sanders, Russ Irvin, Chris Coyle, Brian Humphrey, Ed Davis, and John Crittenden (CCC and contract seasonals). The survey began 2,363 feet below the Highway 36 bridge and extended up the Little Van Duzen River to the forks. The total length of the stream surveyed was 71,890 feet, with an additional 5,569 feet of side channel.

Flows were not measured on the Little Van Duzen River.

This section of the Little Van Duzen River has two channel types: from the beginning of the survey to 25,003' a B2; next 10,534' a C3; and the upper 36,353' is also a B2. B2 channels are moderate gradient (1.0-2.5%), moderately confined,cobble/gravel channels. C3 streams have low gradient, meandering, gravel bed channels. Water temperatures ranged from 54 to 78 degrees Fahrenheit. Air temperatures ranged from 58 to 96 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 35.8%, pools 31.8%, and flatwater 30.4% (Graph 1). Riffle habitat types made up 40.3% of the total survey **length**, flatwater 35.4%, and pools 22.1% (Graph 2).

Twenty-one Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 26.5%; runs, 14.4%;

step runs, 13.3%; and mid-channel pools, 13.2% (Graph 3). By percent total **length**, low gradient riffles made up 34.0%, step runs 22.1%, runs 10.3%, and mid-channel pools 8.4%.

Two hundred forty-eight pools were identified (Table 3). Main channel pools were most often encountered at 53.2%, and comprised 54.8% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. One hundred twelve of the 248 pools (45%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 216 pool tail-outs measured, 26 had a value of 1 (12.0%); 78 had a value of 2 (36.1%); 86 had a value of 3 (39.8%); and 26 had a value of 4 (12.0%). On this scale, a value of one is best for fisheries (Graph 6).

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 types had the highest shelter rating at 47.2. Flatwater habitats had the lowest rating with 32.4 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 50.2, backwater pools rated 44.9, and main channel pools 44.8 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the Little Van Duzen River and are extensive. Large woody debris is the next most common cover type. Graph 7 describes the pool cover in the Little Van Duzen River.

Table 6 summarizes the dominant substrate by habitat type. Large cobble was the dominant substrate observed in 76 of the 207 low gradient riffles (36.7%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 30.0% of the low gradient riffles (Graph 8).
Nearly 54% of the Little Van Duzen River lacked shade canopy. Of the 46% of the stream that was covered with canopy, 65% was composed of deciduous trees, and 35% was composed of coniferous trees. Graph 9 describes the canopy in the Little Van Duzen River.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 35.6%. The mean percent left bank vegetated was 34.7%. The dominant elements composing the structure of the stream banks consisted of 5.0% bedrock, 28.0% boulder, 31.6% cobble/gravel, 0.1% bare soil, 4.9% grass, 1.8% brush. Additionally, 27.4% of the banks were covered with deciduous trees, and 0.8% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on Sept. 14, 1992 in the Little Van Duzen River. The unit was sampled by John Crittenden and Russ Irvin (CCC and contract seasonal). All measurements are fork lengths unless noted otherwise.

The site sampled was habitat unit 465-466, a step run/mid-channel pool, approximately 25,184 feet from the beginning of the habitat survey and 22,821 feet (4.3 miles) from the Highway 36 bridge. The site had an area of 3,040 sq ft, and a volume of 2,630 cu ft. The sample included six steelhead, ranging from 83 to 198 mm; 10 sucker, ranging from 31 to 59 mm; and one Pacific lamprey ammocete 110 mm total length.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on the Little Van Duzen River.

DISCUSSION

The Little Van Duzen River has two channel types: B2 and C3. The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 61,356 feet of this type of channel in the Little Van Duzen River. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

Little Van Duzen River

The middle 10,543' of the survey reach is a C3 channel. C3 channels are meandering steam types on noncohesive gravel beds

which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days Aug. 3-26, and Sept. 8-17, 1992 ranged from 54° F to 78° F. Air temperatures ranged from 58° F to 96° F. These warmer temperatures, if sustained, are above the threshold stress level for salmonids. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Riffle habitat types comprised 40.3% of the total **length** of this survey, flatwater 35.4%, and pools 22.1%. The pools are relatively deep with 112 of the 248 pools having a maximum depth greater than 3 feet. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize the unstable C3 stream banks, or subject the structures to high stream energy.

One-hundred-twelve of the 216 pool tail-outs measured had embeddedness ratings of 3 or 4. Twenty-six had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In the Little Van Duzen River, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was moderate with a rating of 47.2. The shelter rating in the flatwater habitats was lower at 32.4. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris contributes 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.

Eighty-four of the 207 low gradient riffles had either gravel or small cobble as the dominant substrate. The remaining 123 low gradient riffles had either large cobble or boulder as the dominant substrate. This is generally considered on the high end of the substrate size for spawning salmonids.

The mean percent canopy for the survey reach was 46%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in the Little Van Duzen River. The large trees required to contribute shade to the wide channel typical of this reach would also eventually provide a long term source of large woody debris needed for instream structure.

RECOMMENDATIONS

1) The Little Van Duzen River should be managed as an anadromous, natural production stream.

2) Temperatures in the Little Van Duzen River, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) Increase the canopy on the Little Van Duzen River by planting willow, alder, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) 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.

5) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. In some areas the material is at hand.

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.

PROBLEM SITES AND LANDMARKS

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

0' Begin survey 2,363 feet below the Highway 36 bridge. Channel type is a B2 (reach #1).

922' Butte Creek enters from the left bank.

1525' Small man-made dam/rock formation, with water flowing through.

1811' Man-made dam 35' wide x 8' long x 4' high, forming a cascade with water percolating through.

2363' Highway 36 bridge 40' wide x 200' long x 65' high.

5393' Juvenile fish observed 3-9" long.

6528' Man-made dam with water flowing through.

9901' Adult steelhead 16-20" in length. Summer run? Juvenile fish observed 7-10" long.

11038' This reach of the river has excellent substrate with

very little fines.

18653' Tributary enters from the right bank.

20431' Channel is braided.

22120' 20-30 juvenile fish 5-13" long. This pool appears to be excellent rearing habitat.

25003' Channel type changes from a B2 to a C3 (reach #2).

25611' Large tributary enters from the right bank.

27141' Water truck access.

27713' Barbed wire fence crosses the river.

30505' Right bank erosion 15' high x 100' long, contributing gravel, fines, and cobble into the channel.

33771' Road access.

35537' Channel changes type from a C3 to a B2 (reach #3).

35948' Tributary enters from the right bank. Water temperature is 60°F in this tributary.

36771' Left bank erosion 15' high x 185' long, contributing cobble, gravel, and fines into the channel.

37725' Right bank erosion 80' high x 50' long, contributing boulder, cobble, and gravel into the channel.

39695' Left bank erosion 13' high x 40' long, contributing gravel, cobble, and boulders into the channel.

41143' Tributary enters from the left bank from a 4.5' high plunge. Left bank erosion 25-80' high x 169' long.

43408' Dolores Creek enters from the right bank.

45682' Blanket Creek enters from the right bank.

46883' Trail/road crosses the river.

Little Van Duzen River

47023' Right bank erosion 80' high x 100' long, contributing fines and boulders into the channel.

48900' Tributary enters from the left bank.

50914' Bear Creek enters from the right bank.

51750' Left bank erosion 60' high x 60' long, contributing cobble and fines into the channel.

56187' Tributary enters from the right bank. Possible anadromous habitat.

56452' Left bank erosion 40' high x 150' long, contributing gravel and fines into the channel.

60668' Lost Canyon Creek enters from the left bank. Juvenile fish observed, probably young of the year steelhead.

62365' Log and debris accumulation (LDA) 90' wide x 30' long x 15' high, retaining gravel 100' wide x 400' long. Tributary enters from the right bank.

63143' LDA 100' wide x 30' long x 10' high, retaining gravel 110' wide x 300' long.

63781' Exposed gravel bank 40' high x 300' long, contributing gravel into the channel.

63806' LDA 40' wide x 6' high.

65559' Tributary enters from the left bank; steep gradient.

66206' LDA 60' wide x 12' long x 5' high, retaining gravel 50' long x 4' high.

68379' LDA 120' wide x 75' long x 15' high. Juvenile fish observed above this LDA.

70068' Plunge 5' high over bedrock sheet.

70504' Gradient steepens to greater than 10%.

70939' LDA 70' wide x 7' high, with 4' high plunge over a log.

71197' Tributary enters from the right bank.

71890' River forks into two equal volume creeks. Both creeks appear to have rapid increases in gradient. No fish were observed above the LDA at 70939'. End of survey.

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