STREAM INVENTORY REPORT

NANNING CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Nanning Creek 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 Nanning Creek. 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.

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WATERSHED OVERVIEW

Nanning Creek is tributary to the Eel River, located in Humboldt County, California. Nanning Creek's legal description at the

confluence with the Eel River is T1N R1E S05. Its location is 40°07'33" N. latitude and 124°05'14" W. longitude. Nanning Creek is a first order stream and has approximately 2.3 miles of blue line stream, according to the USGS Scotia and Hydesville 7.5 minute quadrangles. Nanning Creek drains a watershed of approximately 4.0 square miles. Summer base runoff is approximately 0.35 cfs at the mouth. Elevations range from about 80 feet at the mouth of the creek to 1,000 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned primarily by the Pacific Lumber Company and is managed for timber production. Vehicle access exists from U.S. Highway 101 at the north end of Scotia, via a private road.

METHODS

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

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 Nanning 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. 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. Both 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". Nanning 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. 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 Nanning 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).

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 Nanning 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 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 Nanning Creek, 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 Nanning Creek, 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 Nanning Creek to document the fish species composition and distribution. Three sites were electrofished in Nanning Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

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. 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 Nanning 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 4, 5, 8, 9, and 10, 1992, was conducted by Chris Coyle and Warren Mitchell (CCC and contract seasonal). The total length of the stream surveyed was 7,600 feet, with an additional 71 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.35 cfs on June 4, 1992.

Nanning Creek is an C3 channel type for the entire 7,600 feet of stream reach surveyed. C3 channels are low gradient (0.5-1.5%), moderately confined streams, with a gravel stream bed.

Water temperatures ranged from 55 to 63 degrees fahrenheit. Air temperatures ranged from 57 to 68 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 38.4%, riffles 36.0%, and flatwater 25.6% (Graph 1). Riffle habitat types made up 43.5% of the total survey **length**, flatwater 30.9%, and pools 25.6% (Graph 2).

Sixteen 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, 33.7%; mid-channel pools, 20.4%; and runs, 12.8% (Graph 3). By percent total **length**, low gradient riffles made up 39.8%, mid-channel pools 14.8%, and runs 12.9%.

Eighty-one pools were identified (Table 3). Main channel pools were most often encountered at 58.0%, and comprised 62.5% 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. Sixty-five of the 81 pools (80%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 76 pool tail-outs measured, zero had a value of 1 (0.0%); 17 had a value of 2 (22.4%); 26 had a value of 3 (34.2%); and 33 had a value of 4 (43.4%). On this scale, a value of one is the 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 habitat types had the highest shelter rating at 57.9. Riffle habitats followed with a rating of 47.8 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 143.6, main channel pools had a rating of 49.9, and scour pools rated 49.6 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 48 of the 71 low gradient riffles (67.6%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 16.9% of the low gradient riffles (Graph 8).

Twenty-nine percent of the survey reach lacked shade canopy. Of the 71% of the stream covered with canopy, 65% was composed of deciduous trees, and 35% was composed of coniferous trees. Graph 9 describes the canopy in Nanning Creek.

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 57.7%. The mean percent left bank vegetated was 61.1%. The

dominant elements composing the structure of the stream banks consisted of 15.2% bedrock, 2.4% boulder, 2.8% cobble/gravel, 0.7% bare soil, 7.1% grass, 28.4% brush. Additionally, 39.6% of the banks were covered with deciduous trees, and 3.8% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on June 30, 1992 in Nanning Creek. The units were sampled by Brian Humphrey and Erick Elliot (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 027, a mid-channel pool, approximately 1,487 feet from the confluence with the Eel River. This site had an area of 606 sq ft, and a volume of 424 cu ft. The unit yielded 33 steelhead, ranging from 50 to 155mm.

The second site was habitat unit 141, a mid-channel pool, located approximately 5,175 feet above the creek mouth. This site had an area of 225 sq ft, and a volume of 135 cu ft. Five steelhead were sampled. They ranged from 56 to 76mm.

The third site sampled was habitat unit 195, a mid-channel pool, located approximately 7,154 feet above the creek mouth. This site is below the log jams at the end of the habitat inventory survey. The site had an area of 240 sq ft, and a volume of 192 cu ft. Two steelhead were sampled, 124 and 148mm.

DISCUSSION

The C3 channel type is generally not suitable for fish habitat improvement structures. 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 June 4-10, 1992 ranged from 55° F to 63° F. Air temperatures ranged from 57° F to 68° F. This is a good water temperature regime for salmonids. However, 63° F, if sustained, is 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 conducted.

Riffle habitat types comprised 43.4% of the total **length** of this survey, flatwater 30.9%, and pools 25.6%. The pools are relatively shallow with only 16 of the 81 pools having a maximum depth greater than 2 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 or deepen pool habitat is recommended for locations where their installation will not interfere with the unstable stream banks, 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 gravels. Any necessary modifications to them should be done with the intent of metering the gravels 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.

Fifty-nine of the 76 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Nanning Creek, 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 57.9. The shelter rating in the flatwater habitats was lower at 23.5. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, boulders contribute a moderate amount. Log and root wad cover structures in the 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 of the 71 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 71%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Increase woody cover in the flatwater habitat units. Most of the existing cover is from large woody debris and boulders. Adding additional high quality complexity with woody cover is desirable and in some areas the material is at hand.

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) There are several log debris accumulations present on Nanning 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.

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 at confluence with the Eel River. Channel type is a C3 for the entire survey reach.
57'	Railroad bridge crosses the channel. Log against the upstream abutment is retaining gravel 20' wide x 50' long x 5' high.
692'	Two 1+ salmonids observed.
1545'	Tributary enters from the left bank.
1773'	Channel is a bedrock controlled canyon for the next 285'.
2038'	Log debris accumulation (LDA) 20' wide x 5' long x 8' high comprised of 5 logs; no apparent barrier.
2386'	Tributary enters from the left bank via a bedrock chute.

2645' LDA 35' wide x 30' long x 8' high, with no gravel retention; probably not a barrier. Old right bank slide 30' high x 75' wide.

3206' LDA comprised of 6 logs across the channel; possible low flow barrier.

3396' LDA 40' wide x 10' long x 10' high, retaining gravel 25' wide x 30' long x 3' high. Possible low flow barrier.

3582' Small LDA 15' wide x 5' long x 5' high, retaining gravel. Possible low flow barrier.

3816' LDA 25' wide x 40' long x 6' high, retaining gravel 20' wide x 75' long x 6' high; probable barrier to anadromous fish passage. This is possibly an old dam site.

4081' One young-of-the-year salmonid (YOY) observed. Number of YOY observed has greatly reduced since LDA at 3816'.

4393' LDA 40' wide x 35' long x 9' high, retaining gravel 25' wide x 8' high.

4775' Plunge over split fallen redwood, retaining gravel 20' wide x 50' long x 3' high. Low flow barrier.

5310' Tributary enters from the right bank.

5500' Small LDA 10' wide x 6' long x 3' high, retaining gravel 7' wide x 50' long x 3' high.

6416' Four YOY observed.

6768' Small LDA 20' wide x 6' long x 6' high, retaining gravel 15' wide x 75' long x 5' high; possible barrier.

6880' Small LDA 15' wide x 4' long x 5' high, retaining gravel 10' wide x 20' long x 5' high; possible barrier.

7179' LDA 20' wide x 10' long x 6' wide, retaining sand and gravel 12' wide x 30' long x 4' high; probable barrier.

7248' LDA 20' wide x 50' long x 9' high, retaining sand and gravel 10' wide x 15' long x 6' high; probable barrier.

7283' LDA 25' wide x 12' long x 10' high, retaining sand and

gravel 20' wide x 40' long x 6' high; probable barrier.

7318' LDA 35' wide x 12' long x 10' high, retaining gravel and sand 20' wide x 60' long x 8' high; probable barrier.

7506' LDA 35' wide x 30' long x 15' high, retaining sand and gravel 20' wide x 40' long x 8' high; probable barrier.

7600' Tributary enters from the left bank. Habitat is marginal above this point with low flows, abundant debris in the channel, and increasing gradient. 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
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5