STREAM INVENTORY REPORT

Nooning Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Nooning Creek. 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 Nooning Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Nooning Creek.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Nooning Creek is tributary to the Mattole River, located in Humboldt County, California. Nooning Creek's legal description at the confluence with the Mattole River is T04S R02E S31. Its location is 40°03'52" North latitude and 123°59'38" West longitude. Nooning Creek is a second order stream and has approximately 2.2 miles of blue line stream according to the USGS Briceland and Shelter Cove 7.5 minute quadrangles. Nooning Creek drains a watershed of approximately 1.4 square miles. Summer base flow is approximately 1.5 cubic feet per second (cfs) at the mouth, but over 25 cfs is not unusual during winter storms. Elevations range from about 860 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 owned by the Bureau of Land Management and is managed for diverse recreation. The watershed also includes several private rural residences. Vehicle access exists by travelling west on Briceland Road approximately one mile past Thorn Junction to Nooning Creek Road. Follow this light-duty road approximately 1.6 miles. The mouth of Nooning Creek is to the east of the road.

METHODS

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The habitat inventory conducted in Nooning 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). Nooning 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 Nooning 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 measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Nooning 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 Nooning 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 Nooning 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 (1) and sub-dominant (2) substrate elements were ocularly estimated from list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Nooning 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 Nooning 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

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Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Nooning 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 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 Nooning 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of June 18, 19, and 20, 1996, was conducted by Dave Smith and Dylan Brown (PCFWWRA). The total length of the stream surveyed was 7,948 feet with an additional 209 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.1 cfs on July 1, 1996.

Nooning Creek is an F3 channel type for the first 301 feet and a B2 for the remaining 7,647 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle-dominated channels with high width/depth ratios and boulder-dominant substrates.
Water temperatures taken during the survey period ranged from 48 to 53° Fahrenheit. Air temperatures ranged from 48 to 65° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 38% pool units, 32% flatwater units, 30% riffle units, and 1% culvert units (Graph 1). Based on total **length** of Level II habitat types there were 57% flatwater units, 25% riffle units, 17% pool units, and 1% culvert units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 28%; plunge pools, 16%; and mid-channel pools, 14% (Graph 3). Based on percent total **length**, step runs made up 55%, low gradient riffles 12%, and high gradient riffles 7%.

A total of fifty-seven pools were identified (Table 3). Main channel pools were most frequently encountered at 51% and comprised 66% 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. Twenty-seven of the 57 pools (47%) had a depth of two feet or greater (Graph 5).

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

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Of the 57 pool tail-outs measured, one had a value of 1 (2%); three had a value of 2 (5%); 12 had a value of 3 (21%); one had a value of 4 (2%); and 40 tail-outs were identified as not suitable for spawning (70%) (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 rating of 64, and flatwater habitats had a mean shelter rating of 36 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 74. Main channel pools had a mean shelter rating of 58 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in one of the two low gradient riffles measured (50%). Small cobble was also observed as a dominant substrate type and occurred in 50% of the low gradient riffles (Graph 8).
The mean percent canopy density for the stream reach surveyed was 85%. The mean percentages of deciduous and coniferous trees were 90% and 10%, respectively. Graph 9 describes the canopy in Nooning Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 88%. The mean percent left bank vegetated was 87%. The dominant elements composing the structure of the stream banks consisted of 33.3% bedrock, 33.3% boulder, and 33.3% cobble/gravel (Graph 10). Grass was the dominant vegetation type observed in 12% of the units surveyed. Additionally, 76.7% of the units surveyed had deciduous trees as the dominant vegetation type, and 3.3% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on July 1, 1996, in Nooning Creek. The sites were sampled by Kelley Garrett (WSP/AmeriCorps) and Ruth Goodfield (DFG).

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The first site sampled included habitat units 0024-0025, a riffle/run sequence approximately 903 feet from the confluence with the Mattole River. This site had an area of 1,200 sq ft and a volume of 920 cu ft. The site yielded seven young-of-the-year (YOY) and three 1+ steelhead rainbow trout.

The second site included habitat units 0035-0036, a run/pool sequence located approximately 1,252 feet above the creek mouth. This site had an area of 720 sq ft and a volume of 576 cu ft. The site yielded eight YOY steelhead rainbow trout.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Nooning Creek.

DISCUSSION

Nooning Creek is an F4 channel type for the first 301 feet of stream surveyed and a B2 for the remaining 7,647 feet. The suitability of F4 channel types for fish habitat improvement structures is good for bank-placed boulders; fair for low-stage weirs and log cover; and poor for medium-stage weirs and boulder clusters. The suitability of B2 channel types for fish habitat improvement structures is excellent for low- and medium-stage plunge weirs, single and opposing wing deflectors, and bank cover.
The water temperatures recorded on the survey days June 18, 19, and 20, 1996, ranged from 48 to 53 degrees Fahrenheit. Air temperatures ranged from 48 to 65 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 57% of the total **length** of this survey, riffles 25%, and pools 17%. The pools are relatively deep, with 27 of the 57 (47%) 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.

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

Thirteen of the 57 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one 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 Nooning 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 64. The shelter rating in the flatwater habitats was slightly lower at 36. 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, bedrock ledges 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.

All of the 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 85%. 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 88% and 87%, 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.

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RECOMMENDATIONS

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

2) 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 and in some areas the material is locally available.

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 Nooning 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) 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.

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 301' of stream surveyed.

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301' Large debris accumulation (LDA) in stream channel - approximately 25'L x 25'W x 8'H. Possibly a seasonal barrier to salmonids. A good site for LDA modification.

302' Channel type changes to a B2 for the remaining 7,647' of stream surveyed.

903' Bioinventory site #1.

1109' Metal arch culvert; 110'L x 10'H x 28'W. Appears to be in good condition.

1252' Bioinventory site #2.

1907' Young-of-the-year (YOY) salmonids observed by surveyors.

2352' Spring on left bank (LB). Temperature is 51°F.

3330' Spring on right bank (RB). temperature is 50°F.

3689' Flowing tributary enters from LB - 52°F. No fish observed.

4029' Spring on RB - 50°F.

4556' Spring on LB - 51°F.

4864' Spring on RB - 51°F.

5195' Tributary enters from LB - 55°F. Tributary enters from RB - 53°F.

6405' LDA in stream channel - 50'L x 30'W. Not a barrier to fish.

6440' LDA in stream channel - 25'L x 25'W. Not a barrier to fish.

6846' Spring on RB - 52°F.

7146' Waterfall in channel; 5-foot drop.

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7729' Spring on RB - 52°F.

7792' Tributary enters from RB - 52°F.

7948' Channel steepens to greater than 6%. No fish observed upstream. 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.

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
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