SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

MIDDLETON CREEK, SOUTH FORK EEL RIVER, 1996

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

1996

North Coast Watershed Planning and Coordination Project

NORTH COAST WATERSHED PLANNING and COORDINATION PROJECT

The North Coast Watershed Planning and Coordination Project (NCWPCP), formerly the Basin Planning Project (BPP), was begun in 1991 to develop salmon and steelhead restoration and enhancement programs in North Coast watersheds for the Department of Fish and Game (DFG). The objectives of the project conform with the goals of California's Salmon and Steelhead Restoration and Enhancement Program of 1988. The Restoration Program strives to enhance the status of anadromous salmonid populations and improve the fishing experience for Californians. The program intends to achieve a doubling of the population of salmon and steelhead by the year 2000. The project is supported by the Sport Fish Restoraion Act, which uses sport fishermen's funds to improve sport fisheries.

The NCWPCP conducts stream and habitat inventories according to the standart methodologies discussed in the *California Salmonid stream Habitat Restoration Manual,* (Flosi et.al., 1998). Biological sampling is conducted using electrofishbing and direct observation to determine species presence and distribution; selected streams are electrofished for population estimates. Some streams are also sampled for sediment composition. Collected information is used for base-line data, public cooperation development, restoraion program planning, specific project design and implementation, and for project evaluation.

The Eel River system was identified as the initial basin for project planning activities. Most anadromous tributaries to the Van Duzen, South Fork Eel, Mainstem Eel, Middle Fork Eel, and the North Fork Eel rivers have been inventoried since 1991. Initial field inventory of the Eel River system should be essentially complete in 1996. NCWPCP personnel have also worked in cooperation with the DFG Salmon Restoration Project's staff to inventory streams on the Mattole River, Mendocino Coast, and Humboldt Bay.

STREAM INVENTORY REPORT

Middleton Creek, South Fork Eel River

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Middleton Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Middleton 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

Middleton Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Middleton Creek's legal description at the confluence with the S.F. Eel River is T21N R15W S33. Its location is 39°37'39" North latitude and 123°32'26" West longitude. Middleton Creek is a first order stream and has approximately 1.1 miles of blue line stream according to the USGS Cahto Peak/Sherwood Peak 7.5 minute quadrangle. Middleton Creek drains a watershed of approximately 0.84 square miles. Elevations range from about 1,780 feet at the mouth of the creek to 2,080 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for cattle grazing, rural residence and dispersed recreation. Vehicle access exists via Branscomb Road, approximately 6.5 miles west of Highway 101 at Laytonville, 1.5 miles west of bench mark 1830.

METHODS

The habitat inventory conducted in Middleton Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. 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 Middleton 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". Middleton 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. 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 Middleton 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 Middleton Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

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 Middleton 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 Middleton Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Middleton Creek fish no biological sampling was conducted.

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 Middleton 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 Sept. 3, 1996, was conducted by Todd Kraemer and Dale Melton (WSP\AmeriCorps). The total length of the stream surveyed was 5,540 feet.

Flow was intermittant during the survey period.

Middleton Creek is a B4 channel type for the entire 5,540 feet of stream reach surveyed. B4 streams are moderately entrenched, moderate gradient (2-4%), riffle dominated channels with infrequently spaced pools; very stable plan and profile; stable banks and gravel channel.

Water temperatures taken during the survey period ranged from 60° to 69°F. Air temperatures ranged from 67° to 84°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 23% flatwater units, 35% pool units, and 42% dry units (Graph 1). Based on total length of Level II habitat types there were 14% flatwater units, 7% pool units, and 79% dry units (Graph 2).

Four Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were dry, 42%; mid-channel pool, 34%; and run, 23% (Graph 3). Based on percent total length, dry made up 79%, run 14%, and mid-channel pool 7%.

A total of thirty-four pools were identified (Table 3). Main channel pools were most frequently encountered at 97% and comprised 97% 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. Two of the 34 pools (5.8%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 34 pool tail-outs measured, two had a value of 1 (6%); one had a value of 2 (3%); zero had a value of 3 (0%); zero had a value of 4 (0%); and thirty-one had a value of 5 (91%) (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 36, and flatwater habitats had a mean shelter rating of 18 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 60. Main channel pools had a mean shelter rating of 30 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed; sand was the next most frequently observed dominant substrate type.

The mean percent canopy density for the stream reach surveyed was 75%. The mean percentages of deciduous and coniferous trees were 49.5% and 25.5%, respectively. Graph 9 describes the canopy in Middleton Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 57%. The mean percent left bank vegetated was 64%. The dominant elements composing the structure of the stream banks consisted of 100% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 83% of the units surveyed.

BIOLOGICAL INVENTORY RESULTS

No sites were electrofished during the stream inventory survey of 1996, in Middleton Creek.

DISCUSSION

Middleton Creek is a B4 channel type for the entire 5,540 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs; boulder clusters; bank placed boulders; single and opposing wing-deflectors; log cover.

The water temperatures recorded on the survey day Sept. 3, 1996, ranged from 60°to 69°F. Air temperatures ranged from 67° to 84°F. This is a nearing 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 would need to be conducted.

Flatwater habitat types comprised 14% of the total length of this survey, riffles 0%, and pools 7%. The pools are relatively shallow, with only two of the 34 (5.8%) 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.

None of the 34 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 2 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 Middleton 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 36. The shelter rating in the flatwater habitats was 18. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, undercut banks and aquatic vegetation 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.

The mean percent canopy density for the stream was 75%. 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 moderate at 57% and 64%, 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) Middleton Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

6) Increase the canopy on Middleton Creek by planting willow, alder, redwood, 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.

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 South Fork Eel River. Channel type is B4.

342' Log crosses channel; small sediment dam 4' high.

1,715' Dirt road crossing.

1,919' Log debris accumulation (LDA), composed of 6 logs.

1,926' Sediment dam.

1,996' LDA.

2,197' LDA.

3,747' LDA.

3,872' Dead logs line both banks.

3,902' Gradient increase through 3966' mark.

4,324' LDA 12'x20'x6'.

4,611' Gradient increase through 4654' mark.

4,769' Cascade barrier 10' plus 6' high.

5,540' End survey.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California salmonid stream habitat restoration manual, 3rd edition. California Department of Fish and Game,

Middleton Creek, South Fork Eel River

Sacramento, 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