STREAM INVENTORY REPORT

Short Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Short 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 Short 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 Short 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

Short Creek is tributary to Mill Creek, tributary to the Middle Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Short Creek's legal description at the confluence with Mill Creek is T22N R12W S04. Its location is 39°47'04" N. latitude and 123°12'33" W. longitude. Short Creek is a first order stream and has approximately 9.6 miles of blue line stream according to the 1982 BLM Covelo 1:100 000 map. Short Creek drains a watershed of approximately 20 square miles. Summer base flow is approximately 0.2 cubic feet per second (cfs) at the mouth, but over ten cfs is not unusual during winter storms. Elevations range from about 1,330 feet at the mouth of the creek to 2,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned by the Round Valley Indian Reservation and is managed for rural residence and rangeland. Vehicle access exists via state highway 162 east to the town of Covelo. Take East Lane to Adobe Lane. Drive south on Adobe Lane until you reach the mouth of Short Creek.

METHODS

The habitat inventory conducted in Short Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The AmeriCorps/Watershed Stewardship Project (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Short 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 Short 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". Short 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 Short 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" (value 5) 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 Short 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:

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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 Short 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 Short 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 Short Creek fish presence was observed from the stream banks, and one site was 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, DFG. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types

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- 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 Short 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 August 21 to 28, 1996, was conducted by Dale Melton and Paul Ouradnik (WSP/AmeriCorps). The total length of the stream surveyed was 43,221 feet with an additional 569 feet of side channel.

Flows were not measured on Short Creek.

Short Creek is an F4 channel type for the first 15,262 feet of stream surveyed, an F3 for the next 17,179 feet, and an F4 for the remaining 10,780 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. F3 channels are very similar, but with cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 63° to 86° F. Air temperatures ranged from 61° to 95°F.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 35% flatwater units, 26% pool units, 19% riffle units, and 20% dry units (Graph 1). Based on total **length** of Level II habitat types there were 62% dry units, 22% flatwater units, and 10% pool units, and 6% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 29%; mid-channel pools, 24%; and dry units, 20% (Graph 3). Based on total **length**, dry units made up 62%, runs 18%, and pocket water 10%.

A total of one hundred and eight pools were identified (Table 3). Main channel pools were most frequently encountered at 93% and comprised 92% 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-two of the 108 pools (39%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 108 pool tail-outs measured, 11 had a value of 1 (10%); 45 had a value of 2 (42%); 23 had a value of 3 (21%); two had a value of 4 (2%); and 27 had a value of 5 (25%) (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 37, and riffle habitats had a mean shelter rating of 33 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 43. Main channel pools had a mean shelter rating of 33 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in eight of the nine low gradient riffles measured (89%). Small cobble was the next most frequently observed dominant substrate type and occurred in 11% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 35%. The mean percentages of deciduous and coniferous trees were 91% and 9%, respectively (Graph 9).

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For the stream reach surveyed, the mean percent right bank vegetated was 59%. The mean percent left bank vegetated was 60%. The dominant elements composing the structure of the stream banks consisted of 13.1% bedrock, 1.2% boulder, 56.0% cobble/gravel, and 29.8% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 33% of the units surveyed. Additionally, 48.8% of the units surveyed had deciduous trees as the dominant vegetation type, and 1.2% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on August 20, 1996, in Short Creek. The site was sampled by Ruth Goodfield (DFG), Dale Melton, and Paul Ouradnik (WSP/AmeriCorps). The site sampled included habitat units 0107-0108, a run/pool sequence approximately 16,836 feet from the confluence with Mill Creek. This site had an area of 800 sq ft and a volume of 640 cu ft. The site yielded two young-of-the-year (YOY) steelhead rainbow trout, three green sunfish, two small-mouth bass, and over 50 California roach.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Short Creek.

DISCUSSION

Short Creek is an F4 channel type for the first 15,262 feet of stream surveyed, an F3 for the next 17,179 feet, and an F4 for the remaining 10,780 feet. The suitability of F3 and F4 channel types for fish habitat improvement structures is described as good for bank-placed boulders; fair for channel constrictors and log cover; and poor for medium-stage weirs.

The water temperatures recorded on the survey days August 21 to 28, 1996, ranged from 62° to 86° F. Air temperatures ranged from 61° to 95° F. This is a warm water temperature range for salmonids. Temperatures above, 68° F, if sustained, are near the threshold stress level for salmonids. This does seem to be the case here, and Short Creek seems to have temperatures that are marginal 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 22% of the total **length** of this survey, riffles 6%, dry units 62%, and pools 10%. The pools are relatively shallow, with 42 of the 108 (39%) 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.

Twenty-five of the 108 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 11 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 Short 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 low with a rating of 37. The shelter rating in the flatwater habitats was slightly lower at 33. 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, aquatic and terrestrial 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.

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 35%. This is a relatively low 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 moderate at 59% and 60%, 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) Short Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are above the optimum 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) Increase the canopy on Short Creek 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) There are at least two sections where the stream is being impacted from cattle trampling the riparian zone and defecating in the water. Alternatives should be explored with the grazier and developed if possible.

5) 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.

6) 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.

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 Mill Creek. Channel type is an F4 for the first 15,262' surveyed. The lower 200' of Short Creek has been channeled into a gully which runs alongside the road. The road has been built in the stream channel and the banks are armored with tires.
751'	Railroad car bridge spans stream.
2374'	Chicken-wire fish weir stretched across the creek.
2479'	Evidence of cattle grazing and defecating in the stream channel.
4561'	California roach and YOY salmonids observed from the streambanks.
14659'	Short Creek Road crosses creek.
15263'	Channel type changes from an F4 to an F3 (reach #2) for the next 17179' of

stream surveyed.

16802'Highway 162 bridge spans creek.

16836'Bioinventory site # 1.

21221'Stream channel is aggraded - water in a few spots, but no single-thread, distinct channel.

25313'Dirt road fords stream.

26881'Railroad car bridge spans stream.

28747'Tributary enters from left bank (LB).

32049'Right bank (RB) armored with concrete.

32441'Channel type changes from an F3 to an F4 (reach 3) for the remaining 10780' of stream surveyed.

38070'Chicken-wire fish weir stretched across the creek.

38604'Evidence of cattle grazing and defecating in the stream.

40371'YOY salmonids observed from the streambanks by surveyors.

42616'Fence on LB; seems to be a type of bank armor.

43221'Channel gradient steepens to greater than 4%.

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