STREAM INVENTORY REPORT

SOUTH FORK DAGO CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on South Fork Dago 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 South Fork Dago Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for 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

The South Fork Dago Creek is a tributary to Dago Creek, tributary to Rancheria Creek, tributary to the Navarro River, located in Mendocino County, California (Figure 1). South Fork Dago Creek's legal description at the confluence with Rancheria Creek is T14N R13W S26. Its location is 39°02′46″ north latitude and 123°28′54″ west longitude. South Fork Dago Creek is a first order stream and has approximately 1.8 miles of blue line stream according to the USGS Philo and Cold Spring 7.5 minute quadrangles. South Fork Dago Creek drains a watershed of approximately 1.32 square miles. Elevations range from about 360 feet at the mouth of the creek to 1060 feet in the headwater areas. A redwood and Douglas fir mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via State Route 128, Philo-Greenwood Road, Cold Spring Road and various gated private roads near Boonville.

METHODS

The habitat inventory conducted in the South Fork of Dago Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and the AmeriCorps Watershed Stewards Project (WSP/AmeriCorps) Members who 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 (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 South Fork Dago 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". South Fork Dago 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 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 South Fork Dago 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) and 76 - 100% (value 4). Additionally, a rating value of 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 the South Fork Dago 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 hand held spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In South Fork Dago Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the end of approximately every third unit in addition to every fully-described unit, giving approximately a 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 South Fork Dago 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 South Fork Dago Creek fish presence was observed from the stream banks, and one site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 Quattro Pro. The developed graphics for South Fork Dago 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 September 26, 1996, was conducted by Andrew MacMillan (WSP/AmeriCorps) and Ann Huber (CCC). The total length of the stream surveyed was 5,872 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.12 cfs on September 18, 1996.

The South Fork of Dago Creek is a B3 channel type for the entire 5,872 feet of stream reach surveyed. B3 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks and a cobble dominated substrate.

Water temperatures taken during the survey period ranged from 56 to 59 degrees Fahrenheit. Air temperatures ranged from 62 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 13% riffle units, 37% flatwater units, 44% pool units, and 5% dry units (Graph 1). Based on total **length** of Level II habitat types there were 9% riffle units, 56% flatwater units, 26% pool units, and 9% was dry (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 35%; mid-channel pools, 30%; and low gradient riffles, 11% (Graph 3). Based on percent total **length**, step runs made up 55%, mid-channel pools 17%, and low gradient riffles made up 8%.

A total of sixty-six pools were identified (Table 3). Main channel pools were most frequently encountered at 73% (Graph 4) and comprised 72% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-one of the 66 pools (32%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 66 pool tail-outs measured, none had a value of 1 or 2, 31 had a value of 3 (47%), 29 had a value of 4 (44%), and six had a value of 5 (9%)(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 53, flatwater habitat types had a mean shelter rating of 9, and riffle habitats had a mean shelter rating of 2 (Table 1). Of the pool types, the main channel pools had the highest mean shelter

rating at 62, while scour pools had a mean shelter rating of 38 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Fork Dago Creek and are extensive. Large and small woody debris is lacking in most habitat types. Graph 7 describes the pool cover in South Fork Dago Creek.

Table 6 summarizes the dominant substrate by habitat type. Of the two low gradient riffles measured, the dominant substrate in one was gravel, the other was small cobble (Graph 8).

The mean percent canopy density for the stream reach surveyed was 73% (Table 7). The mean percentages of deciduous and coniferous trees were 44% and 56%, respectively. Graph 9 describes the canopy in South Fork Dago Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 60%. The mean percent left bank vegetated was 58%. The dominant elements composing the structure of the stream banks consisted of 17.5% bedrock, 80% cobble/gravel, and 2.5% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 45% of the units surveyed, including downed trees, logs, and root wads. Additionally, 42.5% of the units surveyed had deciduous trees as the dominant vegetation type, and 12.5% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on, September 27, 1996 in South Fork Dago Creek. The site was sampled by Andrew MacMillan and Ann Huber.

The site sampled was habitat units 010-015, approximately 220 feet from the confluence with Dago Creek. This site was 319 feet long and had an area of 2,233 sq. ft. The site yielded 15 steelhead and 2 sculpin.

DISCUSSION

The South Fork of Dago Creek is a B3 channel type for the entire 5,872 feet of stream surveyed. The suitability of B3 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, and log cover, and good for medium stage plunge weirs.

The water temperatures recorded on the survey day of September 26, 1996, ranged from 56 to 59 degrees Fahrenheit. Air temperatures ranged from 62 to 82 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 56% of the total **length** of this survey, riffles 9%, and pools 26%. The pools are relatively shallow, with only 21 of the 66 (32%) 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.

All of the 66 pool tail-outs measured had embeddedness ratings of 3, 4, or 5. None had an embeddedness rated of 1. 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 South Fork Dago 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 low with a rating of 53. The shelter rating in the flatwater habitats was much worse at 9. 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 most habitat types. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and divide territorial units to reduce density related competition.

The two 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 73%. This is a moderate percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 60% and 58%, 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) The South Fork of Dago Creek should be managed as an anadromous, natural production stream.

2) 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.

3) 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.

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) Increase the canopy on South Fork Dago 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.

6) 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.

COMMENTS AND LANDMARKS

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

0'	Begin survey at confluence with Dago Creek. Channel type is B3.
133'	Log debris accumulation (LDA), 20' long X 30' wide X 8' high, retaining four feet of sediment, no barrier.
220'	Electrofishing site.
445'	Tributary enters from the left bank. Flow of tributary is underground and shoots out of the bank two feet below the surface of the ground, and two feet above the surface of South Fork Dago Creek.
778'	LDA, 20' long X 40' wide X 12' high, between bedrock constriction, retaining 7' of gravel, possible barrier.
1,400'	LDA, 60' long X 40' wide X 20' high, retaining five feet of sediment, no barrier.
2,654'	LDA, 80' long X 40' wide X 15' high, retaining ten feet of sediment, possible barrier.
3,151'	LDA, 13' long X 16' wide X 5' high, retaining four feet of sediment, no barrier.
3,483'	Right bank tributary, dry, inaccessible to fish.
3,533'	Left bank tributary, dry, inaccessible to fish.

4,128'	Young-of-the-year and one-year-old steelhead observed.
4,221'	Left bank tributary enters. Dry and inaccessible to fish.
4,621'	LDA, 25' long X 30' wide X 8' high. No barrier, retaining no sediment.
4,648'	LDA, 20' long X 40' wide X 5' high, retaining five feet of sediment, posing no barrier, but dry above.
5,495'	Young-of-the-year, and one-year-old steelhead observed.
5,357'	LDA, 10' long X 30' wide X 10' high, retaining six feet of sediment, possible barrier.
5,377'	LDA, 10' long X 30' wide X 10' high, retaining ten feet of sediment, possible barrier.
5,407'	LDA, 20' long X 30' wide X 12' high, retaining ten feet of sediment, possible barrier.
5,872'	End of survey. The stream is a series of boulder cascades in an area of bedrock walls and a very confined channel, easily retaining boulders and large woody debris. There is a 31' rise over a 77' run = 40% gradient. The last fish was observed approximately 800' downstream, and no fish were observed for an additional 500' upstream.

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.

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