STREAM INVENTORY REPORT

Dago Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on 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 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 steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Dago Creek is tributary to Rancheria Creek, tributary to the Navarro River, located in Mendocino County, California (Map 1). Dago Creek's legal description at the confluence with Rancheria Creek is T14N R15W S26. Its location is 39°02′36″ north latitude and 123°28′50″ west longitude. Dago Creek is a second order stream and has approximately 2.9 miles of blue line stream according to the USGS Philo 7.5 minute quadrangle. Dago Creek drains a watershed of approximately 3.8 square miles. Elevations range from about 320 feet at the mouth of the creek to 1000 feet in the headwater areas. 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 near Boonville via State Route 128, Philo-Greenwood Road, Cold Spring Road and gated, private dirt roads.

METHODS

The habitat inventory conducted in Dago Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The AmeriCorps Watershed Stewards Project (WSP/AmeriCorps) Members and the California Conservation Corps (CCC) Technical Advisors 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.

Dago Creek

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 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". 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.

Dago Creek

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 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 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 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 handheld 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 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 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 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.

Dago Creek

BIOLOGICAL INVENTORY

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

The habitat inventory of September 19, 1996, was conducted by Andrew MacMillan (WSP\AmeriCorps) and Ann Huber (CCC). The total length of the stream surveyed was 6,306 feet with an additional 76 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.19 cfs on September 18, 1996.

Dago Creek

Dago Creek is a C4 channel type for the entire 6,306 feet of stream reach surveyed. C4 channels are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains and a gravel channel.

Water temperatures taken during the survey period ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 60 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 44% pool units, 39% flatwater units, and 15% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 49% flatwater units, 34% pool units, 8% riffle units, and 9% was dry (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 31%; mid-channel pools, 28%; and low gradient riffles, 15% (Graph 3). Based on percent total **length**, step runs comprised 44%, mid-channel pools 24%, and 9% was dry (Table 2).

A total of fifty-seven pools were identified (Table 3). Main channel pools were most frequently encountered at 75%, and comprised 81% 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-six of the 57 pools (46%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 57 pool tail-outs measured, none had a value of 1; none had a value of 2; 30 (53%) had a value of 3; 24 (42%) had a value of 4; and 3 (5%) had a value of 5 or were unsuitable for spawning (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. Riffle habitat types had a mean shelter rating of 107, flatwater habitats had a mean shelter rating of 54, and pool habitats had a mean shelter rating of 79 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 120, main channel pools had a mean shelter rating of 80, and scour pools rated 63 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Dago Creek and is extensive. Large woody debris and boulder are also present in fair amounts. Graph 7 describes the pool cover in Dago Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel and small cobble were the dominant substrate observed in the two low gradient riffles measured (Graph 8).

The mean percent canopy density for the stream reach surveyed was 65%. The mean percentages of deciduous and coniferous trees were 49% and 51%, respectively. Graph 9 describes the canopy in Dago Creek.

Dago Creek

For the stream reach surveyed, the mean percent right bank vegetated was 53%. The mean percent left bank vegetated was 55.2%. The dominant elements composing the structure of the stream banks consisted of 2.2% bedrock, 4.4% boulder, 82.6% cobble/gravel, and 11.9% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 47.8% of the units surveyed. Additionally, 28.3% of the units surveyed had coniferous trees as the dominant vegetation, including downed trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 18, 1996. The site was sampled by Andrew MacMillan and Ann Huber.

The site sampled included habitat units 02 through 04, two pools and a step run beginning approximately 50 feet from the confluence with Rancheria Creek. The site yielded 17 steelhead, three Pacific giant salamanders, and one crayfish.

DISCUSSION

Dago Creek is a C4 channel type for the entire 6,306 feet of stream surveyed. The suitability of C4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders and log cover, and fair for low-stage weirs, single and opposing wing deflectors and channel constrictors.

The water temperatures recorded on the survey day September 19, 1996, ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 60 to 80 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 49% of the total **length** of this survey, riffles 8%, and pools 34%. The pools are relatively deep, with 26 of the 57 pools (46%) 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.

All of the pool tail-outs measured had embeddedness ratings of 3, 4 or 5. 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 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 79. The shelter rating in the flatwater habitats was 54. A pool shelter rating of approximately 100 is desirable. The majority of the cover that now exists is being provided by terrestrial vegetation in all habitat types. Large woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to

6

Dago Creek

improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and 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 65%. 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 53% and 55.2%, 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)   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 the canopy on Dago Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4)   Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from terrestrial vegetation. Adding high quality complexity with woody cover such as large wood and root wads is desirable.

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.

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.

Dago Creek

Position (ft):	Comments:
0'	Begin survey at confluence with Rancheria Creek. Channel type is C4.
451'	The South Fork of Dago Creek enters from the right bank. See separate report.
2,093'	Left bank tributary, accessible to fish.
2,328'	Boulder cascade with a 5' jump.
2,855'	Dry left bank tributary, not accessible to fish.
3,016'	Log debris accumulation (LDA), 60' long x 40' wide X 10' high. No barrier to fish and retaining no sediment.
3,960'	Numerous young-of-the-year steelhead and freshwater snails observed along entire survey reach.
4,589'	LDA, 60' long X 30' wide X 10' high, no barrier to fish, but retaining two feet of sediment.
5,190'	LDA, 20' long X 30' wide X 10' high, no barrier, but retaining four feet of sediment.
6,116'	Dry left bank tributary, accessible to fish.
6,306'	End of survey due to lack of landowner access permission. Not the end of the anadromous reach of stream.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2ndedition. 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.

Dago Creek

<u>LEVEL III and LEVEL IV HABITAT TYPE KEY</u>

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

Dago Creek

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET