STREAM INVENTORY REPORT

Dutch Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Dutch Creek. The survey began at the confluence with the Trinity River and extended upstream 0.9 miles. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Dutch Creek.

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

Dutch Creek is a tributary to the Trinity River, a tributary to the Klamath River, which drains to the Pacific Ocean. It is located in Trinity County, California (Map 1). Dutch Creek's legal description at the confluence with the Trinity River is T32N R10W S32. Its location is 40.6640 degrees north latitude and 123.0164 degrees west longitude. Dutch Creek is a fourth order stream and has approximately five miles of blue line stream according to the USGS Junction City 7.5 minute quadrangle. Dutch Creek drains a watershed of approximately 10.5 square miles. Elevations range from about 1,575 feet at the mouth of the creek to 5,050 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily owned by Six Rivers National Forest and is mananged for timber production and recreation.

METHODS

The habitat inventory conducted in Dutch Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisor 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, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 Dutch Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Stream flow was not measured in Dutch Creek.

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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and stadia rod.

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". Dutch 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. All measurements are in feet to the nearest tenth. Habitat characteristics were measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Dutch 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 not suitable for spawning due to inappropriate substrate particle size,

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 Dutch 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. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

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 Dutch 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 Dutch 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 (including downed trees, logs, and rootwads) was estimated and recorded.

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:

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- 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 Dutch 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
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of June 16 and 17, 1999 was conducted by Gina Capser (CCC) and Michelle Hoffman (WSP/AmeriCorps). The total length of the stream surveyed was 4,587 feet with an additional 273 feet of side channel.

Stream flow was not measured on Dutch Creek.

Dutch Creek is an A3 channel type for the entire 4,587 feet of the stream surveyed (United States Forest Service Dutch Creek Stream Condition Inventory 1999). A3 channels are steep, narrow, cascading, cobble dominated step-pool streams with high energy/debris transport associated with depositional soils.

Water temperatures taken during the survey period ranged from 52 to 58 degrees Fahrenheit. Air temperatures ranged from 58 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% riffle units, 35% pool units, and 21% flatwater units (Graph 1). Based on total length of Level II habitat types there were 55% riffle units, 25% flatwater units, and 20% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 34%; low gradient riffles, 22%; and high gradient riffles, 21% (Graph 3). Based on percent total length, low gradient riffles made up 37%, step runs

20%, and mid-channel pools 19%.

A total of 44 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 98%, and comprised 98% 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 44 pools (4.5%) had a depth between three and four feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 44 pool tail-outs measured, 33 had a value of 1 (75%); eight had a value of 2 (18.2%); and three had a value of 5 (6.8%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the three pool tail-outs that had an embeddedness value of 5 was 67% boulder and 33% bedrock.

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 9, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 21 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 21 and scour pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Dutch Creek, while white water is the sub-dominant cover type. Graph 7 describes the pool cover in Dutch Creek. Boulders are the dominant pool cover type followed by white water.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 32% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 30%.

The mean percent canopy density for the surveyed length of Dutch Creek was 95%. The mean percentages of deciduous and coniferous trees were 75% and 25%, respectively. Graph 9 describes the mean percent canopy in Dutch Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 85%. The mean percent left bank vegetated was 85%. The dominant elements composing the structure of the stream banks consisted of 37% boulders, 29% cobble/gravel, 24% sand/silt/clay, and 11% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 63% of the units surveyed; 24% of the units surveyed had brush as the dominant vegetation type; and 13% had grass as the dominant vegetation (Graph 11).

DISCUSSION

Dutch Creek is an A3 channel type for the 4,587 feet of stream surveyed. A3 channels are generally not suitable for fish habitat improvement projects.

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The water temperatures recorded on the survey days of June 16 and 17, 1999, ranged from 52 to 58 degrees Fahrenheit. This is a favorable water temperature range for salmonids. Air temperatures ranged from 58 to 80 degrees Fahrenheit. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 25% of the total length of this survey, riffles 55%, and pools 20%. Two of the 44 (2.3%) pools had a maximum depth between three and four feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

Ninety-three percent of the pool tail-outs measured had embeddedness ratings of 1 or 2 and the remaining seven percent of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Sixty-two percent of the pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating in the flatwater habitats was 8. The mean shelter rating for pools was 21. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders and white water in most habitat types. Log and root wad cover structure in the pool and flatwater habitats would enhance 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 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 85% each. 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) Dutch 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) Increase the large wood component in the pools and flatwater habitat units. Most of the existing cover is from boulders and white water. Adding high quality complexity with

woody cover is desirable.

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.

Position (ft):	Comments:
0'	Start of survey at confluence with the Trinity River. The channel type is an A3.
302'	Road crossing through creek.
638'	Gully on right bank.
794'	Bedrock sheet, 1.2 feet high x 2 feet long.
1,325'	Dry gully enters from right bank.
2,201'	Dry gully enters from right bank.
2,291'	Log debris accumulation, 8 feet long x 22 feet wide x 5 feet high, redirecting flow into left bank.
2,485'	Road crossing creek through pool tail-out.
2,682'	Woody debris in channel causing scour.
3,751'	Tributary enters from right bank with minimal flow. The water temperature was 51 degrees Fahrenheit. The tributary is not accessible to anadromous salmonids.
3,805'	One and a half diameter metal mining pipes crossing channel.
3,850'	Flagging indicating lower end of mining claim.
4,051'	Ephemeral tributary enters from left bank.
4,208'	Maple Creek enters from left bank with a recorded water temperature of 55 degrees Fahrenheit. Accessible to anadromous salmonids.
4,384'	Two and a half foot high plunge.
4,521'	Road is causing erosion.
4,587'	Road crosses through channel. Survey ended at top boundary of mining claim.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	