

STREAM INVENTORY REPORT

Two Log Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Two Log Creek. The survey began at the confluence with Big River and extended upstream 2.85 miles.

The Two Log Creek 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 Two Log 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 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

Two Log Creek is a tributary to Big River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Two Log Creek's legal description at the confluence with Big River is T17N R16W S23. Its location is 39°19'12.8" north latitude and 123°36'47" west longitude. Two Log Creek is a second order stream and has approximately 2.2 miles of blue line stream according to the USGS Comptche 7.5 minute quadrangle. Two Log Creek drains a watershed of approximately 4.6 square miles. Elevations range from about 200 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 20 from Willits to Two Log Creek.

METHODS

The habitat inventory conducted in Two Log Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The 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.

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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 Two Log 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 a Marsh-McBirney Model 2000 flow meter.

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 a 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

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a standard list of 24 habitat types. Dewatered units are labeled "dry". Two Log 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 are 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 Two Log 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, bedrock, 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 Two Log 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Two Log 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.

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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 Two Log 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.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Two Log Creek. In addition, nine sites were 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 Two Log 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

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

HABITAT INVENTORY RESULTS

The habitat inventory of June 11 through June 19, 2002, was conducted by Toni Russell and Janelle Breton (WSP). The total length of the stream surveyed was 15,074 feet with an additional 21 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.42 cfs on June 11, 2002.

Two Log Creek is a B4 channel type for the first 7,197 feet of the stream surveyed, a B3 channel type for the next 483 feet, a B4 for the next 6,873 feet, a G1 for the next 303 feet, and a G6 channel type for the last 218 feet of the surveyed. B4 and B3 channel types are moderately entrenched, moderate gradient, riffle dominated channels with infrequently-spaced pools; very stable plan and profile, stable banks, and having gravel and cobble dominated substrates, respectively. G1 and G6 are entrenched "gully" step-pools and have low width/depth ratios on moderate gradients, and having bedrock and silt/clay dominated substrates, respectively.

Water temperatures taken during the survey period ranged from 52° to 60° Fahrenheit. Air temperatures ranged from 52° to 78° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 30% riffle units, 35% flatwater units, and 35% pool units (Graph 1). Based on total length of Level II habitat types there were 14% riffle units, 44% flatwater units, and 41% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 34%; mid-channel pools, 33%; and low-gradient riffles, 24% (Graph 3). Based on percent total length, runs made up 43%, mid-channel pools 40%, and low-gradient riffles 12%.

A total of 115 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 96%, 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. Sixty-nine of the 115 pools (60%) had a depth of two feet or greater (Graph 5).

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The depth of cobble embeddedness was estimated at pool tail-outs. Of the 113 pool tail-outs measured, 28 had a value of 1 (24.8%); 46 had a value of 2 (40.7%); 22 had a value of 3 (19.5%); 2 had a value of 4 (1.8%); and 15 had a value of 5 (13.2%) (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 8, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 15. Main-channel pools had a mean shelter rating of 12 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Two Log Creek. Graph 7 describes the pool cover in Two Log Creek. Undercut banks are the dominant pool cover type followed by root mass.

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 63.7% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 21.2%.

The mean percent canopy density for the surveyed length of Two Log Creek was 92%. The mean percentages of deciduous and coniferous trees were 59% and 41%, respectively. Graph 9 describes the mean percent canopy in Two Log Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 80.8%. The mean percent left bank vegetated was 81.7%. The dominant elements composing the structure of the stream banks consisted of 8.7% bedrock, 1.9% boulder, 21.2% cobble/gravel, and 68.3% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 77.9% of the units surveyed. Additionally, 16.3% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Nine sites were electrofished for species composition and distribution in Two Log Creek on July 24, 2002. Water temperatures taken during the electrofishing period (0930 to 1430) ranged from 58° to 60° Fahrenheit. The sites were sampled by Trevor Tollefson (DFG) and Toni Russell (WSP).

The first site sampled included habitat unit 0012, a mid-channel pool approximately 412 feet from the confluence with Big River. The site yielded 3 young-of-the-year coho.

The second site included habitat units 0157 and 0159, two mid-channel pools located approximately 7,424 and 7,618 feet above the creek mouth. The sites yielded 2 young-of-the-

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year steelhead and 5 young-of-the-year coho.

The third site sampled included habitat unit 0163, a mid-channel pool located approximately 7,769 feet above the creek mouth. The site yielded 2 young-of-the-year steelhead and 6 young-of-the-year coho.

The fourth site sampled included habitat units 0315, 0318, and 0321, two mid-channel pools and a run, located approximately 14,553, 14,667, and 14,740 feet above the creek mouth. The sites yielded one age one-plus steelhead and 15 young-of-the-year coho.

The fifth site sampled included habitat units 0325 and an unnumbered site just above the survey reach, both mid-channel pools located approximately 14,856 and 15,074 feet, respectively, above the creek mouth. The sites yielded 1 one-plus steelhead and 7 young-of-the-year coho.

The following chart displays the information yielded from these sites:

Date	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	SH YOY	SH 1+	Coho YOY
07/24/02	412	0012	4.2	1	B4	1	0	3
07/24/02	7,424	0157	4.2	2	B3	0	0	3
07/24/02	7,618	0159	4.2	2	B3	2	0	2
07/24/02	7,769	0163	4.2	3	B4	2	0	6
07/24/02	14,553	0315	4.2	4	G1	0	0	6
07/24/02	14,667	0138	4.2	4	G1	0	0	5
07/24/02	14,740	0321	3.3	4	G1	0	1	4
07/24/02	14,856	0325	4.2	5	G6	0	1	4
07/24/02	15,074	-----	4.2	5	G6	0	0	3

DISCUSSION

Two Log Creek is a B4 channel type for the first 7,197 feet of stream surveyed, a B3 channel type for the next 483 feet, a B4 channel type for the next 6,873 feet, an G1 channel type for the next 303 feet, and a G6 channel type for the remaining 218 feet of the survey reach. The suitability of B4 and B3 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder clusters and bank-placed boulders, single and

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opposing wing-deflectors, and log cover. The suitability of G1 channel types is as follows: fair for log cover; poor for boulder clusters. The suitability of G6 channel types is as follows: good for bank-placed boulders; fair for plunge weirs, opposing wing deflectors, and log cover; poor for boulder clusters and single wing deflectors.

The water temperatures recorded on the survey days June 11-19, 2002, ranged from 52° to 60° Fahrenheit. Air temperatures ranged from 52° to 78° Fahrenheit. This is an 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 44% of the total length of this survey, riffles 14%, and pools 41%. The pools are relatively deep, with 69 of the 115 (60%) 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.

Seventy-four of the 113 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-four of the pool tail-outs had embeddedness ratings of 3 or 4. Fifteen of the pool tail-outs had a rating of 5, which is considered unsuitable 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. Sediment sources in Two Log Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Ninety-six of the 113 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 for pools was 12. The shelter rating in the flatwater habitats was 9. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in most habitat types. Additionally, undercut banks contribute a small amount. Log and root wad cover structures 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 92%. Reach 1 had a canopy density of 87% while Reaches 2, 3, 4 and 5 had canopy densities of 92%, 96%, 97%, and 97%, respectively. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 80.8% and 81.7%, 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.

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RECOMMENDATIONS

- 1) Two Log 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 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) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.
- 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.

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'	Begin survey at confluence with Big River. Channel type is B4.
73'	Juvenile salmonids observed. Flow measured at 0.42 cfs.
260'	Right bank culvert: 1.5' diameter, 10' plunge height.
412'	Bridge, 13' above the channel, 12' wide x 50' long. Out of influence of Big River. Electrofishing site #1.
678'	Location of channel types cross-section for B4 channel type.
2,781'	Tributary enters on right bank, water temperature was 53° Fahrenheit.
3,183'	Juvenile salmonids observed.

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- 4,158' Tributary enters on right bank, water temperature was 54° Fahrenheit.
- 4,845' Log debris accumulation (LDA) of 14 pieces: 9' high x 40' wide x 45' long. Stored sediment 10' wide x 8' long x 2' deep.
- 5,634' Tributary enters on right bank, water temperature was 52° Fahrenheit.
- 6,195' Right bank erosion contributing sediment, 15' long x 10' high.
- 6,305' Left bank erosion contributing sediment, 60' long x 25' high.
- 6,534' LDA of 10 pieces: 10' high x 19' wide x 26' long. Stored sediment 6' wide x 5' long x 1' deep.
- 6,544' Juvenile salmonids observed.
- 7,214' Channel type change, B4 to B3.
- 7,283' Tributary enters on left bank, water temperature was 52° Fahrenheit.
- 7,424' Electrofishing site #2.
- 7,618' Electrofishing site #2.
- 7,769' Electrofishing site #3.
- 8,115' Tributary enters on right bank, water temperature was 53° Fahrenheit.
- 9,557' Tributary enters on right bank, water temperature was 53° Fahrenheit.
- 9,648' Left bank erosion contributing sediment, 40' long x 15' high.
- 9,910' Vehicle bridge crosses 8.5' above channel, 10' wide x 45' long.
- 11,371' LDA of 2 pieces: 4' high x 18' wide x 8' long. Stored sediment 4' wide x 4' long x 2' deep.
- 11,724' Tributary enters on left bank, water temperature was 56° Fahrenheit. Tributary is high gradient, no fish observed.
- 12,577' Right bank culvert, 2' diameter, 15' plunge height.

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- 12,991' LDA of 2 pieces: 3' high x 7' wide x 5' long. Stored sediment 6' wide x 4' long x 2' deep.
- 13,230' Tributary enters on left bank and was dry at the time of survey.
- 13,436' Right bank culvert, 1.5' diameter, 20' plunge height.
- 14,149' Tributary enters on right bank, water temperature was 54° Fahrenheit.
- 14,553' Electrofishing site #4.
- 14,627' Channel type change, B4 to G1.
- 14,667' Electrofishing site #4.
- 14,740' Electrofishing site #4
- 14,856' Electrofishing site #5.
- 14,873' Channel type change, G1 to G6.
- 14,990' LDA of 15 pieces: 12' high x 30' wide x 60' long. Stored sediment 7' wide x 5' long x 5' deep. This is a possible barrier to juvenile salmonids.
- 15,005' Left bank erosion contributing sediment, 45' long x 15' high.
- 15,074' End of survey due to marsh conditions. Electrofishing site #5.

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.

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]	