STREAM INVENTORY REPORT

Toss-up Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Toss-up Creek. The survey began at the confluence with Redwood Creek and extended upstream 1.0 mile.

The Toss-up 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 Toss-up 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

Toss-up Creek is a tributary to Redwood Creek, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Toss-up Creek's legal description at the confluence with Redwood Creek is T07N R03E S20. Its location is 40.9867 degrees north latitude and 123.8486 degrees west longitude. Toss-up Creek is a first order stream and has approximately 1.5 miles of blue line stream according to the USGS Lord-Ellis Summit 7.5 minute quadrangle. Toss-up Creek drains a watershed of approximately 2.5 square miles. Elevations range from about 700 feet at the mouth of the creek to 2,000 feet in the headwater areas. Redwood forest, Douglas fir forest and mixed hardwood forest dominate the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 299 to Redwood Valley Road.

METHODS

The habitat inventory conducted in Toss-up 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.

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 Toss-up 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 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 a standard list of 24 habitat types. Dewatered units are labeled "dry". Toss-up 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 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 Toss-up 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, 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 Toss-up 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 Toss-up 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 Toss-up 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 Toss-up Creek. In addition, fourteen 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 Toss-up 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 19 through June 27, 2001 was conducted by L. Ward, A. Jeffries (WSP/AmeriCorps) and T. Tollefson (DFG). The total length of the stream surveyed was 5,462 feet with an additional 246 feet of side channel.

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Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney 2000 Flowmeter at 0.7 cfs on June 28, 2001.

Toss-up Creek is an F4 channel type for the first 919 feet of the stream surveyed (Reach 1), a B2 channel type for the next 988 feet of stream surveyed (Reach 2), and a B4 channel type for the remaining 3,555 feet of stream surveyed (Reach 3). F4 channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio and gravel dominant substrate. Channel types classified as "B" are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, and stable banks. B2 channels are dominated by boulders, whereas, B4 channels are dominated by gravel.

Water temperatures taken during the survey period ranged from 54 to 57 degrees Fahrenheit. Air temperatures ranged from 56 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% riffle units, 30% pool units, and 27% flatwater units (Graph 1). Based on total length of Level II habitat types there were 48% riffle units, 29% flatwater units, and 23% pool units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 28%; runs, 19%; and mid-channel pools, 15% (Graph 3). Based on percent total length, low gradient riffles made up 29%, runs 14%, and mid-channel pools 7%.

A total of 47 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 60%, and comprised 75% 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-one of the 47 pools (45%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 47 pool tail-outs measured, six had a value of 1 (13%); 18 had a value of 2 (38%); seven had a value of 3 (15%); four had a value of 4 (9%); and 12 had a value of 5 (26%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the 12 pool tail-outs that had embeddedness values of 5 was boulders.

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 68, flatwater habitat types had a mean shelter rating of 34, and pool habitats had a mean shelter rating of 23 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 31. Scour pools had a mean shelter rating of 16 and backwater pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders were the dominant cover types in Toss-up Creek. Graph 7 describes the pool cover in Toss-up Creek. Boulders are the

dominant pool cover type followed by large woody debris.

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 40% of pool tail-outs. Boulders were the next most frequently observed substrate type, at 26%.

The mean percent canopy density for the surveyed length of Toss-up Creek was 96%. The mean percentages of deciduous and coniferous trees were 90% and 10%, respectively. Graph 9 describes the mean percent canopy in Toss-up Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 75%. The mean percent left bank vegetated was 69%. The dominant elements composing the structure of the stream banks consisted of 47% boulders, 34% cobble/gravel, and 19% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 86% of the units surveyed. Additionally, 7% of the units surveyed had coniferous trees as the dominant vegetation type, and 5% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Fourteen sites were electrofished for species composition and distribution in Toss-up Creek on July 30, 2001. Water temperatures taken during the electrofishing period ranged from 58 to 60 degrees Fahrenheit. Air temperatures ranged from 67 to 70 degrees Fahrenheit. The sites were sampled by G. Yoshioka, A. Renger, T. Tollefson, P. Divine and K. Bromley (DFG).

The first site sampled was Habitat Unit #009, a root wad enhanced lateral scour approximately 325 feet from the confluence with Redwood Creek. The site yielded 86 young-of-the-year (YOY) steelhead and two age 1+ steelhead.

The second site was Habitat Unit #011, a boulder enhanced lateral scour pool located approximately 453 feet above the creek mouth. The site yielded 18 YOY steelhead and three age 1+ steelhead.

The third site sampled was Habitat Unit #015, a run located approximately 554 feet above the creek mouth. The site yielded 16 YOY steelhead.

The fourth site sampled was Habitat Unit #016.02, a log enhanced lateral scour pool located approximately 615 feet above the creek mouth. The site yielded three YOY steelhead.

The fifth site sampled was Habitat Unit #022, a mid-channel pool located approximately 781 feet above the creek mouth. The site yielded three YOY steelhead and two age 1+ steelhead.

The sixth site sampled was Habitat Unit #024, a mid-channel pool located approximately 823 feet above the creek mouth. The site yielded one YOY steelhead and four age 1+ steelhead.

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The seventh site sampled was Habitat Unit #033, mid-channel pool located approximately 1,105 feet above the creek mouth. The site yielded two YOY steelhead.

The eighth site sampled was Habitat Unit #036, a low gradient riffle located approximately 1,415 feet above the creek mouth. The site yielded one YOY steelhead and one age 1+ steelhead.

The ninth site sampled was Uabitat Unit #037, a run located approximately 1,434 feet above the creek mouth. The site yielded four YOY steelhead.

The tenth site sampled was Habitat Unit #045, a plunge pool located approximately 1,656 feet above the creek mouth. The site yielded three YOY steelhead and two age 1+ steelhead.

The eleventh site sampled was Habitat Unit #049, a plunge pool located approximately 1,881 feet above the creek mouth. The site yielded one age 1+ steelhead.

The twelfth site sampled was Habitat Unit #057, a boulder enhanced lateral scour pool approximately 2,145 feet above the creek mouth. The site yielded one YOY steelhead and three age 1+ steelhead.

The thirteenth site sampled was Habitat Unit #075, a plunge pool approximately 2,688 feet above the creek mouth. The site yielded two age 1+ steelhead and one age 2+ steelhead.

The fourteenth site sampled was Habitat Unit #086, a mid-channel pool approximately 2,998 feet above the creek mouth. The site yielded two YOY steelhead and one age 1+ steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
07/30/01	1	325	009	5.3	1	F4	86	2	0
07/30/01	2	453	011	5.5	1	F4	18	3	0
07/30/01	3	554	015	3.3	1	F4	16	0	0
07/30/01	4	615	016.02	5.2	1	F4	3	0	0
07/30/01	5	781	022	4.2	1	F4	3	2	0
07/30/01	6	823	024	4.2	1	F4	1	4	0
07/30/01	7	1,090	033	4.2	2	B4	2	0	0
07/30/01	8	1,415	036	1.1	2	B4	1	1	0

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Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
07/30/01	9	1,434	037	3.3	2	B4	4	0	0
07/30/01	10	1,656	045	5.6	2	B4	3	2	0
07/30/01	11	1,881	049	5.6	2	B4	0	1	0
07/30/01	12	2,145	057	5.5	2	B4	1	3	0
07/30/01	13	2,688	075	5.6	2	B4	0	2	1
07/30/01	14	2,988	086	4.2	2	B4	2	1	0

DISCUSSION

Toss-up Creek is an F4 channel type for the first 919 feet of stream surveyed, a B2 channel type for the next 988 feet surveyed, and a B4 channel type for the remaining 3,555 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, log cover; poor for boulder clusters. The suitability of B2 channel types for fish habitat improvement structures is as follows: excellent for log cover. The suitability for B4 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder cluster, bank placed boulder, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 19 through June 27, 2001 ranged from 54 to 57 degrees Fahrenheit. Air temperatures ranged from 56 to 76 degrees Fahrenheit. This is a good water temperature for juvenile 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 29% of the total length of this survey, riffles 48%, and pools 23%. The pools are relatively deep, with 26 of the 47 (55%) pools having a maximum depth greater than two 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.

Twenty-four of the 47 pool tail-outs measured had embeddedness ratings of 1 or 2. Eleven of the pool tail-outs had embeddedness ratings of 3 or 4. Twelve of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. The twelve tail-outs were not suitable for

spawning due to the dominant substrate being boulders. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Twenty-nine of the 47 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 23. The shelter rating in the flatwater habitats was 34. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris contributes 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 96%. Reach 1 had a canopy density of 95%, Reach 2 had a canopy density of 96%, and Reach 3 had canopy density of 96%. In general, revegetation projects are considered when canopy density is less than 80% or the canopy composition is dominated by deciduous trees. The percentage of right and left bank covered with vegetation was 75% and 70%, respectively.

RECOMMENDATIONS

1) Toss-up 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) In the B4 channel type design and engineer pool enhancement structures to increase the number of pools or deepen existing 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 Toss-up Creek by planting redwood, Douglas fir or other native conifers within the riparian zone. Tributaries to Toss-up Creek and the reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream.

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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 the confluence with Redwood Creek. The channel type is F4.
325'	Electrofishing site #1.
453'	Electrofishing site #2.
554'	Electrofishing site #3.
615'	Electrofishing site #4.
781'	Electrofishing site #5.
823'	Electrofishing site #6.
1,090'	Electrofishing site #7.
1,415'	Electrofishing site #8.
1,434'	Electrofishing site #9.
1,656'	Electrofishing site #10.
1,757'	Log debris accumulation (LDA) measures approximately 7' high x 24' wide x 6' long. It is composed of 10-15 logs and retaining cobble and boulders.
1,881'	Electrofishing site #11.
2,145'	Electrofishing site #12.
2,688'	Electrofishing site #13.
2,988'	Electrofishing site #14.
3,526'	Two plunges: the first plunge is 4' high; the second plunge is 6' high.
3,548'	Tributary enters on the left bank with a water temperature of 54 degrees Fahrenheit.
3,963'	Plunge height of 2.5'.

4,305' High gradient tributary enters on right bank with a water temperature of 56 degrees Fahrenheit.

4,350' LDA measures 8' high x 25' wide x 30' long. It is composed of 10 logs and retaining gravel.

4,606' Four plunges in unit with average 2' high.

5,071' Plunge height of 4.5'.

5,193' Plunge height of 4'.

5,323' Plunge height of 7'. Also, an 8' tall rock jam with large redwood across top (5' diameter).

5,462' End survey due to very steep gradient, very few resting pools, lack of spawning gravel, and cascades of 6-10' with no resting pools at bottom of plunges.

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]	