

STREAM INVENTORY REPORT

Toss-up Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Toss-up Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Toss-up 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

Toss-up Creek is 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 S21. 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 2.6 miles of blue line stream according to the USGS Lord-Ellis Summit 7.5 minute quadrangle. Toss-up Creek drains a watershed of approximately 2.7 square miles. Elevations range from about 750 feet at the mouth of the creek to 3,000 feet in the headwater areas. Redwood forest and Douglas fir conifer forest dominate the watershed. The watershed is privately owned and is managed for timber production.

METHODS

The habitat inventory conducted in Toss-up Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Northwest Emergency Assistance Program (NEAP) 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.

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.

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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". 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. 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 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, 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.

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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 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 densimeters 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 every unit. 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 unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation 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:

- 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

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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
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of July 20 through July 25, 1995 was conducted by Mike Develin (PCFWWRA), and Nancy Pearson and Dave Allen (NEAP). The total length of the stream surveyed was 2,922 feet with an additional 139 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.24 cfs on September 21, 1995.

Toss-up Creek is a C3 channel type for the first 1,674 feet of the stream surveyed (Reach 1) and an A3 channel type for the next 1,248 feet of the stream surveyed (Reach 2). C3 channel types are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains and are cobble dominant. A3 channel types are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and are cobble dominant.

Water temperatures taken during the survey period ranged from 56 to 65 degrees Fahrenheit. Air temperatures ranged from 60 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 34% riffle units, and 27% flatwater units (Graph 1). Based on total length of Level II habitat types there were 48% flatwater units, 27% pool units, and 24% riffle units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 16%; high gradient riffles, 16%; and step pools, 12% (Graph 3). Based on percent total length, step runs made up 17%, glides, 17%, and step pools 13%.

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A total of 29 pools were identified (Table 3). Scour pools were most frequently encountered at 62% and comprised 47% 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. Eight of the 29 pools (28%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 29 pool tail-outs measured, one had a value of 1 (3%); 12 had a value of 2 (41%); four had a value of 3 (14%); and 12 had a value of 5 (41%); (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 18, flatwater habitat types had a mean shelter rating of 15, and pool habitats had a mean shelter rating of 27 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 33. Main channel pools had a mean shelter rating of 18 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in five of the 12 low gradient riffles measured (42%). Small cobble was the next most frequently observed dominant substrate type and occurred in 25% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 91%. The mean percentages of deciduous and coniferous trees were 91% and 9%, respectively. Graph 9 describes the canopy in Toss-up Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 78%. The mean percent left bank vegetated was 86%. The dominant elements composing the structure of the stream banks consisted of 82% sand/silt/clay, 12% cobble/gravel, 5% boulders, and 1% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 47% of the units surveyed. Additionally, 1% had coniferous trees as the dominant vegetation, including downed trees, logs, and root wads (Graph 11).

DISCUSSION

Toss-up Creek is a C3 channel type for the first 1,674 feet of stream surveyed and an A3 for the remaining 1,248 feet. The suitability of C3 channel types for fish habitat improvement structures is as follows: C3 channel types are excellent for bank placed boulders; good for low stage weirs, boulder clusters, single and opposing wing deflectors, and log cover; and fair for medium stage weirs. A3 channel types are good for bank placed boulders; fair for low stage weirs, opposing wing deflectors, and log cover; and poor for medium stage weirs, boulder clusters, single wing deflectors, and log cover.

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The water temperatures recorded on the survey days July 20 through July 25, 1995 ranged from 56 to 65 degrees Fahrenheit. Air temperatures ranged from 60 to 74 degrees Fahrenheit. This is a suitable water temperature range for salmonids. 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 48% of the total length of this survey, riffles 24%, and pools 27%. The pools are relatively shallow, with only eight of the 29 (28%) 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. Installing structures that will increase or deepen pool habitat is recommended for the locations where their installation will not be threatened by high stream energy.

Sixteen of the 29 pool tail-outs measured had embeddedness ratings of 3, 4 or 5. Only one had an embeddedness rating 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 Toss-up 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 27. The shelter rating in the flatwater habitats was slightly lower at 15. 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 all habitat types. Additionally, small woody debris contributes a small amount. 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 also divide territorial units to reduce density related competition.

Eight of the 12 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 91%. This is a relatively high 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 78% and 86%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

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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) 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.
- 4) 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.
- 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 Comments:
(ft):

- | | |
|--------|---|
| 0' | Start of survey at the confluence with Redwood Creek. The channel type is C3. |
| 1,596' | Several small log jams. |
| 1,674' | Channel type changes to A3. |
| 1,982' | Log jams. |
| 1,998' | Log jams. |
| 2,337' | Log jams above water's surface. |
| 2,684' | Log forms plunge. |
| 2,790' | Major log jam. |
| 2,814' | Bedrock forms 4.5' plunge. |

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2,922' End of survey. Log jams and large boulders make stream impassable.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPE KEY

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