STREAM INVENTORY REPORT

Toro Creek

INTRODUCTION

A stream inventory was conducted during the fall of 2000 on Toro Creek. The survey began at the confluence with the Pacific Ocean and extended upstream 7 miles. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Toro Creek.

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 coastal streams.

WATERSHED OVERVIEW

Toro Creek is a tributary to the Pacific Ocean. Toro Creek is located in San Louis Obispo County, California (Map 1). Toro Creek's legal description at the confluence with the Pacific Ocean is T29S R10E S00. Its location is 35°24′46″ north latitude and 120°52′22″ west longitude. Toro Creek is a first order stream and has approximately 9 miles of blue line stream according to the USGS Morro Bay North 7.5 minute quadrangle. Toro Creek drains a watershed of approximately 13.4 square miles. Elevations range from 0 feet at the mouth of the creek to 1,400 feet in the headwater areas. Mixed hardwood dominates the watershed. The watershed is entirely privately owned and is managed for rangeland. Vehicle access exists via Toro Creek Road located off Highway 1 North.

METHODS

The habitat inventory conducted in Toro Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game Scientific Aid, the California Conservation Corps (CCC) Technical Advisors 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 three-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 Toro 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 a standard list of 24 habitat types. Dewatered units are labeled "dry". Toro 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 Toro 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 Toro 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 Toro 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 Toro 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:

- 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 Toro 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

Toro Creek

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

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of October 19-24, 2000, was conducted by Karen Bromley (DFG), Ethan Jankowski (CCC) and Michelle Waller (WSP). The total length of the stream surveyed was 37,102 feet with an additional 29 feet of side channel. Within the surveyed section of Toro Creek there was approximately 10,560 feet that could not be surveyed due to time and access constraints.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.6 cfs on October 24, 2000.

Toro Creek is a B4 channel type for 23,583 feet of the stream surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated with infrequently spaced pools; very stable plan and profile; stable banks; gravel channel. Toro Creek is an A2 channel type for 2,211 feet of stream reach surveyed. A2 channels are steep, narrow, cascading, step-pool streams; high energy/debris transport associated with depositional soils; boulder channel.

Toro Creek

Water temperatures taken during the survey period ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 65 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 27% riffle units, 40% flatwater units, 33% pool units, and 1% dry units (Graph 1). Based on total **length** of Level II habitat types there were 19% riffle units, 64% flatwater units, 13% pool units, and 4% dry units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 34%; mid-channel pools, 29%; and low gradient riffles, 26% (Graph 3). Based on percent total **length**, runs made up 40%, low gradient riffles 13%, and mid-channel pools 8%.

A total of 117 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 90%, and comprised 92% 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-four of the 117 pools (55%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 117 pool tail-outs measured, 23 had a value of 1 (20%); 51 had a value of 2 (43%); 24 had a value of 3 (21%); 5 had a value of 4 (4%); and 14 had a value of 5 (12%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 14 pool tail-outs that had an embeddedness value of 5 were as follows: 57% silt/clay/sand or small gravel, 21% boulder, 7% large cobble, 7% small cobble and 7% bedrock.

Toro Creek

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 49, flatwater habitat types had a mean shelter rating of 44, and pool habitats had a mean shelter rating of 75 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 94. Main channel pools had a mean shelter rating of 59 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Toro Creek. Graph 7 describes the pool cover in Toro 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 69% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 19%.

The mean percent canopy density for the surveyed length of Toro Creek was 73%. The mean percentages of deciduous and coniferous trees were 99% and 1%, respectively. Graph 9 describes the mean percent canopy in Toro Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 81%. The mean percent left bank vegetated was 75%. The dominant elements composing the structure of the stream banks consisted of 5.94% bedrock, 1.98% boulder, 4.95% cobble/gravel, and 87.13% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 94.06% of the units surveyed. Additionally, 4.95% of the units surveyed had grass as the dominant vegetation type, and 0.99 % had brush as the dominant vegetation (Graph 11).

Toro Creek

DISCUSSION

Toro Creek is a B4 channel type for the first 21,490 feet of stream surveyed, an A2 for 2,211 feet, and a B4 for the remaining 2,093 feet. The suitability of B4 and A2 channel types for fish habitat improvement structures is as follows: B4 channels are excellent for low-stage plunge weirs; boulder clusters; bank placed boulders; single and opposing wing-deflectors; log cover. A2 channels are high energy streams with stable stream banks, and poor gravel retention capabilities, and therefore are not generally considered suitable for structures.

The water temperatures recorded on the survey days of October 19-24, 2000, ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 65 to 76 degrees Fahrenheit. This is a suitable 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 64% of the total length of this survey, riffles 19%, and pools 13%. The pools are relatively deep, with 64 of the 117 (55%) 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. Installing structures that will increase or deepen pool habitat is recommended in the B4 channel type.

Twenty-three of the 117 pool tail-outs measured had an embeddedness rating of 1.

Toro Creek

Twenty-nine of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen of the pool tail-outs had a rating of 5 which is considered unsuitable for spawning. Fourteen of the 117 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or small gravel. 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 Toro Creek should be mapped and rated according to their potential sediment yields and control measures should be taken.

One-hundred-three of the 117 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 75. The shelter rating in the flatwater habitats was 44. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris contributes a small amount.

The mean percent canopy density for the stream was 73%. Reach 1 had a canopy density of 74% while Reaches 2 and 3 had canopy densities of 72% and 57%, respectively. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 81% and 75.3%, 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

Toro Creek

1) Toro 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) In the B4 channel type, 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) 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) There are sections where the stream is being impacted from cattle in the riparian zone. Alternatives should be explored with the grazer and developed if possible.

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.

0' Survey began at confluence with Pacific Ocean. Channel type is B4.

Toro Creek

500' South Bound Highway 1 crosses Toro Creek. Bridge is approximately 40' wide and 25' above Toro Creek.

598' North Bound Highway 1 crosses Toro Creek.

665' Rip Rap on left bank approximately 10' high x 150' long.

999' Wooden wall along left bank approximately 6' high x 150' long.

2,331' Private road crosses through channel.

2,924' Toro Creek Road bridge. Bridge is approximately 10' above water channel and measures 30' wide x 40' long.

3,213' Cement wall structure along right bank. Approximately 10' high x 30' long.

6,456' Small tributary enters left bank. The tributary was dry at the time of survey.

8,266' Small tributary enters right bank. The tributary was contributing only a small trickle of water at the time of survey.

8,460' Right bank erosion approximately 30' high x 55' long.

10,103' Toro Creek Road bridge. Bridge is approximately 15' above water channel and measures 30' wide x 40' long.

10,320' Left bank erosion approximately 20' high x 70' long.

Toro Creek

10,580' Right bank erosion approximately 25' high x 40' long.

10,864' Bridge to private residence crosses Toro Creek. The bridge is approximately 15 feet above creek and is 15' wide.

11,216' Petroleum pipelines cross 8' above Toro Creek.

11,844' Small log debris accumulation spans channel and measures approximately 15' wide x 8' high x 30' long.

12,062' Small tributary enters left bank. Tributary was dry at the time of survey.

12,900' Rip-Rap along right bank for 150 feet.

13,084' Bridge to private residence crosses above Toro Creek. The bridge is approximately 20 feet above creek and is 15' wide.

13,797' Rip-Rap along left bank approximately 10' high x 150' long.

15,053' Right bank erosion actively contributing sediment to creek. Approximately 20' high x 150' long.

16,965' Left bank erosion approximately 15' high x 50' long.

17,998' Small tributary enters left bank. Tributary had a very low flow at time of survey.

18,165' Bridge to private residence crosses Toro Creek. The bridge is approximately

25 feet above creek and is 15' wide.

18,332' Tributary enters left bank. Tributary was dry at time of survey.

18,606' Right bank erosion approximately 20' high x 50' long.

18,710' Left bank erosion approximately 20' high x 50' long.

19,971' Tributary enters right bank. Dry at the time of the survey.

20,677' Left bank erosion approximately 20' high x 100' long.

21,733' Left bank erosion approximately 20' high x 40' long.

22,238' Beginning of non-surveyed section. The section was not surveyed due to time and access constraints.

32,798' Resume survey after bypassing approximately 10,560 feet. Channel Type is A2.

34,991' Channel type changes to B4.

37,102' Ended survey at Burchiel's Bridge. Survey ended here due to time constraints.

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]