STREAM INVENTORY REPORT

Ryan Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Ryan Creek and two of its unnamed tributaries.

The 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 Ryan Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Ryan 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

Ryan Creek is tributary to Freshwater Slough, a tributary to Eureka Slough, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California (Figure 1). Ryan Creek's legal description at the confluence with Freshwater Slough is T05N R01E S30. Its location is 40.7883 degrees north latitude and 124.1142 degrees west longitude. Ryan Creek is a third order stream and has approximately 8.5 miles of blue line stream according to the USGS Eureka 7.5 minute quadrangle. Ryan Creek drains a watershed of approximately 15.2 square miles, and the entire system has about 22.7 miles of blue line stream. Summer base runoff is approximately 1.2 cubic feet per second (cfs) at the confluence with Henderson Gulch. Elevations range from sea level at the mouth of the creek to 800 feet in the headwater areas. Redwood and Douglas fir forest dominates the watershed, with areas of pasture land near the mouth. The watershed is primarily owned by the Louisiana Pacific Corporation and is managed for timber production. Vehicle access exists via Louisiana Pacific Corporation's R-Line Road.

METHODS

The habitat inventory conducted in Ryan Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). 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). Ryan Creek personnel were trained in May, 1995, by Gary Flosi. 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 (Hopelain, 1994). 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. Habitat unit types encountered for the first time are further 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 Ryan 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 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". Ryan 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the

sampling form (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). 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 Ryan 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), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) 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. 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 Ryan 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.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Ryan 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 Ryan Creek, the dominant composition type (options 1-4) and the

dominant vegetation type (options 5-9) 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Ryan Creek fish presence was observed from the stream banks, and four sites were electrofished using one 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 Lotus 1,2,3. Graphics developed for Ryan 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of June 12 through July 11, 1995 was conducted by Chris Coyle, Craig Mesman, and Don Hickethier (CCC) and Shelly Dunn and Heidi Hickethier (WSP/AmeriCorps). The total length of the stream surveyed was 27,682 feet with an additional 157 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.18 cfs on July 14, 1995.

Ryan Creek is an F5 channel type for the first 25,519 feet of stream reach surveyed and an F4 channel type for the remaining 2,163 feet. F-type channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios; F5 channels have sand-dominant substrates and F4 channels have gravel-dominant substrates.

Water temperatures ranged from 53 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 61% pool units, 25% flatwater units, and 13% riffle units (Graph 1). Based on total length of Level II habitat types there were 65% pool units, 29% flatwater units, and 5% riffle units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 56%; run units, 14%; and low-gradient riffle units, 13% (Graph 3). Based on percent total length, mid-channel pools made up 61%, runs 17%, and step runs 9%.

A total of 466 pools were identified (Table 3). Main channel pools were most frequently encountered at 91% and comprised 94% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Eighty-six of the 466 pools (18%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 161 pool tail-outs measured, 12 had a value of 1 (8%); 36 had a value of 2 (22%); 54 had a value of 3 (34%); and 59 had a value of 4 (37%); (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. Pool habitat types had a mean shelter rating of 35, and flatwater habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 38. Main channel pools had a mean shelter rating of 37 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Ryan Creek. Graph 7 describes the pool cover in Ryan Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in five of the six low gradient riffles measured (83%). Sand was the next most frequently observed dominant substrate type and occurred in 17% of the low gradient riffles (Graph 8).

The mean percent canopy for the stream reach surveyed was 94%. The mean percentages of deciduous and coniferous trees were 68% and 32%, respectively. Graph 9 describes the canopy in Ryan Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 84%. The mean percent left bank vegetated was 84%. The dominant elements composing the structure of the stream banks consisted of 99% sand/silt/clay and 1% cobble/gravel (Graph 10). Grass was the dominant vegetation type observed in 47% of the units surveyed. Additionally, 21% of the units surveyed had deciduous trees as the dominant vegetation type, and 4% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on July 14, 1995 in Ryan Creek. The units were sampled by Gary Flosi (DFG) and Chris Coyle (CCC). The first three sites are in an F5 channel type, while the last site is in an F4 channel type.

The first site sampled was Habitat Unit #002, a mid-channel pool approximately 257 feet upstream from the R6 bridge. This site had an area of 434 square feet and a volume of 608 cubic feet. The unit yielded three young-of-the-year (YOY) coho salmon, one age 1+ steelhead/rainbow trout, one age 1+ coastal cutthroat trout, one age 2+ cutthroat trout, and eight three-spine stickleback.

The second site sampled was Habitat Unit #153, a mid-channel pool located approximately 10,583 feet above the R6 bridge. This site had an area of 663 square feet and a volume of 663 cuboc feet. The site yielded thirteen YOY coho salmon, one age 1+ steelhead/rainbow trout, one age 1+ cutthroat trout, and three three-spine stickleback.

The third site sampled was Habitat Unit #626, a plunge pool located approximately 25,306 feet above the R6 bridge. The site had an area of 70 square feet and a volume of 70 cubic feet. The site yielded four YOY coho salmon and two YOY cutthroat trout.

The fourth site sampled was Habitat Unit #638, a mid-channel pool located approximately 25,636 feet above the R6 bridge. The site had an area of 48 square feet and a volume of 43 cubic feet. The site yielded three YOY coho salmon and two YOY cutthroat trout.

DISCUSSION

Ryan Creek is an F5 channel type for the first 25,519 feet of stream surveyed and an F4 for the remaining 2,163 feet. The suitability of F5 and F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, and log cover; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days June 12 through July 11, 1995 ranged from 53 to 60 degrees Fahrenheit. Air temperatures ranged from 57 to 76 degrees Fahrenheit. This is a good 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 29% of the total length of this survey, riffles 5%, and pools 65%. The pools are relatively shallow, with only 86 of the 466 pools having a maximum depth greater than three 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. Installing structures that will deepen pool habitat is recommended.

One hundred thirteen of the 161 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 12 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 Ryan 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 35. The shelter rating in the flatwater habitats was lower at 20. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large woody debris 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 structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Five of the six 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 for the stream was 94%. 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 high at 84% and 84%, 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.

RECOMMENDATIONS

1) Ryan Creek should be managed as an anadromous, natural production stream.

2) 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.

3) Increase woody cover in the pools and flatwater habitat units. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

4) Where feasible, design and engineer pool enhancement structures to deepen the pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) 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.

6) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 16,404', should then be treated to reduce the amount of fine sediments entering the stream.

PROBLEM SITES 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 survey at upstream end of log raft at upstream end of R6 bridge.
6'	Dry left bank ravine.
610'	Right bank rivulet.
776'	Right bank rivulet.
863'	Right bank tributary. Flow estimated at <0.1 cfs. Not suitable as anadromous fish

habitat.

1477' Right bank tributary. Flow estimated at approximately 0.1 cfs. Drains a bog.

1511' Left bank seep.

1624' Log raft measures 76' long x 15' wide. It is not retaining gravel.

2082' Log raft measures 39' long x 15' wide. It is not retaining gravel.

2653' Dry right bank tributary.

2806' Log raft measures 55' long x 20' wide. It is not retaining gravel.

3055' Log raft measures 148' long x 20' wide. It is not retaining gravel.

3263' Right bank rivulet.

3546' Henderson Gulch enters on left bank. Flow estimated at approximately 0.5 cfs. Accessible to anadromous fish.

4072' Right bank seep.

4487' Road R7 log stringer bridge measures 18' long x 16' wide x 8' high.

4771' Right bank seep.

5075' Log raft measures 31' long x 10' wide. It is not retaining gravel.

5877' Log raft measures 25' long x 20' wide. It is not retaining gravel.

6162' Log raft measures 73' long x 20' wide. It is not retaining gravel.

6203' Guptil Gulch enters on right bank. Flow estimated at approximately 0.2 cfs. Accessible to fish.

6225' Relic trestle pilings.

7516' Right bank tributary. Flow estimated at approximately 0.3 cfs. Accessible to fish.

7533' Left bank erosion site measures 10' high x 15' long and is contributing fine sediment to the channel.

7692' Right bank erosion site measures 8' high x 20' long and is contributing fine sediment to the channel.

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8976' Dry left bank ravine.

9173' Left bank erosion site measures 8' high x 30' long and is contributing fine sediment and gravel to the channel.

10233' Right bank tributary. Not accessible to fish.

10412' Log debris accumulation (LDA) measures 6' high x 30' wide x 20' long. It is not retaining gravel.

11277' LDA measures 5' high x 15' wide x 7' long. Right bank erosion site measures 7' high x 20' long.

12143' LDA measures 6' high x 10' wide x 28' long. It is not retaining gravel. Erosion site measures 10' high x 20' long.

13283' LDA measures 3' high x 15' wide x 10' long and is retaining unspecified amount of gravel.

13427' Right bank tributary. Flow estimated at <0.1 cfs. Not accessible to fish.

16404' LDA measures 4' high x 15' wide x 30' long and is causing erosion site measuring 12' high x 35' long.

17497' Stream forks. Survey continues up right fork (see subsection for left fork, Unnamed Tributary to Ryan Creek B).

18029' Corrugated metal pipe (CMP) culvert measures 6' diameter x 50' long. No baffles.

19203' Left bank tributary. Flow estimated at <0.1 cfs. Not accessible to fish.

19717' Relic trestle.

19910' Left bank tributary. Flow estimated at <0.1 cfs. Not accessible to fish.

20811' LDA measures 6' high x 25' wide x 25' long. It is not retaining gravel.

20981' LDA measures 4' high x 20' wide x 25' long. It is not retaining gravel.

21472' Right bank tributary. Flow estimated at <0.1 cfs. Not accessible to fish.

21696' LDA measures 10' high x 50' wide x 40' long. Not a barrier.

22016' LDA measures 6' high x 10' wide x 30' long and is retaining sediment 2' deep at base. Possible barrier.

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22160' CMP culvert on bank, 1.5' diameter. Outfall <0.1 cfs. Not accessible to fish.

22702' Partial LDA measures 6' high x 10' wide x 10' long and is retaining some sediment.

23179' Seep.

23299' Right bank tributary. Flow estimated at <0.1 cfs. Not accessible to fish.

23536' Dry right bank tributary.

23590' Right bank seep.

23833' Collapsed log stringer bridge measures 4' high x 15' wide x 9' long and retaining some sediment.

24115' Right bank erosion site measures 10' high x 30' long.

24473' LDA measures 7' high x 15' wide x 40' long and is retaining sediment.

24628' Left bank tributary. Flow estimated at <0.1 cfs. Possibly fish-bearing.

25430' Unnamed Tributary to Ryan Creek A enters on left bank (see subsection report).

25487' CMP culvert measures 4' diameter x 32' long. No baffles. Partially rusted through and partly blocked at upstream end.

26089' Partial LDA measures 8' wide x 15' long and is retaining gravel.

26330' LDA measures 6' high x 12' wide x 30' long and is retaining gravel.

26483' Left bank seep.

27168' LDA measures 10' high x 25' wide x 27' long. It is not retaining gravel.

27368' LDA measures 8' high x 35' wide x 22' long and is retaining gravel and sand.

27503' LDA measures 5' high x 25' wide x 20' long and is retaining gravel 4' deep at base.

27574' LDA measures 5' high x 21' wide x 8' long and is retaining gravel 5' deep at base.

27862' End of survey. Stream is intermittent above this point.

REFERENCES

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

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript, California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

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