STREAM INVENTORY REPORT

Ryan Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Ryan Creek. 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.

Adult carcass surveys were conducted on Ryan Creek by the California Department of Fish and Game (DFG) from 1987 through 1989. The table below describes the results of those surveys:

Ryan Creek Carcass Surveys 1987 - 1989

	Chinook Salmon					Other	
Year	# of Surveys	Live Fish	# of Carcass	AdiposeClipCWT	Redds seen	Coho seen	SH/RT seen
1987	1	9	118	3	34	15	
1988	1	1	1		3		
1989	1		1			2	

Three carcasses found on the survey of December 1987 had adipose fin clips, of these, two had a coded wire tag (CWT) # H 60701 in their snouts. This CWT brood lot originated in Outlet Creek in 1985, were reared at the Silverado facility near Yountville, and released into Outlet Creek as smolts. The objective of this report is to document the current habitat conditions in Ryan Creek, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Ryan Creek is tributary to Outlet Creek, tributary to the Mainstem Eel River, located in Mendocino County, California. Ryan Creek's legal description at the confluence with Outlet Creek is T19N R14W S26. Its location is 39°28'35" north latitude and 123°22'35" west longitude. Ryan Creek is a first order stream and has approximately 1.2 miles of blue line stream according to the USGS Burbeck 7.5 minute quadrangle. Ryan Creek drains a watershed of approximately 2.8 square miles. Elevations range from about 1,300 feet at the mouth of the

creek to 2,200 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is privately owned. Vehicle access exists via Highway 101.

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 Ruth Goodfield. 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 (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 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 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, in addition, electrofishing has been conducted by the Department of Fish and Game office in Ukiah. These sites were electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85 mm)(Valentine, 1995).

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 4. 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

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

HABITAT INVENTORY RESULTS

The habitat inventory of August 29 and September 5, 1995, was conducted by Brie Darr (CCC) and Jennifer Terwilliger (WSP/AmeriCorps). The total length of the stream surveyed was 7,310 feet with no side channels.

Flows were not measured on Ryan Creek.

Ryan Creek is an B2 channel type for the first 3,326 feet of stream surveyed, and F4 for the remaining 3,984 feet. B2 channel types are moderately entrenched, riffle dominated with a moderate gradient and boulder dominate substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 49 to 61 degrees Fahrenheit. Air temperatures ranged from 59 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of

occurrence there were 34% riffle units, 32% flatwater units, 31% pool units, and 3% dewatered units (Graph 1). Based on total **length** of Level II habitat types there were 33% pool units, 33% flatwater units, 31% riffle units, and 3% dewatered units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 33%; mid-channel pools, 27%; and runs, 25% (Graph 3). Based on percent total **length**, low gradient riffles made up 30%, mid-channel pools 29%, and runs 21%.

A total of ninety-nine pools were identified (Table 3). Main channel pools were most frequently encountered at 89% and comprised 90% 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-five of the 99 pools (25%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 99 pool tail-outs measured, 52 had a value of 1 (53%); 22 had a value of 2 (22%); 2 had a value of 3 (2%); and 23 had a value of 4 (23%) (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 19, and riffle habitats had a mean shelter rating of 11 (Table 1). Of the pool types, main channel pools had the highest mean shelter rating at 21. Scour pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Ryan Creek and is extensive. Large woody debris is lacking in nearly all habitat types. 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 8 of the 15 low gradient riffles measured (53%). Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 94%. The mean percentages of deciduous and coniferous trees were 86% and 8%, respectively. Graph 9 describes the canopy in Ryan Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 61%. The mean percent left bank vegetated was 53%. The dominant elements composing the structure of the stream banks consisted of 6.1% bedrock, 37.8% cobble/gravel, and 56.1% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 82.7% of the units surveyed. Additionally, 2% of the units surveyed had coniferous trees as the dominant

vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Salmonids were observed ocularly throughout the stream survey. In addition, the Department of Fish and Game office in Ukiah has a long-standing bioinventory survey reach showing the presence of steelhead and coho in Ryan Creek.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Ryan Creek.

DISCUSSION

Ryan Creek is a B2 channel type for the first 3,326 feet of stream surveyed and an F4 for the remaining 3,984 feet. The suitability of B2 and F4 channel types for fish habitat improvement structures is as follows: B2 channels are excellent for low- and medium-stage plunge weirs, single and opposing wing deflectors, and bank cover. F4 channel types are 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 August 29 and September 5, 1995, ranged from 49 to 61 degrees Fahrenheit. Air temperatures ranged from 59 to 81 degrees Fahrenheit. This is a good water temperature range for salmonids. Ryan Creek seems to have temperatures favorable to 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 33% of the total **length** of this survey, riffles 31%, and pools 33%. The pools are relatively shallow, with only 25 of the 99 (25%) 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 for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Twenty-five of the 99 pool tail-outs measured had embeddedness ratings of 3 or 4. Fifty-two had a 1 rating. 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 19. The shelter rating in the flatwater habitats was slightly lower at 10. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by terrestrial vegetation 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.

Twelve of the 15 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 94%. This is a relatively high percentage of canopy. 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 moderate at 61% and 53%, 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

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

2) Due to the three culverts present, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

3) 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.

4) 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.

5) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover

is from terrestrial vegetation. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

6) 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.

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.

0'	Begin survey at confluence with Outlet Creek. Channel type is B2. Map Site 1.
174'	Large debris accumulation on the right bank (RB), 3'H x 7'W x 10'L.
536'	Railroad bridge. Map Site 2.
687'	Large debris accumulation on the RB, 5'H x 12'W x 5'L.
1297'	Unnamed road on the RB.
1948'	Stream ford.
2083'	Unnamed roads on both banks.
2246'	Wooden car bridge, road is now on the left bank (LB) only. Map Site 3.
3354'	Channel type changes from a B2 to an F4.
4103'	Small slide on the LB, road is still on the LB.
4814'	Large debris accumulation instream, 6'H x 20'W x 15'L. It is not a barrier.
5019'	A small tributary enters from the RB.
5109'	Concrete box culvert, 6'H x 10'W x 80'L, no baffles. There is a 1/2' drop from the culvert into the pool. Unnamed road above. Possible barrier. Map Site 4.
5147'	A small tributary enters from the RB. Road is no longer visible.
5617'	A tributary enters from the LB, it accounts for approximately 1/2 of the flow.

5693'	Rusted, metal culvert underneath Highway 101, no baffles. It measures 4' in diameter and is approximately 150'L. Map Site 5.
5845'	An unnamed road is on the RB.
6134'	Metal culvert, 5' in diameter and approximately 100'L, no baffles. There is a 2' plunge into the pool. Possible barrier. Map Site 6.
6250'	Unnamed roads on both banks for the next 50'.
6522'	Footbridge.
6585'	A small tributary enters from the LB.
6694'	Footbridge.
6756'	Private road bridge.
7065'	Footbridge.
7126'	Instream structure.
7310'	Flash dam approximately 5'H, not holding water at this time. End of survey, no fish, no water. Map Site 7.

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.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
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