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	Adipose ClipCWT	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.

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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

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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

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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

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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).

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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.

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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

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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

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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.

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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

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> 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.

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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'.

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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

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<u>LEVEL III and LEVEL IV HABITAT TYPE KEY</u>

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