STREAM INVENTORY REPORT
Russ Creek

INTRODUCTION

A stream inventory was conducted from 10/13/2004 to 10/18/2004 on Russ Creek. The survey began at the Centerville Road crossing and extended upstream 2.2 miles.

The Russ Creek inventory was conducted in two parts: habitat inventory and biological inventory. The habitat inventory was conducted to document the habitat available to anadromous salmonids in Russ Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon, steelhead and cutthroat trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Russ Creek is a tributary to Centerville Slough, a tributary to Cutoff Slough, a tributary to Salt River, a tributary to Eel River, a tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Russ Creek's legal description at the confluence with Centerville Slough is T02N R02W S06. Its location is 40°35'31" north latitude and 124°20'10" west longitude, LLID number 1243360405919. Russ Creek is a second order stream and has approximately 5.2 miles of blue line stream according DFG river mile and stream length index for the Eel River Basin. The Russ Creek watershed is located within the USGS Ferndale 7.5 minute quadrangle. Russ Creek drains a watershed of approximately 3.65 mi^2. Elevations range from about 5 feet at the mouth of the creek to 1,515 feet in the headwater areas. Douglas fir, Sitka spruce and mixed hardwood forests dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists 2.6 miles from Ferndale via-Centerville Road to Fern Cottage.

METHODS

The habitat inventory conducted in Russ Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). 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 two-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. All pools except step-pools are fully sampled.

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 Russ Creek to record measurements and observations. There are eleven components to the inventory form.

1. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (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.

2. 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.

3. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). 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". Russ 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 are measured using a clinometer, hip chain, and stadia rod.

4. 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 Russ 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 like bedrock, log sills, boulders or other considerations.

5. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. 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 Russ 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.

6. 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.

7. 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 Russ 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 hardwood trees.

8. 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 Russ 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.

9. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

10. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Russ Creek. In addition, ten sites were electrofished using a 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 Stream Habitat 1.0.50, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Russ Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of 10/13/2004 to 10/18/2004, was conducted by Corby Hines (CCC), and Kevin Lucey (PSMFC). The total length of the stream surveyed was 11,609 feet with an additional 56 feet of side channel.

Russ Creek is a F6 channel type for 3,196 feet of the stream surveyed (Reach 1), a B6 channel type for 8,413 feet of the stream surveyed (Reach 2). F6 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and silt-dominant substrates. B6 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and silt dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 62 degrees Fahrenheit. Air temperatures ranged from 53 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% pool units, 37% flatwater units, 23% riffle units, (Graph 1). Based on total length of Level II habitat types there were 27% pool units, 60% flatwater units, 13% riffle units (Graph 2).

Nine level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 33% mid-channel pool units, 23% low gradient riffle units, 21% step run units (Graph 3). The most frequent habitat types based on percent total length were 43% step run units, 23% mid-channel pool units, 18% run units.

A total of 77 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 84%, and comprised 87% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-one of the 77 pools (53%) had a residual depth of two feet or greater (Graph 5). Fifteen of the 77 pools (19%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 78 pool tail-outs measured, 3 had a value of 2 (3.8%); 44 had a value of 3 (56.4%); 28 had a value of 4 (35.9%); 3 had a value of 5 (3.8%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, and boulders.

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 53, flatwater habitat types had a mean shelter rating of 17, and pool habitats had a mean shelter rating of 79 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 80, scour pools had a mean shelter rating of 70 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Russ Creek. Graph 7 describes the pool cover in Russ Creek. Small woody debris is the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Silt is the dominant substrate in almost all habitat types. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 70% of pool tail-outs, and silt/clay substrate type was observed in 24% of pool tail-outs.

The mean percent canopy density for the surveyed length of Russ Creek was 79%. The mean percentages of hardwood and coniferous trees were 82% and 18%, respectively. Twenty-one percent of the canopy was open. Graph 9 describes the mean percent canopy in Russ Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 89%. The mean percent left bank vegetated was 88%. The dominant elements composing the structure of the stream banks consisted of 97% sand/silt/clay, 1% bedrock, 1% cobble/gravel (Graph 10). Fifty-nine percent of the units surveyed had hardwood trees as the dominant vegetation type, and 5% had coniferous trees as the dominant vegetation (Graph 11). Brush was the next most dominant vegetation type and observed in 21% of the units surveyed.

BIOLOGICAL INVENTORY RESULTS

Ten sites were electrofished for species composition and distribution in Russ Creek on October 22, 2004. Water temperatures taken during the electrofishing period 0900 to 1500 ranged from -

52 to 54 degrees Fahrenheit. Air temperatures ranged from 56 to 62 degrees Fahrenheit. The sites were sampled by Kevin Lucey (PSMFC) and Paul Divine (DFG).

In reach one, seven sites were sampled between habitat units 4 and 55, a distance of 2,500 feet from the Centerville Road crossing. The reach sites yielded one young-of-the-year cutthroat trout, thirteen age 1+ cutthroat trout, and 15 three spine stickleback.

In reach two, three sites were sampled between habitat units 68 and 85, a distance of 921 feet approximately 4,370 feet from Centerville Road. The reach sites yielded 1 young-of-the-year cutthroat, seven age 1+ cutthroat, and numerous stickleback.

The following chart displays the information yielded from these sites:

Russ Creek 2004

Date	Site Number	Habitat Unit	Habitat Type	Aprox. dist from start of survey (ft)	Pike Minnow	Stickle-back	Cuttthroat			
							YOY	1+	2+	3+
Reach 1- F 6 Channel Type										
10/22/2004	1	4	pool	110		1		2		
10/22/2004	2	9	pool	250		3		0		
10/22/2004	3	13	pool	440		7		0		
10/22/2004	4	15	pool	500		0		1		
10/22/2004	5	40	pool	1,900		1		5		
10/22/2004	6	45	pool	2,140		0	1	3		
10/22/2004	7	55	pool	2,670		3		2		
Reach 2- B 6 Channel Type										
10/22/2004	8	68	flatwater	3,450		5	1	3		
10/22/2004	9	75	pool	3,820		3		2		
10/22/2004	10	85	pool	4,371		2		2		

DISCUSSION

Russ Creek is a F6 channel type for the first 3,196 feet of stream surveyed and a B6 channel type for the remaining 8,413 feet. The suitability of F6 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders, fair for plunge weirs; boulder clusters; single and opposing wing deflectors; log cover. The suitability of B6 channel types for fish improvement structures is as follows: excellent for bank-placed boulders; log cover; good for plunge weirs; single and opposing wing-deflectors; channel constrictors, and fair for boulder clusters.

The water temperatures recorded on the survey days 10/13/2004 to 10/18/2004, ranged from 51 to 62 degrees Fahrenheit. Air temperatures ranged from 53 to 74 degrees Fahrenheit. This is a good water temperature for juvenile 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 60% of the total length of this survey, riffles 13%, and pools 27%. The pools are relatively deep, with 41 of the 77 (53%) pools having a maximum residual 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 residual 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.

Three of the 78 pool tail-outs measured had embeddedness ratings of 1 or 2. Seventy-two of the pool tail-outs had embeddedness ratings of 3 or 4. Three of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. 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 Russ Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fifty-three of the 74 pool tail-outs measured had gravel as the dominant substrate. This is generally considered good for spawning salmonids. The second most dominant substrate in Russ Creek is silt/ clay, which is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 79. The shelter rating in the flatwater habitats was 17. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Russ Creek. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance 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.

The mean percent canopy density for the stream was 79%. Reach 1 had a canopy density of 78%, Reach 2 had a canopy density of 80%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 89% and 88%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Survey for fish passage, the box culvert at Centerville Road and the dam, 496 feet from Centerville Road.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with woody cover is desirable.

4) 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.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft.)	Habitat Unit #	Comments:
0	001	Start of survey at Centerville Road crossing
0	001	Box culvert with a three foot plunge. Possible barrier to juvenile salmonids during low flow conditions.
110	004	Electrofishing site #1
145	005	Log debris accumulation (LDA) 8’ high x 20’ wide x 12’ long, composed of 8 pieces of large wood. Not retaining sediment.
250	009	Electrofishing site #2
440	013	Electrofishing site #3
496	015	Seven foot high dam with a 10 foot long concrete apron with a 45 degree slope. There is a one foot plunge pool to the concrete base.

Position (ft.)	Habitat Unit #	Comments:
500	015	Electrofishing site #4
514	016	Water is impounded and pooled upstream of the dam. Cattle using the pond for water. Algae and duckweed is prolific.
1,900	040	Electrofishing site #5
2,140	045	Electrofishing site #6
2,670	055	Electrofishing site #7
2,862	057	Channel type change from F6 to B6
3,450	068	Electrofishing site #8
3,820	075	Electrofishing site #9
4,371	085	Electrofishing site #10
5,417	0103	Five inch long salmonid observed from the bank.
5,697	0108	Right bank tributary #1. Tributary temperature was 54°F. Temperature in Russ Creek above and below the tributary 53°F. The tributary has a slope of 22% and is not accessible to fish.
6,050	0113	LDA, 6’ high x 26’ wide x 28’ long, composed of six pieces of large wood. Retaining some sediment, but not a barrier.

Position (ft.)	Habitat Unit #	Comments:
6,313	0115	Right bank tributary #2, not accessible to fish. Temperature of the tributary and of Russ Creek above and below the tributary 55°F.
6,846	0118	Left bank tributary #3, not accessible to fish. Temperature of the tributary 57°F. The temperature of Russ Creek above and below the tributary 52°F. The slope of the tributary is 10%.
7,965	0127	LDA, 4' high x 12' wide x 15' long, composed of three pieces of large wood. Water flows through LDA and it does not retain sediment
8,636	0142	Left bank tributary #4, not accessible to salmonids. Temperature of the tributary 53°F. Russ Creek temperature above and below tributary 51°F.
8,900	0144	Left bank tributary #5, not accessible to salmonids. Temperature of the tributary 51°F. Russ Creek temperature 53°F both above and below the tributary.
10,721	0172	Left bank tributary #6, with a slope of 6%. The temperature of the tributary 51°F. Russ Creek temperature above and below the tributary 53°F.
11,146	0181	Right bank tributary #7. Temperature of the tributary 55°F. The temperature of Russ Creek 54°F. No fish were observed in tributary.
11,180	0182	LDA, 6' high x 26' wide x 20' long, composed of 15 pieces of large wood. Retaining some sediment. Possible barrier to salmonids.

Position (ft.)	Habitat Unit #	Comments:
11,609	0189	Survey ends due to lack of access to private property.

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]	