SECTION F
SALMONID HABITAT CONDITION

INTRODUCTION

The anadromous fish species inhabiting the Cottaneva WAU are steelhead trout (*Oncorhynchus mykiss)* and coho salmon (*O. kisutch*). Other species include three-spine stickleback *(Gasterosteus aculeatus),* prickly sculpin *(Cottus asper),* coastrange sculpin *(C. aleuticus),* Pacific giant salamander *(Dicamptodon tenebrosus),* tailed frog *(Ascaphus truei),* southern torrent salamander *(Rhyacotriton variegatus),* and tarichid newts *(Taricha spp).* A fish habitat assessment was conducted in the Cottaneva WAU to identify the current habitat conditions and areas of special concern regarding spawning, summer rearing, and over-wintering habitat.

Field surveys conducted to evaluate the quality and quantity of fish habitat in the Cottaneva WAU included fish habitat typing and assessment, aquatic species distribution surveys, outmigrant trapping, stream gravel permeability measurements and bulk gravel samples. The fish habitat assessment evaluated spawning, summer rearing, and over-wintering habitats based on targets derived from scientific literature (Bilby and Ward, 1989; Bisson et al., 1987; Bjornn and Reiser, 1991; CDFG, 2002; Montgomery et al., 1995; Swales et al., 1988; Washington Forest Practices Board, 1997) and professional judgment. The habitat data are used to rate the quality of the habitat for the life history stages discussed above.

Aquatic species distribution surveys were conducted by the previous landowners (Louisiana-Pacific Corp.) from 1994-1996, and were repeated by MRC from 2000-2002 (MRC 2002). The study consisted of single pass electrofishing or snorkeling surveys in the summer months to assess aquatic species distribution and composition in the Cottaneva WAU. All organisms observed were identified to the lowest possible taxonomic level.

Permeability and bulk gravel samples were taken in one long term channel monitoring segment in the Cottaneva WAU to determine an index of spawning gravel quality. Permeability and gravel particle size distributions are stream substrate parameters which affect survival of incubating salmonid embryos. Salmonid eggs buried under as much as a foot of gravel depend on sufficient intragravel water flow for their survival and development. Fine sediment within spawning gravel can impede intragravel water flow, reducing the delivery of dissolved oxygen to eggs, which can increase mortality in the egg to emergence stage. Forest management practices may increase the delivery of fine sediment to the stream channel, potentially impacting spawning gravel. The assessment of substrate permeability and composition are useful in monitoring the effects of increased sediment delivery on salmonid spawning and incubation conditions.

METHODS

Salmonid Habitat Assessment

The habitat inventory used to evaluate the habitat condition of the Cottaneva WAU was conducted during low flow conditions using methods modified from the California Salmonid Stream Habitat Restoration Manual (CDFG, 2002). Surveys described 100% of the stream channel's wetted width, including side channel habitats. Stream segments were created based on stream gradient and channel confinement (see section E "Stream Channel Conditon"). Each of the selected stream segments within the planning watershed was fully sampled or until an adult salmonid upstream migration barrier was reached. Fish habitat conditions were determined by habitat typing the majority of fish bearing stream segments throughout the watershed. High

gradient streams are likely to be non-fish bearing, thus survey efforts were concentrated on low gradient reaches of the stream network.

Data collected during the fish habitat and stream channel surveys provided information on habitat type occurrence (Table F-2); pool, riffle, and flatwater frequency; pool spacing; spawning gravel quantity and quality; shelter complexity and availability (shelter rating); residual pool depths; substrate embeddedness; substrate composition; frequency of key and functional large woody debris pieces (see section D "Riparian Function" for definition of 'Key LWD' and 'Functional LWD'); overwintering substrate; side channel frequency (Table F-5) and dominant cover type (Table F-3).

Evaluations on the quality of habitat available for spawning life stages, summer rearing, and over-wintering were made based upon scientific literature and professional judgment. The criteria used to determine whether a specific variable was 'good', 'fair', or 'poor' is defined within Table F-1. Spawning habitat conditions are evaluated on the basis of gravel availability and quality (gravel size and embeddedness), and were evaluated within preferred salmonid spawning areas located at the tail-outs of pools. Summer rearing habitat was evaluated using methods developed by CDFG (2002). Summer rearing habitat conditions for salmonids are evaluated on the size, depth, and availability of pools; and the complexity and quantity of cover (particularly large woody debris). Over-wintering habitat is evaluated on the size, depth and availability of pools, the proportion of habitat units with cobble or boulder-dominated substrate (over-wintering substrate), side channel frequency, and the quantity of cover(particularly large woody debris). The over-wintering scores reflect parameters measured during summer flows and may not be an accurate representation of actual over-wintering habitat conditions.

The habitat data are combined into indices of habitat quality for the different salmonid life stages. Measured fish habitat parameters were weighted and given a numeric scale to develop a quality rating for individual life history stages. Parameters were divided into subsets that correspond with individual life history stages (spawning, summer rearing, and over-wintering habitat). Parameters were scored as follows: 1 (poor), 2 (fair), and 3 (good). Parameter weights were applied to the total score calculated as shown below. The parameter codes (see Table F-1) are in bold and the weights in parentheses.

Spawning Habitat

E (0.31) + **F** (0.33) + **G** (0.36)

Summer Rearing Habitat

A (0.20) + **B** (0.15) + **C** (0.20) + **D** (0.15) + **F** (0.10) + **H** (0.20)

Over-wintering Habitat

A (0.20) + **B** (0.15) + **C** (0.15) + **D** (0.10) + **H** (0.20) + **I** (0.15) + **J** (0.05)

The overall score is rated as follows:
1.00 - 1.66 = Poor
1.67 - 2.33 = Fair
2.34 - 3.00 = Good

Table F-1. Fish Habitat Quality Criteria for Measured Parameters.

Fish Habitat Parameter	Feature	Fish Habitat Quality Poor	Fair	Good
Percent Riffle (By length) **(A)**	Anadromous Salmonid Streams	>50%	25-50%	<25%
Pool Spacing (Reach length/Bankfull/#pools) **(B)**	Anadromous Salmonid Streams	≥6.0	3.0 - 5.9	≤2.9
Shelter Rating (Shelter value x % of habitat covered) **(C)**	Pools	<60	60-120	>120
% Of Pools that are ≥3 ft. residual depth **(D)**	Pools	<25%	25-50%	>50%
Spawning Gravel Quantity (% of Surface area) **(E)**	Pool Tail-outs	<25%	25-50%	>50%
Percent Embeddedness **(F)**	Pool Tail-outs	>50%	25-50%	<25%
Gravel Quality Rating (Substrate composition) **(G)**	Pool Tail-outs	Silt/Clay Sand Boulder Bedrock	Small Gravel Large Cobble	Large Gravel Small Cobble
Key LWD +root wads / 328 ft of stream. **(H)**	Streams < 40 ft. BFW Streams ≥ 40 ft. BFW	<4.0 <3.0	4.0-6.5 3.0-3.8	>6.5 >3.8
Substrate for Over-wintering **(I)**	All Habitat Types	<20% of Units Cobble or Boulder Dominated	20-40% of Units Cobble or Boulder Dominated	>40% of Units Cobble or Boulder Dominated
Percent Side Channel (By length) **(J)**	Anadromous Salmonid Streams	<3%	3-5%	>5%

Table F-2. Habitat types as described in the California Salmonid Stream Habitat Restoration Manual (CDFG, 2002).

HABITAT TYPES	CODES	DESCRIPTIONS
Riffle		
Low Gradient Riffle	LGR	Shallow reach with swift flowing, turbulent water; partially exposed substrate; and <4% gradient.
High Gradient Riffle	HGR	Steep reach with swift flowing, very turbulent water; high exposed substrate; and >4% gradient.
Cascade		
Cascade	CAS	Steepest riffle habitat; consisting of alternating small waterfalls and shallow pools.
Bedrock Sheet	BRS	Thin sheet of water flowing over a smooth bedrock surface.
Flatwater		
Pocket Water	POW	Swift flowing stream around boulders and obstructions creating eddies or scour holes (pockets).
Glide	GLD	Wide uniform channel bottom; low to moderate flow.
Run	RUN	Swift flowing reaches with little surface agitation and no major flow obstructions; flooded riffle.
Step Run	SRN	Sequence of runs seperated by short riffle steps.
Edgewater	EDW	Quiet, shallow area along stream margins, typically associated with riffles; low water velocities
Main Channel Pool		
Trench Pool	TRP	U-shaped cross section typically flanked by bedrock walls; water velocities are swift.
Mid-Channel Pool	MCP	Large pools formed by mid-channel scours; water velocities are slow.
Channel Confluence Pool	CCP	Large pools formed at the confluence of two or more channels; higher water velocities and turbulence.
Step Pool	STP	Series of pools seperated by short riffles or cascades; generally high gradient, confined streams.
Scour Pool		
Corner Pool	CRP	Lateral scour pools formed at a bend in the channel.
Lateral Scour Pool - Log Formed	LSL	Formed by flow impinging against partial channel obstruction consisting of large woody debris.
Lateral Scour Pool - Rootwad Formed	LSR	Formed by flow impinging against partial channel obstruction consisting of a rootwad.
Lateral Scour Pool - Bedrock Formed	LSBk	Formed by flow impinging against a bedrock stream bank.
Lateral Scour Pool - Boulder Formed	LSBo	Formed by flow impinging against a partial channel obstruction consisting of a boulder.
Plunge Pool	PLP	Stream passes over channel obstruction and drops steeply into stream bed below; scouring depression.
Backwater Pools		
Secondary Channel Pool	SCP	Formed outside the average wetted channel width; mainly associated with gravel bars.
Backwater Pool - Boulder Formed	BPB	Shallow pool found along channel margins; caused by eddies around a boulder obstruction.
Backwater Pool - Rootwad Formed	BPR	Shallow pool found along channel margins; caused by eddies around a rootwad obstruction.
Backwater Pool - Log Formed	BPL	Shallow pool found along channel margins; caused by eddies around a woody debris obstruction.
Damned Pool	DPL	Water impounded from complete or nearly complete channel blockage (debris jams & rockslides).
Additional Unit Designations		
Dry	DRY	Dry stream beds.
Culvert	CUL	Culvert.
Not Surveyed	NS	Not surveyed.
Not Surveyed due to marsh	MAR	Not surveyed due to marsh.

Aquatic Species Distribution
A hierarchical framework was used to select the initial locations of survey sites in each stream. Major streams were broken into lower, middle and upper reaches. Smaller streams were divided into lower and upper reaches. One site is surveyed in each reach, resulting in 3 sites in larger streams, and 2 sites in smaller streams. Additional sites are added directly downstream and upstream of potential migration barriers to determine which salmonid species these barriers are impacting.

A survey site contains a minimum of two consecutive habitat sequences (pool-riffle sequences) and has a minimum length of ninety feet. The survey method used to determine the aquatic species present is single pass electrofishing or snorkeling. The effort put forth at each survey site is not sufficient to delineate the absence of a species. If future fishery research develops reasonable methods to determine the probability that a species is absent, these methods will be incorporated into future distribution surveys.

Prior to initiating surveys water quality is measured using a Horiba™ U-10 Water Quality Checker. Measurements taken are water temperature (°C), conductivity (microS/cc), dissolved oxygen (mg/L), and pH. Air temperature is measured with a pocket thermometer and water visibility is estimated. Stream discharge is estimated or measured with a Swoffer™ Model 2100 flow meter. The actual physical parameters measured at each site vary depending on equipment availability. Horiba™ U-10 Water Quality Checkers were not used prior to the surveys in 2000.

Diving (snorkeling) is used to assess species presence when stream conditions are considered adequate or when elevated stream temperatures have the potential to adversely impact the health of the animals being electrofished. The basic survey unit for diving consists of a minimum of two pools, however if riffles are deep enough to allow underwater observation these units are sampled.

Permeability and Stream Bulk Gravel Samples
Steam gravel permeability and bulk gravel samples were collected on one stream monitoring segment (RC09 in South Fork Cottaneva) in the Cottaneva WAU. The stream gravel permeability was measured using a 1-inch diameter standpipe similar to the standpipe discussed in Terhune (1958) and Barnard and McBain (1994) with the exception that our standpipe is smaller in diameter. We used the smaller diameter standpipe because we hypothesize that it creates fewer disturbances to the stream gravel when inserted. Bulk stream gravel samples were taken with a 12-inch diameter sampler as described in Platts, Megahan and Minshall (1983).

An electric pump was used to create the water suction in the standpipe for the permeability measurements. The permeability measurements were taken at a depth of 25 centimeters, near the maximum depth of coho and steelhead spawning. The permeability measurements were taken in 13 randomly selected pool tail-out sections along the monitoring segment. Two measurements were taken at each pool tail-out. This gave a total of 26 permeability sites for the entire segment.

A bulk gravel sample was taken in 4 randomly selected pool tail-outs. The gravel sample was taken after the permeability measurements. After the bulk gravel samples were collected the gravel is dried and sieved through 7 different size-class screens (50.8, 25.4, 12.5, 6.3, 4.75, 2.36, 0.85 mm). The weight of each gravel size class was determined for each of the bulk gravel samples using a commercial quality scale.

The median permeability measurement for each permeability site in the monitoring segment was used as representative of the site. To characterize the entire monitoring segment the natural log of the mean of the median permeability measurements was determined. The natural log of the permeability is used because of a relationship developed from data from Tagart (1976) and McCuddin (1977) (Stillwater Sciences, 2000) to estimate survival to emergence from permeability data. This relationship equates the natural log of permeability to fry survival (r^2 = 0.85, $p<10^{-7}$). This relationship is:

Survival % = -0.82530 + 0.14882 * ln permeability

It is important to understand that the use of this survival relationship is only an index of spawning gravel quality in the segment. The permeability measurements were taken in randomly selected pool tail-outs and are not indicative of where a salmon may select to spawn. Furthermore, spawning salmon have been shown to improve permeability in gravel where a redd was developed (Kondolf 2003). Therefore the survival percentage developed is only indicative of the quality of potential spawning habitat and not as an absolute number.

From the sieved bulk gravel samples the percent fine particles less than 0.85 mm sieve size class was determined. The survival index for steelhead trout was calculated from the bulk gravel samples using the method described in Tappel and Bjorn (1983). The survival index for steelhead trout was used because Tappel and Bjorn (1983) only present two survival indices, one for chinook salmon and one for steelhead. Chinook salmon are larger fish than coho or steelhead and can spawn in larger substrate making the index based on chinook salmon impractical for this assessment in Cottaneva. The relationship describing steelhead survival based on bulk gravel composition is as follows ($S_{9.5}$ is the percent fines below 9.5 mm and $S_{0.85}$ is the percent fines below 0.85 mm):

Steelhead Survival % = $94.7 - 0.1165 * S_{0.85} * S_{9.5} + 0.007 * (S_{9.5})^2$

RESULTS AND DISCUSSION

Salmonid Habitat Condition

The Cottaneva WAU is comprised of one planning watershed of which it was surveyed for fish habitat and aquatic species distribution. The results are discussed by segment. Tables F-4 and F-5 summarize the 2004 fish habitat assessment data. A total of 24 segments were evaluated. The habitat parameters used to evaluate individual stream segments can be found in Table F-5. The 'rating' is the quality value for calculation of weighted habitat indices (see Table F-1). The ratings were used to calculate habitat quality for each life history stage. A summary of the habitat ratings corresponding to each life history stage can be found in Table F-4. Table F-3 summarizes the percent of dominant cover types found in pool, riffle, and flatwater habitats.

Map F-1 was generated using data collected during the aquatic species distribution surveys. If no adult salmonid upstream migration barrier was found, then the upper extent of salmonid (steelhead and coho) distribution is mapped as far upstream as juveniles have been found. In most circumstances this is close to the actual extent of salmonid distribution. However, in some streams salmonid distribution may extend further upstream.

There is a taxonomic uncertainty that is important to note. Juvenile steelhead and resident rainbow trout cannot be distinguished between in the field. For the purpose of this report, *Oncorhynchus mykiss* juveniles are referred to as "steelhead" if there is not a known migration barrier downstream. If there is a migration barrier downstream the juveniles are referred to as "rainbow trout". Some streams lack aquatic species distribution information. Data from six years

of aquatic species distribution surveys (MRC 2002) are located in Appendix F. The Site ID's presented in Appendix F are also depicted on Map F-1.

Table F-3 presents data collected by MRC while operating an out-migrant trap in Cottaneva Creek between 2000 and 2002 (See Map F-1). Population estimates are presented for age 1+ coho and steelhead based upon a mark recapture program that accounted for the capture efficiency of the trap. The complete report (MRC 2003) should be consulted regarding additional data and the data limitations.

Table F-3. Summary of juvenile out-migrant population estimates in Cottaneva Creek, 2000-2002.

Dates	Coho Population Estimate	Steelhead Population Estimate
4/1/00-6/6/00	2870 ± 1639	2214 ± 608
3/3/01-6/21/01	1313 ± 360	11127 ± 1782
3/5/02-6/24/02	*	14910 ± 6440

*During 2002, only 6 coho smolts were captured. This was not sufficiant to generate a population estimate.

Table F-4. Percent of dominant cover types found in pool, riffle, and flatwater habitats of the Cottaneva WAU, 2004.

Segment	**Pool**		**Riffle**		**Flatwater**	
	Dom. Cover	Percent	Dom. Cover	Percent	Dom. Cover	Percent
RC01	Terrestrial Vegetation	100	Terrestrial Vegetation	50	Terrestrial Vegetation	67
RC02	SWD	63	Rootwad	33	SWD	70
RC03	SWD	43	SWD	41	SWD	52
RC04	LWD	50	Terrestrial Vegetation	59	LWD	40
RC05	LWD	56	LWD	68	SWD	57
RC06	LWD	59	Bubble Curtain	66	Terrestrial Vegetation	33
RC07	SWD	27	Bubble Curtain	64	SWD	50
RC08	LWD	49	Terrestrial Vegetation	52	Terrestrial Vegetation	47
RC09	LWD	65	Bubble Curtain	68	Terrestrial Vegetation	48
RC10	LWD	55	Terrestrial Vegetation	40	LWD	36
RC17	LWD	52	Boulder	24	LWD	43
RC18	SWD	67	LWD	40	LWD	50
RC19	LWD	74	LWD	31	LWD	50
RC20	Boulder	56	Boulder	100	Boulder	83
RC24	LWD	63	LWD	24	LWD	62
RC28	LWD	48	Bubble Curtain	38	Terrestrial Vegetation	44
RC32	Terrestrial Vegetation	38	Terrestrial Vegetation	38	Terrestrial Vegetation	70
RC41	LWD	60	Terrestrial Vegetation	70	Terrestrial Vegetation	44
RC52	LWD	50	SWD	43	Boulder	40
RC53	Rootwad	56	SWD	42	SWD	67
RC54	SWD	42	LWD	27	LWD	100
RC56	LWD	73	LWD	45	LWD	50
RC60	SWD	57	SWD	56	SWD	100
RC63	LWD	60	Bubble Curtain	40	LWD	44

Table F-5. Summary of Fish Habitat Ratings for Three Life History Stages of the Cottaneva WAU, 2004.

Segment	Spawning Habitat Score	Spawning Habitat Rating	Summer Rearing Habitat Score	Summer Rearing Habitat Rating	Over-wintering Habitat Score	Over-wintering Habitat Rating
RC01	2.00	Fair	1.85	Fair	1.70	Fair
RC02	1.36	Poor	2.05	Fair	1.95	Fair
RC03	1.36	Poor	2.05	Fair	1.95	Fair
RC04	1.36	Poor	2.20	Fair	2.05	Fair
RC05	1.67	Fair	1.70	Fair	1.75	Fair
RC06	1.67	Fair	1.70	Fair	1.65	Poor
RC07	1.67	Fair	1.70	Fair	1.65	Poor
RC08	1.36	Poor	1.95	Fair	1.85	Fair
RC09	2.00	Fair	1.80	Fair	1.75	Fair
RC10	1.36	Poor	1.95	Fair	1.90	Fair
RC17	1.67	Fair	1.50	Poor	1.45	Poor
RC18	1.67	Fair	1.50	Poor	1.50	Poor
RC19	2.00	Fair	1.65	Poor	1.50	Poor
RC20	1.67	Fair	1.50	Poor	1.50	Poor
RC24	1.67	Fair	1.70	Fair	1.65	Poor
RC28	1.36	Poor	2.00	Fair	1.90	Fair
RC32	1.36	Poor	1.40	Poor	1.35	Poor
RC41	1.36	Poor	1.55	Poor	1.50	Poor
RC52	1.67	Fair	1.50	Poor	1.45	Poor
RC53	1.67	Fair	1.90	Fair	1.80	Fair
RC54	1.67	Fair	1.35	Poor	1.30	Poor
RC56	1.67	Fair	1.55	Poor	1.50	Poor
RC60	1.36	Poor	1.50	Poor	1.45	Poor
RC63	1.67	Fair	1.50	Poor	1.45	Poor

Table F-6. Summary of Fish Habitat Parameters of the Cottaneva WAU, 2004.

Segment	Length of surveyed habitat (ft.)	**A.** Percent Pool:Riffle: Flatwater by segment length	**B.** Pool Spacing	**C.** Mean Pool Shelter Rating	**D.** Percent of all pools with residual depth >3 ft.	**E.** Percent Spawnable	**F.** Percent Embeddedness	**G.** Dominant Tailout Substrate	**H.** Key LWD + Rootwads / 328ft.	**I.** Percent Over-wintering Substrate	**J.** Percent Side Channel by segment length	Mean Residual Pool Depth (ft.)	Functional LWD / 328ft.
RC01	1576	7:9:84	5.4	120	0	35	25-50	Sm. Gravel	0.0	0	0	1.8	17.5
RC02	1504	36:14:50	2.5	90	50	22	>50	Sm. Gravel	0.3	0	0	3.1	18.3
RC03	5811	51:25:24	1.9	106	44	18	>50	Sm. Gravel	1.5	0	1	2.9	16.8
RC04	3408	46:18:36	1.8	90	63	19	>50	Sm. Gravel	0.9	0	2	3.1	15.7
RC05	3547	36:41:23	1.3	105	24	41	>50	Sm. Gravel	0.4	4	11	2.3	16.6
RC06	4525	47:35:18	2.1	108	10	48	>50	Sm. Gravel	1.3	3	0	2.0	27.2
RC07	2145	24:39:37	2.6	88	9	25	>50	Sm. Gravel	0.2	0	0	2.0	11.3
RC08	2010	34:32:34	4.6	123	0	20	>50	Sm. Gravel	4.8	0	1	1.3	15.3
RC09	5147	30:36:34	1.5	114	10	50	25-50	Sm. Gravel	2.6	0	10	1.9	13.0
RC10	2701	19:48:33	4.2	108	0	23	>50	Sm. Gravel	6.8	1	1	1.1	15.5
RC17	2444	21:53:26	1.8	95	5	37	>50	Sm. Gravel	1.6	2	0	1.8	13.2
RC18	1830	20:59:21	1.9	114	0	46	>50	Lg. Gravel	2.6	0	5	1.4	27.8
RC19	2247	17:44:39	3.4	105	0	41	25-50	Sm. Gravel	3.9	4	0	1.4	20.6
RC20	881	14:72:14	2.1	70	0	29	>50	Lg. Gravel	1.3	19	5	1.7	12.7
RC24	1946	22:54:24	2.6	97	0	37	>50	Lg. Gravel	5.6	4	1	1.5	22.9
RC28	2224	17:44:39	8.3	129	0	24	>50	Sm. Gravel	6.7	0	1	1.2	14.7
RC32	1384	11:60:29	7.1	67	0	8	>50	Sm. Gravel	4.1	0	0	1.1	10.4
RC41	2302	19:44:37	4.2	92	0	22	>50	Sm. Gravel	1.1	0	0	1.0	15.0
RC52	1180	22:56:22	2.4	108	0	32	>50	Sm. Gravel	1.0	0	0	1.7	20.6
RC53	1288	16:46:38	1.8	152	22	27	>50	Lg. Gravel	1.1	0	0	2.2	26.5
RC54	1056	26:64:10	3.2	111	17	39	>50	Lg. Gravel	0.7	4	0	1.8	27.6
RC56	983	21:48:31	3.9	104	0	28	>50	Sm. Gravel	0.4	0	0	1.4	29.0
RC60	581	14:55:31	2.8	114	0	7	>50	Sm. Gravel	0.6	0	0	1.1	40.6
RC63	2285	30:57:13	1.9	116	4	49	>50	Lg. Gravel	1.5	2	0	1.5	20.7

Cottaneva Creek Planning Watershed

Cottaneva Creek (Segment RC01)

The segment surveyed was composed of 7% pool, 9% riffle, and 84% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a high frequency of flatwater habitat. There was an equal proportion of lateral scour pools formed by logs to plunge pools (50%, Figure F-1). Terrestrial vegetation (100%, Table F-4) was the dominant cover available to fish in pools in the segment. The mean residual pool depth was 1.8 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (120), mainly due to an availability of cover. There were no key LWD pieces observed in the segment. However, there was one pool formed by LWD (50%) and 17.5 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was moderate (25-50%).

Spawning Habitat

Spawning habitat in the segment was fair due to a moderate percentage of spawnable gravels available to fish in tailouts (35% of tailout area) and the spawning gravels were slightly embedded. However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate shelter rating and a high frequency of flatwater. However, there was a low frequency of pools, an absence of pools with residual depths ≥3 feet, and absence of key LWD.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a moderate shelter rating and a high frequency of flatwater. However, there was a low frequency of pools, an absence of pools with residual depths ≥3 feet, and an absence of key LWD, over-wintering substrate, and side channels.

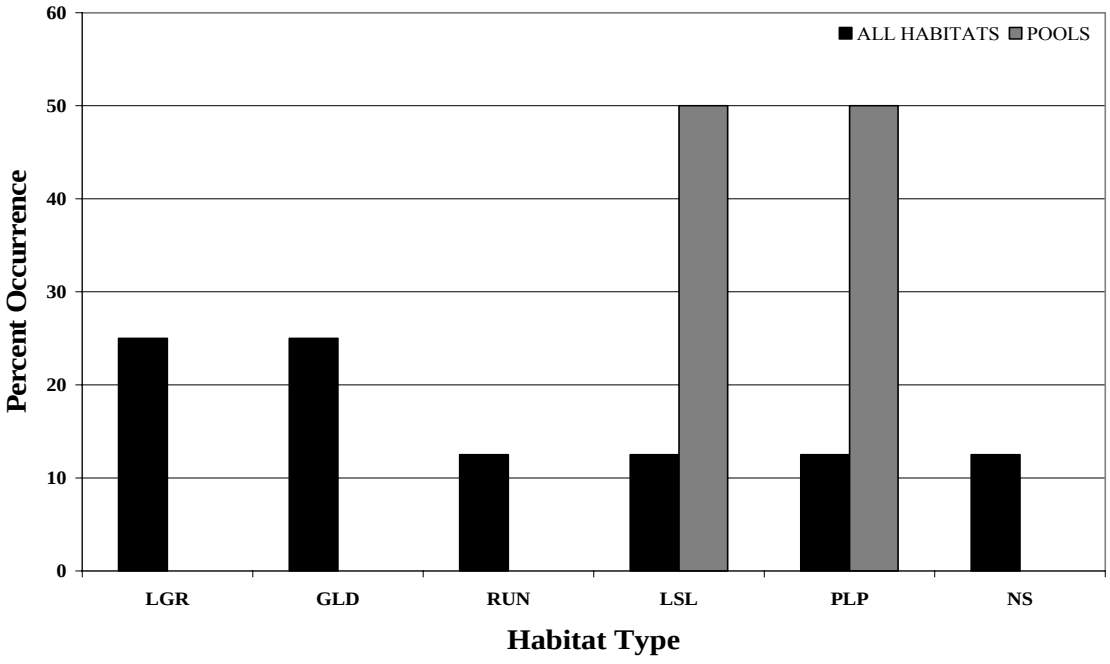


Figure F-1. Percent occurrence of habitat types surveyed in segment RC01 within the Cottaneva WAU, 2004.

Cottaneva Creek (Segment RC02)

The segment surveyed was composed of 36% pool, 14% riffle, and 50% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a low frequency of riffle habitat. The majority of pools were mid-channel pools (63%, Figure F-2). The dominant cover available to fish in pools in the segment was SWD (63%, Table F-4). The mean residual pool depth was 3.1 feet, with 50% of pools having residual depths ≥3 feet. The shelter rating was moderate (90), mainly due to an availability of cover. There were minimal amounts of key LWD (0.3 pieces per 328 feet) observed in the segment and no pools were formed by LWD. However, there were 18.3 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to a low percentage of spawnable gravels available to fish in tailouts (22% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate occurrence of pools with residual depths ≥3 feet, a moderate frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a moderate occurrence of pools with residual depths ≥3 feet, a moderate frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD, an absence of over-wintering substrate and side channels.

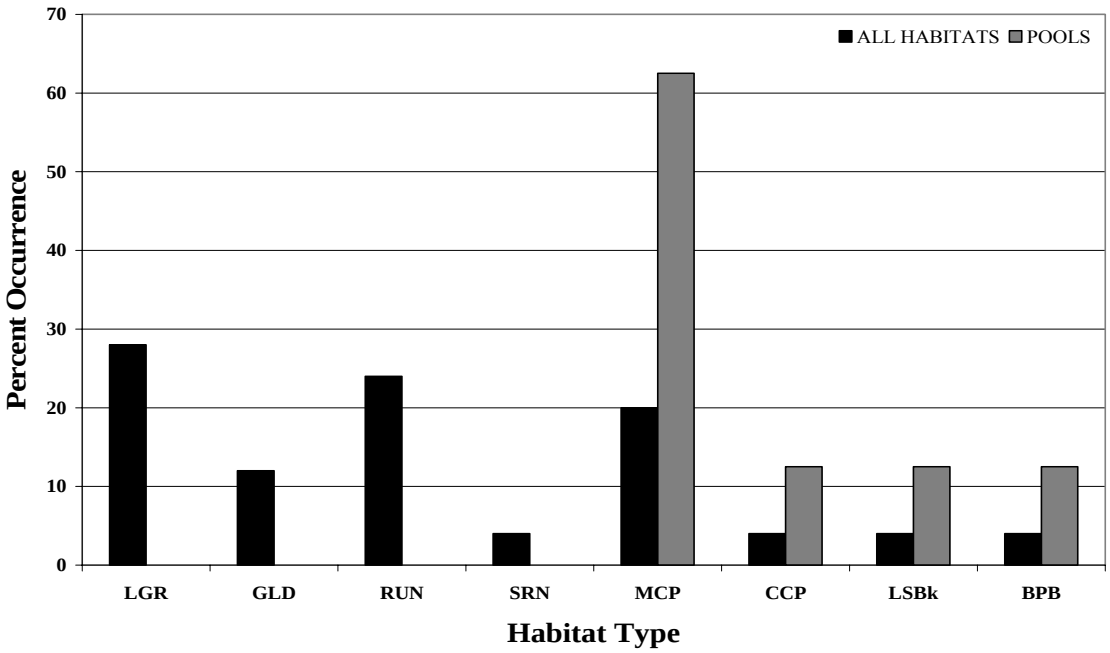


Figure F-2. Percent occurrence of habitat types surveyed in segment RC02 within the Cottaneva WAU, 2004.

Cottaneva Creek (Segment RC03)

The segment surveyed was composed of 51% pool, 25% riffle, and 24% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. The majority of pools were mid-channel pools (43%, Figure F-3). The dominant cover available to fish in pools in the segment was SWD (43%, Table F-4). The mean residual pool depth was 2.9 feet, with 44% of pools having residual depths ≥3 feet. The shelter rating was moderate (106), mainly due to an availability of cover. There were minimal amounts of key LWD (1.5 pieces per 328 feet) observed in the segment. However, 35% of pools were formed by LWD and there were 16.8 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to a low percentage of spawnable gravels available to fish in tailouts (18% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate occurrence of pools with residual depths ≥3 feet, a high frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a moderate occurrence of pools with residual depths ≥3 feet, a high frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD, a low frequency of side channels, and an absence of over-wintering substrate.

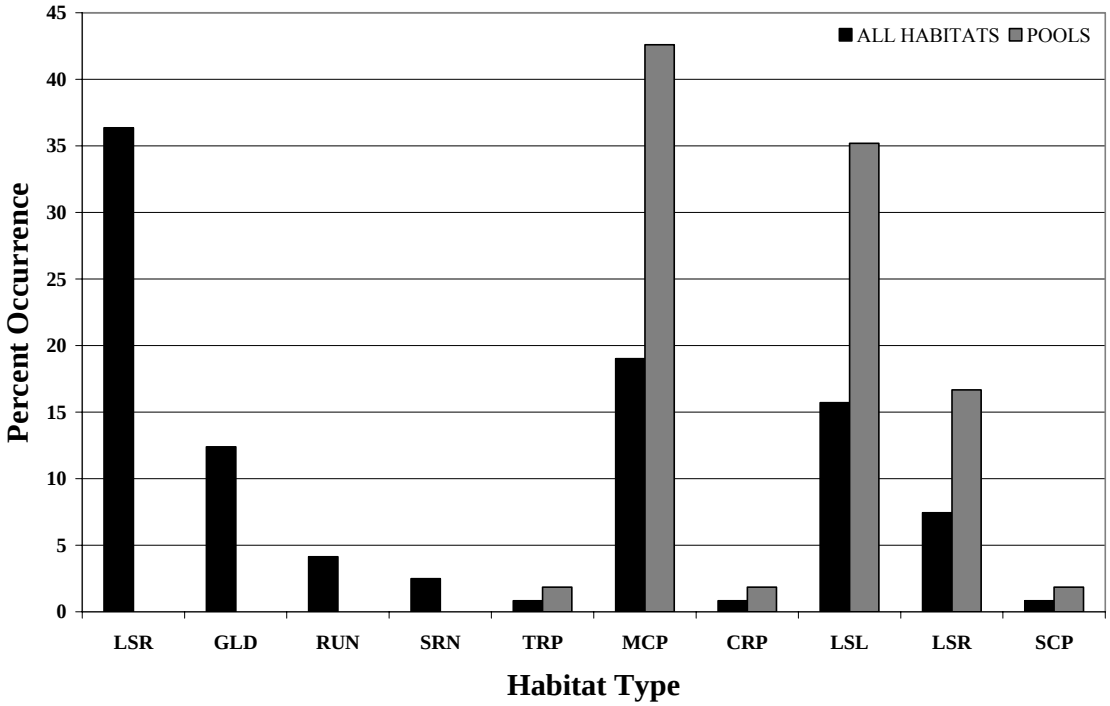


Figure F-3. Percent occurrence of habitat types surveyed in segment RC03 within the Cottaneva WAU, 2004.

Cottaneva Creek (Segment RC04)

The segment surveyed was composed of 46% pool, 18% riffle, and 36% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a low frequency of riffle habitat. The majority of pools were lateral scour pools formed by rootwads (33%, Figure F-4). The dominant cover available to fish in pools in the segment was LWD (50%, Table F-4). The mean residual pool depth was 3.1 feet, with 63% of pools having residual depths ≥3 feet. The shelter rating was moderate (90), mainly due to an availability of cover. There were minimal amounts of key LWD (0.9 pieces per 328 feet) observed in the segment. However, 21% of pools were formed by LWD and there were 15.7 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to a low percentage of spawnable gravels available to fish in tailouts (19% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a high occurrence of pools with residual depths ≥3 feet, a moderate frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a high occurrence of pools with residual depths ≥3 feet, a moderate frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD, a low frequency of side channels, and a minimal amount of over-wintering substrate.

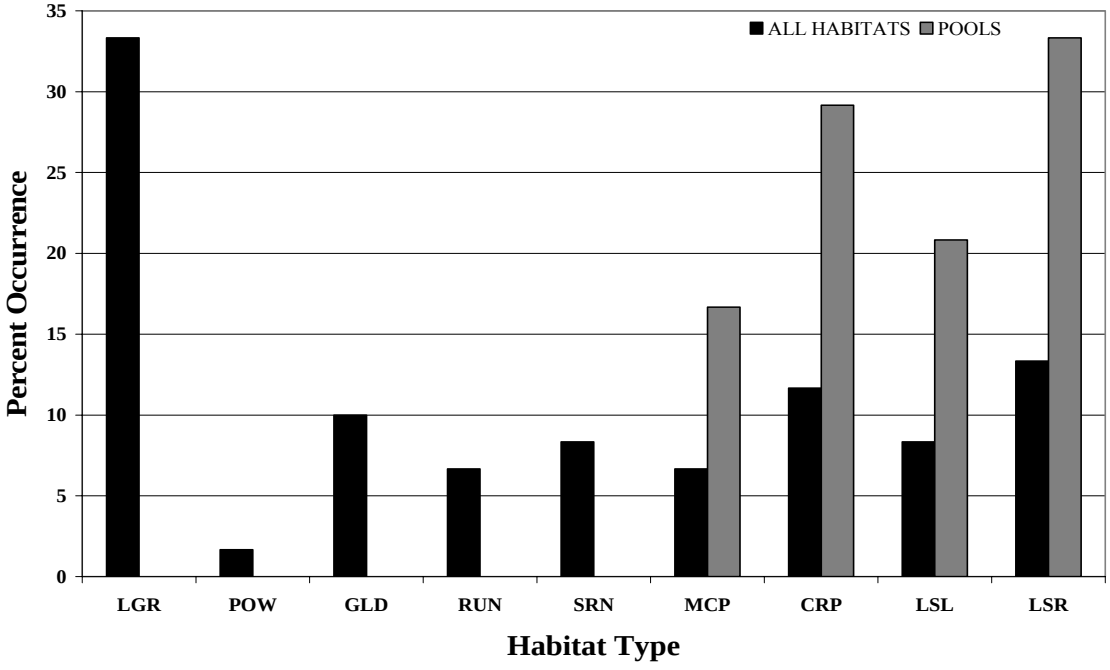


Figure F-4. Percent occurrence of habitat types surveyed in segment RC04 within the Cottaneva WAU, 2004.

Cottaneva Creek (Segment RC05)

The segment surveyed was composed of 36% pool, 41% riffle, and 23% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (40%, Figure F-5). The dominant cover available to fish in pools in the segment was LWD (56%, Table F-4). The mean residual pool depths was 2.3 feet, with 24% of pools having residual depths ≥3 feet. The shelter rating was moderate (105), mainly due to an availability of cover. There were minimal amounts of key LWD (0.4 pieces per 328 feet) observed in the segment. However, 40% of pools were formed by LWD and there were 16.6 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was fair due to a moderate percentage of spawnable gravels available to fish in tailouts (41% of tailout area). However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate frequency of pools and a moderate shelter rating. However, there were minimal amounts of key LWD and a low occurrence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a moderate frequency of pools, a moderate shelter rating, and a high frequency of side channels. However, there were minimal amounts of key LWD, a low occurrence of pools with residual depths ≥3 feet, and a minimal amount of over-wintering substrate.

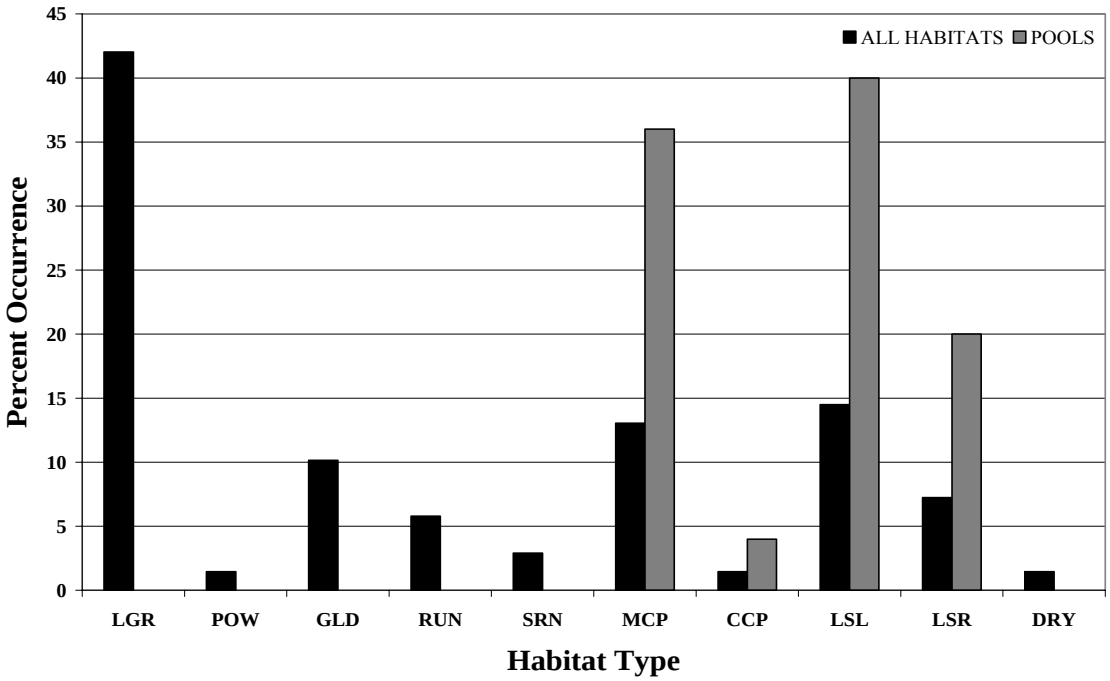


Figure F-5. Percent occurrence of habitat types surveyed in segment RC05 within the Cottaneva WAU, 2004.

North Fork Cottaneva Creek (Segment RC06)

The segment surveyed was composed of 47% pool, 35% riffle, and 18% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (53%, Figure F-6). The dominant cover available to fish in pools in the segment was LWD (59%, Table F-4). The mean residual pool depth was 2.0 feet, with 10% of pools having residual depths ≥3 feet. The shelter rating was moderate (108), mainly due to an availability of cover. There were minimal amounts of key LWD (1.3 pieces per 328 feet) observed in the segment. However, 53% of pools were formed by LWD and there were 27.2 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (48% of tailout area). However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate frequency of pools and a moderate shelter rating. However, there were minimal amounts of key LWD and low occurrence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due minimal amounts of key LWD, a low occurrence of pools with residual depths ≥3 feet, a minimal amount of over-wintering substrate, and an absence of side channels. However, there was a moderate frequency of pools and a moderate shelter rating.

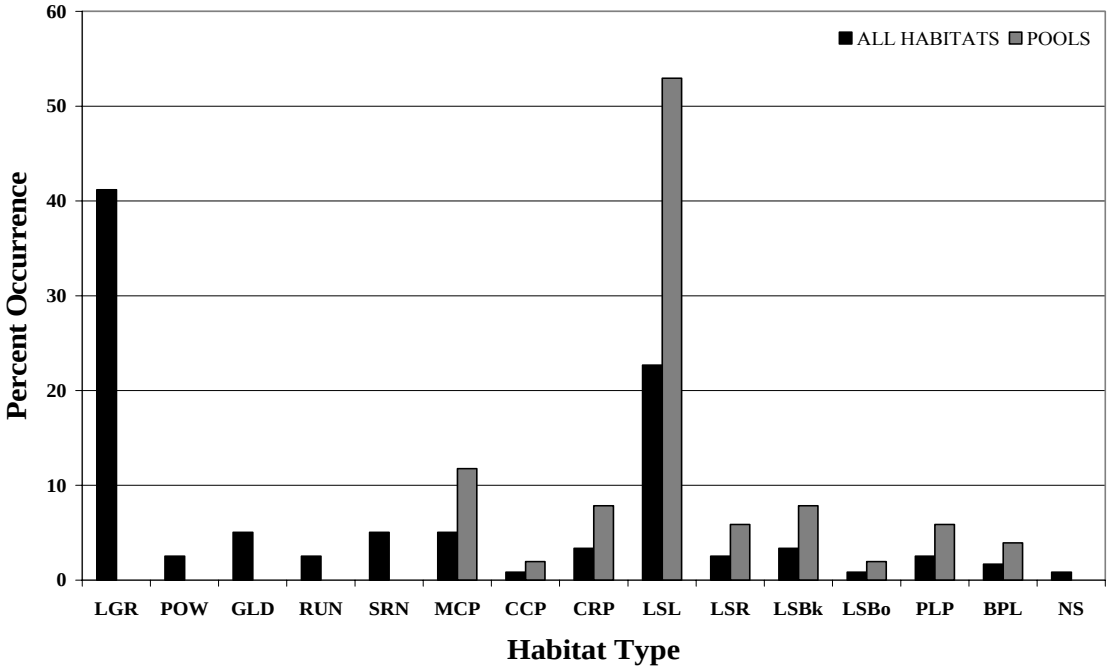


Figure F-6. Percent occurrence of habitat types surveyed in segment RC06 within the Cottaneva WAU, 2004.

South Fork Cottaneva Creek (Segment RC07)

The segment surveyed was composed of 24% pool, 39% riffle, and 37% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a moderate frequency of flatwater habitat. The majority of pools were lateral scour pools formed by logs (55%, Figure F-7). The dominant cover available to fish in pools in the segment was SWD (27%, Table F-4). The mean residual pool depth was 2.0 feet, with 9% of pools having residual depths ≥3 feet. The shelter rating was moderate (88), mainly due to an availability of cover. There were minimal amounts of key LWD (0.2 pieces per 328 feet) observed in the segment. However, 55% of pools were formed by LWD and there were 11.3 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (25% of tailout area). However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate shelter rating and a moderate frequency of flatwater. However, there were minimal amounts of key LWD, a low occurrence of pools with residual depths ≥3 feet, and a low frequency of pools.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to a low occurrence of pools with residual depths ≥3 feet, a low frequency of pools, a minimal amount of key LWD, an absence of over-wintering substrate and side channels. However, there was a moderate shelter rating.

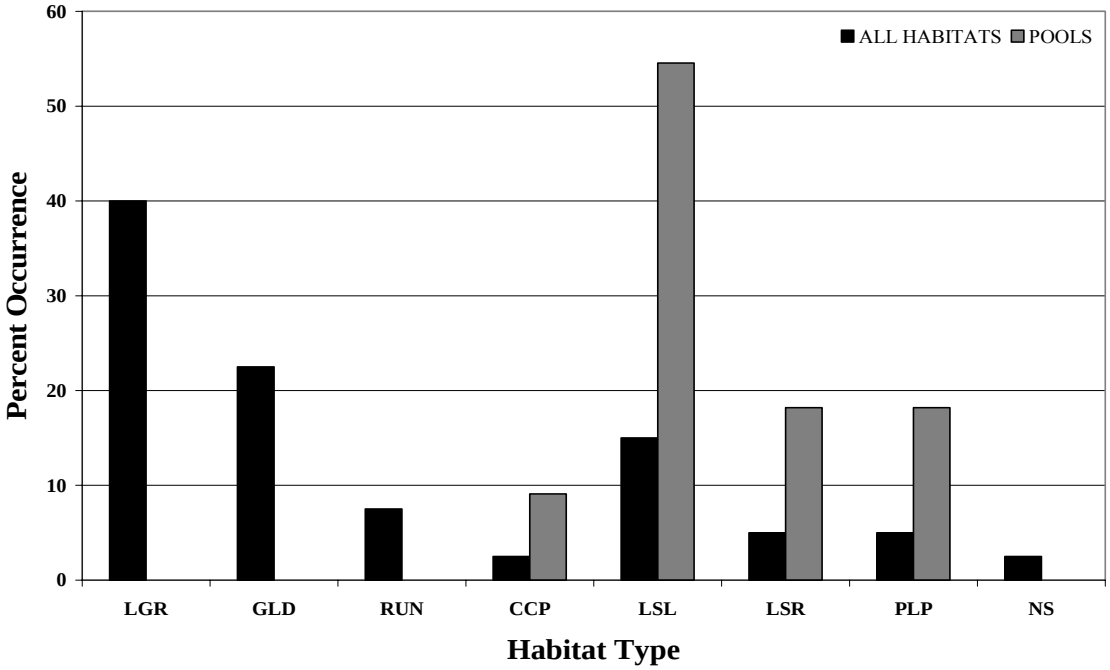


Figure F-7. Percent occurrence of habitat types surveyed in segment RC07 within the Cottaneva WAU, 2004

Rockport Creek (RC08)

The segment surveyed was composed of 34% pool, 32% riffle, and 34% flatwater by stream length (Table F-6). The frequency of pools, riffles, and flatwater in the segment are all considered moderate. The majority of pools were lateral scour pools formed by logs (34%, Figure F-8). The dominant cover available to fish in pools in the segment was LWD (49%, Table F-4). The mean residual pool depth was 1.3 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was high (123), mainly due to good cover complexity and availability. There were significant amounts of key LWD (4.8 pieces per 328 feet) observed in the segment. Therefore, the majority of pools in this segment were formed by LWD (34%) and there were also 15.3 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to a low percentage of spawnable gravels available to fish in tailouts (20% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a high amount of key LWD, a high shelter rating, and a moderate frequency of pools. However, there was an absence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a high amount of key LWD, a high shelter rating, and a moderate frequency of pools. However, there was a low frequency of side channels, an absence of pools with residual depths ≥3 feet, and an absence of over-wintering substrate.

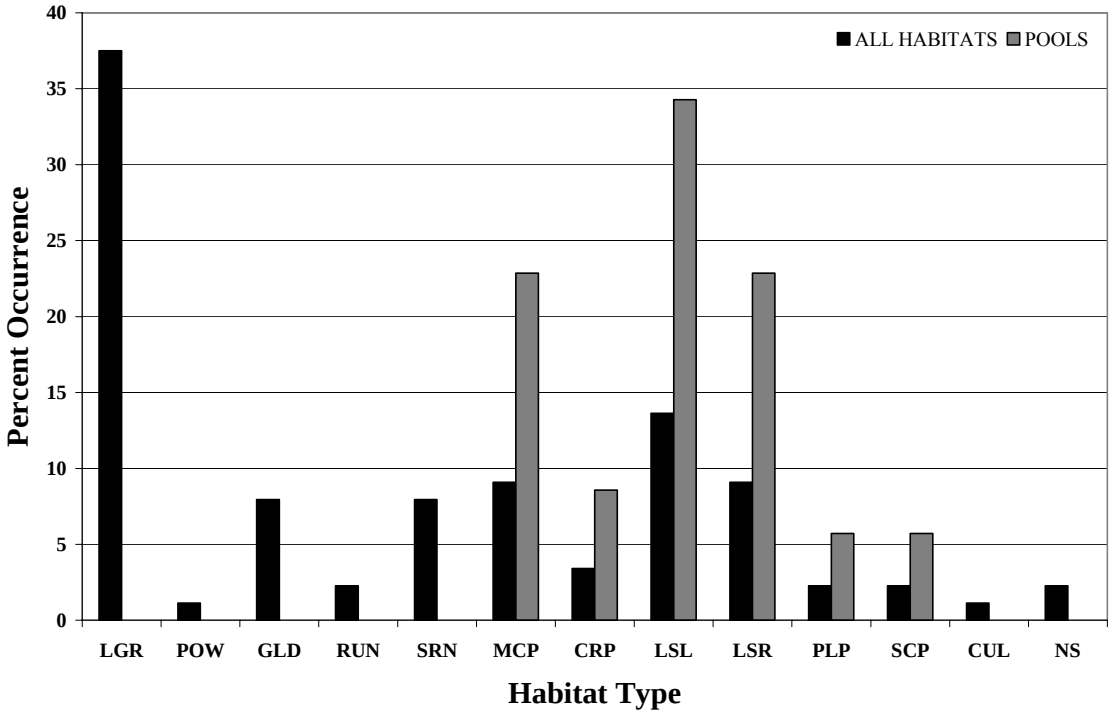


Figure F-8. Percent occurrence of habitat types surveyed in segment RC08 within the Cottaneva WAU, 2004.

South Fork Cottaneva Creek (Segment RC09)

The segment surveyed was composed of 30% pool, 36% riffle, and 34% flatwater by stream length (Table F-6). The frequency of pools, riffles, and flatwater in the segment are all considered moderate. The majority of pools were lateral scour pools formed by logs (39%, Figure F-9). The dominant cover available to fish in pools in the segment was LWD (65%, Table F-4). The mean residual pool depth was 1.9 feet, with 10% of pools having residual depths ≥3 feet. The shelter rating was moderate (114), mainly due to an availability of cover. There were minimal amounts of key LWD (2.6 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (39%) and there were also 13.0 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was moderate (25-50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (50% of tailout area) and the spawning gravels were slightly embedded. However, the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a moderate frequency of pools and a moderate shelter rating. However, there were minimal amounts of key LWD and low occurrence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due a high frequency of side channels, a moderate frequency of pools, and a moderate shelter rating. However, there were minimal amounts of key LWD, a low occurrence of pools with residual depths ≥3 feet, and an absence of over-wintering substrate.

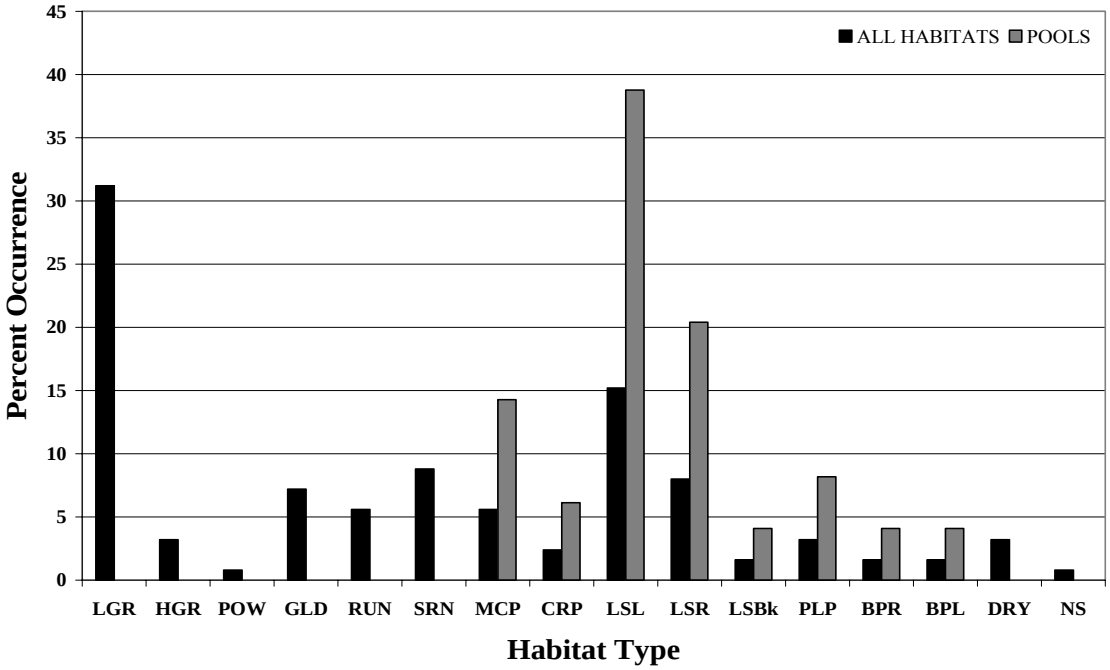


Figure F-9. Percent occurrence of habitat types surveyed in segment RC09 within the Cottaneva WAU, 2004.

Slaughterhouse Gulch (RC10)

The segment surveyed was composed of 19% pool, 48% riffle, and 33% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (52%, Figure F-10). The dominant cover available to fish in pools in the segment was LWD (55%, Table F-4). The mean residual pool depth was 1.1 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (108), mainly due to an availability of cover. There were significant amounts of key LWD (6.8 pieces per 328 feet) observed in the segment. Therefore, the majority of pools in this segment were formed by LWD (52%) and there were also 15.5 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to the low percentage of spawnable gravels available to fish in tailouts (23% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to high amounts of key LWD and a moderate shelter rating. However, there was a low occurrence of pools with residual depths ≥3 feet and a low frequency of pools.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to high amounts of key LWD and a moderate shelter rating. However, there was a low frequency of pools, a low occurrence of pools with residual depths ≥3 feet, a minimal amount of over-wintering substrate, and a low frequency of side channels.

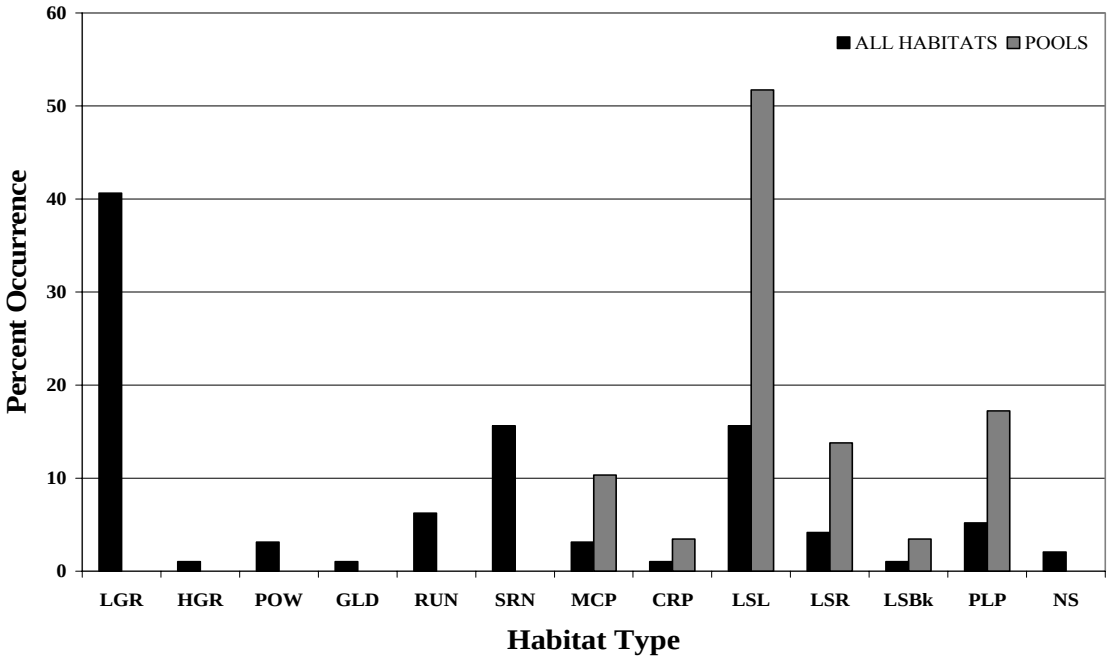


Figure F-10. Percent occurrence of habitat types surveyed in segment RC10 within the Cottaneva WAU, 2004.

South Fork Cottaneva Creek (Segment RC17)

The segment surveyed consisted of 21% pool, 53% riffle, and 26% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (57%, Figure F-11). The dominant cover available to fish in pools in the segment was LWD (52%, Table F-4). The mean residual pool depth was 1.8 feet, with 5% of pools having residual depths ≥3 feet. The shelter rating was moderate (95), mainly due to an availability of cover. There were minimal amounts of key LWD (1.6 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (57%) and there were also 13.2 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (37% of tailout area). However, the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, and a low occurrence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, a low occurrence of pools with residual depths ≥3 feet, a minimal amount of over-wintering substrate, and an absence of side channels. However, there was a moderate shelter rating.

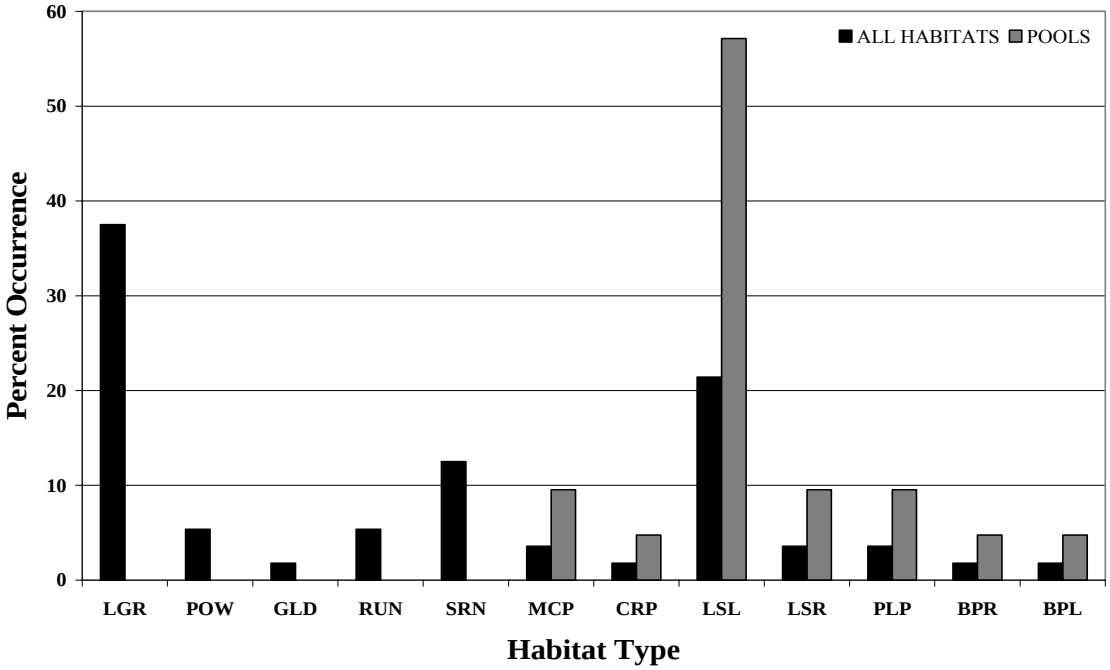


Figure F-11. Percent occurrence of habitat types surveyed in segment RC17 within the Cottaneva WAU, 2004.

South Fork Cottaneva Creek (Segment RC18)

The segment surveyed consisted of 20% pool, 59% riffle, and 21% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (56%, Figure F-12). The dominant cover available to fish in pools in the segment was SWD (67%, Table F-4). The mean residual pool depth was 1.4 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (114), mainly due to an availability of cover. There were minimal amounts of key LWD (2.6 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (56%) and there were also 27.8 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (46% of tailout area) and the dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, an absence of pools with residual depths ≥3 feet and over-wintering substrate. However, there was a moderate frequency of side channels and a moderate shelter rating.

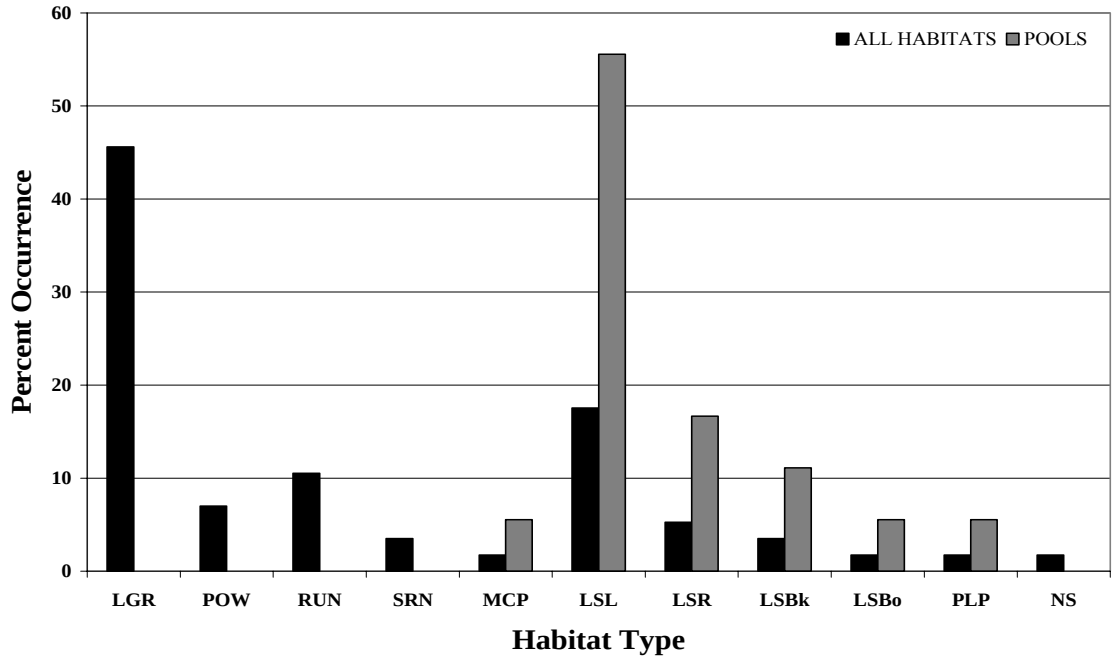


Figure F-12. Percent occurrence of habitat types surveyed in segment RC18 within the Cottaneva WAU, 2004

South Fork Cottaneva Creek (Segment RC19)

The segment surveyed consisted of 17% pool, 44% riffle, and 39% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (52%, Figure F-13). The dominant cover available to fish in pools in the segment was LWD (74%, Table F-4). The mean residual pool depth was 1.4 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (105), mainly due to an availability of cover. There were significant amounts of key LWD (3.9 pieces per 328 feet) observed in the segment. Therefore, the majority of pools in this segment were formed by LWD (52%) and there were also 20.6 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel, and the embeddedness rating was moderate (25-50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (41% of tailout area) and the spawning gravels were slightly embedded. However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to a low frequency of pools and an absence of pools with residual depths ≥3 feet. However, there was a high amount of key LWD and a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to a low frequency of pools, a minimal amount of over-wintering substrate, an absence of pools with residual depths ≥3 feet and side channels. However, there was a high amount of key LWD and a moderate shelter rating.

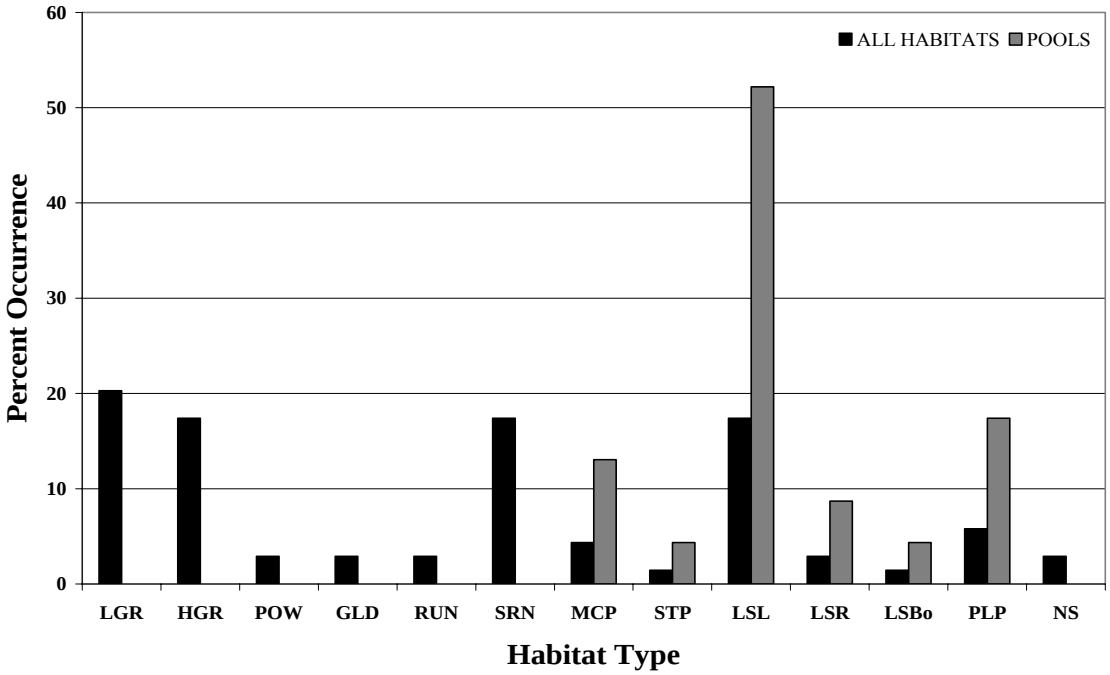


Figure F-13. Percent occurrence of habitat types surveyed in segment RC19 within the Cottaneva WAU, 2004.

South Fork Cottaneva Creek (Segment RC20)

The segment surveyed consisted of 14% pool, 72% riffle, and 14% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were lateral scour pools formed by boulders (33%, Figure F-14). Boulder was the dominant cover available to fish in pools in the segment (56%, Table F-4). The mean residual pool depth was 1.7 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (70), mainly due to an availability of cover. There were minimal amounts of key LWD (1.3 pieces per 328 feet) observed in the segment and there were no pools formed by LWD. However, there were 12.7 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (29% of tailout area) and the dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to a low frequency of pools, a minimal amount of key LWD, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to a low frequency of pools, a minimal amount of over-wintering substrate, a minimal amount of key LWD, and an absence of pools with residual depths ≥3 feet. However, there was a moderate frequency of side channels and a moderate shelter rating.

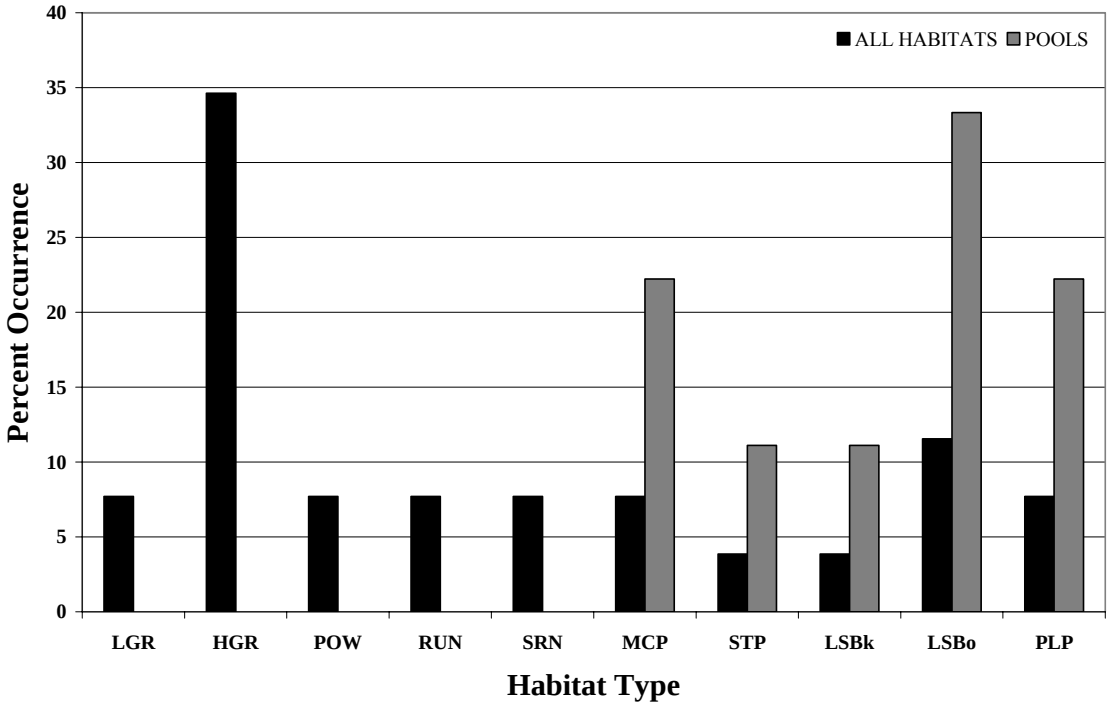


Figure F-14. Percent occurrence of habitat types surveyed in segment RC20 within the Cottaneva WAU, 2004.

Kimball Gulch (Segment RC24)

The segment surveyed consisted of 22% pool, 54% riffle, and 24% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (37%, Figure F-15). The dominant cover available to fish in pools in the segment was LWD (63%, Table F-4).The mean residual pool depth was 1.5 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (97), mainly due to an availability of cover. There were significant amounts of key LWD (5.6 pieces per 328 feet) observed in the segment. Therefore, the majority of pools in this segment were formed by LWD (37%) and there were also 22.9 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (37% of tailout area) and the dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to significant amounts of key LWD and a moderate shelter rating. However, there was a low frequency of pools and an absence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amount of over-wintering substrate, a low frequency of pools and side channels, and an absence of pools with residual depths ≥3 feet. However, there was a significant amount of key LWD and a moderate shelter rating.

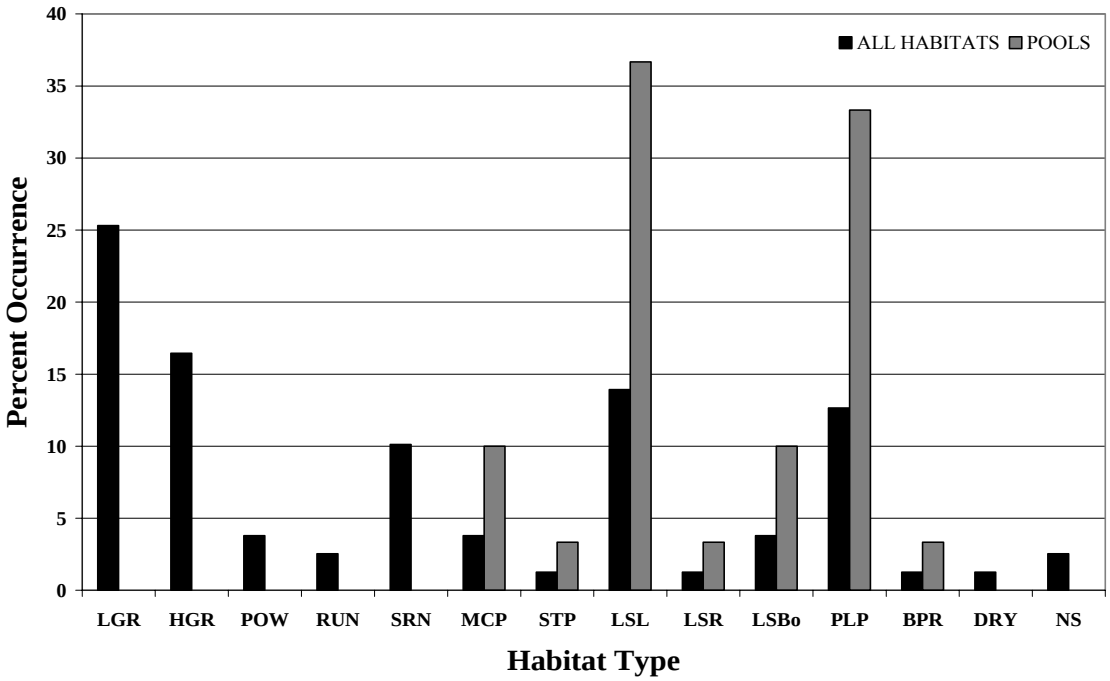


Figure F-15. Percent occurrence of habitat types surveyed in segment RC24 within the Cottaneva WAU, 2004.

Rockport Creek (Segment RC28)

The segment surveyed consisted of 17% pool, 44% riffle, and 39% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a moderate frequency of flatwater habitat. The majority of pools were lateral scour pools formed by logs (52%, Figure F-16). The dominant cover available to fish in pools in the segment was LWD (48%, Table F-4).The mean residual pool depth was 1.2 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was high (129), mainly due to good cover complexity and availability. There were significant amounts of key LWD (6.7 pieces per 328 feet) observed in the segment. Therefore, the majority of pools in this segment were formed by LWD (52%) and there were also 14.7 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to the low percentage of spawnable gravels available to fish in tailouts (24% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to significant amounts of key LWD and a high shelter rating. However, there was a low frequency of pools and an absence of pools with residual depths ≥3 feet.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to significant amounts of key LWD and a high shelter rating. However, there was a low frequency of pools and side channels, an absence of pools with residual depths ≥3 feet and over-wintering substrate.

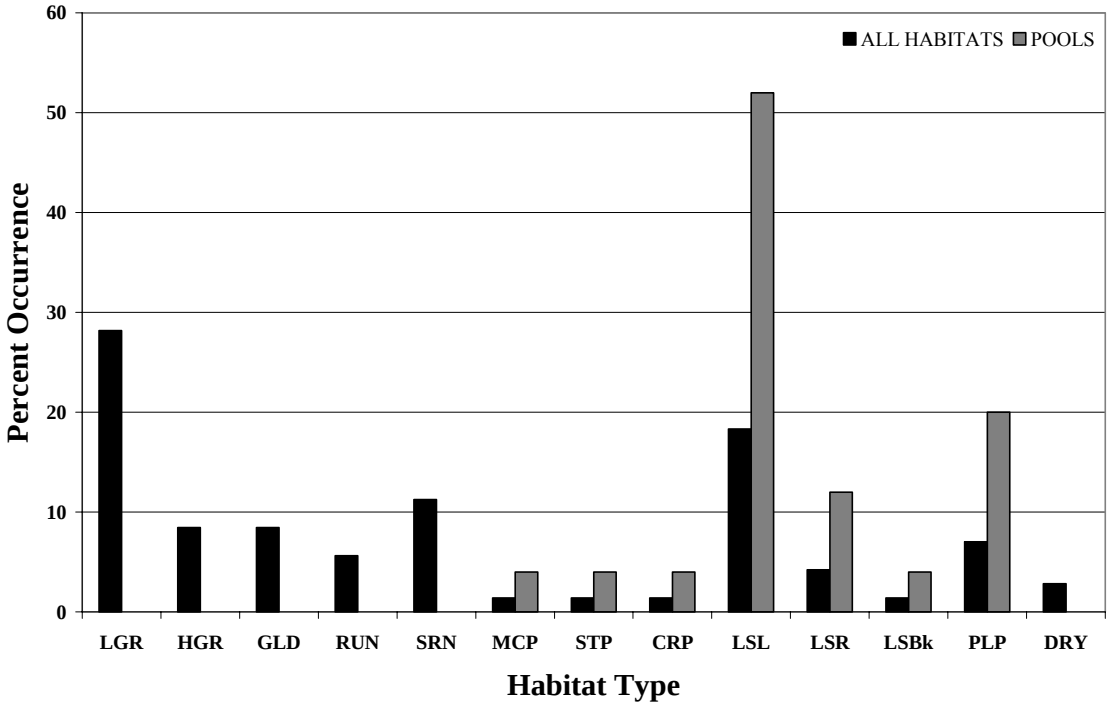


Figure F-16. Percent occurrence of habitat types surveyed in segment RC28 within the Cottaneva WAU, 2004.

Unnamed Left Bank Tributary to Rockport Creek (Segment RC32)

The segment surveyed consisted of 11% pool, 60% riffle, and 29% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. There was an equal proportion of lateral scour pools formed by logs to plunge pools (31%, Figure F-17). Terrestrial vegetation (38%, Table F-4) was the dominant cover available to fish in pools in the segment. The mean residual pool depth was 1.1 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (67), mainly due to an availability of cover. There were significant amounts of key LWD (4.1 pieces per 328 feet) observed in the segment. Therefore, LWD formed the majority of plunge pools and lateral scour pools (combined 62%) in this segment and there were also 10.4 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel, and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to the low percentage of spawnable gravels available to fish in tailouts (24% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to a low frequency of pools and an absence of pools with residual depths ≥3 feet. However, there was a significant amount of key LWD and moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to a low frequency of pools, an absence of pools with residual depths ≥3 feet, an absence of over-wintering substrate and side channels. However, there was a significant amount of key LWD and a moderate shelter rating.

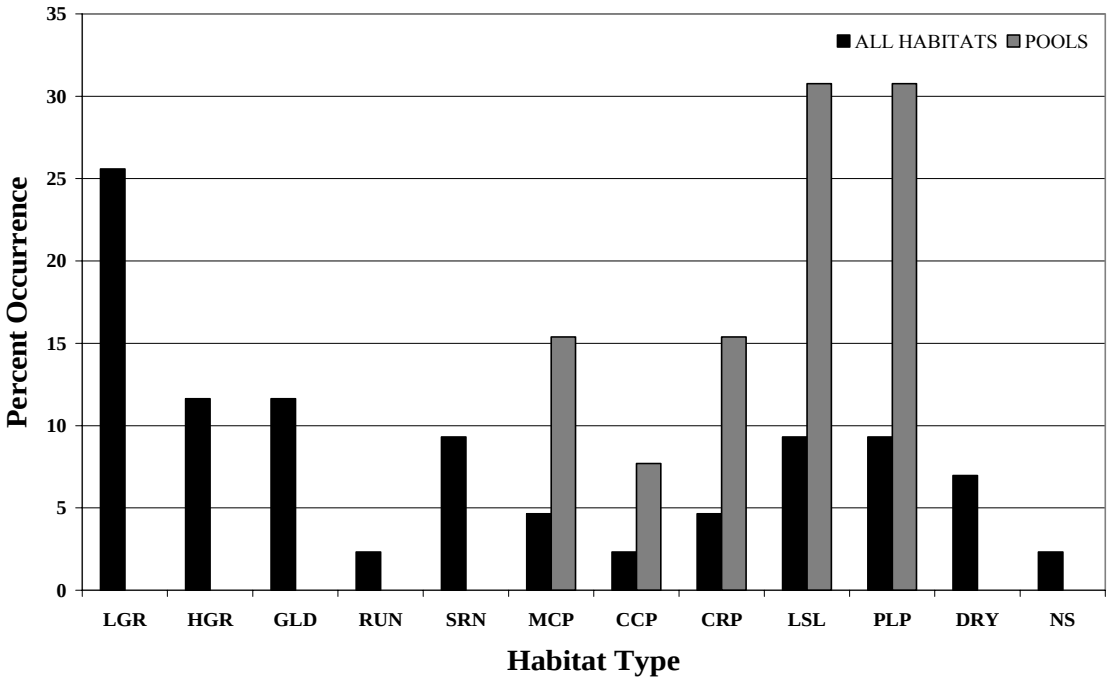


Figure F-17. Percent occurrence of habitat types surveyed in segment RC32 within the Cottaneva WAU, 2004.

Powderhouse Gulch (Segment RC41)

The segment surveyed consisted of 19% pool, 44% riffle, and 37% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a moderate frequency of flatwater habitat. The majority of pools were lateral scour pools formed by logs (48%, Figure F-18). The dominant cover available to fish in pools in the segment was LWD (60%, Table F-4). The mean residual pool depth was 1.0 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (92), mainly due to an availability of cover. There were minimal amounts of key LWD (1.1 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (48%) and there were also 15.0 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to the low percentage of spawnable gravels available to fish in tailouts (22% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to a low frequency of pools, a minimal amount of key LWD, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, an absence of pools with residual depths ≥3 feet, an absence of over-wintering substrate and side channels. However, there was a moderate shelter rating.

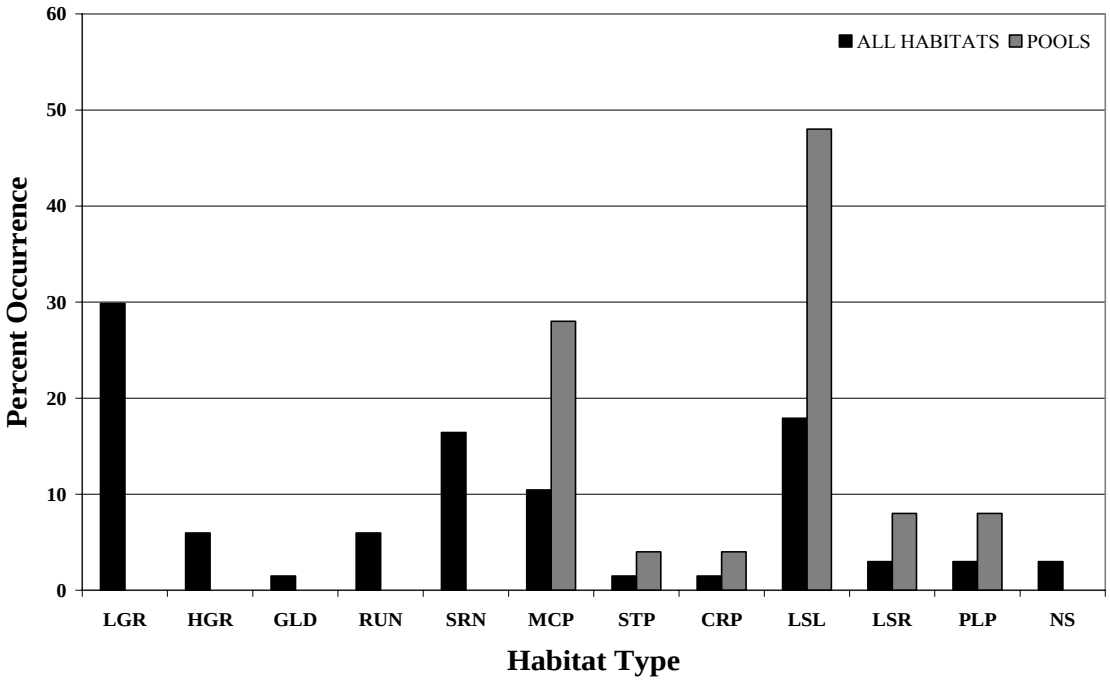


Figure F-18. Percent occurrence of habitat types surveyed in segment RC41 within the Cottaneva WAU, 2004.

Middle Fork Cottaneva Creek (Segment RC52)

The segment surveyed consisted of 22% pool, 56% riffle, and 22% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were mid-channel pools (50%, Figure F-19). The dominant cover available to fish in pools in the segment was LWD (50%, Table F-4). The mean residual pool depth was 1.7 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (108), mainly due to an availability of cover. There were minimal amounts of key LWD (1.0 pieces per 328 feet) observed in the segment. However, 20% of pools were formed by LWD and there were 20.6 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (32% of tailout area). However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to a low frequency of pools, a minimal amount of key LWD, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, an absence of pools with residual depths ≥3 feet, an absence of over-wintering substrate and side channels. However, there was a moderate shelter rating.

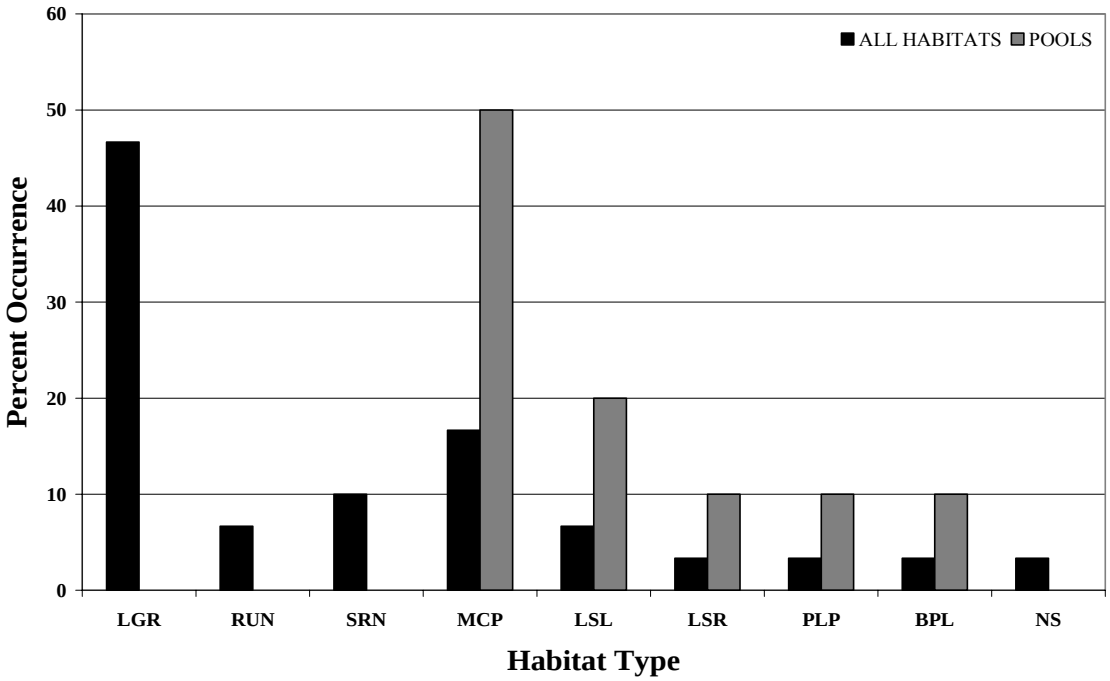


Figure F-19. Percent occurrence of habitat types surveyed in segment RC52 within the Cottaneva WAU, 2004.

Middle Fork Cottaneva Creek (Segment RC53)

The segment surveyed consisted of 16% pool, 46% riffle, and 38% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a moderate frequency of flatwater habitat. The majority of pools were lateral scour pools formed by rootwad (56%, Figure F-20). The dominant cover available to fish in pools in the segment was rootwad (56%, Table F-4). The mean residual pool depth was 2.2 feet, with 22% of pools having residual depths ≥3 feet. The shelter rating was high (152), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (1.1 pieces per 328 feet) observed in the segment. However, 11% of pools were formed by LWD and there were 26.5 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (27% of tailout area) and the dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was fair due to a high shelter rating and a moderate frequency of flatwater. However, there was a low occurrence of pools with residual depths ≥3 feet, a low frequency of pools, and minimal amounts of key LWD.

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to a high shelter rating and a moderate frequency of flatwater. However, there was a low occurrence of pools with residual depths ≥3 feet, a low frequency of pools, a minimal amounts of key LWD, an absence of over-wintering substrate and side channels.

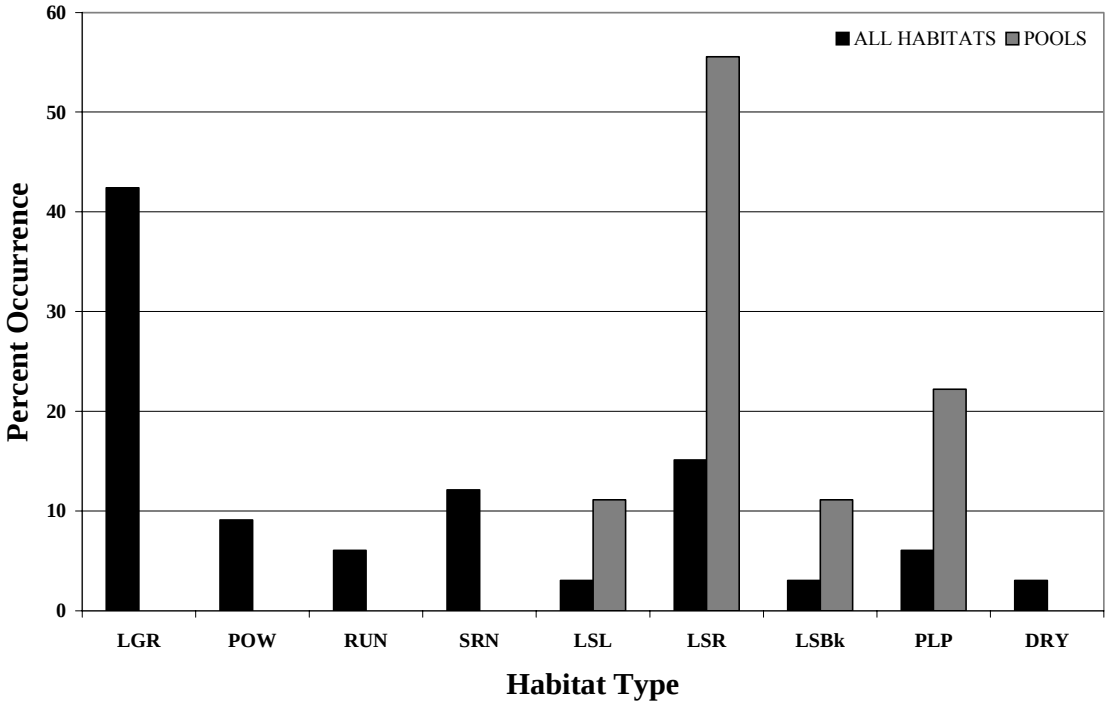


Figure F-20. Percent occurrence of habitat types surveyed in segment RC53 within the Cottaneva WAU, 2004.

Middle Fork Cottaneva Creek (Segment RC54)

The segment surveyed consisted of 26% pool, 64% riffle, and 10% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. There was similar proportion of pool types: lateral scour formed by logs, lateral scour pools formed by rootwad, and plunge pools (25%, Figure F-21). The dominant cover available to fish in pools in the segment was SWD (42%, Table F-4). The mean residual pool depth was 1.8 feet, with 17% of pools having residual depths ≥3 feet. The shelter rating was moderate (111), mainly due to an availability of cover. There were minimal amounts of key LWD (0.7 pieces per 328 feet) observed in the segment and there were 27.6 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (39% of tailout area). The dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, and a low occurrence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, a low occurrence of pools with residual depths ≥3 feet, a minimal amount of over-wintering substrate, and an absence of side channels. However, there was a moderate shelter rating.

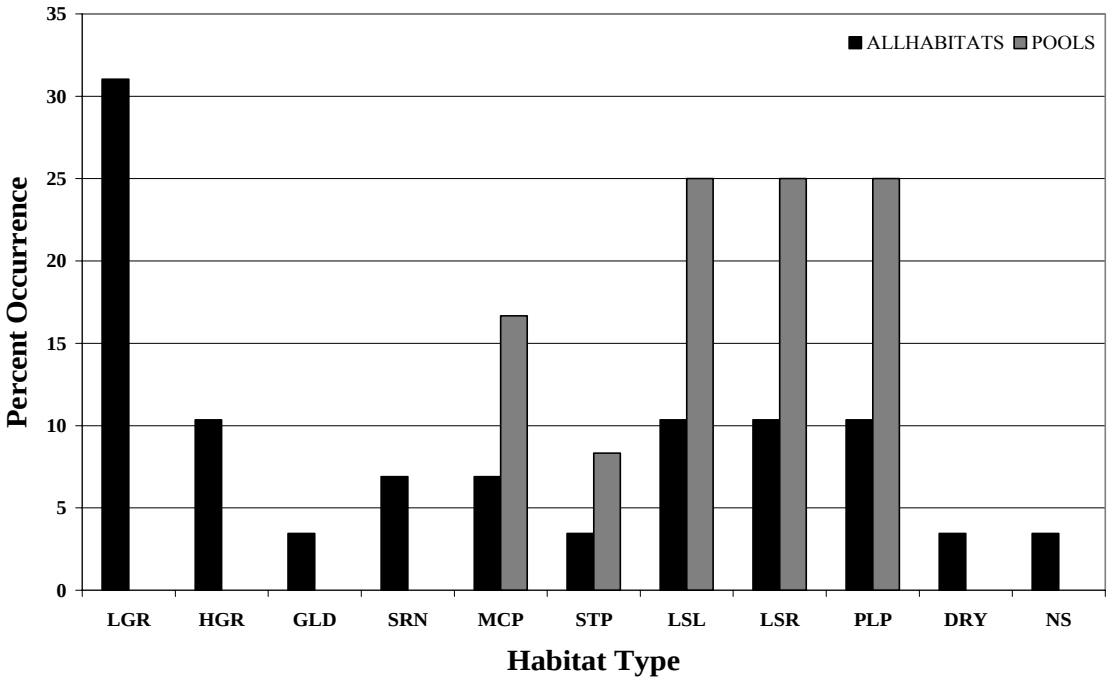


Figure F-21. Percent occurrence of habitat types surveyed in segment RC54 within the Cottaneva WAU, 2004.

Middle Fork Cottaneva Creek (Segment RC56)

The segment surveyed consisted of 21% pool, 48% riffle, and 31% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low, although there was a moderate frequency of flatwater habitat. The majority of pools were lateral scour pools formed by logs (55%, Figure F-22). The dominant cover available to fish in pools in the segment was LWD (73%, Table F-4). The mean residual pool depth was 1.4 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (104), mainly due to an availability of cover. There were minimal amounts of key LWD (0.4 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (55%) and there were also 29.0 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (28% of tailout area). However, the dominant tailout substrate size (small gravel) was slightly smaller than the preferred range of salmonids and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, an absence of pools with residual depths ≥3 feet, an absence of over-wintering substrate and side channels. However, there was a moderate shelter rating.

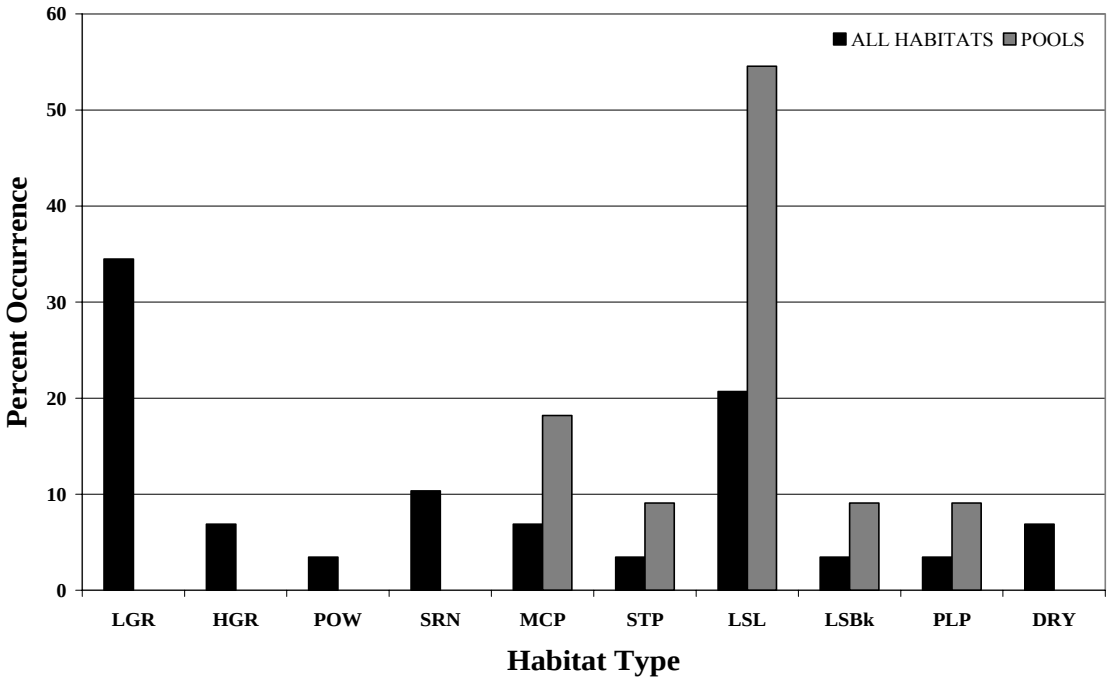


Figure F-22. Percent occurrence of habitat types surveyed in segment RC56 within the Cottaneva WAU, 2004.

Unnamed Right Bank Tributary to Middle Fork Cottaneva Creek (Segment RC60)

The segment surveyed consisted of 14% pool, 55% riffle, and 31% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were plunge pools (43%, Figure F-23). The dominant cover available to fish in pools in the segment was SWD (57%, Table F-4). The mean residual pool depth was 1.1 feet, with 0% of pools having residual depths ≥3 feet. The shelter rating was moderate (114), mainly due to an availability of cover. There were minimal amounts of key LWD (0.6 pieces per 328 feet) observed in the segment. However, 29% of pools were formed by LWD and there were 40.6 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was small gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment was poor due to a low percentage of spawnable gravels available to fish in tailouts (7% of tailout area), the dominant tailout substrate size (small gravel) is slightly smaller than the preferred range of salmonids, and the spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, and an absence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low frequency of pools, an absence of pools with residual depths ≥3 feet, an absence of over-wintering substrate and side channels. However, there was a moderate shelter rating.

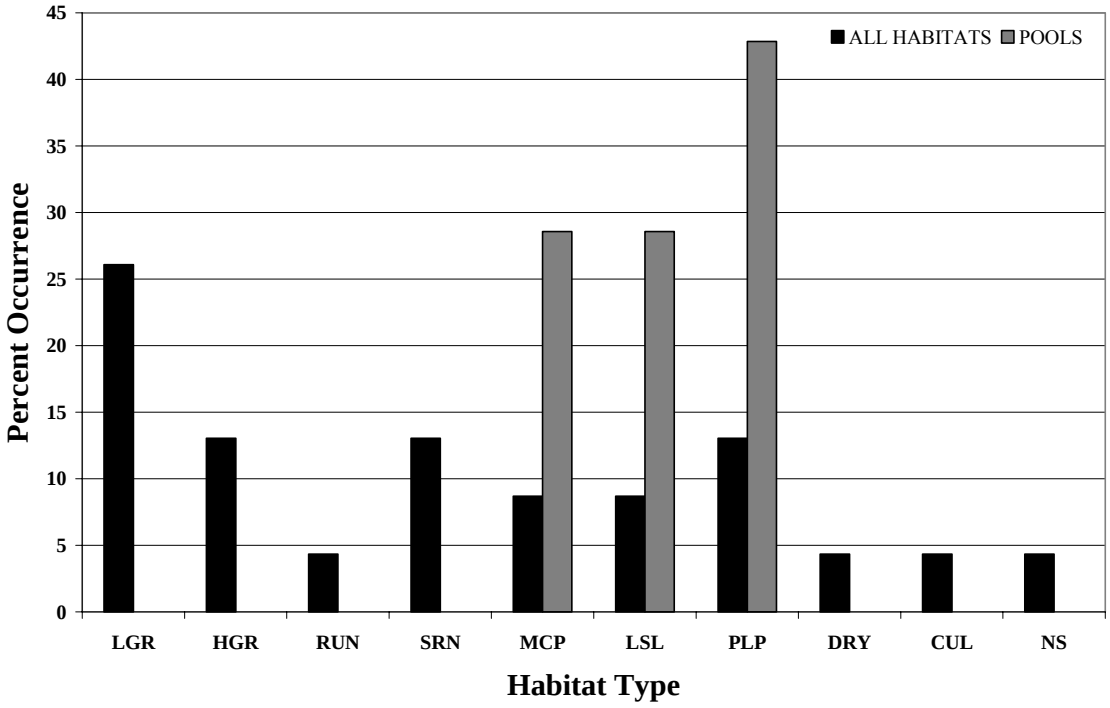


Figure F-23. Percent occurrence of habitat types surveyed in segment RC60 within the Cottaneva WAU, 2004.

North Fork Cottaneva Creek (Segment RC63)

The segment surveyed consisted of 30% pool, 57% riffle, and 13% flatwater by stream length (Table F-6). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (56%, Figure F-24). The dominant cover available to fish in pools in the segment was LWD (60%, Table F-4). The mean residual pool depth was 1.5 feet, with 4% of pools having residual depths ≥3 feet. The shelter rating was moderate (116), mainly due to an availability of cover. There were minimal amounts of key LWD (1.5 pieces per 328 feet) observed in the segment. However, the majority of pools in this segment were formed by LWD (56%), and there were also 20.7 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was high (>50%).

Spawning Habitat

Spawning habitat in the segment appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (49% of tailout area). The dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, and spawning gravels were embedded.

Summer Rearing Habitat

Summer rearing habitat in the segment was poor due to minimal amounts of key LWD and a low occurrence of pools with residual depths ≥3 feet. However, there was a moderate shelter rating and a moderate frequency of pools.

Over-wintering Habitat

Over-wintering habitat in the segment was poor due to minimal amounts of key LWD, a low occurrence of pools with residual depths ≥3 feet, a minimal amount of over-wintering substrate, and an absence of side channels. However, there was a moderate shelter rating and moderate frequency of pools.

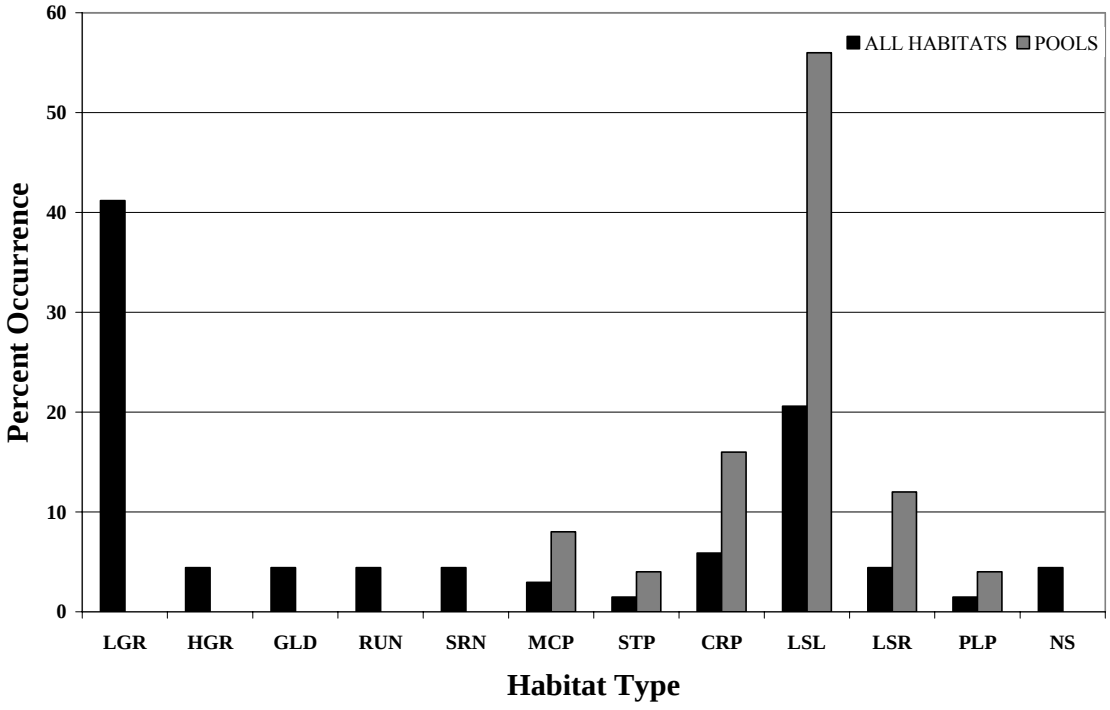


Figure F-24. Percent occurrence of habitat types surveyed in segment RC63 within the Cottaneva WAU, 2004.

Permeability and Bulk Gravel Samples

Results from permeability and percent fine particles <0.85 mm for the stream monitoring segment RC09, South Fork Cottaneva Creek, are presented in Table F-7. MRC used the following criteria for evaluating permeability: 0-3000 cm/hr is deficient, 3000-10,000 cm/hr is marginal, and >10,000 cm/hr is on target. The geometric mean permeability observation for the South Fork Cottaneva Creek stream monitoring segment is in the deficient category. A mean observation, as presented for the segments, provides an index of the segment's condition, however, observations ranged from deficient to on target. This suggests that though the mean observations are low, and of concern, there are some areas of good quality spawning gravels within the segments sampled.

The results from the percent of particles <0.85 mm were encouraging. However, the observations are bordering on a level of concern. Generally, the survival indices predicted by the bulk gravel samples were not too bad, however there is room of improvement; these observations are something that will have to be watched over time.

Table F-7. Permeability and Percent Fine Sediment <0.85 mm and associated survival indices for Long Term Monitoring Segments of the Cottaneva WAU, 2004.

Segment ID	Stream Name	Geometric Mean Permeability for Segment (cm/hr)	Standard Error Permeability (cm/hr)	Range of Permeability Observations (cm/hr)	Permeability Survival Index (Taggart/ McCuddin)	Percent Particles <0.85 mm	Bulk Gravel Survival Index (Tappel/ Bjorn)
RC09	South Fork Cottaneva Creek	1,593	403	6 -10,905	27%	8-11%	51-68%

Literature Cited

Barnhard, K. and S. McBain. 1994. Standpipe to determine permeability, dissolved oxygen, and vertical particle size distribution in salmonid spawning gravels. Fish Habitat Relationships Tech. Bull. No 15. USDA- Forest Service. Six Rivers National Forest, Eureka, CA. 12p.

Bilby R.E., and J.W. Ward. 1989. Changes in characteristics and function of woody debris with increasing size of streams in Western Washington. Transactions of the American Fisheries Society 118: 368-378.

Bisson P.A., R.E. Bilby, M.D. Bryant, C.A. Dolloff, G.B. Grette, R.A. House, M.L. Murphy, K.V. Koski, and J.R. Sedell. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. Streamside Management: Forestry and Fishery Interactions, pp. 143-190. Contribution 57. University of Washington Institute of Forest Resources, Seattle.

Bjorn T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Influences of forest and rangeland management on salmonid fishes and their habitats. Transactions of the American Fisheries Society 117: 262-273.

CDFG. 2002. California Stream Habitat Restoration Manual. Third Edition. Vol. 2. CDFG.

Flosi G., and F.L. Reynolds. 1994. California Stream Habitat Restoration Manual. California Department of Fish and Game.

Mathias Kondolf, G., M. J. Sale, M. G. Wolman. 1993. Modification of fluvial gravel size by spawning salmonids, Water Resources Research, 29(7), 2265-2274

Louisiana Pacific. 1996. Louisiana Pacific Watershed Analysis Manual. Louisiana-Pacific Corporation, Forest Resources Division. Calpella, CA.

McCuddin, M.E. 1977. Survival of salmon and trout embryos and fry in gravel-sand mixtures. M.S. Thesis, University of Idaho, Moscow.

Mendocino Redwood Company. 2000. Preliminary results of redd vs. non-redd permeabilities in the Garcia River. Company Report, Fort Bragg, CA.

Mendocino Redwood Company. 2002. Aquatic species distribution on Mendocino Redwood Company forestlands, 1994-1996 and 2000-2002. Company Report, Fort Bragg, CA.

Mendocino Redwood Company. 2003. Results of Out-migrant Trapping Program in Cottaneva Creek, Mendocino County CA, 2000-2002. Company Report, Fort Bragg, CA.

Montgomery D.R., J.M. Buffington, R.D. Schmidt. 1995. Pool spacing in forest channels. Water Resources Research, 31: 1097-1104.

Platts W.S., W.F. Megahan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. USDA-Forest Service Gen. Tech. Rep. INT-138.

Stillwater Ecosystems, Watershed and Riverine Sciences. 1998. Chapter 3, Stream Channel Monitoring in Draft report on adoptive management and monitoring, pp.13-36. Louisiana-Pacific.

Stillwater Ecosystems, Watershed and Riverine Sciences. 2000. Personal communication of stream permeability index.

Swales, S., F. Caron, J.R. Irvine, and C.D. Levings. 1998. Overwintering habitats of coho salmon *(Oncorhynchus kisutch)* and other juvenile salmonids in the Keogh River system, British Columbia. Canadian Journal of Zoology. 66: 254-261.

Tagart, J.V. 1976. The survival from egg deposition to emergence of coho salmon in the Clearwater River, Jefferson County, Washington. M.S. Thesis, University of Washigton.

Tappel, P.D. and T.C. Bjornn. 1983. A new method of relating size of spawning gravel to salmonid embryo survival. North American Journal of Fisheries Management 3: 123-135.

Terhune. L. D. B. 1958. The Mark IV groundwater standpipe for measuring seepage through salmon spawning gravel. Fish Res. Bd. Canada, 15(5), pp. 1027-1063.

Washington Forest Practice Board. 1997. Board Manual: Standard Methodology for Conducting Watershed Analysis. Version 4.0. Washington Forest Practice Board, Olympia, WA.

APPENDIX F

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
COTTANEVA CREEK	47-35	9/7/2001	3	5				CR PR STB
SF COTTANEVA CREEK	47-01	7/15/1994	12	7				CR PR
SF COTTANEVA CREEK	47-01	7/11/1995	PRESENT	PRESENT				PGS SCP
SF COTTANEVA CREEK	47-01	8/8/1996	PRESENT	PRESENT	PRESENT			PGS SCP
SF COTTANEVA CREEK	47-01	6/8/2000	36	7	1	7	1	CR PGS PR SCP
SF COTTANEVA CREEK	47-01	9/5/2001	3	18				CR PR STB
SF COTTANEVA CREEK	47-01	7/31/2002	3	4	1	1	2	CR PGS PR
ROCKPORT CREEK	47-02	7/20/1994	9	2				CR PGS
ROCKPORT CREEK	47-02	7/11/1995	PRESENT	PRESENT	PRESENT			PGS
ROCKPORT CREEK	47-02	8/8/1996	PRESENT	PRESENT	PRESENT			PGS
ROCKPORT CREEK	47-02	6/9/2000			1			PGS
ROCKPORT CREEK	47-36	9/5/2001	8	4				CR PGS PR
ROCKPORT CREEK	47-36	7/31/2002	3	1		3	2	PGS PR
TRIB TO ROCKPORT CREEK #1	47-03	8/8/1996						PGS
TRIB TO ROCKPORT CREEK #1	47-03	6/9/2000						PGS

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
TRIB TO ROCKPORT CREEK #1	47-03	9/5/2001	3	1				PGS
TRIB TO ROCKPORT CREEK #1	47-03	7/31/2002	13	1	1			PGS
ROCKPORT CREEK	47-04	8/8/1996	PRESENT					PGS
ROCKPORT CREEK	47-04	6/9/2000						PGS
ROCKPORT CREEK	47-04	9/5/2001		1				
ROCKPORT CREEK	47-04	7/31/2002	6	1				PGS
SF COTTANEVA CREEK	47-05	7/15/1994	12	10		2		CR PGS PR
SF COTTANEVA CREEK	47-05	7/11/1995	PRESENT	PRESENT			PRESENT	PGS SCP
SF COTTANEVA CREEK	47-05	8/8/1996	PRESENT	PRESENT		PRESENT	PRESENT	SCP
SF COTTANEVA CREEK	47-05	6/8/2000	1	1		3		CR PGS PR
SF COTTANEVA CREEK	47-05	9/10/2001	6	1				CR
SLAUGHTERHOUSE GULCH	47-06	7/20/1994	14	3				PGS PR
SLAUGHTERHOUSE GULCH	47-06	7/11/1995	PRESENT	PRESENT				PGS SCP
SLAUGHTERHOUSE GULCH	47-06	8/8/1996	PRESENT	PRESENT		PRESENT		PGS SCP
SLAUGHTERHOUSE GULCH	47-06	6/8/2000	12	4	1	4		CR PGS PR TLF

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
SLAUGHTERHOUSE GULCH	47-06	9/10/2001	5	1			1	CR PGS
SLAUGHTERHOUSE GULCH	47-06	7/31/2002	8	1		6		CR PGS
SLAUGHTERHOUSE GULCH	47-07	7/20/1994	10	2				PGS
SLAUGHTERHOUSE GULCH	47-07	7/11/1995		PRESENT				PGS
SLAUGHTERHOUSE GULCH	47-07	8/8/1996	PRESENT					PGS
SLAUGHTERHOUSE GULCH	47-07	6/9/2000		1	1			PGS TLF
SLAUGHTERHOUSE GULCH	47-07	9/10/2001		1				PGS
SLAUGHTERHOUSE GULCH	47-07	7/31/2002	2	1				PGS
KIMBALL GULCH	47-08	7/20/1994		14				PGS
KIMBALL GULCH	47-08	7/11/1995		PRESENT				PGS
KIMBALL GULCH	47-08	8/8/1996						PGS
KIMBALL GULCH	47-08	6/8/2000		1				PGS TLF
KIMBALL GULCH	47-08	7/31/2002	11	1				PGS
SF COTTANEVA CREEK	47-09	7/20/1994	7	3		2		
SF COTTANEVA CREEK	47-09	7/11/1995	PRESENT	PRESENT	PRESENT			PGS

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
SF COTTANEVA CREEK	47-09	8/8/1996	PRESENT	PRESENT	PRESENT			PGS
SF COTTANEVA CREEK	47-09	6/9/2000	38	2				PGS TLF
SF COTTANEVA CREEK	47-09	9/10/2001	7	2				PGS
SF COTTANEVA CREEK	47-09	7/31/2002	14			4		PGS
POWDERHOUSE GULCH	47-10	7/20/1994	6	5				PGS
POWDERHOUSE GULCH	47-10	8/1/1995		PRESENT				PGS
POWDERHOUSE GULCH	47-10	8/7/1996						PGS
POWDERHOUSE GULCH	47-10	6/21/2000						PGS
POWDERHOUSE GULCH	47-10	9/5/2001						PGS
POWDERHOUSE GULCH	47-10	7/29/2002						PGS
COTTANEVA CREEK	47-11	7/14/1994	10			3	1	CR PR STB
COTTANEVA CREEK	47-11	8/1/1995	PRESENT	PRESENT				SCP STB
COTTANEVA CREEK	47-11	8/8/1996	PRESENT	PRESENT				PGS SCP STB
COTTANEVA CREEK	47-11	6/21/2000	23	1		1		CR PR STB
COTTANEVA CREEK	47-11	9/5/2001	6	1	1			CR PR STB

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
COTTANEVA CREEK	47-11	7/29/2002	7	2		3	1	CR
MF COTTANEVA CREEK	47-12	7/14/1994	25	4			3	PGS TLF
MF COTTANEVA CREEK	47-12	8/1/1995	PRESENT	PRESENT				PGS SCP
MF COTTANEVA CREEK	47-12	8/7/1996	PRESENT	PRESENT		PRESENT		PGS
MF COTTANEVA CREEK	47-12	6/21/2000	47					PGS SCP
MF COTTANEVA CREEK	47-12	9/7/2001	14	3				
MF COTTANEVA CREEK	47-12	7/29/2002	11	1		4		PGS
TRIB TO MF COTTANEVA CREEK #1	47-13	8/7/1996						PGS
TRIB TO MF COTTANEVA CREEK #1	47-13	6/21/2000	1					PGS
TRIB TO MF COTTANEVA CREEK #1	47-13	9/7/2001	1	1				PGS
TRIB TO MF COTTANEVA CREEK #1	47-13	7/29/2002	11					PGS
MF COTTANEVA CREEK	47-14	8/7/1996	PRESENT	PRESENT				PGS
MF COTTANEVA CREEK	47-14	6/21/2000	28	2				PGS
MF COTTANEVA CREEK	47-14	9/7/2001	25	2				PGS
MF COTTANEVA CREEK	47-14	7/29/2002	1	1				PGS TLF

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
TRIB TO MF COTTANEVA CREEK #2	47-38	7/29/2002						PGS
MF COTTANEVA CREEK	47-39	7/29/2002	3	1	1			PGS TLF
MF COTTANEVA CREEK	47-37	7/29/2002						PGS
NF COTTANEVA CREEK	47-15	7/14/1994	17	4		1	4	PGS SCP STB
NF COTTANEVA CREEK	47-15	8/1/1995	PRESENT	PRESENT				PGS SCP
NF COTTANEVA CREEK	47-15	8/7/1996	PRESENT	PRESENT	PRESENT	PRESENT		PGS SCP
NF COTTANEVA CREEK	47-15	6/21/2000	32	1				PGS STB
NF COTTANEVA CREEK	47-15	9/7/2001	13	5	1			PGS
NF COTTANEVA CREEK	47-15	7/29/2002	9	2	1	4	2	PGS STB
NF COTTANEVA CREEK	47-16	8/7/1996	PRESENT	PRESENT	PRESENT	PRESENT		PGS SCP
NF COTTANEVA CREEK	47-16	6/21/2000	34	2				PGS
NF COTTANEVA CREEK	47-16	9/7/2001	2	12	1			PGS
NF COTTANEVA CREEK	47-16	7/29/2002	14			9		PGS
NF COTTANEVA CREEK	47-17	8/7/1996		PRESENT				PGS
NF COTTANEVA CREEK	47-17	6/21/2000	40	9	1			PGS

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Appendix F. Summary of results for aquatic species surveys within Cottaneva Creek watershed, Mendocino Co., California. Refer to Map F-1.

STREAM NAME	SITE ID	DATE	STH <70 MM	STH 70-130 MM	STH >130 MM	COH <70 MM	COH 70-130 MM	OTHER SPECIES
NF COTTANEVA CREEK	47-17	9/7/2001	9					PGS
NF COTTANEVA CREEK	47-17	7/29/2002	10	1		2		PGS

* Species Abbreviations; AMM=Pacific Lamprey Larvae; BLF=Bullfrog; BKS=Black Salamander; BUFO=Western Toad; CDS=Clouded Salamander; CHK=Chinook Salmon; CNT=California Newt; COH=Coho Salmon; CR=Coast Range Sculpin; CRY=Crayfish; LAM=Pacific Lamprey; NAL=Northern Alligator Lizard; NEW=Newt (Unidentified Species); NWP=Western Pond Turtle; PBL=Pacific Brook Lamprey; PGS=Pacific Giant Salamander; PR=Prickly Sculpin; PTF=Pacific Tree Frog; RCH=California Roach; RLF=Red Legged Frog; RSN=Rough Skinned Newt; SCP=Sculpin (Unidentified Species); SKR=Sacramento Sucker; STB=Stickleback; STH=Steelhead Trout; TLF=Olympic Tailed Frog; WAGS=Western Aquatic Garter Snake; YLF=Yellow Legged Frog.

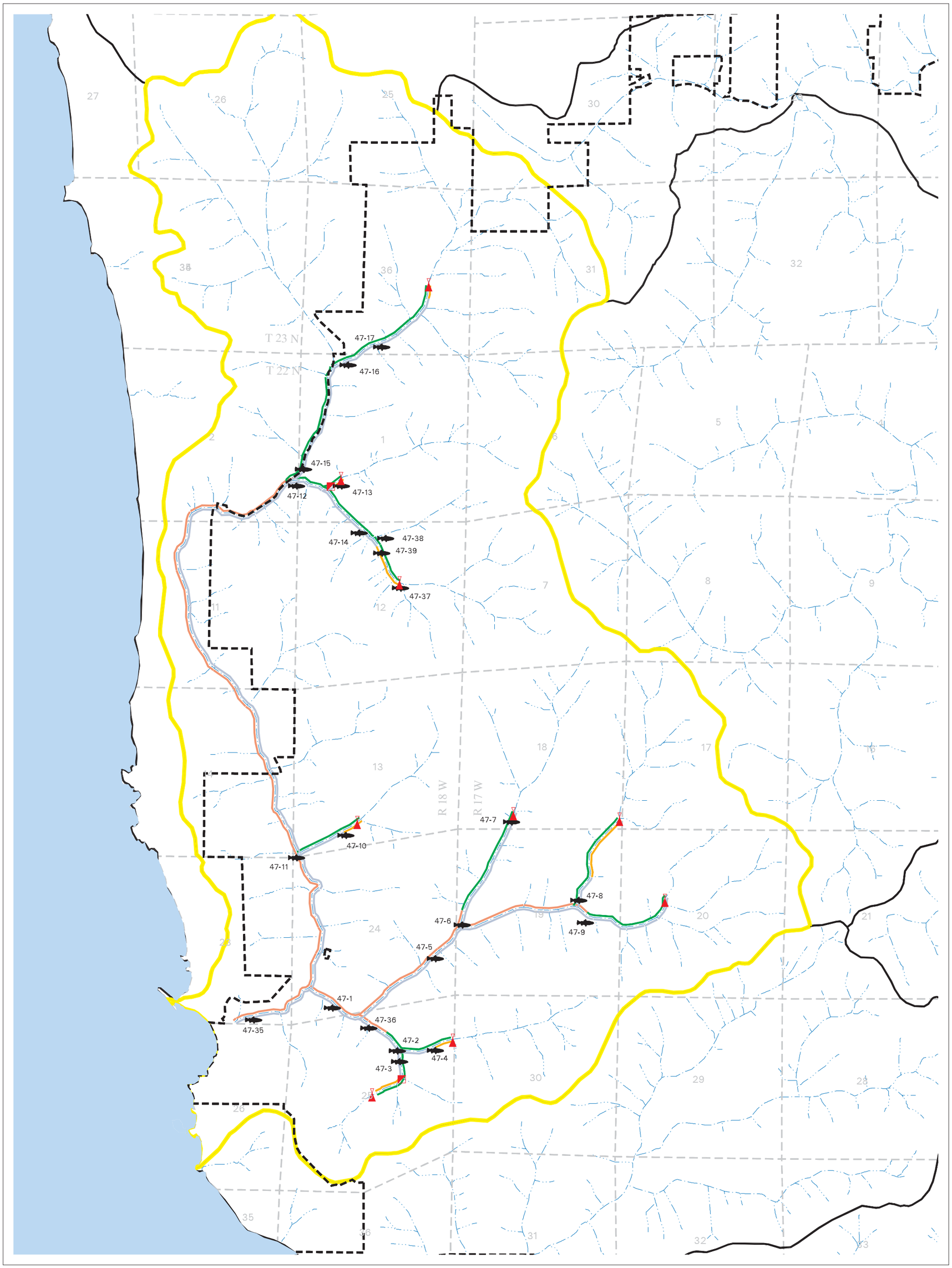
* Blank spaces indicate that no organisms were observed.

*Click here to view physical data.
*Click on a Site ID to view map.

Cottaneva Creek Watershed Analysis Unit

Map F-1
Salmonid Distribution

This map illustrates the documented and potential distribution of steelhead trout and coho salmon in the Cottaneva Creek WAU. Documented distribution is based on distribution surveys conducted by MRC in 2004. Documented distribution only shows presence of fish up to the observation site. Potential distribution represents an interpretation of where coho salmon or steelhead trout potentially use. The potential distribution is only interpreted for the larger watercourses and cannot be considered complete. The potential distribution is our interpretation at this point in time for larger streams; it is highly likely the actual potential distribution is larger.



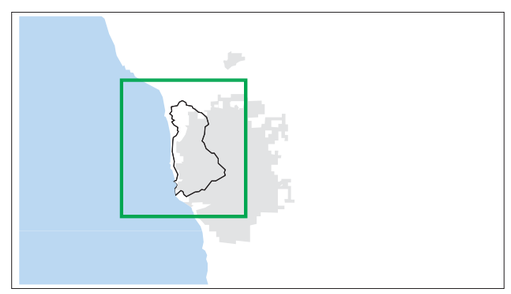
Potential Salmonid Distribution
- Coho Salmon Distribution
- Potential Coho Salmon Distribution
- Steelhead Distribution
- Potential Steelhead Distribution

Fish Distribution Sampling Locations

Barriers to Adult Salmonid Upstream Migration
- Gradient
- Waterfall
- Culvert

- MRC Ownership
- Planning Watershed Boundary
- Cottaneva Creek Watershed Analysis Unit Boundary

Flow Class
- Class I
- Class II
- Class III



N W E S

0 1/2 1 Mile

November 2005