

SECTION F

SALMONID HABITAT CONDITION

INTRODUCTION

The Southcoast Streams WAU includes the following planning watersheds: Mallo Pass Planning Watershed, Lower Alder Creek Planning Watershed, North Fork Alder Creek Planning Watershed, and Point Arena Streams Planning Watershed. The only anadromous fish species inhabiting these four planning watersheds are steelhead trout (*Oncorhynchus mykiss*). Other species include prickly sculpin (*Cottus asper*), coastrange sculpin (*C. aleuticus*), three-spine stickleback (*Gasterosteus aculeatus*), Coastal giant salamander (*Dicamptodon tenebrosus*), tailed frog (*Ascaphus truei*), red-legged frogs (*Rana aurora*), yellow-legged frogs (*Rana boylei*), southern torrent salamander (*Rhyacotriton variegatus*), Pacific newts (*Taricha spp*), and crayfish (*Pacifastacus spp.*). A fish habitat assessment was conducted in the Southcoast Streams 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 Southcoast Streams WAU included fish habitat typing and assessment, aquatic species distribution surveys, stream gravel permeability measurements and V* sediment sampling. 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 Mallo Pass Creek - Alder Creek - Point Arena Streams WAU. All organisms observed were identified to the lowest possible taxonomic level.

Permeability and V* sediment samples were taken in one long term channel monitoring segment located in the Mallo Pass Planning Watershed to determine an index of spawning gravel quality. Permeability and pool volume filled with fine sediment 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 methods used to evaluate the habitat condition of the Southcoast Streams WAU were modified from the California Salmonid Stream Habitat Restoration Manual (CDFG, 2002).

Surveys were conducted during low flow conditions and 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 Condition"). Each of the selected stream segments within the planning watershed were surveyed for a minimum of 20-30 bankfull widths or until a barrier to adult migration was encountered. Fish habitat conditions were evaluated by habitat typing the majority of the fish bearing stream segments throughout the watershed. Survey efforts were focused on low gradient reaches of the stream network, as higher gradient reaches likely do not contain fish habitat.

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, summer rearing, and over-wintering life stages were made based upon scientific literature and professional judgment. The criteria used to determine whether a specific variable was 'good', 'fair', or 'poor' are defined within Table F-1. Spawning habitat conditions are evaluated within tail-outs of pools, which is where salmon prefer to spawn. Spawning habitat evaluations were made based on the availability of gravel and the quality of the gravels present (gravel size and embeddedness). Summer rearing habitat conditions 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

$$\mathbf{E} (0.31) + \mathbf{F} (0.33) + \mathbf{G} (0.36)$$

Summer Rearing Habitat

$$\mathbf{A} (0.20) + \mathbf{B} (0.15) + \mathbf{C} (0.20) + \mathbf{D} (0.15) + \mathbf{F} (0.10) + \mathbf{H} (0.20)$$

Over-wintering Habitat

$$\mathbf{A} (0.20) + \mathbf{B} (0.15) + \mathbf{C} (0.15) + \mathbf{D} (0.10) + \mathbf{H} (0.20) + \mathbf{I} (0.15) + \mathbf{J} (0.05)$$

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 separated 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 separated 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.
Dammed 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 Checkers. 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 Swiffer™ 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.

RESULTS AND DISCUSSION

Salmonid Habitat Condition

The Southcoast Streams WAU is comprised of four planning watersheds of which three were surveyed for fish habitat and all four surveyed for aquatic species distribution. The results are discussed by segment. Tables F-3 through F-5 summarizes the 2007 fish habitat assessment data. A total of 16 segments were evaluated. The habitat parameters used to evaluate individual stream segments can be found in Table F-5 and 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 barrier to adult migration 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. Percent of dominant cover types found in pool, riffle, and flatwater habitats of the Southcoast Streams WAU, 2007.

Segment	Pool		Riffle		Flatwater	
	Dom. Cover	Percent	Dom. Cover	Percent	Dom. Cover	Percent
CM01	LWD	50	LWD	82	-	0
CM03	LWD	42	Boulder	70	-	0
CM05	LWD	36	Boulder	44	-	0
CM06	LWD	74	LWD	44	LWD	100
CA03	Boulder	80	Boulder	83	Boulder	100
CA05	Boulder	86	Boulder	100	Boulder	100
CA08	Boulder	75	Boulder	100	-	0
CA10	Bedrock Ledges	57	Boulder	80	Boulder	100
CA12	Boulder	80	Terrestrial Vegetation	100	Boulder	100
CA14	Boulder	30	Boulder	71	Boulder	40
CA16	Terrestrial Vegetation	50	LWD	50	-	0
CA17	Bedrock Ledges	59	LWD	50	Bedrock Ledges	67
CA21	Rootwad	41	Boulder	60	-	0
CA30	Boulder	63	Boulder	90	-	0
CA34	LWD	40	Boulder	67	Boulder	100
GP01	LWD	45	Boulder	58	Boulder	100

Table F-4. Summary of Fish Habitat Ratings for Three Life History Stages of the Southcoast Streams WAU, 2007..

Segment	Spawning Habitat Score	Spawning Habitat Rating	Summer Rearing Habitat Score	Summer Rearing Habitat Rating	Over-wintering Habitat Score	Over-wintering Habitat Rating
CM01	2.00	Fair	2.00	Fair	1.80	Fair
CM03	1.67	Fair	1.70	Fair	1.70	Fair
CM05	2.03	Fair	1.55	Poor	1.55	Poor
CM06	1.36	Poor	1.55	Poor	1.45	Poor
CA03	2.67	Good	2.00	Fair	1.75	Fair
CA05	2.03	Fair	1.70	Fair	1.60	Poor
CA08	2.00	Fair	1.80	Fair	1.55	Poor
CA10	1.67	Fair	1.85	Fair	2.00	Fair
CA12	2.36	Good	1.45	Poor	1.25	Poor
CA14	2.31	Fair	2.30	Fair	2.00	Fair
CA16	2.31	Fair	2.20	Fair	1.95	Fair
CA17	1.36	Poor	1.70	Fair	1.65	Poor
CA21	2.00	Fair	1.65	Poor	1.60	Poor
CA30	1.00	Poor	1.35	Poor	1.30	Poor
CA34	2.00	Fair	1.65	Poor	1.45	Poor
GP01	2.00	Fair	1.65	Poor	1.45	Poor

Table F-5. Summary of Fish Habitat Parameters of the Southcoast Streams WAU, 2007.

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.
CM01	1437	51:49:0	1.7	151	5	48	25-50	Sm. Gravel	0.2	0	0	1.6	34.7
CM03	982	33:67:0	2.8	165	0	34	>50	Sm. Gravel	0.1	0	5	1.6	33.8
CM05	1393	34:66:0	3.1	122	0	45	>50	Lg. Gravel	0.9	10	12	1.3	66.1
CM06	1069	30:70:0	4.5	151	0	15	>50	Sm. Gravel	0.6	0	0	1.0	31.3
CA03	1728	47:44:9	5.1	146	40	55	25-50	Lg. Gravel	0.0	0	0	3.9	3.8
CA05	1587	51:43:6	4.0	112	29	28	>50	Lg. Gravel	0.0	7	0	3.0	2.7
CA08	920	43:57:0	4.3	148	25	30	25-50	Lg. Cobble	0.0	0	0	2.6	6.1
CA10	1581	54:38:08	3.7	116	86	46	25-50	Sm. Gravel	0.0	46	0	4.6	8.3
CA12	1531	29:66:5	6.1	118	40	33	25-50	Lg. Gravel	0.0	8	0	3.4	4.5
CA14	2184	52:28:19	2.9	133	60	56	25-50	Sm. Gravel	0.0	0	0	3.0	6.0
CA16	1415	79:21:0	3.6	144	25	68	25-50	Sm. Gravel	0.0	0	0	2.5	7.6
CA17	929	55:38:7	2.7	79	0	24	>50	Sm. Gravel	0.1	0	0	1.3	10.6
CA21	1179	35:55:0	3.5	141	0	50	25-50	Sm. Gravel	0.4	0	0	1.1	35.6
CA30	1138	15:85:0	5.7	113	13	15	>50	Bedrock	0.2	17	0	1.9	29.4
CA34	974	33:58:9	3.7	176	10	48	25-50	Sm. Gravel	0.4	0	0	1.5	18.2
GP01	1068	41:56:3	3.7	123	9	33	25-50	Sm. Gravel	0.2	0	0	1.4	42.1

Mallo Pass Planning Watershed

Mallo Pass (Segment CM01)

The segment surveyed consisted of 51% pool, 49% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (68%, Figure F-1). The dominant cover available to fish in pools in the segment was LWD (50%, Table F-3). The mean residual pool depth was 1.6 feet, with 5% of pools having residual depths ≥ 3 feet. The shelter rating was high (151), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.2 pieces per 328 feet) observed in the segment. However, 68% of pools were formed by LWD and there were 34.7 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 (48% 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 high shelter rating and a high frequency of pools. 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 high shelter rating and a moderate frequency of pools. However, there were minimal amounts of key LWD, a low occurrence of pools with residual depths ≥ 3 feet, and absence of over-wintering substrate and side channels.

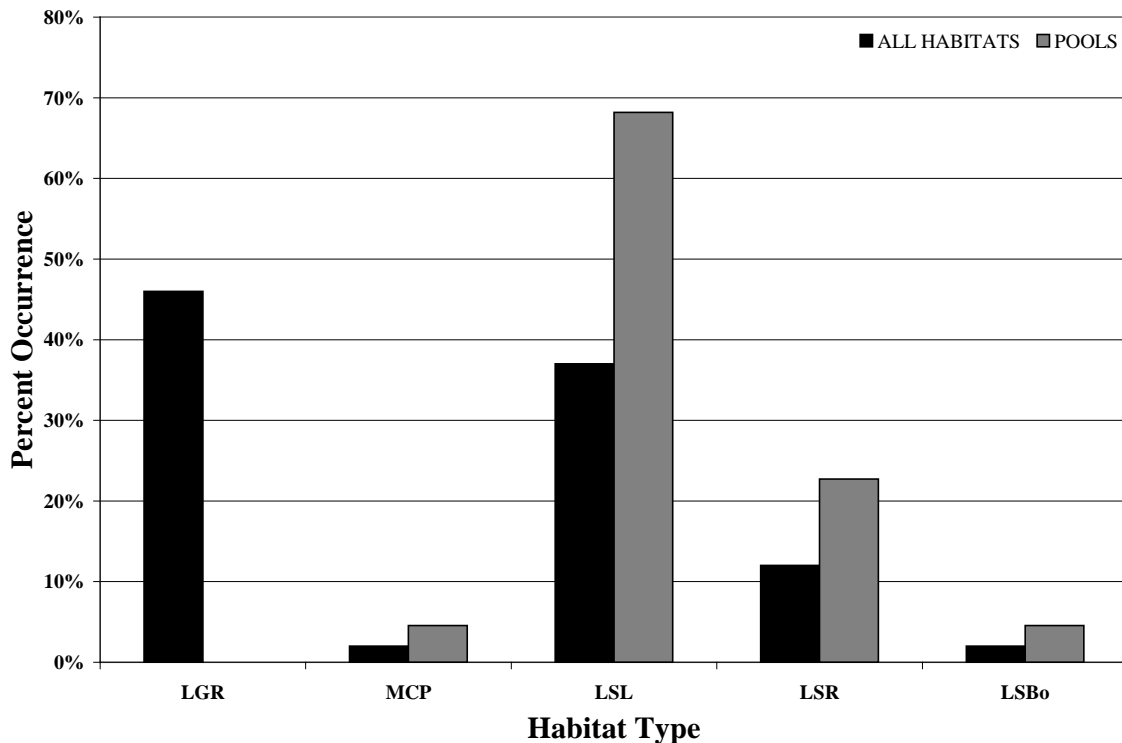


Figure F-1. Percent occurrence of habitat types surveyed in segment CM01 within the Southcoast Streams WAU, 2007.

Mallo Pass (Segment CM03)

The segment surveyed consisted of 33% pool, 67% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. There was similar proportion of the dominant pool types: lateral scour formed by logs, lateral scour formed by rootwads, and lateral scour formed by bedrock (33%, Figure F-2). The dominant cover available to fish in pools in the segment was LWD (42%, Table F-3). The mean residual pool depth was 1.6 feet, with 0% of pools having residual depths ≥ 3 feet. The shelter rating was high (165), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.1 pieces per 328 feet) observed in the segment. However, 33% of pools were formed by LWD and there were 33.8 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 appeared to be fair due to a moderate percentage of spawnable gravels available to fish in tailouts (34% 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 high shelter rating and a moderate frequency of pools. However, there were minimal amounts of key LWD and an absence of pools with residual depths ≥ 3 feet.

Over-wintering Habitat

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

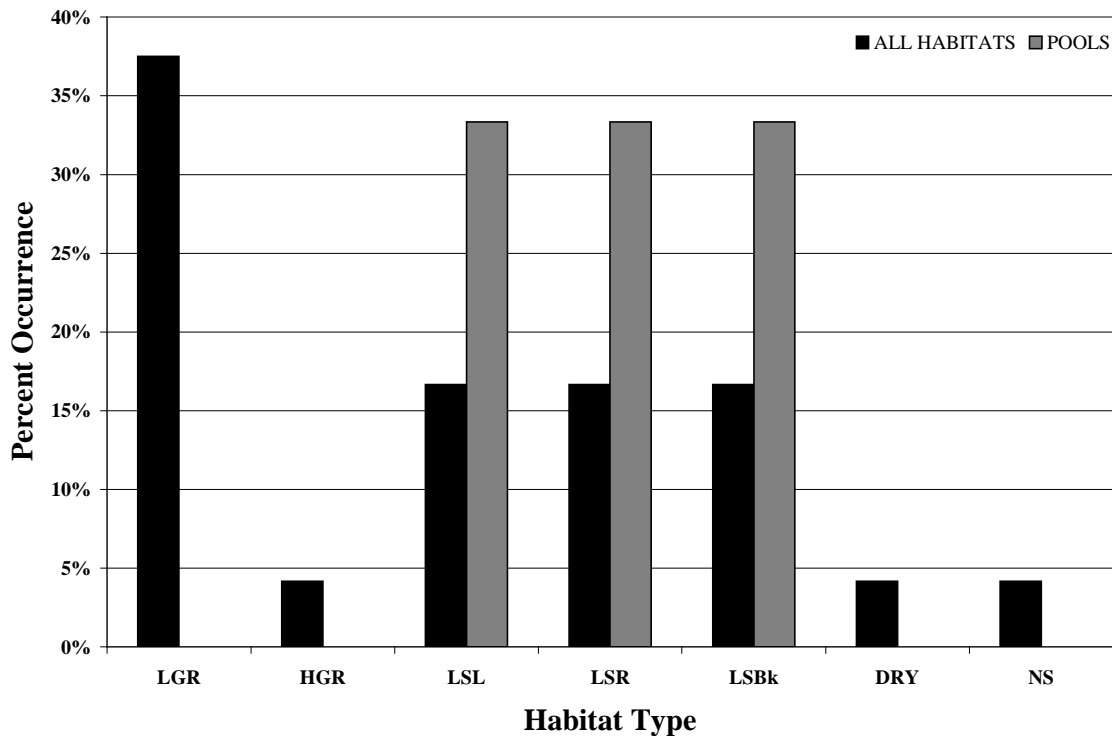


Figure F-2. Percent occurrence of habitat types surveyed in segment CM03 within the Southcoast Streams WAU, 2007.

Mallo Pass (Segment CM05)

The segment surveyed consisted of 34% pool, 66% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. The majority of pools were mid channel (36%, Figure F-3). The dominant cover available to fish in pools in the segment was LWD (36%, Table F-3). The mean residual pool depth was 1.3 feet, with 0% of pools having residual depths ≥ 3 feet. The shelter rating was high (122), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.9 pieces per 328 feet) observed in the segment. However, 18% of pools were formed by LWD and there were 66.1 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 was fair due to a moderate percentage of spawnable gravels available to fish in tailouts (45% of tailout area) and the dominant tailout substrate size (large gravel) was within the preferred range of salmonids. However, the spawning gravels were embedded.

Summer Rearing Habitat

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

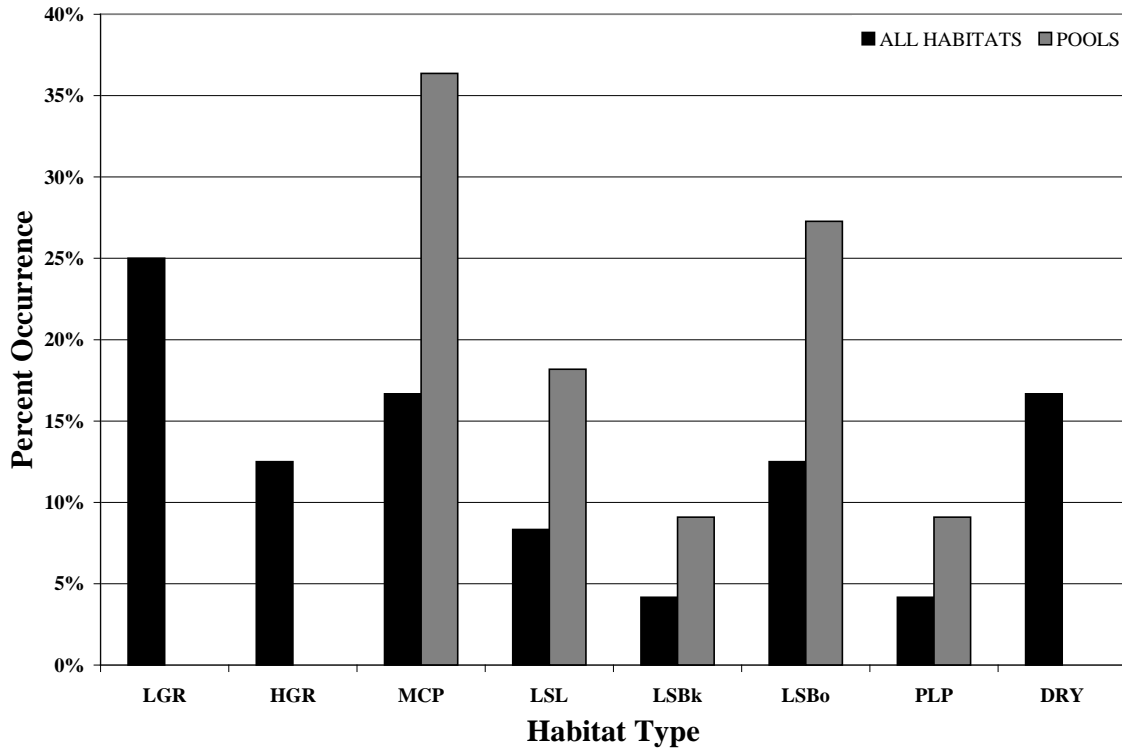


Figure F-3. Percent occurrence of habitat types surveyed in segment CM05 within the Southcoast Streams WAU, 2007.

Mills Creek (Segment CM06)

The segment surveyed consisted of 30% pool, 70% riffle, and 0% flatwater by stream length (Table F-5). 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 (63%, Figure F-4). The dominant cover available to fish in pools in the segment was LWD (74%, Table F-3). The mean residual pool depth was 1.0 feet, with 0% of pools having residual depths ≥ 3 feet. The shelter rating was high (151), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.6 pieces per 328 feet) observed in the segment. However, 63% of pools were formed by LWD and there were 31.3 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 (15% 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 and an absence of pools with residual depths ≥ 3 feet. However, there was a high 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, an absence of pools with residual depths ≥ 3 feet, and an absence of side channels and over-wintering substrate. However, there was a moderate frequency of pools and a high shelter rating.

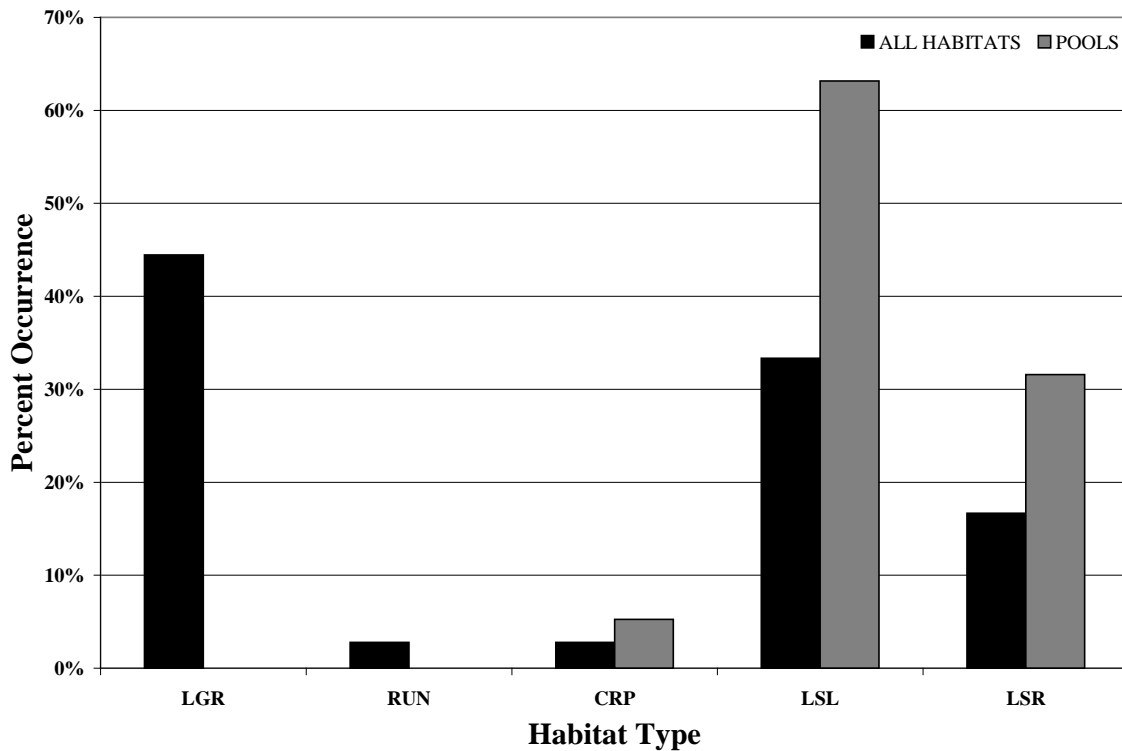


Figure F-4. Percent occurrence of habitat types surveyed in segment CM06 within the Southcoast Streams WAU, 2007.

Alder Creek Planning Watershed

Alder Creek (Segment CA03)

The segment surveyed consisted of 47% pool, 44% riffle, and 9% flatwater by stream length (Table F-5). 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 bedrock (80%, Figure F-5). The dominant cover available to fish in pools in the segment was boulders (80%, Table F-3). The mean residual pool depths was 3.9 feet, with 40% of pools having residual depths ≥ 3 feet. The shelter rating was high (146), mainly due to good cover complexity and availability. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment with none of the pools formed by LWD. However, there were 3.8 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large gravel and the embeddedness rating was moderate (25-50%).

Spawning Habitat

Spawning habitat in the segment was good due to a high percentage of spawnable gravels available to fish in tailouts (55% of tailout area), the dominant tailout substrate size (large gravel) was within the preferred range of salmonids, and the spawning gravels slightly embedded.

Summer Rearing Habitat

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

Over-wintering Habitat

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

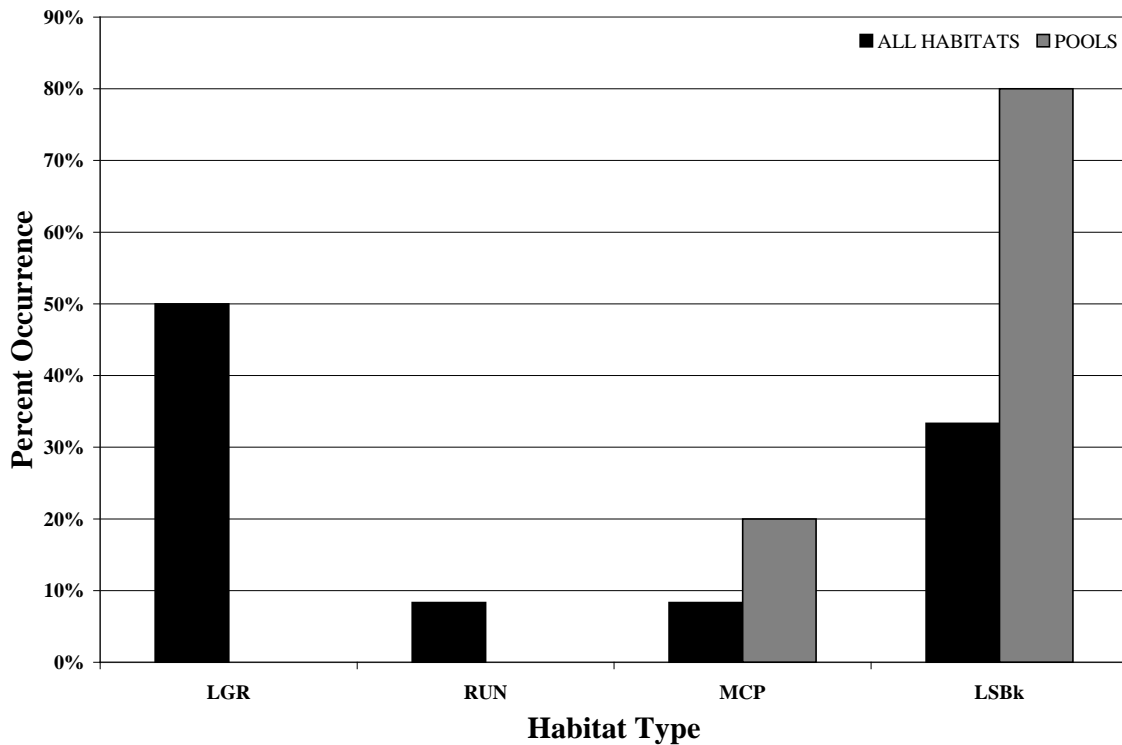


Figure F-5. Percent occurrence of habitat types surveyed in segment CA03 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA05)

The segment surveyed consisted of 51% pool, 43% riffle, and 6% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by bedrock (86%, Figure F-6). The dominant cover available to fish in pools in the segment was boulders (86%, Table F-3). The mean residual pool depth was 3.0 feet, with 29% of pools having residual depths ≥ 3 feet. The shelter rating was moderate (112), mainly due to an availability of cover. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment with none of the pools formed by LWD. However, there were 2.7 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 was 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, the spawning gravels were embedded.

Summer Rearing Habitat

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

Over-wintering Habitat

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

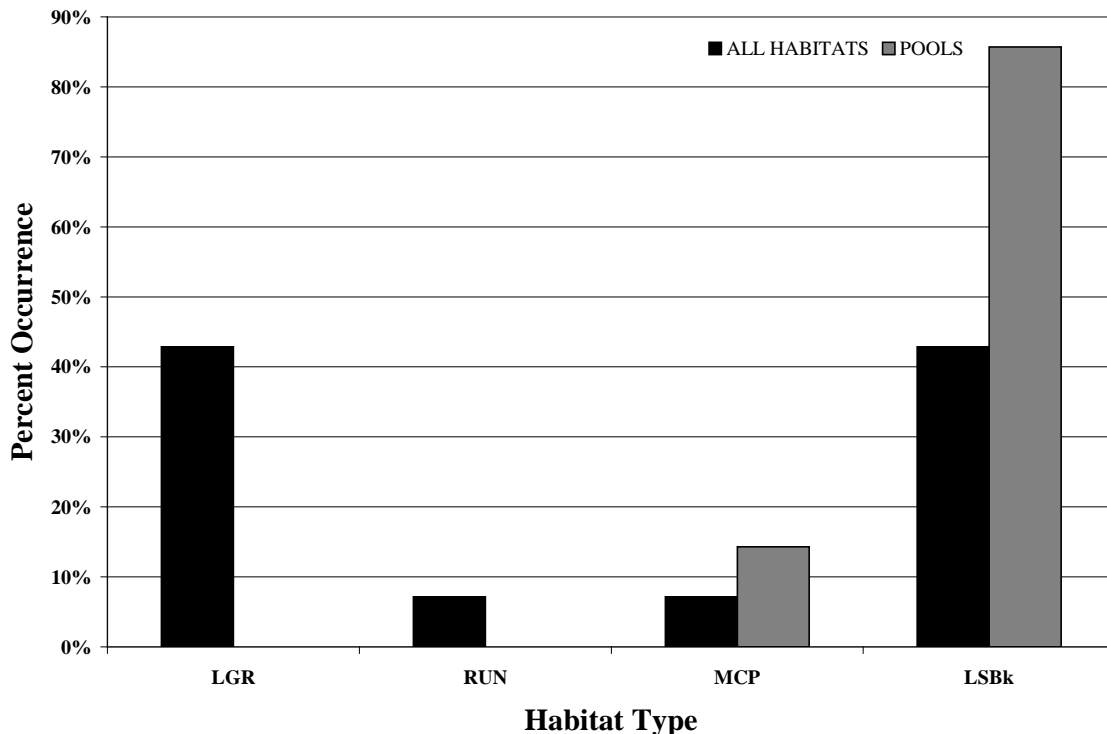


Figure F-6. Percent occurrence of habitat types surveyed in segment CA05 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA08)

The segment surveyed consisted of 43% pool, 57% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. There was an equal proportion of lateral scour pools formed by bedrock to mid channel pools (50%, Figure F-7). The dominant cover available to fish in pools in the segment was boulders (75%, Table F-3). The mean residual pool depth was 2.6 feet, with 25% of pools having residual depths ≥ 3 feet. The shelter rating was high (148), mainly due to good cover complexity and availability. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment with none of the pools formed by LWD. However, there were 6.1 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was large 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 (30% of tailout area), the dominant tailout substrate size (large gravel) was within the preferred range of salmonids, and the spawning gravels were slightly embedded.

Summer Rearing Habitat

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

Over-wintering Habitat

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

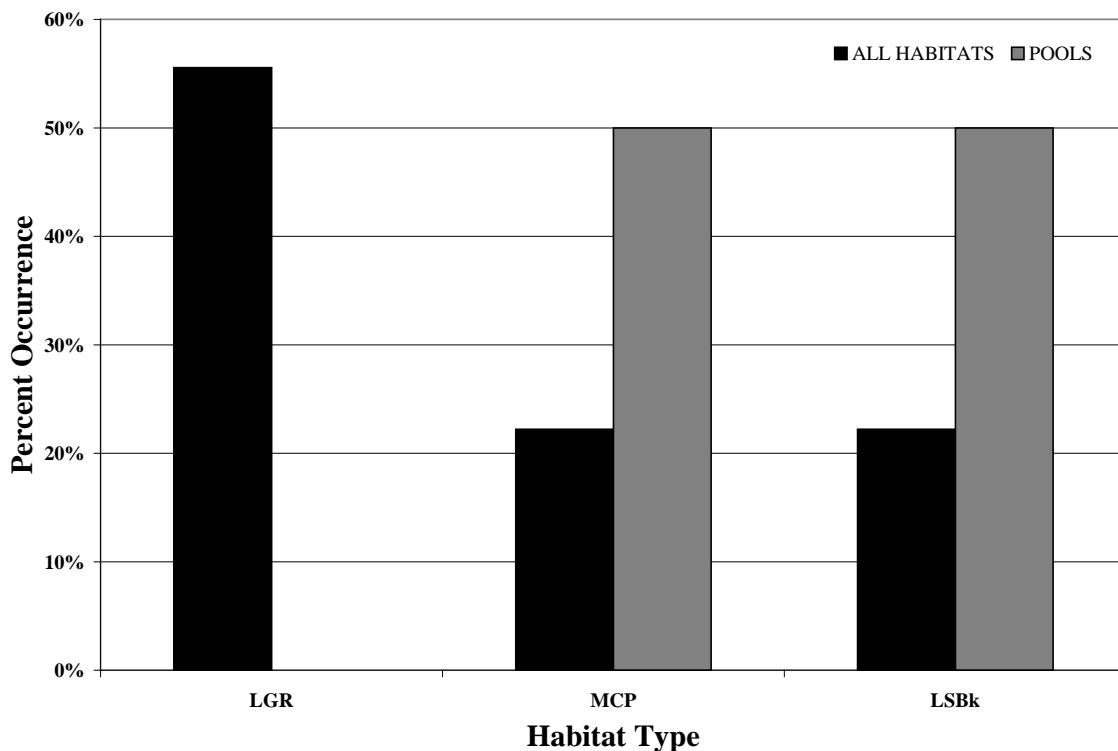


Figure F-7. Percent occurrence of habitat types surveyed in segment CA08 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA10)

The segment surveyed consisted of 54% pool, 38% riffle, and 8% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. The majority of pools were lateral scour pools formed by bedrock (71%, Figure F-8). The dominant cover available to fish in pools in the segment was bedrock ledges (57%, Table F-3). The mean residual pool depth was 4.6 feet, with 86% of pools having residual depths ≥ 3 feet. The shelter rating was moderate (116), mainly due to an availability of cover. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment with none of the pools formed by LWD. However, there were 8.3 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 (46% 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 high frequency of pools, a high occurrence of pools with residual depths ≥ 3 feet, and a moderate shelter rating. However, there was an absence of key LWD.

Over-wintering Habitat

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

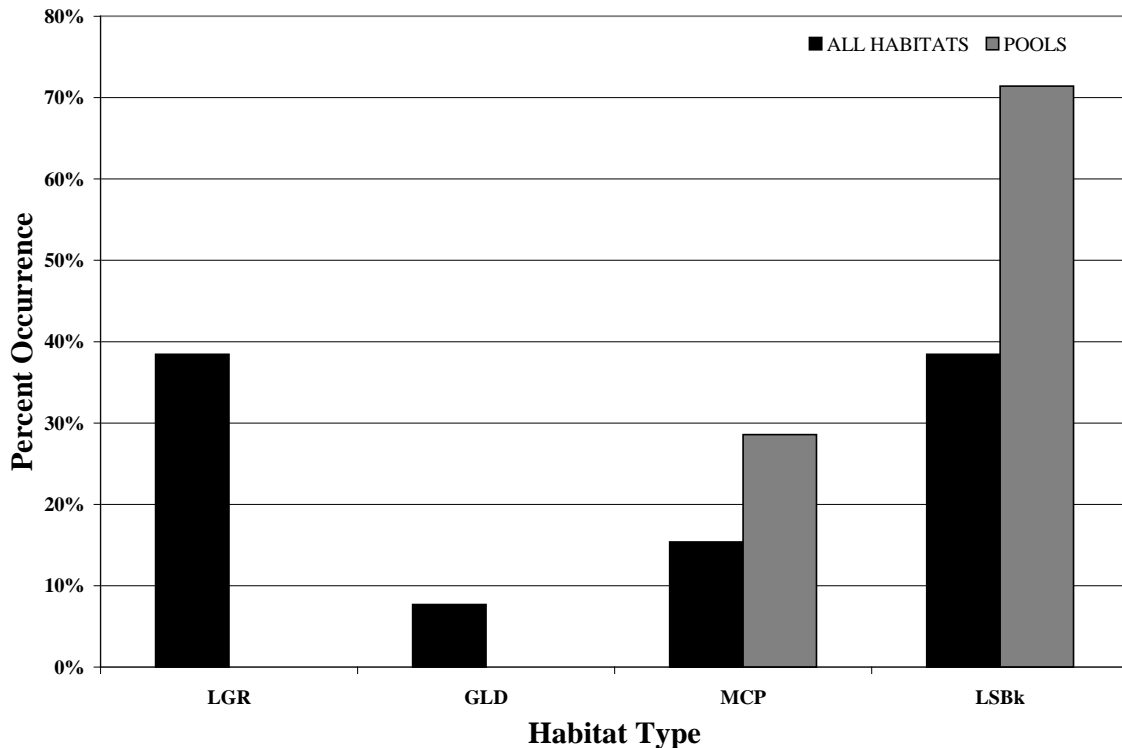


Figure F-8. Percent occurrence of habitat types surveyed in segment CA10 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA12)

The segment surveyed consisted of 29% pool, 66% riffle, and 5% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered moderate with a high frequency of riffle habitat. The majority of pools were lateral scour formed by bedrock (60%, Figure F-9). The dominant cover available to fish in pools in the segment was boulder (80%, Table F-3). The mean residual pool depth was 3.4 feet, with 40% of pools having residual depths ≥ 3 feet. The shelter rating was moderate (118), mainly due to an availability of cover. There was an absence of key LWD (0.0 pieces per 328 feet) in the segment. However, 20% of pools were formed by LWD and there were 4.5 pieces of functional LWD per 328 feet. The dominant tailout substrate was large gravel and the embeddedness rating was moderate (25-50%).

Spawning Habitat

Spawning habitat in the segment was good due to a moderate percentage of spawnable gravels available to fish in tailouts (33% of tailout area), the dominant tailout substrate size (large gravel) was within the preferred range of salmonids, and the spawning gravels were slightly embedded.

Summer Rearing Habitat

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

Over-wintering Habitat

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

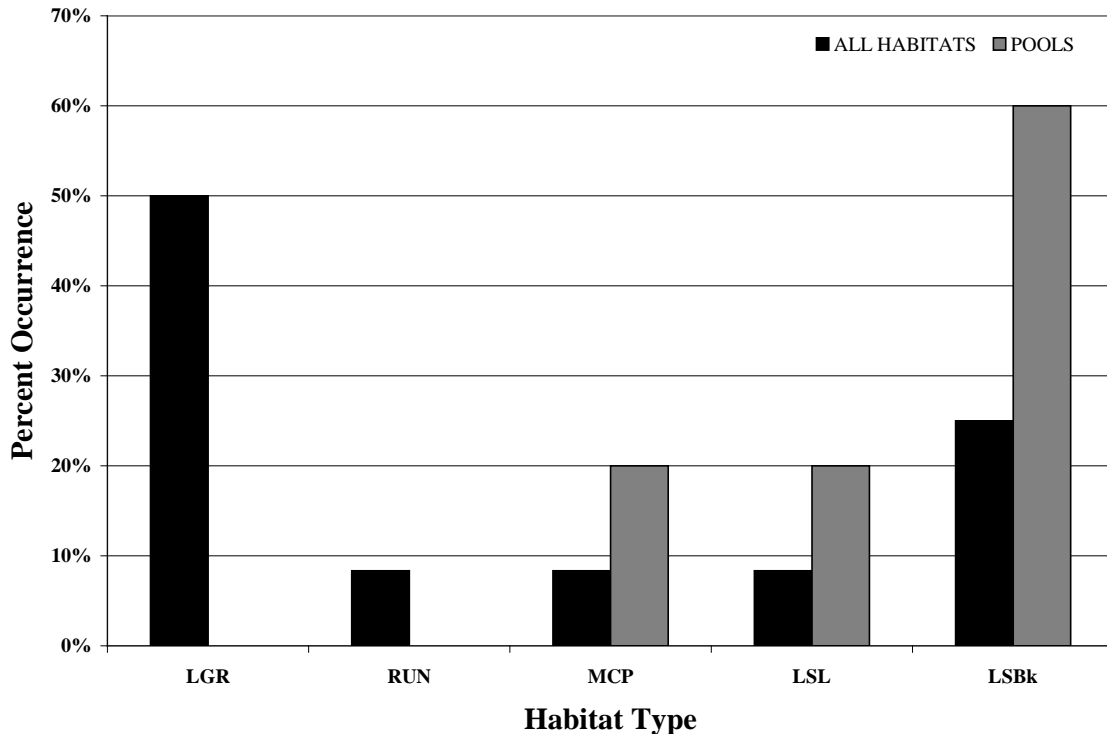


Figure F-9. Percent occurrence of habitat types surveyed in segment CA12 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA14)

The segment surveyed consisted of 52% pool, 28% riffle, and 19% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. There was similar proportion of pool types: lateral scour formed by logs, lateral scour formed by rootwads, lateral scour formed by bedrock, lateral scour formed by boulders, and mid-channel pools (20%, Figure F-10). The dominant cover available to fish in pools in the segment was boulder (30%, Table F-3). The mean residual pool depth was 3.0 feet, with 60% of pools having residual depths ≥ 3 feet. The shelter rating was high (133), mainly due to good cover complexity and availability. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment. However, 20% of pools were formed by LWD and there were 6.0 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 was fair due to the high percentage of spawnable gravels available to fish in tailouts (56% 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 high frequency of pools, a high occurrence of pools with residual depths ≥ 3 feet, and a high shelter rating. However, there was an absence of key LWD.

Over-wintering Habitat

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

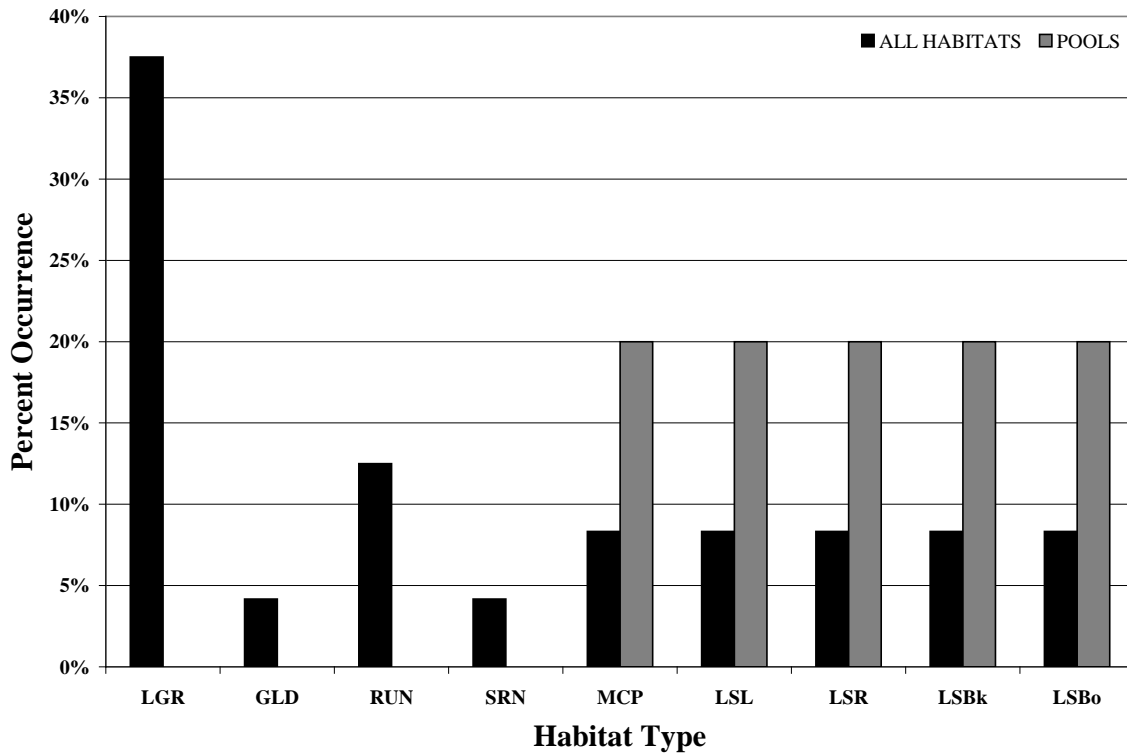


Figure F-10. Percent occurrence of habitat types surveyed in segment CA14 within the Southcoast Streams WAU, 2007.

Alder Creek (Segment CA16)

The segment surveyed consisted of 79% pool, 21% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a low frequency of riffle habitat. The majority of pools were lateral scour pools formed by logs (50%, Figure F-11). The dominant cover available to fish in pools in the segment was terrestrial vegetation (50%, Table F-3). The mean residual pool depth was 2.5 feet, with 25% of pools having residual depths ≥ 3 feet. The shelter rating was high (144), mainly due to good cover complexity and availability. There was an absence of key LWD (0.0 pieces per 328 feet) observed in the segment. However, 50% of pools were formed by LWD and there were 7.6 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 was fair due to the high percentage of spawnable gravels available to fish in tailouts (68% 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 fair due to a high frequency of pools, a high shelter rating, and a moderate occurrence of pools with residual depths ≥ 3 feet. However, there was an absence of key LWD.

Over-wintering Habitat

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

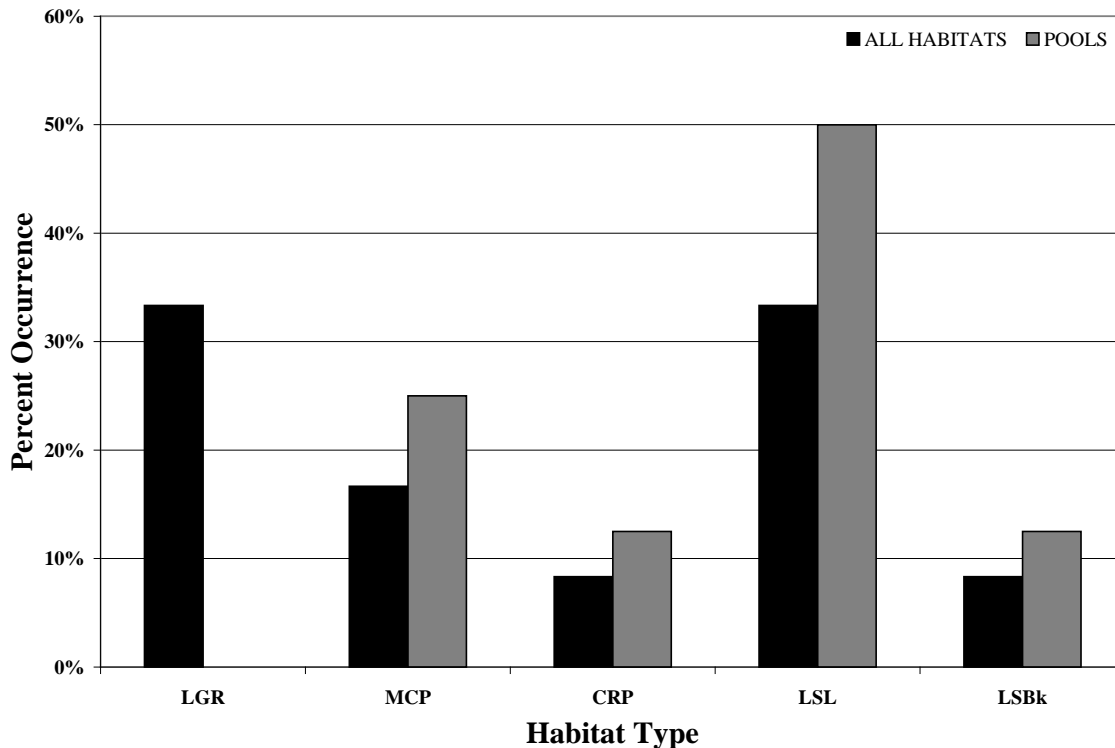


Figure F-11. Percent occurrence of habitat types surveyed in segment CA16 within the Southcoast Streams WAU, 2007.

Unnamed Right Bank Tributary to Alder Creek (Segment CA17)

The segment surveyed consisted of 55% pool, 38% riffle, and 7% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered high with a moderate frequency of riffle habitat. The majority of pools were mid channel (29%, Figure F-12). The dominant cover available to fish in pools in the segment was bedrock ledges (59%, Table F-3). The mean residual pool depth was 1.3 feet, with 0% of pools having residual depths ≥ 3 feet. The shelter rating was moderate (79), mainly due to an availability of cover. There were minimal amounts of key LWD (0.1 pieces per 328 feet) observed in the segment. However, 18% of pools in this segment were formed by LWD and there were also 10.6 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 poor due to a 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 a high frequency of pools and a moderate shelter rating. However, there was a minimal amount of key LWD and an absence of pools with residual depths ≥ 3 feet.

Over-wintering Habitat

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

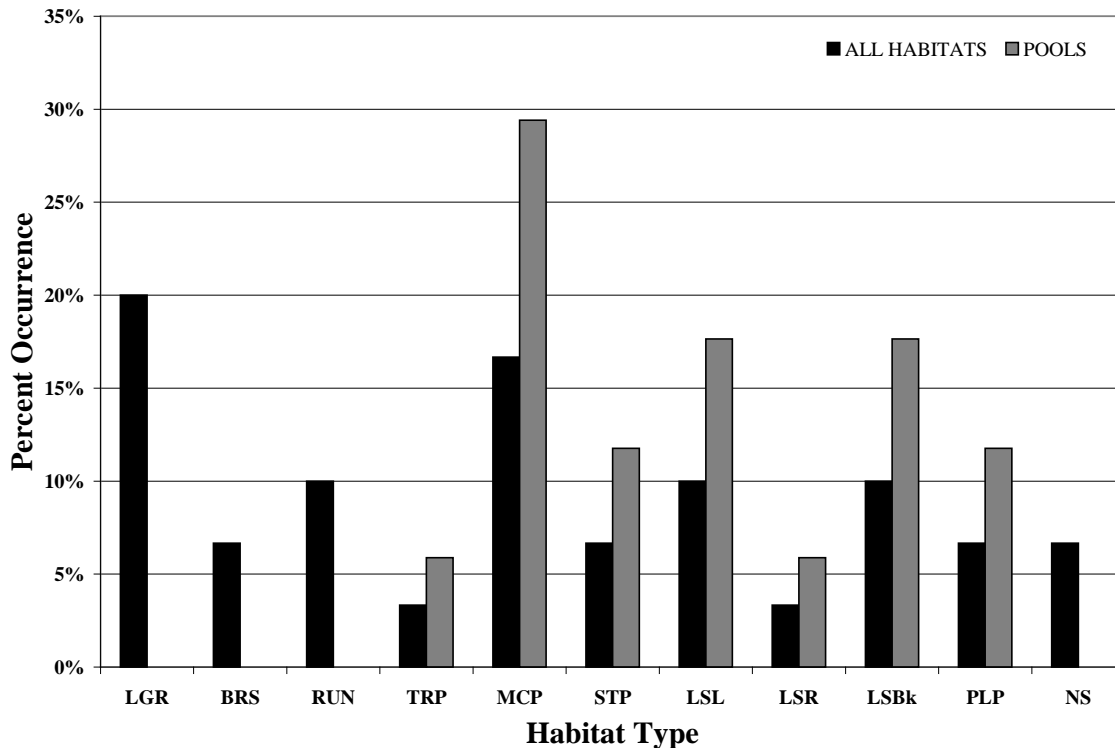


Figure F-12. Percent occurrence of habitat types surveyed in segment CA17 within the Southcoast Streams WAU, 2007.

Bee Tree (Segment CA21)

The segment surveyed consisted of 35% pool, 55% riffle, and 0% flatwater by stream length (Table F-5). 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 rootwads (35%, Figure F-13). The dominant cover available to fish in pools in the segment was rootwads (41%, Table F-3). The mean residual pool depth was 1.1 feet, with 0% of pools having residual depths ≥ 3 feet. The shelter rating was high (141), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.4 pieces per 328 feet) observed in the segment. However, 6% of pools in this segment were formed by LWD and there were also 35.6 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 high percentage of spawnable gravels available to fish in tailouts (540% of tailout area), the dominant tailout substrate size (large gravel) was within the preferred range of salmonids, and the spawning gravels were slightly embedded.

Summer Rearing Habitat

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

Over-wintering Habitat

Over-wintering habitat in the segment was fair due to an absence of side channels and 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 pools and a high shelter rating.

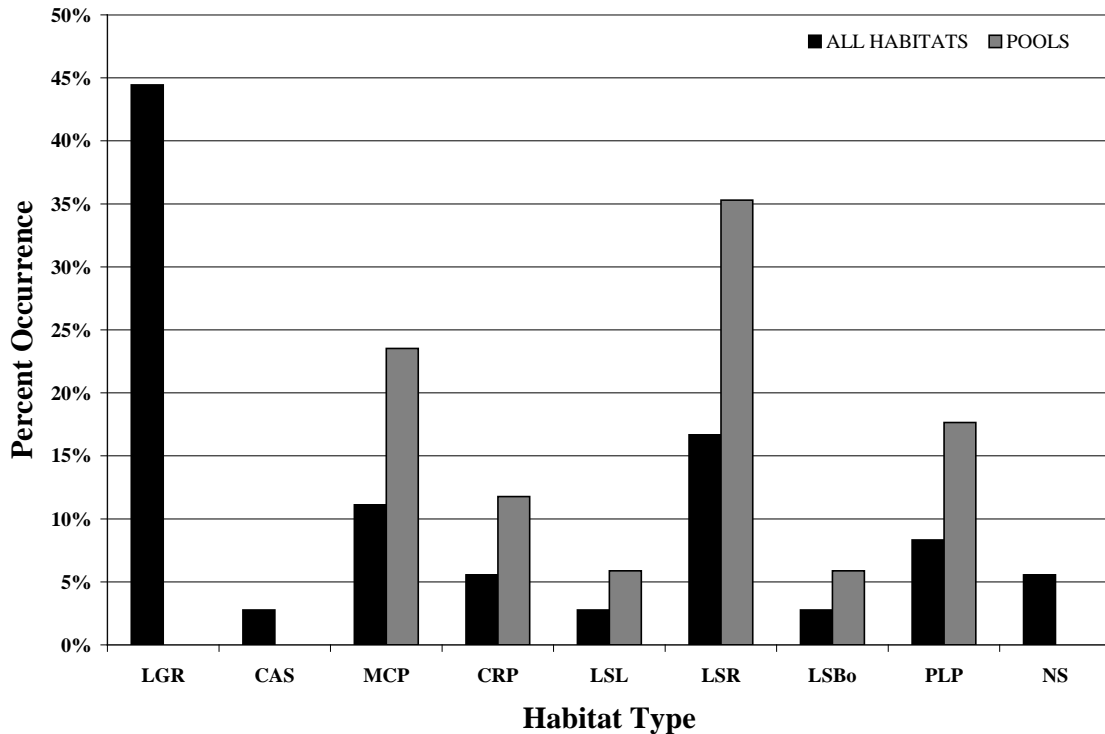


Figure F-13. Percent occurrence of habitat types surveyed in segment CA21 within the Southcoast Streams WAU, 2007.

Nye Creek (Segment CA30)

The segment surveyed consisted of 18% pool, 85% riffle, and 0% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered low with a high frequency of riffle habitat. The majority of pools were mid channel (50%, Figure F-14). The dominant cover available to fish in pools in the segment was boulder (63%, Table F-3). The mean residual pool depth was 1.9 feet, with 13% of pools having residual depths ≥ 3 feet. The shelter rating was moderate (113), mainly due to an availability of cover. There were minimal amounts of key LWD (0.2 pieces per 328 feet) observed in the segment with none of the pools formed by LWD. However, there were 29.4 pieces of functional LWD per 328 feet surveyed. The dominant tailout substrate was bedrock and the embeddedness rating was high ($>50\%$).

Spawning Habitat

Spawning habitat in the segment appeared to be poor due to a low percentage of spawnable gravels available to fish in tailouts (15% of tailout area), the spawning gravels were embedded, and the dominant tailout substrate size (bedrock) is not suitable for salmonid spawning.

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 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 an absence of side channels, a minimal over-wintering substrate, a minimal amount 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.

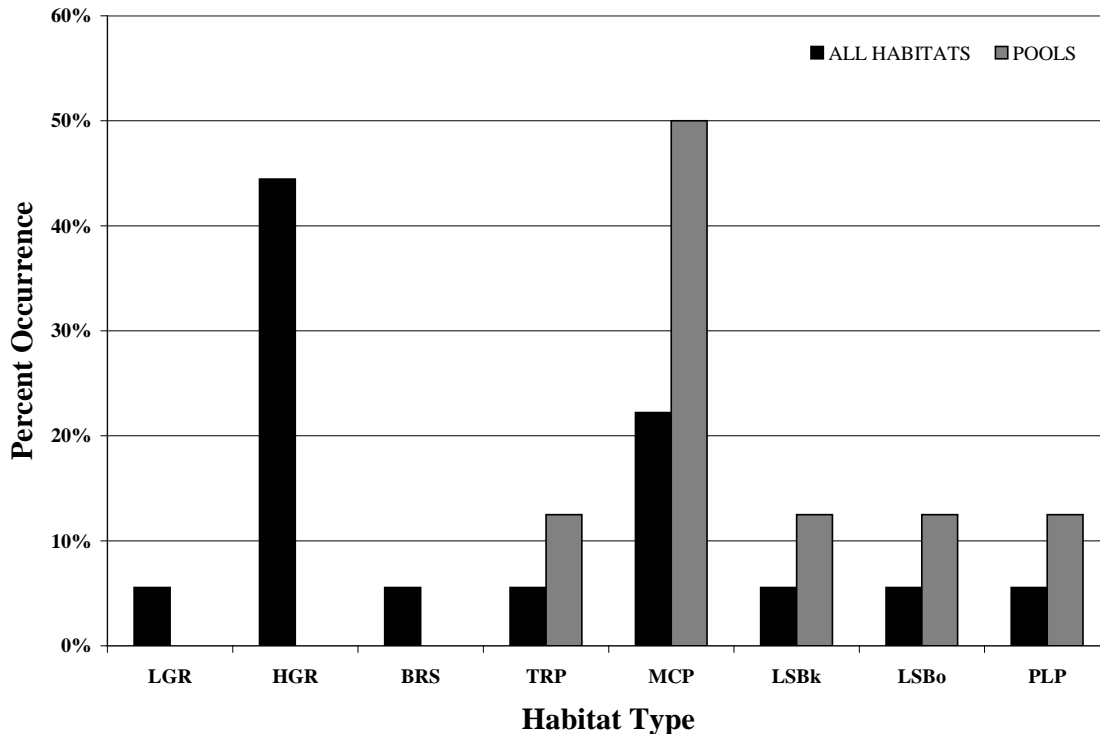


Figure F-14. Percent occurrence of habitat types surveyed in segment CA30 within the Southcoast Streams WAU, 2007.

John Creek (Segment CA34)

The segment surveyed consisted of 35% pool, 58% riffle, and 9% flatwater by stream length (Table F-5). 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 (50%, Figure F-15). The dominant cover available to fish in pools in the segment was LWD (40%, Table F-3). The mean residual pool depth was 1.5 feet, with 10% of pools having residual depths ≥ 3 feet. The shelter rating was high (176), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.4 pieces per 328 feet) observed in the segment. However, 50% of pools in this segment were formed by LWD and there were also 18.2 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 (48% 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 poor due to a minimal amount of key LWD and a low occurrence of pools with residual depths ≥ 3 feet. However, there was a high shelter rating and a moderate frequency of pools.

Over-wintering Habitat

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

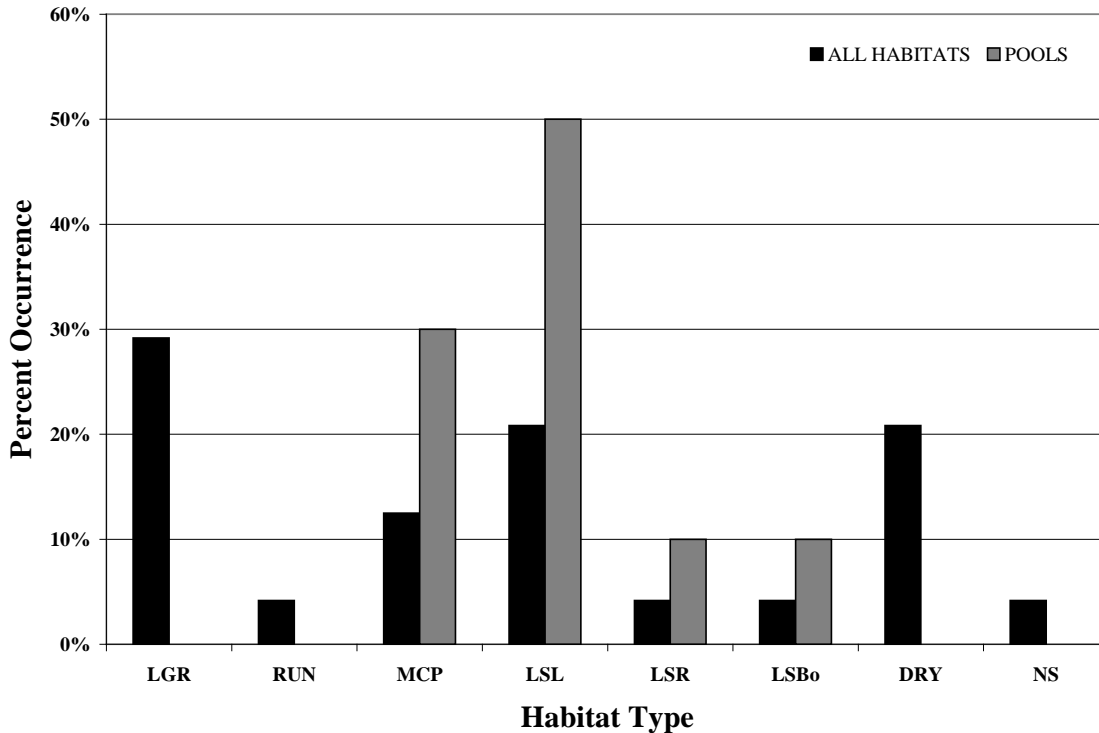


Figure F-15. Percent occurrence of habitat types surveyed in segment CA34 within the Southcoast Streams WAU, 2007.

Point Arena Streams Planning Watershed

Schooner Gulch (Segment GP01)

The segment surveyed consisted of 41% pool, 56% riffle, and 3% flatwater by stream length (Table F-5). The frequency of pools in the segment was considered moderate and there was a high frequency of riffle habitat. There was an equal proportion of lateral scour pools formed by bedrock to lateral scour formed by logs (36%, Figure F-16). The dominant cover available to fish in pools in the segment was LWD (45%, Table F-3). The mean residual pool depth was 1.4 feet, with 9% of pools having residual depths ≥ 3 feet. The shelter rating was high (123), mainly due to good cover complexity and availability. There were minimal amounts of key LWD (0.2 pieces per 328 feet) observed in the segment. However, 36% of pools in this segment were formed by LWD and there were also 42.1 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 the moderate percentage of spawnable gravels available to fish in tailouts (33% 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 poor due to a minimal amount of key LWD and a low occurrence of pools with residual depths ≥ 3 feet. However, there was a high shelter rating and a moderate frequency of pools.

Over-wintering Habitat

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

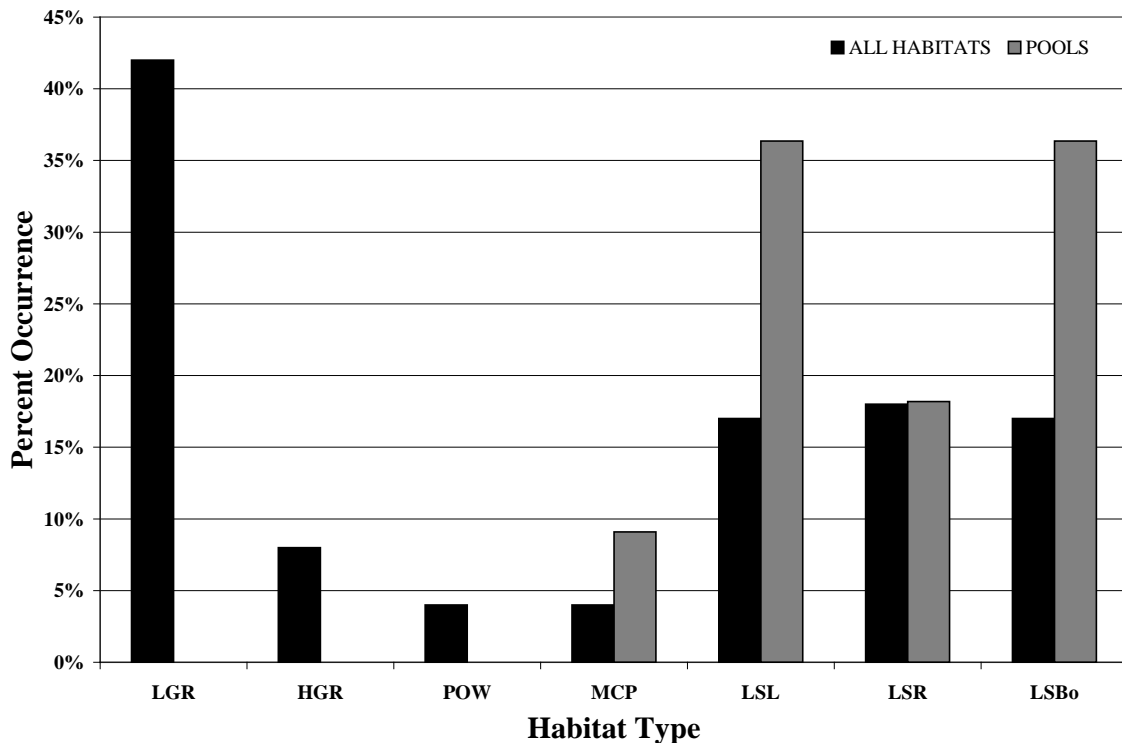


Figure F-16. Percent occurrence of habitat types surveyed in segment GP01 within the Southcoast Streams WAU, 2007.

Permeability and V-Star
KIRK WILL ADD

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APPENDIX F

**Southcoast Streams
Watershed Analysis Unit**

**Mallo Pass, Lower Alder, N.F. Alder,
Lower and Upper Brush Creeks
Planning Watersheds**

**Map F-1 (a)
Salmonid Distribution**

This map illustrates the documented and potential distribution of steelhead trout and coho salmon in the Southcoast Stream WAU. Documented distribution is based on distribution surveys conducted by MRC through 2004. Documented distribution only shows presence of fish up to the observation site. Potential distribution represents our interpretation, at this point in time, for larger streams where coho salmon or steelhead trout could occur. Since the potential distribution is assessed only for larger watercourses, it cannot be considered complete, and it is highly likely the actual potential distribution is larger.

Salmonid Distribution

	Presence	Potential
Coho		
Steelhead		

**Barriers to Adult Salmonid
Upstream Migration**

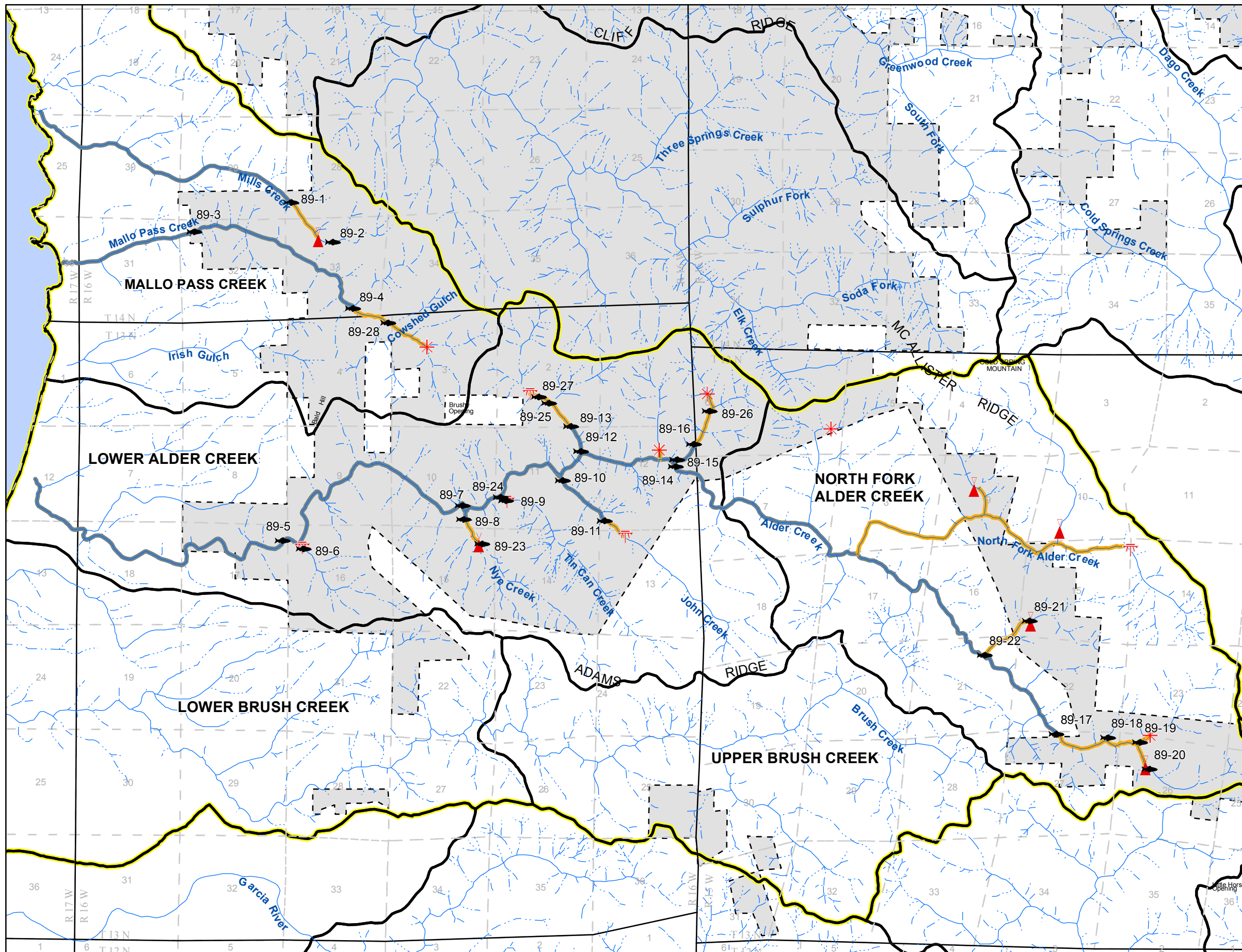
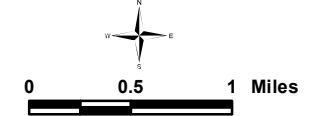
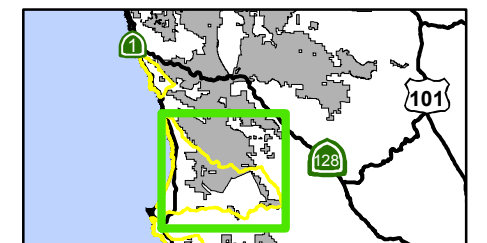
- Gradient
- Waterfall
- Habitat Loss

Fish Distribution Sampling Locations

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

Flow Class

- Class I
- Class II
- Class III



**Southcoast Streams
Watershed Analysis Unit**

**Point Arena Creek
Planning Watershed**

**Map F-1 (b)
Salmonid Distribution**

This map illustrates the documented and potential distribution of steelhead trout and coho salmon in the Southcoast Stream WAU. Documented distribution is based on distribution surveys conducted by MRC through 2004. Documented distribution only shows presence of fish up to the observation site. Potential distribution represents our interpretation, at this point in time, for larger streams where coho salmon or steelhead trout could occur. Since the potential distribution is assessed only for larger watercourses, it cannot be considered complete, and it is highly likely the actual potential distribution is larger.

Salmonid Distribution

	Presence	Potential
Coho		
Steelhead		

**Barriers to Adult Salmonid
Upstream Migration**

- Gradient
- Waterfall
- Habitat Loss

Fish Distribution Sampling Locations

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

Flow Class

- Class I
- Class II
- Class III

