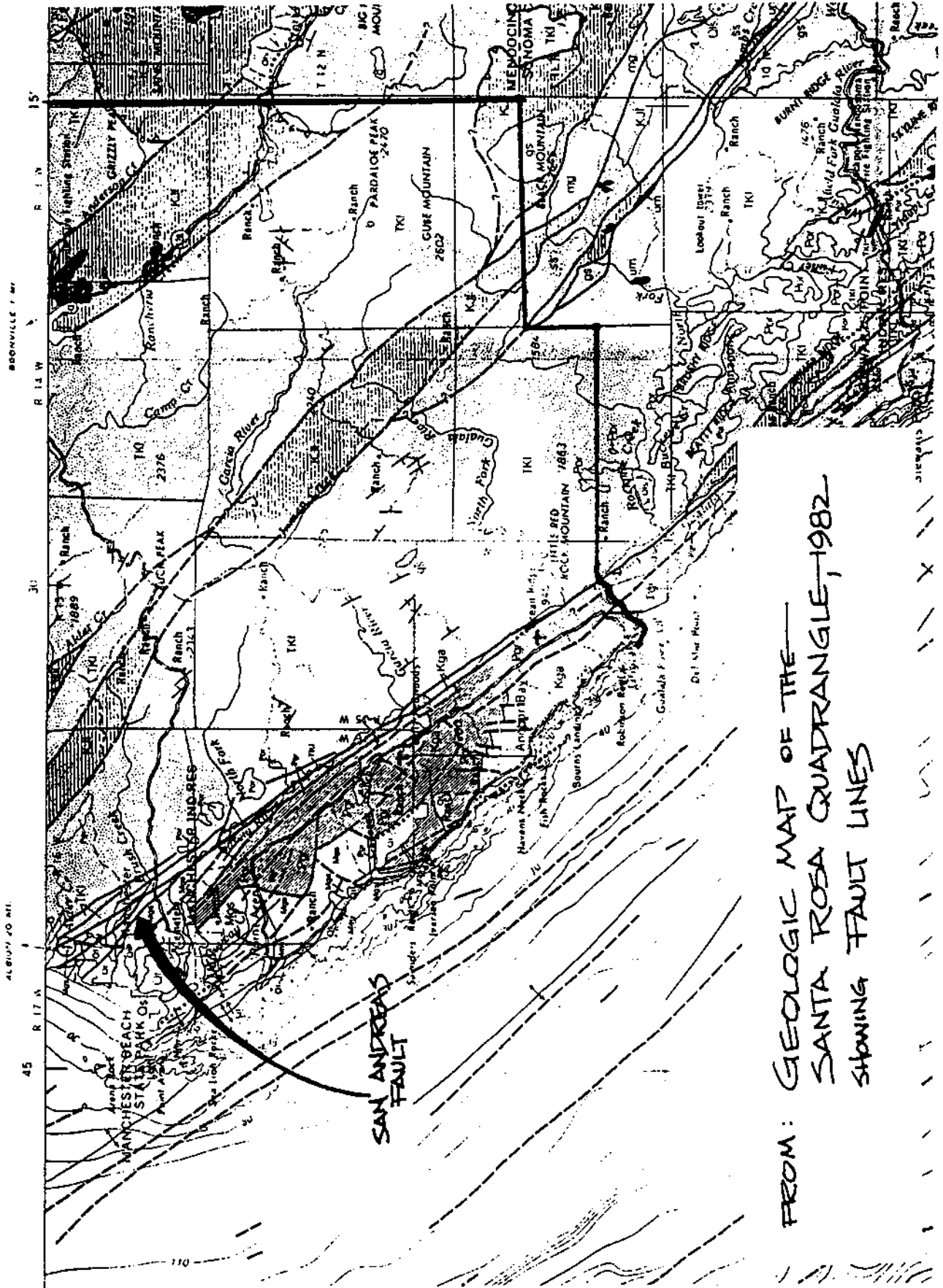


Appendix 1

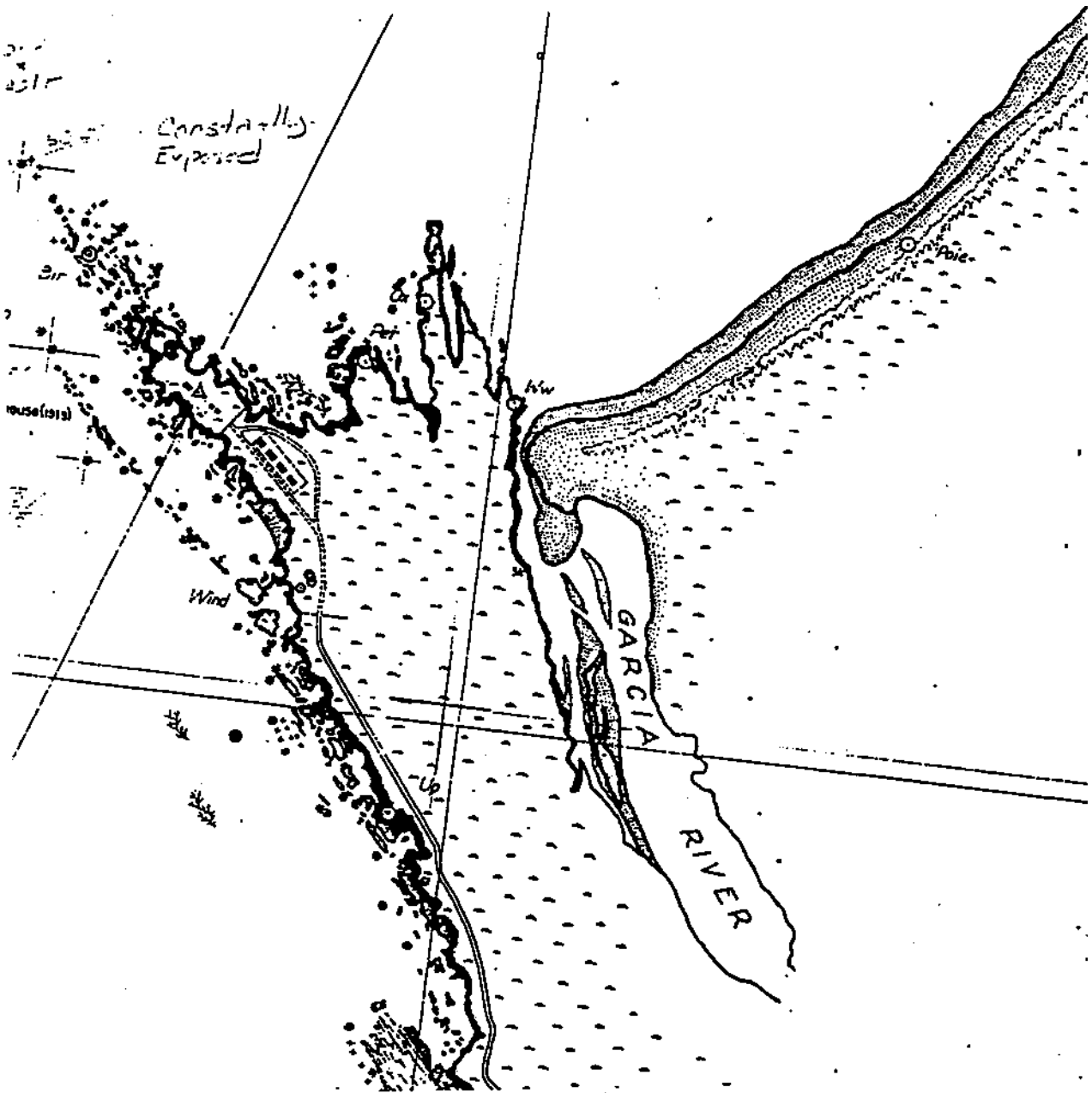
Supporting Documents for Stream Channel Data

I-1: Geologic Map



FROM: GEOLOGIC MAP OF THE
SANTA ROSA QUADRANGLE, 1982
SHOWING FAULT LINES

I-2: Garcia Estuary — 1929 (US Coast and Geodetic Survey)



GARCIA RIVER ESTUARY

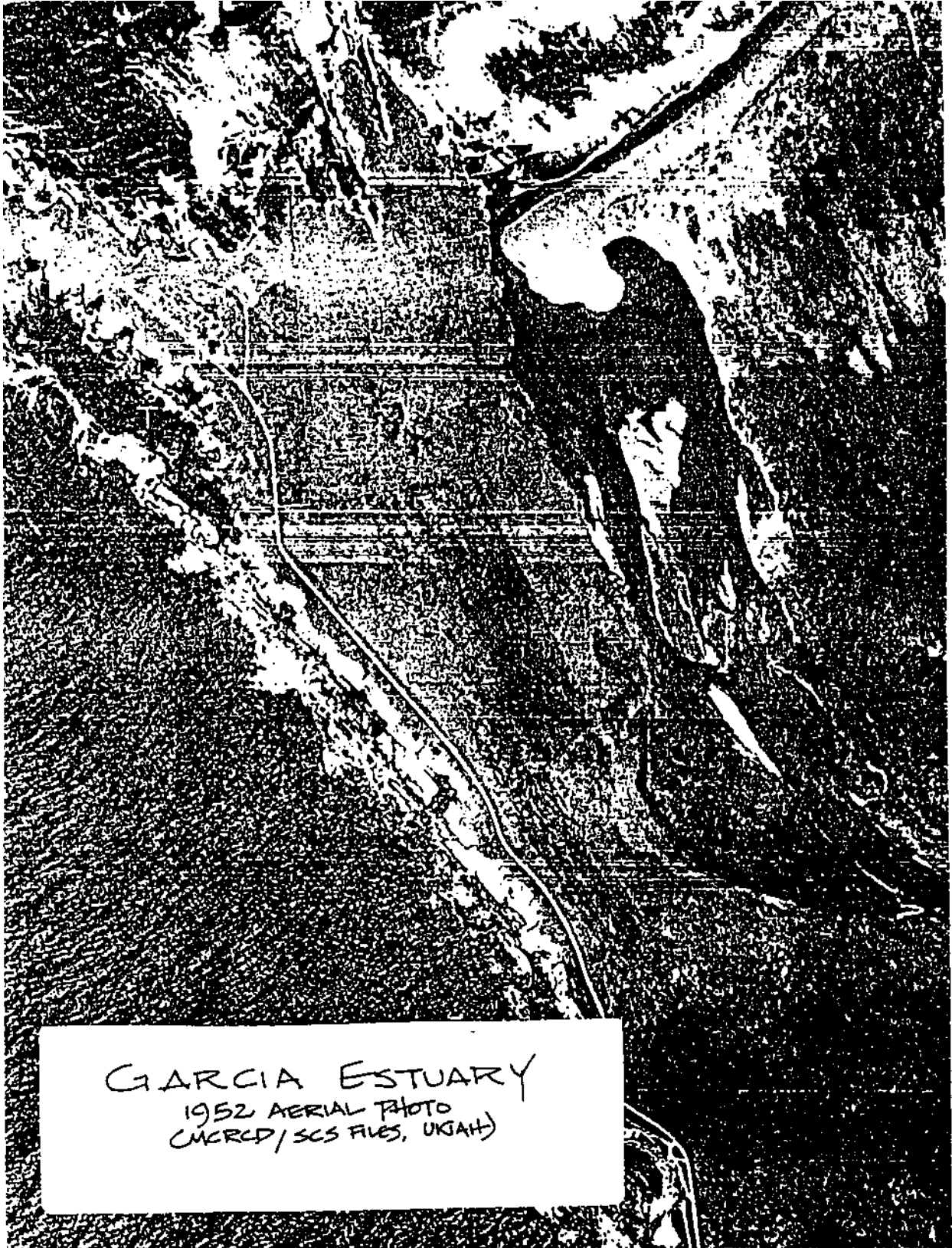
from U.S. COAST & GEODETIC SURVEY
TOPOGRAPHIC MAP T-4504
1929



I-3: Garcia Estuary and Lower River — 1937 Aerial Photo

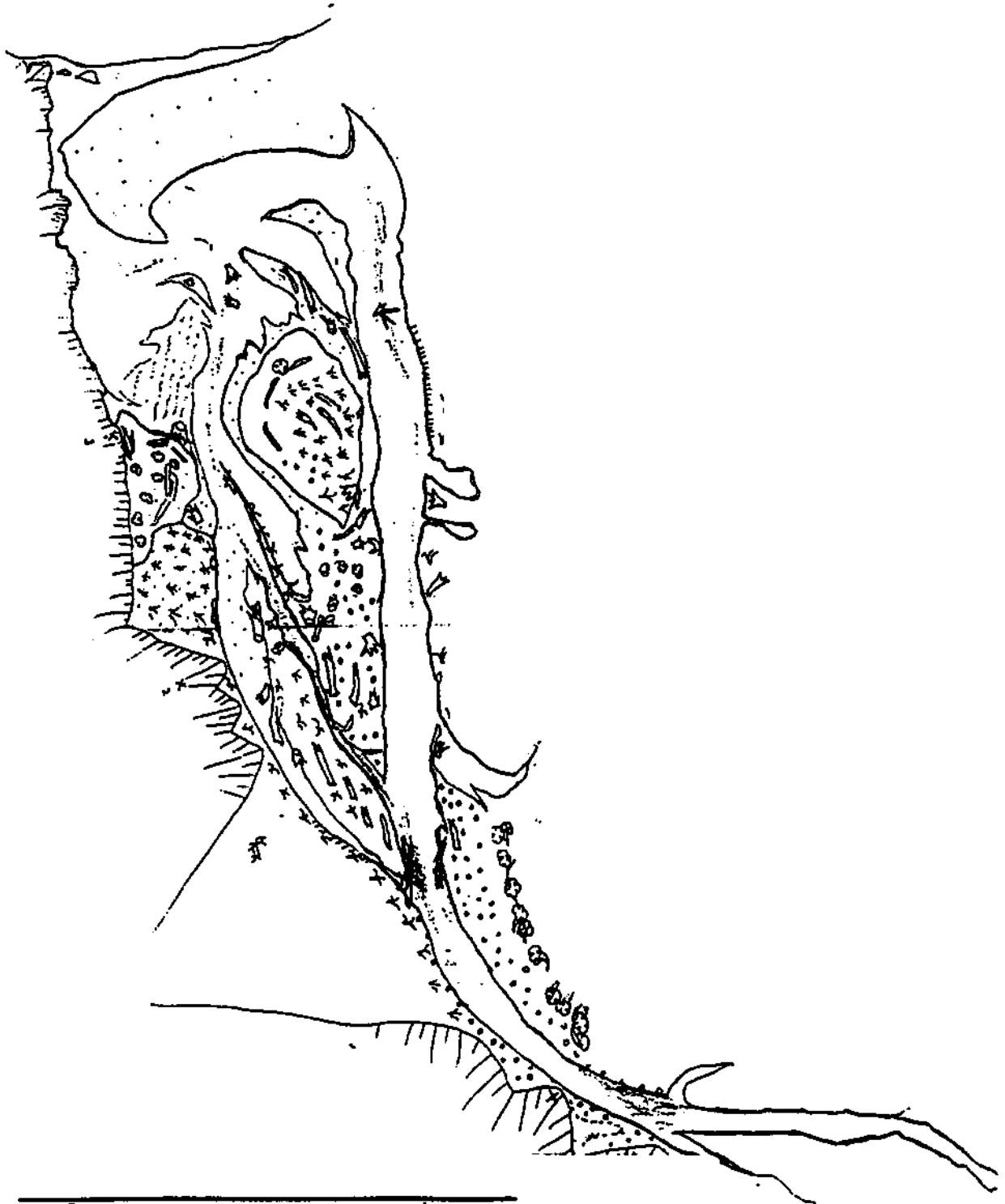


I-4: Garcia Estuary — 1952 Aerial Photo



I-5: Garcia Estuary — 1991 Drawing

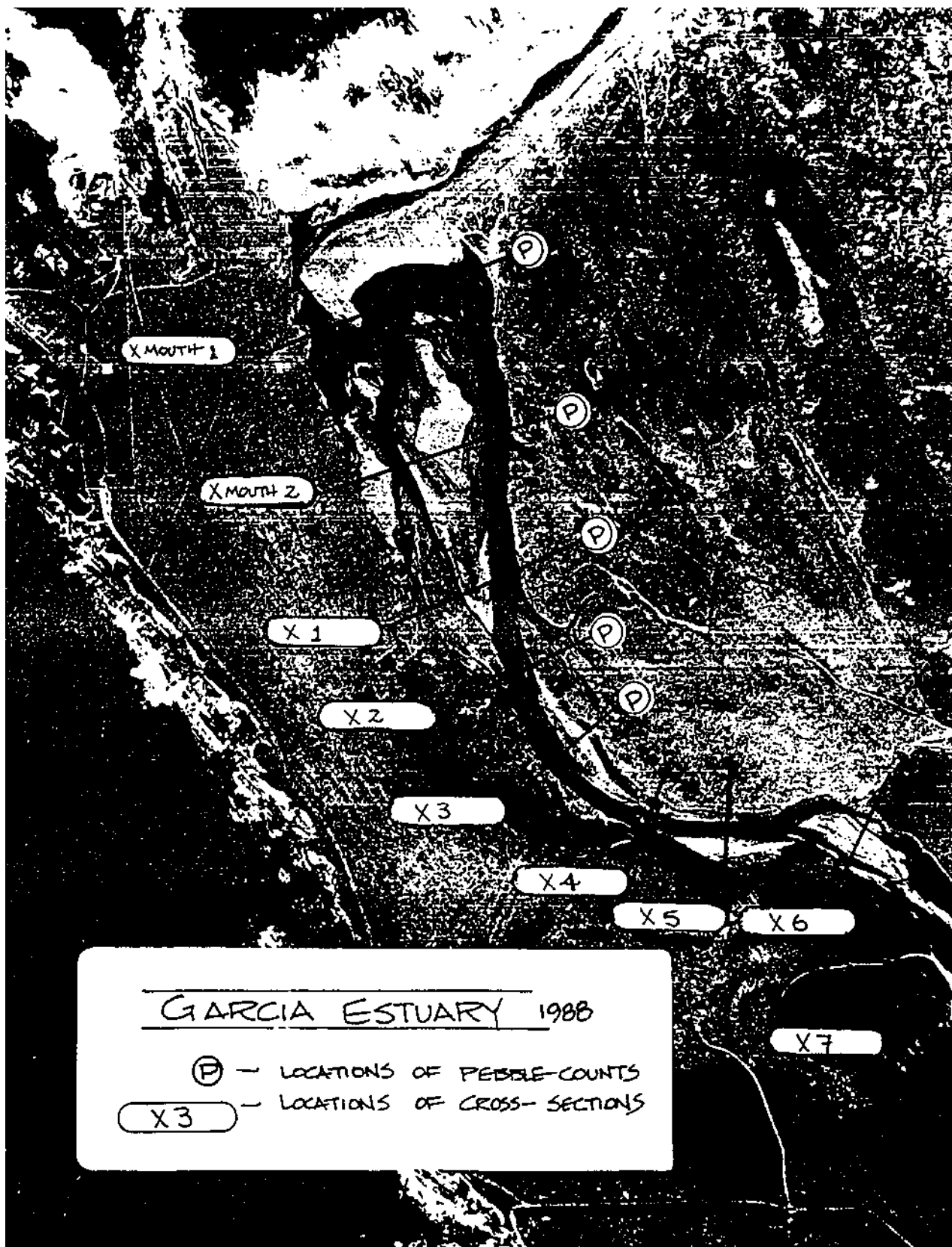
9/23/91: 1430-1620 hrs.



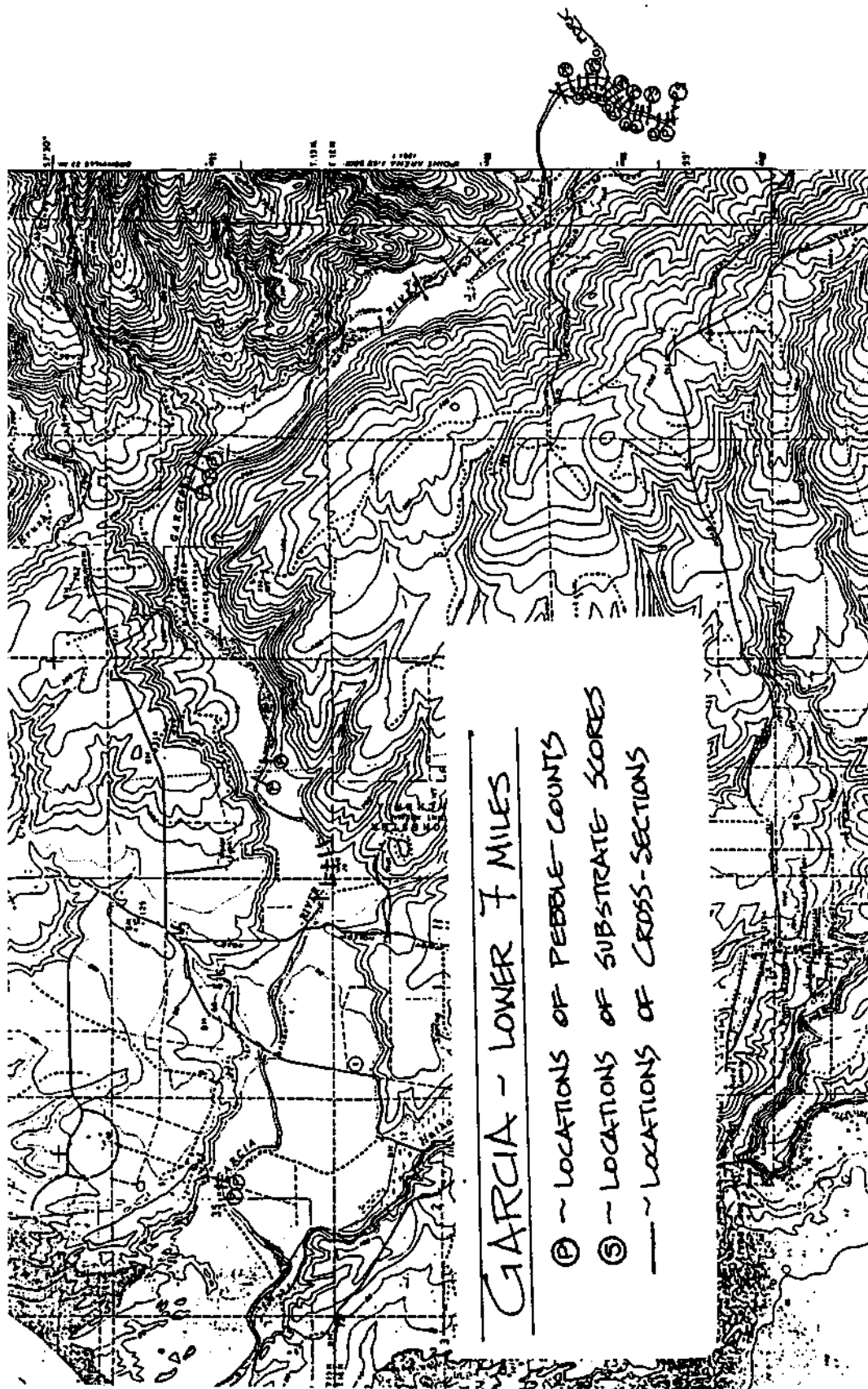
GARCIA ESTUARY

DRAWN BY MAUREEN ROCHE
SEPTEMBER 23, 1991: 1430-1620 HRS.

I-6: Garcia Estuary — 1988 Aerial Photo Showing Sites of Cross Sections and Pebble Counts



I-7: Lower 7 Mile Reach Topo Showing Sites of Cross Sections and Pebble Counts



Appendix II

Supporting Documents for Fisheries Data

II-1: DFG Habitat Typing Manual (excerpts)
(FLOSI & REYNOLDS, 1991)

D. HABITAT TYPING

The habitat typing procedure presented is a standardized (as described in the American Fishery Society's Glossary of stream habitat terms), replicable methodology that physically describes 100% of the wetted channel. It is a composite of systems principally developed or modified by other investigators and compiled by Trinity Fisheries Consulting on contract to the DFG.

Habitat types are described according to location, orientation, and water flow. The attributes distinguishing the various habitat types include over-all channel gradient, velocity, depth, substrate, and the channel features responsible for the unit's formation.

A basin level habitat inventory is designed to produce a thorough description of the physical fish habitat. Basin level habitat classification is on the scale of a stream's naturally occurring pool-riffle-run units. The length of a habitat unit depends on stream size and order. For basin level habitat inventory homogeneous areas of habitat that are equal or greater in length than one wetted channel width are recognized as distinct habitat units.

The information provided by habitat typing, channel typing, and the biological information collected during adult spawning surveys and/or juvenile rearing surveys gives baseline data in which to determine if critical habitat needs of a target species are lacking, and if there are areas where improvements can be made.

Four levels of classification exist when describing fish habitat from a physical viewpoint (Figure 10). Level I habitat types are separated into riffle or pool habitats. Level II separates the riffles into riffle or flatwater habitat types, thus creating three categories. These three level II types are further differentiated at Level III using the following criteria: Riffle types are defined on the basis of water surface gradient (riffle or cascade); Pool types are defined according to their location in the stream channel (main channel, scour, or backwater). Flatwater types are not further subdivided at level III, but at level IV they are differentiated on the basis of depth and velocity. Level IV pools are categorized by the cause of the scour (obstruction, blockage, constriction, or merging flows); riffles are defined by gradient, and cascades by gradient and substrate type. Each of the six level III habitat types are ultimately divided into the 24 habitat types listed below. The level employed in a survey is determined by the objective of the inventory.

Prior to initiation of an inventory, the level of data collection necessary to meet the needs of the investigation should be established. Habitat typing at level IV will provide the greatest detail and the most complete description of existing habitat. This data can later be aggregated into broader levels of habitat classification if detail is found to be excessive.

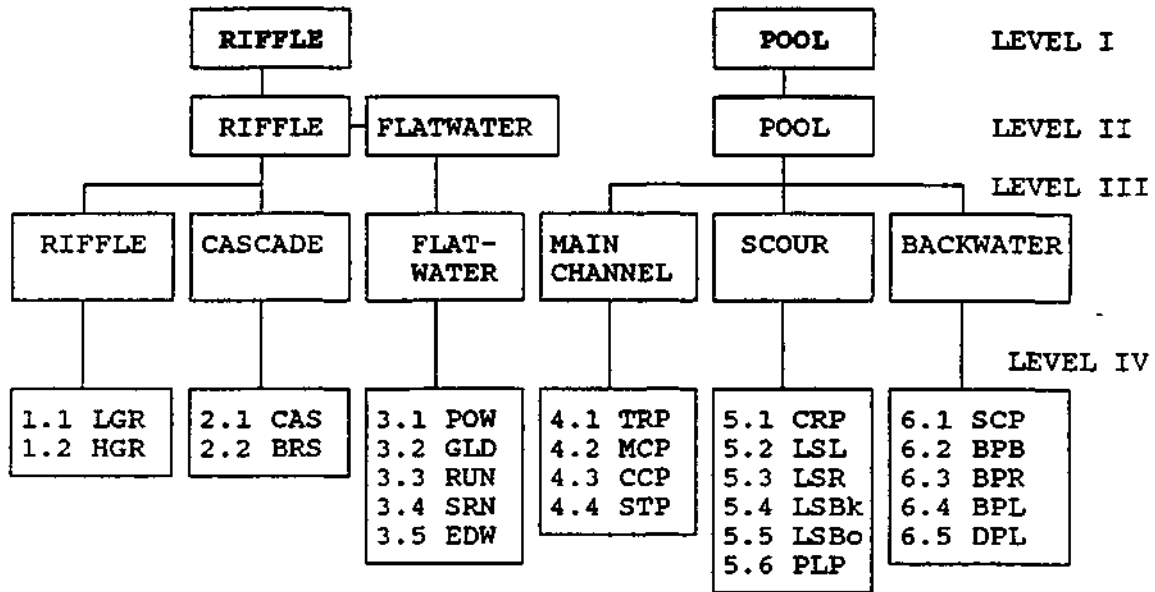


Figure 10. Habitat types hierarchy.

Generally a stream will not contain all 24 habitat types. The mix of habitat types will be reflective of the over-all channel gradient, flow regime, cross-sectional profile, and substrate particle size. Basins that exhibit a wide range in channel gradient will also have a broad mix of habitat types. Stratifying a basin by channel types helps to predict the location of certain habitat types.

For a more detailed habitat analysis, or project level habitat typing, the units can be smaller. Project level habitat typing is used to evaluate and quantify changes in habitat as the result of fish habitat restoration/enhancement projects. It will provide insight on the relationship between channel features and habitat development. The project level habitat size depends on the nature and objective of the particular study. Both levels use the same habitat types.

Application

Habitat typing is intended to yield detailed information that can be used for fisheries management. Basin wide habitat typing can provide a variety of data. Some important applications are:

- a. Physically describe 100% of the habitat in a basin.
- b. Provide baseline data to evaluate habitat responses to restoration efforts.
- c. Facilitate restoration planning and fisheries management.
- d. Determine transect locations for Instream Flow Increment Methodology modeling based on habitat availability and accessibility.

The following list of habitat types and their hierarchy has been adapted from the original system developed by Bisson, et al (1981), modified by Decker, Overton (1985), Sullivan (1988), and Snider (1990).

LEVEL I

HABITAT TYPES:

1. RIFFLE: [RIF]
(Riffle, Cascade, Flatwater)
2. POOL: [POL]
(Main Channel Pool, Scour Pool, Backwater Pool)

LEVEL II

HABITAT TYPES:

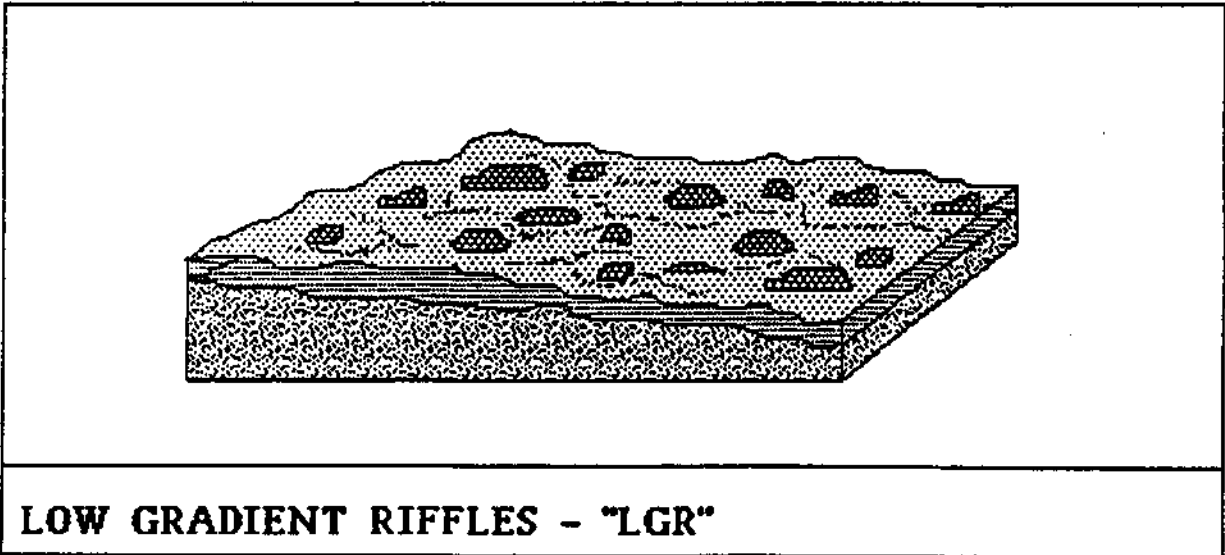
1. RIFFLE: [RIF]
(Low Gradient Riffle, High Gradient Riffle, Cascade, Bedrock Sheet)
2. FLATWATER: [FLT]
(Pocket Water, Run, Step Run, Glide, Edgewater)
3. POOL: [POL]
(Plunge Pool, Mid-Channel Pool, Dammed Pool, Step Pool, Channel Confluence Pool, Trench Pool, Lateral Scour Pool, Root Wad Enhanced, Boulder Formed, Bedrock Formed, and Log Enhanced, Corner Pool, Secondary Channel Pool, Backwater Pool, Boulder Formed, Root Wad Formed, and Log Formed)

LEVEL III and LEVEL IV HABITAT TYPES:		LETTER	NUMBER
1.	RIFFLE		
	Low Gradient Riffle:	[LGR]	1.1
	High Gradient Riffle:	[HGR]	1.2
2.	CASCADE		
	Cascade:	[CAS]	2.1
	Bedrock Sheet:	[BRS]	2.2
3.	FLATWATER		
	Pocket Water:	[POW]	3.1
	Glide:	[GLD]	3.2
	Run:	[RUN]	3.3
	Step Run:	[SRN]	3.4
	Edgewater:	[EDW]	3.5
4.	MAIN CHANNEL POOL		
	Trench Pool:	[TRP]	4.1
	Mid-Channel Pool:	[MCP]	4.2
	Channel Confluence Pool:	[CCP]	4.3
	Step Pool:	[STP]	4.4
5.	SCOUR POOL		
	Corner Pool:	[CRP]	5.1
	L. Scour Pool - Log Enhanced:	[LSL]	5.2
	L. Scour Pool - Root Wad Enhanced:	[LSR]	5.3
	L. Scour Pool - Bedrock Formed:	[LSBk]	5.4
	L. Scour Pool - Boulder Formed:	[LSBo]	5.5
	Plunge Pool:	[PLP]	5.6
6.	BACKWATER POOLS		
	Secondary Channel Pool:	[SCP]	6.1
	Backwater Pool - Boulder Formed:	[BPB]	6.2
	Backwater Pool - Root Wad Formed:	[BPR]	6.3
	Backwater Pool - Log Formed:	[BPL]	6.4
	Dammed Pool:	[DPL]	6.5

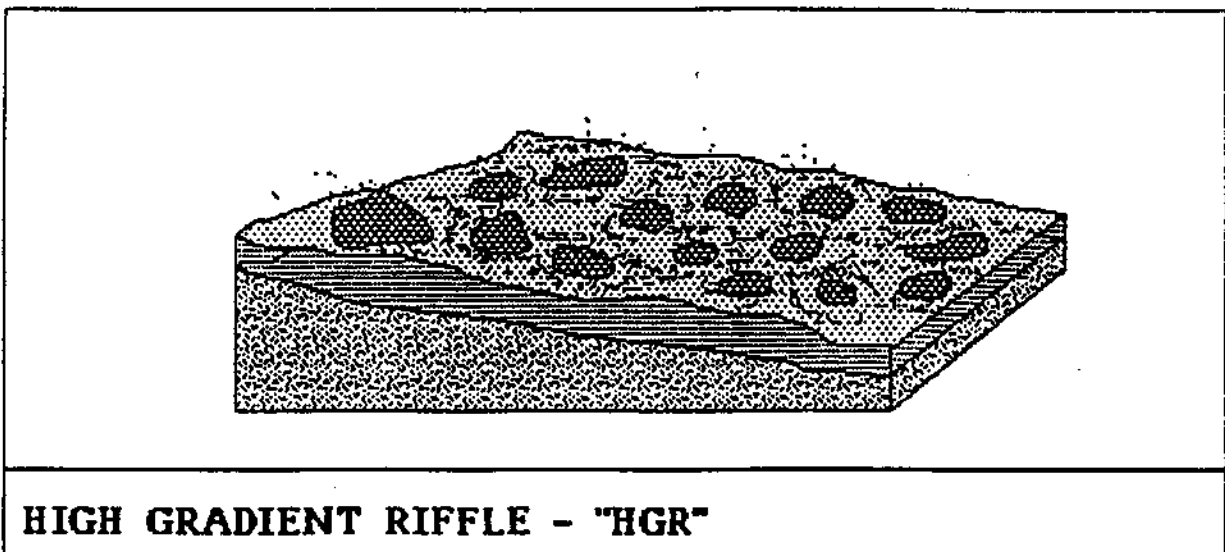
Level IV Habitat Type Descriptions

- * The three or four letter abbreviations in the (***) are the standardized abbreviations adopted by DFG.
- * The three digit numbers in the [*.*] are the standardized numbers adopted by DFG.
- * The numbers in the {**} are the numbers listed in the Pacific Southwest Region Habitat Typing Field Guide USDA-USFS.

THE FOLLOWING HABITAT TYPE DESCRIPTIONS ARE TAKEN FROM THE PACIFIC SOUTHWEST REGION HABITAT TYPING FIELD GUIDE USDA-USFS.

LOW GRADIENT RIFFLE (LGR) [1.1] {1}

Shallow reaches with swiftly flowing, turbulent water with some partially exposed substrate. Gradient $< 4\%$, substrate is usually cobble dominated.

HIGH GRADIENT RIFFLE (HGR) [1.2] {2}

Steep reaches of moderately deep, swift, and very turbulent water. Amount of exposed substrate is relatively high. Gradient is $> 4\%$, and substrate is boulder dominated.

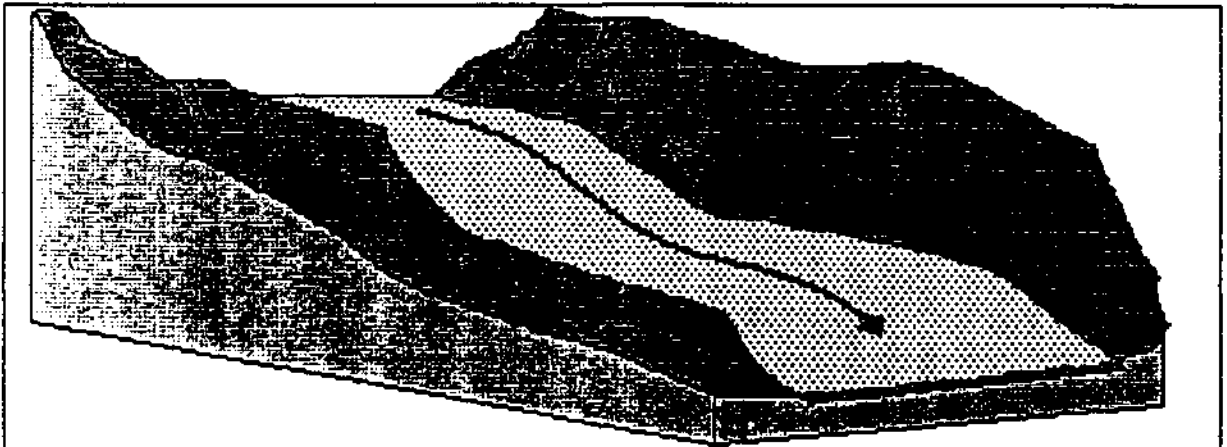
CASCADE (CAS) [2.1] {3}



CASCADE - "CAS"

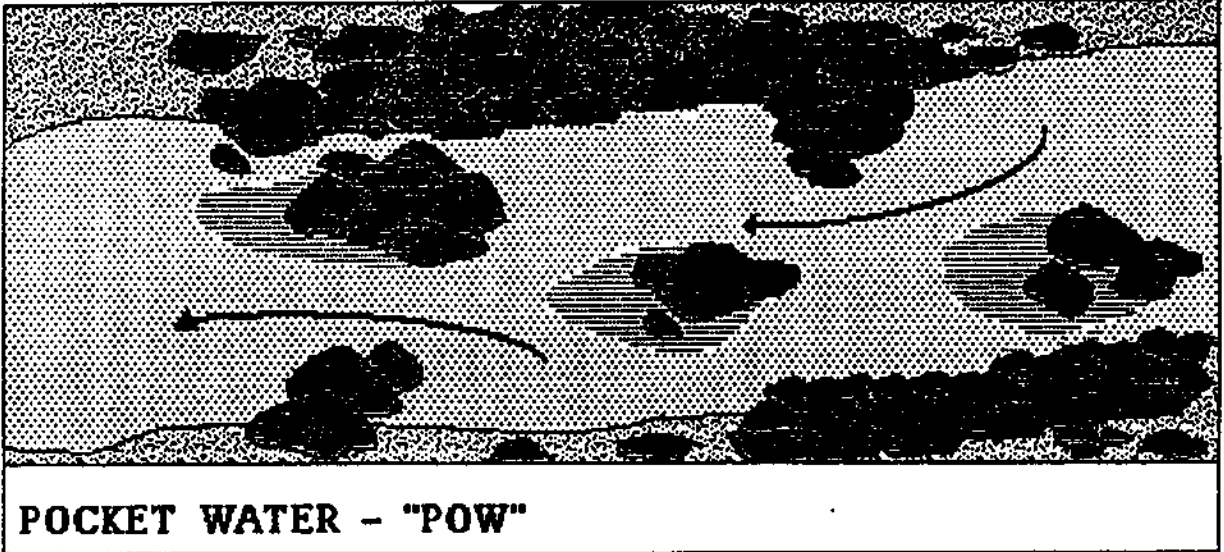
The steepest riffle habitat, consisting of alternating small waterfalls and shallow pools. Substrate is usually bedrock and boulders.

BEDROCK SHEET (BRS) [2.2] {24}

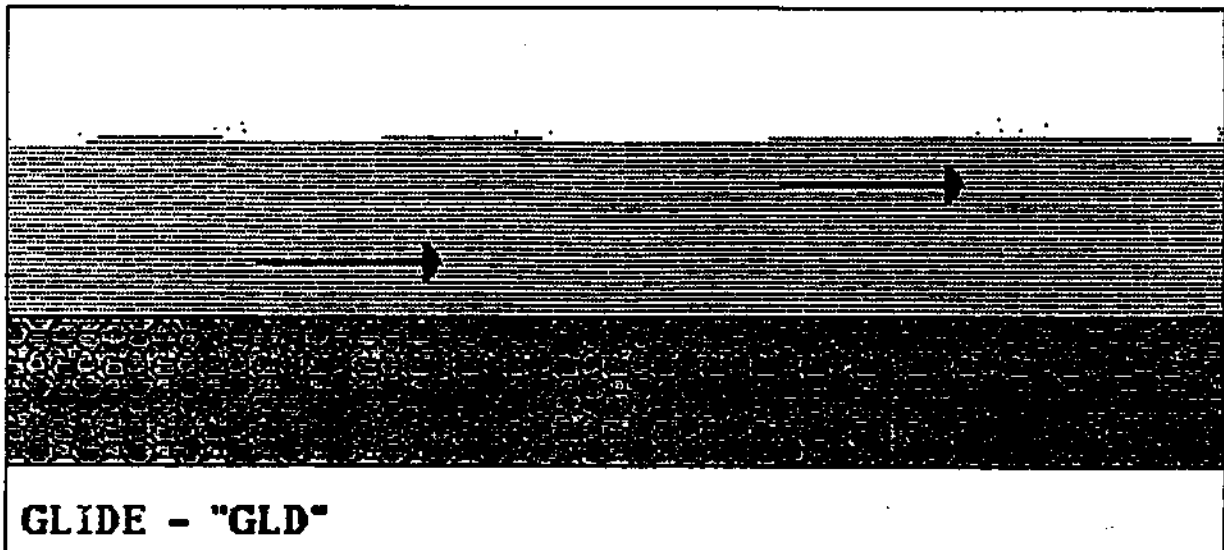


BEDROCK SHEET - "BRS"

A thin sheet of water flowing over a smooth bedrock surface. Gradients are highly variable.

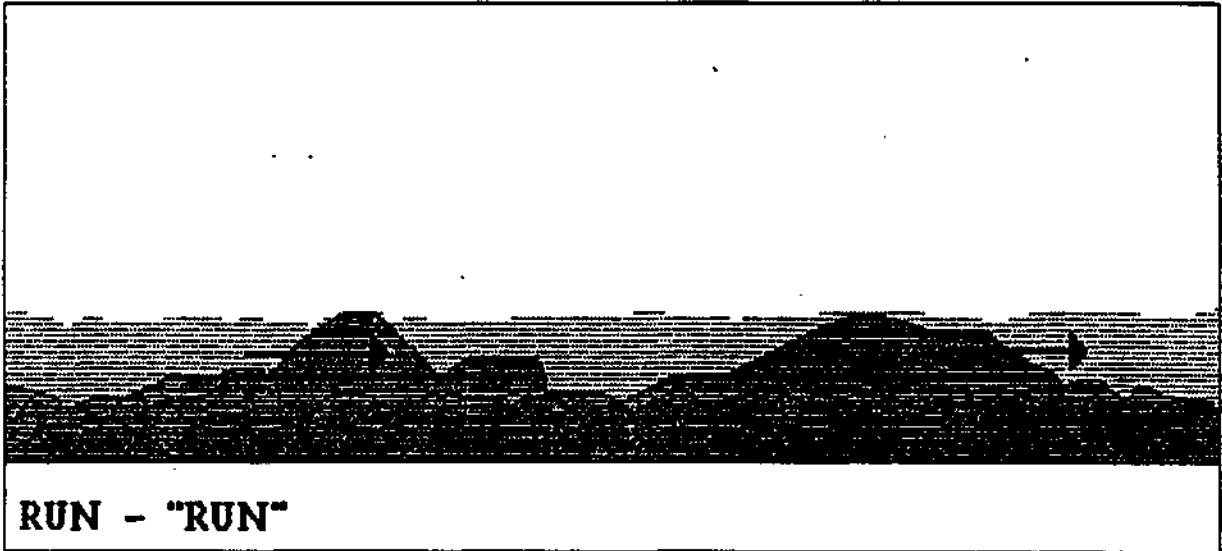
POCKET WATER (POW) [3.1] {21}

A section of swift flowing stream containing numerous boulders or other large obstructions which create eddies or scour holes (pockets) behind the obstructions.

GLIDE (GLD) [3.2] {14}

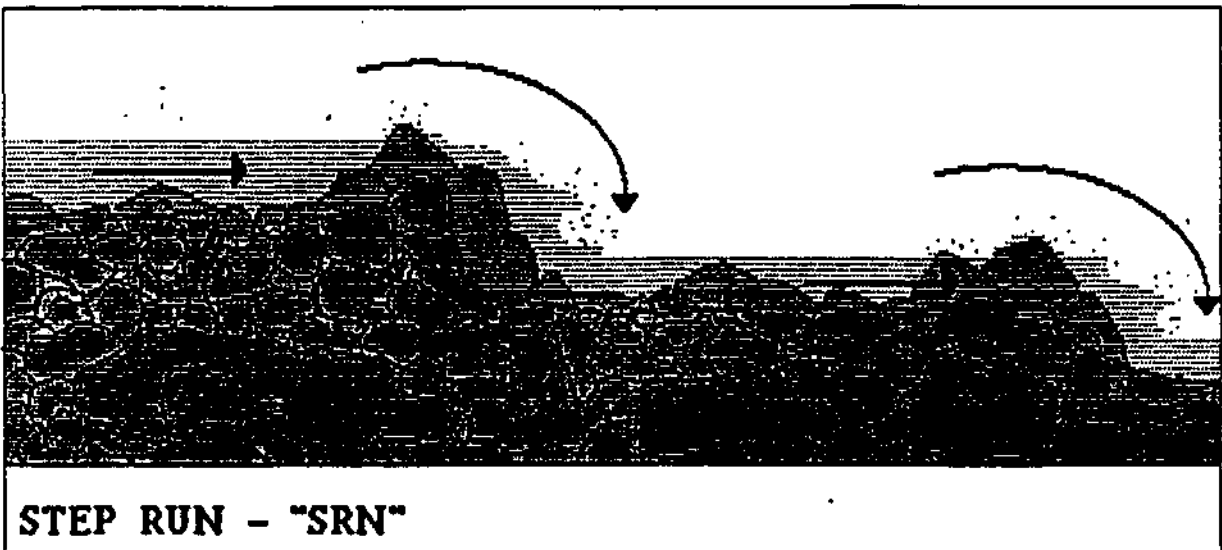
A wide uniform channel bottom. Flow with low to moderate velocities, lacking pronounced turbulence. Substrate usually consists of cobble, gravel, and sand.

RUN (RUN) [3.3] {15}



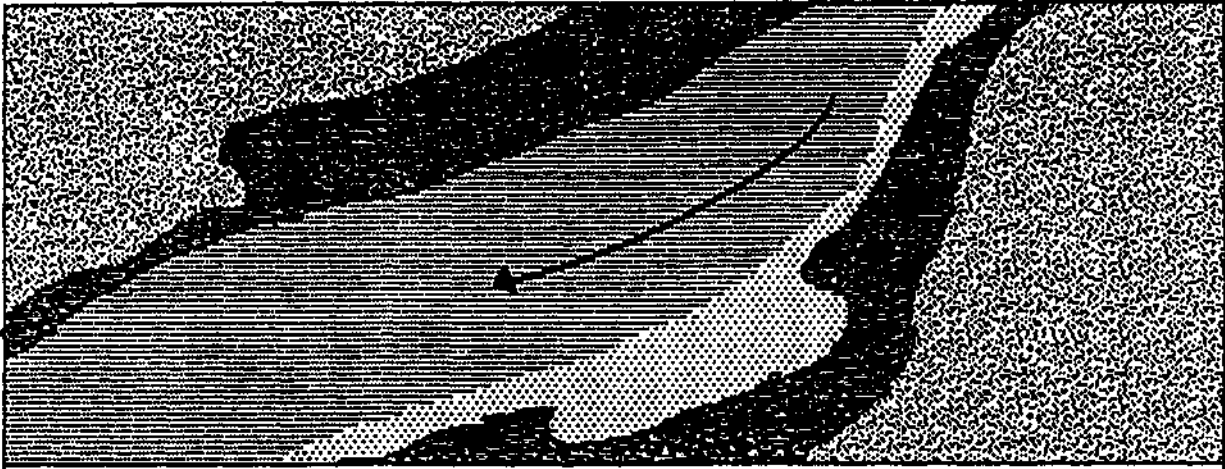
Swiftly flowing reaches with little surface agitation and no major flow obstructions. Often appears as flooded riffles. Typical substrate consists of gravel, cobble, and boulders.

STEP RUN (SRN) [3.4] {16}



A sequence of runs separated by short riffle steps. Substrate is usually cobble and boulder dominated.

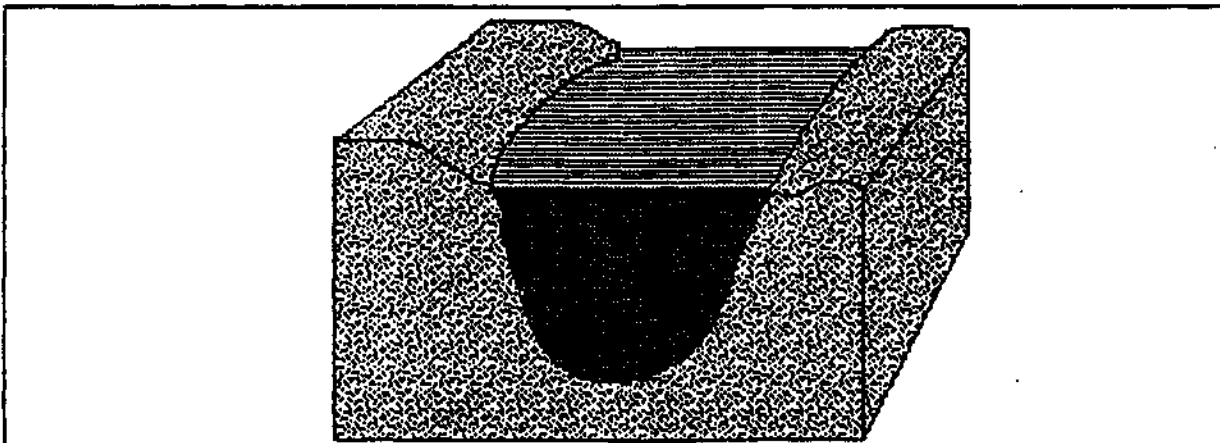
EDGEWATER (EDW) [3.5] (18)



EDGEWATER - "EDW"

Quiet, shallow area found along the margins of the stream, typically associated with riffles. Water velocity is low and sometimes lacking. Substrate varies from cobbles to boulders.

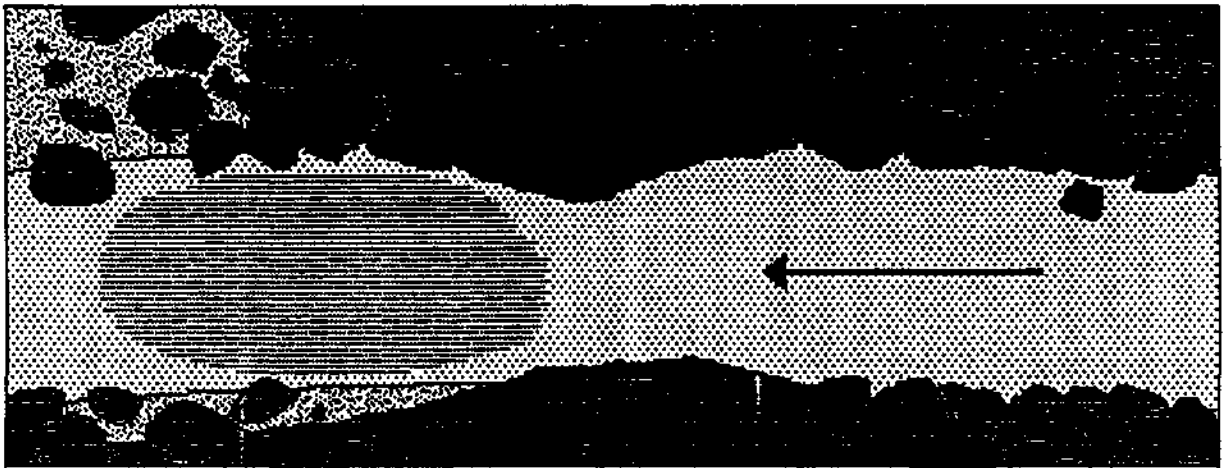
TRENCH POOLS (TRP) [4.1] {8}



TRENCH/CHUTE - "TRP"

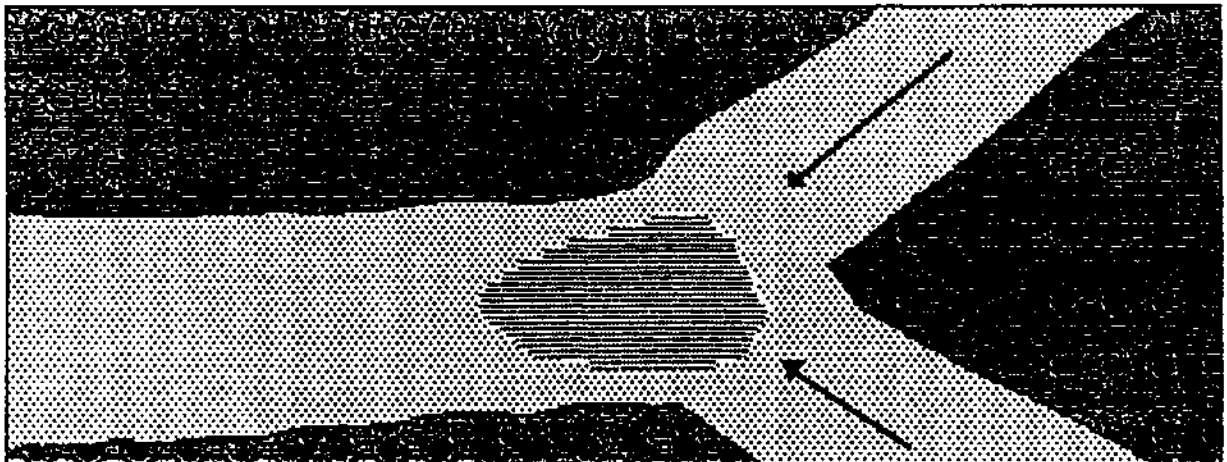
Channel cross sections typically U-shaped with bedrock or coarse grained bottom flanked by bedrock walls. Current velocities are swift and the direction of flow is uniform.

MID-CHANNEL POOL (MCP) [4.2] {17}



MID-CHANNEL POOL - "MCP"

Large pools formed by mid-channel scour. The scour hole encompasses more than 60% of the wetted channel. Water velocity is slow, and the substrate is highly variable.



CHANNEL CONFLUENCE POOL - "CCP"

Large pools formed at the confluence of two or more channels. Scour can be due to plunges, lateral obstructions or scour at the channel intersections. Velocity and turbulence are usually greater than those in other pool types.

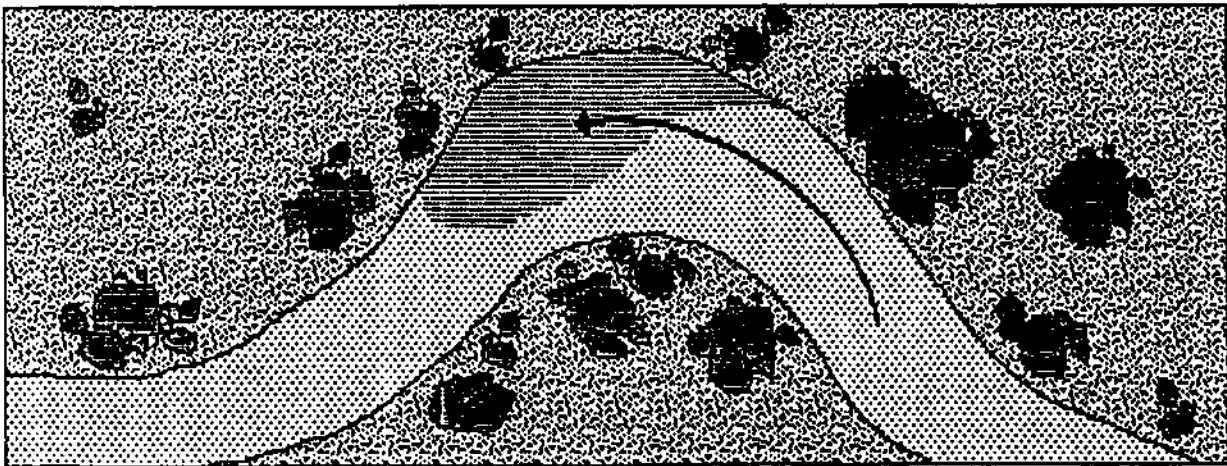
STEP POOL (STP) [4.4] {23}



STEP POOL - "STP"

A series of pools separated by short riffles or cascades. Generally found in high gradient, confined mountain streams dominated by boulder substrate.

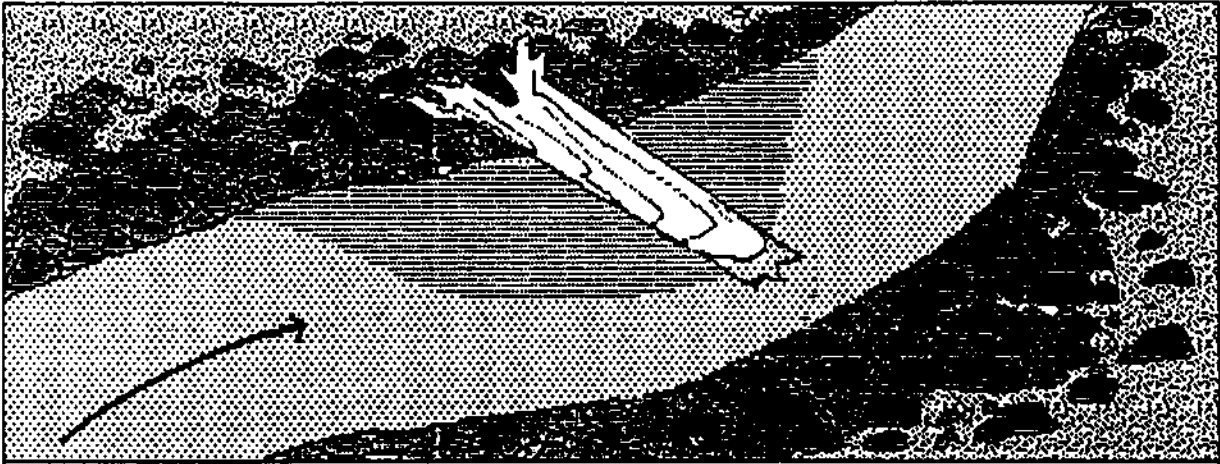
CORNER POOL (CRP) [5.1] {22}



CORNER POOL - "CRP"

Lateral scour pools formed at a bend in the channel. These pools are common in lowland valley bottoms where stream banks consist of alluvium and lack hard obstructions.

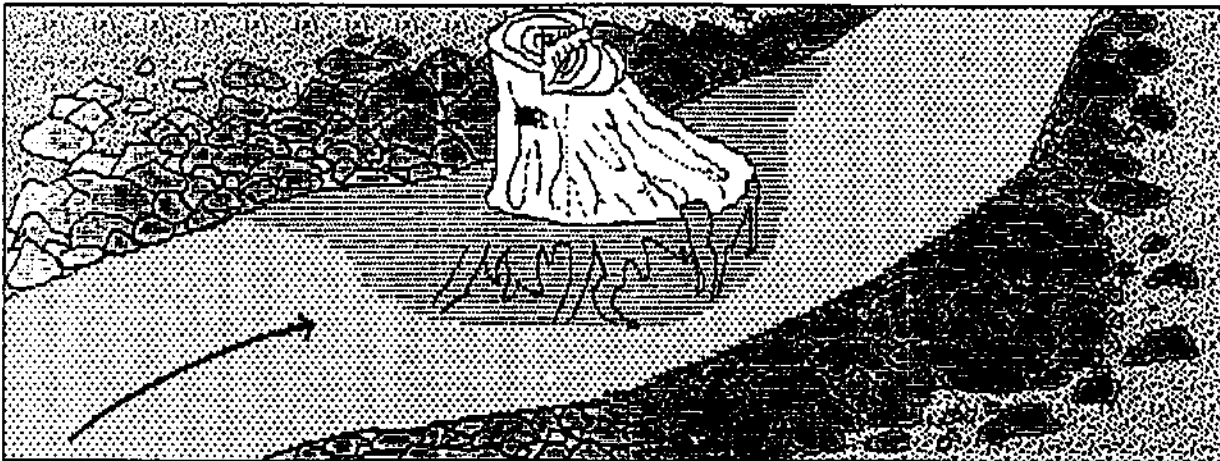
LATERAL SCOUR POOL - LOG ENHANCED (LSL) [5.2] {10}



LATERAL SCOUR POOL - "LSL" LOG ENHANCED

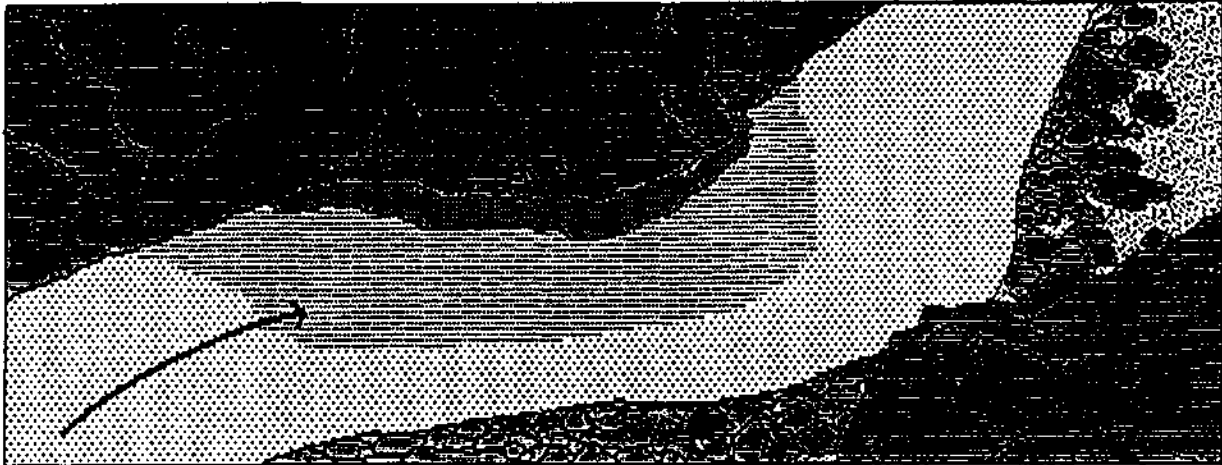
Formed by flow impinging against a partial channel obstruction consisting of large woody debris. The associated scour is generally confined to < 60% of the wetted channel width.

LATERAL SCOUR POOL ROOT WAD ENHANCED (LSR) [5.3] {11}



LATERAL SCOUR POOL - "LSR" ROOT WAD ENHANCED

Formed by flow impinging against a partial channel obstruction consisting of a root wad. The associated scour is generally confined to < 60% of the wetted channel width.

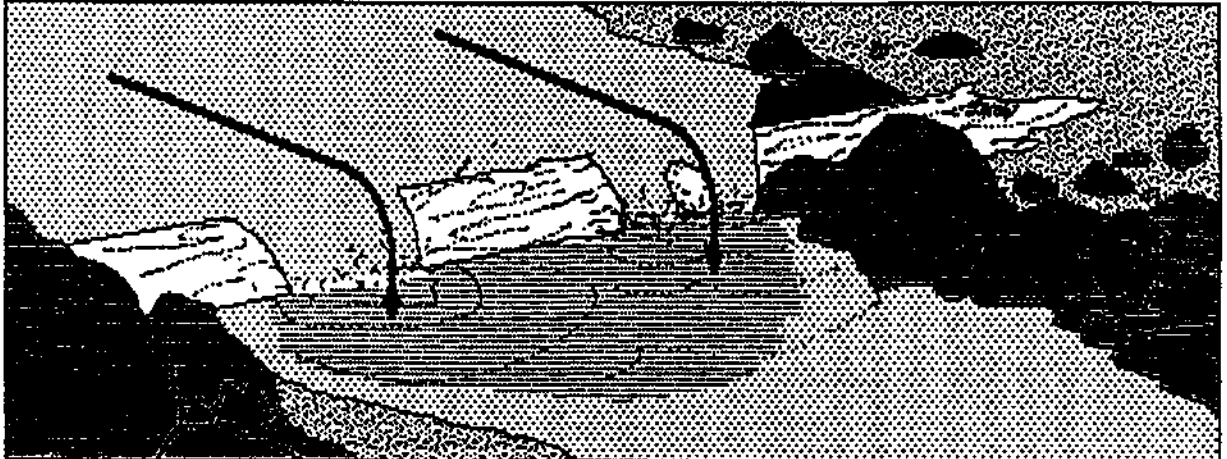
LATERAL SCOUR POOL - BEDROCK FORMED (LSBk) [5.4] {12}**LATERAL SCOUR POOL - "LSBk" BEDROCK FORMED**

Formed by flow impinging against a bedrock stream bank. The associated scour is generally confined to < 60% of the wetted channel width.

LATERAL SCOUR POOL - BOULDER FORMED (LSBo) [5.5] {20}**LATERAL SCOUR POOL - "LSBo" BOULDER FORMED**

Formed by flow impinging against a partial channel obstruction consisting of a boulder. The associated scour is generally confined to < 60% of the wetted channel width.

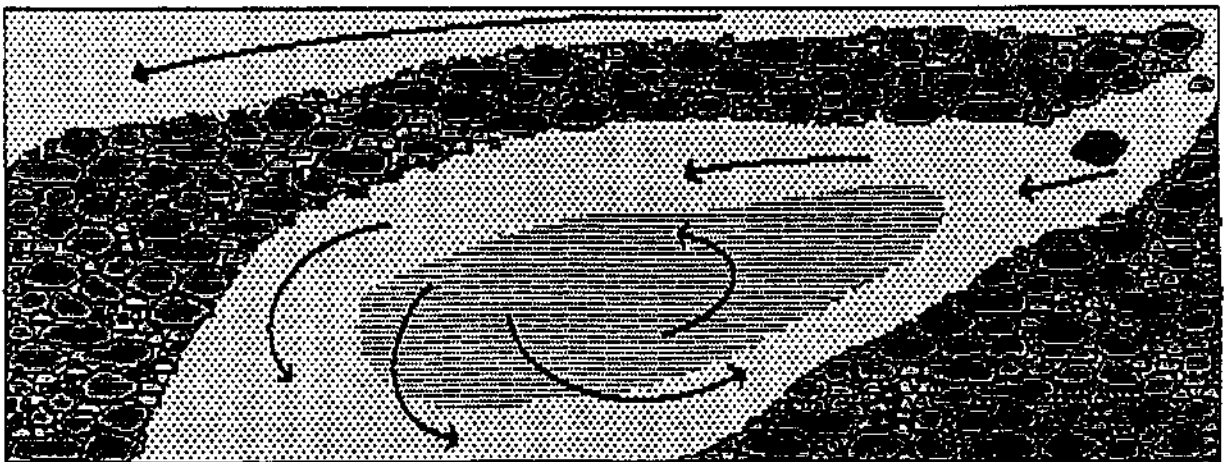
PLUNGE POOL (PLP) [5.6] {9}



PLUNGE POOL - "PLP"

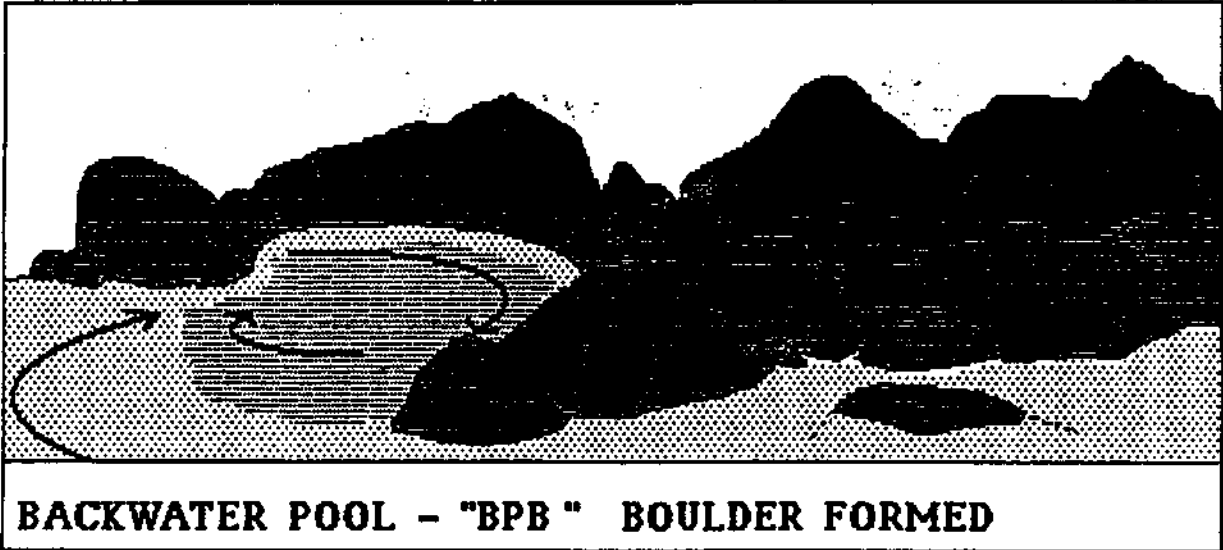
Found where the stream passes over a complete or nearly complete channel obstruction and drops steeply into the stream bed below, scouring out a depression; often large and deep. Substrate size is highly variable.

SECONDARY CHANNEL POOL (SCP) [6.1] {4}

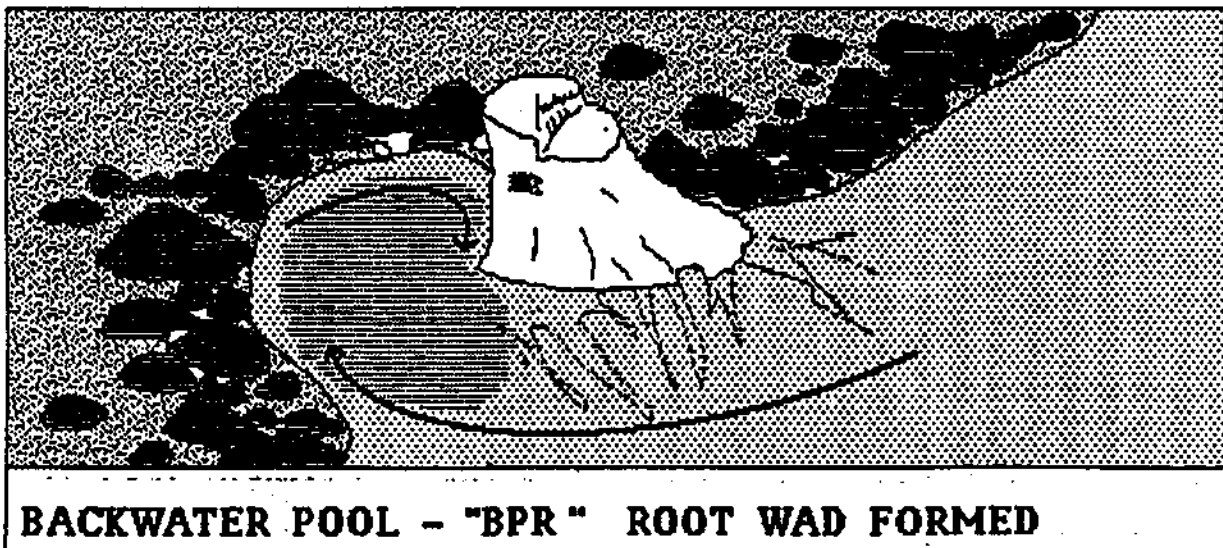


SECONDARY CHANNEL POOL - "SCP"

(sic)
summer, these pools will dry up or have very little flow. Mainly associated with gravel bars and may contain sand and silt substrate.

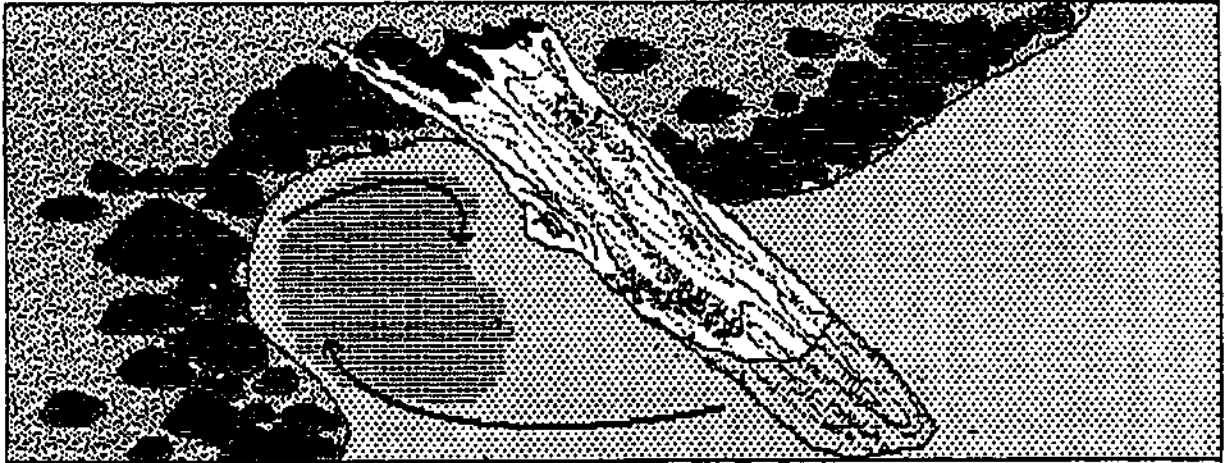
BACKWATER POOL - BOULDER FORMED (BPB) [6.2] {5}

Found along channel margins and caused by eddies around a boulder obstruction. These pools are usually shallow and are dominated by fine-grain substrate. Current velocities are quite low.

BACKWATER POOL - ROOT WAD FORMED (BPR) [6.3] (6)

Found along channel margins, and caused by eddies around a root wad obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Current velocities are quite low.

BACKWATER POOL - LOG FORMED (BPL) [6.4] {7}



BACKWATER POOL - "BPL" LOG FORMED

Found along channel margins and caused by eddies around a large woody debris obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Current velocities are quite low.

DAMMED POOLS (DPL) [6.5] {13}



DAMMED POOL - "DPL"

Water impounded from a complete or nearly complete channel blockage (debris jams, rock landslides or beaver dams). Substrate tend toward smaller gravel and sand.

B.

II-2: Rosgen Classification System Summary

(GLOSI & REYNOLDS, DFG, 1991)

STREAM CLASSIFICATION

Numerous stream classification systems have been developed for a myriad of purposes. This manual uses the stream classification system developed by Dave Rosgen which categorizes various stream types by morphological characteristics. Delineation criteria are soil/landform features, valley confinement, stream gradient (measured as energy slope of the water surface), channel materials or substrate, entrenchment or width/depth ratio, and sinuosity.

The Rosgen system of stream classification can provide a variety of data. Some important applications of this data are:

- a. Determine the suitability of habitat restoration structures.
- b. Describe the specific reaches by channel type, and their sequence within the basin.
- c. Provide baseline data from which to anticipate and measure channel responses to:
 - 1) upslope management activities affecting sediment input rates or water discharge timing;
 - 2) major flood events (to assist in determining the stage and form of channel recovery);
 - 3) controlled or reduced flows resulting from water diversion;
 - 4) installation of instream habitat structures;
 - 5) sediment storage or transport capabilities.
- d. Provide information on the potential effects from restoration and enhancement of the riparian corridor.

Definitions and Delineation Criteria

- a. Bankfull discharge: The discharge corresponding to the stage at which the flood plain of a particular stream reach begins to be flooded. The point at which over bank flow begins. This level is delineated by deposits of fine sediments such as sand or silt at the active scour mark, break in stream bank slope, and or perennial vegetation limit (Figure 5).

- b. Flood plain: Any flat, or nearly flat lowland that borders a stream and is covered by its waters at flood stage (Figure 5).
- c. General Description: A general description of the channel.
- d. Landform/Soils: A general description of the slopes, bank stability, and soil composition.
- e. Water Slope/Gradient (measured as energy slope of the water surface):
 - 1) The general slope, or rate of change in elevation per unit of horizontal distance, as defined by the bankfull discharge demarcations.
 - 2) The rate of change in elevation of any characteristic per unit of horizontal distance.
- f. Dominant Particle Size of Channel Materials: The mineral and/or organic material that forms the bed of the stream.

PARTICLE SIZE:	INCHES	METRIC
Large Boulder	40-160"	102.4-409.6 cm
Medium Boulder	20-40"	51.2-102.4 cm
Small Boulder	10-20"	25.6-51.2 cm
Large Cobble	5-10"	12.8-25.6 cm
Small Cobble	2.5-5"	6.4-12.8 cm
Gravel	0.08-2.5"	2.0-64.0 mm
Sand	<0.08"	0.062-2.0 mm
Silt/Clay	N/A	<0.062 mm
Bedrock	N/A	N/A

- g. Channel Entrenchment: The ratio of the average width to the average depth during bankfull discharge (width/depth ratio). The categories are:
 - 1) Deeply entrenched <10
 - 2) Moderately entrenched 10 to 15
 - 3) Shallow entrenchment >15
 - h. Sinuosity
 - 1) The ratio of channel length between two points on a channel to the straight line distance between the same two points.
 - 2) The ratio of stream length to down valley length (Figure 6).
 - i. Valley Confinement: The ratio of active flood plain width over bankfull width (Figure 7). The categories are:
 - 1) Well confined (FP/BF width <1.5)
 - 2) Moderately confined (FP/BF width 1.5 to 2.5)
 - 3) Slightly confined (FP/BF width >2.5)
 - 4) Braided
-

Stream gradient (water slope/energy gradient), entrenchment or the width/depth ratio, dominant substrate, and confinement are all determined from measurements taken in the field. Sinuosity can be determined from a 7 1/2 minute topographic map by measuring the lengths of the valley and the stream. Each measurement will be discussed later in Part III.

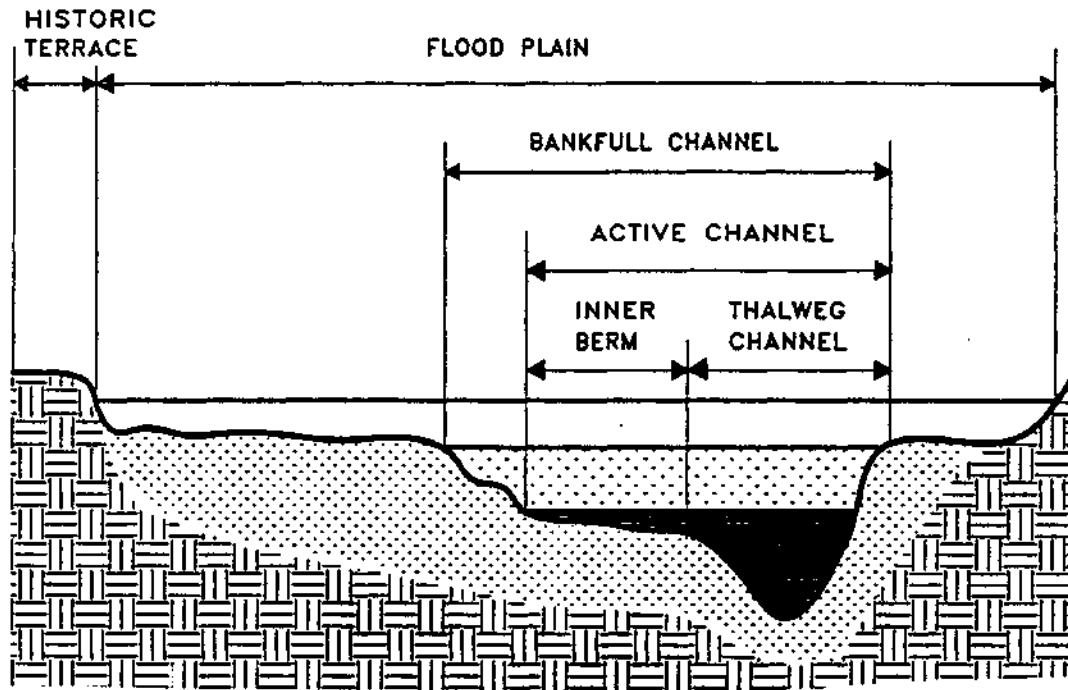


Figure 5. Channel cross section.

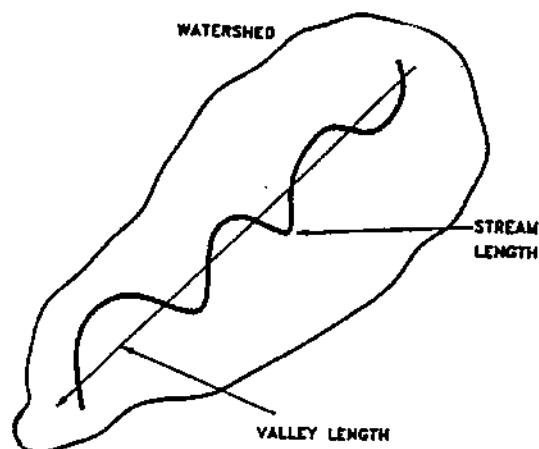


Figure 6. Sinuosity.

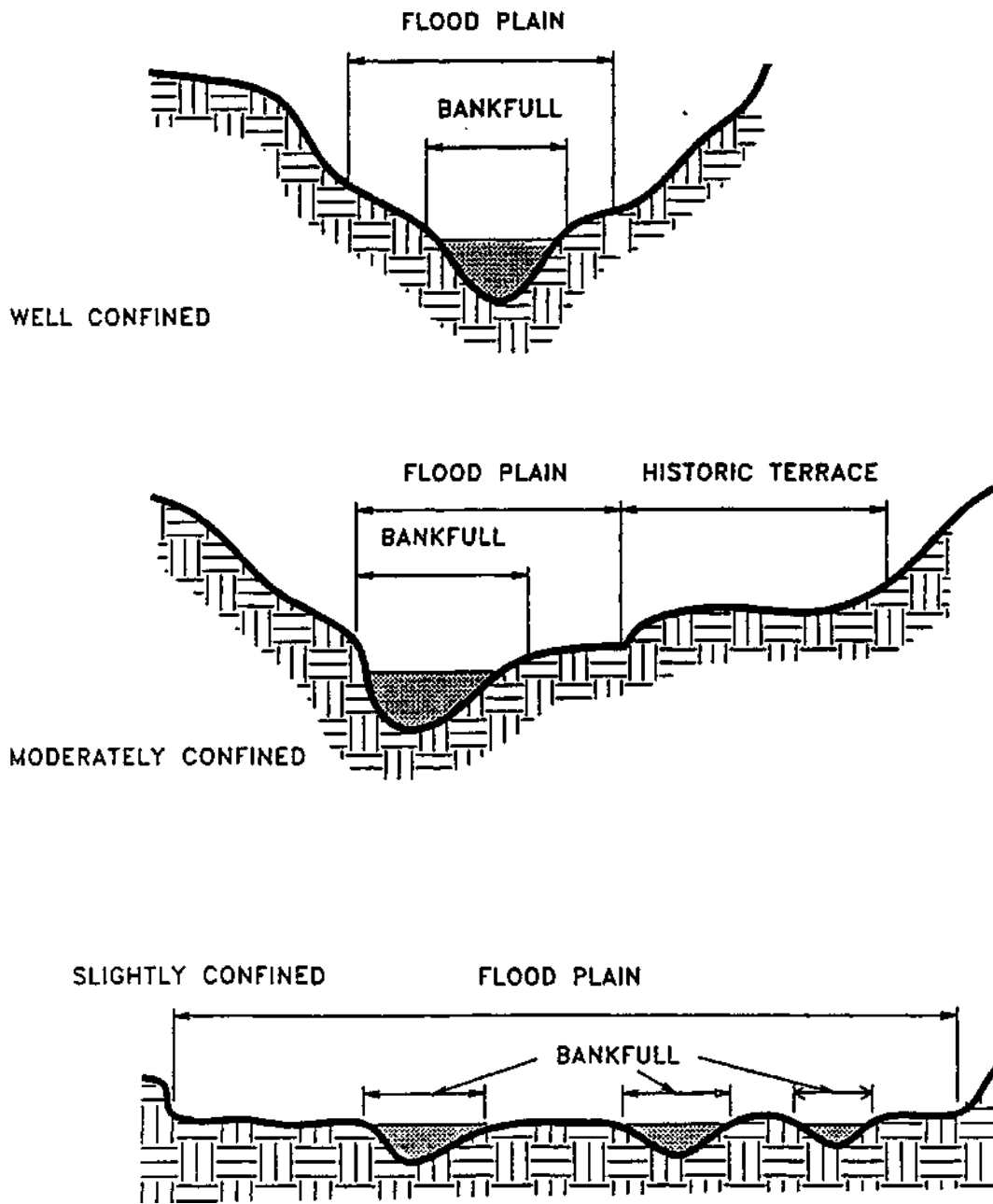


Figure 7. Confinement.

GENERALIZED VISUAL DELINEATION OF
 MAJOR STREAM TYPES
 (ROSGEN, 1991)

A	G <i>Cpvenously b. bela</i>	B	C	D	E	F
A1	G 1	B1	C1			F1
A2	G 2	B2	C2	D2		F2
A3	G 3	B3	C3	D3	E3	F3
A4	G 4	B4	C4	D4	E4	F4
A5	G 5	B5	C5	D5	E5	F5
A6	G 6	B6	C6	D6	E6	F6
000	02-039	02 039	< 01	01-019	< 02	< 02

II-3: McNeil Scores, 1988-91, North Fork Garcia Monitoring Project

McNeil Scores, 1989-1991, sites 1-5, North Fork Garcia River (sic) (NCWQCB & R&J TIMBER< INC., 1989-91)

Year	Site	Sample	-----Raw Scores-----							----- Percent Totals -----							----- Cumulative Percent Totals -----						
			75	25.4	12.5	4.75	2.37	1	<1	75%	25.4%	12.5%	4.75%	2.37%	1%	<1%	<2.37%	<4.75%	<12.5%	<25.4%	<75%	Total%	
89	1	1	0	725	330	355	295	540	550	0	26	12	13	11	19	20	39	50	62	74	100	100	
89	1	2	0	535	550	490	265	290	455	0	21	21	19	10	11	18	29	39	58	79	100	100	
89	1	3	0	540	290	710	540	340	416	0	19	10	25	19	12	15	27	46	71	81	100	100	
89	1	4	0	985	360	410	220	270	385	0	37	14	16	8	10	15	25	33	49	63	100	100	
89	1	5	0	570	420	515	205	190	440	0	24	18	22	9	8	19	27	36	58	76	100	100	
89	1	6	340	465	360	340	275	560	370	12.5	17	13	13	10	21	14	34	44	57	70	87	100	
89	1	7	0	600	500	450	135	155	470	0	26	22	19	6	7	20	27	33	52	74	100	100	
89	1	8	0	600	420	375	270	490	405	0	23	16	15	11	19	16	35	46	60	77	100	100	
89	1	9	0	595	300	390	265	330	390	0	26	13	17	12	15	17	32	43	61	74	100	100	
89	1	10	0	550	480	485	180	180	475	0	23	20	21	6	8	20	28	36	56	77	100	100	
89	2	1	0	540	560	260	65	60	171	0	33	34	16	4	4	10	14	18	34	67	100	100	
89	2	2	0	660	640	380	90	120	252	0	31	30	18	4	6	12	17	22	39	69	100	100	
89	2	3	0	90	490	650	260	210	276	0	5	25	33	13	11	14	25	36	71	95	100	100	
89	2	4	0	470	745	380	40	25	102	0	27	42	22	2	1	6	7	9	31	73	100	100	
89	2	5	0	1280	320	100	30	70	257	0	62	16	5	1	3	12	16	17	22	38	100	100	
89	2	6	0	424	820	460	10	90	374	0	19	37	22	0	4	17	21	22	43	81	100	100	
89	2	7	0	695	305	400	335	380	859	0	23	10	13	11	13	29	42	53	66	77	100	100	
89	2	8	0	830	560	480	270	320	306	0	30	20	17	10	12	11	23	32	50	70	100	100	
89	2	9	0	610	430	440	200	230	285	0	28	20	20	9	10	13	23	33	53	72	100	100	
89	2	10	470	740	630	530	265	300	263	14.7	23	20	17	8	9	8	18	26	42	62	85	100	
89	3	1	0	610	335	610	110	26	740	0	25	14	25	5	1	30	32	36	61	75	100	100	
89	3	2	0	690	415	530	225	250	800	0	24	14	18	8	9	27	36	44	62	76	100	100	
89	3	3	395	250	450	630	285	215	615	13.9	9	16	22	10	8	22	29	39	61	77	86	100	
89	3	4	0	725	335	400	175	95	560	0	32	15	17	8	4	24	29	36	54	68	100	100	
89	3	5	285	560	515	350	94	92	660	11.2	22	20	14	4	4	26	29	33	47	67	89	100	
89	3	6	0	570	570	480	210	140	655	0	22	22	18	8	5	25	30	38	57	78	100	100	
89	3	7	0	620	450	500	275	260	940	0	20	15	16	9	9	31	39	48	65	80	100	100	
89	3	8	530	430	350	240	60	40	425	25.5	21	17	12	3	2	20	22	25	37	54	74	100	
89	3	9	1150	135	350	230	45	25	400	49.3	6	15	10	2	1	17	18	20	30	45	51	100	
89	3	10	320	590	320	490	140	60	630	11.6	21	12	18	S	2	30	32	37	55	67	88	100	
89	4	1	0	600	310	405	165	215	485	0	28	14	19	6	10	22	32	40	58	72	100	100	
89	4	2	0	385	400	455	170	160	480	0	19	20	22	8	8	23	31	40	62	81	100	100	

McNeil Scores, 1989-1991, sites 1 - 5, North Fork Garcia River

Year	Site	Sample	----- Raw Scores -----						----- Percent Totals -----						----- Cumulative Percent Totals -----							
			75	25.4	12.5	4.75	2.37	1	<1	75%	25.4%	12.5%	4.75%	2.37%	1%	<1%	<2.37%	<4.75%	<12.5%	<25.4%	<75%	Total%
89	4	3	0	670	250	385	245	365	562	0	27	10	16	10	15	23	37	47	63	73	100	100
89	4	4	0	810	240	330	200	200	565	0	35	10	14	9	9	24	33	41	55	65	100	100
89	4	5	0	1150	350	320	220	285	635	0	39	12	11	7	10	21	31	39	49	61	100	100
89	4	6	0	180	550	510	125	140	630	0	6	26	24	6	7	30	36	42	66	92	100	100
83	4	7	0	250	465	560	190	240	1085	0	9	17	20	7	9	39	47	54	74	91	100	100
89	4	8	270	670	350	370	170	285	465	10.5	26	14	14	7	11	18	29	36	50	64	90	100
89	4	9	0	330	450	430	190	215	560	0	15	21	20	9	10	26	36	45	64	85	100	100
89	4	10	0	310	265	500	280	320	785	0	13	11	20	11	13	32	45	56	77	87	100	100
89	5	1	0	480	520	520	205	280	490	0	19	21	21	8	11	20	31	39	60	81	100	100
89	5	2	0	470	320	380	210	250	675	0	20	14	16	9	11	29	40	49	66	80	100	100
89	5	3	0	280	320	460	270	330	930	0	11	12	18	10	13	36	49	59	77	89	100	100
89	5	4	0	575	450	430	160	200	700	0	23	18	17	6	8	28	36	42	59	77	100	100
89	S	5	0	520	410	460	225	260	800	0	19	15	17	8	10	30	40	48	65	81	100	100
89	5	6	0	285	280	585	305	390	1100	0	15	15	32	17	21	0	21	38	69	85	100	100
89	5	7	0	650	510	490	205	160	710	0	24	19	18	8	6	26	32	39	57	76	100	100
89	S	8	0	170	510	430	165	200	607	0	8	24	21	8	10	29	39	47	67	92	100	100
89	5	9	0	530	410	480	260	310	685	0	20	15	18	10	12	26	37	47	65	80	100	100
89	5	10	g	370	370	520	240	325	1210	0	12	12	17	8	11	40	51	58	76	88	100	100
90	1	1	0	320	440	570	290	410	555	0	12	17	22	11	16	22	38	49	71	63	100	100
90	1	2	390	640	450	530	300	290	590	12.2	20	14	17	9	9	18	28	37	54	68	88	100
90	1	3	0	390	650	630	290	430	630	0	13	22	21	10	14	21	35	45	66	87	100	100
90	1	4	0	630	520	390	240	180	400	0	27	22	17	10	8	17	25	35	51	73	100	100
90	1	5	380	270	260	330	210	260	330	18.6	13	13	16	10	13	16	29	39	55	68	81	100
90	1	6	0	280	430	480	300	420	565	0	11	17	19	12	17	23	40	52	71	89	100	100
90	1	7	0	720	240	310	200	230	430	0	34	11	15	9	11	20	31	40	55	66	100	100
90	1	8	0	400	310	620	540	940	830	0	11	9	17	15	26	23	49	63	80	89	100	100
90	1	9	0	120	410	430	400	420	670	0	5	17	18	16	17	27	44	61	78	95	100	100
90	1	10	0	270	470	630	480	620	665	0	9	15	20	15	20	21	41	56	76	91	100	100
90	2	1	0	240	450	570	115	390	300	0	12	22	28	6	19	15	33	39	67	86	100	100
90	2	2	0	445	475	535	200	170	315	0	21	22	25	9	8	15	23	32	57	79	100	100
90	2	3	0	60	380	750	470	370	490	0	2	15	30	19	15	19	34	53	83	98	100	100
90	2	4	715	350	170	290	130	260	475	29.9	15	7	12	5	11	20	31	36	48	55	70	100

McNeil Scores, 1989-1991, sites 1-5, North Fork Garcia River

Garcia River Watershed Enhancement Plan

Year	Site	Sample	----- Raw Scores -----								----- Percent Totals -----					----- Cumulative Percent Totals -----						
			75	25.4	12.5	4.75	2.37	1	<1	75%	25.4%	12.5%	4.75%	2.37%	1%	<1%	<2.37%	<4.75%	<12.5%	<25.4%	<75%	Total%
90	2	5	0	310	480	560	490	600	505	0	11	16	19	17	20	17	38	54	73	89	100	100
90	2	6	0	700	470	245	120	90	240	0	38	25	13	6	5	13	18	24	37	62	100	100
90	2	7	0	460	290	530	270	190	260	0	23	15	27	14	10	13	23	36	63	77	100	100
90	2	8	0	525	425	535	330	390	332	0	21	17	21	13	15	13	28	41	63	79	100	100
90	2	9	0	900	510	380	150	150	250	0	38	22	16	6	6	11	17	24	40	62	100	100
90	2	10	0	240	450	460	310	480	440	0	10	19	19	13	20	18	39	52	71	90	100	100
90	3	1	0	60	410	790	310	75	492	0	3	19	37	15	4	23	27	41	78	97	100	100
90	3	2	0	450	520	590	230	110	275	0	21	24	27	11	5	13	18	28	55	79	100	100
90	3	3	0	240	300	520	270	180	413	0	12	16	27	14	9	21	31	45	72	86	100	100
90	3	4	0	990	400	250	70	95	335	0	46	19	12	3	4	16	20	23	35	54	100	100
90	3	5	0	530	340	375	215	415	495	0	22	14	16	9	18	21	38	47	63	78	100	100
90	3	6	0	645	395	285	90	55	410	0	34	21	15	5	3	22	25	30	45	66	100	100
90	3	7	400	435	200	200	70	50	250	24.9	27	12	12	4	3	16	19	23	36	48	75	100
90	3	8	240	400	590	290	50	22	183	13.5	23	33	16	3	1	10	12	14	31	64	86	100
90	3	9	0	380	770	656	60	25	305	0	17	35	30	4	1	14	15	19	48	83	100	100
90	3	10	0	370	310	435	200	180	415	0	19	16	23	10	9	22	31	42	64	81	100	100
90	4	1	0	320	390	560	270	360	670	0	12	15	22	11	14	26	40	51	72	88	100	100
90	4	2	0	290	410	620	330	450	605	0	11	15	23	12	17	22	39	51	74	89	100	100
90	4	3	235	420	330	450	750	450	860	6.72	12	9	13	21	13	25	37	59	72	81	93	100
90	4	4	0	60	100	210	10	110	590	0	6	9	19	1	10	55	65	66	85	94	100	100
90	4	5	0	725	390	620	260	320	500	0	26	14	22	9	11	18	29	36	60	74	100	100
90	4	6	0	460	470	470	140	270	410	0	21	21	21	6	12	18	31	37	58	79	100	100
90	4	7	0	30	400	770	410	260	625	0	1	16	31	16	10	25	35	52	83	99	100	100
90	4	8	0	390	260	380	150	260	520	0	20	13	19	8	13	27	40	47	67	80	100	100
90	4	9	780	370	340	400	200	170	410	29.2	14	13	15	7	6	15	22	29	44	57	71	100
90	4	10	0	300	320	370	260	290	551	0	14	15	18	12	14	26	40	53	70	66	100	100
90	5	1	0	460	425	470	170	210	440	0	21	20	22	8	10	20	30	36	59	79	100	100
90	5	2	0	590	460	480	230	240	764	0	21	17	17	8	9	28	37	45	62	79	100	100
90	5	3	230	310	350	425	340	520	875	7.54	10	11	14	11	17	29	46	57	71	82	92	100
90	5	4	450	175	440	520	175	170	635	17.5	7	17	20	7	7	25	31	38	58	76	82	100
90	5	5	0	360	820	520	110	60	700	0	14	32	20	4	3	27	30	34	54	86	100	100
90	5	6	0	360	440	470	260	350	735	0	14	17	18	10	13	28	41	51	69	86	100	100

McNeil Scores, 1989-1991, sites 1-5, North Fork Garcia River

Year	Site	Sample	Raw Scores							Percent Totals							Cumulative Percent Totals						
			75	25.4	12.5	4.75	2.37	1	<1	75%	25.4%	12.5%	4.75%	2.37%	1%	<1%	<2.37%	<4.75%	<12.5%	<25.4%	<75%	Total%	
90	5	7	0	70	310	670	410	475	758	0	3	12	25	15	18	28	46	61	86	97	100	100	
90	5	8	0	580	620	462	170	130	605	0	23	24	18	7	6	24	29	35	53	77	100	100	
90	5	9	0	240	510	520	260	210	800	0	9	20	20	10	8	31	40	50	70	91	100	100	
90	5	10	0	200	480	580	325	445	910	0	7	16	20	11	15	31	46	57	77	93	100	100	
91	1	1	0	150	380	535	290	395	303	0	7	19	26	14	19	15	34	48	74	93	100	100	
91	1	2	0	870	400	310	100	110	300	0	42	19	15	5	5	14	20	24	39	58	100	100	
91	1	3	0	1000	490	410	150	180	252	0	40	20	17	6	7	10	17	23	40	60	100	100	
91	1	4	0	430	390	420	230	310	350	0	20	18	20	11	15	16	31	42	62	80	100	100	
91	1	5	0	860	620	500	210	100	410	0	32	23	19	8	4	15	19	27	45	68	100	100	
91	1	6	0	940	460	370	150	190	341	0	38	19	15	6	B	14	22	28	43	62	100	100	
91	1	7	0	810	520	420	150	110	328	0	35	22	18	6	5	14	19	25	43	65	100	100	
91	1	8	0	720	360	390	190	100	357	0	34	17	18	9	5	17	22	31	49	66	100	100	
91	1	9	0	570	440	530	260	250	248	0	25	19	23	11	11	11	22	33	56	75	100	100	
91	1	10	570	580	490	330	110	80	366	22.6	23	19	13	4	3	14	18	22	35	54	77	100	
91	2	1	0	590	730	710	300	65	155	0	23	29	28	12	3	6	9	20	48	77	100	100	
91	2	2	0	560	600	470	140	80	325	0	26	28	22	6	4	15	19	25	47	74	100	100	
91	2	3	0	290	410	340	50	495	365	0	15	21	17	3	25	19	44	47	64	85	100	100	
91	2	4	500	560	380	380	100	55	300	22	25	17	17	4	2	13	16	20	37	53	78	100	
91	2	5	2060	320	330	390	260	520	725	44.7	7	7	8	6	11	16	27	33	41	48	55	100	
91	2	6	430	0	380	530	210	240	420	19.5	0	17	24	10	11	19	30	39	63	81	81	100	
91	2	7	250	390	410	210	280	640	345	9.9	15	16	8	11	25	14	39	50	58	75	90	100	
91	2	8	500	210	260	150	110	265	390	26.5	11	14	8	6	14	21	35	41	49	62	73	100	
91	2	9	480	650	300	330	210	340	295	18.4	25	12	13	8	13	11	24	32	45	57	82	100	
91	2	10	0	430	330	380	320	420	415	0	19	14	17	14	18	18	36	50	67	81	100	100	
91	3	1	0	150	310	530	330	440	575	0	6	13	23	14	19	25	43	58	80	94	100	100	
91	3	2	280	640	490	330	90	70	550	11.4	26	20	13	4	3	22	25	29	42	62	89	100	
91	3	3	550	1100	190	180	80	45	410	21.5	43	7	7	3	2	16	18	21	28	35	78	100	
91	3	4	0	250	690	630	210	100	285	0	12	32	29	10	5	13	16	27	57	88	100	100	
91	3	S	0	250	245	460	230	260	430	0	13	13	25	12	14	23	37	49	74	87	100	100	
91	3	6	0	0	260	1010	340	105	320	0	0	13	50	17	5	16	21	38	87	100	100	100	
91	3	7	0	540	430	480	250	305	680	0	20	16	18	9	11	25	37	46	64	80	100	100	
91	3	8	0	340	330	430	185	205	475	0	17	17	22	9	10	24	35	44	66	83	100	100	

McNeil Scores, 1989-1991, sites 1-5, North Fork Garcia River

Year	Site	Sample	Raw Scores							Percent Totals							Cumulative Percent Totals					Total%
			75	254	12.5	4.75	2.37	1	<1	75%	25.4%	12.5%	4.75%	2.37%	1%	<1%	<2.37%	<4.75%	<12.5%	<25.4%	<75%	
91	3	9	0	780	270	350	250	310	600	0	30	11	14	10	12	23	36	45	59	70	100	100
91	3	10	0	0	105	690	860	90	389	0	0	5	32	40	4	18	22	63	95	100	100	100
91	4	1	550	500	300	340	210	330	900	17.6	16	10	11	7	11	29	39	46	57	66	82	100
91	4	2	0	400	310	550	215	302	425	0	18	14	25	10	14	19	33	43	68	82	100	100
91	4	3	360	370	330	425	185	290	975	12.3	13	11	14	6	10	33	43	49	64	75	88	100
91	4	4	0	110	340	420	180	205	400	0	7	21	25	11	12	24	37	47	73	93	100	100
91	4	5	480	220	220	330	170	185	495	22.9	10	10	16	8	9	24	32	40	56	67	77	100
91	4	6	470	640	230	220	146	180	398	20.6	28	10	10	6	8	17	25	32	41	51	79	100
91	4	7	0	290	280	330	180	160	775	0	14	14	16	9	8	38	46	55	72	86	100	100
91	4	8	0	230	330	370	200	240	520	0	12	17	20	11	13	28	40	51	70	88	100	100
91	4	9	0	180	320	420	240	350	60S	0	9	15	20	11	17	29	45	57	76	91	100	100
91	4	10	300	540	340	410	210	260	825	10.4	19	12	14	7	9	29	38	45	59	71	90	100
91	5	1	0	390	440	430	210	230	810	0	16	18	17	8	9	32	41	50	67	84	100	100
91	S	2	0	330	450	550	380	600	1075	0	10	13	16	11	18	32	49	61	77	90	100	100
91	5	3	0	550	605	500	230	185	730	0	20	22	18	8	7	26	33	41	59	80	100	100
91	5	4	0	565	635	565	100	95	775	0	20	25	20	4	3	28	31	35	55	80	100	100
91	S	5	0	420	460	545	230	335	820	0	15	16	19	8	12	29	41	49	69	85	100	100
91	S	6	0	710	480	460	270	375	785	0	23	18	15	9	12	25	38	46	61	77	100	100
91	S	7	0	80	290	320	190	300	725	0	4	15	17	10	16	38	54	64	81	96	100	100
91	S	8	0	110	430	680	275	410	850	0	4	16	25	10	15	31	46	56	80	96	100	100
91	S	9	0	120	430	610	460	495	1170	0	4	13	19	14	15	36	51	65	83	96	100	100
91	5	10	0	220	450	530	320	250	980	0	8	16	19	12	9	36	45	56	76	92	100	100

II-4: Summary of Habitat Types and Biological Inventory
of the North Fork Garcia River, Estuary, and Mainstem Garcia River,
Prepared by Jan Derksen, Ph.D., December 1991

SUMMARY OF HABITAT TYPES AND
BIOLOGICAL INVENTORY OF THE
NORTH FORK GARCIA RIVER ESTUARY AND MAINSTEM GARCIA RIVER

Prepared by

Jan Derksen, Ph.D.

December 10, 1991

TABLE 1.

Garcia River North Fork
12/09/91 Summary of habitat types

#	Habitat	%	Mean Length	Total Length	% Total Length	Mean Width	Mean Depth	Mean Max Depth	Mean Area	Total Area	Mean Volume	Total Volume	Mean Res Pool Vol	Mean Shelter Rating	Mean % Rt Bank Cover	Mean % Lt Bank Cover	Mean % Canopy
Unit	Type	Units	(Ft)	(Ft)	Length (Ft)	(Ft)	(Ft)	Depth	(Sq Ft)	(Ft)	(Cu Ft)	(Cu Ft)	(Sq Ft)	Rating	Cover	Cover	Canopy
15	L6R	6.8	56.2	843.0	4.1	19.3	.4	.9	1117	1676	468	7024		31.8	58.0	58.0	43.7
23	HGR	10.4	41.5	955.0	4.7	15.7	.5	1.0	707	1626	373	8568		81.3	51.4	51.4	63.2
14	CAS	6.3	31.9	447.0	2.2	17.4	.5	1.2	670	938	286	4007		167.6	39.3	39.3	39.3
16	RUN	7.2	102.3	1636.0	8.0	15.9	.6	2.3	1714	2742	1081	17289		42.9	62.5	62.5	58.4
52	SRN	23.5	200.9	10447.0	51.3	17.2	.6	1.6	3606	18752	2250	116981		81.7	42.7	42.7	47.7
2	TRP	.9	46.5	93.0	.5	13.0	.0	2.1	588	117	574	1149	934.0	81.0	25.0	25.0	50.0
16	MCP	7.2	53.5	856.0	4.2	16.1	.3	2.9	830	1407	1263	20212	2273.6	69.3	41.3	41.3	45.6
19	STP	8.6	120.7	2293.0	11.3	17.5	.9	2.2	2296	4362	2345	44555	4600.4	113.2	34.2	34.2	42.6
15	LSL	6.8	44.6	669.0	3.3	17.8	.2	2.8	777	1166	947	14209	1883.0	125.0	38.0	38.0	50.7
9	L5R	4.1	55.7	501.0	2.5	16.0	.2	2.6	1005	904	1343	12090	2573.2	83.7	60.0	60.0	53.3
18	LSBK	8.1	47.6	856.0	4.2	15.1	.2	2.8	717	1291	892	16048	1848.7	64.7	27.8	27.8	52.2
B	LSBC	3.6	39.6	317.0	1.6	18.0	.2	2.7	716	572	891	7127	1734.5	75.0	43.8	43.8	38.8
6	PLP	2.7	30.5	183.0	.9	22.0	.5	3.0	763	457	1132	6790	1930.8	123.5	23.3	23.3	20.0
1	SCP	.5	58.0	58.0	.3	5.0	.3	.9	290	29	87	87		81.0	50.0	50.0	80.0
3	BPB	1.4	23.3	70.0	.3	18.7	.1	2.3	455	136	495	1484	652.6	75.0	36.7	36.7	46.7
1	BPR	.5	13.0	13.0	.1	10.0	.0	2.2	130	13	130	130	234. n	75.0	70.0	70.0	40.0
3	DPL	1.4	39.7	119.0	.6	14.0	.1	2.6	547	164	531	1743	1207.1	68.3	20.0	20.0	50.0

Total : Total Length 20,356.00 (Ft) Total Area 8.35 Acres Total Volume 279,492

Garcia River Estuary and Main Stem
12/09/91 Summary of habitat types

#	Habitat	%	Mean Length	Total Length	% Total Length	Mean Width	Mean Depth	Mean Max Depth	Mean Area	Total Area	Mean Volume	Total Volume	Mean Res Pool Vol	Mean Shelter Rating	Mean % Rt Bank Cover	Mean % Lt Bank Cover	Mean % Canopy
Unit	Type	Units	(Ft)	(Ft)	Length (Ft)	(Ft)	(Ft)	Depth	(Sq Ft)	(Ft)	(Cu Ft)	(Cu Ft)	(Sq Ft)	Rating	Cover	Cover	Canopy
46	LGR	27.5	129.0	5936.0	14.4	32.9	.7	1.2	4063	18669	2767	127275		26.4	90.2	90.2	13.6
18	GLL	10.8	351.9	6334.0	15.4	48.5	1.0	2.2	18916	34048	21878	393797	85319.5	51.8	92.8	92.8	27.0
27	RUN	16.2	323.4	8733.0	21.2	35.6	1.1	2.2	12299	33206	15282	412603	-4351.5	45.0	89.6	89.6	16.8
8	MCP	4.8	258.6	2069.0	5.0	48.3	2.8	4.5	13438	10790	38781	310248	52666.4	112.4	97.5	97.5	23.1
22	CRP	13.2	343.4	7555.0	18.3	45.1	2.9	5.2	17117	37657	49875	1097257	87867.4	115.3	84.1	84.1	25.9
16	L5L	9.6	266.6	4265.0	10.4	37.1	2.1	3.3	12002	19203	21334	341349	33737.6	114.4	82.5	82.5	25.0
9	LSR	5.4	172.1	1549.0	3.8	39.7	2.4	7.6	7740	6965	22568	203109	62657.6	79.3	85.6	85.6	23.1
3	LSBK	1.8	321.3	964.0	2.3	47.7	2.3	4.5	15352	4605	36205	108615	63391.1	133.0	83.3	83.3	38.3
5	LSBC	3.0	239.6	1198.0	2.9	42.0	2.3	4.3	10401	5200	26622	133110	42712.7	94.2	98.0	98.0	27.0
8	SCP	4.8	200.0	1600.0	3.9	19.5	.8	2.6	3831	3064	3572	28576	9181.0	66.4	91.3	91.3	41.5
1	BPB	.6	200.0	200.0	.5	5.0	.7	2.2	1000	100	700	700		180.0	100.0	100.0	100.0
1	BPR	.6	189.0	189.0	.5	4.0	.6	3.0	756	75	454	454	2116.8	105.0	100.0	100.0	90.0
2	BPL	1.2	207.0	414.0	1.0	15.0	1.5	4.5	3115	623	4392	8784	11457.6	126.0	80.0	80.0	70.0
1	DPL	.6	174.0	174.0	.4	48.0	1.3	2.1	8352	835	10858	10855		25.0	100.0	100.0	15.0

Totals: Total Length 41,180.00 (Ft) Total Area 40.19 Acres Total Volume 3,176,733

TABLE 2.

North Fork Garcia

12/09/91

Summary of habitat types

Unit #	Habitat Type	% Units	Mean Length (Pt)	Total Length (Ft)	% Total Length	Mean Width (Ft)	Mean Depth (Ft)	Mean Max Depth	Mean Area (Sq Ft)	Total Area (Ft)	Mean Volume (Cu Ft)	Total Volume (Cu Ft)	Mean Res Pool Vol (Sq Ft)	Mean Shelter Rating
68	FLATWATER	30.8	177.7	12083	59.4	16.9	.6	1.7	3161.0	214947.0	1975	134270.2		72.6
101	POOL	45.7	59.7	6028	29.6	16.7	1.2	- 2.6	1051.7	106221.0	1244	125623.6	2037.6	90.8
52	RIFFLE	23.5	43.2	2245	11.0	17.2	.4	1.0	815.4	42400.0	377	19598.4		90.2

Garcia Estuary and Main Stem

12/10/91

Summary of habitat types

Unit #	Habitat Type	% Units	Mean Length (Ft)	Total Length (Ft)	% Total Length	Mean Width (Ft)	Mean Depth (Ft)	Mean Max Depth	Mean Area (Sq Ft)	Total Area (Ft)	Mean Volume (Cu Ft)	Total Volume (Cu Ft)	Mean Res Pool Vol (Sq Ft)	Mean Shelter Rating
45	FLATWATER	26.9	334.8	15067	36.6	40.7	1.1	2.2	14.946	672549.0	17920	806.400	62901.8	47.3
76	POOL	45.5	265.5	20177	49.0	38.5	2.2	4.5	11.727	891225.2	29514	2,243,058	56717.7	104.7
4ft	RIFFLE	27.5	129.0	5936	14.4	32.9	.1	1.2	4.063	186892.0	2767	127,275		26.4

Garcia River Watershed Enhancement Plan

Table 3.

North Fork Garcia

12/09/91 Summary of habitat types Page 1

Unit	Habitat Type	% Length Units	Mean Length (Ft)	Total Length (Ft)	% Total Length	Mean Width (Ft)	Mean Depth (ft)	Mean Max Depth	Mean Area (Sq Ft)	Total Area (Ft)	Mean Volume (Cu Ft)	Total Volume (Cu Ft)	Mean Res Pool Vol (Sq Ft)	Mean Shelter Rating
8	BACKWATER	3.6	32.5	260	1.3	14.1	1.0	2.2	428.0	3424.0	431	3444.4	916.1	73.3
14	CASCADE	6.3	31.9	447	2.2	17.4	.5	1.2	670.0	9380.0	286	4006.6		167.6
63	FLATWATER	30.8	177.7	12033	59.4	16.9	.6	1.7	3161.0	214947.0	1975	134270.2		72.6
37	MAIN	16.7	87.6	3242	15.9	16.7	1.1	2.5	1591.2	58876.0	1782	65916.1	2574.9	92.5
38	RIFFLE	17.2	47.3	1798	8.8	17.1	.4	1.0	868.9	33020.0	410	15591.8		61.7
56	SCOUR	25.3	45.1	2526	12.4	17.1	1.2	2.8	784.3	43921.0	1005	56263.1	1966.8	92.2

Garcia Estuary and Main Stem

ccl2/10/91 Summary of habitat types

Unit #	Habitat Type	% Length Units	Mean Length (Ft)	Total Length (Ft)	% Total Length	Mean Width (Ft)	Mean Depth (Ft)	Mean Max Depth	Mean Area (Sq Ft)	Total Area (Ft)	Mean Volume (Cu Ft)	Total Volume (Cu Ft)	Mean Res Pool Vol (Sq Ft)	Mean Shelter Rating
13	BACKWATER	7.8	198.2	2577	6.3	18.7	.9	2.8	3,614	46985.0	3798	49,371	8497.1	85.3
45	FLATWATER	26.9	334.8	15067	36.6	40.7	1.1	2.2	14,946	672549.0	17920	806,400	62901.8	47.8
8	MAIN	4.8	258.6	2069	5.0	45.3	2.8	4.5	13,488	107906.0	38781	310,248	52666.4	112.4
46	RIFFLE	27.5	129.0	5936	14.4	32.9	.7	1.2	4,063	186892.0	2767	127,275		26.4
55	SCOUR	32.9	282.4	15531	37.7	41.7	2.5	4.9	13,388	736334.2	34244	1,883,440	64425.1	108.2

TABLE 4.

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North Fork Garcia

12/09/91 Summary of Maximum pool depths

#	Hab. Type	%	<1		1-<2		3-<4		>4	
			Ft Max Depth	Ft %	Ft Max Depth	Ft %	Ft Max Depth	Ft %	Ft Max Depth	Ft %
15	LGR	6.8	9	32.1	6	6.5		0.0		0.0
23	HGR	10.4	10	35.7	13	14.0		0.0		0.0
14	CAS	6.3	3	10.7	10	10.3		0.0		0.0
16	RUN	7.2	1	3.6	13	14.0		0.0	1	14.3
52	SRN	23.5	4	14.3	37	39.8		0.0		0.0
2	TRP	.9		0.0	1	1.1		0.0		0.0
16	MCP	7.2		0.0	2	2.2	4	18.2	2	28.6
19	STP	8.6		0.0	7	7.5	2	9.1		0.0
15	LSL	6.8		0.0	1	1.1	4	18.2	1	14.3
9	LSR	4.1		0.0	1	1.1	3	13.6		0.0
18	LS8K	8.1		0.0		0.0	6	27.3	1	14.3
9	LSBC	3.6		0.0	1	1.1	1	4.5	1	14.3
6	PLP	2.7		0.0	1	1.1	2	9.1	1	14.3
1	SCP	.5	1	3.6		0.0		0.0		0.0
3	BPB	1.4		0.0		0.0		0.0		0.0
1	BPR	.5		0.0		0.0		0.0		0.0
3	DPL	1.4		0.0		0.0		0.0		0.0

Garcia Estuary and Main Stem

12/09/91 Summary of maximum pool depths

#	Hab. Type	%	<1		1-<2		3-<4		>4	
			Ft Max Depth	Ft %	Ft Max Depth	Ft %	Ft Max Depth	Ft %	Ft Max Depth	Ft %
46	LGR	27.5	22	73.3	17	48.6		0.0		0.0
18	GLD	10.8	2	6.7	6	17.1	2	8.7	1	2.3
27	RUN	16.2	3	10.0	9	25.7	7	30.4		0.0
3	MCP	4.3		0.0		0.0	1	4.3	6	14.0
22	CRP	13.2	1	3.3		0.0	4	17.4	.17	39.5
16	LSL	9.6	2	6.7	1	2.9	3	13.0	6	14.0
9	LSR	5.4		0.0	1	2.9	1	4.3	6	14.0
3	LSBK	1.3		0.0		0.0	1	4.3	2	4.7
5	LSBC	3.0		0.0		0.0	2	3.7	1	4.7
3	SCP	4.3		0.0		2.9	1	4.3	1	2.3
1	BPB	.6		0.0		0.0		0.0		0.0
1	BPR	.6		0.0		0.0	1	4.3		0.0
2	BPL	1.2		0.0		0.0		0.0	2	4.7
1	DPL	.6		0.0		0.0		0.0		0.0

Garcia River Watershed Enhancement Plan

Table 5.

North Fork Garcia

12/09/91 Summary of dominant substates

#	Hab. Type	Silt Clay	Silt Clay	Sand Domnt	Sand Domnt	Gravel Domnt	Gravel Domnt	Small Cobbl	Small Cobble	Small Cobble	Small Cobble	Boulder	Boulder	Bedrock Domnt	Bedrock Domnt
15	LGR	0	0.0	0	0.0	8	20.0	12	37.8	7	28.9	3	13.3	0	0.0
23	HGR	0	0.0	0	0.0	0	0.0	15	31.9	14	36.2	17	31.9	0	0.0
14	CAS	0	0.0	0	0.0	0	0.0	0	0.0	12	57.1	14	35.7	2	7.1
16	RUN	0	0.0	3	8.3	11	25.0	8	27.1	8	31.3	2	8.3	0	0.0
52	SRN	0	0.0	0	0.0	15	16.7	34	31.4	17	16.7	37	34.6	1	.6
2	TRP	0	0.0	0	0.0	0	0.0	1	33.3	0	0.0	2	50.0	1	16.7
16	MCP	0	0.0	8	25.0	7	20.8	0	0.0	6	18.8	10	33.3	1	2.1
19	STP	0	0.0	1	3.5	8	21.1	2	7.0	8	26.3	18	38.6	1	3.5
15	LSL	0	0.0	3	6.7	12	37.8	4	15.6	3	8.9	8	31.1	0	0.0
9	LSR	0	0.0	2	14.8	7	29.6	1	3.7	6	40.7	1	3.7	1	7.4
18	LSBK	1	1.9	7	18.5	13	31.5	3	7.4	2	7.4	8	27.8	2	5.6
8	LSBC	0	0.0	6	33.3	3	12.5	0	0.0	2	16.7	5	37.5	0	0.0
6	PLP	0	0.0	2	11.1	2	11.1	1	11.1	0	0.0	6	61.1	1	5.6
1	SCP	0	0.0	0	0.0	1	33.3	0	0.0	0	0.0	1	66.7	0	0.0
3	BPE	0	0.0	2	33.3	1	11.1	0	0.0	0	0.0	3	55.6	0	0.0
1	BPR	0	0.0	1	66.7	1	33.3	0	0.0	0	0.0	0	0.0	0	0.0
3	DPL	0	0.0	1	22.2	2	22.2	1	22.2	1	22.2	1	11.1	0	0.0

Garcia Estuary and Main Stem

12/09/91 Summary of dominant substrates

#	Hab. Type	Silt Clay	Silt Clay	Sand Domnt	Sand Domnt	Gravel Domnt	Gravel Domnt	Small Cobbl	Small Cobble	Small Cobble	Small Cobble	Boulder	Boulder	Bedrock Domnt	Bedrock Domnt
46	LGR	0	0.0	14	20.7	45	42.2	31	37.0	0	0.0	0	0.0	0	0.0
18	GLD	6	14.8	11	35.2	17	44.4	2	5.6	0	0.0	0	0.0	0	0.0
27	RUN	1	1.2	14	23.4	26	42.0	13	23.4	0	0.0	0	0.0	0	0.0
8	MCP	0	0.0	8	33.3	8	66.7	0	0.0	0	0.0	0	0.0	0	0.0
22	CRP	1	3.0	22	42.4	21	54.5	0	0.0	0	0.0	0	0.0	0	0.0
16	LSL	0	0.0	14	35.4	16	56.3	2	8.3	0	0.0	0	0.0	0	0.0
9	LSR	0	0.0	8	37.0	9	55.6	1	7.4	0	0.0	0	0.0	0	0.0
3	LSBK	0	0.0	0	33.3	0	66.7	0	0.0	0	0.0	0	0.0	0	0.0
5	LSBO	6	0.0	4	26.7	5	66.7	1	6.7	0	0.0	0	0.0	0	0.0
8	SCP		16.7	5	33.3	6	37.5	2	12.5	0	0.0	0	0.0	0	0.0
1	BPB	1	33.3	0	0.0	1	66.7	0	0.0	0	0.0	0	0.0	0	0.0
1	BPR	1	33.3	1	66.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	BPL	0	0.0	2	50.0	2	50.0	0	0.0	0	0.0	0	0.0	0	0.0
1	DPL	0	0.0	1	33.3	1	66.7	0	0.0	0	0.0	0	0.0	0	0.0

Table 6.

North Fork Garcia

12/09/91 Summary of mean percent cover

#	Mean % Undercut Banks	Mean % Sand	Mean % Lwd	Mean % Root Mass	Mean % Terr. Veget.	Mean % Aqua. Veget.	Mean % White Water	Mean % Boulder	Mean % Bedrock Ledges
LGR	1.0	2.6	2.3		5.4		1.4	6.9	
HGR	45.0	2.6	3.7	5.0	5.0	5.0	7.7	18.9	
CAS		4.0	3.7		7.5		21.2	31.4	17.5
RUN	1.0	2.9	3.0	2.6	4.7			8.8	
SRN	1.0	2.8	2.4	2.0	3.7		4.0	16.8	5.0
TRF		3.5	5.0					17.5	3.5
MCP	5.0	33.3	5.7	5.4	6.0			14.1	3.6
STP	2.0	3.1	3.4	3.2	2.8		5.8	26.1	4.6
LSL	4.0	9.3	16.7	7.3	6.4			8.5	2.0
LSR	6.8	4.2	6.4	7.6	4.8		20.0	6.9	
LSBK	3.0	3.3	3.5	5.0	5.0		6.0	12.9	5.6
LSBC	1.0	2.0	3.6	10.0	5.0		2.0	16.3	
PLP		20.0	21.0	7.5	10.0		3.8	20.0	8.8
SCP		2.0			5.0			20.0	
BPB			5.0					23.3	
BPR				5.0	10.0			10.0	
DPL		5.0	5.0		5.0			15.0	5.0

Garcia Estuary and Main Stem

12/09/91 Summary of lean percent cover

#	Mean % Undercut Banks	Mean % Swd	Mean % Lwd	Mean % Root Mass	Mean % Terr. Veget.	Mean % Aqua. Veget.	Mean % White Water	Mean % Boulder	Mean % Bedrock Ledges
LGR	4.0	5.2	4.0	5.6	11.5	2.7	9.7		
GLD	4.3	7.5	1.3	4.9	17.9	3.9			
RUN	5.0	6.4	2.0	3.6	12.3	3.9		4.3	
MCP	5.8	10.1	5.5	9.3	19.4	2.5	1.0		
CRP	6.6	12.2	7.3	6.9	20.3	2.9		5.3	
LSL	5.2	15.4	11.5	4.6	14.4	3.1		5.0	5.0
LSR	5.0	10.0	6.3	6.7	13.8	1.2	1.0		
LSEK	6.0	6.7	5.0	5.0	5.0	1.0		11.7	6.7
LSBO	5.0	8.3	5.0	10.0	5.3	3.0		12.0	5.0
SCP	4.0	15.8	1.0	5.0	12.1	4.5		2.0	5.0
BPB	10.0	10.0	10.0	10.0	20.0				
BPR	5.0	10.0	5.0	5.0	10.0				
BPL	7.5	10.0	20.0	15.0	12.5			1.0	
DPL	5.0	10.0			10.0				

Garcia River Watershed Enhancement Plan

Table 7.

North Fork Garcia

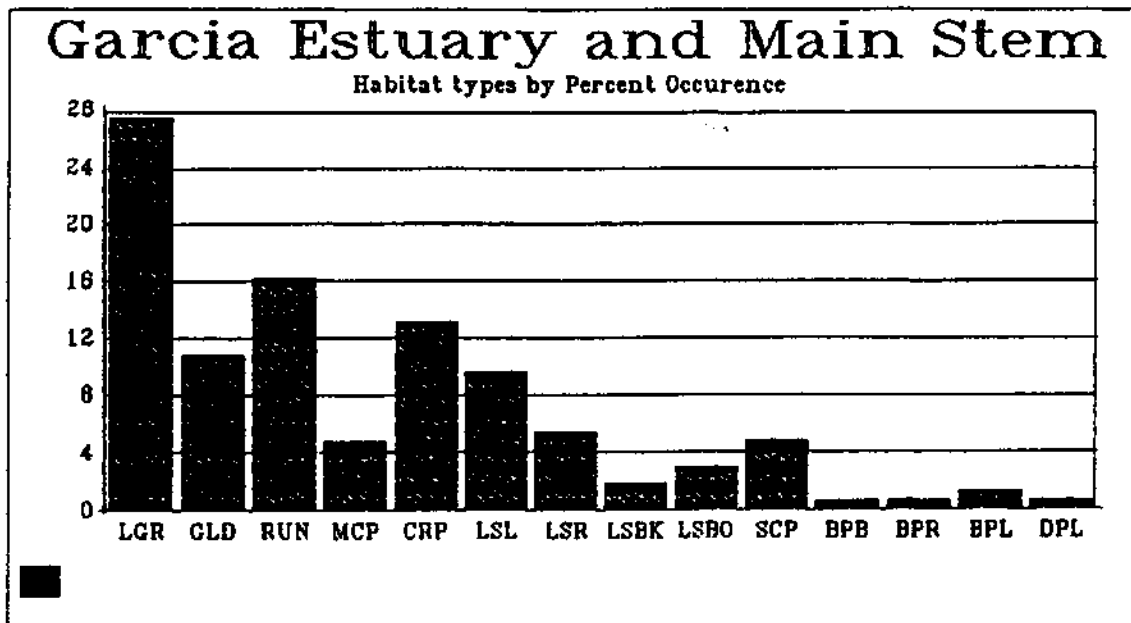
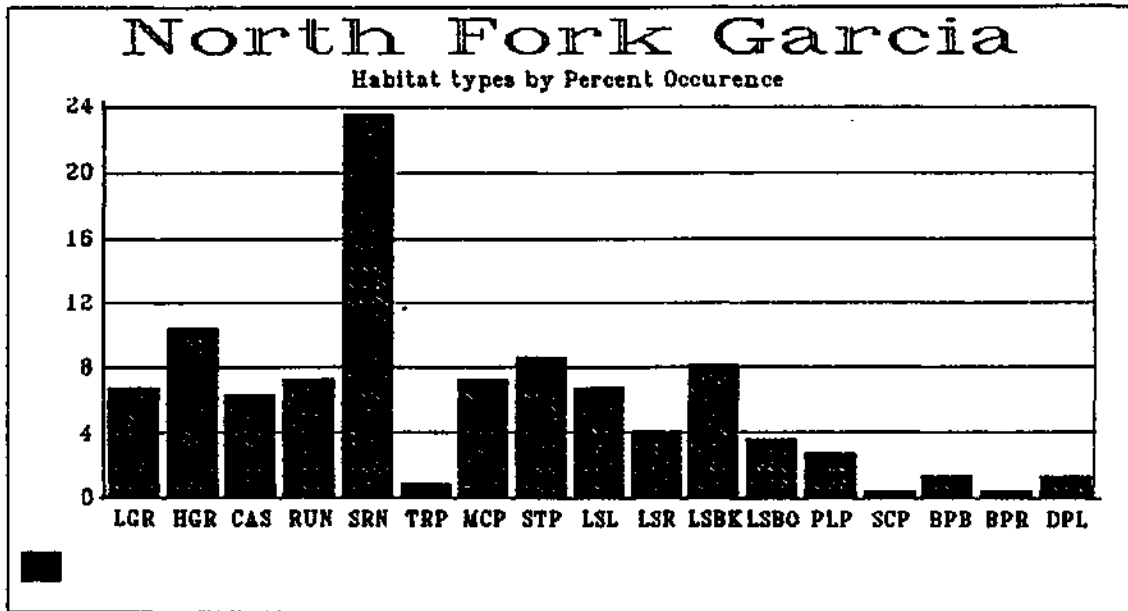
12/09/91 Summary of Biological Inventory

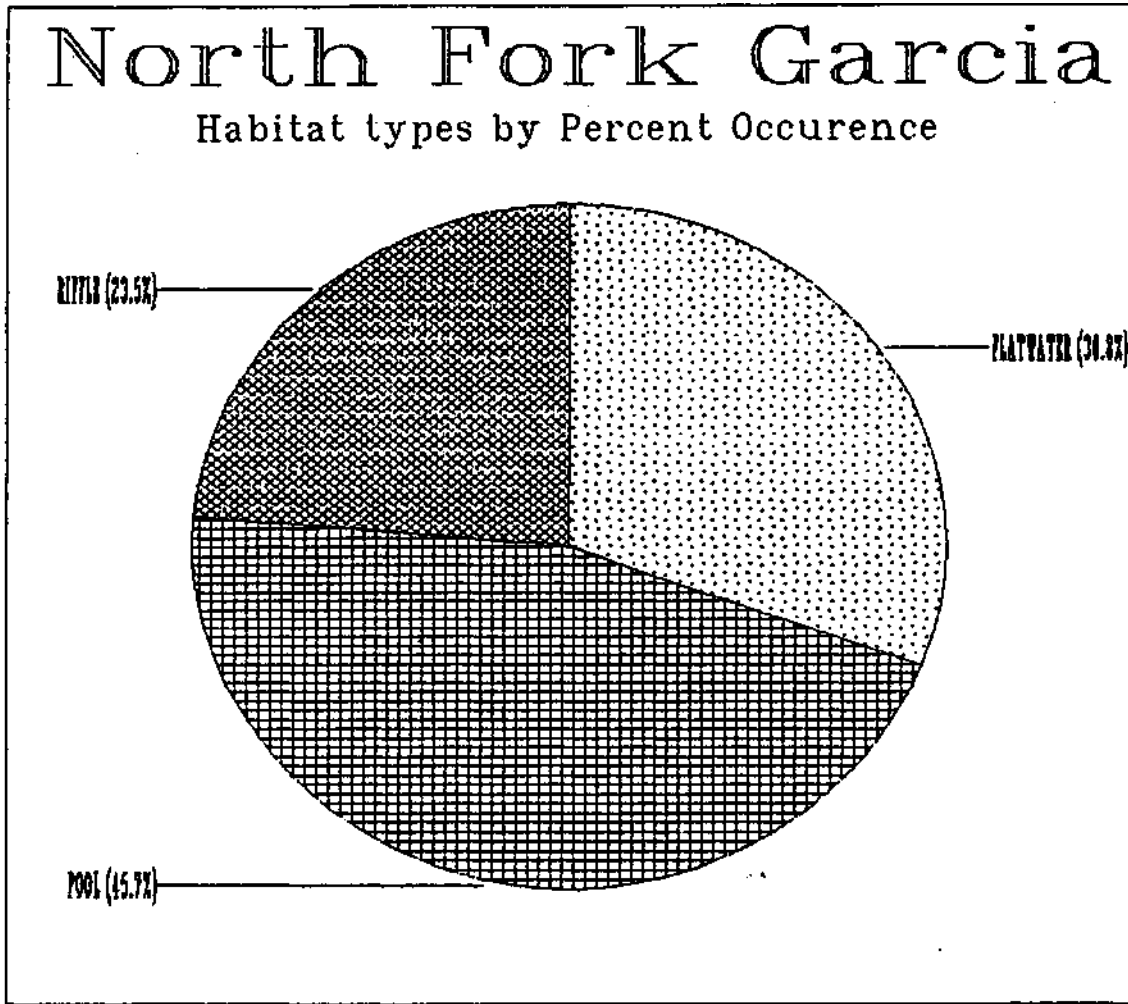
#	Hab. Type	Mean Length	Mean Width	Mean		Total Area	Mean % Canopy	Mean 0+ SH	Total 0+ SH	Mean 1+ SH	Total 1+ SH	Mean 2+ SH	Total 2+ SH	Mean 0+ Density SH	Mean 1+ Density SH	Mean 2+ Density SH	
				Depth	Max Depth												
7	LGR	45.0	20.0	.4	.9	812	2436	16.7	32.7	98	3.3	10		.04315	.00445	0.00000	
1	HGR	50.4	16.1	.5	1.2	801	5608	64.3	20.0	140	1.3	9		.01852	.00140	0.00000	
1	CAS	16.0	17.0	.6	1.2	272	272	90.0	3.0	3	0.0	0		.01103	0.00000	0.00000	
3	RUN	74.7	17.7	.6	1.2	1323	3970	55.0	66.3	199	3.3	10		.06797	.00303	0.00000	
4	SRN	123.3	15.3	.7	1.6	1828	7310	67.5	50.0	200	8.0	32	1.0	1	.02336	.00426	.00019
1	TRP	41.0	16.0	.8	1.3	656	656	40.0	34.0	34	3.0	3		.05133	.00457	0.00000	
1	MCP	57.0	16.0	.9	.2	912	912	70.0	59.0	59	6.0	6		.06469	.00658	0.00000	
4	STP	54.3	15.9	.8	.9	956	3422	62.5	35.5	142	2.8	11		.03847	.00310	0.00000	
2	LSL	56.0	16.5	.0	2.3	942	1883	65.0	38.0	76	5.0	10	1.0	1	.05197	.00667	.00073
1	L3R	71.0	12.0	.8	.4	852	852	40.0	55.0	55	8.0	8		.06455	.00939	0.00000	
4	LSBK	50.3	15.3	.4	.0	761	3042	70.0	20.8	83	3.5	14		.02574	.00462	0.00000	
2	LSBC	44.0	20.5	.6	.8	909	1817	25.0	55.0	110	4.5	9	3.0	3	.05658	.00454	.00123
1	BPB	20.0	20.0	.0	.4	400	400	90.0	14.0	14	2.0	2		.03500	.00500	0.00000	
1	DPL	36.0	19.0	.0	2.4	684	684	70.0	34.0	34	3.0	3		.04971	.00439	0.00000	

Garcia Estuary and Main Stem

12/10/91 Summary of Biological Inventory

#	Hab. Type	Mean Length	Mean Width	Mean		Total Area	Mean % Canopy	Mean 0+ SH	Total 0+ SH	Mean 1+ SH	Total 1+ SH	Mean 2+ SH	Total 2+ SH	Mean 0+ Density SH	Mean 1+ Density SH	Mean 2+ Density SH	
				Depth	Max Depth												
13	LGR	157	34	.5	1.2	5586	72619	7	26.1	339	19.0	247	1.3	17	.00536	.00382	.00042
3	GLD	679	68	.8	2.1	39011	117034	18	32.3	97	43.0	129	0.0	0	.00085	.00108	0.00000
7	RUN	375	33	1.8	2.2	15512	108581	16	34.6	242	13.9	97	4.1	29	.00457	.00126	.00052
3	MCP	304	56	3.6	5.3	16313	48938	40	23.3	70	42.0	126	11.7	35	.00115	.00201	.00062
H	CRP	374	38	2.8	5.4	15043	165468	25	133.7	1471	195.3	2148	35.1	386	.01346	.01806	.00351
9	LSL	338	40	2.1	3.1	16063	144568	22	141.7	1275	164.2	1478	15.3	138	.14011	.09108	.01092
2	LSR	122	33	2.2	16.2	4595	9189	30	52.5	105	50.0	100	31.0	62	.01089	.00985	.00840
1	LSBK	424	39	2.2	3.9	16536	16536	20	0.0	0	2.0	2	0.0	0	0.00000	.00012	0.00000
2	LSBO	190	45	1.5	3.5	9045	18090	30	15.0	30	13.5	27	2.5	5	.00316	.00271	.00053
1	SCP	150	21	.8	2.6	3150	3150	70	0.0	0	2.0	2	7.0	7	0.00000	.00063	.00222
1	DPL	174	43	1.3	2.1	8352	8352	15	265.0	265	180.0	180	27.0	27	.03173	.02155	.00323





Appendix III

Information and Diagrams Pertaining to Recommendations

III-1: Large Debris Retention Diagrams (Rosgen)

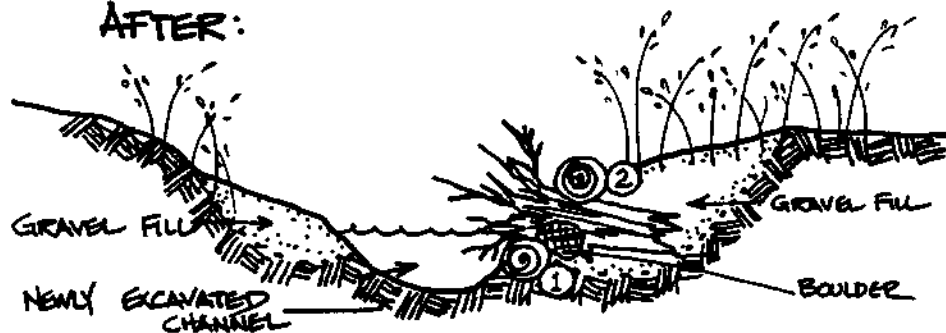
LARGE DEBRIS RETENTION:
 FOR BANK STABILIZATION & FISH HABITAT
 (ROSGEN, 1991)

CROSS-SECTION:

BEFORE:



AFTER:



NOTE: 1) WILLOWS PLANTED IN FILLED & PROTECTED AREA AT TIME OF WORK.

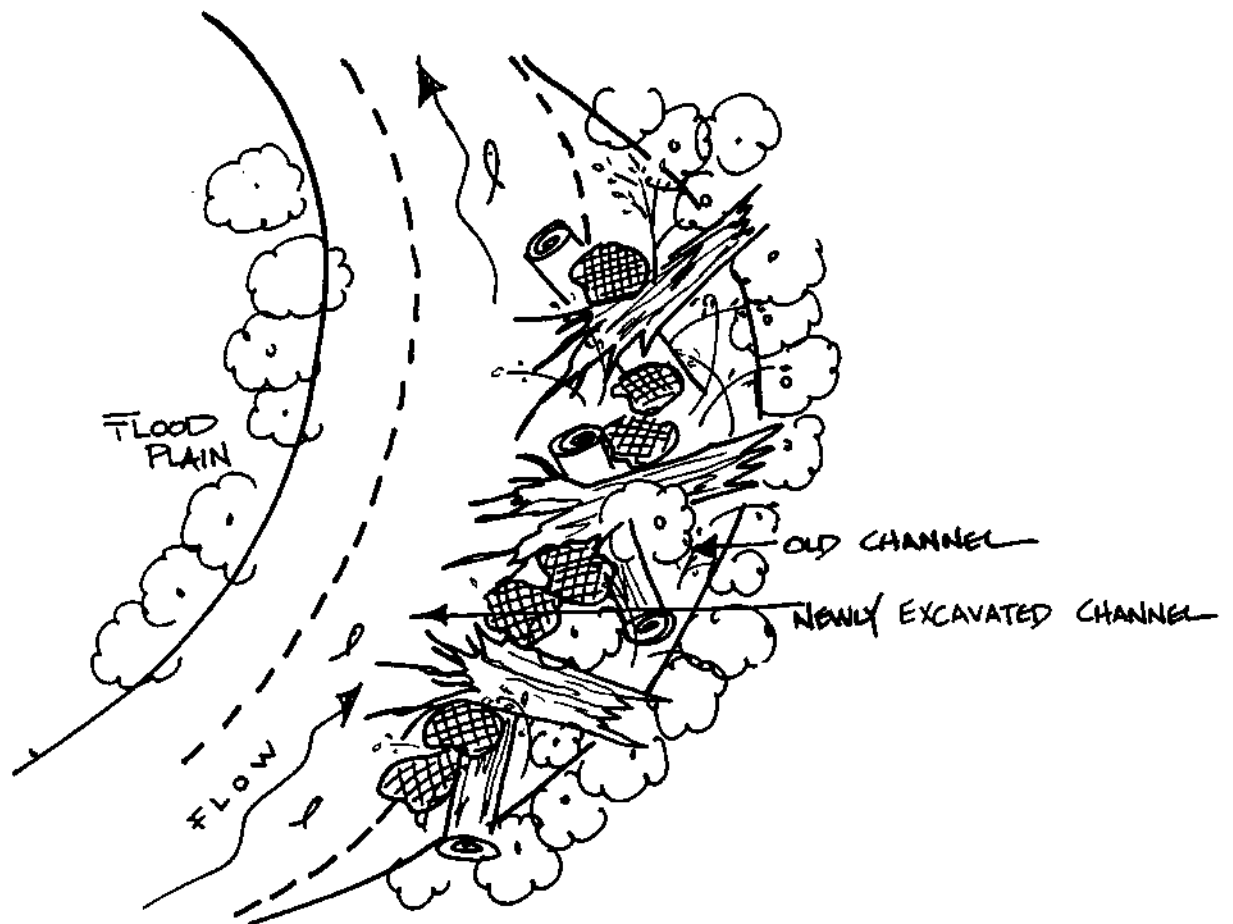
2) ROOT WAS PLACED TO BE PARTLY UNDERWATER AT LOW FLOW.

3) NOTE PLACEMENT OF FOOTER LOG (1) & HIGH STAGE DEFLECTOR LOG (2).

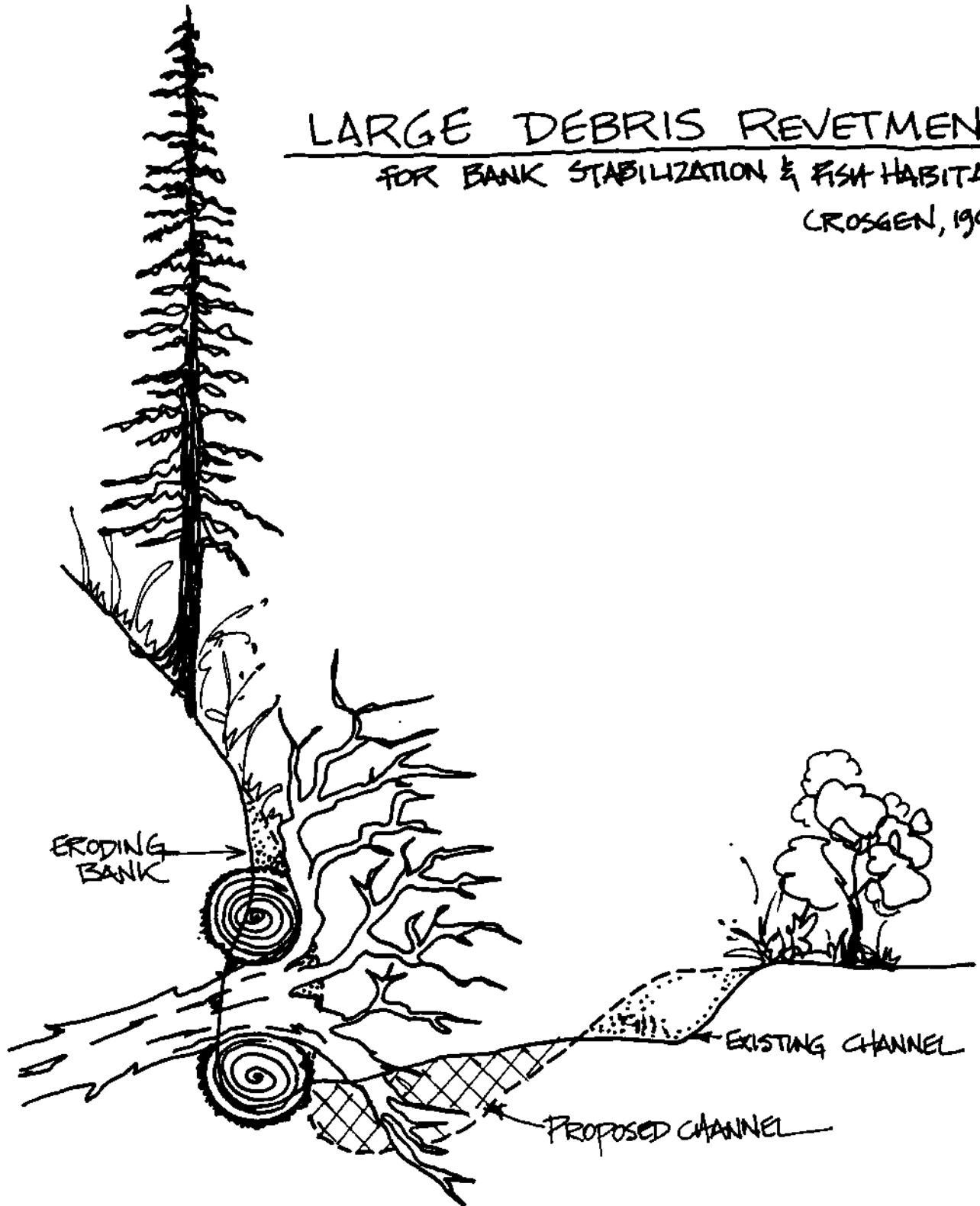
4) NOTE BOULDER PLACEMENT TO KEY STRUCTURE TOGETHER.

LARGE DEBRIS REVETMENT FOR BANK STABILIZATION & FISH HABITAT (ROSGEN, 1991)

PLAN VIEW:



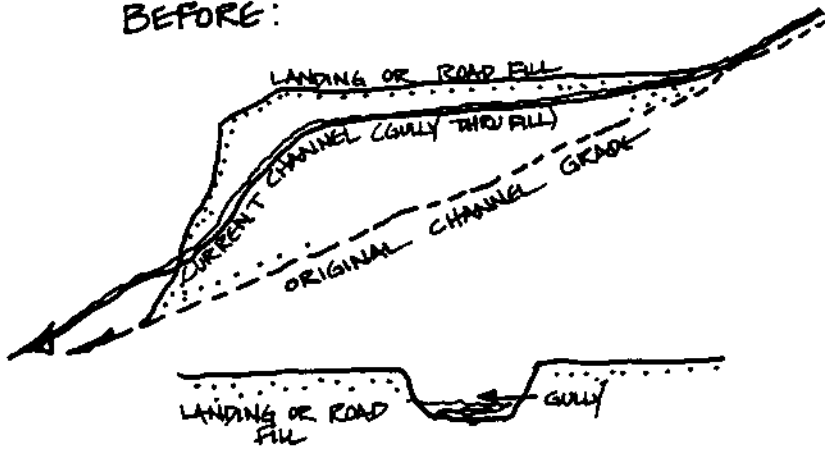
LARGE DEBRIS REVETMENT
FOR BANK STABILIZATION & FISH HABITAT
(CROSGEN, 1991)



III-2: Diagram 3.3 (acc. Recommendation 3.3) — Recontouring

DIAGRAM 3.3
RECONTOURING CROSSINGS &
LANDINGS

EXAMPLE 1 (SIMPLE):
BEFORE:



AFTER:

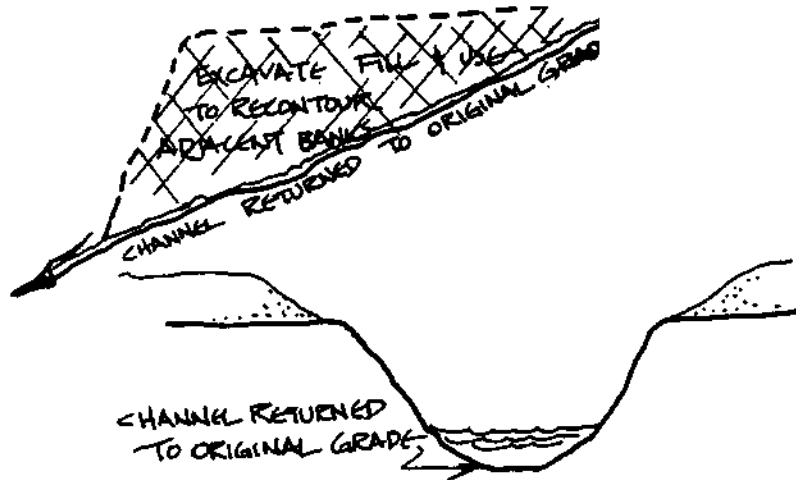
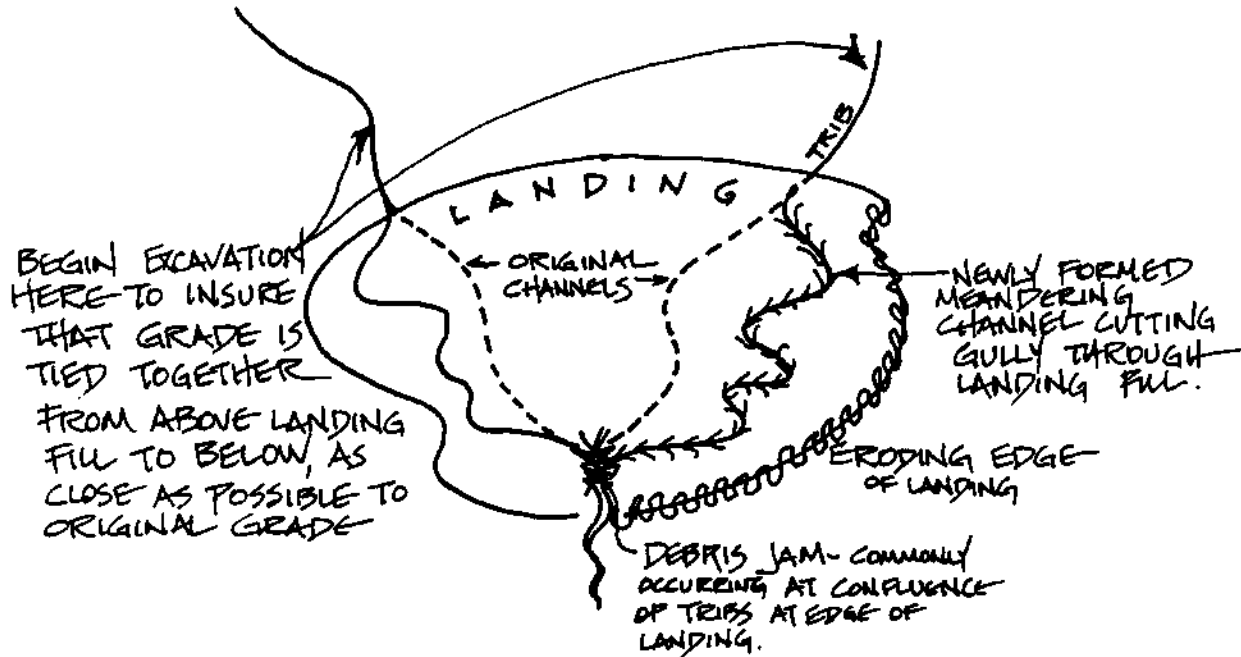


DIAGRAM 3.3 (cont.) RECONTOURING CROSSINGS & LANDINGS

EXAMPLE 2 (COMPLICATED):

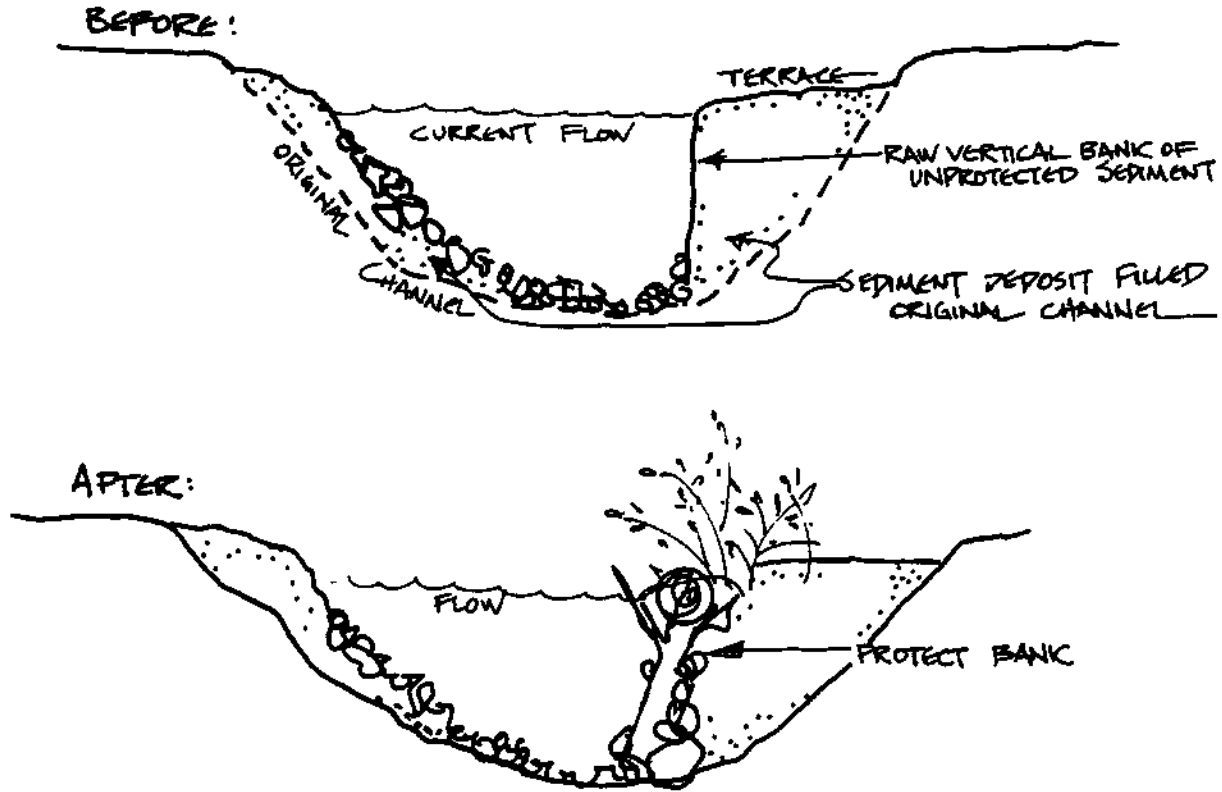


USE EXCAVATED MATERIAL TO RE-CONTOUR (RE-LANDSCAPE) LANDING SITE WITH OBJECTIVE OF RETURNING TO ORIGINAL GRADE & CONTOURS WHERE POSSIBLE.

NOTE: ON SMALLEST CLASS III WATERCOURSES, THE SIMPLEST EXCAVATION AND RECONTOURING, FOLLOWED BY STRAWING, SEEDING & PLANTING CAN BE SUCCESSFUL. ON LARGER CLASS I's & II's WHERE FLOW HAS MORE ENERGY, INCREASED GRADIENT CONTROL & BANK PROTECTION MEASURES MUST BE IMPLEMENTED TO MINIMIZE FURTHER SEDIMENTATION & NEGATIVE IMPACTS.

III-3: Diagram 3.4 (acc. Recommendation 3.4) — Stabilization of Sediment Terraces

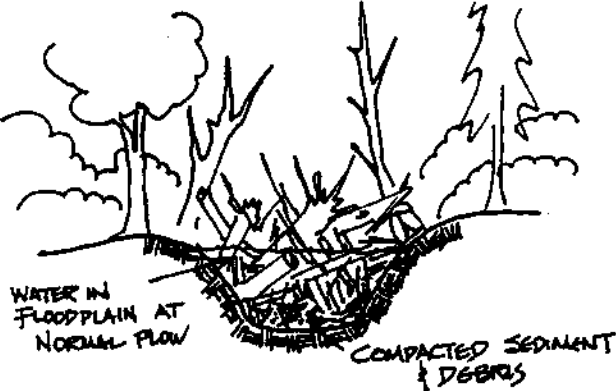
DIAGRAM 3.4
STABILIZATION OF SEDIMENT TERRACES



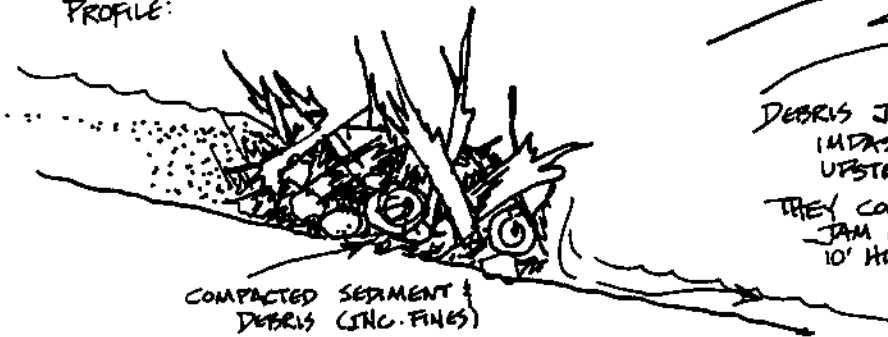
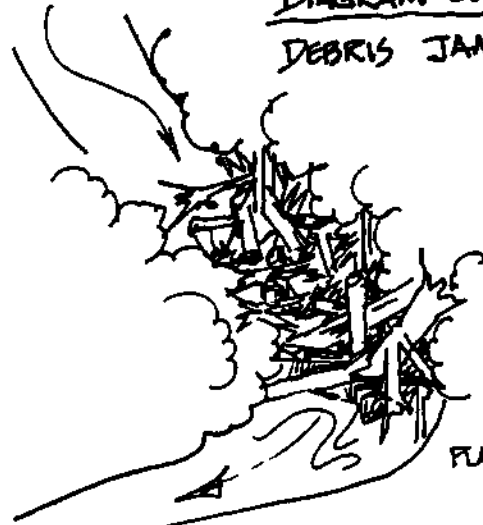
NOTE: THIS RECOMMENDATION APPLIES TO SMALLER UPSLOPE TRIBES, WHERE VOLUME OF FLOW AND GRADIENT ARE RELATIVELY LOW & SURFACE REVELTMENT IS ADEQUATE. EXACT TREATMENT IS ALWAYS SITE-SPECIFIC. BOTH ROCK & WOODY DEBRIS FOUND ON SITE CAN BE USED TO PROTECT BANKS. RECOMMENDED PLANTINGS/TRANSPLANTINGS INCLUDE BERGIES, JUNKUS, WILLOW, ALDER, CONIFERS, DEPENDING ON AVAILABILITY AND NATIVE SPECIES.

III-4: Diagram 3.6 (acc. Recommendation 3.6) — Debris Jams

CROSS-SECTION:



PROFILE:

DIAGRAM 3.6
DEBRIS JAMS

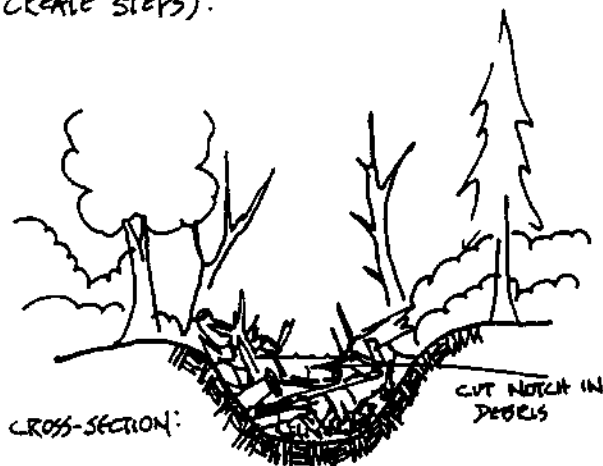
PLAN VIEW:

DEBRIS JAMS FORM BARRIERS THAT ARE IMPASSABLE TO FISH MIGRATING UPSTREAM...

THEY COME IN ALL SIZES: A LARGE JAM ON A GARCIA TRIB MEASURES 10' HIGH, 40' WIDE & 150' LONG.

TWO OPTIONS FOR TREATMENT:

- 1) WHERE ACCESSIBLE TO HEAVY EQUIPMENT, REMOVE ALL DEBRIS & EXCAVATE SEDIMENT BUILD-UP BEHIND JAM TO GREATEST POSSIBLE DEGREE. RECONTOUR ADJACENT BANKS & CHANNEL USING GRADE CONTROL & BANK PROTECTION STRUCTURES (VORTEX WEIRS, RIP RAP, LOG SILLS, ETC) TO MINIMALLY IMPACT CHANNEL DOWNSTREAM. USE SOUND REDWOOD REMOVED FROM JAM FOR STRUCTURES.
- 2) WHERE INACCESSIBLE TO HEAVY EQUIPMENT OR WHERE DESIRABLE, DO NOT REMOVE DEBRIS, BUT RATHER STEP DOWN FLOW BY CUTTING NOTCHES IN DEBRIS (OR REMOVING PARTS OF DEBRIS TO CREATE STEPS).



CROSS-SECTION:

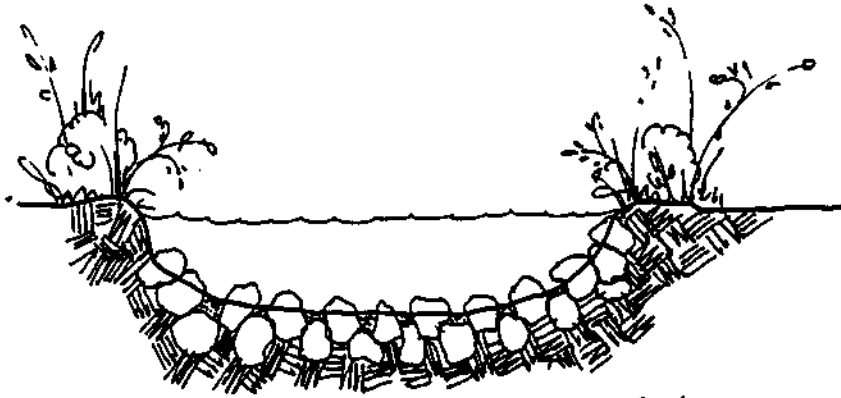


PROFILE:

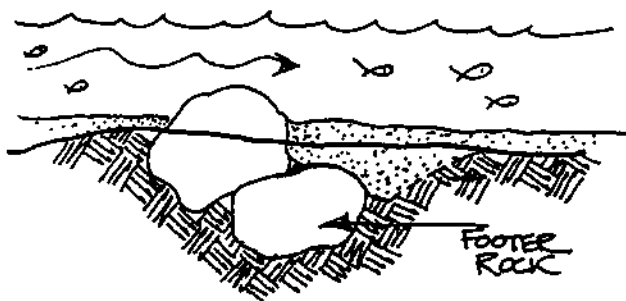
III-5: Diagram 3.8 (acc. Recommendation 3.8) - Vortex Weirs

DIAGRAM 3.8
VORTEX WEIRS
(from D. ROSGEN)

CROSS-SECTION:



PROFILE:



PLAN:

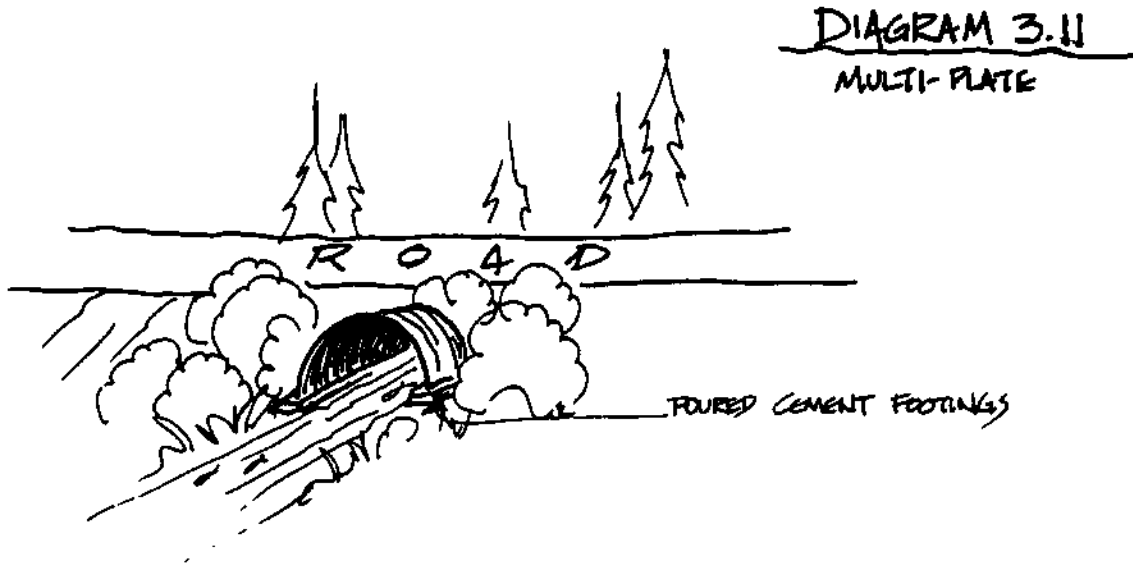


THE OBJECTIVE OF THIS STRUCTURE IS TO:

- 1) PROVIDE INSTREAM COVER IN THE RIFFLE REACH.
- 2) DEEPEN FEEDING AREAS IN THE RIFFLE REACH.
- 3) PROVIDE WIDER RANGE OF VELOCITIES FOR HOLDING WATER AT HIGH FLOW WITHOUT CREATING BACKWATER & SEDIMENT DEPOSITION.
- 4) ACT AS GRADE CONTROL STRUCTURE WITHOUT UPSTREAM LATERAL MIGRATION, BANK EROSION, & AGGREGATION.
- 5) MAINTAIN LOW WIDTH/DEPTH RATIO WHICH WILL REDUCE THE LIKELIHOOD OF BAR DEPOSITION & MAINTAIN SEDIMENT TRANSPORT CAPACITY OF THE STREAM.

SOURCE: SHORT COURSE ON STREAM CLASSIFICATIONS & APPLICATIONS, 1991, by D.L. ROSGEN

III-6: Diagram 3.11 (acc. Recommendation 3.11) - Multi-Plates



Appendix IV

General Cost Estimates and Funding Possibilities

IV-1: General Cost Estimates

APPENDIX IV-1 COST ESTIMATES

The following cost estimates are to be used as guides for prioritizing the recommendations am for developing a basic understanding of relative costs.

Estimates for some recommendations are given in unit terms, i.e., cost per foot or cost per cubic yard, while other costs can only be estimated for the job.

The estimates are for cost of construction and do not include the cost of preparing final detailed plans or the cost of obtaining permits.

At this stage of the planning process even unit prices cannot be exact due to unknown variable such as cost of access development and cost of materials.

Recommendation	Cost Estimate Description
AREA 1: THE ESTUARY	
Rec. 1.1 A	\$25-\$70/lineal foot (channel realignment and bank protection)
Rec. 1.1B	\$100+/lineal foot (channel realignment and bank protection)
Rec. 1.2	Specific plans are required to make cost estimate
Rec. 1.3	\$50-\$75/lineal foot (bank protection)
Rec. 1.4	\$300-\$2000 for each structure (debris cover for fish)
Rec. 1.5	Needs further study
AREA 2: THE LOWER 7 MILES	
Rec. 2.1	\$100-\$5000+ for each fish habitat structure
Rec. 2.2	\$0.50-\$2.50/tree for site prep, planting, and browse protection (riparian planting)
Rec. 2.3	\$50042000 for each site (remove and transplant willows)
Rec. 2.4	N/A
Rec. 2.5	N/A
AREA 3: THE UPPER TRIBUTARIES	
Rec. 3.1	\$25-\$50/lineal foot using large woody debris and transplants
Rec. 3.2	N/A
Rec. 3.3	\$200415,000+ for each job (recontour old instream landings and crossings)

Rec. 3.4	\$1.00-\$10.00/lineal foot (stabilize instream sediment terraces)
Rec. 3.5	\$0.50-\$3.00/lineal foot (excavate well defined channel)
Rec. 3.6	\$500-\$15,000+ for each job (stabilize stored sediment behind log jams)
Rec. 3.7	\$100-\$5000+ for each fish habitat structure
Rec. 3.8	\$0.50-\$3.00/lineal foot (remove cemented cobble and define channel)
Rec. 3.9	No estimate
Rec. 3.10	\$0.50-\$2.50/tree for site prep, planting, and browse protection (riparian planting)
Rec. 3.11	\$500-\$15,000+/crossing (replace or modify culverts that are fish migration barriers)
Rec. 3.12	No estimate

IV-2: Possible Funding Sources

POTENTIAL FUNDING SOURCES/APPENDIX

GRANT NAME -----	\$ AMOUNT -----	DATE PROPOSAL DUE -----
319h - State Water Resources Control Board	\$40-100,000	Dec. 21
Forest Stewardship Program CDF&FP	\$15,000	May 4
Fish & Game Salmon Restoration Fund	\$20-100,000	April 3
* Wildlife Conservation Board		OPEN
* Prop. 70		quarterly
* Salmon Stamp		
Coastal Conservancy	\$100,000-	OPEN
	\$1,000,000	quarterly
U.S. Fish & Wildlife Service Habitat Restoration (Wetland or Salmon)	\$30,000	Dec. 31
Near Coastal Waters (EPA)		March 13
Urban Streams - DWR	\$30,000	
Resource Cons. Fund - CARCD	\$1,000	
Sustainable Agricultural Projects	Variable	
Integrated Hardwood/Research Proposals		Variable
COST SHARE PROGRAMS		
Agricultural Conservation Program (ACP) - ASCS	\$3,500/yr	OPEN
Forest Improvement Program ASCS	\$10,000/yr	
CFIP - CA Forest Improvement Program - CDF		OPEN
Stewardship Incentives Program	\$10,000/yr	

Appendix V

Recommended Guidelines and Information for Future Action

V-I: Outline of Tasks Recommended for a Comprehensive Gravel Management Plan for the Garcia River

- I. Identify current status
 - A. Establish base map
 1. Obtain mylars of aerial photos for the lower 13 miles of the river at scale of 1" = 200' if possible, but no smaller than 1" = 500'.
 2. Delineate specific features, such as pools, riffles, runs, bars, terraces (active and inactive), riparian vegetation, etc.
 3. Locate all data collection sites, i.e., cross section sites, longitudinal profile points, gravel sampling sites, gauging stations, weather stations, biological sampling sites, etc.
 4. Locate other pertinent sites, i.e., gravel mining operations (past, active, and proposed), bridges, etc.
 - B. Establish channel geometry by collecting appropriate data, including but not limited to:
 1. Channel cross sections
 2. Longitudinal profiles
 3. Gravel samples
 4. Core samples.
 - C. Develop accurate monitoring program to identify current replenishment rates. This program should include but not be limited to the following:
 1. Cross sections
 - a. At sites where past or current gravel operations have occurred or are occurring - above and below active sites as well as on the site.
 - b. At sites unimpacted by recent gravel mining.
 - c. Cross sections at active mining operations should be taken each spring or early summer before extraction and in the fall after extraction. All other cross sections should be taken during the summer.
 2. Gravel sampling - should be done in spring before extraction at active gravel sites, and any time during summer at all other sites.
 - D. Establish current biological status of river, including but not limited to:
 1. Fish populations
 2. Other wildlife populations
 3. Habitat typing
 4. Condition of riparian vegetation
 5. Stream substrate analysis
 6. Status of estuary
-

- E. Study current river flow
 - 1. Reestablish gauging station
 - 2. Establish stage recording at each extraction site
 - 3. Establish precipitation stations

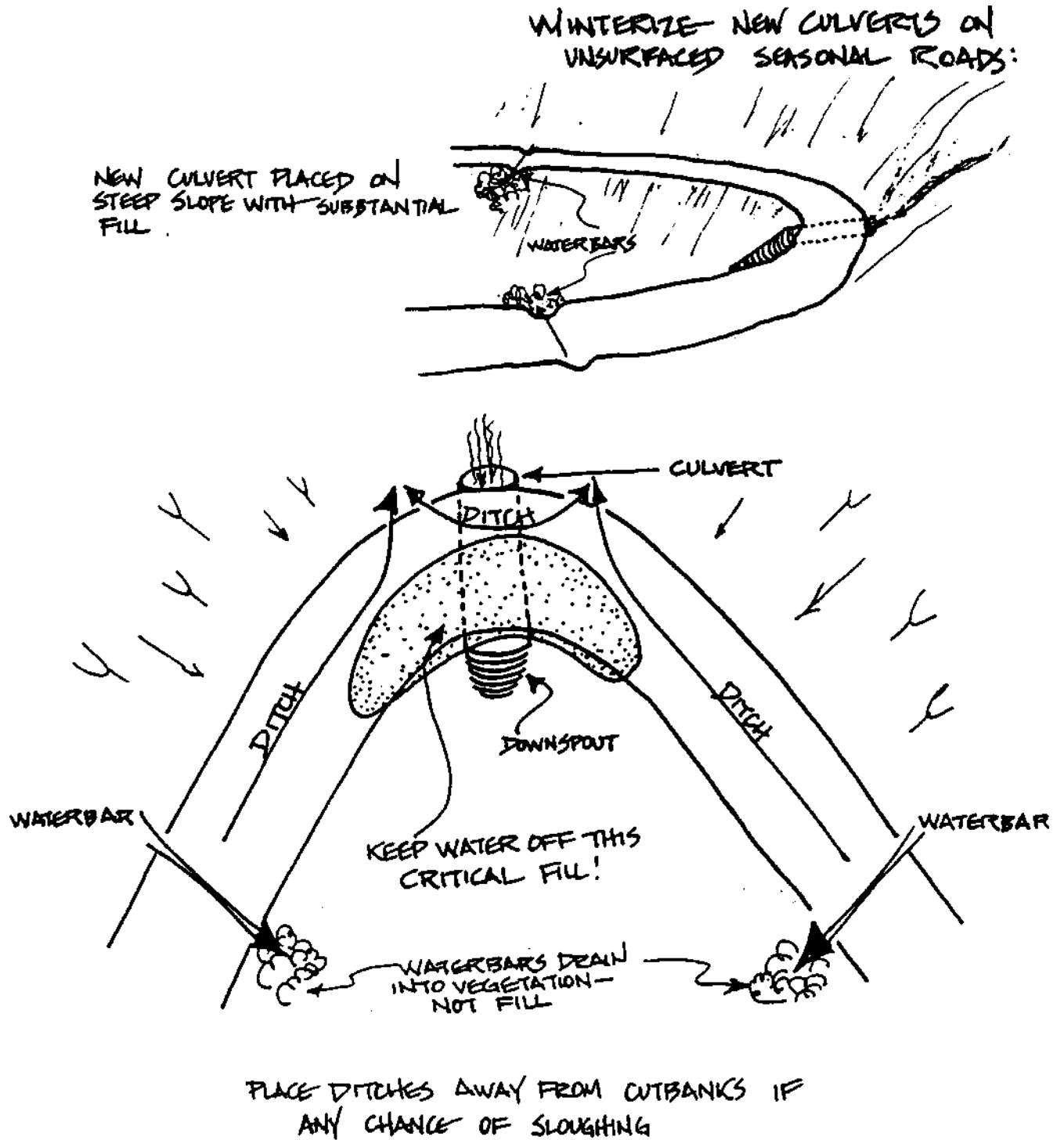
 - II. Study historical status
 - A. Interpret historical aerial photos, maps and cross sections
 - B. Study other historical records (books, interviews, etc.)
 - C. Review precipitation records
 - D. Review gauging records
 - E. Attempt to establish historical replenishment rates

 - III. Develop gravel management goals and objectives based on:
 - A. Analysis of current status
 - B. Comparison of historical status and current status
 - C. Social, political and economic considerations

 - IV. Establish permit process
 - A. Lead agency must be able to:
 - 1. Define necessary monitoring
 - 2. Analyze data from monitoring
 - 3. Formulate policy from analysis
 - 4. Enforce policy

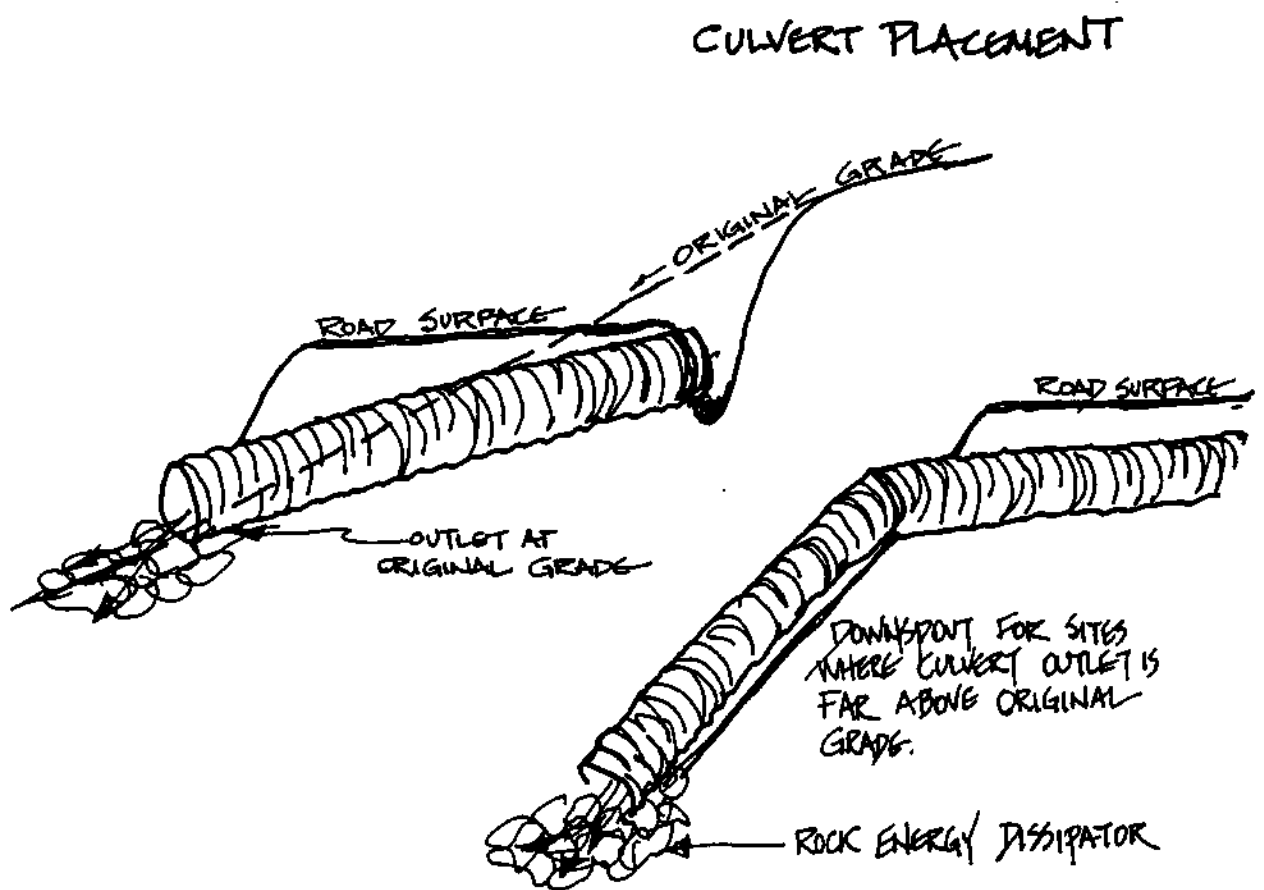
 - B. Further input and guidelines for lead agency:
 - 1. 3-year maximum permit (could be reviewed over time)
 - 2. Permit reviewed annually
 - 3. Permit fees must cover real costs
 - 4. Mandatory monitoring at operator's expense should include but not be limited to:
 - a. Cross sections in spring and fall to show actual volume removed and replenishment rates.
 - b. Flow stage recording
 - c. Operator can run his own cross sections if properly trained.
 - 5. Operator must mitigate to insure no cumulative loss of fish habitat.
 - 6. Whenever possible, out of stream sources for gravel should be encouraged (i.e., upslope quarries, gravel terraces, etc.).
 - 7. Experimental or innovative gravel extraction methods (alternatives to skimming) should be permitted if they are carefully reviewed and monitored.
 - 8. This gravel management plan should be reviewed regularly and changed as real data from monitoring dictates.
-

* Winterize new culverts on unsurfaced seasonal roads (such as haul and ranch roads) by protecting fill from surface erosion. This can be done by insloping road surface at crossing, or outsloping the road surface using a berm to channel the road surface runoff away from the fill. If there is a chance of bank sloughing, ditching can be done as shown in the diagram below:



Cover culverts at temporary summer crossings of Class I and n streams with clean rock from instream or from upslope quarry. Do not use dirt.

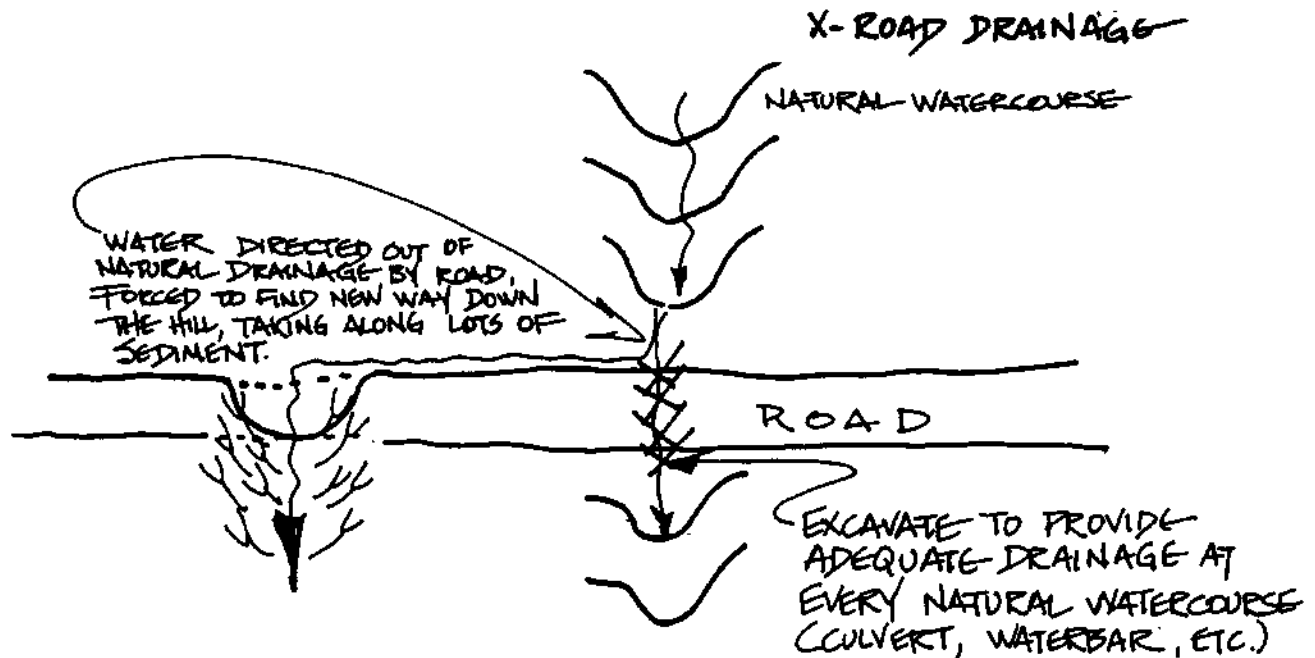
* Place culverts at grade of original drainage where possible. Where this is not possible, provide downspout or enery dissipator to return water from sulvert outlet to drainage at original grade. (See diagram.)



V-2: Road Construction and Maintenance Guidelines

SUGGESTED ROAD CONSTRUCTION AND MAINTENANCE GUIDELINES

- * Provide cross-road drainage at every natural watercourse. (See diagram.)



- * Construct new roads during dry season, but early enough that soil moisture is still adequate for compaction. Water road for compaction if necessary.
- * Build smallest road possible to meet the objective.
- * Provide road surface drainage by a combination of the following: outsloping, utilizing natural variations in grade, and rolling dips. (See diagram.)

