LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN

LOCAL COASTAL PROGRAM
MONTEREY COUNTY, CALIFORNIA

LITTLE SUR RIVER PROTECTED WATERWAY MANAGEMENT PLAN

County of Monterey
Planning Department

State of California
Resources Agency

Department of Fish and Game
Protected Waterways Program

California Coastal Commission
Big Sur Coast Local Coastal Program

Adopted by the Monterey County
Planning Commission August 10, 1983

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Board of Supervisors November 5, 1985

Certification Acknowledged by the California
Coastal Commission on April 9, 1986

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INTRODUCTION

The California Protected Waterways Plan (Initial Elements) prepared in 1971, pursuant to the Protected Waterways Act of 1969, recognized the Little Sur River as a Class III (Important) Steelhead Trout Stream and as possessing a Class III (Important) Lagoon (Wildlife Waterway) serving waterfowl, shorebirds, and other water-associated birds. The Class III designation indicates waterways which are usually of countywide interest and importance.

In 1973, the State Legislature, with the support of the Monterey County Board of Supervisors, designated the Little Sur River a protected waterway. The resolution (Appendix A) which incorporated the Little Sur River into the Protected Waterways Program requested that the Resources Agency and affected local agencies prepare a detailed waterway management plan for the Little Sur River. Furthermore, this resolution specified that this plan "shall include provisions for water conservation, recreation, fish and wildlife preservation and enhancement, water quality protection and enhancement, streamflow augmentation, and free-flowing and wild status."

In 1979, the California State Department of Fish and Game and the Monterey County Board of Supervisors entered into an agreement to prepare a detailed protected waterway management plan for the Little Sur River with the County's funding commitment represented by work performed as part of the Local Coastal Planning effort for the Big Sur Coast.

This protected waterway plan has been developed in response to the California Protected Waterways Act and also as a management program intended to assist in implementing the Big Sur Coast Local Coastal Program Land Use Plan. Accordingly, the plan is both a local and a state document to be adopted jointly by the County of Monterey, the State Resources Agency and the California Coastal Commission. As a state plan it will serve as a guide to all affected state agencies in the performance of their management responsibilities in the Little Sur River Watershed and will provide a basis for the agencies to anticipate future operational and funding needs. Through its coastal permit authority, the County will require conformance to this plan by both state agencies and private individuals during the consideration of applications for development in the portion of the watershed with the Coastal Zone.

This plan is not legally binding upon the greater portion of the upper watershed which lies within the Los Padres National Forest. Nevertheless, the plan must examine and consider the entire upper watershed as it is an integral part of the river system. Recently, the U.S. Forest Service completed an environmental assessment for the Ventana Wilderness Area. This planning process will culminate in the preparation of a management plan for the entire wilderness. Hopefully, the Forest Service management plan will address the important issues of the entire

watershed and, together with the present plan, will serve as a management tool for the river system as a whole. The attempt in this protected waterway plan is to treat the river and its watershed as one total ecosystem and to develop an integrated program of land, water and resource management which will adequately protect both local and statewide interests in the Little Sur River, its resources and its environs.

STUDY AREA

GEOGRAPHICAL SETTING

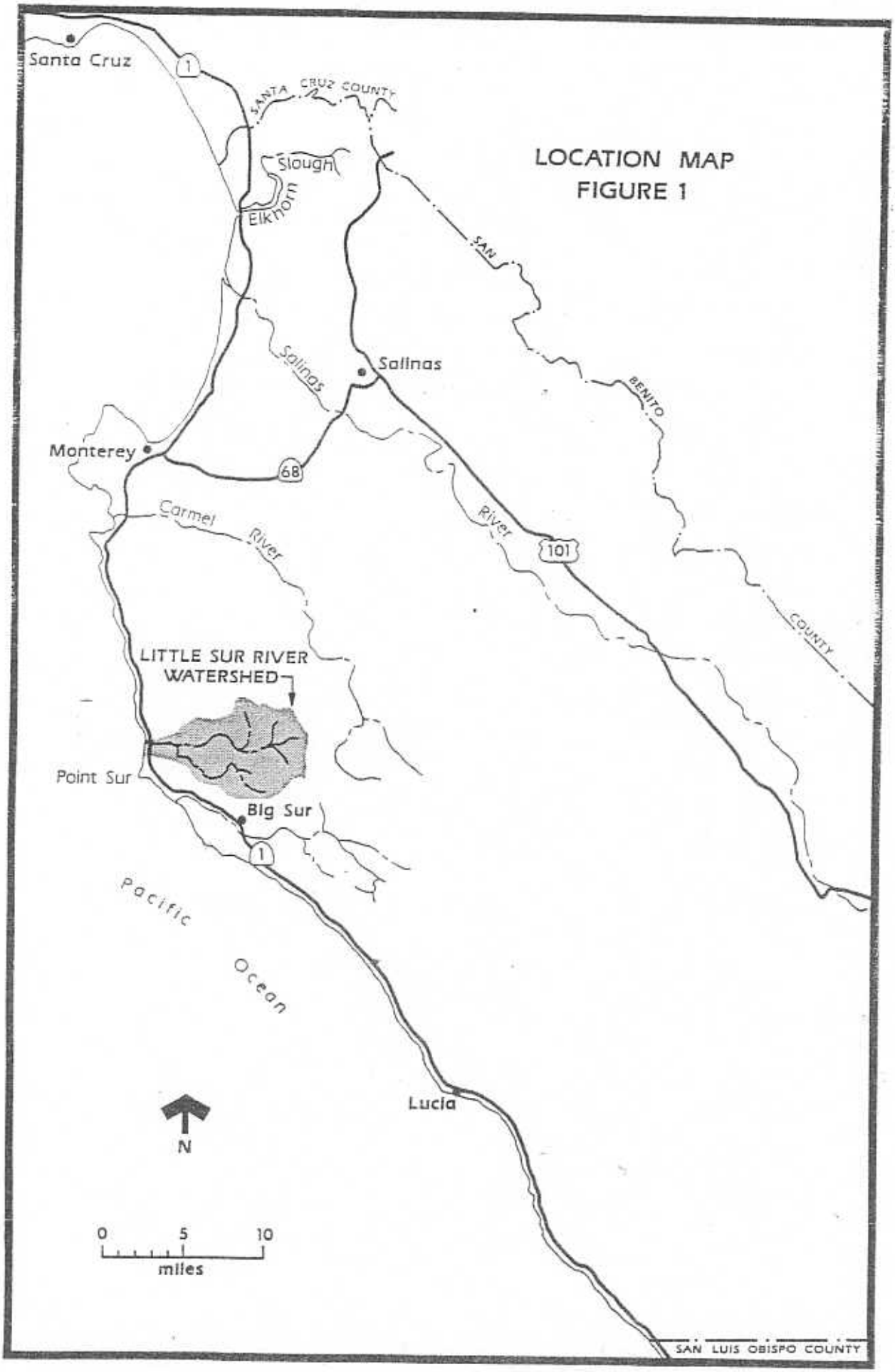
The area covered by this plan encompasses the entire Little Sur River Basin, approximately 40 square miles (25,600 acres) on the west slope of the Santa Lucia Mountains (Figures 1 and 2). The Little Sur River comprises two branches, the Main (north) Fork and the South Fork, both of which flow westward to join about 2 miles from the ocean. The watershed is separated from Sierra Creek on the northwest by the westward ridge of Bixby Mountain (2,920 ft.) and from Mill and Turner Creeks by the common ridge joining Bixby Mountain to the lateral Skinner Ridge, all these creeks being tributaries of Bixby Creek. East and south from Skinner Ridge a series of ridges connecting to Uncle Sam Mountain (4,766 ft.) and on to Ventana Double Cone separate the Little Sur River from the upper Carmel River and its tributaries, namely, Pine, Danish, and Ventana Mesa Creeks. The Little Sur River Watershed is separated from the Big Sur River Watershed and its tributaries, Ventana, Doolan's Hole, Juan Higuera and Pheneger Creeks, by the common ridge between Ventana Double Cone (4,853 ft.) and Post Summit (3,345 ft), and the extension of this ridge westward through Little River Hill to the coast.

The North Fork arises on the northwest slopes of Ventana Double Cone and picks up Puerto Suello, Comings and Skinner Creeks on its north side and Jackson Creek on the south side. The South Fork drains only the south central portion of the watershed which is separated from the North Fork by Dani and Launtz Ridges, centered upon Pico Blanco Mountain (3,709 ft.).

Relief is pronounced, the upper North Fork watershed above Pico Blanco Boy Scout Camp ranging chiefly from 1,000 to 4,800 ft. elevation. The South Fork originates around 4,500 ft. near the west slopes of Ventana Double Cone and drops precipitously to the forks at around 100 ft. elevation. From thence, the river flows on its floodplain west to the ocean, forming a lagoon at its mouth.

GEOLOGY

The Little Sur River watershed lies within the Coast Range physiographic province of California where the geology is quite variable and intricate. Several major faults cut through the area adding to the complicated structural and statigraphic relationships and history. Oldest rocks in the area are the Sur Series metamorphics which were intruded by granitic rocks during one of the great mountain building stages. Later, many periodic episodes of inundations by the sea account for the bulk of the clastic marine rocks of the area. Marine deposition was occasionally broken by uplifing and erosion. Marine rocks of


LOCATION MAP
FIGURE 1
Santa Cruz
1
SANTA CRUZ COUNTY
Slough
Elkhorn
SAN
Salinas
Salinas
BENITO
Monterey
68
Carmel
River
River
101
COUNTY
LITTLE SUR RIVER
WATERSHED
Point Sur
Big Sur
1
Pacific
Ocean
Lucia
N
0
5
10
miles
SAN LUIS OBISPO COUNTY

Miocene and Pliocene and Pliocene age lie unconformably atop older "basement" metamorphic and granitic rocks, accounting for either a restriction of the seas or great removal of the land by erosion prior to that period. Last withdrawal of the seas occurred in late Pliocene time as marked by renewed uplifting (Hart, 1966).

During this episode, deformation by folding and faulting changed the landscape and by mid-Pleistocene time all the major topographic features and watershed drainage patterns seen today had been established.

Generally the rock units become younger from east to west down the watershed. The easternmost portion of the watershed is underlain by Sur Series metamorphic and granitic rocks. The Sur Series rocks are composed of schists, gneisses, crystalline limestones, dolomites, and quartzites. The Santa Lucia Quartz Diorite intrudes the Sur Series. From an economic standpoint, the Sur Series rocks in the watershed are the most important rock unit. Crystalline limestone and dolomite ("Gabilan limestone") is potentially an important source of lime for chemical and metallurgical uses, and for high quality cement.

Franciscan formation rocks are next younger in age and are found along the South Fork of the Little Sur River together with Upper Cretaceous marine deposits. The Franciscan is composed of dark gray sandstone, red chert, shale, greenstones and other volcanic rocks. The Upper Cretaceous rocks consists of sandstone, conglomerate and some shale.

Rocks of Miocene age that outcrop along the lower portions of the Little Sur watershed are made up of Santa Margarita sandstone.

Non-marine Pliocene clastic debosits can be found north of the mouth of the Little Sur River along the coastline.

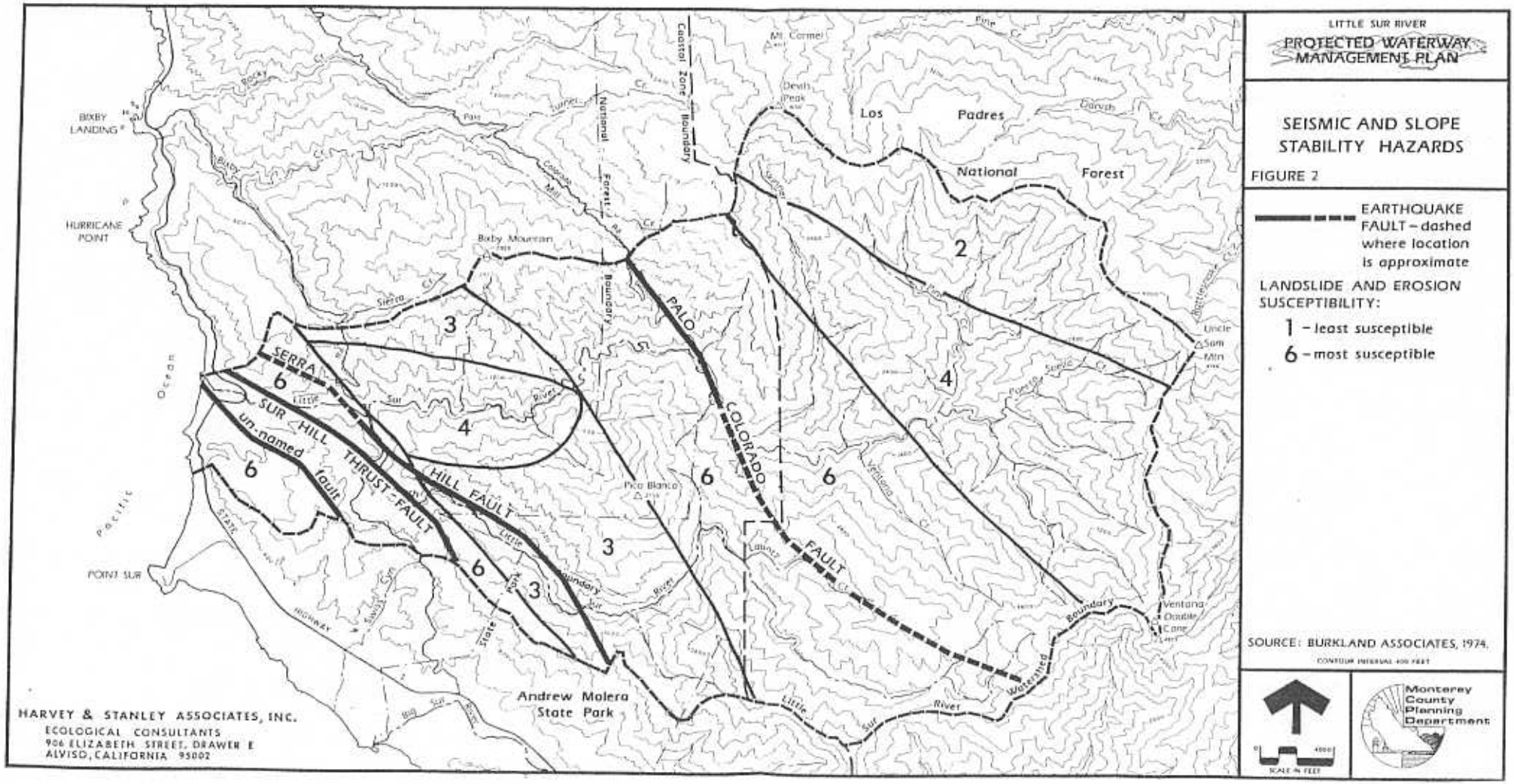
The youngest units in the watershed are recent sand dunes and beach deposits lying to the south of the mouth of the Little Sur along the shoreline.

Faults in the watershed are shown on Figure 2. The Palo Colorado fault and other subparallel faults in the area are part of the San Gregorio-Hosgri fault trend which is part of the San Andreas fault system (Graham & Dickinson, 1978).

HYDROLOGY

Physiography of the Watershed

The Little Sur Watershed (area approximately 39.9 square miles, U.S. Geological Survey, 1977), is bounded on the north by the Bixby Creek basin, on the east and northeast by the Carmel River


LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN
SEISMIC AND SLOPE STABILITY HAZARDS
FIGURE 2
EARTHQUAKE FAULT – dashed where location is approximate
LANDSLIDE AND EROSION SUSCEPTIBILITY:
1 – least susceptible
6 – most susceptible
SOURCE: BURKLAND ASSOCIATES, 1974.
CONTOUR INTERVAL 400 FEET
SCALE IN FEET
Monterey County Planning Department
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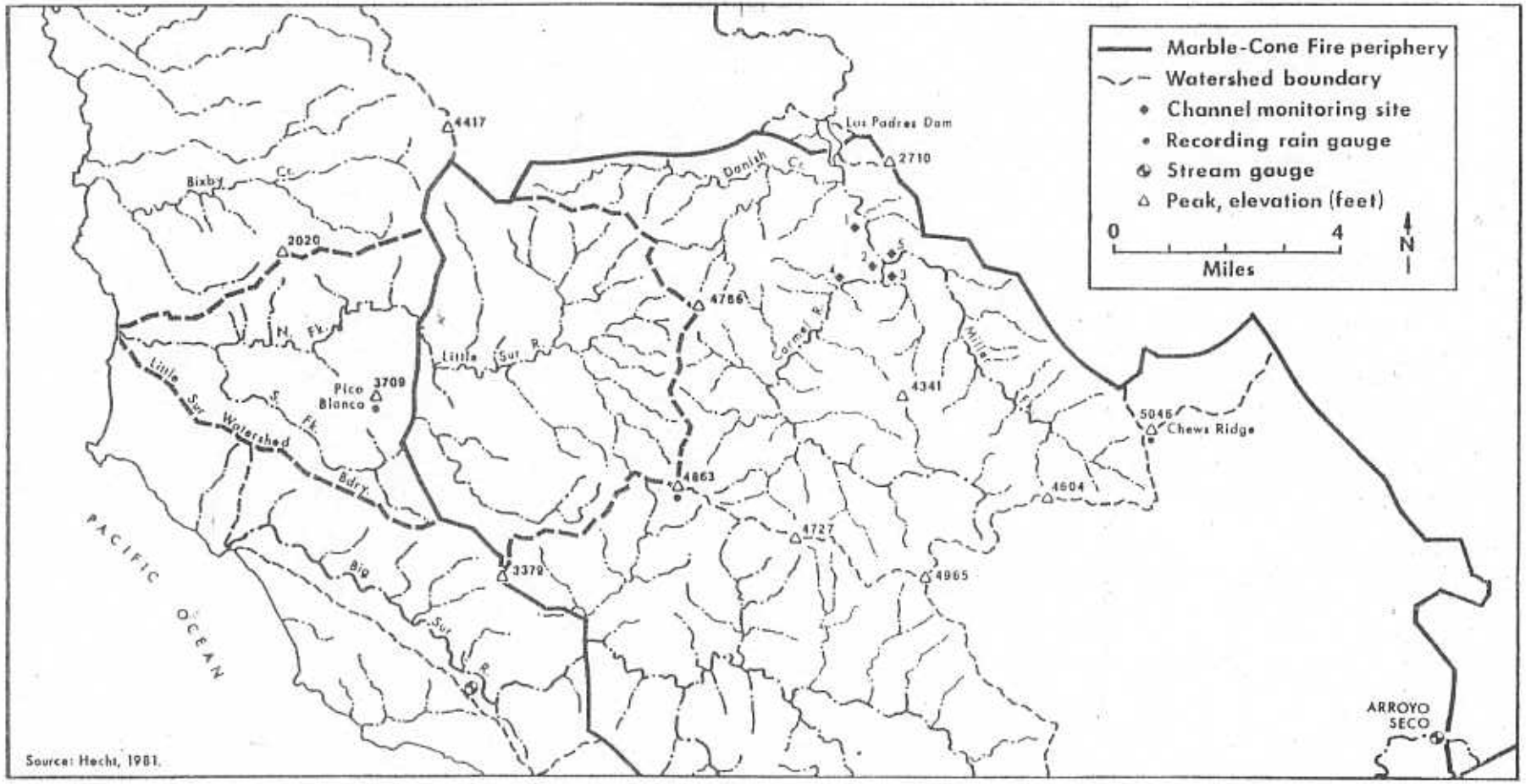
ECOLOGICAL CONSULTANTS
906 ELIZABETH STREET, DRAWER E
ALVISO, CALIFORNIA 95002
BIXBY LANDING
HURRICANE POINT
POINT SUR
PACIFIC Ocean
Bixby Mountain
Mt. Carmel
Devils Peak
Los Padres National Forest
Coastal Zone Boundary
National Forest Boundary
SERRA
SUR HILL un-named fault
THRUST FAULT
HILL FAULT
PALO COLORADO FAULT
Pico Blanco
Uncle Sam Mtn
Ventana Double Cone
Watershed Boundary
Andrew Molera State Park
Little Sur River
Big Sur River
HIGHWAY 1
6
4
3
2

FIGURE 3
HYDROGRAPHY OF LITTLE SUR BASIN



Source: Hecht, 1981.

drainage, and by the Big Sur River watershed to the southeast and southwest. These basins drain the northern Santa Lucia Mountains, one of the most rugged landscapes of California. The crystalline bedrock is deformed and broken by northwesterly-trending structural elements which have resulted in an oblique, trellis-like network (Figures 2 and 3).

Both forks of the Little Sur River are actively eroding across the structural grain of the region. This affects the movement of water and the slope-forming processes in many ways, two of which are especially important. First, the profiles of the major channels are uneven. Wooded, alluvial segments of low gradient alternate with steep, bluff-lined reaches cut into the more resistant structural elements (Figure 4). Groundwater inflow, deposition of sediment and organic matter, and formation of pools and riffles vital to sustaining the instream biologic resources all occur primarily in the more level alluvial segments of the channel. A special and important case of alluviated channel occurs in the lower two miles of channel, where the river deposited a wide, flat valley floor in response to a rise in sea level of about 350 to 400 feet since the maximum extent of worldwide glaciation, approximately 18,000 years ago (Bloom et al; 1974). The former and steeper channel, adjusted to this much lower sea level, probably occurs at a depth of 150-200 feet below the present coastline (dotted line in Figure 4), presumably overlying bedrock. A disproportionate amount of deposition continues to take place, especially during major floods and fires, in this reach where the gradient abruptly flattens.

Secondly, groundwater movements are strongly affected by the streams running across the structural grain of the Little Sur River area. Groundwater flows toward adjacent master drains - the principal ones differing in elevation by one thousand feet or more. The heads of the two forks of Bixby Creek are about 1200 feet higher than the nearby segment of the North Fork of the Little Sur (Figure 3). It is quite possible that much of Mescal and Skinner Ridges have groundwater drainage toward the Little Sur basin. Similarly, the South Fork of the Little Sur is perched 1200 to 1500 feet above the nearby Big Sur Valley. The unusually large flows of Pheneger, Juan Higuera, and Doolan's Hole Creeks in the Big Sur basin may be due in part to groundwater inflow from the South Fork catchment.

Precipitation

Precipitation has been measured since 1904 at the present site of Pfeiffer-Big Sur State Park. As elsewhere in central California, rainfall is strongly seasonal, and generally increases with altitude. The distribution of rainfall by months at this station is shown in Table 1. Virtually all the precipitation falls in the form of rain. There are usually one or two snowfalls per year at the upper elevations. While having at most minor direct effects on runoff and the hydrologic budget, the snows and occasional hail can significantly damage

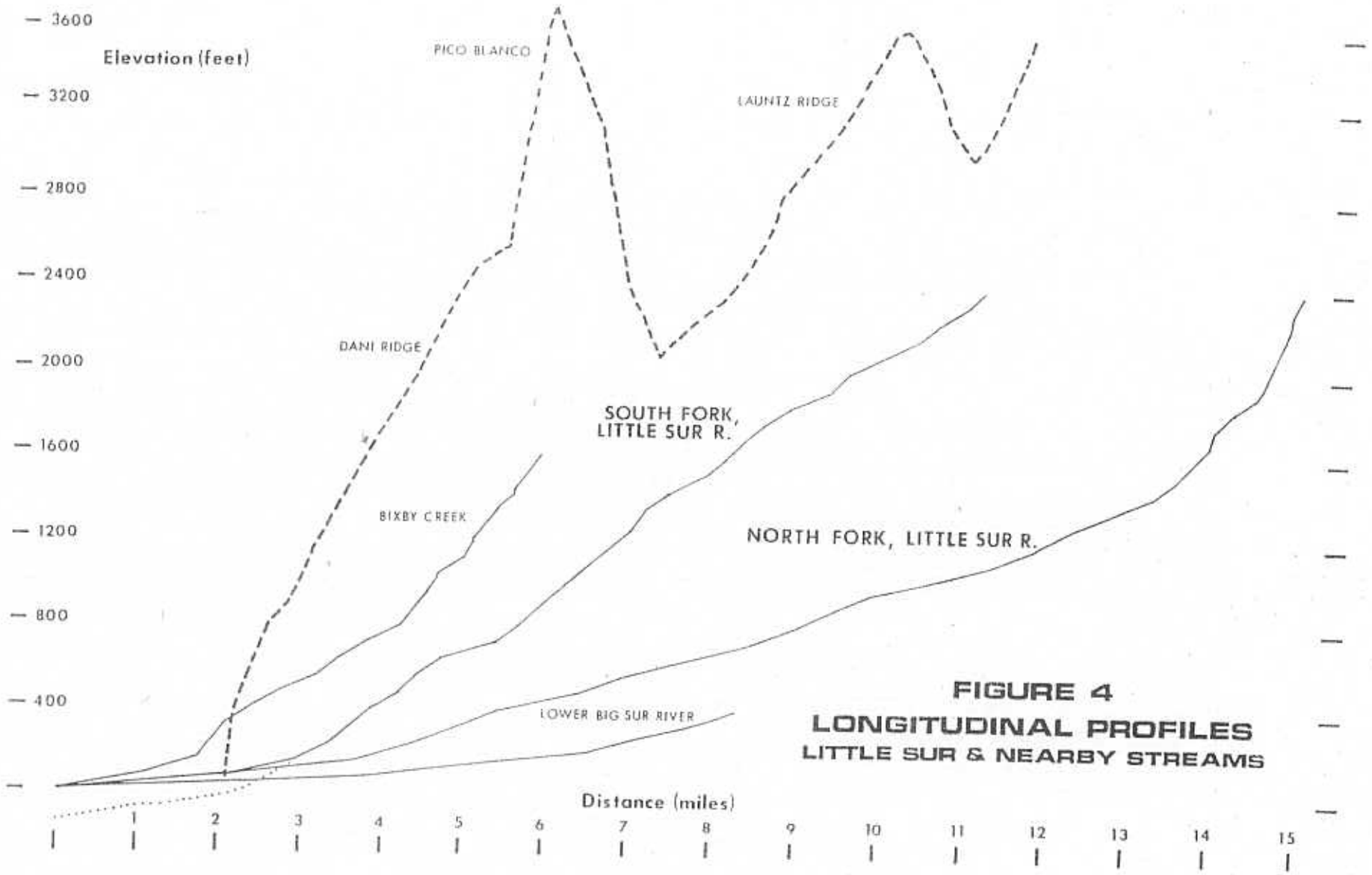


FIGURE 4
LONGITUDINAL PROFILES
LITTLE SUR & NEARBY STREAMS

Table 1
Seasonal Rainfall Distribution at Big Sur
Source: State Park Staff

60 Year Statistics (1914-15 through 1973-74 Seasons):

	(Jul)	(Aug)	(Sep)	(Oct)	(Nov)	(Dec)	(Jan)	(Feb)	(Mar)	(Apr)	(May)	(Jun)	(Total)
Greatest:													
Year-	1966	1935	1959	1962	1965	1955	1969	1940	1974	1967	1957	1934	1940-41
Amount-	00.12	00.45	08.72	08.15	14.97	27.21	23.50	22.39	16.12	12.41	07.58	02.53	77.53
Least:													
Year-	1973	1973	1968	1966	1959	1930	1948	1953	1934	1949	1974	1973	1923-24
Amount-	00.00	00.00	00.00	00.00	00.00	00.27	00.21	00.00	00.00	00.03	00.00	00.00	18.87
Average:													
Amount-	00.00	00.02	00.39	01.69	04.34	07.87	08.10	07.57	05.54	03.12	00.94	00.25	39.83

vegetation, resulting in some major indirect watershed influences (Griffin, 1978; Hecht, 1981).

There is little agreement on the average annual rainfall throughout the Little Sur Watershed, a reflection of minimal available data. A rainfall map of the northern Santa Lucia Mountains published in 1967 as part of a Flood Plain Information series for the Carmel River (U.S. Army Corps of Engineers, 1967) indicates a basinwide annual rainfall mean for the Little Sur River of about 28 inches. The Department of Water Resources however, concluded that precipitation in the basin averaged 48 inches (Black & Veatch, 1980). The U.S. Geological Survey isohyetal map (Rantz, 1969) gives a range of 30-50 inches throughout the basin. The existing published data are plainly inadequate, even for general planning purposes. A recording rain gage was installed on Pico Blanco in late 1977 by the Monterey County Flood Control and Water Conservation District. Available data from this source are limited, but will allow a more authoritative assessment of the precipitation regime during the next few years.

Streamflow and Loads

The Little Sur River conveys water, sediment, salts, nutrients and vegetative debris to the Pacific Ocean. Each element is a component in the ecology of the riparian and coastal zones. Additionally, delivery of most elements is greatly accelerated by major floods or wildfires. At the present time, these stream loads are probably elevated to an unknown degree as a result of the Marble-Cone Fire; hence no measurements were made for this report.

Streamflow in the Little Sur River has been measured only periodically. Measurements of steamflow were made during the drought of 1976 and 1977 (Table 2) by R. Trotter, civil engineer and longtime local resident (Trotter, 1979) and by the United States Geological Survey (U.S.G.S. Report CA-77-2). The lowest flow recorded by Roy Trotter was 930 gpm (2.04 cfs) in early October of 1977. In conjunction with Mr. Trotter, Black & Veatch Engineers (1980) estimated that annual runoff from the Little Sur River averages about 36,500 acre feet per year. The principal basis for the estimate is apparently correlation with the Big Sur River, the only local stream with a sustained gaging history. The greatest estimated flow was 81,370 gpm (200 cfs) in January of 1970. (See Table 3 which presents randomly estimated flows between 1953 and 1970.)

Seasonal variations in discharge, as simulated by Trotter and Vida, are shown in Figure 5. Low flows during the late summer and early fall months are deemed critical for most organisms dependent upon aquatic habitat. Trotter and Vida estimated that the mean flow expected during the months of July, August, and September would average about 4360 gpm (9.37 cfs) under normal conditions. This estimate is 3.5 times the lowest flows measured by Mr. Trotter in the drought year of 1976, the same

Table 2
Drought Flows Measured In Little Sur Basin

Stream, Station	Date	Time (hours)	Air Temp. (F)	Water Temp. (F)	Discharge (gpm)	Discharge (cfs)	(cfs.sq.mi)	Source
Little Sur Watershed								
Little Sur River, 0.5 miles below junction of North & South Forks	9-6-76	1400	64	--	1246	2.77	.076	Trotter
	10-8-77	1200	61	57	930	2.04	.057	Trotter
South Fork, Litle Sur River, above Old Coast Highway Bridge	9-6-76	1000	60	57	280	0.62	.054	Trotter
	12-11-76	1100	49	45	270	0.60	.053	Trotter
	9-17-77	1130	64	56	120	0.27	.022	Trotter
	10-8-77	1200	--	57	110	0.25	.022	Trotter
U.S.G.S.								USGS
Big Sur Watershed								
Pheneger Cr.	8-22-76		--	--	0	0	0	Trotter
Juan Higuera Cr.	8-30-76		--	--	367.1	0.82	0.45	Trotter
Pfeiffer-Redwood Cr.	9-20-76		--	--	56.9	0.13	0.13	Trotter
Pfeiffer Cr.	8-22-76				0	0	0	Trotter
Post Cr.	9-20-76				12.1	0.027	0.020	Trotter
Big Sur River	7-30-76				2287	5.1	0.110	USGS
	8-23-77				1165	2.6	0.056	USGS

Measurements by Roy M. Trotter, assisted by Monterey County staff.

1 Lowest reported mean daily discharge at U.S. Geological Survey gage (drainage area = 46.5 sq. mi.)
2 Lowest discharge reported for period of record, beginning March 1950, prior to the drought of 1976-77 the lowest recorded. Flow was 3.7 cfs on October 7, 1961.
3 Trotter and Vida, 1980.
4 U.S.G.S., 1977.

Table 3
Water Quality In Selected Coastal Streams Supporting
Anadromous Fisheries [a/] [b/]

Stream & Station	Date	Discharge [c/] cfs	Temp °C	EC [d/] umhos/cm	pH [d/] units	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	TDS [e/]	Geologic [f/] Influences
Little Sur River at Hwy. 1	01/21/53	-	11	234	7.8	29	6.3	10	1.4	0.0	115	13	9.5	0.1	0.2	0.02	—	gr, m, m-l
	06/23/53	13	17.9	304	7.6	38	8.3	12	1.4	0.0	149	17	12	0.5	0.2	0.03	—	
	02/18/69	-	12	191	8.1	24	5.8	7.3	1.0	0.0	94	—	6.6	0.1	—	0.0	—	
	04/22/69	80	13	239	7.6	30	7.3	9.0	0.7	0.0	120	15	8.4	0.0	—	0.00	142	
	10/03/69	6.4	14	372	8.4	—	—	15	—	5.0	178	—	16	—	—	0.1	—	
	01/21/70	200	16	199	7.7	17	10	6.8	—	0.0	101	—	7.1	0.2	—	—	—	
Little Sur River at N. Fork at Old Coast Road	07/27/53	5.5	15	278	7.9	30	9.6	13	1.5	0.0	138	16	11	0.1	0.4	0.00	—	gr, m
	02/26/70	50	14	192	7.8	22	5.4	9.2	1.3	0.0	96	7.7	5.9	0.0	—	0.00	118	
Little Sur River S. Fork at Old Coast Road	07/27/53	5.5	13.9	380	8.0	57	4.3	9.6	0.8	0.0	206	20	9.8	0.1	0.2	0.01	—	m, m-l, gr
	02/26/70	30	—	296	8.1	45	6.3	8.2	0.9	0.0	168	12	6.7	0.0	—	0.00	162	
Little River Hill Runoff at Highway 1	01/21/53	0.8	12	474	7.9	34	16	41	1.0	0.0	151	42	49	2.4	0.5	0.06	—	Tm, f
Swiss Canyon at Highway 1	01/21/53	1.0	12	410	8.0	38	15	24	1.2	0.0	165	31	28	2.2	0.3	0.03	—	f, Tm
	04/22/69	1.0	16	471	8.2	46	18	27	—	0.0	200	—	30	0.1	—	--	—	
	01/21/70	30	16	362	7.8	28	15	22	—	0.0	137	—	27	2.2	—	--	—	
Carmel River at Robles del Rio	01/20/53	125	11	207	7.5	20	7.3	12	1.8	0.0	85	20	11	—	0.1	0.01	—	gr, Tm
	07/15/53	3.0	21	599	7.5	61	18	38	3.8	0.0	174	104	43	—	0.2	0.09	—	Tm, gr
	05/15/69	3.61	16	——	7.9	34	11	18	2.4	0.0	116	41	18	0.3	—	0.1	—	
Pajaro River at Chittenden	09/24/53	3.19	19.5	1860	8.2	87	88	212	6.5	0.0	602	278	184	1.8	0.5	0.68	—	f, Tm
	09/04/69	—	16	1790	8.1	9.2	134	207	5.2	0.0	523	——	200	4.5	—	0.90	1190	
San Lorenzo River at Felton	09/20/74	22	16.5	268	7.9	39	6.8	21	1.8	0.0	136	32	22	0.23	0.2	0.07	—	Tm, gr, m
Fall Creek at Felton	10/24/73	2.7	13.0	241	8.4	36	5.2	9.3	2.0	0.0	139	8.6	8.1	—	—	——	—	m
Majors Creek near Santa Cruz	08/18/77	0.76	16.0	425	7.6	64	4.0	16	1.7	0.0	150	72	16	0.37	0.1	0.02	—	Tm
San Vicente Creek near Davenport	08/26/77	0.23	13.5	215	7.1	18	4.3	16	1.9	0.0	83	7.0	14	0.05	0.1	0.03	—	gr, m-l

Footnotes for Table 6

a/ Data include all known general mineral analyses in or adjacent to the Little Sur watershed, plus other selected streams in which water quality is strongly influenced by rock types occurring in the Little Sur basin. Samples collected on dates with conditions as similar as possible to the summer analyses have been chosen.

b/ All analyses in milligrams per liter (mg/l) unless otherwise indicated. Changes in analytical methods and precision occurred during the 25-year period represented in this table; not all reported values are strictly comparable.

c/ Means of determination unknown, except for flows given to the nearest 0.01 cfs, which are recorded at nearby gauging station. Many other flows, presumably, are estimated.

d/ Laboratory value.

e/ Gravimetric or residue determinations only.

f/ Key to abbreviations of geologic types:

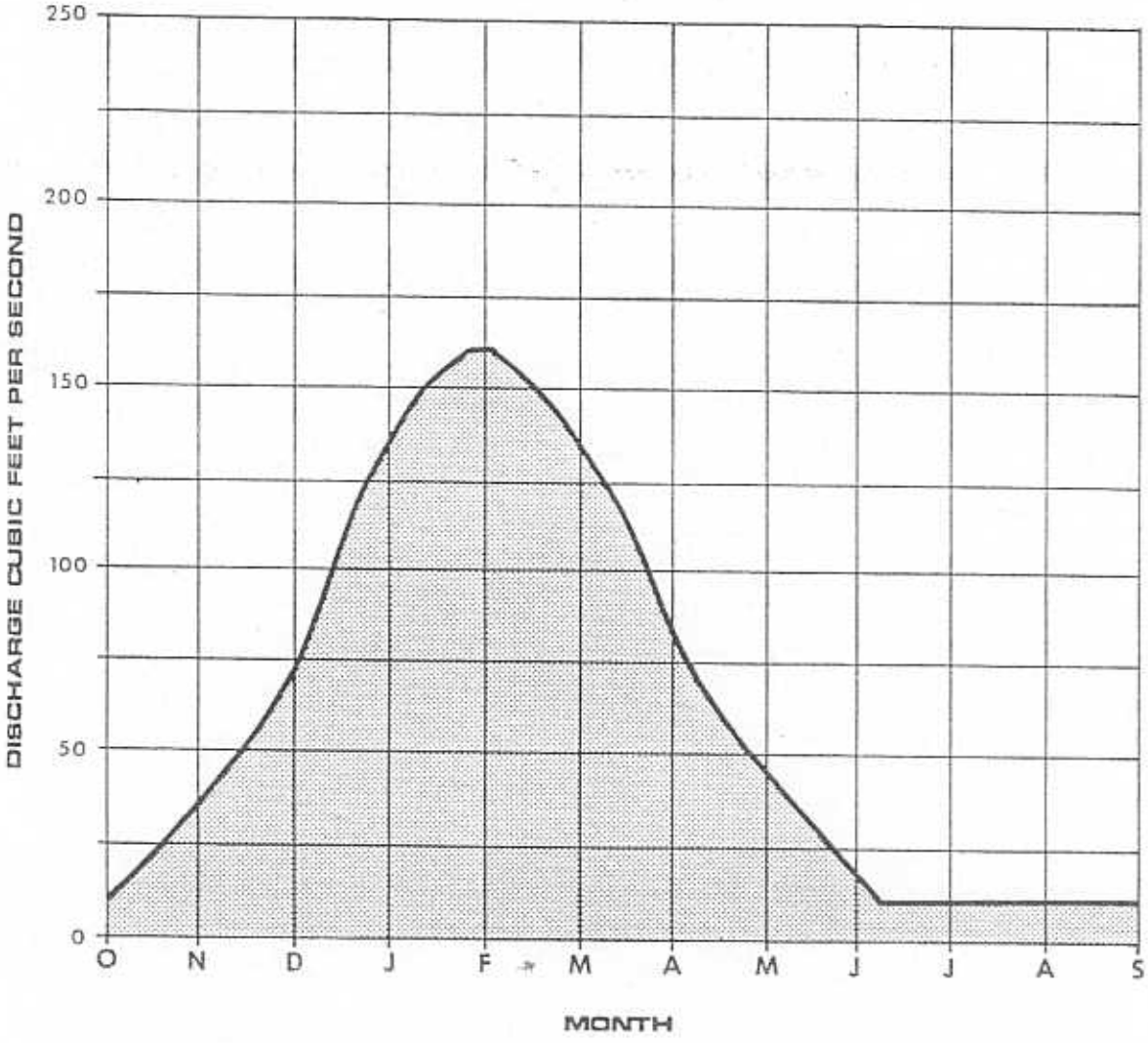
Tm: Tertiary marine sediments
gr: Granitic rocks of acidic to basic composition
m: Sur Series metasediments, undifferentiated
m-l: Sur Series metasediments, primarily limestone

Source: Unpublished records of Department of Water Resources and U. S. Geological Survey.

FIGURE 5

SYNTHETIC SEASONAL DISTRIBUTION OF RUNOFF, LITTLE SUR RIVER

Source: Trotter and Vida, 1980



ratio as the normal to drought flows at the Big Sur River gage. The Big Sur River sustains a higher rate of low flow per unit area of drainage (Table 2).

Pending validation by field measurements, the estimates developed by Trotter and Vida are the most recent and may be accepted for interim use in the Protected Waterways Plan. It must be understood that these estimates are based on similarities of the Little Sur to the Big Sur Basin, and should be interpreted in this light. For example, runoff properties of the two basins may not currently be similar, due to the much greater extent of burning in the Big Sur Basin during the 1977 fire. The Trotter and Vida study also used the higher mean annual rainfall estimates (48 inches) for the Little Sur Watershed, nearly equal to those of the Big Sur Basin. If the true rainfall is closer to the 28 inches estimated by the Corps of Engineers, estimates based upon the assumed similarity of basins might not be as valid.

No data on sediment transport in the Little Sur Basin have been collected, and no estimates of sediment yields from the watershed have been computed. Sediment yields in a steep, montane basin are highly dependent upon sediment supplies, which are often dominated by fires, floods, landslides, and disruption by roads or other land uses. For the purposes of this plan, the findings cited in Hecht's (1981) reports on the adjacent upper Carmel River Watershed are probably applicable to the Little Sur Basin. These suggest long-term sediment yields of about 500 to 1000 tons per year per square mile (tpy/mi) which may not be greatly in error for largely undisturbed portions of these basins. Of this total, perhaps 30 percent (or 150 to 300 tpy/mi) may be material of the sizes transported as bedload. This material has been shown (Hecht and Enkeboll, 1980) to constitute the pool and glide fills which are probably principal constraints on salmonid rearing habitat.

Water Quality

The current and anticipated beneficial uses of the Little Sur River are as follows:

(1) Domestic water supply
(2) Groundwater recharge
(3) Agricultural (livestock watering)
(4) Industrial (mining)
(5) Water contact recreation
(6) Nonwater contact recreation
(7) Cold freshwater habitat
(8) Fish migration
(9) Fish spawning
(10) Wildlife habitat

Of the foregoing all but items (3) and (4) are given in the Central Coastal Basin Plan (RWQCB, 1975). The specific water quality criteria designed to protect these uses are given in the Basin Plan.

The watershed management plan should first compare the existing water quality parameters of the watershed with the criteria designed to protect its beneficial uses. Secondly, it should then examine the projected uses of the watershed and estimate their impacts on water quality in the future. Thirdly, it should offer mitigation measures in both the present and future to keep the water quality parameters within the criteria so as to maintain all of the existing and anticipated beneficial uses.

All known general mineral analyses within the watershed and the El Sur Ranch are presented in Table 3. Although the data are very limited, it appears in general that there are few existing water quality problems in the Little Sur River Watershed. This general condition is to be expected due to the very low intensity of development of the watershed and limited resource extraction as well as the existence of the Ventana Wilderness in the upper watershed.

The streams within the watershed have alkaline waters of low to moderate salinities. Calcium and bicarbonate are the predominant dissolved species, except in the coastal portion of the basin, where relatively greater amounts of magnesium, sodium, sulfate, and nitrates are observed. Rock type is the principal influence on the composition of these waters. Elevated levels of dissolved nitrate in Swiss Canyon and the unnamed stream draining Little River Hill probably reflect use of these watersheds by livestock. Table 3 also presents analyses from the Pajaro, Fall, San Vicente, and San Lorenzo basins, characteristic of the influences of Franciscan, schistose, limestone and granitic, and mixed rock types. The greater salinities and sulfate concentrations typical of the Tertiary marine sediments are reflected in low flow analyses for the Carmel River and Majors Creek. Each of these streams has much more substantial water quality records. If it proves necessary to project the effects of altered or extreme watershed conditions to sub-basins of the Little Sur River, these streams may serve as a realistic basis for analysis.

Similarly, reports of analyses for trace metals in the basin are very rare. Those that do exist indicate that very low levels of levels of toxic or nuisance metals are expected throughout the region (Table 4). The most likely source of these metals is weathering of the minor pockets of sulfide mineralization reported in upper portions of the basin and nearby watersheds. However, a recent comprehensive assessment of levels of metals in seepage from a disturbed deposit of this type at Felton Quarry (San Lorenzo River Basin) demonstrated that only iron and manganese are released in detectable concentrations (HEA, 1978). It should also be noted that the Little Sur River is free of cadmium, mercury, and other metals present in the Carmel, Salinas, and San Lorenzo rivers, which may adversely affect some aquatic organisms in these streams. The only portion of the Little Sur Watershed in which trace constituents might be found in problematic concentrations is in the Franciscan and marine sedimentary rocks west of the Sur Hill fault. The highest

Table 4
Results of Spectrographic Analysis Monterey County
Coastal Drainage Basins, January 1970

Source	Location	Al	Be	Bi	Cd	Cr	Co	Cu	Ga	Ge	Fe	Pb	Mn	Mo	Ni	Ti	V	Zn
		(in micrograms per liter)																
San Jose Creek	16s/01W-23R	127	<1.3	<0.7	<3.3	<3.3	<3.3	<3.3	<13	<0.7	200	<3.3	6.7	<0.7	<0.7	6.3	2.8	<13
Wildcat Creek	16s/01W-35L	67	"	"	"	"	"	"	"	"	73	"	50	"	"	<1.3	<0.7	"
Garrapata Creek	17s/01W-36A	11	"	"	"	"	"	"	"	"	10	"	<3.3	"	"	"	1.3	"
Palo Cologado Canyon	18s/01W-06B	20	"	"	"	"	"	"	"	"	11	"	"	"	"	"	"	"
Bixby Creek	18s/01W-18B	7.3	"	"	"	"	"	"	"	"	<3.3	"	"	"	"	"	0.9	"
Little Sur River	18s/01W-29Q	27	"	"	"	"	"	"	"	"	27	"	"	"	"	"	1.5	"
Big Sur River	19s/02W-29N	12	"	"	"	"	"	"	"	"	15	"	"	"	"	"	1.1	"
Arroyo Seco Creek	19s/14W-36J	<3.3	"	"	"	"	"	"	"	"	8.7	"	"	"	"	"	1.5	"
Partington Creek	20s/02W-24K	11	"	"	"	"	"	"	"	"	13	"	"	"	"	"	2.2	"
Hot Springs Creek	21s/03W-09B	7.3	"	"	"	"	"	"	"	"	11	"	"	"	"	"	2.3	"
Big Creek	21s/03W-26R	6.0	"	"	"	"	"	"	"	"	15	"	"	"	"	"	1.8	"
Limekiln Creek	22s/04W-22B	20	"	"	"	"	"	"	"	"	27	"	"	"	"	"	1.3	"
Wild Cattle Creek	22s/04W-35Q	<3.3	"	"	"	"	"	"	"	"	80	"	"	"	"	"	<0.7	"
Willow Creek	23s/05W-31A	15	"	"	"	"	"	"	"	"	35	"	"	"	"	"	"	"
Villa Creek	24s/05W-15A	25	"	"	"	"	"	"	"	"	17	"	"	"	"	"	0.8	"
Redwood Gulch	24s/05W-23A	25	"	"	"	"	"	"	"	"	29	"	"	"	"	"	<0.7	"
Soda Springs Creek	24s/05W-25A	8.7	"	"	"	"	"	"	"	"	12	"	"	"	"	"	"	"
Salmon Creek	24s/06W-30K	27	"	"	"	"	"	"	"	"	22	"	"	"	"	"	"	"

* Trace element concentrations determined by the spectrochemical method are reported as specified and relative values. If the concentration of the trace element in question is greater than a specified minimum, it is reported as a specific value. When an element has not been positively identified in a sample, it is reported as less than a predetermined minimum detection limit. Failure to detect a particular element does not mean that the element is absent but that it may be present at some concentration below the detection limit. In some cases, the concentraction may be so large as to exceed the upper limit of precision. In this case it is reported as greater than a predetermined maximum detection limit. The maximum and minimum detection limits are determined by aliquot size and the sensitivity of the equipment used to make the determination.

< means less than the indicated value.

Al - Aluminum, Be - Berryllium, Bi - Bismuth, Cd - Cadmium, Cr - Chromium, Co - Cobalt, Cu - Copper, Ga - Gallium, Ge - Ge - Germanium, Fe - Iron, Pb - Lead, Mn - Manganese, MO - Molybdenium, Ni - Nickel, Ti -Titanium, V - Vandadium, Zn - Zinc

Source. California Department of Water Resources, 1971.

levels of sodium, fluoride, and boron were reported in the unnamed stream draining Little River Hill.

No information is available on bacterial counts in the surface waters of the basin.

Groundwater Occurrence and Movement

Groundwater occurs in locally variable amounts within all major rock units outcropping in the watershed. The only aquifer of regional significance is the alluvium of the lower Little Sur River. Locally significant waterbearing units are the Tertiary marine sediments (Oakeshott, 1951) and limestone rich portions of the crystalline metasediments. The limestone, widely distributed in the basin, is regarded as an important source of baseflow in both forks of the river (Trotter and Vida, 1981).

The granitic and noncalcareous metasediments collectively contribute a large proportion of the baseflow of both forks and their major tributaries; the distribution of water within these units is extremely variable, largely determined by the local extent of weathering, fractures, and veins and dikes. Smaller volumes of water are yielded by the Franciscan rocks, especially where heavily fractured.

The relative amounts and reliabilities of yields are shown in Table 5. The data clearly establish the partially consolidated tertiary marine sediments and the limestone as predominant sources for springs and upland water supplies. Minimal and more variable flows emanate from the Franciscan rocks, even where extensively fractured; these sources are often dry toward the end of the summer, and are generally not developed for livestock use where other supplies are available.

Water Resources Development and Potential

At present, development of water resources within the watershed is limited to the springs listed in Table 5 and shown on Figure 6, one shallow well serving the former labor camp at the mouth of the river, and isolated small diversions for residences and camps. There are five active water rights in the watersheds, four held by The Monterey Bay Council, Boy Scouts of America and one - Spring 13 - held by Granite Rock Company. The Boy Scouts of America entitlements are for a total of 45,000 gallons per day (about 0.07 cfs) from unnamed springs and streams near the Boy Scout camp, for domestic use and fire protection, and also up to 4 acre feet per year from the North Fork for recreational use. The total appropriation is well under 5 percent of the late summer flows at the camp.

There is one interbasin transfer from the basin - Spring No. 6, a deeded water supply for the Point Sur Lighthouse Reservation. This facility is presently automated and unstaffed, so no water is being drawn. The pipeline is, however, in use by El Sur Ranch to supply three cattle troughs outside of the basin near

Highway 1. The annual volume of exported water is negligible.

Springs 12 and 13, located on the south side of Pico Blanco, are perhaps the largest in the watershed, and are the only significant sources known to local residents. The springs are presently in use as water supplies for the Granite Rock Company's development camp. Flows are reportedly sufficiently strong and reliable to drive a Pelton wheel, the electric power source for the camp. Principal undeveloped water resources are the Little Sur River and the alluvium underlying its lower reaches. The two are likely to be in hydraulic continuity; appropriations from one would likely affect the other. Neither source has been appreciably developed due largely to the lack both of local demand and of residential and visitor-serving developments.

Table 5
Known Springs and Seeps Lower Little Sur
Watershed and Environs

Spring/Seep (number)	Probable Source (geologic unit)	Estimated Early Fall Yield (gallons/ minute)	Current Use
1.	m-l	1	L
2.	m, or gr	7	L
3.	m, or gr	7-10	L
4.	gr	2-3	L
5.	gr	0.2	L
6.	Tm, Qt	4	I,L
7.	Tm, Qt	25-30	F
8.	Qt, Tm, f	seep	F
9.	Tm, Qt	0	L,F
10.	Tm	4-5	L
11.	f	<0.2	L
12.	m-l	>100	I
13.	m-l	>100	I
14.	m, m-l	5-6	L
15.	m, m-l	2-3	undev
16.	m, m-l	0	undev
17.	m	10-12	L
18.	m	0	undev
19.	m, gr(?)	seep	undev
20.	m, gr	5-6	undev

Notes for Table 5.

1. Inferred groundwater source based on mapped distribution of geologic units and faults or other structural features likely to affect groundwater movement. Not field verified.

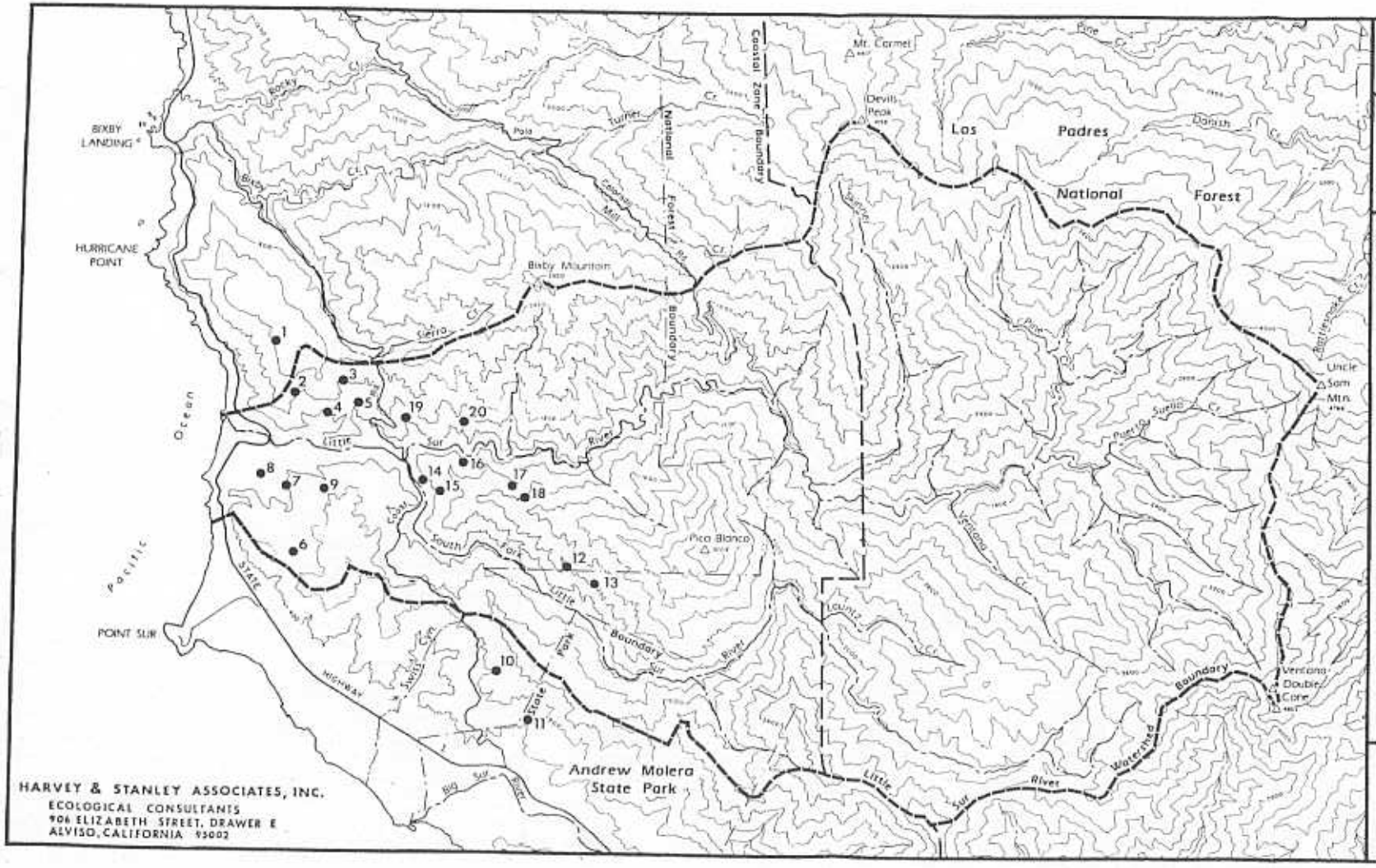
2. Source: Mr. Tom Asmus, El Sur Ranch foreman.

3. Code to geologic units:
   - Oal — Alluvium of Little Sur or Big Sur River.
   - Qt — Terraces, marine and/or alluvial.
   - Tm — Tertiary marine sediments, including Santa Margarita Formation.
   - gr — Granitic rocks, with local.
   - f — Franciscan sedimentary, volcanic, and ultrabasic rocks
   - m — Sur Series metamorphic rocks, undifferentiated.
   - m-l — Sur Series, limestone predominant.

4. Beneficial use code:
   - L — Livestock watering
   - F — Fishery
   - I — Industrial (water supply an/or power generation)

5. Yield reported to be constant 7 gpm, sustained during drought of 1976-1977.

6. Springs and seeps are shown by number on figure 5.



LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN

SPRINGS & SEEPS

FIGURE 6

LOCATIONS OF PRINCIPAL
• SPRINGS & SEEPS IN LOWER LITTLE SUR BASIN

Note: Numbered springs are described in Table 5.

SOURCES: TOM ASMUS, EL SUR RANCH AND BARRY HECHT, H. ESMAILI & ASSOCIATES.

CONTOUR INTERVAL 400 FEET

SCALE IN FEET

Monterey County Planning Department

BIOTIC RESOURCES

Plant Communities

Within the Little Sur River watershed the community of primary importance, to plants and animals alike, is the riparian community. Other notable communities are the redwood forest, coastal strand, coastal grassland, coastal scrub, chaparral, serpentine and limestone areas (Figure 7).

The riparian community is multi-tiered, represented by trees, shrubs, vines and groundcover plants which line the streamsides. It is linear, extending from the river's mouth to the far (or near) reaches of the water source.

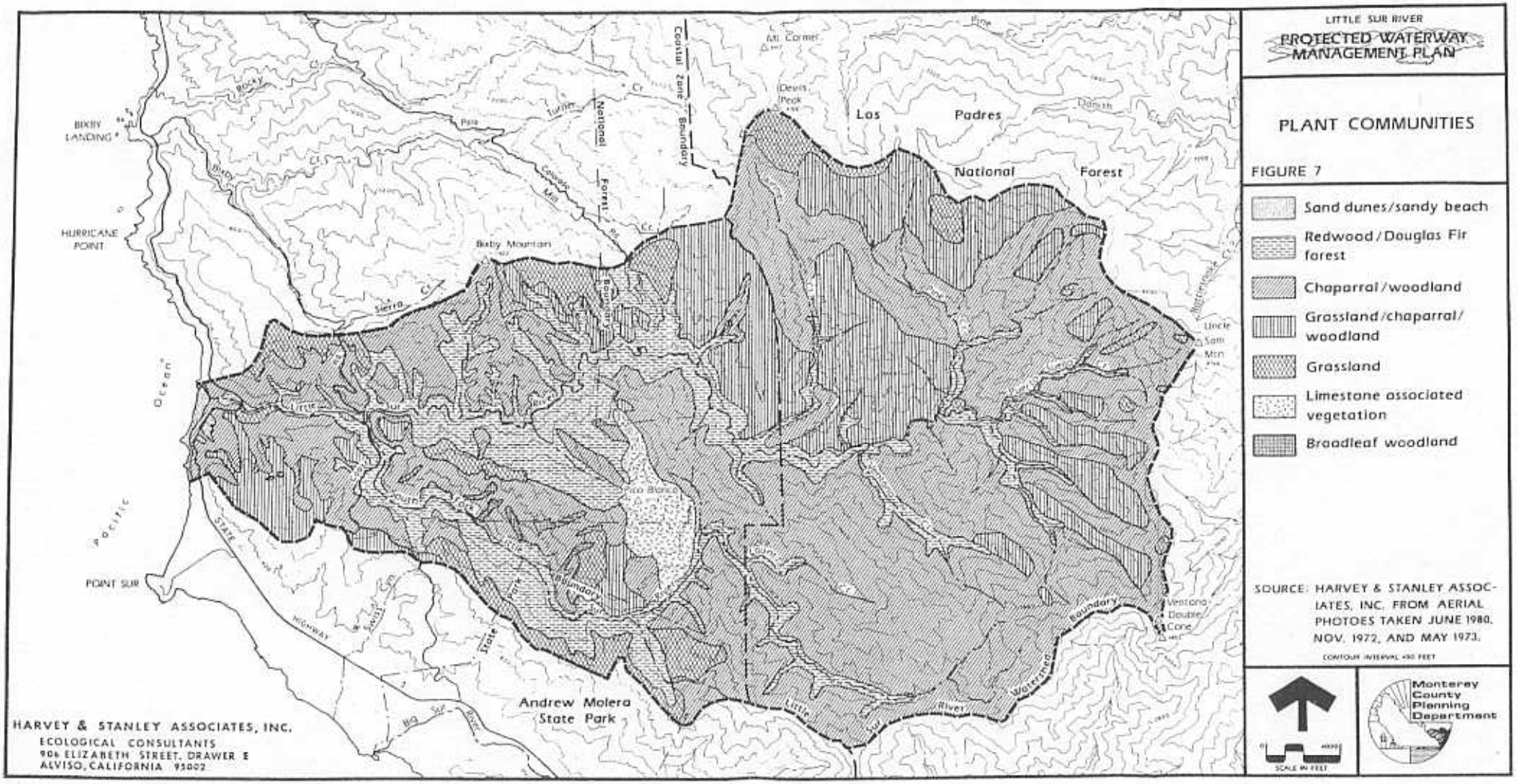
At the mouth of the Little Sur River is a fresh water lagoon. West of Highway 1, the stream meanders among willows (Salix spp.) on its approach to the lagoon.

East of Highway 1, the stream bed takes on a more permanent appearance with its immediate banks closely lined with willows and alders (Alnus rhombifolia) to the near exclusion of grazing livestock. The adjoining meadow is reverting to its former state with willows, and on the drier sites, coyote brush (Baccharis pilularis consanguinea) and bush lupine (Lupinus arboreus). Prior to domestic grazing and the introduction of annual grasses, this meadow may have been a wooded floodplain. With revegetation, the forest could return.

South of the meadow along a tributary is a group of unusually shaped redwoods (Sequoia sempervirens), stunted and molded by the forces of offshore winds. These trees are unique as few redwoods grow in such an exposed location. Nearby along the road is a unique sycamore. It appears to be espaliered against the hillside, though actually wind pruned.

The coastal strand community includes the vegetation on sandy beach and coastal sand dunes. South of the Little Sur River this community extends from the beach up a broad dune to an altitude of approximately 200 feet. The highway cuts across the face of the dune just below the center. Below the highway the lower dune has been stabilized due to an introduced ice plant (Mesembryanthemum sp.). Near and below the highway the rare prostrate ceanothus (Ceanothus griseus var. horizontalis) is found on the southern edge of the watershed and may extend northward to the Little Sur River mouth. The rare plant Little Sur manzanita (Arctostaphylos edmundsii), has been reported as being present at the river mouth (Munz, 1979), although it was not found in a quick field check. Above the highway most of the dune face is exposed due to the strong onshore winds.

The grassland community has two expressions. The major one is found on the two ridge tops, Molera Ridge and Bixby Mountain. The species here were probably largely introduced, with a few


LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN
PLANT COMMUNITIES
FIGURE 7
Sand dunes/sandy beach
Redwood/Douglas Fir forest
Chaparral/woodland
Grassland/chaparral/woodland
Grassland
Limestone associated vegetation
Broadleaf woodland
SOURCE: HARVEY & STANLEY ASSOCIATES, INC. FROM AERIAL PHOTOES TAKEN JUNE 1980, NOV. 1972, AND MAY 1973.
CONTOUR INTERVAL 400 FEET
SCALE IN FEET
Monterey County Planning Department
HARVEY & STANLEY ASSOCIATES, INC.
ECOLOGICAL CONSULTANTS
906 ELIZABETH STREET, DRAWER E
ALVISO, CALIFORNIA 95002
Andrew Molera State Park
Los Padres National Forest
Coastal Zone Boundary
Mt. Carmel
Devil Peak
Bixby Landing
Hurricane Point
Bixby Mountain
Point Sur
Pacific Ocean
Uncle Sam Mtn
Ventana Double Cone
Little Sur River
Big Sur River
State Highway 1

native ones. The second grassland area is found only on the southeastern slope of Pico Blanco. Vegetation is quite sparse on this arid calcareous medium with few native or introduced grass species.

The chaparral community consists of low dense shrubs, generally evergreen, which grow on dry sunny slopes. In the Little Sur River Watershed, as for example on the southfacing slopes of Bixby Mountain and Dani Ridge, this community is situated between the grassy ridges above and the streamside riparian and redwood communities below. This location is based on the chaparral's intermediate water needs, namely, less than those of the riparian community but more than the grassland's. The interdigitating fingers of the redwood forest also extend up moist draws into the chaparral. Hollyleaved buckthorn (Rhamnus crocea ssp. ilicifolia). California scrub oak (Quercus dumosa), manzanita (Arctostaphylos spp.), and ceanothus (Ceanothus spp.) are representative of the chaparral community. To the east of Pico Blanco chaparral clothes the higher ridges which are dissected by redwood - dominated ravines.

The limestone areas on the south side of Pico Blanco are a combination of rocky outcrop and areas of very shallow soil, mainly 2-5 inches deep. The vegetation is sparse. Most of the plants are native except for a few exotic grasses. An occasional bush is represented by hollyleaf buckthorn and, on deeper soil, by California scrub oak.

The redwood forest community in this southerly portion of its range outlines most of the canyon bottoms, being closely associated with the riparian communities due to its high water requirements. In the reaches of the North and South Forks west of Pico Blanco, the canyon bottom redwood forest community is nearly continuous and can form nearly pure stands of coast redwood. This community also climbs rather high on the northfacing slopes of canyons, particulary where limestone occurs.

Wildlife Communities

Due to the great diversity of plant life in the Little Sur River Watershed, a wide variety of animals utilize the area during part or all of their lives and the preservation of this habitat is essential to the maintenance of that wildlife. Water, escape and protective cover, food sources, and roosting, denning, or nesting sites are the available watershed resources used extensively by wildlife. Several biotic communities, including riparian, coastal strand, chaparral, grassland, redwood, and mixed coniferous forest, are found within the watershed.

Riparian: The riparian community, with its aquatic environment and rich supply of resources, provides habitat for likely the greatest number and diversity of wildlife. The Little Sur River and its tributaries provide the needed water for many wildlife species. Fish and amphibians require water for feeding,

breeding, egg laying, and larval development. Native fishes found within the Little Sur River and its tributaries include steelhead and rainbow trout, three spined stickleback, Pacific lamprey, and coast range sculpin. The steelhead and lamprey are anadromous and migrate from the ocean, upstream to spawn in fresh water. Amphibians associated with the riparian community include the arboreal salamander, California newt, ensatina, California slender salamander, red-legged frog, yellow-legged frog, and Pacific treefrog. Reptiles found along the riparian corridor may include the western pond turtle, common garter snake, and western fence lizard.

Riparian vegetation is extremely important for wildlife as escape or protective cover, perching or nesting sites, and for denning. The dense ground cover, understory and canopy of the riparian vegetation along the Little Sur River offer a variety of spatial niches for many species of birds. Dead trees, snags, or denuded limbs, and crevices in the bark provide shelter for cavity nesters such as the brown creeper, nuthatch, American kestrel, and various woodpeckers. Hawks and owls perch or roost on the branches of larger trees. Many of these perches become regular roost sites for these raptors. The large trees not only provide cover and living quarters for some animals, but also shade the water in the creekbed, thereby reducing its temperature and making it more suitable for use by wildlife. High water temperatures particulary affect the steelhead, a cold water species. Riparian vegetation along the streams of the Little Sur River Watershed also serves to protect wildlife as they come to the creek to drink water. In addition, some riparian plants provide food for many animals. Mammals found along the riparian corridor include bats, opossum, raccoon, mice, gray fox, European wild boar, and black-tailed deer.

The riparian corridor and Little Sur River mouth are particularly important to a wide variety of birds. Belted kingfishers and great blue herons forage for fish along the lower river course. The dipper or water ouzel pursues aquatic invertebrates underwater. Migrating and resident shorebirds and waterfowl congregate at the river mouth and lagoon to feed and nest. Insectivorous birds (warblers, flycatchers) forage among the willows. The band-tailed pigeon, Steller's jay, purple finch, robin, and cedar waxwing are a few of the numerous fruit eating species attracted to fruiting elderberries and blackberries found along the stream courses. Riparian vegetation attracts the greatest numbers of birds during spring and fall migration.

Chaparral: The warm and dry conditions of the chaparral community within the Little Sur River Watershed restricts wildlife activities to the cooler times of the day. Therefore, most chaparral wildlife species are nocturnal or crepuscular. The dense, tangled network of chaparral vegetation provides excellent cover for inhabitants such as the dusky-footed woodrat, brush rabbit, various mice species, gray fox, and wildboar. Chaparral vegetation is an extremely important food

source for black-tailed deer, as they browse on the new plant growth. Mountain lions hunt for deer and other prey in this community. Common birds found in this community include the California thrasher, scrub jay, wrentit, Bewick's wren, California quail, towhee, fox sparrow, Anna's hummingbird and golden-crowned sparrow. The western rattlesnake, southern alligator lizard, and western fence lizard are representative reptiles of the chaparral common in the Little Sur River Watershed. As one might expect, few amphibians are found in chaparral due to the xeric conditions.

Grassland: In the Little Sur River watershed, the grassland community is comprised mostly of introduced grasses. Livestock grazing helps to maintain its open nature. The grassy areas interspersed with invading shrubs offer habitat for a variety of burrowing animals such as Botta pocket gophers, Beechey ground squirrels, and meadow mice. Predators such as hawks, owls, white-tailed kites, coyotes, gray foxes, skunks, various snakes, and the mountain lion take advantage of the abundant food source and forage for prey as they visit the grasslands. In the early mornings and evenings, deer and wild boar are often seen as they stop to feed on their way to the river or its tributaries for water. Both insectivorous and seed eating birds such as the western meadowlark, Brewer's blackbird, house finch and California quail find valuable food amongst the grasses.

Redwood Community: Within the Little Sur River Watershed, the variety of wildlife is rather limited in the redwood community. Bats forage for flying insects amongst the tree tops. Dusky-footed woodrats, some mice, broadhanded moles, and the western gray squirrel are permanent residents. Birds such as the Steller's jay, varied thrush, dark-eyed junco, and golden-crowned kinglet are found at the edge of the community. Nocturnal predators such as screech and great horned owls, mountain lion, raccoons, bobcats, and coyote often pass through on their way to forage elsewhere. Amphibians such as ensatina, California slender salamander, and arboreal salamander find refuge in the cool, moist leaf litter.

Mixed Coniferous and Mixed Evergreen Forests: The mixed coniferous and evergreen forests offer habitat for a wide variety of wildlife in the upper Little Sur River Watershed. Spatial niches for the many species of birds, mammals, amphibians, and reptiles abound. Some of the more common birds seen in this community include the chestnut-backed chickadee, Steller's jay, dark-eyed junco, brown creeper, screech owl, and various species of woodpeckers, flycatcher, vireos, and warblers. Representative mammals found in the forests are mice, the dusky-footed woodrat, raccoon, bobcat, western gray squirrel, and black-tailed deer. Various bats pursue flying insects throughout the forest canopy. Amphibians and reptiles associated with the forests include the arboreal salamander, California slender salamander, ensatina, western skink, western ringneck snake, and racer.

Coastal Strand: The coastal strand is a narrow strip of land bordered on the west by the Pacific Ocean, while to the east it merges with the coastal scrub community. The abundant invertebrates, mostly sand crabs and crustaceans, provide food for the great variety and number of shorebirds that come to feed and rest along the sandy shore. Few mammals are found in this community. Occasionally, seals and sea lions are seen as they haul out to rest. The raccoon forages for shellfish that have washed up along the beach. Gray foxes, skunks, and the European wild boar will sporadically visit the coastal strand in pursuit of food.

ISSUES AND CONCERNS

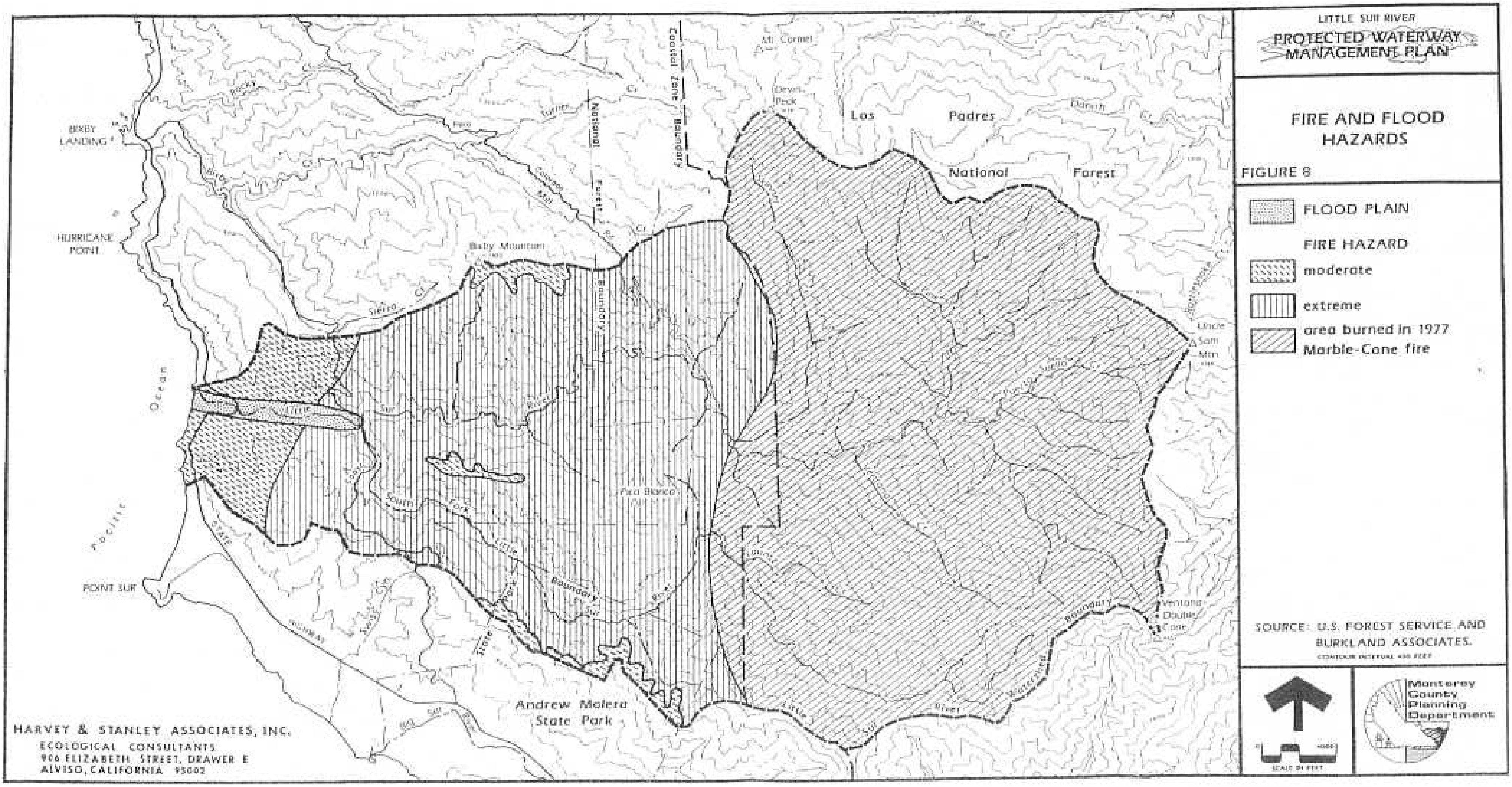
WATERSHED RESOURCE

Fire Hazard

The Santa Lucia Mountains generally are a fire-prone and fire-adapted natural area and undoubtedly saw many natural fires before the coming of man. The Little Sur River Watershed has burned a number of times since the U.S. Forest Service commenced keeping records in 1911 (U.S.F.S. undated). In 1911, a fire centered in Doolan's Hole area crossed the ridge into the upper South Fork of the Little Sur drainage (approximately 200 acres), as did also the 1972 Andrew Molera Park fire (approximately 300 acres). A major fire swept essentially all of the Ventana Wilderness area in the upper watershed (approximately 12,000 acres) in 1924. In 1926, a local fire swept the southeast slope of Pico Blanco Mountain (approximately 400 acres). The Bixby Mountain fire of 1939 burned around 2,700 acres in the watershed, and is the only recorded fire near the ocean. In 1970, the Mt. Carmel fire entered the watershed from the north at Bottcher's* Gap, burning all of Skinner Ridge and eastward to Comings Creek as far south as the Main Fork (approximately 4,500 acres). The largest fire recorded has been the 1977 Marble Cone fire which burned over all of the wilderness area part of the watershed and to a line joining Devil's Peak on the north to Post Summit on the south (approximately 15,000 acres), missing the Boy Scout Camp by about one-half mile.

Based on the historic fire mapping of the area as well as on the temperature and relative humidity as functions of distance inland from the coast, the observed fire behavior agrees with the LCP fire hazard map (Fig. 8). This map shows moderate fire hazard along the immediate coastline and extreme hazard beyond a line approximately one mile inland. It is based on the fire hazard severity classification system employed by the California Division of Forestry (CDF, 1973). Steep slopes (largely 40-60%) and medium-to-heavy fuel loading (scrub and woodland or brushland) combine during the dry season to put most of the watershed in the extreme hazard category. The fuel loading factor has likely been somewhat increased, mainly in the lower watershed and lower elevations of the upper watershed, by fire suppression. Overall, present fuel loading is considered to be moderate to low, particularly in the upper watershed, as a result of the Marble Cone Fire.

* The place name "Bottcher's Gap", being the name and spelling used by the local inhabitants, is employed here in the text, while the U.S.G.S. topographic map erroneously uses the name "Boucher's Gap".


LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN
FIRE AND FLOOD HAZARDS
FIGURE 8
FLOOD PLAIN
FIRE HAZARD
moderate
extreme
area burned in 1977 Marble-Cone fire
SOURCE: U.S. FOREST SERVICE AND BURKLAND ASSOCIATES.
SCALE IN FEET
Monterey County Planning Department
HARVEY & STANLEY ASSOCIATES, INC.
ECOLOGICAL CONSULTANTS
906 ELIZABETH STREET, DRAWER E
ALVISO, CALIFORNIA 95002
BIXBY LANDING
HURRICANE POINT
POINT SUR
Pacific Ocean
Andrew Molera State Park
Los Padres National Forest
National Forest Boundary
Coastal Zone Boundary
Bixby Mountain
Pico Blanco
Mt. Carmel
Devils Peak
Uncle Sam Mtn
Ventana Double Cone
Sierra Cr.
Swiss Cyn
State Park Boundary
Little Sur River Watershed Boundary

Fire, Flood, and Drought Impacts on Watershed

Unusual, episodic events are central considerations in managing steep, small watersheds such as the Little Sur basin. The principal influences in this area appear to be fires, floods, and droughts. Landslides have occurred in the Little Sur basin, especially west of the Sur Hill fault, and along the South Fork; these probably have a minor effect presently on the channel or flow regime. Landslides might potentially be a significant source of sediment if reactivated by poorly planned road construction or by rainfall of extreme magnitude.

Major floods of record in the nearby Carmel River Watershed have occurred in 1911, 1914, 1955, and 1969 with occasional high waters of lesser magnitude since that time. The northern Santa Lucia Mountains channels are among the few in the state which have not experienced a high recurrence event in the past 30 years or more. Tom Asmus, lifelong resident, reports that the highest waters in the Little Sur River occurred in 1938 and 1978. The floodplain of the Little Sur River is generally illustrated in Figure 8. Detailed mapping of the Little Sur's 100-year floodplain has not been done.

The most acute drought of this century occurred in 1976 and 1977. Rainfall was the 60th and 59th lowest in 60 years of record at the nearby Big Sur weather station, totaling 38 and 42 percent of the long term mean. Reportedly, flow was sustained in the Little Sur River throughout this drought, one of the few streams of the central coast in which this held true.

The Marble Cone Fire resulted in a sharp increase in water, sediment, nutrients, and vegetal matter discharged from the basin. Runoff from gaged basins within the burn perimeter has been much greater than normal since the fire (Table 6). Sediment accumulation in Los Padres Reservoir in the adjacent upper Carmel River basin during the first year following the fire equalled the amount deposited in the reservoir during the previous 30 years (Table 7). Logs, limbs, and other organic debris were transported out by the streams in volumes probably much greater than normal; huge jams accumulated near the junction of the two forks and in other areas where the gradient locally flattened.

FISHERIES RESOURCES

Background - Steelhead Ecology

Steelhead require spawning sites with gravels having a minimum of fine material (sand and silt) mixed in them and good flows of clean water moving over and through them. Increases in fine materials, or cementing of the gravels together with fine materials, restrict water flow and oxygen to the fertilized eggs and severely reduce hatching success. Unless hatching success

has been severely reduced, however, it appears that, in most coastal streams, spawning success is not the factor that determines the size of the adult run.

Young steelhead spend one to three years in freshwater, and this rearing period appears to determine the size of the smolt (young steelhead which go out to the ocean) population. In most small, cool coastal streams two years are required to reach smolt size. Young-of-the-year steelhead are apparently regulated by available food. Larger juvenile steelhead (yearlings and older fish in most small, cool streams) appear, however, to be regulated by cover (hiding areas) produced by undercut banks, deeper pools, surface turbulance, and by larger rocks (rubble and cobble) which are not buried or embedded in the finer substrate. In most coastal streams, suitable habitat for these smolt sized fish is the most critical factor determing the size of the smolt population and of the returning adult run. In addition, percentage of smolts which survive to return as adults is strongly dependent upon size. A stream which can support many young-of-the-year fish, but due, to slow growth or lack of cover, has few larger fish may have a very small run of adults.

Current Status of Steelhead Populations and Habitat

At the present time, the Little Sur River has good flows of clear, cool water. The stream is mostly well shaded with deciduous riparian vegetation (willows, cottonwoods and alders) or with evergreen forest of redwood and tan oak. The recent Marble Cone Fire, however, resulted in massive inputs of fine sediment to the stream. On the North Fork this sediment is primarily coarse (granitic) sand; on the South Fork finer sands and silts have been added. The extent of substrate change from pre-fire conditions and the rate of return to pre-fire substrate conditions is not now known. Substrate conditions, however, are the dominant factor in present and potential steelhead productivity in the drainage, primarily because of the impact upon cover and pool development and thus upon smolt sized juvenile steelhead.

Upstream on the North Fork, the steep gradient has allowed rapid recovery of the stream substrate. Pools are well developed, larger substrate is only slightly embedded, and cover for larger fish is abundant. Young-of-the-year fish are abundant, as they are throughout the stream, but yearling fish are especially abundant compared to the remainder of the stream. These substantially recovered stream sections should be the standard for gaging potential steelhead production in the Little Sur River; although width and flow are only about half of that found in the lower section of the river, production of yearling fish (which will smolt the next spring) is two to four times that found in other portions of the river. Smolt production in other portions of the stream should be expected to improve as much as 500% as substrate gradually improves.

The South Fork presently has the most severely disturbed substrate. Most pools are primarily sand, and the larger material, even when present as riffles, is severely embedded. Spawning and rearing conditions are poor, and both yearling steelhead and young-of-the-year fish are presently relatively rare.

Below the confluence of the two forks, pool development is quite poor. The riffles, runs and shallow pools have large amounts of coarser substrate, but it is mostly quite embedded. Because of the reduced cover, the number of yearling fish is reduced, and fish larger than 5 inches are almost nonexistent. In this section, as well as in other sections of the stream, small openings in the canopy are associated with increased fish populations, primarily because of increased algae and resultant increases in benthic insects.

Spawning conditions in the various stream sections appear to be only poor to fair. Most gravels have large amounts of fine to coarse sand mixed within them. The populations of young fish present, however, indicate that the steam has been properly "seeded"; spawning success is thus presently not the critical factor in steelhead success, except possibly for the South Fork. Improvements in spawning habitat will generally improve net smolt production only if rearing habitat also improves.

The only section of stream where larger fish (5 to 10 inches) are common is in the lagoon. Because of the large rocky cliff at the lagoon, the river manages to dig deeply against the cliffs - the lagoon is at least 8 to 10 feet deep. Due to the lagoon's ability to provide habitat for larger fish and to also provide abundant food, allowing rapid growth, it is probably very important to overall steelhead productivity in the drainage. The lagoon also probably offers a feeding habitat for out migrating smolts in the spring.

A small tributary to the Little Sur River near the mouth of the river is used as a steelhead spawning and rearing area. Its location near the highway (and potential future development sites) and its small size and flow indicate that it will be especially vulnerable to impacts from any future developments.

Other Aquatic Species Populations

Threespine sticklebacks are present in the portion of the stream below the confluence of the forks and are also present in the small tributary near the mouth. Their reduction upstream may be due to increasing shade and resultant reduction of algae for nest building. The coastrange sculpin is abundant and is found from the mouth to above the confluence of the two forks. Pacific lamprey are found as far upstream as the Pico Blanco Boy Scout Camp and probably are present in sandy areas as far upstream as steelhead penetrate. These three fish species are widespread in California coastal streams and do not have significant recreational value.

The Columbia River crayfish is also present in the lower portions of the stream.

Barriers

A large impassable falls is present far upstream on the South Fork. Otherwise, there are no barriers except in the extreme headwaters of the river. Access is not a problem for the steelhead.

Instream Flow Requirements

Flow, as it affects depth and velocity, is critical to summer rearing habitat of steelhead. Water movement provides the insect "drift" upon which the steelhead feed and also surface turbulance for overhead cover. Depth interacts with substrate to provide suitable resting and feeding stations. Larger fish tend to prefer deeper and faster water than do smaller fish. Many studies have established the dependence of fish populations upon flow rates, and various efforts have been made to quantify this relationship. Such efforts are hindered by the interaction of many stream factors (depth and cover, temperature and velocity, etc.) and by the variation in requirements by fishes of different sizes. All present "instream flow" models, however, suggest that any reduction in summer flow of small coastal streams would reduce fish populations.

At the present time, water use in the basin is very low. Future developments, however, could increase demands upon streamflow. These demands will be greatest in summer, especially in dry years, when water availability for fish is also most critical. To protect the present steelhead population, consumptive use of water should not alter summer streamflow.

Alteration in streamflow near the mouth might also alter the temperature of the lagoon. Since the lagoon is unshaded, inflow of cool water may be essential to maintenance of suitable rearing temperatures for the young steelhead utilizing the lagoon.

Sedimentation and Pollution

Any disturbance which will increase the sediment inputs to the stream will severely impact summer rearing habitat, benthic insect production, and, in some locations (especially the South Fork), may even limit spawning success. Any such development in the watershed will have to be carefully designed, utilizing sediment catchment basins, revegetation and other erosion control measures, in order to prevent increased sedimentation problems for the stream. Successful implementation of such control measures may not be possible on the very steep slopes surrounding much of the stream.

Septic tanks and leach fields associated with any future developments can be expected to add nitrates and phosphates to

the stream. The addition of these plant nutrients may increase algal growth in the stream. The usually dense shading of the stream and the apparent importance of small increases in algae in producing increases in benthic insects, indicates that nutrient impacts upon the fish population will be positive or neutral, as long as the algal increases are small. Sewage disposal may, however, present health hazards for people utilizing the river.

Recreational developments should be planned so as not to increase stream sediment problems. If public access to the lagoon area is provided (such as by state purchase), fishing pressure on juvenile fish in the lagoon during summer or during the spring period of down migration could seriously affect the steelhead population.

Logging of redwoods along the stream could have three adverse impacts upon the steelhead fishery: reduction of shade, adding sediment to the stream, and adding logging debris to the stream. Small reductions in shade may be beneficial, as long as water temperatures are not significantly increased. Any addition of sediment to the stream will aggravate the existing substrate problem and delay recovery of the substrate and the steelhead population. Buffer strips and careful logging practices are, thus, essential. Limited amounts of logging slash may in some cases improve the stream for fish by providing cover and increased pool development. However, logging debris also presents potential problems from log jams and barrier development.

The severe impact of the large Marble Cone Fire on the fishery resource indicates that large wildfires must be controlled or prevented. Construction and maintenance of firebreaks may be necessary, and a carefully planned program of small controlled burns appears desirable. Such a program of controlled burning may also be desirable for maintaining certain successional vegetation types and the wildlife associated with them.

At the present time, the most critical concern is how quickly the stream substrate will recover from the massive sediment inputs from the Marble Cone Fire. Observations on the North Fork in the upper area indicate that recovery in steeper sections can be relatively fast (3-4 years). In the lowergradient portions of the stream, recovery will be much slower, possibly decades. In the absence of any substantial development of the area, recovery will occur. Thus, any potential development impacts should be judged against the quality of the recovered stream.

ENVIRONMENTALLY SENSITIVE HABITATS

Rare and Endangered Wildlife Species

The following wildlife species, found in the Little Sur River area are listed as endangered species by both the U.S. Fish and Wildlife Service (1980) and the California Department of Fish and Game (1980). They are protected by state and federal laws. For life history information and references on each species, refer to the California Department of Fish and Game publication "At the Crossroads."

1. American Peregrine Falcon (Falco peregrinus anatum)
Peregrine falcons nest on suitable, coastal seacliffs or rocky outcrops inland. Historically, in the 1930s and 1940s, eyries (nest sites) were located along the coast, both north and south of the Little Sur River mouth, near Point Sur Lighthouse, and in the immediate vicinity of Pico Blanco. Presently, several active eyries are located along the Monterey County coast and within the Little Sur River watershed (Walton and Jurek, 1981). The watershed is one of the most critical habitats for the peregrine falcon in California. Two pairs have been planted within the watershed in the late 1970s (Walton 1981). Peregrines forage year round within the watershed. Most important is the area from the Little Sur River mouth up to and around Pico Blanco, due to the abundance of prey in the form of passerine birds, shorebirds, and other bird species (Walton, 1981).

   Food chain contamination by persistent pesticides (DDT) and other contaminants, illegal take by falconers, wanton shootings and human disturbance at eyries and foraging areas have contributed to the peregrine's decline in the 1950s (CDFG, 1980). Loss of habitat remains a primary concern, even if the effects of pesticides are eliminated. Watershed yield management programs, agricultural practices, urbanization, land conversion and manipulation, all of which destroy or disturb peregrine eyries and the habitats of the prey, can make otherwise suitable habitat unusable (Mallette and Schlorff, 1978).

2. Bald Eagle (Haliaeetus leucocephalus)
The bald eagle occurs as an irregular, sporadic winter visitor to the Little Sur River Watershed. Individuals may spend part of all of the winter season in the watershed, particularly at the river mouth and lagoon, as they forage for fish, waterfowl, and carrion. The Little Sur watershed, however, is considered to be of marginal value to the southern bald eagle, as more suitable habitat is available elsewhere (Jurek, 1981). This is supported by the paucity of recent sightings. No nests are found within the watershed. Historically, bald eagles nested in abundance on the Channel Islands and along the coast;

present nesting activities are limited to Northern California in the Sierra Nevada, Cascade, and Klamath Mountains. The reasons for its decline include irresponsible shooting, removal of nest trees, human encroachment into nesting and feeding areas, power line electrocution, environmental pollution and the contamination of the food chain with persistent pesticides (CDFG, 1980).

3. California Brown Pelican (Pelecanus occidentalis californicus)
The California brown pelican occurs as a fall visitor to the Monterey County coastline. Within the Little Sur River Watershed, individuals and small groups use the beach, lagoon, and sandspit near the river mouth as daytime rest areas (Hale, 1968 present). These rest areas are not considered to be significant to the population as a whole, as more suitable daytime roosts occur elsewhere. Eggshell thinning as a result of persistent pesticides, namely DDT and DDE, and food stress, resulting in nest abandonment early in the season, contributed to the pelican's decline in numbers in the recent past (CDFG, 1980).

Locally Unique Wildlife

The following species, found within the Little Sur River Watershed, warrant special consideration. Their status, as locally rare, unique, declining in numbers, and/or sensitive to disturbances, is cause for concern.

1. Western Snowy Plover (Charadrius alexandrinus nivosus)
The western snowy plover (protected by state and federal laws) nests on undisturbed sandy beaches above the normal tide limit. Nesting occurs in the spring months with 2-3 eggs being layed in a shell lined scrape on the beach. The snowy plover feeds mainly on sandy beaches, picking up small crustaceans and other invertebrates. Historically, snowy plovers have nested near Point Sur and along the beach below and near the Little Sur River mouth (Hale, 1968 present; USFS, 1978). Recent records of local nesting activity are not available. Human harassment and direct destruction of nest sites and breeding habitat are unquestionably the reasons for their decline (Remsen, undated).

2. Spotted Owl (Strix occidentalis)
The spotted owl has been observed within the upper Little Sur River Watershed (Hale, 1968 present). Nesting within the watershed has not been confirmed, although it can be expected. Spotted owls are quite secretive in their habitats and apparently are rare within this part of their range. They prefer old growth timber stands as habitat, although in Southern California they utilize a variety of habitats including chaparral, riparian, and coniferous forests. Nests have been found in cliffs, oak and sycamore trees, and dead conifers. They often utilize nests

previously built by other birds. Removal of old growth timber, timber harvesting, construction and recreation activity have generally contributed to its decline.

3. American Osprey (Pandion haliaetus carolinensis)
The American osprey (protected by state and federal laws) occurs as an irregular, sporadic visitor to the Little Sur River Watershed (Hale, 1968 present). Ospreys are closely associated with large rivers, lakes, reservoirs, and coastal environments as they depend upon fish for their diet. Visiting individuals would be found near the mouth of the Little Sur River. Nesting site losses, egg collecting, indiscriminate shooting and chlorinated hydrocarbon contamination have led to the osprey's decline.

4. Black Swift (Cypseloides niger)
The black swift occurs as a locally rare, summer visitor and transient in the Little Sur River Watershed from April to October (Hale, 1968 present; USFS, 1978). Sea cliffs are utilized for nesting along the Monterey coast and potential cliff nest sites are located near the Little Sur River mouth and on Pico Blanco. The inaccessability of this species' nest sites makes it nearly invulnerable to most disturbances. Rock climbing and human disturbance in the vicinity of nest sites seems to be the only likely menace (Remsen, undated).

5. Purple Martin (Progne subis)
The purple martin occurs as a locally rare, summer visitor from March to September (Hale, 1968 present). Riparian, forested, and woodland areas with snags are the martins' breeding habitat. Potential nest snags occur throughout the Little Sur River Watershed. Competition with the introduced European starling and elimination of nesting sites by the removal of dead trees and snags have threatened the martins' existence.

6. Western Burrowing Owl (Atene cunicularia)
The burrowing owl (protected by state and federal laws) was formerly a common, even locally abundant, permanent resident throughout much of California, but its decline, noticeable since the 1940's (Grinnell and Miller, 1944), has continued through the present in most areas. Burrowing owls have been observed within the Little Sur River Watershed (Hale, 1968 present), although recent sightings appear to be lacking. Destruction of ground squirrel colonies and human disturbance of grassland and pastureland have led to their decline (Remsen, undated).

7. Golden Eagle (Aquila chrysaetos)
This species (protected by state and federal laws) was once a common permanent resident throughout the open areas in California. Golden eagles have declined in numbers in certain areas. Active eyries are found within the Little Sur River Watershed and, until one or two years ago, were

found on Pico Blanco (Walton,1981; Jurek, 1982). Disturbance by humans at nest sites and foraging areas, shooting, and habitat destruction threaten their existence.

8. Prairie Falcon (Falco mexicanus)
The total population of prairie falcons (protected by federal law; the take by falconers is regulated by state law) in California is very small and vulnerable (Remsen, undated). Until very recently, active eyries were found on Pico Blanco (Walton, 1981; Jurek, 1982). Pesticide contamination, illegal take by falconers, and habitat destruction threaten the prairie falcon's existence. If the eyrie on Pico Blanco is reestablished the noise and human activities associated with expanded mining operations could possibly interfere with this species' breeding or else drive it from its eyries.

9. Mountain Lion (Felis concolor)
Mountain lion density in the coast range of Monterey County is the highest in California, with one lion per 10 square miles (Sitton and Wallen, 1976). Lions use the Little Sur River Watershed extensively (Hale, 1968 present). While their population as a whole may not be in serious jeopardy, habitat destruction, logging practices, isolation of habitat, human disturbances, increased road construction and off-road motor vehicle use pose potential threats to mountain lion populations.

10. Ringtail (Bussariscus astutus)
The ringtail is protected by California state law. Due to its secretive habitats, it is rarely seen or encountered. Ringtails probably were never plentiful in most areas. They are found within the Little Sur River Watershed, particularly near water in rocky, brushy habitat (Hale, 1968 present). Habitat destruction and human disturbance are major threats to their existence.

Sensitive Wildlife Areas

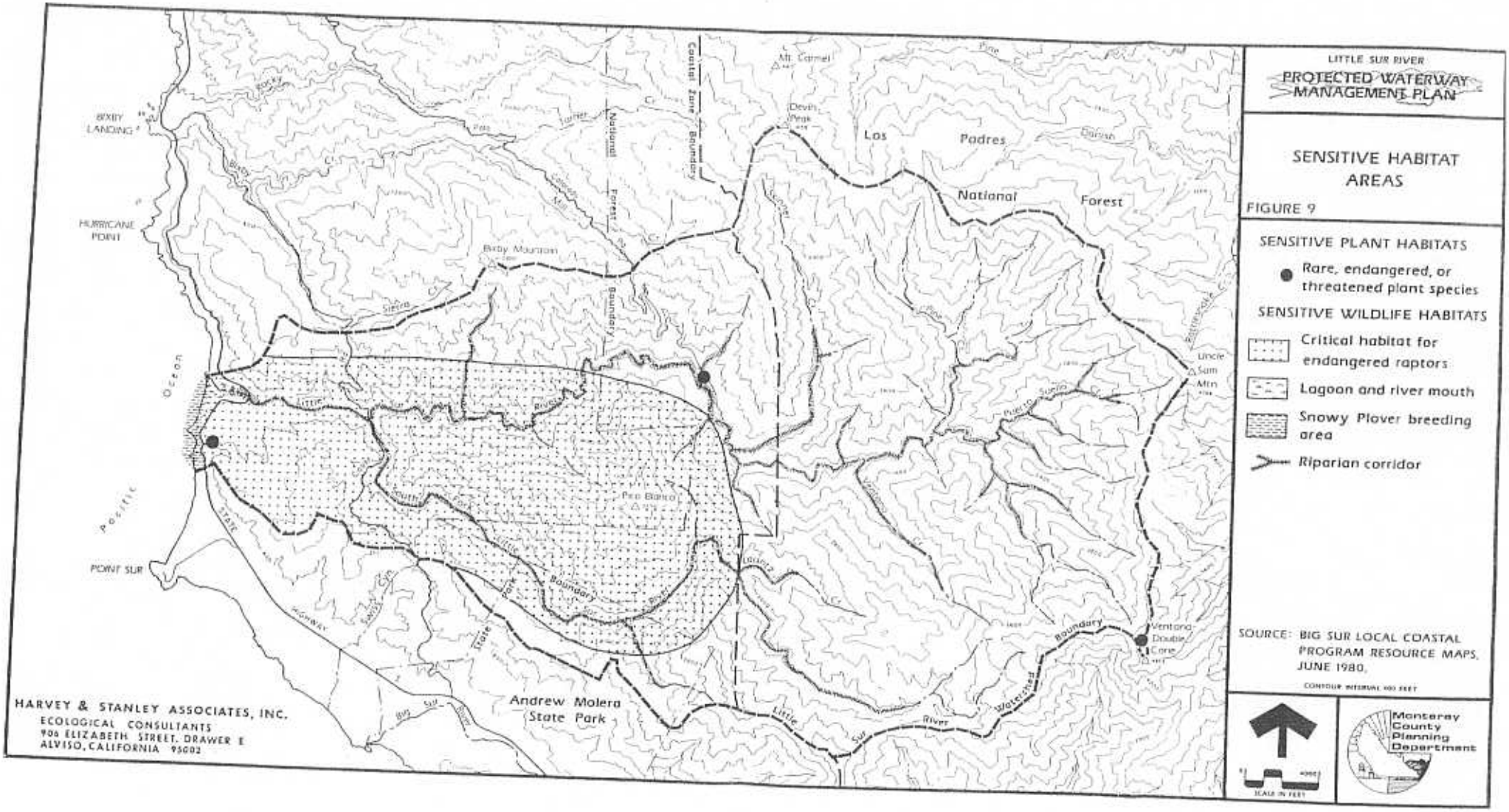
The degradation and loss of habitat are the major causes of loss of sensitive wildlife. Habitat offers the essential resources necessary for wildlife to survive, including the following: food, water, escape or protective cover, nesting or denning sites, adequate space, and protection from disturbances. The alteration, degradation, or loss of any one of these resources may adversely affect sensitive wildlife. Direct impacts to wildlife species include disturbances from human activities, introduction of non-native species, illegal hunting or capturing of wildlife, road kills, pesticide contamination, water pollution, logging, fire suppression, water diversion, and road construction.

Several sensitive wildlife areas are found within the Little Sur River Watershed (Figure 9). These sensitive areas deserve special attention during land use planning and land management. They are discussed as follows:

Raptor Nest Area: The general area around Pico Blanco provides excellent raptor nest sites. Peregrine falcons, a state and federally protected endangered species, prairie falcons, and golden eagles all have, or have had until recently, established nests or eyries in the area. Other birds which may nest in the area include turkey vultures, swifts, and swallows. This area is particularly vulnerable during the springtime, when raptors undergo courtship, breeding, and nesting activities. Disturbances in the nest area, including rock climbing, illegal take of eggs or raptors, shooting, construction, mining and other activities may lead to nest failure or abandonment of the nest site by raptors. The coastal cliffs north and south of Little Sur River mouth also provide nesting sites for the endangered peregrine falcon (Walton, 1981).

Raptor Hunting Area: The Little Sur River Watershed, especially the area from around Pico Blanco to the river mouth (including the coastal strip west of the highway and north and south of the mouth) provides excellent foraging grounds for raptors (Walton, 1980). The peregrine falcons, prairie falcon, and golden eagle, all forage extensively in this area because of the abundance of prey. Peregrines feed particularly on passerine birds and other birds that fly across the Little Sur River canyon. Shorebirds at the river's mouth and along the coast provide important food for the peregrines as well. Golden eagles feed on a variety of small mammals in the grasslands, rocky areas, and brushy areas of the Little Sur River Watershed, including California beechy ground squirrels, botta pocket gophers, brush rabbits, and even small carnivores. Prairie falcons forage for a variety of small mammals and birds of prey. The area provides valuable foraging grounds for other raptors including white-tailed kites, red-tailed hawks, red-shouldered hawks, sharp-shinned hawks, Cooper's hawks, American kestrels, barn owls, great horned owls, pygmy owls, saw-whet owls, screech owls, and, possibly at certain times, American ospreys, bald eagles, and burrowing owls (Hale, 1968 present; USFS, 1978; Walton, 1980). Various disturbances to important raptor foraging areas such as human activity, habitat alteration or destruction, and factors adversely affecting prey species may have negative effects on foraging raptor species.

Riparian Corridor: As discussed previously, the riparian corridor is extremely important to a great diversity of wildlife species. It provides the needed water for wildlife, particularly for some amphibians, the Pacific pond turtle, and native fishes, including the steelhead. Excellent habitat for many birds in a variety of spatial niches abounds. Belted kingfishers, water ouzels (dippers), black phoebes, waterfowl, and some shorebirds, herons, and egrets are closely associated with or dependent upon the riparian community for their life's


LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN
SENSITIVE HABITAT AREAS
FIGURE 9
SENSITIVE PLANT HABITATS
Rare, endangered, or threatened plant species
SENSITIVE WILDLIFE HABITATS
Critical habitat for endangered raptors
Lagoon and river mouth
Snowy Plover breeding area
Riparian corridor
SOURCE: BIG SUR LOCAL COASTAL PROGRAM RESOURCE MAPS, JUNE 1980.
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Los Padres National Forest
Andrew Molera State Park
BIXBY LANDING
HURRICANE POINT
POINT SUR
Pacific Ocean
Big Sur River
Little Sur River
Mt. Carmel
Devils Peak
Bixby Mountain
Pico Blanco
Uncle Sam Mtn
Ventana Double Cone
Coastal Zone Boundary
Watershed Boundary

activities. Cavity-nesting species, such as various woodpeckers, the brown creeper and American kestrel, find nesting sites in the snags, denuded limbs, and crevices in the bark of riparian trees. The riparian corridor also provides foraging grounds for various predators as they move from one plant community to the next. Water pollution, siltation due to logging, mining and road construction, flood control measures, extensive water appropriations, and various other human activities may destroy, alter, or adversely affect this extremely important, sensitive wildlife area.

River Mouth, Lagoon, and Seashore Cliffs: The Little Sur River mouth, lagoon, and seashore cliffs provide nesting and foraging areas particularly for migratory and resident shorebirds, waterfowl, and other water associated birds including the California brown pelican, a state and federally endangered species. The pelagic cormorant, pigeon guillemot, and the black swift nest on the seashore cliffs. Anadromous and native fish, crustaceans, and small invertebrates provide food for the variety of bird life drawn to the river mouth and lagoon to feed and nest. The river mouth, lagoon, and seashore cliffs are most vulnerable to disturbance during winter when a variety of birds use the area. Human access to the river mouth area during these periods would likely be disruptive to the bird life. Water pollution, pets, construction, and recreational activities or use at certain times may adversely affect various wildlife species of these important sensitive wildlife areas.

Snowy Plover Breeding Area: The western snowy plover prefers undisturbed sandy beaches for nesting. Although information on population trends of the snowy plover in California is scant, detectable decreases in abundance and nesting success in recent coastal surveys suggest some protection for this species is warranted. Along the coast near the Little Sur River mouth, sandy beach habitat is available for nesting by snowy plovers. Historically, these areas have been used by snowy plovers, but recent records of nest activity are unavailable. Human harassment and direct destruction of nest sites and breeding habitat are unquestionably the reasons for this species' decline (Remsen, undated). Seasonal closure of sandy beach areas where snowy plovers nest may alleviate this problem.

Other Sensitive Wildlife Areas: The upper watershed and other areas of the Little Sur River contain sensitive wildlife habitat for many species, some being locally rare or unique. The mountain lion needs large tracts of undisturbed land for foraging, denning, and movements in general. Human disturbances, particularly road construction, logging, and habitat degradation or alteration adversely affect this seclusive, sensitive species. The ringtail, a locally unique species associated with rocky or brushy areas near water, is also secretive and easily disturbed. Deep forested canyons with old growth Douglas fir and redwood in the upper Little Sur Watershed provide habitat for the spotted owl. Future logging activities could threaten its existence. In general, the

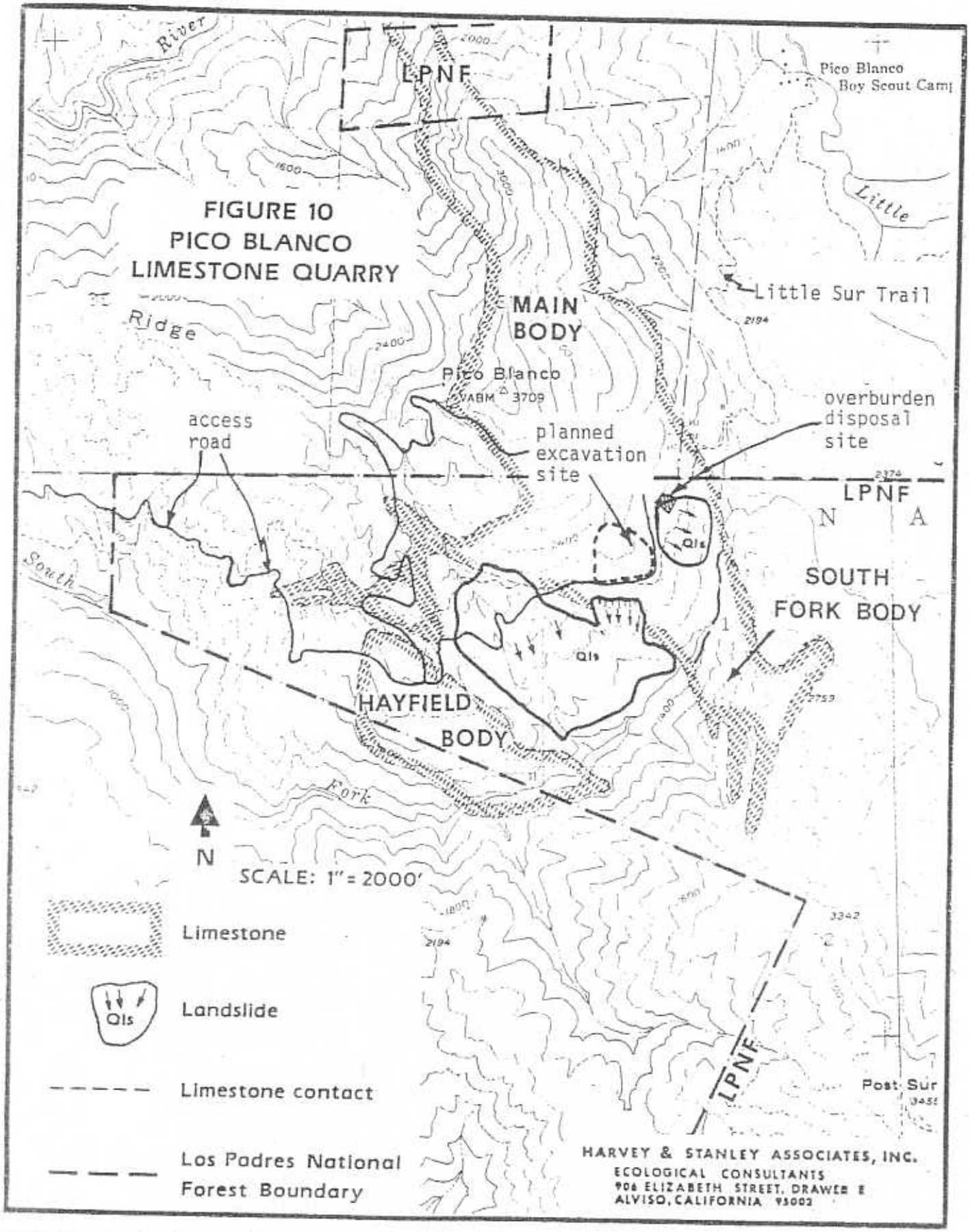
exclusion of fire lessens the quality of grassland and chaparral habitat for wildlife and impedes their movements. Snag trees are commonly removed during logging of timber thereby eliminating important nest sites for cavity-nesting birds. Other negative impacts to sensitive wildlife are incurred as a result of land use changes, habitat degradation or alteration, and various human activities.

MINERAL RESOURCES

Pico Blanco Mining Claims

Pico Blanco (White Peak) is the site of a large deposit of very high grade limestone, recently classified by the State Mining and Geology Board (May, 1982) as a Mineral Resource Zone-2 - an area "where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists" (California Division of Mines and Geology, 1981). The classification report by the Division of Mines and Geology (1981) describes the deposit as consisting of three bodies of economic importance, i.e., the Main or Peak limestone body, the South Fork body and the Hayfield body (Figure 10). The Main body is a thick, irregular mass of over 500 acres, varying in thickness from around 500 feet to possibly 1500 feet. and capping the summit and eastern flanks of Pico Blanco. The Hayfield body blankets nearly 100 acres of the peak's south slope and has a maximum thickness of about 500 feet. The South Fork body has a surface area of about 100 acres and underlies the west side of a steep ridge. It has about the same thickness as the Main or Peak body. All three bodies consist of white, coarsely crystalline limestone composed almost entirely of calcite, with minor amounts of quartz and graphite.

According to Oliver E. Bowen (Woolpert, 1980), consulting geologist, "The Pico Blanco deposit is the only large, high purity limestone occurrence located on tidewater on the Pacific Coast of the United States exclusive of Alaska." At the present time, there is only one other known deposit in California from which high grade, white grinding limestone is being produced (CDMG, 1981). Most of the limestone is of sufficiently high quality for cement, and part of the deposit are pure enough for most lime, chemical and metallurgical uses. Bowen estimates the reserves on the combined fee land and adjoining claims held under the mining laws of the United States as exceeding one billion tons, while a more conservative estimate by Hart (1978) places the reserves in excess of 650 million tons (CDMG, 1981). The thickness of the bodies needs to be more accurately determined before more precise reserve estimates can be made.



Source: U. S. Forest Service Environmental Assessment of Pico Blanco Mining Operation, 1981, and State Mining and Geology Board Mineral Land Classification Map of Pico Blanco, 1982.

The deposits are presently claimed by Granite Rock Company which holds 1,000 acres in fee plus 32 mining claims within the Los Padres National Forest, for a total of 2,800 acres. The principal factors which have delayed the development of this resource are its inaccessibility, its location in the Coastal Zone and the fact that the peak is a prominent scenic attraction and landmark on the Big Sur Coast.

Current Status of the Pico Blanco Mining Claims

The Big Sur Coast Local Coastal Program Land Use Plan (LUP), as revised by the Board of Supervisors February 22, 1982, recognizes the importance of mineral resources within the Coastal Zone such as the Pico Blanco limestone deposit. It also recognizes the following potential environmental issues in any future mining operation at Pico Blanco: (1) visual impacts to the highly visible and scenic Pico Blanco peak, (2) impacts on water quality, wildlife and recreational amenities in the Little Sur River Watershed, a Protected Waterway, (3) impacts of mining on the adjoining Ventana Wilderness Area, and (4) impacts of quarry trucks on Highway 1.

Among the policy issues involved, General Policy 3.8.2.1 of the LUP states that "Surface mining proposals for minerals or materials which are also adequately and economically available from inland or less sensitive locations shall be denied until such time that other available sources are exhausted."

General Policy 3.8.2.2 states that "Mining will not be allowed in environmentally sensitive habitat areas such as riparian corridors, rare and endangered plant and animal habitat locations, or wetlands. Mining activities and related facilities such as roads, loading or conveyance facilities, shall not be permitted to be constructed in the critical viewshed and shall be sited and designed to protect views to and along the ocean and designated scenic coastal zone areas."

General Policy 3.8.2.3 states that "Surface mining proposals shall not be allowed in areas susceptible to landslide, erosion and other hazards such as proximity to earthquake faults, as designated on the Big Sur LCP Hazard Map."

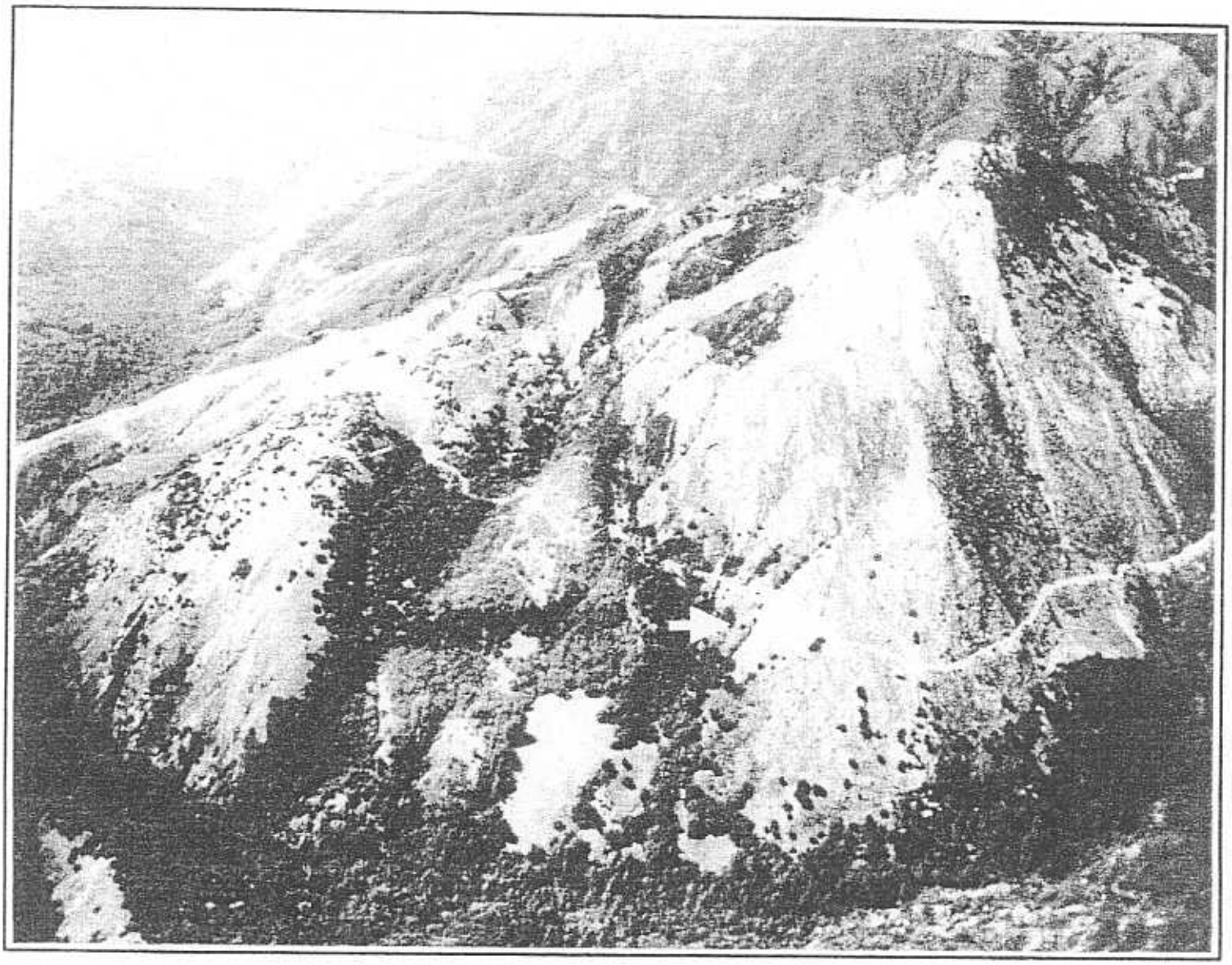
General Policy 3.8.2.5 states that "Alternative methods of mineral extraction which result in minimal environmental impact shall be given substantive consideration before surface mining is allowed. Surface mining will not be considered an acceptable practice where less environmental damaging techniques are feasible or in streams supporting anadromous fish runs unless it can be demonstrated that no adverse impacts will result."

The Environmental Assessment (USFS, 1981) prepared by the Los Padres National Forest concerning the Pico Blanco mining claims of Granite Rock Company on federal lands makes no reference to any policies or jurisdiction of either the California Coastal Commission or of Monterey County with regard to permitting

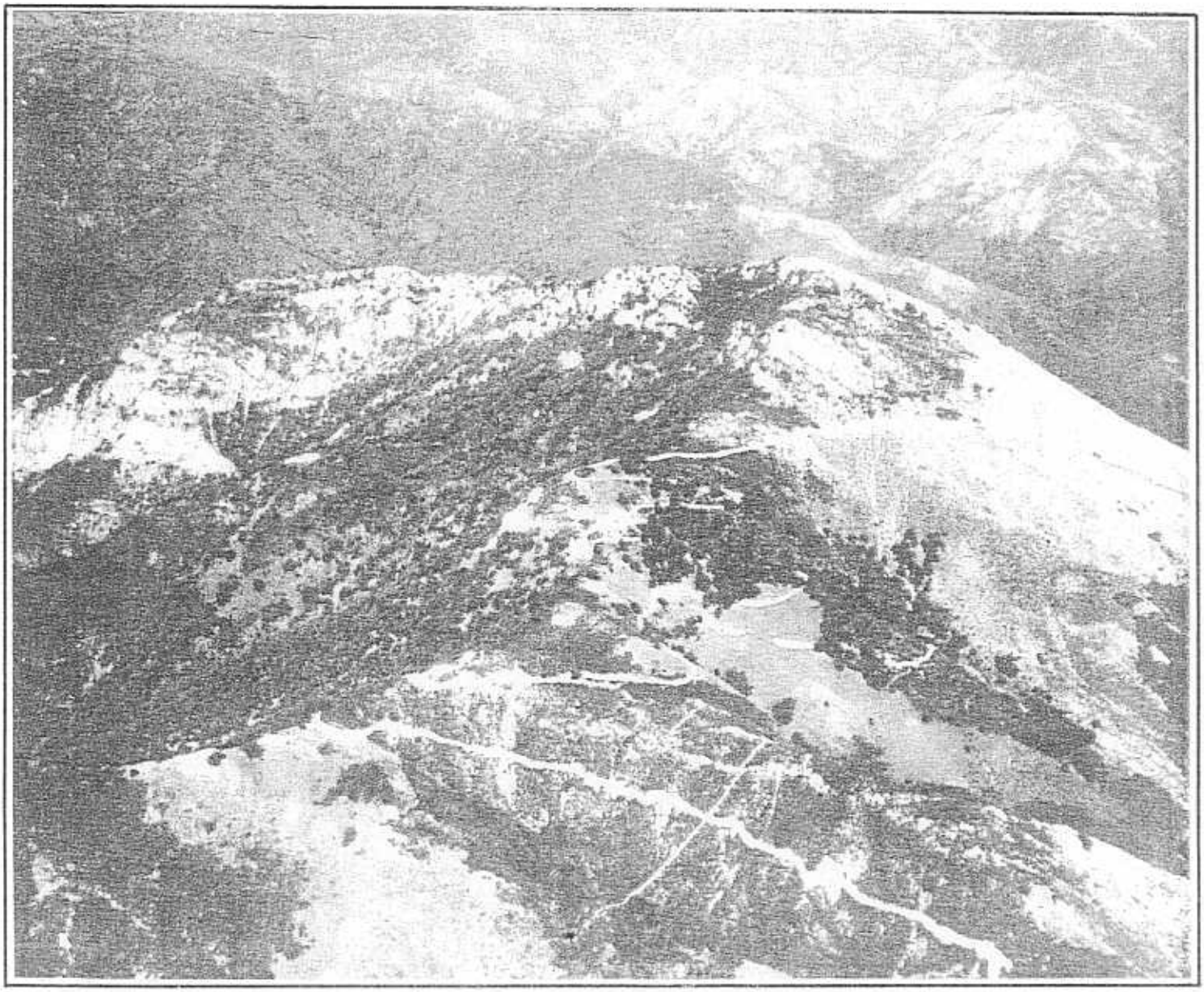
mining operations at the Pico Blanco site. The Forest Service policies adhere strictly to the Mining Act of 1872 and allow mining claims to be worked alongside of or in lieu of other uses. While the Forest Service attached mitigating conditions regarding visual and overburden and spoils disposal impacts in approving the company's operating plan, the overriding regulation (36 CFR 252) provides that the "Proposed alternative must provide for operations minimizing adverse environmental impact where feasible on the following surface resources (emphasis added): air quality, water quality, soil stability, fisheries and wildlife habitat, and cultural resources habitat." This policy is further reinforced in the same regulation by the statement that "Proposed alternative must provide for the continuation of mining activities in a prudent reasonable manner."

On this basis, the Forest Service approved a modified plan of operation for Granite Rock's claims on federal lands in early 1981 and the company has so far commenced a small scale exploratory operation. During this first phase, lasting 3 to 5 years, it is expected that full scale production will entail the removal of ore at a rate of 15,000 to 32,000 tons per year, resulting in truck traffic of four to eight 25 ton loads per day (USFS, 1981). Reportedly, the existing road from the confluence of the North and South Forks of the Little Sur River and leading up over the shoulder of Dani Ridge is adequate to complete this phase. The first phase would impact about 7 acres total surface area for mining, disposal and roads. If the ore proves to be of competitive quality, then a second phase of major mining operations could commence, based on a revision of the present operating plan, and upon obtainment of a permit from and approval of a reclamation plan by the lead agency, in this case, the U.S. Forest Service. This second phase could continue for 25 to 45 years, involving a total of 30 acres. If the ore does not prove to be of competitive quality and the operator decides not to expand its mining operations, then rehabilitation of the mined area would be required under the present Forest Service permit conditions (D. Zechentmayer, 1982).

The State Mining and Geology Board (Freitas, 1980) has recently indicated its concern to Monterey County concerning the rigid regulation of mining at Pico Blanco in the Local Coastal Program and concerning the County's legal obligations under the State Surface Mining and Reclamation Act (SMARA). SMARA requires the County in its planning to recognize mineral deposits of economic importance to the region, state or nation. The Mining and Geology Board classifies such deposits as to their geologic and economic importance, and then may designate them as of regional or statewide significance. Though the Pico Blanco deposit was recently classified by the State Board as an area containing significant mineral deposits, its designation as a deposit of regional or statewide significance does not appear likely in the foreseeable future (Robert Sleppy, 1982). In the event of such designation, the County must then, through its general plan, recognize the mineral deposit and develop management policies to



PICO BLANCO MINING OPERATION - looking at south face of mountain. (See arrow)



ROAD TO PICO BLANCO - looking at west face of mountain.

guide the future use of the resource. The County can still impose restrictions upon any permit it might issue for mining or mining related development, such as the development or improvement or roads, on non-federal lands, and where mining is proposed on non-federal lands, the County has the final authority as to whether such use may actually take place.

Potential Impacts of Mining

Potential impacts in the watershed from large scale mining include primarily erosion, siltation, noise and visual impacts. The construction of new roads and improvement of existing roads would be the major source of these impacts. As the majority of roads are or would be located on steep sideslopes, the potential for hill and gully erosion, road fill washouts and slope failure is appreciable, and could lead to siltation of the South Fork nearby. A strict program for road maintenance, involving ditching, operable culverts, waterbars and energy dispersers, would be required to protect the river.

A second major concern would be the disposition of spoils and overburden. These materials are subject to erosion, with resultant siltation, and can also trigger landslides and mass movement of soil into the river if not properly placed. Thus, the proposed location of the Pico Blanco mining disposal site at the top edge of a possible landslide area should be carefully reviewed at such time that expansion of mining operations is proposed. At the present time, there are no official estimates of the amount of spoils and overburden that would be generated by large scale mining; however, there will likely be little overburden due to the surface exposure of limestone rock in much of the deposit area and, elsewhere, the presence of shallow soils.

While the quarry would not be visible from the coastside, it would be clearly visible to a number of points in the nearby Ventana Wilderness Area. It also is situated approximately 640 feet above and 1,500 feet away from the Forest Service's Pico Blanco Trail Camp. The mine road, quarry and disposal site all lie close to the South Fork Trail, the disposal site lying within 200 feet of the trail. Although the Forest Service recognized that the operation of the quarry will present a potential hazard to nearby campers and hikers (USFS, 1981), the full impact of the mining on the recreational experience has not been completely addressed. Some of these visual and aesthetic impacts are unavoidable, while others should be mitigated by the requirements in the operating plan for terraced quarrying, regrading with overburden following quarrying, and replanting with native vegetation.

Noise would be another major impact at times from mining. Blasting, although occasional, would produce both noise and shock waves which would most likely be disturbing to nearby recreationists and to animals. The recent reporting (Walton and Jurek, 1981) that the endangered peregrine falcon is once again

inhabiting the area around the peak introduces a complication for mining. Both the noise and the proximity of human activity could interfere with the reproduction of the species or might drive the birds out of the area. The critical period for courtship, mating and nesting of this species is from January through about July. It may be that mining operations can be phased seasonally to avoid this critical period for the falcon.

Once a crusher is operating at the mine (possibly as early as 1982) there will be a continuous source of unavoidable noise in the canyon of the South Fork.

The second larger scale phase of mining operations would probably require a wider and easier grade haul road to deliver product to market, or else another type of transport such as a conveyor belt. The latter has been considered by Granite Rock Co. in conjunction with coastal barging. The company also has an agreement with the adjacent El Sur Ranch for a second road easement, to take effect in around 10 years, which leads along the north side of the canyon of the South Fork of the Little Sur River to the Old Coast Highway. This route runs over very steep slopes not that far above the river. Considering the road width required for heavy truck traffic, if a road were to be constructed along such steep slopes, it is unlikely that the required erosion control and other mitigating needed to protect the river could be successfully implemented. It should be noted that the Big Sur Land Use Plan restricts new roads that cross slopes exceeding 30%, unless no feasible alternative exists and the proposed design of the road better achieves the resource protection objective of the plan. Thus, there will most likely be serious difficulties in providing adequate road access for expanded mining operations under the LUP's provisions.

FORESTRY AND GRAZING

Timber Harvesting

The Little Sur River Watershed contains a moderate amount of merchantable timber, almost entirely in the form of redwood. The forest (Fig. 7) is rather continuous along the North Fork from its lower end to above Jackson Creek and discontinuous beyond to near the upper end of the watershed. On the South Fork, redwoods extend up to Launtz Creek. Merchantable redwoods extend only about a mile below the forks, due to the pronounced wind-pruning of the crowns in the lower canyon. A considerable amount of this forest appears to be virgin or else relatively uncut. Almost pure stands of redwoods grow at elevations up to 800 feet above the river on the cooler north-facing slopes, rather an unusual phenomenon in the southern end of the species' range. This may be due to both improved groundwater supply and soil fertility due to the limestone bedrock. The redwoods also ascend the tributaries to an unusually high elevation in much of the watershed.

With the present general demand for redwood timber and increasing demand for stumpage placed upon the southern end of the redwood region by the large mills in Northern California, there expectedly will be increasing pressures for harvesting timber in the Little Sur River Watershed. Any such harvesting would require the construction of a considerable mileage of new roads both close to the river and also on very steep slopes. The roads could potentially damage the river through erosion and sedimentation and increased runoff more than any other aspect of the logging and would have to be very carefully designed in these narrow canyons and on the slopes, which average around 50% or higher. The potential for erosion and soil slippage from the harvesting itself is also very high in most of the redwood areas of the watershed; thus cable, balloon and helicopter methods of harvesting must be considered to minimize soil damage. The cutting of any large acreages at one time, particularly clear cutting, would increase runoff and aggravate an existing flood potential created by the Marble Cone Fire. Thus, any timber harvesting is likely to cause some siltation of the river and damage to the fisheries and aquatic habitat, unless very strictly regulated.

Timber harvesting could also interfere visually with recreational use of the watershed. This is not such a problem where there are several large private ownerships. One means of minimizing this conflict, especially where the timber is less merchantable, would be to fell and saw the timber in place and use it for fence posts, trail guards, etc. on the property. This has apparently been a common practice on the El Sur Ranch in the past, and by this means harvesting can be accomplished with minimal or no road building.

The harvesting of timber is not permitted in the portion of the upper watershed which lies within the Ventana Wilderness Area of the Los Padres National Forest. The part of the national forest just west of the wilderness area along the North Fork, centered around the Pico Blanco Boy Scout Camp, is accessible for timber harvesting via the Bottchers Gap road. Apparently, the Forest Service has permitted little or no harvesting in this area in order to protect its recreational values.

Current Timber Harvesting

A Timber Harvesting Plan (No. 5-80-57M) was filed on December 12, 1980, on private lands within the watershed (R.1E., T.18S., Sect. 26 and 27) on the south slope of Bixby Mountain with the California Department of Forestry (CDF, 1980). The plan calls for harvesting of redwoods, and possibly hardwoods, on the 27 acre parcel, using a 3-drum mobile skyline system. The site is relatively inaccessible and has slopes of 35-85%, and an erosion hazard rating of high-very high. The plan was approved by the Department of Forestry on February 18, 1981, with various mitigation measures attached. All redwood areas were treated as being in the riparian corridor zone where stricter regulations concerning any dumping of soil, slash or organic debris, the amount of leaf canopy (50% or more), and cutting apply in order to minimize any stream pollution and to maintain low stream temperatures. In addition, the site was under special regulations in a Special Treatment Area within the Coastal Zone. Thus, the landowner and timber owner were legally required to obtain both a Coastal Zone permit and a use permit from Monterey County before commencing operations.

This case illustrates a number of problems which exist, both administratively and technically, in regulating uses affecting a watershed. Apparently, the landowner and timber owner proceeded to construct a road into the site, not only without the latter two permits, but allegedly without permission from either of the two intervening property owners. The road has been cut most of the way through the site, but no timber has been removed so far and operations have been stopped. The road was cut across very steep slopes and is a conspicuous scar within the coastal viewshed. It has involved a considerable volume of cut and fill and will soon become an erosion and sedimentation hazard unless seeding and waterbar protective measures called for in the THP are stringently carried out along the entire length of the road. In addition, since there is no other merchantable timber close to that covered by the THP and since the site was rather inaccessible, it seems clear that serious consideration should have been given in this case to removing the timber (which was of limited volume) by helicopter without the use of a road. Such a harvesting method might have even proved economically advantageous if all of the restrictions on surface yarding required to fully protect the stream had been applied.

The present case illustrates the kinds of impacts from timber harvesting which can cause problems for the streams and

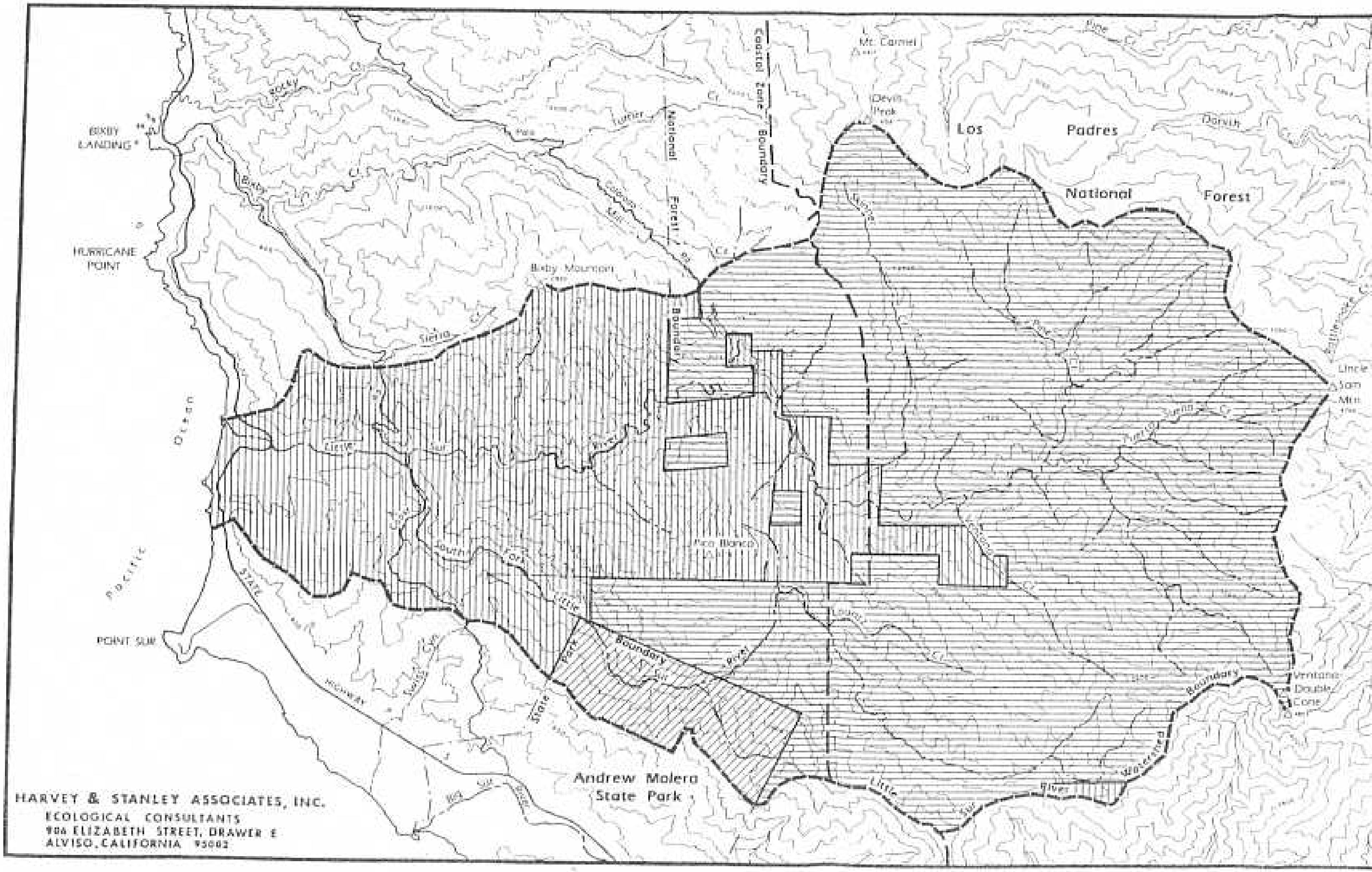
watershed of a protected waterway. The kind of situation which developed here must not be repeated since once the action has been taken, no amount of well-phrased regulations are going to undo the damage.

Grazing and Ranching

The general area of Little Sur River has been ranched since the arrival of the Spaniards around 1800. A Spanish land grant, Rancho El Sur (8,949 acres) was deeded to its original owner, Juan Bautista Alvarado, but soon changed hands to his uncle, Captain John Roger Cooper, a Yankee trader who had first sailed into Monterey Bay in 1823 (Lussier, 1979). Cooper continued to live in Monterey but ran an active cattle ranch at Ranco El Sur which stretched from north of the Little Sur River down the coast to Cooper Point, about 3 miles south of the mouth of the Big Sur River. Cooper managed to visit his ranch from time to time and maintain a ranch house in the Little Sur River valley. The northern part of the Rancho El Sur became known as the Cooper Ranch, while the southern portion became known as the Molera Ranch, named after Andrew Molera, Cooper's grandson.

Early in this century, the Cooper Rancho El Sur (comprising some 7,000 acres) was acquired by the descendants of James J. Hill, the Canadian who built the Great Northern Railroad from Minneapolis to Seattle without one penny of government subsidy. The El Sur Ranch, as it is now known, is operated as a trust under the will of the late C.T. Hill, grandson of the railroad magnate. His son, Jim Hill, is presently assuming the responsibilities of continuing to operate the property as a ranch, in accordance with his father's wishes. Meanwhile, in 1965, Francis Molera, the sister of Andrew Molera, donated most of the Molera Ranch property west of Highway 1 to the state park system in honor of her brother.

The greater portion of the El Sur Ranch (Fig. 11), is located within the Little Sur River Watershed from near the summit of Pico Blanco, westward. The portion outside of the watershed - the southwest facing slopes of Little River Hill and much of Molera Ridge - contains the majority of the grasslands, roughly 2,000 acres. This area produces better forage under warmer exposures which in turn, allow for higher legume content and better developed soils. Grass coverage in the Little Sur River Watershed portion is more limited, with around 400 acres on Serra Hill, 200 acres on Dani Ridge, 250 acres in the Steer Pasture, and 600 acres on the Back Range, for a total of about 1450 acres in the watershed. A grazing plan (SCS/USDA, 1971), prepared for the ranch in conjunction with the Monterey Coast Soil Conservation District, designated the animal units per month (AUM's) grazable on each part of the watershed (Table 8).



LITTLE SUR RIVER
PROTECTED WATERWAY MANAGEMENT PLAN

LAND OWNERSHIP

FIGURE 11

- Private Land
- State Park
- National Forest

SOURCE: MONTEREY COUNTY PLANNING DEPARTMENT, 1982.

CONTOUR INTERVAL 400 FEET

SCALE IN FEET

Monterey County Planning Department

Table 8
Grazing Plan for El Sur Ranch
(Little Sur River Watershed)

Area	Total Acreage	Grassland Acreage (approx.)	Allowable AUM's*
Serra Hill	1240	400	900
Dani Ridge	960	200	480
Steer Pasture	1120	250	1152
Back Range	1580	600	2160
TOTAL	4900	1450	4692

* - AUM = Animal Units (1000 lbs.) per Month.

The El Sur Ranch presently shows no real evidence of overgrazing in terms of erosion. However, at the river mouth area, cattle have been damaging the willows of the riparian strip. So long as grazing is properly controlled it is compatible with protecting the river. The maintenance of the grasslands is always a problem, especially in the cool coastal climatic zone where coastal scrub will readily invade. In earlier years the Indians apparently burned the grasslands annually to keep out the brush, and this practice was continued by the ranch management up through World War II (Asmus, 1981). Continuous grazing accomplishes much of the brush removal by the consumption of seedlings, but either natural fire, prescribed burning, or other more artificial means, such as spraying, discing, cutting, or scraping must be resorted to at times to maintain the balance between grass, scrub and trees. Fire suppression in recent years, as regulated by both the U.S. Forest Service and the Monterey Bay Area Pollution Control District, has aggravated this situation.

The only other grazing in the watershed worthy of mention has been that of the Molera Ranch which extends over Molera Ridge into the South Fork for a limited distance. Now a state park in which grazing is usually not permitted as a matter of standard policy, this area is likely to revert to scrub and forest unless the park administration adopts an adequate policy for managing grasslands.

The Big Sur Land Use Plan encourages grazing as being the traditional agricultural pursuit along the Big Sur Coast. El Sur Ranch is one of the few large ranches remaining and has the advantage of a large and flexible acreage of grasslands. Even so, it is not economically viable according to its owners (Walker et al., 1981), and the ranch ownership is looking for diversified means of improving its income through recreational use (see following section on Recreation) while continuing to maintain the ranching activities as provided for by the trust.

RECREATION

The current recreational uses of the Little Sur River watershed include hiking, backpacking, rockclimbing, boys camps, surfing, sunbathing, nature study, beachcombing, birdwatching, fishing and hunting, and recreational driving along Highway 1 and, to a limited extent, on the Old Coast Highway. Potential uses include river running, horseback riding, hang gliding, and cycling.

The greater portion of the upper watershed lies within the Los Padres National Forest Ventana Wilderness Area. All of this area has been managed largely for recreational uses.

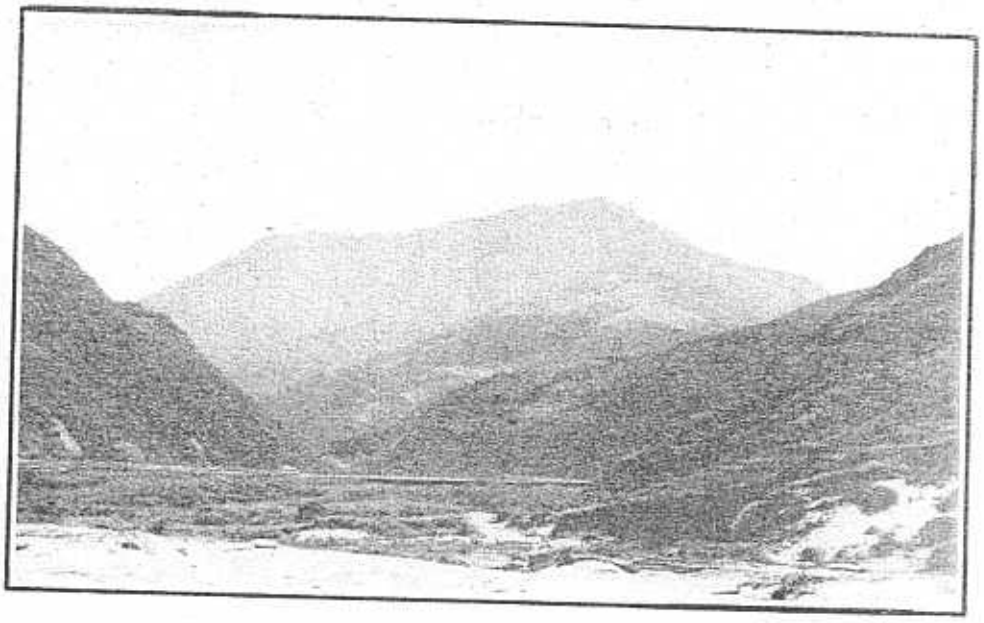
Public Viewshed

Recreational driving along Highway 1 affords outstanding views of the lower Little Sur River canyon, the upper portions of Dani Ridge and Pico Blanco Mountain as the highway crosses the Little Sur River. Views of Pico Blanco's summit are obtained from the highway at several points south of Point Sur; the summit is also highly visible from Andrew Molera State Park (west portion). Spectacular views of the Little Sur River Watershed, including Pico Blanco, are also obtained from the Old Coast Highway as it crosses Molera Ridge above Swiss Canyon and as it climbs out of the watershed on the north side.

Of all the visual features in the watershed, Pico Blanco is undoubtedly the most impressive. The mountain is a major scenic landmark on the Big Sur Coast and, historically, was used a navigational aid by early sailors. Along with Cone Peak and Mt. Manual, Pico Blanco is one of the most visually prominent summits along the entire Big Sur Coast. Its bare limestone summit is a looming presence over Andrew Molera State Park. Protection of the Big Sur Coast's Critical Viewshed will require that visual impacts to the upper portions of the mountain be avoided (approximately 2000 foot elevation and above). This may preclude further roadwork on the mountain.

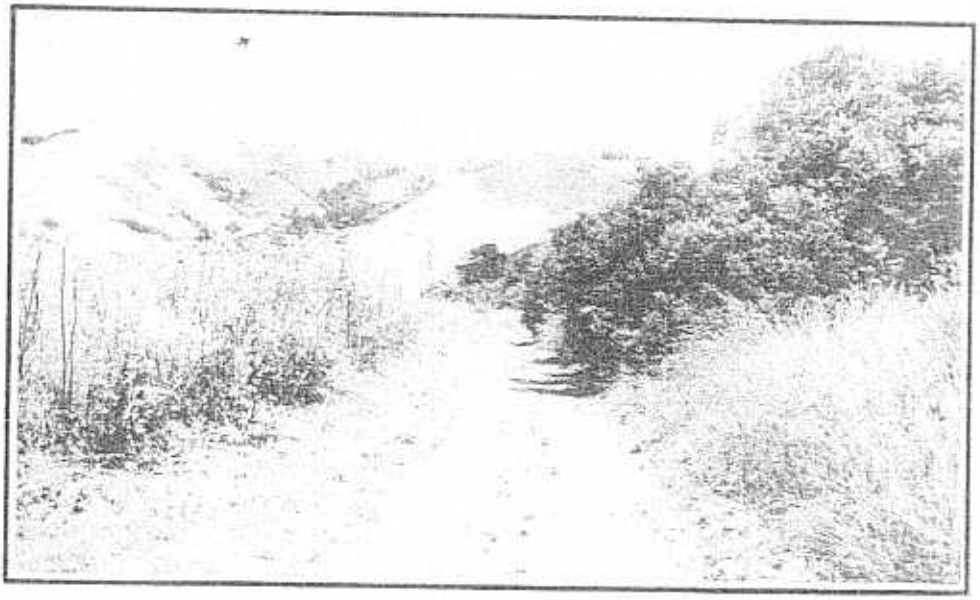
The Little Sur River Watershed as viewed from Highway 1 and Molera Park is still largely undisturbed. A recent, illegal road cut across Bixby Mountain for timber harvesting has resulted in a conspicuous scar. To a much lesser extent, the Granite Rock Company mining road on Dani Ridge has also affected the near pristine quality of the mountain scenery. The construction of new roads or improvement of existing roads clearly constitutes the major potential visual impact to the watershed.

Little Sur River Canyon and Pico Blanco from Little Sur River Beach at Lagoon



Pico Blanco Summit from Highway One at Swiss Canyon

Pico Blanco Summit from Andrew Molera State Park, River Trail



Public views available from Highway 1 and other selected points along the coast are carefully protected under the Big Sur Coast LCP. The Old Coast Road was not designated in the Big Sur Land Use Plan as a major public viewing corridor in order not to preclude potential development. However, it should be recognized that the views from this road, particularly from the upper section, are highly scenic, if not spectacular at points, and are deserving of careful protection.

Public Access

Access to any public lands, including the shoreline, for recreational use does not presently exist in the lower watershed, since both Highway 1 and the Old Coast Road pass through private lands the entire way. This, of course, has led to trespassing problems, particularly from Highway 1 to the beach. Public vehicular access to the periphery of the upper watershed is attained presently via Palo Colorado Road to Bottcher's Gap. From Bottcher's Gap, public access on foot is attained via the unpaved road to the Pico Blanco Boy Scout Camp on the North Fork and via the U.S. Forest Service trail into the South Fork. A foot trail from the Old Coast Road up the South Fork leads to the Pico Blanco Camp, but passes through private lands enroute. There are several undeveloped camp sites along this trail on the El Sur Ranch property. With the most recent addition to Andrew Molera State park it will be possible to afford access from Highway 1 near Big Sur via a trail over Molera Ridge into the South Fork of the Little Sur River to join the South Fork Trail in the Los Padres National Forest. No such trail has yet been planned.

Hiking, Trails, and Campgrounds

Existing trails in the watershed are largely on public land. The road from Bottcher's Gap to the Pico Blanco Boy Scout Camp is not open to public vehicular traffic; thus, it serves as a trail to the camp. Beyond the camp the Mt. Manuel Trail (2E06) crosses over into the South Fork, passing Launtz and Vado Camps, leaves the watershed at Post Summit and terminates in Pfeiffer-Big Sur State Park. The South Fork Trail (1E03) branches off to the west passing Pico Blanco Camp but enters private lands a short way up the North Fork to Jackson Camp. The rest of the bowl of the upper basin is presently devoid of maintained trails. A rustic trail leads up the South Fork from Vado Camp to Tin House Camp.

A second series of trails follows the rim of the watershed all along its northeast and eastern boundaries. The Skinner Ridge Trail (1E04) leads from the Bottcher's Gap roadhead over Skinner Ridge to join the Turner Creek Trail (1E02) and the Big Pines Trail (2E03) which passes Comings and Spaghetti Camps on its way out of the watershed to Los Padres Dam. At Spaghetti Camp, the Ventana Trail (2E04) branches southeastward to Uncle Sam Mountain, at which point Trail 3E08 leads from the tope of the mountain out to the Carmel River Trail (but does not directly

connect to the Ventana Trail which lies not far below on the west slope of the mountain). From Uncle Sam Mountain, the Ventana Trail leads past Little Pines Camp and then continues southward to a dead end on top of Ventana Double Cone.

New trails and camps planned for the national forest (USFS, 1980) include a Skinner Creek Trail, connecting the existing Turner Creek Trail with Jackson Camp and adding Upper and Lower Skinner Creek Camps; an extension of Trail 2E08 from Jackson Camp up the North Fork and Puerto Suello Creek to a new Puerto Suello Camp (and possibly connect with Trail 3E08 to the Carmel River Trail); and a new trail from Tin House Camp up the South Fork to Ventana Cone to meet Trail 3E06 (which connects eastward to Pine Valley and westward to Pfeiffer-Big Sur State Park, following the Big Sur River). This would add about 25 new trail miles to the existing system and make it possible for hikers and backpackers to get through all of the upper watershed and to connect with other main trails of the Ventana Wilderness, allowing some delightful loop trips to be carried out. The hiker in this country obtains many fine views of the rugged peaks and watersheds of the Santa Lucia Mountains. Presently one still sees evidence of the Marble Cone Fire, but already the vegetation is rejuvenating into a greener and healthier state than before the fire. Wilderness Area permit data for the Bottchers Gap roadhead (USFS, 1980) for 1979 show 455 permits issued, involving 1,702 visitors (12% of the total number of visitors to the Ventana Wilderness Area) accounting for 6,030 visitor days of use (10% of total for the wilderness area). Lesser numbers of users may have entered the watershed from the Big Sur River, Carmel River and Los Padres Dam Trails.

Wilderness Area Management

The Los Padres National Forest administration is currently developing a management plan for the 164,554 acre Ventana Wilderness Area in three phases as follows: (1) Phase I - Wilderness Management Environmental Assessment, (2) Phase II - Watershed Addendum, and (3) Phase III - Wilderness Management Direction. The Phase I Environmental Assessment was completed in February, 1980 and documented the environmental analysis process. Four management alternatives were considered as follows: (A) Present Management, involving a carrying capacity of 100,000 visitor days annually; (B) Pristine, involving changing trail and camp facilities from developed to rustic and limiting carrying capacity to 75,000 visitor days annually (20% over 1979 actual use); (C) Maximum Visitor Use, involving increasing the carrying capacity to 150,000 by developing the maximum trail mileage, number of new campsites, and new roadheads, the attempt being to disperse users from the areas of concentrated use to those of less use; and (D) Intermediate Visitor Use, which sets the carrying capacity at 125,000 and, according to the Forest Service, "allows an intermediate level of visitor use continually adjusted to prevent resource damage, serve the public and ensure solitude."

Alternative D is the Forest Service's preferred alternative amongst the four considered in Phase I. This alternative would allow for some development of new trails and campsites, but not necessarily all of the ones mentioned earlier. It is projected that under Alternative D the carrying capacity for the Ventana Wilderness would not be reached until 1994 or later; however, it could be reached sooner for the Little Sur River drainage. The Monterey District Ranger of the Los Padres National Forest has concluded that implementation of Alternative D will not have a significant effect on the human environment (emphasis added) and has therefore recommended that an environmental impact statement not be prepared. This Environmental Assessment has not yet been approved by the Forest Supervisor or the Regional Forester.

There are problems with the Forest Service's Environmental Assessment. At minimum, any such documents must discuss specific impacts of both the present and projected wilderness use. Especially important are the impacts of specific recreational activities, such as camping, hiking, etc., and their effects on such resources as vegetation and sensitive soil areas. However, none of these impacts appear to have been evaluated; nor does it appear that any studies or monitoring concerning these problems have been done. The assessment does recognize, however, the need for monitoring of use and activities to provide factual data for updating the management plan.

The Environmental Assessment is based upon what are termed "evaluation criteria" which are simply the generalized legal environmental goals and objectives set forth by various laws such as the Wilderness Act, Endangered Species Act, Clean Air Act, etc. The proposed management alternatives are then "evaluated" by rating them against the criteria, by using a single numerical rating for each. Thus, for example, in the case of watersheds, the evaluation criterion is, "Conforms to laws, agency policies and goals by: a. guaranteeing viable quality watershed". From all appearances there is a dearth of information concerning both the environmental status of the Ventana Wilderness Area and the exact causes of any degradation that has occurred.

The following steps are needed for an adequate environmental assessment of the Ventana Wilderness Management Plan.

1. A thorough inventory of the condition of the resource.
2. A determination of present use of the resource and an estimation of future use.
3. An evaluation of impacts of present and anticipated uses of the resource.
4. An analysis of conflicts between various wilderness uses and the analysis of conflicts between wilderness uses and adjacent land uses.
5. An evaluation of the potential impacts of use. Specific standards and statuatory and administrative regulations for wilderness and environmental protection.

Apparently then there is a pronounced need to study the status of the upper watershed, especially near the campsites, along the trails and anywhere else that human activity takes place. While it appears that some studies of the status of plants and of the wildlife, particularly of the rare and endangered species, have been made, more such studies are probably called for, especially studies of the interaction of man with such species.

As a concrete example, it has been stated (Asmus, 1981) that the North Fork on the El Sur Ranch lands has shown coliform bacterial counts above permitted levels for a number of recent years. This condition was attributed to inadequate sanitary conditions at the Pico Blanco Boy Scout Camp. The Director the the Camp, however, does not believe that the camp has caused any serious pollution as evidenced by satisfactory inspections by the County Health Department, but attributes any problem to the U.S. Forest Service's Little Sur Campground, located on the North Fork below the road into the scout camp (Nye, 1981). According to Mr. Nye, this campground has been seriously misused, especially since the pit toilets are hard for campers to find. It is concluded therefore, that there has and may continue to be a coliform pollution problem in this one reach of the North Fork due to recreational use, possibly from the Little Sur Campground. This situation could be mitigated by improvement in the management of the national forest and watershed.

River Mouth Uses

This Big Sur Coast Local Coastal Program LUP gives recreational uses and facilities related to the coast top priority both as to appropriateness and need. The Big Sur Coast LUP calls for low level expansion and development of visitor-serving facilities aimed at providing increased recreational opportunities while preserving the Big Sur environment for the enjoyment of future generations. The Little Sur River mouth and beach is also designated as a Priority 1 area for acquisition to provide shoreline access.

The degree of anticipated recreational use of the river mouth will likely conflict with other existing uses, particularly wildlife use. This area is recognized in the Local Coastal Program and also by this plan (see section on Wildlife) as an environmentally sensitive habitat for a number of species. All of the dunes immediately behind the high tide line are potential nesting sites for the snowy plover (Figure 9). The area generally furnishes nesting and foraging areas for many migratory and resident shorebirds, waterfowl and pelagic birds. The sea cliffs are important nesting habitat for the peregrine falcon and the lagoon affords a resting area for many birds.

The critical period for the reproductive cycle of these birds is during the winter and spring months until about May. If the Little Sur Beach is opened for public use, careful monitoring of the types and levels of recreational uses and associated effects

upon wildlife and wildlife habitat will be necessary, especially during this critical period. Careful management of the beach and dune areas will also be required - well-marked and signed trails through the dunes to the beach area will be necessary in order to direct human use to the beach area; educational signs concerning the biological values and sensitivity of the dunes and lagoon area should be erected and maintained; dogs should be prohibited during the critical period for wildlife; and hang gliding should also be restricted. If, even with careful management of recreational use, ongoing monitoring and studies indicate conflicts between recreational and wildlife uses and adverse effects upon the wildlife present, protection of this environmentally sensitive habitat area in accordance with the policies of the Big Sur Land Use Plan, may necessitate closure of the Little Sur River mouth area to recreational use during the winter and spring months. This might be feasible as a large part of the recreational demand occurs during the summer months from May to October. Without such restrictions on recreational use, the impacts associated with human activity, including nest destruction, habitat destruction, proximity effect leading to endocrine stress, etc., would certainly reduce the natural habitat for wildlife and could directly affect the health and vigor of the wildlife populations present. Additionally, habitat destruction by the development of roads, parking areas, and picnic sites would generally reduce the value of the river mouth habitat to wildlife.

At the same time, it would seem to be advisable to have some access to the beach throughout the year, as this has always been a critical issue along this part of the coast and has high priority in the LUP. It may be possible to provide access on the south side of the river mouth while closing off the critical area.

SUMMARY OF MANAGEMENT CONCERNS

WATERSHED CONTROLS - FIRE, FLOOD, EROSION AND SEDIMENTATION

1. Flooding and erosion from effects of fire or timber harvesting, overgrazing, recreational roads, and campground use.

2. Blocking of streams by log and rock debris accumulations due to flooding.

3. Property damage (road bridges, roads, and dwellings) due to flooding.

4. Reduced summer stream flows due to fire or timber harvesting.

5. Excessive fuel loading, chiefly in the forest just west of the wilderness area boundary.

6. Overgrazing on the steepest areas of the lower watershed where plant cover protection against erosion is most needed.

7. Invasion of grasslands by scrub near the coast, especially where grazing pressure is light, resulting in loss of grazing areas.

8. Movement of mining spoils and possibly some overburden from disposal sites into the streams.

9. Landslides triggered by the weight of mining spoils, and the increased erosion and siltation produced thereby.

10. Lack of adequate control of width of roads, particularly mining, timber harvesting and recreational roads, on steep slopes, which strongly affects the amount of cut and fill and the amount of erosion.

11. Lack of winter maintenance of roads with respect to drainage, which can result in gullying of the steeper slopes.

12. Impacts on groundwater flow and forest moisture status caused by the use of excessive road widths and by cutting roads too close to the finest tree specimens.

13. Soil erosion and flooding impacts caused by methods of brush control which either break the soil surface (discing, ripping) or which destroy the plant cover root systems (bulldozing).

WATER QUALITY PROTECTION AND ENHANCEMENT

14. Siltation of streams from flooding and erosion and from mining operations.

15. Fecal coliform pollution of streams from surface runoff from unimproved campgrounds.

16. Potential for water pollution should spraying for brush control occur.

17. Adequacy of toilet facilities in campgrounds, and the potential for fecal coliform pollution of streams.

18. Ability of Pico Blanco Boy Scout Camp facilities to accommodate more than the average number of users while conforming to public health standards.

19. Pollution of groundwater supplies for residential and recreational development by spraying of herbicides or recreational activities.

FISH AND WILDLIFE PRESERVATION AND ENHANCEMENT

20. Loss of spawning riffle habitat for anadromous fish from siltation and corresponding reduction of spawning and growth rates.

21. Loss of summer steelhead rearing habitat due to siltation.

22. Interference with anadromous fish migrations due to stream blockages.

23. Loss of aquatic invertebrates and environment due to siltation.

24. Reduced oxygen content and increased temperature of water in streams, resulting in increased fish mortality and reduced carrying capacity of the stream.

25. Depletion of anadromous fishery by illegal fishing at or near the mouth of the river or in the lagoon.

26. Impacts of noise and human proximity in the Pico Blanco quarry operation upon wildlife.

27. Impacts of human use of the river mouth and lagoon areas on the ocean bluff nesting sites.

28. Impact of sport fishing in the lagoon on young steelhead.

29. Protection of the breeding and feeding habitats of the endangered peregrine falcon from human proximity, noise, habitat destruction and water pollution.

30. Protection of the feeding habitats, particularly the river mouth and lagoon, of the bald eagle (protected under both federal and state laws) from human proximity, noise, habitat destruction, and water pollution.

31. Protection of the resting areas at the river mouth of the California brown pelican (protected under both federal and state laws) from human proximity, noise, habitat destruction, and water pollution.

32. Need for special management practices to protect locally unique wildlife species: (1) western snowy plover (sandy beach feeding and nesting sites), (2) American osprey (river mouth feeding area), (3) black swift (sea cliff nesting sites), (4) western burrowing owl (grassland sites), (5) purple martin (riparian forested snags), (6) spotted owl (old growth timber nesting sites), (7) golden eagle (mountain cliff and forest nesting sites), (8) prairie falcon (cliff nesting sites), (9) ringtail (rocky brushy habitat), (10) mountain lion (wilderness area).

33. Loss of wildlife habitat through timber harvesting, overgrazing, road building, mining, recreational development, fire suppression.

34. Illegal taking of protected raptors by falconers.

35. Maintenance of instream flows adequate in the summer months to produce smolt sized fish (4+ inches).

36. The need to protect the lagoon at the river mouth as steelhead rearing habitat.

37. Lack of adequate data to serve as a basis for estimating surface and groundwater supplies in the watershed and determining necessary instream flow requirements.

38. How existing water rights and water appropriations yet to be authorized will affect summer stream flows and the instream flow requirements for fish and aquatic biota.

RIPARIAN CORRIDOR PRESERVATION AND ENHANCEMENT

39. Scouring of riparian vegetation and attendant wildlife losses due to flooding.

40. Destruction of riparian habitat during timber harvesting near stream.

RECREATION MANAGEMENT

41. Interference of siltation with recreational use of the streams (sports fishing, swimming, etc.).

42. Safety aspects of blasting and quarrying near a public trail and campground.

43. Impacts of proposed new trails in the Ventana Wilderness Area in relation to increased use of the wilderness (littering, fecal pollution, soil erosion).

44. Impacts of human recreational use of the river mouth area on the rare shrub Arctostaphylos edmundsii.

45. Permanent public access to the South Fork Trail from Old Coast Road to Los Padres National Forest lands.

46. Need for an extended trail system in the upper Little Sur River watershed to improve access to the wilderness area and to allow loop trips to be made through the watershed connecting to adjacent watersheds.

47. Failure to optimize recreational use of the watershed, especially those uses, such as fishing, camping, backpacking, photography and nature study, which are compatible with conservation of the river and the watershed.

SCENIC RESOURCE PROTECTION AND ENHANCEMENT

48. Visual impacts of roadbuilding for timber harvesting, mining and recreation.

49. Visual impacts of timber harvesting, especially near the wilderness area.

50. Visual impacts of a conveyor belt for mineral transport, should that method be used rather than trucking.

GOALS AND OBJECTIVES

LEGISLATIVE MANDATE

The goals and objectives for the management of the Little Sur River follow from the California Protected Waterways Act, the California Protected Waterways Plan (Initial Elements), Assembly Concurrent Resolution No. 32, and from the mandates and adopted policies of federal, state, regional, and local agencies responsible for flood control, water quality, water resources development, wildlife and wildlife habitat protection, resource conservation, recreation management and land use planning. In addition, these goals and objectives have been developed within the context of the Local Coastal Plan for the Big Sur Coast which involved considerable public input during the planning process. As such, the objectives represent a recognition of the special environmental and social conditions found on the Little Sur River and within its watershed.

The California Protected Waterways Plan (Initial Elements) specifies that the objective of each detailed management plan should be consistent with the policy of the Waterways Act:

> "To provide for the conservation of those waterways of the state possessed of extraordinary scenic, fishery, wildlife, or outdoor recreation values."

EVALUATION OF STATUS

The California Protected Waterways Plan (Initial Elements) also provides for the classification of waterways or waterway segments into three possible categories as a basis for further refining planning and management objectives. The three possible classifications are: natural waterways, pastoral waterways, and developed waterways. Of these, the first two are considered to be applicable to the Little Sur River. A natural waterway would have wild, scenic, recreational and resource attributes, while a pastoral waterway would be characterized by rural or farmland uses, support resources and recreation and would contain scenic values. The attributes and management standards, and requirements of both the natural and pastoral waterway categories are contained in Appendix B.

The Little Sur River and the watershed area below the forks (lower watershed) fit well into the "pastoral" waterway classification. This segment of the river and its watershed area are readily accessible by road - Highway 1 crosses the river near its mouth, a private ranch road runs parallel and in close proximity to the river, and the Old Coast Road provides vehicular access through the lower watershed. The river mouth and the beach presently support passive recreational uses, but overall, the lower watershed area is primarily used for cattle grazing and ranching at the present time.

In contrast, both the South and North Forks fit best into the "natural" category of wild and primitive rivers used for scenic and recreational purposes. The forks and their watershed area (upper watershed) are remote with limited vehicular access. The upper watershed consists of rugged mountainous terrain dissected by steep forested canyons. The greater portion is in public ownership as part of Los Padres National Forest with close to 85 percent of national forest lands lying within the Ventana Wilderness area. The forks and the upper watershed are aptly characterized as wild, highly scenic, and primitive.

While all three protected waterway categories "are designed to conserve to varying degrees, and in several ways, the extraordinary scenic, fishery, wildlife and outdoor recreational values of our waterways," the following additional guidance is provided in the state plan concerning the management standards generally suitable for pastoral and natural waterways:

Pastoral Waterways

1. Motorized vehicles allowed on the land area, few restrictions on watercraft and aircraft.

2. No unharmonious improvements and few habitations permitted, except in small communities; limited modern, screened public use facilities permitted, such as campgrounds, visitor centers, including new construction for unobtrusive marinas, campground and community development. Industrial development screened.

3. Unobtrusive fences, gaging stations, and water management facilities permitted if they have no significant adverse effect on the rural character of the area.

4. A wide range of agriculture, forestry, and other resources uses permitted on adjacent lands.

Natural Waterways

1. Motorized vehicular use limited on the land area; possible restrictions on watercraft and aircraft.

2. Only public use necessitating primitive-type facilities permitted; new structures and improvement of old ones permitted only where in keeping with the natural objectives.

3. Unobtrusive fences, gaging stations, and other management facilities permitted if they have no significant adverse effect on the area's natural character.

4. A limited range of agriculture, forestry, and other resource uses permitted on adjacent lands.

Streams falling into the "Natural Waterways" category may also be eligible for designation as a "Wild and Scenic River" under the California Wild and Scenic River Act enacted by the State Legislature in 1972 (Public Resources Code, Section 5093.50 - 5093.65). The purpose of the Act is to preserve those rivers or sections thereof, "which possess extraordinary scenic, recreational, fishery or wildlife values,. . . in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state" (Sec. 5093.50). The Act provides for classification of these rivers by the Secretary of the Resources Agency as one of the following:

1. "Wild rivers, which are those rivers or segments of rivers that are free of impoundments and generally inaccessible except by trail with watersheds or shorelines essentially primitive and waters unpolluted."
2. "Scenic rivers, which are those rivers or segments of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."
3. "Recreational rivers, which are those rivers or segments of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past." (Sec. 5093.53).

Both the North and South Forks appear to satisfy the state criteria for classifaction as a "wild" and/or "scenic" river.

Of particular importance to this management plan is the Big Sur Local Coastal Program, the County's principal land use plan document for the area, which governs the actions of both state and local agencies in the area. It provides both a broad policy framework for the entire Big Sur area, including the Little Sur River, as well as numerous specific land use and resource protection policies and standards. Accordingly, this plan has been fully coordinated with the LCP to achieve consistency in intent and policy direction. The goals, policies, and recommendations that follow are intended to provide the additional management guidance for the Little Sur River necessary to resolve the issues and concerns set forth in the preceeding section.

PRIMARY GOAL

The Primary Goal of the Little Sur River Protected Waterway Management Plan shall be:

> To protect and enhance the outstanding natural values of the Little Sur River and its watershed as prime fish and wildlife habitat and for scenic and passive outdoor recreation and to support continued ranching use and those visitor-serving uses and limited resource-dependent uses which are compatible with protection of these natural values.

OBJECTIVES

The following objectives are presented in order to carry out the Primary Goal and as a guide to understanding and implementing the specific policies and management recommendations of this plan:

1. Protect and manage the North and South Forks of the Little Sur River and the upper watershed area as Natural Waterways whose highest and best use shall be for fish and wildlife habitat, scenic enjoyment, and passive outdoor recreation.

2. Protect and manage the lower Little Sur River and its watershed below the confluence of the Forks as a Pastoral Waterway whose primary uses shall be ranching and agriculture, and passive outdoor recreation, compatible with protection of the natural and scenic values of the Little Sur River and lower watershed area.

3. Manage existing and future water supplies in the Little Sur River Basin consistent with basin capacity, satisfaction of instream flow needs, and protection of water-dependent resources and values.

4. Preserve the stream channels and floodplain in their natural state to the maximum extent possible, while restricting those types of future development which would necessitate flood control measures.

5. Maintain and protect the water quality of the Little Sur River, its tributaries and groundwater basin for existing domestic and ranching use, for maintenance and enhancement of fisheries and aquatic environments and for scenic and recreation enjoyment (including body contact sports). In this regard, maintain essentially a zero turbidity level in surface waters at normal flow rates.

6. Maximize stream habitat values and optimize productivity for the anadromous fishery, resident fishes, and other aquatic organisms, by preventing and mitigating adverse impacts to the aquatic ecosystem and restoring degraded or damaged areas.

7. Protect unique, endangered and sensitive wildlife species and maintain and enhance wildlife habitat values throughout the watershed.

8. Protect and, where necessary, restore riparian woodland vegetation along the streambanks and on the floodplain of the Little Sur River and its tributaries and thereby seek to enhance riparian wildlife habitat values.

9. Guide the development and management of appropriate river-oriented recreational activities and facilities in a manner consistent with the maintenance and protection of the recreational resource and the natural environment.

10. Conserve the prevailing natural scenic values which dominate the Little Sur River Basin. Maintain the traditional pastoral landscapes of the lower Little Sur Valley, preserve the wilderness character of the upper watershed, protect the "natural" appearance of the river mouth area and preserve the scenic grandeur of Pico Blanco Mountain as viewed from the coast highways and Andrew Molera State Park.

11. Provide public access to the Little Sur River Beach while at the same time protecting wildlife values of the lagoon and shoreline.

MANAGEMENT STRATEGIES

MANAGEMENT APPROACH

Numerous management tools and procedures are available for protecting and restoring the sensitive and essential environments in the Little Sur River Basin and ensuring the continued utilization of these resources upon which development and activity are dependent. Resource management agencies and professionals are familiar with the application of the appropriate management options. Often a combination of approaches employed by several agencies in concert is required in order to achieve the desired results. Difficult policy decisions also arise when the application of a specific management option may help to achieve the desired results for one management concern while simultaneously hindering the potential for resolution of another seemingly more important, and, therefore, overriding concern. A major challenge will be, therefore, to resolve conflicts between seemingly mutually exclusive applications.

The discussion which follows attempts to evaluate alternative management approaches to a given management concern in a manner which would either produce minimal impacts to the natural river-watershed system or else would restore it closest to its natural state. The impacts of the mitigation or restorative measures have also been considered along with those originating from the human uses planned for the watershed.

MANAGEMENT ALTERNATIVES

Water Use, Conservation and Rights

The problem of balancing water use during the summer drought period in California versus the instream flow requirements to maintain fish and aquatic and riparian ecosystems is a delicate one. At the present time, it is assumed that the total summer flow of the Little Sur River and its tributaries is required for instream uses (see page 40). Under such an assumption, essentially no additional surface water should be drawn from the streams during this period. (This plan also calls for studies of instream flow requirements which could result in a change in this basic recommendation).

The most common alternative to drawing on summer stream flows is to store sufficient water from winter flows to serve the summer needs. However, in the Little Sur River Watershed no large storages have ever been constructed, and the Big Sur Land Use Plan limits such water diversions to those needed for agricultural irrigation, improvement of fish and wildlife habitat and watershed restoration projects. A second alternative is the use of groundwater for domestic purposes. With the present low level of domestic use, the effect of well

pumping on the groundwater inflow into the streams should be minimal, since the groundwater basin is a storage zone. Water development approval in the future, however, should take into account the small volume of groundwater storage and the possible impacts of heavier withdrawal from wells upon the summer stream flows.

Watershed Controls

Fire Control: Of the chief natural factors affecting the watershed, fire probably comes first in importance. It is assumed that natural fires were of sufficient frequency that both the size of the burned areas and the percentage of vegetation destroyed was limited. Under fire suppression management, however, the fuel loadings were increased, leading to disastrously large and intense fires such as the Marble-Cone fire.

This plan proposes to use prescribed burning as the principal fire-control tool, since it simulates the natural control most closely. Fire is not only necessary as a pruning mechanism to remove dead wood and reduce the fuel loading, but it also serves to rejuvenate certain ecosystems, particularly chaparral, and to help maintain others, e.g., redwood forest, knobcone pine forest, etc. The alternatives to burning are spraying with herbicides or mechanical means of brush removal, such as cutting or ripping. Spraying has the disadvantages of polluting both the water and soil, leading to kills of both fish and wildlife. Ripping damages both the soil and vegetation unnecessarily and increases erosion and siltation. In contrast, prescribed burning involves less labor than other methods and has the least adverse impacts. It can be easily used in this terrain of very steep slopes, sharp ridges and complex drainages. The Little Sur River Watershed is particularly suited for prescribed burning because of the small extent of development in it.

Fuelbreaks, such as were conventionally used earlier for fire control in areas like the Santa Lucia Range, are not recommended in the long-term, since they produce impacts similar to those resulting from the ripping of vegetation. In addition, fuelbreaks must be maintained regularly which intensifies their impacts. As a short-term measure, the limited use of fuelbreaks in the lower watershed and the lower elevations of the upper watershed (east of Pico Blanco) may be necessary until the existing fuel load is reduced through a prescribed burning program.

Grasslands and Grazing Control: The extent of grasslands and grazing under natural conditions in the watershed is not known. The present ranching use is likely maintaining a grassland area not appreciably different from the natural, although the grass species maintained are largely introduced annuals. The grassland ecosystem probably yields somewhat more water and a steadier flow of water than would the scrub or chaparral ecosystems. Thus, grazing is recommended as a management tool to control vegetation, i.e., to maintain grasslands, on the

warmer slopes of the lower watershed (except the very steepest slopes which maintain themselves in scrub or chaparral cover). Grazing, like fire, constitutes a nearly natural means of control, although making use of domestic stock chiefly in place of natural grazers. However, a grazing management plan, such as the one developed for El Sur Ranch, must be followed to prevent undergrazing or overgrazing as the latter can result in serious erosion and stream siltation. The alternatives to grazing, in order to maintain the grasslands, are spraying or the mechanical ripping of scrub and brush. The adverse impacts of both of these methods have already been discussed. The latter methods might have to be used in limited areas where grazing is not an effective control, but only where the soil is suitable to support a grassland.

Scenic Protection: Scenic protection is directly connected to watershed protection and control, since scenery is simply the outward manifestation of balanced and healthy natural systems. The same management tools of prescribed burning, domestic grazing and others yet to be mentioned provide the greatest scenic protection by minimizing alterations of the natural systems. Fire scars from prescribed burning will be visible for the first few years just as in the case of natural fires, but not nearly to the extent of catastrophic fires where trees and all vegetative cover may be removed. Furthermore, the recovery of rejuventated vegetation affords some of nature's finest displays of greenery. At the same time, properly managed grazing renders the pastoral scenes considered to be appropriate for the lower watershed.

Where timber harvesting is to be accomplished, the use of the selective cut silvicultural system would simulate most closely the natural process of tree death and uprooting, and a limitation on the percent of cut would distinctly soften the visual impacts. Mitigating the visual impacts of quarrying will be particularly difficult. Sculpturing of the quarry face is the most basic technique which can soften the disruption of the topography. The feasibility of the proposal to plant native vegetation for screening purposes (USFS, 1981) is questionable since very few plant species grow on the limestone proper and these provide only scanty cover. Vegetation recovery could be improved by importing topsoil and possibly by irrigating, but both of these solutions are expensive in the long term. There may be no sound alternatives for mitigating the visual impacts of the quarry.

Road building will probably produce the greatest visual impacts overall. Roads are most visible on the exposed grassland and brushland slopes of the lower watershed. Such roads can be hidden in the critical coastline viewshed only by careful location behind ridges and hills. Otherwise, the road must be located in woodland or forest adequate to screen it, or, where appropriate, the road must be screened by plantings which would very likely have to be maintained. (Landscaping itself can become a source of visual disruption as, for example, when

Monterey pines are planted on a grassland terrain.) The visual impact of any road can be softened by reducing the width of the road, and thereby the extent of cut and fill which greatly affects the visual impact. There are really no other means available to mitigate the visual impacts of roads.

The problem of a heavy haul road for the Pico Blanco mining operation in the future constitutes a special case. It is doubtful that a new and wider road alignment can be found which will not have major visual impacts in the critical viewshed. Thus, if a mining operation is proposed, then serious consideration should be given to the potential mitigating effects of a conveyor system, both visual and otherwise.

Timber Harvesting Regulation: Current State Forest Practice Rules prohibit clear cutting and limit the percent cut in a given timber harvesting plan to a 50% selection cut in the High Use Sub-district of the Southern Forest District, including the Little Sur Watershed. Only sanitation salvage cutting will be allowed in the cutover areas for 10 years following harvest. In the Coastal Commission Special Treatment areas 50% of the trees 12" to 18", 18" to 32", and 32" and over must be left. The Coastal Commission Special Treatment area covers only part of the entire Little Sur Watershed.

The Big Sur Coast LUP requires salvage or selection cutting methods as specified under the State Forest Practice Rules for Coastal Zone Special Treatment Areas, but in addition limits the total merchantable timber which may be cut in any watershed providing domestic water downstream to 15% in any 10-year period. Such limitation is not now recognized by the California Department of Forestry which operates under rules promulgated only by the State Board of Forestry. Such a limitation could be instituted by a request from Monterey County to the State Board and adoption by the State Board of a Little Sur Watershed Special Treatment Area with a 15% cut limitation in any 10 year period. It should be understood that the cutting methods largely determine the immediate localized impacts of harvesting and can noticeably affect forest regeneration, while the total amount cut in the watershed in a given period of time determines the cumulative impacts on runoff, sedimentation, aesthetics, and forest regeneration.

To reduce the amount of soil disturbance and siltation and canopy disturbance occurring at any one time, the allowable selective cut in a given timber harvest plan should be further limited to 40%. The reentry time should also be kept as long as possible, e.g., a minimum of 20 years. Such a schedule has the effect of lengthening the regenerative cycle and somewhat reducing the annual yield of timber while protecting the soil and yielding larger trees and higher quality wood. Shorter cutting cycles will not only create more soil disturbance but, in addition, the intensity of the cutting will require that thinning be accomplished between cuts, thereby producing further disturbance of the soil. In addition, it is important to limit

the total percentage cut in the entire watershed within a given time period, in order to control the cumulative impacts upon the stream in times of runoff, flooding and sedimentation. The 15% limit within a 10-year period as provided in the LUP appears to be practical, since most cut areas, if not severely damaged, should regain their normal hydrologic function in less than 5 years.

In the riparian corrider, in stretches of closed canopy, limited tree removal may actually improve the aquatic habitat for fish and invertebrates by increasing the primary production of the stream. The difficult problem in this case is the removal of the trees within the riparian corridor without siltation of the stream. Under current California forest practice rules the standard is that streams and lakes "shall be kept substantially free of slash, debris and other material resulting from such (timber) operations." Since some siltation is virtually certain to occur, the above standard does not define any real limit to the damage which can be done. Because of this problem, the Big Sur Coast Land Use Plan prohibits all salvage or selective logging activities, except the felling of trees, within the riparian corridor. The State Board of Forestry could be requested to modify its rules to further protect the riparian courses of the streams in the Little Sur Watershed by allowing only filling in the stream protection zone.

The regional water quality control boards have generally requested that monitoring of turbidity be carried out both upstream and downstream of the harvesting site during operations, and that the turbidity readings downstream not exceed those upstream by more than 20%. However, such monitoring should also be continued through the first winter period following harvesting operations. Only by this means can siltation actually be measured and the timber harvesting operations be regulated so as to fully protect the stream. In the absence of this latter standard, timber harvesting should be prohibited in the riparian corridor. If prohibited, turbidity monitoring is still advisable as the surest test of the environmental effectiveness of the harvesting methods.

The maintenance of erosion control facilities on the harvest site and the logging roads for a minimum of three years following completion of timber operations is of critical importance. Erosion control facilities are discussed in the following section.

Roadbuilding Controls: Roadbuilding impacts on the watershed are generally similar, whether the roads are to be used for timber harvesting, mining, recreation or other purposes. Since most of the impacts of roads are a strong function of the road width, it is absolutely essential to control the latter parameter in order to control the magnitude of the impacts. Potential impacts include erosion, siltations, landsliding and soil slumping and slippage, groundwater and surface water flow displacement and visual impacts. The magnitude of these impacts

is also a strong function of the percent side slope; that is, the greater the side slope, the greater the magnitude of impacts.

The Big Sur Coast Land Use Plan generally limits new roads to slopes under 30 percent unless no other feasible alternative exists; it also establishes maximum road width for roads serving new residential development and standards for controlling erosion and sedimentation and protecting environmentally sensitive habitats. In many cases, these standards should be adequate to prevent or significantly avoid the impacts identified above.

Logging and mining roads typically must cross slopes greater than 50% in certain places. In addition to the Big Sur Coast LUP safeguards concerning mitigation of erosion and slope instability impacts of road construction, the width of any new roads or improvements to existing roads proposed on slopes exceeding 30 percent should be controlled as a function of the side slope in order to minimize necessary grading. The rule of thumb is that the width of the road should decrease as the side slope increases. This rule was generally applied in the construction of older roads before present day environmental regulations took force. A typical set of standards would be as follows: maximum roadbed width of 18 ft. for slopes under 30%, 12 ft. for slopes of 30-50%, and 10 ft. for slopes over 50%. The alternative to such road design should be another means of conveyence, e.g., conveyor belt for mining and helicopter yarding for timber harvesting.

The proper installation and maintenance of drainage and erosion control facilities is critical in the construction and improvement of roads. The California Forest Practice Rules generally provide adequate guidance for the installation of drainage ditches, culverts and waterbars on any types of roads to afford both adequate distribution of runoff and erosion control. On unsurfaced roads the installation of waterbars is the most critical feature, and this is a function of the soil erosion hazard rating and the road grade. Waterbars and culverts should discharge onto a suitable energy-dissipating surface, and sidecast material used for fill must be seeded and protected against any concentrated flows of water.

It is also essential that all erosion control facilities be inspected during the first heavy rains of the wet seasons to determine whether or not they are operating properly, and that they be maintained throughout the wet season. For temporary roads and side trails such as are used during timber harvesting, it is necessary to maintain the erosion control facilities for a minimum of three years, at least until vegetative recovery has occurred.

If sediment is likely to enter any of the watercourses in the draws and small canyons, sediment catch basins should be provided on the watercourse. Barriers for such basins need tg

be sturdily build lest the basin be destroyed by a flood and contribute to stream siltation rather than prevent it. The same facilities are called for where mining spoils are eroding or likely to erode.

Riparian Corridor Protection

Flood control of the river by artificial means is not recommended except where the road, i.e., the El Sur Ranch road following the river below the forks, or any essential structure must absolutely be located on the floodplain. The use of gabbions, riprap, etc., to channelize the stream for any length has the adverse impacts of increased streamflow rates, loss of spawning areas, decreased groundwater recharge, loss of soil replenishment and abnormal flooding if the lining is breached. In addition, the riparian corridor is partially or totally disrupted for certain reaches of the stream with consequent disruption of the riparian, wildlife, aquatic and fish resources. Rivers use their entire floodplain over the long term and as a result the soils, ecosystems and hydrology of the floodplain remain natural. Floodplains in their natural condition (allowing for the possibility of agricultural use) are generally of greatest use to man. Any permanent structures should not be located within the 100 year floodplain. The Big Sur LUP prohibits all new development, including filling and grading, within the 100-year floodplain. However, temporary recreational facilities in the floodplain may be consistent with the intent of the LUP so long as they do not preclude natural flooding that may occur and do not damage the riparian corridor. Buffer zones between the corridor and any permitted development are usually advisable. The 150 foot setback requirement of the LUP may, in many cases, afford this recommended buffer zone.

Wildlife Protection

The river mouth is a sensitive wildlife area both for nesting of the snowy plover on the sandy beach and for feeding and resting of waterfowl and shorebirds in the lagoon area. Most of the critical breeding and feeding use of the river mouth area by migratory birds occurs during the winter months (December-April). Management options for controling visitor access to the river mouth area during this period need to be thoroughly evaluated after additional information on wildlife use and sensitivity to human activity has been obtained.

Recreational use of the river mouth during the summer period can occur with only a few restrictions. Fishing in the lagoon might have to be restricted, pending the outcome of the anadromous fish study of the lagoon, and the lagoon itself may need to be set aside as a wildlife preserve, depending upon the amount of summer use by birds. The stream's riparian corridor should be protected by a buffer zone, but the remaining area of willows should afford an opportunity for the observation of wildlife. With careful study and design, controlled public access to the beach may be possible year round while still protecting wildlife

during the critical season.

For the peregrine falcon and the prairie falcon which use Pico Blanco Mountain as habitat, the critical breeding period is January-July. Currently Granite Rock Company does not operate during the wet season which is beneficial to the habitat requirements of these endangered raptors. Considering the potential impacts of noise, truck traffic, dust, blasting, and human proximity, it is believed that an appropriate solution to protecting these endangered species is to set up an ongoing study to monitor the health and reproduction of these birds at Pico Blanco. In the event that mining activities are found to adversely affect these species then the County may need to place restrictions on any use permits, especially during the critical months of January-July. Permits for mining obtained from the U.S. Forest Service should carry similar limitations.

POLICIES AND RECOMENDATIONS

WATER CONSERVATION

1. A data collection program should be established to determine necessary instream flow needs and available water supply to serve new or intensified uses in the watershed. Accordingly, the U. S. Geological Survey shall install and maintain a stream gauge on the Little Sur River below the forks in order to obtain necessary baseline data on a largely natural watershed, especially just as it is recovering from the effects of the Marble-Cone Fire. From this baseline data, the Department of Fish and Game shall undertake the necessary studies to determine instream flow requirements for maintenance of the anadromous fishery.

2. The appropriation of additional water from the Little Sur River, its tributary creeks and springs and from wells in the river gravel, between the months of July-November, inclusive, to serve either private applicants or public agencies, should not be permitted by the State Water Resources Control Board (SWRCB), Division of Water Rights until determinations of instream flow needs for maintenance of the anadromous fishery and the cumulative impacts of water resources development in the watershed have been completed.

3. New development requiring the appropriation of additional water from the Little Sur River Watershed between the months of July-November, inclusive, should not be permitted by Monterey County until determinations of instream flow needs for maintenance of the anadromous fishery and the cumulative impacts of water resources development in the watershed have been completed.

4. Subsequent to determination of instream flow needs, future water use and new development shall be limited to a level consistant with the maintenance of necessary instream flows.

5. The SWRCB, Division of Water Rights should recognize any wells drawing water from the gravels and sands adjacent to the Little Sur River as riparian uses and should grant each existing user a permit for the current established level of water withdrawal.

6. Monterey County should require that all applicants for additional development appropriating water from the watershed have an approved permit for such appropriation from the SWRCB, Division of Water Rights prior to receiving project approval.

7. The SWRCB, Division of Water Rights should approve only those requests for water appropriation from the Little Sur River, its tributaries, the river gravels and, if there is underflow, the groundwater basin which are consistent with maintaining required instream flow needs as determined by the California Department of Fish and Game.

8. Where development of water supplies or intensification of use of existing supplies in the watershed is proposed, compliance with Policy 3.4.3.1 (Water Supply and Use) of the LUP may necessitate an investigation that establishes the boundaries and characteristics of the groundwater basin, including available groundwater supply and quality.

WATERSHED CONTROLS - FIRE, EROSION AND SEDIMENTATION

9. The U.S. Forest Service should develop plans for prescribed burning and "let burn areas" in order to minimize high fuel loading in the Los Padres National Forest (this will be much more applicable in the future than presently due to the recent Marble-Cone Fire).

10. The California Department of Forestry in conjuction with the U.S. Forest Service and California Department of Parks and Recreation and private landowners should develop a program for the periodic prescribed burning of chaparral, forest and possibly some grassland areas on non-federal lands to achieve a systematic reduction of fuel loads in high fire hazard areas in the watershed. In the case where normal grazing pressure is inadequate to control brush invasion of grasslands, prescribed burning should be considered in preference to the more disruptive methods of herbicide spraying or mechanical removal.

11. Machine-constructed firebreaks which result in the exposure of bare mineral soil and in visual intrusions on the landscape should generally be avoided, and less severe measures should be used for fuel reduction along the borders of burn units. Where necessary to prevent the outbreak of large wildfires, machine-constructed firebreaks may be used until such time that the existing fuel load is reduced through a prescribed burning program provided that they are not constructed on steep slopes susceptible to erosion.

12. Development and uses incompatible with the periodic flooding that occurs within the 100-year floodplain of the Little Sur River shall be restricted in accordance with the Big Sur Coast Land Use Plan. Outdoor recreational uses, such as those permitted in the LUP's Resource Conservation category and the principal permitted uses of the Outdoor Recreation category, and agricultural uses are considered acceptable uses within the 100-year floodplain.

13. Streambank vegetation should be protected in order to prevent bank erosion as well as protect wildlife values.

14. Monterey County shall request that the State Board of Forestry declare the Little Sur Watershed a Board of Forestry Special Treatment Area in which the following allowable cut and reentry time shall apply: maximum allowable cut under the selective cutting method shall be 20% of the total merchantable timber with a 30 year reentry time period.

15. Small-scale selective timber removal for non-commercial, on-site purposes, such as fuel wood, split products and removal of diseased trees, is permitted on an on-going basis provided that such timber harvesting is in conformance with all other applicable policies of the Big Sur Land Use Plan and this management plan, particularly those policies concerning protection of riparian corridors and other environmentally sensitive habitats, construction of roads and erosion and sedimentation control.

16. In addition to the policies and standards contained in the Big Sur LCP, special restrictions on the number of trees taken within the riparian corridor should be established and enforced by the California Department of Forestry and the U. S. Forest Service when members of the State review team determine these special restrictions are necessary to protect all of the multitude of riparian vegetation functions.

17. Monterey County, as a review team member shall request the U.S. Forest Service to consider, and the California Department of Forestry and the Regional Water Quality Control Board should require, monitoring of stream turbidity and other water quality parameters both upstream and downstream of timber harvest sites during commercial harvesting operations and through the first winter following harvest operations.

18. The El Sur Ranch should continue to limit grazing intensities on the grassland and scrub areas in accordance with its current grazing management plan so as to minimize soil erosion, particularly on the steeper and warmer slopes. At such time that additional grassland area is provided, this plan should be reviewed and, if necessary, revised with the assistance of the U.S. Soil Conservation Service.

19. The California Department of Parks and Recreation should evaluate the advantages and disadvantages of continuing grazing on the northeastern portion of Andrew Molera State Park within the Little Sur Watershed.

20. The U.S. Soil Conservation Service should provide advice to any future private campgrounds, concerning measures which

should be employed to reduce soil erosion. Pico Blanco Boy Scout Camp should take necessary measures to limit the area of soil compaction and loss of groundcover within the camp, restore the groundcover wherever possible and to reduce soil erosion and resultant siltation of the river. The U.S. Forest Service should undertake similar measures at its public streamside campsites, if necessary, moving the campsite so as to allow natural recovery to take place.

21. In addition to enforcing policies 3.5.3.4, 3.2.3.A-4 and 5.4.3.K-1 & 2 of the Big Sur Land Use Plan, Monterey County shall restrict the width of any roads traversing steeper slopes, including roads to be used for timber harvesting, mining, recreational or other purposes, in order to control erosion and siltation. Accordingly, the allowable width of such roads should be a function of the side slope as follows:

Side Slope (%)	Maximum Allowable Width of Roadbed (ft.)
Less than 30%	18
30-50	12
Greater than 50	10

This policy shall apply to both the construction of new roads and the improvement of existing roads where the improvement would entail road widening. In addition, roads across slopes exceeding 50% should be limited to reaches of 300 ft. maximum because of the difficulty in successfully implementing erosion and sedimentation control measures on such steep slopes. Monterey County should strongly encourage the U.S. Forest Service to adhere to these road width standards.

22. The U.S. Forest Service and Monterey County should enforce road maintenance plans which will provide for adequate drainage collection (ditches and waterbars) and disposal (drainpipes, dissipators) facilities and for the regular maintenance of such facilities. Similar enforcement should be provided for skid trails on harvested areas. Existing gullies created by the road leading from Bottcher's Gap to the Pico Blanco Boy Scout Camp and along the Sierra Hill of the Old Coast Road should be repaired by the Forest Service and the County, respectively, through diversion of runoff, construction of soil catchment basins, and revegetation of gully walls.

23. Both the U. S. Forest Service and the California Department of Forestry should require sediment catch basins to be constructed on any water courses carrying excessive sediment loads from road, timber harvesting or mining operations and which are likely to enter the main stream courses.

24. Monterey County and the California Coastal Commission should carefully consider the potential environmental advantages of a conveyor belt vs. a haul road as a means of transporting mineral products from the Pico Blanco mine, should mining operations be proposed.

WATER QUALITY PROTECTION AND ENHANCEMENT

25. The Monterey County Environmental Health Department should establish, and request the U.S. Forest Service to cooperate in, a monitoring program for both forks of the Little Sur River which should include the following:

    - monthly samples for fecal coliform tests during the months of May through September.
    - fecal coliform test samples from upstream and downstream of each major recreational area along the river during the summer months.

26. The bacteriological quality of the Little Sur River should be maintained within acceptable health standards for body contact sports. (No more than 20% of a minimum of 5 fecal coliform samples taken within a 30 day period should exceed 200 colonies per 100 milliliters of sample.)

27. Monterey County should enforce the following provisions of the Septic Tank Ordinance, Zoning Ordinance and Building Code for controlling the construction of new septic tanks and leach fields:

    - New septic systems should not be allowed within 100 feet of the river or any perennial tributary.
    - septic systems for new development should be prohibited on slopes exceeding 30% and on landslides.
    - septic systems should be prohibited in areas with groundwater within 10 feet of the bottom of the proposed leaching device.
    - required watertable determinations and percolation tests shall be conducted only during the rainy season (December - March) when necessary as determined by the Department of Environmental Health.
    - a minimum parcel size of one acre should be required for all new developments requiring septic systems.

28. Monterey County should enact an ordinance to require the inspection of septic systems by a licensed septic tank

contractor before permitting the sale of existing developed properties.

29. The Monterey County Environmental Health Department should require the Pico Blanco Boy Scout Camp to comply with the provisions of Monterey County Code Title 15.04 so as to stay within the safe limit of occupancy.

30. The Monterey County Environmental Health Department should commence monitoring groundwater quality of the lower watershed if and when the planned recreational development of the El Sur Ranch takes place.

31. Potable water systems should be tested at least twice a year (staff and fiscal constraints permitting), standards applied and enforcement action taken, if necessary, by the Monterey County Environmental Health Department.

32. Potable water systems which collect surface water from springs and/or tributaries should receive adequate treatment for the protection of public health.

33. At such time that expansion of present mining operations is proposed, Monterey County, the U.S. Forest Service, and the Central Coast Regional Water Quality Control Board should cooperate in requiring a water quality monitoring program both upstream and downstream (on the South Fork) of the Pico Blanco mining site, to include turbidity and/or suspended sediment, electrical conductivity (EC) and bed-load, amongst other parameters.

34. The Regional Water Quality Control Board's (RWQCB) water quality standards for the Little Sur River should be enforced for the mining operation by both the U.S. Forest Service and RWQCB. The Forest Service is thus requested to undertake periodic inspections of the mining operations to identify potential water quality problems related to the operations, drainage and other factors.

35. All temporary work activities requiring more than one day and conducted within the watershed of the Little Sur River, including, but not limited to forestry crews, mining crews, livestock line camps and recreational campgrounds, shall maintain chemical toilets for use during human occupation at the site. Said toilets shall be subject to all applicable laws of the State and/or local Health and Safety Codes.

FISH AND WILDLIFE PRESERVATION AND ENHANCEMENT

36. Monterey County should consider protesting all applications for significant withdrawals of additional water from the river and its tributaries between July and November until a more thorough analysis of the present level of water

consumption has been made and the Department of Fish and Game or another appropriate agency has made a determination of instream flow needs to maintain the anadromous fishery.

37. The California Department of Fish and Game should quantify the instream flow requirements for the Little Sur River using an incremental flow method which takes into account the interaction of flow and substrate in determining anadromous fish rearing habitat quality. These requirements should also be designed to measure the habitat's ability to produce smolt-sized (4+ in.) fish.

38. The California Department of Fish and Game or other appropriate agency should periodically and systematically monitor the rate of recovery of stream substrate conditions (amount of sand and extent of embeddedness) and of pool development since the Marble Cone Fire. The rate of recovery of juvenile steelhead populations should also be monitored as substrate conditions improve; density, age, and size structure should be determined by electroshocker sampling.

39. The California Department of Fish and Game or other appropriate agency should undertake a creel census of adult fish, using scale aging techniques, to obtain data on the relative importance of various life history strategies utilized by steelhead in the Little Sur River and how these strategies change with improving substrate and pool conditions.

40. The California Department of Fish and Game or another appropriate agency should undertake a study to determine the extent of utilization of the lagoon by juvenile steelhead as summer rearing habitat or as temporary feeding habitat during down-migration. Such a study should help to determine the role of lagoons in small coastal streams.

41. If public access to the lagoon is provided, the California Department of Fish and Game should consider altering fishing regulations so as to protect down-migrating smolts and juvenile steelhead utilizing the lagoon as summer rearing habitat.

42. Live trees with visible evidence of nesting by hawks, owls, waterfowl, herons, egrets, eagles, osprey or any endangered species, as identified by the Department of Fish and Game, should not be felled.

43. The California Department of Fish and Game, U.S. Forest Service, California Department of Forestry and California Department of Parks and Recreation should jointly take advantage of opportunities to enhance wildlife habitat values in the watershed as a part of a prescribed burning program.

44. Monterey County, with the advice of the California Department of Fish and Game, should require Granite Rock Company to monitor the health and reproduction of the peregrine falcon and, if present, the prairie falcon on and in the immediate vicinity of Pico Blanco as a condition of approval of any future use permits pertaining to mining activities. In the event that impacts to these endangered birds are recorded, appropriate limitations on mining activity during the critical period (January-July) should be required. The U.S. Forest Service should comply with this and any other standard the County may impose for the purpose of protecting these sensitive species.

45. In the event of state park acquisition of the Little Sur River Beach, the California Department of Parks and Recreation should evaluate the merits of designating the lagoon at the river mouth in the proposed new state park as a Natural Preserve in recognition of its wildlife values.

46. In the event of state park acquisition of the Little Sur River Beach, the California Department of Parks and Recreation and the State Department of Fish and Game should carefully evaluate management options, including the possibility of seasonal closure, for the protection of waterfowl and shorebird nesting and feeding habitat downstream of State Highway 1. Wildlife habitat protection shall be carefully considered during the preparation of an access management plan for the river mouth area in accordance with the Big Sur Local Coastal Program Land Use Plan. In particular, dogs should not be allowed on the beach area and hang-gliding should be restricted, at least during the critical period of winter and spring months.

RIPARIAN CORRIDOR PROTECTION AND ENHANCEMENT

47. Monterey County should adopt a Riparian Corridor Protection Ordinance. The County should ask the California Department of Fish and Game to recommend a model ordinance for adoption. This ordinance should apply to all perennial tributary creeks as well as to the lower reaches of the river.

48. A buffer zone at least 150 feet wide should be maintained between the edge of any campsite and the bank of the adjacent stream. Such uses may be located as close as 25 feet to a stream or river when the reduction in setback is found compatible with sensitive habitat protection. Existing campsites closer than 25 feet should be moved and trails within this zone should be minimized and kept at least 10 feet from the river bank.

49. The U.S. Soil Conservation Service should assist managers of any future private campgrounds with the preparation of

campground management plans. These management plans should contain provisions for the protection and/or restoration of a strip of riparian vegetation along the riverbank and screening between campsites.

50. The use of gabbions, riprap and other bank stabilization materials along the floodplain reach of the river should be avoided. Preference should be given to planting suitable native riparian tree and shrub species to improve bank stability.

51. Standing trees (dead or alive) on the river banks should be removed only if they present a hazard to structures downstream and/or park and campground users. Removal of materials should be effected by the least disturbing means available.

RECREATION MANAGEMENT

52. The U.S. Forest Service should implement a wilderness quota system at Bottcher's Gap (and any future trailhead) in order to keep wilderness use along the upper river within established carrying capacities.

53. The U.S. Forest Service and the California Department of Parks and Recreation should establish a joint task force responsible for developing plans for providing trailhead overnight camping facilities for backpackers visiting the Ventana Wilderness Area via Andrew Molera State Park. The task force should also develop plans for a new access trail to the Little Sur River section of the wilderness area, starting at either Big Sur Village or Andrew Molera State Park, climbing over Molera Ridge and connecting to either the South Fork of the Little Sur River Trail or to the proposed new South Fork Trail at Tin House Camp.

54. The U.S. Forest Service should augment the existing trail system within the watershed with those new trails planned for in the Ventana Wilderness Environmental Assessment so as to increase the accessibility of the upper watershed and connect it with the Carmel River and Big Sur River trail systems.

55. Monterey County, the California Department of Parks and Recreation, the U.S. Forest Service and private landowners should cooperatively solve the problem of providing permanent public access for the South Fork Trail from the Old Coast Road trailhead upstream to the Los Padres National Forest. Additional parking space may also be required at some location other than the trailhead which can presently accommodate very few vehicles.

56. The U.S. Forest Service should augment the existing public campsite system with those new campsites identified in the Ventana Wilderness Environmental Assessment.

57. The California Department of Parks and Recreation and the U.S. Forest Service should jointly prepare an information plan (interpretive plan) for the Little Sur River Basin in the event of additional public land acquisition and visitation in the lower watershed.

58. Monterey County should require any private developer of recreational facilities to install primitive pit toilets at backcountry campsites. The County should also request the U.S. Forest Service to provide such toilets at all campsites in the national forest. Private developers must comply with the requirements of the Division of Environmental Health.

59. The Monterey Peninsula Transit District or other public carriers should maintain and expand daily bus service along the Big Sur coast and should encourage both residents and visitors to take the bus (e.g., through the media and the use of informational fliers). This route should establish a new bus stop at the Little Sur River Bridge once recreational facilities are developed in that area.

SCENIC RESOURCE PROTECTION AND ENHANCEMENT

60. Monterey County shall control all development in the lower watershed in accordance with the Big Sur Local Coastal Program so that the coastal viewshed from Highway 1 is protected. Views from the Old Coast Road should also be protected to the greatest extent possible through the careful siting, design and, where appropriate, screening of new development.

61. Monterey County should emphasize the protection of Pico Blanco and the adjoining ridges as a major scenic landmark on the Big Sur Coast. No further road work that would visually disrupt the portion of the mountain within the Critical Viewshed shall be allowed. Every effort should be taken by the County and U.S. Forest Service to minimize the visual impact of mining on Pico Blanco as viewed from the Ventana Wilderness.

62. As many viewpoints other than Highway 1 and those public viewpoints designated in the Big Sur Land Use Plan afford spectacular views of the Little Sur canyons and the adjacent Santa Lucia Range, significant viewpoints and vistas from within the upper watershed and outside the Critical Viewshed should also be protected to the greatest possible extent.

63. Future proposals for development and/or landscape alteration within scenic areas both within and outside of the Critical Viewshed should be subjected to an analysis of visual impacts, and appropriate mitigating measures implemented.

MINERAL EXTRACTION

64. The Pico Blanco limestone deposit has been "classified" by the State Board of Mining and Geology as a "significant" deposit under the Surface Mining and Reclamation Act based on information furnished by Granite Rock Company. "Designation" of the deposit under the Act has not been sought. Surface mineral extraction on non-federal lands shall not be allowed unless it can be demonstrated that such mining can be done in a manner consistent with the preservation of local aesthetic and physical resource values and, therefore, shall not violate the policies of this plan or the Big Sur Coast Land Use Plan. To the extent permissible under Federal Supremacy principles and federal mining laws, the same policies will also apply to federal lands.

IMPLEMENTING THE MANAGEMENT PLAN
A COOPERATIVE PROCESS

A key premise of this plan emanates from the mandating legislation which has established the Little Sur River as a resource of statewide significance. Effective implementation of the plan, thus, is not only of concern to Monterey County but is of vital interest to the State.

Implementing the plan will require considerable cooperation. The plan should serve as a basis for day to day decision-making on matters affecting the river, and should also provide direction for longer range funding and operational planning for many of the state agencies identified in the plan. The County, through its coastal permit authority, will require adherence to the plan as a condition of approval of development proposals affecting the river within the Coastal Zone, either on state or private land. Beyond these mechanisms, however, it will ultimately be the spirit of cooperation and commitment to the purposes of the plan that will make the plan a success.

A second compelling reason for broad cooperation among agencies and the private sector are the present limitations on available funds to support the activities of the public agencies. Consequently, cooperation and coordination among all concerned in the interest of conserving limited agency personnel and funding is an essential underlying theme for plan implementation.

A wide variety of public agencies, private individuals and two major property owners will be involved over time in the maintenance of environmental and recreational values of the Little Sur River. The Policies and Recommendations chapter assigns specific responsibilities to sixteen different agencies and agency departments. In addition, certain actions are to be taken by the Monterey County Board of Supervisors. Private landowners should also undertake various measures in order to help maintain the river's resources. For easy reference, Table 10 on the following page provides a complete list of the policies or recommendations assigned to the various agencies and individuals.

KEY AGENCIES

It is evident that certain agencies have a much larger role than others. The State Resources Agency and the County of Monterey share major responsibility for coordinating cooperation between the numerous agencies and individuals. The Resources Agency, in particular, must assist in the furtherance of this plan by directing its various agencies which are so vital to the success of the plan, including the Department of Fish and Game, the

TABLE 9

SUMMARY OF RESPONSIBILITY FOR ACTION

MONTEREY COUNTY	POLICIES AND RECOMMENDATIONS
Board of Supervisors/Planning Commission	3*, 4*, 6*, 8, 12, 14*, 16, 17*, 21*, 23*, 24*, 28*, 34, 36*, 44*, 47*, 55, 60*, 61*, 62*
Flood Control and Water Conservation District	8, 13, 50*, 51*
Environmental Health Department	25*, 26*, 27*, 28, 29*, 30*, 31*, 32*, 58*
Planning Department	3, 4, 6, 8*, 12*, 13, 14, 15*, 16*, 21, 23, 27, 48*, 50, 55, 60, 61, 63*
Building Department	27
Public Works Department	22*
Special Districts	
Monterey Peninsula Transit	59*
State of California	
California Coastal Commission	24*
Department of Water Resources	1*
SWRQB, Division of Water Rights	2*, 4, 5*, 7*
Department of Parks and Recreation	10, 13, 19*, 33, 42, 43, 45*, 46*, 51, 53*, 55, 57*
Regional Water Quality Control Board	17*, 34*, 35*
Cal Trans	59
Department of Fish and Game	1*, 7, 36, 37*, 38*, 39*, 40*, 41*, 42, 43, 44, 47, 51
Department of Forestry	10*, 14, 17*, 43
Federal Government	
Forest Service	9*, 10, 11, 13*, 14, 16*, 17, 20*, 21, 22*, 23*, 25, 33, 34*, 35*, 42, 43, 44*, 48*, 52*, 53*, 54*, 55, 56*, 57*, 58*, 61*, 62*
Soil Conservation Service	18, 20*, 49*
Private	
Property Owners, Private Campgrounds	10, 11, 13*, 15*, 18*, 20*, 32, 33, 42, 44, 49, 50, 51, 60, 62

* Denotes Major Responsibility.

Department of Parks and Recreation and the Water Resources Control Board, to bring their day-to-day management activities into conformance with the plan and to undertake those longer range actions called for in the plan.

Monterey County, as a principal proponent of the plan, has a custodial responsibility to promote its implementation. As a general purpose government, the County has broad powers and responsibilities in the area of land use regulation and the maintenance of health standards. Through the Local Coastal Program authority, the County will require compliance to the plan by state agencies when the agencies are required to obtain coastal development permits from the County. Both the County Planning Commission and the Board of Supervisors will use the plan as a policy guide to land use and environmental matters in the Little Sur River Watershed, and over time, can ensure that public and private land use decisions are made in concert with the plan.

The U.S. Forest Service has exclusive management jurisdiction in Los Padres National Forest yet has been an interested and cooperative participant in the development of this plan. Many of the activities that will be undertaken by the Forest Service in the areas of mining, wildlife protection, fuel reduction and recreational management will have direct, measurable impacts on the implementation of the plan. The continued support and cooperation of the Forest Service in this program is indispensable.

FIRST STEPS

Once the management plan is adopted, the County should begin using it on a day-to-day basis as it considers requests for development permits in the Little Sur Watershed. Since the policies and recommendations call for participation by other agencies in the process of reviewing development permit requests, the County should transmit the adopted plan to each of these agencies with a letter formally requesting their participation, assistance, and compliance to the policies and recommendations of the plan. It may be necessary to prepare formal arrangements in some cases by using Memorandums of Understanding or Joint Powers Agreements. The Board of Supervisors should formally request the Director of the Resources Agency to assist in this coordination effort.

Several actions called for in the plan should be started as soon as possible as they are essential to the long range management of the river and because the plan's policies impose restrictions on public and private land development that should only be removed based on the finding of the studies.

The California Department of Water Resources should immediately install a stream flow gauge on the Little Sur River to obtain important baseline data on stream flows. The Department of Fish

and Game should then begin the studies necessary to determine instream flow requirements needed to maintain the anadromous fishery. The Department of Fish and Game should be requested to provide a schedule to the County indicating the time these instream flow studies will be completed. The Board of Supervisors should request the SWRCB Division of Water Rights to temporarily withhold approval of new applications to appropriate water from the Little Sur River as directed by Policy 2.

CONTINUED WORK

After the initial work just described has been completed, the plan should be used on a continuing basis by all of the agencies and individuals concerned as a guide to land use and management decisions affecting the Little Sur River. The state agencies called upon by the plan to undertake specific activities or studies, should use the plan as a basis for projecting future budget needs. As it reviews and adjusts these funding requests, the state legislature should remain mindful of the commitment made to this program and should allocate sufficient funds to carry needed work foreward. It will be particularly incumbent upon the Resources Agency to coordinate funding requests by its various departments in the implementation of this plan.

If the Department of Parks and Recreation eventually acquires the Little Sur River Beach or other portions of the Little Sur Watershed, it will, in time, prepare master plans for these areas. Prior to opening the beach area to general public use, the Department should prepare a detailed management plan in conformance with the Big Sur Land Use Plan that adequately resolves potential conflicts between recreational uses and protection of rare, endangered and other sensitive wildlife species and their habitats and protection of the steelhead fishery. As these plans are prepared, they must also be consistent with the policies and recommendations of this plan.

The U.S. Forest Service is currently preparing a management plan for the Ventana Wilderness Area of Los Padres National Forest. The Forest Service plan should also be consistent with this plan so that integrated management of the entire Little Sur River can be ensured.

Because the plan is intended as a management tool, periodic assessment of the plan's performance should be made. If necessary, the plan should be modified to incorporate improved policies and recommendations. Some modifications in the plan may be necessary following completion of the instream flow studies and review of existing levels of water use and results of monitoring studies of endangered and other sensitive wildlife species utilizing the Pico Blanco and river mouth areas.

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APPENDIX A

Assembly Concurrent Resolution No. 32-Relative to the Little Sur and Big Sur Rivers.

Legislative Counsel's Digest

ACR 32, Wood. Waterway management plans. Requests Resources Agency and affected local agencies to prepare detailed waterway management plans, including specified provisions, for the Little Sur and Big Sur Rivers in Monterey County.

WHEREAS, The Legislature passed the California Protected Waterways Act in 1968; and

WHEREAS, This act directed the Resources Agency to develop the California Protected Waterways Plan (a) to identify those waterways of the state possessed of extraordinary scenic, fishery, wildlife, or outdoor recreation values, (b) to identify the public interest in, including potential human demands for, the resources of such waterways and adjacent lands, (c) to identify the activities or conditions which diminish, or threaten to diminish, the resources of such waterways, (d) to propose standards and requirements, and administrative and legislative actions, which would extend effective, long-range protection to the extraordinary scenic, fishery, wildlife, or outdoor recreation values of such waterways and adjacent lands on a basis which would permit the development and management of other natural resources where compatible, including appraisals of estimated costs and alternative means of financing to achieve such protection, and (e) to identify select waterways which merit priority action due to the nature of their resources; and

WHEREAS, The Resources Agency transmitted to the Legislature the initial elements of such a plan in February 1971; and

WHEREAS, The aforementioned report recommended that detailed protected waterway management plans be prepared for certain waterways of the state in accordance with the intent and provisions of the California Protected Waterways Act; and

WHEREAS, Chapter 761 of the Statutes of 1971 declares that it is appropriate that the Resources Agency proceed with the development of detailed waterway management plans as proposed in such report, and that such planning efforts include, but need not be limited to, certain designated waterways; and

WHEREAS, The Little Sur and the Big Sur Rivers in Monterey County possess certain unique qualities and values which should be preserved; and

WHEREAS, The Monterey County Board of Supervisors is in support of having prepared detailed protected waterway plans for the Little Sur and Big Sur Rivers in Monterey County; now, therefore, be it

RESOLVED BY THE ASSEMBLY OF THE STATE OF CALIFORNIA, THE SENATE THEREOF CONCURRING, That the Resources Agency and affected local agencies are requested to prepare detailed waterway management plans which shall include provisions for water conservation, recreation, fish and wildlife preservation and enhancement, water quality protection and enhancement, streamflow augmentation, and free-flowing and wild status for the Little Sur and Big Sur Rivers; and be it further

RESOLVED, That the Chief Clerk of the Assembly transmit a copy of this resolution to the Board of Supervisors of Monterey County.

APPENDIX B

WATERWAY CLASSIFICATION SYSTEM

A. Natural Waterways (Synonyms: wild, preserved, Primitive) Attributes of the Waterway

1. Free-flowing: Low dams, diversion works or other minor structures which do not inundate the natural bank or interfere unreasonably with boat passage may not bar consideration as natural waterway. Future construction of impediments to free-flow or water travel would be restricted.

2. Generally inaccessible by road: One or two inconspicuous access roads may be permissible.

3. Banks and shorelines primitive: A few inconspicuous dwellings and land devoted to production of hay; the watershed is natural, appears to be natural or primeval in appearance and represents vestiges of primitive California.

4. Water quality unimpaired: Meets the minimum criteria for primary contact recreation, except where such criteria would be exceeded by natural background conditions; is capable of supporting the propagation of aquatic life normally adapted to the habitat of the waterway.

5. May represent a waterway typical of natural conditions in one of the nine scenic landscape provinces, provide habitat for rare or endangered species of fish and wildlife, such as salmon spawning gravels or eel grass beds for black brant.

Management Objectives for Water and Adjacent Lands

1. Limited motorized land travel in the areas; most access is by water or foot-trail, possible restrictions on watercraft and aircraft.

2. No unharmonious or new habitations or improvements permitted; only primitive-type public use provided. New structures and improvement of old ones prohibited except in keeping with the natural objectives.

3. Unobtrusive fences, gaging stations, and other management facilities may be permitted if they have no significant adverse effect on the natural character of the area.

4. A limited range of agriculture, forestry and other resource uses permitted in adjacent land use areas visible from the waterway, if not disruptive of the natural scene.

B. Pastoral Waterways (Synonyms: rural, scenic, conserved)

Attributes of the Waterway

1. Free-flowing: Low dams, diversion works or other minor structures which do not inundate the natural bank or interfere with passage over water allowed. Future construction of impediments to free-flow or water travel restricted.

2. Accessible by roads: Short stretches of conspicuous, or longer stretches of inconspicuous and well-screened roads or railroads adjacent or parallel to the waterway and occasional bridges permitted.

3. Shoreline development allowed: Small communities limited to short sections or small areas in proportion to the total area acceptable. Agricultural and forestry practices generally permitted, in accord with rural or pastoral conditions.

4. Water quality standard: For desired types of recreation, except where such criteria would be exceeded by natural background conditions; and capable of supporting the propagation of aquatic life normally adapted to the habitat of the waterway; or capable of immediate restoration to standard quality.

5. Should represent a waterway typical (either past or present) of rural conditions in one of the nine scenic landscape provinces; can provide habitat for rare or endangered species of fish and wildlife and satisfy environmental requirements for other fish and wildlife.

Management Standards and Requirements for Water and Adjacent Lands

1. Motorized vehicles allowed on the land area, few restrictions on watercraft and aircraft.
2. No unharmonious improvements and few habitations permitted, except in small communities; limited modern screened public use facilities permitted, such as campgrounds, visitors centers, including new construction for unobtrusive marinas, campground and community development. Industrial development screened.
3. Unobtrusive fences, gaging stations, and water management facilities permitted if they have no significant adverse effect on the rural charater of the area.
4. A wide range of agriculture, forestry and other resource uses permitted on adjacent lands.

SEVERABILITY

If any provision of the Plan is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions shall remain in full force and effect.