OPEN-FILE REPORT
76-326

WATER-QUALITY STUDY OF A REACH OF THE MERCED RIVER IN YOSEMITE NATIONAL PARK AND VICINITY CALIFORNIA APRIL 1973 THROUGH SEPTEMBER 1974

PREPARED IN COOPERATION WITH THE NATIONAL PARK SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey

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By Ray J. Hoffman, Alex E. Dong, and Gail L. Keeter

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Menlo Park, California
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CONVERSION FACTORS

Factors for converting English units to the International System of Units (SI) are given below to four significant figures. However, in the text the metric equivalents are shown only to the number of significant figures consistent with the values for the English units.

English	*Multiply by*	*Metric (SI)*
ft (feet)	3.048×10^{-1}	m (metres)
ft^3/s (cubic feet per second)	2.832×10^{-2}	m^3/s (cubic metres per second)
in (inches)	25.40	mm (millimetres)
in^2 (square inches)	645.2	mm^2 (square millimetres)
mi (miles)	1.609	km (kilometres)

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ABSTRACT

A 25-mile (40-kilometre) reach of the Merced River was studied to provide the National Park Service with water-quality data prior to the operation of a new sewage-treatment plant. Data were collected periodically at four Merced River and two inflow stations.

Discharge varied seasonally with highest flow occurring at the time of spring snowmelt runoff. Lowest flow occurred during late summer, coinciding with high park visitor use and elevated water temperature. Water-quality variables investigated were discharge, temperature, major chemical constituents, selected trace metals, specific conductance, suspended sediment, turbidity, dissolved oxygen, pH, alkalinity, carbon dioxide, total organic carbon, nitrogen, phosphorus, algal growth potential, coliform bacteria, periphyton, and benthic invertebrates. Diel measurements were made at some stations to delineate daily fluctuations in selected water-quality variables.

Results indicate that water in the reach of the Merced River studied was of good quality. The river had low concentrations of dissolved solids (8 to 41 milligrams per litre) and low alkalinity values (2 to 24 milligrams per litre of alkalinity as $CaCO_3$). Mean concentrations of nitrogen and phosphorus were highest in the Merced River at Rancheria Flat. Algal growth potential tests showed that phosphorus was limiting algal growth at Happy Isles Bridge, El Capitan Bridge, and South Fork Merced River, whereas nitrogen was limiting growth at Rancheria Flat. Input of excessive nitrogen and phosphorus concentrations in the Merced River during the summer low-flow period, and mixing with warm tributary inflow could cause excessive algal growth and production. The algal types found were diatoms, green algae, and blue-green algae. Biomass/chlorophyll *a* ratios in the Merced River were low (0.3 to 7.7). Benthic invertebrates consisted chiefly of Diptera, Ephemeroptera, and Plecoptera.

INTRODUCTION

The Merced River, in and near Yosemite National Park (fig. 1) is a prime scenic attraction. Each summer, vacationers are attracted to the river and its environs in Yosemite Valley. In addition to having esthetic appeal, the Merced River is used for fishing and swimming; water from the river is used for power generation, and for the park water supply. Since 1931, a sewage-treatment plant near Yosemite Village (no. 6 in fig. 1) has discharged effluent into the river.

During 1975-76, the National Park Service plans to construct a new sewage-treatment plant (secondary treatment with phosphorus removal) near the Merced River about 2 mi (3.2 km) downstream from the western park boundary. Effluent from the new treatment plant will be discharged into the Merced River downstream from El Portal (fig. 1).

Although contamination of the Merced River from the new treatment plant is not anticipated, the California Regional Water Quality Control Board--Central Valley Region, has required the National Park Service to insure that water-quality standards in the river are not violated. To evaluate subsequent changes, water-quality data are needed prior to operation of the treatment plant. To provide this water-quality base data, the National Park Service requested in 1973 that the U.S. Geological Survey start a water-quality study at sites upstream and downstream from the proposed sewage outfall. Fieldwork began in April 1973 and ended in September 1974.

Purpose and Scope

This study was to provide the National Park Service with selected water-quality data (physical, chemical, and biological) from a 25-mile (40-km) reach of the Merced River in and near Yosemite National Park for a period prior to construction of the new sewage-treatment plant downstream from the park boundary.

Sampling stations (see table 1 for number designations and fig. 1 for location) on the Merced River were selected at Happy Isles Bridge, El Capitan Bridge, Rancheria Flat[1] (downstream from the proposed sewage outfall), and near Briceburg. Two stations not on the mainstem of the Merced River were selected near the mouth of South Fork Merced River, and at the existing treatment plant, the latter to measure selected plant-nutrient concentrations in treated effluent.

Water-quality samples were collected and onsite physical and chemical measurements were made periodically throughout the study period. In addition, diel studies (intensive sampling for a period of 24 hours) were made at the Happy Isles Bridge, El Capitan Bridge, Rancheria Flat, and South Fork stations during Labor Day weekend in September of both study years when heavy visitor use coincided with low flow and high water temperatures.

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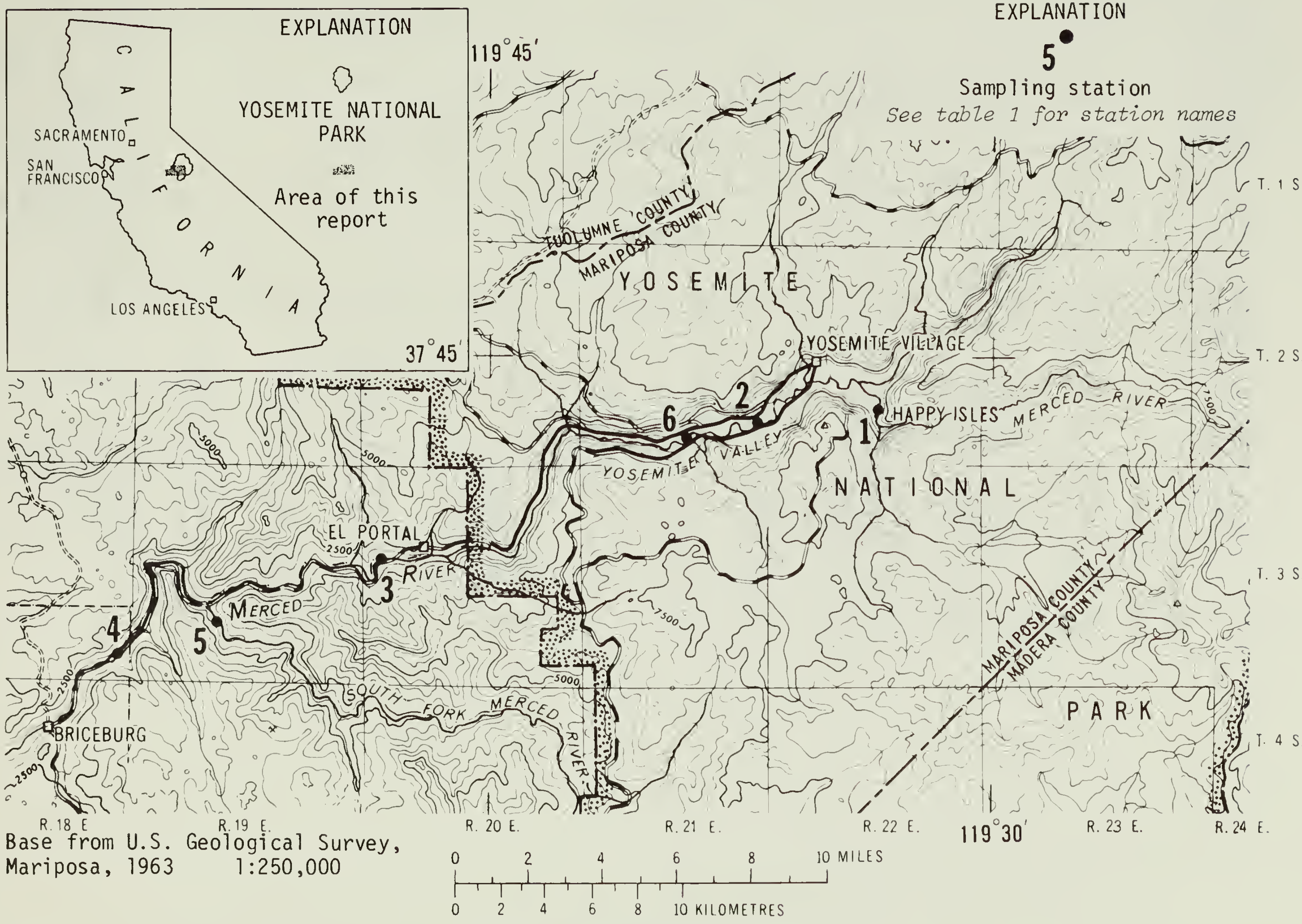
[1]Locally known as Railroad Flat.



Base from U.S. Geological Survey,
Mariposa, 1963 1:250,000

FIGURE 1.--Sampling stations.

Type of data: Constituents	Sampling station[1]	Apr	May	June	July	Aug	Sept
Discharge	1					Continuous	
	4						
Stream temperature	1					Continuous	
Suspended sediment and turbidity	1	-	29	19	3,4,5	8	2,3,4
	2	-	30	19	3,4,5	8	2,3,4
	3	-	30	19	3,4,5	9	2,3,4
	5	-	31	20	3,4,5	8	2,3,4
Major dissolved constituents: Silica, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, dissolved solids	1	-	29	-	3,4,5	8	2,3,4
	2	-	30	-	3,4,5	-	2,3,4
	3	-	30	-	3,4,5	-	2,3,4
	5	-	31	-	3,4,5	-	2,3,4
Selected plant nutrients: Nitrate, ammonium, organic nitrogen, total organic carbon, total phosphorus, inorganic orthophosphate	1	-	29	-	3,4,5	-	2,3,4
	2	-	30	-	3,4,5	-	2,3,4
	3	-	30	-	3,4,5	-	2,3,4
	4	-	31	-	3,4,5	-	2,3,4
	5	-	31	-	3,4,5	-	2,3,4
	6	20	30	19	4	7	3
Trace metals (in filtered and unfiltered samples): Arsenic, cadmium, chromium, iron, mercury, lead, zinc	1	-	29	-	3,4,5	-	2,3,4
	2	-	30	-	3,4,5	-	2,3,4
	3	-	30	-	3,4,5	-	2,3,4
	5	-	31	-	3,4,5	-	2,3,4
Field measurements: Alkalinity, pH, specific conductance, discharge, stream temperature	1	19	29	19	3	8	2
	2	20	30	19	3	8	-
	3	23	30	19	3	8	-
	4	23	31	20	3	8	-
	5	23	31	20	3	8	-
Dissolved-oxygen concentration	3	-	30	19	4	8	-
Diel sampling: Dissolved oxygen, alkalinity, pH, specific conductance, temperature, and fecal coliform bacteria	1	-	-	-	-	-	2,3
	2	-	-	-	-	-	2,3
	3	-	-	-	-	-	2,3
	5	-	-	-	-	-	2,3
Fecal coliform bacteria	2	-	30	19	3	8	-
	3	-	30	19	4	8	-
Algal growth potential: Indigenous in control as well as nitrogen and phosphorus spiked samples	1	-	-	21	5	9	4
	2	-	-	21	5	9	4
	3	-	-	21	5	9	4
	5	-	-	21	5	9	4
Periphyton: Species composition and biomass from artificial substrates	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	3	-	-	-	-	-	-
	5	-	-	-	-	-	-
Benthic invertebrates: Taxonomic composition and percent composition	1	-	-	-	-	8	4
	2	-	-	-	-	7	4
	3	-	-	-	-	7	4
	5	-	-	-	-	7	4

[1]Numbers refer to following stations. See figure 1 for locations.

1. 11-2645.00 Merced River at Happy Isles Bridge
2. 11-2664.00 Merced River at El Capitan Bridge
3. 11-2670.50 Merced River at Rancheria Flat (Railroad Flat)
4. 11-2682.00 Merced River near Briceburg
5. 11-2680.00 South Fork Merced River near El Portal
6. 11-2664.50 Effluent from existing treatment plant

collection matrix

Date collected												
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct
record												
record												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
3	20	-	16	21	-	10	--	12	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	22	-	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	23	-	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	23	-	3,4,5	-	1,2,3	-
3	20	-	16	21	-	10	--	12	3,4,5	-	1,2,3	-
-	-	-	15	-	-	-	22	-	3,4,5	-	1,2,3	-
-	-	-	16	-	-	-	22	-	3,4,5	-	1,2,3	-
-	-	-	16	-	-	-	23	-	3,4,5	-	1,2,3	-
-	-	-	16	-	-	-	23	-	3,4,5	-	1,2,3	-
-	20	-	15	21	-	10	22	11	4	14	2	-
-	-	-	-	-	-	-	--	-	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	22	-	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	22	-	3,4,5	-	1,2,3	-
-	-	-	-	-	-	-	23	-	3,4,5	-	1,2,3	-
3	15	-	16	21	-	10	--	12	4	15	3	-
3	-	-	15	21	-	10	22	12	4	14	3	-
4	-	-	16	21	-	10	22	12	4	14	3	-
4	-	-	16	27	-	10	23	12	4	15	3	-
4	-	-	16	21	-	10	23	12	4	14	-	-
4	-	-	16	21	-	10	22	12	4	14	3	-
-	-	-	-	-	-	-	-	-	-	-	1,2	-
-	-	-	-	-	-	-	-	-	-	-	1,2	-
-	-	-	-	-	-	-	-	-	-	-	1,2	-
-	-	-	-	-	-	-	-	-	-	-	1,2	-
-	-	-	-	-	-	-	22	12	-	14	-	-
-	-	-	-	-	-	-	22	12	-	14	-	-
-	-	-	-	-	-	-	-	12	5	15	3	-
-	-	-	-	-	-	-	-	12	5	15	3	-
-	-	-	-	-	-	-	-	12	5	15	3	-
-	-	-	-	-	-	-	-	12	5	15	3	-
-	-	-	-	-	-	-	-	-	-	15	2	5
-	-	-	-	-	-	-	-	-	-	-	2	5
-	-	-	-	-	-	-	-	-	-	14	2	5
-	-	-	-	-	-	-	-	-	-	-	2	5
3	-	-	-	-	-	-	-	-	-	15	2	-
3	-	-	-	-	-	-	-	-	-	14	2	5
4	-	-	-	-	-	-	-	-	-	14	-	5
3	-	-	-	-	-	-	-	-	-	14	2	5

Description of Study Area

The area of study is about 170 road mi (225 km) southeast of Sacramento, Calif. It includes a reach of the Merced River extending 25 mi (40 km) from Happy Isles Bridge downstream to Briceburg (fig. 1). The Merced River originates on the western slope of the central Sierra Nevada at an altitude of 11,000 ft (3,353 m) above mean sea level. Flowing westward, the river drops to 4,000 ft (1,219 m) at Happy Isles Bridge at the eastern end of Yosemite Valley. The valley is about 7 mi (11 km) long and 1 mi (1.6 km) wide, and is bounded by nearly vertical cliffs rising 3,000 to 4,000 ft (914 to 1,219 m). From the western end of Yosemite Valley, the Merced River flows through a narrow canyon and drops to about 1,200 ft (366 m) at Briceburg.

The climate is moderate, having dry summers and cold, wet winters. Snow covers the ground much of the time from November to April. Total precipitation was 35.0 in (889 mm) and 42.4 in (1,080 mm) in water years 1973 and 1974, respectively.

Hydrographs illustrating annual discharge for Happy Isles Bridge and Briceburg are shown in figure 2. The discharge pattern is typical of Sierran streams subject to snowmelt runoff. The spring snowmelt peak occurred in May, and lowest flow occurred in September and October. Daily discharge values are listed in table 2.

METHODS

Field data and samples for laboratory analysis were collected according to the schedule shown in table 1.

Discharge measurements of streamflow were made using the method of Corbett and others (1943). Continuous temperature and continuous stage measurements (converted to discharge) were made using a digital recorder (Buchanan and Somers, 1968, p. 5-7). Periodic temperature measurements were made using a calibrated hand-held thermometer. Specific conductance and pH were measured using standard meters. Alkalinity was determined immediately after sample collection by titration with 0.01639N sulfuric acid to a pH of 4.5. Dissolved-oxygen concentration was measured using the Winkler method described by Brown and others (1970).

Water samples for determination of suspended sediment and turbidity were collected using hand-held depth-integrating samplers (DH-49) described by Guy and Norman (1970, p. 4-11). The suspended-sediment samples were analyzed at the Geological Survey laboratory in Sacramento using the methods described by Guy (1969). Turbidity also was measured at the Geological Survey laboratory in Sacramento using the methods described by Brown and others (1970, p. 29).

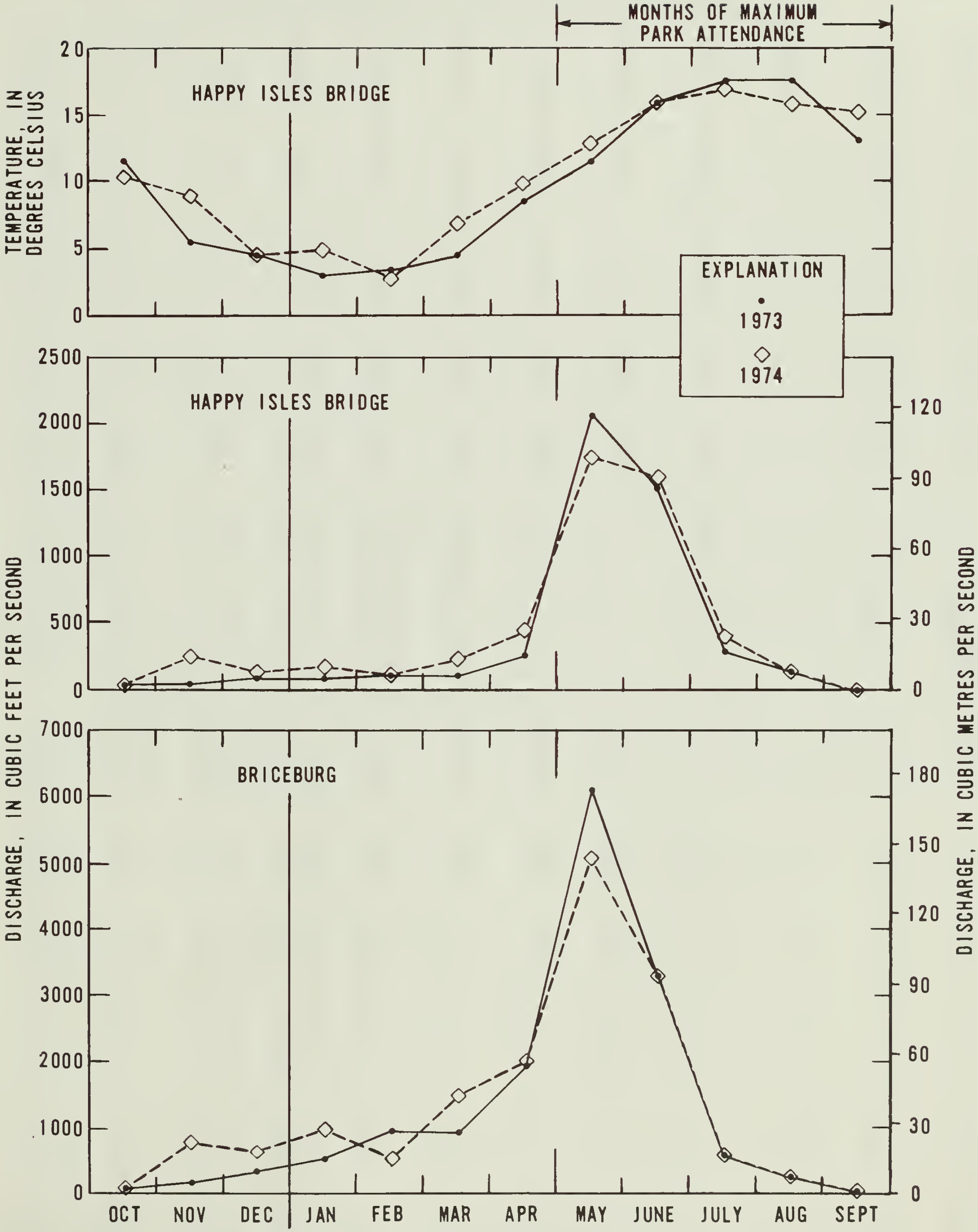


FIGURE 2.--Monthly mean discharge and water temperature.

Table 2.--*Discharge data for the Merced River and South Fork Merced River*

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE NEAR YOSEMITE

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	35	78	85	103	124	125	950	2,910	655	328	24
2	15	34	74	85	103	119	118	1,020	2,270	542	318	21
3	18	34	74	81	101	118	118	1,160	2,060	474	332	20
4	24	43	78	74	104	120	124	1,060	2,000	457	433	19
5	41	50	64	63	100	114	150	830	2,150	470	326	19
6	45	49	69	64	107	114	222	720	2,170	537	357	18
7	50	49	64	60	116	108	288	896	2,320	470	374	17
8	62	50	62	68	114	108	322	1,270	2,370	437	252	16
9	62	49	53	74	110	104	393	1,700	2,400	433	197	16
10	62	51	63	76	120	108	368	1,930	1,960	417	161	15
11	69	54	57	83	127	120	409	2,240	1,800	382	137	14
12	68	53	58	120	141	113	429	2,380	1,730	371	116	14
13	60	57	56	118	137	114	405	2,340	1,680	336	103	13
14	53	66	54	108	132	104	322	2,390	1,360	288	96	12
15	49	72	56	106	127	104	303	2,640	974	267	93	12
16	47	86	57	147	122	113	285	2,790	914	273	90	12
17	47	90	148	146	120	119	357	3,100	920	261	88	11
18	48	86	200	161	120	118	374	3,220	914	255	84	11
19	49	83	241	152	120	119	354	3,150	1,040	233	77	10
20	64	74	230	146	118	124	336	2,550	1,090	202	71	10
21	79	73	200	152	112	119	343	2,270	1,140	192	67	10
22	83	72	188	143	103	118	457	2,310	1,090	165	63	9.8
23	78	65	157	143	101	119	645	2,060	974	155	58	9.8
24	72	64	139	137	104	129	836	2,190	735	146	53	9.6
25	64	69	124	130	99	148	1,030	1,850	795	137	49	9.4
26	57	83	118	120	101	157	1,270	1,720	1,040	137	46	9.2
27	53	90	116	118	110	152	1,400	1,920	1,450	143	43	9.0
28	50	89	112	114	122	148	1,480	2,690	1,340	165	39	8.8
29	46	84	85	113	------	132	1,350	2,900	956	168	33	8.6
30	39	79	97	108	------	129	1,120	2,820	836	161	28	8.4
31	35	------	86	107	------	125	------	3,610	------	161	26	------
TOTAL	1,604	1,933	3,258	3,402	3,194	3,761	15,733	64,676	45,388	9,490	4,538	396.6
MEAN	51.7	64.4	105	110	114	121	524	2,086	1,513	306	146	13.2
MAX	83	90	241	161	141	157	1,480	3,610	2,910	655	433	24
MIN	15	34	53	60	99	104	118	720	735	137	26	8.4
AC-FT	3,180	3,830	6,460	6,750	6,340	7,460	31,210	128,300	90,030	18,820	9,000	787

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.8	47	130	190	152	174	304	964	2,240	858	612	39
2	7.4	45	148	152	140	236	310	1,190	1,960	776	375	36
3	7.0	40	171	177	140	182	290	1,320	1,930	648	285	33
4	7.0	29	154	166	137	182	279	1,280	2,120	625	354	31
5	6.8	29	146	144	133	190	316	1,340	2,200	612	414	30
6	6.8	37	144	140	126	193	322	1,660	2,720	548	382	30
7	8.3	78	146	152	124	190	334	2,030	2,760	486	277	30
8	23	90	144	148	122	184	358	2,330	2,420	442	222	29
9	18	74	148	137	122	179	340	2,430	2,220	422	182	29
10	15	429	152	131	122	182	299	2,340	2,260	540	158	28
11	14	1,700	154	126	119	175	296	2,270	2,300	406	144	26
12	14	1,610	144	135	119	186	344	2,380	2,320	293	131	25
13	15	553	152	131	113	193	400	2,180	2,160	266	119	24
14	16	368	148	130	112	222	499	2,020	2,070	279	106	23
15	18	279	139	152	108	264	584	2,100	1,870	290	98	22
16	19	254	133	210	108	272	607	1,830	1,660	302	85	19
17	19	261	135	269	98	264	690	1,460	1,340	304	78	18
18	18	274	124	290	104	251	700	1,080	1,120	285	72	16
19	17	237	121	403	108	264	540	869	1,020	272	68	15
20	17	227	117	331	99	279	494	750	886	266	65	15
21	16	201	119	272	104	293	526	735	1,010	274	60	13
22	18	177	122	237	99	293	680	814	1,160	290	56	12
23	65	160	122	232	96	299	685	1,050	1,190	299	52	12
24	49	160	121	218	99	322	580	1,230	982	285	51	11
25	57	148	117	210	104	340	474	1,940	825	403	49	11
26	53	144	113	195	108	304	414	2,490	770	450	49	12
27	50	139	137	177	104	290	372	2,810	735	319	48	12
28	49	140	184	179	102	313	396	2,900	740	264	45	12
29	49	144	299	171	------	304	486	2,680	776	254	45	12
30	47	140	264	162	------	322	670	2,290	858	249	44	11
31	46	------	215	158	------	290	------	2,260	------	614	43	------
TOTAL	773.1	8,214	4,663	5,925	3,222	7,632	13,589	55,022	48,622	12,621	4,769	636
MEAN	24.9	274	150	191	115	246	453	1,775	1,621	407	154	21.2
MAX	65	1,700	299	403	152	340	700	2,900	2,760	858	612	39
MIN	6.8	29	113	126	96	174	279	735	735	249	43	11
AC-FT	1,530	16,290	9,250	11,750	6,390	15,140	26,950	109,100	96,440	25,030	9,460	1,260

Table 2.--*Discharge data for the Merced River and South Fork Merced River*--Continued

11268000 SOUTH FORK MERCED RIVER NEAR EL PORTAL

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	21	68	79	145	738	346	972	1,760	199	38	15
2	11	21	68	85	138	562	318	972	1,530	173	44	15
3	11	21	65	93	140	490	302	1,210	1,410	156	36	15
4	11	25	72	74	283	490	302	1,070	1,260	145	33	15
5	11	38	115	64	271	430	326	844	1,350	140	44	15
6	12	34	77	69	374	430	398	684	1,350	138	42	15
7	12	31	82	70	876	426	520	884	1,380	123	49	15
8	13	38	81	81	525	410	571	1,190	1,400	117	56	14
9	18	36	79	103	366	370	613	1,560	1,280	113	41	13
10	23	33	57	159	1,310	354	592	1,730	1,070	104	35	13
11	29	50	76	125	1,740	530	641	2,040	972	95	31	12
12	36	48	69	259	1,120	435	661	2,150	940	88	28	12
13	32	42	63	280	785	398	634	1,820	852	84	27	12
14	28	189	58	209	642	354	535	1,870	720	79	25	12
15	26	134	63	173	545	326	455	2,030	545	74	25	12
16	24	196	191	666	455	312	418	2,150	525	72	24	12
17	24	111	702	1,060	394	309	450	2,380	510	66	22	12
18	27	84	343	785	358	296	500	2,500	490	62	20	12
19	26	73	402	792	336	283	460	2,570	495	60	19	12
20	28	67	286	430	315	530	445	2,000	480	59	19	12
21	37	60	239	340	305	480	445	1,700	455	55	18	12
22	42	57	242	268	280	460	520	1,810	390	55	18	12
23	41	56	196	233	265	450	677	1,710	346	53	18	12
24	35	54	163	212	332	490	930	1,770	289	49	16	14
25	31	54	136	202	332	500	1,090	1,400	299	46	17	14
26	28	59	125	183	358	525	1,370	1,330	318	42	17	15
27	25	74	121	168	720	470	1,500	1,400	366	39	19	14
28	25	81	123	161	1,310	445	1,530	1,850	350	37	19	13
29	24	78	97	156	------	390	1,380	1,980	262	36	18	12
30	23	72	95	163	------	362	1,150	1,810	231	36	17	12
31	22	------	91	154	------	354	------	2,100	------	34	16	------
TOTAL	746	1,937	4,645	7,896	15,020	13,399	20,079	51,486	23,625	2,629	851	395
MEAN	24.1	64.6	150	255	536	432	669	1,661	788	84.8	27.5	13.2
MAX	42	196	702	1,060	1,740	738	1,530	2,570	1,760	199	56	15
MIN	11	21	57	64	138	283	302	684	231	34	16	12
AC-FT	1,480	3,840	9,210	15,660	29,790	26,580	39,830	102,100	46,860	5,210	1,690	783

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	38	799	379	263	620	900	1,060	1,430	201	42	16
2	12	38	382	298	246	750	1,430	1,160	1,310	178	40	16
3	11	35	293	280	242	750	900	1,270	1,210	143	37	16
4	12	33	250	277	233	726	726	1,230	1,310	129	37	15
5	12	30	216	274	226	672	684	1,280	1,300	124	51	15
6	12	30	195	270	221	660	654	1,470	1,520	117	56	15
7	13	48	188	320	211	625	653	1,810	1,410	110	49	14
8	28	62	185	310	214	642	658	1,990	1,180	103	42	14
9	54	53	179	305	206	580	662	1,950	1,060	110	38	14
10	31	172	178	295	207	540	586	1,840	1,030	188	35	14
11	25	940	182	280	201	495	559	1,840	1,010	179	34	13
12	23	1,800	178	300	203	500	590	2,010	964	135	33	13
13	22	486	180	290	205	500	678	1,740	860	115	31	13
14	21	362	216	320	203	505	732	1,610	785	104	29	13
15	23	261	178	355	196	560	820	1,680	702	96	27	13
16	23	219	167	487	193	570	820	1,520	616	89	25	14
17	21	407	164	852	184	550	892	1,250	505	86	23	14
18	20	956	166	771	181	510	956	948	415	85	23	13
19	19	351	152	852	199	520	738	771	397	81	22	13
20	18	271	144	764	187	540	616	664	354	72	22	12
21	18	248	146	655	193	536	637	660	356	70	21	12
22	19	203	230	515	181	531	820	828	357	68	21	12
23	173	175	195	457	176	517	844	1,130	341	65	20	12
24	102	169	175	404	178	529	757	1,070	296	65	19	12
25	54	153	170	373	181	572	635	1,620	255	73	19	12
26	48	153	170	346	186	510	576	1,840	239	79	18	12
27	43	138	399	313	181	546	553	1,920	221	72	17	12
28	41	140	600	308	176	690	571	1,880	211	59	17	12
29	42	151	593	287	------	642	614	1,650	205	51	17	13
30	40	149	626	277	------	690	806	1,460	204	49	17	13
31	37	------	428	267	------	671	------	1,440	------	45	17	------
TOTAL	1,029	8,269	8,324	12,481	5,673	18,249	22,067	44,591	22,053	3,141	899	402
MEAN	33.2	276	269	403	203	589	736	1,438	735	101	29.0	13.4
MAX	173	1,800	799	852	263	750	1,430	2,010	1,520	201	56	16
MIN	11	30	144	267	176	495	553	660	204	45	17	12
AC-FT	2,040	16,400	16,510	24,760	11,250	36,200	43,770	88,450	43,740	6,230	1,780	797

Table 2.--*Discharge data for the Merced River and South Fork Merced River*--Continued

11268200 MERCED RIVER NEAR BRICEBURG

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	87	222	254	365	1,360	816	3,250	7,950	1,190	312	78
2	52	87	218	261	355	1,090	755	3,500	6,220	1,010	459	76
3	50	87	208	270	360	961	722	4,000	5,350	891	400	74
4	51	98	268	237	532	980	695	3,750	4,900	830	538	73
5	55	128	241	199	525	883	765	2,930	5,120	802	501	69
6	71	136	215	216	643	901	948	2,390	4,990	837	543	68
7	82	128	228	206	1,350	912	1,250	2,930	5,170	801	585	65
8	88	135	216	224	933	875	1,400	3,930	5,100	732	470	64
9	103	140	194	365	716	806	1,600	5,210	5,170	707	355	62
10	120	138	195	370	2,030	778	1,560	5,820	4,270	674	300	59
11	126	200	212	331	3,210	1,080	1,680	6,740	3,900	632	263	57
12	145	190	190	633	2,050	950	1,770	7,260	3,730	591	231	56
13	141	178	194	707	1,470	892	1,760	6,960	3,550	567	207	56
14	126	350	182	550	1,210	799	1,470	7,000	3,080	512	189	53
15	116	284	186	473	1,050	744	1,300	7,700	2,350	466	180	52
16	109	363	193	1,870	901	707	1,190	8,070	2,120	454	174	52
17	107	281	728	1,850	802	725	1,340	9,020	2,050	449	166	51
18	109	253	1,070	1,420	733	695	1,490	9,450	1,980	420	158	51
19	109	231	896	1,420	696	682	1,410	9,530	2,060	421	150	50
20	117	213	967	873	672	1,090	1,380	7,810	2,090	374	144	48
21	147	196	745	760	651	1,040	1,360	6,380	2,060	353	133	49
22	174	195	686	608	604	984	1,610	6,750	1,980	334	127	49
23	171	190	635	540	577	973	2,110	6,400	1,820	312	120	49
24	157	181	506	499	681	1,030	2,850	6,560	1,510	292	114	50
25	148	186	425	475	682	1,070	3,510	5,360	1,450	274	109	51
26	133	208	384	442	698	1,140	4,250	5,010	1,630	259	104	51
27	122	250	367	406	1,140	1,080	4,770	5,260	2,010	252	104	49
28	114	258	368	399	2,200	1,040	4,960	6,850	2,170	256	101	47
29	108	247	315	396	------	921	4,600	7,650	1,600	274	96	45
30	101	232	287	401	------	857	3,810	6,910	1,390	271	90	43
31	94	------	288	383	------	842	------	9,100	------	256	82	------
TOTAL	3,399	5,850	12,029	18,038	27,836	28,887	59,131	189,470	98,770	16,493	7,505	1,697
MEAN	110	195	388	582	994	932	1,971	6,112	3,292	532	242	56.6
MAX	174	363	1,070	1,870	3,210	1,360	4,960	9,530	7,950	1,190	585	78
MIN	50	87	182	199	355	682	695	2,390	1,390	252	82	43
AC-FT	6,740	11,600	23,860	35,780	55,210	57,300	117,300	375,800	195,900	32,710	14,890	3,370

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	138	1,300	1,020	727	1,740	2,490	3,280	5,510	1,370	707	96
2	43	139	790	772	655	4,050	3,410	3,920	5,100	1,230	558	95
3	42	134	724	724	655	2,060	2,140	4,350	4,650	1,060	403	90
4	43	126	653	748	642	1,560	1,770	4,250	5,100	965	437	88
5	43	114	569	719	608	1,460	1,710	4,430	4,960	931	537	84
6	42	114	537	721	596	1,450	1,660	5,210	5,770	861	516	82
7	47	159	527	780	569	1,410	1,670	6,230	5,890	779	434	80
8	77	241	516	829	582	1,400	1,700	6,900	5,100	716	352	78
9	134	220	513	791	560	1,260	1,720	7,090	4,470	715	302	78
10	102	586	516	690	566	1,200	1,510	6,780	4,450	1,210	268	77
11	86	3,140	532	654	548	1,120	1,480	6,520	4,370	990	245	76
12	80	5,860	509	772	551	1,120	1,590	6,940	4,360	709	228	75
13	77	1,970	523	846	547	1,130	1,790	6,420	4,010	587	213	73
14	74	1,310	595	771	536	1,160	2,040	5,720	3,800	541	200	69
15	76	965	510	803	526	1,330	2,350	5,970	3,470	533	188	69
16	77	818	488	1,060	518	1,390	2,430	5,380	3,070	515	175	69
17	75	975	483	1,820	496	1,360	2,680	4,480	2,640	518	166	67
18	75	1,980	477	1,790	492	1,260	2,930	3,540	2,190	492	156	67
19	72	982	441	2,390	547	1,280	2,220	2,940	2,030	462	148	64
20	71	829	430	1,920	504	1,350	1,920	2,490	1,810	443	142	61
21	70	741	434	1,600	516	1,390	1,950	2,450	1,820	432	138	59
22	72	609	555	1,290	495	1,390	2,520	2,760	1,960	436	129	59
23	247	537	504	1,190	472	1,370	2,750	3,500	2,000	441	122	57
24	253	535	477	1,080	478	1,430	2,390	3,790	1,770	470	116	56
25	176	476	473	1,000	480	1,550	1,960	5,210	1,520	526	114	54
26	173	482	460	930	497	1,390	1,760	6,480	1,390	640	111	53
27	161	441	832	827	496	1,400	1,630	7,260	1,300	528	108	52
28	154	453	1,210	854	480	1,670	1,670	7,320	1,270	425	105	51
29	152	473	1,350	787	------	1,620	1,810	6,800	1,290	384	102	50
30	147	466	1,670	761	------	1,730	2,330	5,730	1,340	372	98	49
31	140	------	1,170	736	------	1,680	------	5,550	------	541	97	------
TOTAL	3,124	26,033	20,758	31,585	15,339	46,710	61,980	159,690	98,410	20,821	7,615	2,078
MEAN	101	868	670	1,019	548	1,507	2,066	5,151	3,280	672	246	69.3
MAX	253	5,860	1,670	2,390	727	4,050	3,410	7,320	5,890	1,370	707	96
MIN	42	114	430	654	472	1,120	1,480	2,450	1,270	372	97	49
AC-FT	6,200	51,640	41,170	62,650	30,420	92,650	122,900	316,700	195,200	41,300	15,100	4,120

Water samples for determination of chemical constituents, except carbon, were collected in PVC (polyvinyl chloride) bottles. Water samples for TOC (total organic carbon) were collected and chilled in acid-rinsed glass bottles. Samples for trace metals were collected and stored in 250 millilitre acid-rinsed PVC bottles and preserved by acidifying with 1.0 millilitre of 1.0N nitric acid. All samples for analysis of dissolved chemical constituents were filtered through a 0.45-micrometre membrane filter immediately after collection. Dissolved constituents are noted as such in the data tables. Selected plant-nutrient samples were preserved by chilling.

Determinations of chemical constituents were made by the Geological Survey Central Laboratory, Salt Lake City, Utah, using the methods described by Brown and others (1970) and Goerlitz and Brown (1972).

AGP (algal growth potential) in water samples was determined by the staff of the California Department of Water Resources laboratory at Bryte using the fluorometric method described by the Environmental Protection Agency (1971). Native algal populations were used in the AGP determinations rather than stock test algae.

Periphyton samples were collected from artificial substrates (transparent plastic strips) submerged in the water for about 4 weeks during 3 sampling periods from July 5 to October 5, 1974. Randomly selected 3.9-in^2 (2,500-mm^2) areas were scraped from each substrate and preserved in formaldehyde (Slack and others, 1973, p. 86). The samples were analyzed for biomass and the attached algae were identified at the Geological Survey Central Laboratory, Doraville, Ga.

Benthic invertebrates were collected using a Surber sampler (Slack and others, 1973, p. 145). A minimum of three samples were collected at each station. The collected organisms were preserved with 40 percent isopropyl alcohol (Slack and others, 1973, p. 129) and identified by a commercial laboratory.

RESULTS OF PERIODIC SAMPLING

Major Chemical Constituents

The results of analyses for major chemical constituents are tabulated in table 3.

The data show that the concentrations of major chemical constituents in samples were uniformly low and typical of Sierra Nevada streams (Feth and others, 1964, p. 53). Dissolved solids (sum of constituents) ranged from 8 to 41 mg/ℓ and hardness ranged from 2 to 16 mg/ℓ. Thus, the water is generally quite dilute and soft (Durfor and Becker, 1964, p. 27). Based upon equivalent concentrations, water in the Merced River may be classified as a calcium bicarbonate type (Hem, 1970, p. 237).

Table 3.--*Physical and chemical analyses*

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE

DATE	TIME	INSTANTANEOUS DISCHARGE (FT^3/S)	DISSOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)	DISSOLVED SODIUM (NA) (MG/L)	DISSOLVED POTASSIUM (K) (MG/L)
APR., 1973											
19...	0900	350	8.1	--	50	--	--	2.0	.2	1.5	.3
MAY											
29...	1510	2520	4.7	250	70	--	--	.9	.2	.7	.2
JULY											
03...	1630	483	.9	60	50	--	--	.9	.1	.6	.2
04...	0840	470	3.9	70	30	--	--	1.6	.1	.1	.2
05...	0745	474	3.8	70	20	--	--	1.1	.1	.7	.2
AUG.											
08...	0915	261	4.0	--	40	--	--	1.5	.2	1.3	.3
SEP.											
02...	1510	20	8.0	110	60	--	--	2.9	.2	2.7	.4
03...	0825	20	8.6	130	120	--	--	4.0	.2	2.5	.4
04...	0805	20	7.2	100	50	--	--	2.8	.2	3.2	.5
OCT.											
03...	1100	7.4	8.9	--	50	--	--	3.4	.2	2.9	.5
NOV.											
20...	0945	222	6.4	--	80	--	--	1.9	.2	2.0	.3
JAN., 1974											
16...	0830	182	8.0	--	70	--	--	2.1	.1	1.4	.4
FEB.											
21...	1535	113	10	--	140	--	--	2.3	.3	2.2	.4
APR.											
10...	0845	274	9.0	--	60	--	--	2.1	.0	1.4	.4
MAY											
23...	0800	1050	5.6	--	--	20	0	1.6	.1	1.0	.2
JUNE											
12...	0915	2430	3.1	--	80	--	--	.3	.3	.6	.2
JULY											
03...	1400	652	3.2	70	--	--	--	1.0	.0	.4	.1
04...	1350	643	3.9	70	--	--	--	.7	.1	.5	.2
05...	0745	634	4.1	80	--	--	--	1.8	.0	.5	.2
AUG.											
15...	0830	99	4.2	--	--	--	--	1.5	.0	1.4	.2
SEP.											
01...	1430	37	5.0	90	50	--	--	1.2	.2	1.6	.3
02...	1400	34	5.0	90	50	--	--	1.3	.0	1.7	.3
03...	0800	34	5.1	90	50	--	--	1.1	.0	1.7	.3

DATE	DISSOLVED SULFATE (SO4) (MG/L)	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	DISSOLVED NITRATE (N) (MG/L)	DISSOLVED NITRITE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	AMMONIA NITROGEN (N) (MG/L)	ORGANIC NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)
APR., 1973										
19...	.9	1.4	.0	--	--	.03	.01	.08	.06	.14
MAY										
29...	1.8	1.3	.1	--	--	.05	.01	.01	.13	.14
JULY										
03...	1.5	.3	--	--	--	.01	.93	.01	.47	.48
04...	1.6	.3	--	--	--	.01	.00	.02	.08	.10
05...	.9	.5	--	--	--	.02	.00	.02	.05	.07
AUG.										
08...	3.0	1.3	.0	--	--	.24	.12	.07	.17	.24
SEP.										
02...	1.8	2.6	--	.16	.01	--	.17	.04	.08	.12
03...	1.3	3.1	--	.44	.01	--	.45	.03	.06	.09
04...	1.1	3.8	--	.09	.00	--	.09	.07	.00	.03
OCT.										
03...	2.8	5.1	.1	--	--	.04	.03	.11	.10	.21
NOV.										
20...	1.8	1.8	.1	--	--	.13	.05	.10	.08	.18
JAN., 1974										
16...	2.1	2.5	.0	--	--	.07	.07	.07	.07	.14
FEB.										
21...	.7	2.3	.4	--	--	.07	.01	.03	.00	.01
APR.										
10...	3.1	2.0	.1	--	--	.10	.10	.06	.19	.25
MAY										
23...	.9	.6	--	.00	.00	.01	.00	.05	.24	.29
JUNE										
12...	.4	.0	.0	--	--	.59	.04	.02	.19	.21
JULY										
03...	1.1	.8	--	--	--	--	--	.04	--	--
04...	.9	.7	--	--	--	--	--	.05	--	--
05...	.9	.5	--	--	--	--	--	.07	--	--
AUG.										
15...	1.1	.6	.0	--	--	.02	--	--	--	--
SEP.										
01...	.9	.9	--	.03	.00	--	.03	.03	.44	.47
02...	.8	.7	--	.03	.00	--	.03	.02	.32	.34
03...	1.3	1.1	--	.05	.00	--	.05	.02	.44	.46

Table 3.--*Physical and chemical analyses*--Continued

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE--Continued

DATE	TOTAL NITRO-GEN (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED ORTHO. PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)
APR., 1973										
19...	.17	.01	.01	--	22	.03	20.8	6	0	--
MAY										
29...	.19	.00	.00	25	12	.03	169	3	0	2.0
JULY										
03...	.49	.00	.00	19	11	.03	24.8	3	0	2.5
04...	.11	.02	.00	21	11	.03	26.6	4	0	1.5
05...	.09	.01	.00	21	13	.03	26.9	3	0	2.5
AUG.										
08...	.48	.01	.02	--	15	.02	10.6	5	0	--
SEP.										
02...	--	.01	.02	34	23	.05	1.84	8	2	1.0
03...	--	.01	.03	30	30	.04	1.62	11	0	--
04...	--	.01	.02	34	27	.05	1.84	8	0	--
OCT.										
03...	.25	.02	.02	25	31	.03	.50	9	0	12
NOV.										
20...	.31	.00	.03	14	19	.02	8.20	6	0	--
JAN., 1974										
16...	.21	.02	.00	23	21	.03	11.7	6	0	--
FEB.										
21...	.08	.02	.00	18	24	.02	5.49	7	0	--
APR.										
10...	.35	.10	.02	21	22	.03	15.5	5	0	--
MAY										
23...	.30	.00	.00	14	12	.02	39.7	4	0	1.8
JUNE										
12...	.80	.01	.00	--	8	.01	52.5	2	0	--
JULY										
03...	--	.00	.00	4	9	.01	7.04	3	0	2.5
04...	--	.00	.00	8	10	.01	13.9	2	0	5.5
05...	--	.00	.00	7	11	.01	12.0	5	0	5.0
AUG.										
15...	--	.03	--	11	13	.02	2.94	4	0	2.4
SEP.										
01...	--	.00	.00	22	14	.03	2.20	4	0	4.5
02...	--	.00	.00	24	14	.03	2.20	3	0	3.1
03...	--	.00	.00	23	15	.03	2.11	3	0	2.1

11266400 MERCED RIVER AT EL CAPITAN BRIDGE, NEAR YOSEMITE VILLAGE

DATE	TIME	INSTAN-TANEOUS DIS-CHARGE (FT^3/S)	DIS-SOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL MAN-GANESE (MN) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM (NA) (MG/L)
MAY , 1973										
30...	1200	3680	4.1	210	30	--	--	.8	.2	.6
JULY										
03...	1500	--	4.6	160	50	--	--	1.4	.2	.1
04...	0935	--	4.8	120	40	--	--	3.3	.2	.2
05...	0815	--	4.8	120	30	--	--	1.4	.1	1.0
SEP.										
02...	1445	42	12	280	60	--	--	4.3	.4	2.9
03...	1050	40	12	240	120	--	--	4.0	.4	2.6
04...	0910	38	12	340	60	--	--	3.7	.4	2.6
MAY , 1974										
22...	1530	1340	6.3	--	--	30	20	1.2	.1	1.1
JULY										
03...	1315	--	5.2	110	--	--	--	1.2	.4	.7
04...	1200	--	5.2	110	--	--	--	.8	.1	.8
05...	0820	--	5.4	110	--	--	--	1.6	.0	1.0
SEP.										
01...	1400	59	9.1	270	100	--	--	4.4	.6	1.9
02...	1300	56	8.8	290	70	--	--	2.5	.2	1.9
03...	0900	56	8.9	200	70	--	--	2.5	.0	2.1

11266400 MERCED RIVER AT EL CAPITAN BRIDGE, NEAR YOSEMITE VILLAGE--Continued

DATE	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED NITRATE (N) (MG/L)	DIS-SOLVED NITRITE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	ORGANIC NITRO-GEN (N) (MG/L)	TOTAL KJEL-DAHL NITRO-GEN (N) (MG/L)
MAY , 1973										
30...	.4	1.6	1.3	--	--	.02	.00	.01	.20	.21
JULY										
03...	.3	1.3	.7	--	--	.01	.01	.01	.04	.05
04...	.3	1.6	.7	--	--	.02	.02	.02	.27	.29
05...	.3	1.3	.8	--	--	.02	.00	.02	.15	.17
SEP.										
02...	1.0	.9	2.4	.03	.00	--	.03	.03	.06	.09
03...	1.0	1.1	2.4	.04	.00	--	.04	.03	.18	.21
04...	1.1	.9	2.8	.05	.00	--	.05	.04	.00	.04
MAY , 1974										
22...	.3	.9	.5	.03	.00	.03	.03	.05	.18	.23
JULY										
03...	.2	.8	.8	--	--	--	--	.04	--	--
04...	.2	.3	.2	--	--	--	--	.05	--	--
05...	.2	.4	.1	--	--	--	--	.04	--	--
SEP.										
01...	.7	1.1	1.7	.01	.00	--	.01	.03	.02	.05
02...	.7	1.4	1.8	.01	.00	--	.01	.03	.06	.09
03...	.7	1.1	2.0	.01	.00	--	.01	.04	.06	.10

DATE	TOTAL NITRO-GEN (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED ORTHO. PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)
MAY , 1973										
30...	.23	.00	.00	21	11	.03	209	3	1	2.0
JULY										
03...	.06	.00	.00	18	12	.02	--	4	0	1.0
04...	.31	.00	.00	18	18	.02	--	9	0	1.0
05...	.19	.00	.00	23	13	.03	--	4	0	1.5
SEP.										
02...	--	.01	.01	40	35	.05	4.54	12	0	1.5
03...	--	.02	.02	35	33	.05	3.78	12	0	1.5
04...	--	.01	.02	38	33	.05	3.90	11	0	1.0
MAY , 1974										
22...	.26	.01	.01	9	16	.01	32.6	3	0	1.4
JULY										
03...	--	.01	.01	5	12	.01	--	5	0	4.3
04...	--	.07	.03	5	11	.01	--	2	0	1.4
05...	--	.00	.00	8	12	.01	--	4	0	2.5
SEP.										
01...	--	.05	.00	27	27	.04	4.30	13	2	4.2
02...	--	.01	.00	27	24	.04	4.08	7	0	5.6
03...	--	.01	.00	28	30	.04	4.23	6	0	1.4

11266450 EFFLUENT FROM TREATMENT PLANT NEAR YOSEMITE VILLAGE

DATE	TIME	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)
APR., 1973						
20...	1155	86	0	385	6.5	11.0

Table 3.--*Physical and chemical analyses*--Continued

11267050 MERCED RIVER AT RANCHERIA FLAT, NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DISCHARGE (FT3/S)	DIS-SOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	DIS-SOLVED MANGANESE (MN) (UG/L)	DIS-SOLVED CALCIUM (CA) (MG/L)	DIS-SOLVED MAGNESIUM (MG) (MG/L)	DIS-SOLVED SODIUM (NA) (MG/L)
MAY, 1973										
30...	1600	4860	4.8	230	30	--	--	.9	.1	.7
JULY										
03...	1400	--	5.9	130	50	--	--	1.5	.1	1.0
04...	1030	--	5.9	120	50	--	--	2.7	.2	.4
05...	0900	632	5.8	120	40	--	--	1.7	.2	1.2
SEP.										
02...	1205	52	12	80	40	--	--	5.4	.5	3.3
03...	1255	54	12	100	30	--	--	5.4	.5	3.3
04...	1025	54	12	100	20	--	--	4.3	.5	3.4
MAY, 1974										
22...	1245	--	7.1	--	--	10	20	2.1	.2	1.1
JULY										
03...	1200	--	5.2	120	--	--	--	1.6	.1	.9
04...	1030	--	5.3	150	--	--	--	1.5	.0	.9
05...	0900	--	5.3	110	--	--	--	1.4	.0	.9
SEP.										
01...	1250	61	11	70	60	--	--	3.1	.1	3.1
02...	1030	61	11	80	50	--	--	3.2	.5	2.7
03...	1020	55	11	80	60	--	--	3.1	.4	3.0

DATE	DIS-SOLVED POTASSIUM (K) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLORIDE (CL) (MG/L)	DIS-SOLVED NITRATE (N) (MG/L)	DIS-SOLVED NITRITE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L)	AMMONIA NITROGEN (N) (MG/L)	ORGANIC NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)
MAY, 1973										
30...	.4	1.6	1.3	--	--	.01	.00	.01	.13	.14
JULY										
03...	.4	1.6	.8	--	--	.00	.00	.03	.12	.15
04...	.4	1.5	.7	--	--	.04	.00	.04	.14	.18
05...	.4	2.0	.7	--	--	.04	.01	.01	.07	.08
SEP.										
02...	1.0	1.5	2.8	.39	.00	--	.39	.05	.08	.13
03...	1.1	1.5	3.0	.38	.00	--	.38	.04	.06	.10
04...	1.1	1.6	3.4	.43	.01	--	.44	.06	.06	.12
MAY, 1974										
22...	.3	.8	.6	.00	.01	.01	.01	.05	.21	.26
JULY										
03...	.3	.9	.6	--	--	--	--	.02	--	--
04...	.3	.9	.7	--	--	--	--	.03	--	--
05...	.3	.9	.8	--	--	--	--	.02	--	--
SEP.										
01...	.8	1.3	.8	.16	.00	--	.16	.07	.49	.56
02...	.9	1.5	.7	.30	.01	--	.31	.06	.22	.28
03...	1.0	1.4	.9	.40	.01	--	.41	.06	.52	.58

DATE	TOTAL NITROGEN (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	DIS-SOLVED ORTHO. PHOSPHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARDNESS (CA,MG) (MG/L)	NON-CARBONATE HARDNESS (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)
MAY, 1973										
30...	.15	.00	.00	24	14	.03	315	3	0	2.0
JULY										
03...	.15	.02	.00	29	16	.04	--	4	0	3.0
04...	.22	.02	.00	26	19	.04	--	8	0	1.5
05...	.12	.02	.00	24	17	.03	41.0	5	0	1.0
SEP.										
02...	--	.08	.07	39	37	.05	5.48	16	2	--
03...	--	.08	.07	44	41	.06	6.42	16	0	2.0
04...	--	.08	.09	46	38	.06	6.71	13	0	1.5
MAY, 1974										
22...	.27	.01	.01	11	16	.02	--	6	0	1.7
JULY										
03...	--	.01	.00	2	14	.00	--	4	0	10
04...	--	.01	.00	10	14	.01	--	4	0	3.4
05...	--	.00	.00	8	14	.01	--	4	0	2.5
SEP.										
01...	--	.07	.03	41	29	.06	6.75	8	0	3.2
02...	--	.08	.04	34	31	.05	5.60	10	0	.6
03...	--	.09	.05	40	31	.05	5.94	9	0	.5

11630000 SOUTH FORK MERCED RIVER NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DISCHARGE (FT³/S)	DISSOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)	DISSOLVED SODIUM (NA) (MG/L)
MAY , 1973										
31...	0820	1910	4.7	320	30	--	--	1.0	.2	.6
JULY										
03...	1240	140	9.7	60	10	--	--	3.1	.4	1.4
04...	1100	129	10	50	10	--	--	3.8	.4	2.0
05...	0925	127	11	60	10	--	--	4.2	.4	2.3
SEP.										
02...	1100	15	15	50	30	--	--	9.3	1.3	5.9
03...	1510	15	16	40	10	--	--	9.2	1.2	6.7
04...	1100	15	15	50	20	--	--	9.2	1.2	6.3
MAY , 1974										
23...	1100	1170	6.8	--	--	20	0	2.6	.2	1.2
JULY										
03...	1130	134	12	70	--	--	--	2.7	.5	1.8
04...	0930	111	13	50	--	--	--	4.0	.4	1.8
05...	0920	107	13	50	--	--	--	3.1	.4	1.9
SEP.										
01...	1230	17	15	40	20	--	--	9.1	1.2	6.4
02...	0900	16	15	40	20	--	--	8.9	1.2	6.6
03...	1130	16	15	50	20	--	--	9.0	.4	6.3

DATE	DISSOLVED POTASSIUM (K) (MG/L)	DISSOLVED SULFATE (SO4) (MG/L)	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED NITRATE (N) (MG/L)	DISSOLVED NITRITE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	AMMONIA NITROGEN (N) (MG/L)	ORGANIC NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)
MAY , 1973										
31...	.4	1.8	1.2	--	--	.00	.00	.01	.23	.24
JULY										
03...	.5	2.0	1.4	--	--	.00	.00	.03	.12	.15
04...	.5	1.8	1.5	--	--	.00	.00	.03	.19	.22
05...	.6	2.1	1.6	--	--	.00	.00	.04	.06	.10
SEP.										
02...	1.2	2.3	9.1	.02	.00	--	.02	.02	.07	.09
03...	1.1	3.0	10	.19	.00	--	.19	.05	.12	.17
04...	1.1	2.1	8.8	.02	.00	--	.02	.12	.02	.14
MAY , 1974										
23...	.3	6.4	.6	.00	.00	.00	.00	.20	.09	.29
JULY										
03...	.4	1.3	1.6	--	--	--	--	.04	--	--
04...	.4	1.1	2.2	--	--	--	--	.04	--	--
05...	.5	1.4	2.2	--	--	--	--	.04	--	--
SEP.										
01...	1.0	2.3	8.5	.01	.00	--	.01	.05	.00	.05
02...	1.0	2.4	8.5	.02	.00	--	.02	.06	.04	.10
03...	1.1	2.3	8.9	.01	.00	--	.01	.05	.13	.18

DATE	TOTAL NITROGEN (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	DISSOLVED ORTHO. PHOSPHORUS (P) (MG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)	DISSOLVED SOLIDS (TONS PER AC-FT)	DISSOLVED SOLIDS (TONS PER DAY)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)
MAY , 1973										
31...	.24	.01	.00	29	11	.04	147	3	1	2.5
JULY										
03...	.15	.01	.00	31	25	.04	11.7	9	0	1.5
04...	.22	.01	.00	41	30	.06	14.3	11	0	1.5
05...	.10	.01	.00	33	31	.04	11.3	12	0	1.0
SEP.										
02...	--	.01	.03	65	63	.09	2.81	29	0	1.0
03...	--	.01	.02	76	66	.10	3.08	28	0	1.5
04...	--	.01	.02	73	64	.10	2.96	28	0	2.0
MAY , 1974										
23...	.29	.02	.00	18	22	.02	56.9	7	0	1.4
JULY										
03...	--	.00	.00	18	28	.02	6.51	9	0	5.2
04...	--	.00	.00	23	30	.03	6.89	12	0	3.2
05...	--	.00	.00	25	30	.03	7.22	9	0	1.2
SEP.										
01...	--	.01	.00	65	61	.09	2.98	28	0	5.0
02...	--	.01	.00	67	62	.09	2.89	27	0	3.1
03...	--	.01	.00	65	61	.09	2.81	24	0	.7

A comparison of low-flow and high-flow data, shown in tables 4 and 5, helps to demonstrate the variability in the concentration of major chemical constituents during extreme flow conditions.

At high flow, the concentrations of major constituents and specific conductance remained relatively constant from Happy Isles to Rancheria Flat and were uniformly very low. Nitrate concentrations also showed virtually no change in passage through the valley. Discharge in 1973 was higher than in 1974 which may account for the generally lower constituent concentrations at high flow in 1973.

By contrast, at low flow, the concentrations of major constituents tend to increase from Happy Isles to Rancheria Flat. The increase is most noticeable in the nitrate concentration which increases about eightfold. Concentrations at low flow also tend to be higher than at high flow because at low flow less water is available to dilute dissolved solids being added from other sources. Even at low flow, however, concentrations of major constituents are quite low and the river water remains dilute.

Specific conductance tends to vary inversely with streamflow over a normal range of discharges in most river systems. Logarithmic plots of specific conductance as a function of discharge (fig. 3) show that the inverse relation exists in the Merced River. Much of the scatter about the trend line is probably due to the normal variance on specific conductivity measurements made in dilute solutions.

Trace Metals

Trace-metal concentrations are listed in table 6. The concentrations of arsenic, chromium, cobalt, iron, lead, and zinc in the dissolved form often were below detectable limits and were always within the recommended limits for the protection of aquatic organisms (California State Water Resources Control Board, 1963; Environmental Protection Agency, 1972).

High concentrations of total mercury occurred during periods of high flow in the spring. The highest concentration (4.2 μg/ℓ), found at El Capitan Bridge, may have resulted from contamination of the sample or from analytical error. The Environmental Protection Agency (1972, p. 174) recommends that total mercury concentrations not exceed 0.2 μg/ℓ, and that the average concentration not exceed 0.05 μg/ℓ. High mercury concentrations are listed below.

		Concentration, in micrograms per litre	
Date	Station	Highest	Average
July 4, 1973	Happy Isles Bridge	0.4	0.09
July 4, 1974	El Capitan Bridge	4.2	.05
May 22, 1974	Rancheria Flat	.8	.14
May 23, 1974	South Fork Merced River	1.0	.13

Table 4.--*Principal dissolved chemical constituents during high flow (May 1973) and low flow (September 1973)*

Measurement	Stations on the Merced River					
	at Happy Isles Bridge		at El Capitan Bridge		at Rancheria Flat	
	May 29	Sept. 4	May 30	Sept. 4	May 30	Sept. 4
Time (hours)	1510	0805	1200	0910	1600	1025
Discharge (ft^3/s)	2,520	20	3,680	38	4,860	54
	Concentrations in milligrams per litre (except as otherwise noted)					
Silica (SiO_2)	4.7	7.2	4.1	12.	4.8	12.
Calcium (Ca)	.9	2.8	..8	3.7	.9	4.3
Magnesium (Mg)	.2	.2	.2	.4	.1	.5
Sodium (Na)	.7	3.2	.6	2.6	.7	3.4
Potassium (K)	.2	.5	.4	1.1	.4	1.1
Bicarbonate (HCO_3)	5.0	16.	3.0	18.	4.0	19.
Carbonate (CO_3)	0	0	0	0	0	0
Sulfate (SO_4)	1.8	1.1	1.6	.9	1.6	1.6
Chloride (Cl)	1.3	3.8	1.3	2.8	1.3	3.4
Nitrate (NO_3)	--	.09	--	.05	--	.43
Dissolved solids:						
Residue at 180°C	25.	34.	21.	38.	24.	46.
Sum	12.	27.	11.	33.	14.	38.
Specific conductance (micromhos per centimetre at 25°C)	8.	27.	8.	41.	8.	47.

Table 5.--*Principal dissolved chemical constituents during high flow (May 1974) and low flow (September 1974)*

Measurement	Stations on the Merced River					
	at Happy Isles Bridge		at El Capitan Bridge		at Rancheria Flat	
	May 23	Sept. 3	May 22	Sept. 3	May 22	Sept. 3
Time (hours)	0800	0800	1530	0900	1245	1020
Discharge (ft^3/s)	1,050	34	1,340	56	1,200	55
	Concentrations in milligrams per litre (except as otherwise noted)					
Silica (SiO_2)	5.6	5.1	6.3	8.9	7.1	11.
Calcium (Ca)	1.6	1.1	1.2	2.5	2.1	3.1
Magnesium (Mg)	.1	0	.1	0	.2	.4
Sodium (Na)	1.0	1.7	1.1	2.1	1.1	3.0
Potassium (K)	.2	.3	.3	.7	.3	1.0
Bicarbonate (HCO_3)	5.	8.	10.	26.	8.	17.
Carbonate (CO_3)	0	0	0	0	0	0
Sulfate (SO_4)	.9	1.3	.9	1.1	.8	1.4
Chloride (Cl)	.6	1.1	.5	2.0	.6	.9
Nitrate (NO_3)	0	.05	.03	.01	0	.40
Dissolved solids:						
Residue at 180°C	14.	23.	9.	28.	11.	40.
Sum	12.	15.	16.	30.	16.	31.
Specific conductance (micromhos per centimetre at 25°C)	10.	11.	14.	27.	18.	40.

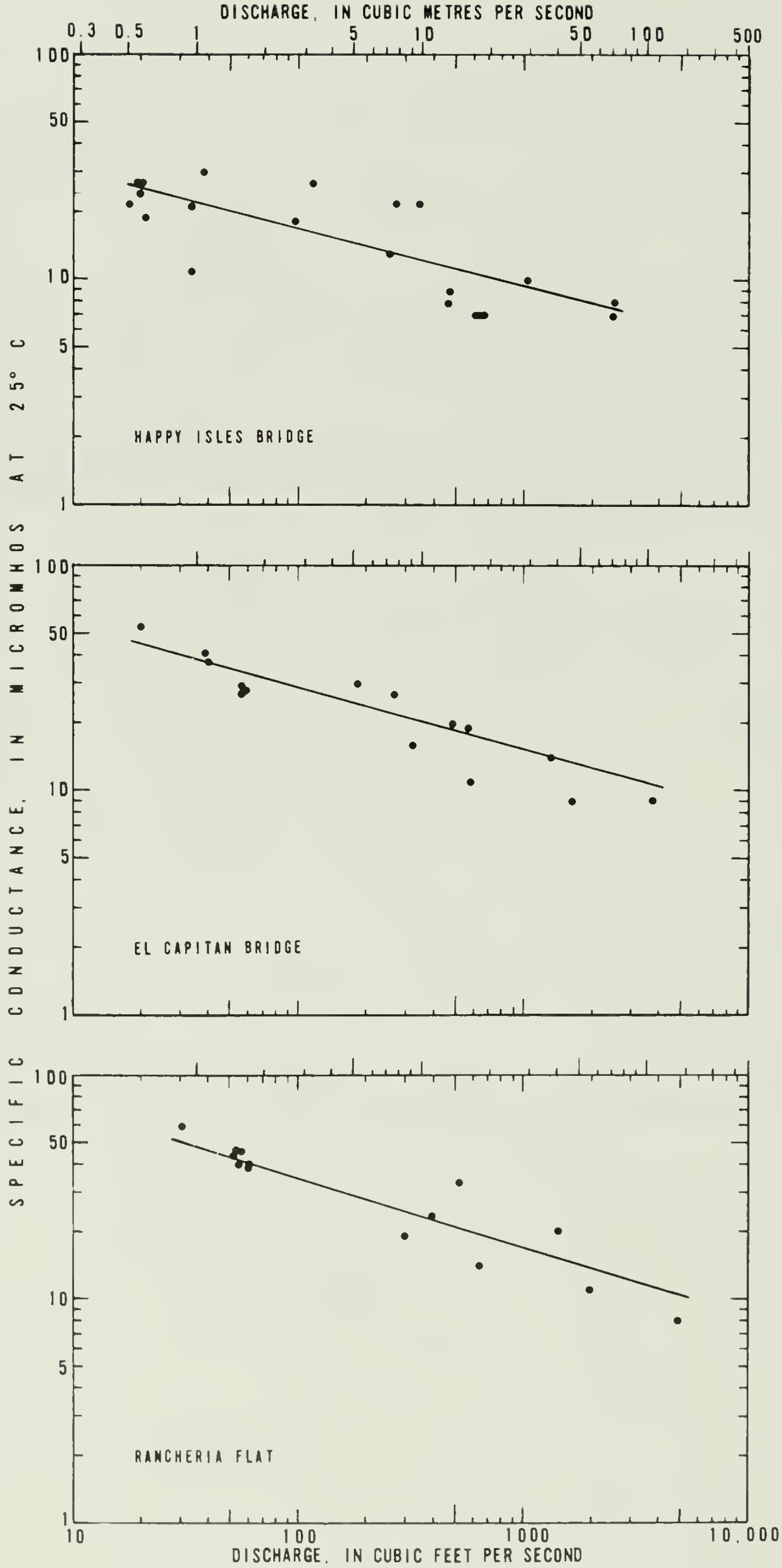


FIGURE 3.--Specific conductance versus discharge.

Table 6.--*Analyses of trace-metal concentrations*

[Some constituents show total concentrations less than dissolved. Discrepancies of this kind occasionally occur with present analytical methods. The values were retained if the differences were within the limits of detectability]

112645 MERCED RIVER AT HAPPY ISLES BRIDGE NEAR YOSEMITE

DATE	TIME	INSTANTANEOUS DISCHARGE (FT^3/S)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL ARSENIC (AS) (UG/L)	DISSOLVED ARSENIC (AS) (UG/L)	TOTAL CADMIUM (CD) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	TOTAL CHROMIUM (CR) (UG/L)
APR., 1973									
19...	0900	350	--	50	--	--	--	--	--
MAY									
29...	1510	2520	250	70	3	--	0	--	10
JULY									
03...	1630	483	60	50	5	1	<10	1	0
04...	0840	470	70	30	0	0	<10	0	10
05...	0745	474	70	20	1	0	<10	0	0
AUG.									
08...	0915	261	--	40	--	--	--	--	--
SEP.									
02...	1510	20	110	60	21	3	0	0	0
03...	0825	20	130	120	2	0	0	0	0
04...	0805	20	100	50	0	4	0	0	0
OCT.									
03...	1100	7.2	--	50	--	0	--	0	--
NOV.									
20...	0945	222	--	80	--	--	--	--	--
JAN., 1974									
16...	0830	182	--	70	--	--	--	--	--
FEB.									
21...	1535	113	--	140	--	--	--	--	--
APR.									
10...	0845	274	--	60	--	--	--	--	--
JUNE									
12...	0915	2430	--	80	--	--	--	--	--
JULY									
03...	1400	652	70	--	2	3	<10	0	0
04...	1350	643	70	--	9	3	<10	0	0
05...	0745	634	80	--	2	3	<10	0	0
SEP.									
01...	1430	37	90	50	0	2	<10	0	0
02...	1400	34	90	50	0	2	<10	0	0
03...	0800	34	90	50	1	3	<10	<1	0

DATE	DISSOLVED CHROMIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DISSOLVED COBALT (CO) (UG/L)	TOTAL LEAD (PB) (UG/L)	DISSOLVED LEAD (PB) (UG/L)	TOTAL MERCURY (HG) (UG/L)	DISSOLVED MERCURY (HG) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)
APR., 1973									
19...	--	--	--	--	--	.3	.3	--	--
MAY									
29...	--	0	--	<100	--	.3	--	10	--
JULY									
03...	0	<25	0	<50	2	.1	.1	--	--
04...	0	<25	0	<50	1	.4	.1	20	20
05...	0	<25	0	<50	1	.2	.1	10	0
AUG.									
08...	--	--	--	--	--	.0	.0	--	--
SEP.									
02...	0	<25	0	<50	2	.1	.1	--	--
03...	0	<25	0	<50	3	.0	.0	70	60
04...	0	<25	0	<50	1	.0	.0	--	--
OCT.									
03...	0	--	0	--	1	.1	--	--	20
NOV.									
20...	--	--	--	--	--	--	--	--	--
JAN., 1974									
16...	--	--	--	--	--	--	--	--	--
FEB.									
21...	--	--	--	--	--	--	--	--	--
APR.									
10...	--	--	--	--	--	--	--	--	--
JUNE									
12...	--	--	--	--	--	.0	.1	--	--
JULY									
03...	0	<50	0	<100	4	.0	.0	0	10
04...	0	<50	0	<100	2	.0	.0	0	10
05...	0	<50	0	<100	2	.0	.0	0	0
SEP.									
01...	0	<50	1	<100	2	.0	.0	20	0
02...	0	<50	0	<100	1	.0	.0	10	0
03...	0	<50	0	<100	1	.0	.0	10	0

Table 6.--*Analyses of trace-metal concentrations*--Continued

11266400 MERCED RIVER AT EL CAPITAN BRIDGE NEAR YOSEMITE VILLAGE

DATE	TIME	INSTAN-TANEOUS DIS-CHARGE (FT^3/S)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL ARSENIC (AS) (UG/L)	DIS-SOLVED ARSENIC (AS) (UG/L)	TOTAL CAD-MIUM (CD) (UG/L)	DIS-SOLVED CAD-MIUM (CD) (UG/L)	TOTAL CHRO-MIUM (CR) (UG/L)
MAY , 1973									
30...	1200	3680	210	30	6	--	0	--	10
JULY									
03...	1500	--	160	50	0	0	<10	0	10
04...	0935	--	120	40	1	0	<10	1	0
05...	0815	--	120	30	6	0	<10	1	0
SEP.									
02...	1445	42	280	60	4	0	0	2	0
03...	1050	40	240	120	1	2	0	0	0
04...	0910	38	340	60	33	2	0	1	0
JULY, 1974									
03...	1315	--	110	--	2	3	<10	1	0
04...	1200	--	110	--	1	2	<10	0	0
05...	0820	--	110	--	2	4	<10	0	0
SEP.									
01...	1400	59	270	100	1	0	<10	<1	0
02...	1300	56	290	70	0	2	<10	0	0
03...	0900	56	200	70	0	1	<10	0	0

DATE	DIS-SOLVED CHRO-MIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	TOTAL LEAD (PB) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)	TOTAL MERCURY (HG) (UG/L)	DIS-SOLVED MERCURY (HG) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DIS-SOLVED ZINC (ZN) (UG/L)
MAY , 1973									
30...	--	0	--	400	--	.3	--	560	--
JULY									
03...	0	<25	1	<50	0	.3	.1	10	10
04...	0	<25	0	<50	2	.2	.1	0	0
05...	0	<25	2	<50	0	.5	.0	0	0
SEP.									
02...	0	<25	0	<50	1	.3	.3	--	--
03...	0	<25	0	<50	3	.0	.0	40	50
04...	0	<25	0	<50	1	.0	.0	200	0
JULY, 1974									
03...	0	<50	0	<100	2	.0	.0	0	0
04...	0	<50	0	<100	3	4.2	.0	0	0
05...	0	<50	0	<100	2	.0	.0	0	0
SEP.									
01...	0	<50	2	<100	4	.0	.0	10	10
02...	0	<50	0	<100	2	.0	.0	10	0
03...	0	<50	0	<100	1	.0	.0	0	0

Table 6.--*Analyses of trace-metal concentrations*--Continued

11267050 MERCED RIVER AT RANCHERIA FLAT NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DISCHARGE (FT3/S)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL ARSENIC (AS) (UG/L)	DISSOLVED ARSENIC (AS) (UG/L)	TOTAL CADMIUM (CD) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	TOTAL CHROMIUM (CR) (UG/L)
MAY , 1973									
30...	1600	4860	230	30	4	--	0	--	0
JULY									
03...	1400	--	130	50	1	0	<10	0	10
04...	1030	--	120	50	5	6	<10	0	10
05...	0900	632	120	40	0	0	<10	0	0
SEP.									
02...	1205	52	80	40	0	1	0	0	0
03...	1255	54	100	30	2	0	0	0	0
04...	1025	54	100	20	0	0	0	0	0
JULY, 1974									
03...	1200	--	120	--	2	2	<10	0	0
04...	1030	--	150	--	1	3	<10	0	0
05...	0900	--	110	--	2	3	<10	0	0
SEP.									
01...	1250	61	70	60	1	1	<10	0	0
02...	1030	61	80	50	2	1	<10	0	0
03...	1020	55	80	60	1	1	<10	<1	0

DATE	DISSOLVED CHROMIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DISSOLVED COBALT (CO) (UG/L)	TOTAL LEAD (PB) (UG/L)	DISSOLVED LEAD (PB) (UG/L)	TOTAL MERCURY (HG) (UG/L)	DISSOLVED MERCURY (HG) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)
MAY , 1973									
30...	--	0	--	<100	--	.4	--	20	--
JULY									
03...	0	<25	1	<50	2	.1	.0	10	0
04...	0	<2	1	<50	2	.2	.0	0	0
05...	0	<25	1	<50	1	.1	.0	100	0
SEP.									
02...	0	<25	0	<50	2	.0	.0	80	80
03...	0	<25	0	<50	0	.0	.0	50	60
04...	0	<25	1	<50	1	.0	.0	0	0
JULY, 1974									
03...	0	<50	0	<100	2	.1	.1	--	--
04...	0	<50	0	<100	4	.0	.0	0	0
05...	0	<50	0	<100	3	.0	.0	0	0
SEP.									
01...	0	<50	0	<100	0	.0	.0	10	0
02...	0	<50	0	<100	2	.0	.0	10	0
03...	0	<50	0	<100	3	.2	.0	10	0

Table 6.--*Analyses of trace-metal concentrations*--Continued

11268000 SOUTH FORK MERCED RIVER NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DISCHARGE (FT³/S)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL ARSENIC (AS) (UG/L)	DISSOLVED ARSENIC (AS) (UG/L)	TOTAL CADMIUM (CD) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	TOTAL CHROMIUM (CR) (UG/L)
MAY, 1973									
31...	0820	1910	320	30	1	--	0	--	0
JULY									
03...	1240	140	60	10	0	0	<10	1	0
04...	1100	129	50	10	0	0	<10	0	10
05...	0925	127	60	10	0	0	<10	0	0
SEP.									
02...	1100	15	50	30	3	0	0	0	0
03...	1510	15	40	10	0	2	0	0	0
04...	1100	15	50	20	2	2	0	0	0
JULY, 1974									
03...	1130	134	70	--	2	2	<10	0	0
04...	0930	111	50	--	2	3	<10	0	0
05...	0920	107	50	--	1	3	<10	0	0
SEP.									
01...	1230	17	40	20	0	0	<10	0	0
02...	0900	16	40	20	1	1	<10	<1	0
03...	1130	16	50	20	1	0	<10	0	0

DATE	DISSOLVED CHROMIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DISSOLVED COBALT (CO) (UG/L)	TOTAL LEAD (PB) (UG/L)	DISSOLVED LEAD (PB) (UG/L)	TOTAL MERCURY (HG) (UG/L)	DISSOLVED MERCURY (HG) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)
MAY, 1973									
31...	--	0	--	<100	--	.3	--	20	--
JULY									
03...	0	<25	1	<50	3	.1	.1	0	0
04...	0	<25	1	<50	3	.2	.0	10	0
05...	0	<25	1	<50	3	.2	.1	30	0
SEP.									
02...	0	<25	1	<50	2	.0	.0	--	--
03...	0	<25	0	<50	0	.0	.0	0	0
04...	0	<25	0	<50	1	.0	.0	0	10
JULY, 1974									
03...	0	<50	0	<100	3	.0	.0	40	0
04...	0	<50	0	<100	3	.0	.0	0	0
05...	0	<50	0	<100	4	.0	.0	0	0
SEP.									
01...	0	<50	0	<100	2	.0	.0	10	0
02...	0	<50	0	<100	2	.0	.0	20	0
03...	0	<50	0	<100	2	.0	.0	0	0

High trace-metal concentrations become important because some metals are more toxic in soft water systems such as the Merced River (Environmental Protection Agency, 1972, p. 178).

Suspended Sediment and Turbidity

Suspended-sediment concentrations (table 7) were low (1 to 32 mg/ℓ), indicating a system that transports limited quantities of suspended material. Turbidity (table 7) was extremely low in all samples, ranging from <1 to 6 JTU (Jackson Turbidity Units).

Dissolved Oxygen

The highest DO (dissolved oxygen) concentration (15 mg/ℓ) was measured February 21, 1974, at Happy Isles Bridge; the lowest (7.1 mg/ℓ) was measured on September 3, 1973, at El Capitan Bridge. In the Merced River the recommended minimum concentration of DO for high-level protection of fish (including trout) should not be less than 6.5 mg/ℓ. For spawning salmonid fishes (salmon, trout), the recommended minimum DO concentration should not be less than 6.8 mg/ℓ (Environmental Protection Agency, 1972, p. 134). Periodic measurements of DO concentration (fig. 4) were above these recommended concentrations.

RESULTS OF DIEL SAMPLING

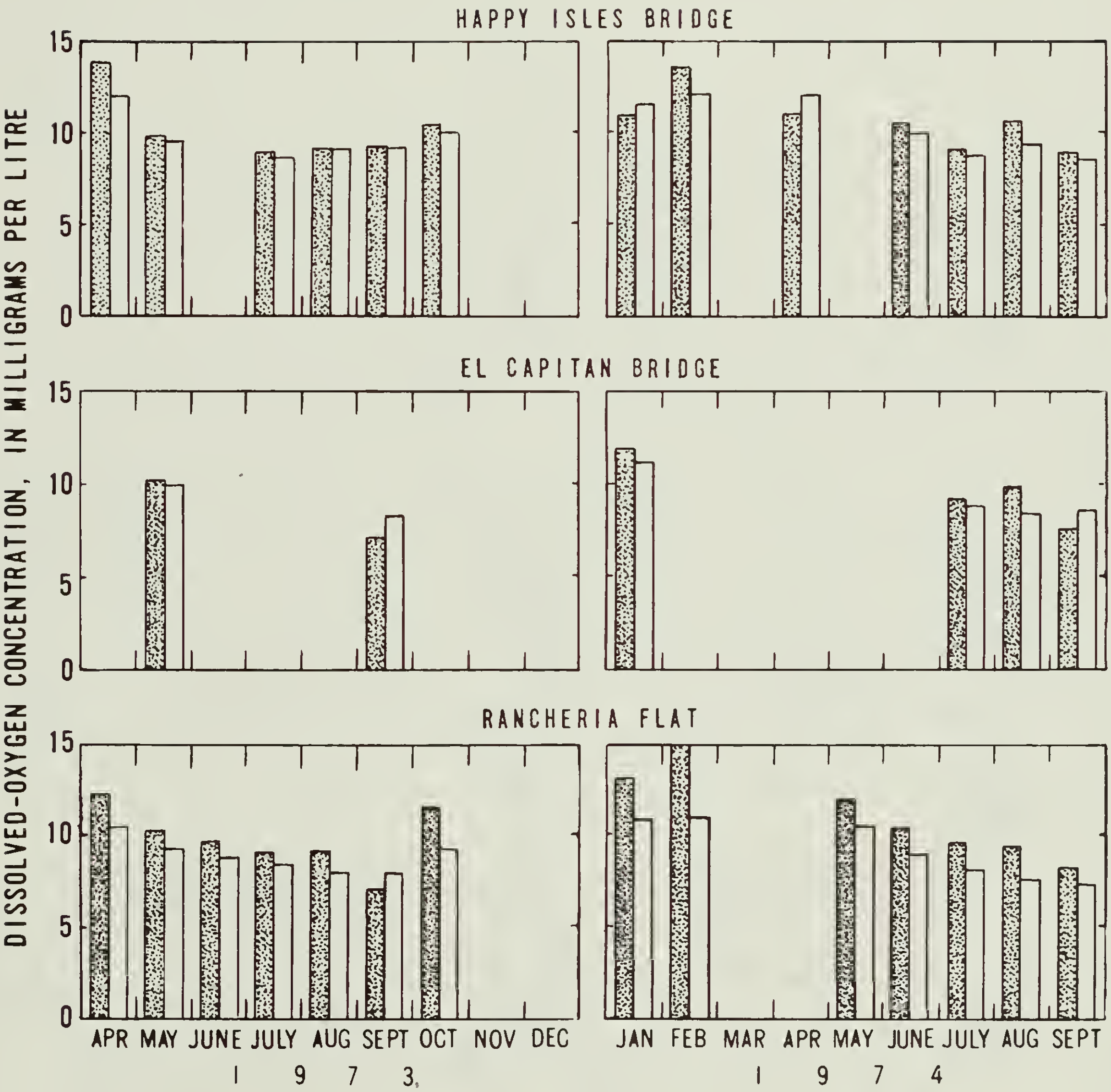
Daily fluctuations of dissolved-oxygen concentration are to be expected where there are appreciable numbers of aquatic plants. To delineate daily changes in the concentration of DO, measurements were made over 24-hour periods on the Labor Day weekends of September 1973 and 1974 (fig. 5). Associated variables, such as temperature, alkalinity, and pH were also determined. The conditions of low flow, prolonged sunlight, and elevated temperature are inducive to increased photosynthesis. In addition, coliform bacteria densities (table 8) were measured because Labor Day weekend was also the time of increased numbers of park visitors; consequently, large amounts of wastewater would be discharged into the river.

Dissolved Oxygen

The three Merced River stations and South Fork Merced station showed the expected daily DO fluctuations, with a diurnal increase and a nocturnal decrease (fig. 5). Maximum oxygen production generally occurred during the late afternoon, when photosynthesis greatly exceeded respiration; minimum production usually occurred during the late night hours when respiration greatly exceeded photosynthesis.

Table 7.--*Suspended-sediment concentrations and turbidity*

DATE	TIME	TEMPERATURE (DEG C)	INSTANTANEOUS DISCHARGE (FT^3/S)	SUSPENDED SEDIMENT (MG/L)	SUSPENDED SEDIMENT DISCHARGE (T/DAY)	TURBIDITY (JTU)
11264500 MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE						
APR., 1973						
19...	1130	2.5	309	1	.83	--
MAY						
29...	1815	10.5	2660	20	144	--
JUNE						
19...	1330	12.0	1030	3	8.3	--
JULY						
03...	1400	--	--	2	--	<1
03...	1825	15.5	470	2	2.5	--
04...	0740	11.5	465	1	1.3	--
05...	0735	13.0	474	1	1.3	--
SEP.						
02...	1510	14.0	20	1	.06	--
03...	0925	12.5	20	1	.05	--
04...	0805	12.0	20	1	.05	--
JULY, 1974						
04...	1350	15.5	643	1	1.7	<1
05...	0745	12.5	634	2	3.4	<1
AUG.						
15...	0800	--	99	2	.53	--
SEP.						
01...	1430	13.5	37	2	.20	--
02...	1400	13.0	34	1	.09	--
03...	0800	13.0	34	1	.09	--
11266400 MERCED RIVER AT EL CAPITAN BRIDGE, NEAR YOSEMITE VILLAGE						
MAY , 1973						
30...	1345	--	3680	10	99	2
JUNE						
19...	1610	--	1640	3	13	1
JULY						
03...	1500	15.0	--	3	--	1
04...	0940	--	--	2	--	1
05...	0940	--	--	2	--	2
AUG.						
08...	1245	--	317	2	1.7	6
SEP.						
02...	1445	17.0	42	2	.23	6
03...	1050	15.5	40	3	.32	6
04...	0910	14.5	38	2	.21	6
SEP., 1974						
02...	1300	18.5	56	3	.45	--
03...	0900	15.5	56	1	.15	--
11267050 MERCED RIVER AT RANCHERIA FLAT, NEAR EL PORTAL						
MAY , 1973						
30...	1700	--	4860	32	420	1
JUNE						
19...	1800	--	1970	4	21	2
JULY						
04...	1040	--	--	2	--	1
05...	1210	--	632	2	3.4	1
AUG.						
08...	1100	18.5	299	2	1.6	6
SEP.						
02...	1205	20.0	52	2	.28	4
03...	1255	19.5	54	1	.15	6
04...	1025	18.0	54	1	.15	5
JULY, 1974						
03...	1200	17.0	--	2	--	<1
04...	1030	17.5	--	2	--	<1
05...	0900	17.0	--	3	--	<1
AUG.						
15...	1030	--	--	3	--	--
SEP.						
01...	1250	20.0	61	1	.16	--
02...	1030	18.5	61	1	.16	--
03...	1020	13.0	55	2	.30	--
11268200 MERCED RIVER NEAR BRICEBURG						
JULY, 1974						
03...	1315	--	--	2	--	<1
04...	1200	--	--	2	--	2
05...	0820	--	--	2	--	<1
AUG.						
15...	0930	--	--	3	--	--
SEP.						
01...	1140	21.0	97	1	.26	--
01...	1400	--	--	2	--	--
02...	0820	20.5	97	1	.26	--



EXPLANATION

Stippled bar represents measured dissolved oxygen;
open bar represents dissolved oxygen at saturation

FIGURE 4.--Summary of dissolved-oxygen analyses.

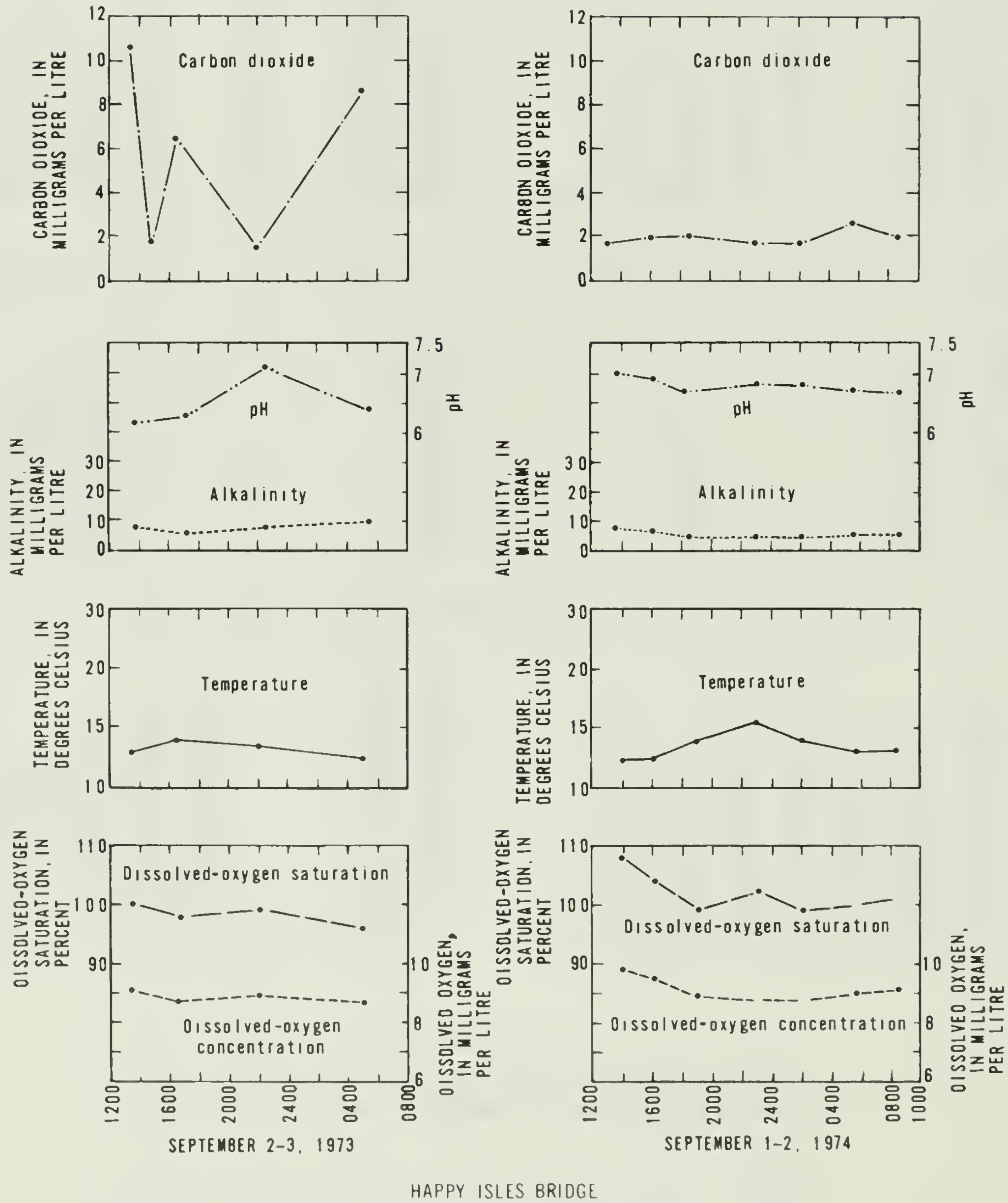


FIGURE 5.--Results of diel study.

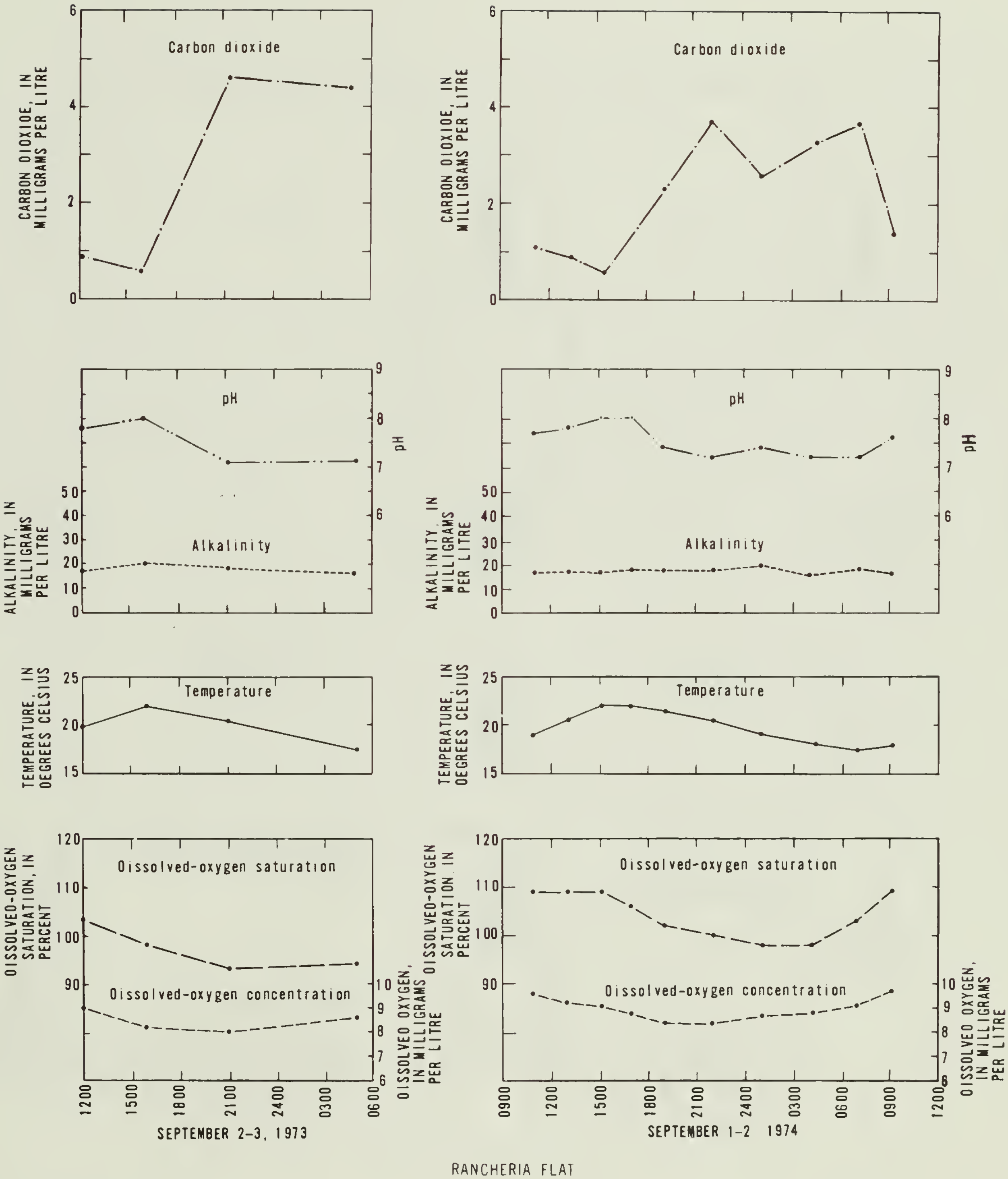


FIGURE 5.-- Results of diel study--continued.

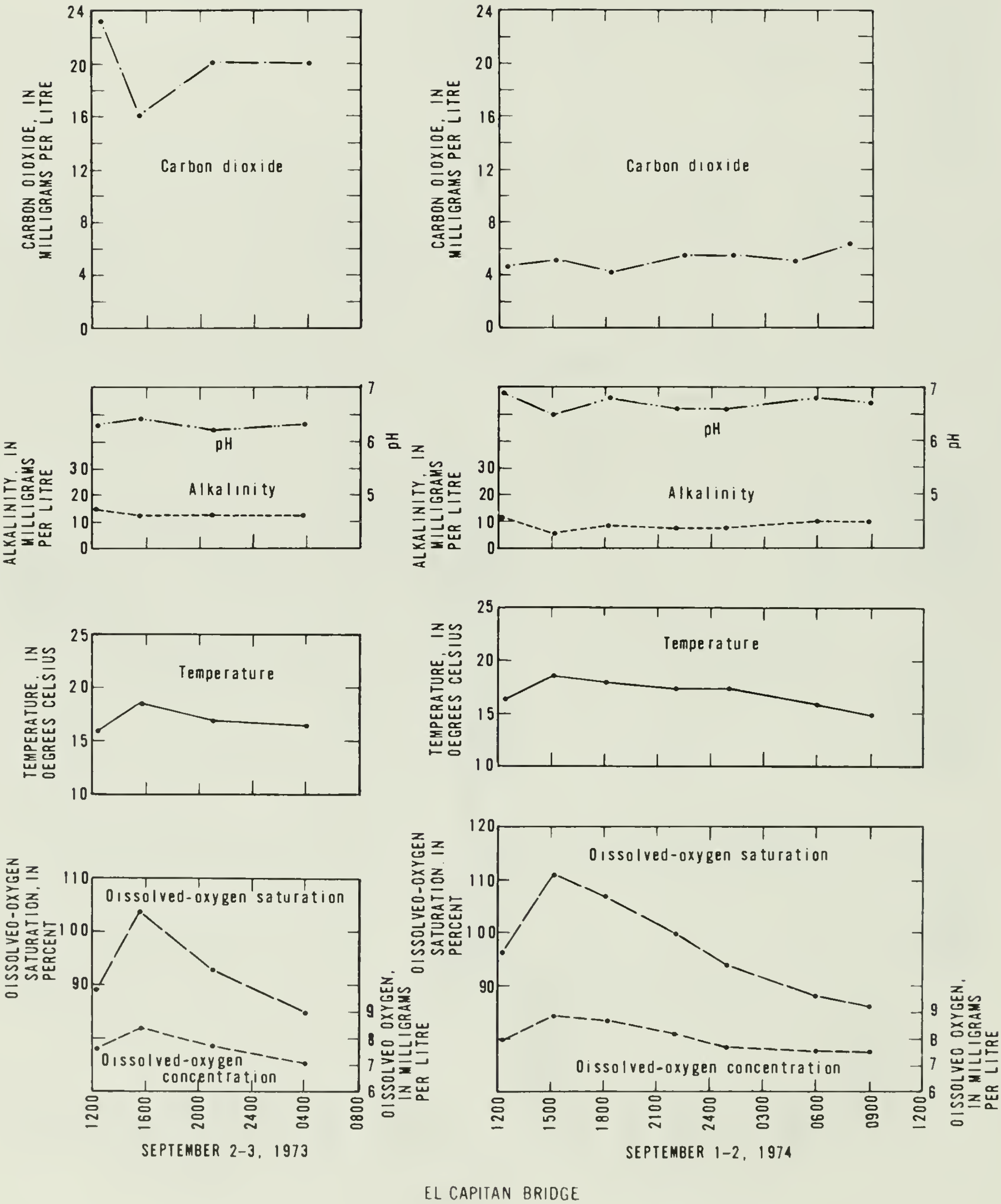


FIGURE 5.--Results of diel study--continued.

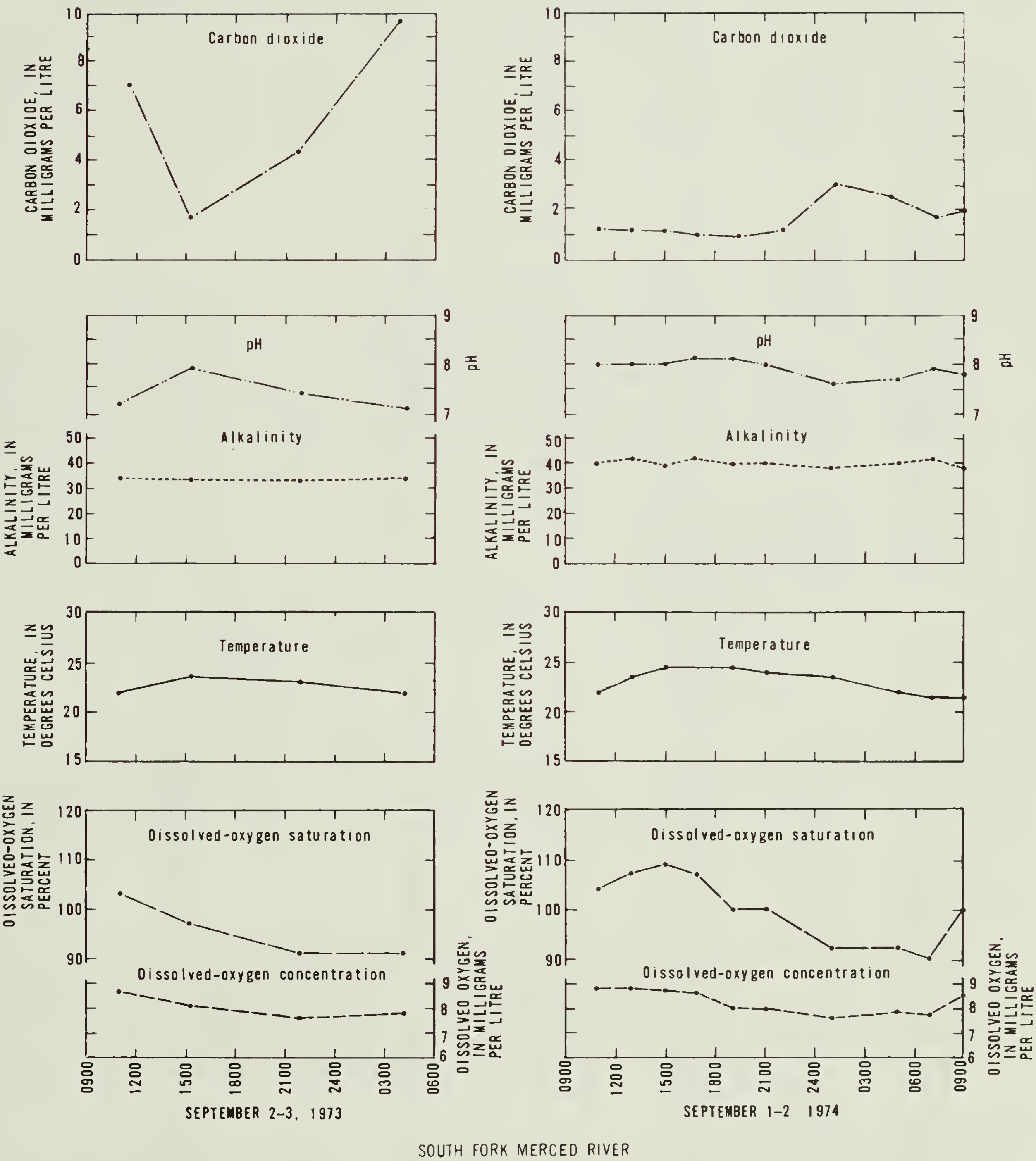


FIGURE 5.--Results of diel study--continued.

Table 8.--*Results of bacteria counts over a diel (24-hour) period*

[B, indicates counts based on nonideal numbers of colonies in samples]

Sampling date	Time (hours)	Water temperature (°C)	Discharge (ft^3/s)	Bacteria counts, in colonies/100 ml	
				Fecal coliform	Fecal streptococci
		Merced River at Happy Isles Bridge			
9-2-73	1330	13.0	--	B4	--
9-2-73	1510	14.0	20	--	--
9-2-73	1630	14.0	--	<1	--
9-2-73	2200	13.5	--	B9	--
9-1-74	1340	12.5	37	B5	--
9-1-74	1600	12.5	--	B8	--
9-1-74	1840	14.0	--	B10	--
9-1-74	2300	15.5	--	B5	--
9-2-74	0200	14.0	--	B8	--
9-2-74	0530	13.0	--	B6	--
9-2-74	0830	13.0	34	B14	--
		Merced River at El Capitan Bridge			
9-2-73	1230	16.0	--	B2	--
9-2-73	1545	18.5	42	62	--
9-2-73	2115	17.0	--	18	--
9-3-73	0415	16.5	41	B18	--
9-1-74	1515	18.0	59	59	--
9-1-74	1815	18.0	--	52	--
9-1-74	2330	17.5	--	B16	--
9-2-74	1115	17.5	--	32	--
9-2-74	0445	16.0	--	23	--
9-2-74	0745	15.0	56	24	--
		Merced River at Rancheria Flat			
9-2-73	1205	20.0	52	<1	--
9-2-73	1545	22.0	--	<1	--
9-2-73	2110	20.5	--	B3	--
9-2-73	0455	17.5	53	B3	--
9-1-74	1120	19.0	61	B2	B12
9-1-74	1325	20.5	--	B2	B11
9-1-74	1520	22.0	--	B9	B14
9-1-74	1715	22.0	--	B3	20
9-1-74	1915	21.5	--	B5	40
9-1-74	2200	20.5	--	B6	30
9-2-74	0110	19.0	--	B5	100
9-2-74	0430	18.0	--	B6	21
9-2-74	0705	17.5	--	B10	29
9-2-74	0915	18.0	61	24	B4
		South Fork Merced River			
9-2-73	1135	22.0	16	B1	--
9-2-73	1515	23.5	--	B2	--
9-2-73	2150	23.0	--	B1	--
9-3-73	0420	22.0	15	B2	--
9-1-74	1100	22.0	--	B1	120
9-1-74	1310	23.5	16	B1	65
9-1-74	1500	24.5	--	<1	85
9-1-74	1700	24.5	--	B2	75
9-1-74	1930	24.5	--	<1	70
9-1-74	2210	24.0	--	B2	55
9-2-74	0125	23.5	--	<1	60
9-2-74	0440	22.0	--	B2	45
9-2-74	0720	21.5	--	B2	40
9-2-74	0900	21.5	16	B5	40

Temperature

Water-temperature data, except for the measurements at Happy Isles Bridge during September 1-2, 1974, show the usual daily warming-cooling cycle (fig. 5). The data also show an increase in temperature from Happy Isles Bridge downstream to Rancheria Flat. The late afternoon temperatures in the Merced River at Rancheria Flat and in the South Fork Merced River are critical to the livelihood of trout and potential algal growth. Continuous temperature data recorded at Happy Isles Bridge are shown in table 9.

Alkalinity

Alkalinity is a measure of the ability of water to neutralize acids. The Merced River had extremely low alkalinity values (fig. 5) and little daily fluctuation occurred at each station. A downstream increase in alkalinity from Happy Isles Bridge to Rancheria Flat, however, was evident. The South Fork Merced River had the highest alkalinity during the September 1973-74 diel measurements. Periodic measurements indicate that alkalinity was low at other times throughout the 1973-74 study period:

Sampling station	Range in alkalinity expressed as $CaCO_3$ (milligrams per litre)
Happy Isles Bridge	3 - 17
El Capitan Bridge	2 - 23
Rancheria Flat	3 - 33
South Fork Merced River	2 - 70

Low values indicate that the Merced River could not withstand the addition of much acid without sustaining a significant change in the aquatic environment.

pH

The graphs of pH measurements (fig. 5) show a downstream increase from Happy Isles Bridge to Rancheria Flat. With the exception of the September 2-3, 1973, measurements at Happy Isles Bridge, there was a noticeable rise in pH during the daytime. Typically, pH increases during the period of active photosynthesis with plant uptake of dissolved carbon dioxide and decreases during the hours of darkness because of community respiration.

In general, during the diel sampling periods, the Happy Isles Bridge and El Capitan Bridge stations had pH values below neutral (<7.0), whereas Rancheria Flat and South Fork Merced River had pH values above neutral (>7.0).

Table 9.--*Daily water temperature, Merced River at Happy Isles Bridge*

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE NEAR YOSEMITE

TEMPERATURE (DEG. C) OF WATER , WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DAY	OCTOBER MAX	OCTOBER MIN	NOVEMBER MAX	NOVEMBER MIN	DECEMBER MAX	DECEMBER MIN	JANUARY MAX	JANUARY MIN	FEBRUARY MAX	FEBRUARY MIN	MARCH MAX	MARCH MIN
1	11.5	10.5	5.0	3.5	2.5	1.5	0.5	0.5	1.5	1.0	3.5	2.0
2	11.5	10.0	5.5	4.5	2.0	1.0	1.0	0.5	2.0	1.5	3.0	1.0
3	11.0	10.0	5.5	4.5	2.5	1.5	1.0	0.5	2.5	2.0	2.0	1.0
4	11.0	10.0	5.5	5.5	2.5	1.0	0.5	0.5	2.5	1.5	1.5	1.0
5	11.0	9.0	5.5	4.0	1.0	0.5	0.5	0.5	2.5	1.5	1.5	0.5
6	11.0	9.5	4.5	3.0	1.0	0.5	1.0	0.5	3.0	2.0	2.0	1.5
7	11.5	10.0	5.0	4.5	1.0	0.5	1.0	0.5	3.0	2.0	2.5	1.0
8	11.0	9.5	4.5	3.5	1.0	0.5	1.5	1.0	3.0	1.5	3.0	2.0
9	10.5	9.0	3.5	2.5	0.5	0.5	1.5	1.0	2.5	1.5	4.0	1.5
10	10.0	9.0	3.5	3.0	1.0	0.5	1.5	1.5	2.5	1.5	4.5	2.5
11	9.5	8.5	3.5	2.5	0.5	0.5	1.5	1.5	1.5	1.0	3.5	1.5
12	9.0	7.5	2.5	1.5	1.0	0.5	2.5	1.0	1.5	1.0	2.5	1.0
13	8.5	7.0	2.5	2.0	1.5	1.0	3.0	2.0	2.0	1.5	2.5	1.0
14	8.5	6.5	2.5	1.5	1.5	1.0	3.0	1.5	2.0	1.0	2.0	1.0
15	8.0	7.0	2.5	1.5	2.0	1.5	3.0	2.0	2.0	1.0	3.0	1.0
16	7.5	6.5	2.5	1.5	2.0	1.5	2.5	1.5	2.0	1.0	4.0	2.0
17	7.5	6.5	3.0	2.0	1.5	1.0	2.0	1.5	2.5	1.0	3.5	1.5
18	7.5	6.5	3.0	2.0	3.0	1.0	3.0	1.5	2.0	1.0	3.5	1.0
19	7.5	6.5	3.0	1.5	3.5	3.0	2.0	1.0	2.5	1.0	3.5	1.0
20	8.0	7.0	2.0	1.5	3.5	2.5	1.0	0.5	2.5	1.0	1.5	1.0
21	9.0	7.0	2.0	1.5	4.0	2.0	2.0	1.0	2.5	1.5	1.5	0.5
22	9.0	6.5	2.0	1.5	4.5	3.0	1.5	1.0	3.5	1.0	1.5	0.5
23	9.0	7.0	1.5	1.0	3.5	2.5	1.5	1.0	3.5	2.0	2.5	1.0
24	8.5	6.5	1.5	1.0	3.5	2.5	1.5	1.0	3.5	2.5	4.5	1.5
25	7.0	5.5	3.0	1.5	3.0	2.0	2.0	1.5	3.0	1.5	5.0	2.5
26	7.0	5.5	3.5	2.0	3.5	2.5	1.5	1.0	3.0	1.5	4.0	3.5
27	7.0	6.0	3.0	2.0	3.5	2.0	1.0	1.0	3.5	2.5	4.5	3.0
28	7.0	5.5	3.0	2.0	2.0	1.0	1.5	1.0	3.5	2.5	3.5	1.5
29	5.5	3.0	2.5	1.5	1.0	0.5	1.5	1.0	---	---	3.0	1.0
30	3.0	2.0	2.5	1.5	1.0	0.5	1.5	1.0	---	---	4.0	3.0
31	3.5	2.0	---	---	0.5	0.5	1.5	1.0	---	---	5.5	3.5
MONTH	11.5	2.0	5.5	1.0	4.5	0.5	3.0	0.5	3.5	1.0	5.5	0.5

DAY	APRIL MAX	APRIL MIN	MAY MAX	MAY MIN	JUNE MAX	JUNE MIN	JULY MAX	JULY MIN	AUGUST MAX	AUGUST MIN	SEPTEMBER MAX	SEPTEMBER MIN
1	3.5	1.0	7.0	2.5	10.0	7.5	14.5	10.5	17.0	14.0	13.0	11.0
2	2.5	0.5	7.5	3.5	11.0	6.5	15.0	10.5	17.0	15.0	14.0	12.0
3	3.5	1.5	7.0	3.5	10.5	7.5	16.0	11.0	17.0	15.5	13.0	12.0
4	5.0	2.5	5.5	3.5	12.0	7.5	16.5	11.5	16.0	14.0	13.0	11.5
5	6.5	2.5	5.0	2.5	11.5	8.0	16.5	13.5	16.0	14.0	13.0	11.5
6	6.5	3.5	8.5	3.5	12.0	8.5	16.5	13.0	16.5	15.0	13.5	11.5
7	5.5	2.0	9.0	4.5	12.5	8.0	16.5	13.0	17.0	14.0	13.5	11.5
8	6.5	1.5	9.5	4.5	13.0	9.0	17.0	13.5	17.0	14.5	13.5	11.5
9	5.5	3.0	9.0	4.5	12.0	8.5	17.5	14.0	16.5	14.0	13.0	11.0
10	6.0	3.5	9.0	5.0	12.0	9.0	17.5	14.0	16.0	12.5	13.0	11.0
11	6.5	3.5	9.5	5.0	12.0	9.5	17.0	14.0	16.5	13.5	13.0	11.0
12	6.5	3.5	9.0	5.5	12.0	9.5	16.5	14.0	16.0	13.5	13.5	11.5
13	4.5	2.5	8.5	6.0	11.5	9.5	17.0	13.5	17.0	15.0	14.0	12.0
14	5.5	2.5	9.0	6.5	10.0	8.5	17.5	14.0	17.5	15.0	14.0	12.0
15	5.5	3.0	9.0	6.0	11.0	7.0	17.5	14.5	17.0	15.5	13.5	11.5
16	6.5	3.0	10.0	6.0	11.0	7.5	17.5	14.0	16.0	14.5	13.0	11.0
17	6.0	2.0	10.5	6.5	11.5	8.0	17.0	14.5	16.5	14.5	12.5	11.0
18	5.0	1.5	9.5	7.0	12.5	8.0	17.0	15.0	16.0	13.5	12.0	10.0
19	5.0	2.5	9.0	6.5	13.5	9.5	17.0	14.0	16.0	14.0	12.5	10.0
20	4.5	1.5	9.0	6.0	13.5	9.5	16.0	13.0	15.0	13.0	11.5	10.0
21	6.5	2.0	10.0	6.0	13.5	10.5	16.0	13.0	15.5	13.5	11.5	9.5
22	7.0	2.5	9.0	6.5	13.0	10.0	15.5	11.5	14.5	12.5	11.0	9.5
23	8.0	4.0	10.5	6.5	13.0	10.0	15.0	13.0	13.0	10.5	11.0	9.0
24	8.5	3.5	8.5	6.5	14.0	10.0	15.5	12.0	12.0	9.0	11.0	9.0
25	8.5	3.5	8.5	6.0	15.5	10.5	16.5	13.5	12.0	10.5	10.5	8.5
26	7.5	4.0	9.5	5.5	16.0	12.5	16.5	14.5	12.0	11.0	10.5	8.5
27	7.5	4.0	11.5	6.0	16.5	14.5	16.5	14.5	12.5	10.5	11.0	9.0
28	7.0	4.0	11.5	7.5	15.5	13.5	17.0	15.0	13.0	11.0	11.0	9.0
29	6.5	3.0	10.5	8.0	15.5	12.5	17.0	14.5	13.0	11.5	11.0	9.0
30	5.5	3.0	10.0	8.0	14.0	11.5	16.0	14.5	14.0	12.0	11.0	8.5
31	---	---	9.5	7.5	---	---	16.5	14.5	13.5	11.5	---	---
MONTH	8.5	0.5	11.5	2.5	16.5	6.5	17.5	10.5	17.5	9.0	14.0	8.5
YEAR	17.5	0.5										

Table 9.--*Daily water temperature, Merced River at Happy Isles Bridge*--Continued

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE NEAR YOSEMITE--Continued

TEMPERATURE (DEG. C) OF WATER , WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCTOBER MAX	OCTOBER MIN	NOVEMBER MAX	NOVEMBER MIN	DECEMBER MAX	DECEMBER MIN	JANUARY MAX	JANUARY MIN	FEBRUARY MAX	FEBRUARY MIN	MARCH MAX	MARCH MIN
1	10.0	8.5	7.0	6.0	3.5	0.5	1.5	1.0	3.0	1.0	2.5	1.5
2	10.5	8.5	6.5	5.5	1.0	0.5	1.0	0.5	1.5	0.5	3.5	0.0
3	9.5	7.0	6.5	3.5	1.5	1.0	1.0	0.5	2.5	1.0	0.5	0.0
4	10.0	7.5	3.5	2.5	2.5	1.5	1.0	0.5	2.5	1.0	1.0	0.0
5	9.5	7.5	4.5	2.5	2.5	1.5	1.5	1.0	---	---	3.0	1.0
6	9.5	7.5	7.5	4.5	3.0	2.0	1.5	1.0	---	---	3.5	1.5
7	8.5	8.5	9.0	7.0	4.0	2.5	1.5	1.0	---	---	2.5	1.5
8	8.5	7.5	7.5	5.0	3.0	2.0	2.0	1.5	---	---	3.0	1.5
9	7.5	6.5	8.0	4.5	3.5	2.0	2.0	1.0	---	---	4.0	1.5
10	7.0	6.0	8.5	7.0	3.5	2.0	1.0	1.0	---	---	4.0	2.0
11	7.5	6.5	8.0	7.0	3.0	1.5	1.5	1.0	---	---	4.5	2.5
12	8.0	7.0	7.0	4.0	3.5	1.5	2.5	1.5	1.5	0.5	5.0	3.5
13	9.5	8.0	5.0	3.5	3.5	3.0	2.0	1.5	1.0	0.5	5.0	2.0
14	9.5	8.5	4.0	3.0	3.5	2.0	3.0	1.5	1.5	1.0	6.5	3.5
15	9.5	8.5	5.0	3.0	3.5	2.0	4.0	3.0	2.5	1.5	6.0	3.5
16	9.5	8.5	5.0	4.0	4.0	2.5	3.5	3.0	2.5	1.0	6.5	4.0
17	9.5	8.5	5.0	4.0	4.0	2.0	4.5	3.0	1.5	0.5	5.5	3.0
18	9.0	8.0	4.0	2.0	2.0	1.0	5.0	3.0	2.5	1.0	5.5	3.0
19	9.0	9.0	2.5	1.0	2.0	1.0	4.5	3.5	2.5	0.5	6.5	3.0
20	10.0	9.0	3.0	2.5	2.5	1.5	4.0	2.5	1.5	0.5	6.0	2.5
21	9.0	8.5	3.0	1.5	3.5	1.5	2.5	1.0	1.5	1.0	5.5	2.5
22	9.0	8.5	1.5	1.0	2.0	1.5	2.5	1.0	2.5	1.5	5.5	2.0
23	8.5	6.5	2.0	1.0	2.0	1.5	3.5	2.0	2.5	1.0	6.0	2.5
24	7.0	6.5	2.5	1.5	3.0	2.0	3.5	2.5	3.0	1.0	6.5	3.0
25	7.0	6.5	1.5	1.0	3.5	2.5	3.0	2.0	3.0	1.0	5.0	3.5
26	7.5	5.5	1.5	1.5	3.5	2.0	2.0	0.5	3.0	1.5	6.5	4.5
27	7.5	5.5	2.5	1.5	3.5	2.0	1.5	0.5	3.0	2.0	5.5	4.5
28	7.5	6.0	3.0	2.0	4.5	3.0	2.0	0.5	3.0	2.0	6.0	3.0
29	6.5	5.0	3.5	2.5	4.5	3.0	2.0	0.5	---	---	7.0	5.0
30	7.0	5.5	4.0	3.5	3.0	1.5	2.0	1.0	---	---	5.5	3.5
31	7.5	6.5	---	---	2.0	1.5	3.0	1.5	---	---	4.5	1.5
MONTH	10.5	5.0	9.0	1.0	4.5	0.5	5.0	0.5	---	---	7.0	0.0

DAY	APRIL MAX	APRIL MIN	MAY MAX	MAY MIN	JUNE MAX	JUNE MIN	JULY MAX	JULY MIN	AUGUST MAX	AUGUST MIN	SEPTEMBER MAX	SEPTEMBER MIN
1	4.0	3.0	---	---	---	---	15.5	12.0	---	---	14.5	12.5
2	3.5	1.0	---	---	---	---	15.5	12.0	---	---	15.0	13.5
3	4.5	1.0	---	---	---	---	15.5	12.0	---	---	15.5	13.5
4	6.0	2.0	---	---	---	---	15.0	12.0	---	---	14.5	13.0
5	6.0	3.5	---	---	---	---	14.5	11.5	---	---	15.0	13.5
6	7.0	3.5	---	---	---	---	14.0	10.5	---	---	15.5	14.0
7	7.0	2.5	---	---	---	---	14.0	11.0	---	---	15.5	14.0
8	5.5	3.5	---	---	---	---	12.5	11.5	---	---	15.0	13.5
9	5.5	2.0	---	---	---	---	---	---	---	---	15.0	13.5
10	5.5	1.0	---	---	---	---	---	---	---	---	14.5	13.5
11	7.5	3.0	---	---	---	---	---	---	---	---	14.5	13.5
12	8.0	4.0	---	---	---	---	---	---	---	---	15.0	14.0
13	---	---	---	---	13.0	8.5	---	---	---	---	14.0	12.5
14	---	---	---	---	12.5	8.5	---	---	13.5	11.0	13.5	12.0
15	---	---	---	---	12.0	8.5	---	---	14.5	11.5	13.5	12.5
16	---	---	---	---	11.0	9.0	---	---	14.0	11.0	13.0	12.0
17	---	---	---	---	11.0	8.0	---	---	14.0	10.5	13.0	11.5
18	---	---	---	---	11.0	8.0	---	---	14.0	11.0	12.5	11.0
19	---	---	---	---	11.0	8.5	---	---	12.5	10.5	13.0	11.5
20	---	---	---	---	12.5	7.5	---	---	13.5	10.0	12.5	11.0
21	---	---	---	---	13.0	9.5	---	---	13.5	11.5	13.0	11.0
22	---	---	---	---	13.5	10.5	---	---	13.5	11.0	13.0	11.5
23	---	---	9.5	6.0	14.0	10.5	---	---	15.5	---	13.0	11.5
24	---	---	---	---	13.0	9.5	---	---	---	---	12.5	11.0
25	---	---	---	---	13.0	10.0	---	---	---	---	12.5	11.0
26	---	---	---	---	13.0	9.0	---	---	15.0	12.5	13.0	11.0
27	---	---	---	---	14.0	9.5	---	---	15.5	13.0	13.0	11.0
28	---	---	---	---	15.0	11.0	---	---	15.5	13.5	12.5	10.5
29	---	---	---	---	16.0	11.5	---	---	16.0	14.0	11.5	10.0
30	---	---	---	---	15.5	12.5	---	---	15.0	13.0	12.0	10.0
31	---	---	---	---	---	---	---	---	15.0	13.0	---	---
MONTH	---	---	---	---	---	---	---	---	---	---	15.5	10.0
YEAR	16.0	0.0										

Station	pH range
Happy Isles Bridge	6.4-7.1
El Capitan Bridge	6.0-7.3
Rancheria Flat	6.4-8.0
South Fork Merced River	6.4-8.1

The range of measurements of pH at each of the stations throughout the 18-month study period (table 10) is given below.

According to Hem (1970, p. 93), pH in surface water not affected by pollution ranges from 6.5 to 8.5.

Carbon Dioxide

Carbon dioxide is essential for photosynthesis; like dissolved oxygen and pH, the CO_2 (carbon dioxide) concentration varies in response to photosynthetic activity. Usually, a decrease in CO_2 concentration, resulting from aquatic-plant uptake, causes a corresponding increase in pH; conversely, an increase in CO_2 concentration, because of community respiration, causes a decrease in pH. The plotted data (fig. 5) for each of the stations clearly show the inverse relationship between CO_2 and pH concentrations found during active photosynthesis in the daytime and during the night when respiration is dominant.

Bacteria

Coliform bacteria densities determined during the diel sampling periods are shown in table 8. Fecal coliform bacteria tests were made throughout the 1973-74 study. In the summer of 1974, fecal streptococcal bacteria tests were begun and results obtained from this technique were included in subsequent analyses.

Bacterial densities at the sampling stations were low; however, in many instances, the results are based on nonideal colony counts. For reliable results, the ideal number of colony counts per filter should range from 20-60 for fecal coliform, and 20-100 for fecal streptococci. The fecal coliform bacteria colony counts were below the recommended minimum. For primary contact recreation, fecal coliform colony counts should not exceed a log mean of 200 per 100 ml (millilitre), nor more than 10 percent of the total samples taken during a 30-day period exceed 400 per 100 ml ([U.S.] Federal Water Pollution Control Administration, 1968, p. 8-12). In samples collected outside the diel sampling periods, fecal coliform bacteria densities (table 10) ranged from less than 1 to 20 colonies per 100 ml.

Table 10.--*Field measurements of selected physical, chemical, and biological variables*

11264500 MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE

DATE	TIME	INSTAN-TANEOUS DIS-CHARGE (FT³/S)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)	FECAL COLI-FORM (COL. PER 100 ML)	STREP-TOCOCCI (COL-ONIES PER 100 ML)
APR.										
19...	0900	350	15	0	22	6.6	2.0	13.5	--	--
MAY										
29...	1510	2520	5	0	8	6.4	10.0	9.9	<1	--
JUNE										
19...	1345	--	4	0	10	6.6	12.5	--	10	--
JULY										
03...	1630	483	5	0	9	6.5	15.5	8.8	--	--
04...	0840	470	6	0	8	6.6	11.5	9.5	--	--
05...	0745	474	11	0	8	--	13.0	--	--	--
AUG.										
08...	0915	261	6	0	13	6.5	13.5	9.2	--	--
SEP.										
02...	1330	--	8	0	24	6.2	13.0	9.1	B4	--
02...	1510	20	7	0	24	6.6	14.0	9.0	--	--
02...	1630	--	6	0	24	6.3	14.0	8.7	<1	--
02...	2200	--	8	0	24	7.1	13.5	8.9	B9	--
03...	0500	--	10	0	24	6.4	12.5	8.7	B3	--
03...	0825	20	16	0	27	--	12.5	--	--	--
04...	0805	20	16	0	27	--	12.0	--	--	--
OCT.										
03...	1100	7.4	14	0	3	7.1	7.5	10.7	--	--
NOV.										
20...	0945	222	8	0	19	--	2.5	--	--	--
JAN., 1974										
16...	0830	182	9	0	22	6.8	3.0	11.0	<1	<1
FEB.										
21...	1535	113	10	0	27	6.5	2.0	13.8	--	--
APR.										
10...	0845	274	7	0	22	6.4	1.0	11.2	<1	<1
MAY										
23...	0800	1050	5	0	10	6.8	5.5	--	--	--
JUNE										
12...	0915	2430	6	0	7	6.8	9.5	10.6	6	7
JULY, 1974										
03...	1400	652	5	0	7	6.8	15.5	--	--	--
04...	1350	643	5	0	7	6.6	15.5	9.2	4	5
05...	0745	634	6	0	8	6.8	12.5	--	--	--
AUG.										
15...	0830	99	9	0	18	6.7	11.5	10.5	20	B17
SEP.										
01...	1340	--	8	0	11	7.0	12.5	9.8	B5	--
01...	1430	37	8	0	30	--	13.5	--	--	--
01...	1600	--	7	0	11	6.9	12.5	9.5	B8	--
01...	1840	--	5	0	11	6.7	14.0	8.9	B10	--
01...	2300	--	5	0	10	6.8	15.5	8.8	B5	--
02...	0200	--	5	0	10	6.8	14.0	8.8	B8	--
02...	0530	--	6	0	10	6.7	13.0	9.0	B6	--
02...	0830	--	6	0	10	6.8	13.0	9.1	B14	--
02...	1400	34	9	0	21	--	13.0	--	--	--
03...	0800	34	8	0	11	6.9	13.0	--	--	--

Table 10.--*Field measurements of selected physical, chemical, and biological variables*--Continued

11266400 MERCED RIVER AT EL CAPITAN BRIDGE, NEAR YOSEMITE VILLAGE

DATE	TIME	INSTANTANEOUS DISCHARGE (FT^3/S)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)	FECAL COLIFORM (COL. PER 100 ML)
APR., 1973									
20...	1635	566	6	0	19	6.4	5.5	--	--
MAY									
30...	1200	3680	3	0	8	6.0	9.0	10.1	<1
JUNE									
19...	1430	1640	4	0	9	6.4	13.0	--	<1
JULY									
03...	1500	--	6	0	11	6.6	15.0	--	<1
04...	0935	--	13	0	11	--	12.5	--	--
05...	0815	--	7	0	11	--	14.0	--	--
AUG.									
08...	1000	317	7	0	16	6.5	15.0	--	B10
SEP.									
02...	1230	--	14	0	35	6.3	16.0	7.6	B2
02...	1445	42	23	0	38	--	17.0	--	--
02...	1545	--	12	0	37	6.4	18.5	8.4	62
02...	2115	--	12	0	36	6.3	17.0	7.7	18
03...	0415	--	12	0	36	6.3	16.5	7.1	B18
03...	1050	40	19	0	38	--	15.5	--	--
04...	0910	38	18	0	41	--	14.5	--	--
OCT.									
03...	1400	20	20	0	54	7.3	12.0	--	--
JAN., 1974									
15...	1500	264	--	--	27	6.4	4.0	12.0	--
FEB.									
21...	1510	186	14	0	30	6.5	3.0	--	--
APR.									
10...	0800	492	6	0	20	6.2	2.0	--	--
MAY									
22...	1530	1340	10	0	14	6.3	7.5	--	>20
JUNE									
12...	1045	--	8	0	8	6.7	9.5	--	B11
JULY									
03...	1315	--	6	0	10	--	15.0	--	--
04...	1200	--	7	0	10	6.5	15.0	9.3	--
05...	0820	--	7	0	10	--	13.5	--	--
AUG.									
14...	1500	--	9	0	24	6.5	17.0	9.8	B9
SEP.									
01...	1230	--	11	0	18	6.9	16.5	7.9	28
01...	1400	59	14	0	28	--	18.0	--	--
01...	1515	--	5	0	18	6.5	18.5	8.9	59
01...	1815	--	8	0	17	6.8	18.0	8.7	52
01...	2230	--	7	0	17	6.6	17.5	8.2	B16
02...	0115	--	7	0	15	6.6	17.5	7.7	32
02...	0445	--	10	0	14	6.8	16.0	7.5	23
02...	0745	--	10	0	14	6.7	15.0	7.5	24
02...	1300	56	14	0	29	--	18.5	--	--
03...	0900	56	26	0	27	6.4	15.5	--	--

Table 10.--*Field measurements of selected physical, chemical, and biological variables*--Continued

11267050 MERCED RIVER AT RANCHERIA FLAT, NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DIS-CHARGE (FT^3/S)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)	FECAL COLI-FORM (COL. PER 100 ML)	STREP-TOCOCCI (COL-ONIES PER 100 ML)
APR., 1973										
23...	0910	1420	7	0	20	6.7	7.5	12.2	--	--
MAY										
30...	1600	4860	4	0	8	6.6	12.0	10.3	<1	--
JUNE										
19...	1605	1970	5	0	11	6.5	15.0	9.7	<1	--
JULY										
03...	1400	--	9	0	14	6.6	18.0	--	--	--
04...	1030	--	14	0	14	--	17.0	9.1	B1	--
05...	0900	632	10	0	14	--	17.0	--	--	--
AUG.										
08...	1100	299	8	0	19	6.4	18.5	9.2	B4	--
SEP.										
02...	1205	52	17	0	39	7.8	20.0	9.0	<1	--
02...	1545	--	20	0	39	8.0	22.0	8.2	<1	--
02...	2110	--	18	0	37	7.1	20.5	8.0	B3	--
03...	0455	--	17	0	37	7.1	17.5	8.6	B3	--
03...	1255	54	24	0	46	--	19.5	--	--	--
04...	1025	54	19	0	47	--	18.0	--	--	--
OCT.										
04...	0850	31	22	0	59	7.5	12.0	11.5	--	--
JAN., 1974										
16...	1030	520	--	--	33	6.8	6.0	13.0	--	--
FEB.										
21...	1315	--	12	0	32	6.7	5.0	15.1	--	--
APR.										
10...	1050	--	10	0	26	6.4	4.0	13.2	--	--
MAY										
22...	1245	--	8	0	18	6.6	8.5	12.0	<1	--
JUNE										
12...	1150	--	6	0	9	6.5	12.5	10.5	B9	--
JULY										
03...	1200	--	8	0	12	--	17.0	--	--	--
04...	1030	--	8	0	14	6.6	17.5	9.7	--	--
05...	0900	--	8	0	13	--	17.0	--	--	--
AUG.										
14...	1300	--	13	0	30	7.2	21.0	9.5	B4	--
SEP.										
01...	1120	--	17	0	38	7.7	19.0	9.6	B2	B12
01...	1250	61	17	0	40	--	20.0	--	--	--
01...	1325	--	17	0	38	7.8	20.5	9.3	B2	B11
01...	1520	--	17	0	38	8.0	22.0	9.1	B9	B14
01...	1715	--	18	0	39	8.0	22.0	8.8	B3	20
01...	1915	--	18	0	40	7.4	21.5	8.4	B5	40
01...	2200	--	18	0	41	7.2	20.5	8.4	B6	30
02...	0110	--	20	0	40	7.4	19.0	8.7	B5	100
02...	0430	--	16	0	40	7.2	18.0	8.8	B6	21
02...	0705	--	18	0	40	7.2	17.5	9.1	B10	29
02...	0915	--	17	0	39	7.6	18.0	9.7	24	B4
02...	1030	61	18	0	39	--	18.5	--	--	--
03...	1020	55	17	0	40	7.5	19.0	9.4	--	--

Table 10.--*Field measurements of selected physical, chemical, and biological variables*--Continued

11268000 SOUTH FORK MERCED RIVER NEAR EL PORTAL

DATE	TIME	INSTANTANEOUS DISCHARGE (FT^3/S)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)	FECAL COLIFORM (COL. PER 100 ML)	STREPTOCOCCI (COLONIES PER 100 ML)
APR., 1973										
23...	1120	678	13	0	30	7.0	11.5	--	--	--
MAY										
31...	0820	1910	3	0	10	6.4	8.5	--	--	--
JUNE										
20...	0800	575	8	0	17	6.6	15.0	--	--	--
JULY										
03...	1240	140	14	0	17	6.6	20.5	--	--	--
04...	1100	129	20	0	37	7.2	19.5	--	--	--
05...	0925	127	17	0	31	7.6	19.5	--	--	--
AUG.										
08...	1140	--	24	0	56	6.6	--	--	--	--
SEP.										
02...	1100	15	38	0	87	--	21.0	--	--	--
02...	1135	--	34	0	81	7.2	22.0	8.7	81	--
02...	1515	--	33	0	79	7.8	23.5	8.1	82	--
02...	2150	--	33	0	84	7.4	23.0	7.6	81	--
03...	0420	--	34	0	83	7.1	22.0	7.8	82	--
03...	1510	15	37	0	92	--	22.5	--	--	--
04...	1100	15	41	0	90	--	21.0	--	--	--
OCT.										
04...	1020	--	42	0	129	7.8	14.5	--	--	--
JAN., 1974										
16...	1115	418	--	--	57	6.9	6.5	12.0	--	--
APR.										
10...	1140	--	12	0	42	6.5	8.5	--	--	--
MAY										
23...	1100	1170	8	0	18	6.4	10.0	--	--	--
JUNE										
12...	1230	--	0	7	12	6.8	15.0	--	--	--
JULY										
03...	1130	134	15	0	27	--	21.0	--	--	--
04...	0930	111	15	0	31	6.9	20.0	--	813	--
AUG.										
14...	1200	29	31	0	70	7.6	24.0	--	--	--
SEP.										
01...	1100	16	40	0	91	8.0	22.0	8.8	81	120
01...	1230	17	35	0	88	--	22.5	--	--	--
01...	1310	--	42	0	90	8.0	23.5	8.8	81	65
01...	1500	--	39	0	90	8.0	24.5	8.7	<1	85
01...	1700	--	42	0	91	8.1	24.5	8.6	82	75
01...	1930	--	40	0	91	8.1	24.5	8.0	<1	70
01...	2210	--	40	0	92	8.0	24.0	8.0	82	55
02...	0125	--	38	0	92	7.6	23.5	7.6	<1	60
02...	0440	--	40	0	92	7.7	22.0	7.8	82	45
02...	0720	--	42	0	91	7.9	21.5	7.7	82	40
02...	0900	16	38	0	91	7.8	21.5	8.5	85	40
03...	1130	16	36	0	97	--	23.0	--	--	--

Table 10.--*Field measurements of selected physical, chemical, and biological variables*--Continued

11268200 MERCED RIVER NEAR BRICEBURG

DATE	TIME	INSTANTANEOUS DISCHARGE (FT^3/S)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)	FECAL COLIFORM (COL. PER 100 ML)
APR., 1973									
23...	1325	--	9	0	27	6.7	10.5	--	--
MAY									
31...	1100	8700	4	0	9	6.8	10.0	--	--
JUNE									
20...	0915	--	6	0	13	6.8	15.0	--	--
JULY									
03...	1200	864	9	0	16	6.5	17.5	--	--
AUG.									
08...	1200	--	10	0	24	6.4	19.5	--	--
OCT.									
04...	1140	--	32	0	93	8.0	15.0	--	--
JAN., 1974									
16...	1230	1000	--	--	42	6.9	7.0	12.0	--
FEB.									
21...	1400	--	2	0	45	6.8	5.0	--	--
27...	1015	--	18	0	43	6.9	5.5	--	--
APR.									
10...	1210	--	14	0	38	6.6	6.5	--	--
MAY									
23...	1300	3480	8	0	15	6.5	10.5	--	--
JUNE									
12...	1245	--	5	0	10	6.7	13.0	--	--
JULY									
04...	0900	920	9	0	18	6.6	18.0	--	816
AUG.									
15...	1150	--	14	0	39	7.0	20.0	--	--
SEP.									
03...	1200	93	6	0	56	7.5	22.0	--	--

PLANT NUTRIENTS

Total Organic Carbon

Determination of TOC provides an estimate of the organic load in water. TOC is important as an oxygen-demanding component as well as a nutrient source in an aquatic ecosystem. The mean concentrations found at each sampling station were:

Station	Mean concentration (mg/ℓ)	Number of samples
Merced River:		
Happy Isles Bridge	3.2	15
El Capitan Bridge	2.1	15
Rancheria Flat	2.5	14
Briceburg	1.6	12
Tributaries:		
South Fork Merced River	2.2	15
Treatment plant effluent	13	12

Concentrations of TOC found in the Merced River were low and within the normal range for unpolluted surface water, which is 1.1 to 7.7 mg/ℓ (Nelson and Lysyj, 1968, p. 61-62). The mean concentrations of TOC found at Happy Isles Bridge were twice those found at the Briceburg station, indicating higher concentrations in the upstream reach.

Nitrogen and Phosphorus

Of the essential elements required for plant growth and reproduction, nitrogen and phosphorus are considered the most important. Insufficient quantities of nitrogen and phosphorus can restrict plant growth; conversely, excessive plant productivity in surface water (algal blooms, for example) can occur in the presence of sufficient quantities of nitrogen and phosphorus. The minimum requirements for algal growth range from a trace to 5.3 mg/ℓ for nitrogen and 0.002 to 0.09 mg/ℓ for phosphorus (Greeson and Meyers, 1969).

Concentrations of the different forms of nitrogen and phosphorus in samples from all stations are listed in table 3. The mean and 95-percent probability confidence limits about the mean of three forms of nitrogen and two forms of phosphorus at four Merced River stations are shown in figure 6.

With the exception of the Rancheria Flat station, the concentrations of nitrogen and phosphorus were low. The wide confidence intervals, such as those for samples from Rancheria Flat, indicate that the mean was computed from values that varied widely. The increase in nitrogen and phosphorus found at Rancheria Flat may be the result of input from a local source and probably are not due to an accumulative effect because low concentrations of nitrogen and phosphorus were found downstream at the Briceburg station.

Nitrogen and phosphorus concentrations in water samples taken from the sewage-treatment plant outfall near Yosemite Village are shown in table 11. Although the values are high, they are not unusual for treated effluent. The volume of effluent flowing into the Merced River, however, is important. The maximum discharge of the effluent was estimated at 2 to 3 ft^3/s (0.06 to 0.08 m^3/s) during the late summer when the discharge of the river ranges from about 7 to 80 ft^3/s (0.2 to 2.3 m^3/s) in the upstream reach.

Table 11.--*Mean concentration of nitrogen and phosphorus in effluent from treatment plant near Yosemite Village, 1973-74*

Nutrients	Mean concentration, in milligrams per litre	Number of samples
Total nitrate (N)	10.	5
Dissolved nitrate (N)	14.	6
Total nitrite (N)	.07	5
Dissolved nitrite (N)	.16	6
Total nitrite plus nitrate (N)	10.	11
Dissolved nitrite plus nitrate (N)	12.	11
Ammonia nitrogen (N)	.5	15
Dissolved ammonia nitrogen (N)	6.	6
Organic nitrogen (N)	4.3	13
Dissolved organic nitrogen (N)	3.3	4
Total Kjeldahl nitrogen (N)	8.9	13
Dissolved Kjeldahl nitrogen (N)	7.2	4
Total nitrogen (N)	18.	11
Total phosphorus (P)	4.5	15
Dissolved phosphorus (P)	3.7	3
Total orthophosphorus (P)	4.0	5
Dissolved orthophosphorus (P)	3.7	13

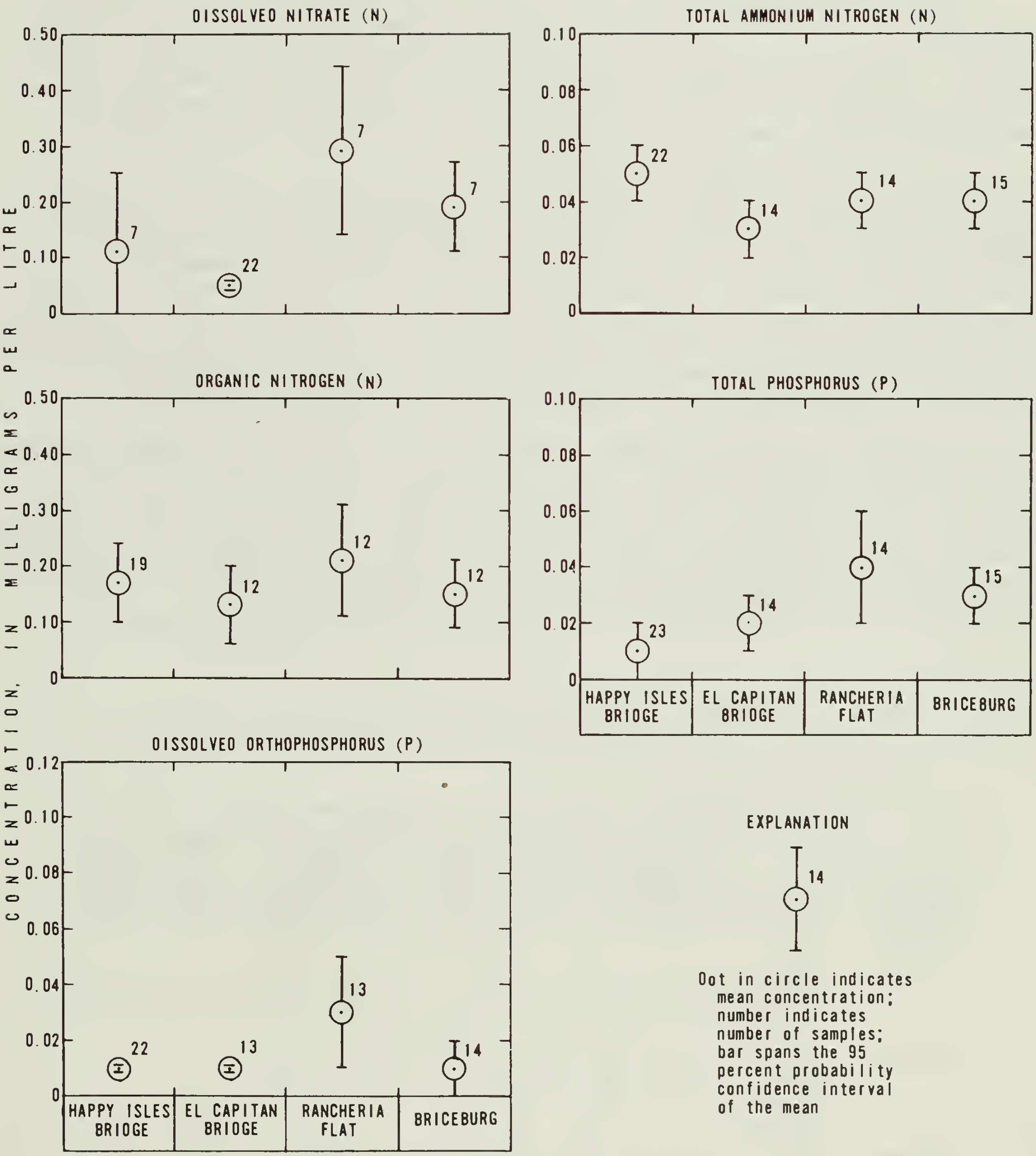


FIGURE 6.--Results of nitrogen and phosphorus analyses.

Algal Growth Potential

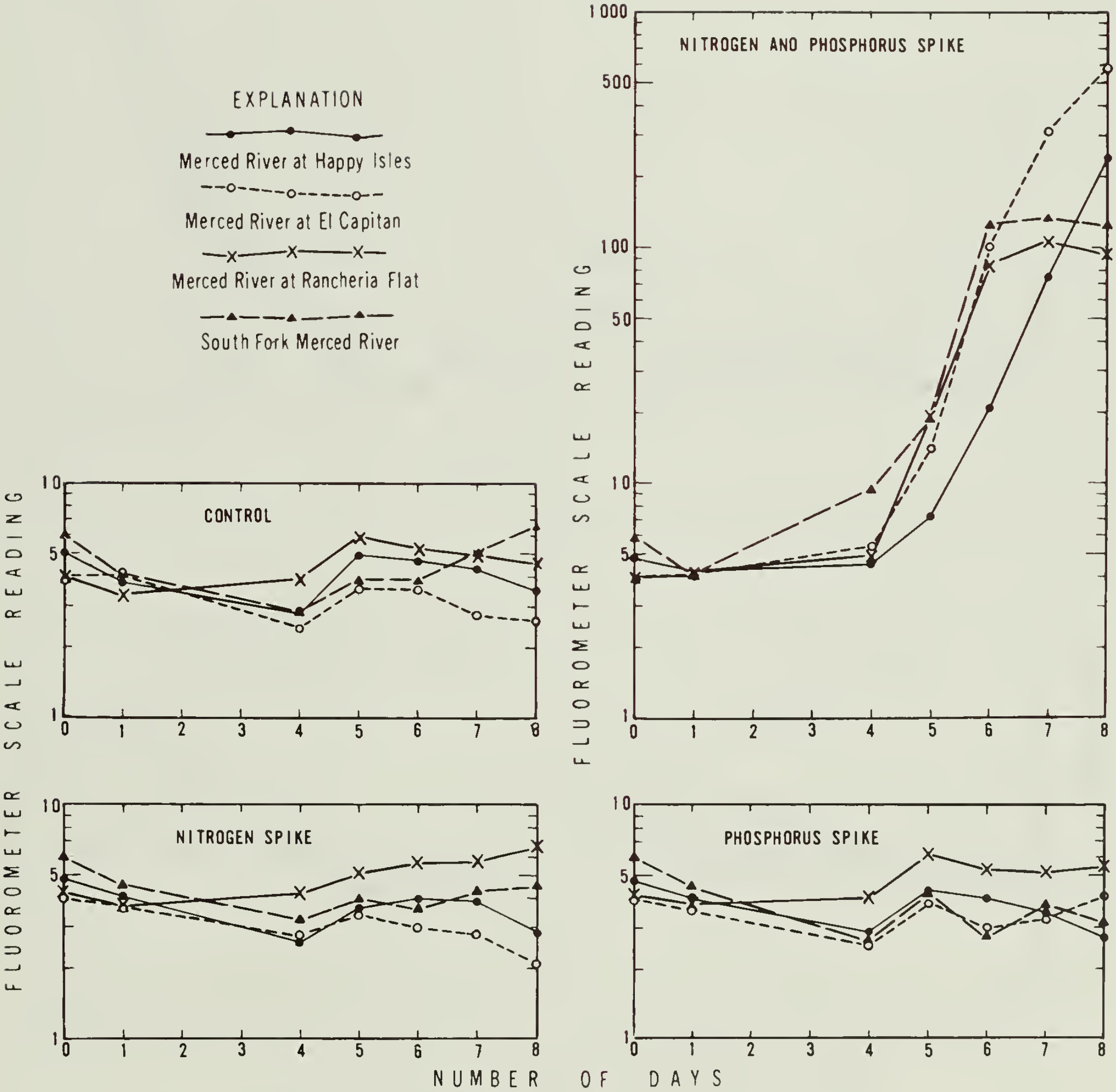
Algal growth potential is a biological test to determine: (1) Growth-limiting nutrients and their ability to grow algae, and (2) potential algal production when specific quantities of selected nutrients are added to sample water. The tests were made in the laboratory using unaltered water as a control, samples with nitrogen added, phosphorus added, and nitrogen and phosphorus added. Results of the tests are shown graphically in figure 7.

The AGP (algal growth potential) data summarized in table 12, suggest that phosphorus is limiting algal growth at Happy Isles Bridge, El Capitan Bridge, and at South Fork Merced River, and that nitrogen is limiting at Rancheria Flat. Samples that were spiked with nitrogen and phosphorus together showed dramatic increases in AGP at all stations. The tests suggest that small increases in the concentration of nitrogen and phosphorus in the Merced River could cause significant increases in algal growth and production. The high AGP in control water from Rancheria Flat (fig. 7) is correlative with the higher nitrogen and phosphorus values noted previously (fig. 6).

The low-flow period of August and September is important because at this time nutrient concentrations, water temperature, and park visitor use are highest. Warm tributary inflow, such as the South Fork Merced River, mixing with Merced River water having high concentrations of plant nutrients, could possibly cause algal-bloom conditions in the downstream reaches. During late summer, the South Fork Merced River contributes about 25 percent of the Merced River's discharge (table 2) downstream of the confluence.

Table 12.--*Summary of AGP tests indicating those stations with significant increases in AGP (≥10 fluorometer units above control values)*

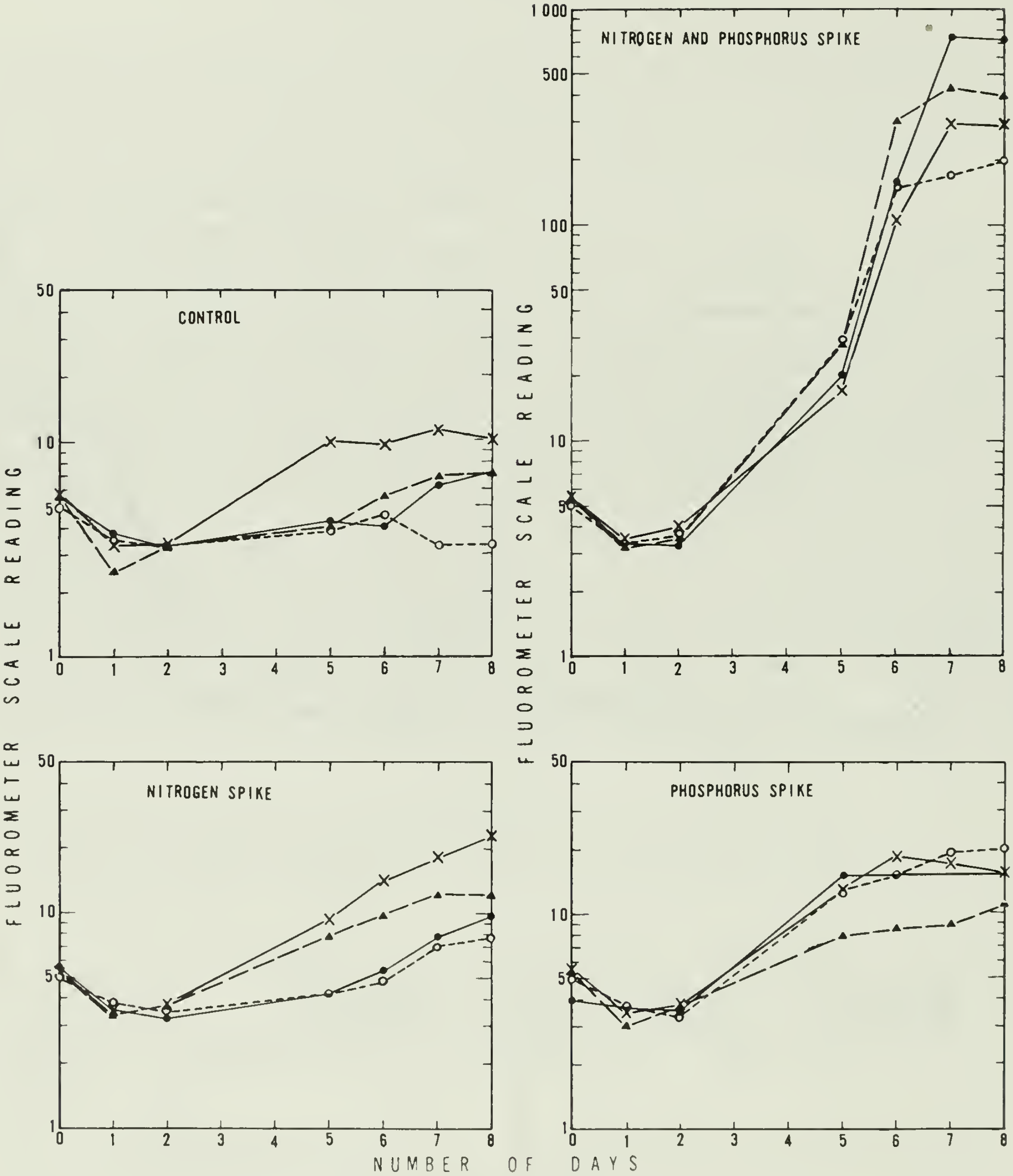
Nutrient spike	Month	Station: Happy Isles Bridge 1973	1974	El Capitan Bridge 1973	1974	Rancheria Flat 1973	1974	South Fork Merced River 1973	1974
Nitrogen	June	-	X	-	X	-	-	-	-
	July	-	-	-	-	X	X	-	-
	August	-	-	-	-	X	X	-	-
	September	-	-	X	X	X	X	X	-
Phosphorus	June	-	-	-	-	-	-	-	-
	July	-	X	-	-	-	-	-	-
	August	X	X	X	-	-	-	X	X
	September	X	X	X	-	-	-	X	X
Nitrogen and phosphorus	June	X	X	X	X	X	X	X	X
	July	X	X	X	X	X	X	X	X
	August	X	X	X	X	X	X	X	X
	September	X	X	X	X	-	X	X	X



Mean discharge at Briceburg station 2,060 ft^3/s (58 m^3/s)

June 21, 1973

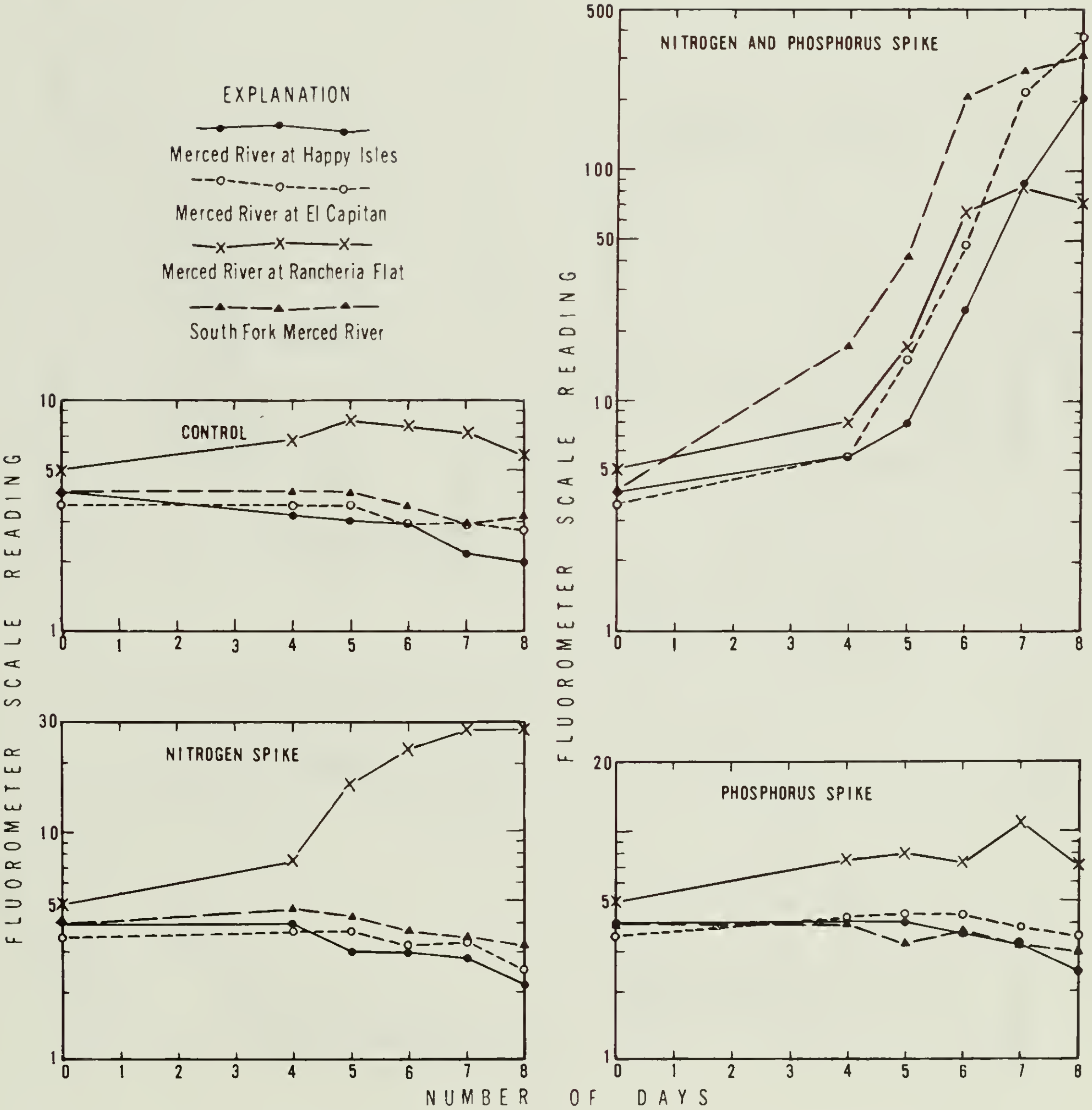
FIGURE 7.--Algal growth potential.



Mean discharge at Briceburg station 4,360 ft^3/s (123 m^3/s)

June 12, 1974

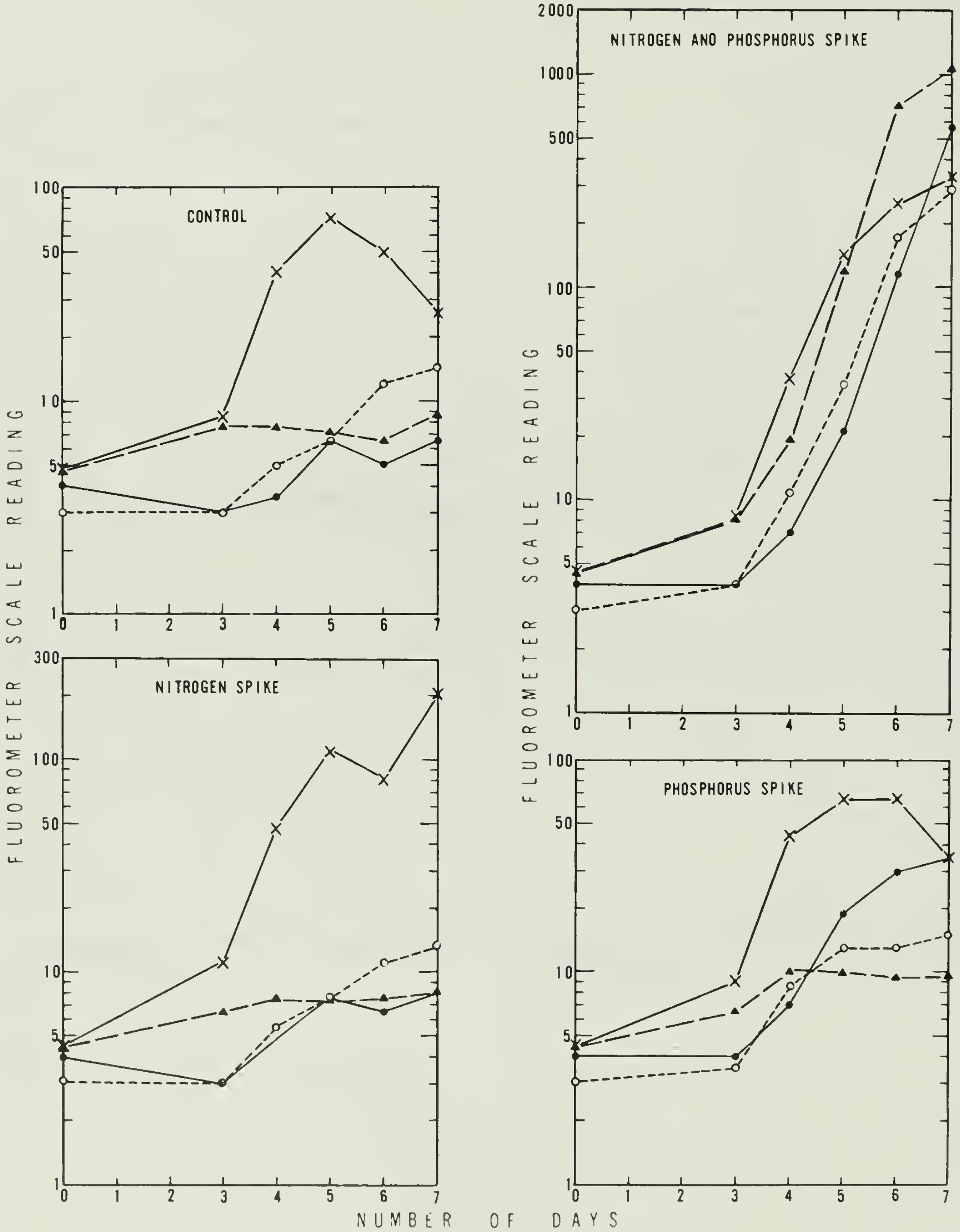
FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 802 ft^3/s (23 m^3/s)

July 5, 1973

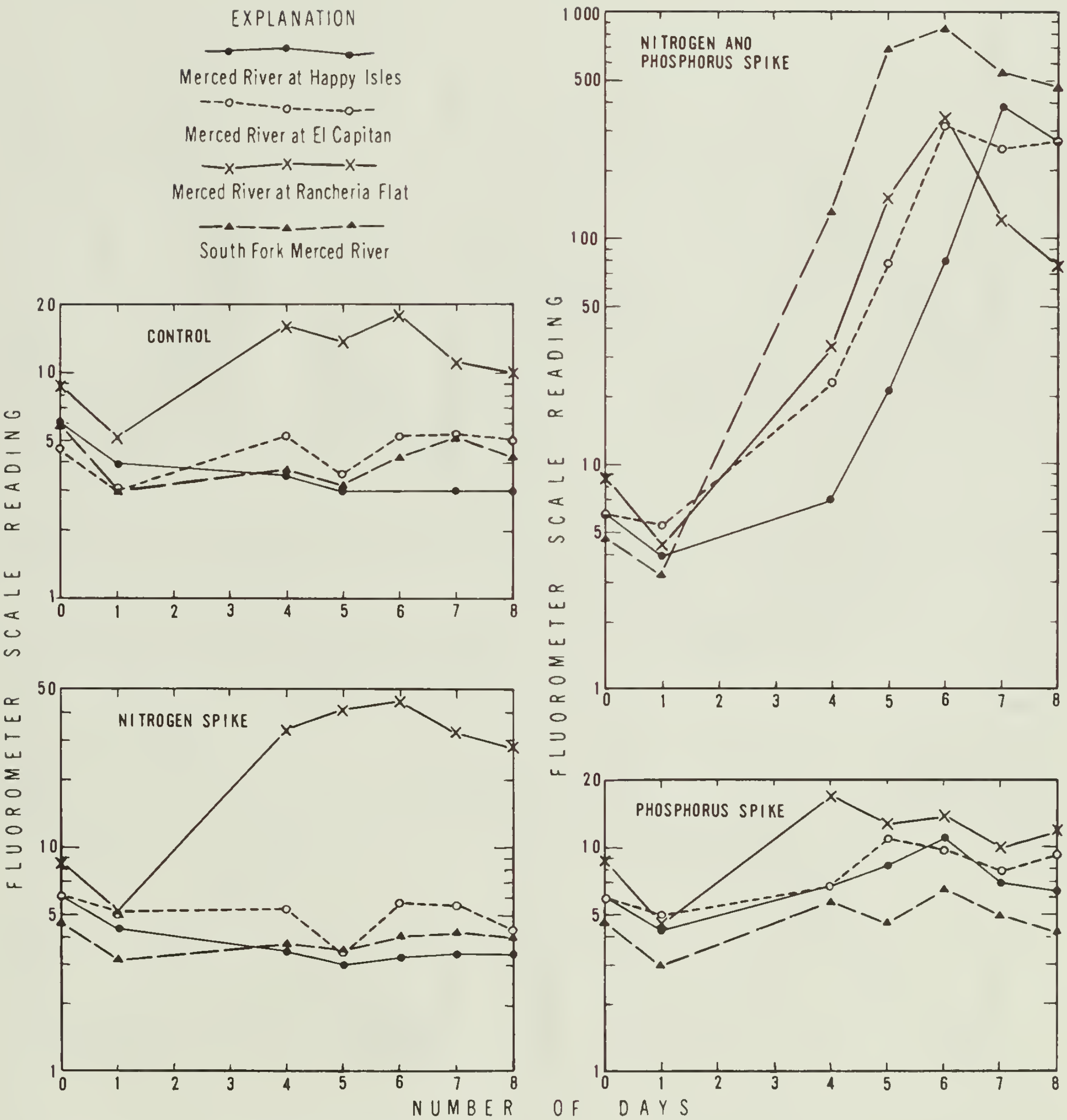
FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 931 ft^3/s (26 m^3/s)

July 5, 1974

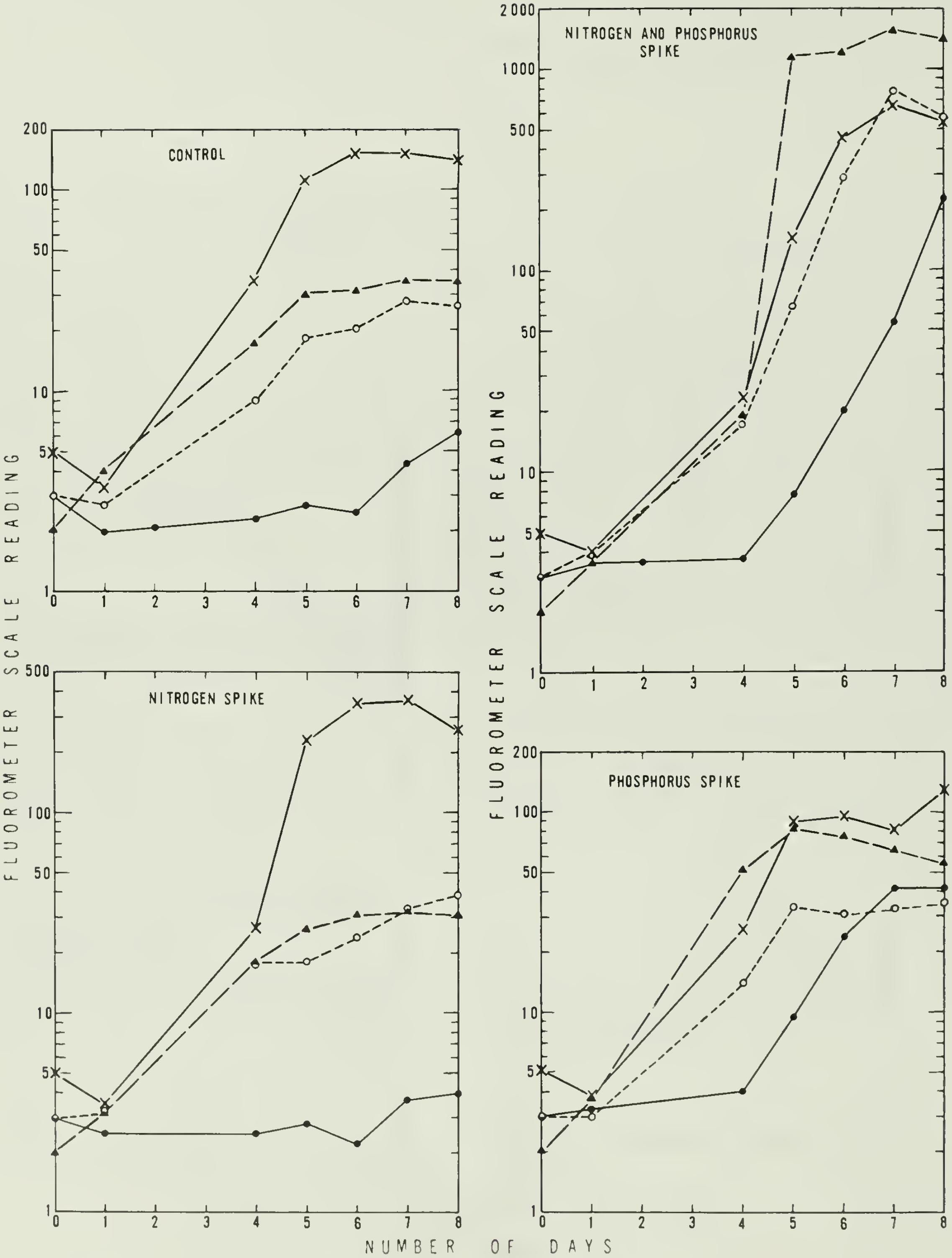
FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 355 ft^3/s (10 m^3/s)

August 9, 1973

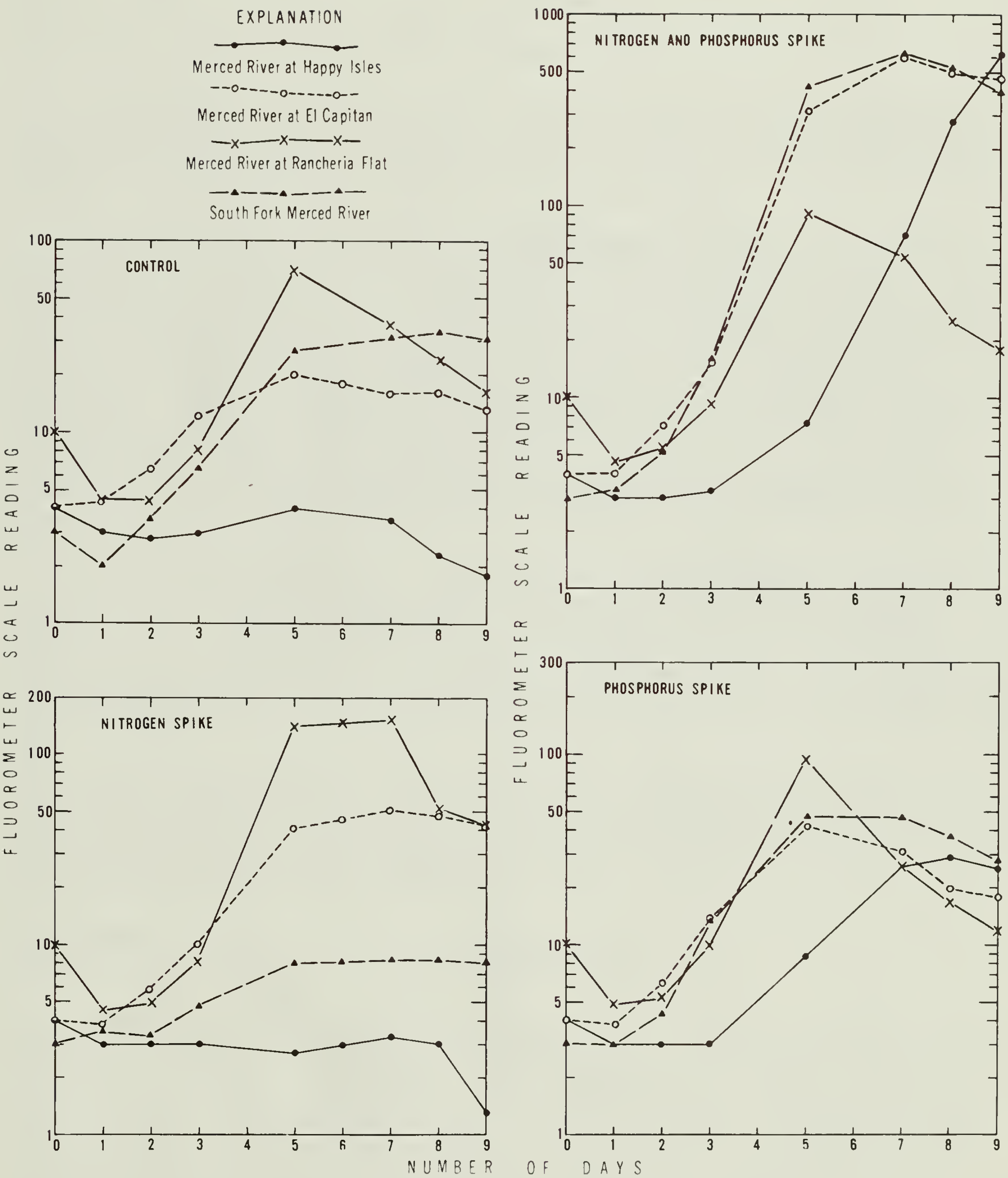
FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 188 ft^3/s (5 m^3/s)

August 15, 1974

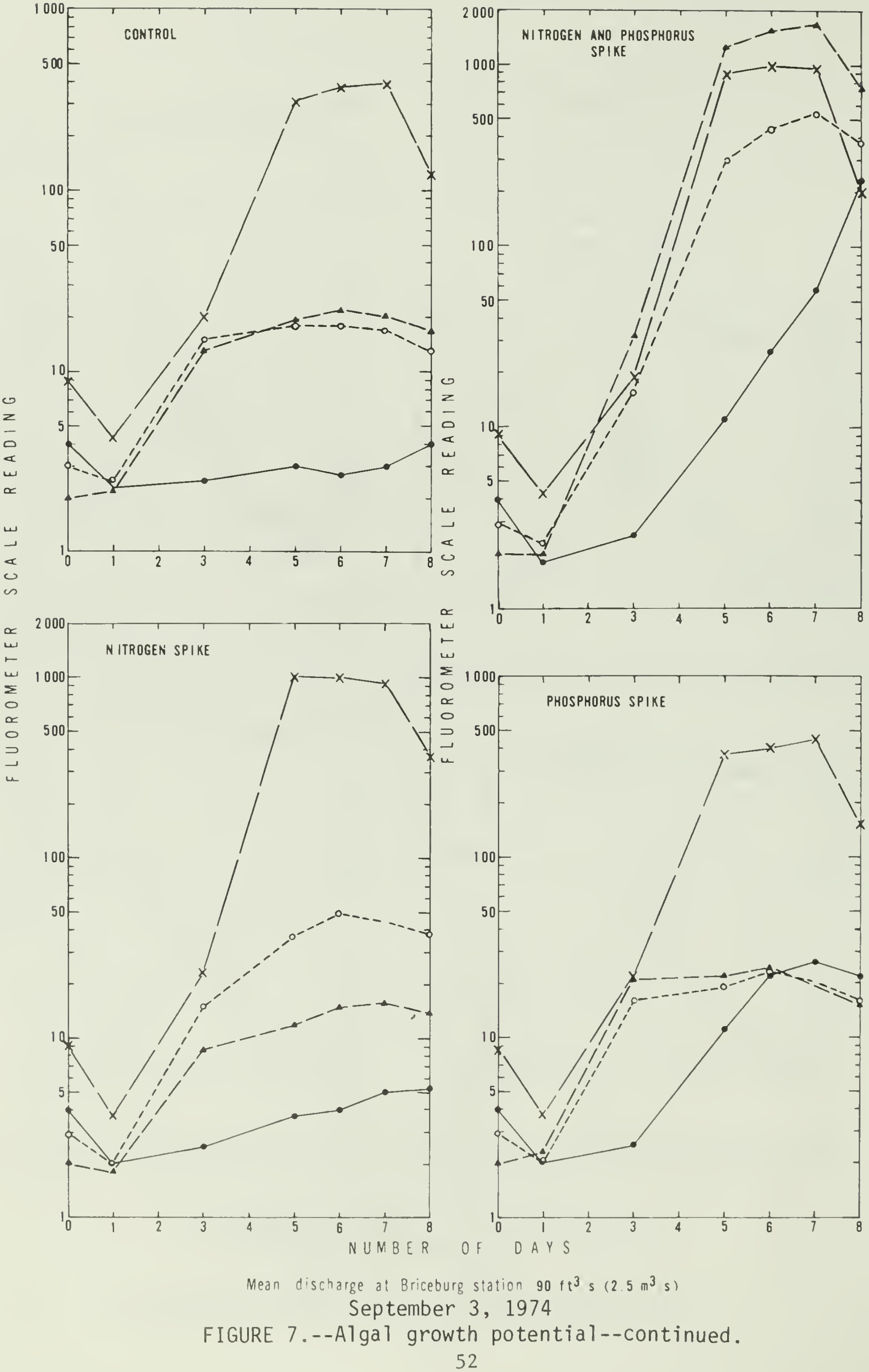
FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 73 ft³/s (2.1 m³/s)

September 4, 1973

FIGURE 7.--Algal growth potential--continued.



Mean discharge at Briceburg station 90 ft^3 s (2.5 m^3 s)

September 3, 1974

FIGURE 7.--Algal growth potential--continued.

PLANTS AND ANIMALS

Periphyton

Periphyton is the assemblage of algae and associated micro-organisms usually found attached to underwater substrates. Periphytic algae are good indicators of water quality; their presence or absence and their abundance reflect the condition of the water in which they live.

The occurrence and the dominant algal genera are shown in table 13. Analyses of the periphyton data show that three groups of algae were found: Diatoms, green algae, and blue-green algae. The diatoms were found in greater variety at all sampling stations, and were generally the dominant types in the Merced River at the upstream stations, although the green algae replaced the diatoms as the dominant type in late summer (September 2-October 5, 1974) at El Capitan Bridge. At Rancheria Flat in late summer (September 2-October 5, 1974), blue-green algae replaced green algae as the dominant type; however, in the warm South Fork Merced River, green algae replaced blue-greens as the dominant genera. There was also a greater variety of green algae in the South Fork Merced River in comparison to the other stations in the September 2-October 5, 1974, sampling period.

Analysis of chlorophyll concentration of periphyton (table 14) usually yields data on the algal biomass. In streams with low concentrations of dissolved or suspended organic matter, large populations of chlorophyll-bearing organisms may exist; as a result, the ratio of periphyton biomass to chlorophyll *a* would be small. In streams with high organic loads, many non-chlorophyll-bearing organisms may develop; in this condition, the ratio often exceeds 100 (Weber and McFarland, 1969; Weber, 1973).

The ratio of biomass to chlorophyll *a* in the Merced River is low (table 15), suggesting low activity of non-photosynthetic organisms. This would be expected in water with low total organic carbon concentrations. The low concentrations of total organic carbon mentioned earlier correlated with the low biomass/chlorophyll ratios.

Benthic Invertebrates

Benthic invertebrates are animals that live in and on the river bottom. Because many have restricted mobility during their aquatic life cycle and can live 2 to 4 years, they are useful indicators of water quality. A detectable change in population numbers and species composition can reflect change in their specific environment. Benthic invertebrate data from the Merced River and South Fork Merced River are listed in table 16. Most of the collected organisms belong to the phylum Arthropoda; exceptions were members of the phyla Mollusca and Platyhelminthes found at South Fork Merced River, and phylum Annelida found at Rancheria Flat. Benthic invertebrates in the Merced River were mainly Diptera (two-winged flies), Ephemeroptera (mayflies), and Plecoptera (stoneflies).

Table 13.--*Occurrence of periphytic algae in the Merced River and South Fork Merced River*

[X1 indicates the dominant genera]

	Sampler submerged from July 5-Aug. 15, 1974		Sampler submerged from Aug. 14-Sept. 2, 1974			
	Merced River	South Fork Merced River	Merced River			South Fork Merced River
	Happy Isles Bridge		Happy Isles Bridge	El Capitan Bridge	Ran-cheria Flat	
CHRYSOPHYTA						
Bacillariophyceae						
(Diatoms)						
Achnanthes	X	X	-	X	X	X
Caloneis	-	-	-	X	-	-
Cocconeis	X	X	X1	-	X	X
Cymbella	-	X	-	-	X	X
Epithemia	-	-	-	-	-	X
Eunotia	X	-	X	X1	-	-
Fragilaria	X	-	X	-	-	X
Gomphonema	X	X	X	X	X	X
Hannea arcus	X	-	-	-	-	-
Navicula	-	-	-	-	X	X
Nitzschia	-	X	X	X	X	-
Rhoiocosphenia	-	-	X	-	-	-
Rhopalodia	-	X	-	-	-	-
Synedra	X1	X	X	-	X	X
Tabellaria	X	-	X	X	-	-
CHLOROPHYTA						
Chlorophyceae						
(Green algae)						
Bulbochaete	-	X	-	-	-	X
Oedogonium	-	X	-	-	-	X
Scenedesmus	-	X	-	X	-	-
Stigeoclonium	-	X1	-	-	X1	X
CYANOPHYTA						
Myxophyceae						
(Blue-green algae)						
Anacystis	-	X	-	-	-	X1
Lyngbya	-	X	-	-	-	-

[X1 indicates the dominant genera]

	Sampler submerged from Sept. 2-Oct. 5, 1974			
	Merced River			South Fork Merced River
	Happy Isles Bridge	El Capitan Bridge	Ran-cheria Flat	
CHRYSOPHYTA				
Bacillariophyceae				
(Diatoms)				
Achnanthes	X	-	X	X
Cocconeis	X	X	X	X
Cyclotella	-	-	-	X
Cymbella	-	X	X	X
Epithemia	-	-	-	X
Eunotia	X	X	-	-
Fragilaria	-	-	-	X
Gomphoneis	-	-	X	-
Gomphonema	-	X	X	X
Melosira	-	-	-	X
Navicula	-	-	X	X
Pinnularia	-	-	X	-
Rhopalodia	-	-	-	X
Stauroneis	-	-	X	-
Synedra	-	-	-	X
Tabellaria	X1	-	-	-
CHLOROPHYTA				
Chlorophyceae				
(Green algae)				
Bulbochaete	-	-	-	X1
Chaetosphaeridium	-	X1	-	-
Cosmarium	X	-	-	X
Microspora	-	X	-	-
Oedogonium	-	X	-	-
Pediastrum	-	-	-	X
Scenedesmus	-	-	X	-
Spirogira	-	-	-	X
Stigeochlonium	-	-	-	X
Ulothrix	X	-	-	-
CYANOPHYTA				
Myxophyceae				
(Blue-green algae)				
Lyngbya	X	X	X1	X
Oscillatoria	-	-	X	X

Table 14.--*Periphyton biomass and chlorophyll a and b concentrations*

DATE	PERI-PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI-PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	UNCOR-RECTED PERI-PHYTON CHLORO-PHYLL A MG/SQ M	UNCOR-RECTED PERI-PHYTON CHLORO-PHYLL B MG/SQ M
11264500 MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE				
AUG., 1974				
15...	1.5	4.6	1.2	.2
SEP.				
02...	1.5	2.3	--	--
OCT.				
05...	1.5	1.5	.4	.2
11266400 MERCED RIVER AT EL CAPITAN BRIDGE, NEAR YOSEMITE VILLAGE				
SEP., 1974				
02...	1.5	3.9	.3	.5
OCT.				
05...	.80	1.5	.5	.3
11267050 MERCED RIVER AT RANCHERIA FLAT, NEAR EL PORTAL				
SEP., 1974				
02...	3.1	4.6	6.0	.5
OCT.				
05...	4.6	13	4.4	1.0
11268000 SOUTH FORK MERCED RIVER NEAR EL PORTAL				
AUG., 1974				
14...	18	21	6.3	.2
SEP.				
02...	.80	2.3	--	--
OCT.				
05...	.80	3.1	.2	.3

Table 15.--*Biomass/chlorophyll a ratios, July-October 1974*

	Merced River			
Submerged period	Happy Isles Bridge	El Capitan Bridge	Rancheria Flat	South Fork Merced River
July 5 - Aug. 15	2.6	--	--	0.5
Aug. 14 - Sept. 2	--	7.7	0.3	--
Sept. 2 - Oct. 5	--	1.5	1.9	12.

Table 16.--*Taxa and numbers of benthic invertebrates*

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11264500 Merced River at Happy Isles Bridge			
8-8-73	0915	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	1	12.5
		Diptera (two-winged beetles)			
		Chironomidae	larva	1	12.5
		Tipulidae sp.	larva	1	12.5
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	3	37.5
		Plecoptera (stoneflies)			
		Chloroperlidae			
		Paraperla sp.	nymph	1	12.5
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Arctopsyche sp.	larva	1	12.5
			TOTAL	8	
9-4-73	0805	ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Rhagionidae			
		Atherix variegata	larva	3	37.5
		Ephemeroptera (mayflies)			
		Ephemerellidae			
		Ephemerella sp.	nymph	1	12.5
		Plecoptera (stoneflies)			
		Perlidae			
		Acroneuria sp.	nymph	4	50.0
			TOTAL	8	
10-3-73	0750	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	adult	2	9.5
		Diptera (two-winged flies)			
		Simuliidae	larva	2	9.5
		Ephemeroptera			
		Baetidae			
		Baetis sp.	nymph	3	14.5
		Heptageniidae			
		Rhithrogena	nymph	2	9.5
		Plecoptera (stoneflies)			
		Nemouridae	nymph	4	19
		Perlidae			
		Acroneuria sp.	nymph	2	19
		Perlodidae	nymph	2	9.5
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Arctopsyche sp.	larva	2	9.5
			TOTAL	21	

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11264500 Merced River at Happy Isles Bridge--Continued			
8-15-74	0830	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	1	20
		Diptera (two-winged flies)			
		Chironomidae	larva	1	20
		Heleidae			
		Palpomyia sp.	larva	1	20
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	2	40
			TOTAL	5	
9-2-74	1430	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	3	17.5
			adult	1	6.0
		Diptera (two-winged flies)			
		Rhagionidae			
		Atherix variegata	larva	12	70.5
		Neuroptera			
		Corydalidae (dobsonflies)			
		Dysmicohermes crepusculus	larva	1	6.0
			TOTAL	17	
		11266400 Merced River at El Capitan Bridge			
8-7-73	1000	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	adult	1	25
		Diptera (two-winged flies)			
		Chironomidae	larva	4	50
		Tipulidae			
		Hexatoma sp.	larva	1	25
			TOTAL	6	
9-4-73	0910	ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Chironomidae	larva	4	16.7
		Tipulidae			
		Hexatoma sp.	larva	3	12.5
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	3	12.5
		Ephemerellidae			
		Ephemerella sp.	nymph	1	4.2
		Odonata (dragonflies)			
		Gomphidae	naiad	1	4.2
		Ophiogoniphus sp.			
		Plecoptera (stoneflies)			
		Perlodidae			
		Isoperla sp.	nymph	10	41.7
		Trichoptera (caddisflies)			
		Hydroptilidae	larva	1	4.2
		Lepidostomatidae	larva	1	4.2
			TOTAL	24	

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11266400 Merced River at El Capitan Bridge--Continued			
10-3-73	1450	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	3	23
		Diptera (two-winged flies)			
		Chironomidae	larva	7	54
		Tipulidae			
		Hexatoma sp.	larva	3	23
			TOTAL	13	
8-14-74	1500	ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Chironomidae	larva	3	42
		Tipulidae			
		Hexatoma sp.	larva	2	29
		Ephemeroptera (mayflies)			
		Ephemerellidae			
		Ephemerella micheneri	nymph	2	29
			TOTAL	7	
9-2-74	1300	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	2	7.5
			adult	6	23.0
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	2	7.5
		Ephemerellidae			
		Ephemerella micheneri	nymph	5	19.0
		Siphlonuridae			
		Ameletus sp.	nymph	2	7.5
		Heptageniidae			
		Rhithrogena sp.	nymph	4	15.5
		Plecoptera (stoneflies)			
		Chloroperlidae			
		Hastaperla sp.	nymph	2	7.5
		Perlodidae			
		Arcynopteryx parallela	nymph	3	11.5
			TOTAL	26	
10-5-74	1315	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	12	41.4
		Diptera (two-winged flies)			
		Chironomidae	larva	15	51.7
		Ephemeroptera (mayflies)			
		Ephemerellidae			
		Ephemerella (serrata)	nymph	1	3.4
		Leptophlebidae			
		Paraleptoplebia sp.	nymph	1	3.4
			TOTAL	29	

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11267050 Merced River at Rancheria Flat			
8-7-73	1100	ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Chironomidae	larva	15	83.3
		Simuliidae	larva	1	5.6
		Ephemeroptera (mayflies)			
		Siphlonuridae	nymph	1	5.6
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Cheumatopsyche sp.	larva	1	5.6
			TOTAL	18	
9-4-73	1025	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	adult	1	3.4
		Diptera (two-winged flies)			
		Chironomidae	larva	2	6.9
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	12	41.4
		Ephemerellidae			
		Ephemerella sp.	nymph	1	3.4
		Heptageniidae			
		Iron sp.	nymph	5	17.2
		Plecoptera (stoneflies)			
		Perlodidae			
		Arcynopteryx sp.	nymph	5	17.2
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	2	6.9
		Limnephilidae			
		Dicosmoecus sp.	larva	1	3.4
			TOTAL	29	
10-4-73	0850	ANNELIDA			
		OLIGOCHAETA			
		Opisthopora (earthworms)			
		Lumbricidae			
		Eiseniella sp.		2	2.8
		ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Chironomidae	larva	3	4.2
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	10	14.1
		Ephemerellidae			
		Ephemerella sp.	nymph	1	1.4
		Ephemerella (walkeri)	nymph	2	2.8
		Heptageniidae			
		Iron sp.	nymph	6	8.5

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11267050 Merced River at Rancheria Flat--Continued			
10-4-73	0850	ARTHROPODA			
		INSECTA			
		Plecoptera (stoneflies)			
		Perlodidae			
		Arcynopteryx sp.	nymph	27	38.0
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	20	28.2
			TOTAL	71	
8-14-74	1230	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	3	6.7
			adult	1	2.2
		Ptilodactylidae			
		Stenocolus sp.	larva	1	2.2
		Diptera (two-winged flies)			
		Tipulidae			
		Autocha sp.	larva	3	6.7
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	6	13.3
		Plecoptera (stoneflies)			
		Perlodidae			
		Arcynopteryx parallela	nymph	8	17.8
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropysche sp.	larva	23	51.1
			TOTAL	45	
9-14-74	1300	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	2	14.3
		Diptera (two-winged flies)			
		Tipulidae			
		Antocha sp.	larva	2	14.3
		Hexatoma sp.	larva	1	7.1
		Ephemeroptera (mayflies)			
		Ephemerellidae			
		Ephemerella micheneri	nymph	1	7.1
		Lepidoptera (moths & butterflies)			
		Pyralidae			
		Parargyractis sp.	larva	1	7.1
		Plecoptera (stoneflies)			
		Chloroperlidae			
		Hastaperla sp.	nymph	1	7.1
		Perlodidae			
		Arcynopteryx parallela	nymph	3	21.4
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	3	21.4
			TOTAL	14	

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta- morphic stage	Organism count (total)	Percent compo- sition
		11267050 Merced River at Rancheria Flat--Continued			
10-5-74	1230	ARTHROPODA			
		INSECTA			
		Diptera (two-winged flies)			
		Chironomidae	larva	7	41.2
		Lepidoptera (moths & butterflies)			
		Pyralidae			
		Parargyractis sp.	larva	3	17.6
		Plecoptera (stoneflies)			
		Perlidae			
		Acroneuria pacifica	nymph	1	5.9
		Perlodidae			
		Arcynopteryx parallela	nymph	4	23.5
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	2	11.8
			TOTAL	17	
		11268000 South Fork Merced River near El Portal			
8-7-73	1000	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	adult	1	25
		Diptera (two-winged flies)			
		Chironomidae	larva	4	50
		Ephemeroptera (mayflies)			
		Ephemerellidae			
		Ephemerella sp.	nymph	1	25
			TOTAL	6	
9-4-73	1100	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	adult	2	2.4
		Ptilodactylidae			
		Stenocolus sp.	larva	1	1.2
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	5	6.0
		Heptageniidae			
		Iron sp.	nymph	15	17.9
		Plecoptera (stoneflies)			
		Perlidae			
		Claassenia sp.	nymph	5	6.0
		Perlodidae	nymph	1	1.2
		Pteronarcidae			
		Pteronarcys sp.	nymph	1	1.2
		Trichoptera (caddisflies)			
		Glossosomatidae			
		Glossosoma sp.	larva	2	2.4
		Hydropsychidae			
		Cheumatopsyche sp.	larva	14	16.7
			pupa	1	1.2
		Hydroptilidae	larva	2	2.4
		Philopotamidae			
		Chimarra sp.	larva	23	27.4
		Psychomiidae	larva	12	14.3
			TOTAL	84	

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11268000 South Fork Merced River near El Portal--Continued			
10-4-73	1200	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	3	4.0
			adult	1	1.3
		Diptera (two-winged flies)			
		Chironomidae	larva	2	2.6
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	11	14.3
		Heptageniidae			
		Iron sp.	nymph	10	13.0
		Plecoptera (stoneflies)			
		Perlidae			
		Claassenia sp.	nymph	5	6.5
		Perlodidae			
		Arcynopteryx sp.	nymph	4	5.2
		Pteronarcidae			
		Pteronarcys sp.	nymph	2	2.6
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	20	26.0
		Philopotamidae			
		Chimarra sp.	larva	13	16.9
		Psychomiidae	larva	6	7.8
			TOTAL	77	
8-14-74	1200	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Ptilodactylidae			
		Stenocolus sp.	larva	1	11.1
		Diptera (two-winged flies)			
		Chironomidae	larva	3	33.3
		Ephemeroptera (mayflies)			
		Baetidae			
		Baetis sp.	nymph	1	11.1
		Tricorythidae			
		Tricorythodes fallax	nymph	4	44.4
			TOTAL	9	

Table 16.--*Taxa and numbers of benthic invertebrates*--Continued

Date	Time	PHYLUM CLASS Order Family *Genus species*	Meta-morphic stage	Organism count (total)	Percent compo-sition
		11268000 South Fork Merced River near El Portal--Continued			
9-2-74	0900	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Elmidae	larva	1	2.4
			adult	6	14.3
		Ephemeroptera (mayflies)			
		Heptágeniidae			
		Iron albertae	nymph	7	16.7
		Plecoptera (stoneflies)			
		Perlidae			
		Claassenia sabulosa	nymph	3	7.1
		Perlodidae			
		Arcynopteryx parallela	nymph	9	21.4
		Pteronarcidae			
		Pteronarcys californica	nymph	1	2.4
		Trichoptera (caddisflies)			
		Hydropsychidae			
		Hydropsyche sp.	larva	5	11.9
		Philopotamidae			
		Chimarra sp.	larva	2	4.8
		Psychomiidae	larva	8	19.0
			TOTAL	42	
10-5-74	1115	ARTHROPODA			
		INSECTA			
		Coleoptera (beetles)			
		Psephenidae			
		Psychenus sp.	larva	2	28.6
		Diptera (two-winged flies)			
		Chironomidae	larva	2	28.6
		MOLLUSCA			
		GASTROPODA			
		Basommatophora			
		Physidae (fresh-water clams)			
		Physa sp.		1	14.3
		PLATYHELMINTHES			
		TURBELLARIA			
		Tricladida			
		Planariidae (planaria)			
		Dugesia sp.		2	28.6
			TOTAL	7	

The diversity index of benthic invertebrates was computed for each station (table 17). Wilhm (1970) reported that diversity index values often ranged from 3 to 4 in clean water streams (or in recovered zones in streams receiving pollution), and the diversity index was frequently less than 1.0 in stream sections receiving pollution.

Table 17.--*Diversity index of benthic invertebrates*

Date of collection	Merced River: Happy Isles Bridge	Merced River: El Capitan Bridge	Merced River: Rancheria Flat	South Fork Merced River
August 1973	2.4	1.3	.9	1.3
1974	1.9	1.6	2.1	1.8
September 1973	1.4	2.5	2.4	3.0
1974	1.3	2.9	2.8	2.9
October 1973	2.9	1.5	2.3	3.0
1974	--	1.4	2.1	2.0

The diversity indices computed for the Merced River are not unusually low, and when supported by other water-quality variables measured in this study, including visual observations, indicate that the Merced River is of good quality. Except for the low value computed for Rancheria Flat in August 1973, the diversity index data show that there was no major difference between 1973 and 1974. A gradual increase in the diversity of benthic invertebrates (suggested by the diversity-index values), however, seems to occur in the downstream direction.

SUMMARY AND SUGGESTIONS FOR FUTURE STUDIES

Selected physical, chemical, and biological data, collected and analyzed from April 1973 to September 1974, indicate that water in the reach of the Merced River from Happy Isles Bridge to Briceburg is of good quality with respect to nearly all the recommended criteria for most fresh-water organisms and for primary contact recreation. Concentrations of total mercury that exceeded the recommended limits were found during high-flow conditions.

The Merced River is dilute and has low alkalinity values; consequently, the addition of much acid or of trace metals, such as lead or zinc, could adversely affect the aquatic ecosystem. The Merced River from Happy Isles Bridge to Briceburg had high algal growth potential; an input of nitrogen and phosphorus above threshold values, with warm tributary inflow, could result in excessive algal growth during the summer.

Future water-quality studies on the Merced River should focus on the high nitrogen and phosphorus concentrations found at Rancheria Flat and warm inflow from the South Fork Merced River. Five sampling stations are suggested: One each immediately upstream and downstream from the new sewage treatment plant outfall and from the confluence with South Fork Merced River, and a fifth at the gaging station near Briceburg. An auxiliary sampling station should be on the South Fork Merced River.

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