State of California

The Resources Agency

Memorandum

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JAN 21 1987
79-AFC-4

To : Lloyd L. Dillon
Compliance Project Manager
California Energy Commission (MS-2000)
1516 Ninth Street
Sacramento, CA 95814

Date : January 14, 1987

File No.: 79-AFC-4 & 81-AFC-2C

Subject: 1986 Semi-Annual Compliance Monitoring Reports for Bottle Rock and South Geysers Geothermnal Powerplant

From : **Department of Water Resources**

The attached reports describe monitoring activities conducted from Janaury through June 30, 1986, with respect to Water Quality and Biological Monitoring and Mitigation (Part II, Section 5 and 6 of the Compliance Monitoring Plan) for the Bottle Rock and South Geysers Geothermal Powerplants.

Should you have any questions or comments regarding the attached reports, please call Gurmel Singh of my staff at ATSS 454-7417.

James Snow

James R. Snow, Chief
Compliance Monitoring Section
Division of Opertions
and Maintenance

Attachments

cc: Ted Wooster
Department of Fish and Game, Region III
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Yountville, CA 94599

William H. Crooks, Executive Officer
California Regional Water Quality Control Board
Central Valley Region
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Steve Zalusky, Geothermal Coordinator
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DOCKET
79-AFC-4C
DATE: JAN 14 1987
RECD: JAN 21 1987

81-AFC-2C
0502

State of California

The Resources Agency

Memorandum

Date : July 21, 1986

To : Jim Snow
Division of Operations & Maintenance

Gerald Boles
Northern District

From : **Department of Water Resources**

Subject : Semi-Annual Compliance Monitoring Report for the South Geysers Powerplant

This report presents activities conducted from January 1 through June 30, 1986, that meet the compliance monitoring and mitigation requirements for the South Geysers Geothermal Powerplant.

Water Quality

Monthly water samples were collected from each of the three surface water monitoring stations and sent to the Department's Bryte Chemical Laboratory for analyses. Results for analyses completed to date are presented in Tables 1 through 3. Since results from earlier analyses have been presented in previous reports, only those portions of the tables containing the most recent analyses are presented.

Most general water quality parameters and nutrient, mineral, and minor element concentrations remain essentially unchanged during corresponding periods of the year since monitoring began in 1981, prior to the start of construction. Normal seasonal variations are evident for the various parameters. Patterns of occurrence and concentrations are generally similar between stations located upstream and downstream of the powerplant site.

Turbidity and total suspended sediment (TSS) levels were unusually high at all three stations during March. Exceptionally heavy rainfall and surface runoff during this period undoubtedly contributed to the higher than normal turbidity and TSS levels, either through erosion from land surfaces or resuspension of sediments contained in the streambeds. Subsequent measurements of turbidity and TSS produced levels well within the normal ranges for corresponding periods of the year.

An uncharacteristically high quantity of zinc was reported from the April sample from Big Sulphur Creek above Eagle Rock. Stations located upstream as well as downstream contained normal levels of zinc. The source for the high zinc level is unknown.

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Benthic Macroinvertebrates

Benthic macroinvertebrates are collected during April, July, and October from the three Big Sulphur Creek monitoring stations. Data from samples for which analyses have been completed are presented in Tables 4 through 6.

Benthic macroinvertebrate communities from all three Big Sulphur Creek stations exhibit normal seasonal variations. The types of organisms present and distribution of organisms among the species indicate healthy, unimpacted communities. Domination by several opportunistic species (Baetis, Simulium, Helicopsyche, and Hydropsyche) occurs during some parts of the year due to lack of competition by other species. Natural environmental perturbations, such as high spring flows that result in washout of organisms or high summer temperatures that limit habitat suitability, enable such opportunistic species to develop disproportionately large populations.

Sediments

Stream sediment samples are collected in January, April, and October from the three stations on Big Sulphur Creek and two ephemeral tributaries that drain from the powerplant site. Results of the monitoring are presented in Tables 7 through 11.

Particle-size distribution has remained relatively constant since monitoring began in 1981. The data do not indicate any trend to increasing amounts of sediments in the stream gravels. The size distribution of materials has been somewhat variable, but this is due to the uneven distribution of materials in the streambed.

Storm runoff from each pad passes through energy dissipators where sediments settle prior to discharging the water to natural drains. The dissipators are cleaned of sediments each spring after the end of the rainy season. Negligible amounts of sediments have been found except following the winter of 1986. Approximately 1.4 cubic yards of sediments were removed from dissipators in March of 1986, with most of this material eminating from the middle pad. The sediments were removed via bucket to a flat area, spread, and seeded with a grass mixture.

The fabric filter fences have become badly decomposed due to exposure to sunlight. Replacement is not warranted, however, since rainwater drains freely through the pad fill material, and the drainage ditches do not fill with water. No sediments have accumulated in the ditches.

The fill slopes were inspected during March of 1986 for erosion and mass movement of materials. No problems were noted for the pad. However, water discharging from the dissipator for the upper pad was found to be eroding the

natural drainage channel. The channel where erosion was occurring was lined with sand bags and filled with rocks to prevent further erosion. The rest of the channel was cleaned of debris to permit free draining.

Wildlife Water Basins

The two sets of wildlife water basins were inspected for damages, cleaned, and charged with water during March of 1986.

Revegetation

Approximately 440 shrubs and trees of ten species were planted on the east fill slope during January. The species used incuded digger pine, flannel bush, buckeye, big-leaf maple, manzanita, deer brush, toyon, buckbrush, coast live oak, and interior live oak.

A drip irrigation system was installed during March to provide water to the plants during the summer. Irrigation of the plants was begun on May 1.

The survival and growth of each species will be monitored during the summer and fall, and compared to results obtained during the past two seasons to help select species suitable for revegetating the entire fill slope areas.

Attachments

TABLE 1a. BIG SULPHUR CREEK AT GEYSERS RESORT - GENERAL WATER QUALITY PARAMETERS (Continued)

Date	Time (PST)	Temp. °C	Temp. °F	D.O. ppm	D.O. % Sat.	pH Field	pH Lab	EC (umhos/cm) Field	EC (umhos/cm) Lab	Turb. (NTU)	Alkalinity (mg/L) ($CaCO_3$)
01/09/86	1000	9.5	49.1	10.8	100.4	7.6	7.9	242	248	1.2	51
02/06/86	1120	10.5	50.9	10.5	99.9	7.8	8.2	200	197	3.9	84
03/07/86	0840	15.5	59.9	9.3	98.8	7.5	7.8	275	268	56	93
04/02/86	1040	13.5	56.3	10.1	102.8	8.2	8.1	285	293	0.8	114
05/05/86	1430	15.0	59.0	9.9	104.1	8.2	8.2	310	317	0.9	123
06/04/86	0820	19.5	67.1	8.8	101.4	8.1	8.1	382	370	0.5	154

TABLE 1b. BIG SULPHUR CREEK AT GEYSERS RESORT - MINERAL ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Ca	Mg	Na	K	SO_4	Cl	B	TSS	TH
05/08/85	0920	28	23	7	-	34	2	1.2	19	165
06/05/85	0830	34	26	10	-	41	2	1.7	17	192
07/10/85	1230	40	37	16	-	75	3	3.2	68	252
08/07/85	0830	49	38	20	-	105	2	3.3	107	279
09/04/85	1245	45	40	20	-	101	3	14	58	277
10/01/85	1045	43	37	18	-	79	3	9.6	-	259
11/06/85	0915	41	35	19	-	86	3	17	49	246
12/03/85	0910	13	11	4	-	18	2	0.8	305	78
01/09/86	1000	21	16	4	-	23	2	1.3	51	119
02/06/86	1120	19	13	4	-	18	2	0.5	77	101
03/07/86	0840	23	19	5	-	40	2	1.2	1415	136

TABLE 1c. BIG SULPHUR CREEK AT GEYSERS RESORT - NUTRIENT ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Total NO_3+Org. N.	Dissolved NO_2+NO_3 1/	Dissolved o-PO_4	Total P
01/08/85	1200	0.6	0.41	0.01	0.02
02/05/85	0945	0.8	0.50	0.01	0.01
03/08/85	1010	0.4	0.34	0.00	0.01
04/02/85	1350	0.2	0.20	0.00	0.01
05/08/85	0920	0.4	0.51	0.00	0.01
06/05/85	0830	0.8	0.82	0.00	0.02
07/10/85	1230	1.2	1.8	0.02	0.03
08/07/85	0830	2.1	3.7	0.00	0.02
09/04/85	1245	0.9	2.8	0.01	0.04
10/01/85	1045	0.9	2.0	0.01	0.03
11/06/85	0915	1.2	1.8	0.01	0.04
12/03/85	0910	0.1	0.35	0.00	0.04
01/09/86	1000	0.4	0.30	0.01	0.01
02/06/86	1120	0.2	0.26	0.01	0.02
03/07/86	0840	1.1	0.09	0.01	0.12
04/02/86	1040	0.9	0.28	0.01	0.03
05/05/86	1430	0.9	0.59	0.00	0.03

TABLE 1d. BIG SULPHUR CREEK AT GEYSERS RESORT-MINOR ELEMENT ANALYSES (in ug/L)

Date	Time (PST)	Cd	Cu	Fe	Pb	Mn	Hg	Zn
06/16/81	1500	0	0	170	0	50	0	0
07/28/81	1225	0	20	140	0	100	0	0
08/20/81	1420	-	-	-	-	-	0	-
11/04/81	1040	0	10	220	0	60	0	0
03/09/82	1200	0	10	290	0	30	0	0
07/09/82	0915	0	20	270	0	40	0	0
10/12/82	1330	0	20	230	0	50	0	20
04/06/83	1515	0	20	480	0	40	0	10
07/07/83	0600	0	30	270	0	50	0	20
10/06/83	1130	0	20	240	0	50	0	10
03/09/84	0900	0	10	130	0	30	0	0
07/11/84	1130	0	30	120	10	20	0	10
10/03/84	1015	0	0	230	0	40	0	0
04/02/85	1350	0	0	240	0	20	0	10
07/10/85	1230	0	10	180	10	40	0	0
10/01/85	1045	0	20	240	0	30	0	10
04/02/86	1040	0	0	160	0	40	0	10

TABLE 2a. BIG SULPHUR CREEK ABOVE EAGLE ROCK[1/] - GENERAL WATER QUALITY PARAMETERS (Continued)

Date	Time (PST)	Temp. °C	Temp. °F	D.O. ppm	D.O. % Sat.	pH Field	pH Lab	EC (umhos/cm) Field	EC (umhos/cm) Lab	Turb. (NTU)	Alkalinity (mg/L) ($CaCO_3$)
01/09/86	1030	9.0	48.2	10.9	100.1	7.8	7.9	279	258	1.2	102
02/06/86	1040	10.0	50.0	10.4	97.8	7.8	8.2	221	229	4.7	87
03/07/86	0915	15.5	59.9	9.4	99.9	7.8	7.7	285	286	152	90
04/02/86	0900	12.0	53.6	10.4	102.4	8.0	8.1	320	333	1.7	122
05/05/86	1400	15.0	59.0	9.7	102.0	8.0	8.2	340	356	1.5	128
06/04/86	0845	19.5	67.1	10.2	117.6	8.1	8.0	415	389	0.6	146

TABLE 2b. BIG SULPHUR CREEK ABOVE EAGLE ROCK[1/] - MINERAL ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Ca	Mg	Na	K	SO_4	Cl	B	TSS	TH
06/05/85	0915	37	28	10	-	51	2	1.6	15	208
07/10/85	1320	45	35	17	-	99	3	2.9	32	256
08/07/85	0900	39	40	19	-	83	2	3.8	-	262
09/04/85	1145	52	40	21	-	113	3	11	-	294
10/01/85	1215	45	36	18	-	93	2	8.3	95	260
11/06/85	0930	44	34	20	-	99	4	16	9	250
12/03/85	0930	16	11	4	-	23	2	0.9	204	85
01/09/86	1030	23	17	4	-	28	2	1.3	23	128
02/06/86	1040	21	14	4	-	25	2	0.6	126	110
03/07/86	0915	25	18	6	-	46	2	1.1	2715	137

TABLE 2c. BIG SULPHUR CREEK ABOVE EAGLE ROCK[1/] - NUTRIENT ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Total NO_3+Org. N.	Dissolved NO_2+NO_3[2/]	Dissolved o-PO_4	Total P
01/08/85	1400	1.1	0.86	0.01	0.02
02/05/85	1110	0.8	0.92	0.01	0.01
03/08/85	1040	0.9	0.56	0.00	0.02
04/02/85	1530	0.4	0.32	0.00	0.01
05/08/85	1015	1.0	0.89	0.00	0.01
06/05/85	0915	1.4	1.5	0.00	0.02
07/10/85	1320	1.5	3.6	0.01	0.02
08/07/85	0900	0.9	2.4	0.00	0.02
09/04/85	1145	1.7	3.7	0.00	0.03
10/01/85	1215	1.5	3.3	0.00	0.02
11/06/85	0930	1.6	3.0	0.01	0.03
12/03/85	0930	0.5	0.56	0.00	0.04
01/09/86	1030	0.6	0.48	0.01	0.01
02/06/86	1040	0.6	0.42	0.00	0.02
03/07/86	0915	2.0	0.74	0.02	0.52
04/02/86	0900	1.3	0.53	0.00	0.01
05/05/86	1400	1.7	1.0	0.00	0.03

TABLE 2d. BIG SULPHUR CREEK ABOVE EAGLE ROCK[1/]-MINOR ELEMENT ANALYSES (in ug/L)

Date	Time (PST)	Cd	Cu	Fe	Pb	Mn	Hg	Zn
08/20/81	1130						0.00	-
11/03/81	1130	1	2	100	10	46	0.05	3
12/03/81	1430	-	-	-	-	-	0.05	-
01/04/82	1510	-	-	-	-	-	0.09	-
02/08/82	1440	-	-	-	-	-	0.08	-
03/09/82	1300	1	2	430	10	25	0.23	11
04/07/82	1100	-	-	-	-	-	0.05	-
05/05/82	1000	-	-	-	-	-	0.05	-
06/03/82	1245	-	-	-	-	-	0.20	-
08/04/82	1115	-	-	-	-	-	0.23	-
09/01/82	1130	-	-	-	-	-	0.05	-
07/08/82	1515	0.25	15	300	10	34	0.20	54
10/06/82	1700	1	2	16000	-	120	0.05	79
11/03/82	0915	-	-	-	-	-	0.05	-
12/08/82	0940	-	-	-	-	-	0.05	-
01/05/83	1140	-	-	-	-	-	0.05	-
02/02/83	1045	-	-	-	-	-	0.05	-
03/09/83	1210	1	3	540	10	44	0.05	14
04/06/83	1345	-	-	-	-	-	0.05	-
05/05/83	0845	-	-	-	-	-	0.05	-
06/08/83	0800	-	-	-	-	-	0.05	-
07/07/83	0700	0.50	3	900	10	40	0.05	4
08/03/83	0745	-	-	-	-	-	0.05	-
09/07/83	0915	-	-	-	-	-	0.05	-
10/06/83	1330	3	12	626	0	53	0.20	13
11/06/83	1315	1	2	810	10	50	0.05	5
12/13/83	1415	-	-	-	-	-	0.10	-
01/26/84	1100	-	-	-	-	-	0.05	-
03/08/84	1430	0	10	350	0	40	0	0
07/11/84	1300	0	30	180	0	20	0	0
10/03/84	1215	0	0	350	0	30	0	0
04/02/85	1530	0	0	350	0	20	0	10
07/10/85	1320	0	0	120	10	20	0	10
10/01/85	1215	0	20	160	0	30	0	10
04/02/86	0900	0	0	360	0	40	0	100

1/ Sampled as part of KGRA-ARM Program from October 1981 through September 1983 and November 1983 through January 1984.

TABLE 3a. BIG SULPHUR CREEK ABOVE SQUAW CREEK[1/] - GENERAL WATER QUALITY PARAMETERS (Continued)

Date	Time (PST)	Temp °C	Temp °F	D.O. ppm	D.O. % Sat.	pH Field	pH Lab	EC (umhos/cm) Field	EC (umhos/cm) Lab	Turb. (NTU)	Alkalinity (mg/L) ($CaCO_3$)
10/01/85	0830	13.0	55.4	9.7	97.7	8.1	8.3	615	618	1.6	188
11/06/85	0800	9.5	49.1	10.7	99.4	7.9	8.4	600	589	2.0	174
12/03/85	0840	11.0	51.8	10.7	103.0	7.6	7.9	205	194	20	66
01/09/86	0900	8.0	46.4	11.2	100.4	7.9	8.0	310	307	1.2	117
02/06/86	0940	10.0	50.0	10.0	94.0	7.8	7.9	239	255	5.0	98
03/07/86	0750	16.0	60.8	9.4	100.9	7.9	7.8	345	359	30	130
04/02/86	1315	14.5	58.1	10.0	104.0	8.0	8.3	-	370	1.5	140
05/05/86	1500	14.5	58.1	10.0	104.0	8.1	8.2	398	403	3.3	143
06/04/86	0730	18.0	64.4	9.4	105.2	8.1	8.4	442	421	0.9	157

TABLE 3b. BIG SULPHUR CREEK ABOVE SQUAW CREEK1/ - MINERAL ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Ca	Mg	Na	K	SO_4	Cl	B	TSS	TH
12/05/84	1100	26	17	6	0.9	32	2	0.9	55	135
01/08/85	0915	31	22	9	1.2	48	2	1.4	125	168
02/05/85	0915	35	26	11	1.3	53	2	1.6	55	195
03/08/85	0935	28	20	8	-	37	2	1.0	93	152
04/02/85	0915	33	22	8	-	28	2	0.8	24	173
05/08/85	0900	36	26	11	-	51	2	1.3	19	197
06/05/85	0800	40	29	14	-	62	2	1.6	21	220
07/10/85	1130	47	37	26	-	121	4	2.9	29	269
08/07/85	0800	51	39	30	-	136	3	3.4	59	288
09/04/85	1330	52	40	30	-	140	3	7.9	-	294
10/01/85	0830	50	37	24	-	118	2	8.3	-	277
11/06/85	0800	49	36	24	-	100	3	13	22	270
12/03/85	0840	16	12	5	-	30	2	0.8	407	90
01/09/86	0900	27	19	7	-	37	2	1.4	27	146
02/06/86	0940	23	15	5	-	26	2	0.6	139	119
03/07/86	0750	34	23	8	-	52	2	0.9	572	180

TABLE 3c. BIG SULPHUR CREEK ABOVE SQUAW CREEK[1/] - NUTRIENT ANALYSES (in mg/L) (Continued)

Date	Time (PST)	Total NO_3+Org. N.	Dissolved NO_2+NO_3[2/]	Dissolved o-PO_4	Total P
03/08/85	0935	0.6	0.88	0.00	0.01
04/02/85	0915	0.6	0.65	0.00	0.02
05/08/85	0900	0.2	2.2	0.00	0.01
06/05/85	0800	0.6	3.4	0.00	0.02
07/10/85	1130	1.3	5.6	0.01	0.03
08/07/85	0800	0.5	5.8	0.00	0.01
09/04/85	1330	0.4	6.0	0.00	0.02
10/01/85	0830	0.4	5.9	0.00	0.01
11/06/85	0800	0.4	5.7	0.01	0.02
12/03/85	0840	0.5	0.60	0.01	0.05
01/09/86	0900	0.3	1.3	0.01	0.01
02/06/86	0940	0.9	0.48	0.00	0.03
03/07/86	0750	1.3	1.0	0.01	0.04
04/02/86	1315	0.9	0.95	0.00	0.00
05/05/86	1500	0.7	2.0	0.00	0.03

TABLE 3d. BIG SULPHUR CREEK ABOVE SQUAW CREEK[1/]-MINOR ELEMENT ANALYSES (in ug/L)

Date	Time (PST)	Cd	Cu	Fe	Pb	Mn	Hg	Zn
04/23/81	1315	0	0	250	0	30	0	10
06/16/81	1330	0	10	260	0	10	0	0
08/20/81	1345	-	-	-	-	-	0	-
11/02/81	1445	1	2	110	10	32	0.05	3
12/03/81	1015	-	-	-	-	-	0.05	-
01/04/82	1345	-	-	-	-	-	0.05	-
02/08/82	1545	-	-	-	-	-	0.05	-
03/09/82	1015	1	2	758	10	35	0.22	5
04/07/82	1000	-	-	-	-	-	0.05	-
05/05/82	0745	-	-	-	-	-	0.05	-
06/03/82	0715	-	-	-	-	-	0.05	-
07/08/82	1645	0.25	2	240	10	12	0.20	57
08/14/82	1300	-	-	-	-	-	0.16	-
09/01/82	0935	-	-	-	-	-	0.08	-
10/06/82	1030	1	2	110	14	10	0.05	5
11/03/82	1200	-	-	-	-	-	0.05	-
12/08/82	1300	-	-	-	-	-	0.05	-
01/05/83	1520	-	-	-	-	-	0.05	-
02/02/83	1440	-	-	-	-	-	0.05	-
03/09/83	0900	1	3	1100	10	50	0.05	18
04/06/83	1615	-	-	-	-	-	0.05	-
05/05/83	1500	-	-	-	-	-	0.34	-
06/08/83	0945	-	-	-	-	-	0.05	-
07/06/83	1500	0.5	5	410	10	10	0.05	6
08/03/83	1020	-	-	-	-	-	0.05	-
09/18/83	0745	-	-	-	-	-	0.05	-
10/06/83	0730	2	20	626	0	30	0.20	9
11/16/83	1015	1	2	2200	10	70	0.05	2
12/13/83	0830	-	-	-	-	-	0.10	-
01/11/84	0930	-	-	-	-	-	0.05	-
03/08/84	1400	0	10	270	0	20	0	0
07/11/84	1240	0	30	100	0	10	0	10
10/03/84	0800	0	0	120	0	0	0	0
04/02/85	0915	0	0	410	0	30	0	10
07/10/85	1130	0	10	170	10	10	0	40
10/01/85	0830	0	10	180	0	10	0	10
04/02/86	1315	0	0	330	0	20	0	10

1/ Sampled as part of KGRA-ARM Program from October 1981 through September 1983 and November 1983 through January 1984.

Table 4a. Benthic Macroinvertebrates Collected from Big Sulphur Creek at Geysers Resort During 1981 (number per square meter)

	07/28/81	11/04/81
Coleoptera		
Dryopidae		
Helichus sp.	2.7	
Dytiscidae		
Deronectes sp.		
Elmidae		
Ampumixis dispar	1.3	
Microcylloepus sp.		
Narpus sp.	1.3	
Optioservus sp.		16.1
Ordobrevia nubifera		
Zaitzevia parvula		2.7
Hydrophilidae		
Tropisternus sp.	2.7	
Psephenidae		
Eubrianax edwardsi		
Psephenus sp.	36.3	5.3
Diptera		
Blephariceridae		
Chironomidae		
Chironominae	9.4	
Tanytarsus sp.	5.3	2.7
Orthocladiinae	1.3	2.7
Cricotopus sp.		
Tanypodinae		
Empididae		
Psychodidae		
Maruina lanceolata		
Simuliidae		
Prosimulium sp.		
Simulium sp.	209.8	
Stratiomyidae	1.3	
Euparyphus sp.	6.7	
Tipulidae		
Antocha sp.	12.1	
Hexatoma sp.	13.4	6.7
Ephemeroptera		
Baetidae		
Baetis sp.	182.9	33.6
Ephemerellidae		
Ephemerella coloradensis	204.4	
E. euterpe		
E. levis	10.7	
E. micheneri		
Heptageniidae		
Cinygmula sp.		
Iron sp.		
Ironodes sp.		
Rhithrogena sp.	119.7	18.8
Leptophlebiidae		
Paraleptophlebia sp.	1.3	
Siphlonuridae		
Ameletus sp.	4.0	
Isonychia velma		
Tricorythidae		
Tricorythodes fallax		
Hemiptera		
Naucoridae		
Ambrysus mormon	2.7	
Veliidae		
Microvelia sp.		
Lepidoptera		
Pyralidae		
Parargyractis sp.	5.3	
Megaloptera		
Sialidae		
Sialis sp.		
Odonata		
Coenagrionidae		
Argia sp.		
A. emma		1.3
A. sedula	1.3	
Plecoptera		
Chloroperlidae		
Hastaperla chilnualna	9.4	
Perlidae		
Calineuria californica	8.0	6.7
Hesperoperla pacifica	1.3	
Perlodidae		
Isogenus sp.	1.3	
Pteronarcyidae		
Pteronarcys californica		
Trichoptera		
Glossosomatidae		
Glossosoma sp.	1.3	
Helicopsychidae		
Helicopsyche borealis	377.9	104.9
Hydropsychidae		
Cheumatopsyche sp.		10.7
Hydropsyche sp.	593.1	73.9
Hydroptilidae		
Hydroptila sp.		
Leucotrichia pictipes		
Neotrichia sp.	4.0	
Ochrotrichia sp.		
Leptoceridae		
Mystacides sp.		1.3
Oecetis sp.		
Limnephilidae		
Dicosmoecus sp.	10.7	
Odontoceridae		
Marilia sp.		
Philopotamidae	2.7	
Chimarra sp.	8.0	
Rhyacophilidae		
Rhyacophila sp.	9.4	
Sericostomatidae		
Gumaga nigricula		6.7
Annelida		
Oligochaeta	4.0	1.3
Arachnoidea		
Hydracarina sp.		
Platyhelminthes		
Planariidae		
Dugesia sp.	15.8	
Number of Organisms	1882.0	295.0
Number of Species	36.0	16.0
Diversity	3.1	2.8
Equitability	0.33	0.61

Table 4b. Benthic Macroinvertebrates Collected from Big Sulphur Creek at Geysers Resort During 1982 (number per square meter)

	04/23/82	07/09/82	10/02/82
Coleoptera			
Dryopidae			
Helichus sp.			
Dytiscidae			
Deronectes sp.			2.7
Elmidae			
Ampumixis dispar			
Microcylloepus sp.			2.7
Narpus sp.			
Optioservus sp.	2.7		45.7
Ordobrevia nubifera			2.7
Zaitzevia parvula		2.7	78.0
Hydrophilidae			
Tropisternus sp.			
Psephenidae			
Eubrianax edwardsi			
Psephenus sp.			111.6
Diptera			
Blephariceridae	1.3		1.3
Chironomidae		1.3	
Chironominae			
Tanytarsus sp.		4.0	1827.8
Orthocladiinae	1.3	13.4	71.2
Cricotopus sp.			94.1
Tanypodinae		1.3	71.2
Empididae			1.3
Psychodidae			
Maruina lanceolata		1.3	4.0
Simuliidae			
Prosimulium sp.			
Simulium sp.		15,154.1	29.5
Stratiomyidae			
Euparyphus sp.			
Tipulidae	1.3		
Antocha sp.			
Hexatoma sp.		2.7	
Ephemeroptera			
Baetidae			
Baetis sp.	9.4	344.3	250.1
Ephemerellidae			
Ephemerella coloradensis	10.7		
E. euterpe			
E. levis			
E. micheneri			
Heptageniidae			
Cinygmula sp.			
Iron sp.			
Ironodes sp.			
Rhithrogena sp.	4.0		14.7
Leptophlebiidae			
Paraleptophlebia sp.			
Siphlonuridae			
Ameletus sp.			
Isonychia velma			
Tricorythidae			
Tricorythodes fallax			2.7
Hemiptera		1.3	
Naucoridae			
Ambrysus mormon			2.7
Veliidae			
Microvelia sp.			
Lepidoptera			1.3
Pyralidae			
Parargyractis sp.			1.3
Megaloptera			
Sialidae			
Sialis sp.			
Odonata			
Coenagrionidae			
Argia sp.			
A. emma			
A. sedula			5.3
Plecoptera			
Chloroperlidae			
Hastaperla chilnualna			
Perlidae			
Calineuria californica	4.0	4.0	29.5
Hesperoperla pacifica			
Perlodidae			
Isogenus sp.			
Pteronarcyidae			
Pteronarcys californica			
Trichoptera			
Glossosomatidae			
Glossosoma sp.			
Helicopsychidae			
Helicopsyche borealis		158.7	1119.0
Hydropsychidae			33.6
Cheumatopsyche sp.			
Hydropsyche sp.	4.0	256.8	3726.9
Hydroptilidae			
Hydroptila sp.		118.3	
Leucotrichia pictipes			1.3
Neotrichia sp.			
Ochrotrichia sp.			1.3
Leptoceridae			
Mystacides sp.			
Oecetis sp.			2.7
Limnephilidae			
Dicosmoecus sp.			
Odontoceridae			
Marilia sp.			5.3
Philopotamidae			
Chimarra sp.			
Rhyacophilidae			
Rhyacophila sp.	1.3	5.3	2.7
Sericostomatidae			
Gumaga nigricula	1.3		5.3
Annelida			
Oligochaeta			
Arachnoidea			
Hydracarina sp.			
Platyhelminthes			
Planariidae			
Dugesia sp.			126.4
Number of Organisms	41.0	16,067.0	7674.0
Number of Species	11.0	15.0	32.0
Diversity	3.0	0.4	2.2
Equitability	1.03	0.10	0.20

Table 4c. Benthic Macroinvertebrates Collected from Big Sulphur Creek at Geysers Resort During 1983 (number per square meter)

	04/13/83	07/12/83	10/06/83
Coleoptera			
Dryopidae			
Helichus sp.		4.0	5.3
Dytiscidae			
Deronectes sp.			
Elmidae			
Ampumixis dispar			
Microcylloepus sp.			
Narpus sp.			
Optioservus sp.	2.7	48.4	150.6
Ordobrevia nubifera		4.0	5.3
Zaitzevia parvula		8.0	67.2
Hydrophilidae			
Tropisternus sp.			
Psephenidae			
Eubrianax edwardsi			2.7
Psephenus sp.	2.7		37.6
Diptera			
Blephariceridae	2.7	28.2	
Chironomidae			
Chironominae			
Tanytarsus sp.		84.7	2.7
Orthocladiinae	53.8	347.0	8.0
Cricotopus sp.			
Tanypodinae	5.3	44.3	
Empididae		24.2	
Psychodidae			
Maruina lanceolata		4.0	2.6
Simuliidae			
Prosimulium sp.	4.0		
Simulium sp.		3998.6	2.7
Stratiomyidae			
Euparyphus sp.		4.0	
Tipulidae			
Antocha sp.		4.0	2.7
Hexatoma sp.	1.3	16.1	16.1
Ephemeroptera			
Baetidae			
Baetis sp.	110.2	1437.8	177.5
Ephemerellidae			
Ephemerella coloradensis	69.9		
E. euterpe	57.8		
E. levis			
E. micheneri	2.7		
Heptageniidae			
Cinygmula sp.	4.0		
Iron sp.	24.2		
Ironodes sp.	5.3		
Rhithrogena sp.			43.0
Leptophlebiidae			
Paraleptophlebia sp.	1.3		2.7
Siphlonuridae			
Ameletus sp.			
Isonychia velma		1.3	
Tricorythidae			
Tricorythodes fallax		4.0	
Hemiptera			
Naucoridae			
Ambryus mormon		8.0	2.6
Veliidae			
Microvelia sp.	1.3		
Lepidoptera			
Pyralidae			
Parargyractis sp.			2.7
Megaloptera			
Sialidae			
Sialis sp.		4.0	
Odonata			
Coenagrionidae			
Argia sp.		8.0	
A. emma			
A. sedula			
Plecoptera			
Chloroperlidae			
Haataperla chilnualna			
Perlidae			
Calineuria californica		8.0	10.7
Hesperoperla pacifica	1.3	1.3	
Perlodidae			
Isogenus sp.			
Pteronarcyidae			
Pteronarcys californica			2.7
Trichoptera			
Glossosomatidae			
Glossosoma sp.			
Helicopsychidae			
Helicopsyche borealis		395.4	2012.1
Hydropsychidae			
Cheumatopsyche sp.			112.9
Hydropsyche sp.		1238.7	2765.3
Hydroptilidae		4.0	
Hydroptila sp.		95.4	
Leucotrichia pictipes			2.7
Neotrichia sp.			
Ochrotrichia sp.			
Leptoceridae			
Mystacides sp.			
Oecetis sp.		12.1	
Limnephilidae			
Dicosmoecus sp.			
Odontoceridae			
Marilia sp.			
Philopotamidae			
Chimarra sp.			
Rhyacophilidae			
Rhyacophila sp.		24.2	
Sericostomatidae			
Gumaga nigricula		100.8	40.3
Annelida			
Oligochaeta		44.3	
Arachnoidea			
Hydracarina sp.	2.7		
Platyhelminthes			
Planariidae			
Dugesia sp.		76.6	196.3
Number of Organisms	302.0	8083.0	5564.0
Number of Species	18.0	31.0	24.0
Diversity	2.8	2.4	1.9
Equitability	0.53	0.23	0.20

Table 5a. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Eagle Rock During 1981 (number per square meter)

	11/03/81
Coleoptera	
Dytiscidae	
Deronectes sp.	1.3
Elmidae	
Mycrocylloepus sp.	
Narpus sp.	
Optioservus sp.	75.4
Ordobrevia nubifera	
Zaitzevia parvula	5.4
Hydrophilidae	1.3
Psephenidae	
Eubrianax edwardsi	
Psephenus sp.	177.7
Collembola	
Diptera	
Blephariceridae	
Ceratopogonidae	
Chironomidae	
Chironominae	
Tanytarsus sp.	
Orthocladiinae	1.3
Cricotopus sp.	
Tanypodinae	
Empididae	
Psychodidae	
Maruina lanceolata	
Simuliidae	
Simulium sp.	
Stratiomyidae	
Euparyphus sp.	
Stratiomys sp.	
Tipulidae	
Antocha sp.	1.3
Dicranota sp.	
Hexatoma sp.	4.0
Unidentified sp.	
Ephemeroptera	
Baetidae	
Baetis sp.	33.6
Ephemerellidae	
Ephemerella sp.	
E. coloradensis	
E. euterpe	
E. flavilinea	
E. levis	
Heptageniidae	
Cinygmula sp.	
Iron sp.	
Rhithrogena sp.	18.8
Siphlonuridae	
Ameletus sp.	
Tricorythidae	
Tricorythodes fallax	6.7
Hemiptera	
Gerridae	
Trepobates sp.	
Naucoridae	
Ambrysus mormon	1.3
Lepidoptera	
Pyralidae	
Parargyractis sp.	16.2
Neuroptera	
Sisyridae	
Climacia california	
Odonata	
Coenagrionidae	
Argia sp.	
A. emma	6.7
Gomphidae	
Ophiogomphus sp.	1.3
Plecoptera	
Capniidae	
Paracapnia sp.	5.4
Chloroperlidae	
Hastaperla chilnualna	
Nemouridae	
Malenka sp.	
Perlidae	
Calineuria californica	2.7
Trichoptera	
Helicopsychidae	
Helicopsyche borealis	18.8
Hydropsychidae	
Cheumatopsyche sp.	148.0
Hydropsyche sp.	205.9
Hydroptilidae	
Hydroptila sp.	
Leucotrichia pictipes	1.3
Ochrotrichia sp.	
Lepidostomatidae	
Lepidostoma sp.	
Leptoceridae	
Nectopsyche sp.	
Oecetis sp.	
Odontoceridae	
Marilia sp.	14.8
Parthina sp.	
Philopotamidae	
Chimarra sp.	5.4
Psychomyidae	
Tinodes sp.	1.3
Rhyacophilidae	
Rhyacophila, sp.	
Sericostomatidae	
Gumaga nigricula	13.5
Annelida	
Oligochaeta	
Arachnoidea	
Hydracarina	
Mollusca	
Lymnaeidae	
Lymnaea sp.	1.3
Platyhelminthes	
Planaridae	
Dugesia sp.	20.2
Typhloplanidae	
Mesostoma sp.	
Number of Organisms	790.0
Number of Species	27.0
Diversity	3.1
Equitability	0.46

Table 5b. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Eagle Rock During 1982 (number per square meter)

	04/23/82	07/08/82	10/08/82
Coleoptera			
Dytiscidae			
Deronectes sp.			
Elmidae			
Mycrocylloepus sp.		2.7	
Narpus sp.	2.7	2.7	
Optioservus sp.	1.3	16.2	48.4
Ordobrevia nubifera		6.7	
Zaitzevia parvula		10.8	6.7
Hydrophilidae			
Psephenidae			
Eubrianax edwardsi	4.0	6.7	2.7
Psephenus sp.		2.7	31.0
Collembola			
Diptera			
Blephariceridae			
Ceratopogonidae			
Chironomidae			
Chironominae	1.3		
Tanytarsus sp.	2.7	9.4	4.0
Orthocladiinae		41.7	1.3
Cricotopus sp.		10.8	2.7
Tanypodinae		2.7	
Empididae			
Psychodidae			
Maruina lanceolata		9.4	33.6
Simuliidae			
Simulium sp.		100.9	452.1
Stratiomyidae			
Euparyphus sp.		2.7	
Stratiomys sp.		1.3	
Tipulidae			
Antocha sp.			8.1
Dicranota sp.		1.3	
Hexatoma sp.		1.3	1.3
Unidentified sp.			
Ephemeroptera			
Baetidae			
Baetis sp.	8.1	290.7	289.3
Ephemerellidae			
Ephemerella sp.	2.7		
E. coloradensis			
E. euterpe			
E. flavilinea			
E. levis		2.7	
Heptageniidae			
Cinygmula sp.			
Iron sp.			
Rhithrogena sp.			16.2
Siphlonuridae			
Ameletus sp.			
Tricorythidae			
Tricorythodes fallax			
Hemiptera			
Gerridae			
Trepobates sp.			
Naucoridae			
Ambrysus mormon		5.4	2.7
Lepidoptera			
Pyralidae			
Parargyractis sp.			25.6

	04/23/82	07/08/82	10/08/82
Neuroptera			
Sisyridae			
Climacia california			
Odonata			
Coenagrionidae			
Argia sp.			
A. emma			
Gomphidae			
Ophiogomphus sp.			
Plecoptera			
Capniidae			
Paracapnia sp.			
Chloroperlidae			
Hastaperla chilnualna			
Nemouridae			
Malenka sp.			
Perlidae			
Calineuria californica	2.7	16.2	
Trichoptera			
Helicopsychidae			
Helicopsyche borealis		43.1	113.0
Hydropsychidae			
Cheumatopsyche sp.			106.3
Hydropsyche sp.	4.0	438.8	1044.1
Hydroptilidae		13.5	1.3
Hydroptila sp.		123.8	
Leucotrichia pictipes			18.8
Ochrotrichia sp.			
Lepidostomatidae			
Lepidostoma sp.			
Leptoceridae			
Nectopsyche sp.			
Oecetis sp.			
Odontoceridae			
Marilia sp.			
Parthina sp.			
Philopotamidae			
Chimarra sp.			
Psychomyidae			
Tinodes sp.			
Rhyacophilidae			
Rhyacophila sp.		28.3	9.4
Sericostomatidae			
Gumaga nigricula		1.3	4.0
Annelida			
Oligochaeta	4.0	8.1	
Arachnoidea			
Hydracarina			
Mollusca			
Lymnaeidae			
Lymnaea sp.			
Platyhelminthes			
Planaridae			
Dugesia sp.		9.4	10.8
Typhloplanidae			
Mesostoma sp.			
Number of Organisms	34.0	1211.0	2233.4
Number of Species	10.0	29.0	23.0
Diversity	3.1	3.0	2.5
Equitability	1.23	0.38	0.33

Table 5c. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Eagle Rock During 1983 (number per square meter)

	04/13/83	07/07/83	10/06/83
Coleoptera	1.3		
Dytiscidae			
Deronectes sp.			
Elmidae			
Mycrocylloepus sp.			
Narpus sp.			
Optioservus sp.	1.3	41.7	34.9
Ordobrevia nubifera	6.7	4.0	2.7
Zaitzevia parvula	1.3	41.7	5.4
Hydrophilidae			
Psephenidae			
Eubrianax edwardsi			
Psephenus sp.	10.8	1.3	91.4
Collembola	2.7		
Diptera	2.7		
Blephariceridae		35.0	
Ceratopogonidae		4.0	
Chironomidae			
Chironominae			
Tanytarsus sp.	29.6	181.6	10.7
Orthocladiinae	43.1	8.1	
Cricotopus sp.			
Tanypodinae		52.5	
Empididae		13.5	
Psychodidae			
Maruina lanceolata			
Simuliidae			
Simulium sp.		200.5	
Stratiomyidae			
Euparyphus sp.		9.4	
Stratiomys sp.			
Tipulidae			
Antocha sp.	2.7	14.8	
Dicranota sp.		51.1	
Hexatoma sp.	5.4	113.0	5.4
Unidentified sp.	2.7		
Ephemeroptera			
Baetidae			
Baetis sp.	21.5	3023.4	8.0
Ephemerellidae			
Ephemerella sp.			
E. coloradensis	37.7		
E. euterpe	87.5		
E. flavilinea	1.3		
E. levis			
Heptageniidae			
Cinygmula sp.	2.7		
Iron sp.	1.3		
Rhithrogena sp.			
Siphlonuridae			
Ameletus sp.	10.8		
Tricorythidae			
Tricorythodes fallax	9.4		2.7
Hemiptera			
Gerridae			
Trepobates sp.		1.3	
Naucoridae			
Ambrysus mormon		25.6	5.4
Lepidoptera			
Pyralidae			
Parargyractis sp.			16.1
Neuroptera			
Sisyridae			
Climacia california		1.3	
Odonata			
Coenagrionidae			
Argia sp.			2.7
A. emma			
Gomphidae			
Ophiogomphus sp.			
Plecoptera			
Capniidae			
Paracapnia sp.			
Chloroperlidae			
Hastaperla chilnualna	1.3		
Nemouridae			
Malenka sp.	1.3		
Perlidae			
Calineuria californica	2.7	28.3	
Trichoptera			
Helicopsychidae			
Helicopsyche borealis	53.8	78.0	3841.3
Hydropsychidae			
Cheumatopsyche sp.			78.0
Hydropsyche sp.	2.7	4184.6	406.1
Hydroptilidae			
Hydroptila sp.		146.7	
Leucotrichia pictipes			
Ochrotrichia sp.		4.0	
Lepidostomatidae			
Lepidostoma sp.	1.3	2.7	
Leptoceridae			
Nectopsyche sp.		6.7	
Oecetis sp.	1.3		
Odontoceridae			
Marilia sp			
Parthina sp.	2.7		
Philopotamidae			
Chimarra sp.			
Psychomyidae			
Tinodes sp.			
Rhyacophilidae			
Rhyacophila sp.	1.3	166.8	2.7
Sericostomatidae			
Gumaga nigricula		670.1	16.1
Annelida			
Oligochaeta	4.0	21.5	
Arachnoidea			
Hydracarina		10.8	
Mollusca			
Lymnaeidae			
Lymnaea sp.			
Platyhelminthes			
Planaridae			
Dugesia sp.	1.3	51.1	8.0
Typhloplanidae			
Mesostoma sp.		9.4	
Number of Organisms	349.5	9204.5	4537.1
Number of Species	31.0	32.0	17.0
Diversity	3.6	2.3	1.0
Equitability	0.58	0.20	0.13

Table 6a. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Squaw Creek During 1981 (number per square meter)

	04/23/81	11/12/81
Coleoptera		
Chrysomelidae		
Dryopidae		
Helichus sp.		1.3
Elmidae	6.7	
Ampumixis sp.	4.0	
Microcylloepus sp.		
Narpus sp.	2.7	
Optioservus sp.		8.1
Ordobrevia nubifera		
Zaitzevia parvula		
Haliplidae		
Peltodytes sp.		
Psephenidae		
Eubrianax edwardsi		
Psephenus sp.	20.2	8.1
Diptera		
Blephariceridae		
Chironomidae		
Chironominae	2.7	
Tanytarsus sp.		2.7
Orthocladiinae		
Cricotopus sp.	4.0	
Tanypodinae		
Psychodidae		
Maruina lanceolata		
Simuliidae		
Simulium sp.	22.9	33.6
Stratiomyidae		
Euparyphus sp.		
Tabanidae		
Tipulidae		
Antocha sp.	6.7	
Gonomyia sp.		
Hexatoma sp.	4.0	4.0
Molophilus sp.		
Ephemeroptera		
Baetidae		
Baetis sp.	484.2	90.2
Ephemerellidae		
Ephemerella sp.		
E. coloradensis	86.1	
E. euterpe	75.3	
E. soquele		1.3
Heptageniidae		
Cinygmula sp.		
Iron sp.		
Ironodes sp.		
Ironopsis sp.	1.3	
Rhithrogena sp.		37.7
R. sp. 2		6.7
Siphlonuridae		
Ameletus sp.		
Hemiptera		
Gerridae		
Trepobates sp.		
Hebridae		
Naucoridae		
Ambrysus mormon	1.3	
Lepidoptera		
Pyralidae		
Parargyractis sp.		
Megaloptera		
Sialidae		
Sialis sp.		
Odonata		
Agrionidae		
Hetaerina americana		
Coenagrionidae		
Argia sp.		
A. emma		4.0
A. sedula		
Plecoptera		
Capniidae		
Capnia sp.		31.0
Nemouridae		
Malenka sp.		
Perlidae		
Calineuria californica	1.3	
Pteronarcyidae		
Pteronarcys californica		
Trichoptera		
Brachycentridae		
Amiocentrus aspilus	6.7	
Glossosomatidae		
Glossosoma sp.		
Helicopsychidae		
Helicopsyche borealis		2.7
Hydropsychidae		
Cheumatopsyche sp.		87.5
Hydropsyche sp.	18.8	228.8
Hydroptilidae		
Hydroptila sp.		
Leucotrichia pictipes		
Neotrichia sp.	8.1	
Ochrotrichia sp.		
Leptoceridae		
Oecetis sp.		
Odontoceridae		
Marilia sp.		
Philopotamidae		
Chimarra sp.		5.4
Wormaldia sp.		
Psychomyiidae		
Psychomyia sp.	5.4	
Rhyacophilidae		
Rhyacophila sp.		1.3
Sericostomatidae		
Gumaga nigricula		1.3
Annelida		
Oligochaeta		2.7
Arachnoidea		
Hydracarina		
Platyhelminthes		
Planaridae		
Dugesia sp.	37.7	20.2
Number of Organisms	800.0	578.0
Number of Species	20.0	20.0
Diversity	2.2	2.8
Equitability	0.31	0.50

Table 6b. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Squaw Creek During 1982 (number per square meter)

	04/23/82	07/08/82	10/02/82
Coleoptera			
Chrysomelidae	1.3		
Dryopidae		1.3	
Helichus sp.			
Elmidae			
Ampumixis sp.			
Microcylloepus sp.		1.3	1.3
Narpus sp.			
Optioservus sp.		9.4	37.7
Ordobrevia nubifera		2.7	
Zaitzevia parvula		10.8	39.0
Haliplidae			
Peltodytes sp.			
Psephenidae			
Eubrianax edwardsi			
Psephenus sp.	5.4	9.4	84.8
Diptera			
Blephariceridae		37.7	
Chironomidae			
Chironominae			
Tanytarsus sp.		2.7	378.1
Orthocladiinae		33.6	13.5
Cricotopus sp.		8.1	21.5
Tanypodinae		6.7	6.7
Psychodidae			
Maruina lanceolata		4.0	10.8
Simuliidae			
Simulium sp.		1267.8	431.9
Stratiomyidae			
Euparyphus sp.			
Tabanidae			
Tipulidae			
Antocha sp.			14.8
Gonomyia sp.			
Hexatoma sp.			4.0
Molophilus sp.	1.3		
Ephemeroptera			
Baetidae			
Baetis sp.	8.1	262.4	168.2
Ephemerellidae			
Ephemerella sp.			
E. coloradensis	10.8		
E. euterpe	14.8		
E. soquele			
Heptageniidae			
Cinygmula sp.	2.7		
Iron sp.	1.3		
Ironodes sp.			
Ironopsis sp.			
Rhithrogena sp.			20.2
R. sp. 2			
Siphlonuridae			
Ameletus sp.			8.1
Hemiptera			
Gerridae			
Trepobates sp.			
Hebridae			
Naucoridae			
Ambrysus mormon		1.3	4.0
Lepidoptera			
Pyralidae			
Parargyractis sp.			13.5

	04/23/82	07/08/82	10/02/82
Megaloptera			
Sialidae			
Sialis sp.			1.3
Odonata			
Agrionidae			
Hetaerina americana			
Coenagrionidae			
Argia sp.			
A. emma			
A. sedula			2.7
Plecoptera			
Capniidae			
Capnia sp.			
Nemouridae			
Malenka sp.			
Perlidae			
Calineuria californica		4.0	
Pteronarcyidae			
Pteronarcys californica		1.3	
Trichoptera			
Brachycentridae			
Amiocentrus aspilus			
Glossosomatidae			
Glossosoma sp.			
Helicopsychidae			
Helicopsyche borealis	2.7	4.0	106.3
Hydropsychidae			
Cheumatopsyche sp.			123.8
Hydropsyche sp.	4.0	100.9	1523.1
Hydroptilidae			2.7
Hydroptila sp.			
Leucotrichia pictipes			
Neotrichia sp.			
Ochrotrichia sp.		102.3	
Leptoceridae			
Oecetis sp.			
Odontoceridae			
Marilia sp.			90.2
Philopotamidae			
Chimarra sp.			
Wormaldia sp.			5.4
Psychomyiidae			
Psychomyia sp.			
Rhyacophilidae			
Rhyacophila sp.	2.7	14.8	
Sericostomatidae			
Gumaga nigricula		5.4	
Annelida			
Oligochaeta		6.7	
Arachnoidea			
Hydracarina			
Platyhelminthes			
Planaridae			
Dugesia sp.		12.1	56.5
Number of Organisms	55.0	1910.0	3172.0
Number of Species	11.0	24.0	26.0
Diversity	3.0	1.9	2.7
Equitability	1.02	0.20	0.35

Table 6c. Benthic Macroinvertebrates Collected from Big Sulphur Creek Above Squaw Creek During 1983 (number per square meter)

	04/12/83	07/12/83	10/06/83
Coleoptera			
Chrysomelidae			
Dryopidae			
Helichus sp.			2.7
Elmidae			
Ampumixis sp.			
Microcylloepus sp.			
Narpus sp.		2.7	
Optioservus sp.	1.3	16.2	78.0
Ordobrevia nubifera		2.7	10.7
Zaitzevia parvula			94.1
Haliplidae			
Peltodytes sp.		1.3	
Psephenidae			
Eubrianax edwardsi	1.3		
Psephenus sp.	2.7	10.8	164.0
Diptera			
Blephariceridae	1.3	9.4	
Chironomidae			
Chironominae	36.0	5.4	
Tanytarsus sp.		18.8	8.0
Orthocladiinae	5.4	16.2	21.5
Cricotopus sp.			
Tanypodinae		1.3	
Psychodidae			
Maruina lanceolata			
Simuliidae			
Simulium sp.		3522.6	188.3
Stratiomyidae			
Euparyphus sp.		16.2	5.4
Tabanidae			2.7
Tipulidae	1.3		
Antocha sp.		21.5	16.1
Gonomyia sp.	1.3		
Hexatoma sp.	1.3	8.1	26.9
Molophilus sp.			
Ephemeroptera			
Baetidae			
Baetis sp.	36.3	1130.2	330.8
Ephemerellidae			
Ephemerella sp.	5.4		
E. coloradensis	52.5		
E. euterpe	170.9		
E. soquele			
Heptageniidae			
Cinygmula sp.	6.7		
Iron sp.	5.4	5.4	
Ironodes sp.	2.7		
Ironopsis sp.			
Rhithrogena sp.	1.3		78.0
R. sp. 2			
Siphlonuridae			
Ameletus sp.			
Hemiptera			
Gerridae			
Trepobates sp.		2.7	
Hebridae	1.3		
Naucoridae			
Ambrysus mormon		13.5	5.4
Lepidoptera			
Pyralidae			
Parargyractis sp.			126.4

	04/12/83	07/12/83	10/06/83
Megaloptera			
Sialidae			
Sialis sp.		1.3	
Odonata			
Agrionidae			
Hetaerina americana			2.7
Coenagrionidae			
Argia sp.			5.4
A. emma			
A. sedula			
Plecoptera			
Capniidae			
Capnia sp.			
Nemouridae			
Malenka sp.		2.7	
Perlidae			
Calineuria californica		8.1	8.0
Pteronarcyidae			
Pteronarcys californica			5.4
Trichoptera			
Brachycentridae			
Amiocentrus aspilus	1.3		
Glossosomatidae			
Glossosoma sp.		1.3	
Helicopsychidae			
Helicopsyche borealis	1.3	59.2	64.5
Hydropsychidae			
Cheumatopsyche sp.			
Hydropsyche sp.	2.7	196.4	2533.9
Hydroptilidae			
Hydroptila sp.		48.4	
Leucotrichia pictipes			5.4
Neotrichia sp.			
Ochrotrichia sp.			
Leptoceridae			
Oecetis sp.			32.2
Odontoceridae			
Marilia sp.			126.4
Philopotamidae			
Chimarra sp.			
Wormaldia sp.			
Psychomyiidae			
Psychomyia sp.			
Rhyacophilidae			
Rhyacophila sp.	1.3	35.0	8.0
Sericostomatidae			
Gumaga nigricula	2.7		
Annelida			
Oligochaeta		45.7	
Arachnoidea			
Hydracarina		32.3	
Platyhelminthes			
Planaridae			
Dugesia sp.	2.7		201.7
Number of Organisms	343.0	5234.0	4154.0
Number of Species	24.0	28.0	27.0
Diversity	2.5	1.6	2.4
Equitability	0.33	0.14	0.26

Table 7. Particle size distribution from Big Sulphur Creek at Geysers Resort

	Percent Passing													
Mesh:	3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5 m	2 m	1 m
11/9/81	100	95	66	35	15	11	9	8	7	7	6	3	1	1
4/23/82	100	99	89	58	31	23	17	13	10	8	7	3	2	1
10/2/82	77	61	48	35	20	17	13	10	8	8	7	2	1	0
4/13/83	95	78	61	42	25	17	10	7	6	5	4	2	1	0
10/6/83	94	76	61	37	17	10	6	5	4	4	3	1	0	0
1/27/84	100	97	84	58	36	30	23	17	14	11	10	4	2	2
4/11/84	100	86	65	41	24	18	12	9	7	6	5	2	1	1
10/2/84	94	82	72	58	41	32	23	18	15	13	10	4	2	1
1/8/85	98	82	72	57	38	23	10	4	3	1	1	0	0	0
4/2/85	100	98	88	59	30	21	15	12	10	8	7	3	2	1
10/1/85	100	100	91	66	42	28	19	15	13	12	10	4	2	1
4/2/86	100	87	73	58	41	26	16	7	3	2	1	0	0	0

Table 9. Particle size distribution from Big Sulphur Creek above Squaw Creek

	Percent Passing													
Mesh:	3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5 m	2 m	1 m
11/4/81	100	71	45	32	23	15	8	5	3	2	2	1	1	0
4/23/82	100	95	83	51	21	9	7	6	4	3	2	1	1	0
10/2/82	100	100	95	78	51	25	9	5	4	3	2	1	1	0
4/13/83	96	87	64	41	23	14	8	4	3	2	1	1	1	0
10/6/83	95	90	77	61	42	35	24	16	12	10	8	3	2	1
1/27/84	91	85	70	47	28	21	14	10	8	7	6	2	1	1
4/11/84	100	92	72	42	23	16	13	10	8	6	5	2	1	1
10/2/84	87	79	58	36	21	14	10	8	6	4	4	1	1	0
1/8/85	100	93	71	40	20	9	5	3	2	1	0	0	0	0
4/2/85	100	93	75	48	26	17	12	9	7	6	4	2	1	1
10/1/85	100	93	67	38	20	10	6	4	2	2	1	1	0	0
4/2/86	100	96	84	69	49	30	14	4	2	1	0	0	0	0

Table 8. Particle size distribution from Big Sulphur Creek above Eagle Rock

	Percent Passing													
Mesh:	3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5 m	2 m	1 m
11/4/81	90	75	49	29	17	11	7	4	2	1	1	1	1	0
4/23/84	100	96	82	57	35	23	13	6	3	2	1	1	1	0
10/2/82	100	89	66	46	33	24	13	6	3	2	1	1	1	0
4/13/83	100	84	58	44	34	25	15	6	3	2	1	1	1	0
10/6/83	100	94	64	45	30	23	16	11	8	6	5	2	2	1
1/27/84	100	98	89	65	35	25	19	15	12	10	8	3	2	1
4/11/84	100	92	71	40	22	17	13	11	8	7	6	2	1	1
10/2/84	100	97	86	63	39	28	21	17	14	11	9	3	2	1
1/8/85	97	89	74	54	37	24	14	7	2	1	0	0	0	0
4/2/85	90	89	82	73	61	53	43	32	24	19	16	7	5	3
10/1/85	100	99	88	65	46	31	23	17	10	7	6	3	1	1
4/2/86	98	85	67	48	31	20	11	6	2	1	0	0	0	0

Table 10. Particle size distribution from East tributary

	Percent Passing													
Mesh:	3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5 m	2 m	1 m
11/4/81	100	91	68	46	31	27	24	21	18	15	13	5	3	2
3/24/82	93	66	39	28	19	17	14	13	11	10	8	4	2	1
10/2/82	100	97	85	69	59	54	47	41	35	30	26	11	6	4
1/5/83	87	69	55	42	29	24	21	19	17	15	13	5	3	2
4/12/83	100	100	93	75	49	44	37	31	26	22	19	7	4	1
10/6/83	100	100	95	81	59	52	44	38	31	26	23	8	4	2
1/27/84	100	81	55	37	23	19	16	14	12	10	9	4	2	2
4/11/84	100	91	81	65	45	39	34	30	27	24	21	8	5	3
10/2/84	100	98	83	64	45	39	34	30	27	23	20	8	5	3
1/8/85	100	93	78	62	44	26	14	8	4	2	1	1	0	0
4/2/85	100	85	71	52	36	30	25	22	20	17	14	6	4	3
10/1/85	100	92	86	68	49	40	33	27	24	20	18	8	5	3
2/13/86	100	99	87	65	44	30	18	10	5	3	2	1	0	0
4/2/86	100	100	91	67	49	35	23	14	7	4	2	1	0	0

Table 11. Particle size distribution from West tributary

	Percent Passing													
Mesh:	3"	1-1/2"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	5 m	2 m	1 m
11/4/81	100	76	53	36	25	22	20	18	15	11	9	4	2	1
3/24/82	100	74	57	41	29	24	21	19	17	14	11	5	3	2
10/2/82	100	92	70	50	36	32	29	27	24	18	14	6	4	3
1/5/83	100	89	65	43	27	23	19	17	14	12	10	4	2	2
4/12/83	69	49	36	25	14	12	10	9	8	6	5	2	1	1
10/6/83	100	72	46	29	18	14	13	12	11	9	8	2	1	0
1/27/84	96	85	69	64	42	38	33	31	28	25	22	8	6	2
4/11/84	100	55	38	25	16	13	11	10	9	8	6	2	2	1
10/2/84	100	93	70	50	33	30	26	24	20	17	14	6	4	2
1/8/85	100	83	52	30	17	10	6	4	3	2	2	0	0	0
4/2/85	88	53	39	27	16	12	8	7	6	4	4	2	1	0
10/1/85	100	87	63	43	27	21	17	15	12	10	8	4	3	2
2/13/86	91	80	56	35	20	12	7	4	3	2	1	0	0	0
4/2/86	100	78	50	34	23	17	12	8	6	3	2	1	0	0