

DISSOLVED PESTICIDE DATA FOR THE SAN JOAQUIN RIVER AT VERNALIS AND THE SACRAMENTO RIVER AT SACRAMENTO, CALIFORNIA, 1991-94

By Dorene MacCoy, Kathryn L. Crepeau, and Kathryn M. Kuivila

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Abstract

Water samples were collected from sites on the San Joaquin and Sacramento Rivers, California and were analyzed for dissolved organic pesticides. This data collection and analysis are a part of an ongoing project by the U.S. Geological Survey Toxic Contaminants Hydrology program to determine the fate and transport of organic pesticides that enter the San Francisco Bay Estuary. Concentrations of selected pesticides were measured in filtered water samples using solid-phase extraction and gas chromatograph-mass spectrometry at the U.S. Geological Survey organic chemistry laboratory in Sacramento.

INTRODUCTION

The San Francisco Bay Estuary, one of the most economically and ecologically important estuarine systems in the Nation, receives a broad range of agricultural organic pesticides that vary widely in their environmental behavior, sources, seasonality, and toxicity. The drainage system of the estuary includes the Central Valley of California (fig. 1), most of which is irrigated and intensively farmed for a diverse group of crops. Agriculture in the Central Valley accounts for 10 percent of the total pesticide use in the United States—20,000 tons annually and over 500 different organic compounds (Wright and Phillips, 1988).

Little is known about the timing or actual amounts of pesticides that enter the estuary. To gain a better understanding of the transport, transformation, and ultimate fate of pesticides within the estuary, the U.S. Geological Survey (USGS) began the San Francisco Bay Estuary Toxic Contaminants Project in 1990.

Two rivers, the Sacramento and the San Joaquin, drain most of the Central Valley and account for the largest loads of pesticides to the San Francisco Bay Estuary. Water samples were collected routinely at two sites, one on the San Joaquin River at Vernalis and one on the Sacramento River at Sacramento, and were analyzed for selected dissolved pesticides. The site at Vernalis, a long-term USGS water-quality station, is downstream of most other riverine inputs from the San Joaquin Valley, and the site at Sacramento is downstream of most other riverine inputs from the Sacramento Valley.

This report presents a compilation of the dissolved pesticide data collected at Vernalis and at Sacramento. Water samples were collected routinely at Vernalis beginning in January 1991 and at Sacramento beginning in May 1991. Sample collection continued at both sites through April 1994. The samples were analyzed for concentrations of selected pesticides, and the results of the analyses were compiled.

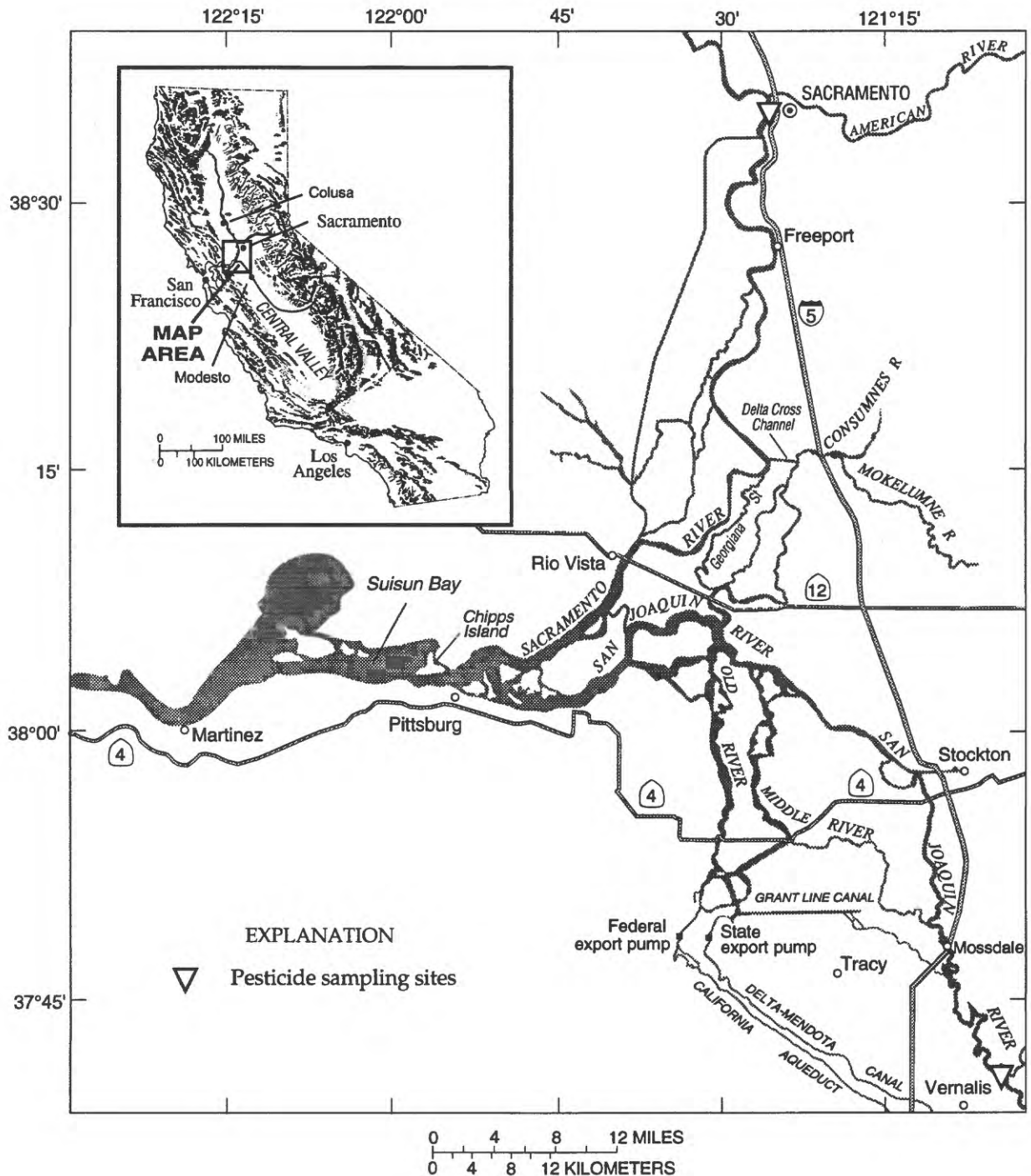


Figure 1. Location of study area and sampling sites in the Central Valley, California.

The authors would like to thank Joe Domagalski of the U.S. Geological Survey for his help in setting up the analytical method in the Sacramento laboratory and Kathy Hui for her endless hours of data entry. A special thanks is given to the USGS observer, Mark Pombert, who faithfully collected a water sample from the San Joaquin River at Vernalis every day during the 4-year period of data collection.

SAMPLE COLLECTION, PROCESSING, AND ANALYSIS

Water samples were collected at Vernalis near the center of flow using a D-74 depth-integrating, discharge-weighting sampler designed to provide a representative sample of the average suspended-sediment concentration for a river cross section (Porterfield, 1992). Samples collected during 2 or more consecutive days usually were combined for analysis. During critical sampling periods such as during periods of rainfall, water samples collected during a single day were analyzed.

Water samples were collected from the Sacramento River and processed singly. These samples were collected three times a week at a point in the river near the center of flow, which under normal flow conditions is representative of a cross section. Two different sample collectors were used at the Sacramento River site. From May 10, 1991, through November 20, 1991, the samples were collected using a specially designed two-bottle sampler that was weighted with a 15-pound brass fish and was built to hold two 1-liter amber glass bottles. From November 20, 1991, through April 30, 1994, a D-77 depth-integrating, discharge-weighting sampler equipped with a Teflon bottle and nozzle was used to collect the samples.

All water samples were filtered through a baked 0.7-micron glass-fiber filter, and the pesticides were extracted using C-8 solid-phase extraction cartridges. A surrogate compound, terbuthylazine, was added before extraction to provide quantitative data on the efficiency of the extraction. The cartridges were dried with carbon dioxide and then eluted with hexane:diethyl ether (1:1). The eluant was concentrated and analyzed using gas chromatography/mass spectrometry (GC/MS).

Initially, water samples collected from the Sacramento River at Sacramento were analyzed only for pesticides used on rice, a major crop in the Sacramento Valley. In contrast, water samples collected from the San Joaquin River at Vernalis were analyzed for a large suite of pesticides. Beginning in August 1991, the water samples collected at both sites were analyzed for the same suite of pesticides. Other pesticides were added to the analysis during the course of the study as additional information on pesticide usage in the Central Valley became available. Water samples collected from January 1991 through September 1992 were processed and analyzed using one analytical method, and those samples collected from October 1992 through April 1994 were processed and analyzed using a modified analytical method. The modifications included reducing the volume of water extracted and adding internal standards for quantification of the pesticides. Details of the analytical and modified analytical methods, including accuracy and precision of data, are described by Crepeau and others (1994).

QUALITY ASSURANCE

Equipment blanks, replicate samples, matrix spikes, and surrogate recovery were the types of quality-control data collected. The equipment blanks were processed about every 20 samples and at the beginning and end of intensive sampling. None of the pesticides analyzed for were detected in the equipment blanks. Replicate samples constituted about 10 percent of the samples analyzed and were within 25 percent agreement for each of the pesticides detected. Matrix spikes of all the analytes were checked on a regular basis after the method had been validated (Crepeau and others, 1994). Recovery of the surrogate, terbuthylazine, was recorded to assess the efficiency of each extraction. The average percent recovery and standard deviation for terbuthylazine was calculated for each year. Sample data were excluded if the recovery of terbuthylazine was outside the warning limit; that is, the annual mean \pm 1.5 standard deviations.

COMPILATION OF DATA

The method detection limits determined for each pesticide using the original or modified method are given in table 1 (at back of report). Pesticide data collected from the San Joaquin River at Vernalis are presented in tables 2 through 5 (at back of report), and pesticide data collected from the

Sacramento River at Sacramento are presented in tables 6 through 9 (at back of report). The method detection limits are dependent on both the matrix and the pesticide and were determined using the 99-percent confidence level. Pesticide concentrations below the method detection limit are in parenthesis in the data tables because these values are estimates.

REFERENCES CITED

- Crepeau, K.L., Domagalski, J.L., and Kuivila, K.M., 1994, Methods of analysis and quality-assurance practices of the U.S. Geological Survey Organic Laboratory, Sacramento, California-- Determination of pesticides in water by solid-phase extraction and capillary-column gas chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 94-362, 17 p.
- Porterfield, George, 1992, Computation of fluvial-sediment discharge: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. C3, 66 p.
- Wright, D.A., and Phillips, D.J.H., 1988, Chesapeake and San Francisco Bays--A study in contrasts and parallels: Marine Pollution Bulletin, v. 19, p. 405-413.

Table 1. Method detection limits for the original analytical method calculated at the 50-nanogram-per-liter concentration and for the modified analytical method calculated at the 100-nanogram-per-liter concentration

[Values are in nanograms per liter. --, not included in original method]

Pesticide	Sacramento River water		San Joaquin River water	
	Original	Modified	Original	Modified
Eptam	--	38	--	129
Butylate ¹	--	44	--	19
Pebulate	--	50	--	44
Molinate	25	110	38	53
Ethalfuralin ¹	--	75	--	31
Trifluralin ¹	19	85	28	60
Simazine	47	60	82	63
Carbofuran	41	44	31	28
Atrazine	22	47	35	28
Terbuthylazine ²	13	50	28	41
Fonofos ¹	19	28	22	25
Diazinon d-10 ²	--	44	--	38
Diazinon	19	38	38	31
Carbaryl	41	50	44	31
Alachlor ¹	--	35	--	22
Thiobencarb	16	41	38	60
Malathion ¹	19	35	31	44
Metolachor	--	35	--	47
Cyanazine	--	50	--	50
Chlorpyrifos	28	44	28	35
Dacthal	--	44	--	63
Methidathion	31	31	28	28
Napropamide ¹	--	47	--	28

¹Compound analyzed for but not detected.

²Surrogate compound.

Table 2. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, January through September 1991

[Original analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following pesticides, but none were detected: atrazine, chlorpyrifos, fonofos, malathion, and trifluralin. nd, nondetection; --, not analyzed for; (), concentration below detection limit]

Date	Simazine	Carbofuran	Diazinon	Thiobencarb
1/13-14	nd	nd	39	--
1/15-16	nd	nd	42	--
1/17-18	nd	nd	40	--
1/19-20	(53)	nd	(32)	--
1/21-22	(68)	nd	44	--
1/23-24	253	nd	102	--
1/25-26	143	nd	38	--
1/27-29	119	nd	(34)	--
1/30-31	(71)	nd	(32)	--
2/1-2	83	nd	(36)	--
2/3	315	nd	61	--
2/4	283	nd	65	--
2/5	290	nd	75	--
2/6	426	nd	71	--
2/7-8	287	nd	(29)	--
2/9-10	(72)	nd	(23)	--
2/11-12	(54)	nd	(24)	--
2/14	(43)	nd	(17)	--

Table 2. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, January through September 1991--*Continued*

Date	Simazine	Carbofuran	Diazinon	Thiobencarb
2/15-16	(24)	nd	(14)	--
2/17-18	(27)	nd	nd	--
2/19-20	(25)	nd	nd	--
2/21-22	(35)	nd	nd	--
2/23-24	(19)	nd	nd	--
2/25-26	(38)	nd	nd	--
2/27-28	(21)	nd	nd	--
3/1-2	213	nd	69	--
3/3	508	nd	(35)	--
3/4-5	281	nd	(25)	--
3/6-7	345	nd	(14)	--
3/8-9	317	50	(16)	--
3/10-11	233	82	(15)	--
3/14-15	126	56	92	--
3/16-17	107	59	(24)	--
3/18-19	141	75	44	--
3/20-21	277	96	50	--
3/22-23	330	53	(31)	--
3/24-25	456	74	44	--
3/26-27	247	59	47	--
3/30-31	244	(29)	nd	--
4/1-2	(66)	(23)	nd	nd
4/3-4	145	42	(37)	(8)
4/5-6	109	42	(22)	(14)
4/7-8	(70)	(17)	(12)	(15)
4/9-10	96	(17)	(17)	(17)
4/11-12	101	(14)	(14)	(22)
4/13-14	129	(14)	(13)	(29)
4/15-16	(72)	(18)	nd	(35)
4/17-18	(79)	(11)	nd	(10)
4/19-20	98	34	(14)	(21)
4/21-22	342	48	(28)	nd
4/23-24	(59)	(13)	nd	nd
4/25-26	(80)	37	(24)	nd
4/27-28	(41)	(20)	nd	nd
4/29-30	(58)	35	(11)	(13)
5/1-2	(64)	(19)	(15)	nd
5/3-4	(42)	(14)	nd	nd
5/5-6	(53)	(26)	(23)	nd
5/7-8	(63)	(29)	(25)	nd
5/9-10	(60)	(23)	(14)	nd
5/14-15	(52)	nd	(18)	nd
5/16-17	nd	nd	nd	nd
5/18-19	(22)	nd	nd	nd
5/20-21	(36)	nd	nd	nd
5/22-23	(13)	nd	nd	nd
5/24-25	(23)	nd	41	nd
5/26-27	nd	nd	nd	nd
5/28-29	(19)	nd	nd	nd
5/30-31	(26)	nd	(19)	nd
6/1-2	83	nd	(18)	nd
6/3-4	(21)	nd	(13)	nd
6/5-6	(27)	nd	nd	nd
6/7-8	nd	nd	(14)	nd
6/9-10	(22)	nd	nd	nd
6/11-12	(18)	nd	nd	nd
6/13-14	(21)	nd	nd	nd

Table 2. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, January through September 1991--*Continued*

Date	Simazine	Carbofuran	Diazinon	Thiobencarb
6/15-16	(19)	nd	nd	nd
6/19-20	nd	nd	nd	nd
6/21-22	(35)	nd	nd	nd
6/23-24	nd	nd	nd	nd
6/25-26	nd	nd	nd	nd
6/27-28	(35)	nd	nd	nd
6/29-30	(41)	nd	nd	nd
7/3-4	(33)	nd	nd	nd
7/5-6	(24)	nd	nd	nd
7/7-8	(29)	nd	nd	nd
7/9-10	(16)	nd	nd	nd
7/11-12	(17)	nd	nd	nd
7/13-14	(38)	nd	nd	nd
7/15-16	nd	nd	nd	nd
7/17-18	nd	nd	nd	nd
7/19-21	nd	nd	nd	nd
7/22-23	(46)	nd	(14)	nd
7/24-25	(25)	nd	nd	nd
7/26-27	nd	nd	nd	nd
7/28-29	nd	nd	nd	nd
7/30-31	(35)	nd	nd	nd
8/1-2	(45)	nd	nd	nd
8/3-4	(39)	nd	nd	nd
8/5-6	(29)	nd	nd	nd
8/7-8	(53)	nd	nd	nd
8/9-10	(59)	nd	nd	nd
8/11-12	(62)	nd	nd	nd
8/13-14	(24)	nd	nd	nd
8/15-16	(28)	nd	nd	nd
8/17-18	(27)	nd	nd	nd
8/19-20	(37)	nd	nd	nd
8/21-22	(17)	nd	nd	nd
8/23-24	nd	nd	nd	nd
8/25-26	(16)	nd	nd	nd
8/27-28	(21)	nd	nd	nd
8/29-30	nd	nd	nd	nd
8/31-9/1	(13)	nd	nd	nd
9/2-3	nd	nd	nd	nd
9/4-5	nd	nd	nd	nd
9/6-7	(16)	nd	(13)	nd
9/8-9	(10)	nd	nd	nd
9/10-11	(16)	nd	nd	nd
9/12-13	(18)	nd	nd	nd
9/14-15	(16)	nd	nd	nd
9/18-19	nd	nd	nd	nd
9/20-21	(10)	nd	nd	nd
9/22-23	nd	nd	nd	nd
9/24-25	nd	nd	nd	nd
9/26-27	nd	nd	nd	nd
9/28-29	nd	nd	nd	nd

Table 3. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1991 through September 1992

[Original analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following pesticides, but none were detected: atrazine, chlorpyrifos, fonofos, malathion, molinate, and trifluralin. nd, nondetection; (), concentration below detection limit]

Date	Simazine	Carbofuran	Diazinon	Carbaryl	Thiobencarb	Methidathion
1991						
10/2-3	nd	nd	nd	nd	nd	nd
10/4-5	nd	nd	nd	nd	nd	nd
10/6-7	nd	nd	nd	nd	nd	nd
10/8-9	(20)	nd	nd	nd	nd	nd
10/10-11	nd	nd	(23)	nd	nd	nd
10/12-13	nd	nd	(14)	nd	nd	nd
10/14-15	nd	nd	nd	nd	nd	nd
10/16-17	nd	nd	nd	nd	nd	nd
10/18	nd	nd	nd	nd	nd	nd
10/20-21	nd	nd	nd	nd	nd	nd
10/22-23	(13)	nd	nd	nd	nd	nd
10/24-25	nd	nd	nd	nd	nd	nd
10/26-27	nd	nd	nd	(17)	nd	nd
10/28-29	(29)	nd	(12)	nd	nd	nd
10/30-31	(35)	nd	(18)	(26)	nd	nd
11/1-2	(38)	nd	nd	45	nd	nd
11/3-4	(27)	nd	nd	nd	nd	nd
11/5-6	(16)	nd	nd	nd	nd	nd
11/7	(13)	nd	nd	nd	(15)	nd
11/8-9	(10)	nd	nd	nd	nd	nd
11/10-11	(50)	nd	nd	nd	nd	nd
11/12-13	(79)	nd	nd	nd	nd	nd
11/14-15	(51)	nd	nd	nd	nd	nd
11/16-17	(30)	nd	nd	nd	nd	nd
11/18-19	(80)	nd	nd	nd	nd	nd
11/20-21	(55)	nd	nd	nd	nd	nd
11/22-23	(55)	nd	nd	nd	nd	nd
11/24-25	(31)	nd	nd	nd	nd	nd
11/26-27	(33)	nd	nd	nd	nd	nd
11/28-29	(62)	nd	nd	nd	nd	nd
11/30-12/1	(69)	nd	nd	nd	nd	nd
12/2-3	122	nd	nd	nd	nd	nd
12/4-5	(47)	nd	nd	nd	nd	nd
12/6-7	(30)	nd	nd	nd	nd	nd
12/8-9	(61)	nd	nd	nd	nd	nd
12/12-13	nd	nd	nd	nd	nd	nd
12/14-15	nd	nd	nd	nd	nd	nd
12/16-17	(26)	nd	nd	nd	nd	nd
12/18-19	nd	nd	nd	nd	nd	nd
12/20-21	nd	nd	(17)	nd	nd	nd
12/22-23	nd	nd	nd	nd	nd	nd
12/24-25	nd	nd	nd	nd	nd	nd
12/26-27	nd	nd	nd	nd	nd	nd
12/28-29	nd	nd	(12)	nd	nd	nd
1992						
1/1-2	nd	nd	(12)	nd	nd	nd
1/3-4	nd	nd	(13)	nd	nd	nd
1/5-6	nd	nd	53	nd	nd	(27)
1/7-8	nd	nd	(17)	nd	nd	(24)
1/9-10	nd	nd	(14)	nd	nd	214
1/11-12	nd	nd	(30)	nd	nd	155
1/13-14	nd	nd	(16)	nd	nd	45

Table 3. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1991 through September 1992--*Continued*

Date	Simazine	Carbofuran	Diazinon	Carbaryl	Thiobencarb	Methidathion
<i>1992--Continued</i>						
1/15-16	nd	nd	(20)	nd	nd	54
1/17-18	nd	nd	(33)	nd	nd	31
1/19-20	nd	nd	(33)	nd	nd	31
1/21-22	nd	nd	38	nd	nd	30
1/23-24	nd	nd	59	nd	nd	(23)
1/25-26	nd	nd	(32)	nd	nd	nd
1/27-28	nd	nd	65	nd	nd	nd
1/29-30	nd	nd	84	nd	nd	(15)
2/2-3	nd	nd	52	nd	nd	nd
2/4-5	nd	nd	49	nd	nd	nd
2/6-7	nd	nd	48	nd	nd	nd
2/8-9	nd	nd	62	(15)	nd	nd
2/10-11	nd	nd	161	(19)	nd	nd
2/12-13	nd	nd	527	(33)	nd	(26)
2/14-15	nd	nd	191	nd	nd	52
2/16-17	nd	nd	192	nd	nd	44
2/18-19	nd	nd	111	nd	nd	(27)
2/20-21	nd	nd	82	nd	nd	(12)
2/22-23	nd	nd	(24)	nd	nd	nd
2/24-25	nd	nd	65	nd	nd	nd
2/26-27	nd	nd	74	nd	nd	nd
2/28-29	nd	nd	51	nd	nd	nd
3/1-2	nd	nd	55	nd	nd	nd
3/3-4	nd	nd	50	nd	nd	nd
3/5-6	nd	nd	55	nd	nd	nd
3/7-8	nd	nd	56	(29)	nd	nd
3/11-12	nd	nd	(34)	nd	nd	nd
3/13-14	nd	nd	110	nd	nd	nd
3/15-16	nd	nd	45	nd	nd	nd
3/17-18	nd	nd	98	nd	nd	nd
3/19-20	nd	nd	73	nd	nd	nd
3/21-22	nd	nd	61	nd	nd	nd
3/23-24	nd	nd	102	nd	nd	nd
3/25-26	nd	nd	50	nd	nd	nd
3/27-28	nd	nd	(32)	nd	nd	nd
3/29-30	nd	nd	(33)	nd	nd	nd
3/31-4/1	nd	nd	(37)	nd	nd	nd
4/2-3	(43)	nd	(30)	nd	nd	nd
4/4-5	(41)	nd	(16)	nd	nd	nd
4/6-7	(54)	nd	(14)	nd	nd	nd
4/8-9	(75)	nd	(17)	nd	nd	nd
4/10-11	(43)	nd	nd	nd	nd	nd
4/12-13	(68)	nd	nd	nd	nd	nd
4/14-15	(44)	nd	nd	nd	nd	nd
4/16-17	86	(27)	nd	nd	nd	nd
4/18-19	(56)	nd	nd	nd	nd	nd
4/20-21	(60)	(21)	nd	nd	nd	nd
4/22-23	(56)	nd	nd	(21)	nd	nd
4/24-25	(49)	nd	nd	nd	nd	nd
4/26-27	(30)	nd	nd	nd	nd	nd
4/28-29	(23)	nd	nd	nd	nd	nd
4/30-5/1	(24)	nd	nd	46	nd	nd
5/2-3	(45)	nd	nd	(24)	nd	nd
5/4-5	(20)	nd	nd	(24)	nd	nd
5/6-7	(34)	nd	nd	50	nd	nd
5/8-9	(30)	nd	nd	50	nd	nd

Table 3. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1991 through September 1992--*Continued*

Date	Simazine	Carbofuran	Diazinon	Carbaryl	Thiobencarb	Methidathion
<i>1992--Continued</i>						
5/10-11	(38)	nd	nd	47	nd	nd
5/14-15	(23)	nd	(19)	(35)	nd	nd
5/18-19	(34)	nd	(22)	(33)	nd	nd
5/20-21	(27)	nd	(28)	nd	nd	nd
5/22-23	nd	nd	(24)	nd	nd	nd
5/24-25	(39)	nd	(26)	nd	nd	nd
5/28-29	(25)	nd	(14)	nd	nd	nd
5/30-31	(49)	nd	nd	nd	nd	nd
6/1-2	(46)	nd	nd	nd	nd	nd
6/5-6	(29)	nd	nd	nd	nd	nd
6/7-8	(40)	nd	nd	nd	nd	nd
6/11-12	(25)	nd	nd	nd	nd	nd
6/13-14	(16)	nd	nd	nd	nd	nd
6/17-18	nd	nd	nd	nd	nd	nd
6/19-20	(24)	nd	nd	nd	nd	nd
6/21-22	(26)	nd	nd	nd	nd	nd
6/23-24	(24)	nd	nd	nd	nd	nd
6/25-26	nd	nd	nd	nd	nd	nd
6/27-28	nd	nd	nd	nd	nd	nd
6/29-30	nd	nd	nd	nd	nd	nd
7/1-2	nd	nd	nd	nd	nd	nd
7/3-4	nd	nd	(13)	nd	nd	nd
7/5-6	nd	nd	nd	nd	nd	nd
7/7-8	nd	nd	nd	nd	nd	nd
7/9-10	(38)	nd	nd	nd	nd	nd
7/11-12	(35)	nd	nd	nd	nd	nd
7/13-14	(46)	nd	nd	nd	nd	nd
7/15-16	(36)	35	nd	nd	nd	nd
7/17-18	(36)	nd	nd	nd	nd	nd
7/19-20	(51)	(30)	nd	nd	nd	nd
7/21-22	(38)	nd	nd	nd	nd	nd
7/23-24	(33)	nd	(17)	nd	nd	nd
7/25-26	(43)	nd	nd	nd	nd	nd
7/27-28	(37)	nd	nd	nd	nd	nd
8/2-4	(33)	nd	(15)	nd	nd	nd
8/5-6	(41)	nd	(22)	nd	nd	nd
8/7-8	(47)	nd	100	nd	nd	nd
8/9-10	(46)	nd	(13)	nd	nd	nd
8/11-12	(57)	nd	nd	nd	nd	nd
8/13-14	(32)	nd	nd	nd	nd	nd
8/17-18	(34)	nd	nd	nd	nd	nd
8/19-20	(16)	nd	nd	nd	nd	nd
8/21-22	(35)	nd	(16)	nd	nd	nd
8/23-24	(45)	nd	nd	nd	nd	nd
8/25-26	(29)	nd	nd	nd	nd	nd
8/27-28	(41)	nd	(15)	nd	nd	nd
8/29-30	(37)	nd	nd	nd	nd	nd
8/31-9/1	(45)	nd	nd	nd	nd	nd
9/2-3	(42)	nd	nd	nd	nd	nd
9/4-5	(44)	nd	nd	nd	nd	nd
9/6-7	(46)	nd	nd	nd	nd	nd
9/8-9	nd	nd	(14)	nd	nd	nd
9/10-11	(33)	nd	nd	nd	nd	nd
9/12-13	(25)	nd	nd	nd	nd	nd
9/14-15	(22)	nd	nd	nd	nd	nd
9/16-17	(27)	nd	nd	nd	nd	nd

Table 3. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1991 through September 1992--*Continued*

Date	Simazine	Carbofuran	Diazinon	Carbaryl	Thiobencarb	Methidathion
1992--Continued						
9/18-19	(23)	nd	nd	nd	nd	nd
9/20-21	(19)	nd	nd	nd	nd	nd
9/24-25	(16)	nd	nd	nd	nd	nd
9/26-27	(14)	nd	nd	nd	nd	nd
9/28-29	(17)	nd	nd	nd	nd	nd

Table 4. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1992 through September 1993

[Modified analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following pesticides, but none were detected: alachlor, atrazine, butylate, fonofos, malathion, napropamide, pebulate, and trifluralin. nd, nondetection; --, not analyzed for; (), concentration below detection limit]

Date	Eptam	Molinate	Simazine	Carbofuran	Diazinon	Carbaryl	Thiobencarb	Metolachlor	Cyanazine	Chlorpyrifos	Dacthal	Methidathion
1992												
10/2-3	--	nd	(47)	nd	nd	nd	nd	--	--	nd	--	nd
10/4-5	--	nd	(39)	nd	nd	nd	nd	--	--	nd	--	nd
10/6-7	--	nd	nd	nd	nd	nd	nd	--	--	nd	--	nd
10/8-9	--	nd	(40)	nd	nd	nd	nd	--	--	nd	--	nd
10/10-11	--	nd	(29)	nd	(17)	nd	nd	--	--	nd	--	nd
10/12-13	--	nd	(51)	nd	nd	nd	nd	--	--	nd	--	nd
10/16-17	--	nd	69	nd	nd	nd	nd	--	--	nd	--	nd
10/18-19	--	nd	(38)	nd	nd	nd	nd	--	--	nd	--	nd
10/20-21	--	nd	(59)	nd	nd	nd	nd	--	--	nd	--	nd
10/22-23	--	nd	(45)	nd	nd	nd	nd	--	--	nd	--	nd
10/24-25	--	nd	(54)	nd	nd	nd	nd	--	--	nd	--	nd
10/26-27	--	nd	(54)	nd	nd	nd	nd	--	--	nd	--	nd
10/28-29	--	nd	(47)	nd	nd	nd	nd	--	--	nd	--	nd
10/30-31	--	nd	(14)	nd	nd	nd	nd	--	--	nd	--	nd
11/1-2	--	nd	(39)	nd	nd	nd	nd	--	--	nd	--	nd
11/3-4	--	nd	(18)	nd	nd	nd	nd	--	--	nd	--	nd
11/5-6	--	nd	(44)	nd	nd	nd	nd	--	--	nd	--	nd
11/7-8	--	nd	(45)	nd	nd	nd	nd	--	--	nd	--	nd
11/10-11	--	nd	(38)	nd	nd	nd	nd	--	--	nd	--	nd
11/12-13	--	nd	(22)	nd	nd	nd	nd	--	--	nd	--	nd
11/14-15	--	nd	(44)	nd	nd	nd	nd	--	--	nd	--	nd
11/16-17	--	nd	(41)	nd	nd	nd	nd	--	--	nd	--	nd
11/18-19	--	nd	(39)	nd	nd	nd	nd	--	--	nd	--	nd
11/20-21	--	nd	(39)	nd	nd	nd	nd	--	--	nd	--	nd
11/22-23	--	nd	(37)	nd	nd	nd	nd	--	--	nd	--	nd
11/24-25	--	nd	(48)	nd	nd	nd	nd	--	--	nd	--	nd
11/26-27	--	nd	(41)	nd	nd	nd	nd	--	--	nd	--	nd
11/28-29	--	nd	(61)	nd	nd	nd	nd	--	--	nd	--	nd
12/2-3	--	nd	(45)	nd	nd	nd	nd	--	--	nd	--	nd
12/4-5	--	nd	(42)	nd	nd	nd	nd	--	--	nd	--	nd
12/6-7	--	nd	(57)	nd	nd	nd	nd	--	--	nd	--	nd
12/8-9	--	nd	233	nd	(13)	nd	nd	--	--	nd	--	nd
12/10-11	--	nd	153	nd	nd	nd	nd	--	--	nd	--	nd
12/12-13	--	nd	145	nd	(20)	nd	nd	--	--	nd	--	nd
12/14-15	--	nd	177	nd	nd	nd	nd	--	--	nd	--	nd
12/16-17	--	nd	197	nd	(17)	nd	nd	--	--	nd	--	(24)
12/18-19	--	nd	273	nd	(13)	nd	nd	--	--	nd	--	nd

Table 4. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1992 through September 1993--*Continued*

Date	Eptam	Molin- ate	Sima- zine	Carbo- furan	Diaz- inon	Car- baryl	Thio- bencarb	Meto- lachlor	Cyana- zine	Chlor- pyrifos	Dact- hal	Methi- dathion
1992--Continued												
12/20	--	nd	257	nd	(13)	nd	nd	--	--	nd	--	nd
12/22-23	--	nd	92	nd	(19)	nd	nd	--	--	nd	--	70
12/24-25	--	nd	68	nd	(20)	nd	nd	--	--	nd	--	(21)
12/26-27	--	nd	87	nd	(23)	nd	nd	--	--	nd	--	nd
12/28-29	--	nd	66	nd	(16)	nd	nd	--	--	nd	--	nd
12/30-31	--	nd	150	nd	48	(30)	nd	--	--	nd	--	nd
1993												
1/1-2	--	nd	84	nd	(28)	51	nd	--	--	nd	--	nd
1/3-4	--	nd	208	nd	40	34	nd	--	--	nd	--	52
1/5	--	nd	74	nd	(19)	nd	nd	--	--	nd	--	34
1/6	--	nd	204	nd	36	nd	nd	--	--	nd	--	nd
1/7	--	nd	176	nd	(12)	nd	nd	--	--	nd	--	nd
1/8	--	nd	174	nd	77	nd	nd	--	--	nd	--	nd
1/9	--	nd	407	nd	173	nd	nd	--	--	nd	--	nd
1/10	--	nd	595	nd	319	nd	nd	--	--	nd	--	nd
1/11	--	nd	379	nd	151	nd	nd	--	--	nd	--	38
1/12	--	nd	253	nd	165	nd	nd	--	--	nd	--	nd
1/13	--	nd	301	nd	189	(16)	nd	--	--	nd	--	(13)
1/14	nd	nd	159	nd	283	nd	nd	nd	--	nd	91	nd
1/15	nd	nd	226	nd	395	nd	nd	nd	--	nd	(29)	(13)
1/16	nd	nd	280	nd	295	nd	nd	nd	--	nd	(34)	(13)
1/17	nd	nd	146	nd	126	nd	nd	nd	--	nd	(19)	nd
1/18	nd	nd	163	nd	89	nd	nd	nd	--	nd	(52)	nd
1/19	nd	nd	288	nd	211	nd	nd	nd	--	nd	(26)	nd
1/20	nd	nd	272	nd	195	nd	nd	nd	--	nd	(20)	nd
1/21	nd	nd	216	nd	100	nd	nd	nd	--	nd	(20)	nd
1/22	nd	nd	224	nd	100	nd	nd	nd	--	nd	(13)	nd
1/23	nd	nd	220	nd	183	nd	nd	nd	--	nd	(16)	nd
1/24	nd	nd	140	nd	128	nd	nd	nd	--	nd	(14)	nd
1/25	nd	nd	137	nd	66	nd	nd	nd	--	nd	(10)	nd
1/26	nd	nd	302	nd	92	nd	nd	nd	--	nd	(24)	nd
1/27	nd	nd	215	nd	87	nd	nd	nd	--	nd	(10)	nd
1/28	nd	nd	129	nd	77	nd	nd	nd	--	nd	nd	nd
1/29	nd	nd	132	nd	58	nd	nd	nd	--	nd	nd	nd
1/30	nd	nd	155	nd	70	nd	nd	nd	--	nd	nd	nd
1/31	nd	nd	138	nd	59	nd	nd	nd	--	nd	nd	nd
2/1	nd	nd	163	nd	70	nd	nd	nd	--	nd	(11)	nd
2/3	nd	nd	122	nd	80	nd	nd	nd	--	nd	nd	nd
2/4	nd	nd	108	nd	50	nd	nd	nd	--	nd	nd	(15)
2/5	nd	nd	128	nd	90	nd	nd	nd	--	nd	nd	nd
2/6	nd	nd	74	nd	71	nd	nd	nd	--	nd	nd	nd
2/7	nd	nd	95	nd	70	nd	nd	nd	--	(12)	nd	nd
2/8	nd	nd	103	nd	452	nd	nd	nd	--	nd	nd	nd
2/9	nd	nd	733	nd	714	195	nd	(20)	--	nd	181	90
2/10	nd	nd	492	nd	280	146	nd	nd	--	(12)	(33)	586
2/11	nd	nd	844	nd	582	197	nd	nd	--	(16)	(39)	116
2/12	nd	nd	455	nd	591	(27)	nd	nd	--	43	(17)	93
2/13	nd	nd	284	nd	335	nd	nd	nd	--	(24)	(11)	66
2/14	nd	nd	247	nd	296	nd	nd	nd	--	(23)	(45)	64
2/15	nd	nd	248	nd	293	nd	nd	nd	--	nd	(22)	66
2/16	nd	nd	123	nd	159	nd	nd	nd	--	nd	nd	52
2/17	nd	nd	229	nd	164	nd	nd	nd	--	nd	(18)	59
2/18	nd	nd	229	nd	138	nd	nd	nd	--	nd	(21)	31

Table 4. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1992 through September 1993--*Continued*

Date	Eptam	Molin- ate	Sima- zine	Carbo- furan	Diaz- inon	Car- baryl	Thio- bencarb	Meto- lachlor	Cyana- zine	Chlor- pyrifos	Dact- hal	Methi- dathion
<i>1993--Continued</i>												
2/19	nd	nd	356	nd	228	nd	nd	nd	--	nd	(42)	(13)
2/20	nd	nd	187	nd	82	nd	nd	nd	--	nd	(35)	nd
2/21	nd	nd	238	nd	71	nd	nd	nd	--	nd	(35)	nd
2/22	nd	nd	226	nd	245	nd	nd	nd	--	nd	(19)	nd
2/23	nd	nd	194	nd	73	nd	nd	nd	--	nd	(10)	(18)
2/24	nd	nd	141	nd	29	nd	nd	nd	--	nd	nd	(9)
2/25	nd	nd	232	nd	44	nd	nd	nd	--	nd	nd	nd
2/26	nd	nd	339	nd	177	nd	nd	nd	--	nd	(38)	(10)
2/27	nd	nd	431	nd	98	nd	nd	nd	--	nd	(30)	(10)
2/28	nd	nd	324	nd	41	nd	nd	nd	--	nd	(16)	(17)
3/1	nd	nd	357	nd	(30)	nd	nd	nd	--	nd	(13)	nd
3/2	nd	nd	275	nd	(30)	nd	nd	nd	--	nd	(11)	nd
3/3	nd	nd	219	nd	(17)	nd	nd	nd	--	nd	nd	nd
3/5	nd	nd	172	nd	(25)	nd	nd	nd	--	nd	nd	nd
3/6	nd	nd	157	nd	(17)	nd	nd	nd	--	nd	nd	nd
3/7	nd	nd	157	nd	(16)	nd	nd	nd	--	nd	nd	nd
3/8	nd	nd	164	nd	(17)	nd	nd	nd	--	nd	nd	nd
3/9	nd	nd	180	nd	(16)	nd	nd	nd	--	nd	nd	nd
3/10	nd	nd	286	nd	(20)	nd	nd	nd	--	nd	nd	nd
3/11	nd	nd	180	nd	(16)	nd	nd	nd	--	nd	nd	nd
3/12	nd	nd	282	nd	(22)	nd	nd	nd	--	nd	nd	nd
3/13	nd	nd	218	nd	37	nd	nd	nd	--	nd	nd	nd
3/14	nd	nd	244	nd	110	nd	nd	nd	--	nd	nd	nd
3/15	nd	nd	212	nd	59	nd	nd	nd	--	nd	nd	nd
3/16	nd	nd	340	(16)	52	nd	nd	nd	--	nd	(27)	(13)
3/17	nd	nd	377	58	65	(26)	nd	(41)	--	nd	(29)	62
3/18	nd	nd	409	(14)	59	nd	nd	nd	--	nd	(40)	nd
3/19	nd	nd	322	nd	46	nd	nd	nd	--	(21)	nd	nd
3/20	nd	nd	314	(20)	33	nd	nd	nd	--	(19)	nd	nd
3/21	nd	nd	258	(20)	(26)	nd	nd	nd	--	(20)	nd	nd
3/22	nd	nd	277	(11)	(23)	nd	nd	nd	--	nd	nd	nd
3/23	nd	nd	262	nd	86	nd	nd	nd	--	nd	(27)	nd
3/24	nd	nd	444	nd	59	nd	nd	nd	--	nd	(15)	nd
3/25	nd	nd	361	nd	35	nd	nd	nd	--	nd	(14)	nd
3/26	nd	nd	565	nd	(19)	nd	nd	nd	--	nd	nd	nd
3/27	nd	nd	665	nd	31	nd	nd	nd	--	nd	(20)	nd
3/28	nd	nd	326	nd	32	(19)	nd	nd	--	nd	(13)	nd
3/29	nd	nd	320	nd	(12)	(26)	nd	nd	--	nd	nd	nd
3/30	nd	nd	508	30	(15)	nd	nd	nd	--	(13)	nd	nd
3/31	nd	nd	382	(23)	(11)	nd	nd	nd	--	nd	nd	nd
4/1	nd	nd	350	(24)	nd	nd	nd	nd	--	nd	nd	nd
4/2	nd	nd	323	(24)	nd	nd	nd	nd	--	nd	nd	nd
4/3	nd	nd	230	(24)	nd	nd	nd	nd	--	nd	nd	nd
4/4	nd	nd	239	(25)	(12)	nd	nd	nd	--	nd	nd	nd
4/5	nd	nd	217	(23)	nd	nd	nd	nd	--	nd	nd	nd
4/6	nd	nd	202	(24)	nd	nd	nd	nd	--	nd	nd	nd
4/7	nd	nd	155	nd	nd	nd	nd	nd	--	nd	nd	nd
4/8	nd	nd	178	nd	nd	nd	nd	nd	--	nd	nd	nd
4/9	nd	nd	175	nd	nd	nd	nd	nd	--	nd	nd	nd
4/10	nd	nd	205	nd	nd	nd	nd	nd	--	nd	nd	nd
4/14	nd	nd	130	nd	nd	nd	nd	nd	--	nd	nd	nd
4/15	nd	nd	137	nd	nd	nd	nd	nd	--	nd	nd	nd
4/16	nd	nd	133	nd	nd	nd	nd	nd	--	nd	nd	nd
4/17	nd	nd	129	nd	nd	nd	nd	nd	--	nd	nd	nd

Table 4. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1992 through September 1993--*Continued*

Date	Eptam	Molin- ate	Sima- zine	Carbo- furan	Diaz- inon	Car- baryl	Thio- bencarb	Meto- lachlor	Cyana- zine	Chlor- pyrifos	Dact- hal	Methi- dathion
1993--Continued												
4/18	nd	nd	183	nd	nd	nd	nd	nd	--	nd	nd	nd
4/19	(14)	nd	121	nd	nd	nd	nd	nd	--	nd	nd	nd
4/20	(14)	nd	127	nd	nd	nd	nd	nd	--	nd	nd	nd
4/22	nd	nd	172	nd	nd	nd	nd	nd	--	nd	nd	nd
4/23	nd	nd	112	nd	nd	nd	nd	nd	--	nd	nd	nd
4/24	nd	nd	107	nd	nd	nd	nd	nd	--	nd	nd	nd
4/25	nd	nd	116	(11)	nd	nd	nd	(40)	--	nd	nd	nd
4/26	nd	nd	116	nd	nd	nd	nd	(42)	--	nd	nd	nd
4/27	(75)	nd	114	nd	nd	nd	nd	(32)	--	nd	nd	nd
4/28	(28)	nd	121	nd	nd	nd	nd	57	--	nd	nd	nd
4/29	(14)	nd	138	nd	nd	nd	nd	(24)	--	nd	nd	nd
4/30	nd	nd	116	nd	nd	nd	nd	(16)	--	nd	nd	nd
5/1-2	nd	nd	134	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/3-4	nd	nd	98	nd	(16)	nd	nd	(18)	nd	nd	nd	nd
5/5-6	nd	nd	97	nd	(12)	nd	nd	(23)	nd	(12)	nd	nd
5/7-8	nd	nd	86	nd	nd	nd	nd	(18)	nd	nd	nd	nd
5/9-10	(16)	nd	114	(13)	(16)	(18)	nd	(29)	nd	nd	nd	nd
5/11-12	nd	nd	80	nd	(21)	(12)	nd	(20)	nd	nd	nd	nd
5/13-14	nd	nd	85	nd	37	nd	nd	(29)	nd	nd	nd	nd
5/15-16	(77)	nd	78	nd	(25)	(18)	nd	(19)	nd	nd	nd	nd
5/17-18	nd	nd	73	nd	(22)	(15)	nd	(33)	nd	nd	nd	nd
5/19-20	nd	nd	(61)	nd	(15)	(19)	nd	(22)	nd	nd	nd	nd
5/21-22	nd	nd	63	nd	nd	(16)	nd	(29)	nd	nd	nd	nd
5/23-24	(58)	nd	69	nd	(14)	nd	130	(38)	nd	nd	nd	nd
5/25-26	nd	nd	93	nd	(22)	(17)	100	62	nd	nd	nd	nd
5/27/28	(93)	nd	87	nd	(26)	nd	79	56	nd	nd	nd	nd
5/29-30	nd	(46)	74	nd	nd	(19)	110	69	nd	nd	nd	nd
5/31-6/1	(57)	nd	96	nd	nd	nd	528	49	nd	nd	nd	nd
6/2-3	(78)	nd	(45)	nd	nd	(18)	nd	(18)	nd	nd	nd	nd
6/4-5	230	nd	(55)	nd	nd	(13)	(26)	(40)	nd	nd	nd	nd
6/6-7	nd	92	89	nd	nd	nd	nd	53	nd	nd	nd	nd
6/8-9	nd	56	(50)	nd	nd	nd	(26)	(38)	nd	nd	nd	nd
6/10-11	nd	59	78	nd	nd	nd	nd	(43)	nd	nd	nd	nd
6/12-13	nd	98	91	nd	nd	(20)	nd	(39)	nd	nd	nd	nd
6/16-17	154	145	nd	nd	nd	(14)	nd	(37)	nd	nd	nd	nd
6/18-19	(127)	nd	89	nd	nd	(16)	nd	(31)	nd	nd	nd	nd
6/20-21	404	nd	95	nd	nd	nd	nd	(28)	nd	nd	nd	nd
6/22-23	489	nd	103	nd	nd	(27)	nd	(41)	nd	nd	nd	nd
6/24-25	340	(26)	87	nd	nd	nd	nd	62	nd	nd	nd	nd
6/26-27	288	nd	67	nd	nd	nd	nd	76	nd	(22)	nd	nd
6/28-29	184	nd	72	nd	nd	nd	nd	117	nd	nd	nd	nd
6/30-7/1	(21)	nd	63	nd	nd	nd	nd	100	nd	nd	nd	nd
7/2-3	(53)	nd	(52)	nd	nd	nd	(25)	71	nd	nd	nd	nd
7/4-5	(43)	nd	80	nd	(22)	(26)	nd	59	nd	nd	nd	nd
7/6-7	(24)	nd	82	nd	nd	nd	nd	51	nd	nd	nd	nd
7/8-9	(38)	nd	74	nd	nd	nd	nd	55	(40)	nd	nd	nd
7/10-11	284	nd	65	nd	nd	nd	nd	58	nd	nd	nd	nd
7/12-13	135	nd	(51)	nd	nd	nd	nd	55	nd	nd	nd	nd
7/14-15	276	nd	nd	nd	nd	nd	nd	75	nd	nd	nd	nd
7/16-17	365	nd	(47)	nd	nd	nd	nd	63	54	nd	nd	nd
7/18-19	(103)	nd	nd	nd	nd	nd	nd	57	79	nd	nd	nd
7/20-21	nd	nd	(57)	nd	nd	nd	nd	71	589	nd	nd	nd
7/22-23	198	nd	(53)	nd	nd	nd	nd	52	163	nd	nd	nd
7/24-25	(24)	nd	81	nd	nd	nd	nd	60	92	nd	nd	nd

Table 4. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1992 through September 1993--*Continued*

Date	Eptam	Molin- ate	Sima- zine	Carbo- furan	Dia- zinon	Car- baryl	Thio- bencarb	Meto- lachlor	Cyana- zine	Chlor- pyrifos	Dact- hal	Methi- dathion
1993--Continued												
7/26-27	(23)	nd	(59)	nd	nd	nd	nd	(44)	77	nd	nd	nd
7/28-29	nd	nd	(57)	nd	39	nd	nd	51	251	nd	nd	nd
8/1-2	(53)	nd	73	nd	33	nd	nd	114	232	nd	nd	nd
8/3-4	nd	nd	97	nd	72	60	nd	67	168	nd	nd	nd
8/5-6	(14)	nd	63	nd	49	nd	nd	50	(37)	nd	nd	nd
8/7-8	(36)	nd	66	nd	31	(11)	nd	51	(49)	nd	nd	nd
8/9-10	674	nd	63	nd	(23)	(14)	nd	58	52	nd	nd	nd
8/11-12	(72)	nd	(59)	nd	37	nd	nd	48	(49)	nd	nd	nd
8/13-14	(36)	nd	(61)	nd	115	nd	nd	53	(18)	nd	nd	nd
8/15-16	(46)	nd	(51)	nd	59	(20)	nd	(38)	nd	nd	nd	nd
8/17-18	(31)	nd	(62)	nd	40	39	nd	50	nd	nd	nd	nd
8/19	170	nd	(36)	nd	58	(19)	nd	47	nd	nd	nd	nd
8/20-21	239	nd	(53)	nd	250	96	nd	(44)	nd	nd	nd	nd
8/22-23	251	nd	(59)	nd	78	nd	nd	(38)	nd	(15)	nd	nd
8/24-25	(43)	nd	nd	nd	(29)	nd	nd	(25)	nd	nd	nd	nd
8/26-27	(24)	nd	64	nd	65	nd	nd	(28)	nd	nd	nd	nd
8/28-29	(24)	nd	74	nd	(22)	nd	nd	(23)	nd	nd	nd	nd
8/30-31	(51)	nd	98	nd	(21)	nd	nd	(18)	nd	nd	nd	nd
9/1-2	(34)	nd	96	nd	(16)	nd	nd	(41)	nd	nd	nd	nd
9/3-4	(34)	nd	119	nd	(27)	nd	nd	(28)	nd	nd	nd	nd
9/5-6	439	nd	76	nd	(14)	nd	nd	nd	nd	nd	nd	nd
9/7-8	(104)	nd	78	nd	(19)	nd	nd	nd	nd	nd	nd	nd
9/9-10	(28)	nd	71	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/11-12	(18)	nd	93	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/13-14	458	nd	75	nd	(12)	nd	nd	nd	nd	nd	nd	nd
9/15-16	nd	nd	84	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/17-18	(35)	nd	79	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/19-20	nd	nd	71	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/21-22	nd	nd	79	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/23-24	(35)	nd	(38)	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/25-26	256	nd	(52)	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/27-28	nd	nd	68	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/29-30	nd	nd	(49)	nd	nd	nd	nd	nd	nd	nd	nd	nd

Table 5. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1993 through April 1994

[Modified analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following chemicals but none were detected: alachlor, atrazine, butylate, chlorpyrifos, fonofos, malathion, molinate, thiobencarb, and Trifluralin. nd, nondetection; (), concentration below detection limit]

Date	Eptam	Pebu- ate	Sima- zine	Carbo- furan	Dia- zinon	Car- baryl	Meto- lachlor	Cyana- zine	Dact- hal	Methi- dathion	Naprop- amide
1993											
10/1-2	nd	nd	77	nd	nd	nd	nd	nd	nd	nd	nd
10/4-5	(109)	nd	70	nd	nd	nd	nd	nd	nd	nd	nd
10/6-7	nd	nd	59	nd	nd	nd	nd	nd	nd	nd	nd
10/8-9	nd	nd	67	nd	nd	nd	nd	nd	nd	nd	nd
10/10-11	nd	nd	(34)	nd	nd	nd	nd	nd	nd	nd	nd
10/12-13	nd	nd	(57)	nd	nd	nd	nd	nd	nd	nd	nd
10/14-15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10/18-19	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10/20-21	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Table 5. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1993 through April 1994--*Continued*

Date	Eptam	Pebu- late	Sima- zine	Carbo- furan	Dia- zinon	Car- baryl	Meto- lachlor	Cyana- zine	Dact- hal	Methi- dathion	Naprop- amide
1993--Continued											
10/24-25	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10/28-29	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10/30-31	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/1-2	(97)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/3-4	(20)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/5-6	(21)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/7-8	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/9-10	nd	nd	(25)	nd	nd	nd	nd	nd	nd	nd	nd
11/11-12	(77)	nd	nd	nd	(15)	nd	nd	nd	nd	nd	nd
11/13-14	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/15-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/19-20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/21-22	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/23-24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11/25-26	nd	nd	(33)	nd	nd	nd	nd	nd	nd	nd	nd
11/27-28	nd	nd	(56)	nd	nd	nd	nd	nd	nd	nd	nd
11/29-30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12/1-2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12/3-4	nd	nd	(53)	nd	nd	nd	nd	nd	nd	nd	nd
12/5-6	nd	nd	nd	nd	nd	nd	nd	nd	(27)	nd	nd
12/7-8	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12/9-10	nd	nd	93	nd	nd	nd	nd	(47)	nd	nd	nd
12/11-12	nd	nd	175	nd	nd	nd	nd	114	nd	nd	nd
12/13-14	nd	nd	(47)	nd	nd	nd	nd	143	nd	nd	nd
12/15-16	nd	nd	87	nd	nd	nd	nd	(47)	nd	nd	nd
12/17-18	nd	nd	81	nd	nd	nd	nd	156	nd	nd	nd
12/19-20	nd	nd	(51)	nd	nd	nd	nd	88	nd	nd	nd
12/21-22	nd	nd	89	nd	nd	nd	nd	nd	nd	nd	nd
12/23-24	nd	nd	73	nd	nd	nd	nd	nd	nd	nd	nd
12/25-26	nd	nd	78	nd	nd	nd	nd	nd	nd	nd	nd
12/27-28	nd	nd	(34)	nd	nd	nd	nd	(46)	nd	nd	nd
12/29-30	nd	nd	(31)	nd	nd	nd	nd	(39)	nd	nd	nd
12/31-1/1	nd	nd	(33)	nd	nd	nd	nd	nd	nd	nd	nd
1994											
1/2-3	nd	nd	(31)	nd	nd	nd	nd	nd	nd	nd	nd
1/4-5	nd	nd	(42)	nd	nd	nd	nd	nd	nd	nd	nd
1/6-7	nd	nd	(46)	nd	nd	nd	nd	nd	nd	nd	nd
1/8-9	nd	nd	nd	nd	35	nd	nd	nd	nd	nd	nd
1/10-11	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1/12-13	nd	nd	nd	nd	(11)	nd	nd	nd	nd	nd	nd
1/14-15	nd	nd	nd	nd	(18)	nd	nd	nd	nd	nd	nd
1/16	nd	nd	nd	nd	(14)	nd	nd	nd	nd	nd	nd
1/17	nd	nd	nd	nd	(28)	nd	nd	nd	nd	nd	nd
1/18	nd	nd	nd	nd	(25)	nd	nd	nd	nd	nd	nd
1/19	nd	nd	nd	nd	53	nd	nd	nd	nd	nd	nd
1/20-21	nd	nd	nd	nd	53	nd	nd	nd	nd	nd	nd
1/22-23	nd	nd	nd	nd	48	nd	nd	nd	nd	nd	nd
1/25	nd	nd	662	nd	288	50	nd	nd	(22)	802	nd
1/26	nd	nd	556	nd	132	nd	nd	nd	nd	270	nd
1/27	nd	nd	1,068	nd	252	nd	nd	nd	nd	735	nd
1/28	nd	nd	901	nd	147	nd	nd	nd	(27)	545	nd
1/29	nd	nd	444	nd	57	nd	nd	237	(60)	186	nd
1/30	nd	nd	472	nd	108	nd	nd	270	(36)	114	nd

Table 5. Pesticide concentrations in water samples from the San Joaquin River at Vernalis, California, October 1993 through April 1994--*Continued*

Date	Eptam	Pebu- late	Sima- zine	Carbo- furan	Dia- zinon	Car- baryl	Meto- lachlor	Cyana- zine	Dact- hal	Methi- dathion	Naprop- amide
<i>1994--Continued</i>											
1/31	nd	nd	353	nd	67	nd	nd	220	(24)	92	nd
2/1	nd	nd	219	nd	89	nd	nd	nd	nd	80	nd
2/2	nd	nd	217	nd	76	nd	nd	nd	nd	nd	nd
2/3	nd	nd	132	nd	102	nd	nd	(46)	nd	nd	nd
2/4	nd	nd	113	nd	62	nd	nd	nd	nd	nd	nd
2/5	nd	nd	(47)	nd	52	nd	nd	nd	nd	nd	nd
2/6	nd	nd	(49)	nd	34	nd	nd	nd	nd	nd	nd
2/8	nd	nd	114	nd	71	nd	nd	nd	nd	nd	nd
2/9	nd	nd	1,081	nd	173	(21)	nd	113	nd	230	nd
2/10	nd	nd	1,747	nd	243	nd	nd	84	nd	438	nd
2/11	nd	nd	1,329	nd	115	nd	nd	131	nd	383	nd
2/12	nd	nd	845	nd	57	nd	nd	131	nd	244	nd
2/13	nd	nd	780	nd	70	nd	nd	133	nd	167	nd
2/14	nd	nd	769	nd	45	nd	nd	201	nd	239	nd
2/15	nd	nd	594	nd	41	nd	nd	162	nd	136	nd
2/16	nd	nd	471	nd	42	nd	nd	146	nd	114	nd
2/17	nd	nd	250	nd	nd	nd	nd	99	nd	72	nd
2/18	nd	nd	300	nd	(23)	nd	nd	152	nd	(17)	nd
2/19	nd	nd	758	nd	48	nd	nd	269	nd	56	nd
2/20	nd	nd	863	nd	62	nd	nd	461	nd	88	nd
2/21	nd	nd	1,084	nd	52	nd	nd	227	nd	59	nd
2/22	nd	nd	1,067	nd	55	nd	nd	211	nd	93	nd
2/23	nd	nd	878	nd	(30)	nd	(27)	565	nd	83	nd
2/24	nd	nd	784	nd	(30)	nd	nd	516	(28)	53	nd
2/25	nd	nd	569	nd	37	nd	nd	804	88	32	nd
2/26	nd	nd	426	nd	(21)	nd	nd	530	(54)	28	nd
2/27	nd	nd	292	nd	nd	nd	nd	336	(38)	nd	nd
2/28	nd	nd	207	nd	nd	nd	nd	255	nd	nd	nd
3/1-2	nd	nd	267	nd	(17)	nd	nd	324	nd	nd	nd
3/3-4	nd	nd	191	nd	nd	(22)	nd	255	nd	nd	nd
3/5-6	nd	nd	585	nd	52	(23)	nd	319	nd	nd	nd
3/7-8	nd	nd	207	nd	nd	nd	nd	296	nd	nd	nd
3/9-10	nd	nd	199	nd	nd	nd	nd	215	nd	nd	nd
3/11-12	nd	nd	(49)	nd	(22)	nd	nd	(24)	nd	nd	nd
3/13-14	nd	nd	94	nd	nd	nd	nd	140	nd	nd	nd
3/17-18	nd	nd	114	(25)	nd	nd	nd	146	nd	nd	nd
3/19-20	nd	nd	106	40	nd	nd	nd	211	nd	nd	nd
3/21-22	nd	nd	114	(17)	64	nd	nd	145	nd	nd	nd
3/23-24	nd	nd	108	(15)	40	nd	nd	107	nd	nd	nd
3/27-28	nd	nd	113	64	(22)	nd	nd	(45)	nd	nd	nd
3/29-30	nd	nd	116	85	nd	nd	nd	nd	nd	nd	nd
3/31-4/1	nd	nd	148	(22)	nd	nd	nd	nd	nd	nd	nd
4/2-3	nd	nd	120	76	nd	nd	nd	nd	nd	nd	nd
4/4-5	nd	nd	93	49	nd	nd	nd	nd	nd	nd	nd
4/6-7	nd	nd	89	38	nd	nd	nd	nd	nd	nd	nd
4/9-10	nd	nd	120	45	nd	99	nd	nd	nd	nd	nd
4/11-12	nd	nd	119	50	nd	(16)	nd	nd	nd	nd	nd
4/13-14	nd	1,046	121	105	nd	37	nd	nd	nd	nd	nd
4/15-16	578	471	67	62	nd	51	nd	nd	nd	nd	nd
4/17-18	118	444	(55)	32	49	32	nd	nd	nd	nd	nd
4/19-20	nd	651	(23)	nd	nd	60	nd	nd	nd	nd	nd
4/21-22	(44)	45	70	102	nd	67	(16)	nd	nd	nd	nd
4/23-24	(56)	62	90	38	nd	178	116	nd	nd	nd	nd
4/26-27	nd	nd	nd	nd	nd	nd	(25)	nd	nd	nd	nd
4/28-29	nd	nd	nd	nd	nd	nd	52	nd	nd	nd	nd
4/30	nd	nd	nd	nd	nd	nd	49	nd	nd	nd	nd

Table 6. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, May through September 1991

[Original analytical method used for analysis. Values are in nanograms per liter. Water samples collected from May through July were analyzed for the following pesticides but none were detected: methyl parathion. Water samples collected from August through September were analyzed for the following pesticides but none were detected: atrazine, carbaryl, chlorpyrifos, diazinon, fonofos, malathion, methidathion, simazine, and trifluralin. nd, nondetection; R, replicate sample; (), concentration below detection limit]

Date	Molinate	Carbofuran	Thiobencarb	Date	Molinate	Carbofuran	Thiobencarb
5/10	140	(23)	nd	7/26	(23)	nd	nd
5/17	410	86	nd	7/29	35	nd	(10)
5/20	407	52	nd	7/31	26	nd	nd
5/22	453	nd	nd	7/31R	37	nd	nd
5/22R	360	nd	nd	8/2	35	nd	nd
5/24	467	(14)	nd	8/5	42	nd	nd
5/28	666	(18)	nd	8/7	nd	nd	nd
5/30	1,220	(20)	(11)	8/7R	nd	nd	nd
5/30R	1,231	(21)	(12)	8/9	nd	nd	nd
6/3	846	nd	19	8/12	nd	nd	(24)
6/5	527	nd	nd	8/14	nd	nd	nd
6/5R	688	nd	nd	8/14R	nd	nd	nd
6/7	446	nd	(12)	8/16	nd	nd	nd
6/10	212	nd	nd	8/19	nd	nd	nd
6/12	413	nd	nd	8/21	nd	nd	nd
6/12R	474	nd	nd	8/21R	nd	nd	nd
6/14	231	nd	nd	8/23	nd	nd	nd
6/17	371	nd	nd	8/26	nd	nd	nd
6/19	213	nd	nd	8/28	nd	nd	nd
6/21	169	nd	nd	8/28R	nd	(22)	nd
6/24	144	nd	nd	8/30	nd	nd	nd
6/26	508	nd	nd	9/3	nd	nd	(8)
6/26R	473	nd	nd	9/5	nd	nd	nd
6/28	294	nd	nd	9/5R	nd	18	nd
7/1	243	nd	nd	9/9	nd	nd	nd
7/3	504	109	24	9/13	nd	nd	nd
7/5	406	75	24	9/16	nd	nd	nd
7/8	201	(19)	nd	9/18	nd	nd	nd
7/10	102	(19)	nd	9/18R	nd	nd	nd
7/12	108	nd	nd	9/20	nd	nd	nd
7/15	146	nd	nd	9/23	nd	nd	nd
7/17	52	nd	nd	9/25	nd	nd	nd
7/19	85	nd	nd	9/25R	nd	nd	nd
7/22	52	nd	nd	9/27	nd	nd	nd
7/24	277	nd	nd	9/30	nd	nd	nd
7/24R	222	nd	nd				

Table 7. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1991 through September 1992

[Original analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following pesticides but none were detected: carbaryl, chlorpyrifos, fonofos, malathion, methidathion, molinate, thiobencarb, and trifluralin. nd, nondetection; R, replicate sample; (), concentration below detection limit]

Date	Simazine	Carbofuran	Atrazine	Diazinon	Date	Simazine	Carbofuran	Atrazine	Diazinon
1991					1992				
10/2	nd	nd	nd	nd	1/3	66	nd	(15)	nd
10/2R	nd	nd	nd	nd	1/6	58	nd	(17)	(8)
10/4	nd	nd	nd	nd	1/8	(39)	nd	(9)	nd
10/7	nd	nd	nd	nd	1/8R	53	nd	nd	nd
10/9	nd	nd	nd	nd	1/10	126	nd	nd	nd
10/9R	nd	nd	nd	nd	1/13	59	nd	nd	nd
10/11	nd	nd	nd	nd	1/15	(43)	nd	nd	nd
10/14	nd	nd	nd	nd	1/15R	(20)	nd	nd	nd
10/16	nd	nd	nd	nd	1/17	79	nd	nd	24
10/16R	nd	nd	nd	nd	1/20	62	nd	nd	(15)
10/18	nd	nd	nd	nd	1/22	nd	nd	nd	20
10/18R	nd	nd	nd	nd	1/29	(38)	nd	nd	40
10/21	nd	nd	nd	nd	2/3	nd	nd	nd	68
10/23	nd	nd	nd	nd	2/5	(19)	nd	nd	42
10/25	nd	nd	nd	nd	2/5R	(15)	nd	nd	24
10/28	nd	nd	50	(8)	2/7	(16)	nd	(17)	32
10/30	nd	nd	nd	nd	2/10	(37)	nd	(13)	22
10/30R	nd	nd	nd	nd	2/12	130	nd	97	31
11/1	nd	nd	(10)	nd	2/14	158	nd	43	155
11/4	nd	nd	nd	nd	2/19	67	nd	(20)	65
11/6	nd	nd	nd	nd	2/19R	75	nd	(21)	62
11/6R	nd	nd	nd	nd	2/21	107	nd	(20)	50
11/8	nd	nd	nd	nd	2/24	nd	nd	nd	26
11/11	nd	nd	nd	nd	2/26	(19)	nd	nd	26
11/13	nd	nd	nd	nd	2/26R	51	nd	31	33
11/13R	nd	nd	nd	nd	2/28	(35)	nd	nd	29
11/15	nd	nd	nd	nd	3/2	(40)	nd	nd	19
11/18	(39)	nd	238	(9)	3/4	(38)	nd	nd	(12)
11/20	nd	nd	137	nd	3/4R	(35)	nd	nd	(14)
11/25	nd	nd	(15)	nd	3/6	(44)	nd	nd	(12)
11/27	nd	nd	23	nd	3/9	83	nd	(20)	57
11/27R	nd	nd	(20)	nd	3/11	61	nd	(12)	(18)
11/29	nd	nd	nd	nd	3/11R	48	nd	(20)	19
12/2	nd	nd	nd	nd	3/13	nd	(24)	nd	31
12/4	nd	nd	nd	nd	3/16	(24)	nd	nd	(11)
12/4R	nd	nd	nd	nd	3/18	nd	nd	nd	nd
12/6	nd	nd	nd	nd	3/20	70	(14)	nd	(12)
12/9	(24)	nd	(16)	nd	3/23	49	(18)	33	(13)
12/11	(19)	nd	nd	nd	3/25	69	(20)	(19)	(8)
12/11R	(19)	nd	nd	nd	3/25R	61	(18)	(10)	(11)
12/13	nd	nd	(10)	nd	3/27	(19)	nd	nd	nd
12/16	nd	nd	nd	nd	3/30	(19)	nd	nd	nd
12/23	(16)	nd	nd	nd	4/1	(19)	nd	nd	nd
12/27	nd	nd	nd	nd	4/1R	(21)	nd	nd	nd
12/30	57	nd	(21)	nd	4/3	(19)	nd	nd	nd

Table 7. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1991 through September 1992--*Continued*

Date	Simazine	Carbofuran	Atrazine	Diazinon	Date	Simazine	Carbofuran	Atrazine	Diazinon
<i>1992--Continued</i>					<i>1992--Continued</i>				
4/6	nd	nd	nd	nd	7/8	nd	(21)	(21)	nd
4/8	nd	nd	nd	nd	7/10	nd	nd	nd	nd
4/8R	(17)	nd	nd	(8)	7/15	nd	nd	nd	nd
4/10	(17)	nd	nd	nd	7/17	nd	nd	nd	nd
4/13	(28)	nd	(12)	(15)	7/20	(21)	nd	nd	nd
4/15	(24)	nd	nd	nd	7/22	nd	nd	nd	nd
4/15R	(31)	nd	nd	nd	7/22R	nd	nd	nd	nd
4/17	(24)	nd	nd	nd	7/27	nd	nd	nd	nd
4/20	(16)	nd	nd	nd	7/29	(16)	nd	nd	nd
4/22	(16)	nd	nd	nd	7/29R	nd	nd	nd	nd
4/22R	(24)	nd	nd	nd	7/31	nd	nd	nd	nd
4/24	nd	nd	nd	nd	8/3	nd	nd	nd	nd
4/27	nd	nd	nd	nd	8/5	nd	nd	nd	nd
4/29	(19)	nd	nd	nd	8/5R	nd	nd	nd	nd
4/29R	nd	nd	nd	nd	8/7	nd	nd	nd	nd
5/1	nd	nd	nd	nd	8/10	nd	nd	nd	nd
5/4	nd	nd	nd	nd	8/12	nd	nd	nd	nd
5/6	nd	nd	nd	nd	8/12R	nd	nd	nd	nd
5/8	nd	nd	nd	nd	8/14	nd	nd	nd	nd
5/11	nd	nd	nd	nd	8/17	nd	nd	nd	nd
5/13	nd	nd	nd	nd	8/19	nd	nd	nd	nd
5/13R	nd	nd	nd	nd	8/19R	nd	nd	nd	nd
5/15	nd	nd	nd	nd	8/21	nd	nd	nd	nd
5/18	nd	nd	nd	nd	8/24	nd	nd	nd	nd
5/20	nd	nd	nd	nd	8/26	nd	nd	nd	nd
5/20R	nd	nd	nd	nd	8/26R	nd	nd	nd	nd
5/22	nd	nd	nd	nd	8/28	nd	nd	nd	nd
5/25	nd	nd	nd	nd	8/31	nd	nd	nd	nd
6/1	nd	nd	nd	nd	9/2	nd	nd	nd	nd
6/3	nd	nd	nd	nd	9/2R	nd	nd	nd	nd
6/3R	nd	nd	nd	nd	9/4	nd	nd	nd	nd
6/8	nd	nd	nd	nd	9/7	nd	(16)	(16)	nd
6/10	nd	nd	nd	nd	9/9	nd	nd	(8)	nd
6/10R	nd	nd	nd	nd	9/9R	nd	nd	(9)	nd
6/17	nd	nd	nd	nd	9/11	nd	nd	nd	nd
6/17R	nd	nd	nd	nd	9/14	nd	nd	(10)	nd
6/19	nd	nd	nd	nd	9/16	nd	nd	nd	nd
6/22	nd	nd	nd	nd	9/16R	nd	nd	nd	nd
6/24	nd	nd	nd	nd	9/18	nd	nd	nd	nd
6/26	nd	nd	nd	nd	9/21	nd	nd	nd	nd
6/29	nd	nd	nd	nd	9/23	nd	nd	nd	nd
7/1	nd	nd	nd	nd	9/23R	nd	nd	nd	nd
7/1R	nd	nd	nd	nd	9/28	nd	nd	nd	nd
7/3	nd	nd	nd	nd	9/30	nd	nd	nd	nd
7/6	nd	nd	nd	nd	9/30R	nd	nd	nd	nd

Table 8. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1992 through September 1993

[Modified analytical method used for analysis. Values are in nanograms per liter. Water samples collected from October through December 1992 were analyzed for the following pesticides but none were detected: carbaryl, chlorpyrifos, fonofos, malathion, and trifluralin. Water samples collected from January through September 1993 were analyzed for the following pesticides but none were detected: alachlor, butylate, carbaryl, chlorpyrifos, cyanazine (not analyzed for the following pesticides in water samples collected from January through April 1993), dacthal, eptam, fonofos, malathion, metolachlor, napropamide, pebulate, and trifluralin. nd, nondetection; R, replicate sample; (), concentration below detection limit]

Date	Molinate	Simazine	Carbofuran	Atrazine	Diazinon	Thiobencarb	Methodathion
1992							
10/2	nd	nd	nd	nd	nd	nd	nd
10/5	nd	nd	nd	nd	nd	nd	nd
10/7	nd	nd	nd	nd	nd	nd	nd
10/7R	nd	nd	nd	nd	nd	nd	nd
10/9	nd	nd	nd	nd	nd	nd	nd
10/12	nd	nd	nd	nd	nd	nd	nd
10/14	nd	nd	nd	nd	nd	nd	nd
10/14R	nd	nd	nd	nd	nd	nd	nd
10/16	nd	nd	nd	nd	nd	nd	nd
10/19	nd	nd	nd	nd	nd	nd	nd
10/21	nd	nd	nd	nd	nd	nd	nd
10/23	nd	(29)	nd	nd	nd	nd	nd
10/28	nd	nd	nd	nd	nd	nd	nd
10/28R	nd	nd	nd	nd	nd	nd	nd
10/30	nd	(28)	nd	nd	nd	nd	nd
11/2	nd	nd	nd	nd	nd	nd	nd
11/4	nd	nd	nd	nd	nd	nd	nd
11/6	nd	nd	nd	nd	nd	nd	nd
11/9	nd	nd	nd	nd	nd	nd	nd
11/11	nd	nd	nd	nd	nd	nd	nd
11/11R	nd	nd	nd	nd	nd	nd	nd
11/13	nd	nd	nd	nd	nd	nd	nd
11/16	nd	nd	nd	nd	nd	nd	nd
11/20	nd	nd	nd	nd	nd	nd	nd
11/23	nd	nd	nd	nd	nd	nd	nd
11/25	nd	nd	nd	nd	nd	nd	nd
11/25R	nd	nd	nd	nd	nd	nd	nd
11/27	nd	nd	nd	nd	nd	nd	nd
11/30	nd	nd	nd	nd	nd	nd	nd
12/2	nd	nd	nd	nd	nd	nd	nd
12/2R	nd	nd	nd	nd	nd	nd	nd
12/4	nd	158	nd	nd	nd	nd	nd
12/7	nd	216	nd	nd	nd	nd	nd
12/9	nd	72	nd	nd	nd	nd	nd
12/9R	nd	79	nd	nd	nd	nd	nd
12/11	nd	180	nd	nd	nd	nd	nd
12/14	nd	126	nd	nd	nd	nd	nd
12/16	nd	239	(17)	nd	nd	nd	nd
12/16R	nd	251	(17)	nd	nd	nd	nd
12/18	nd	89	nd	nd	nd	nd	nd
12/22	nd	(58)	nd	nd	nd	nd	nd
12/29	nd	(40)	nd	nd	nd	nd	nd
12/31	nd	320	nd	nd	nd	nd	nd

Table 8. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1992 through September 1993--*Continued*

Date	Molinate	Simazine	Carbofuran	Atrazine	Diazinon	Thiobencarb	Methidathion
1993							
1/04	nd	148	nd	nd	nd	nd	nd
1/06	nd	(46)	nd	nd	nd	nd	nd
1/08	nd	189	nd	(36)	nd	nd	nd
1/08R	nd	128	nd	(31)	nd	nd	nd
1/11	nd	157	nd	nd	(26)	nd	nd
1/12	nd	93	nd	(15)	(14)	nd	nd
1/12	nd	88	nd	(23)	(15)	nd	nd
1/13	nd	91	nd	nd	(22)	nd	nd
1/13R	nd	83	nd	(26)	(23)	nd	nd
1/15	nd	92	nd	(16)	(20)	nd	nd
1/15	nd	88	nd	nd	(20)	nd	nd
1/17	nd	104	nd	(27)	54	nd	nd
1/18	nd	160	nd	48	41	nd	nd
1/19	nd	107	nd	(25)	(29)	nd	nd
1/19	nd	100	nd	nd	(23)	nd	nd
1/21	nd	126	nd	(39)	(20)	nd	nd
1/22	nd	104	nd	(44)	(18)	nd	nd
1/23	nd	118	nd	(26)	(30)	nd	nd
1/23	nd	160	nd	nd	(32)	nd	nd
1/24	nd	98	nd	nd	(26)	nd	nd
1/25	nd	(52)	nd	nd	(24)	nd	(30)
1/26	nd	195	nd	nd	(17)	nd	nd
1/26	nd	66	nd	nd	(17)	nd	(12)
1/27	nd	84	nd	nd	nd	nd	nd
1/28	nd	89	nd	nd	38	nd	(22)
1/28	nd	(58)	nd	nd	(22)	nd	(15)
1/29	nd	75	nd	nd	(19)	nd	nd
1/30	nd	(41)	nd	nd	(27)	nd	(21)
1/30	nd	(55)	nd	nd	(33)	nd	(12)
2/1	nd	76	nd	nd	(35)	nd	(18)
2/1	nd	61	nd	nd	(33)	nd	nd
2/2	nd	(52)	nd	nd	(37)	nd	(14)
2/2	nd	(51)	nd	nd	(37)	nd	(13)
2/3	nd	(34)	nd	nd	(27)	nd	(16)
2/4	nd	(46)	nd	nd	40	nd	(12)
2/4	nd	(40)	nd	nd	(35)	nd	(11)
2/5	nd	(39)	nd	nd	39	nd	(15)
2/6	nd	(44)	nd	nd	40	nd	nd
2/7	nd	(48)	nd	nd	43	nd	(11)
2/8	nd	63	nd	nd	64	nd	(14)
2/9	nd	150	nd	(26)	96	nd	37
2/10	nd	378	nd	nd	67	nd	171
2/10	nd	372	nd	nd	66	nd	159
2/11	nd	194	nd	(33)	272	nd	161
2/12	nd	205	nd	(32)	393	nd	212
2/12	nd	211	nd	(28)	221	nd	162
2/13	nd	150	nd	(36)	175	nd	141
2/14	nd	237	nd	(26)	147	nd	106
2/14	nd	208	nd	(22)	162	nd	99
2/15	nd	89	nd	nd	101	nd	53
2/16	nd	63	nd	nd	67	nd	(24)
2/17	nd	(51)	nd	nd	67	nd	(28)
2/18	nd	(49)	nd	nd	60	nd	(29)

Table 8. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1992 through September 1993--*Continued*

Date	Molinate	Simazine	Carbofuran	Atrazine	Diazinon	Thiobencarb	Methodathion
<i>1993--Continued</i>							
2/19	nd	100	nd	nd	58	nd	32
2/20	nd	131	nd	nd	127	nd	64
2/21	nd	123	nd	nd	193	nd	59
2/22	nd	155	nd	nd	191	nd	66
2/23	nd	98	nd	nd	103	nd	40
2/24	nd	91	nd	nd	68	nd	31
2/25	nd	(58)	nd	nd	50	nd	31
2/26	nd	119	nd	nd	79	nd	34
2/27	nd	79	nd	nd	43	nd	nd
2/28	nd	101	nd	nd	43	nd	(26)
3/1	nd	92	nd	nd	40	nd	(19)
3/2	nd	92	nd	nd	38	nd	(21)
3/3	nd	60	nd	nd	(32)	nd	(33)
3/4	nd	91	nd	nd	(32)	nd	(24)
3/5	nd	97	nd	nd	(28)	nd	(14)
3/6	nd	112	nd	nd	(24)	nd	(14)
3/7	nd	108	nd	nd	(17)	nd	nd
3/8	nd	104	nd	nd	(20)	nd	nd
3/8	nd	138	nd	nd	(22)	nd	(15)
3/9	nd	104	nd	nd	(14)	nd	nd
3/10	nd	62	nd	nd	(15)	nd	nd
3/11	nd	62	nd	nd	nd	nd	nd
3/11	nd	74	nd	nd	nd	nd	nd
3/12	nd	83	nd	nd	nd	nd	nd
3/12	nd	83	nd	nd	nd	nd	nd
3/13	nd	81	nd	nd	nd	nd	nd
3/13	nd	84	nd	nd	nd	nd	nd
3/14	nd	78	nd	nd	nd	nd	nd
3/14	nd	81	nd	nd	nd	nd	nd
3/15	nd	80	nd	nd	nd	nd	nd
3/17	nd	159	nd	nd	nd	nd	nd
3/17R	nd	172	nd	nd	nd	nd	nd
3/19	nd	(45)	nd	nd	nd	nd	nd
3/22	nd	(47)	nd	nd	nd	nd	nd
3/24	nd	nd	nd	nd	nd	nd	nd
3/24R	nd	(39)	nd	nd	nd	nd	nd
3/26	nd	170	nd	nd	nd	nd	nd
3/29	nd	79	nd	nd	nd	nd	nd
3/31	nd	60	(19)	nd	nd	nd	nd
3/31R	nd	(46)	(23)	nd	nd	nd	nd
4/2	nd	(44)	(23)	nd	nd	nd	nd
4/5	nd	(59)	nd	nd	nd	nd	nd
4/7	nd	nd	nd	nd	nd	nd	nd
4/7R	nd	nd	nd	nd	nd	nd	nd
4/9	nd	60	nd	nd	nd	nd	nd
4/12	nd	(56)	nd	nd	nd	nd	nd
4/14	nd	nd	nd	nd	nd	nd	nd
4/14R	nd	nd	nd	nd	nd	nd	nd
4/16	nd	nd	nd	nd	nd	nd	nd
4/19	nd	65	nd	nd	nd	nd	nd
4/21	nd	92	nd	nd	nd	nd	nd
4/21R	nd	65	nd	nd	nd	nd	nd

Table 8. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1992 through September 1993--*Continued*

Date	Molinate	Simazine	Carbofuran	Atrazine	Diazinon	Thiobencarb	Methidathion
<i>1993--Continued</i>							
4/23	nd	69	nd	nd	nd	nd	nd
4/26	nd	nd	nd	nd	nd	nd	nd
4/28	nd	(30)	nd	nd	nd	nd	nd
4/28R	nd	(39)	nd	nd	nd	nd	nd
4/30	nd	nd	nd	nd	nd	nd	nd
5/3	nd	nd	nd	nd	nd	nd	nd
5/5	nd	nd	nd	nd	nd	nd	nd
5/5R	nd	nd	nd	nd	nd	nd	nd
5/7	nd	nd	nd	nd	nd	nd	nd
5/10	nd	nd	nd	nd	nd	nd	nd
5/12	nd	nd	nd	nd	nd	nd	nd
5/12R	nd	nd	nd	nd	nd	nd	nd
5/14	nd	nd	nd	nd	nd	nd	nd
5/17	nd	nd	nd	nd	nd	nd	nd
5/19	nd	nd	nd	nd	nd	nd	nd
5/19R	nd	nd	nd	nd	nd	nd	nd
5/21	nd	nd	nd	nd	nd	(17)	nd
5/24	(89)	nd	nd	nd	nd	49	nd
5/26	178	(33)	nd	nd	nd	nd	nd
5/26R	230	(38)	nd	nd	nd	(20)	nd
5/28	926	nd	(36)	nd	nd	(31)	nd
5/31	1,467	nd	70	nd	nd	302	nd
6/2	1,509	nd	51	nd	nd	184	nd
6/4	813	nd	(10)	nd	nd	(31)	nd
6/7	403	nd	(9)	nd	nd	697	nd
6/9	1,232	nd	(25)	nd	nd	101	nd
6/9R	1,221	nd	(24)	nd	nd	(39)	nd
6/11	1,553	nd	(21)	nd	nd	142	nd
6/14	1,390	nd	(18)	nd	nd	63	nd
6/16	580	nd	nd	nd	nd	nd	nd
6/16R	562	nd	nd	nd	nd	(24)	nd
6/18	485	nd	nd	nd	nd	nd	nd
6/21	543	nd	nd	nd	nd	nd	nd
6/23	193	nd	nd	nd	nd	nd	nd
6/23R	260	nd	nd	nd	nd	nd	nd
6/25	157	nd	nd	nd	nd	nd	nd
6/28	(108)	nd	nd	nd	nd	nd	nd
6/30	143	nd	nd	nd	nd	nd	nd
6/30R	116	nd	nd	nd	nd	nd	nd
7/2	123	nd	nd	nd	(16)	nd	nd
7/5	167	nd	nd	nd	nd	nd	nd
7/7	(100)	nd	nd	nd	nd	nd	nd
7/7R	134	nd	nd	nd	nd	nd	nd
7/9	165	nd	nd	nd	nd	nd	nd
7/12	(45)	nd	nd	nd	nd	nd	nd
7/14	127	nd	nd	nd	nd	nd	nd
7/14R	111	nd	(16)	nd	nd	nd	nd
7/16	(57)	nd	nd	nd	nd	nd	nd
7/19	(71)	nd	nd	nd	nd	nd	nd
7/21	nd	nd	nd	nd	nd	nd	nd
7/23	(92)	nd	nd	nd	nd	nd	nd
7/23R	(86)	nd	(11)	nd	nd	nd	nd

Table 8. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1992 through September 1993--*Continued*

Date	Molinate	Simazine	Carbofuran	Atrazine	Diazinon	Thiobencarb	Methidathion
1993--Continued							
7/26	(99)	nd	nd	nd	57	nd	nd
7/28	(87)	nd	nd	nd	nd	nd	nd
7/28R	(85)	nd	nd	nd	nd	nd	nd
8/2	nd	nd	nd	nd	nd	nd	nd
8/4	nd	nd	nd	nd	nd	nd	nd
8/6	nd	nd	nd	nd	nd	nd	nd
8/9	nd	nd	nd	nd	nd	nd	nd
8/11	nd	nd	nd	nd	nd	nd	nd
8/16	nd	nd	nd	nd	nd	nd	nd
8/18	nd	nd	nd	nd	nd	nd	nd
8/18R	nd	nd	nd	nd	nd	nd	nd
8/27	nd	nd	nd	nd	nd	nd	nd
8/30	nd	nd	nd	nd	nd	nd	nd
9/1	nd	nd	nd	nd	nd	nd	nd
9/1R	nd	nd	nd	nd	nd	nd	nd
9/3	nd	nd	nd	nd	nd	nd	nd
9/3R	nd	nd	nd	nd	nd	nd	nd
9/7	nd	nd	nd	nd	nd	nd	nd
9/7R	nd	nd	nd	nd	nd	nd	nd
9/9	nd	nd	nd	nd	nd	nd	nd
9/13	nd	nd	nd	nd	nd	nd	nd
9/15	nd	nd	nd	nd	nd	nd	nd
9/15R	nd	nd	nd	nd	nd	nd	nd
9/17	nd	nd	(15)	nd	nd	nd	nd
9/20	nd	nd	nd	nd	nd	nd	nd
9/22	nd	nd	nd	nd	nd	nd	nd
9/22R	nd	nd	nd	nd	nd	nd	nd
9/24	nd	nd	nd	nd	nd	nd	nd
9/27	nd	nd	nd	nd	nd	nd	nd

Table 9. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1993 through April 1994

[Modified analytical method used for analysis. Values are in nanograms per liter. Water samples were analyzed for the following pesticides but none detected: alachlor, atrazine, butylate, carbaryl, carbofuran, chlorpyrifos, cyanazine, dacthal, eptam, fonofos, malathion, metolachlor, molinate, napropamide, pebulate, thiobencarb, and trifluralin. nd, nondetection; R, replicate sample; (), concentration below detection limit]

Date	Simazine	Diazinon	Methidathion	Date	Simazine	Diazinon	Methidathion
1993				1994			
10/1	nd	nd	nd	1/3	nd	nd	nd
10/1R	nd	nd	nd	1/5	(37)	nd	nd
10/4	nd	nd	nd	1/7	nd	nd	nd
10/6	nd	nd	nd	1/10	nd	(28)	nd
10/6R	nd	nd	nd	1/12	nd	(26)	nd
10/8	nd	nd	nd	1/12R	nd	(33)	nd
10/11	nd	nd	nd	1/14	nd	(21)	nd
10/13	nd	nd	nd	1/17	nd	46	nd
10/13R	nd	nd	nd	1/19	nd	(28)	nd
10/15	nd	nd	nd	1/19R	(22)	(34)	nd
10/18	nd	nd	nd	1/21	(19)	(27)	nd
10/20	nd	nd	nd	1/24	69	42	nd
10/20R	nd	nd	nd	1/24R	71	43	nd
10/25	nd	nd	nd	1/25	104	40	nd
10/27	nd	nd	nd	1/26	114	97	46
10/29	nd	nd	nd	1/27	342	236	51
11/1	nd	nd	nd	1/28	127	151	(23)
11/10	nd	nd	nd	1/29	208	133	41
11/10R	nd	nd	nd	1/30	132	82	nd
11/12	nd	nd	nd	1/31	114	76	nd
11/15	nd	nd	nd	2/1	111	41	nd
11/17	nd	nd	nd	2/2	98	(32)	nd
11/17R	nd	nd	nd	2/2R	100	(30)	nd
11/19	nd	nd	nd	2/3	98	39	nd
11/22	nd	nd	nd	2/4	71	(25)	nd
11/24	nd	nd	nd	2/7	nd	(14)	nd
11/24R	nd	nd	nd	2/8	180	nd	nd
11/29	nd	nd	nd	2/9	483	126	56
12/1	100	nd	nd	2/9R	452	115	32
12/1R	84	nd	nd	2/10	349	253	53
12/3	nd	nd	nd	2/11	354	180	57
12/6	nd	nd	nd	2/12	134	46	nd
12/8	nd	nd	nd	2/13	115	(28)	nd
12/8R	nd	nd	nd	2/14	115	(33)	nd
12/10	nd	nd	nd	2/15	157	(27)	nd
12/13	89	nd	nd	2/16	140	40	nd
12/15	nd	nd	nd	2/17	245	(28)	nd
12/17	nd	nd	nd	2/17R	266	(32)	nd
12/23	nd	nd	nd	2/18	134	(26)	nd
12/23R	nd	nd	nd	2/19	209	(31)	nd
12/28	nd	nd	nd	2/20	224	38	nd
12/30	nd	nd	nd	2/21	182	(29)	nd

Table 9. Pesticide concentrations in water samples from the Sacramento River at Sacramento, California, October 1993 through April 1994--*Continued*

Date	Simazine	Diazinon	Methodathion	Date	Simazine	Diazinon	Methodathion
<i>1994--Continued</i>				<i>1994--Continued</i>			
2/22	522	44	nd	3/28	nd	nd	nd
2/23	182	53	nd	3/30	(44)	nd	nd
2/23R	155	49	nd	3/30R	(35)	nd	nd
2/24	233	41	nd	4/1	nd	nd	nd
2/25	156	(19)	nd	4/4	nd	nd	nd
2/28	108	(17)	nd	4/6	(36)	nd	nd
2/28R	74	nd	nd	4/6R	(36)	nd	nd
3/2	75	nd	nd	4/8	nd	nd	nd
3/4	nd	nd	nd	4/11	nd	nd	nd
3/7	nd	nd	nd	4/13	nd	nd	nd
3/9	nd	nd	nd	4/13R	nd	nd	nd
3/9R	nd	nd	nd	4/15	nd	nd	nd
3/11	nd	nd	nd	4/18	nd	nd	nd
3/14	nd	nd	nd	4/20	76	nd	nd
3/16	nd	nd	nd	4/23	61	nd	nd
3/16R	nd	nd	nd	4/25	111	nd	nd
3/18	nd	nd	nd	4/27	nd	nd	nd
3/21	nd	nd	nd	4/27R	nd	nd	nd
3/23	nd	nd	nd	4/29	nd	nd	nd