ZONE 3

Zone 3 Description

Zone 3 is essentially the San Joaquin River Drainage. It includes the irrigated lands within the geographic areas represented by the East San Joaquin Water Quality Coalition, the Westside San Joaquin River Watershed Coalition, and the San Luis Water District Watershed Coalition.

Pesticide Use information for Zone 3 is summarized in Appendix B. The Appendix lists the primary crops by acreage that were grown in 2005 sorted by county. The Appendix also references a selection of the types and quantity of pesticides that are recorded as being used for these crops (Department of Pesticide Regulation for 2005).

The summary presented here includes data collected between March 2003 and September 2006. In all, data collected from 81 different sampling locations within Zone 3 are included in the summary. Approximate location of sampling sites are shown on Figure Z3-1, Zone 3 Monitoring Locations. Monitoring site identification and tests that were conducted at each site are provided in Table Z3-1, Monitoring Site Identification and Samples Collected.

Table Z3-1
Monitoring Site Identification and Samples Collected

Site ID	Site Name	Physical Parameters	Toxicity	Pesticides	Metals	Bacteria	Nutrients
1	Ash Slough at Ave 21	6/14/05 - 9/12/06	6/14/05 - 9/12/06	6/14/05 - 9/12/06	5/16/06 - 9/12/06	6/14/05 - 9/12/06	5/16/06 - 9/12/06
2	August Rd Drain u/s Crows Landing Bridge	7/31/04 - 9/29/04	7/31/04 - 9/29/04	7/31/04 - 9/29/04	None	7/31/04 - 9/29/04	None
3	Bear Ck at Kiby Rd	3/21/05 - 9/12/06	3/21/05 - 9/12/06	3/21/05 - 9/12/06	5/17/06 - 9/12/06	3/21/05 - 9/12/06	5/17/06 - 9/12/06
4	Berenda Slough at Dairyland Rd	5/16/06 - 9/21/06	5/16/06 - 9/21/06	5/16/06 - 9/12/06	None	5/16/06 - 9/12/06	None
5	Black Rascal Ck at Yosemite Rd	5/18/06 - 9/12/06	5/18/06 - 9/12/06	5/18/06 - 9/12/06	None	5/18/06 - 9/12/06	None
6	Cottonwood Ck at Rd 20	2/16/05 - 9/12/06	2/16/05 - 9/12/06	2/16/05 - 9/12/06	5/16/06 - 9/12/06	2/16/05 - 9/12/06	5/16/06 - 9/12/06
7	Deadman Ck at Hwy 59	5/17/06 - 9/12/06	5/17/06 - 9/12/06	5/17/06 - 9/12/06	None	5/17/06 - 9/12/06	None
8	Deadman Ck at Gurr Rd	7/31/04 - 9/12/06	7/31/04 - 9/12/06	7/31/04 - 9/12/06	5/17/06 - 9/12/06	7/31/04 - 9/12/06	5/17/06 - 9/12/06
9	Dry Ck at Wellsford Rd	2/15/05 - 9/21/06	2/15/05 - 9/21/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06
10	Dry Ck at Rd 18	8/16/05 - 9/12/06	8/16/05 - 9/12/06	8/16/05 - 9/12/06	5/16/06 - 9/12/06	8/16/05 - 9/12/06	5/16/06 - 9/12/06
11	Duck Slough at Gurr Rd	7/31/04 - 9/13/06	7/31/04 - 9/13/06	7/31/04 - 9/13/06	5/17/06 - 9/13/06	7/31/04 - 9/13/06	5/17/06 - 9/13/06
12	Duck Slough at Hwy 99	2/16/05 - 9/13/06	2/16/05 - 9/13/06	2/16/05 - 9/13/06	5/17/06 - 9/13/06	2/16/05 - 9/13/06	5/17/06 - 9/13/06
13	Highline Canal at Hwy 99	5/10/05 - 9/21/06	5/10/05 - 9/21/06	5/10/05 - 9/13/06	5/17/06 - 9/13/06	5/10/05 - 9/13/06	5/17/06 - 9/13/06
14	Highline Canal at Lombardy Ave	2/15/05 - 9/21/06	2/15/05 - 9/21/06	2/15/05 - 9/13/06	5/17/06 - 9/13/06	2/15/05 - 9/13/06	5/17/06 - 9/13/06
15	Hilmar Drain at Central Ave	2/15/05 - 9/14/06	2/15/05 - 9/14/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06
16	Jones Drain at Oakdale Rd	2/16/05 - 9/13/06	2/16/05 - 9/13/06	2/16/05 - 9/13/06	5/17/06 - 9/13/06	2/16/05 - 9/13/06	5/17/06 - 9/13/06
17	Lone Willow Slough at Madera Ave	2/16/05 - 9/12/05	2/16/05 - 7/12/05	2/16/05 - 7/12/05	None	2/16/05 - 7/12/05	None
18	Merced River at Sante Fe Ave	7/31/04 - 9/13/06	7/31/04 - 9/13/06	7/31/04 - 9/13/06	5/16/06 - 9/13/06	7/31/04 - 3/16/06	5/16/06 - 9/13/06
19	Mustang Ck at East Ave	5/18/06 - 9/14/06	5/18/06 - 8/10/06	5/18/06 - 8/10/06	None	5/18/06 - 8/10/06	None
20	Prairie Flower Drain at Crows Landing Rd	2/15/05 - 9/14/06	2/15/05 - 9/14/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06	2/15/05 - 9/14/06	5/18/06 - 9/14/06
21	Silva Drain at Meadow	5/18/06 - 9/13/06	5/18/06 - 9/13/06	5/18/06 - 9/13/06	None	5/18/06 - 9/13/06	7/13/06

Site ID	Site Name	Physical Parameters	Toxicity	Pesticides	Metals	Bacteria	Nutrients
	Dr						
22	South Slough at Quinley Rd	7/11/06 - 9/12/06	7/11/06 - 8/9/06	7/11/06 - 8/9/06	None	7/11/06 - 8/9/06	None
23	Hospital Ck at River Rd	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/8/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
24	Ingram Ck at River Rd	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/8/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
25	Westley Wasteway nr Cox Rd	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/8/06	8/8/06 - 10/10/06	7/6/04 - 10/10/06	8/8/06 - 10/10/06
26	Del Puerto Ck nr Cox Rd	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/8/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
27	Del Puerto Ck at Hwy 33	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/8/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
28	Salado Ck nr Olive Ave	7/6/04 - 3/14/06	7/6/04 - 8/10/04	7/6/04 - 8/10/04	None	7/6/04 - 10/12/04	None
29	Ramona Lake nr Fig Ave	7/6/04 - 10/10/06	7/6/04 - 8/8/06	7/6/04 - 8/8/06	8/8/06 - 10/10/06	7/6/04 - 10/10/06	8/8/06 - 10/10/06
30	Marshall Rd Drain nr River Rd	7/6/04 - 10/10/06	7/6/04 - 8/8/06	6/13/06 - 8/8/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
31	Orestimba Ck at River Rd	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/9/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
32	Orestimba Ck at Hwy 33	7/6/04 - 10/10/06	7/6/04 - 9/11/06	7/6/04 - 8/9/06	7/11/06 - 10/10/06	7/6/04 - 10/10/06	7/11/06 - 10/10/06
33	Newman Wasteway nr Hills Ferry Rd	7/13/04 - 10/10/06	7/13/04 - 9/11/06	7/13/04 - 8/8/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
34	SJR at Sack Dam	7/13/04 - 10/10/06	None	7/13/04 - 2/15/05	None	None	None
35	SJR at Lander Ave	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/13/04 - 4/11/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
36	Mud Slough u/s of San Luis Drain	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
37	Salt Slough at Lander Ave	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
38	Salt Slough at Sand Dam	7/13/04 - 10/10/06	7/13/04 - 9/11/06	7/13/04 - 8/8/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
39	Los Banos Ck at Hwy 140	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/13/04 - 10/10/06	7/11/06 - 10/10/06	8/10/04 - 10/10/06	7/11/06 - 10/10/06
40	Los Banos Ck at China Camp Rd	7/13/04 - 9/11/06	9/13/04 - 3/13/06	12/29/04 - 4/11/06	None	11/9/04 - 1/11/05	None
41	Turner Slough nr Edminster Rd	7/13/04 - 10/10/06	9/13/04 - 9/11/06	3/8/05 - 4/11/06	7/11/06 - 10/10/06	11/9/04 - 10/10/06	7/11/06 - 10/10/06
42	Westley Wasteway at Refuge Ponds	8/9/05	8/9/05	8/9/05	None	8/9/05	None
43	SJR at WSID Pumps	8/9/05	8/9/05	8/9/05	None	8/9/05	None
44	Delta Mendota Canal at DPWD	8/9/05	8/9/05	8/9/05	None	8/9/05	None
45	Little Panoche Ck at Hwy 5	3/17/06	3/17/06	None	None	3/17/06	None
46	Russell Ave Drain at San Luis Canal	3/17/06	3/17/06	None	None	3/17/06	None
47	Boundary Drain at Henry Miller Ave	6/22/05 - 8/20/05	6/22/05 - 8/20/05	6/22/05 - 8/3/05	6/22/05 - 8/3/05	None	6/22/05 - 8/3/05
48	Hospital Ck at Hwy 33	8/27/04	8/27/04	8/27/04	None	None	None
49	Island Field Drain at Catrina Rd	8/27/04 - 8/20/05	8/27/04 - 8/20/05	8/27/04 - 8/3/05	6/22/05 - 8/3/05	None	6/22/05 - 8/3/05
50	Orestimba Ck at Kilburn Rd	7/15/04 - 4/12/05	7/15/04 - 4/12/05	7/15/04 - 9/9/04	7/15/04 - 9/9/04	None	7/15/04 - 9/9/04
51	Poso Drain at NE corner Turner Island & Palazzo Rd	7/15/04 - 9/9/04	7/15/04 - 9/9/04	7/15/04 - 9/9/04	7/15/04 - 9/9/04	None	7/15/04 - 9/9/04
52	Unnamed Drain at Pomelo Ave near Paradise Ave	3/26/03 - 9/23/03	3/26/03 - 9/23/03	None	None	None	None
53	Westport Drain at Jennings Rd.	3/26/03 - 9/23/03	3/26/03 - 9/23/03	None	None	None	None
54	Berenda Ck at Ave 17.5 west of Madera	1/27/05 - 8/20/05	1/27/05 - 8/20/05	1/27/05 - 8/3/05	6/22/05 - 8/3/05	None	1/27/05 - 8/3/05
55	Cottonwood Ck at Hwy 145	7/22/04 - 8/17/04	7/22/04 - 8/17/04	7/22/04 - 8/17/04	8/3/04 - 8/17/04	None	7/22/04 - 8/17/04
56	Dry Ck at J9	7/20/04 - 9/15/04	7/20/04 - 9/15/04	7/20/04 - 9/15/04	7/20/04 - 9/15/04	None	7/20/04 - 9/15/04

Site ID	Site Name	Physical Parameters	Toxicity	Pesticides	Metals	Bacteria	Nutrients
57	Duck Slough at Arboleda Dr	7/20/04 - 4/12/05	7/20/04 - 4/12/05	7/20/04 - 2/4/05	7/20/04 - 2/4/05	None	7/20/04 - 2/4/05
58	Ingalsbe Slough at J17	7/20/04 - 9/15/04	7/20/04 - 9/15/04	7/20/04 - 9/15/04	7/20/04 - 9/15/04	None	7/20/04 - 9/15/04
59	Owens Ck at Gurr Rd	6/22/05 - 8/20/05	6/22/05 - 8/20/05	6/22/05 - 8/3/05	6/22/05 - 8/3/05	None	6/22/05 - 8/3/05
60	Sand Slough on Turner Island Rd w of Merced NWR	8/27/04	8/27/04	8/27/04	None	None	None
61	Stevinson Lower Lat at Faith Home Rd	7/15/04 - 9/9/04	7/15/04 - 9/9/04	7/15/04 - 7/29/04	7/15/04 - 9/9/04	None	7/15/04 - 9/9/04
62	Casebeer Lat Exten at Deadman Ck	7/14/04 - 10/25/05	None	7/14/04 - 10/25/05	7/14/04 - 10/5/04	None	7/14/04 - 10/25/05
63	El Nido Canal Spill to Chowchilla Slough	7/15/04 - 3/2/06	None	7/15/04 - 3/2/06	None	None	7/15/04 - 3/2/06
64	El Nido Dam on Mariposa Ck	7/14/04 - 3/2/06	None	7/14/04 - 3/2/06	None	None	7/14/04 - 3/2/06
65	Fancher Lat at Head	7/15/04 - 10/25/05	None	7/15/04 - 10/25/05	None	None	7/15/04 - 10/25/05
66	Livingston Canal Spill to Merced R	10/5/04 - 3/2/06	None	10/5/04 - 3/2/06	10/5/04	None	10/5/04 - 3/2/06
67	Livingston Drain	7/12/04 - 10/25/05	None	7/12/04 - 10/25/05	7/12/04 - 10/5/04	None	7/12/04 - 10/25/05
68	North Side Canal at Spill to Merced R	7/12/04 - 3/2/06	None	7/12/04 - 3/2/06	7/12/04 - 10/5/04	None	7/12/04 - 3/2/06
69	Puglizevich Dam on Miles and Owen Cks	7/14/04 - 3/2/06	None	7/14/04 - 3/2/06	None	None	7/14/04 - 3/2/06
70	Jacobson Drain	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
71	Lat 1 Spill	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
72	Lat 5 Spill	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
73	Lat 6 Spill	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
74	Main Drain Spill	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
75	Spenker Spill	1/8/05 - 3/2/06	None	1/8/05 - 3/2/06	None	None	1/8/05 - 3/2/06
76	Waterford LM Spill	7/6/04 - 3/2/06	None	7/6/04 - 3/2/06	None	None	7/6/04 - 3/2/06
77	Coulter Pond	6/23/04 - 1/22/06	None	6/23/04 - 1/22/06	None	None	6/23/04 - 1/22/06
78	Langworth Pipeline	6/23/04 - 1/22/06	None	6/23/04 - 1/22/06	None	None	6/23/04 - 1/22/06
79	Highline Spill	7/14/04 - 9/28/05	None	7/14/04 - 9/28/05	None	None	7/14/04 - 9/28/05
80	Lat 5 1/2 Drop 23 (Lower Spill)	1/13/05 - 2/27/06	None	1/13/05 - 2/27/06	None	None	1/13/05 - 2/27/06
81	Lower Lat 2 1/2 Spill	7/14/04 - 3/2/06	None	7/14/04 - 3/2/06	None	None	7/14/04 - 3/2/06
82	Poso Slough at Hudson	3/25/05 - 11/20/05	3/25/05 - 11/20/05	None	None	None	None
83	Holland Drain at Hudson	3/25/05 - 8/20/05	3/25/05 - 8/20/05	None	None	None	None

Monitoring Data. Data summaries for the identified general categories are described below. Each section includes a discussion of the frequency of detection and the magnitude of detected constituent measurements, along with notable trends or characteristics pertaining to the results. The summaries include an evaluation of results that exceeded or may have exceeded numeric or narrative water quality objectives. The location or spatial distribution of particular types or ranges of results have been emphasized in some cases, where evaluation of this information is considered critical.

AQUATIC AND SEDIMENT TOXICITY. Information regarding the monitoring results of the three species water column toxicity tests and the one species sediment toxicity test is described below.

Pimephales promelas (Fathead Minnow). Based on the number of toxicity tests conducted within the reference period, toxicity to fathead minnow is relatively infrequent in Zone 3. Out of 588 samples analyzed for minnow toxicity only 2.2% (or 13 tests) resulted in reduced survival in the 96-hour test. However, the number of individual monitoring sites that exhibited fathead minnow toxicity at least one time during the three year period was 11 sites, which is 18.9% of the total number of monitoring sites in Zone 3.

A review of chemistry results generally supports these toxicity data. The highest observed concentration of chlorpyrifos in a Zone 3 sample was 2.2 ug/L, which is 22 times the level expected to be toxic to *Ceriodaphnia*, but approximately 1/50th the concentration expected to be toxic to minnows. Other constituents, such as ammonia, were likewise generally below concentrations that would be expected to cause significant mortality to minnows (in non-toxic samples).

It should be noted that only two of the 13 minnow-toxic samples caused more than 50% mortality. For those two samples, mortality reached 60% at Los Banos Creek at China Camp Road, and 92% at Prairie Flower Drain at Crows Landing Road. The sample that exhibited 92% mortality also contained an ammonia concentration of 18 mg/L. All other ammonia measurements in Zone 3 were less than 3.6 mg/L, and many were below the detection limit of 0.04 mg/L. The LC50 (Lethal Concentration for 50% mortality) for ammonia to fathead minnows is in the range of 5.9 to 8.2 mg/L, indicating that ammonia was the likely cause of toxicity in the Prairie Flow Drain sample.

The toxicology lab which conducted these analyses made observations of the presence of fungal coronas on fish. This was described as an indicator that the mortality in some minnow-toxic samples was due to pathogens that may have originated in the sample water, or in control fish cultures. Pathogens to fish are a concern, as are pathogens to humans. There are many unknowns about these observations, including that the presence of any pathogen has not been verified. If a pathogen in the laboratory minnow contributed to minnow mortality, it is not known if the pathogen resulted from pollutants in the field samples, or if it was already present in the laboratory minnow. The minnow that were tested in the field sample water were compared to the minnow in the laboratory water, according to test requirements. Further studies need to be conducted to determine if the cause of mortality was caused by agriculture drainage waters.

Toxicity to fathead minnow in Zone 3 monitoring is typically mid-range in magnitude (generally 10 to 65% mortality). TIEs were not performed on samples with less than 50% mortality, which includes most samples that exhibited significant toxicity within Zone 3. One sample contained a toxic level of ammonia, and possible sources of ammonia include animal waste and fertilizers. No other correlations have been drawn between observed toxicity to fathead minnows and likely impacts from discharges from irrigated lands within Zone 3. This is due, in part, to the limited number of samples that exceeded 50% mortality. Figure Z3-2, Toxicity to *Pimephales promelas,* identifies the approximate location of minnow tests, both with toxicity and without.

Ceriodaphnia dubia (Water flea). Toxicity to water flea has been observed in 61 of 597 samples in Zone 3 (10.2%). Out of the 58 different monitoring sites, 34 exhibited toxicity to water flea at least one time, or 59% of the monitoring sites. Complete mortality of 100% was frequent (36 of the 61 toxic samples) and the magnitude of the observed toxicity was as high as 22 toxic units.

Toxicity Identification Evaluations were performed in most cases where mortality exceeded 50% in the field samples. For samples with less than 50% mortality, TIEs were not performed. TIEs that were conducted often indicated non-polar organics as contributing to (or as the only cause of) toxicity, and sometimes showed that metabolically activated substances were responsible. Most insecticides are non-polar organic compounds, and many organophosphate insecticides (e.g. chlopyrifos, diazinon) are metabolically activated poisons. The TIE information that identified metabolically activated non-polar organics, combined with pesticide use information in Zone 3 strongly point to organophosphate insecticides as the cause of the toxicity. In samples where both toxicity and some pesticides were analyzed, the concentrations of detected pesticides were compared to the level of toxicity and the established lethal concentration of the detected pesticides, if such data were available in the literature.

Three organophosphate insecticide compounds (chlorpyrifos, diazinon and methyl parathion) were found to exceed concentrations expected to be toxic to *Ceriodaphnia* in a portion of the samples that exhibited *Ceriodaphnia* toxicity. Bailey, et al. (1997), determined *Ceriodaphnia* 48-hour LC50 concentrations for chlorpyrifos (ranging from 0.058 to 0.079 ug/L) and for diazinon (ranging from 0.26 to 0.58 ug/L), (*Joint Acute Toxicity of Diazinon and Chlorpyrifos to Ceriodaphnia dubia*, Bailey, H.C., Journal of Environmental and Toxicological Chemistry, 1997). The California Department of Fish & Game (2000) developed *Ceriodaphnia* genus mean acute values for chlorpyrifos (at 0.06 ug/L) and diazinon (at 0.44 ug/L), (*Water Quality Criteria for Diazinon and Chlorpyrifos*, California Department of Fish and Game, Office of Spill Prevention and Response, 2000). Using these references, conservative benchmarks of 0.1 ug/L for chlorpyrifos and 0.5 ug/L for diazinon were selected to compare to measured concentrations of these compounds (when available) in samples that were toxic to *Ceriodaphnia* and to determine their potential to have contributed to the observed toxicity. Forty-nine of the Zone 3 samples that were toxic to *Ceriodaphnia* were also analyzed for chlorpyrifos, and in 19 of those 49 (39%), chlorpyrifos was detected above 0.1 ug/L, indicating a likely cause and effect relationship. Additionally, diazinon exceeded 0.5 ug/L in 4 toxic samples, indicating that diazinon was a likely cause, or contributor to, toxicity in those samples. Similarly, a methyl parathion *Ceriodaphnia* 48-hour LC50 of 2.1 ug/L and a 7-day lowest observed effect concentration (LOEC) of 1.37 ug/L were established by Norberg-King et al. (*Application of Toxicity Identification Evaluation Procedures to the Ambient Waters of the Colusa Basin Drain, California*, Norberg-King, T.J., Journal of Environmental and Toxicological Chemistry,1991). Methyl parathion exceeded 1 ug/L in two *Ceriodaphnia*-toxic samples, indicating that methyl parathion was likely to have contributed to toxicity in those two samples.

Other pesticides that were detected at least once in *Ceriodaphnia*-toxic Zone 3 samples included: the insecticides dimethoate, dicofol, disulfoton, malathion, methomyl, DDT, DDE, dieldrin, and methidathion; and the herbicides atrazine, cyanazine, simazine, thiobencarb, pendamethalin (Prowl), and trifluralin. These compounds were not observed at levels above known LC50 concentrations for *Ceriodaphnia* (where such data exist), but it is possible that they may have contributed to observed toxicity through additive effects, especially in samples for which non-polar organics were determined to be the primary cause of toxicity.

Water bodies with two or more incidents of toxicity to *Ceriodaphnia* include the following: Bear Creek at Kibby Rd. (2 of 12 tests); Dry Creek at Wellsford Rd. (2 of 15 tests); Duck Slough at Gurr Rd. (3 of 18 tests); Highline Canal at Highway 99 (4 of 14 tests); Highline Canal at Lombardy Rd. (2 of 15 tests); Merced River at Santa Fe (3 of 18 tests); Hospital Creek at River Road (2 of 14 tests); Ramona Lake near Fig Ave. (2 of 10 tests); Orestimba Creek at River Road (3 of 19 tests); Orestimba Creek at Highway 33 (6 of 19 tests); Salt Slough at Lander Ave. (3 of 31 tests); Salt Slough at Sand Dam (3 of 19 tests); Los Banos Creek at Highway 140 (2 of 29 tests); Island Field Drain at Katrina Road (3 of 4 tests); and Berenda Creek at Ave. 17.5 (2 of 7 tests).

The measured concentrations of just three compounds (chlorpyrifos, diazinon, and methyl parathion) can potentially account for at least half of all the observed *Ceriodaphnia* toxicity, based on actual measured concentrations of the pesticides. These same pesticides may have caused additional toxicity in samples where these constituents were not analyzed. These insecticides are used on a variety of crops including alfalfa, orchards, and row crops. *Ceriodaphnia* toxicity was not limited to a specific area or watershed in Zone 3. The approximate locations of water flea toxicity tests with toxicity and without toxicity are presented in Figure Z3-3, Toxicity to *Ceriodaphnia dubia*.

Selenastrum capricornutum (Algal species). Toxicity to the algae test species was observed in a total of 8.5% of all samples (45 of 529) collected within Zone 3. The total number of monitoring sites that were tested for algae toxicity showed that 43% of the 56 sample sites showed algae toxicity on at least one occasion. The approximate locations of algae toxicity tests with toxicity and without toxicity are presented in Figure Z3-4, Toxicity to *Selenastrum capricornutum*.

TIEs for algae-toxic samples have indicated non-polar organics as the cause of (or contributor to) toxicity in some cases, but several TIEs conducted within Zone 3 have also shown that a treatment removing non-polar organics and a separate treatment to remove divalent cationic metals both improved algal growth in the same toxic sample. This indicates a possibility that in some cases, more than one toxicant, or an organo-metal compound is present.

Correlations between observed algae toxicity and detected (measured) metals and pesticides in algae-toxic samples have not been firmly established. Monitoring results suggest possible toxicity to algae from the herbicide simazine. During a December 2004 storm-sampling event, algae toxicity was determined to be present at four monitoring locations (Del Puerto Creek, Ingram Creek, Hospital Creek and Newman Wasteway). All four re-samples contained simazine. The concentrations of simazine in the toxic samples ranged from 2.2 to 7.7 ug/L. Simazine was also found to be present in other algae-toxic samples. However, no conclusions can be made until more information is available regarding the potential for simazine to inhibit algae growth.

An herbicide known to be toxic to *Selenastrum* that was detected in some algae-toxic samples is diuron. Various herbicides were often detected in algae-toxic samples, however non-toxic samples also frequently had herbicides detected. The role that excess nutrients play in the level of toxicity caused by metals or herbicides, as well as the additive or synergistic effects of multiple herbicides or herbicides and metals in combination, is not yet clear, and deserves further investigation.

Hyalella azteca (sediment toxicity). All sediment toxicity testing to date has been done using the test species *Hyalella azteca*. Toxicity to *Hyalella* generally seems to occur in about 25 to 35% of samples throughout various geographic locations in Zone 3, and for both MRP Plan monitoring and Supplemental Monitoring Programs. One notable exception to this higher trend for sediment toxicity found in the Patterson sub-watershed area, which is located in the northwest portion of Zone 3. The Patterson sub-area lies generally on the west side of the San Joaquin River, east of Interstate 5, from Highway 132 on the north to approximately the Newman Wasteway on the south. The frequency of *Hyalella* toxicity in the Patterson sub-watershed is 76% of all samples tested.

The mortality in toxic samples in the Patterson area is also generally higher than that observed in other locations, with 14 instances of 2% or less total survival in monitoring samples. Elsewhere within Zone 3, only three samples that were toxic to *Hyalella* had comparable magnitudes of toxicity -- less than 30% total survival.

Seven of eight monitoring locations within the Patterson area have yielded more than one toxic sediment sample. Three locations, Orestimba Creek at Highway 33, Del Puerto Creek at Highway 33, and Ingram Creek at River Road, have exhibited sediment toxicity each time they were tested (4, 4 and 5 times, respectively). Two other locations, Hospital Creek at River Road, and the Westley Wasteway near Cox Road, have exhibited toxicity on four of five sampling events. The Patterson sub-area is relatively narrow (approximately eight miles wide and 25 miles long), and nearly all drainage moves from west to east. The area has fine-grained soils, and have a large proportion of acres planted to furrow-irrigated row crops, which commonly discharge tail water. Drainage channels, including natural and modified creeks and constructed agricultural drains, are narrow and water typically moves rapidly. All of these characteristics promote the movement of fine sediments and soils off fields and into waterways.

On the east side of the river, five of 22 locations have exhibited sediment toxicity on two or more occasions. The location with the highest frequency of sediment toxicity on the east side was Duck Slough at Gurr Road, with four toxic samples out of six that were analyzed. Figure Z3-5, Toxicity to *Hyalella azteca*, presents the approximate locations of sediment toxicity tests, with mortality and without.

Studies that are being conducted by University of California for the Water Board in the San Joaquin River basin are showing strong correlations between the presence and magnitude of certain hydrophobic pesticides and observed sediment toxicity. The cause of toxicity in the majority of toxic sediment samples in the study has been clearly linked to several pyrethroid insecticides (bifenthrin, lambda-cyhalothrin, esfenvalerate, and permethrin), and/or the organophosphate insecticide chlorpyrifos, all of which are relatively hydrophobic insecticides and have a strong propensity to adhere to particulate matter. These compounds are also commonly used in Zone 3 and throughout the Central Valley to control agricultural pests on a variety of crops. Many toxic sediments from the study were shown to have concentrations of pyrethroids and/or chlorpyrifos which would account for all of the observed toxicity.

In the studies, 27% of all sediment samples (53 of 200 samples collected across all of Region 5) were toxic, and in 67% of those toxic samples the measured concentrations of pyrethroids and/or chlorpyrifos were sufficient to explain the toxicity. The comparison was performed using established LC50 concentrations for a group of measured pyrethroid and organochlorine insecticides, and chlorpyrifos (assuming additivity where multiple constituents were present), measured concentrations of those pesticides in the samples, and the presence and magnitude of toxicity in the same samples. Toxicity in the remaining 33% of the toxic samples in the study have not been linked to a cause or source. These study data strongly suggest that adequate control of the movement of a relatively small group of chemical products to prevent entry into waterways would significantly reduce the frequency and magnitude of sediment toxicity in agricultural drains and affected receiving waters. Efforts to control off-site movement of sediment would be likely to mitigate the detrimental effects of these chemicals, as well as other sediment-bound toxicants.

The Westside Coalition submitted several toxic sediment samples to the Water Board throughout the testing period, which were in turn submitted to a contractor to perform experimental TIE procedures on the sediment. There are no approved TIE procedures for sediment, and the techniques are still under development. The experimental TIEs generally indicated that non-polar organic compounds were the general class of compounds causing toxicity in all cases (which is consistent with insecticides being the primary cause of toxicity). In some instances, either pyrethroids or DDT and its degradates DDD and DDE were identified as possible toxicants. However, this information conflicts somewhat with the UC studies, which indicate that the concentrations of DDT/DDD/DDE were insufficient to be toxic to *Hyalella* in any field samples. In the UC studies pyrethroid concentrations could fully account for the majority of sediment toxicity.

The use of DDT has been banned in the United States for over 30 years, but the product is still used in other countries, and residues from past use are still present in the environment. DDT, DDD, and DDE are extremely persistent in the environment and are somewhat ubiquitous due to past use. The UC study also found measurable concentrations of DDT/DDD/DDE in over 90% of all sediment samples analyzed, in both toxic and non-toxic samples.

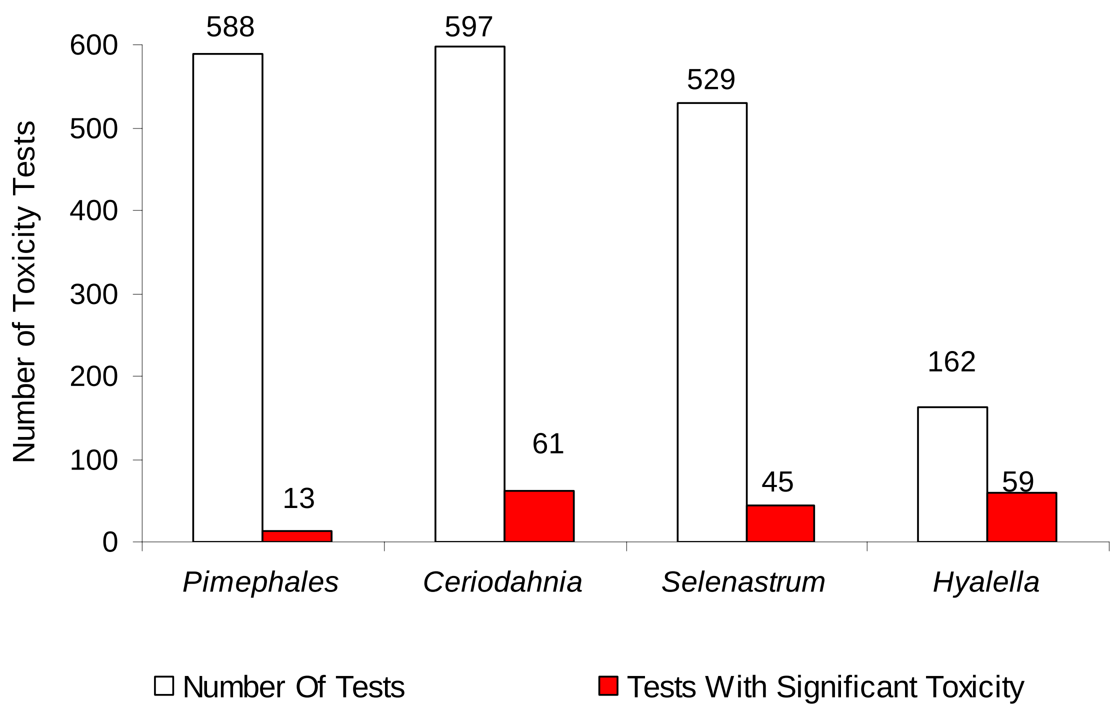
Table Z3-2, Frequency of Water Column and Sediment Toxicity, summarizes the water column and sediment toxicity frequency information for Zone 3, with the distribution for east of the San Joaquin and West San Joaquin.

TABLE Z3-2
Frequency of Water Column and Sediment Toxicity

	Minnow			Water Flea			Algae			*Hyalella*		
	# Toxic Tests	# Tests	% Toxic	# Toxic Tests	# Tests	% Toxic	# Toxic Tests	# Tests	%	# Toxic Tests	# Tests	% Toxic
East Side of San Joaquin River	5	267	1.9%	27	271	10%	28	228	12.3%	20	82	24%
West Side of San Joaquin River	8	321	2.5%	34	326	10.4%	17	301	5.6%	39	80	49%
TOTAL	**13**	**588**	**2.2%**	**61**	**597**	**10.2%**	**45**	**529**	**8.5%**	**59**	**162**	**36%**

Figure Z3-6 shows the same information compiled for Zone 1, which more graphically represents the number of toxic samples compared to the total number collected.

Figure Z3-6
Tests with Statistically Significant Toxicity



PESTICIDES. Pesticides have been evaluated and summarized from 712 samples collected at 75 locations. These analyses yielded a total of 18,435 individual pesticide results from the 712 samples analyzed for pesticides – an average of 26 pesticide results for each sample that was analyzed for a group of pesticides. The exact number and identity of the pesticides that were analyzed in any given sample was dependent on the monitoring plans. Different groups of pesticides were analyzed in different samples, depending on a number of factors including the "phase" of the monitoring being conducted, applicable CWA 303(d) listing monitoring requirements, site locations, irrigation district monitoring plans, and other factors. The frequency with which individual pesticides were detected in samples for which they were analyzed ranged from 0 to 100%.

Table Z3-3, List of Pesticide Detects, summarizes all pesticides that were detected in Zone 3 at least once during the monitoring period, along with applicable numeric objectives criteria, and numeric data that could be used to interpret the narrative objectives. While the primary effort in evaluating pesticide results is to identify where concentrations exceed numeric or narrative objectives, the results for several chemical pesticides within Zone 3 are noteworthy for various reasons and are summarized below.

Table Z3-3
List of Pesticide Detects

<table>
<tr><th>Pesticide</th><th>Zone 3 Detects/ No. of Tests</th><th>Percent Detects to No. of Tests</th><th>Range of Detected Results (ug/L)</th><th>Water Quality Trigger (ug/L)</th><th>Reference</th></tr>
<tr><td>2,4-D</td><td>3 of 6</td><td>50 %</td><td>0.3 to 0.45 ug/L</td><td>70 ug/L</td><td>Maximum Contaminant Level (MCL)</td></tr>
<tr><td>2,4-DB</td><td>2 of 6</td><td>33 %</td><td>0.41, 0.96 ug/L</td><td>None</td><td>N/A</td></tr>
<tr><td rowspan="2">Atrazine</td><td rowspan="2">11 of 235</td><td rowspan="2">5 %</td><td rowspan="2">0.035 to 0.13 ug/L</td><td>1 ug/L</td><td>MCL</td></tr>
<tr><td>0.15 ug/L</td><td>CA Public Health Goal (PHG)</td></tr>
<tr><td rowspan="2">Biphenthrin</td><td rowspan="2">8 of 236</td><td rowspan="2">3 %</td><td rowspan="2">0.0088 to 0.037 ug/L</td><td>110 ug/L</td><td>USEPA Integrated Risk Information System (IRIS)</td></tr>
<tr><td>0.0004 ug/L</td><td>1/10 LC50 for crustacea</td></tr>
<tr><td>Bromacil</td><td>1 of 10</td><td>10 %</td><td>1.8 ug/L</td><td>87.5 ug/L</td><td>National Academy of Sciences Suggested No Adverse Response Level (SNARL)</td></tr>
<tr><td rowspan="3">Carbaryl</td><td rowspan="3">2 of 184</td><td rowspan="3">1 %</td><td rowspan="3">0.25, 0.256 ug/L</td><td>700 ug/L</td><td>IRIS</td></tr>
<tr><td>574 ug/L</td><td>SNARL</td></tr>
<tr><td>2.53 ug/L</td><td>CA DFG Freshwater Aquatic Life Protection (fr aquatic life)</td></tr>
<tr><td>Carbofuran</td><td>1 of 184</td><td>0.5 %</td><td>0.32 ug/L</td><td>ND</td><td>Basin Plan Pesticide Discharge Prohibition</td></tr>
<tr><td>Chlorpyrifos</td><td>141 of 592</td><td>24 %</td><td>0.004 to 2.2 ug/L</td><td>0.015 ug/L</td><td>Basin Plan numeric water quality objective for segments of the San Joaquin River</td></tr>
<tr><td>Cyanazine</td><td>13 of 226</td><td>6 %</td><td>0.028 to 0.44 ug/L</td><td>1.0 ug/L</td><td>SNARL</td></tr>
<tr><td rowspan="4">DDE</td><td rowspan="4">29 of 208</td><td rowspan="4">14 %</td><td rowspan="4">0.003 to 0.29 ug/L</td><td>No detects (zero)</td><td>Basin Plan</td></tr>
<tr><td>0.00059 ug/L</td><td>CTR</td></tr>
<tr><td>0.00022 ug/L</td><td>USEPA human health protection</td></tr>
<tr><td>0.001 ug/L</td><td>fr aquatic life</td></tr>
<tr><td>DDD</td><td>6 of 200</td><td>3 %</td><td>0.003 to 0.01 ug/L</td><td>No detects (zero)</td><td>Basin Plan</td></tr>
</table>

REVISED DRAFT

Pesticide	Zone 3 Detects/ No. of Tests	Percent Detects to No. of Tests	Range of Detected Results (ug/L)	Water Quality Trigger (ug/L)	Reference
				0.00083 ug/L	CTR
				0.00031 ug/L	USEPA human health protection
DDT	17 of 200	8 %	0.00097 to 0.13 ug/L	No detects (zero)	Basin Plan
				0.00059 ug/L	CTR
				0.00022 ug/L	USEPA human health protection
				0.001 ug/L	fr aquatic life
Demeton	1 of 282	0.3 %	0.14 ug/L	0.1 ug/L	fr aquatic life
				0.3 ug/L	IRIS
Diazinon	59 of 600	10 %	0.01 to 3.6 ug/L	0.1 ug/L	Basin Plan numeric water quality objective for segments of the San Joaquin River
Dichlorprop	1 of 6	17 %	0.34 ug/L	None	N/A
Dieldrin	7 of 200	3.5 %	0.0036 to 0.1 ug/L	No detects (zero)	Basin Plan
				0.00014 ug/L	CTR
				0.000052 ug/L	USEPA human health protection
				0.056 ug/L	fr aquatic life
Dimethoate	95 of 489	19 %	0.04 to 2.5 ug/L	1.4 ug/L	IRIS
				1.0 ug/L	CA Notification Level, DHS
				0.2 ug/L	1/10 LC50 for *Cyclops strennus*
Dicofol	11 of 200	5.5 %	0.019 to 0.27 ug/L	5.3 ug/L	1/10 LC50 for Cutthroat trout
Diuron	26 of 184	14 %	0.003 to 1 ug/L	10 ug/L	SNARL
				14 ug/L	IRIS
				2.4 ug/L	EC50 for *Selenastrum*
EPN	3 of 276	1 %	0.09 to 0.34 ug/L	None	N/A
EPTC	19 of 277	7 %	0.03 to 4.6 ug/L	None	N/A
Esfenvalerate	2 of 325	0.6 %	0.021, 0.05 ug/L	0.007 ug/L	1/10 LC50 for Rainbow trout
Ethoprop	3 of 276	1 %	0.035 to 0.081 ug/L	None	N/A
Fenamiphos	1 of 277	0.4 %	1.4 ug/L	1.8 ug/L	IRIS
Fensulfothion	1 of 276	0.4 %	0.26 ug/L	None	N/A
Glyphosate	2 of 134	1 %	6.5, 12 ug/L	700 ug/L	MCL
Lambda-cyhalothrin	4 of 293	1 %	0.005 to 0.03 ug/L	35 ug/L	IRIS
				0.00041 ug/L	1/10 LC50 for crustacea
Malathion	8 of 476	1.9 %	0.04 to 0.69 ug/L	ND	Basin Plan Pesticide Discharge Prohibition
Methyl Parathion	14 of 476	3 %	0.03 to 1.4 ug/L	ND	Basin Plan Pesticide Discharge Prohibition

Pesticide	Zone 3 Detects/ No. of Tests	Percent Detects to No. of Tests	Range of Detected Results (ug/L)	Water Quality Trigger (ug/L)	Reference
Methidathion	1 of 200	0.5 %	0.049 ug/L	0.7 ug/L	IRIS
				0.07 ug/L	1/10 LC50 for Opossum shrimp
Methomyl	19 of 184	10 %	0.08 to 2.25 ug/L	175 ug/L	SNARL
				0.52 ug/L	fr aquatic life
Metolachlor	15 of 25	60 %	0.03 to 1.2 ug/L	110 ug/L	IRIS
				70 ug/L	Health Advisory, USEPA OPP
				100 ug/L	fr aquatic life
Metribuzin	1 of 3	33 %	0.63 ug/L	170 ug/L	IRIS
				91 ug/L	Health Advisory, USEPA OPP
				100 ug/L	fr aquatic life
Molinate	3 of 206	1.5 %	0.035 to 0.042 ug/L	10.0 ug/L	Basin Plan Pesticide Discharge Prohibition
Oryzalin	1 of 1	100 %	0.2 ug/L	35 ug/L	IRIS
Paraquat	1 of 134	0.7 %	0.24 ug/L	3.2 ug/L	IRIS
Permethrin	1 of 320	0.3 %	0.23 ug/L	350 ug/L	IRIS
				0.03 ug/L	fr aquatic life
Prometryn	4 of 55	7 %	0.35 to 1.4 ug/L	28 ug/L	IRIS
Pendimethalin (Prowl)	54 of 298	18 %	0.03 to 3.1 ug/L	280 ug/L	IRIS
				5 to 30 ug/L	EC50 for *Selenastrum*
Simazine	38 of 240	16 %	0.035 to 7.7 ug/L	4 ug/L	MCL
				3.5 ug/L	IRIS
				10 ug/L	Fr aquatic life
				2 ug/L	EC50 for *Selenastrum*
Thiobencarb	1 of 206	3 %	0.035 to 5.8 ug/L	1.0 ug/L	Secondary MCL
Trifluralin	87 of 292	30 %	0.016 to 1.5 ug/L	5 ug/L	USEPA SNARL

Results listed in Table Z3-3 with results that were higher than an identified water quality trigger are summarized in Table Z3-4, Number of Pesticides Exceeding Trigger Levels, with chlorpyrifos, in particular, identified.

Table Z3-4
Number of Pesticides Exceeding Trigger Levels

	PESTICIDES			CHLORPYRIFOS			
	No. Individual Pesticide Analyses	No. Detects over Trigger Limits	No. of Sample Events	No. of Chlorpyrifos Analyses	Chlorpyrifos detections	No. over Levels	Chlorpyrifos Percent over Trigger Levels
East Side of SJR	7449	76	374	262	64	47	18
West Side of SJR	10986	170	338	330	77	67	20
TOTAL	**18435**	**246**	**712**	**592**	**141**	**114**	**19**

SJR = San Joaquin River

Chlorpyrifos was detected in more Zone 3 samples than any other pesticide. It was detected in 141 of 592 samples analyzed (24%, or nearly one out of every four samples). Zone 3 chlorpyrifos samples were collected 592 times, with 114 detected measurements exceeding 0.015 ug/L (Basin Plan numeric objective for portions of the San Joaquin River). Locations of the chlorpyrifos measurements are identified in Figure Z3-7, Monitoring results for Chlorpyrifos.

Chlorpyrifos is an organophosphate pesticide that was frequently associated with samples that were toxic to *Ceriodaphnia dubia.* It is also the only pesticide that was strongly indicated as a cause of toxicity to more than one of the toxicity test species in Zone 3 (*Ceriodaphnia* and *Hyalella*). Chlorpyrifos was detected above the *Ceriodaphnia* LC50 in over one-third of the toxic samples analyzed for both *Ceriodaphnia* toxicity and chlorpyrifos. Chlorpyrifos accounts for 50% of the pesticide measurements that were higher than trigger levels. Similarly, 19% (115 of 592) of samples analyzed in Zone 3 were determined to have chlopyrifos levels greater than 0.015 ug/L. Table Z3-3, List of Pesticide Detects, identifies the pesticide trigger limits used in this Review.

Diazinon, another organophosphate pesticide, had measured results that were significant with regard to both the frequency of detection and its potential impairments on water quality. Diazinon was detected 59 times in 600 analyses, or about 10% of the time. Eleven measurements were above the 0.10 ug/L basin plan numeric objective set for specific segments of the San Joaquin and Sacramento Rivers, and four measurements were above the USEPA goal of 0.6, recommended for human health protection as a drinking water level. Diazinon was detected above its literature-based LC50 concentration (of approximately 0.5 ug/L) for *Ceriodaphnia* in four *Ceriodaphnia*-toxic samples in Zone 3 (*Joint Acute Toxicity of Diazinon and Chlorpyrifos to Ceriodaphnia dubia*, Bailey, H.C., Journal of Environmental Toxicology and Chemistry, 1997). The highest concentration of diazinon observed in Zone 3 was 3.6 ug/L.

DDT, DDE and DDD, and dieldrin are no longer applied legally in California, but are still present in Zone 3 as a result of historical applications. Applications of a legal product, dicofol, is also a potential source of DDT, because DDT is a trace contaminant in dicofol. These organochlorine insecticides are extremely persistent in the environment, with half-lives of up to 30 years or longer, and are bio-accumulative. They are also extremely hydrophobic, with very low solubility in water, and a very strong propensity to adhere to particulates. Most detections in surface water are likely due to residues that are present in the sample in the form of suspended particulates.

The CTR objectives are generally below the detection limits for the compounds that are available at commercial analytical laboratories, and additionally, the Basin Plan states that any laboratory detections of these compounds exceed the objective. Therefore, all detections of these compounds exceed numeric Basin Plan water quality objectives. The number of detections of these compounds in Zone 3 were as follows:

1. DDE – 14% (29 detections in 208 analyses);
2. DDT – 8% (17 detections in 200 analyses);
3. DDD – 3% (6 detections in 200 analyses);
4. Dieldrin – 4% (4 detects in 200 analyses).

Twenty-four of the 29 detections for DDE were from the Patterson sub-area, which is an area with typically high concentrations of suspended particulates. This is consistent with the concept that much of the organochlorine content measured in samples is likely to be adsorbed to particulate matter. Additionally, over 90% of sediment samples analyzed by UC Berkeley contained measurable amounts of DDT/DDD/DDE, although concentrations in those same samples did not reach levels known to be toxic to the sediment test species, *Hyalella*.

Effective 1 January 1991, the Regional Board prohibited the discharge of irrigation return flows containing the pesticides carbofuran, malathion, thiobencarb, molinate, and methyl parathion, unless the discharger is following Board approved management practices. Water Board approved management practices are associated with the use of these pesticides on rice fields represented by the California Rice Commission in the Sacramento and San Joaquin River Basins. Discharges from any other irrigated lands are prohibited in Zone 3. No rice field applications of carbofuran (no longer a rice pesticide), malathion, or methyl parathion took place in Zone 3 from 2004-2006. However, all five pesticides mentioned above were detected in Zone 3 in multiple instances throughout the monitoring period.

Table Z3-5, Frequency of Select Pesticide Detects, summarizes detections of these compounds and the frequency with which detected concentrations exceeded other numeric criteria. Malathion and methyl parathion were each detected at least once in samples that were toxic to *Ceriodaphnia*. Methyl parathion was detected in two *Ceriodaphnia*-toxic samples in concentrations that exceeded the literature-based LC50 for *Ceriodaphnia* (of approximately 1 ug/L), indicating that it was a contributing factor to toxicity in at least two samples.

Table Z3-5
Frequency of Select Pesticide Detects

Pesticide	No. Samples Greater than Trigger Limit	No. Samples Analyzed for Pesticide	Percent Greater than Trigger Limit	East of SJR: No. Samples Greater than Trigger Limit Analyses	West of SJR: No. Samples Greater than Trigger Limit Analyses	Trigger Limit used (ug/L)	Reference
Pesticides Exceeding Numeric Water Quality Objectives							
Chlorpyrifos	114	592	19	47 of 262	67 of 330	0.015	Basin Plan
DDD	6	200	3	2 of 142	4 of 58	0.00083	CTR
DDE	29	208	14	0 of 142	29 of 66	0.00059	CTR
DDT	17	200	8	2 of 142	15 of 58	0.00059	CTR
Diazinon	11	600	1.8	4 of 262	7 of 338	0.1	Basin Plan
Dieldrin	7	200	3.5	0 of 142	7 of 58	0.00014	CTR
Simazine	2	258	0.8	0 of 158	2 of 100	4.0	MCL
Pesticides under a Basin Plan Prohibition of Discharge							
Carbofuran	1	184	0.5	1 of 126	0 of 58	ND	Basin Plan
Malathion	8	476	1.7	2 of 146	6 of 330	ND	Basin Plan
Methyl Parathion	14	476	2.9	0 of 146	14 of 330	ND	Basin Plan
Pesticides Used to Assess Compliance with Basin Plan Narrative Water Quality Objectives							
Biphenthrin	8	236	3.4	4 of 178	2 of 58	0.0004 ug/L	1/10 LC50
	0		0	0 of 178	0 of 58	110 ug/L	IRIS
Demeton	1	282	0.3	0 of 4	1 of 278	0.14 ug/L	Freshwater Aq. Life protect.
Dimethoate	35	507	7.1	6 of 164	29 of 343	0.2 ug/L	1/10 LC50
	11		1.6	0 of 164	11 of 343	1.0 ug/L	Human health
Diuron	8	311	2.6	8 of 253	0 of 58	14 ug/L	IRIS
Lambda-Cyhalothrin	4	293	1.3	1 of 243	3 of 50	0.00041 ug/L	1/10 LC50
	0		0	0 of 243	0 of 50	35 ug/L	IRIS
Methomyl	5	184	2.7	0 of 126	5 of 58	0.52 ug/L	Freshwater Aq. Life

Pesticide	No. Samples Greater than Trigger Limit	No. Samples Analyzed for Pesticide	Percent Greater than Trigger Limit	East of SJR: No. Samples Greater than Trigger Limit Analyses	West of SJR: No. Samples Greater than Trigger Limit Analyses	Trigger Limit used (ug/L)	Reference
							protect.
Oryzalin	3	89	3.4	3 of 88	0 of 1	35 ug/L	IRIS
Permethrin	1	320	0.3	1 of 262	0 of 58	0.03 ug/L	Freshwater Aq. Life protect.
Esfenvalerate	2	320	0.6	1 of 262	1 of 58	0.007 ug/L	1/10 LC50

Atrazine, cyanizine, simazine, diruon, metolachlor, pendimethalin (prowl), and Trifluralin are all herbicides that have been detected in Zone 3. Of these, only simazine can be compared to a numeric trigger level. However, all the herbicides together are a cause for concern due to their use rates and the frequency with which they were detected in surface water samples. It is also possible that these or other detected herbicides are cumulatively playing a role in observed toxicity to the algae test species. However, the reader needs to consider that additional study is needed to determine any potential connection between the presence and magnitude of these chemicals and observed toxicity to *Selenastrum*.

Detection rates for these herbicides were as follows:

1. Atrazine – 5% (11 detections in 235 analyses);
2. Cyanazine – 6% (13 detections in 226 analyses);
3. Simazine – 16% (38 detections in 240 analyses);
4. Diuron – 14% (26 detections in 184 analyses);
5. Pendamethalin --25% (54 detections in 218 analyses), and
6. Trifluralin –30% (87 detections in 292 analyses).

Two simazine samples exceeded the drinking water maximum contaminant level (MCL) of 4 ug/L. The California Department of Fish & Game has established a fresh water aquatic life goal of 10 ug/L for simazine. Several algae-toxic samples were found to contain Simazine at concentrations ranging from 0.94 to 7.7 ug/L.

Dimethoate is another organophosphate insecticide that is used widely for many crops, and was frequently detected in Zone 3. There were 95 detections in 489 analyses (19%). Eight detections were above 1 ug/L, which is the California DHS action level for drinking water. No freshwater criteria have been recommended by Fish & Game or by USEPA. Dimethoate was detected in some samples that were toxic to *Ceriodaphnia*, however, LC50 information for *Ceriodaphnia* has not been determined. The highest observed concentration of dimethoate in Zone 3 was 3 ug/L.

The pyrethroids, bifenthrin, lambda-cyhalothrin, esfenvalerate and permethrin are all hydrophobic pesticides with have a propensity to adhere to particulate matter. The compounds have been identified as having caused toxicity to *Hyalella* in many toxic sediment samples, however they are infrequently detected in the water column. They are of particular concern due to their association with sediment toxicity, moderate persistence in the environment, high level of toxicity to aquatic species in general, and the fact that their use rates are generally increasing. Because pyrethroids are more toxic in general than some other classes of chemical pesticides, they are used in somewhat smaller amounts compared to some alternatives.

Because pyrethroids in general are toxic to aquatic organisms at lower concentrations, however, numeric interpretations of the narrative toxicity objective to protect freshwater aquatic life beneficial uses are comparatively very low. Ambient water quality criteria for these pyrethroids have not been recommended by USEPA or by Dept of Fish & Game for these compounds, with the exception of permethrin. Using literature studies to establish protective numbers results in objectives below laboratory detection limits in most cases. This results in most detections falling below water quality goals for human health-based protection, but above goals that would be protective of aquatic species. Table Z3-3, List of Pesticide Detects, summarizes the ranges of detected results and numeric criteria that may be applied to these pyrethroid compounds.

METALS. A total of 182 samples from 41 locations were analyzed for metals during the sampling period. Analyzed metals included arsenic, boron, cadmium, copper, lead, nickel, selenium, and zinc. Concentrations were compared to protective levels established as MCLs for drinking water and the CTR and USEPA values for the protection of freshwater aquatic life. The CTR values are based on correction factors established by the hardness content of the sample. Using these criteria, total exceedances of the objectives were determined as follows: arsenic (3), boron (6), cadmium (9), copper (48), lead (63), nickel (4), selenium (4), and zinc (1).

The Water Code and Basin Plan state that where naturally occurring background levels for metals are above water quality goals, discharges shall not degrade water quality further. An evaluation of naturally occurring background levels would likely need to occur for metals where protective goals have been exceeded in order to determine effects of agricultural discharges.

The federal MCL for arsenic is 10 ug/L, which is generally used to compare for drinking water quality beneficial uses (MUN), eventhough the California State MCL remains at 50 ug/L. Other comparisons can be made using a public health goal based on cancer risk set at 0.004 ug/L, which is lower than available laboratory detection limits. If this value is used to evaluate threats to human health through contact recreation and municipal supply beneficial uses, then any of the detections for arsenic exceed the trigger limit. Background studies would still need to be undertaken for individual sites and water bodies, however program data suggest that typical arsenic levels in Central Valley surface waters may be between 0.9 and 10 ug/L.

Among the analyzed metals, only copper is applied in significantly high amounts in Zone 3, in the form of copper hydroxide and copper sulfates (primarily to control fungi). However, naturally occurring toxic metals such as selenium can be leached from soils and discharged to surface water by irrigation practices. There is, therefore, the potential for agricultural discharges to degrade water quality through the contribution of these metals.

PATHOGENS. Results for the pathogen indicator, *E. coli* of the 46 locations monitored by the coalitions in Zone 3. Forty-five locations were monitored at least once for *E. coli*, and some locations have been sampled and analyzed for *E. coli* as many as 30 times (generally at a monthly frequency). Forty-two of the 45 locations tested for *E. coli* had at least one measurement above the USEPA Recommended Criteria of 235 MPN/100mL. Thirty-six of the 45 locations monitored have shown multiple detections above 235 MPN/100ml, with as many as 23 exceedances at one location. The overall number of *E.* coli samples in excess of the trigger limit is 338 of 633 total samples, or 53%. Maximum values outside of the upper range of laboratory test detection, such as >1600 or >2400 MPN/100mL, are frequently reported. No strong trends regarding the frequency of exceedances or the magnitude of measurements in relation to sample location or watershed areas have yet been identified, however exceedances appear to be slightly more prevalent in the northwest portion of Zone 3. Based on this limited monitoring, the exceedances, as such, are generally wide-spread, unpredictable, frequent and of unidentified origin. Approximate locations of the *E. coli* measuresments are identified on Figure Z3-8, *E.coli* Sample Results greater than 235 MPN/100 mls.

The current routine monitoring data does not provide information on the source of the *E. coli* – human, wildlife, domestic animal, etc. Coalitions in Zone 3 have undertaken studies in an effort to help determine the source animals of the observed fecal bacteria. More information regarding sources is needed in order to evaluate the effects of naturally occurring background bacteria (from wildlife), and to determine the appropriate level of effort and specific activities that may be needed to mitigate any contributions from agricultural activities.

Focused studies may be needed to further characterize *E. coli*, such as more DNA testing, or analysis of the magnitude of measurements along more intensely sampled sections of waterways to show spatial differences in the results with regard to the site location and the magnitude of measurements comparing closely located samples. Studies may reveal more information on sources.

DISSOLVED OXYGEN AND pH. Measurements for these parameters were compared to Basin Plan objectives. The Basin Plan minimum value for dissolved oxygen of 7.0 mg/L was compared to results from all locations, and the reader needs to consider this generalization in conducting independent evaluations of the data. This generalization was considered reasonable, as all water bodies sampled either had cold water aquatic life beneficial uses, spawning beneficial uses, or are tributary to the San Joaquin River (which has spawning beneficial uses).

From these measurements, 225 of 1,145 (20%) were below 7 mg/L. For some water bodies throughout Zone 3, the less stringent objective of 5 mg/L may apply, as the waters may require further characterization with regard to beneficial uses. For several monitoring locations on the west side of the river, there were numerous values measured below the threshold of 7 mg/L, but none below 5 mg/L, so the above percentage may represent an overly conservative number of potential exceedances.

The pH of waters is generally to be maintained between 6.5 and 8.5 pH units. This range was exceeded in 7.8% of Zone 3 samples (89 of 1,145 measurements). It is important to note that pH measurements are also affected by the daily flux of carbon dioxide and dissolved oxygen in surface water, which in turn are dependent on temperature, and the time of day. Additionally, pH is dependent on carbon dioxide levels, and thus also fluctuates on a daily cycle in most surface waters due to the photosynthetic activities of aquatic plants, including algae.

Waters with measurements outside of the trigger limits identified for pH or dissolved oxygen may require further study or evaluation to determine if agricultural discharges are having a significant effect on these parameters, and what, if any, appropriate mitigation measures are warranted.

SALINITY. Salinity was evaluated by comparing the results of electrical conductivity analyses against established thresholds that are protective of various beneficial uses. The goal of 700 umhos/cm^3 is the most restrictive of these goals, and is protective of agricultural supply for salt-sensitive crops, as well as municipal supply and aquatic life beneficial uses. It has been noted that agricultural supply water coming from the Delta-Mendota Canal for portions of the Westside Coalition often exceeds the 700 umhos/cm^3 goal.

A total of 26% of the conductivity measurements in Zone 3 exceeded 700 umhos/cm. The number of exceedances is far greater on the west side of the river, where water supplies are primarily obtained from water pumped from the Sacramento-San Joaquin Delta through state or federal water projects. Water supplies on the east side of the river originate primarily from snowmelt runoff from the Sierra Nevada, and this source water is generally much lower in salt content. Additionally, soils in the southwest portion of the San Joaquin basin are high in salt content, and drainage from the use of these lands for agriculture contributes greatly to the discharge of dissolved salts from this portion of the watershed into the San Joaquin River. Eleven percent of measurements on the east side of the river exceeded the conductivity goal, and 39% of the measurements on the west side of the river were above the goal. Additionally, of the 56 exceedances identified on the east side of the river, 32 (57%) came from two drains (Prairie Flower Drain and Hilmar Drain), indicating and anomalously high level of salt in these drains, when compared to other locations on the east side of the river. On the west side, 54% of the exceedances were obtained from Mud Slough, Salt Slough and Los Banos Creek, which drain the south-west portion of the watershed. Measurements above 700 umhos/cm^3 were less common in the northern portion of the Westside area. A TMDL program for salt loads and salt management for the San Joaquin River is under development, and management of agricultural discharges is expected to play a significant role in the reduction of salt loads to the San Joaquin River in the future. For the purposes of management, the TMDL program has identified sub-basins within the San Joaquin watershed (based on historical measurements and load calculations), along with goals and timelines for salt management within these sub-basins.

Table Z3-6 summarizes the field measurements for conductivity, dissolved oxygen, pH and *E. coli*.

Table Z3-6
Field and Pathogen Results for East and West Sides of San Joaquin River

	Specific Conductivity			Dissolved Oxygen			pH			*E. coli*		
	No. > Trigger Limit[1]	No. of Tests	%	No. > Trigger Limit[2]	No. of Tests	%	No. > Trigger Limit[3]	No. of Tests	%	No. >Trigger Limit[4]	No. of Tests	%
East Side	56	524	11	85	524	16	46	524	8.8	100	210	48
West Side	243	621	39	140	621	23	43	621	6.9	238	423	56
Total	**299**	**1145**	**26**	**225**	**1145**	**20**	**89**	**1145**	**7.8**	**338**	**633**	**53**

[1] results >700 umhos/cm[3]
[2] results <7.0 mg/L
[3] results < 6.5 or > 8.5
[4] results > 235 MPN/100 mL

SUMMARY
Chlorpyrifos alone accounted for half of all identified pesticide exceedances, and measurements in 19% of samples (one of every five) were above the trigger limit of 0.015 ug/L and can account for approximately one-third of all *Ceriodaphnia* toxicity in Zone 3. Chlorpyrifos concentrations can also account for one fifth of all *Hyalella* toxicity region-wide, according to recent studies conducted by the University of California.

Based on an evaluation of all results, pesticide concentrations measured above water quality objectives occurred in 246 of the 18,435 total pesticide results (1.3%). At least one measured pesticide was found to exceed a trigger limit in 164 of the 712 samples analyzed (23%). This evaluation is presented in Table Z3-4, Pesticides Exceeding Trigger Levels.

The review of nutrient data is continuing and will be summarized in subsequent monitoring data reviews. Ammonia was identified as a potential toxicant to aquatic life on one occasion during the sampling period. Nitrates also pose a potential hazard to human health. Evaluation of the effects of nutrient compounds at bio-stimulatory levels will continue, especially with regard to the potential for excessive algal growth.

The Patterson sub-watershed area was found to exhibit both an elevated frequency and very high magnitude of sediment toxicity at multiple locations. The Patterson sub-watershed lies on the west side of the San Joaquin River, east of Interstate 5, between Highway 132 on the north and the Newman Wasteway on the south. The frequency of *Hyalella* toxicity in the Patterson sub-watershed during the testing period was 76% of all samples tested. Seven of 8 monitoring locations within the Patterson area have yielded more than 1 toxic sediment sample. Three locations in the Patterson area have exhibited sediment toxicity each time they were tested, and two other locations exhibited toxicity on four of five sampling events. A number of distinct characteristics in the area, including fine-grained soils, predominant furrow-irrigated row crops, and narrow drainage channels promote the movement of fine sediments and soils off fields and into waterways. The use of hydrophobic pesticides, especially pyrethroids and chlorpyrifos, and the movement of these insecticides bound to sediment into creeks, is the likely cause of the toxicity observed at the Patterson area sampling locations.

Salinity, as measured through electrical conductivity analyses was compared against established thresholds that are protective of various beneficial uses. The levels of salinity are far greater on the west side of the river, where water supplies are primarily obtained from water pumped from the Sacramento-San Joaquin Delta through state or federal water projects. Water supplies on the east side of the river originate primarily from Sierra Nevada snowmelt, are much lower in salt content. Additionally, soils in the southwest portion of the San Joaquin basin are high in salt content, and drainage from the use of these lands for agriculture contributes greatly to the discharge of dissolved salts from this portion of the watershed into the San Joaquin River. Shallow confining layers in the soil in the southwest portion of the Zone (southwest portion of the San Joaquin drainage) promote the build-up of salts in the root zone of agricultural crops. These salts are frequently flushed out with excess irrigation water to allow adequate growing conditions, and these salts are drained into the major drainage channels in the area, including Salt Slough, Mud Slough, and Los Banos Creek. Of all conductivity exceedances in Zone 3, 54% were obtained from Mud Slough, Salt Slough and Los Banos Creek, which drain the south-west portion of the watershed.

Water quality problems identified in Zone 3, in particular with respect to toxicity to all water species and sediment are being addressed through management plans that are being developed.

Table Z3-7 Analytical Detects by Monitoring Site, identifies the locations and frequency of measurements that exceeded trigger limits within Zone 3.

REVISED DRAFT

TABLE Z3-7
ANALYTICAL DETECTS BY MONITORING SITE:
East Side of San Joaquin River

Site Name	Aquatic Toxic Events	Minnow tests performed	Minnow Toxic Events	Flea tests performed	Flea Toxic Events	Algae tests performed	Algae of Toxic Events	Sediment tests performed	Sediment Toxic Events
Coalition Data, East Side of San Joaquin River									
(1) Ash Slough @ Ave 21	1	10	0	9	0	9	1	3	0
(2) August Road Drain upstream of Crows Landing Bridge (Hogin Rd)	0	3	0	3	0	3	0	1	0
(3) Bear Creek @ Kiby Rd	2	13	0	13	2	12	0	5	0
(4) Berenda Slough along Avenue 18 ½	1	5	0	5	1	4	0	1	0
(5) Black Rascal Creek @ Yosemite Road	0	5	0	4	0	5	0	1	0
(6) Cottonwood Creek @ Road 20	1	14	1	13	0	12	0	5	1
(7) Deadman Creak @ Highway 59	0	5	0	5	0	5	0	1	0
(8) Deadman Creek (Dutchman) @ Gurr Rd	1	8	1	7	0	7	0	2	0
(9) Dry Creek @ Wellsford Road, Sta Co	2	14	0	15	2	12	0	5	1
(10) Dry Creek at Road 18, Mad Co	1	7	0	8	1	7	0	3	1
(11) Duck Slough @ Gurr Rd	4	16	0	18	3	16	1	6	4
(12) Duck Slough @ Hwy 99	3	14	1	15	1	14	1	2	0
(13) Highline Canal @ Hwy 99	5	12	0	14	4	12	1	6	3
(14) Highline Canal @ Lombardy Rd	4	14	0	15	2	14	2	5	3
(15) Hilmar Drain @ Central Ave	2	14	0	15	1	12	1	5	2
(16) Jones Drain @ Oakdale Road	2	14	0	15	1	13	1	5	0
(17) Lone Willow Slough @ Madera Ave	2	5	0	5	1	4	1	2	1
(18) Merced River @ Sante Fe	4	17	0	18	3	13	1	6	0
(19) Mustang Creek @ East Ave	0	3	0	3	0	2	0	1	0
(20) Prairie Flower Drain @ Crows Landing Road	3	15	2	15	1	10	0	5	3
(21) Silva Drain @ Meadow Drive	1	5	0	4	1	5	0	2	1
(22) South Slough at Quinley Road	0	2	0	1	0	2	0	1	0
Totals	**39**	**215**	**5**	**220**	**24**	**193**	**10**	**73**	**20**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side of San Joaquin River

Site Name	Aquatic Toxic Events	Minnow tests performed	Minnow Toxic Events	Flea tests performed	Flea Toxic Events	Algae tests performed	Algae of Toxic Events	Sediment tests performed	Sediment Toxic Events
Coalition Data, West Side of San Joaquin River									
(23) Hospital Creek at River Road	5	14	1	14	2	14	2	5	4
(24) Ingram Creek at River Road	4	16	1	16	0	16	3	5	5
(25) Westley Wasteway near Cox Road	0	11	0	11	0	11	0	5	4
(26) Del Puerto Creek near Cox Road	2	15	1	15	1	15	0	4	3
(27) Del Puerto Creek at Highway 33	2	17	0	17	1	16	1	4	4
(28) Salado Creek near Olive Ave.	1	2	0	3	1	2	0	0	0
(29) Ramona Lake near Fig Ave.	2	9	0	10	2	9	0	0	0
(30) Marshall Road Drain near River Road	3	13	0	14	1	12	2	0	0
(31) Orestimba Creek at River Road	4	17	1	19	3	16	0	5	1
(32) Orestimba Creek at Highway 33	6	17	0	19	6	16	0	4	4
(33) Newman Wasteway near Hills Ferry Road	2	17	1	15	0	14	1	5	3
(34) San Joaquin River at Sack Dam	0	0	0	0	0	0	0	0	0
(35) San Joaquin River at Lander Ave.	1	30	0	30	1	26	1	5	0
(36) Mud Slough upstream of San Luis Drain	2	30	0	29	1	27	1	5	1
(37) Salt Slough at Lander Ave	5	30	0	31	3	29	3	5	1
(38) Salt Slough at Sand Dam	6	17	0	19	3	17	2	5	0
(39) Los Banos Creek at Highway 140	2	30	0	29	2	27	0	5	1
(40) Los Banos Creek at China Camp Road	1	4	1	4	0	4	0	4	1
(41) Turner Slough near Edminster Road	3	9	2	8	0	7	0	5	1
(42) Westley Wasteway at Refuge Ponds	0	1	0	1	0	1	0	0	0
(43) SJR at WSID Pumps	0	1	0	1	0	1	0	0	0
(44) Delta Mendota Canal at DPWD	0	1	0	1	0	1	0	0	0
(45) Little Panoche Creek at Interstate 5	1	1	0	1	1	1	0	1	1
(46) Russell Avenue Drain at San Luis Canal	2	1	0	1	1	1	1	1	1
Totals	**54**	**303**	**8**	**308**	**29**	**283**	**17**	**73**	**35**
Total, All Coalition Data	**93**	**518**	**13**	**528**	**53**	**476**	**27**	**146**	**55**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
East Side of San Joaquin River

Site Name	individual pesticide analyses	individual Pesticide exceedances	Pesticide suites analyzed	Pesticide suites w/ 1 or more exceedances	Chlorpyrifos Exceedances	individual Metals analyses	individual Metals exceedances	Metal suites analyzed	Metal sets w/ 1 or more exceedances
Coalition Data, East Side of San Joaquin River									
(1) Ash Slough @ Ave 21	229	4	10	4	4	40	7	5	5
(2) August Road Drain upstream of Crows Landing Bridge (Hogin Rd)	46	1	3	1	1	0	0	0	0
(3) Bear Creek @ Kiby Rd	249	1	13	1	1	40	0	5	0
(4) Berenda Slough along Avenue 18 ½	195	2	5	2	2	0	0	0	0
(5) Black Rascal Creek @ Yosemite Road	195	1	5	1	1	0	0	0	0
(6) Cottonwood Creek @ Road 20	255	0	14	0	0	40	4	5	3
(7) Deadman Creak @ Highway 59	195	3	5	2	1	0	0	0	0
(8) Deadman Creek (Dutchman) @ Gurr Rd	241	2	8	2	1	40	0	5	0
(9) Dry Creek @ Wellsford Road, Sta Co	255	4	14	4	3	40	0	5	0
(10) Dry Creek at Road 18, Mad Co	209	1	7	1	1	40	8	5	5
(11) Duck Slough @ Gurr Rd	300	2	17	2	0	40	2	5	2
(12) Duck Slough @ Hwy 99	253	2	14	2	2	40	6	5	3
(13) Highline Canal @ Hwy 99	242	1	12	1	1	40	2	5	2
(14) Highline Canal @ Lombardy Rd	254	3	14	3	2	40	4	5	4
(15) Hilmar Drain @ Central Ave	254	2	14	2	1	40	1	5	1
(16) Jones Drain @ Oakdale Road	254	3	14	2	2	40	5	5	4
(17) Lone Willow Slough @ Madera Ave	29	2	5	2	2	0	0	0	0
(18) Merced River @ Sante Fe	300	0	17	0	0	39	2	5	1
(19) Mustang Creek @ East Ave	116	0	3	0	0	0	0	0	0
(20) Prairie Flower Drain @ Crows Landing Road	254	2	14	2	2	40	0	5	0
(21) Silva Drain @ Meadow Drive	195	1	5	1	1	0	0	0	0
(22) South Slough at Quinley Road	78	0	2	0	0	0	0	0	0
Totals	**4598**	**37**	**215**	**35**	**28**	**559**	**41**	**70**	**30**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side of San Joaquin River

Site Name	individual pesticide analyses	individual Pesticide exceedances	Pesticide suites analyzed	Pesticide suites w/ 1 or more exceedances	Chlorpyrifos Exceedances	individual Metals analyses	individual Metals exceedances	Metal suites analyzed	Metal sets w/ 1 or more exceedances
Coalition Data, West Side of San Joaquin River									
(23) Hospital Creek at River Road	511	6	16	5	1	32	8	4	4
(24) Ingram Creek at River Road	570	16	18	7	5	32	11	4	4
(25) Westley Wasteway near Cox Road	340	6	11	4	3	24	4	3	2
(26) Del Puerto Creek near Cox Road	490	7	15	5	4	32	6	4	4
(27) Del Puerto Creek at Highway 33	579	7	18	5	0	24	1	3	1
(28) Salado Creek near Olive Ave.	116	6	2	2	1	0	0	0	0
(29) Ramona Lake near Fig Ave.	288	2	9	2	2	24	4	3	3
(30) Marshall Road Drain near River Road	180	10	15	6	5	32	10	4	4
(31) Orestimba Creek at River Road	556	21	17	11	7	32	5	4	3
(32) Orestimba Creek at Highway 33	558	22	17	11	6	32	4	4	3
(33) Newman Wasteway near Hills Ferry Road	581	2	18	2	1	32	5	4	4
(34) San Joaquin River at Sack Dam	120	0	4	0	0	0	0	0	0
(35) San Joaquin River at Lander Ave.	998	0	31	0	0	32	0	4	0
(36) Mud Slough upstream of San Luis Drain	998	2	31	2	1	32	2	4	2
(37) Salt Slough at Lander Ave	1009	9	31	8	8	32	1	4	1
(38) Salt Slough at Sand Dam	614	10	19	9	9	32	0	4	0
(39) Los Banos Creek at Highway 140	988	0	31	0	0	32	5	4	3
(40) Los Banos Creek at China Camp Road	161	0	5	0	0	0	0	0	0
(41) Turner Slough near Edminster Road	289	0	9	0	0	32	0	4	0
(42) Westley Wasteway at Refuge Ponds	30	0	1	0	0	0	0	0	0
(43) SJR at WSID Pumps	30	0	1	0	0	0	0	0	0
(44) Delta Mendota Canal at DPWD	30	0	1	0	0	0	0	0	0
(45) Little Panoche Creek at Interstate 5	0	0	0	0	0	0	0	0	0
(46) Russell Avenue Drain at San Luis Canal	0	0	0	0	0	0	0	0	0
Totals	**10036**	**126**	**320**	**79**	**53**	**488**	**66**	**61**	**38**
Total, All Coalition Data	**14634**	**163**	**535**	**114**	**81**	**1047**	**107**	**131**	**68**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
East Side of San Joaquin River

Site Name	Bacteria samples collected	Bacteria Exceedances	DO Exceedances	pH Exceedances	EC Exceedances	DO pH and EC samples collected
Coalition Data, East Side of San Joaquin River						
(1) Ash Slough @ Ave 21	10	3	0	0	0	15
(2) August Road Drain upstream of Crows Landing Bridge (Hogin Rd)	3	3	0	0	3	3
(3) Bear Creek @ Kiby Rd	13	3	1	0	0	19
(4) Berenda Slough along Avenue 18 ½	5	1	1	0	0	9
(5) Black Rascal Creek @ Yosemite Road	5	2	3	0	0	9
(6) Cottonwood Creek @ Road 20	14	4	7	0	0	19
(7) Deadman Creak @ Highway 59	5	0	2	0	0	9
(8) Deadman Creek (Dutchman) @ Gurr Rd	8	8	5	0	0	12
(9) Dry Creek @ Wellsford Road, Sta Co	14	8	4	3	0	19
(10) Dry Creek at Road 18, Mad Co	7	2	1	0	0	15
(11) Duck Slough @ Gurr Rd	17	10	2	0	1	24
(12) Duck Slough @ Hwy 99	14	6	1	0	0	20
(13) Highline Canal @ Hwy 99	12	1	1	1	0	20
(14) Highline Canal @ Lombardy Rd	14	2	0	2	0	21
(15) Hilmar Drain @ Central Ave	14	10	1	2	13	24
(16) Jones Drain @ Oakdale Road	14	11	5	1	0	20
(17) Lone Willow Slough @ Madera Ave	5	3	3	1	0	5
(18) Merced River @ Sante Fe	12	1	0	1	0	24
(19) Mustang Creek @ East Ave	3	3	1	0	0	6
(20) Prairie Flower Drain @ Crows Landing Road	14	13	6	2	19	23
(21) Silva Drain @ Meadow Drive	5	4	2	0	0	9
(22) South Slough at Quinley Road	2	2	0	0	0	6
Totals	**210**	**100**	**46**	**13**	**36**	**331**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side of San Joaquin River

Site Name	Bacteria samples collected	Bacteria Exceedances	DO Exceedances	pH Exceedances	EC Exceedances	DO pH and EC samples collected
Coalition Data, West Side of San Joaquin River						
(23) Hospital Creek at River Road	21	17	2	2	3	33
(24) Ingram Creek at River Road	28	13	4	2	10	29
(25) Westley Wasteway near Cox Road	21	12	2	4	3	25
(26) Del Puerto Creek near Cox Road	25	15	4	4	10	31
(27) Del Puerto Creek at Highway 33	27	16	8	4	5	30
(28) Salado Creek near Olive Ave.	8	6	2	0	4	10
(29) Ramona Lake near Fig Ave.	12	9	6	0	13	21
(30) Marshall Road Drain near River Road	21	15	7	2	8	32
(31) Orestimba Creek at River Road	30	23	4	1	1	34
(32) Orestimba Creek at Highway 33	30	22	8	3	4	35
(33) Newman Wasteway near Hills Ferry Road	29	15	9	0	27	33
(34) San Joaquin River at Sack Dam	0	0	1	3	1	30
(35) San Joaquin River at Lander Ave.	24	8	2	2	13	35
(36) Mud Slough upstream of San Luis Drain	29	11	5	2	29	35
(37) Salt Slough at Lander Ave	29	10	11	0	36	37
(38) Salt Slough at Sand Dam	29	9	12	3	18	38
(39) Los Banos Creek at Highway 140	30	18	20	1	31	38
(40) Los Banos Creek at China Camp Road	8	3	9	2	10	31
(41) Turner Slough near Edminster Road	17	13	15	8	5	37
(42) Westley Wasteway at Refuge Ponds	1	1	0	0	0	1
(43) SJR at WSID Pumps	1	0	1	0	1	1
(44) Delta Mendota Canal at DPWD	1	0	1	0	0	1
(45) Little Panoche Creek at Interstate 5	1	1	0	0	0	1
(46) Russell Avenue Drain at San Luis Canal	1	1	0	0	0	1
Totals	**423**	**238**	**133**	**43**	**232**	**599**
Total, All Coalition Data	**633**	**338**	**179**	**56**	**268**	**930**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side and East Side, UCD data

Site Name	Aquatic Toxic Events	Minnow tests performed	Minnow Toxic Events	Flea tests performed	Flea Toxic Events	Algae tests performed	Algae Toxic Events	Sediment tests performed	Sediment Toxic Events
West Side of San Joaquin River (Phase 2 Contract)									
(47) Boundary Drain at Henry Miller Ave.	1	4	0	4	1	4	0	1	1
(48) Hospital Creek at Highway 33	0	0	0	0	0	0	0	1	1
(49) Island Field Drain at Catrina Road	3	4	0	4	3	4	0	2	1
(50) Orestimba Creek at Kilburn Road	1	5	0	5	1	5	0	2	1
(51) Poso Drain at NE corner of Turner Island and Palazzo Rd	0	5	0	5	0	5	0	1	0
Totals	**5**	**18**	**0**	**18**	**5**	**18**	**0**	**7**	**4**
East Side of San Joaquin River (Phase 1 Contract)									
(52) Unnamed Drain at Pomelo Ave. near Paradise Ave.	0	8	0	7	0	0	0	0	0
(53) Westport Drain at Jennings Rd.	1	9	0	8	1	0	0	0	0
East Side of San Joaquin River (Phase 2 Contract)									
(54) Berenda Creek at Ave 17.5 west of Madera	3	6	0	7	2	6	1	2	0
(55) Cottonwood Creek at Hwy 145 in Madera County	3	3	0	3	0	3	3	1	0
(56) Dry Creek at J9	5	5	0	5	0	5	5	1	0
(57) Duck Slough at Arboleda Drive	4	7	0	7	0	7	4	2	0
(58) Ingalsbe Slough at J17	5	5	0	5	0	5	5	1	0
(59) Owens Creek at Gurr Rd	0	4	0	4	0	4	0	1	0
(60) Sand Slough on Turner Island Rd. W of Merced Natl. Wildlife Refuge	0	0	0	0	0	0	0	1	0
(61) Stevinson Lower Lateral at intersection of Faith Home Rd	0	5	0	5	0	5	0	0	0
Totals	**21**	**52**	**0**	**51**	**3**	**35**	**18**	**9**	**0**
Total, All UC Davis Contract Data	**26**	**70**	**0**	**69**	**8**	**53**	**18**	**16**	**4**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side and East Side, UCD data

Site Name	individual pesticide analyses	individual Pesticide exceedances	Pesticide suites analyzed	Pesticide suites w/ 1 or more exceedances	Chlorpyrifos Exceedances	individual Metals analyses	individual Metals exceedances	Metal suites analyzed	Metal sets w/ 1 or more exceedances
West Side of San Joaquin River (Phase 2 Contract)									
(47) Boundary Drain at Henry Miller Ave.	268	3	4	3	3	32	2	4	2
(48) Hospital Creek at Highway 33	0	0	0	0	0	0	0	0	0
(49) Island Field Drain at Catrina Road	268	7	4	4	4	32	5	4	4
(50) Orestimba Creek at Kilburn Road	207	24	5	5	3	40	3	5	3
(51) Poso Drain at NE corner of Turner Island and Palazzo Rd	207	10	5	4	4	40	6	5	3
Totals	**950**	**44**	**18**	**16**	**14**	**144**	**16**	**18**	**12**
East Side of San Joaquin River (Phase 1 Contract)									
(52) Unnamed Drain at Pomelo Ave. near Paradise Ave.	0	0	0	0	0	0	0	0	0
(53) Westport Drain at Jennings Rd.	0	0	0	0	0	0	0	0	0
East Side of San Joaquin River (Phase 2 Contract)									
(54) Berenda Creek at Ave 17.5 west of Madera	856	18	18	15	15	32	4	4	4
(55) Cottonwood Creek at Hwy 145 in Madera County	125	0	3	0	0	25	1	3	1
(56) Dry Creek at J9	203	5	5	4	3	40	0	5	0
(57) Duck Slough at Arboleda Drive	277	2	7	2	1	60	10	7	5
(58) Ingalsbe Slough at J17	203	0	5	0	0	41	0	5	0
(59) Owens Creek at Gurr Rd	268	3	4	3	0	33	0	4	0
(60) Sand Slough on Turner Island Rd. W of Merced Natl. Wildlife Refuge	0	0	0	0	0	na	na	na	na
(61) Stevinson Lower Lateral at intersection of Faith Home Rd	207	0	5	0	0	40	0	5	0
Totals	**2139**	**28**	**47**	**24**	**19**	**271**	**15**	**33**	**10**
Total, All UC Davis Contract Data	**3089**	**72**	**65**	**40**	**33**	**415**	**31**	**51**	**22**

TABLE Z3-7 CONT.
ANALYTICAL DETECTS BY MONITORING SITE:
West Side and East Side, UCD data

Site Name	DO Exceedances	pH Exceedances	EC Exceedances	DO pH and EC samples collected
West Side of San Joaquin River (Phase 2 Contract)				
(47) Boundary Drain at Henry Miller Ave.	2	0	5	5
(48) Hospital Creek at Highway 33	0	0	0	0
(49) Island Field Drain at Catrina Road	2	0	0	6
(50) Orestimba Creek at Kilburn Road	0	0	3	6
(51) Poso Drain at NE corner of Turner Island and Palazzo Rd	3	0	3	5
Totals	**7**	**0**	**11**	**22**
East Side of San Joaquin River (Phase 1 Contract)				
(52) Unnamed Drain at Pomelo Ave. near Paradise Ave.	1	0	9	9
(53) Westport Drain at Jennings Rd.	0	0	3	10
East Side of San Joaquin River (Phase 2 Contract)				
(54) Berenda Creek at Ave 17.5 west of Madera	2	1	0	20
(55) Cottonwood Creek at Hwy 145 in Madera County	1	0	0	3
(56) Dry Creek at J9	0	0	0	5
(57) Duck Slough at Arboleda Drive	2	1	0	12
(58) Ingalsbe Slough at J17	3	0	0	5
(59) Owens Creek at Gurr Rd	3	0	0	5
(60) Sand Slough on Turner Island Rd. W of Merced Natl. Wildlife Refuge	0	0	0	1
(61) Stevinson Lower Lateral at intersection of Faith Home Rd	1	1	1	5
Totals	**13**	**3**	**13**	**75**
Total, All UC Davis Contract Data	**20**	**3**	**24**	**97**