ZONE 4

Zone 4 Data Considerations

The review of data from Zone 4 varies from that of the other Zones for several reasons. The most significant of these is that water quality within Zone 4 is subject to water quality objectives and beneficial uses (standards) set forth in the Tulare Lake Basin Plan, not to those in the Sacramento and San Joaquin Rivers Basin Plan, which applies only to Zones 1, 2, and 3. Though some water quality objectives are the same in both basin plans (i.e., those determined by the designated beneficial use), standards unique to a specific water or specific basin plan apply only to that location.

Numeric objectives for electrical conductivity are a case in point. The Tulare Lake Basin Plan specifies numeric water quality objectives specific to very high quality reaches of the Kings, Kaweah, Tule and Kern Rivers. These objectives are as low as 100 µS/cm, which is much lower than the 900 µS/cm of the recommended secondary maximum contaminant level (MCL) both basin plans incorporate by reference for all waters with the designated beneficial use of MUN. The specific numeric objectives are also much lower than the 700 µS/cm agricultural recommended concentration cited in *Water Quality for Agriculture*, published by the Food and Agriculture Organization of the United Nations.

Where the Tulare Lake Basin Plan lacks a numeric objective for a particular waste constituent found in detectable concentrations in Zone 4, the Basin Plan's "Policy for Application of Water Quality Objectives" was utilized to evaluate exceedances to narrative water quality objectives. In this way, a comparison of waste constituent concentrations can be made with a screening value consistent with the appropriate narrative objective. For example, the Tulare Lake Basin Plan contains both numeric and narrative water quality objectives for pesticides. The narrative pesticide water quality objective, which does apply to chlorpyrifos state, in part: "Waters shall not contain pesticides in concentrations that adversely affect beneficial uses." In order to evaluate compliance with the narrative pesticide objective with respect to chlorpyrifos, the Policy for Application of Water Quality Objectives was utilized. To determine what the appropriate concentration is, the Policy requires a case-by-case consideration of, among other things, numerical criteria developed or published by other agencies for its relevance and appropriateness to the situation. In the case of chlorpyrifos, the Regional Water Board established a numeric standard in the Sacramento/San Joaquin Basin Plan following the full basin planning process, including peer review. Unless a particular situation within the Tulare Lake Basin can be determined to be substantially different from situations in the other basins, it is relevant and appropriate to use the numeric water quality objectives adopted by the Regional Water Board for water bodies in the Sacramento/San Joaquin Rivers Basin Plan to evaluate compliance with the narrative pesticide objective in the Tulare Lake Basin Plan.

Another reason for the different approach to a review and assessment for Zone 4 is due to the scarcity of monitoring data. There are several monitoring sites within Zone 4 for which fewer than 5 different sampling events took place within the three-year period. In many locations, sampling only occurred once or twice within the three-year period.

There can be a variety of reasons for this scarcity of monitoring data, including limitations caused by natural characteristics such as soil texture, low rainfall, and snowpack, as well as the different interpretations for monitoring programs utilized by Coalitions in Zone 4. The limited amount of data creates a limited ability to assess the water bodies and develop an understanding of baseline water quality conditions in Zone 4.

Monitoring data available for Zone 4 can be considered in conjunction with other information such as the identification of waterways, the amount of pesticide use, and field observations of potential return flows, to establish the need for additional scrutiny by both the Water Board and the Coalitions.

Zone 4 Description

The climate and soils of the Tulare Lake region contribute significantly to the tremendous agricultural production of the farmlands and to the diversity of crops grown. More than 250 varieties of crops and farm commodities are produced from approximately 3 million plus acres of irrigated agricultural lands within Zone 4. The generally arid climate (hot summers and mild winters with less than five inches of rainfall), coupled with fertile soils, allows for a variety of crops to be grown year round, or near year round in portions of Zone 4 (lettuce, potatoes, spinach, broccoli, carrots, sugar beets, cabbage, lemons, grapefruit, strawberries, and sod). Depending on rainfall events, irrigation of these crops also approaches year-round applications. This extended irrigation season coupled with the use of pre-planting irrigation (tomato, cotton, winter forage, and melons), post-harvest irrigation (nut crops, grapes, and various stone fruit), and application of water for frost protection (citrus), results in near year-round water use with a corresponding potential for agricultural runoff.

In 2005, the top ten commodities produced in Zone 4 based on dollar amounts (excluding livestock) were; grapes, almonds, citrus, cotton, pistachios, alfalfa, tomatoes, peaches, nectarines and corn silage. While cotton was the number one crop in many past years, grapes have recently outpaced cotton in terms of gross production receipts. More than ten percent of the irrigated acreage in California and about 12 percent of the three million irrigated acres in the region is planted in alfalfa. Alfalfa acreage in the region has been rising in recent years in response to the needs of the expanding dairy industry. Tulare County, in the heart of the region, is currently the nation’s richest dairy county. In fact, the number one commodity for the entire zone based on dollar amounts was milk.

Table Z4-1, Pesticide Use in Zone 4, lists the primary crops by acreage that were grown in 2005 the four counties that comprise Zone 4. The table 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).

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Table Z4-1
Pesticide Use in Zone 4*

FRESNO COUNTY			
CROP	**ACREAGE**	**CROP PESTICIDES**	**TOTAL POUNDS APPLIED**
1. Cotton	219,530	Bifenazate, Chlopyrifos, Cyfluthrin, Ethephon, Endosulfan, Esfenvalerate, Docofol, Dimethoate, Diuron, Indoxacarb, Methamidophos, S-Metolachlor, Naled, Oxymyl, Oxyfluorfen, Pendimethalin, Prometryn, Propargite, S-Metolachlor, Thidazuron, Thiamethoxam, Trifluralin	1,014,144
2. Grapes	202,240	Buprofezin, Captan, Cryolite, Chlorpyrifos, Copper hydroxide, 2,4-D, Diazinon, Diuron, Ethephon, Fenamiphos, Glyphosate, Iprodione, Mancozeb, Myrothecium verruca, Oryazlin, Paraquat Dichloride, Phosmet, Propargite, Simazine, Sulfur, 1,3-Dichloropropene, Paraquat Dichloride, Methyl Bromide	9,940,440
3. Tomatoes	128,000	Chlorothalonil, Copper hydroxide, 1,3-Dichloropropene, Dimethoate, Endosulfan, Mancozeb, S-Metolachlor, Oxyfluorfen, Paraquat Dichloride, Sulfur	4,646,094
4. Almonds	88,400	Chlorpyrifos, Copper hydroxide, 2,4-D, Esfenvalerate, Flumioxazin, Iprodione, Maneb, Norflurazon, Oryzalin, Oxyfluorfen, Pendimethalin, Phosmet, Propargite, Simazine, Trifluralin, Ziram	461,497
5. Alfalfa	88,310	Benefin, chlorpyrifos, 1,3-Dichloropropene, Diuron, Endosulfan, Glyphosate, Hexazinone, Indoxacarb, Lambda-Cyhalothrin, Malathion, Methamidophos, Methomyl, Naled, Paraquat Dichloride, Pendimethalin, Trifluralin	186,137
6. Stone fruit	55,348	Chlorothalonil, Chloropicrin, Chloropyrifos, Copper Hydroxide and Copper oxide, Diazinon, 1,3-Dichloropropene, 2,4-D, Glyphosate, Iprodione, Methidathion, Methyl Bromide, Oryazlin, Oxyfluorfen, Paraquat Dichloride, Phosmet, Propargite, Ziram	527,262
7. Wheat	49,400	Bromozynil, 2,4-D, Dimethoate, Glyphosate, MCPA	
8. Corn/sileage	38,260	Bifenthrin, Chlorpyrifos, Dimethoate, Glyphosate, Paraquat Dichloride, Propargite, S-Metolachlor	44,042
9. Melons	37,220	Carbaryl, Diazinon, 1,3-Dichloropropene, Endosulfan, glyphosate, Oxyfluorfen, Potasskium N-Methyldithiocarbamate, Trifluralin	200,367
10. Citrus	35,660	Chloropyrifos, Bromacil, Copper Hydorxide and Copper Oxide, 2,4-D, Diuron, Glyphosate, Simazine, Paraquat Dichloride, Thiabendazole, 1,3-Dichloropropene	392,201
		FRESNO COUNTY TOTAL:	**17,447,899**

KINGS COUNTY			
CROP	**ACREAGE**	**CROP PESTICIDES**	**TOTAL POUNDS APPLIED**
1. Cotton	223,854	Ethephon, Endosulfan, Diuron, Thidiazuron, Thiamethoxam, Propargite, Esfenvalerate, S-metolachlor	225,167
2. Wheat (grain/silage)	83,584	Bromoxynil, 2,4-D,Dimethylamine Salt, Dimethoate, Glyphosate, MCPA	50,994
3. Corn/silage	65,502	Glyphosate, paraquat dichloride, dimethoate, bifenthrin, chlorpyrifos, propargite, S-metolachlor	109,503
4. Alfalfa	54,887	Chlorpyrifos, paraquat dichloride, glyphosate, pendimethalin, lambda-cyhalothrin, diruon, 1,3-Dichloropropene, malathion, trifluralin	103,807
5. Tomatoes	21,889	Chlorothalonil, Copper hydroxide, Dimethoate, Endosulfan, Manozeb, S-Metolachlor, Oxyfluorfen, Paraquat Dichloride, Sulfur	906,638

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CROP	ACREAGE	CROP PESTICIDES	TOTAL POUNDS APPLIED
6. Stone Fruit	10,586	Ziram, Copper oxide, Methidathion, glyphosate, chlorothalonil, phosmet, methyl bromide, 2,4-D Dimethylamine salt, 1,3 Dichloropropene, Diazinon, Paraquat Dichloride, Propargite	98,098
7. Pistachios	9,690	Sulfur, oxyfluorfen, glyphosphate, oryzalin, copper hydroxide, thiophanate-methyl, permethrin	149,378
8. Almonds	9,275	Copper hydroxide, oryzalin, chlopyrifos, 2,4-D, Esfenvelarate, Oxyfluorfen, Simazine, Ziram	23,825
9. Walnuts	8,776	Methyl parathion, copper hydroxide, chlorpyrifos, endosulfan, diflubenzuron, xylene	20,882
10. Oat Hay	6,695	MCPA, Dicamba	
		TOTAL KINGS COUNTY:	**1,690,591**
TULARE COUNTY			
CROP	**ACREAGE**	**CROP PESTICIDES**	**TOTAL POUNDS APPLIED**
1. Corn/silage	147,300	Bifenthrin, Chlorpyrifos, Dimethoate, Glyphosate, Paraquat Dichloride, Propargite, S-Metolachlor	215,593
2. Citrus	109,533	Bromacil, Chlorpyrifos, Copper Hydroxide and Copper Oxide, 2,4-D, Diuron, Glyphosate, Simazine, Paraquat Dichloride, Thiabendazole, 1,3-Dichloropropene	1,190,416
3. Alfalfa	101,800	Chlorpyrifos, EPTC, diuron, indoxacarb, malathion, hexazinane, paraquat dichloride, methomyl, trifluralin	150,4289
4. Silage/small grains	95,200	Information not available	Not available
5. Grapes	65,035	Azoxystrobin, Cryolite, Chlorpyrifos, Copper Hydroxide, Cyprodinil, Copper Hydroxide, Diuron, 1,3-Dichloropropene, Ethephon, Fenamiphos, Mancozeb, Methomyl, Methyl Bromide, Oryzalin, Oxyfluorfen, Propargite, Paraquat Dichloride, Simazine, Sulfur	3,425,401
6. Cotton	50,665	Ethephon, Endosulfan, Diuron, Thidiazuron, Thiamethoxam, Dicofol, Propargite, Trifluralin	86,256
7. Stone fruit	41,702	Chloropicrin, Chloropyrifos, Chlorothalonil, Copper Hydroxide & Copper Oxide, Diazinon, 1,3-Dochloropropene, 2,4-D, Glyphosate, Iprodione, Phosmet, Methyl Bromide, Methidathion, Oryzalin, Oxyfluorfen, Paraquat Dichloride, Phosmet, Propargite, Simazine, Ziram	664,044
8. Wheat	34,500	2,4-D, Dicamba, Glyphosate, MCPA	23,601
9. Walnuts	30,670	Copper hydroxide, chlorpyrifos, 1,3-Dichloroprene, Diflubenzuron, Diuron, Glyphosate, Nameb, Methyl Bromide, Methyl Parathion, Propargite, Xylene	264,804
10. Olives	14,616	Spinosad, copper hydroxide, simazine, diuron, glyphosate, Methidathion, Oxyfluorfen	48,740
		TULARE COUNTY TOTAL:	**6,069,283**
KERN COUNTY			
CROP	**ACREAGE**	**CROP PESTICIDES**	**POUNDS APPLIED**
1. Alfalfa	155,000	Chlorpyrifos, paraquat dichloride, glyphosate, pendimethalin, lambda-cyhalothrin, diruon, molybdenum, 1,3Dichloropropene, Methamidophos	117,143
2. Cotton	134,585	Ethephon, Endosulfan, Diuron, Thidiazuron, Thiamethoxam, Propargite, Esfenvalerate, S-Metolachlor	114,553
3. Almonds	93,500	Copper hydroxide, oryzalin, chlopyrifos, 2,4-D, Esfenvalerate, Oryzalin, Oxyfluorfen, Simazine, Ziram	271,051
4. Wheat	85,000	Bromoxynil, 2,4-D, Dimethoate, Glyphosate, MCPA	15,901

CROP	ACREAGE	CROP PESTICIDES	POUNDS APPLIED
5. Silage/forage	80,000	Glyphosate, paraquat dichloride, dimethoate, bifenthrin, chlorpyrifos, S-Metolachlor, Propargite	38,451
6. Grapes	72,000	Sulfur, cryolite, chlorpyrifos, Copper hydroxide, 2,4-D, Diazinon, Diuron, myrothecium verruca, Simazine1,3-dichloropropene, Paraquat Dichloride, Methyl Bromide	4,725,659
7. Pistachios	46,500	Sulfur, oxyfluorfen, glyphosphate, oryzalin, copper hydroxide, thiophanate-methyl, permethrin	787,322
8. Citrus	44,406	Chlorpyrifos, diuron, glyphosate, copper hydroxide, ximazine, buprofezin, bromacil	341,759
9. Grain	30,000	Information not available	Not available
10. Potatoes	23,390	Information not available	Not available
		KERN COUNTY TOTAL:	**64,411,839**
Zone 4 Total: 89,619,612 lbs applied			

*Data from California Department of Pesticide Regulation, 2005 Pesticide Use Report

Monitoring Data

The data generated for Zone 4 is a combination of information obtained from the four subwatershed groups in the Southern San Joaquin Valley Water Quality Coalition, the Westlands Coalition sampling programs, monitoring for the Central Valley Water Board through the UC contract for the ILP, and SWAMP. The SWAMP monitoring sites were located in areas that represent agriculture. The UC Monitoring sites and SWAMP monitoring sites are heretofore referred to as Supplemental Monitoring sites.

Monitoring at most Coalition sites (MRP Plan sites) began during irrigation season of 2004, and most Supplemental Monitoring began in 2005. Overall, 74 different monitoring sites are identified as locations that represent agricultural land use for Zone 4. There are two additional monitoring sites (No. 7, ACOE Army Corps of Engineer Bridge and No. 18 Mill Creek) which were selected by the Kings River Subwatershed to represent background conditions on the Kings River. These monitoring locations are reportedly upstream of any influence by irrigated agriculture, and interpretations of the monitoring data from these sites are considered separately.

Sites No. 63 (Deer Creek), No. 67 (Kaweah River- Dam Outflow) and 74 (Tule River – Dam Outflow) were sampled by SWAMP. The Tule River and Kaweah River sites are located downstream of citrus and irrigated pasture for cattle. The Deer Creek site is located in the middle of a cattle-grazing operation that does not include irrigated pasture.

The data that is used in this 2007 Review includes only the monitoring data submitted in the Coalitions' Annual and Semi-Annual Monitoring Reports which included laboratory quality control information, and data generated through the University of California and SWAMP.

Table Z4-2, Summary of Monitoring Date Ranges, identifies the period of time from which monitoring data was collected at each site, as well as the number of samples collected for toxicity, pesticides or metals. The general locations of these monitoring sites are also identified on Figures Z4-1, MRP Plan Monitoring Sites, and Z4-2, Supplemental Monitoring Sites.

Table Z4-2
Summary of Monitoring Date Ranges
2004 through 2006

Site ID	SiteName	Sub-watershed	Date Range	No. of Sediment Toxicity Tests	No. of Water Flea Tests	No. of Algae Tests	No. of Minnow Tests	No. of Pesticide Tests	No. of Metals Tests
1	**Kaweah River**	Kaweah River	07/22/2004 to 07/19/2006	2	8	8	8	5	4
2	**St. Johns River**	Kaweah River	07/22/2004 to 07/19/2006	2	8	8	8	6	5
3	**Stone Corral I.D. Discharge**	Kaweah River	07/22/2004 to 11/28/2005	2	6	6	6	4	3
4	**Cross Creek at Highway 99 (Revised)**	Kaweah River	10/26/2004 to 07/19/2006	2	7	7	7	6	5
5	**Elk Bayou (New site for 2006)**	Kaweah River	7/19/2006	0	1	1	1	1	1
6	**Goshen Ditch (New site for 2006)**	Kaweah River	7/19/2006	0	1	1	1	1	1
7	**Army Corps of Eng. Bridge – BACKGROUND SAMPLE**	Kings River	05/18/2006-10/03/2006	0	12	12	12	1*	1*
8	**Deer Creek at Highway 99**	Tule River		0	0	0	0	0	0
9	**Deer Creek at Road 120**	Tule River	08/16/2006 to 9/13/2006	1	2	2	2	2	2
10	**Deer Creek at Road 176**	Tule River	08/16/2006 to 9/13/2006	1	2	2	2	2	2
11	**Deer Creek at Road 208**	Tule River	3/28/2005	0	1	1	1	0	0
12	**Kings River at Fresno Weir**	Kings River	7/6/2004	0	1	1	1	0	0
13	**Kings River at Jackson Avenue****	Kings River	07/06/2004 to 08/09/2004	0	0	0	0	0*	0*
14	**Kings River at James Bypass**	Kings River	05/17/2006 to 11/19/2006	2	4	4	4	0*	0*
15	**Kings River at Lemoore Weir**	Kings River	07/06/2004 to 10/19/2006	3	20	20	20	4*	4*
16	**Kings River at Manning**	Kings River	08/08/2004 to 10/19/2006	3	22	22	22	4*	4*
17	**Main Drain Canal near Highway 46**	Kern River	8/16/2004 to 8/30/2006	8	9	9	9	4	9
18	**Mill Creek – BACKGROUND SAMPLE**	Kings River	05/18/2006 to 06/21/2006	0	7	7	7	0	1*
19	**Poso Creek at Highway 99**	Kern River	NA	0	0	0	0	0	0
20	**Tule River at McCarthy Check**	Tule River	08/10/2004 to 1/17/2005	2	2	2	2	0	0
21	**Tule River - North Fork - at 144**	Tule River	08/16/2006 to 9/13/2006	1	2	2	2	2	2

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Site ID	SiteName	Sub-watershed	Date Range	No. of Sediment Toxicity Tests	No. of Water Flea Tests	No. of Algae Tests	No. of Minnow Tests	No. of Pesticide Tests	No. of Metals Tests
22	**Tule River at Road 92**	Tule River	08/16/2006 to 9/13/2006	1	2	2	2	2	2
23	**Tule River at Woods-Central Ditch Diversion**	Tule River	07/12/2004 to 1/17/2005	2	3	3	3	0	0
24	**White River**	Kern River	04/12/06	1	1	1	1	1	1
25	**White River at Road 128**	Kings River	NA	0	0	0	0	0	0
26	**White River at Road 208**	Kings River	NA	0	0	0	0	0	0
27	**Gale Ave./San Luis Canal Intake**	Westlands	03/27/2002 to 4/18/2002	1	1	1	1	0	0
28	**Interstate 5/Arroyo Pasajero**	Westlands	03/27/2002 to 4/18/2002	1	1	1	1	0	0
29	**Interstate 5/Panoche Silver Cre**	Westlands	3/14/2002 to 04/04/2002	2	2	2	2	0	1
30	**Panoche-Silver Creek at Belmont Avenue**	Westlands	4/4/2002	1	1	1	1	0	0
	SUBTOTALS		NA	**38**	**126**	**126**	**126**	**45**	**48**
31	Button Ditch on Ave 368 west of Alta Ave	Kings River	07/22/2004 to 8/19/2005	3	6	6	6	7	6
32	Calloway Canal at Hwy 46	Kern Tulare	07/20/2004 to 08/16/2004	1	3	3	3	3	3
33	Cantua Creek at South Stanislaus Ave.	Westlands	02/28/2006 to 03/01/2006	0	2	2	2	3	2
34	Deer Creek @ Alila Ave.	Tule River	3/24/2005	1	0	0	0	0	0
35	Ditch on S. side of Utica Ave.	Kings River	03/24/2005 to 03/4/2006	3	0	0	0	0	0
36	Drain to Fink Ditch at Central Ave	Kings River	06/20/2005 to 8/19/2005	1	4	4	4	4	0
37	Drain to Wooten Cr along Hill Rd at Wooten Cr	Kings River	07/20/2005 to 8/19/2005	1	1	1	1	4	0
38	Elbow Creek on Rd 112 N of Visalia	Kaweah River	01/27/2005 to 8/18/2005	2	2	2	2	6	0
39	Elk Bayou abv Tule R Channel at Road 96	Kaweah River	07/21/2005 to 8/18/2005	1	3	3	3	4	0
40	Farmer's Ditch @ Rt. 137 (Tulare Ave)	Kaweah River	3/24/2005 to 8/18/2005	2	0	0	0	0	0
41	Fresno Slough at Huntsman Ave.	Kings River	01/15/2006 to 03/01/2006	0	3	3	3	3	0
42	Kaweah River at Rd. 168	Kaweah River	NA	0	0	0	0	0	0
43	King Ditch @ Ave 368 & Rd. 60	Kings River	3/25/2005 to 8/19/2005	2	0	0	0	0	0
44	Kings River at Jackson Ave Bridge	Kings River	07/20/2004 to 08/16/2004	0	3	3	3	1	3
45	Kings River at Reed Ave	Kings River	NA	0	0	0	0	6	7
46	Knestirc Ditch @ Rt. 201 (Ave. 400)	Kings River	3/25/2005 to 8/19/2005	2	0	0	0	0	0
47	Los Gatos Crek at El Dorado Ave.	Westlands	NA	0	0	0	0	0	0
48	Melga Canal at Jersey Ave	Kaweah River	06/20/2005 to 08/01/2005	1	4	4	4	4	4

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Site ID	SiteName	Sub-watershed	Date Range	No. of Sediment Toxicity Tests	No. of Water Flea Tests	No. of Algae Tests	No. of Minnow Tests	No. of Pesticide Tests	No. of Metals Tests
49	Mill Creek at Road 168	Kaweah River	03/24/2005 to 08/18/2005	2	0	0	0	0	0
50	Murphy Slough @ Elm	Kings River	03/25/2005 to 8/18/2005	2	0	0	0	0	0
51	Near Kings River at Reed Ave	Kings River	3/25/2005	1	0	0	0	0	0
52	Peoples Ditch at Elder Ave	Kings River	06/20/2005 to 08/19/2005	1	4	4	4	4	4
53	St. Johns River at Road 108	Kaweah River	07/21/2005 to 8/01/2005	0	4	4	4	4	4
54	Stinson Ditch @ Kamm	Kings River	3/25/2005 to 3/4/2006	3	0	0	0	0	0
55	Tule River at Poplar Ave	Tule River	06/20/2004 to 8/16/2004	1	2	2	2	6	2
56	Turner Ditch @ Marks (aka 22nd Ave)	Kings River	03/25/2005 to 8/19/2005	2	0	0	0	0	0
57	Unnamed Drain along Utica Ave.	Kings River	NA	0	0	0	0	0	0
58	West Reedley Ditch at East Adams Ave	Kings River	07/22/2004 to 8/17/2004	1	2	2	2	3	2
59	Bates Slough	Kaweah River	08/30/2005 to 01/22/2007	0	6	6	6	0	2
60	Cross Creek	Kaweah River	6/27/2006 to 01/29/2007	0	3	3	3	0	0
61	Cross Creek_Houston Ave	Kaweah River	6/27/2006 to 01/29/2007	0	1	1	1	0	0
62	Cross Creek	Kaweah River	6/27/2006 to 01/29/2007	0	1	1	1	0	0
63	Deer Creek	Tule River	08/30/2005 to 01/22/2007	0	10	10	10	0	0
64	Deer Creek and Hwy 65	Tule River	08/30/2005 to 01/22/2007	0	4	4	4	0	0
65	Deer Creek; Road 192 and Ave. 96	Tule River	08/30/2005 to 01/22/2007	0	7	7	7	0	0
66	Deer Creek at Pixley wildlife refuge	Tule River	08/30/2005 to 01/22/2007	0	7	7	7	0	0
67	Kaweah River - Dam outflow	Kaweah River	06/27/2006 to 01/29/2007	0	4	5	4	0	0
68	Kaweah River at Rd. 196 North of Hwy 198	Kaweah River	06/27/2006 to 01/29/2007	0	4	5	4	0	0
69	N. Fork Tule River	Tule River	08/30/2005 to 01/22/2007	0	6	6	6	0	0
70	Outside Creek_west of Exeter	Kaweah River	06/27/2006 to 01/29/2007	0	3	3	3	0	0
71	Packwood Creek	Kaweah River	06/27/2006 to 01/29/2007	0	3	3	3	0	0
72	Porter Slough	Tule River	08/30/2005	0	2	2	2	0	0

Site ID	SiteName	Sub-watershed	Date Range	No. of Sediment Toxicity Tests	No. of Water Flea Tests	No. of Algae Tests	No. of Minnow Tests	No. of Pesticide Tests	No. of Metals Tests
			to 10/23/2006						
73	St. John's River	Kaweah River	06/27/2006 to 01/29/2007	0	3	3	3	0	0
74	Tule River - Dam Outlfow	Tule River	08/30/2005 to 01/22/2007	0	10	10	10	0	0
75	Elk Bayou	Kaweah River	08/30/2005 to 01/22/2007	0	5	5	5	0	0
76	Tule River	Tule River	08/30/2005 to 01/22/2007	0	6	8	6	0	0
	SUBTOTALS			**33**	**128**	**132**	**128**	**62**	**39**
	TOTALS			**71**	**254**	**258**	**254**	**107**	**87**

Shaded = Sample sites used in Coalition monitoring
* MRP pesticides and metals – site monitored more frequently for toxaphene and molybdenum only
****** Jackson Avenue site monitored for flow, conductivity, toxaphene, and molybdenum only

AQUATIC AND SEDIMENT TOXICITY. As discussed in the Introduction to this 2007 Review, the three different water toxicity test species react differently to different types of stressors. In some cases, the same stressor will affect two species, but it will require different concentration levels for each. For example, chlorpyrifos concentrations can affect both the *Pimephales promelas (*fathead minnow) species as well as the *Ceriodaphnia* (water flea) species, although the concentrations that cause an effect are generally orders of magnitude higher for fathead minnow, as opposed to the water flea.

This difference in organism response to dose and contaminant means that the mortality to more than one species within the same sample indicates the presence of more than one contaminant of concern, or potentially a single stressor of sufficiently high concentration to affect the least sensitive of the species as well as the most sensitive. In Zone 4, significant toxicity in water column tests did occur in to up to three water column species (as well as sediment toxicity) at the monitoring locations identified in Table Z4-3, Toxicity Test Sites with Mortality in Multiple Species.

Table Z4-3
Toxicity Test Sites with Mortality in Multiple Species

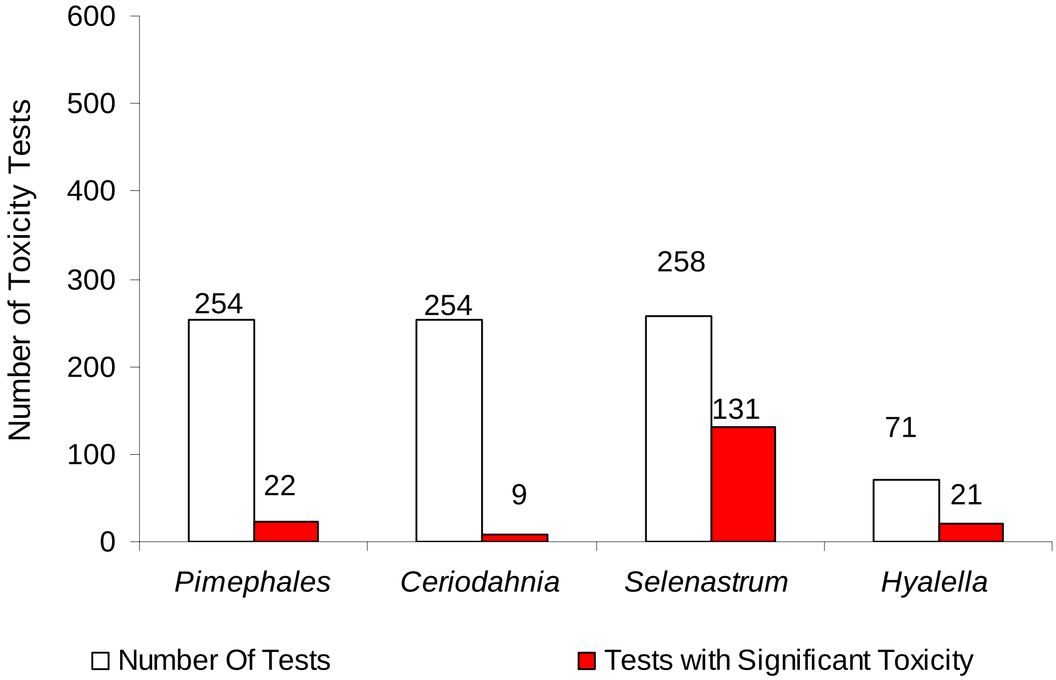
Site ID	Site Name	Site ID	Site Name
3	Stone Corral (minnow, flea, algae, sediment)	63	Deer Creek (minnow & algae)
15	Kings River at Lemoore Weir	64	Deer Creek at 65 (minnow & algae)
16	Kings River at Manning (minnow & algae)	65	Deer Creek at 192 (minnow,& algae)
17	Main Drain Canal near Hwy 46 (algae and sediment)	67	Kaweah River – Dam outflow (minnow & algae)
20	Tule River at McCarthy Check (algae and sediment)	69	North Fork Tule River (minnow & algae)
31	Button Ditch at 368 (minnow, flea & algae)	73	St. John's River (minnow & algae)

Site ID	Site Name	Site ID	Site Name
39	Elk Bayou at 96 (minnow & flea)	74	Tule River – Dam outflow (minnow, algae)
41	Fresno Slough (flea & algae)	75	Elk Bayou (flea, algae)
59	Bates Slough (flea & algae)		

Shaded = Sample sites used in Coalition monitoring

Figure Z4-3 shows the number of tests with significant toxicity for all four species as compared to the total number of tests conducted. These tallies in Figure Z4-3 include the measurements taken at two monitoring sites that are considered 'Background Sites'. Sample Site #7 (ACOE) and Sample Site #18 (Mill Creek) are sites selected by the Coalition to represent water quality conditions without the influence of irrigated lands. The following sections discuss the results for each of the toxicity species, as well as possible causes for identified toxicity.

Figure Z4-3
Tests With Statistically Significant Toxicity



Pimephales promelas (fathead minnow). Mortality in fathead minnow is generally associated with sensitivity to ammonia, although high concentrations insecticides, or combinations of various insecticides at lower concentrations of insecticides will also result in fathead minnow mortality. Table Z4-4, Monitoring sites with *Pimephales promelas* Toxicity, identifies the monitoring sites where the fish toxicity was found, as well as the number of tests that exhibit different ranges of mortality, described as percent difference from laboratory control. The approximate locations of these sites are depicted in Figure Z4-4, Toxicity to *Pimephales promelas*

Overall, throughout Zone 4, about 9.4% of the number of samples (22 out of 235) tested for fathead minnow toxicity did demonstrate significant toxicity. Furthermore, toxicity to the fathead minnow was found in 31% of the sample sites from which fathead minnow toxicity tests were collected. These tallies exclude the fathead minnow tests conducted on the two background sample sites, No. 7 and No. 18. Mortality to fathead minnow was found in both of these Kings River background sample sites, one time each.

Table Z4-4
Monitoring Sites with Toxicity to *Pimephales promelas*

					No. of Tests and Percent Reduction as Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples (including non-toxic)**	**Sub-watershed**	**Up to 20**	**20-50**	**> 50**	**Totals**
1	**Kaweah River**	MRPPlan	8	Kaweah River	0	2	0	**2**
3	**Stone Corral**	MRPPlan	6	Kaweah River	0	0	1	**1**
5	**Elk Bayou**	MRPPlan	1	Kaweah River	0	0	1	**1**
7	**ACOE – BACKGROUND SAMPLE**	Coalition	12	Kings River	0	1	0	**1**
11	**Deer Creek at Rd 208**	MRPPlan	1	Tule River	0	0	1	**1**
15	**Kings River at Lemoore Weir**	MRPPlan	20	Kings River	1	0	0	**1**
16	**Kings River at Manning Ave.**	MRPPlan	22	Kings River	0	1	0	**1**
18	**Mill Creek – BACKGROUND SAMPLE**	Coalition	7	Kings River	1	0	0	**1**
21	**Tule River at North Fork**	MRPPlan	2	Tule River	0	1	0	**1**
31	Button Ditch	Supplemental	6	Kings River	1	0	0	**1**
39	Elk Bayou above channel	Supplemental	3	Kaweah River	1	0	0	**1**
63	Deer Creek	Supplemental	10	Tule River	0	1	0	**1**
64	Deer Creek & Hwy 65	Supplemental	4	Tule River	0	1	0	**1**
65	Deer Creek, Road 192	Supplemental	7	Tule River	0	1	0	**1**
75	Elk Bayou	Supplemental	5	Kaweah River	0	1	0	**1**
67	Kaweah River – dam outflow	Supplemental	4	Kaweah River	1	0	0	**1**
73	St. John's River	Supplemental	3	Kaweah River	1	0	0	**1**
69	N. Fork Tule River	Supplemental	6	Tule River	0	1	1	**2**
74	Tule River – Dam outflow	Supplemental	10	Tule River	1	1	0	**2**
		TOTALS:	137		7	11	4	**22**

Shaded = Sample sites used in Coalition monitoring

The magnitude of toxicity to fathead minnow was predominantly in the 20-50% mortality range, which does not generally result in a toxicity identification evaluation (TIE), but may have trigger follow-up monitoring to interpret the persistence of the toxicity in the environment. This report does not consider if the follow-up monitoring was conducted, and therefore does not evaluate the persistence factor. TIE information was not available for the two monitoring test results that had 50% or greater mortality.

Both fathead minnow and the *Ceriodaphnia dubia* (water flea) species are sensitive to insecticides, although higher concentrations of pesticides are required to induce mortality with the fathead minnow than the flea. For this reason, it is interesting to note that there is a greater number of monitoring sites with demonstrated fathead minnow toxicity than to the water flea. This information indicates the presence of one or more stressors that would affect the fathead minnow to a greater extent than the water flea. One such stressor that might do this could be ammonia. More information, such as TIE analysis, is needed to verify this assumption, or to otherwise identify the cause of fathead minnow toxicity.

Ceriodaphnia dubia (water flea). The water flea species is generally used in water quality testing to indicate the presence of insecticides. Within the Central Valley, mortality of the water flea is associated with non-polar organic compounds, such as the organophosphate pesticides diazinon or chlorpyrifos. Water flea mortality could also result from use of other insecticides or insecticide combinations, including the pyrethroids, which are replacement pesticides for organophosphates.

Overall, throughout Zone 4, about 3.8% of the samples tested (9 out of 235) for water flea toxicity did demonstrate significant toxicity. Furthermore, toxicity to water flea was found in greater than 14.5% of the monitoring sites used in Zone 4. These tallies exclude the fathead minnow tests conducted on the two background sample sites, No. 7 and No. 18, although there was no toxicity found in either of the background sample sites.

Table Z4-5, Toxicity to *Ceriodaphnia dubia*, identifies the monitoring sites where toxicity to water flea was found, as well as the ranges of mortality described as percent difference from laboratory control.

Table Z4-5
Monitoring Sites with *Ceriodaphnia dubia* Toxicity

					No. of Tests with Percent Reduction - Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples (including non-toxic)**	**Sub-watershed**	**Up to 20%**	**20-50%**	**> 50%**	**Total**
3	**Stone Corral**	MRP Plan	6	Kaweah	0	0	1	**1**
16	**Kings River @ Manning**	MRP Plan	22	Kings	0	1	0	**1**
29	**I-5 Panoche Silver Creek**	MRP Plan	2	Westlands	0	0	1	**1**
31	Button Ditch	Supplemental	6	Kings	0	0	1	**1**
39	Elk Bayou	Supplemental	3	Kaweah	0	0	1	**1**
41	Fresno	Supplemental	3	Kings	0	0	1	**1**

					No. of Tests with Percent Reduction - Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples (including non-toxic)**	**Sub-watershed**	**Up to 20%**	**20-50%**	**> 50%**	**Total**
	Slough							
59	Bates Slough	Supplemental	6	Kaweah	0	0	2	**2**
75	Elk Bayou	Supplemental	5	Kaweah	0	0	1	**1**
		Total:	**53**		**0**	**1**	**8**	**9**

Shaded = Sample site used in Coalition monitoring

Table Z4-5, Monitoring Sites with *Ceriodaphnia dubia* Toxicity indicates that where significant toxicity to water flea is found, it is generally of high in magnitude. Eight of the nine toxic samples resulted in mortality greater than 50%. Although there is a greater percentage of sites that are toxic to the fathead minnow, the magnitude of toxicity for water flea is in the higher range of mortality. This could be an indicator that some of the fathead minnow mortality can be attributed to ammonia, as opposed to insecticides and provide a clue to the source of the toxicity.

Three of the Supplemental monitoring sites listed in Table Z4-5, Monitoring Sites with *Ceriodaphnia dubia* Toxicity, resulted in complete mortality (100%) of all water flea. Toxicity identification evaluations (TIE) were conducted on each site. The summary of the TIE information is as follows:

1. Site #31 on 22 July 2004, Button Ditch (0% survival) TIE indicated non-polar organic, and pesticide detections for chlorpyrifos was 0.284 ug/L and dimethoate at 0.046 ug/L)

2. Site #39 on 1 August 2005, Elk Bayou (0% survival) TIE indicated nonpolar organics with chlorpyrifos at 0.27 ug/L and dimethoate at 0.046 ug/L)

3. Site #41 on 15 January 2006, Fresno Slough (0% survival), TIE indicated non-polar organics tied to organophosphate pesticides. There were also multiple pesticides detected in the sample including chlorpyrifos (0.138 ug/L), disulfoton (0.021 ug/L), diuron (0.012). Also detected in the TIE procedure was cyfluthrin at 0.021 ug/L and dioxathion at 0.13 ug/L)

Selenastrum capricornutum (algal species). Toxicity to this species can be caused by algaecides, and by metal compounds that are both naturally present, or applied for weed control. Herbicides, such as diruon, simazine, glyphosate, cyanizine, etc., as well as copper compounds, are periodically applied to canals and canal banks throughout the Central Valley to control algae. The correct application of these pesticides in irrigation canals is to be conducted under conditions specified by permit, with holding time considerations, and the water is to be discharged only when the herbicide is no longer present in toxic amounts.

Overall, throughout Zone 4, about 50% of the samples tested (119 out of 239) for algae toxicity demonstrated significant toxicity. Furthermore, toxicity to algae toxicity was found in 56% of the monitoring sites used in Zone 4. These tallies exclude the fathead minnow tests conducted on the two background sample sites, No. 7 and No. 18. In fact, statistically significant algae toxicity was also found in both of these background sites, with 10 out of 12 samples toxic at site No. 7, and two out of seven toxic samples at site No. 18.

Table Z4-6, Monitoring Sites with *Selenastrum capricornutum* Toxicity, identifies the monitoring sites where these samples were collected, as well as the number of tests that exhibit different ranges of reduced growth, described as percent difference from laboratory control. The approximate locations of these monitoring sites are identified in Figure Z4-6, Toxicity to *Selenastrum capricornutum.*

Table Z4-6
Monitoring Sites with *Selenastrum capricornutum* Toxicity

					No. of Tests with Percent Reduction as Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples**	**Sub-watershed**	**Up to 20%**	**20-50%**	**> 50%**	**Total**
3	**Stone Corral**	MRPPlan	6	Kaweah	0	0	1	**1**
7	**ACOE (Army Corps of Eng) Bridge – BACKGROUND SAMPLE**	Coalition	12	Kings	2	8	0	**10**
12	**Kings River at Fresno Weir**	MRPPlan	1	Kings	0	1	0	**1**
14	**Kings River At James Bypass**	MRPPlan	4	Kings	0	4	0	**4**
15	**Kings River at Lemoore**	MRPPlan	20	Kings	5	12	0	**17**
16	**Kings River at Manning**	MRPPlan	22	Kings	6	8	0	**14**
17	**Main Drain Canal**	MRPPlan	9	Kern	1	1	0	**2**
18	**Mill Creek – BACKGROUND SAMPLE**	Coalition	7	Kings	1	1	0	**2**
20	**Tule River at McCarthy Check**	MRPPlan	2	Tule	1	0	0	**1**
31	Button Ditch	Supplemental	6	Kings	0	1	0	**1**
33	Cantua Creek at South Stanislaus Ave.	Supplemental	2	Westlands	0	1	0	**1**
38	Elbow Creek	Supplemental	2	Kaweah	1	0	0	**1**
41	Fresno Slough	Supplemental	3	Kings	0	0	2	**2**
44	Kings River at Jackson Ave Bridge	Supplemental	3	Kings	0	3	0	**3**
55	Tule River at Poplar	Supplemental	2	Tule	0	2	0	**2**
58	West Reedley Ditch	Supplemental	2	Kings	0	2	0	**2**
59	Bates Slough	Supplemental	6	Kaweah	4	0	1	**5**
60	Cross Creek	Supplemental	3	Kaweah	0	3	0	**3**
61	Cross Creek at Houston	Supplemental	1	Kaweah	0	1	0	**1**
63	Deer Creek	Supplemental	10	Tule	1	5	1	**7**
64	Deer Creek & Hwy 65	Supplemental	4	Tule	0	1	0	**1**
65	Deer Creek, Rd 192	Supplemental	7	Tule	0	5	1	**6**
66	Deer Creek @ Pixley Wildlife refuge	Supplemental	7	Tule	0	5	1	**6**
67	Kaweah River – Dam outflow	Supplemental	5	Kaweah	1	4	0	**5**
68	Kaweah River at 196	Supplemental	5	Kaweah	2	2	0	**4**
69	North Fork Tule River	Supplemental	6	Tule	0	5	2	**7**

					No. of Tests with Percent Reduction as Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples**	**Sub-watershed**	**Up to 20%**	**20-50%**	**> 50%**	**Total**
70	Outside Creek – west of Exeter	Supplemental	3	Kaweah	0	3	0	**3**
71	Packwood Creek	Supplemental	3	Kaweah	0	4	0	**4**
72	Porter Slough	Supplemental	2	Tule	0	1	0	**1**
73	St. John's River	Supplemental	3	Kaweah	1	2	0	**3**
74	Tule River – Dam outflow	Supplemental	10	Tule	3	0	0	**3**
75	Elk Bayou	Supplemental	5	Kaweah	1	1	0	**2**
76	Tule River	Supplemental	8	Tule	0	6	0	**6**
		TOTALS:	**191**		**30**	**92**	**9**	**131**

Shaded = Sample site used in Coalition monitoring

The majority of the algae toxicity tests exhibited less than the fifty percent reduced growth, which would caused the laboratory to conduct a TIE. There is limited TIE information provided for Zone 4, although two TIE results from Supplemental Monitoring sites are available, as follows:

4. Site #41: on 28 February 2006, Fresno Slough (7 toxic units). TIE results indicated metals, or non-polar organics, or both. The sample results also had detections of diuron at 0.41 ug/L, simazine at 0.033 ug/L, atrazine at 0.02 ug/L, chlorpyrifos at 0.066 ug/L, and diazinon at 0.011 ug/L.

5. Site #41: on 1 March 2006, Fresno Slough (7 toxic units). TIE results indicated metals or non-polar organics or both. The sample results had diuron at 0.29 ug/L, simazine at 0.039 ug/L, chlorpyrifos at 0.061 ug/L, and diazinon at 0.007 ug/L.

The approximate locations of water column toxicity tests for all three species at all sites are identified in Figures Z4-2 through Z4-4. Sites that had more than one toxic event within the three-year period are also identified.

Hyalella azteca (sediment amphipod). The *Hyalella azteca,* is the only species that has been used thus far in the program to determine toxicity in sediment. Toxicity in the sediment can be linked to the presence of stressors with low water solubility, including certain pesticides such as chlorpyrifos, pyrethroids, and chlorinated pesticides. Toxicity in the sediment can be the result of irrigation runoff that contains pesticides that settle into the water body sediments, from overspray during aerial applications, or by erosion of contaminated sediment. Common stressors that are hydrophobic, and therefore are best detected through sediment toxicity tests include various pyrethroid insecticides, which are replacements for organophosphate pesticides, chlorpyrifos, and several chlorinated pesticides, such as DDT and its breakdown products.

Overall, throughout Zone 4, sediment toxicity was identified in 29.6% of the total number of individual sediment toxicity samples collected (21 out of 71). Sediment toxicity samples were collected at 39 different sites throughout Zone 4, from which 16 demonstrated statistically significant toxicity on at least one occasion. That is 41% of the sample sites in Zone 4 had significant toxicity. The majority of these samples with toxic results were high in magnitude, greater than 50% mortality.

Table Z4-7
Monitoring Sites with
***Hyalella azteca* Toxicity**

					No. of Tests with Percent Reduction - Compared to Laboratory Control			
Site ID	**Site Name**	**Sample Type**	**No. Samples**	**Sub-watershed**	**Up to 20%**	**20-50%**	**> 50%**	**Total**
2	**St. John's River**	MRPPlan	2	Kaweah	0	1	1	**2**
3	**Stone Corral Discharge**	MRPPlan	2	Kaweah	0	0	1	**1**
4	**Cross Creek at 99**	MRPPlan	2	Kaweah	0	0	1	**1**
17	**Main Drain Canal at 46**	MRPPlan	8	Kern	0	2	1	**3**
20	**Tule River at McCarthy**	MRPPlan	2	Tule	0	0	1	**1**
23	**Tule River at Woods**	MRPPlan	2	Tule	0	0	1	**1**
29	**I-5 @Panoche Silver Creek**	MRPPlan	2	Westlands	1	0	0	**1**
30	**Panoche-Silver @ Belmont**	MRPPlan	1	Westlands	0	0	1	**1**
35	Ditch south of Utica Ave.	Supplemental	3	Kings	0	0	3	**3**
37	Drain to Wooten Creek	Supplemental	1	Kings	0	0	1	**1**
38	Elbow Creek @ 112	Supplemental	2	Kaweah	0	1	0	**1**
43	King Ditch at 368	Supplemental	2	Kings	0	0	1	**1**
46	Kinestirc Ditch at 201	Supplemental	2	Kings	0	0	1	**1**
50	Mill Creek at 168	Supplemental	2	Kaweah	0	0	1	**1**
54	Stinson Ditch @ Kamm	Supplemental	3	Kings	0	0	1	**1**
56	Turner Ditch @ Marks	Supplemental	2	Kings	0	0	1	**1**
		Other:	25					
		TOTALS:	**63**		**1**	**4**	**16**	**21**

Shaded = Sample site used in Coalition monitoring

Table Z4-7, Toxicity to *Hyalella azteca*, provides information about these sixteen monitoring sites, as well as the range of sediment toxicity for the results. Sediment toxicity could be explained through TIE analyses, although limited numbers of TIEs are being conducted.

Figure Z4-7, Toxicity to *Hyalella azteca*, provides the approximate locations of sediment toxicity monitoring, including those for which toxicity was not found.

PESTICIDES. Although some pesticide detections have been identified in the MRP Plan and Supplemental Monitoring in Zone 4, the frequency of pesticide monitoring information, and the spatial distribution of the data is not as great as in other Zones presented in this 2007 Review. Measurements for pesticides can provide information regarding toxic events to the water column or sediment samples that were collected, and some of this corroborative information has been discussed in the sections on toxicity results above. However, limited water and sediment monitoring data is available to identify the quantity, variety and impact to the environment from pesticides that are used in Zone 4.

Table Z4-8, Pesticide Tests and Results Greater than Trigger Levels, the number of samples that were collected, as well as the pesticides that exceeded either Basin Plan numeric limits or other trigger levels used to characterize water quality conditions. Figure Z4-8, Monitoring Results for Pesticides, provides the approximate locations of all of the monitoring sites, including those locations where no sample results were provided, and those with no detections that exceeded trigger limits. The map also identifies monitoring sites with more than one sample result that exceeded a trigger limit within the three-year period.

Table Z4-8
Pesticide Tests and Results Greater than Trigger Limits

Site ID	Site Name	Sample Type	No. of Tests	Chlor-pyrifos[b]	Prohibited Pesticides[b]	DDT & Break-down products[a]	Other[a&b]	TOTAL
6	**Goshen Ditch**	MRPPlan	1	1	0	0	0	**1**
16	**Kings River @ Manning**	MRPPlan	4	0	1	0	0	**1**
31	Button Ditch	Supplemental	7	5	0	0	0	**5**
32	Calloway Canal	Supplemental	3	0	1	0	1	**2**
33	Cantua Creek	Supplemental	3	1	0	2	1	**4**
37	Drain to Wooten Creek	Supplemental	4	3	2	0	1	**6**
38	Elbow Creek	Supplemental	6	12	0	0	0	**12**
39	Elk Bayou	Supplemental	4	4	0	0	0	**4**
41	Fresno Slough	Supplemental	3	3	0	1	0	**4**
44	Kings River @ Jackson Ave	Supplemental	1	0	1	0	1	**2**
45	Kings River @ Reed	Supplemental	6	6	0	0	0	**6**
48	Melga Canal	Supplemental	4	0	0	0	1	**1**
55	Tule River @ Poplar Ave	Supplemental	6	0	1	0	0	**1**
		Totals:	**52**	**35**	**6**	**3**	**5**	**49**

Shaded = Sample site used in Coalition monitoring
Footnotes:
a. Tulare Lake Basin Plan Numeric objective exceedances
b. Detects above interpretation of Basin Plan Objectives

ELECTRICAL CONDUCTIVITY. One measure of salinity that is used in the Central Valley is that of electrical conductivity, measured in µS/cm. The Tulare Lake Basin also promulgates maximum electrical conductivity levels for certain reaches of the Kings, Kaweah, Tule and Kern Rivers in Zone 4. These specific numeric limits vary from 100 to 450 µS/cm, depending on the reach.

The measurements for conductivity that have been collected for the Program in Zone 4 have very few values that are greater than either the specific Tulare Lake Basin Plan objectives, or the trigger limit of 700 µS/cm that is used to evaluate water quality for agricultural use.

Some of the reasons for the low frequency of conductivity measures that are greater than trigger levels as compared to Zones 2 and 3 may include the following:

1. The relatively low number of monitoring events in Zone 4 as compared to other zones;
2. The type of water bodies that are generally monitored in Zone 4 (main stem water bodies, such as Kings, Kern, Tule and Kaweah);
3. Lower levels of salinity in water bodies within Zone.

Table Z4-9
Electrical Conductivity Results that Exceed Trigger Limits

Site ID	Site Name	Sub-watershed	Date	Result in µS/cm	Limit in µS/cm
12	**Kings River at Fresno Weir**	Kings	1/26/2005	107	100
17	**Main Drain Canal near Highway 46**	Kern	8/30/2006	1073	700
27	Gale Ave/San Luis Canal Intake	Westlands	4?19/2006	1642	1000
29	Interstate 5/Panoche Silver Creek	Westlands	3/15/2006	5709	700
29	Interstate 5/Panoche Silver Creek	Westlands	4/05/2006	1339	700
30	Panoche Silver Creek at Belmont Avenue	Westlands	4/5/2006	1633	700
31	Button Ditch on Ave 368 west of Alta Ave	Kings	3/25/2005	829	700
35	Ditch on S. side of Utica Ave.	Kings	3/24/2005	1820	700
35	Ditch on S. side of Utica Ave.	Kings	8/18/2005	990	700
41	Fresno Slough at Huntsman Ave.	Kings	2/28/2006	1640	700
41	Fresno Slough at Huntsman Ave.	Kings	3/1/2006	1666	700
45	Kings River at Reed Avenue	Kings	3/25/2006	202	200
54	Stinson Ditch @ Kamm	Kings	3/25/2005	1280	700

Shaded = Sample site used in Coalition monitoring

More information is necessary to adequately evaluate salinity in Zone 4.

Data Gaps

The quantity of pesticides that are applied in Zone 4 (89,619,612 pounds in 2005), particularly in Fresno County, raises the need to conduct sufficient toxicity and pesticide monitoring to be able to understand whether or not pesticide use is appropriately protective, or if more effective management practice implementation should occur. The toxicity data that is available is certainly indicative of an impact from pesticide use.

The low frequency of monitoring data per monitoring site does severely limit the ability to evaluate the information with respect to seasons, land-use, pesticide application, or source identification. Identification of monitoring sites that have toxic results, however, does provide information to direct continued monitoring and to investigate management practice implementation.

The locations of most MRP Plan monitoring comes from four main water bodies, Kings River, Kern River, Kaweah River and Tule River. Very little information about the smaller sloughs, irrigation supply canals and waterbodies that drain from irrigated lands in the area. Similarly, there is no monitoring data provided to this Program for the San Joaquin River, although field inspections have identified the fact that there are direct discharges from irrigation districts and runoff from irrigated lands to the San Joaquin River. There are currently no ongoing monitoring sites located on these discharges to the San Joaquin.

Depending on rainfall events, irrigation of crops in Zone 4 approaches year-round applications. This extended irrigation season coupled with the use of pre-planting irrigation (tomato, cotton, winter forage, and melons), post-harvest irrigation (nut crops, grapes, and various stone fruit), and application of water for frost protection (citrus), results in near year-round water use with a corresponding potential for agricultural runoff. In spite of this fact, monitoring information is available for only a very limited number of monitoring events, depending on the subwatershed.

Zone 4 Summary

Even considering the relatively limited monitoring that has been conducted in Zone 4, some observations can be made, as follows:

The greatest frequency of toxicity in Zone 4 occurs to the species, *Selenastrum* (algal toxicity) which is an indicator of herbicide or metal toxicity. There is limited toxicity identification information, but the few results available also indicate the presence of pesticides. Two monitoring sites that have been referred to as ‘background sites’ also have significant algae toxicity, and further investigation into the cause of this toxicity through TIE or other procedures is warranted.

Toxicity from hydrophobic stressors, as demonstrated in the sediment toxicity tests is also very high, with 41% of the monitoring sites showing sediment toxicity. Studies conducted by University of California have implicated pyrethroids for this type of toxicity, although the possible presence of other hydrophobic contaminants should be investigated.

Toxicity to *Pimphales promelas* (fathead minnow) is demonstrated at 31% of the sites that have been tested in Zone 4. This, coupled with the lower percent of sites that have demonstrated toxicity to water flea (10%) does imply that ammonia could be the cause of minnow toxicity in some instances.

Other information that should be considered for Zone 4 includes the magnitude of certain exceedances, including toxicity. Prioritization of actions to address source identification and management practice implementation could be made using magnitude criteria. For example, Monitoring Site No. 35 (Ditch South of Utica Avenue) had only three samples reported for *Hyalella* testing, and all three of the samples resulted in mortality to the species at magnitudes greater than 50%.

The incidence of salinity in excess of trigger limits, measured as electrical conductivity, is relatively low in Zone 4.

Throughout Zone 4, there are multiple monitoring sites, both MRP Plan sites and Supplemental Sites, which have demonstrated toxicity at a sufficient frequency and magnitude to warrant further investigation and management practice implementation. Some of these sites also show toxicity to more than one species, which could require a variety of approaches to reducing contaminant loads. Some of these sites include the following:

- Site No. 1, Kaweah River
- Site No. 3, Stone Corral
- Site No. 14, RAJB Bypass
- Sites No. 15-16, and 44 Kings River
- Site No. 16, Kings River at Manning
- Site No. 31, Button Ditch at 368
- Site No. 41, Fresno Slough
- Site No. 55, Tule River at Poplar
- Site No. 58, West Reedly Ditch
- Site No. 59, Bates Slough
- Site No. 60, Cross Creek
- Sites 63-66, Deer Creek
- Site No. 67-68, Kaweah River
- Site No. 69, North Fork Tule
- Site No. 70, Outside Creek, west of Exeter
- Site No. 71, Packwood Creek
- Site No. 73, St. John’s River
- Site No. 75, Elk Bayou

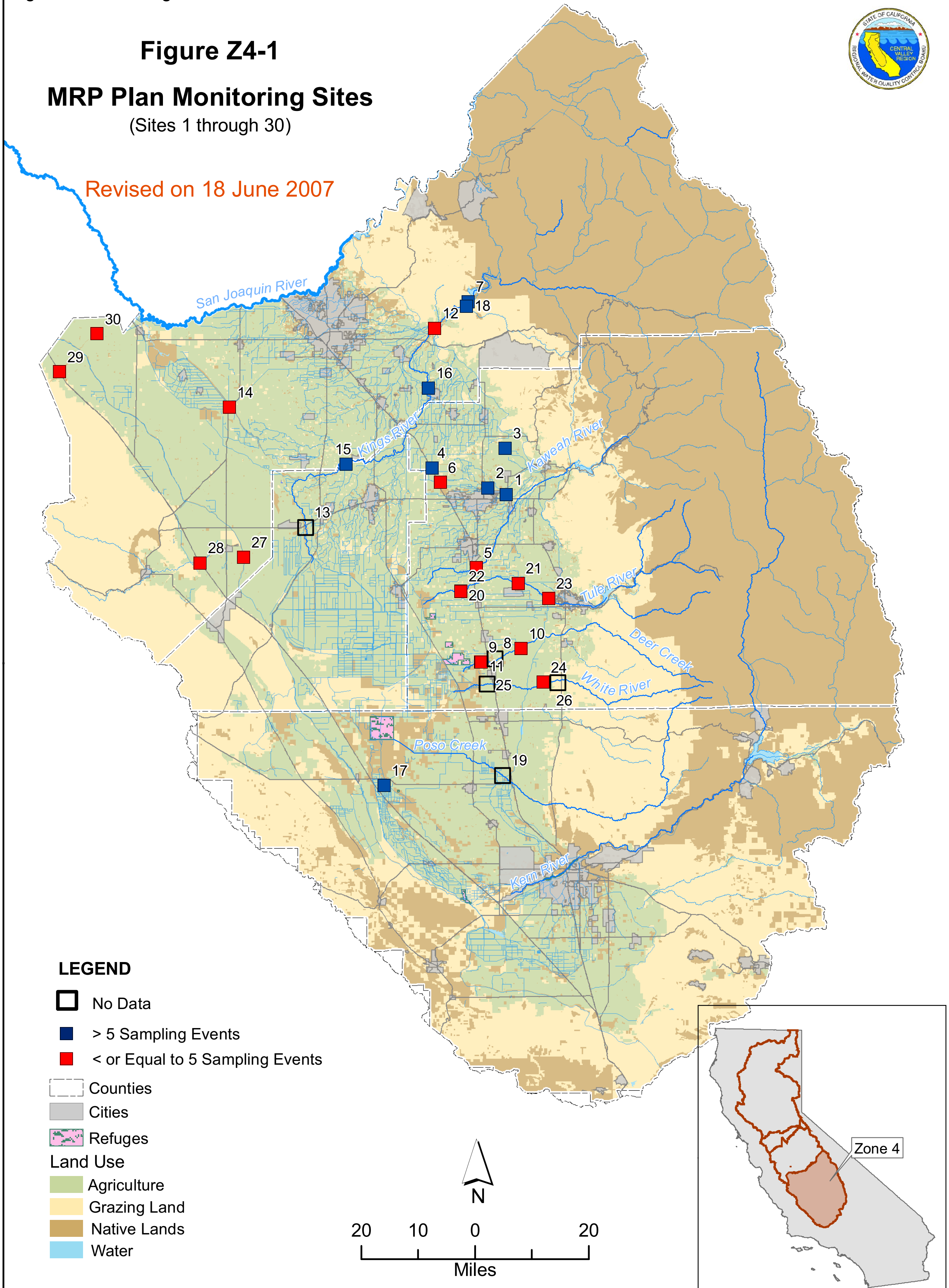
Irrigated Lands Program

Figure Z4-1

MRP Plan Monitoring Sites

(Sites 1 through 30)

Revised on 18 June 2007



Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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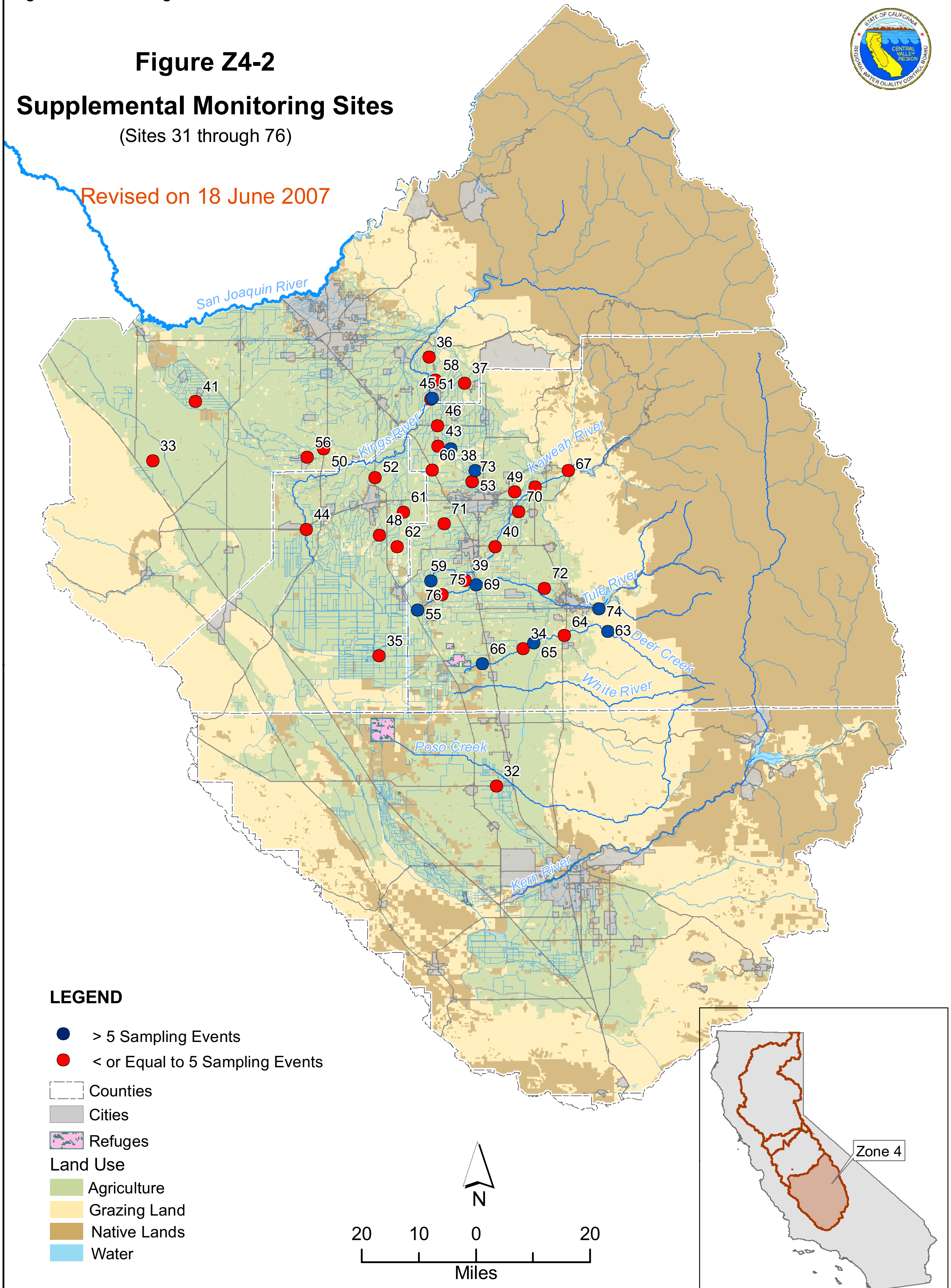
Irrigated Lands Program

Figure Z4-2

Supplemental Monitoring Sites

(Sites 31 through 76)

Revised on 18 June 2007



Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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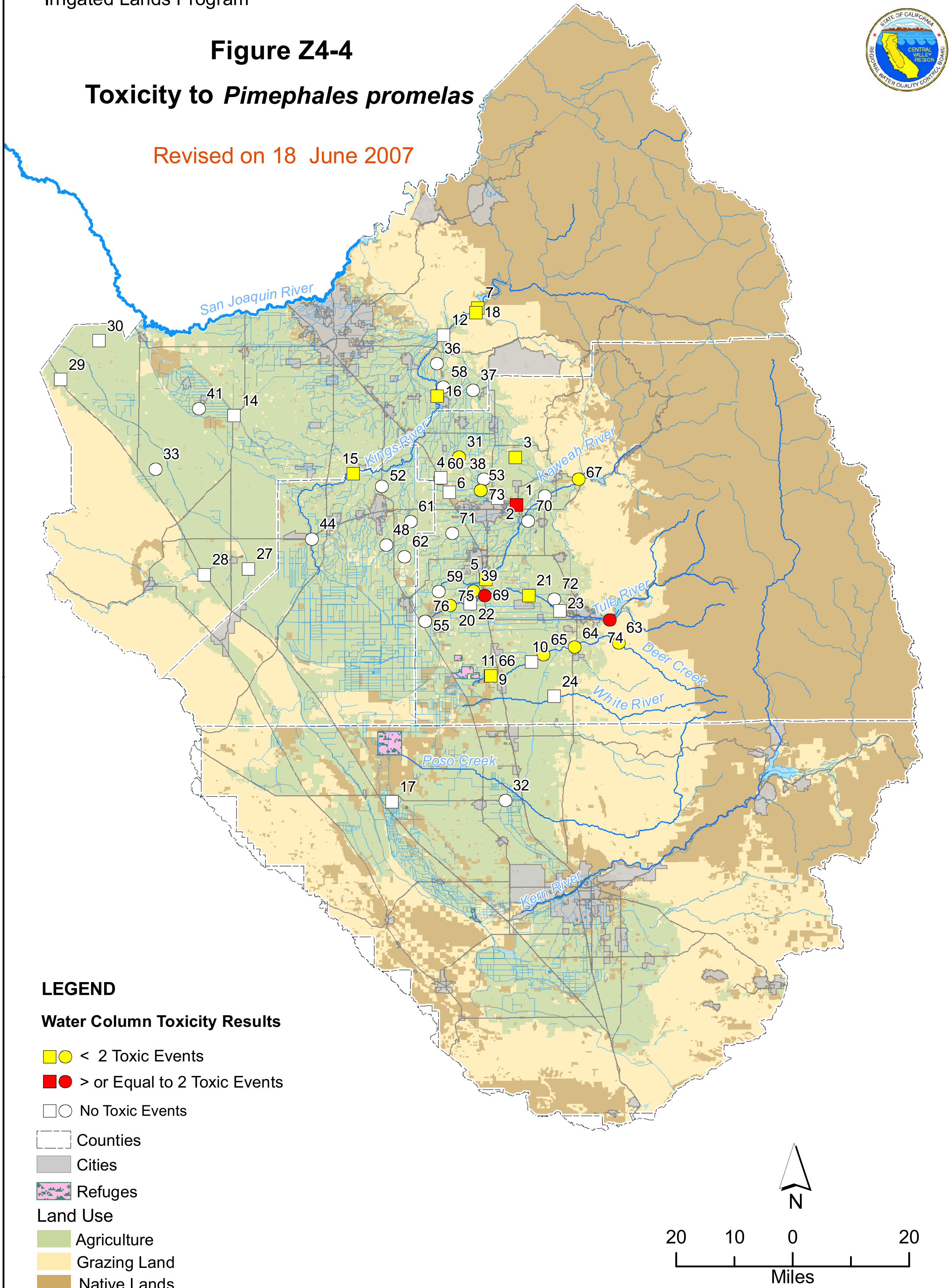
Irrigated Lands Program

Figure Z4-4

Toxicity to *Pimephales promelas*

Revised on 18 June 2007



LEGEND

Water Column Toxicity Results

< 2 Toxic Events

> or Equal to 2 Toxic Events

No Toxic Events

Counties

Cities

Refuges

Land Use

Agriculture

Grazing Land

Native Lands

Water

Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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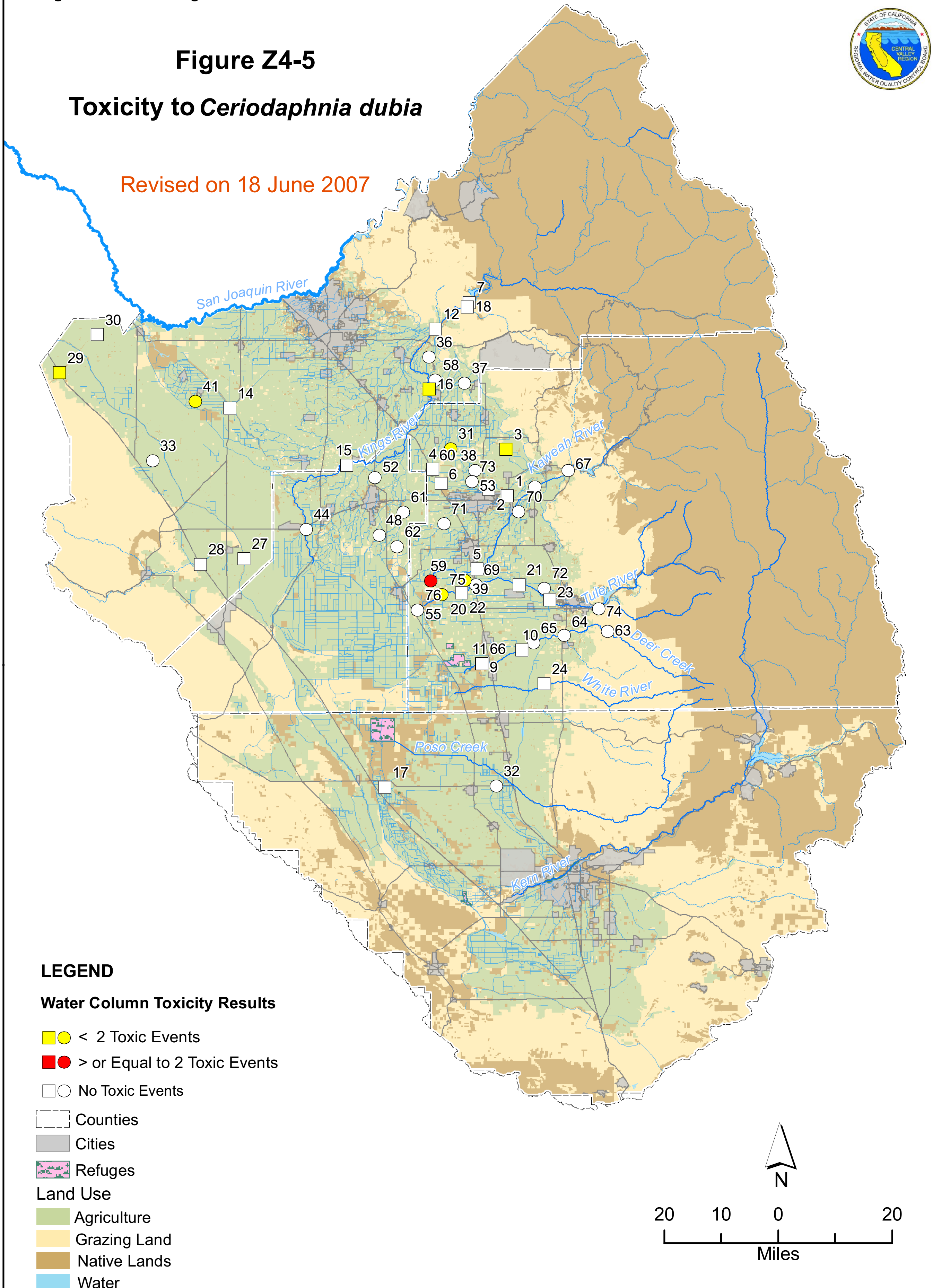
Irrigated Lands Program

Figure Z4-5

Toxicity to *Ceriodaphnia dubia*

Revised on 18 June 2007



Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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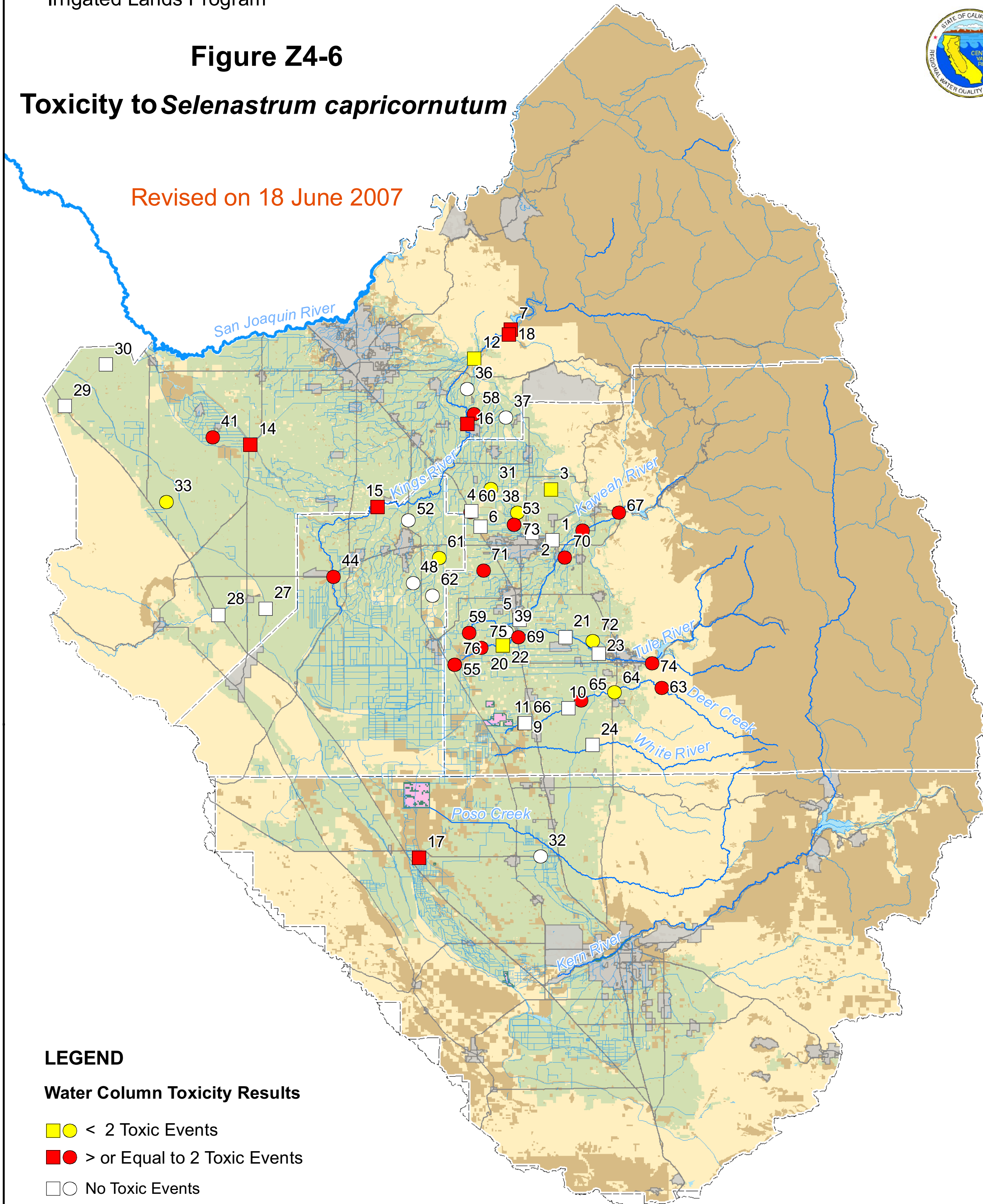
Irrigated Lands Program

Figure Z4-6

Toxicity to *Selenastrum capricornutum*

Revised on 18 June 2007



LEGEND

Water Column Toxicity Results

< 2 Toxic Events

> or Equal to 2 Toxic Events

No Toxic Events

Counties

Cities

Refuges

Land Use

Agriculture

Grazing Land

Native Lands

Water

Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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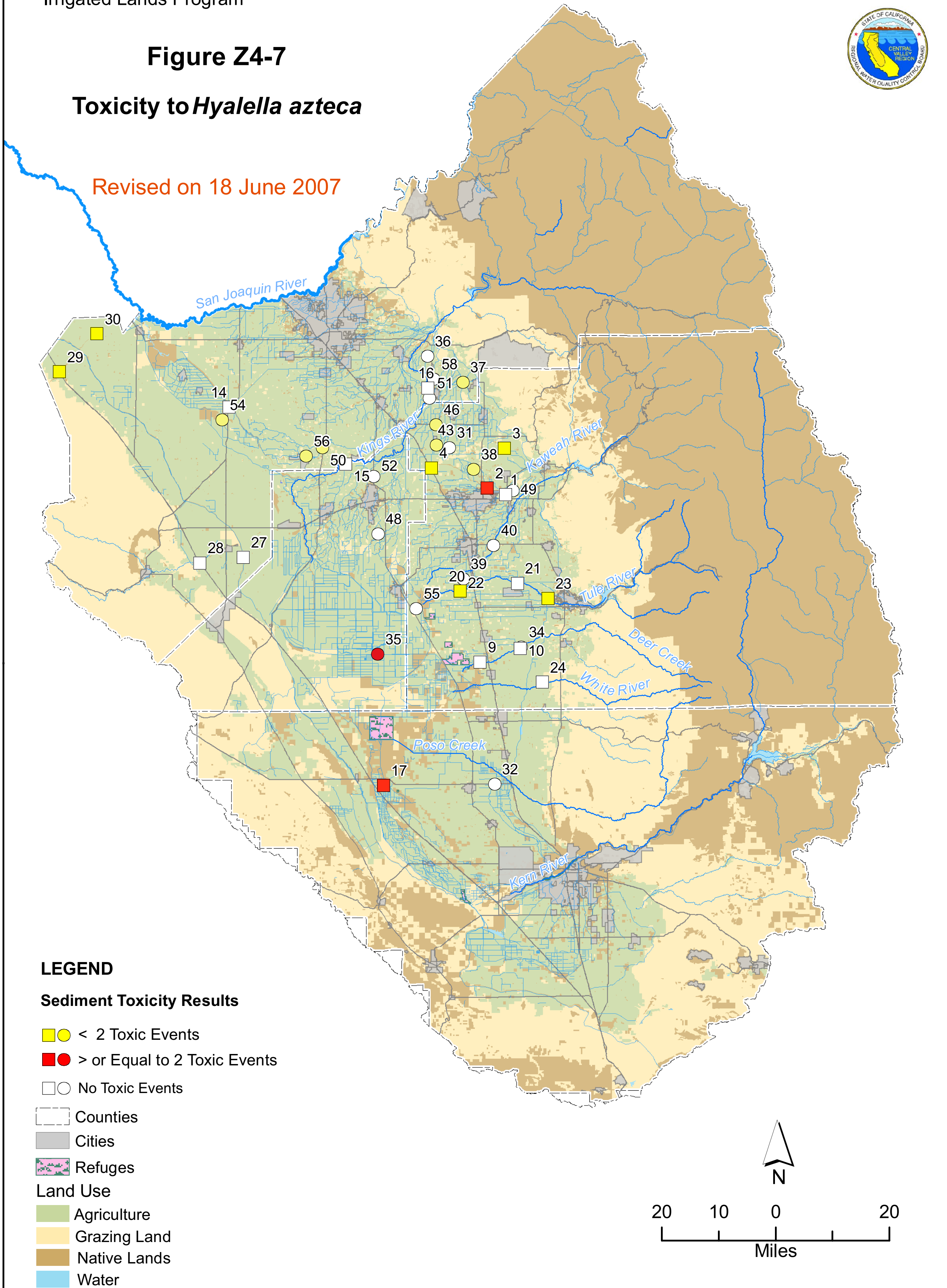
Irrigated Lands Program

Figure Z4-7

Toxicity to *Hyalella azteca*



Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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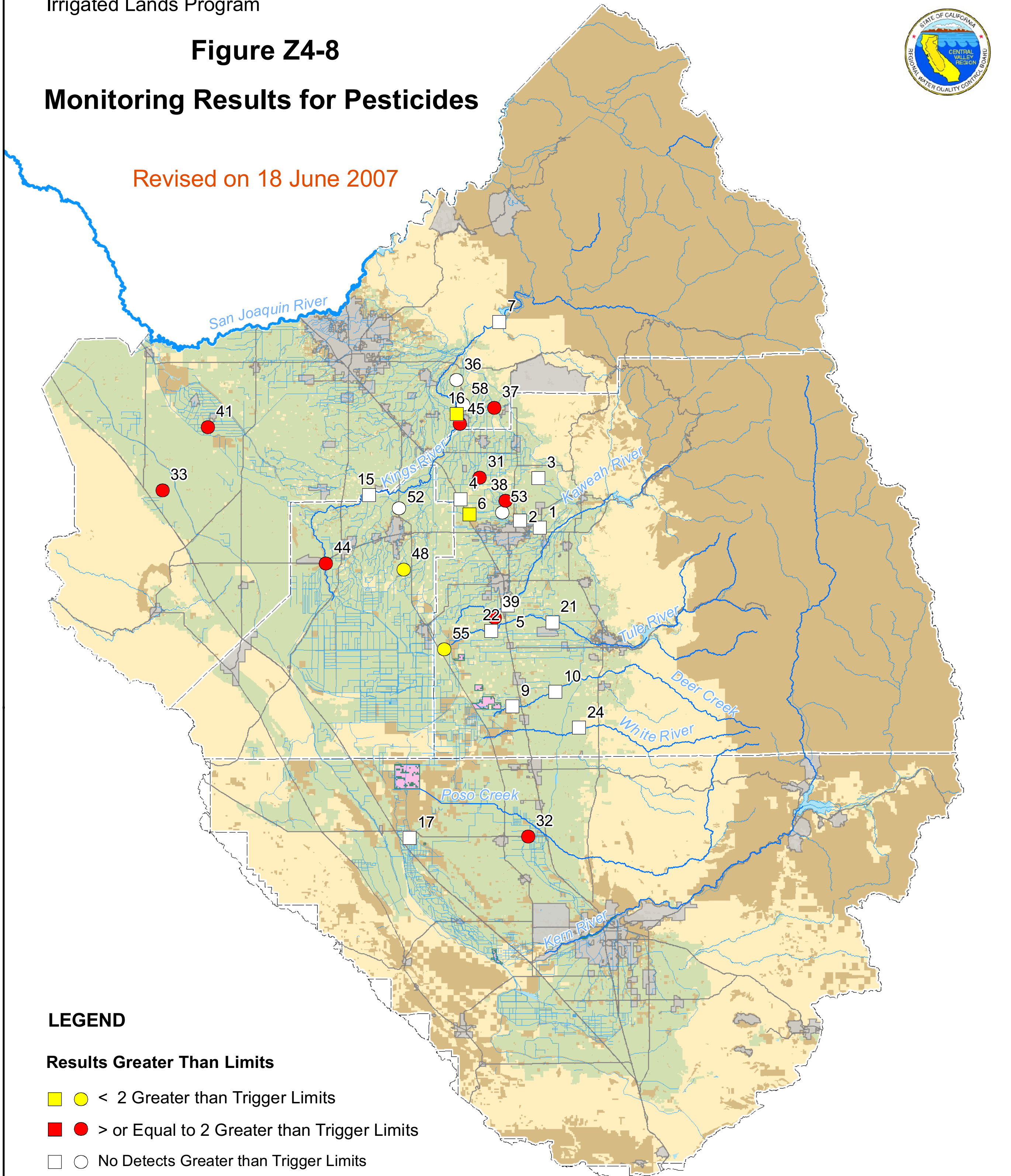
Irrigated Lands Program

Figure Z4-8

Monitoring Results for Pesticides

Revised on 18 June 2007



LEGEND

Results Greater Than Limits

< 2 Greater than Trigger Limits

> or Equal to 2 Greater than Trigger Limits

No Detects Greater than Trigger Limits

Counties

Cities

Refuges

Land Use

Agriculture

Grazing Land

Native Lands

Water

Sources:

- Department of Conservation. 2004. Division of Land Resources Protection. Farm Land Mapping and Monitoring Program.
- US EPA. 1998. River REach File 3 (RF3). United States Environmental Protection Agency. Office of Water, Office of Science and Technology, BASINS.

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