Appendix I

East San Joaquin Water Quality Coalition

High Priority Site Subwatershed Analysis

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HIGH PRIORITY SITE SUBWATERSHEDS (2008-2010)

I. DRY CREEK @ WELLSFORD RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper
- Diuron

Priority D

- *Selenastrum capricornutum* water column toxicity
- *Hyalella azteca* sediment toxicity

Priority E

- Dissolved Oxygen
- *E. coli*
- pH
- Specific Conductance
- Total Dissolved Solids

Description of Dry Creek at Wellsford Rd Site Subwatershed

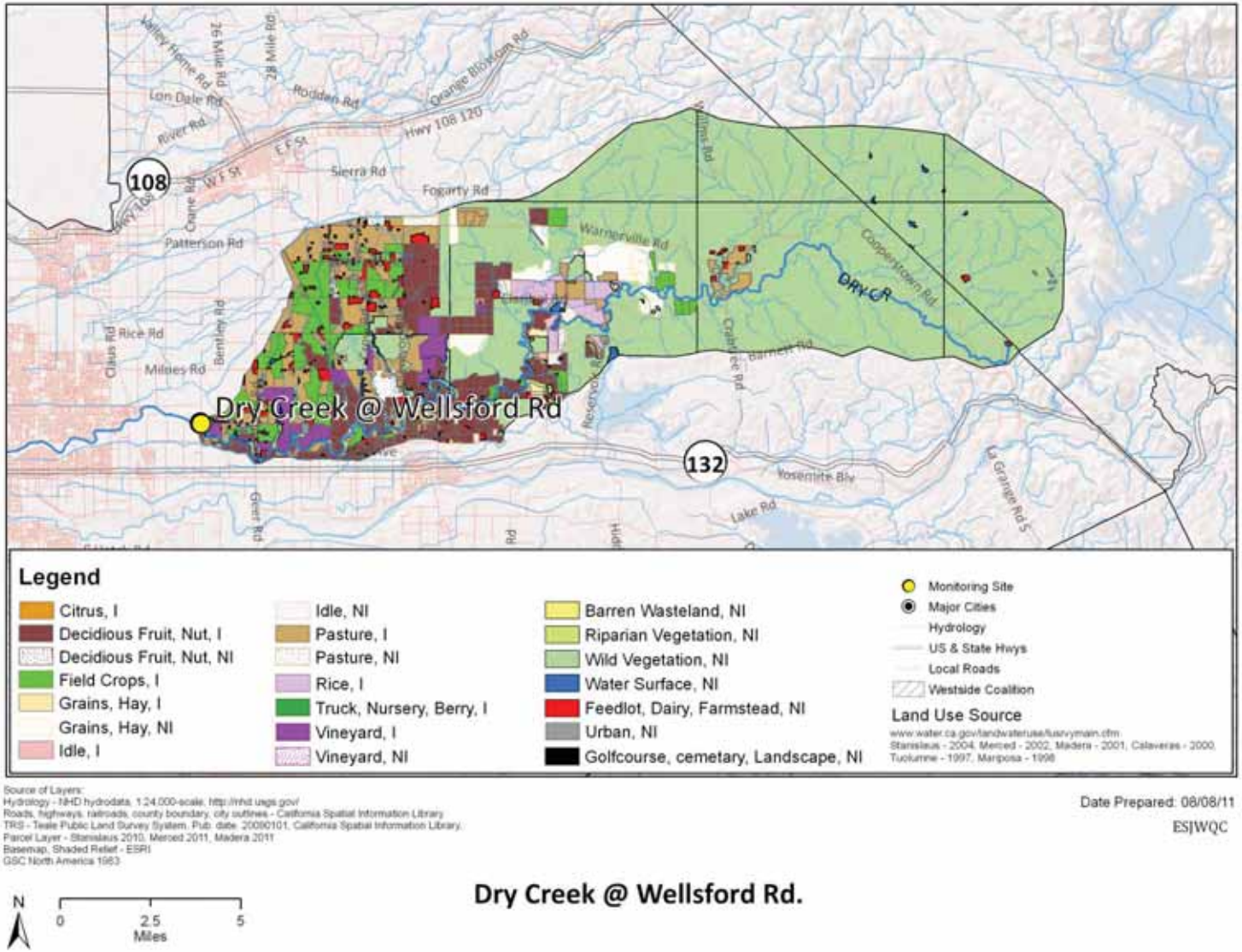
Dry Creek @ Wellsford Rd (23,794 irrigated acres) – Dry Creek originates to the east of Modesto and drains into the Tuolumne River. This site subwatershed samples Dry Creek at the furthest downstream location that collects agricultural drainage prior to flowing through the urban areas of Modesto (Table I-1). This site subwatershed includes an upstream location (Dry Creek @ Waterford Rd) which was sampled in 2008 and 2009. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal. Located in the northern part of the Coalition region, the primary irrigated agriculture is a combination of field crops, deciduous nuts, mixed pasture, and vineyards (Figure I-1).

Table I-1. Dry Creek @ Wellsford Rd site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Dry Creek @ Waterford Rd[u]	535XDCWF	37.6588	-120.7789
Dry Creek @ Wellsford Rd*	535XDCAWR	37.6602	-120.8743

U – Upstream sites
*Original ESJWQC sampling site

Figure I-1. Dry Creek @ Wellsford Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring within the Dry Creek subwatershed was initiated at Dry Creek @ Wellsford Rd in 2005 and continued uninterrupted through 2011 (Table I-2). The site is the Zone 1 Core Monitoring location under the 2008 MRPP and was monitored for Core constituents during the fall of 2008, and the 2009 through 2011 sampling years (Table I-3). Assessment Monitoring occurred at the site during 2011 and is scheduled to occur every third year (e.g. 2014, 2017). Core Monitoring resumed at this location in 2012. All constituents sampled at the Dry Creek subwatershed from 2005 through 2011 are listed in Table I-3.

Dry Creek @ Wellsford Rd MPM was initiated during the 2007 irrigation season and continued through 2011. Additional sampling occurred at Dry Creek @ Wellsford Rd in 2007 and upstream monitoring occurred at Dry Creek @ Waterford Rd in 2008 and 2009 for chlorpyrifos and toxicity to *C. dubia* (Table I-4). Due to exceedances, copper, diuron and toxicity to *S. capricornutum* and *H. azteca* were added to the Dry Creek @ Wellsford Rd management plan in 2010 (Table I-4). During 2011, monthly Assessment Monitoring occurred and the following MPM constituents were analyzed monthly: copper (February and April), chlorpyrifos (July-September), diuron (February), *S. capricornutum* (February and March), and *H. azteca* (March and September).

Dry Creek is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos, diazinon, *E. coli*, and unknown water toxicity.

Table I-2. Dry Creek @ Wellsford Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	9	0	**9**
2008	Storm	3	0	**3**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2009	Winter	2	0	**2**
	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2010	Winter	1	0	**1**
	Storm	3	0	**3**
	Irrigation	5	0	**5**
	Fall	3	0	**3**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	3	0	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.

Table I-3. Dry Creek @ Wellsford Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
Field and Physical Parameters																						
EPA 110.2	Color	2	5	2	5	2	6	2	6													
EPA 160.1	Dissolved Solids	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 160.2	Suspended Solids							1		2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 180.1	Turbidity	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 405.1	BOD				1	2	2															
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
SM 9223	*E. coli*	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
Walkley-Black	Total Organic Carbon (sediment)																		1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)																		1		1	
NA	Dissolved Oxygen	2	5	3	5	3	10	4	8	2	2	2	6	2	1	3	5	3	3	1	7	3
NA	Specific Conductivity	2	5	3	5	3	10	4	8	2	2	2	6	2	1	3	5	3	3	1	7	3
NA	pH	2	5	3	5	3	10	4	8	2	2	2	6	2	1	3	5	3	3	1	7	3
Carbamates																						
EPA 8321A	Aldicarb				5	2	6	2	6										2	1	6	3
EPA 8321A	Carbaryl				5	2	6	2	6										2	1	6	3
EPA 8321A	Carbofuran				5	2	6	2	6										2	1	6	3
EPA 8321A	Diuron				5	2	6	2	6							1			2	1	6	3
EPA 8321A	Linuron				5	2	6	2	6										2	1	6	3
EPA 8321A	Methiocarb				5	2	6	2	6										2	1	6	3
EPA 8321A	Methomyl				5	2	6	2	6										2	1	6	3
EPA 8321A	Oxamyl				5	2	6	2	6										2	1	6	3
Organochlorines																						
EPA 8081A	DDD(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	DDE(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	DDT(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	Dicofol				5	2	6	2	6										2	1	4	
EPA 8081A	Dieldrin				5	2	6	2	6										2	1	4	
EPA 8081A	Endrin				5	2	6	2	6										2	1	4	

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Methoxychlor				5	2	6	2	6										2	1	4	
Group A Pesticides																						
EPA 8081A	Aldrin																		2	1	4	
EPA 8081A	Chlordane																		2	1	4	
EPA 8081A	Endosulfan I																		2	1	4	
EPA 8081A	Endosulfan II																		2	1	4	
EPA 8081A	HCH, alpha																		2	1	4	
EPA 8081A	HCH, beta																		2	1	4	
EPA 8081A	HCH, delta																		2	1	4	
EPA 8081A	HCH, gamma																		2	1	4	
EPA 8081A	Heptachlor																		2	1	4	
EPA 8081A	Heptachlor epoxide																		2	1	4	
EPA 8081A	Toxaphene																		2	1	4	
Organophosphates																						
EPA 8141A	Azinphos methyl				5	2	7	2	6										2	1	6	3
EPA 8141A	Chlorpyrifos	2	5	2	5	2	8	2	6				2				3		2	1	6	3
EPA 8141A	Diazinon	2	5	2	5	2	7	2	6										2	1	6	3
EPA 8141A	Dimethoate	2	5	2	5	2	7	2	6										2	1	6	3
EPA 8141A	Disulfoton				5	2	7	2	6										2	1	6	3
EPA 8141A	Malathion				5	2	7	2	6										2	1	6	3
EPA 8321A	Methamidophos				5	2	6	2	6										2	1	6	3
EPA 8141A	Methidathion				5	2	7	2	6										2	1	6	3
EPA 8141A	Molinate				5	2	7	2	6													
EPA 8141A	Parathion, Methyl				5	2	7	2	6										2	1	6	3
EPA 8141A	Phorate				5	2	7	2	6										2	1	6	3
EPA 8141A	Phosmet				5	2	7	2	6										2	1	6	3
EPA 8141A	Thiobencarb				5	2	7	2	6													
EPA 8141A	Trifluralin																		2	1	6	3
Pyrethroids																						
EPA 8081A	Bifenthrin		1	2	5	2	6															
EPA 8081A	Cyfluthrin, total		1	2	5	2	6															
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6															

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6															
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6															
EPA 8081A	Permethrin, total	2	5	2	5	2	6															
Triazines																						
EPA 547M	Glyphosate				5	2	6	2	6										2		4	
EPA 549.2M	Paraquat dichloride				5	2	6	2	6										2		4	
EPA 619	Atrazine				5	2	6	2	6										2	1	6	3
EPA 619	Cyanazine				5	2	6	2	6										2	1	6	3
EPA 619	Simazine				5	2	6	2	6										2	1	6	3
Metals (Total)																						
EPA 200.8	Arsenic				5	2	6	2	6										2	1	5	
EPA 200.8	Boron				5	2	6	2	6										2	1	6	3
EPA 200.8	Cadmium				5	2	6	2	6										2	1	5	
EPA 200.8	Copper				5	2	6	2	6							2			2	1	6	3
EPA 200.8	Lead				5	2	6	2	6			1					3	3	2	1	5	
EPA 200.8	Molybdenum																		2	1	5	
EPA 200.8	Nickel				5	2	6	2	6										2	1	6	3
EPA 200.8	Selenium				5	2	2	2	6										2	1	6	3
EPA 200.8	Zinc				5	2	6	2	6										2	1	6	3
Metals (Dissolved)																						
EPA 200.8	Cadmium																		2	1	5	
EPA 200.8	Copper															2			2	1	6	3
EPA 200.8	Lead											1					3	3	2	1	5	
EPA 200.8	Nickel																		2	1	6	3
EPA 200.8	Zinc																		2	1	6	3
Nutrients																						
SM 2340 C	Hardness as CaCO3				5	2	6	2	6			1				2	3	3	2	1	6	3
EPA 300.0	Nitrate as N				5	2	6	2	6													
EPA 350.2	Ammonia as N				5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	3	6	2	2	1	1				3	3	2	1	6	3
EPA 354.1	Nitrite as N				5	2	6	2	6													
EPA 353.2	Nitrate + Nitrite as N							1		2	2	2	6	2	1	3	5	3	2	1	6	3

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 365.2	OrthoPhosphate as P				5	2	6	3	6	2	3	1	1				3	3	2	1	6	3
EPA 365.2	Phosphate as P				5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
Sediment Pesticides																						
EPA 8270M_NCI	Bifenthrin																				1	
EPA 8270M_NCI	Chlorpyrifos																				1	
EPA 8270M_NCI	Cyfluthrin																				1	
EPA 8270M_NCI	Cyhalothrin, lambda																				1	
EPA 8270M_NCI	Cypermethrin																				1	
EPA 8270M_NCI	Deltamethrin: Tralomethrin																				1	
EPA 8270M_NCI	Esfenvalerate/ Fenvalerate																				1	
EPA 8270M_NCI	Fenpropathrin																				1	
EPA 8270M_NCI	Permethrin																				1	
Toxicity																						
EPA 821-02-012	*Ceriodaphnia dubia*	2	5	2	6	2	7	2	6										2	1	6	3
EPA 821-02-012	*Pimephales promelas*	2	5	2	5	2	6	2	6										2	1	6	3
EPA 821-02-013	*Selenastrum capricornutum*	2	5	2	5	2	6	4	6							1			2	1	6	3
EPA 600/R-99-064	*Hyalella azteca*		1	1	1	1	1	2	2								1		1		1	

NA – Not applicable.

Table I-4. Dry Creek @ Wellsford Rd site subwatershed Management Plan Monitoring schedule (2007-2011).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Copper	Chlorpyrifos	Diuron	*C. dubia*	*S. capricornutum*	*H. azteca*
Dry Creek @ Wellsford Rd	31-Jul-07	A		X				
Dry Creek @ Wellsford Rd	28-Aug-07	A		X				
Dry Creek @ Wellsford Rd	25-Sep-07	A				X		
Dry Creek @ Waterford Rd	22-Jul-08	U		X				
Dry Creek @ Waterford Rd	19-Aug-08	U		X				
Dry Creek @ Waterford Rd	23-Sep-08	U		X		X		
Dry Creek @ Waterford Rd	21-Jul-09	U		X				
Dry Creek @ Wellsford Rd	21-Jul-09	MPM		X				
Dry Creek @ Waterford Rd	18-Aug-09	U		X				
Dry Creek @ Wellsford Rd	18-Aug-09	MPM		X				
Dry Creek @ Wellsford Rd	23-Feb-10	MPM	X		X		X	
Dry Creek @ Wellsford Rd	20-Apr-10	MPM	X					
Dry Creek @ Wellsford Rd	18-May-10	MPM						
Dry Creek @ Wellsford Rd	20-Jul-10	MPM		X				
Dry Creek @ Wellsford Rd	17-Aug-10	MPM		X				
Dry Creek @ Wellsford Rd	14-Sept-10	MPM		X				X
Dry Creek @ Wellsford Rd	17-Feb-11	MPM	X		X		X	
Dry Creek @ Wellsford Rd	15-Mar-11	MPM					X	
Dry Creek @ Wellsford Rd	17-Mar-11	MPM						X
Dry Creek @ Wellsford Rd	19-Apr-11	MPM	X					
Dry Creek @ Wellsford Rd	12-Jul-11	MPM		X				
Dry Creek @ Wellsford Rd	9-Aug-11	MPM		X				
Dry Creek @ Wellsford Rd	6-Sept-11	MPM		X				X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Dry Creek subwatershed (Dry Creek @ Wellsford Rd and Dry Creek @ Waterford Rd) from 2005 through 2011 exceeded the WQTLs for field parameters, *E. coli*, pesticides, and metals as well as water column and sediment toxicity. Table I-5 includes exceedances in this subwatershed (including the upstream site) of DO (39), pH (6), SC (1), TDS(1), *E. coli* (40), chlorpyrifos (10), diuron (2), thiobencarb (1), copper (3), lead (1), toxicity to *C. dubia* (2), *S. capricornutum* (4), and *H. azteca* sediment (3).

In 2011, exceedances included DO (4), pH (1), TDS (1) and *E. coli* (5). One sediment sample tested toxic to *H. azteca.*

All exceedances are listed in Table I-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. Using the ESJWQC Management Plan prioritization process flow chart (see Figure 4 on page 22 of the 2010 MPUR), priorities have been assigned to Management Plan constituents and are listed in the bottom row of Table I-5. The highest priority constituents in the Dry Creek @ Wellsford Rd site subwatershed are chlorpyrifos (A/B), copper and diuron (C), and toxicity to *S. capricornutum* and *H. azteca* (D; Table I-5).

Table I-5. Dry Creek @ Wellsford Rd site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	Diuron, > 2 µg/L	Thiobencarb, > 0 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Wellsford Rd	Storm	2/15/2005											80		
Dry Creek @ Wellsford Rd	Storm	3/22/2005		8.96			900								
Dry Creek @ Wellsford Rd	Irrigation	5/11/2005		6.26											
Dry Creek @ Wellsford Rd	Irrigation	6/15/2005	5.9				240								
Dry Creek @ Wellsford Rd	Irrigation	7/13/2005	5.7												
Dry Creek @ Wellsford Rd	Irrigation	8/17/2005		9.18			900			0.024					
Dry Creek @ Wellsford Rd	Irrigation	9/21/2005	6.98				500								
Dry Creek @ Wellsford Rd	Storm	3/1/2006					300								
Dry Creek @ Wellsford Rd	Storm	3/16/2006					1600								
Dry Creek @ Wellsford Rd	Irrigation	5/18/2006					280								
Dry Creek @ Wellsford Rd	Irrigation	6/15/2006	6.08												
Dry Creek @ Wellsford Rd	Irrigation	7/13/2006	6.69							0.026					
Dry Creek @ Wellsford Rd	Irrigation	8/10/2006								0.024					
Dry Creek @ Wellsford Rd	Irrigation	9/14/2006					310					0.1	70		
Dry Creek @ Wellsford Rd	Storm	2/11/2007	6.17				290				37			52	
Dry Creek @ Wellsford Rd	Storm	2/22/2007												16	
Dry Creek @ Wellsford Rd	Storm	2/28/2007					2400	8.4 (7.2)			4			32	

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	Diuron, > 2 µg/L	Thiobencarb, > 0 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Wellsford Rd	Storm	3/7/2007													
Dry Creek @ Wellsford Rd	Irrigation	4/17/2007						5.1 (5.0)							
Dry Creek @ Wellsford Rd	Irrigation	6/19/2007	5.77												
Dry Creek @ Wellsford Rd	Irrigation	7/17/2007	6.64							0.021					
Dry Creek @ Wellsford Rd	Irrigation	7/31/2007	6.91												
Dry Creek @ Wellsford Rd	Irrigation	8/14/2007	6.58				440								
Dry Creek @ Wellsford Rd	Irrigation	9/11/2007	6.5				420			0.043					
Dry Creek @ Wellsford Rd	Storm	1/24/2008					>2400								
Dry Creek @ Wellsford Rd	Storm	2/26/2008					>2400	11 (6.0)	1.8 (1.7)					33	
Dry Creek @ Wellsford Rd	Sediment	3/4/2008													88
Dry Creek @ Wellsford Rd	Irrigation	4/22/2008					>2400								
Dry Creek @ Wellsford Rd	Irrigation	5/20/2008	5.67				330								
Dry Creek @ Wellsford Rd	Irrigation	6/17/2008	6.31				>2400								
Dry Creek @ Waterford Rd	*Irrigation*	*7/22/2008*	*6.08*							*0.02*					
Dry Creek @ Wellsford Rd	Irrigation	7/22/2008	6.67				>2400			0.03					
Dry Creek @ Waterford Rd	*Irrigation*	*8/19/2008*	*5.93*							*0.023*					
Dry Creek @ Wellsford Rd	Irrigation	8/19/2008	6.85				580								
Dry Creek @ Wellsford Rd	Sediment	8/28/2008	6.64												73
Dry Creek @ Wellsford Rd	Irrigation	9/23/2008					290								

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	Diuron, > 2 µg/L	Thiobencarb, > 0 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Wellsford Rd	Irrigation	10/2/2008	5.83												
Dry Creek @ Wellsford Rd	Fall	10/21/2008	4.91				550								
Dry Creek @ Wellsford Rd	Fall	12/16/2008	2.77	8.68											
Dry Creek @ Wellsford Rd	Winter	1/20/2009	5.1		707										
Dry Creek @ Wellsford Rd	Winter	3/17/2009					250								
Dry Creek @ Wellsford Rd	Irrigation	5/19/2009	6.24				260								
Dry Creek @ Wellsford Rd	Irrigation	6/16/2009					1600								
Dry Creek @ Waterford Rd	*Irrigation*	*7/21/2009*	*6.89*												
Dry Creek @ Wellsford Rd	Irrigation	7/21/2009	5.9				270								
Dry Creek @ Wellsford Rd	Irrigation	8/18/2009					410			0.027					
Dry Creek @ Wellsford Rd	Fall	10/20/2009	4.04				490								
Dry Creek @ Wellsford Rd	Fall	11/17/2009	3.04				730								
Dry Creek @ Wellsford Rd	Storm	12/15/2009	6.65				820								
Dry Creek @ Wellsford Rd	Storm	1/19/2010	2.05												
Dry Creek @ Wellsford Rd	Storm	4/20/2010	6.99				2000								
Dry Creek @ Wellsford Rd	Irrigation	5/18/2010					370								
Dry Creek @ Wellsford Rd	Irrigation	6/15/2010	5.77												
Dry Creek @ Wellsford Rd	Irrigation	7/20/2010	6.30				490			0.067					
Dry Creek @ Wellsford Rd	Irrigation	8/17/2010	6.91				490								

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	Diuron, > 2 µg/L	Thiobencarb, > 0 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Wellsford Rd	Fall	10/19/2010	6.01				370								
Dry Creek @ Wellsford Rd	Fall	11/16/2010	5.36	6.14			390								
Dry Creek @ Wellsford Rd	Winter	1/18/2011				660									
Dry Creek @ Wellsford Rd	Winter	3/17/2011		8.68											
Dry Creek @ Wellsford Rd	Irrigation	4/19/2011					2000								
Dry Creek @ Wellsford Rd	Irrigation	5/10/2011					340								
Dry Creek @ Wellsford Rd	Irrigation	6/14/2011	6.36				280								
Dry Creek @ Wellsford Rd	Irrigation	7/12/2011	6.82												
Dry Creek @ Wellsford Rd	Irrigation	8/9/2011	6.52												
Dry Creek @ Wellsford Rd	Irrigation	9/6/2011					240								76
Dry Creek @ Wellsford Rd	Fall	12/6/2011	6.7				330								
		Constituent Priority	**E**	**E**	**E**	**E**	**E**	**C**	**NP**	**A/B**	**C**	**NP[R]**	**NP**	**D**	**D**

[1]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[R] – Not Prioritized; thiobencarb is only applied to rice and therefore will be managed under the Rice Coalition.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Dry Creek @ Wellsford Rd subwatershed are listed in Table I-6. These constituents include chlorpyrifos, copper, diuron, water toxicity to *S. capricornutum* and *C. dubia*, and sediment toxicity to *H. azteca*.

Chlorpyrifos exceeded the WQTL of 0.015 µg/L once during the first year of monitoring in 2005 (August) and twice again during 2006 (July and August). Normal Monitoring and additional monitoring occurred during 2007 and chlorpyrifos exceeded the WQTL in July and September. Neither exceedance was associated with a 2007 additional monitoring event. Upstream MPM occurred at Dry Creek @ Waterford Rd in 2008 and chlorpyrifos exceeded the WQTL in July and August, as well as once during 2008 Normal Monitoring (July) at the downstream Dry Creek @ Wellsford Rd location. Although upstream monitoring is typically scheduled for one season only, the Coalition continued to monitor the Dry Creek upstream location during 2009 irrigation season because of the inconsistent chlorpyrifos exceedances in 2008 at the Normal Monitoring and upstream locations. A single chlorpyrifos exceedance occurred at Dry Creek @ Wellsford Rd in 2009 (August) and in 2010 (July). Assessment Monitoring occurred at Dry Creek @ Wellsford Rd in 2011 and there were no chlorpyrifos exceedances (Table I-6). Chlorpyrifos MPM is scheduled to continue in 2012 during months of past exceedances (July, August, and September).

Copper exceeded the WQTL (calculated from associated hardness value) twice during 2007 Normal Monitoring (February and April) and again during 2008 Normal Monitoring (February). Due to the updated monitoring schedule that was implemented with the 2008 MRPP, MPM for copper did not begin until 2010. In the current 2008 MRPP, copper is not a Core Monitoring constituent and was not sampled during fall of 2008 and 2009 Core Monitoring at Dry Creek @ Wellsford Rd. Management Plan Monitoring for copper began during 2010 (February and April), and there were no exceedances. Assessment Monitoring occurred at Dry Creek @ Wellsford Rd in 2011 and again there were no exceedances of copper (TableI-6). Copper MPM is scheduled to continue in 2012 during months of past exceedances (February and April).

Diuron exceeded the WQTL twice during 2007 Normal Monitoring (February). In the current 2008 MRPP, diuron is not a Core Monitoring constituent and was not sampled during fall of 2008 and 2009 Core Monitoring at Dry Creek @ Wellsford Rd. The Coalition's original management plan strategy did not address storm exceedances due to the difficulty in sourcing those exceedances, and at the time of the management plan strategy's development the Coalition was not monitoring monthly (only storms and irrigation months). Starting in 2010, the Coalition updated its management plan strategy to monitor management plan constituents during the storm month that they occurred regardless of a rain event. In response to the updated management plan strategy, diuron MPM at Dry Creek @ Wellsford Rd began in February of 2010 and continued in February of 2011 (along with Assessment Monitoring). No exceedances of diuron occurred during 2010 or 2011. Core Monitoring will resume at Dry Creek @ Wellsford in 2012, and diuron MPM is scheduled during the month of past exceedances (February).

Toxicity to *C. dubia* occurred twice since 2005 (February 2005 and September 2006). Dry Creek @ Wellsford Rd was monitored monthly for toxicity to *C. dubia* during 2007 and the storm and irrigation seasons of 2008. Additional monitoring also occurred for toxicity to *C. dubia* in 2007 (September) and upstream MPM occurred in 2008 (September). No toxicity to *C. dubia* occurred during the 2007 and 2008 Normal Monitoring, additional monitoring, or MPM events. In 2009, *C. dubia* MPM was stopped because no exceedances occurred during the previous two consecutive years. *C. dubia* toxicity was analyzed during 2011 Assessment Monitoring and no toxicity occurred. No MPM monitoring is scheduled in 2012 for toxicity to *C. dubia*.

Toxicity to *S. capricornutum* occurred three times in February 2007, and once in February 2008. In the current 2008 MRPP, *S. capricornutum* toxicity is not a Core Monitoring constituent and was not sampled during fall of 2008 and 2009 Core Monitoring at Dry Creek @ Wellsford Rd. Due to the updated monitoring schedule that was implemented with the 2008 MRPP, MPM for *S. capricornutum* toxicity did not begin until 2010. The Coalition's original management plan strategy did not address storm exceedances due to the difficulty in sourcing those exceedances, and at the time of the management plan strategy's development the Coalition was not monitoring monthly (only storms and irrigation months). Starting in 2010, the Coalition updated its management plan strategy to monitor management plan constituents during the month that they occurred regardless of a rain event. In response to the updated management plan strategy, *S. capricornutum* toxicity MPM at Dry Creek @ Wellsford Rd began in February of 2010 and continued in February and March of 2011 (along with Assessment Monitoring). No toxicity occurred during 2010 or 2011 monitoring. Dry Creek @ Wellsford Rd will return to Core Monitoring in 2012 and the Coalition will conduct MPM for *S. capricornutum* toxicity during February and March 2012.

Toxicity to *H. azteca* occurred twice in 2008 (March and August). In the current 2008 MRPP, *H. azteca* toxicity is not a Core Monitoring constituent and was not sampled during fall of 2008, 2009, and winter 2010 Core Monitoring at Dry Creek @ Wellsford Rd. Sediment toxicity was added to the MPM schedule in September of 2010, so MPM for *H. azteca* only occurred once in 2010 (September). Starting in 2011, *H. azteca* MPM occurred in both months of past exceedances, March and September of 2011, with the September sample exhibiting toxicity to *H. azteca*. Management Plan Monitoring is scheduled to continue in 2012 during March and September.

Table I-6. Dry Creek @ Wellsford Rd site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007 NM (@ Wellsford Rd)	Date	NA	2/11/07	NA	4/17/07	5/15/07	6/19/07	7/17/07	8/14/07	9/11/07	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	0.011	<0.003	**0.021**	<0.003	**0.043**	NA	NA	NA
	C. dubia toxicity (% Control)	NA	95	NA	100	100	100	100	100	100	NA	NA	NA
2007 MPM A (@ Wellsford Rd)	Date	NA	2/28/07	NA	NA	NA	NA	7/31/07	8/28/07	9/25/07	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	<0.003	<0.003	NA	NA	NA	NA
	C. dubia toxicity (% Control)	NA	100	NA	NA	NA	NA	NA	NA	100	NA	NA	NA
2008 NM (@ Wellsford Rd)	Date	1/24/08	2/26/08	NA	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	9/23/08	NA	NA	NA
	Chlorpyrifos (µg/L)	<0.003	<0.003	NA	<0.003	<0.003	<0.003	**0.03**	<0.003	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	100	100	NA	100	100	100	100	100	100	NA	NA	NA
	S. capricornutum toxicity (% Control)	214	**33**	NA	176	201	380	237	320	624	NA	NA	NA
2008 MPM US (@ Waterford Rd)	Date	NA	NA	NA	NA	NA	NA	7/22/08	8/19/08	9/23/08	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	**0.02**	**0.023**	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	100	NA	NA	NA
2009 MPM (@ Wellsford Rd)	Date	NA	NA	NA	NA	NA	NA	7/21/09	8/18/09	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	0.013	**0.027**	NA	NA	NA	NA
2009 MPM US (@ Waterford Rd)	Date	NA	NA	NA	NA	NA	NA	7/21/09	8/18/09	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	<0.003	<0.003	NA	NA	NA	NA
2010 MPM (@ Wellsford Rd)	Date	NA	2/23/10	NA	4/20/10	NA	NA	7/20/10	8/17/10	9/14/10	NA	NA	NA
	Copper, dissolved (µg/L)	NA	3.2	NA	2.8	NA	NA	NA	NA	NA	NA	NA	NA
	Copper, total (µg/L)	NA	3.9	NA	4.3	NA	NA	NA	NA	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	**0.067**	0.013	<0.003	NA	NA	NA
	Diuron (µg/L)	NA	<0.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	1219	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	H. azteca toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	115	NA	NA	NA

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Date	1/18/11	2/17/11	3/15/11	4/19/11	5/10/11	6/14/11	7/12/11	8/9/11	9/6/11	10/11/11	11/8/11	12/6/11
2011 NM & MPM (@ Wellsford Rd)	Copper, dissolved (µg/L)	1.5	1.7*	2.0	2.5*	2.0	2.2	2.0	1.9	2.2	2.1	1.3	1.1
	Copper, total (µg/L)	2.4	2.1*	2.8	3.8*	3.2	3.7	3.5	3.0	3.0	3.3	1.7	1.4
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003*	<0.003*	<0.003*	<0.003	<0.003	<0.003
	Diuron (µg/L)	<0.2	<0.2*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	S. capricornutum toxicity (% Control)	725	393*	1212*	834	807	1325	422	548	686	893	4134	496
	H. azteca toxicity (% Control)	NA	NA	102*	NA	NA	NA	NA	NA	**76***	NA	NA	NA

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 and 2009 only.
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for the chlorpyrifos, copper and diuron detections (Table I-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values calculated and presented for pesticides or other constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide the Regional Water Board with a context for the concentrations of various constituents at the time samples were collected.

Table I-7. Dry Creek @ Wellsford Rd site subwatershed instantaneous load calculations for chlorpyrifos, copper and diuron.

Upstream site is italicized. Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Wellsford Rd	Chlorpyrifos	08/17/05	0	0.024	0
Dry Creek @ Wellsford Rd	Chlorpyrifos	07/13/06	123.91	0.026	91.23
Dry Creek @ Wellsford Rd	Chlorpyrifos	05/15/07	51.13	0.011	15.93
Dry Creek @ Wellsford Rd	Chlorpyrifos	07/17/07	68.57	0.021	40.78
Dry Creek @ Wellsford Rd	Chlorpyrifos	09/11/07	61.02	0.043	74.30
Dry Creek @ Wellsford Rd	Chlorpyrifos	07/22/08	63.22	0.03	53.71
Dry Creek at Waterford	*Chlorpyrifos*	*08/19/08*	*24.24*	*0.023*	*15.79*
Dry Creek @ Wellsford Rd	Chlorpyrifos	07/21/09	71.26	0.013	26.23
Dry Creek @ Wellsford Rd	Chlorpyrifos	08/18/09	47.07	0.027	35.99
Dry Creek @ Wellsford Rd	Chlorpyrifos	07/20/10	51.2	0.067	97.14
Dry Creek @ Wellsford Rd	Chlorpyrifos	08/17/10	51.94	0.013	19.12
Dry Creek @ Wellsford Rd	Copper	07/13/06	123.91	3.1	10877.15
Dry Creek @ Wellsford Rd	Copper	04/17/07	30.71	5.1	4435.04
Dry Creek @ Wellsford Rd	Copper	05/15/07	51.13	6.1	8831.87
Dry Creek @ Wellsford Rd	Copper	06/19/07	32.21	5.9	5381.33
Dry Creek @ Wellsford Rd	Copper	07/17/07	68.57	3.9	7572.62
Dry Creek @ Wellsford Rd	Copper	08/14/07	65.83	5.3	9879.77
Dry Creek @ Wellsford Rd	Copper	09/11/07	61.02	3.3	5702.08
Dry Creek @ Wellsford Rd	Copper	04/22/08	39.8	4.7	5296.98
Dry Creek @ Wellsford Rd	Copper	05/20/08	38.3	3.8	4121.26
Dry Creek @ Wellsford Rd	Copper	06/17/08	38.94	3.7	4079.86
Dry Creek @ Wellsford Rd	Copper	07/22/08	63.22	3.2	5728.64
Dry Creek @ Wellsford Rd	Copper	08/19/08	52.75	5.3	7916.73
Dry Creek @ Wellsford Rd	Copper	09/23/08	33.48	2.3	2180.52
Dry Creek @ Wellsford Rd	Copper	02/23/10	4.96	3.9	547.76
Dry Creek @ Wellsford Rd	Copper	04/20/10	20.8	4.3	2532.67
Dry Creek @ Wellsford Rd	Copper	01/18/11	27	2.4	1834.94
Dry Creek @ Wellsford Rd	Copper	02/17/11	2.74	2.1	162.94
Dry Creek @ Wellsford Rd	Copper	03/15/11	16.48	2.8	1306.66
Dry Creek @ Wellsford Rd	Copper	04/19/11	33.16	3.8	3568.17

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Wellsford Rd	Copper	05/10/11	21.39	3.2	1938.24
Dry Creek @ Wellsford Rd	Copper	06/14/11	34.06	3.7	3568.56
Dry Creek @ Wellsford Rd	Copper	07/12/11	56.41	3.5	5590.77
Dry Creek @ Wellsford Rd	Copper	08/09/11	50.1	3	4256.05
Dry Creek @ Wellsford Rd	Copper	09/06/11	39.42	3	3348.77
Dry Creek @ Wellsford Rd	Copper	10/11/11	29.5	3.3	2756.66
Dry Creek @ Wellsford Rd	Copper	11/08/11	0.34	1.7	16.37
Dry Creek @ Wellsford Rd	Copper	12/06/11	0.37	1.4	14.67
Dry Creek @ Wellsford Rd	Copper (D)	02/23/10	4.96	3.2	449.45
Dry Creek @ Wellsford Rd	Copper (D)	04/20/10	20.8	2.8	1649.18
Dry Creek @ Wellsford Rd	Copper (D)	01/18/11	27	1.5	1146.84
Dry Creek @ Wellsford Rd	Copper (D)	02/17/11	2.74	1.7	131.90
Dry Creek @ Wellsford Rd	Copper (D)	03/15/11	16.48	2	933.33
Dry Creek @ Wellsford Rd	Copper (D)	04/19/11	33.16	2.5	2347.48
Dry Creek @ Wellsford Rd	Copper (D)	05/10/11	21.39	2	1211.40
Dry Creek @ Wellsford Rd	Copper (D)	06/14/11	34.06	2.2	2121.85
Dry Creek @ Wellsford Rd	Copper (D)	07/12/11	56.41	2	3194.72
Dry Creek @ Wellsford Rd	Copper (D)	08/09/11	50.1	1.9	2695.50
Dry Creek @ Wellsford Rd	Copper (D)	09/06/11	39.42	2.2	2455.76
Dry Creek @ Wellsford Rd	Copper (D)	10/11/11	29.5	2.1	1754.24
Dry Creek @ Wellsford Rd	Copper (D)	11/08/11	0.34	1.3	12.52
Dry Creek @ Wellsford Rd	Copper (D)	12/06/11	0.37	1.1	11.53
Dry Creek @ Wellsford Rd	Diuron	04/17/07	30.71	0.29	252.19
Dry Creek @ Wellsford Rd	Diuron	04/22/08	39.8	0.2	225.40

Copper (D)-Dissolved Copper

Source Identification and Outreach

The Coalition addressed source identification in the 2011 MPUR and, in the following sections, considers 2011 monitoring results and Pesticide Use Report (PUR) data as they expand upon that discussion. The Coalition focuses its efforts on applied pesticides. During 2007 and 2008, the Coalition conducted additional and upstream MPM during those months when exceedances historically occurred to better characterize water quality in the subwatershed. From 2009 through 2011, MPM continued at Dry Creek @ Wellsford Rd to continue to assess water quality in the subwatershed as outreach in the area progressed. Assessment Monitoring occurred at the site during 2011. The PUR data are reviewed to determine the most frequent crop type and timing associated with applications. Dry Creek @ Wellsford subwatershed PUR data are available through November 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Dry Creek subwatershed began in 2009 and continued through 2011. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (25) representing 6,392 acres within the Dry Creek @ Wellsford subwatershed, including a new grower who joined the Coalition in 2010. Twenty-three growers participated in follow up contacts to determine if additional management practices were implemented and if any are planned to be

implemented, excluding two growers who no longer claimed their parcels. Management Plan Monitoring will continue in the Dry Creek @ Wellsford subwatershed during 2012 in order to demonstrate two consecutive years of monitoring with no exceedances of high priority constituents.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent in the Dry Creek @ Wellsford subwatershed.

Chlorpyrifos

Ten exceedances of the chlorpyrifos WQTL (0.015 µg/L) occurred at Dry Creek during the latter months of irrigation seasons in samples collected between 2005 and 2011 (Table I-5), including one exceedance in July of 2010. The Coalition evaluates monitoring and PUR data to identify possible sources of exceedances of constituents of concern.

In every high priority subwatershed, PUR data are reviewed for the number of monthly applications and pounds of active ingredient (AI) applied of the constituent of concern, and the acres treated by the constituent of concern (Table I-8, Figure I-2). The greatest amount of chlorpyrifos use occurred in 2005 (11,429 lbs AI) with the lowest amount of use occurring in 2011 (1,871 lbs AI). The greatest chlorpyrifos use occurs consistently in the month of July and exceedances often occur in the late summer (Figure I-2). The most recent chlorpyrifos applications preceding the 2010 July chlorpyrifos exceedance occurred in June 2010 (2219.5 lbs AI). There has been a steady decline in the overall used from 2005 to the present.

The Coalition also uses PUR data from each subwatershed to determine which crops receive the most applications of the constituent of concern (Table I-9). The highest application rates of chlorpyrifos in the Dry Creek subwatershed are associated with almond/walnut orchards, corn and grapes. The largest amount of chlorpyrifos applied from 2005 through 2011 was to almonds (22,744 lbs AI) followed by walnuts (16,683 lbs AI). The most common product containing chlorpyrifos used within this subwatershed was Lorsban.

Table I-8. Dry Creek @ Wellsford Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2004-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2005	1	152.5	75.0
February, 2005	3	170.4	94.0
March, 2005	3	120.9	111.0
April, 2005	6	464.6	521.5
May, 2005	23	3565.5	2988.4
June, 2005	15	1970.3	1244.0
July, 2005	50	4473.6	2865.0
August, 2005	14	509.8	381.8
September, 2005	1	2.0	0.8
February, 2006	1	8.0	83.0
March, 2006	4	98.1	60.5
May, 2006	28	4119.7	2738.4
June, 2006	15	863.3	559.9
July, 2006	55	3800.6	3489.0
August, 2006	28	864.6	481.0
September, 2006	5	123.9	62.5
October, 2006	3	137.4	73.9
December, 2006	1	29.9	15.0
March, 2007	1	10.2	23.0
April, 2007	6	28.1	140.4
May, 2007	25	2604.1	1663.9
June, 2007	27	965.4	637.0
July, 2007	43	2638.5	1700.2
August, 2007	12	470.4	237.8
September, 2007	3	33.6	22.0
October, 2007	2	137.6	93.3
November, 2007	4	247.4	133.2
January, 2008	1	29.9	14.0
April, 2008	3	20.8	10.4
May, 2008	34	1461.1	998.2
June, 2008	17	1184.9	905.0
July, 2008	58	2498.8	1636.9
August, 2008	14	517.7	367.5
September, 2008	7	363.4	212.6
October, 2008	5	68.1	301.2
March, 2009	4	381.2	203.0
April, 2009	6	389.9	164.4
May, 2009	22	1483.2	745.5
June, 2009	16	967.7	814.0
July, 2009	24	1119.8	641.7
August, 2009	11	430.0	364.8
September, 2009	5	132.5	78.8
November, 2009	3	487.4	259.5
February, 2010	1	112.7	60.0
April, 2010	2	0.7	0.4
May, 2010	6	393.9	197.0

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
June, 2010	8	598.3	346.5
July, 2010	44	2219.5	1761.3
August, 2010	17	1081.9	547.0
September, 2010	5	258.6	200.8
October, 2010	5	598.7	318.8
November, 2010	2	27.9	14.0
January, 2011	1	3.8	2.0
April, 2011	1	0.4	0.2
May, 2011	5	184.6	97.0
June, 2011	10	377.8	602.2
July, 2011	20	1190.5	617.0
August, 2011	4	113.1	53.9
September, 2011	1	1.6	27.0
Summaries by Year			
2005 Total	116	11429.8	8281.4
2006 Total	140	10045.5	7563.2
2007 Total	123	7135.3	4650.7
2008 Total	139	6144.6	4445.8
2009 Total	91	5391.6	3271.6
2010 Total	90	5292.2	3445.8
2011 Total	42	1871.7	1399.3
Total	**741**	**47310.7**	**33057.8**

Figure I-2. Dry Creek @ Wellsford Rd site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

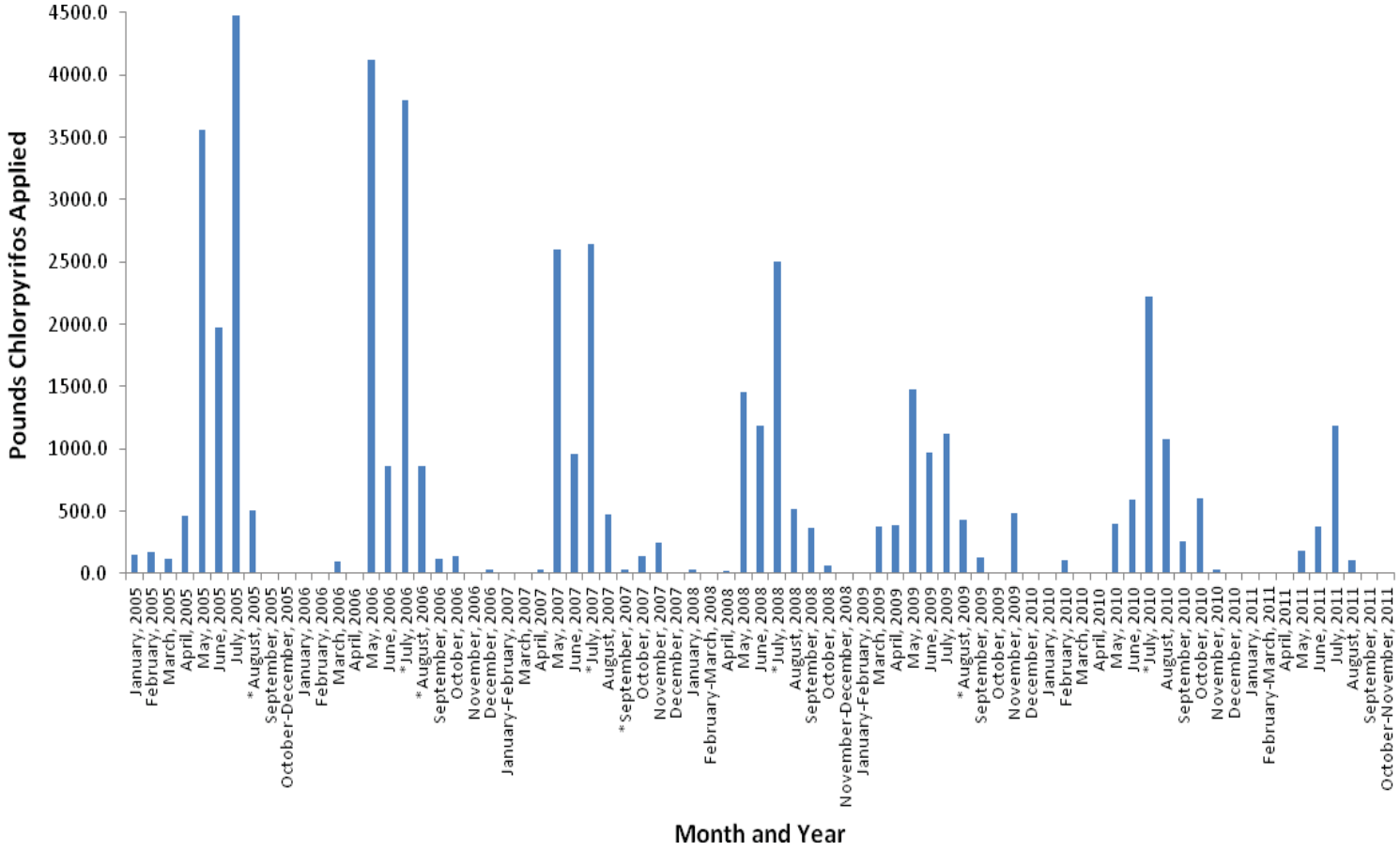


Table I-9. Dry Creek @ Wellsford Rd site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	NUFOS 4E	21.4
	ALMOND	CHLORPYRIFOS 4E AG	371.7
		GOVERN 4E INSECTICIDE	1173.7
		LORSBAN 4E INSECTICIDE	716.9
		LORSBAN 4E-HF	2724.7
		LORSBAN ADVANCED	2480.3
		LORSBAN-4E	13491.1
		NUFOS 4E	1737.6
		WARHAWK	48.5
	APPLE	LORSBAN 4E-HF	5.0
		LORSBAN ADVANCED	0.4
	APRICOT	LORSBAN 4E-HF	9.0
	CORN (FORAGE - FODDER)	GOVERN 4E INSECTICIDE	619.8
		LORSBAN 15G GRANULAR INSECTICIDE	1326.1
		LORSBAN 4E-HF	508.4
		LORSBAN ADVANCED	376.7
		LORSBAN-4E	476.8
		NUFOS 15G	618.0
		NUFOS 4E	97.0
		WARHAWK	775.0
	GRAPES (WINE)	LORSBAN 4E-HF	98.1
		LORSBAN ADVANCED	1648.1
		LORSBAN-4E	804.7
	N-OUTDR CONTAINER/FLD GRWN PLANTS	LORSBAN 15G GRANULAR INSECTICIDE	2.3
		LORSBAN 4E-HF	43.9
		LORSBAN 75WG	25.5
		LORSBAN-75WG	110.6
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	LORSBAN-4E	316.2
	WALNUT	CHLORPYRIFOS 4E AG	1357.3
		GOVERN 4E INSECTICIDE	197.0
		LORSBAN 4E INSECTICIDE	575.1
		LORSBAN 4E-HF	2488.4
		LORSBAN ADVANCED	1829.2
		LORSBAN-4E	6488.7
		NUFOS 4E	3647.2
		WARHAWK	101.0

ALFALFA - Total Pounds Chlorpyrifos Applied	**21.4**
ALMOND - Total Pounds Chlorpyrifos Applied	**22744.3**
APPLE - Total Pounds Chlorpyrifos Applied	**5.4**
APRICOT - Total Pounds Chlorpyrifos Applied	**9.0**
CORN - Total Pounds Chlorpyrifos Applied	**4797.7**
GRAPES - Total Pounds Chlorpyrifos Applied	**2550.8**
N-OUTDR CONTAINER - Total Pounds Chlorpyrifos Applied	**182.3**
N-OUTDR GRWN TRNSPLNT - Total Pounds Chlorpyrifos Applied	**316.2**
WALNUT - Total Pounds Chlorpyrifos Applied	**16683.7**
Total Pounds Chlorpyrifos Applied (2005 - 2011)	**47310.7**

The Coalition determined the most probable source of chlorpyrifos in Dry Creek was spray drift from adjacent orchards, particularly during the months July and August. As described in the 2010 and 2011 MPURs, results from general management practice surveys indicated spray application and orchard and vineyard water management practices are not widely implemented across the Coalition region within the subwatershed. Farmers applying to row crop were advised of methods to better manage their irrigation tailwater and storm water runoff, whereas outreach efforts focus on encouraging management practices aimed at reducing spray drift and also to improve orchard and vineyard water management. The Coalition understands not all management practices are applicable or even necessary for all irrigated acres and thus designed their outreach to affect an increase in implementation of relevant and effective management practices in parcels adjacent to the creek, which should result in the greatest improvement in water quality.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

Additionally, to gain more information about potential sources of discharge into the Dry Creek @ Wellsford Rd site subwatershed, the Stanislaus County Agricultural Commissioner's staff walked the waterway in November 2007 and documented the location all drains using GPS and digital photos. The Coalition mapped the drains and used this information to further assess possible sources of water quality impairments and to compile a list of growers targeted for outreach. The Coalition notified individuals owning the parcels where drains were found and conducted a joint meeting with the Stanislaus County Agriculture Commissioner in June 2008.

As outlined in the Coalition's Management Plan strategy, individual contacts with targeted growers began in January 2009. Targeted growers were selected based on the potential to drain or drift to the creek. The Coalition eventually developed a list of 24 targeted members with the potential to discharge to the creek. Two members who were previously dropped due to not scheduling a meeting elected to remain in the Coalition and participate in a grower meeting where they completed the management practice survey. Moreover, due to continued chlorpyrifos exceedances occurring during monitoring in 2010, a single grower was additionally contacted who had reported chlorpyrifos use on parcels that were associated with the exceedances. The grower had recently joined the Coalition and during the irrigation season of 2011 implemented new practices to address offsite movement of chlorpyrifos. No additional chlorpyrifos exceedances occurred during 2011.

The Coalition has now contacted 25 targeted growers within the Dry Creek @ Wellsford Rd subwatershed. Of the 23,331 irrigated acres in the Dry Creek subwatershed, the 25 targeted growers represent 6,392 acres of direct drainage, whereas the 22 growers only represented 6,116 acres of direct drainage (2012 MPUR, page 35).

Coalition representatives met with growers on their property to discuss the Dry Creek Management Plan and offer management practice recommendations specific to the parcel and land owner/operator. Individual meetings gave the Coalition a chance to better assess current management practices as well as planned management practice. Individual contacts focused mainly on chlorpyrifos exceedances, however, all water quality results were reviewed and discussed including exceedances of copper, diuron, *E. coli*, DO, SC, TDS, and pH, and toxicity to *S. capricornutum* and *H. azteca*.

To date, the Coalition contacted all 25 targeted members, which represent 6,392 or 27% of the total irrigated subwatershed acreage. The final targeted acreage is less than the acreage that has the potential to drain due to parcels/members being dropped from the original targeted list. Reasons for the drops include 1) the acres were not currently farmed, 2) the acres were pasture with no pesticide use, 3) the acres determined not to drain or have the potential to drift to the creek, or 4) there was no reported pesticide use.

On February 26, 2010, the Coalition hosted a Follow-Up to the 2009 Individual Contacts Grower Meeting. Using the Coalition's Interactive Survey Devices, growers were polled to determine what additional management practices were implemented in 2009 and if additional practices were planned for 2010. Members unable to attend the meeting were asked to participate in a phone interview with a Coalition representative between March 1 and August 4, 2010 to report their newly implemented management practices. Of the 25 targeted growers, three completed their initial survey late, two were not required to complete a follow up, and the additional member contacted who joined the Coalition in 2010 was followed up with in fall 2011. Therefore, 22 members were required to participate in follow up contacts. Three growers representing 524 acres received a recommendation to shut off outside nozzles when spraying outer rows next to sensitive sites, implemented the recommended management practice. The single grower farming 45 acres recommended to plant or allow vegetation to grow along ditches indicated that the drainage ditches around the fields was removed and therefore the management practice was no longer applicable. The same grower informed Coalition representatives during follow up contact that they continue to maintain vegetation buffer strips around the perimeter of their fields. Several other members with no irrigation drainage indicated they implemented new management practices in 2009 and 2011 without specific recommendations from the Coalition. One grower (107 acres) now allows grass to grow in the center of orchard rows, two growers (443 acres), began to use recirculation/tailwater return systems on their properties, a single grower (121.3 acres) constructed a drainage basin/sediment pond, a single grower (28 acres) installed filter strips at least 10 feet wide around their field perimeter and one grower (162 acres) used less water during surface irrigation. Overall, newly implemented management practices in 2009 and 2011 in the Dry Creek subwatershed included: shutting off outside nozzles when spraying outer rows next to sensitive sites, maintaining filter strips at least 10 feet wide around field perimeters, allowing grass to grow in the centers of orchard rows, using less water during surface irrigation, using recirculation/tailwater return systems, and constructing drainage basins/sediment ponds for operations with no irrigation drainage account for 2,585.5 acres. In addition, a single grower with drainage from their 2,450 acre property

indicated that they implemented new management practices but did not specify which type. This was the only implementation to property in the Dry Creek subwatershed with irrigation drainage.

All members were responsive to follow up interviews and have completed their *follow up* questions. The Coalition Assessment of implemented management practices is included in the Summary of Implemented Management Practices section of this report.

The Coalition will continue to assess water quality at Dry Creek @ Wellsford Rd through MPM during months of past exceedances. If exceedances occur, the Coalition will discuss with the Regional Board supplementary actions for outreach that may include contacting other chlorpyrifos sources such as dairy operations and/or contacting new members to the Coalition.

Priority C Constituents

Copper and diuron are listed as priority C constituents for the Dry Creek @ Wellsford subwatershed.

Copper

Exceedances of the hardness based copper WQTL occurred three times in this subwatershed from 2005 through 2011 (Table I-5). The Coalition began monitoring for both the total and dissolved copper fractions in October 2008 to better characterize copper contamination in the subwatershed. During 2011 Assessment Monitoring at Dry Creek @ Wellsford Rd, copper was analyzed every month and no exceedances occurred.

PUR data are reviewed for the number of monthly copper applications, pounds AI applied, and acres treated (Table I-10, Figure I-3). PUR data for the Dry Creek @ Wellsford subwatershed are available through November 2011. The greatest amount of copper was applied in 2005 (29,768 lbs) and the lowest amount applied in 2008 (12,278 lbs). Between 2004 and 2011, the greatest amount of copper use occurred in the months of January and April. There is no relationship between exceedances and time periods with the greatest use of copper (Figure I-3).

The largest amount of copper applied was associated with almond/walnut orchards and rice (Table I-11). The largest amount of copper from 2005 through 2011 was applied to walnuts (76,809 lbs AI), followed almond (44,947 lbs AI, Table I-11). The most common product containing copper used within this subwatershed was Kocide (Table I-11). Copper use is variable over time with no trend toward decreasing use.

Table I-10. Dry Creek @ Wellsford Rd site subwatershed copper applications, lbs AI applied and acres treated by month (2005-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	31.0	7502.5	1164.4
February, 2005	51.0	3674.3	1670.3
March, 2005	37.0	4857.1	1240.5

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
April, 2005	47.0	6643.5	2055.3
May, 2005	24.0	2935.5	691.7
June, 2005	3.0	161.6	72.0
July, 2005	1	0.5	10.0
August, 2005	2	84.3	35.1
September, 2005	1	15.0	10.0
November, 2005	3	3384.9	805.0
December, 2005	7	508.9	93.0
January, 2006	31	3440.9	823.5
February, 2006	46	2918.6	1551.5
March, 2006	5	146.7	103.0
April, 2006	50	4815.0	1139.9
May, 2006	46	8536.0	1657.8
June, 2006	6	816.5	132.0
August, 2006	2	49.5	22.0
October, 2006	1	6.2	2.0
November, 2006	4	177.8	57.5
December, 2006	4	353.9	51.0
January, 2007	20	6408.0	1517.2
February, 2007	45	2123.5	1348.0
March, 2007	31	3624.7	940.0
April, 2007	69	8186.8	2402.0
May, 2007	11	1542.5	254.8
June, 2007	3	938.1	100.0
July, 2007	2	129.0	43.0
August, 2007	1	18.0	6.0
October, 2007	1	32.3	3.0
November, 2007	5	1714.7	435.0
December, 2007	5	203.0	59.0
January, 2008	23	2736.1	603.5
February, 2008	41	1770.0	1270.0
March, 2008	15	1713.0	530.0
April, 2008	41	4943.4	1426.3
May, 2008	9	791.3	160.5
November, 2008	4	64.0	28.0
December, 2008	8	260.2	53.0
January, 2009	14	2432.3	590.3
February, 2009	48	1591.9	1125.0
March, 2009	2	23.4	23.0
April, 2009	54	5993.3	1539.0
May, 2009	20	3565.4	846.5
June, 2009	3	194.2	102.8
November, 2009	4	140.7	21.0
December, 2009	10	750.7	124.0
January, 2010	26	1316.9	368.5
February, 2010	67	2336.6	2098.5
March, 2010	19	756.4	285.0
April, 2010	114	11921.9	3493.0
May, 2010	24	1631.2	494.8
September, 2010	2	1005.9	380.0

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
October, 2010	1	45.2	14.0
November, 2010	2	45.2	14.0
December, 2010	7	359.2	79.0
January, 2011	14	1735.9	305.7
February, 2011	60	1880.9	1280.0
March, 2011	25	885.2	605.5
April, 2011	58	6996.3	2085.5
May, 2011	31	2307.3	745.0
June, 2011	13	1395.9	339.5
September, 2011	1	9.2	5.0
Summaries by Year			
2005 Total	207	29767.9	7847.3
2006 Total	195	21261.0	5540.1
2007 Total	193	24920.7	7108.0
2008 Total	141	12278.0	4071.3
2009 Total	155	14692.0	4371.5
2010 Total	262	19418.5	7226.8
2011 Total	202	15210.7	5366.1
Total	**1355**	**137548.7**	**41531.0**

Figure I-3. Dry Creek @ Wellsford Rd site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

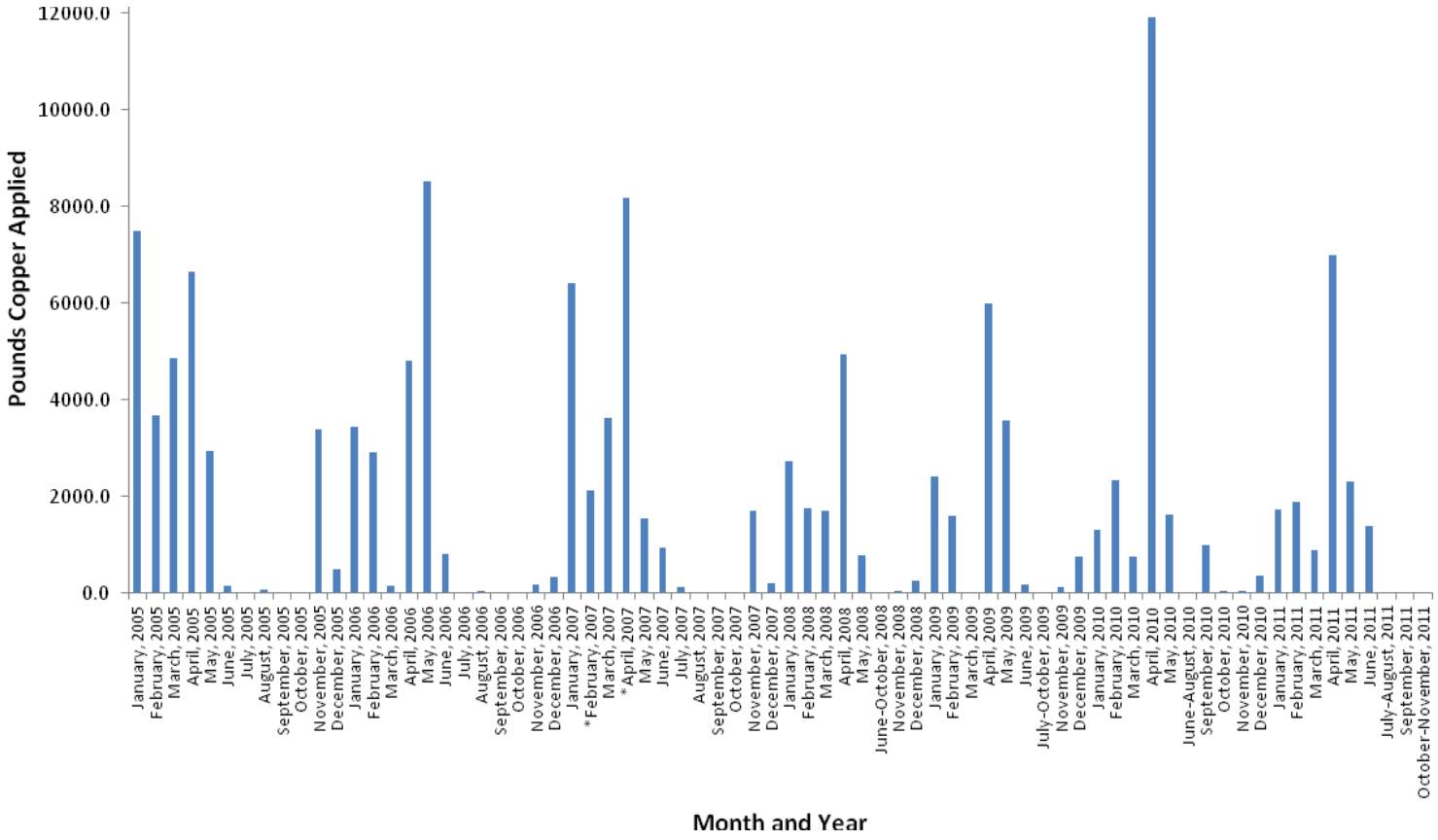


Table I-11. Dry Creek @ Wellsford Rd site subwatershed copper PUR data (2005-2011).

PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALMOND	BASIC COPPER 53	5742.8
		BASICOP	712.9
		CHAMP FORMULA 2 FLOWABLE	10060.4
		CHAMP WG	743.1
		CHAMPION WETTABLE POWDER	1545.8
		CUPROFIX ULTRA 40 DISPERSS	1601.2
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	2168.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	379.9
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	518.2
		HYDROX	4864.9
		KENTAN DF	282.0
		KOCIDE 101	2943.2
		KOCIDE 2000	1637.7
		KOCIDE DF	1796.3
		NORDOX	49.4
		NORDOX 75 WG	4256.6
		NU-COP 50 WP	352.7
		NU-COP 50DF	5179.8
		NUCOP DF	112.5
		NUTRA-SPRAY ZN12-MN2-CU10	0.5
	APRICOT	CHAMPION WETTABLE POWDER	69.3
		COPPER SULFATE CRYSTALS	89.1
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	62.2
		NORDOX	34.5
		NORDOX 75 WG	56.6
		NU-COP 50DF	6.2
		TRIANGLE BRAND COPPER SULFATE	89.1
	CHERRY	CHAMPION WETTABLE POWDER	107.8
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	17.3
		KOCIDE 101	57.8
	GRAPES (WINE)	BRITZ COPPER SULFUR 15-25 DUST	445.8
		CHAMP FORMULA 2 FLOWABLE	979.4
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	43.0
		KOCIDE 2000	82.2
		KOCIDE DF	58.4
		NU-COP 3L	35.8
		WIL-DRY	1005.9
	NECTARINE	CHAMP WG	170.9
		CHAMPION WETTABLE POWDER	862.4
		KOCIDE 101	154.0
	N-OUTDR CONTAINER/FLD GRWN PLANTS	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	206.6
		KOCIDE 101	146.3
		KOCIDE 2000	37.1
		KOCIDE DF	180.5
		PHYTON-27 BACTERICIDE & FUNGICIDE	2.1
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	CHAMP FORMULA 2 FLOWABLE	386.4
	OLIVE (ALL OR UNSPEC)	CUPROFIX ULTRA 40 DISPERSS	2.7

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	PEACH	BASIC COPPER 53	73.5
		CHAMP WG	23.1
		CHAMPION WETTABLE POWDER	1002.5
		CUPROFIX ULTRA 40 DISPERSS	76.8
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	63.8
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	30.7
		HYDROX	442.0
		KOCIDE 101	16.2
		KOCIDE 2000	33.9
		KOCIDE DF	334.0
		NORDOX 75 WG	490.6
		NU-COP 50 WP	164.8
		NU-COP 50DF	91.6
	PISTACHIO (PISTACHE NUT)	CUPROFIX ULTRA 40 DISPERSS	36.7
		KENTAN DF	367.8
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	CHAMPION WETTABLE POWDER	314.2
		NORDOX 75 WG	48.5
	RICE (ALL OR UNSPEC)	BLUE VIKING COPPER SULFATE STAR SHINE CRYSTAL	910.8
		CHIPCO COPPER SULFATE CRYSTALS	5098.5
		KOCIDE COPPER SULFATE STAR SHINE CRYSTALS	782.1
	WALNUT	BLUE SHIELD DF	92.4
		CHAMP FLOWABLE	79.4
		CHAMP FORMULA 2 FLOWABLE	3559.4
		CHAMP WG	2387.4
		CHAMPION WETTABLE POWDER	2631.1
		CUPROFIX ULTRA 40 DISPERSS	989.7
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	1037.7
		DUPONT KOCIDE 101 FUNGICIDE/BACTERICIDE	739.2
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	12547.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	3483.8
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	175.6
		HYDROX	1216.6
		KENTAN DF	2855.4
		KOCIDE 101	5439.5
		KOCIDE 2000	8015.3
		KOCIDE DF	13306.0
		NORDOX	450.1
		NORDOX 75 WG	1854.2
		NU-COP 50 WP	802.3
		NU-COP 50DF	14007.8
		NU-COP HB	1139.6

ALMOND - Total Pounds Copper Applied	**44947.9**
APRICOT - Total Pounds Copper Applied	**407.0**
CHERRY - Total Pounds Copper Applied	**182.8**
GRAPES - Total Pounds Copper Applied	**2650.5**
N-OUTDR CONTAINER - Total Pounds Copper Applied	**572.6**
N-OUTDR GRWN TRNSPLNT - Total Pounds Copper Applied	**386.4**
NECTARINE - Total Pounds Copper Applied	**1187.3**

Chemical Name	Commodity	Product Name	Lbs AI Applied
		OLIVE - Total Pounds Copper Applied	2.7
		PEACH - Total Pounds Copper Applied	2843.5
		PISTACHIO - Total Pounds Copper Applied	404.5
		PLUM - Total Pounds Copper Applied	362.7
		RICE - Total Pounds Copper Applied	6791.4
		WALNUT - Total Pounds Copper Applied	76809.4
		Total Pounds Copper Applied (2005-2011)	137548.7

The Coalition determined future outreach should focus on providing information to specific growers located adjacent to Dry Creek to encourage the retention of water and sediment on the fields, especially during the dormant season when copper is known to enter the waterway. This coincides with the Coalition's Management Plan strategy outlined in the chlorpyrifos Source Identification and Outreach section above. Orchard and vineyard operators are advised to consider management practices to prevent copper from entering the waterway with runoff when applicable. Storm runoff management relevant to copper applications was recommended to reduce runoff and prevent winter exceedances. Individual contacts with growers within this subwatershed are described in the First Priority Subwatersheds Summary of Management Practices section of this report, as are discussions of copper exceedances and relevant management practices. Management practices recommended to prevent chlorpyrifos from entering the creek are also applicable in preventing offsite movement of copper. The Coalition believes that their outreach strategy and management practice implementation is responsible for the improvement in water quality since no additional copper exceedances occurred at Dry Creek @ Wellsford Rd since February 2008.

Diuron

Diuron is a soluble herbicide applied in the Dry Creek subwatershed primarily in October through June. Between 2004 and 2011, the largest amount of diuron used was in 2006 (1,063 lbs AI) and the least amount used was in 2005 (233 lbs AI), see Table I-12. The month with the greatest amount AI applied varied over the years with the most applications occurring in January and November 2006, January 2007, November 2009, November and December 2010, and July 2011 (Table I-12, Figure I-4). The highest application rates and largest amount of diuron applied from 2005 through 2011 are associated with walnuts and grapes (including wine, Table I-13).

Two applications were associated with two storm exceedances in 2007. A third application occurred five weeks prior to the first exceedance and a fourth application occurred approximately seven weeks prior to the first exceedance. No exceedances of diuron have occurred since February 2007.

Core Monitoring took place at Dry Creek during 2009; diuron was not monitored as a part of 2009 MPM. Diuron was monitored during February 2010 MPM and monthly during 2011 Assessment Monitoring and was not detected. In 2011, a total of seven applications of diuron occurred in the Dry Creek subwatershed. Dry Creek @ Wellsford will return to Core Monitoring in 2012, and diuron MPM will occur during February 2012.

Table I-12. Dry Creek @ Wellsford Rd site subwatershed diuron applications, lbs AI applied and acres treated by month (2005-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
January, 2005	2	40.5	42.0
February, 2005	1	9.8	6.0
March, 2005	1	40.2	25.8
April, 2005	3	72.4	70.0
June, 2005	1	34.2	17.5
November, 2005	3	36.1	47.0
January, 2006	2	348.1	338.5
February, 2006	3	93.0	38.0
May, 2006	2	41.8	33.0
June, 2006	1	233.9	320.0
November, 2006	4	336.3	430.0
December, 2006	1	10.1	7.0
January, 2007	2	220.4	156.0
February, 2007	1	29.3	40.0
August, 2007	2	23.4	41.0
November, 2007	1	215.6	275.0
December, 2007	6	128.1	409.0
February, 2008	2	9.0	11.3
March, 2008	1	7.7	24.0
April, 2008	1	58.5	40.0
July, 2008	4	39.6	39.0
August, 2008	2	28.4	26.0
October, 2008	2	43.7	142.5
December, 2008	3	111.5	303.0
January, 2009	5	24.0	46.0
February, 2009	1	4.0	5.0
November, 2009	5	237.8	795.0
December, 2009	3	143.6	489.0
February, 2010	5	68.4	379.0
July, 2010	1	12.3	12.3
November, 2010	4	314.7	825.0
December, 2010	4	292.3	554.0
January, 2011	4	41.2	57.3
February, 2011	1	389.8	200.0
July, 2011	2	334.2	222.9
Summaries by Year			
2005 Total	11	233.1	208.3
2006 Total	13	1063.2	1166.5
2007 Total	12	616.8	921.0
2008 Total	15	298.4	585.8
2009 Total	14	409.4	1335.0
2010 Total	14	687.6	1770.3
2011 Total	7	765.2	480.3
Total	**86**	**4073.6**	**6467.1**

Figure I-4. Dry Creek @ Wellsford Rd site subwatershed lbs diuron applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

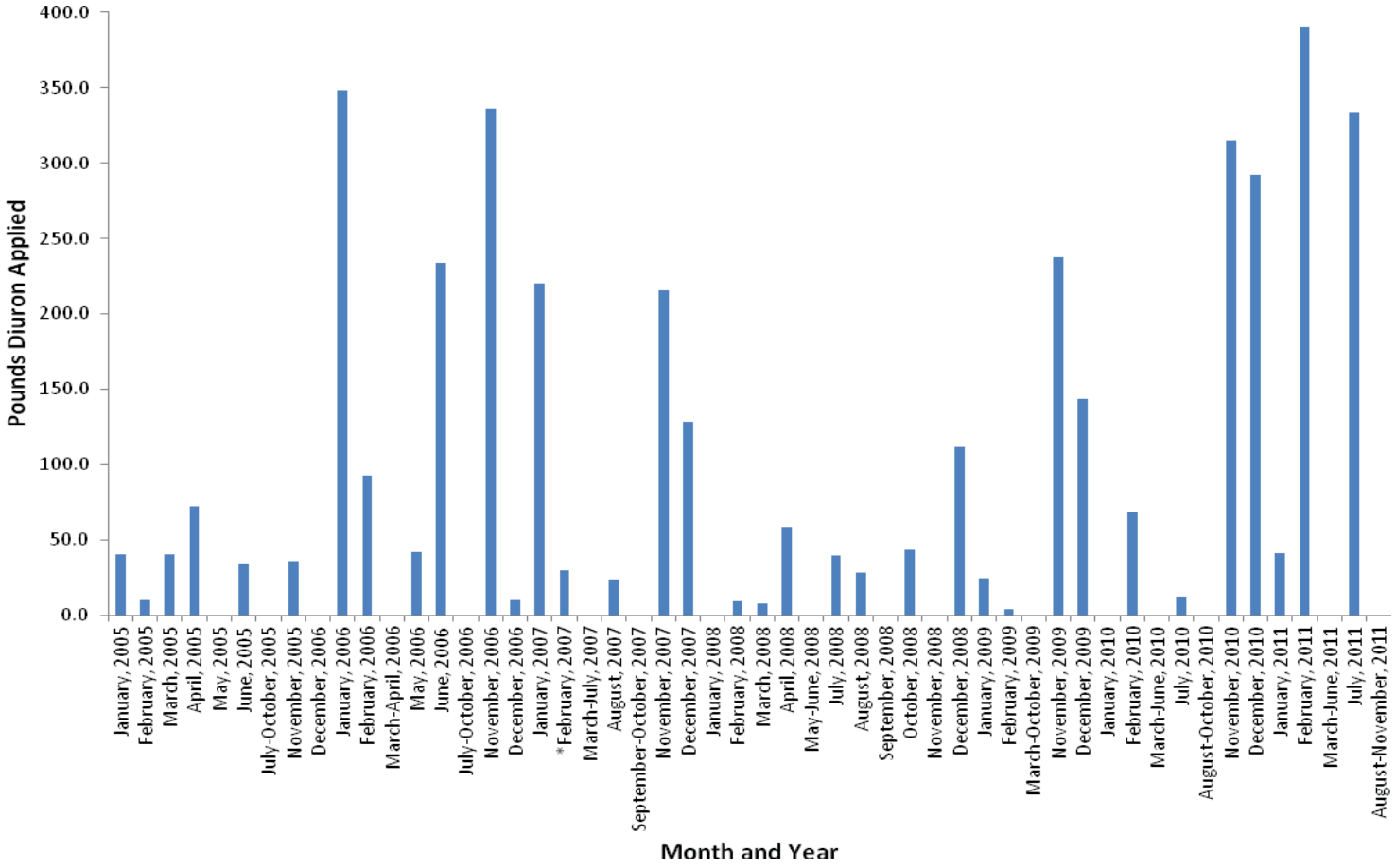


Table I-13. Dry Creek @ Wellsford Rd site subwatershed diuron PUR data (2005-2011).
PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIURON	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DIREX 4L	10.1
	ALMOND	DUPONT DIREX 4L HERBICIDE	2.6
	GRAPES (WINE)	DIREX 4L	371.5
		DIURON 4L	215.6
		DIURON 4L HERBICIDE	320.2
		DUPONT DIREX 4L HERBICIDE	843.2
	PASTURES (ALL OR UNSPEC)	DIREX 4L	31.0
	UNCULTIVATED NON-AG AREAS (ALL OR UNSPEC)	DUPONT DIREX 4L HERBICIDE	4.0
	WALNUT	DIREX 4L	1703.3
		DIURON 4L HERBICIDE	47.1
		DREXEL DIURON 4L HERBICIDE	334.2
		DUPONT DIREX 4L HERBICIDE	190.8

ALFALFA -Total Pounds Diuron Applied	**10.1**
ALMOND - Total Pounds Diuron Applied	**2.6**
GRAPES - Total Pounds Diuron Applied	**1750.5**
PASTURES - Total Pounds Diuron Applied	**31.0**
UNCULTIVATED NON-AG AREAS - Total Pounds Diuron Applied	**4.0**
WALNUT - Total Pounds Diuron Applied	**2275.4**
Total Pounds Diuron Applied (2005-2011)	**4073.6**

The Coalition's Management Plan strategy for addressing diuron exceedances is to include diuron in discussions with individual growers. Improved and additional water management practices should reduce or eliminate diuron exceedances.

Priority D Constituents

The priority D constituents in the Dry Creek @ Wellsford Rd subwatershed are water column toxicity to *S. capricornutum* and sediment toxicity to *H. azteca.*

S. capricornutum toxicity

S. capricornutum toxicity occurred once during the 2008 storm season and was associated with an exceedance of the copper WQTL. Copper exceedances and *S. capricornutum* toxicity can be closely tied as copper is used as an algaecide as well as a fungicide. Diuron can also adversely affect algae. *S. capricornutum* toxicity was monitored for but did not occur in 2011. Total and dissolved copper and diuron were also monitored in 2011 along with *S. capricornutum* toxicity and none of these constituents exceeded their WQTLs.

Since focused outreach began in 2009, *S. capricornutum* toxicity has not occurred at Dry Creek @ Wellsford Rd. The Coalition has discussed toxicity to *S. capricornutum* and associated pesticides during individual grower meetings, and has conducted outreach regarding the retention of storm water runoff. If the Coalition finds that diuron and copper exceedances are eliminated and *S. capricornutum* toxicity persists, then additional herbicides will be targeted for outreach and management. The Coalition will

conduct MPM in 2012 for *S. capricornutum* toxicity in order to demonstrate two consecutive years of monitoring with no toxicities.

H. azteca toxicity

As a result of *H. azteca* toxicities that occurred in March and August 2008, *H. azteca* was listed as a priority D constituent in the Dry Creek site subwatershed. In September 2011 during Assessment Monitoring/MPM, an additional *H. azteca* toxicity occurred. In 2010, the Coalition began analyzing for pyrethroids and chlorpyrifos in toxic sediment samples with 80% or less survival compared to the control. The chemistry analysis of the sediment samples collected from Dry Creek @ Wellsford Rd on September 6, 2011 indicated the samples contained sediment bound bifenthrin and chlorpyrifos. Pyrethroids have a high sorption rate to sediment particles and can be carried with suspended particles in storm water runoff and irrigation tailwater to waterways. The Coalition believes that addressing storm water and irrigation tailwater management, movement of pyrethroids to waterways will also be addressed.

Priority E Constituents

The priority E constituents are listed under the Dry Creek @ Wellsford Rd subwatershed management plan are DO, *E. coli*, pH, SC, and TDS.

Total Dissolved Solids was added to the Dry Creek @ Wellsford Rd management plan in 2011, due to a single exceedance in January 2011. Although DO, *E. coli*, pH, SC and TDS remain low priority, the Coalition will continue to collect priority E constituent monitoring data as a part of Core, and/or Assessment Monitoring. Dry Creek @ Wellsford Rd is scheduled for Core Monitoring in 2012. The priority E constituents were discussed during individual contacts and at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

This subwatershed is one of the first three priority site subwatersheds within the ESJWQC. Therefore, the Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Dry Creek subwatershed is to target growers with crops located adjacent to the waterway and whose agricultural practices may result in the discharge or drift of pesticides into the creek. Outreach includes grower notification of exceedances and the need for meetings, outreach and education regarding management practices, tracking of the implementation of management practices, and providing information to growers on studies of the efficacy of those management

practices. The Coalition believes that because land use near the creek is predominately orchards and vineyards, outreach aimed toward orchard and vineyard management practices will target the appropriate audience and result in the greatest improvement of water quality.

Individual grower surveys documenting current management practices and follow up contacts assessing planned implementation strategies were completed and returned for 100% of the targeted growers. The Summary of Implemented Management Practice section of this report summarizes the results of these surveys.

Both the overall acres treated and pounds of chlorpyrifos applied decreased since 2005, which may be a result of many factors including educating growers about alternative products. Usage of chlorpyrifos has decreased in the months of July and August, when the largest number of exceedances have occurred historically. Despite this, chlorpyrifos last exceeded the WQTL in Dry Creek in July 2010. The exceedance was traced to a new member who joined the Coalition in 2010. The grower was contacted and implemented a micro-irrigation system over 68 acres. Since the management practice implementation, no additional chlorpyrifos exceedances have occurred.

During 2012, Dry Creek @ Wellsford Rd is scheduled for Core Monitoring and MPM will continue to take place during months of past exceedances. The Coalition believes continued MPM will provide the data needed to assess if additional funding and implemented management practices are improving water quality.

Although chlorpyrifos remains a high priority constituent in the Dry Creek @ Wellsford management plan, copper, diuron and SC have seen zero exceedances for two or more consecutive years of monitoring in months of past exceedances. Additionally, there has been no toxicity to *S. capricornutum* for two consecutive years of monitoring in months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove these constituents from the Dry Creek @ Wellsford management plan. Until the letter is approved, the constituents will continue to be monitored as scheduled.

II. DUCK SLOUGH @ HWY 99

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Selenastrum capricornutum* water column toxicity

Priority E

- Dissolved Oxygen
- *E. coli*
- pH
- Lead

Description of Duck Slough @ Hwy 99 Site Subwatershed

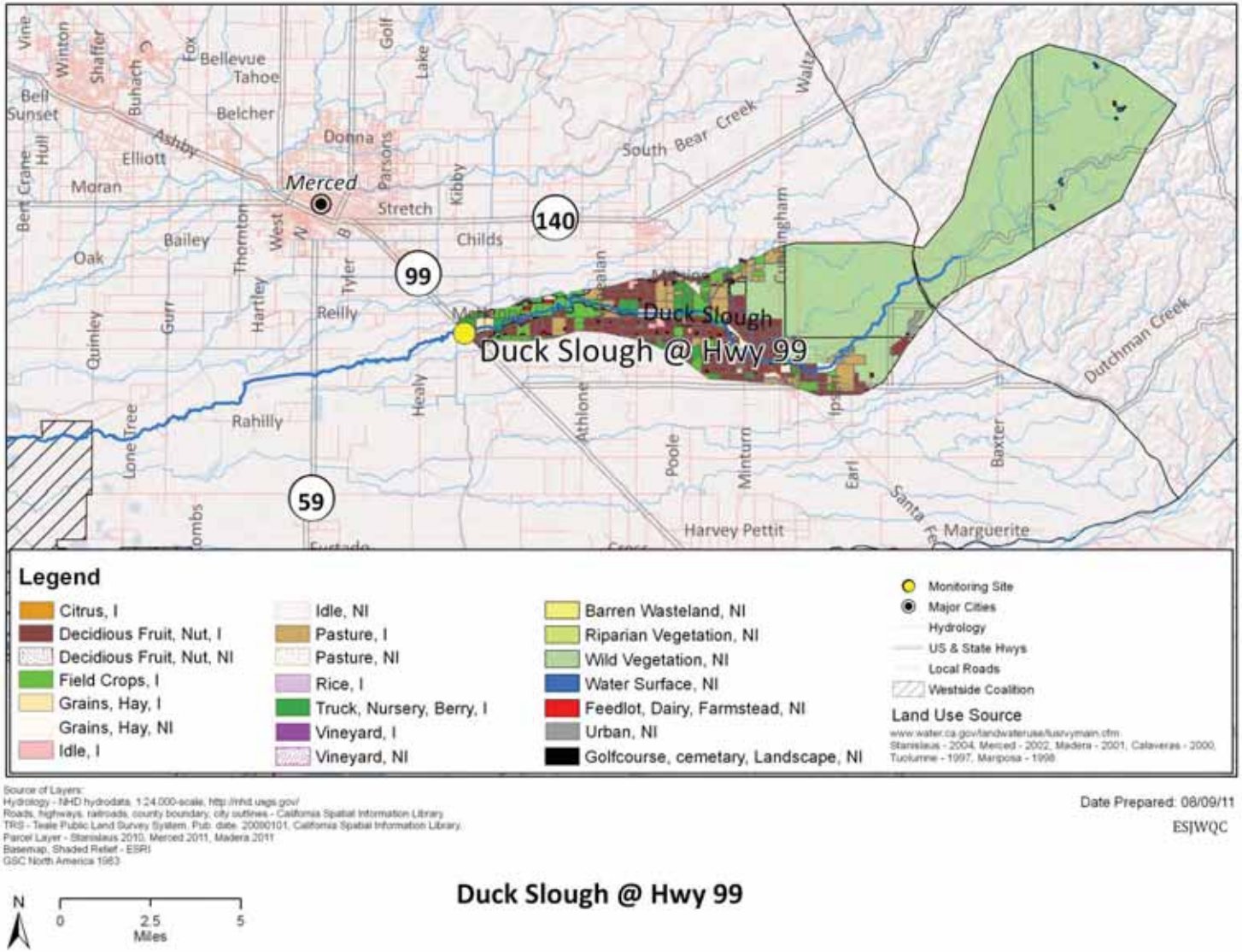
Duck Slough @ Hwy 99 (10,149 irrigated acres) – This site subwatershed is located upstream of the Duck Slough @ Gurr Road site and was selected to determine the relative contribution of water quality impairments from the upstream portion of the Duck Slough subwatershed to the overall waterway. Duck Slough originates in the Sierra foothills and flows west eventually joining with Deadman Creek in the western portion of the Coalition region. The monitoring site is located just east of Highway 99, south of Planada and Merced (Table II-1). This site subwatershed includes an upstream location (Duck Slough @ Whealan Rd) which was sampled in 2008. Irrigated agriculture in this site subwatershed is primarily deciduous nuts with some truck crops, field crops, and irrigated pasture (Figure II-1).

Table II-1. Duck Slough @ Hwy 99 site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Duck Slough @ Hwy 99*	535XDSAHN	37.2502	-120.4100
Duck Slough @ Whealan Rd[U]	535XDSAWH	37.2615	-120.3433

[U] Upstream sites
*Original ESJWQC sampling site

Figure II-1. Duck Slough @ Hwy 99 site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Duck Slough was initiated in the storm season of 2005 at Duck Slough @ Highway 99 and continued throughout the storm and irrigation seasons from 2006 through 2008 (Table II-2). Duck Slough @ Hwy 99's upstream site, Duck Slough @ Whealan Rd, was sampled during the 2008 irrigation season. Starting in October 2008, Duck Slough @ Hwy 99 was removed from the monitoring schedule except for MPM events which occurred during the irrigation season of 2009 and 2010 and the storm and irrigation seasons of 2011. The constituents sampled at this location from 2005 through 2011 are listed in Table II-3. Assessment Monitoring is scheduled to occur at the site during the 2013 through 2014 sampling years.

Beginning as early as May 2012, sampling access to Duck Slough @ Hwy 99 will be blocked by construction crews while Highway 99 is expanded, samples from the site will no longer be representative of agricultural irrigation due to runoff from construction, and once the highway expansion is complete the current sampling location will no longer exist. The Coalition is in the process of drafting a letter to the Regional Board requesting that Duck Slough @ Hwy 99 be dropped from the Coalition's monitoring program. All Duck Slough @ Hwy 99 MPM will occur at the downstream location, Duck Slough @ Gurr Rd, once the Duck Slough @ Hwy 99 location removal is approved.

Management Plan Monitoring occurred at Duck Slough @ Hwy 99 in 2007 through 2011 for copper and chlorpyrifos. Water column toxicity MPM for *S. capricornutum* was added in 2009 (April and July), and lead MPM (April-September) began in 2011 (Table II-4).

Duck Slough is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos, *E. coli*, sediment toxicity and unknown water column toxicity.

Table II-2. Duck Slough @ Hwy 99 site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	9	0	**9**
2008	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	6	0	**6**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	1	0	**1**
	Irrigation	5	0	**5**
	Fall	NA	NA	**NA**
2011	Winter	NA	NA	**NA**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA - Not applicable. This site was not scheduled for sampling during this season/year.

Table II-3. Duck Slough @ Hwy 99 site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter*	Storm*	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*
Field and Physical Parameters																						
EPA 110.2	Color	2	5	2	5	2	6	2	6													
EPA 160.1	Dissolved Solids	2	5	2	5	2	6	2	6													
EPA 180.1	Turbidity	2	5	2	5	2	6	2	6													
EPA 405.1	BOD				1	2	2															
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6	2	6													
SM 9223 B	*E. coli*	2	5	2	5	2	6	2	6													
NA	Dissolved Oxygen	2	6	3	6	3	10	3	7				6			1	5			1	6	
NA	Specific Conductivity	2	6	3	6	3	10	3	7				6			1	5			1	6	
NA	pH	2	6	3	6	3	10	3	7				6			1	5			1	6	
Carbamates																						
EPA 8321A	Aldicarb				5	2	6	2	6													
EPA 8321A	Carbaryl				5	2	6	2	6													
EPA 8321A	Carbofuran				5	2	6	2	6													
EPA 8321A	Diuron				5	2	6	2	6													
EPA 8321A	Linuron				5	2	6	2	6													
EPA 8321A	Methiocarb				5	2	6	2	6													
EPA 8321A	Methomyl				5	2	6	2	6													
EPA 8321A	Oxamyl				5	2	6	2	6													
Organochlorines																						
EPA 8081A	DDD(p,p')				5	2	6	2	6													
EPA 8081A	DDE(p,p')				5	2	6	2	6													
EPA 8081A	DDT(p,p')				5	2	6	2	6													
EPA 8081A	Dicofol				5	2	6	2	6													
EPA 8081A	Dieldrin				5	2	6	2	6													
EPA 8081A	Endrin				5	2	6	2	6													
EPA 8081A	Methoxychlor				5	2	6	2	6													
Organophosphates																						
EPA 8141A	Azinphos methyl				5	2	7	2	6													

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter*	Storm*	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*
EPA 8141A	Chlorpyrifos	2	5	2	5	2	7	2	6				3				3				3	
EPA 8141A	Diazinon	2	5	2	5	2	7	2	6													
EPA 8141A	Dimethoate				5	2	7	2	6													
EPA 8141A	Disulfoton				5	2	7	2	6													
EPA 8141A	Malathion				5	2	7	2	6													
EPA 8141A	Methamidophos				5	2	6	2	6													
EPA 8141A	Methidathion				5	2	7	2	6													
EPA 8141A	Molinate				5	2	7	2	6													
EPA 8141A	Parathion, Methyl				5	2	7	2	6													
EPA 8141A	Phorate				5	2	7	2	6													
EPA 8141A	Phosmet				5	2	7	2	6													
EPA 8141A	Thiobencarb				5	2	7	2	6													
Pyrethroids																						
EPA 8081A	Bifenthrin			2	5	2	6															
EPA 8081A	Cyfluthrin, total			2	5	2	6															
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6															
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6															
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6															
EPA 8081A	Permethrin, total	2	5	2	5	2	6															
Triazines																						
EPA 547M	Glyphosate				5	2	6	2	6													
EPA 549.2M	Paraquat dichloride				5	2	6	2	6													
EPA 619	Atrazine				5	2	6	2	6													
EPA 619	Cyanazine				5	2	6	2	6													
EPA 619	Simazine				5	2	6	2	6													
Metals (Total)																						
EPA 200.8	Arsenic				5	2	6	2	6													
EPA 200.8	Boron				5	2	6	2	6													
EPA 200.8	Cadmium				5	2	6	2	6													
EPA 200.8	Copper				5	2	8	2	6				4			1	4			1	5	

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter*	Storm*	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*	Winter*	Storm	Irrigation	Fall*
EPA 200.8	Lead				5	2	6	2	6												6	
EPA 200.8	Molybdenum																					
EPA 200.8	Nickel				5	2	6	2	6													
EPA 200.8	Selenium				5	2	2	2	6													
EPA 200.8	Zinc				5	2	6	2	6													
Metals (Dissolved)																						
EPA 200.8	Cadmium																					
EPA 200.8	Copper												4			1	4			1	5	
EPA 200.8	Lead																				6	
EPA 200.8	Nickel																					
EPA 200.8	Zinc																					
Nutrients																						
SM 2340 C	Hardness as CaCO3				5	2	8	2	6				4			1	4			1	6	
EPA 300.0	Nitrate as N				5	2	6	2	6													
EPA 350.2	Ammonia as N				5	2	6	2	6													
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	2	6													
EPA 354.1	Nitrite as N				5	2	6	2	6													
EPA 353.2	Nitrate + Nitrite as N																					
EPA 365.2	OrthoPhosphate as P				5	2	6	2	6													
EPA 365.2	Phosphate as P				5	2	6	2	6													
Toxicity																						
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	2	6	2	7	2	6													
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5	2	7	2	6													
EPA 821/R-02-013	*Selenastrum capricornutum*	2	7	2	5	2	7	2	7				1			1	1				2	
EPA 600/R-99-064	*Hyalella azteca*			1	1	1	1	1	2													

*Site not sampled during the 2008 fall, 2009 winter, storm and fall seasons, 2010 winter and fall seasons, and 2011 winter and fall seasons.

Table II-4. Duck Slough @ Hwy 99 site subwatershed Management Plan Monitoring Schedule (2007-2011).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Copper	Lead	Chlorpyrifos	*S. capricornutum*
Duck Slough @ Hwy 99	24-Jul-07	A			X	
Duck Slough @ Hwy 99	21-Aug-07	A	X			
Duck Slough @ Hwy 99	18-Sep-07	A	X			
Duck Slough @ Whealan Rd	29-Apr-08	U	X			
Duck Slough @ Whealan Rd	27-May-08	U			X	
Duck Slough @ Whealan Rd	24-Jun-08	U	X			
Duck Slough @ Whealan Rd	29-Jul-08	U	X		X	
Duck Slough @ Whealan Rd	26-Aug-08	U	X			
Duck Slough @ Whealan Rd	30-Sep-08	U	X			
Duck Slough @ Hwy 99	21-Apr-09	MPM				X
Duck Slough @ Hwy 99	19-May-09	MPM			X	
Duck Slough @ Hwy 99	16-Jun-09	MPM	X			
Duck Slough @ Hwy 99	21-Jul-09	MPM	X		X	
Duck Slough @ Hwy 99	18-Aug-09	MPM	X			
Duck Slough @ Hwy 99	22-Sep-09	MPM	X		X	
Duck Slough @ Hwy 99	20-Apr-10	MPM	X			X
Duck Slough @ Hwy 99	18-May-10	MPM			X	
Duck Slough @ Hwy 99	15-Jun-10	MPM	X			
Duck Slough @ Hwy 99	20-Jul-10	MPM	X		X	X
Duck Slough @ Hwy 99	17-Aug-10	MPM	X			
Duck Slough @ Hwy 99	14-Sept-10	MPM	X		X	
Duck Slough @ Hwy 99	17-Feb-11	MPM	X			
Duck Slough @ Hwy 99	19-Apr-11	MPM	X	X		X
Duck Slough @ Hwy 99	17-May-11	MPM		X	X	
Duck Slough @ Hwy 99	21-Jun-11	MPM	X	X		
Duck Slough @ Hwy 99	19-Jul-11	MPM	X	X	X	X
Duck Slough @ Hwy 99	16-Aug-11	MPM	X	X		
Duck Slough @ Hwy 99	13-Sept-11	MPM	X	X	X	

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from Duck Slough @ Hwy 99 from 2005 through 2011 exceeded the WQTLs for field parameters, *E. coli*, metals, and chlorpyrifos, as well as water column and sediment toxicity (Table II-5). Table II-5 includes exceedances in this subwatershed (including upstream sampling at Duck Slough @ Whealan Rd), of DO (2), pH (3), *E. coli* (12), chlorpyrifos (4), copper (14), lead (11), toxicity to *C. dubia* (1), *S. capricornutum* (3) and *H. azteca* sediment (2). However, sediment toxicity to *H. azteca* is not prioritized because both toxic samples were from the same sampling event (sample and resample to test for persistence).

No exceedances of the chlorpyrifos or copper WQTL occurred at Duck Slough @ Hwy 99 during MPM in 2011.

All exceedances are listed in Table II-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Duck Slough @ Hwy 99 subwatershed are chlorpyrifos (A/B), copper (C), and toxicity to *S. capricornutum* (D).

Table II-5. Duck Slough @ Hwy 99 site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Duck Slough @ Hwy 99	Storm	3/21/2005			1600						
Duck Slough @ Hwy 99	Irrigation	5/10/2005			1600						
Duck Slough @ Hwy 99	Irrigation	7/12/2005						0.026		77	
Duck Slough @ Hwy 99	Storm	3/15/2006			900						
Duck Slough @ Hwy 99	Irrigation	5/17/2006		8.57	280		5.2 (3.02)	0.27	0		
Duck Slough @ Hwy 99	Irrigation	6/14/2006			260						
Duck Slough @ Hwy 99	Irrigation	8/8/2006				3.4 (2.4)	2.3 (0.41)				
Duck Slough @ Hwy 99	Irrigation	9/13/2006	6.72		340	19 (5.0)	24 (1.25)				
Duck Slough @ Hwy 99	Storm	2/12/2007			2400	31 (10.1)	15 (3.59)				
Duck Slough @ Hwy 99	Storm	2/28/2007			2400						
Duck Slough @ Hwy 99	Irrigation	4/24/2007				4.1 (3.7)	1.5 (0.81)				
Duck Slough @ Hwy 99	Irrigation	6/26/2007				3.0 (2.4)	0.68 (0.41)				
Duck Slough @ Hwy 99	Irrigation	7/24/2007				3.5 (3.0)	0.64 (0.57)				
Duck Slough @ Hwy 99	Irrigation	7/31/2007		8.8				0.042			
Duck Slough @ Hwy 99	Irrigation	8/21/2007				5.5 (3.3)	1.1 (0.69)				
Duck Slough @ Hwy 99	Irrigation	8/28/2007				3.1 (2.4)					
Duck Slough @ Hwy 99	Irrigation	9/18/2007			610	6.9 (2.8)	1.8 (0.52)				
Duck Slough @ Hwy 99	Storm	1/25/2008			>2400						
Duck Slough @ Hwy 99	Storm	2/25/2008			>2400	9.9 (8.0)					

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	*E. coli*, > 235 MPN/100 mL	Copper, Total[1], > 1,300 µg/L	Lead, Total[1], > 15 µg/L	Chlorpyrifos, > 0.015 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Duck Slough @ Hwy 99	Sediment	3/4/2008		8.65							
Duck Slough @ Hwy 99	Irrigation	4/29/2008			280					86	
Duck Slough @ Hwy 99	Irrigation	5/7/2008								5	
Duck Slough @ Whealan Rd	*Irrigation*	*6/24/2008*				*73 (5.0)*					
Duck Slough @ Hwy 99	Irrigation	7/29/2008				2.7 (2.6)	0.69 (0.5)				
Duck Slough @ Hwy 99	Irrigation	8/26/2008					0.72 (0.69)				
Duck Slough @ Whealan Rd	*Irrigation*	*8/26/2008*				*3.4 (1.9)*					
Duck Slough @ Hwy 99	Sediment	8/28/2008									86
Duck Slough @ Hwy 99	Irrigation	9/30/2008						0.034			
Duck Slough @ Whealan Rd	*Irrigation*	*9/30/2008*				*3.7 (1.3)*					
Duck Slough @ Hwy 99	Sediment	10/2/2008									90
Duck Slough @ Hwy 99	Irrigation	6/16/2009	6.78								
		Constituent Priority	**E**	**E**	**E**	**C**	**E**	**A/B**	**NP**	**D**	**NP[T]**

[1]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[T] – Not prioritized; both toxic samples were from the same sampling event (sample and resample to test for persistence).

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Duck Slough @ Hwy 99 subwatershed are listed in Table II-6. These constituents include chlorpyrifos, copper, lead, and water column toxicity to *S. capricornutum*.

Chlorpyrifos exceeded the WQTL (0.015 µg/L) once during each of the first four years of monitoring at Duck Slough @ Hwy 99 (2005-2008). Normal Monitoring occurred during 2005 and 2006 and chlorpyrifos exceeded the WQTL in July 2005 and May 2006. Normal Monitoring and additional MPM occurred during 2007 resulting in a single chlorpyrifos exceedance during the July additional MPM event (Table II-6). The upstream site, Duck Slough @ Whealan Rd, was sampled during May and July of 2008 along with Normal Monitoring at Duck Slough @ Hwy 99. A single chlorpyrifos exceedance occurred in September 2008. As part of the current 2008 MRPP, Normal Monitoring for chlorpyrifos did not occur in the Duck Slough @ Hwy 99 subwatershed starting in 2009. In 2009 through 2011, chlorpyrifos was only monitored as part of MPM during months of past exceedances (May, July, and September). There were no exceedances of chlorpyrifos at the Duck Slough @ Hwy 99 site from 2009 through 2011. Currently, chlorpyrifos at Duck Slough @ Hwy 99 is scheduled for MPM in 2012 (May, July, and September), but the Coalition is in the process of drafting a letter to the Regional Board requesting to drop the location from the Coalition's monitoring program due to the site disappearing in lieu of the expansion of Highway 99. When approved, Duck Slough @ Hwy 99 chlorpyrifos MPM will occur at the downstream site location, Duck Slough @ Gurr Rd.

Copper exceeded the WQTL (calculated from associated hardness value) twice during 2006 monitoring (August and September). In 2007, Normal Monitoring and additional MPM (August) occurred resulting in exceedances (based on total copper) during all months from February through September except for May (Table II-6). During 2008, Normal Monitoring and upstream MPM occurred at Duck Slough @ Whealan Rd for copper (April, June, July, August and September) resulting in exceedances once during Normal Monitoring (July) and three times at the upstream location (June, August and September, Table II-6). The 2009 monitoring year was the first year copper was analyzed for both total and dissolved copper fractions. Samples collected for MPM (June-September) were analyzed for both fractions and no exceedances of copper occurred in 2009. In previous years, the WQTL was based on total copper which included water hardness in the determination of the concentration of copper considered toxic. In 2009 the determination was based on the dissolved copper fraction only. During 2010, Duck Slough @ Hwy 99 MPM for copper occurred during irrigation season (April, June-September); Normal Monitoring did not occur in this subwatershed during 2010 (Table II-6). None of the 2010 MPM samples collected for copper exceeded the copper WQTL. During 2011, MPM occurred for copper (February, April and June-September) and there were no exceedances (Table II-6). Duck Slough @ Hwy 99 is scheduled for copper MPM in 2012 during months of past exceedances (February, April and June- September).

Exceedances of lead occurred at Duck Slough @ Hwy 99 in 2006 (May, August and September), in 2007 (February, April and June-September) and in 2008 (July and August). In 2011, MPM for lead occurred

during April and June through September and no exceedance of lead occurred. In 2012, Duck Slough @ Hwy 99 is scheduled for lead MPM (April and June-September).

Toxicity to *S. capricornutum* occurred three times in July 2005, and in April and May 2008. Starting in 2009, the Coalition began MPM for *S. capricornutum* toxicity at Duck Slough @ Hwy 99 during April and samples were not toxic. In 2010, MPM for *S. capricornutum* toxicity occurred during April and July and did not result in toxicity. There are no other instances of *S. capricornutum* toxicity to occur since 2008. In 2012, MPM for *S. capricornutum* toxicity is scheduled to occur during months of previous instances of toxicity (April and July).

Table II-6. Duck Slough @ Hwy 99 site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	MONTH:	JAN	FEB		APR	MAY	JUN	JUL	AUG	SEP
2007 NM (@ Hwy 99)	Date	NA	2/12/07	2/28/07	4/24/07	5/29/07	6/26/07	7/24/07	8/21/07	9/18/07
	Copper (µg/L)	NA	NA	NA	**4.1**	<0.06	**3**	**3.5**	**5.5**	**6.9**
	Lead (µg/L)	NA	**15**	1.6	**1.5**	0.35	**0.68**	**0.64**	**1.1**	**1.8**
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	<0.003	<0.003	0.011	<0.003	<0.003
2007 MPM A (@ Hwy 99)	Date	NA	NA	NA	NA	NA	NA	7/31/07	8/28/07	9/25/07
	Copper (µg/L)	NA	NA	NA	NA	NA	NA	NA	**3.1**	2.5
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA[1]	NA	**0.42**	NA	NA
2008 NM (@ Hwy 99)	Date	1/25/08	2/25/08		4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08
	Copper (µg/L)	7.1	**9.9**		3.3	2.4	2.9	**2.7**	3	3.8
	Lead (µg/L)	1.2	2.1		1.4	0.42	0.53	**0.69**	**0.72**	0.71
	Chlorpyrifos (µg/L)	NA	0.0035		<0.003	<0.003	<0.0026	0.0067	<0.003	**0.034**
2008 MPM US (@ Whealan Rd)	Date	NA	NA		4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08
	Copper (µg/L)	NA	NA		3.5	NA	**73**	3	**3.4**	**3.7**
	Chlorpyrifos (µg/L)	NA	NA		NA	<0.003	NA	0.0081	NA	NA
2009 MPM (@ Hwy 99)	Date	NA	NA		4/21/09	5/19/09	6/16/09	7/21/09	8/18/09	9/22/09
	Copper, dissolved (µg/L)	NA	NA		NA	NA	0.61	0.7	0.61	0.25
	Copper, total (µg/L)	NA	NA		NA	NA	2.3	2.5	2.4	2.7
	Chlorpyrifos (µg/L)	NA	NA		NA	<0.003	NA	<0.003	NA	<0.003
	S. capricornutum toxicity (% control)	NA	NA		222	NA	NA	NA	NA	NA
2010 MPM (@ Hwy 99)	Date	NA	NA		4/20/10	5/18/10	6/15/10	7/20/10	8/17/10	9/14/10
	Copper, dissolved (µg/L)	NA	NA		1.2	NA	1.2	0.63	0.48	0.46
	Copper, total (µg/L)	NA	NA		2.6	NA	2.3	2.7	5.1	2
	Chlorpyrifos (µg/L)	NA	NA		NA	0.0048	NA	<0.003	NA	<0.003
	S. capricornutum toxicity (% control)	NA	NA		1846	NA	NA	378	NA	NA
2011 MPM (@ Hwy 99)	Date	NA	2/17/11		4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11
	Copper, dissolved (µg/L)	NA	2.6		1.2	NA	0.59	0.71	0.61	.27
	Copper, total (µg/L)	NA	2.4		2.8	NA	2.8	1.9	5.7	1.4
	Lead, dissolved (µg/L)	NA	NA		0.06	0.04	0.05	0.04	0.22	0.05
	Lead, total (µg/L)	NA	NA		0.4	0.38	1	0.55	7.9	0.64
	Chlorpyrifos (µg/L)	NA	NA		NA	<0.003	NA	<0.003	NA	<0.003
	S. capricornutum toxicity (% control)	NA	NA		541	NA	NA	404	NA	NA

[1]Additional (A) monitoring (2007 only) was initiated in June 2007; therefore no sample was collected for scheduled May additional monitoring. US – Upstream MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads were calculated for the chlorpyrifos and copper detections (Table II-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values presented for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Very few discharge measurements have been taken at the Duck Slough @ Hwy 99 site since it is usually too deep to wade. Table II-7, indicates exceedances and/or detections which occurred when discharge was measured during a sampling event.

Table II-7. Duck Slough @ Hwy 99 site subwatershed instantaneous load calculations for chlorpyrifos and copper.

Upstream site is italicized. Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Duck Slough @ Whealan Rd	*Chlorpyrifos*	*07/29/08*	*18.73*	*0.0081*	*4.30*
Duck Slough @ Hwy 99	Copper	07/12/06	58.3	2.7	4457.38
Duck Slough @ Hwy 99	Copper	09/18/07	0	6.9	0
Duck Slough @ Whealan Rd	*Copper*	*04/29/08*	*5.73*	*3.5*	*567.90*
Duck Slough @ Whealan Rd	*Copper*	*06/24/08*	*22.15*	*73*	*45787.17*
Duck Slough @ Whealan Rd	*Copper*	*07/29/08*	*18.73*	*3*	*1591.13*
Duck Slough @ Whealan Rd	*Copper*	*08/26/08*	*21.6*	*3.4*	*2079.60*
Duck Slough @ Whealan Rd	*Copper*	*09/30/08*	*7.56*	*3.7*	*792.08*

Source Identification and Outreach

The Coalition addressed source identification in the 2011 MPUR and, in the following sections, considers 2011 monitoring results and PUR data as they expand upon that discussion. The Coalition focuses its efforts on applied pesticide. During 2007 and 2008, the Coalition conducted additional and upstream MPM during those months when exceedances historically occurred to better characterize water quality in the subwatershed. During 2009 through 2011, MPM continued at the Duck Slough @ Hwy 99 site to continue to assess water quality in the subwatershed as outreach in the area progressed. PUR data are reviewed to determine the most frequent crop type and timing associated with applications. Duck Slough @ Hwy 99 subwatershed PUR data are available through October 2011.

Since the Duck Slough subwatershed became high priority in 2008, the Coalition actively engaged in grower outreach and education to address the Duck Slough Management Plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about

management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (24) representing 4,016 acres within the Duck Slough @ Hwy 99 subwatershed. All 24 growers participated in follow up contacts, including two who submitted their surveys late, to determine if additional management practices were implemented and if any are planned to be implemented. Management Plan Monitoring will continue in the Duck Slough @ Hwy 99 subwatershed during 2012 in order to demonstrate two consecutive years of monitoring with no exceedances of high priority constituents. Once the planned construction near Duck Slough @ Hwy 99 begins and the Regional Board approves to drop the site from the MRPP schedule, all remaining MPM for the site will take place at the downstream location, Duck Slough @ Gurr Rd.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent in the Duck Slough @ Hwy 99 subwatershed.

Chlorpyrifos

Four exceedances of the chlorpyrifos WQTL (0.015 µg/L) occurred during the irrigation season at Duck Slough @ Hwy 99 from 2005 through 2011 (May, twice in July, and September); there were no chlorpyrifos exceedances since September 2008 (Table II-5). The Coalition evaluates monitoring and PUR data to identify possible sources of exceedances of constituents of concern.

In every high priority subwatershed, PUR data are reviewed for the number of monthly applications, pounds AI applied of the constituent of concern, and acres treated of the constituent of concern (Table II-8, Figure II-2). The greatest amount of chlorpyrifos applied was in 2005 (4,684 lbs AI) with the lowest amount applied in 2009 (153 lbs AI). From 2009 through 2011, there was significantly less chlorpyrifos use compared to the previous four years; only 815 lbs of active ingredient were applied to 1302 acres as compared to 9146 lbs of active ingredient over 5728 acres from 2005 through 2008. Over the years, the greatest amounts of chlorpyrifos use occurred in the months of March, May and July. Three of the four chlorpyrifos exceedances in the subwatershed occurred during months of greatest use (Figure II-2).

The Coalition also used PUR data to assess which crops receive the most applications of chlorpyrifos (Table II-9). The highest application rates in the Duck Slough subwatershed from 2005 through 2011 are associated with almonds (6685 lbs AI) and alfalfa (1981 lbs AI). The most common product used within this subwatershed containing chlorpyrifos was Lorsban.

Table II-8. Duck Slough @ Hwy 99 site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2005	4.0	76.9	38.1
March, 2005	14.0	408.7	695.0
June, 2005	2.0	50.0	30.0
July, 2005	15.0	4120.1	760.0
September, 2005	1.0	28.0	14.0
January, 2006	6.0	119.7	59.0
March, 2006	3.0	56.1	151.0
May, 2006	12.0	634.7	397.0
June, 2006	1.0	137.6	69.0
July, 2006	5.0	570.2	508.0
August, 2006	4.0	190.6	131.0
September, 2006	3.0	168.4	92.5
January, 2007	2.0	29.9	15.0
March, 2007	15.0	370.0	433.8
April, 2007	3.0	28.8	57.4
May, 2007	3.0	327.3	177.8
July, 2007	3.0	567.5	328.0
August, 2007	3.0	150.1	232.3
March, 2008	15.0	290.4	347.5
May, 2008	2.0	140.1	70.0
June, 2008	1.0	10.2	8.0
July, 2008	10.0	343.1	655.5
August, 2008	10.0	328.0	458.0
March, 2009	1.0	57.5	136.0
July, 2009	2.0	70.1	140.0
September, 2009	2.0	25.9	103.4
March, 2010	9.0	216.8	261.5
July, 2010	3.0	61.1	169.0
September, 2010	1.0	17.5	35.0
August, 2011	3.0	176.8	146.0
September, 2011	1.0	87.5	175.0
October, 2011	1.0	102.1	136.0
Summaries by Year			
2005 Total	36.0	4683.7	1537.1
2006 Total	34.0	1877.2	1407.5
2007 Total	29.0	1473.5	1244.4
2008 Total	38.0	1111.8	1539.0
2009 Total	5.0	153.5	379.4
2010 Total	13.0	295.5	465.5
2011 Total	5.0	366.3	457.0
Total	**160.0**	**9961.4**	**7029.9**

Figure II-2. Duck Slough @ Hwy 99 site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

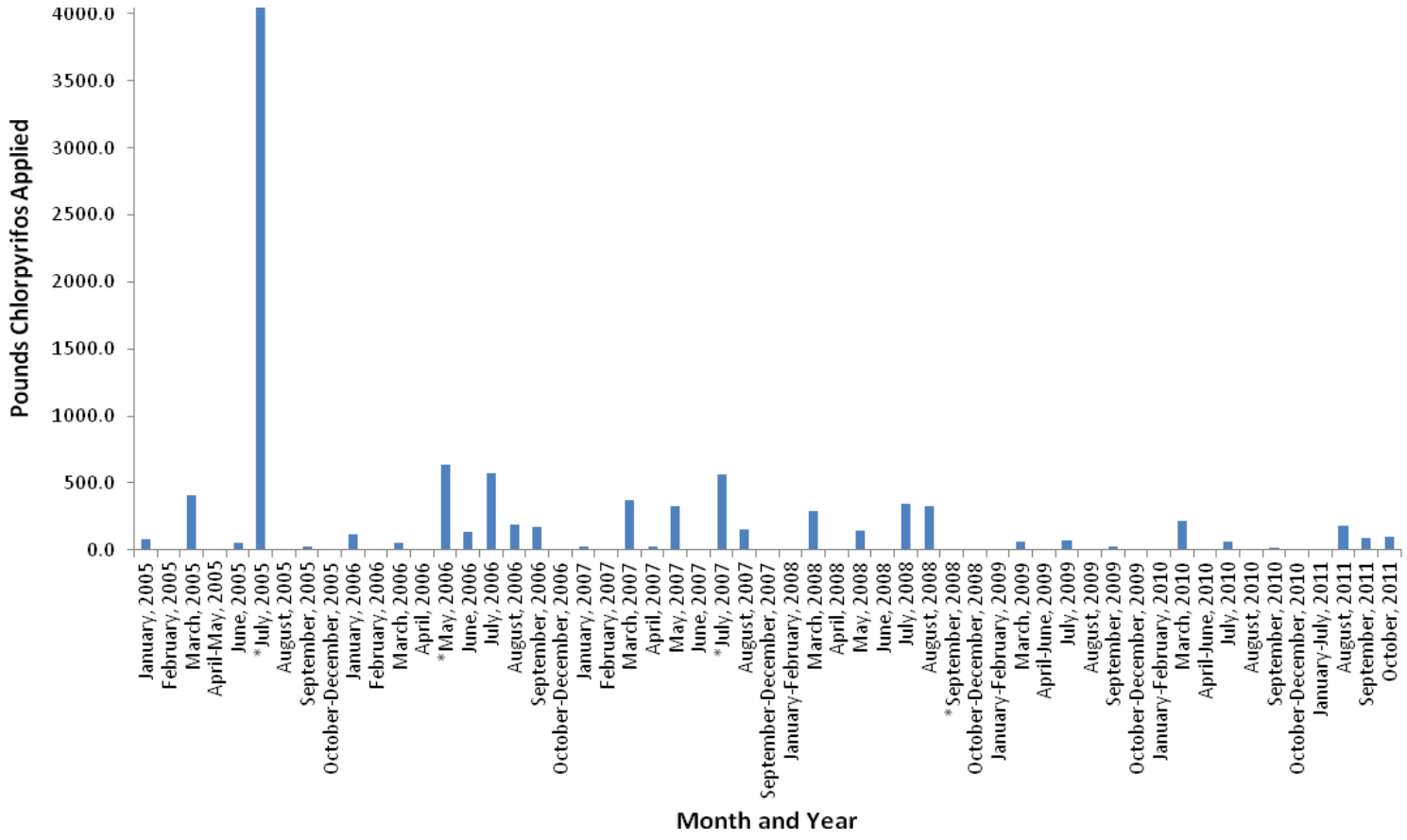


Table II-9. Duck Slough @ Hwy 99 site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	COBALT	57.5
		GOVERN 4E INSECTICIDE	184.6
		LOCK-ON INSECTICIDE	472.4
		LORSBAN 4E INSECTICIDE	63.9
		LORSBAN 4E-HF	658.1
		LORSBAN 4E-HF INSECTICIDE	63.4
		LORSBAN-4E	144.5
		NUFOS 4E	221.2
		WHIRLWIND	115.0
	ALMOND	CHLORPYRIFOS 4E AG	84.7
		GOVERN 4E INSECTICIDE	993.9
		LORSBAN 4E INSECTICIDE	198.5
		LORSBAN 4E-HF	973.0
		LORSBAN ADVANCED	10.9
		LORSBAN-4E	3592.1
		NUFOS 4E	155.5
		WHIRLWIND	675.9
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	131.8
		LORSBAN 15G GRANULAR INSECTICIDE	262.1
		LORSBAN-4E	23.5
		NUFOS 4E	20.3
	PEACH	CHLORPYRIFOS 4E AG	76.9
		LORSBAN 4E-HF	121.6
	WALNUT	GOVERN 4E INSECTICIDE	15.2
		LORSBAN-4E	489.1
		QUALI-PRO CHLORPYRIFOS 4E	155.8

ALFALFA - Total Pounds Chlorpyrifos Applied	**1980.6**
ALMOND - Total Pounds Chlorpyrifos Applied	**6684.5**
CORN - Total Pounds Chlorpyrifos Applied	**437.8**
PEACH - Total Pounds Chlorpyrifos Applied	**198.5**
WALNUT - Total Pounds Chlorpyrifos Applied	**660.0**
Total Pounds Chlorpyrifos Applied (2005 - 2011)	**9961.4**

The Coalition determined that parcels associated with past chlorpyrifos exceedances are located in close proximity to Duck Slough suggesting that spray drift could play a major role in generating the exceedances. Management of chlorpyrifos in this subwatershed focused on providing information to inform targeted growers of the proper management of irrigation tailwater and spray drift.

Growers were targeted for outreach prior to the irrigation season and heavy application periods. Growers were encouraged to review their operation to determine if irrigation return flows are managed properly. Owners with orchards were instructed to evaluate their applications to minimize spray drift. Row crop farmers were advised of methods to better manage their irrigation tailwater and storm water

runoff, whereas outreach efforts to orchard and vineyard growers focused on reducing spray drift and improving orchard and vineyard water management.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began in May 2009 and continued through August 2009. Targeted growers were identified by the use of chlorpyrifos and parcels that have the potential to drain or drift to the creek. Of the 10,695 irrigated acres in the Duck Slough @ Hwy 99 subwatershed, the Coalition developed a list of 24 targeted members that represented 4,016 acres with the potential to discharge to the creek. Coalition representatives then met with growers on their property to discuss the Duck Slough management plan and offer management practice recommendations specific to the land owner. Current management practices were assessed by Coalition representatives and additional management practices were discussed and encouraged. Individual contacts focused mainly on chlorpyrifos exceedances; however, all water quality results were reviewed and discussed including copper, *E. coli*, DO, lead, and pH, and toxicity to *S. capricornutum*.

The Coalition contacted all 24 targeted members, representing 4,016 acres or 38% of the irrigated acreage in the subwatershed. On February 19, 2010, the Coalition hosted a follow up to the 2009 Individual Contacts Grower Meeting. Using the Coalition's Interactive Survey Devices, growers were polled to determine what additional management practices were implemented in 2009 and if additional practices were planned for 2010. Members unable to attend the meeting were asked to participate in a phone interview with a Coalition representative between March and August 2010 to report their newly implemented management practices. Of the initial 24 targeted growers, two members were not required to participate in follow up contacts. Two other members were initially unresponsive to repeated attempts by the Coalition to schedule a follow up phone interview and were in the process of being dropped from the Coalition. The two growers have since elected to remain in the Coalition and have completed their follow up surveys. Of the two or more management practices recommended, newly implemented management practices to acreages in the Duck Slough @ Hwy 99 include: reduced amount of water used in surface irrigation (32%), microirrigation system (11%), other not specified (19%), install device to control discharge (20%), shut off outside nozzles during spray (18%). The Coalition Assessment of implemented management practices is included in the Summary of Implemented Management Practices section of this report.

There are no exceedances of the chlorpyrifos WQTL for two consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove chlorpyrifos from the Duck Slough management plan. Until the approval from the Regional Board, the Coalition will continue to assess water quality at Duck Slough @ Hwy 99 (eventually

all MPM for Duck Slough @ Hwy 99 will occur at Duck Slough @ Gurr Rd) through MPM during those months of past chlorpyrifos exceedances. If any exceedances occur, the Coalition will discuss with the Regional Board supplementary actions for outreach that may include contacting other chlorpyrifos sources such as dairy operations and/or contacting new members to the Coalition.

Priority C Constituents

Copper is the only priority C constituent for the Duck Slough @ Hwy 99 subwatershed.

Copper

Exceedances of the hardness based copper WQTL occurred numerous times in this subwatershed from 2005 through 2008 (Table II-5). Starting in 2009 in the Duck Slough @ Hwy 99 subwatershed, the Coalition began monitoring for both the total and dissolved copper fractions to better characterize copper contamination. There were no copper exceedances from 2009 through 2011 monitoring.

PUR data are reviewed for the number of monthly copper applications, pounds AI applied, and acres treated (Table II-10, Figure II-3). The amount of copper applied within the subwatershed decreased from 2005 through 2010, but increased again in 2011. The greatest amount of copper applied was in 2005 (4,459 lbs AI) and the lowest amount applied was in 2010 (1,463 lbs AI). The greatest use of copper occurred in the months of January 2005, 2006 and 2011 and in December 2005 respectively (Table II-10, Figure II-3) indicating winter season use is the most common in this subwatershed. Not all exceedances occurred during months of the greatest use, and interestingly several exceedances occurred in later irrigation season months when there were few or no reported applications (Figure II-3).

The largest amount of copper applied was associated with almonds, walnuts, and outdoor container operations (Table II-11). The largest amount of copper applied from 2005 through 2011 was to almonds (6,454 lbs AI) followed by walnuts (5,329 lbs AI), see Table II-11. The most common products containing copper used within this subwatershed were Kocide and DuPont™ Kocide (Table II-11).

Table II-10. Duck Slough @ Hwy 99 site subwatershed lbs copper applied by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	8.0	1061.0	209.1
February, 2005	5.0	514.8	159.7
March, 2005	2.0	203.6	45.0
April, 2005	20.0	881.3	340.3
May, 2005	8.0	358.5	103.5
August, 2005	3.0	139.8	127.8
September, 2005	2.0	82.4	74.7
October, 2005	1.0	25.8	21.0
November, 2005	1.0	69.1	45.0
December, 2005	5.0	1122.8	153.0
January, 2006	11.0	1718.8	289.0
February, 2006	4.0	340.1	128.0
March, 2006	3.0	248.7	232.0

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
April, 2006	7.0	537.2	116.5
May, 2006	6.0	493.1	175.0
August, 2006	1.0	113.0	103.0
December, 2006	2.0	539.0	70.0
January, 2007	8.0	1330.6	191.0
February, 2007	5.0	441.3	215.0
March, 2007	1.0	264.9	43.0
April, 2007	12.0	536.6	183.5
December, 2007	5.0	247.0	88.0
January, 2008	4.0	601.0	110.0
February, 2008	1.0	23.1	10.0
April, 2008	1.0	27.7	15.0
May, 2008	3.0	168.3	95.5
November, 2008	1.0	166.0	60.0
December, 2008	3.0	901.0	100.0
January, 2009	1.0	220.5	70.0
February, 2009	1.0	35.6	58.0
April, 2009	5.0	341.6	161.0
May, 2009	5.0	278.1	139.5
August, 2009	1.0	69.3	30.0
November, 2009	1.0	77.0	10.0
December, 2009	4.0	861.0	73.0
January, 2010	5.0	551.7	117.3
February, 2010	3.0	22.9	51.0
March, 2010	6.0	151.3	105.0
April, 2010	8.0	539.4	259.0
May, 2010	10.0	197.6	212.0
January, 2011	12.0	2231.9	595.0
February, 2011	4.0	172.4	188.0
April, 2011	10.0	729.4	209.0
May, 2011	11.0	480.1	404.3
June, 2011	10.0	185.9	399.5
October, 2011	1.0	27.7	60.0
Summaries by Year			
2005 Total	55.0	4459.1	1279.1
2006 Total	34.0	3990.0	1113.5
2007 Total	31.0	2820.4	720.5
2008 Total	13.0	1886.9	390.5
2009 Total	18.0	1883.2	541.5
2010 Total	32.0	1462.9	744.3
2011 Total	48.0	3827.4	1855.8
Total	**231.0**	**20329.8**	**6645.2**

Figure II-3. Duck Slough @ Hwy 99 site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

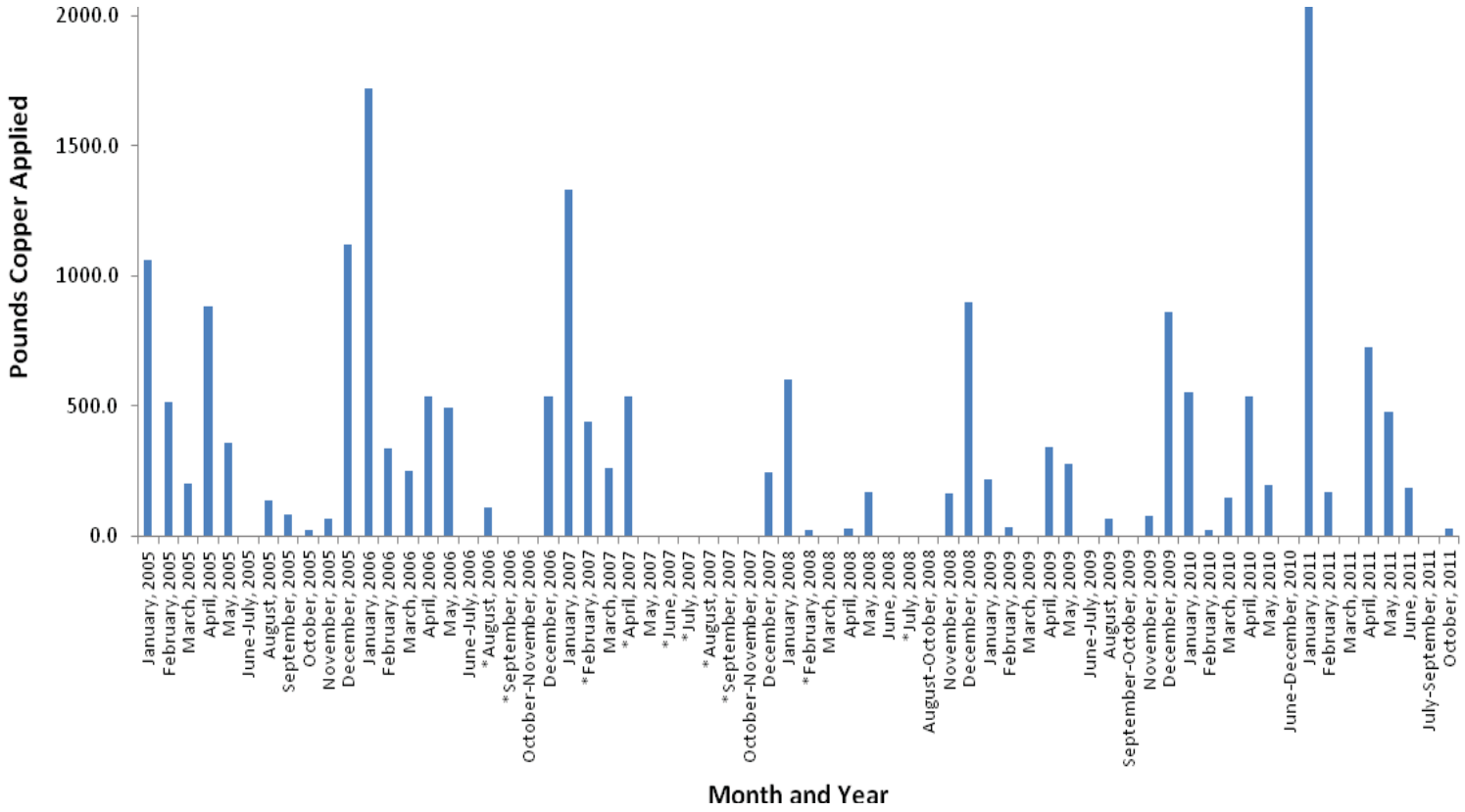


Table II-11. Duck Slough @ Hwy 99 site subwatershed copper PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	KOCIDE 2000	63.8
	ALMOND	BASIC COPPER 53	230.3
		CUPROFIX ULTRA 40 DISPERSS	1539.9
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1472.5
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	29.5
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	35.6
		KOCIDE 101	471.2
		KOCIDE 2000	35.0
		KOCIDE DF	742.9
		NORDOX	76.7
		NORDOX 75 WG	1768.6
		NU-COP 50 WP	52.4
	APRICOT	BASIC COPPER 53	58.8
		KOCIDE 2000	118.4
		KOCIDE DF	122.8
	CHERRY	NU-COP 50DF	154.0
	NECTARINE	BASIC COPPER 53	98.0
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	27.7
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	42.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	23.1
		KOCIDE 101	1155.0
		KOCIDE 2000	201.8
	N-OUTDR CONTAINER/FLD GRWN PLANTS	BASIC COPPER 53	1519.0
		CUPROFIX ULTRA 40 DISPERSS	113.8
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	53.4
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	64.6
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	497.9
		KOCIDE 101	473.6
	PEACH	BASIC COPPER 53	1078.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	8.7
		KOCIDE 101	154.0
		KOCIDE DF	608.5
	PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	144.0
		KOCIDE 101	21.9
	PISTACHIO (PISTACHE NUT)	CUPROFIX DISPERSS DRY FLOWABLE FUNGICIDE/BACTERCIDE FOR TURF AND ORNAMENTAL USE	8.3
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	80.7
		KOCIDE 101	154.0
	PRUNE	NORDOX 75 WG	171.2
	TOMATO	CHAMPION WETTABLE POWDER	69.3
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	65.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	308.2
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	151.7
		KOCIDE 101	147.3
		KOCIDE 2000	427.3
		KOCIDE DF	106.5
		NU-COP 50DF	52.4
		NU-COP HB	1.2

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	WALNUT	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1121.6
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	875.6
		KOCIDE 101	843.9
		KOCIDE 2000	1497.5
		KOP-HYDROXIDE 50W	396.6
		NU-COP 50DF	259.9
		NU-COP HB	334.2

ALFALFA - Total Pounds Copper Applied	**63.8**
ALMOND - Total Pounds Copper Applied	**6454.6**
APRICOT - Total Pounds Copper Applied	**300.0**
CHERRY - Total Pounds Copper Applied	**154.0**
N-OUTDR CONTAINER - Total Pounds Copper Applied	**2722.2**
NECTARINE - Total Pounds Copper Applied	**1547.8**
PEACH - Total Pounds Copper Applied	**1849.1**
PEPPERS - Total Pounds Copper Applied	**165.9**
PISTACHIO - Total Pounds Copper Applied	**8.3**
PLUM - Total Pounds Copper Applied	**234.7**
PRUNE - Total Pounds Copper Applied	**171.2**
TOMATO - Total Pounds Copper Applied	**1329.0**
WALNUT - Total Pounds Copper Applied	**5329.2**
Total Pounds Copper Applied (2005-2011)	**20329.8**

The Coalition determined future outreach should focus on providing information to growers located adjacent to Duck Slough to encourage the retention of water and sediment on the fields, especially during the dormant season when copper is known to enter the waterway. This coincides with the Coalition's Management Plan strategy outlined in the chlorpyrifos Source Identification and Outreach section above. Individual contacts with growers within this subwatershed are described, as are discussions of copper exceedances and relevant management practices in the First Priority Subwatersheds Summary of Management Practices section of this report. Orchard operators are advised to manage storm water runoff occurring after copper applications. The Coalition believes that their outreach strategy and management practice implementation has lead to improvement in water quality concerning copper since no additional copper exceedances have occurred at Duck Slough @ Hwy 99 since September 2008.

Priority D Constituents

Water column toxicity to *S. capricornutum* is a priority D constituent in the Duck Slough @ Hwy 99 subwatershed.

S. capricornutum toxicity

Toxicity to *S. capricornutum* occurred in July 2005 and in April 2008 and was persistent in the resample collected in May 2008. Although there were no copper WQTL exceedances associated with *S. capricornutum* toxicity, the Coalition elected to list water column toxicity to *S. capricornutum* as a priority D constituent because of the high frequency of copper WQTL exceedances at this site. There

was no toxicity associated with the MPM samples collected in April 2009 and April and July 2010 and 2011. Total and dissolved copper were also monitored in 2010 and 2011 alongside *S. capricornutum* toxicity and none of these constituents exceeded their WQTLs.

Since focused outreach began in 2009, *S. capricornutum* toxicity has not occurred at Duck Slough @ Hwy 99. The Coalition discussed toxicity to *S. capricornutum* focusing on copper individual grower meetings and conducted outreach regarding the retention of storm water and irrigation tailwater runoff. If the Coalition finds that copper exceedances are eliminated and *S. capricornutum* toxicity persists, then additional herbicides will be targeted for outreach and management. The Coalition will conduct MPM in 2012 for *S. capricornutum* toxicity in order to demonstrate two consecutive years of monitoring with no toxicities.

Priority E Constituents

The priority E constituents listed under the Duck Slough @ Hwy 99 subwatershed management plan are DO, *E. coli*, pH, and lead.

Due to an oversight, MPM for lead began in April 2011 instead of 2010.

Although DO, *E. coli*, pH and lead remain low priority, the Coalition will continue to collect DO and pH during each monitoring event, *E. coli* during Core and Assessment Monitoring events, and lead during Assessment Monitoring and MPM. Currently, Duck Slough @ Hwy 99 is scheduled for Assessment Monitoring in 2013-2014. All priority E constituent monitoring results were discussed during individual contacts and at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Duck Slough @ Hwy 99 is one of the first three priority site subwatersheds within the ESJWQC. Therefore, the Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Duck Slough subwatershed is to target growers located adjacent to the waterway and whose agricultural practices may result in the discharge or drift of pesticides into the creek. Outreach focus is on both aerial application and tailwater retention. Outreach includes grower notification of exceedances, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of the efficacy of those management practices.

Individual grower surveys documenting current management practices and follow up contacts assessing planned implementation strategies were completed and returned by 100% of targeted growers. The Summary of Implemented Management Practice section of this report summarizes the results of these surveys. The Coalition will continue to notify growers of funding opportunities for management practice implementation and will continue to encourage growers to take advantage of such opportunities.

Both the overall acres treated and pounds of chlorpyrifos applied decreased since 2005, which may be a result of many factors including educating growers about alternative products. Usage of chlorpyrifos decreased in the months of July, May and September, when the exceedances occurred historically at the site. Since grower outreach and management practice implementation, no additional chlorpyrifos exceedances occurred at the Duck Slough @ Hwy 99 subwatershed.

During 2012, Duck Slough @ Hwy 99 is scheduled to continue MPM during months of past exceedances. If and when the Regional Board approves dropping the Duck Slough @ Hwy 99 site due to the expansion of highway 99 over the site area, all Duck Slough @ Hwy 99 MPM constituents will continue to be monitored at the Duck Slough @ Gurr Rd downstream location. Any additional water quality impairments that arise will be discussed with the Regional Board and outreach may then include dairy and new member contacts within the subwatershed.

Monitoring for chlorpyrifos, DO and toxicity to *S. capricornutum* indicates no exceedances/toxicities for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove these constituents from the active Duck Slough @ Hwy 99 management plan; until the letter is approved, the constituents will continue to be monitored as scheduled.

III. PRAIRIE FLOWER DRAIN @ CROWS LANDING RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Dimethoate
- Nitrate / Nitrate + Nitrite

Priority D

- *Ceriodaphnia dubia* water column toxicity
- *Pimephales promelas* water column toxicity
- *Hyalella azteca* sediment toxicity

Priority E

- Ammonia
- Dissolved Oxygen
- *E. coli*
- Molybdenum
- pH
- Specific Conductivity
- *Selenastrum capricornutum* water column toxicity
- Total Dissolved Solids

Description of Prairie Flower Drain @ Crows Landing Rd Site Subwatershed

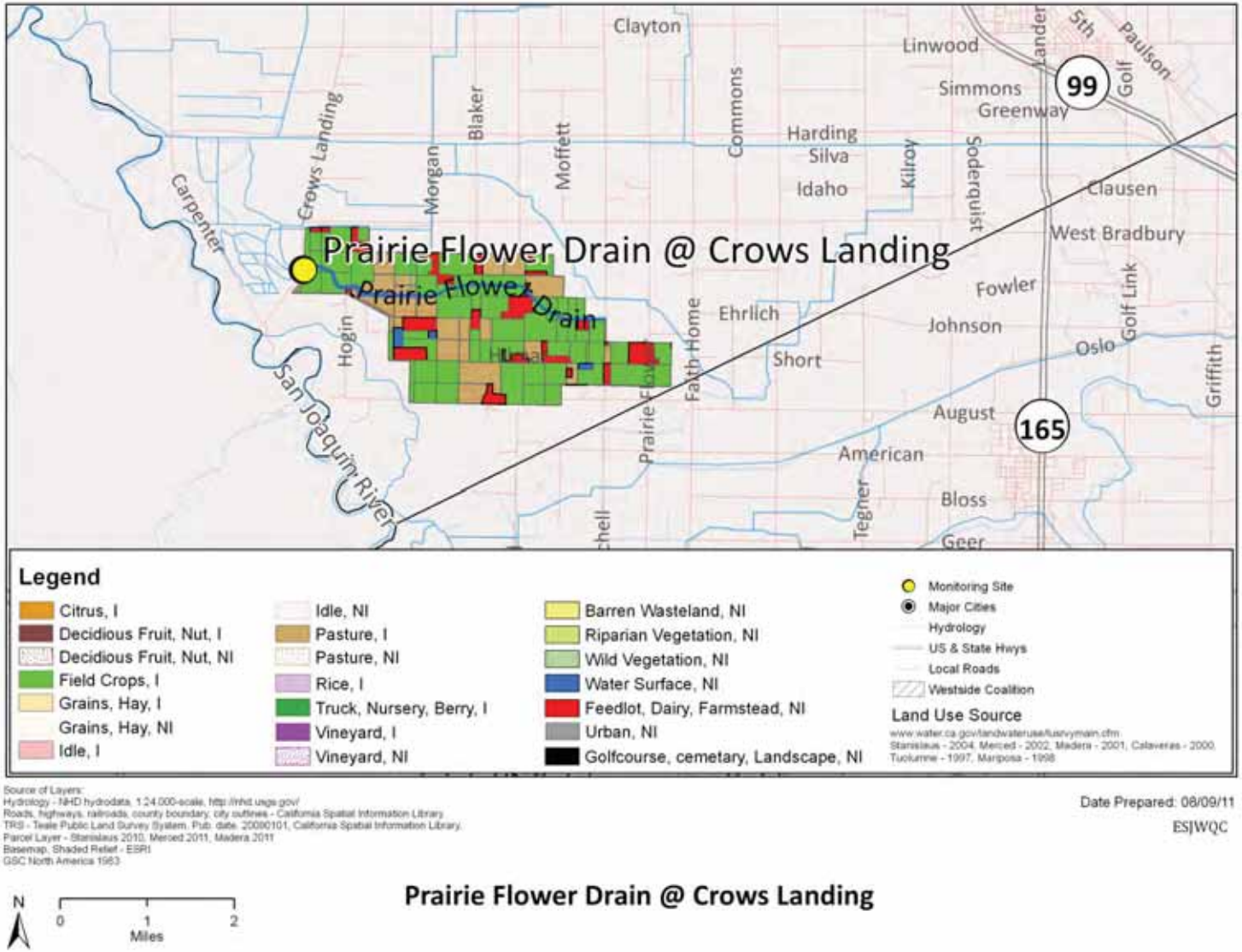
Prairie Flower Drain @ Crows Landing Rd (2,714 irrigated acres) – This site is located southwest of Turlock near the southern border of Stanislaus county (Table III-1). This site subwatershed includes an upstream location (Prairie Flower Drain @ Morgan Rd) which was sampled in 2008. Relative to other drains in the western portion of the Coalition region, Prairie Flower Drain is longer. Dairies and feedlots are ubiquitous in this part of the Coalition region and this drain may receive runoff from several dairies immediately upstream. Many of the drains in the eastern part of the Coalition region, including Prairie Flower Drain, were constructed to intercept shallow ground water and lower the water table sufficiently to allow agriculture. Consequently, agriculture in the subwatershed tends to be dominated by shallow rooted field crops and pastures (Figure III-1).

Table III-1. Prairie Flower Drain site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Prairie Flower Drain @ Crows Landing Road*	535XPFDCL	37.4422	-121.0024
Prairie Flower Drain @ Morgan Rd[U]	535XPFDMR	37.4379	-120.9757

[U] Upstream sites
* Original ESJWQC sampling site

Figure III-1. Prairie Flower Drain @ Crows Landing Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring of ambient water began at Prairie Flower Drain @ Crows Landing Rd during the storm season of 2005 and continued uninterrupted through 2011 (Table III-2). Prairie Flower Drain @ Crows Landing Rd is the Zone 2 Core Monitoring location under the current 2008 MRPP. Assessment Monitoring occurred at the site during 2011 and is scheduled to recur every third year (e.g. 2014, 2017). Core Monitoring resumed at this location in 2012. All constituents sampled at the Prairie Flower Drain subwatershed from 2005 through 2011 are listed in (Table III-3).

During the 2007 irrigation season, MPM was initiated. Additional monitoring for chlorpyrifos and toxicity to *Pimephales promelas* occurred in 2007 (Table III-4). Upstream monitoring at Prairie Flower Drain @ Morgan Rd occurred for chlorpyrifos, nitrate, and toxicity to *C. dubia* and *P. promelas* in 2008 (Table III-4). Management Plan Monitoring during months of past exceedances occurred at Prairie Flower Drain @ Crows Landing Rd in 2009 (chlorpyrifos and *S. capricornutum* toxicity), and in 2010 and 2011 (chlorpyrifos, *C. dubia*, *S. capricornutum* and *H. azteca* toxicity).

Prairie Flower Drain is not considered impaired on California's 2008-2010 303d List of Impaired Waterbodies. However, the section of the San Joaquin River which receives water from Prairie Flower Drain (Harding Drain) is listed as impaired for BHC-alpha, chlorpyrifos, DDE, HCB, HCH and *E. coli*.

Table III-2. Prairie Flower Drain site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	9	0	**9**
2008	Storm	3	0	**3**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2009	Winter	2	0	**2**
	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2010	Winter	1	0	**1**
	Storm	3	0	**3**
	Irrigation	5	0	**5**
	Fall	3	0	**3**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	3	0	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA - Not applicable. This site was not scheduled for sampling during this season/year.

Table III-3. Prairie Flower Drain @ Crows Landing Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
Field and Physical Parameters																						
EPA 110.2	Color	2	5	2	5	3	6	2	6													
EPA 160.1	Dissolved Solids	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 160.2	Suspended Solids							1		2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 180.1	Turbidity	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 405.1	BOD				1	2	2															
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
SM 9223 B	*E. coli*	2	5	2	5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
Walkley-Black	Total Organic Carbon (sediment)																		1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)																		1		1	
NA	Dissolved Oxygen	2	5	4	6	3	13	5	10	2	2	2	6	2	1	3	5	3	3	1	7	3
NA	Specific Conductivity	2	5	4	6	3	13	5	10	2	2	2	6	2	1	3	5	3	3	1	7	3
NA	pH	2	5	4	6	3	13	5	10	2	2	2	6	2	1	3	5	3	3	1	7	3
Carbamates																						
EPA 8321A	Aldicarb				5	2	6	2	6										2	1	6	3
EPA 8321A	Carbaryl				5	2	6	2	6										2	1	6	3
EPA 8321A	Carbofuran				5	2	6	2	6										2	1	6	3
EPA 8321A	Diuron				5	2	6	2	6										2	1	6	3
EPA 8321A	Linuron				5	2	6	2	6										2	1	6	3
EPA 8321A	Methiocarb				5	2	6	2	6										2	1	6	3
EPA 8321A	Methomyl				5	2	6	2	6										2	1	6	3
EPA 8321A	Oxamyl				5	2	6	2	6										2	1	6	3
Organochlorines																						
EPA 8081A	DDD(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	DDE(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	DDT(p,p')				5	2	6	2	6										2	1	4	
EPA 8081A	Dicofol				5	2	6	2	6										2	1	4	
EPA 8081A	Dieldrin				5	2	6	2	6										2	1	4	
EPA 8081A	Endrin				5	2	6	2	6										2	1	4	

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Methoxychlor				5	2	6	2	6										2	1	4	
Group A Pesticides																						
EPA 8081A	Aldrin																		2	1	4	
EPA 8081A	Chlordane																		2	1	4	
EPA 8081A	Endosulfan I																		2	1	4	
EPA 8081A	Endosulfan II																		2	1	4	
EPA 8081A	HCH, alpha																		2	1	4	
EPA 8081A	HCH, beta																		2	1	4	
EPA 8081A	HCH, delta																		2	1	4	
EPA 8081A	HCH, gamma																		2	1	4	
EPA 8081A	Heptachlor																		2	1	4	
EPA 8081A	Heptachlor epoxide																		2	1	4	
EPA 8081A	Toxaphene																		2	1	4	
Organophosphates																						
EPA 8141A	Azinphos methyl				5	2	6	2	6										2	1	6	3
EPA 8141A	Chlorpyrifos	2	5	2	5	2	8	2	6				1				2		2	1	6	3
EPA 8141A	Demeton-s																		2	1	6	3
EPA 8141A	Diazinon	2	5	2	5	2	6	2	6										2	1	6	3
EPA 8141A	Dimethoate				5	2	6	2	6										2	1	6	3
EPA 8141A	Disulfoton				5	2	6	2	6										2	1	6	3
EPA 8141A	Malathion				5	2	6	2	6										2	1	6	3
EPA 8141A	Methamidophos				5	2	6	2	6										2	1	6	3
EPA 8141A	Methidathion				5	2	6	2	6										2	1	6	3
EPA 8141A	Molinate				5	2	6	2	6													
EPA 8141A	Parathion, Methyl				5	2	6	2	6										2	1	6	3
EPA 8141A	Phorate				5	2	6	2	6										2	1	6	3
EPA 8141A	Phosmet				5	2	6	2	6										2	1	6	3
EPA 8141A	Thiobencarb				5	2	6	2	6													
EPA 8141A	Trifluralin																		2	1	6	3
Pyrethroids																						
EPA 8081A	Bifenthrin		1	2	5	2	6															
EPA 8081A	Cyfluthrin, total		1	2	5	2	6															

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6															
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6															
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6															
EPA 8081A	Permethrin, total	2	5	2	5	2	6															
Triazines																						
EPA 547M	Glyphosate				5	2	6	2	6										2		4	
EPA 549.2M	Paraquat dichloride				5	2	6	2	6										2		4	
EPA 619	Atrazine				5	2	6	2	6										2	1	6	3
EPA 619	Cyanazine				5	2	6	2	6										2	1	6	3
EPA 619	Simazine				5	2	6	2	6										2	1	6	3
Metals (Total)																						
EPA 200.8	Arsenic				5	2	6	2	6										2	1	5	
EPA 200.8	Boron				5	2	6	2	6										2	1	6	3
EPA 200.8	Cadmium				5	2	6	2	6										2	1	5	
EPA 200.8	Copper				5	2	6	2	6										2	1	6	3
EPA 200.8	Lead				5	2	6	2	6										2	1	5	
EPA 200.8	Molybdenum																		2	1	5	
EPA 200.8	Nickel				5	2	6	2	6										2	1	6	3
EPA 200.8	Selenium				5	2	2	2	6										2	1	6	3
EPA 200.8	Zinc				5	2	6	2	6										2	1	6	3
Metals (Dissolved)																						
EPA 200.8	Cadmium																		2	1	5	
EPA 200.8	Copper																		2	1	6	3
EPA 200.8	Lead																		2	1	5	
EPA 200.8	Nickel																		2	1	6	3
EPA 200.8	Zinc																		2	1	6	3
Nutrients																						
SM 2340 C	Hardness as CaCO3				5	2	6	2	6										2	1	6	3
EPA 300.0	Nitrate as N				5	2	6	2	6													
EPA 350.2	Ammonia as N				5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	3	6	2	2	1	1				3	3	2	1	6	3
EPA 354.1	Nitrite as N				5	2	6	2	6													

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 353.2	Nitrate + Nitrite as N							1		2	2	2	6	2	1	3	5	3	2	1	6	3
EPA 365.2	OrthoPhosphate as P				5	2	6	3	6	2	2	1	1				3	3	2	1	6	3
EPA 365.2	Phosphate as P				5	2	6	3	6	2	2	2	6	2	1	3	5	3	2	1	6	3
Toxicity																						
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	3	5	2	8	2	6								1		2	1	6	3
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	6	2	8	2	6										2	1	6	3
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	5	2	8	4	8				2			3	1		2	1	6	3
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	3	1	2								1		1		1	

Table III-4. Prairie Flower Drain site subwatershed Management Plan Monitoring schedule (2007-2011).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Chlorpyrifos	Nitrate	*C. dubia*	*P. promelas*	*S. capricornutum*	*H. azteca*
Prairie Flower @ Crows Landing Rd	31-Jul-07	A				X		
Prairie Flower @ Crows Landing Rd	28-Aug-07	A	X					
Prairie Flower @ Crows Landing Rd	25-Sep-07	A	X					
Prairie Flower @ Morgan Rd	22-Apr-08	U		X				
Prairie Flower @ Morgan Rd	20-May-08	U		X				
Prairie Flower @ Morgan Rd	17-Jun-08	U		X				
Prairie Flower @ Morgan Rd	22-Jul-08	U		X		X		
Prairie Flower @ Morgan Rd	19-Aug-08	U	X	X				
Prairie Flower @ Morgan Rd	23-Sep-08	U	X	X	X			
Prairie Flower Drain @ Crows Landing Rd	21-Apr-09	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	19-May-09	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	18-Aug-09	MPM	X					
Prairie Flower Drain @ Crows Landing Rd	19-Jan-10	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	23-Feb-10	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	20-Apr-10	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	18-May-10	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	17-Aug-10	MPM	X					
Prairie Flower Drain @ Crows Landing Rd	14-Sep-10	MPM	X		X			X
Prairie Flower Drain @ Crows Landing Rd	18-Jan-11	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	17-Feb-11	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	15-Mar-11	MPM			X			
Prairie Flower Drain @ Crows Landing Rd	17-Mar-11	MPM						X
Prairie Flower Drain @ Crows Landing Rd	19-Apr-11	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	10-May-11	MPM					X	
Prairie Flower Drain @ Crows Landing Rd	9-Aug-11	MPM	X					
Prairie Flower Drain @ Crows Landing Rd	6-Sep-11	MPM	X		X			X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Prairie Flower Drain subwatershed (Prairie Flower Drain @ Crows Landing Rd and Prairie Flower Drain @ Morgan Rd) from 2005 through 2011 exceeded the WQTLs for field and physical parameters, *E. coli*, nutrients, metals, pesticides, and water column and sediment toxicity occurred in the Prairie Flower Drain site subwatershed (Table III-5). Samples collected over the entire five years of monitoring at the Prairie Flower Drain sample site resulted in exceedances of DO (23), pH (6), SC (90), TDS (67), *E. coli* (51), nitrate (23), nitrite (1), nitrate + nitrite (37), ammonia (11), chlorpyrifos (4), arsenic (1), dimethoate (3), malathion (1), molybdenum (5), and carbaryl (1). Toxicity to *C. dubia* (3), *S. capricornutum* (12), *P. promelas* (3), and *H. azteca* sediment (6) occurred (Table III-5).

During 2011, exceedances detected during NM and MPM included DO (3), specific conductivity (13), TDS (11), *E. coli* (19), ammonia (5), dimethoate (2), nitrate + nitrite (10), molybdenum (5), and carbaryl (1). Toxicity to *C. dubia* (1) and *S. capricornutum* (3) occurred.

All exceedances are listed in Table III-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Prairie Flower Drain subwatershed are chlorpyrifos (A/B), Nitrate/Nitrite and dimethoate (C) and toxicity to *C. dubia*, *P. promelas* and *H. azteca* (D).

Table III-5. Prairie Flower Drain site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Prairie Flower Drain @ Crows Landing Rd	Storm	2/15/2005			2561	1600															
Prairie Flower Drain @ Crows Landing Rd	Storm	3/22/2005	6.5		2568	1600	1600														
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/11/2005			3168	1600	500														
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/15/2005			1705	1300	300														
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/13/2005	3.2		1723	1100	1600														
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/17/2005			1779	990	1600								0.029						
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/21/2005	5.22		791	460	500								0.018						86
Prairie Flower Drain @ Crows Landing Rd	Storm	3/1/2006			2419	1600	900														
Prairie Flower Drain @ Crows Landing Rd	Storm	3/16/2006		8.77	2728	1600	300											75			
Prairie Flower Drain @ Crows Landing Rd	Storm	3/24/2006			2782																
Prairie Flower Drain @ Crows Landing Rd	Storm	5/2/2006			2724																92
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/18/2006			2958	1700	550														
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/15/2006			2660	1700	1300		21												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/13/2006	5.45	8.85	1560	720	790	18											8		
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/20/2006	6.41		1950														70		

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/10/2006			2302	1800	820		17	1.1											
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/14/2006	6.01		1276	760	2400		11												
Prairie Flower Drain @ Crows Landing Rd	Storm	2/11/2007		6.12	2659	1600	2400		24												
Prairie Flower Drain @ Crows Landing Rd	Storm	3/1/2007		8.57	2592	1500			42												
Prairie Flower Drain @ Crows Landing Rd	Storm	3/7/2007			4798																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	4/17/2007			2127	1700			25												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/15/2007	5.59		2473	1500	920		32											88	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/23/2007			2390																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/19/2007		8.54	2304	1500			41			12									
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/17/2007	4.3		1067	730			13												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/14/2007			1126	700	260		16												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/16/2007			2562																59
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/28/2007	3.64		1015										0.094						
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/11/2007	7.86		1097	540	2400											0			17
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/18/2007			2262																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/25/2007			2489																

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% control)	*S. capricornutum*, (% control)	*H. azteca*, (% control)
Prairie Flower Drain @ Crows Landing Rd	Storm	1/24/2008			2371	1500	1100		23											71	
Prairie Flower Drain @ Crows Landing Rd	Storm	1/30/2008			2944																
Prairie Flower Drain @ Crows Landing Rd	Storm	2/26/2008			2722	1600			28											39	
Prairie Flower Drain @ Crows Landing Rd	Sediment	3/4/2008			2639																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	4/22/2008			2548	1700	370		23											29	
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*4/22/2008*	*3.29*		*2574*				*35*												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	4/29/2008	5.44		1739															56	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/20/2008			2526	1600	610		26											61	
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*5/20/2008*	*1.17*		*2026*				*22*												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/27/2008			2273															88	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/17/2008			2049	1200	1300	2.1	19												
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*6/17/2008*			*2893*				*30*												
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/22/2008	2.51		1012	620	250		11							2.7					
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*7/22/2008*	*2.76*		*1417*																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/19/2008	4.93		956	610	440		13						0.024		0.12				
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*8/19/2008*	*3.63*		*1300*				*20*												

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Prairie Flower Drain @ Crows Landing Rd	Sediment	8/28/2008			1114																90
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/23/2008			2525	1800			33												
Prairie Flower Drain @ Morgan Rd	*Irrigation*	*9/23/2008*	*3.3*		*2675*				*29*												
Prairie Flower Drain @ Crows Landing Rd	Sediment	10/2/2008			2449																86
Prairie Flower Drain @ Crows Landing Rd	Fall	10/21/2008			1742	1100	370				27										
Prairie Flower Drain @ Crows Landing Rd	Fall	11/11/2008			2151	1500					39										
Prairie Flower Drain @ Crows Landing Rd	Fall	12/16/2008			2298	2900	1300				40										
Prairie Flower Drain @ Crows Landing Rd	Winter	1/20/2009			2414	1500					43										
Prairie Flower Drain @ Crows Landing Rd	Storm	2/7/2009			2255	1300					31										
Prairie Flower Drain @ Crows Landing Rd	Winter	3/17/2009		8.74	2394	1400					34										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	4/21/2009			2223	1400	410				24										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/19/2009	4.78		2066	1200	>2400	3.2			20									30	
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/16/2009			2417	1400		1.3			22										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/21/2009			1366	820		1.8			14										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/18/2009			1984	1200					22										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/22/2009			2171	1400	1300				35										

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Prairie Flower Drain @ Crows Landing Rd	Fall	10/20/2009			2459	1400	1300				25										
Prairie Flower Drain @ Crows Landing Rd	Fall	11/17/2009			2415	1500	>2400	8.8			36										
Prairie Flower Drain @ Crows Landing Rd	Storm	12/15/2009			2695	1600	2000				36										
Prairie Flower Drain @ Crows Landing Rd	Storm	1/19/2010			1837	1300	2400				43									56	
Prairie Flower Drain @ Crows Landing Rd	Storm	2/23/2010			2833	1700	440				32										
Prairie Flower Drain @ Crows Landing Rd	Winter	3/23/2010			2833	1700	1400				31										
Prairie Flower Drain @ Crows Landing Rd	Storm	4/20/2010			2399	1500	1300				33										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/18/2010			2428	1500	460				35										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/15/2010	4.25		2703	1600	820				29										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/20/2010			2556	1500	260				26										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/17/2010			2776	1700	870				24										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/14/2010									12										
Prairie Flower Drain @ Crows Landing Rd	Fall	10/19/2010			1795	1100	580				20										
Prairie Flower Drain @ Crows Landing Rd	Fall	11/16/2010			2710	1700	460				42										
Prairie Flower Drain @ Crows Landing Rd	Fall	12/14/2010			2688	1700	>2400				40										
Prairie Flower Drain @ Crows Landing Rd	Winter	1/18/2011	5.35		2951	1800	870	1.90			29		25								

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Dissolved Solids, >450 mg/L	*E. coli*, >235 MPN/100 mL	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	Nitrite as N, >1 mg/L	Nitrate + Nitrite as N, >10 mg/L	Arsenic, >10 µg/L	Molybdenum, >10 µg/L	Carbaryl, > 2.53 µg/L	Chlorpyrifos, >0.015 µg/L	Dimethoate, >1µ g/L	Malathion, >0 µg/L	*C. dubia*, (% control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Prairie Flower Drain @ Crows Landing Rd	Storm	2/17/2011			2647	1600					33		21							82	
Prairie Flower Drain @ Crows Landing Rd	Winter	3/15/2011			2685	1700					31		19								
Prairie Flower Drain @ Crows Landing Rd	Winter	3/17/2011			2643																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	4/19/2011	2.14		1471	800	>2400	12.00											80		
Prairie Flower Drain @ Crows Landing Rd	Irrigation	5/10/2011			1775	1000	370	1.80			17		11								
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/14/2011			2035	1200					24		13								
Prairie Flower Drain @ Crows Landing Rd	Irrigation	6/15/2011			2423																
Prairie Flower Drain @ Crows Landing Rd	Irrigation	7/12/2011			1083	770	>2400	1.8			16										
Prairie Flower Drain @ Crows Landing Rd	Irrigation	8/9/2011			1141	680	1000	4.1						13		10		0			
Prairie Flower Drain @ Crows Landing Rd	Irrigation	9/6/2011					370				11					1.1					
Prairie Flower Drain @ Crows Landing Rd	Fall	10/11/2011	6.59		2447	1600	290				28									35	
Prairie Flower Drain @ Crows Landing Rd	Fall	11/8/2011			2206	1500	520				33										
Prairie Flower Drain @ Crows Landing Rd	Fall	12/6/2011			2095	1400	460				41									8	
Constituent Priority			**E**	**E**	**E**	**E**	**E**	**E**	**C**	**NP**	**C**	**NP**	**E**	**NP**	**A/B**	**C**	**NP**	**D**	**D**	**E**	**D**

[1]Ammonia WQTL variable based on pH and temperature.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[T] – Not prioritized; both toxic samples were from the same sampling event (sample and resample to test for persistence).

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Prairie Flower Drain subwatershed are listed in Table III-6. These constituents include chlorpyrifos, dimethoate, nitrate, and toxicity to *C. dubia*, *P. promelas*, *S. capricornutum* and *H. azteca.*

Chlorpyrifos exceeded the WQTL four times in samples collected from the Prairie Flower Drain @ Crows Landing Rd subwatershed (Table III-6). No exceedances of chlorpyrifos occurred during upstream monitoring in 2008 at Prairie Flower Drain @ Morgan Rd. All exceedances occurred during the irrigation season, twice during 2005 (August and September), once each in 2007 and 2008 (August). Since the most recent exceedance in August 2008, the Coalition completed Normal Monitoring in 2008 (September) and conducted MPM for chlorpyrifos in 2009 (August) and in 2010 and 2011 (August and September). Assessment Monitoring occurred at the site during 2011 from January through December and no exceedances of the chlorpyrifos WQTL occurred. Zero exceedances of the chlorpyrifos WQTL have occurred since August 2009. In 2012, MPM for chlorpyrifos is scheduled in August, and September.

Dimethoate exceeded the WQTL twice at Prairie Flower Drain @ Crows Landing Rd during 2011 Assessment Monitoring (August and September). In 2012, MPM for dimethoate is scheduled to occur during months of past exceedances (August and September).

Nitrate exceedances occurred at Prairie Flower Drain @ Crows Landing Rd consistently since 2006 monitoring (Table III-5). During 2007, Normal Monitoring exceedances of nitrate occurred in samples collected from February through August (Table III-6). Nitrate MPM during 2008 (April-September) at the upstream location at Prairie Flower @ Morgan Rd resulted in exceedances of the nitrate WQTL during every month except July. In addition, 2008 Normal Monitoring resulted in exceedances of the nitrate WQTL during January, February and April through September. The Coalition replaced separate analysis of nitrate and nitrite with the combined analysis of nitrate + nitrite starting in October 2008. Exceedances of the nitrate WQTL (either of separately measured nitrate or of combined nitrate + nitrite analysis) occurred during every month of the year from 2007 through 2011. Since the Coalition does not possess the capabilities to track fertilizer applications or understand dairy contributions and therefore cannot determine the exact source of the nitrate exceedances, MPM for nitrate is no longer scheduled at Prairie Flower Drain. However, in the current 2008 MRPP, nitrate is a Core Monitoring constituent and since Prairie Flower Drain @ Crows Landing Rd is a Core Monitoring location nitrate is monitored on a monthly basis, therefore scheduling MPM for nitrate is not necessary. Nitrate is still a priority constituent at Prairie Flower Drain @ Crows Landing Rd and in 2012 nitrate will be monitored monthly as part of Core Monitoring at the site.

Toxicity to *C. dubia* occurred three times at Prairie Flower Drain since monitoring began in 2005 (May 2006, September 2007 and August 2011). The site was monitored monthly for toxicity to *C. dubia* during the storm and irrigation seasons of 2007 and 2008. Toxicity to *C. dubia* occurred during the 2007 (September) Normal Monitoring event, but no toxicity occurred in samples collected during 2008 during Normal Monitoring or upstream MPM at Prairie Flower Drain @ Morgan Rd (Table III-6). The TIE for the

toxic samples from September 2007 indicated that organophosphates were responsible for toxicity (3.2 TUa). *C. dubia* toxicity was analyzed monthly during 2011 Assessment Monitoring and toxicity occurred in August (Table III-6). Toxicity was not persistent. A TIE was conducted on the samples from the August 2011 toxicity and it was concluded that pyrethroid insecticides were the cause of toxicity. In 2012, MPM is scheduled for *C. dubia* toxicity (March, August and September).

Toxicity to *P. promelas* occurred in July 2006. In 2007, MPM was implemented at Prairie Flower Drain @ Crows Landing Rd for *P. promelas* toxicity and did not result in toxicity (Table III-6). Normal Monitoring and upstream MPM for *P. promelas* occurred during the 2008 irrigation season at Prairie Flower Drain @ Morgan Road and no samples were toxic to *P. promelas*. In 2009 and 2010, MPM for *P. promelas* was not scheduled. In 2012, Prairie Flower Drain @ Crows Landing Rd rotated into Assessment Monitoring and *P. promelas* was monitored monthly for toxicity. Samples collected during the April 2011 monitoring event were toxic to *P. promelas* (80% survival compared to the control). Survival was greater than 50% compared to the control and therefore a TIE was not initiated. Samples from this April event also exceeded the WQTL for ammonia with a concentration of 12 mg/L. It is likely that the high ammonia was the cause of the 20% reduction in *P. promelas* survival. In 2012, MPM for *P. promelas* is scheduled to occur (April and July).

Toxicity to *S. capricornutum* occurred nine times at Prairie Flower Drain @ Crows Landing Rd in 2007 (May), 2008 (January, February, April and May), in 2009 (May), in 2010 (January) and in 2011 (February, October and December). A TIE was initiated on the February 2008 toxic samples; however, the sample lost all toxicity and the analysis was inconclusive. The results for the April 2008 TIE indicated that the toxicity was caused by cationic chemicals and non-polar organics. The TIE for the toxic May 2009 samples indicated that cationic chemicals and ammonia were the cause of toxicity. Due to the updated monitoring schedule from the 2008 MRPP, MPM for *S. capricornutum* toxicity did not begin until 2009 at Prairie Flower Drain @ Crows Landing Rd. The Coalition's original management plan strategy did not address storm exceedances due to the difficulty in sourcing those exceedances, and at the time of the management plan strategy's development the Coalition was not monitoring monthly (only storms and irrigation months). Starting in 2010, the Coalition updated its management plan strategy to monitor management plan constituents during the storm month that they occurred regardless of a rain event. In response to the updated management plan strategy, *S. capricornutum* toxicity MPM at Prairie Flower Drain @ Crows Landing Rd began in January and February of 2010 and continued through May. In 2011, Assessment Monitoring occurred at the site and resulted in toxicity three times (February, October and December). In 2012, MPM is scheduled for *S. capricornutum* toxicity (January, February, April, May, October and December).

Toxicity to *H. azteca* occurred six times (Table III-6) at Prairie Flower Drain @ Crows Landing Rd, in 2005 (September), 2006 (May), 2007 (August and September) and in 2008 (August and October). Sediment toxicity was added to the MPM schedule in September of 2010, so MPM for *H. azteca* only occurred once in 2010 (September). Starting in 2011, *H. azteca* MPM occurred in both winter and irrigation

monitoring (March and September). Samples collected for sediment monitoring in 2010 and 2011 were not toxic to *H. azteca*. In 2012, MPM is scheduled to continue during March and September.

Table III-6. Prairie Flower Drain site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007 NM (@ Crows Landing Rd)	Date	NA	2/11/07	3/01/07	4/17/07	5/15/07	6/19/07	7/17/07	8/14/07	9/11/07	NA	NA	NA
	Nitrate (mg/L)	NA	24	42	**25**	**41**	**32**	**13**	**16**	9.8	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	<0.003	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	NA	90	105	105	90	95	100	100	**0**	NA	NA	NA
	P. promelas toxicity (% Control)	NA	103	100	98	100	100	98	100	100	NA	NA	NA
2007 MPM A (@ Crows Landing Rd)	Date	NA	NA	NA	NA	NA	NA	7/31/07	8/28/07	9/25/07	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	**0.094**	<0.003	NA	NA	NA
	P. promelas toxicity (% Control)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
2008 NM (@ Crows Landing Rd)	Date	1/24/08	2/26/08	NA	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	9/23/08	NA	NA	NA
	Nitrate (mg/L)	**23**	**28**	NA	**23**	**26**	**19**	**11**	**13**	**33**	NA	NA	NA
	Chlorpyrifos (µg/L)	<0.003	<0.003	NA	<0.003	<0.003	<0.003	<0.003	**0.024**	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	100	95	NA	100	95	100	95	100	95	NA	NA	NA
	P. promelas toxicity (% Control)	103	98	NA	100	100	103	100	100	100	NA	NA	NA
2008 MPM US (@ Morgan Rd)	Date	NA	NA	NA	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	9/23/08	NA	NA	NA
	Nitrate (mg/L)	NA	NA	NA	**35**	**22**	**30**	<0.1	**20**	**29**	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	<0.003	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	100	NA	NA	NA
	P. promelas toxicity (% Control)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
2009 MPM (@ Crows Landing Rd)	Date	NA	NA	NA	4/21/09	5/19/09	NA	NA	8/18/09	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	<0.003	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	248	**30**	NA	NA	NA	NA	NA	NA	NA
2010 MPM (@ Crows Landing Rd)	Date	1/19/10	2/23/10	NA	4/20/10	5/18/10	NA	NA	8/17/10	9/14/10	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	0.014	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	100	NA	NA	NA
	S. capricornutum toxicity (% Control)	**56**	340	NA	281	96	NA	NA	NA	NA	NA	NA	NA
	H. azteca toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	114	NA	NA	NA

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011 NM & MPM (@ Crows Landing Rd)	Date	1/18/11	2/17/11	3/15/11	4/19/11	5/10/11	6/14/11	7/12/11	8/9/11	9/6/11	10/11/11	11/8/11	12/6/11
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003*	<0.003*	<0.003	<0.003	<0.003
	Dimethoate (µg/L)	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	**10**	**1.1**	<0.008	<0.008	<0.008
	C. dubia toxicity (% Control)	100	100	100*	90	100	100	100	**0**	100*	95	100	100
	S. capricornutum toxicity (% Control)	617*	**82***	316	119*	269*	251	305	647	715	**35**	1543	**8**
	H. azteca toxicity (% Control)	NA	NA	100*	NA	NA	NA	NA	NA	106*	NA	NA	NA

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 only.
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for all chlorpyrifos, dimethoate, and nitrate + nitrite detections in the site subwatershed (Table III-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table III-7. Prairie Flower Drain @ Crows Landing Rd site subwatershed instantaneous load calculations for chlorpyrifos, dimethoate, and nitrate + nitrite.
Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	08/17/05	0	0.029	0
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	09/21/05	0	0.018	0
Prairie Flower Drain @ Crows Landing Rd*	Chlorpyrifos	09/21/05	0	0.018	0
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	07/13/06	0	0.014	0
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	07/17/07	2.32	0.009	0.59
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	08/19/08	4.67	0.024	3.17
Prairie Flower Drain @ Crows Landing Rd	Chlorpyrifos	08/17/10	1.34	0.014	0.53
Prairie Flower Drain @ Crows Landing Rd	Dimethoate	08/09/11	5.61	10	1588.58
Prairie Flower Drain @ Crows Landing Rd	Dimethoate	09/06/11	0	1.1	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	10/21/08	0.93	27	711.04
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	11/11/08	0.09	39	99.39
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	12/16/08	0.19	40	215.21
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	02/07/09	0.097	31	85.15
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	03/17/09	0.12	34	115.53
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	04/21/09	0.3	24	203.88
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	05/19/09	0.5	20	283.17
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	06/16/09	0.61	22	380.01
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	07/21/09	4.15	14	1645.22
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	08/18/09	2.85	22	1775.48
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	09/22/09	2.08	35	2061.48
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	10/20/09	0.72	25	509.71
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	11/17/09	0	36	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	12/15/09	0.31	36	316.02
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	01/19/10	0	43	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	02/23/10	1.5	32	1359.22
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	03/23/10	1.33	31	1167.51
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	04/20/10	0.49	33	457.89
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	05/18/10	0.36	35	356.79
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	06/15/10	0	29	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	07/20/10	0	26	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	08/17/10	1.34	24	910.67
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	09/14/10	0	12	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	10/19/10	0.83	20	470.06

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	11/16/10	0.39	42	463.83
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	12/14/10	0.59	40	668.28
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	01/18/11	1.61	29	1322.12
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	02/17/11	0.41	33	383.13
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	03/15/11	0.71	31	623.26
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	04/19/11	2.95	7	584.75
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	05/10/11	1.6	17	770.22
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	06/14/11	0.65	24	441.75
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	07/12/11	2.68	16	1214.23
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	08/09/11	5.61	8.2	1302.64
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	09/06/11	0	11	0
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	10/11/11	0.47	28	372.65
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	11/08/11	0.27	33	252.30
Prairie Flower Drain @ Crows Landing Rd	Nitrate + Nitrite as N	12/06/11	0.13	41	150.93

*Field Duplicate

Source Identification and Outreach

The Coalition addressed source identification in the 2011 MPUR and, in the following sections, considers 2011 monitoring results and PUR data as it expands upon that discussion. The Coalition focuses its efforts on applied pesticides. During 2007 and 2008, the Coalition conducted additional and upstream MPM during those months when exceedances historically occurred to better characterize water quality in the subwatershed. From 2009 through 2011, MPM continued at the Prairie Flower Drain @ Crows Landing Rd to assess water quality in the subwatershed as outreach in the area progressed. Assessment Monitoring took place at the site during 2011. The PUR data are reviewed to determine the most frequent crop type and timing associated with applications. Prairie Flower @ Crows Landing Rd subwatershed PUR data are available through November 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Prairie Flower Drain @ Crows Landing Rd subwatershed began in 2009 and has continued through 2011. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality objectives. The Coalition contacted 100% of targeted growers (11) representing 865 acres within the Prairie Flower Drain @ Crows Landing Rd subwatershed. Ten growers participated in follow up contacts to determine if additional management practices were implemented and if any are planned to be implemented, excluding one grower who no longer claimed their parcel(s). Management Plan Monitoring will continue in the Prairie Flower Drain @ Crows Landing Rd subwatershed during 2012 in order to demonstrate two consecutive years of monitoring with no exceedances of high priority constituents.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent in the Prairie Flower Drain @ Crows Landing Rd subwatershed.

Chlorpyrifos

Four exceedances of the chlorpyrifos WQTL occurred at this site, once during the month of September (2005) and three times during the month of August (2005, 2007, 2008; Table III-5). There were no exceedances during the 2009 through 2011 MPM, as well as during monthly Assessment Monitoring in 2011. The Coalition evaluates monitoring and PUR data to identify possible sources of exceedances of constituents of concern.

In every high priority subwatershed, PUR data are reviewed for the number of monthly applications and pounds of active ingredient applied of the constituent of concern, and the acres treated by the constituent of concern (Table III-8, Figure III-2). The greatest use of chlorpyrifos occurred in 2005 (1,066 lbs AI) with the lowest use in 2007 (150 lbs AI), see Table III-8. The greatest chlorpyrifos use occurred consistently during the month of July. Exceedances occurred in the late summer, but have not always occurred in the months with the highest applications (Figure III-2).

The Coalition also uses PUR data from each subwatershed to determine which crops receive the most applications. Only two crops receive applications of chlorpyrifos in the subwatershed, alfalfa and corn, with corn receiving the largest amount (2,858 lbs AI, alfalfa - 768 lbs AI), (Table III-9). The most common product containing chlorpyrifos used within this subwatershed was Lorsban, while the product with the most pounds AI applied within the subwatershed was Nufos (Table III-9).

Table III-8. Prairie Flower Drain @ Crows Landing Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
March, 2005	2	122.0	240.0
July, 2005	7	362.7	476.0
August, 2005	11	581.7	666.0
July, 2006	6	248.9	265.0
August, 2006	3	147.4	207.0
July, 2007	1	75.1	150.0
August, 2007	1	75.1	150.0
May, 2008	2	212.1	140.0
July, 2008	9	746.9	865.0
August, 2008	4	90.5	89.0
March, 2009	1	76.3	150.0
July, 2009	3	274.5	270.0
August, 2009	2	40.7	40.0
March, 2010	3	24.5	96.0
June, 2010	2	141.4	140.0
July, 2010	2	18.8	36.0
August, 2010	2	112.7	120.0
July, 2011	3	79.9	157.0
August, 2011	4	195.4	194.0
Summaries by Year			
2005 Total	20	1066.4	1382.0
2006 Total	9	396.3	472.0
2007 Total	2	150.2	300.0
2008 Total	15	1049.5	1094.0
2009 Total	6	391.5	460.0
2010 Total	9	297.3	392.0
2011 Total	7	275.3	351.0
Total	**68**	**3626.5**	**4451.0**

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Figure III-2. Prairie Flower Drain @ Crows Landing Rd site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

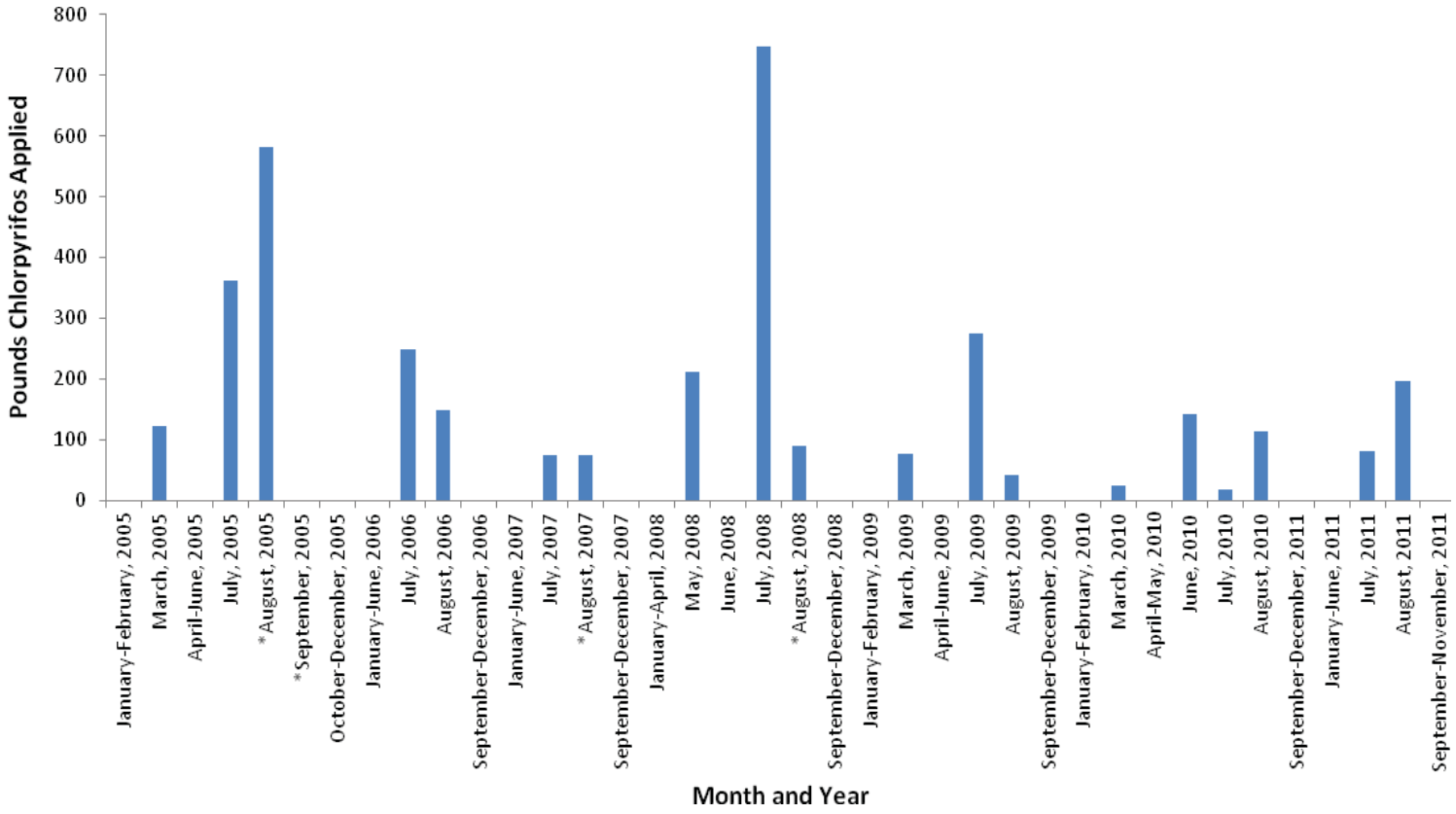


Table III-9. Prairie Flower Drain @ Crows Landing Rd site subwatershed chlorpyrifos PUR data (2005-2011).
PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	545.3
		NUFOS 4E	198.3
		WARHAWK	24.5
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	93.8
		GOVERN 4E INSECTICIDE	212.1
		LORSBAN ADVANCED	131.5
		LORSBAN-4E	223.2
		NUFOS 4E	2056.5
		WARHAWK	141.4

ALFALFA - Total Pounds Chlorpyrifos Applied	**768.1**
CORN - Total Pounds Chlorpyrifos Applied	**2858.4**
Total Pounds Chlorpyrifos Applied (2005 - 2011)	**3626.5**

The Coalition determined the most probable source of chlorpyrifos in the Prairie Flower Drain was runoff from row crops recently receiving chlorpyrifos applications. Unfortunately, of the areas associated with exceedances in 2008, Coalition members own only a small portion of the acreage (2009 MPUR). A large amount of the acreage is owned and farmed by dairies and it is assumed that the land not covered by the Coalition is part of the dairy program. This pattern of ownership suggests that it may be difficult to improve water quality in this site subwatershed. It is difficult to receive cooperation and track implementation of management practices with nonmembers.

The results from the general surveys administered to all members in the subwatershed are summarized in the ESJWQC General Survey Summary Report submitted January 30, 2009. The results were used as a starting point to evaluate management practice implementation within the subwatershed. The survey assessed practices used in the period from May 17, 2007 to December 2009. The Coalition noted that irrigation water is actively managed by Coalition members in this subwatershed. The Coalition designed outreach to increase relevant and effective management practice implementation in member parcels. Growers of row crops were targeted for outreach prior to the irrigation season and heavy application periods and were advised of methods to better manage their irrigation tailwater and storm water runoff.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information, such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began June, 2009 and continued through September, 2009. Targeted growers were selected based on pesticide usage, and the potential for discharge to the creek. Of the 3,611 irrigated acres in Prairie Flower Drain subwatershed with the potential to drain directly to the creek, the Coalition compiled a list

of 11 target members representing 865 acres of irrigated direct drainage. Coalition representatives met with growers to discuss management practices and recommendations specific to the land owner. This also gave the Coalition a chance to better assess currently implemented management practices as well as future planned management practice implementation. Individual contacts with growers focused mainly on chlorpyrifos exceedances however all water quality results were reviewed and discussed including nitrate/nitrate + nitrite, ammonia, *E. coli*, molybdenum, DO, SC, TDS, and pH exceedances and toxicity to *C. dubia*, *S. capricornutum*, and *H. azteca*.

The Coalition contacted all 11 targeted members. In February 2010, the Coalition hosted a follow up meeting to the 2009 Individual Contacts Grower Meeting. Members who attended the meeting provided information as to which recommended management practices were implemented. Members unable to attend the meeting were asked to report their newly implemented management practices via a phone call with a Coalition representative between March 1 and August 4, 2010. All 11 targeted growers completed their follow ups and the Coalition Assessment of implemented management practices is included in the Summary of Implemented Management Practices section of this report. Of the 11 targeted members (except for one member), all required a follow up meeting. Of the 10 members requiring a follow up meeting, the following management practices were implemented to acreages in the Prairie Flower Drain subwatershed: install device to control discharge (43%), reduce amount of water used in surface irrigation (27%), use of polyacrylamide (15%), and drainage basin/sediment pond installation (15%).

The Coalition will continue to assess water quality at Prairie Flower Drain @ Crows Landing Rd through MPM during months of past exceedances. Prairie Flower Drain is scheduled for Assessment Monitoring during 2013-2014 when every constituent will be analyzed during each month of the year. If exceedances of high priority constituents occur, the Coalition will discuss with the Regional Board supplementary actions for outreach that may include contacting other chlorpyrifos sources such as dairy operations and/or contacting new members to the Coalition.

There were no exceedances of the chlorpyrifos WQTL for two or more consecutive years of monitoring in months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove chlorpyrifos from the Prairie Flower Drain management plan. Until the approval from the Regional Board, the Coalition will continue to assess water quality at Prairie Flower Drain @ Crows Landing Rd through MPM during those months of past chlorpyrifos exceedances.

Priority C Constituents

Dimethoate and nitrate + nitrite/nitrate are listed as priority C constituents for the Prairie Flower Drain @ Crows Landing Rd subwatershed. The Coalition replaced separate analysis of nitrate and nitrite with the combined analysis of nitrate + nitrite starting in October 2008. Exceedances of the nitrate WQTL, either of separately measured nitrate or of combined nitrate + nitrite analysis, occurred during almost every sample event (excluding a few in 2011).

Dimethoate

Exceedances of the dimethoate WQTL (1 µg/L) occurred three times in this subwatershed, once in 2008 (July) and two in 2011 (August and September). Subsequently, dimethoate was added to the 2012 Prairie Flower Drain MPM schedule. PUR data are reviewed for the number of monthly dimethoate applications, pounds AI applied, and acres treated (Table III-10, Figure III-3).

PUR data for the Prairie Flower Drain subwatershed are available through November 2011. The greatest amount of dimethoate was applied in 2005 (843 lbs) and the lowest amount applied in 2011 (345 lbs). Between 2005 and 2011, the greatest amount of dimethoate use occurred in the month of July. Dimethoate use over time is a slight trend toward decreasing use. Not all exceedances occurred at Prairie Flower Drain during a month in which dimethoate was applied (Figure III-3).

The Coalition also uses PUR data to assess which crops received the most applications of dimethoate from 2005 through 2011 (Table III-11). The largest amount of dimethoate applied was associated with corn, (3,689 lbs; Table III-11). The most common products containing dimethoate used within this subwatershed were Dimethoate and Drexel™ Dimethoate (Table III-11).

Table III-10. Prairie Flower Drain @ Crows Landing Rd site subwatershed dimethoate applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Dimethoate Applications	Pounds of AI Applied	Acres Treated
June, 2005	4	99.0	129.0
July, 2005	15	517.7	1104.5
August, 2005	7	158.0	348.0
June, 2006	5	100.7	197.0
July, 2006	23	469.9	1076.0
August, 2006	7	96.6	206.0
July, 2007	29	487.9	1163.6
August, 2007	10	216.5	415.0
July, 2008	40	795.6	1697.0
August, 2008	2	47.0	95.0
June, 2009	5	55.1	111.0
July, 2009	13	391.9	779.6
August, 2009	2	69.2	140.0
July, 2010	18	493.4	955.0
August, 2010	2	39.4	79.0
June, 2011	2	31.2	84.0
July, 2011	12	220.2	442.0
August, 2011	3	94.0	188.6
Summaries by Year			
2005 Total	26	774.7	1581.5
2006 Total	35	667.2	1479.0
2007 Total	39	704.4	1578.6
2008 Total	42	842.6	1792.0
2009 Total	20	516.2	1030.6
2010 Total	20	532.7	1034.0
2011 Total	17	345.4	714.6
Total	**199**	**4383.1**	**9210.3**

Figure III-3. Prairie Flower Drain @ Crows Landing Rd site subwatershed lbs dimethoate applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

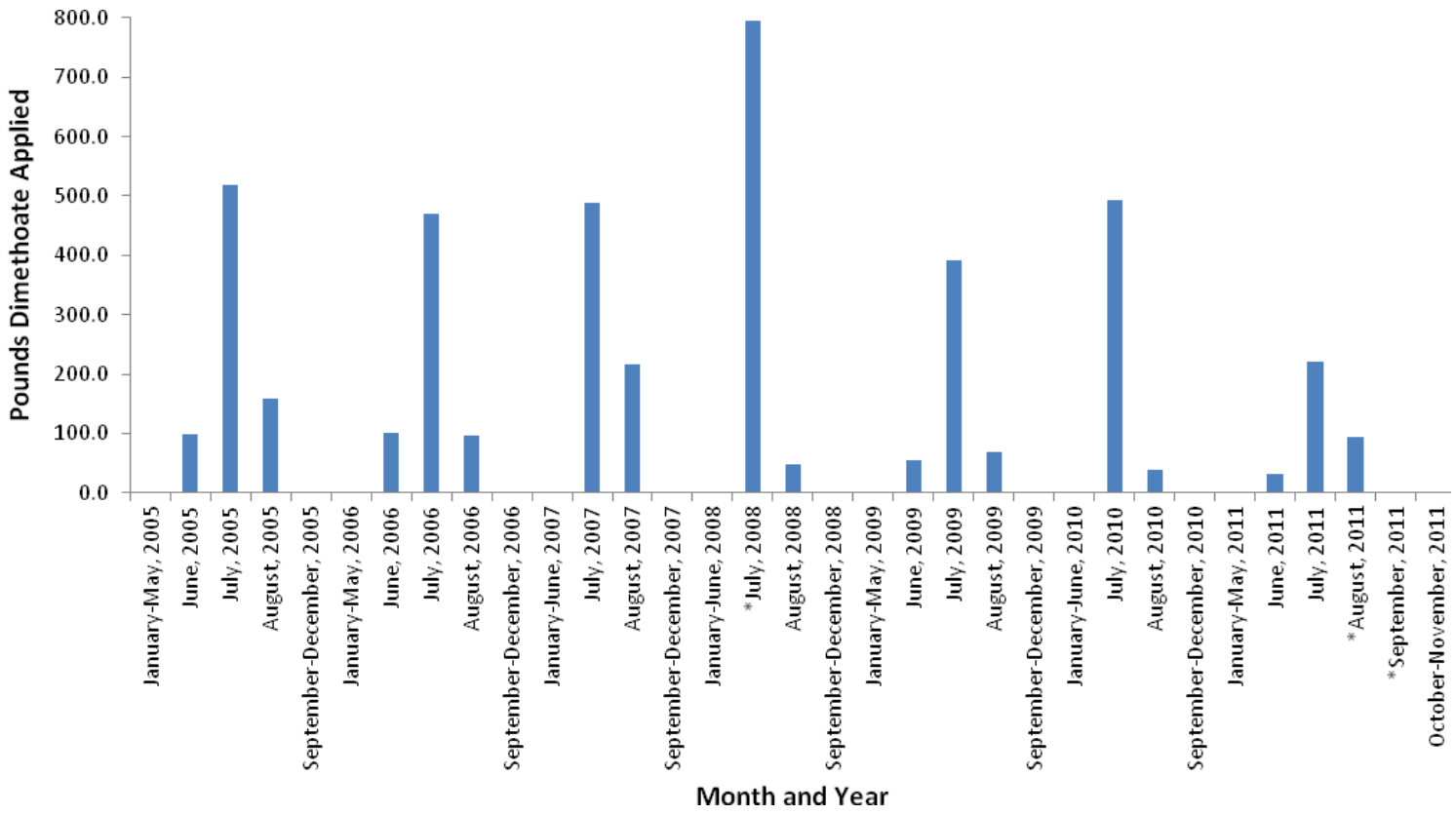


Table III-11. Prairie Flower Drain @ Crows Landing Rd site subwatershed dimethoate PUR data (2005-2011).
PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIMETHOATE	BEAN DRIED	DREXEL DIMETHOATE 4EC	37.4
	CORN (FORAGE - FODDER)	5 LB. DIMETHOATE SYSTEMIC INSECTICIDE	22.4
		CHEMINOVA DIMETHOATE 4E	29.7
		CLEAN CROP DIMETHOATE 400	79.0
		CYMATE 267	205.4
		DIMETHOATE 267	129.9
		DIMETHOATE 400	39.5
		DIMETHOATE 4E	1293.6
		DIMETHOATE 4E (WITHDRAWN)	95.8
		DREXEL DIMETHOATE 4EC	1707.2
		PROKIL DIMETHOATE E-267	86.2
	TOMATOES, FOR PROCESSING/CANNING	DIMETHOATE 400	487.3
		DIMETHOATE 4E	93.4
		DREXEL DIMETHOATE 4EC	76.2

BEAN - Total Pounds Dimethoate Applied	**37.4**
CORN - Total Pounds Dimethoate Applied	**3688.8**
TOMATOES - Total Pounds Dimethoate Applied	**656.9**
Total Pounds Dimethoate Applied (2005 - 2011)	**4383.1**

In 2012, dimethoate MPM is scheduled at Prairie Flower Drain @ Crows Landing Rd for months of past exceedances (July-September). The Coalition's Management Plan strategy for addressing dimethoate exceedances is to include dimethoate in future discussions with individual growers. Improved and additional water management practices should reduce or eliminate dimethoate exceedances. If exceedances of dimethoate continue, the Coalition will discuss with the Regional Board supplementary actions for outreach that may include contacting other possible sources and/or contacting new members to the Coalition.

Nitrate + Nitrite / nitrate

There were 10 exceedances of the nitrate WQTL in the Prairie Flower Drain site subwatershed in 2011. Sources of nitrate are discussed in the introduction of the ESJWQC 2008 Management Plan and include fertilizer applications and dairy manure (solid and liquid) waste. Prairie Flower Drain subwatershed contains approximately 443 acres of confined animal operations most of which are dairies. In addition, nitrate contamination of ground water is common in the region, and Prairie Flower Drain intercepts shallow ground water. It is not clear if the nitrates are originating from recent applications of dairy waste that may be reaching surface waters, or from past contamination of ground water which is being intercepted by the drain. The Coalition does not have the capabilities to track fertilizer applications and therefore cannot determine the exact source of the nitrate exceedances. However, in the current 2008 MRPP, nitrate is a Core Monitoring constituent and since Prairie Flower Drain @ Crows Landing Rd is a Core Monitoring location nitrate is monitored on a monthly basis, therefore scheduling MPM for nitrate is not necessary. Nitrate is still a priority constituent at Prairie Flower Drain @ Crows Landing Rd and in 2012 nitrate will be monitored monthly as part of Core Monitoring at the site. In 2008, exceedances

occurred during every sampling event and during upstream sampling at Morgan Rd in all months except July. Exceedances during 2011 occurred every month of the year except April, June and August. It is unlikely that applications of manure would occur in every month, indicating that ground water and/or dairy discharge are the more likely sources.

Priority D Constituents

The priority D constituents in the Prairie Flower Drain @ Crows Landing Rd subwatershed are water column toxicity to *C. dubia* and *P. promelas*, and sediment toxicity to *H. azteca.*

C. dubia toxicity

C. dubia toxicity occurred three times in the Prairie Flower Drain subwatershed in 2006 (March), 2007 (September), and 2011 (August). Toxicity to *C. dubia* was not monitored during 2009, but was monitored in September 2010 and monthly in 2011 during Assessment Monitoring. The 2007 toxicity was associated with an exceedance of chlorpyrifos in August, and a TIE performed on the 2011 toxic sample indicated pyrethroids were the likely cause of toxicity. Consequently, the Coalition's strategy for eliminating *C. dubia* toxicity is to focus on chlorpyrifos. If chlorpyrifos is prevented from entering waterways throughout the irrigation season, the Coalition believes that *C. dubia* toxicity can also be eliminated. The Coalition will conduct MPM in 2012 for *C. dubia* toxicity during months of past exceedances.

P. promelas toxicity

Toxicity to *P. promelas* occurred in July 2006 to both the original sample and resample, and again in April 2011. The TIE associated with the 2006 toxicities indicated ammonia was the cause. A TIE was not required on the April 2011 toxic samples as the survival was greater than 50% compared to the control. Fertilizers applied to agricultural fields can contain ammonium. However, the ammonium is rapidly converted to nitrate in the natural environment, and it is unlikely that the source of ammonia would be agricultural applications of fertilizer. The Coalition believes that dairies in the subwatershed are responsible for the ammonia exceedances, so re-prioritizing *P. promelas* as a higher priority will not occur. The Coalition continues to emphasize the importance of irrigation tailwater and storm water management, which is consistent with the strategy for the subwatershed.

H. azteca toxicity

Sediment toxicity to *H. azteca* occurred during the September 2005 and May 2006 sampling events, and most recently on August 28, 2008 (sample and resample collected on October 2, 2008). Both of the 2008 samples had survival greater than 80% compared to the control. As of 2009, the Coalition tests for total organic carbon and grain size in all sediments. Addition chemistry analysis is run for pyrethroids and chlorpyrifos in sediment that exhibits toxicity of 80% or less compared to the control. Toxicity to *H. azteca* was not monitored during 2009. However, in 2010 sediment toxicity was monitored as part of MPM in September, and in 2011 as part of Assessment Monitoring/MPM in March and September. No toxicity to *H. azteca* occurred in 2010 or 2011. The Coalition will continue to monitor for sediment toxicity to *H. azteca* during 2012 MPM (March and September).

Priority E Constituents

The priority E constituents listed under the Prairie Flower Drain subwatershed management plan are ammonia, DO, pH, SC, TDS, *E. coli*, molybdenum and water column toxicity to *S. capricornutum.*

Exceedances of ammonia, DO, SC, TDS, and *E. coli* continued to occur during 2011. Molybdenum was added as a priority E constituent as a result of five exceedances during 2011 Assessment Monitoring. Toxicity to *S. capricornutum* occurred several times at the site, usually in the winter or early irrigation months, but was not associated with an herbicide or metal exceedance, except for once in February 2011 when toxicity coincided with a molybdenum exceedance. Toxicity to *S. capricornutum* occurred three times during 2011 Assessment Monitoring/MPM (February, October and December), and again only the February sample was associated with a metal exceedance.

The Coalition will continue to collect priority E constituent monitoring data for DO, pH and SC during each monitoring event, *E.coli* and ammonia are monitored during Assessment and Core Monitoring events and molybdenum and *S. capricornutum* are monitored during Assessment Monitoring only; Assessment Monitoring will resume at this site in 2014. These constituents remain low priority but will be discussed during individual contacts with growers and at annual grower meetings. The Coalition also plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

In addition to chlorpyrifos, there were no exceedances of the pH WQTL for two or more consecutive years of monitoring, and it was included in the letter submitted to the Regional Board on January 6, 2012, petitioning to also have it removed from the active Prairie Flower Drain management plan.

Evaluation

The Prairie Flower Drain subwatershed is one of the first three priority site subwatersheds within the ESJWQC. Therefore, the Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Prairie Flower Drain subwatershed is to target growers with the potential to discharge into the drain. Outreach includes grower notification, management practice education, tracking of the implementation of management practices, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practices and follow up contacts assessing planned implementation strategies were completed and returned representing 100% of the targeted growers. The Summary of Implemented Management Practices section of this report summarizes the results of these surveys.

Both the overall acres treated and pounds of chlorpyrifos applied decreased since 2005. A decrease between 2008 and 2011 use is evident, which may further demonstrate that recent Coalition outreach is resulting in a positive impact. Additionally, usage of chlorpyrifos decreased in the months of July and August, when the most exceedances occurred historically. Also encouraging was the absence of chlorpyrifos exceedances during 2011 monthly Assessment Monitoring.

During 2012, Prairie Flower Drain @ Crows Landing Rd is scheduled for Core Monitoring and MPM will continue to take place during months of past exceedances. The Coalition believes continued MPM will provide more data needed to assess if additional funding and additional implemented management practices are improving water quality, or if further outreach to dairies and new member contacts is needed.

There were no exceedances of chlorpyrifos and pH WQTLs for two or more consecutive years of monitoring. Both constituents have been included in the letter submitted to the Regional Board on January 6, 2012, petitioning to have these constituents removed from the Prairie Flower Drain management plan. Until the letter is approved, the constituents will continue to be monitored as scheduled.

HIGH PRIORITY SITE SUBWATERSHEDS (2010-2012)

IV. BEAR CREEK @ KIBBY RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Ceriodaphnia dubia* water column toxicity

Priority E

- Dissolved Oxygen
- pH
- *E. coli*

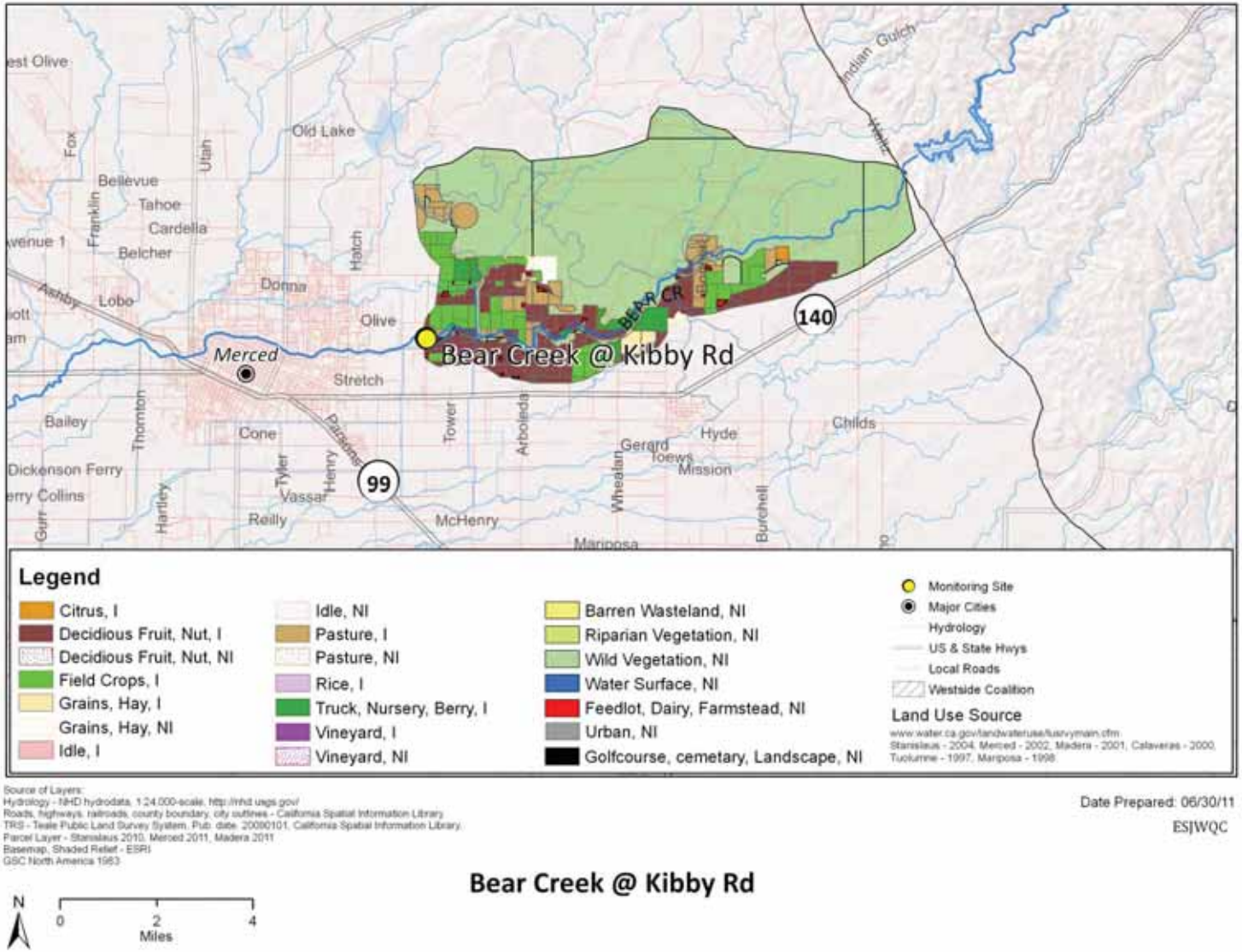
Description of Bear Creek @ Kibby Rd Site Subwatershed

Bear Creek @ Kibby Rd (7,784 irrigated acres) – This site subwatershed drains an eastern portion of the Coalition region in Merced County. Bear Creek originates in the foothills of the Sierras with Burn's Creek as one of the major tributaries. Bear Creek drains to the east just north of the towns of Planada, through Merced and eventually to the San Joaquin River. Table IV-1 includes the station name (sample site), station code and target latitude/longitudes for the site sampled within this subwatershed. The primary irrigated agriculture in the site subwatershed includes deciduous nuts, field crops, truck crops, and irrigated pasture (Figure IV-1).

Table IV-1. Bear Creek @ Kibby Rd site subwatershed sampling location coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Bear Creek @ Kibby Rd	535XBCAKR	37.3128	-120.4138

Figure IV-1. Bear Creek @ Kibby Rd site subwatershed land use map.



Subwatershed Monitoring History

Sampling was initiated at Bear Creek @ Kibby Rd during the storm season of 2005 and continued through irrigation season of 2008 (Table IV-2). Under the current 2008 MRPP, the Bear Creek @ Kibby Rd site subwatershed is a rotating Assessment Monitoring location within the Merced River @ Santa Fe Zone (Zone 4). Bear Creek @ Kibby Rd is not scheduled for Assessment Monitoring until 2023 through 2024. The constituents monitored at this location from 2005 through 2011 are listed in Table IV-3.

Management Plan Monitoring for the Coalition at Bear Creek @ Kibby Rd occurred in 2008 (May and July) and included additional sampling for chlorpyrifos and *C. dubia* toxicity (Table IV-4). There were no samples collected at this site during 2009; however, the Coalition began high priority MPM (chlorpyrifos, copper and *C. dubia* toxicity) in May 2010 and continued through 2011 during months of past exceedances (Table IV-4).

Bear Creek is currently on California's 2008-2010 303d List of Impaired Waterbodies for *E. coli* and unknown water column toxicity.

Table IV-2. Bear Creek @ Kibby Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	1	1	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	6	0	**6**
2008	Storm	2	0	**2**
	Irrigation	8	0	**8**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	3	0	**3**
	Fall	NA	NA	**NA**
2011	Winter	1	0	**1**
	Storm	1	0	**1**
	Irrigation	3	0	**3**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA - Not applicable. This site was not scheduled for sampling during this season/year.

Table IV-3. Bear Creek @ Kibby Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007		2008			2009	2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter*	Storm*	Irrigation	Fall*	Winter	Storm	Irrigation	Fall*
Field and Physical Parameters																			
EPA 110.2	Color	1	5	2	5	2	6	2	6										
EPA 160.1	Dissolved Solids	1	5	2	5	2	6	2	6										
EPA 180.1	Turbidity	1	5	2	5	2	6	2	6										
EPA 405.1	BOD				1	2	2												
EPA 415.1	Total Organic Carbon	1	5	2	5	2	6	2	6										
SM 9223	*E. coli*	1	5	2	5	2	6	2	6										
NA	Dissolved Oxygen	1	6	3	6	3	7	3	10					3		1	1	3	
NA	Specific Conductivity	1	6	3	6	3	7	3	10					3		1	1	3	
NA	pH	1	6	3	6	3	7	3	10					3		1	1	3	
Carbamates																			
EPA 8321A	Aldicarb				5	2	6	2	6										
EPA 8321A	Carbaryl				5	2	6	2	6										
EPA 8321A	Carbofuran				5	2	6	2	6										
EPA 8321A	Diuron				5	2	6	2	6										
EPA 8321A	Linuron				5	2	6	2	6										
EPA 8321A	Methiocarb				5	2	6	2	6										
EPA 8321A	Methomyl				5	2	6	2	6										
EPA 8321A	Oxamyl				5	2	6	2	6										
Organochlorines																			
EPA 8081A	DDD (p,p')				5	2	6	2	6										
EPA 8081A	DDE (p,p')				5	2	6	2	6										
EPA 8081A	DDT (p,p')				5	2	6	2	6										
EPA 8081A	Dicofol				5	2	6	2	6										
EPA 8081A	Dieldrin				5	2	6	2	6										
EPA 8081A	Endrin				5	2	6	2	6										
EPA 8081A	Methoxychlor				5	2	6	2	6										
Organophosphates																			
EPA 8141A	Azinphos methyl				5	2	6	2	6										

Method	Analyte	2005		2006		2007		2008			2009	2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter*	Storm*	Irrigation	Fall*	Winter	Storm	Irrigation	Fall*
EPA 8141A	Chlorpyrifos	1	5	2	5	2	6	2	8					2				2	
EPA 8141A	Diazinon				5	2	6	2	6										
EPA 8141A	Dimethoate				5	2	6	2	6										
EPA 8141A	Disulfoton				5	2	6	2	6										
EPA 8141A	Malathion				5	2	6	2	6										
EPA 8141A	Methamidophos				5	2	6	2	6										
EPA 8141A	Methidathion				5	2	6	2	6										
EPA 8141A	Molinate				5	2	6	2	6										
EPA 8141A	Parathion, Methyl				5	2	6	2	6										
EPA 8141A	Phorate				5	2	6	2	6										
EPA 8141A	Phosmet				5	2	6	2	6										
EPA 8141A	Thiobencarb				5	2	6	2	6										
Pyrethroids																			
EPA 8081A	Bifenthrin		1	2	5	2	6												
EPA 8081A	Cyfluthrin, total		1	2	5	2	6												
EPA 8081A	Cyhalothrin, lambda, total	1	5	2	5	2	6												
EPA 8081A	Cypermethrin, total	1	5	2	5	2	6												
EPA 8081A	Esfenvalerate/ Fenvalerate, total	1	5	2	5	2	6												
EPA 8081A	Permethrin, total	1	5	2	5	2	6												
Triazines																			
EPA 547M	Glyphosate				5	2	6	2	6										
EPA 549.2M	Paraquat dichloride				5	2	6	2	6										
EPA 619	Atrazine				5	2	6	2	6										
EPA 619	Cyanazine				5	2	6	2	6										
EPA 619	Simazine				5	2	6	2	6										
Metals (Total)																			
EPA 200.8	Arsenic				5	2	6	2	6										
EPA 200.8	Boron				5	2	6	2	6										
EPA 200.8	Cadmium				5	2	6	2	6										
EPA 200.8	Copper				5	2	6	2	6					1		1	1	1	
EPA 200.8	Lead				5	2	6	2	6										

Method	Analyte	2005		2006		2007		2008			2009	2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter*	Storm*	Irrigation	Fall*	Winter	Storm	Irrigation	Fall*
EPA 200.8	Molybdenum																		
EPA 200.8	Nickel				5	2	6	2	6										
EPA 200.8	Selenium				5	2	2	2	6										
EPA 200.8	Zinc				5	2	6	2	6										
Metals (Dissolved)																			
EPA 200.8	Cadmium																		
EPA 200.8	Copper													1		1	1	1	
EPA 200.8	Lead																		
EPA 200.8	Nickel																		
EPA 200.8	Zinc																		
Nutrients																			
SM 2340 C	Hardness as CaCO3				5	2	6	2	6					1		1	1	1	
EPA 300.0	Nitrate as N				5	2	6	2	6										
EPA 350.2	Ammonia as N				5	2	6	2	6										
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	2	6										
EPA 354.1	Nitrite as N				5	2	6	2	6										
EPA 353.2	Nitrate + Nitrite as N																		
EPA 365.2	OrthoPhosphate as P				5	2	6	2	6										
EPA 365.2	Phosphate as P				5	2	6	2	6										
Toxicity																			
EPA 821/R-02-012	*Ceriodaphnia dubia*	1	6	2	6	2	8	2	8					2				2	
EPA 821/R-02-012	*Pimephales promelas*	1	6	2	5	2	7	2	6										
EPA 821/R-02-013	*Selenastrum capricornutum*	1	6	2	5	2	7		7										
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	1	1	2										

*Site not sampled during the 2008 fall season, 2009 sampling year, 2010 winter, storm and fall seasons, and 2011 fall season.

Table IV-4. Bear Creek @ Kibby Rd site subwatershed Management Plan Monitoring schedule (2008-2011).

Site Name	Sample Date	Monitoring Type	Copper	Chlorpyrifos	*C. dubia*
Bear Creek @ Kibby Rd	7-May-08	A		X	X
Bear Creek @ Kibby Rd	8-Jul-08	A		X	X
Bear Creek @ Kibby Rd	18-May-10	MPM		X	X
Bear Creek @ Kibby Rd	20-Jul-10	MPM		X	X
Bear Creek @ Kibby Rd	17-Aug-10	MPM	X		
Bear Creek @ Kibby Rd	18-Jan-11	MPM	X		
Bear Creek @ Kibby Rd	17-Feb-11	MPM	X		
Bear Creek @ Kibby Rd	17-May-11	MPM		X	X
Bear Creek @ Kibby Rd	19-Jul-11	MPM		X	X
Bear Creek @ Kibby Rd	16-Aug-11	MPM	X		

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Bear Creek @ Kibby Rd subwatershed from 2005 through 2011 have resulted in exceedances of the WQTLs for field and physical parameters, *E. coli*, nutrients, metals, pesticides, and water column and sediment toxicity occurred within the Bear Creek site subwatershed (Table IV-5). During ambient water monitoring several exceedances occurred, including DO (2), pH (3), *E. coli* (7), arsenic (1), copper (4), chlorpyrifos (2), and DDT (1). Toxicity to *C. dubia (3)*, and *S. capricornutum* (2), including a resample of initial toxicity. Toxicity to *H. azteca* sediment (2) occurred (Table IV-5).

No exceedances occurred at Bear Creek @ Kibby Rd during MPM sampling in 2011.

All exceedances are listed in Table IV-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Bear Creek subwatershed are chlorpyrifos (A), copper (C), and toxicity to *C. dubia* (D).

Table IV-5. Bear Creek @ Kibby Rd site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Arsenic, >10 µg/L	Copper, Total[1], >1,300 µg/L	Chlorpyrifos, >0.015 µg/L	DDT, (p,p'), >0.00059 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Bear Creek @ Kibby Rd	Storm	3/21/2005	4.4		1600							
Bear Creek @ Kibby Rd	Irrigation	5/10/2005			280					5		
Bear Creek @ Kibby Rd	Storm	3/15/2006			1600							
Bear Creek @ Kibby Rd	Irrigation	5/17/2006						0.52		0		
Bear Creek @ Kibby Rd	Irrigation	6/13/2006	6.99	8.69								
Bear Creek @ Kibby Rd	Storm	2/12/2007			2400		12 (9.3)		0.0091			
Bear Creek @ Kibby Rd	Storm	3/1/2007			1300							
Bear Creek @ Kibby Rd	Irrigation	7/24/2007						0.049		0		
Bear Creek @ Kibby Rd	Irrigation	8/21/2007		8.69								
Bear Creek @ Kibby Rd	Storm	1/24/2008			2400		8.6 (7.7)					
Bear Creek @ Kibby Rd	Storm	2/25/2008			>2400		7.2 (6.4)					
Bear Creek @ Kibby Rd	Sediment	3/4/2008		8.72								
Bear Creek @ Kibby Rd	Irrigation	4/29/2008									4	
Bear Creek @ Kibby Rd	Irrigation	5/7/2008									21	
Bear Creek @ Kibby Rd	Irrigation	6/24/2008				17						
Bear Creek @ Kibby Rd	Irrigation	7/29/2008										
Bear Creek @ Kibby Rd	Irrigation	8/26/2008					7.1 (2.4)					
Bear Creek @ Kibby Rd	Sediment	8/28/2008										91

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Arsenic, >10 µg/L	Copper, Total[1], >1,300 µg/L	Chlorpyrifos, >0.015 µg/L	DDT, (p,p'), >0.00059 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Bear Creek @ Kibby Rd	Sediment	10/2/2008										91
	Constituent Priority		**E**	**E**	**E**	**NP**	**C**	**A/B**	**NP**	**D**	**NP[T]**	**NP[T]**

[1]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[T] – Not prioritized; both toxic samples were from the same sampling event (sample and resample to test for persistence).

2008-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Bear Creek @ Kibby Rd subwatershed are listed in Table IV-6. These constituents include chlorpyrifos, copper and *C. dubia* toxicity.

There were two exceedances of the chlorpyrifos WQTL at Bear Creek @ Kibby Rd (Table IV-5). Both exceedances occurred during irrigation season sampling events in 2006 (May) and 2007 (July). Since the most recent chlorpyrifos WQTL exceedance in July 2007, the Bear Creek @ Kibby Rd was monitored for chlorpyrifos during 2008 Normal Monitoring (January-February and April-September), 2008 additional MPM (May and July) and during MPM in 2010 and 2011 (May and July). There were no exceedances of the chlorpyrifos WQTL during normal or MPM in 2008, 2010, or 2011 (Table IV-6). Since the July 2007 exceedance, there was one detection of chlorpyrifos (during storm sampling in February 2008) in samples collected from Bear Creek @ Kibby Rd; however, there were no detections of chlorpyrifos in any of the samples collected during irrigation months (months of past exceedances). In 2012, chlorpyrifos MPM is scheduled to continue in May and July.

Copper concentrations exceeded the hardness based WQTL three times during 2008 Normal Monitoring (January, February, and August) and copper was therefore added to the Bear Creek management plan. Management Plan Monitoring for copper was conducted during the 2010 irrigation season in August and resulted in no exceedances (Table IV-6). In 2011, MPM occurred for copper (January, February and August) and there were no exceedances (Table IV-6). In 2012, copper MPM is scheduled to continue in January, February and August.

There were three instances of *C. dubia* toxicity in the Bear Creek @ Kibby Rd site subwatershed (Table IV-6). Toxicity to *C. dubia* occurred in 2005 (May), 2006 (May) and 2007 (July). No toxicity occurred during the 2006 and 2007 resampling events. The TIE that was initiated for the May 2005 toxicity indicated that toxicity in the sample was no longer present. Non-polar organics were determined to be the cause of the May 2006 toxicity and the cause of toxicity for July 2007 samples could not be identified. Toxicity was not persistent in either resampling event for May 2006 and July 2007 samples. Both the 2006 and 2007 toxicities coincided with the only two chlorpyrifos exceedances to have occurred at Bear Creek @ Kibby Rd. Normal Monitoring occurred during the storm and irrigation seasons in 2007 and 2008, and the Coalition also conducted MPM for *C. dubia* toxicity in May and July of 2010 and 2011 and there have been no instances of *C. dubia* toxicity since July 2007 (Table IV-6). In 2012, *C. dubia* toxicity MPM is scheduled to continue in May and July.

Table IV-6. Bear Creek @ Kibby Rd site subwatershed monitoring results for high priority constituents (2008-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	MONTH:	JAN	FEB	APR	MAY	JUN	JUL	AUG	SEP
2008 NM (@ Kibby Rd)	Date	1/24/08	2/25/08	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08
	Chlorpyrifos (µg/L)	<0.003	0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	C. dubia toxicity (% Control)	90	100	100	100	100	100	100	100
2008 MPM (@ Kibby Rd)	Date	NA	NA	NA	5/07/08	NA	7/08/08	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	NA	<0.003	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	100	NA	95	NA	NA
2010 MPM (@ Kibby Rd)	Date	NA	NA	NA	5/18/10	NA	7/20/10	8/17/10	NA
	Copper, dissolved (µg/L)	NA	NA	NA	NA	NA	NA	0.46	NA
	Copper, total (µg/L)	NA	NA	NA	NA	NA	NA	1.2	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	NA	<0.003	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	100	NA	100	NA	NA
2011 MPM (@ Kibby Rd)	Date	1/18/11	2/17/11	NA	5/17/11	NA	7/19/11	8/16/11	NA
	Copper, dissolved (µg/L)	1.5	1.2	NA	NA	NA	NA	0.38	NA
	Copper, total (µg/L)	2.4	2.3	NA	NA	NA	NA	0.86	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	NA	<0.003	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	100	NA	100	NA	NA

MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed (Table IV-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table IV-7. Bear Creek @ Kibby Rd site subwatershed instantaneous load calculations for copper.
Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Bear Creek @ Kibby Rd*	Copper	04/17/07	29.13	2	1649.75
Bear Creek @ Kibby Rd	Copper	04/17/07	29.13	2.1	1732.24
Bear Creek @ Kibby Rd	Copper	08/21/07	56.1	1.6	2541.73
Bear Creek @ Kibby Rd	Copper	09/18/07	51.02	1.7	2456.05
Bear Creek @ Kibby Rd	Copper	04/29/08	113.34	1.1	3530.39
Bear Creek @ Kibby Rd	Copper	05/27/08	147.77	1.4	5858.16
Bear Creek @ Kibby Rd	Copper	08/26/08	94.9	7.1	19079.71
Bear Creek @ Kibby Rd	Copper	09/30/08	33.1	1.3	1218.48

*Field Duplicate

Source Identification and Outreach

To address source identification and determine an outreach strategy, the Coalition focuses its efforts on applied pesticides by considering past monitoring results and associated PUR data. In 2008, the Coalition conducted additional MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. Management Plan Monitoring resumed at Bear Creek in 2010 and continued in 2011 to assess water quality in the subwatershed as outreach in the area progressed. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with high priority constituent applications. Bear Creek @ Kibby Rd subwatershed PUR data are available through October 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Bear Creek @ Kibby Rd subwatershed began in 2010 and continued through 2011. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (14) representing 1,292 acres within the Bear Creek @ Kibby subwatershed. All 14 growers participated in follow up contacts to determine if additional management practices were implemented and if any are planned to be implemented. Management Plan Monitoring will continue in the Bear Creek @ Kibby Rd subwatershed in 2012 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent in the Bear Creek @ Kibby Rd subwatershed management plan.

Chlorpyrifos

Two water samples contained chlorpyrifos above the WQTL of 0.015 µg/L from 2006 through 2011 (May 2006 and July 2007). Chlorpyrifos was omitted from the monitoring schedule in October 2008 when the Coalition began monitoring under the current 2008 MRPP. In 2009, no MPM took place at this site. Starting in May 2010 through 2011, MPM continued and chlorpyrifos was monitored during months of past exceedances, no exceedances of the chlorpyrifos WQTL occurred. The Coalition evaluates monitoring and PUR data to identify possible sources of past exceedances.

In every high priority subwatershed, PUR data are reviewed for the number of monthly applications, pounds of active ingredient applied of the constituent of concern, and the acres treated by the constituent of concern (Table IV-8, Figure IV-2). The largest amount of chlorpyrifos was applied in 2008 (1,430 lbs AI, see Table IV-8, Figure IV-2). The months with the greatest amount of chlorpyrifos use from 2005 through 2011 were May, June and July (Table IV-8, Figure IV-2). Both past exceedances occurred during months with historically the greatest amount of use (May and July), but not all of the largest pounds of AI applied months have coincided with exceedances (Figure IV-2).

The Coalition also uses PUR data from each subwatershed to determine which crops receive the most applications of the constituent of concern. The highest application rates of chlorpyrifos in the Bear Creek subwatershed from 2005 through 2011 were to almonds (2,371 lbs AI), walnuts (1,836 lbs AI), and corn (1,674 lbs AI) (Table IV-9). The most common product containing chlorpyrifos used within this subwatershed was Lorsban (Table IV-9).

Table IV-8. Bear Creek @ Kibby Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
March, 2005	1	39.6	99.0
May, 2005	5	347.0	178.0
June, 2005	2	49.9	25.0
July, 2005	3	109.9	55.0
August, 2005	2	95.6	50.0
September, 2005	1	18.0	10.0
May, 2006	11	980.6	520.0
June, 2006	4	154.9	78.0
July, 2006	3	403.6	200.0
August, 2006	2	131.4	81.0
May, 2007	10	403.2	216.0
June, 2007	1	29.9	15.0
July, 2007	5	518.7	264.0
August, 2007	3	215.7	110.0
September, 2007	1	76.3	75.0
February, 2008	2	325.2	175.0
May, 2008	1	20.0	10.0
June, 2008	13	529.0	385.0
July, 2008	6	458.4	352.0
August, 2008	2	97.4	106.0
May, 2009	7	356.1	436.0
March, 2010	1	28.7	22.0
June, 2010	8	590.3	451.7
July, 2010	1	45.1	90.0
April, 2011	2	24.2	103.0
Summaries by Year			
2005 Total	14	660.0	417.0
2006 Total	20	1670.6	879.0
2007 Total	20	1243.8	680.0
2008 Total	24	1430.0	1028.0
2009 Total	7	356.1	436.0
2010 Total	10	664.1	563.7
2011 Total	2	24.2	103.0
Total	**97**	**6048.8**	**4106.7**

Figure IV-2. Bear Creek @ Kibby Rd site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

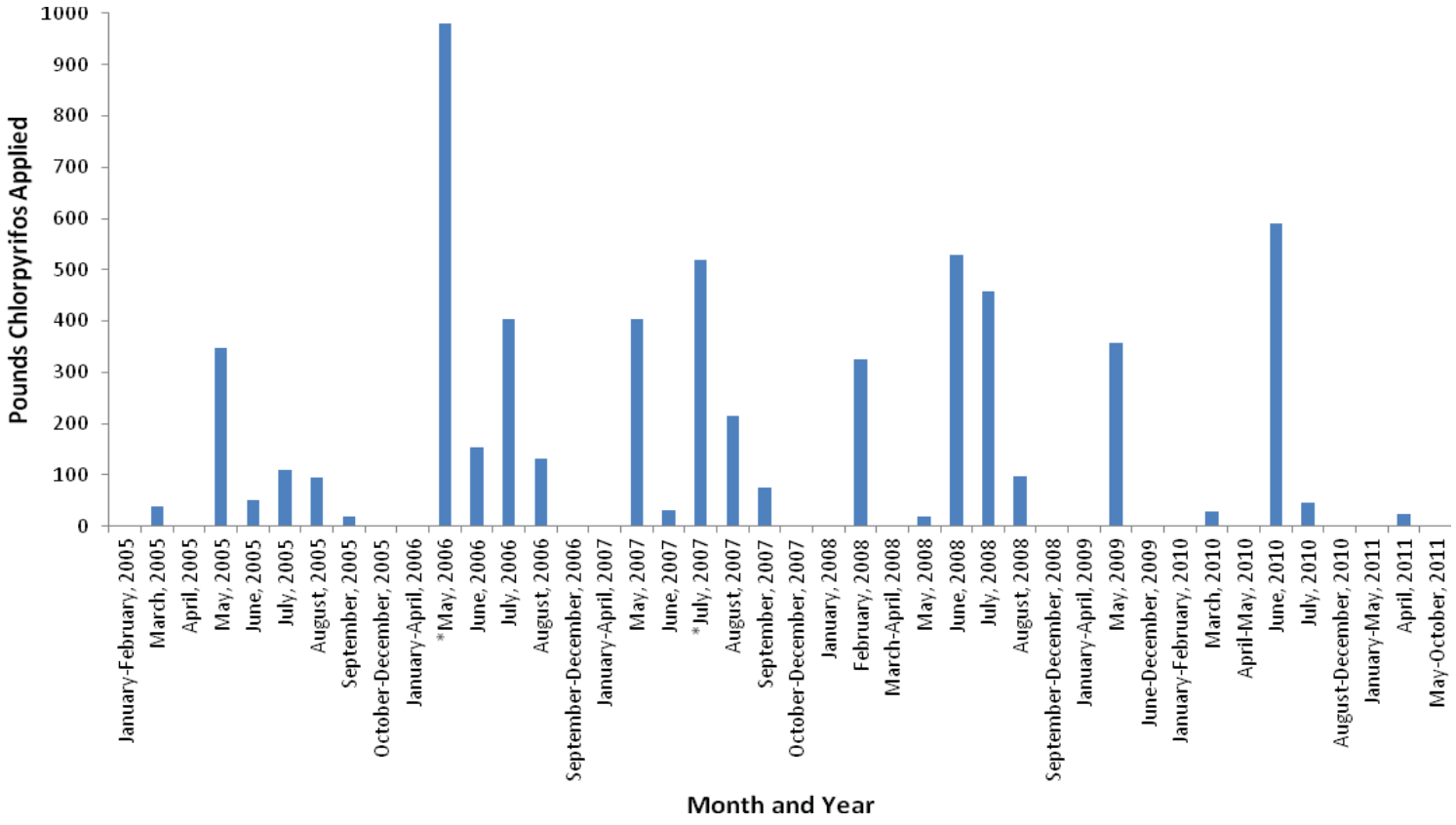


Table IV-9. Bear Creek @ Kibby Rd site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	39.6
		LOCK-ON INSECTICIDE	45.1
	ALMOND	GOVERN 4E INSECTICIDE	997.9
		LORSBAN 4E INSECTICIDE	80.1
		LORSBAN 4E-HF	517.4
		LORSBAN-4E	675.8
		WHIRLWIND	100.0
	CORN (FORAGE - FODDER)	NUFOS 4E	699.4
		SAURUS	975.1
	PEACH	LORSBAN-4E	158.0
	WALNUT	CHLORPYRIFOS 4E AG	57.4
		LORSBAN 4E INSECTICIDE	60.1
		LORSBAN 4E-HF	665.9
		LORSBAN-4E	1052.8
	WHEAT	LORSBAN ADVANCED	24.2

ALFALFA - Total Pounds Chlorpyrifos Applied	**84.7**
ALMOND - Total Pounds Chlorpyrifos Applied	**2371.2**
CORN - Total Pounds Chlorpyrifos Applied	**1674.5**
PEACH - Total Pounds Chlorpyrifos Applied	**158.0**
WALNUT - Total Pounds Chlorpyrifos Applied	**1836.2**
WHEAT - Total Pounds Chlorpyrifos Applied	**24.2**
Total Pounds Chlorpyrifos Applied (2005 - 2011)	**6148.7**

Based on chlorpyrifos exceedances occurring in the months with some of the highest application rates, the Coalition suspected the most probably source of chlorpyrifos in Bear Creek was a combination of spray drift and irrigation tailwater discharge. Growers were encouraged to review their operation to determine if irrigation return flows were managed properly. Owners with orchards were requested to evaluate their applications to minimize spray drift. Row crop farmers were advised of methods to better manage their irrigation tailwater and storm water runoff, whereas outreach efforts to orchard growers focused on encouraging management practices to reduce spray drift and improve orchard and vineyard water management.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as funding available for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began in June 2010. The Coalition focused outreach efforts on growers owning parcels with the potential to drain to the creek and those applying chlorpyrifos with the potential for spray drift. The Coalition developed a list of 14 targeted members that represented 1,292 of the 4,179 acres with the potential to discharge to the creek. Coalition representatives met with growers on their property to

discuss the Bear Creek Management Plan and offer management practice recommendations specific to the parcel and land owner/operator. Current management practices were assessed by Coalition representatives and additional management practices were discussed and encouraged. Individual contacts focused mainly on chlorpyrifos exceedances; however, all water quality results were reviewed and discussed including exceedances of copper, DO, *E. coli*, pH and toxicity to *C. dubia*.

To date, the Coalition contacted all 14 targeted members, representing 1,292 acres or 31% of the total direct drainage acreage of the subwatershed. Of the 14 targeted members, recommended management practices to acreages in the Bear Creek subwatershed include: recirculation/tailwater return system (62%), and drainage basin/sediment pond (38%). Based on the exact timing of each individual meeting and/or the grower's resources, some owners would not be able to implement recommended management practices until during or after the 2011 irrigation season. In addition, long term structural Best Management Practices (BMPs; e.g. sediment ponds) will most likely take longer than two years to implement and will require additional tracking to document their implementation.

In April 2011, the Coalition followed up with growers to determine if the management practices recommended by Coalition representatives were implemented in 2010 and if any additional practices were planned for 2011. One grower, farming 45 acres with irrigation drainage, indicated in 2010 he planned to install a recirculation/tailwater return system by the 2011 irrigation season, but at the time of the follow up survey was still waiting for equipment. Another grower did not implement the recommended management practice because it was no longer applicable to his property. All of the remaining growers in the Bear Creek subwatershed indicated they would like to install the recirculation/tailwater return systems and/or drainage basins/sediment ponds that were recommended, but did not have the resources to do so. Two of the remaining growers who could not afford the recommended practices opted for alternative management practices; microirrigation system installation and decreasing the amount of water used during surface irrigation. The Coalition will continue its strategy of notifying members about available funding opportunities and encourage them to take advantage of the application process.

To evaluate the management practice process, the Coalition monitored for high priority constituents at Bear Creek @ Kibby Rd during months of past exceedances in 2011, and no exceedances occurred. Bear Creek @ Kibby Rd is scheduled to continue MPM in 2012. Since there no chlorpyrifos WQTL exceedances for two or more consecutive years of monitoring during months of past exceedances, a letter was submitted to the Regional Board on January 6, 2012, petitioning to remove chlorpyrifos from the active Bear Creek @ Kibby Rd management plan.

Priority C Constituents

Copper is listed as the only priority C constituent for the Bear Creek @ Kibby Rd subwatershed.

Copper

Copper exceeded the hardness based WQTL four times in this subwatershed from 2005 through 2011. Copper exceedances occurred once during the 2007 storm season, twice during the 2008 storm season and once in the 2008 irrigation season in July. The Coalition began monitoring for both the total and dissolved copper fractions in October 2008 to better characterize copper contamination. Bear Creek was not scheduled for monitoring in 2009; however, MPM samples were collected in 2010 and 2011 for copper analysis and did not exceed the WQTL.

PUR data are reviewed for the number of monthly applications, pounds of active ingredient applied, and acres treated (Table IV-10, Figure IV-3). The amount of copper applied within the subwatershed decreased annually from 2005 through 2009, subsequently the amount of copper applied then increased in 2010 and 2011 (Table IV-10, Figure IV-3). Between 2005 through 2011, the greatest amount of copper applied was in the months of January, February, March, April and May (Table IV-10, Figure IV-3). Not all exceedances occurred during months of the greatest amount of use (Figure IV-3).

The Coalition uses PUR data to assess which crops receive the most applications of copper. The largest amount of copper applied from 2005 through 2011 was associated with walnut and peach orchards (Table IV-11). Walnut orchards received the greatest overall amount (lbs applied) of copper (13,808 lbs AI). The most common product containing copper used within this subwatershed was Kocide (Table IV-11).

Table IV-10. Bear Creek @ Kibby Rd site subwatershed copper applications, lbs AI applied and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	2	1178.9	175.0
February, 2005	3	307.2	121.0
March, 2005	4	818.6	174.0
April, 2005	9	1834.1	345.5
May, 2005	8	1762.6	603.0
November, 2005	1	26.9	40.0
January, 2006	6	2290.7	493.0
February, 2006	4	1212.1	244.0
March, 2006	2	51.9	95.0
April, 2006	11	1614.5	499.0
May, 2006	3	323.8	186.0
June, 2006	2	142.0	88.0
October, 2006	2	150.6	140.0
January, 2007	3	1111.0	275.0
February, 2007	1	729.9	116.9
March, 2007	7	965.3	242.0

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
April, 2007	17	2025.8	595.0
February, 2008	3	2752.6	291.9
March, 2008	8	711.0	310.0
April, 2008	7	667.7	235.0
October, 2008	1	67.5	80.0
January, 2009	2	945.1	201.9
February, 2009	1	62.9	15.0
March, 2009	1	122.7	38.0
April, 2009	2	1562.2	128.0
May, 2009	2	156.0	54.0
September, 2009	6	249.3	333.8
January, 2010	3	2710.2	311.8
February, 2010	2	493.3	175.5
March, 2010	5	1072.5	335.1
April, 2010	9	989.9	347.9
May, 2010	4	323.1	205.0
January, 2011	3	2635.0	250.0
February, 2011	1	273.0	48.0
March, 2011	2	43.3	57.7
April, 2011	9	821.2	223.0
May, 2011	16	1143.1	454.0
June, 2011	5	350.2	228.0
Summaries by Year			
2005 Total	27	5928.3	1458.5
2006 Total	30	5785.7	1745.0
2007 Total	28	4831.9	1228.9
2008 Total	19	4198.8	916.9
2009 Total	14	3098.2	770.7
2010 Total	23	5589.0	1375.3
2011 Total	36	5265.8	1260.7
Total	**177**	**34697.6**	**8756.0**

Figure IV-3. Bear Creek @ Kibby Rd site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

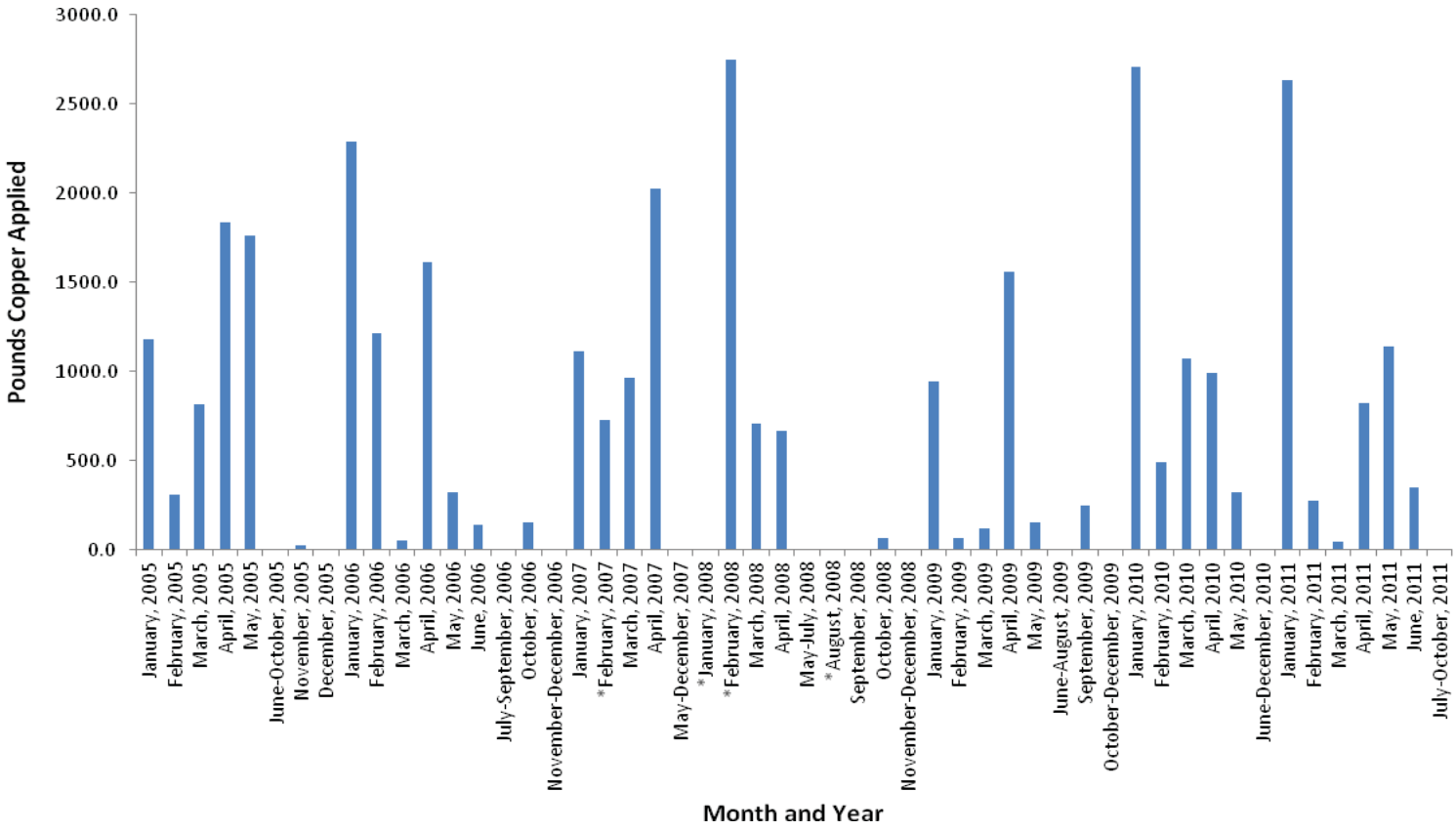


Table IV-11. Bear Creek @ Kibby Rd site subwatershed copper PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	KOCIDE 2000	48.4
	ALMOND	CUPROFIX ULTRA 40 DISPERSS	1993.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1533.3
		KOCIDE 101	61.6
		KOCIDE 2000	798.9
		KOCIDE DF	337.7
		NORDOX 75 WG	62.9
		NU-COP HB	77.0
	PEACH	BASIC COPPER 53	5292.0
		CUPROFIX ULTRA 40 DISPERSS	877.4
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	895.8
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1010.5
		KOCIDE DF	2410.0
		NORDOX	395.9
		NORDOX 75 WG	2146.3
	PRUNE	NORDOX 75 WG	1141.0
	TOMATO	CHAMP FLOWABLE	3.5
		CHAMP FORMULA 2 FLOWABLE	189.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	236.5
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	344.1
		KOCIDE 2000	915.1
		NU-COP HB	117.8
	WALNUT	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1273.7
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	785.5
		KENTAN DF	576.2
		KOCIDE 101	323.4
		KOCIDE 2000	1954.3
		KOCIDE DF	1061.0
		NORDOX	21.2
		NORDOX 75 WG	42.0
		NU-COP 50DF	7694.6
		NU-COP HB	77.0

ALFALFA - Total Pounds Copper Applied	**48.4**
ALMOND - Total Pounds Copper Applied	**4865.0**
PEACH - Total Pounds Copper Applied	**13027.8**
PRUNE - Total Pounds Copper Applied	**1141.0**
TOMATO - Total Pounds Copper Applied	**1806.5**
WALNUT - Total Pounds Copper Applied	**13808.8**
Total Pounds Copper Applied (2005 - 2011)	**34697.6**

The Coalition determined that outreach should focus on providing information to specific growers located adjacent to Bear Creek to encourage the retention of water and sediment on the fields, especially during the dormant season. This coincides with the Coalition's Management Plan strategy outlined in the chlorpyrifos Source Identification and Outreach section above. Orchard operators were

advised to consider water retention and management to prevent copper from entering the waterway during irrigation and winter runoff events.

Priority D Constituents

The priority D constituent in the Bear Creek @ Kibby Rd subwatershed is water column toxicity to *C. dubia*.

C. dubia toxicity

Toxicity to *C. dubia* occurred in May of 2005 and 2006, and in July of 2007. Toxicity Identification Evaluations were conducted for all three toxicities. The May 2005 and July 2007 cause of toxicity could not be determined since the toxicity did not persist through the TIE, and the May 2006 cause of toxicity was determined to be non-polar organics. The 2006 and 2007 toxicities both coincided with an exceedance of chlorpyrifos. Consequently, the Coalition's strategy for eliminating *C. dubia* toxicity involves focusing on chlorpyrifos. If chlorpyrifos is prevented from entering waterways throughout the irrigation season, the Coalition believes that *C. dubia* toxicity can be eliminated. The Coalition discussed toxicity to *C. dubia* and pesticide applications during individual grower meetings, and conducted outreach regarding the retention of irrigation and storm water runoff on the grower's property. Since there were no instances of toxicity to *C. dubia* for two or more consecutive years of monitoring during months of past exceedances, a letter was submitted to the Regional Board on January 6, 2012, petitioning to remove *C. dubia* from the active Bear Creek @ Kibby Rd management plan. The Coalition will conduct MPM in 2012 for *C. dubia* toxicity during months of past exceedances (May and July).

Priority E Constituents

The following priority E constituents listed in the Bear Creek @ Kibby Rd subwatershed management plan are DO, *E. coli*, and pH.

There were no exceedances for any priority E constituents during 2011 monitoring. However, *E. coli* was not sampled in 2011 due to MPM only. Although DO and pH remain low priority, the Coalition will continue to collect monitoring data for these parameters during each monitoring event. Since there were no instances of DO WQTL exceedances for two or more consecutive years of monitoring during months of past exceedances, a letter was submitted to the Regional Board on January 6, 2012, petitioning to remove DO from the active Bear Creek @ Kibby Rd management plan. *E.coli* monitoring will resume during Assessment Monitoring at this site in 2023-2024. The priority E constituents are discussed during individual contacts with growers and at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Bear Creek @ Kibby Rd is one of the four second priority site subwatersheds within the ESJWQC and just completed its second year of focused outreach (2010-2012). Therefore, the Coalition focused its

resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Bear Creek subwatershed is to target growers adjacent to the waterway that have the potential to discharge into the creek. Focus is on water retention and minimizing spray drift. Outreach includes grower notification, management practice outreach and education, tracking of management practices implementation, and providing information on special studies of management practice efficacy.

Individual surveys documenting current management practice implementations and follow up contacts assessing future planned implementations were completed and returned for 100% of targeted growers. The Second Priority Subwatersheds Summary of Implemented Management Practices section of this report summarizes the results of these contacts.

During 2012, MPM will continue during months of past exceedances in the Bear Creek @ Kibby subwatershed. In addition to chlorpyrifos, monitoring for DO and toxicity to *C. dubia* resulted in no exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove these constituents from the Bear Creek management plan.

V. COTTONWOOD CREEK @ RD 20

Management Plan Constituents

Priority A/B

- Chlorpyrifos
- Diazinon

Priority C

- Copper
- Diuron

Priority E

- Dissolved Oxygen
- Lead
- *E. coli*

Description of Cottonwood Creek @ Rd 20 Site Subwatershed

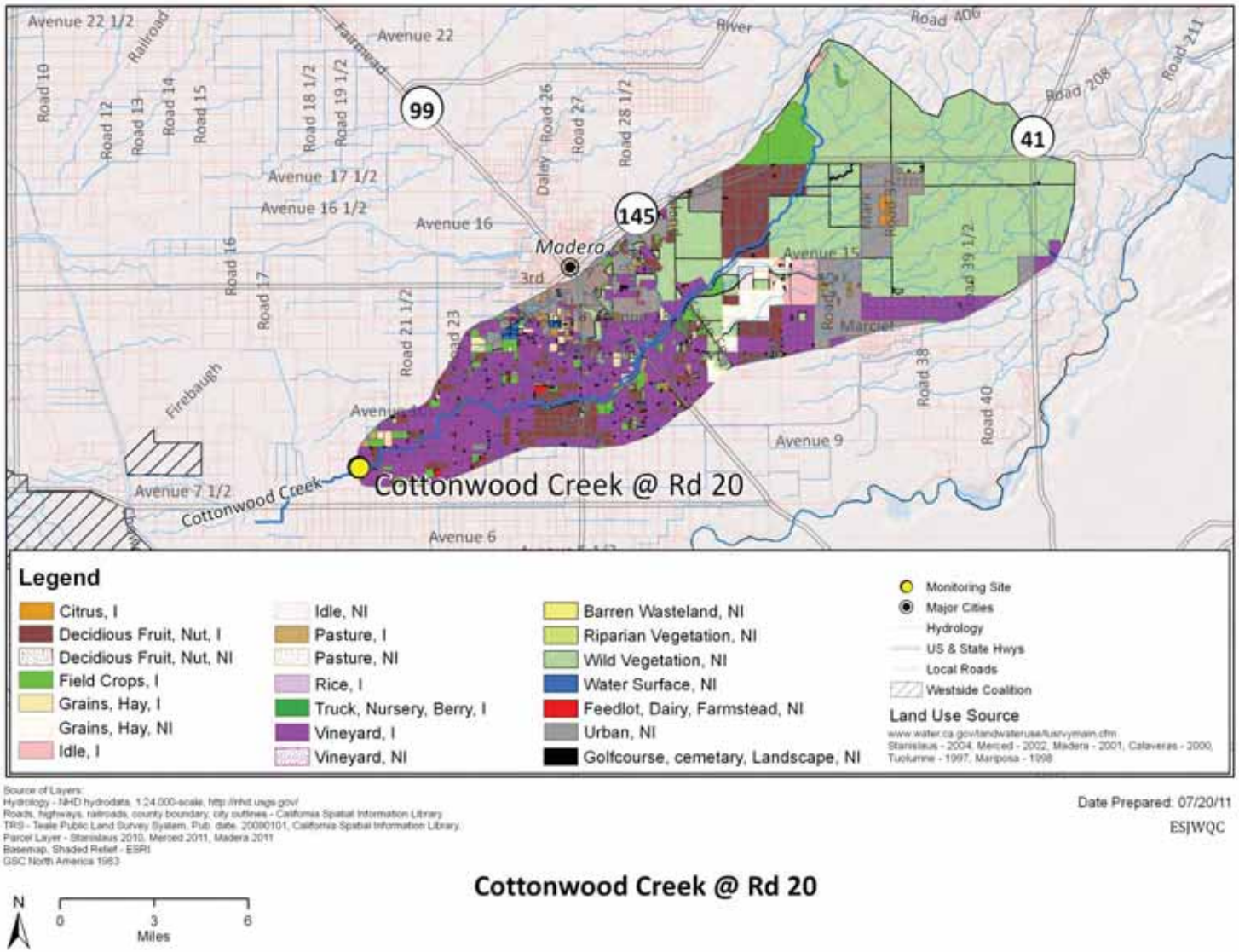
Cottonwood Creek @ Rd 20 (36,906 irrigated acres) – This site subwatershed is at the very southern edge of the Coalition region in Madera County and drains into the Eastside Bypass 9 (Table V-1). This site subwatershed includes an upstream location (Cottonwood Creek @ Hwy 145) which was sampled in 2008. The immediate upstream agriculture is vineyards, with deciduous nut orchards farther to the east. There are also a few dairies in the Cottonwood Creek site subwatershed (Figure V-1).

Table V-1. Cottonwood Creek site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Cottonwood Creek @ Rd 20*	545XCCART	36.8686	-120.1818
Cottonwood Creek @ Hwy 145[U]	545XCCAHO	36.9002	-120.0555

[U]Upstream sites
*Original ESJWQC sampling site

Figure V-1. Cottonwood Creek @ Rd 20 site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Cottonwood Creek @ Rd 20 began during the storm season of 2005 and continued through fall 2011(Table V-2). Under the current 2008 MRPP, Cottonwood Creek @ Rd 20 is the Core Monitoring location in Zone 6. In 2006, 2007 and 2008, Normal Monitoring occurred. Core constituents were monitored at Cottonwood Creek @ Rd 20 beginning in the fall of 2008 through the fall 2010. Assessment Monitoring was initiated in 2011 and is scheduled to occur every third year thereafter (e.g. 2014, 2017). Core Monitoring will resume at this site in 2012.

The constituents sampled at this location from 2005 through 2011 are listed in Table V-3. Due to the single toxic *S. capricornutum* sample in 2008 (April; resample toxic one week later in May 2008), *S. capricornutum* toxicity, simazine and cyanazine were monitored monthly starting in October 2009 through December 2010.

Management Plan Monitoring occurred within the Cottonwood Creek site subwatershed in 2007 and 2008 for copper (Table V-4). The Cottonwood Creek @ Rd 20 subwatershed includes an upstream location (Cottonwood Creek @ Hwy 145) which was sampled during the irrigation seasons of 2007 and 2008. Cottonwood Creek was monitored twice a month in June and September 2007 and at Cottonwood Creek @ Hwy 145 (upstream location) monthly from May through September 2008. During 2011, all constituents were monitored monthly as a part of Assessment Monitoring and the following MPM constituents were analyzed monthly during Assessment Monitoring: copper (April-September), and for chlorpyrifos, diazinon and diuron (January and February) occurred (Table V-4).

Cottonwood Creek is currently on California's 2008-2010 303d List of Impaired Waterbodies for *E. coli* and unknown water column toxicity.

Table V-2. Cottonwood Creek @ Rd 20 site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	0	2	**2**
	Irrigation	6	2	**8**
2008	Storm	1	2	**3**
	Irrigation	5	1	**6**
	Fall	0	2	**2**
2009	Winter	0	2	**2**
	Storm	2	0	**2**
	Irrigation	3	3	**6**
	Fall	2	0	**2**

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2010	Winter	0	1	**1**
	Storm	2	1	**3**
	Irrigation	5	0	**5**
	Fall	1	2	**3**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	1	2	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table V-3. Cottonwood Creek @ Rd 20 site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
Field and Physical Parameters																						
EPA 110.2	Color	2	5	2	5		5	2	5													
EPA 160.1	Dissolved Solids	2	5	2	5		5	2	5			2	3	2		2	5	1	2	1	6	1
EPA 160.2	Suspended Solids											2	3	2		2	5	1	2	1	6	1
EPA 180.1	Turbidity	2	5	2	5		5	2	5			2	3	2		2	5	1	2	1	6	1
EPA 405.1	BOD				1		2															
EPA 415.1	Total Organic Carbon	2	5	2	5		5	2	5			2	3	2		2	5	1	2	1	6	1
Walkley-Black	Total Organic Carbon (sediment)												1				1		1		1	
SM 9223	*E. coli*	2	5	2	6		5	2	5			2	3	2		2	5	1	2	1	6	1
ASTM D422 or ASTM D4464	Grain size (sediment)												1				1		1		1	
NA	Dissolved Oxygen	2	5	3	5		7	3	6			2	3	2		2	5	1	3	1	6	1
NA	Specific Conductivity	2	5	3	5		7	3	6			2	3	2		2	5	1	3	1	6	1
NA	pH	2	5	3	5		7	3	6			2	3	2		2	5	1	3	1	6	1
Carbamates																						
EPA 8321A	Aldicarb				5		5	2	5										2	1	6	1
EPA 8321A	Carbaryl				5		5	2	5										2	1	6	1
EPA 8321A	Carbofuran				5		5	2	5										2	1	6	1
EPA 8321A	Diuron				5		5	2	5							1			2	1	6	1
EPA 8321A	Linuron				5		5	2	5										2	1	6	1
EPA 8321A	Methiocarb				5		5	2	5										2	1	6	1
EPA 8321A	Methomyl				5		5	2	5										2	1	6	1
EPA 8321A	Oxamyl				5		5	2	5										2	1	6	1
Organochlorines																						
EPA 8081A	DDD(p,p')				5		5	2	5										2	1	4	
EPA 8081A	DDE(p,p')				5		5	2	5										2	1	4	
EPA 8081A	DDT(p,p')				5		5	2	5										2	1	4	
EPA 8081A	Dicofol				5		5	2	5										2	1	4	
EPA 8081A	Dieldrin				5		5	2	5										2	1	4	
EPA 8081A	Endrin				5		5	2	5										2	1	4	

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Methoxychlor				5		5	2	5										2	1	4	
Group A Pesticides																						
EPA 8081A	Aldrin																		2	1	4	
EPA 8081A	Chlordane																		2	1	4	
EPA 8081A	Endosulfan I																		2	1	4	
EPA 8081A	Endosulfan II																		2	1	4	
EPA 8081A	HCH, alpha																		2	1	4	
EPA 8081A	HCH, beta																		2	1	4	
EPA 8081A	HCH, delta																		2	1	4	
EPA 8081A	HCH, gamma																		2	1	4	
EPA 8081A	Heptachlor																		2	1	4	
EPA 8081A	Heptachlor epoxide																		2	1	4	
EPA 8081A	Toxaphene																		2	1	4	
Organophosphates																						
EPA 8141A	Azinphos methyl				5		5	2	5										2	1	6	1
EPA 8141A	Chlorpyrifos	2	5	2	5		5	2	5							1			2	1	6	1
EPA 8141A	Demeton-s																		2	1	6	1
EPA 8141A	Diazinon	2	5	2	5		5	2	5							1			2	1	6	1
EPA 8141A	Dimethoate				5		5	2	5										2	1	6	1
EPA 8141A	Disulfoton				5		5	2	5										2	1	6	1
EPA 8141A	Malathion				5		5	2	5										2	1	6	1
EPA 8321A	Methamidophos				5		5	2	5							1			2	1	6	1
EPA 8141A	Methidathion				5		5	2	5										2	1	6	1
EPA 8141A	Molinate				5		5	2	5													
EPA 8141A	Parathion, Methyl				5		5	2	5										2	1	6	1
EPA 8141A	Phorate				5		5	2	5										2	1	6	1
EPA 8141A	Phosmet				5		5	2	5										2	1	6	1
EPA 8141A	Thiobencarb				5		5	2	5													
EPA 8141A	Trifluralin																		2	1	6	1
Pyrethroids																						
EPA 8081A	Bifenthrin		1	2	5		5															
EPA 8081A	Cyfluthrin, total		1	2	5		5															

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5		5															
EPA 8081A	Cypermethrin, total	2	5	2	5		5															
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5		5															
EPA 8081A	Permethrin, total	2	5	2	5		5															
Triazines																						
EPA 547M	Glyphosate				5		5	2	5										2		4	
EPA 549.2M	Paraquat dichloride				5		5	2	5										2		4	
EPA 619	Atrazine				5		5	2	5										2	1	6	1
EPA 619	Cyanazine				5		5	2	5			1	2	2		2	5	1	2	1	6	1
EPA 619	Simazine				5		5	2	5			1	2	2		2	5	1	2	1	6	1
Metals (Total)																						
EPA 200.8	Arsenic				5		5	2	5										2	1	5	
EPA 200.8	Boron				5		5	2	5										2	1	6	1
EPA 200.8	Cadmium				5		5	2	5										2	1	5	
EPA 200.8	Copper				5		6	2	5							1	5		2	1	6	1
EPA 200.8	Lead				5		5	2	5										2	1	5	
EPA 200.8	Molybdenum																		2	1	5	
EPA 200.8	Nickel				5		5	2	5										2	1	6	1
EPA 200.8	Selenium				5		2	2	5										2	1	5	1
EPA 200.8	Zinc				5		5	2	5										2	1	6	1
Metals (Dissolved)																						
EPA 200.8	Cadmium																		2	1	5	
EPA 200.8	Copper															1	5		2	1	6	1
EPA 200.8	Lead																		2	1	5	
EPA 200.8	Nickel																		2	1	6	1
EPA 200.8	Zinc																		2	1	6	1
Nutrients																						
SM 2340 C	Hardness as CaCO3				5		6	2	5							1	5		2	1	6	1
EPA 300.0	Nitrate as N				5		5	2	5													
EPA 350.2	Ammonia as N				5		5	2	5			2	3	2		2	5	1	2	1	6	1
EPA 351.3	Nitrogen, Total Kjeldahl				5		5	2	5			1					3	1	2	1	6	1
EPA 354.1	Nitrite as N				5		5	2	5													

Method	Analyte	2005		2006		2007		2008			2009				2010				2011			
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 353.2	Nitrate + Nitrite as N											2	3	2		2	5	1	2	1	6	1
EPA 365.2	OrthoPhosphate as P				5		5	2	5			1					3	1	2	1	6	1
EPA 365.2	Phosphate as P				5		5	2	5			2	3	2		2	5	1	2	1	6	1
Toxicity																						
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	5	2	5		6	2	5										2	1	6	1
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5		6	3	5			1	3	2		2	5	1	2	1	6	1
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	5		6		6			1	3	2		2	5	1	2	1	6	1
EPA 600/R-99-064	*Hyalella azteca*		5	1	1		1	1	1				1				1		1		1	

Table V-4. Cottonwood Creek site subwatershed Management Plan Monitoring schedule (2007-2011).

Site Name	Sample Date	Monitoring Type	Copper	Chlorpyrifos	Diazinon	Diuron
Cottonwood Creek @ Rd 20	19-Jun-07	A	X			
Cottonwood Creek @ Rd 20	26-Sep-07	A	X			
Cottonwood Creek @ Hwy 145	27-May-08	U	X			
Cottonwood Creek @ Hwy 145	24-Jun-08	U	X			
Cottonwood Creek @ Hwy 145	29-Jul-08	U	X			
Cottonwood Creek @ Hwy 145	26-Aug-08	U	X			
Cottonwood Creek @ Hwy 145	30-Sep-08	U	X			
Cottonwood Creek @ Rd 20	19-Jan-10	MPM		X	X	X
Cottonwood Creek @ Rd 20	23-Feb-10	MPM		X	X	X
Cottonwood Creek @ Rd 20	20-Apr-10	MPM	X			
Cottonwood Creek @ Rd 20	18-May-10	MPM	X			
Cottonwood Creek @ Rd 20	15-Jun-10	MPM	X			
Cottonwood Creek @ Rd 20	20-Jul-10	MPM	X			
Cottonwood Creek @ Rd 20	17-Aug-10	MPM	X			
Cottonwood Creek @ Rd 20	14-Sep-10	MPM	X			
Cottonwood Creek @ Rd 20	18-Jan-11	MPM	X	X		X
Cottonwood Creek @ Rd 20	17-Feb-11	MPM	X	X	X	X
Cottonwood Creek @ Rd 20	19-Apr-11	MPM	X			
Cottonwood Creek @ Rd 20	17-May-11	MPM	X			
Cottonwood Creek @ Rd 20	21-Jun-11	MPM	X			
Cottonwood Creek @ Rd 20	19-Jul-11	MPM	X			
Cottonwood Creek @ Rd 20	16-Aug-11	MPM	X			
Cottonwood Creek @ Rd 20	13-Sep-11	MPM	X			

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Cottonwood Creek subwatershed (Cottonwood Creek @ Rd 20 and Cottonwood Creek @ Hwy 145) from 2005 through 2011 resulted in exceedances of the WQTLs for field and physical parameters, *E. coli*, nutrients, metals, pesticides, and water column and sediment toxicity (Table V-5). Table V-5 includes exceedances in this subwatershed (including the upstream site) for DO (20), pH (1), *E. coli* (19), total copper (13), dissolved copper (8), total lead (3), chlorpyrifos (3), cyanazine (1), diazinon (1), simazine (1), and diuron (2). Toxicity to *P. promelas* (1), *S. capricornutum* (2), and *H. azteca* sediment (1) also occurred.

During 2011, exceedances detected during monitoring included DO (1), *E. coli* (3), and dissolved copper (5).

All exceedances are listed in Table V-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Cottonwood Creek subwatershed are chlorpyrifos and diazinon (A/B) as well as copper and diuron (C).

Table V-5. Cottonwood Creek site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[1] µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Chlorpyrifos, >0.015 µg/L	Cyanazine, >1 µg/L	Diazinon, >0.1 µg/L	Diuron, >2 µg/L	Simazine, >4 µg/L	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Cottonwood Creek @ Rd 20	Storm	2/16/2005			1600											
Cottonwood Creek @ Rd 20	Storm	3/21/2005	5.6		1600											
Cottonwood Creek @ Rd 20	Irrigation	5/10/2005			540											
Cottonwood Creek @ Rd 20	Irrigation	6/14/2005	5.7													
Cottonwood Creek @ Rd 20	Irrigation	7/12/2005	5.17													
Cottonwood Creek @ Rd 20	Irrigation	8/16/2005			300											
Cottonwood Creek @ Rd 20	Irrigation	9/20/2005	6.5													
Cottonwood Creek @ Rd 20	Storm	2/28/2006			300											
Cottonwood Creek @ Rd 20	Storm	3/15/2006			1600											
Cottonwood Creek @ Rd 20	Irrigation	5/16/2006	5.71				4.4 (3.5)									
Cottonwood Creek @ Rd 20	Irrigation	6/13/2006	6.9				8 (6.9)	0.73 (0.63)								
Cottonwood Creek @ Rd 20	Irrigation	7/11/2006	6.51													
Cottonwood Creek @ Rd 20	Irrigation	8/8/2006	6.95													
Cottonwood Creek @ Rd 20	Irrigation	9/12/2006	6.11				5.5 (4.4)									
Cottonwood Creek @ Rd 20	Irrigation	5/29/2007	6.55				6.7 (5.5)									
Cottonwood Creek @ Rd 20	Irrigation	6/19/2007					6.7 (4.1)									
Cottonwood Creek @ Rd 20	Irrigation	6/26/2007					4.3 (4.1)									
Cottonwood Creek @ Rd 20	Irrigation	7/24/2007		9.04			5.4 (4.6)									

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[1] µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Chlorpyrifos, >0.015 µg/L	Cyanazine, >1 µg/L	Diazinon, >0.1 µg/L	Diuron, >2 µg/L	Simazine, >4 µg/L	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Cottonwood Creek @ Rd 20	Irrigation	8/21/2007	6.81				5.2 (4.6)									
Cottonwood Creek @ Rd 20	Irrigation	8/23/2007	3.95													
Cottonwood Creek @ Rd 20	Storm	1/25/2008			1200		24 (3.0)	5.4 (0.6)	0.02			68		45		
Cottonwood Creek @ Rd 20	Storm	2/25/2008					21 (6.5)	1.9 (1.9)	0.04		0.2	65	5			
Cottonwood Creek @ Rd 20	Sediment	3/4/2008														96
Cottonwood Creek @ Rd 20	Irrigation	4/29/2008			580		8 (6.9)								5	
Cottonwood Creek @ Rd 20	Irrigation	5/7/2008													4	
Cottonwood Creek @ Rd 20	Irrigation	5/27/2008			250					1						
Cottonwood Creek @ Hwy 145	*Irrigation*	*6/24/2008*					*39 (5.5)*									
Cottonwood Creek @ Rd 20	Irrigation	6/24/2008			1300											
Cottonwood Creek @ Rd 20	Irrigation	7/29/2008			1000											
Cottonwood Creek @ Hwy 145	*Irrigation*	*8/26/2008*	*6.45*													
Cottonwood Creek @ Rd 20	Irrigation	8/26/2008	6.83		390		4.4 (3.7)									
Cottonwood Creek @ Rd 20	Storm	2/7/2009			>2400											
Cottonwood Creek @ Rd 20	Irrigation	5/19/2009	6.72													
Cottonwood Creek @ Rd 20	Fall	11/17/2009			770											
Cottonwood Creek @ Rd 20	Storm	1/19/2010							0.21							
Cottonwood Creek @ Rd 20	Storm	4/20/2010	6.36			3.1 (2.17)										
Cottonwood Creek @ Rd 20	Irrigation	5/18/2010				3.6 (2.36)										
Cottonwood Creek @ Rd 20	Irrigation	6/15/2010			2000											

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[1] µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Chlorpyrifos, >0.015 µg/L	Cyanazine, >1 µg/L	Diazinon, >0.1 µg/L	Diuron, >2 µg/L	Simazine, >4 µg/L	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Cottonwood Creek @ Rd 20	Irrigation	7/20/2010	6.80													
Cottonwood Creek @ Rd 20	Irrigation	8/17/2010	6.04			5.3 (4.9)										
Cottonwood Creek @ Rd 20	Irrigation	9/14/2010	6.44													
Cottonwood Creek @ Rd 20	Fall	10/19/2010			290											
Cottonwood Creek @ Rd 20	Irrigation	4/19/2011	6.7			4.6 (3.83)										
Cottonwood Creek @ Rd 20	Irrigation	5/17/2011				3.8 (3.02)										
Cottonwood Creek @ Rd 20	Irrigation	6/21/2011			550											
Cottonwood Creek @ Rd 20	Irrigation	7/19/2011				4.3 (3.56)										
Cottonwood Creek @ Rd 20	Irrigation	8/16/2011			250											
Cottonwood Creek @ Rd 20	Irrigation	9/13/2011				5.8 (3.20)										
Cottonwood Creek @ Rd 20	Fall	10/11/2011			>2400	4.1 (3.56)										
		Constituent Priority	**E**	**NP**	**E**	**C**	**C**	**E**	**A/B**	**NP**	**A/B**	**C**	**NP**	**NP**	**NP[T]**	**NP**

[1]Dissolved metals not analyzed until October 2008; WQTL variable based on hardness.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[T] – Not prioritized; both toxic samples were from the same sampling event (sample and resample to test for persistence).

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Cottonwood Creek subwatershed are listed in Table V-6. These constituents include chlorpyrifos, copper, diazinon, and diuron.

The Regional Board established a TMDL for diazinon for the ESJWQC region (Lower San Joaquin River Chlorpyrifos and Diazinon TMDL); consequently, diazinon is considered one of the highest priority constituents under the Coalition's Management Plan. There was one exceedance of the diazinon WQTL at Cottonwood Creek @ Rd 20 in February 2008 (Table V-6). Beginning in October 2008, only Core Monitoring constituents were sampled at Cottonwood Creek. In January and February 2010, MPM was initiated for diazinon. Since the single exceedance of the diazinon WQTL in February 2008, MPM occurred during the month of past exceedance in 2010 (February) and Assessment Monitoring occurred monthly in 2011. There were no exceedances of the diazinon WQTL in samples collected from Cottonwood Creek @ Rd 20 in 2010 or 2011. In 2012, MPM for diazinon is scheduled to occur during months of past exceedances (February).

Chlorpyrifos exceeded the WQTL at Cottonwood Creek @ Rd 20 three times, twice during the storm season of 2008 (January and February) and once in 2009 (January). In 2010 and 2011, MPM for chlorpyrifos (January and February) took place and no exceedances occurred (Table V-6). In 2012, Cottonwood Creek @ Rd 20 will return to Core Monitoring and MPM is scheduled to occur for chlorpyrifos during months of past exceedances (January and February).

In 2007, Cottonwood Creek @ Rd 20 was monitored for copper from April through September plus additional copper monitoring was conducted in June and September (Table V-6). Exceedances of copper occurred in all samples analyzed from 2007 (May-August) Normal Monitoring including the additional sample collected in June 2007 (Table V-6). The April sample had detectable amounts of copper; however, the concentration was not an exceedance. Cottonwood Creek was dry in September and therefore there are no results for September 2007 NM or MPM. In accordance with the 2008 upstream MPM schedule, Cottonwood Creek @ Hwy 145 was monitored for copper from May through September 2008 (Table V-6). Copper was detected in all samples collected during the irrigation season except in September when the site was dry. Exceedances of the copper WQTL occurred in samples collected during April and August 2008 at the Normal Monitoring site, but not at the upstream monitoring site. Cottonwood Creek @ Rd 20 was not scheduled for MPM in 2009. Management Plan Monitoring for copper took place during every month of the 2010 irrigation season (April-September). Copper exceedances occurred in April, May and August 2010 (Table V-6). During 2011, Cottonwood Creek @ Rd 20 rotated into Assessment Monitoring where all high priority constituents were monitored monthly and exceedances of copper occurred during April, May, July, September and October. In 2012, MPM is scheduled for copper during months of past exceedances (January-February and April-October).

Samples containing diuron exceeded the WQTL twice at the Cottonwood Creek @ Rd 20 site subwatershed (Table V-5); both exceedances occurred during 2008 storm events (January and

February). Since the most recent diuron exceedance in February 2008, samples were collected for diuron during MPM in months of past exceedances and this site was sampled monthly during normal irrigation and storm monitoring in 2008 as well as monthly Assessment Monitoring in 2011 (Table V-6). The Coalition conducted MPM for diuron in January and February 2010 and 2011. There were no exceedances of the diuron WQTL in any sample collected from Cottonwood Creek @ Rd 20 in 2008, 2010 or 2011. In 2012, MPM for diuron is scheduled to occur during months of past exceedances (January and February).

Table V-6. Cottonwood Creek site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007 NM (@ Rd 20)	Date	NA	NA	NA	4/24/07	5/29/07	6/26/07	7/24/07	8/21/07	9/18/07	NA	NA	NA
	Copper (µg/L)	NA	NA	NA	3.9	**6.7**	**4.3**	**5.4**	**5.2**	Dry	NA	NA	NA
2007 MPM A (@Rd 20)	Date	NA	NA	NA	NA	NA	6/19/07	NA	NA	9/25/07	NA	NA	NA
	Copper (µg/L)	NA	NA	NA	NA	NA	**6.7**	NA	NA	Dry	NA	NA	NA
2008 NM (@ Rd 20)	Date	1/25/08	2/25/08	NA	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08	NA	NA	NA
	Copper (µg/L)	**24**	**21**	NA	**8**	4.9	4.5	4.8	**4.4**	Dry	NA	NA	NA
2008 MPM US (@ Hwy 145)	Date	NA	NA	NA	NA	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08	NA	NA	NA
	Copper (µg/L)	NA	NA	NA	NA	2.4	**39**	2.3	2.1	Dry	NA	NA	NA
2010 MPM (@ Rd 20)	Date	1/19/10	2/23/10	NA	4/20/10	5/18/10	6/15/10	7/20/10	8/17/10	9/14/10	NA	NA	NA
	Copper, dissolved (µg/L)	NA	NA	NA	**3.1**	**3.6**	3.2	2.8	**5.3**	3.5	NA	NA	NA
	Copper, total (µg/L)	NA	NA	NA	4.2	5.1	10	5.6	6.6	8.5	NA	NA	NA
	Chlorpyrifos (µg/L)	**0.21**	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Diuron (µg/L)	<0.20	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Diazinon (µg/L)	<0.004	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 NM & MPM (@ Rd 20)	Date	1/18/11	2/17/11	3/15/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11	10/11/11	11/8/11	12/6/11
	Copper, dissolved (µg/L)	2.4*	2.3*	2.7	**4.6***	**3.8***	3.7*	**4.3***	3.4*	**5.8***	**4.1**	Dry	Dry
	Copper, total (µg/L)	4.4*	3.8*	3.9	7.3*	5.9*	5.9*	6.2*	6.4*	9.8*	14	Dry	Dry
	Chlorpyrifos (µg/L)	<0.003*	<0.003*	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	Dry	Dry
	Diuron (µg/L)	<0.20*	<0.20*	1.1	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	Dry	Dry
	Diazinon (µg/L)	<0.004	<0.004*	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	Dry	Dry

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 only.
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for all chlorpyrifos, diazinon, copper, and diuron detections in the site subwatershed (Table V-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table V-7. Cottonwood Creek site subwatershed instantaneous load calculations for chlorpyrifos, copper, diazinon, and diuron.

Upstream site is italicized. Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Cottonwood Creek @ Rd 20	Chlorpyrifos	03/15/06	0	0.011	0
Cottonwood Creek @ Rd 20*	Chlorpyrifos	03/15/06	0	0.012	0
Cottonwood Creek @ Rd 20	Chlorpyrifos	07/11/06	1.96	0.014	0.78
Cottonwood Creek @ Rd 20	Chlorpyrifos	07/24/07	0	0.007	0
Cottonwood Creek @ Rd 20	Chlorpyrifos	01/25/08	3.05	0.019	1.64
Cottonwood Creek @ Rd 20	Chlorpyrifos	02/25/08	0.22	0.036	0.22
Cottonwood Creek @ Rd 20	Chlorpyrifos	01/19/10	0	0.21	0
Cottonwood Creek @ Rd 20	Copper	05/16/06	2.33	4.4	290.31
Cottonwood Creek @ Rd 20*	Copper	05/16/06	2.33	4.8	316.70
Cottonwood Creek @ Rd 20	Copper	06/13/06	2.66	8	602.59
Cottonwood Creek @ Rd 20	Copper	07/11/06	1.96	5.3	294.16
Cottonwood Creek @ Rd 20	Copper	08/08/06	12.92	4.1	1500.01
Cottonwood Creek @ Rd 20	Copper	09/12/06	38.2	5.5	5949.40
Cottonwood Creek @ Rd 20	Copper	04/24/07	28.24	3.9	3118.72
Cottonwood Creek @ Rd 20	Copper	06/19/07	0.59	6.7	111.94
Cottonwood Creek @ Rd 20	Copper	07/24/07	0	5.4	0
Cottonwood Creek @ Rd 20*	Copper	07/24/07	0	5.1	0
Cottonwood Creek @ Rd 20	Copper	01/25/08	3.05	24	2072.80
Cottonwood Creek @ Rd 20	Copper	02/25/08	0.22	21	130.82
Cottonwood Creek @ Rd 20	Copper	04/29/08	8.26	8	1871.19
Cottonwood Creek @ Rd 20	Copper	05/27/08	17.41	4.9	2415.69
Cottonwood Creek at Highway 145	*Copper*	*05/27/08*	*20.01*	*2.4*	*1359.90*
Cottonwood Creek @ Rd 20	Copper	06/24/08	0.08	4.5	10.19
Cottonwood Creek at Highway 145	*Copper*	*06/24/08*	*60.24*	*39*	*66526.83*
Cottonwood Creek @ Rd 20	Copper	07/29/08	0.16	4.8	21.75
Cottonwood Creek at Highway 145	*Copper*	*07/29/08*	*35.03*	*2.3*	*2281.47*
Cottonwood Creek @ Rd 20	Copper	08/26/08	0.79	4.4	98.43
Cottonwood Creek at Highway 145	*Copper*	*08/26/08*	*10.85*	*2.1*	*645.20*
Cottonwood Creek @ Rd 20	Copper	04/20/10	12.68	4.2	1508.05
Cottonwood Creek @ Rd 20	Copper	05/18/10	12.42	5.1	1793.66
Cottonwood Creek @ Rd 20	Copper	06/15/10	0	10	0
Cottonwood Creek @ Rd 20	Copper	07/20/10	12.97	5.6	2056.72

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Cottonwood Creek @ Rd 20	Copper	08/17/10	14.29	6.6	2670.69
Cottonwood Creek @ Rd 20	Copper	09/14/10	3.82	8.5	919.45
Cottonwood Creek @ Rd 20	Copper	01/18/11	42.66	4.4	5315.21
Cottonwood Creek @ Rd 20	Copper	02/17/11	27.62	3.8	2972.04
Cottonwood Creek @ Rd 20	Copper	03/15/11	31.48	3.9	3476.53
Cottonwood Creek @ Rd 20	Copper	04/19/11	1.35	7.3	279.06
Cottonwood Creek @ Rd 20*	Copper	04/19/11	1.35	8	305.82
Cottonwood Creek @ Rd 20	Copper	09/13/11	6.25	9.8	1734.42
Cottonwood Creek @ Rd 20	Copper	10/11/11	0.21	14	83.25
Cottonwood Creek @ Rd 20*	Copper	10/11/11	0.21	13	77.31
Cottonwood Creek @ Rd 20	Copper (D)	04/20/10	12.68	3.1	1113.08
Cottonwood Creek @ Rd 20	Copper (D)	05/18/10	12.42	3.6	1266.11
Cottonwood Creek @ Rd 20	Copper (D)	06/15/10	0	3.2	0
Cottonwood Creek @ Rd 20	Copper (D)	07/20/10	12.97	2.8	1028.36
Cottonwood Creek @ Rd 20	Copper (D)	08/17/10	14.29	5.3	2144.64
Cottonwood Creek @ Rd 20	Copper (D)	09/14/10	3.82	3.5	378.60
Cottonwood Creek @ Rd 20	Copper (D)	01/18/11	42.66	2.4	2899.21
Cottonwood Creek @ Rd 20	Copper (D)	02/17/11	27.62	2.3	1798.87
Cottonwood Creek @ Rd 20	Copper (D)	03/15/11	31.48	2.7	2406.83
Cottonwood Creek @ Rd 20	Copper (D)	04/19/11	1.35	4.6	175.85
Cottonwood Creek @ Rd 20*	Copper (D)	04/19/11	1.35	5.2	198.79
Cottonwood Creek @ Rd 20	Copper (D)	09/13/11	6.25	5.8	1026.49
Cottonwood Creek @ Rd 20	Copper (D)	10/11/11	0.21	4.1	24.38
Cottonwood Creek @ Rd 20*	Copper (D)	10/11/11	0.21	3.8	22.60
Cottonwood Creek @ Rd 20	Diazinon	02/28/06	0.26	0.02	0.15
Cottonwood Creek @ Rd 20*	Diazinon	02/28/06	0.26	0.023	0.17
Cottonwood Creek @ Rd 20	Diazinon	01/25/08	3.05	0.06	5.18
Cottonwood Creek @ Rd 20	Diazinon	02/25/08	0.22	0.24	1.50
Cottonwood Creek @ Rd 20	Diuron	04/24/07	28.24	0.85	679.72
Cottonwood Creek @ Rd 20	Diuron	01/25/08	3.05	68	5872.95
Cottonwood Creek @ Rd 20	Diuron	02/25/08	0.22	65	404.93
Cottonwood Creek @ Rd 20	Diuron	04/29/08	8.26	0.63	147.36
Cottonwood Creek @ Rd 20	Diuron	05/27/08	17.41	0.23	113.39
Cottonwood Creek @ Rd 20	Diuron	03/15/11	31.48	1.1	980.56

Copper (D)-Dissolved Copper
*Field Duplicate

Source Identification and Outreach

The Coalition addressed source identification in the 2011 MPUR and, in the following sections, considers 2011 monitoring results and PUR data as it expands upon that discussion. The Coalition focuses its efforts on applied pesticides. During 2007 and 2008, the Coalition conducted additional copper MPM and upstream monitoring during the months when exceedances historically occurred to better characterize water quality in the subwatershed. From 2009 through 2010, Core Monitoring occurred at Cottonwood Creek, and MPM continued starting in 2010 to assess water quality in the subwatershed as outreach in the area progressed. Assessment Monitoring occurred at the site during 2011. The PUR data are reviewed to determine the most frequent crop type and timing associated with applications. Cottonwood Creek @ Rd 20 PUR data are available through June 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Cottonwood Creek @ Rd 20 subwatershed began in 2010 and continued through 2011. The Coalition actively engaged in grower outreach and education to address the subwatershed's priority constituents. The Coalition organized meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (25) representing 5,768 acres within the Cottonwood Creek subwatershed. Twenty-four growers participated in follow up contacts to determine if additional management practices were implemented and if any were planned to be implemented, excluding one grower who sold the property after initial contact. Management Plan Monitoring and Assessment Monitoring will take place in 2012 to further assess the affect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos and diazinon are both priority A/B constituents listed in the Cottonwood Creek @ Rd 20 subwatershed management plan.

Chlorpyrifos

Chlorpyrifos exceeded the WQTL of 0.015µg/L three times (Table V-5) from 2005 through 2011 (January and February 2008 and January 2010). Chlorpyrifos was omitted from the monitoring schedule in October 2008 when the Coalition began monitoring under the current 2008 MRPP; chlorpyrifos is not monitored during Core Monitoring. Starting in 2010, as part of the MPM schedule, chlorpyrifos was monitored in January and February. The Coalition evaluated both monitoring and PUR data to identify possible sources.

In every high priority subwatershed, PUR data are reviewed for the number of monthly applications, pounds of AI applied of the constituent of concern, and acres treated of the constituent of concern (Table V-8, Figure V-2). The greatest chlorpyrifos use occurred in 2006 (7,703 lbs AI) with the lowest use occurring in 2008 (738 lbs AI). In 2005 and 2007 the greatest amount of chlorpyrifos use occurred in July, in 2006 and 2010, the greatest use occurred in May, and in 2008 and 2009 during March (Table V-8, Figure V-2). The most recent chlorpyrifos use prior to the 2008 January and February chlorpyrifos exceedances occurred in October 2007; no use was reported from November 2007 through February 2008. The most recent use preceding the January 2010 chlorpyrifos exceedance was in October 2009 (Figure V-2).

The Coalition also uses PUR data from each subwatershed to determine which crops receive the most applications. The top three application rates of chlorpyrifos in the Cottonwood Creek subwatershed were associated with almonds, oranges, and vineyards/grapes (Table V-9). The largest amount of chlorpyrifos applied from 2005 through 2011 was to almond orchards (9,383 lbs AI) followed by orange groves (3,008 lbs AI) and vineyards/grapes (2,479 lbs AI) (Table V-9). The most common product containing chlorpyrifos used within this subwatershed was Lorsban (Table V-9).

Table V-8. Cottonwood Creek @ Rd 20 site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
February, 2005	1	326.0	163.0
March, 2005	1	0.4	0.1
May, 2005	2	296.1	241.0
July, 2005	15	1371.2	735.0
August, 2005	11	1039.5	351.1
September, 2005	16	628.0	212.0
February, 2006	3	353.1	181.0
March, 2006	2	131.9	71.0
May, 2006	20	4029.8	1140.0
June, 2006	4	277.4	166.5
July, 2006	17	1292.2	821.3
August, 2006	12	882.3	338.8
September, 2006	7	244.4	88.5
October, 2006	4	492.5	110.0
March, 2007	2	329.0	168.5
April, 2007	1	48.5	200.0
May, 2007	2	57.1	208.0
July, 2007	8	369.9	197.2
August, 2007	4	133.6	74.0
October, 2007	1	33.5	18.0
March, 2008	2	346.0	201.0
May, 2008	2	26.9	58.0
July, 2008	4	206.9	118.0
August, 2008	1	160.1	80.0
February, 2009	1	80.7	40.0
March, 2009	2	335.2	181.0
May, 2009	1	9.0	4.5
June, 2009	1	80.8	40.0
July, 2009	1	75.1	40.0
August, 2009	2	146.8	73.0
September, 2009	1	248.5	41.0
October, 2009	5	262.9	140.0
May, 2010	2	362.6	337.0
June, 2010	4	356.5	105.0
July, 2010	4	164.1	293.0
August, 2010	2	347.1	56.9
September, 2010	5	258.1	50.4
October, 2010	3	293.0	156.0
January, 2011	1	75.1	40.0
February, 2011	3	91.1	48.5
Summaries by Year			
2005 Total	46	3661.3	1702.2
2006 Total	69	7703.7	2917.0
2007 Total	18	971.6	865.7
2008 Total	9	739.9	457.0
2009 Total	14	1239.0	559.5
2010 Total	20	1781.4	998.3
2011 Total	4	166.2	88.5
Total	**180**	**16263.0**	**7588.2**

Figure V-2. Cottonwood Creek @ Rd 20 site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

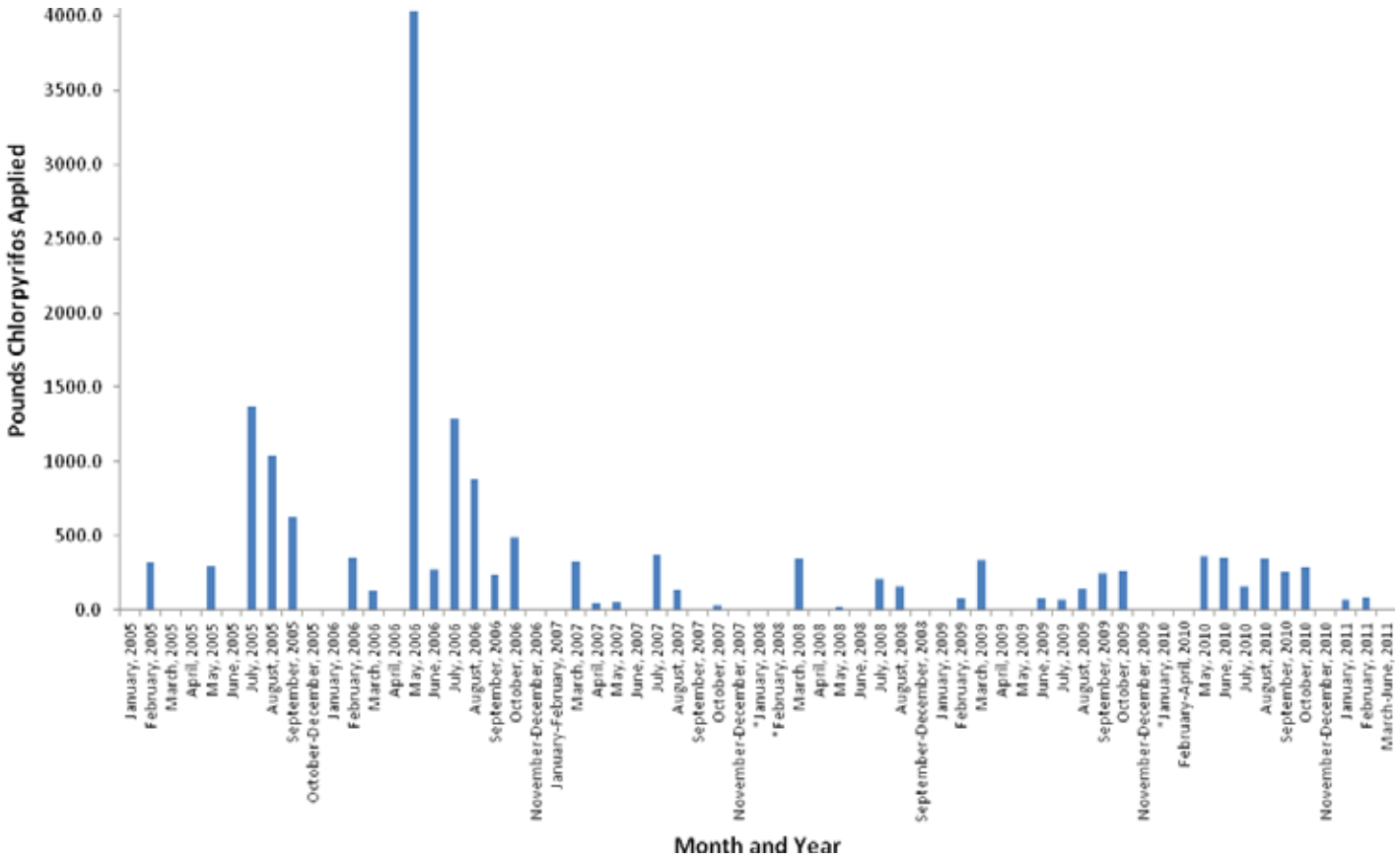


Table V-9. Cottonwood Creek @ Rd 20 site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	40.1
		LORSBAN 4E-HF	117.6
		LORSBAN-4E	224.9
	ALMOND	AGRISOLUTIONS YUMA 4E INSECTICIDE	80.7
		CHLORPYRIFOS 4E AG	0.4
		GOVERN 4E INSECTICIDE	1653.4
		LORSBAN 4E-HF	727.8
		LORSBAN ADVANCED	534.1
		LORSBAN-4E	6086.4
		NUFOS 4E	256.2
		WARHAWK	44.4
	CHERRY	LORSBAN 4E INSECTICIDE	27.1
	CORN (FORAGE - FODDER)	LORSBAN 4E-HF	117.6
	GRAPES	LORSBAN 4E INSECTICIDE	1304.2
		LORSBAN ADVANCED	668.9
		LORSBAN-4E	506.4
	ORANGE	CHLORPYRIFOS 4E AG	48.5
		GOVERN 4E INSECTICIDE	600.0
		LORSBAN 4E-HF	748.3
		LORSBAN-4E	1122.5
		NUFOS 4E	488.7
	TANGELO	LORSBAN-4E	306.6
		NUFOS 4E	94.6
	TANGERINE	GOVERN 4E INSECTICIDE	84.8
		LORSBAN-4E	160.8
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	GOVERN 4E INSECTICIDE	161.6
		LORSBAN 4E-HF	1.0
		LORSBAN-4E	55.3

ALFALFA - Total Pounds Chlorpyrifos Applied	**382.6**
ALMOND - Total Pounds Chlorpyrifos Applied	**9383.4**
CHERRY - Total Pounds Chlorpyrifos Applied	**27.1**
CORN - Total Pounds Chlorpyrifos Applied	**117.6**
GRAPES - Total Pounds Chlorpyrifos Applied	**2479.6**
ORANGE - Total Pounds Chlorpyrifos Applied	**3008.0**
TANGELO - Total Pounds Chlorpyrifos Applied	**401.2**
TANGERINE - Total Pounds Chlorpyrifos Applied	**245.7**
WALNUT - Total Pounds Chlorpyrifos Applied	**217.9**
Total Pounds Chlorpyrifos Applied (2005 - 2011)	**16263.0**

The Coalition determined the most probable source of chlorpyrifos in the Cottonwood Creek waterway to be spray drift from adjacent orchards. Cottonwood Creek has sandy soils and a large percentage of the adjacent acreage is orchards. Also, for a large portion of the watershed, the creek is raised above the level of the surrounding agricultural land and no drainage to the creek is possible. Consequently, it is likely that the exceedances of chlorpyrifos that occurred in 2008 were due to spray drift. Although no use was reported in November, December, January or February preceding the exceedances, applications

of chlorpyrifos during this time of year would be either for vine mealy bug control (applied to grapes) or dormant sprays (applied to orchards like cherries). The same assumption can be made concerning the January 2010 chlorpyrifos exceedance. There was no application associated with this exceedance and there were no applications reported since October 2009. Consequently, outreach efforts focused on encouraging management practices aimed at reducing spray drift and also improving orchard and vineyard water management. Outreach efforts were directed toward management practices designed to reduce spray drift and increase effective management of parcels adjacent to the creek.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began in November 2009. Targeted growers were selected based on the potential of their agricultural practices to cause pesticide drift to the creek. In the Cottonwood Creek subwatershed, 25 targeted growers representing 5,768 acres were contacted with the potential to drain or drift directly into the creek. Coalition representatives met with growers on their property to discuss the Cottonwood Creek Management Plan and recommend management practices specific to the parcel and land owner/operator. This gave the Coalition a chance to better assess currently used management practices as well as review planned management practice implementation. Individual contacts focused mainly on chlorpyrifos exceedances however, all water quality results were reviewed and discussed including diazinon, copper, diuron, *E. coli*, DO, and lead exceedances.

The Coalition contacted all 25 targeted members, representing 45% of the subwatershed's direct drainage acreage. Of the 25 targeted members, recommended management practices to acreages in the Cottonwood Creek subwatershed included: control timing of pump/drain into waterway from storm water (27%) and spray when wind is blowing away from waterbodies (73%). Based on the exact timing of each individual meeting and/or a grower's resources, some owners would not be able to implement recommended management practices until the 2011 irrigation season.

The Coalition followed up with growers in April of 2011 to determine what practices were implemented during the first year of high priority monitoring. All members were responsive to the follow up interviews. Growers implemented all recommended practices as well as practices that were not specifically recommended for their operations. Newly implemented management practices within the Cottonwood Creek subwatershed include maintaining filer strips at least 10 feet wide around perimeter of orchard (1%), spraying close to waterbodies when the wind is blowing away from them (58%), using electronic controlled sprayer nozzles (20%), and using less water during surface irrigation (22%).

In 2012, the Coalition will continue to assess water quality at Cottonwood Creek @ Rd 20 through MPM during months of past exceedances.

Diazinon

Concentrations of diazinon in samples exceeded the WQTL (0.1 µg/L) one time, on February 25, 2008 (Table V-5). Diazinon was not monitored at Cottonwood Creek from October 2008 through December 2009 due to a change in the current 2008 MRPP monitoring schedule. In 2010, MPM for diazinon began again during months of past exceedances and during 2011, monthly Assessment Monitoring occurred. There were no instances of diazinon exceedances in samples collected during 2010 or 2011.

All PUR data are reviewed for the number of monthly diazinon applications, pounds of active ingredient applied, and acres treated (Table V-10, Figure V-3). Overall, the amount of diazinon applied within the subwatershed decreased since 2005. The amount of diazinon used in 2005 was 1,087 lbs AI compared to 196 lbs AI in 2010 and 181 lbs AI through June 2011. Diazinon use generally occurs between December and March during dormant sprays. The exceedance that occurred in February 2008 was in the month of greatest diazinon use in 2008 (Figure V-3).

The Coalition also uses PUR data to assess which crops receive the most applications of diazinon. The largest amounts of diazinon applied are associated with peaches and almonds (1,981 lbs AI and 930 lbs AI respectively, Table V-11). Diazinon was applied to peach, almond, cherry and fig orchards prior to the February 2008 exceedance.

Table V-10. Cottonwood Creek @ Rd 20 site subwatershed diazinon applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Diazinon Applications	Pounds of AI Applied	Acres Treated
January, 2005	11	471.8	236.0
February, 2005	9	407.8	204.0
May, 2005	6	5.8	4.2
June, 2005	2	162.5	50.0
July, 2005	1	4.0	4.0
August, 2005	1	35.8	35.8
January, 2006	18	756.8	398.8
February, 2006	3	86.1	42.5
May, 2006	7	8.1	32.2
June, 2006	1	31.2	40.0
January, 2007	17	887.6	449.8
February, 2007	1	20.0	10.0
March, 2007	1	42.0	28.0
January, 2008	8	238.0	122.5
February, 2008	10	537.6	610.5
March, 2008	1	42.0	28.0
February, 2009	10	291.7	147.0
December, 2009	2	134.9	68.0
January, 2010	6	176.6	96.5
February, 2010	1	19.9	10.0
January, 2011	6	161.3	81.0
February, 2011	1	19.9	10.0
Summaries by Year			
2005 Total	30	1087.7	534.0
2006 Total	29	882.2	513.5
2007 Total	19	949.6	487.8
2008 Total	19	817.5	761.0
2009 Total	12	426.6	215.0
2010 Total	7	196.5	106.5
2011 Total	7	181.2	91.0
Total	**123**	**4541.4**	**2708.8**

.

Figure V-3. Cottonwood Creek @ Rd 20 site subwatershed lbs diazinon applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

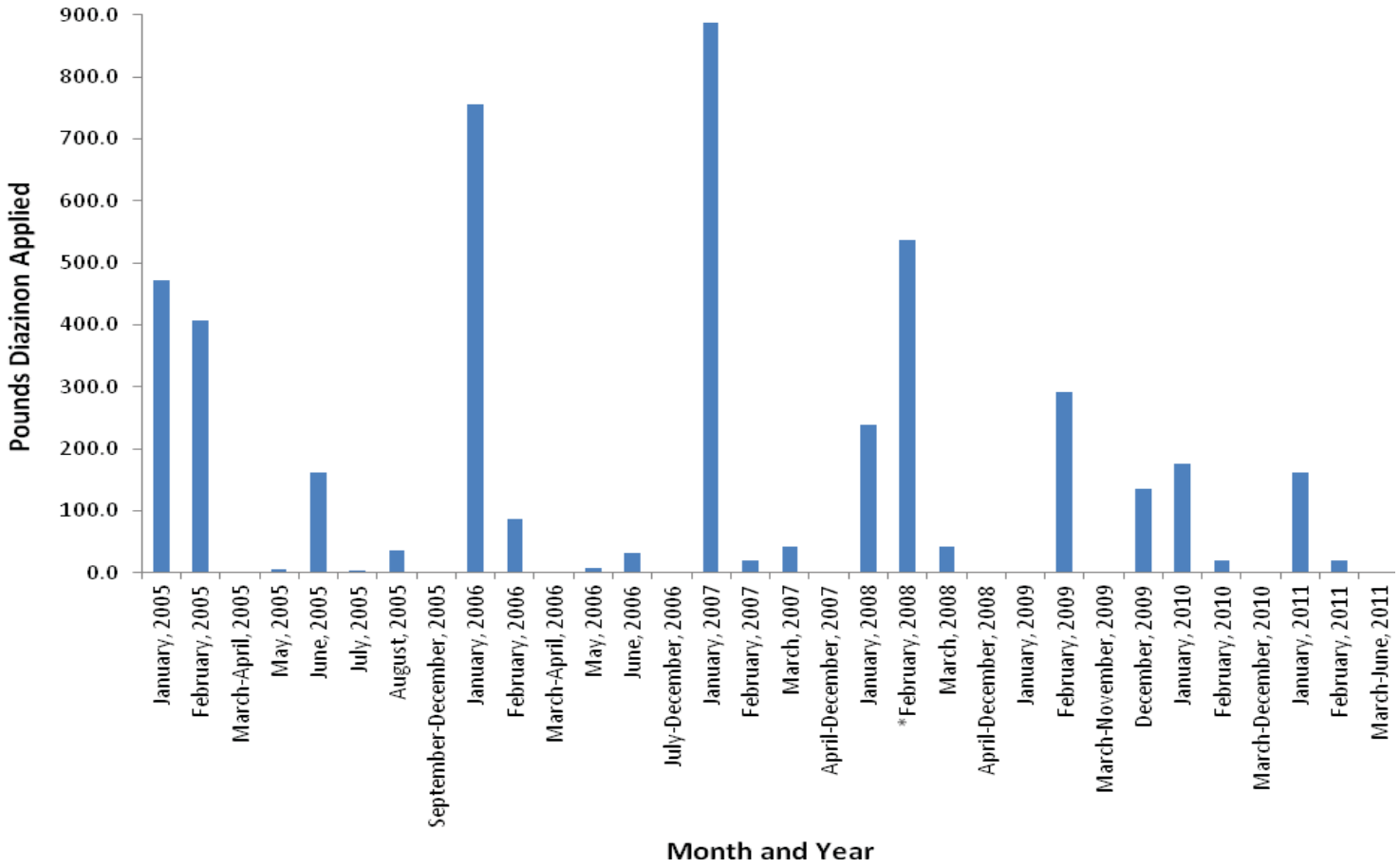


Table V-11. Cottonwood Creek @ Rd 20 site subwatershed diazinon PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIAZINON	ALMOND	CLEAN CROP DIAZINON AG500 INSECTICIDE	417.9
		DIAZINON 50W	100.0
		DIAZINON AG 500	234.2
		DIAZINON AG500 INSECTICIDE	71.7
		GOWAN DIAZINON 4E	106.0
	APPLE	DIAZINON 50W	0.4
	APRICOT	DIAZINON 50W	4.7
	CHERRY	CLEAN CROP DIAZINON AG500 INSECTICIDE	39.4
		DIAZINON AG 500	19.8
		DIAZINON AG500 INSECTICIDE	39.8
		DIAZOL 50 W	20.0
		GOWAN DIAZINON 4E	20.0
	FIG	DIAZOL AG 500	220.8
	GRAPES	GOWAN DIAZINON 50 WSB	39.8
	NECTARINE	DIAZINON 50W	4.3
		DIAZINON AG 500	158.8
		GOWAN DIAZINON 4E	292.3
	PEACH	CLEAN CROP DIAZINON AG500 INSECTICIDE	677.2
		DIAZINON 50W	4.3
		DIAZINON AG 500	412.8
		DIAZINON AG500 INSECTICIDE	15.9
		DIAZOL 50 W	81.0
		GOWAN DIAZINON 4E	790.0
	PLUM	CLEAN CROP DIAZINON AG500 INSECTICIDE	146.9
		DIAZINON 50W	4.8
		DIAZINON AG 500	192.5
		DIAZINON AG500 INSECTICIDE	73.7
		GOWAN DIAZINON 4E	60.0
	PRUNE	DIAZINON 50W	93.8
		DIAZINON AG500 INSECTICIDE	42.8
		DIAZOL 50 W	42.0
	STONE FRUIT	DIAZINON 50W	1.7
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	GOWAN DIAZINON 4E	112.5

ALMOND - Total Pounds Diazinon Applied	**929.7**
APPLE - Total Pounds Diazinon Applied	**0.4**
APRICOT - Total Pounds Diazinon Applied	**4.7**
CHERRY - Total Pounds Diazinon Applied	**139.1**
FIG - Total Pounds Diazinon Applied	**220.8**
GRAPES - Total Pounds Diazinon Applied	**39.8**
NECTARINE - Total Pounds Diazinon Applied	**455.3**
PEACH - Total Pounds Diazinon Applied	**1981.1**
PLUM - Total Pounds Diazinon Applied	**477.8**
PRUNE - Total Pounds Diazinon Applied	**178.6**
STONE FRUIT - Total Pounds Diazinon Applied	**1.7**
WALNUT - Total Pounds Diazinon Applied	**112.5**
Total Pounds Diazinon Applied (2005 - 2011)	**4541.4**

Applications of diazinon in January 2008 were associated with the February 2008 exceedance; however months with higher application rates did not result in exceedances. The 2008 exceedance was most likely due to spray drift from parcels located next to the creek. Therefore, the Coalition focused its outreach to target growers with the potential to drift to the creek. Orchard operators were advised to manage spray drift as well as storm water runoff to prevent the winter exceedances. Individual contacts which occurred within this subwatershed are described under the chlorpyrifos outreach section above and included discussions of diazinon exceedances as well as spray drift and storm runoff management practices. Monitoring for diazinon found no exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove it from the active Cottonwood Creek management plan.

Priority C Constituents

Copper and diuron are listed as priority C constituents in the Cottonwood Creek @ Rd 20 subwatershed management plan.

Copper

Copper in water samples exceeded the hardness based WQTL numerous times in this subwatershed from 2005 through 2011 based on total and dissolved copper analyses (Table V-5). The Coalition began monitoring for both the total and dissolved copper fractions in October 2008 to better characterize copper contamination in the subwatershed.

Additional and upstream MPM confirmed that copper is a water quality concern throughout the subwatershed. The Coalition began MPM monitoring for copper (both total and dissolved) in 2010 (April-September) and continued in 2011 (January, February, and April-September) including monthly Assessment Monitoring.

PUR data are reviewed for the number of monthly copper applications, pounds of AI applied, and acres treated (Table V-12, Figure V-4). In the years since 2006, the amount of copper applied within the subwatershed varied slightly (ranging from 21,824 lbs AI applied to 14, 564 lbs AI applied). Copper use was inconsistent from month to month between 2005 and 2011. The greatest amount of applied copper in 2011 was in January, but PUR data are only available through June 2011. Not all exceedances occurred during the month of the greatest use, or within three months of the greatest use (Figure V-4).

The Coalition also uses PUR data to determine which crops receive the most applications of copper. The crops associated with the largest amount of copper applied from 2005 through 2011 were grapes (71,669 lbs AI), almonds (29,256 lbs AI) and oranges (18,014 lbs AI) (Table V-13). The most common product containing copper used within this subwatershed is Kocide (Table V-13).

Table V-12. Cottonwood Creek @ Rd 20 site subwatershed copper applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	25	3955.7	806.3
February, 2005	18	2146.3	395.0
March, 2005	75	5211.5	4200.7
April, 2005	112	6402.9	5439.5
May, 2005	12	229.3	231.0
June, 2005	9	678.8	536.0
August, 2005	9	1473.7	487.0
September, 2005	3	705.0	235.0
October, 2005	7	1219.3	238.0
November, 2005	25	2553.9	602.4
January, 2006	46	8362.3	2085.8
February, 2006	24	1999.9	452.2
March, 2006	11	839.2	720.6
April, 2006	226	12599.0	12864.3
May, 2006	45	2657.9	2294.1
June, 2006	9	640.3	450.0
July, 2006	3	281.6	107.0
August, 2006	3	393.8	190.0
September, 2006	1	108.0	36.0
October, 2006	10	1294.7	409.8
November, 2006	15	1670.1	650.3
December, 2006	5	677.2	183.5
January, 2007	28	2787.0	944.8
February, 2007	8	612.7	303.0
March, 2007	88	4409.2	4487.6
April, 2007	59	2592.4	2850.0
May, 2007	9	159.8	178.8
July, 2007	9	1017.0	684.2
August, 2007	2	82.5	30.0
September, 2007	2	348.0	116.0
October, 2007	4	1044.0	393.8
November, 2007	8	1183.4	421.5
December, 2007	3	328.1	76.0
January, 2008	46	7163.7	2949.8
February, 2008	12	1499.5	490.5
March, 2008	46	1203.7	2112.0
April, 2008	110	4721.3	5543.2
May, 2008	3	549.2	471.2
June, 2008	7	134.6	68.0
July, 2008	2	289.9	112.0
October, 2008	11	897.6	350.0
November, 2008	4	1510.3	470.0
December, 2008	5	198.4	192.0
January, 2009	19	2533.8	938.9
February, 2009	20	1150.7	374.1
March, 2009	31	971.4	1473.9
April, 2009	99	3184.1	5019.8

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
May, 2009	7	184.8	186.0
June, 2009	1	11.1	16.0
August, 2009	3	201.0	76.0
September, 2009	3	4944.5	217.0
October, 2009	17	1594.5	905.0
November, 2009	16	2189.5	752.7
December, 2009	8	214.4	220.0
January, 2010	62	9972.5	3036.8
February, 2010	4	355.6	71.0
March, 2010	89	3736.5	5031.9
April, 2010	121	4355.9	5902.9
May, 2010	13	387.3	412.2
June, 2010	1	33.7	40.0
July, 2010	1	67.5	80.0
August, 2010	3	157.5	120.0
September, 2010	3	101.5	80.0
October, 2010	2	108.0	72.0
November, 2010	1	282.0	100.0
December, 2010	5	2266.8	593.0
January, 2011	47	5684.9	2024.0
February, 2011	20	1911.8	858.9
March, 2011	36	1375.0	1307.4
April, 2011	80	3052.9	3995.3
May, 2011	5	106.7	110.0
June, 2011	8	864.8	412.6
Summaries by Year			
2005 Total	295	24576.4	13170.8
2006 Total	398	31524.0	20443.6
2007 Total	220	14564.1	10485.7
2008 Total	246	18168.3	12758.6
2009 Total	224	17179.6	10179.3
2010 Total	305	21824.9	15539.8
2011 Total	196	12996.2	8708.2
Total	**1884**	**140833.4**	**91285.9**

Figure V-4. Cottonwood Creek @ Rd 20 site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

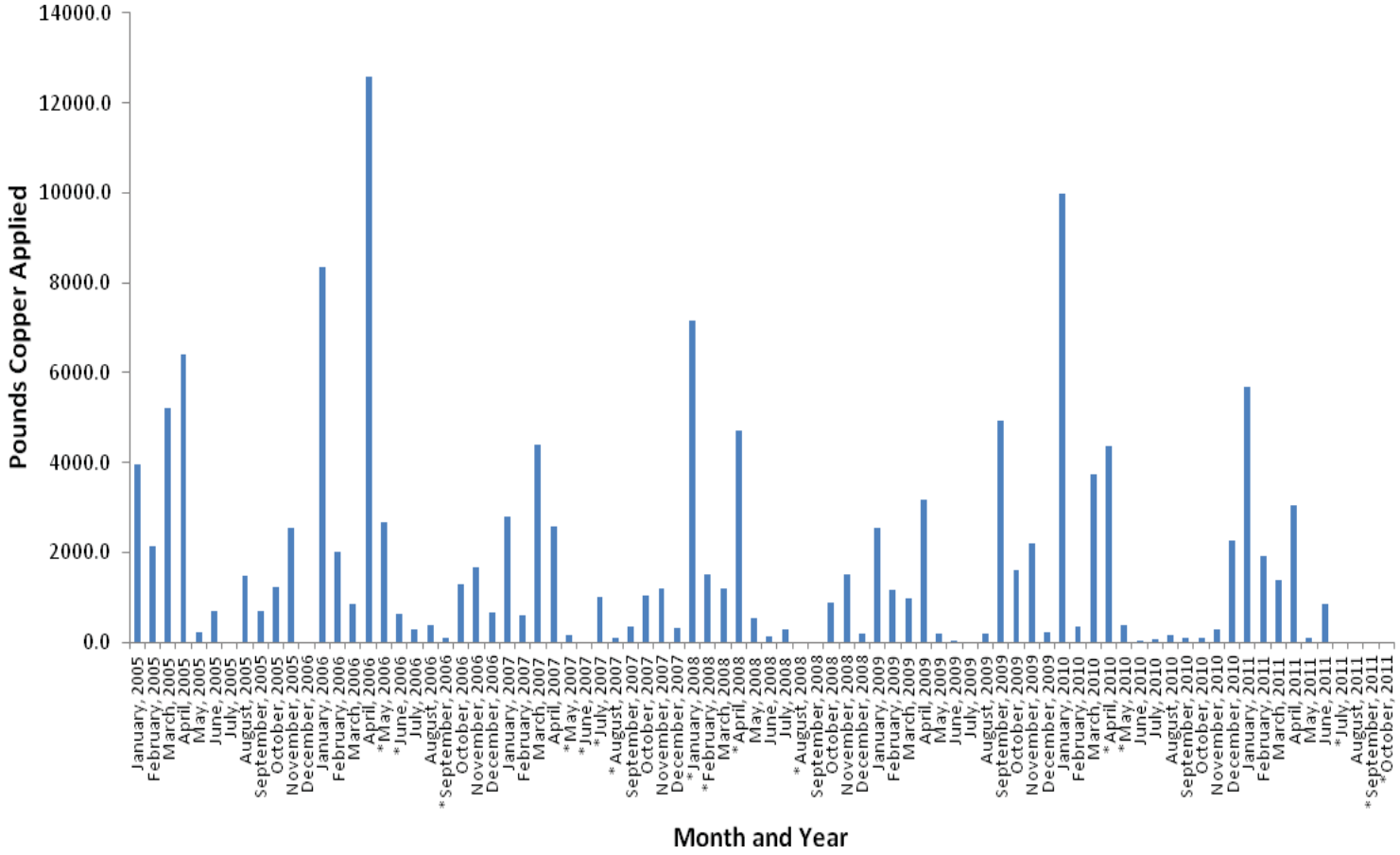


Table V-13. Cottonwood Creek @ Rd 20 site subwatershed copper PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	2.4
	ALMOND	BADGE X2	45.1
		CHAMP DRY PRILL	5642.3
		CHAMP FORMULA 2 FLOWABLE	8552.0
		CHAMP WG	970.2
		CUPROFIX DISPERSS	243.5
		CUPROFIX ULTRA 40 DISPERSS	1253.8
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	23.1
		DUPONT KOCIDE 101 FUNGICIDE/BACTERICIDE	15.4
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	3127.8
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	3168.7
		KOCIDE 101	1188.9
		KOCIDE 2000	1087.5
		KOCIDE DF	2173.6
		NORDOX 75 WG	1573.1
		TRIANGLE BRAND COPPER SULFATE CRYSTAL	190.9
	APPLE	KOCIDE 2000	0.9
		NU-COP 50DF	8.9
	APRICOT	KOCIDE 2000	3.6
		NU-COP 50DF	27.7
	CHERRY	CUPROFIX ULTRA 40 DISPERSS	53.7
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	113.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	51.6
		KENTAN DF	49.0
		KOCIDE DF	122.8
	FIG	TRIANGLE BRAND BASIC COPPER SULFATE	73.7
	GRAPES	BADGE X2	347.3
		BASIC COPPER 53	138.2
		BRITZ COPPER SULFUR 15-25 DUST	9332.8
		CHAMP DRY PRILL	46.1
		CHAMP FORMULA 2 FLOWABLE	14462.3
		CHAMP WG	183.0
		CHAMPION FLOWABLE	8.4
		CHAMPION WETTABLE POWDER	2231.9
		CHIPCO COPPER SULFATE CRYSTALS	5.0
		CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	3435.0
		COPPER SULFATE CRYSTALS	134.6
		CSC COPPER SULFUR DUST	1737.7
		CUPROFIX DISPERSS	8.9
		CUPROFIX ULTRA 40 DISPERSS	3371.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	4190.1
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	8502.9
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	184.7
		HYDROX	92.4
		IAP COPPER SULFUR 15-25 DUST	37.5
		KENTAN DF	445.0
		KOCIDE 101	1855.5
		KOCIDE 2000	9195.6

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	GRAPES	KOCIDE 4.5 LF	1467.9
		KOCIDE DF	3309.9
		NORDOX	742.1
		NORDOX 75 WG	3481.8
		NU-COP 50 WP	860.1
		NU-COP 50DF	791.8
		NU-COP HB	547.5
		OXYCOP	400.0
		STRETCH FUNGICIDE	1.9
		ZINC COPOSIL SULFUR 15-30 DUST	120.0
	NECTARINE	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	534.4
		KENTAN DF	175.9
		KOCIDE 2000	574.1
		KOCIDE DF	982.4
		NU-COP 50DF	107.8
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	CHAMP FORMULA 2 FLOWABLE	371.9
	OLIVE	CUPROFIX ULTRA 40 DISPERSS	501.3
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	387.4
	ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	NORDOX 75 WG	9.1
	ORANGE	BASIC COPPER 53	3965.9
		BASIC COPPER SULFATE	3118.4
		BLUE SHIELD DF	30.8
		COP-O-ZINC	301.3
		CUPROFIX ULTRA 40 DISPERSS	455.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	27.7
		KOCIDE 20/20	1345.9
		KOCIDE DF	1726.8
		NORDOX	5552.3
		NU-COP 50DF	1489.6
	PEACH	CHAMP FORMULA 2 FLOWABLE	77.2
		CUPROFIX ULTRA 40 DISPERSS	76.8
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	2388.7
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	16.1
		KENTAN DF	622.8
		KOCIDE 2000	971.5
		KOCIDE DF	2781.4
		NORDOX 75 WG	201.4
		NU-COP 50DF	266.4
		STRETCH FUNGICIDE	0.7
	PISTACHIO (PISTACHE NUT)	TRIANGLE BRAND COPPER SULFATE CRYSTAL	99.0
		TRIANGLE BRAND COPPER SULFATE INSTANT POWDER	27.5
	PLUM	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	551.6
		KENTAN DF	328.6
		KOCIDE 2000	3.2
		KOCIDE DF	368.4
		NU-COP 50DF	129.4
	PRUNE	CHAMP WG	699.8
	STONE FRUIT	DUPONT GX-569 FUNGICIDE/BACTERICIDE	7.9
		DUPONT KOCIDE 20/20 FUNGICIDE/BACTERICIDE	18.9
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	13.2

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	TANGELO	BASIC COPPER 53	250.9
		COP-O-ZINC	175.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	23.1
		KOCIDE 20/20	359.2
		KOCIDE DF	226.0
		NORDOX	1983.4
		NU-COP 50DF	215.6
	TANGERINE	BASIC COPPER 53	2030.6
		CHAMPION WETTABLE POWDER	431.2
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	597.0
		NORDOX	868.6
	TOMATOES, FOR PROCESSING/CANNING	KOCIDE 2000	95.8
	UNKNOWN	BASIC COPPER 53	75.3
		CUPROFIX ULTRA 40 DISPERSS	31.7
	VEGETABLES (ALL OR UNSPEC)	NEUDORFF CUEVA FUNGICIDE CONCENTRATE	2.1
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CHAMP DRY PRILL	324.9
		NORDOX 75 WG	402.7

ALFALFA - Total Pounds Copper Applied	**2.4**
ALMOND - Total Pounds Copper Applied	**29255.8**
APPLE - Total Pounds Copper Applied	**9.7**
APRICOT - Total Pounds Copper Applied	**31.3**
CHERRY - Total Pounds Copper Applied	**390.1**
FIG - Total Pounds Copper Applied	**73.7**
GRAPES - Total Pounds Copper Applied	**71669.5**
NECTARINE - Total Pounds Copper Applied	**2374.6**
N-OUTDR GRWN TRNSPLNT - Total Pounds Copper Applied	**371.9**
OLIVE - Total Pounds Copper Applied	**888.6**
ONION - Total Pounds Copper Applied	**9.1**
ORANGE - Total Pounds Copper Applied	**18013.6**
PEACH - Total Pounds Copper Applied	**7402.9**
PISTACHIO - Total Pounds Copper Applied	**126.5**
PLUM - Total Pounds Copper Applied	**1381.1**
PRUNE - Total Pounds Copper Applied	**699.8**
STONE FRUIT - Total Pounds Copper Applied	**40.0**
TANGELO - Total Pounds Copper Applied	**3233.0**
TANGERINE - Total Pounds Copper Applied	**3927.3**
TOMATOES - Total Pounds Copper Applied	**95.8**
VEGETABLES - Total Pounds Copper Applied	**2.1**
WALNUT - Total Pounds Copper Applied	**727.6**
UNKNOWN - Total Pounds Copper Applied	**107.0**
Total Pounds Copper Applied (2005 - 2011)	**140833.4**

The Coalition will continue with its Management Plan strategy for addressing copper exceedances in the Cottonwood Creek @ Rd 20 subwatershed as outlined in the chlorpyrifos Source Identification and Outreach section above. Orchard and vineyard operators were advised to manage irrigation tailwater and management to prevent copper from entering the waterway with runoff when applicable. Storm runoff management relevant to copper applications was advised to reduce runoff prevent the winter

exceedances. Individual contacts with growers within this subwatershed are described under the chlorpyrifos outreach section above and under the copper outreach section, as are discussions of copper exceedances and relevant management practices. Copper MPM will continue during 2012 during months of past exceedances (January, February, April-October).

Diuron

Concentrations of diuron exceeded the WQTL twice in this subwatershed from 2005 through 2011 (January and February 2008; Table V-5). Core Monitoring took place at Cottonwood Creek during 2009. Diuron MPM began in January 2010 and continued through 2011 (January and February). Diuron was also monitored monthly during 2011 Assessment Monitoring.

All PUR data are reviewed for the number of monthly diuron applications, pounds of AI applied, and acres treated (Table V-14, Figure V-5). There has been a general decrease in diuron use since 2005. The amount of diuron used in 2005 was 3,372 lbs compared to 1,235 lbs in 2011 (PUR data available for Cottonwood Creek through June 2011). Neither of the exceedances occurred during months of the greatest amount of use, although February was the month with the second highest amount of use in 2008 (Figure V-5). The highest application rates and largest amount of diuron applied from 2005 through 2011 were associated with grapes and oranges (Table V-15). The most common product containing diuron used within this subwatershed was Karmex (Table V-15).

Table V-14. Cottonwood Creek @ Rd 20 site subwatershed diuron applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
January, 2005	4	103.7	83.3
February, 2005	18	539.4	466.0
March, 2005	29	620.1	663.2
April, 2005	12	270.8	360.6
May, 2005	1	9.6	6.0
October, 2005	5	10.5	184.0
November, 2005	3	974.4	434.0
December, 2005	30	843.9	681.5
January, 2006	9	464.7	392.7
February, 2006	35	1321.3	1851.3
March, 2006	20	793.0	582.3
April, 2006	3	100.8	83.0
October, 2006	4	3.4	106.0
November, 2006	13	449.6	854.2
December, 2006	7	314.0	338.0
January, 2007	6	87.1	324.0
February, 2007	10	391.9	389.7
March, 2007	15	792.2	689.0
April, 2007	3	164.8	226.0
September, 2007	1	14.8	403.0
October, 2007	2	0.7	32.0
November, 2007	2	248.9	171.5

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
December, 2007	6	343.2	153.8
January, 2008	1	8.0	20.0
February, 2008	18	690.7	627.3
March, 2008	17	826.3	797.9
April, 2008	2	296.0	240.0
December, 2008	5	223.2	258.0
January, 2009	14	336.0	401.9
February, 2009	20	425.1	522.1
March, 2009	12	294.0	429.0
April, 2009	1	246.4	154.0
November, 2009	12	554.5	449.7
December, 2009	3	30.8	44.0
January, 2010	7	177.3	197.0
February, 2010	11	578.1	381.3
March, 2010	8	197.1	183.0
April, 2010	2	56.0	22.5
November, 2010	3	54.0	90.0
December, 2010	1	113.2	141.9
February, 2011	19	793.7	546.8
March, 2011	27	400.5	363.1
April, 2011	5	41.0	30.7
Summaries by Year			
2005 Total	102	3372.5	2878.6
2006 Total	91	3446.7	4207.5
2007 Total	45	2043.7	2389.0
2008 Total	43	2044.2	1943.2
2009 Total	62	1886.8	2000.7
2010 Total	32	1175.7	1015.7
2011 Total	51	1235.2	940.6
Total	**426**	**15204.8**	**15375.3**

Figure V-5. Cottonwood Creek @ Rd 20 site subwatershed lbs diuron applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

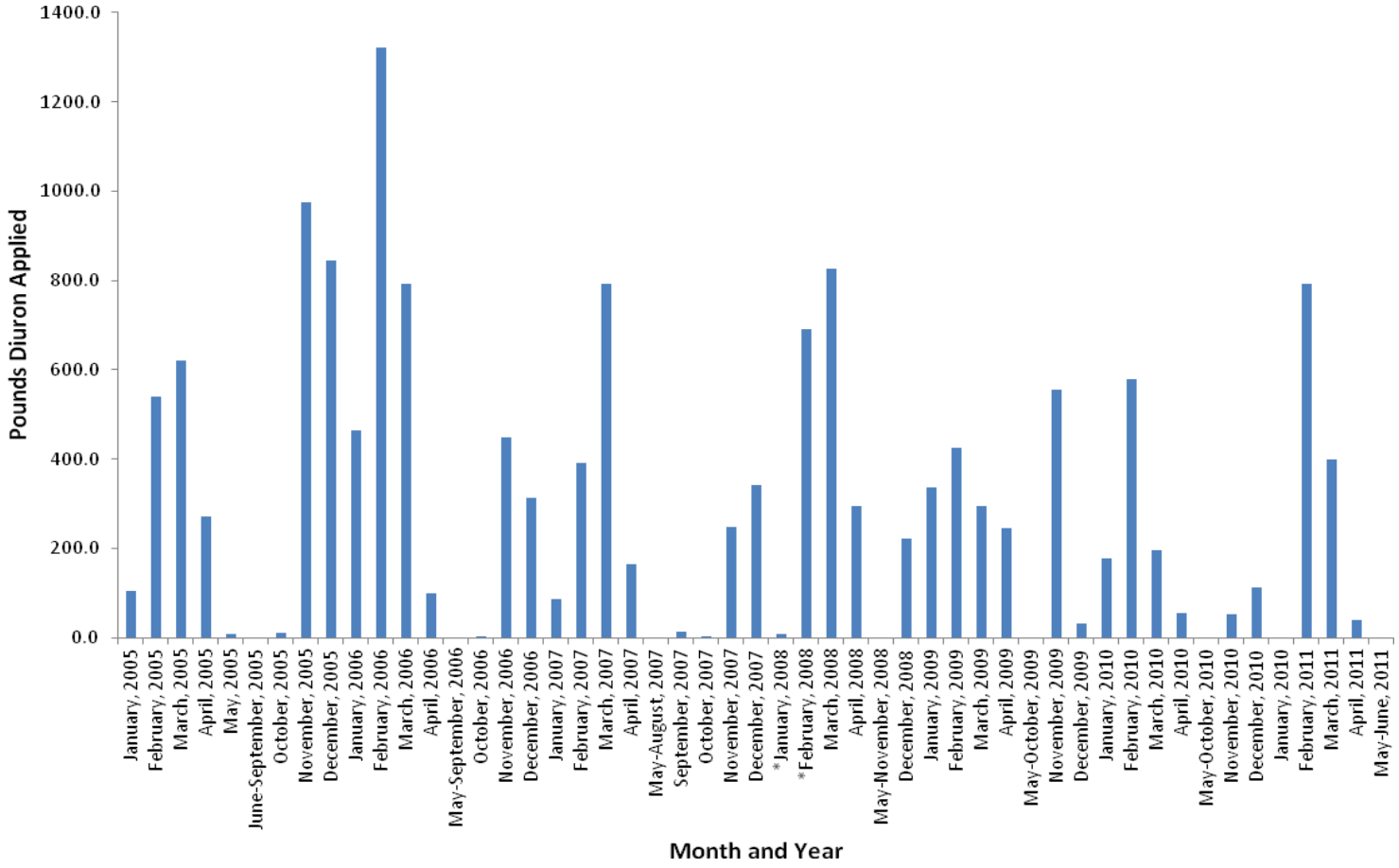


Table V-15. Cottonwood Creek @ Rd 20 site subwatershed diuron PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIURON	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DIURON 80 DF HERBICIDE	248.0
		DREXEL DIURON 80 HERBICIDE	940.0
		DUPONT DIREX 4L HERBICIDE	164.0
	COTTON (GENERAL)	ADIOS COTTON DEFOLIANT	14.8
		GINSTAR EC COTTON DEFOLIANT	14.7
	GRAPES	DIREX 4L	191.4
		DIREX 80DF	533.5
		DIURON 4L	65.6
		DIURON 4L HERBICIDE	6.6
		DIURON 80 DF HERBICIDE	74.4
		DIURON 80 WP WEED KILLER	9.6
		DREXEL DIURON 4L HERBICIDE	241.2
		DREXEL DIURON 80 HERBICIDE	862.0
		DU PONT KARMEX	29.2
		DU PONT KARMEX DF HERBICIDE	785.2
		DUPONT DIREX 4L HERBICIDE	71.0
		DUPONT KARMEX DF HERBICIDE	722.0
		DUPONT KARMEX XP HERBICIDE	334.0
		KARMEX DF HERBICIDE	506.0
		KARMEX XP HERBICIDE	2079.8
	OLIVE	DU PONT KARMEX	12.8
		DU PONT KARMEX DF HERBICIDE	6.4
		DUPONT DIREX 4L HERBICIDE	8.1
	ORANGE	DIREX 80DF	2120.3
		DREXEL DIURON 80 HERBICIDE	277.6
		DU PONT KROVAR I DF HERBICIDE	1438.4
		DUPONT KARMEX DF HERBICIDE	96.0
		DUPONT KARMEX XP HERBICIDE	297.6
		KARMEX DF HERBICIDE	467.2
		KARMEX XP HERBICIDE	202.8
	TANGELO	DREXEL DIURON 80 HERBICIDE	51.2
		DU PONT KROVAR I DF HERBICIDE	879.6
		DUPONT KARMEX XP HERBICIDE	38.4
		KARMEX XP HERBICIDE	9.6
	TANGERINE	DU PONT KROVAR I DF HERBICIDE	450.0
		DUPONT KARMEX DF HERBICIDE	2.0
		DUPONT KARMEX XP HERBICIDE	914.7
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	DIREX 4L	39.1

ALFALFA - Total Pounds Diuron Applied	**1352.0**
COTTON - Total Pounds Diuron Applied	**29.5**
GRAPES - Total Pounds Diuron Applied	**6511.5**
OLIVE - Total Pounds Diuron Applied	**27.3**
ORANGE - Total Pounds Diuron Applied	**4899.9**
TANGELO - Total Pounds Diuron Applied	**978.8**
TANGERINE - Total Pounds Diuron Applied	**1366.7**
WALNUT - Total Pounds Diuron Applied	**39.1**
Total Pounds Diuron Applied (2005 - 2011)	**15204.8**

Diuron is most likely transported to Cottonwood Creek by drift from dormant sprays or direct applications to the berms along the water way. As discussed above, diuron applications decreased since 2005 and no exceedances have occurred in the subwatershed since 2008. The Coalition provides information on a subwatershed basis to growers to review their operation and determine if storm water runoff and irrigation discharge to waterways is managed properly. Monitoring for diuron resulted in no exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove it from the active Cottonwood Creek management plan.

Cottonwood Creek returned to Core Monitoring in 2012, and diuron MPM occurred during January and February.

Priority E Constituents

The following priority E constituents listed under the Cottonwood Creek management plan are DO, *E. coli*, and lead.

One DO exceedance and three *E. coli* exceedances occurred during 2011 monthly Assessment Monitoring. Although these constituents remain low priority, the Coalition will continue to collect priority E constituent monitoring data as part of Core and/or Assessment Monitoring at Cottonwood Creek @ Rd 20. Dissolved oxygen is a Core Monitoring constituent monitored monthly at the site and *E. coli* and lead will be monitored again during Assessment Monitoring at this site in 2014. All priority E constituents are discussed during individual grower contacts and will continue to be discussed at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Cottonwood Creek @ Rd 20 is one of the four second high priority site subwatersheds within the ESJWQC and just completed its second year of focused outreach (2010-2012). Therefore, the Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments, extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Cottonwood Creek subwatershed is to target growers along or adjacent to the waterway that have the potential to discharge into the creek. Focus is on implementing management practices that retain water on the grower's property and minimizing spray drift. Outreach includes grower notification, management practice outreach and education, tracking management practice implementation, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practices and assessing future implementations were completed and returned representing 100% of targeted growers. The Second Priority Subwatersheds Summary of Implemented Management Practices section of this report summarizes the results of these contacts.

During 2012, Cottonwood Creek @ Rd 20 is scheduled for Core Monitoring and MPM will continue during months of past exceedances. Although chlorpyrifos and copper remain high priority constituents in the Cottonwood Creek management plan, monitoring for diazinon and diuron found no exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove these constituents from the active Cottonwood Creek management plan.

VI. DUCK SLOUGH @ GURR RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Ceriodaphnia dubia* water column toxicity
- *Selenastrum capricornutum* water column toxicity
- *Hyalella azteca* sediment toxicity

Priority E

- Dissolved Oxygen
- *E. coli*
- Lead
- pH
- Specific Conductivity
- Total Dissolved Solids

Description of Duck Slough @ Gurr Rd Site Subwatershed

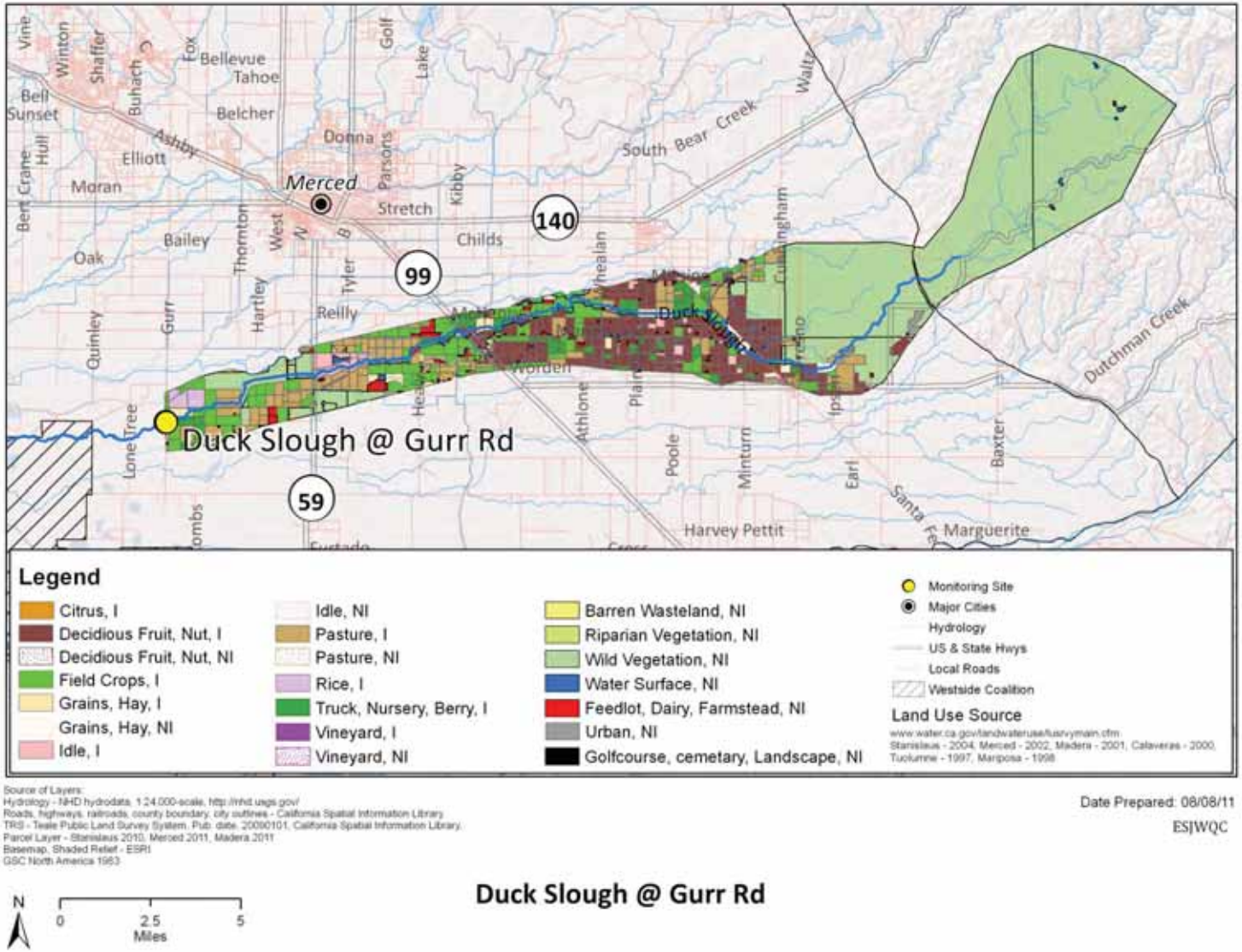
Duck Slough @ Gurr Rd (20,414 irrigated acres) – This site subwatershed is a monitoring location downstream from Duck Slough @ Hwy 99. Duck Slough flows west eventually becoming Deadman Creek in the western portion of the Coalition region. The slough eventually flows into the San Joaquin River via Deadman Creek and Deep Slough. The city of Merced delivers treated waste water effluent to Duck Slough a few miles upstream of the Gurr Road site. This site subwatershed also includes upstream locations (Duck Slough @ Hwy 59 and North Slough @ Hwy 59) that were sampled in 2008. Table VI-1 includes the station name (sample site), station code and target latitude/longitudes for sites sampled within this subwatershed. Located to the south and west of Merced, this site drains field crops immediately upstream and deciduous nuts further upstream as well as some irrigated pasture (Figure VI-1).

Table VI-1. Duck Slough @ Gurr Rd site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Duck Slough @ Gurr Rd*	535XDSAGR	37.2142	-120.5596
Duck Slough @ Hwy 59[U]	535XDSHFN	37.2345	-120.4881
North Slough @ Hwy 59[U]	535XNSHFN	37.2277	-120.4880

[U]Upstream sites
*Original ESJWQC sampling site

Figure VI-1. Duck Slough @ Gurr Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Duck Slough @ Gurr Rd began during the irrigation season of 2004 and continued through fall 2011 (Table VI-2). Under the current ESJWQC 2008 MRPP, Duck Slough @ Gurr Rd is the Core Monitoring location in Zone 5. In 2006, 2007 and 2008 normal irrigation and storm monitoring occurred. Core constituents were monitored at Duck Slough @ Gurr Rd beginning in the fall of 2008 through the fall 2010. Assessment Monitoring was initiated in 2011 and is scheduled to occur every third year thereafter (e.g. 2014, 2017, etc.). The constituents sampled at this location from 2004 through 2011 are listed in Table VI-3. Core Monitoring will resume at this site in 2012.

There are two upstream monitoring locations in the Duck Slough @ Gurr Rd subwatershed: Duck Slough @ Hwy 59 and North Slough @ Hwy 59. In 2008, upstream MPM occurred at Duck Slough @ Hwy 59 for *S. capricornutum* water column toxicity (July and September). Upstream monitoring also occurred in 2008 at North Slough @ Hwy 59 for *S. capricornutum* water column toxicity (July and September); the site was dry for both monitoring events. Upstream monitoring ended after the September 2008 monitoring events.

MPM occurred within the Duck Slough @ Gurr Rd subwatershed in 2007 for chlorpyrifos, thiobencarb and copper and in 2008 for copper and *S. capricornutum* toxicity (Table VI-4). Duck Slough was monitored twice a month in June and July 2007. MPM in 2008 occurred at Duck Slough @ Hwy 59 for copper (June), for copper and *S. capricornutum* toxicity (July), for *S. capricornutum* toxicity (September), and at North Slough @ Hwy 59 for copper and *S. capricornutum* toxicity (July) and for *S. capricornutum* toxicity (September, Table VI-4). There were no MPM samples collected in 2009. Starting in January 2010, the Coalition began collecting MPM samples during January, February and March (previously MPM was limited to irrigation months). Duck Slough MPM samples were collected in 2010 for copper (January-February and June-July), chlorpyrifos (April and July 2010), toxicity to *S. capricornutum* (July and September) and sediment toxicity to *H. azteca* (September) (Table VI-4). In 2011, Duck Slough @ Gurr Rd was an Assessment Monitoring location and all MPM constituents were analyzed monthly from January through December.

Duck Slough @ Gurr Rd is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos, *E. coli*, sediment toxicity and unknown water column toxicity.

Table VI-2. Duck Slough @ Gurr Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	3	0	**3**
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	8	0	**8**
2008	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	0	2	**2**
2009	Winter	2	0	**2**
	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2010	Winter	1	0	**1**
	Storm	3	0	**3**
	Irrigation	5	0	**5**
	Fall	2	1	**3**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	2	1	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table VI-3. Duck Slough @ Gurr Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2004	2005		2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
Field and Physical Parameters																							
EPA 110.2	Color	3	2	5	2	6	3	6	2	6													
EPA 160.1	Dissolved Solids	3	2	5	2	6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
EPA 160.2	Suspended Solids								1			2	2	6	2	1	3	5	2	2	1	6	2
EPA 180.1	Turbidity	3	2	5	2	6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
EPA 405.1	BOD					2	3	2															
EPA 415.1	Total Organic Carbon	2	2	5	1	6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
Walkley-Black	Total Organic Carbon (sediment)																			1		1	
SM 9223	*E. coli*	3	2	5	2	6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
ASTM D422 or ASTM D4464	Grain size (sediment)																	1		1		1	
NA	Dissolved Oxygen	3	2	5	5	5	3	10	4	7		2	2	6	2	1	3	5	2	3	1	6	2
NA	Specific Conductivity	3	2	5	5	5	3	10	4	7		2	2	6	2	1	3	5	2	3	1	6	2
NA	pH	3	2	5	5	5	3	10	4	7		2	2	6	2	1	3	5	2	3	1	6	2
Carbamates																							
EPA 8321A	Aldicarb					5	2	6	2	6										2	1	6	2
EPA 8321A	Carbaryl					5	2	6	2	6										2	1	6	2
EPA 8321A	Carbofuran					5	2	6	2	6			1	4	2	1	3	5	2	2	1	6	2
EPA 8321A	Diuron					5	2	6	2	6										2	1	6	2
EPA 8321A	Linuron					5	2	6	2	6										2	1	6	2
EPA 8321A	Methiocarb					5	2	6	2	6										2	1	6	2
EPA 8321A	Methomyl					5	2	6	2	6										2	1	6	1
EPA 8321A	Oxamyl					5	2	6	2	6										2	1	6	2
Organochlorines																							
EPA 8081A	DDD(p,p')					5	2	6	2	6										2	1	4	
EPA 8081A	DDE(p,p')					5	2	6	2	6										2	1	4	
EPA 8081A	DDT(p,p')					5	2	6	2	6										2	1	4	
EPA 8081A	Dicofol					5	2	6	2	6										2	1	4	
EPA 8081A	Dieldrin					5	2	6	2	6										2	1	4	
EPA 8081A	Endrin					5	2	6	2	6										2	1	4	

Method	Analyte	2004	2005		2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Methoxychlor					5	2	6	2	6										2	1	4	
Group A Pesticides																							
EPA 8081A	Aldrin																			2	1	4	
EPA 8081A	Chlordane																			2	1	4	
EPA 8081A	Endosulfan I																			2	1	4	
EPA 8081A	Endosulfan II																			2	1	4	
EPA 8081A	HCH, alpha																			2	1	4	
EPA 8081A	HCH, beta																			2	1	4	
EPA 8081A	HCH, delta																			2	1	4	
EPA 8081A	HCH, gamma																			2	1	4	
EPA 8081A	Heptachlor																			2	1	4	
EPA 8081A	Heptachlor epoxide																			2	1	4	
EPA 8081A	Toxaphene																			2	1	4	
Organophosphates																							
EPA 8141A	Azinphos methyl					5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Chlorpyrifos	3	2	5	2	5	2	7	3	6		2	1	2			1	1		2	1	6	2
EPA 8141A	Demeton-s								1			2	1	2						2	1	6	2
EPA 8141A	Diazinon	3	2	5	2	5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Dichlorvos								1			2	1	2						2	1	6	2
EPA 8141A	Dimethoate	1				5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Disulfoton	1				5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Malathion	1				5	2	7	3	6		2	1	2						2	1	6	2
EPA 8321A	Methamidophos					5	2	6	3	6		2	1	2						2	1	6	2
EPA 8141A	Methidathion					5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Molinate					5	2	7	2	6													
EPA 8141A	Parathion, Methyl	1				5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Phorate	1				5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Phosmet					5	2	7	3	6		2	1	2						2	1	6	2
EPA 8141A	Thiobencarb					5	2	9	2	6													
EPA 8141A	Trifluralin																			2	1	6	2
Pyrethroids																							
EPA 8081A	Bifenthrin			1	2	5	2	9	2	6													

Method	Analyte	2004	2005		2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Cyfluthrin, total			1	2	5	2	7	2	6													
EPA 8081A	Cyhalothrin, lambda, total	3	2	5	2	5	2	7	2	6													
EPA 8081A	Cypermethrin, total	3	2	5	2	5	2	7	2	6													
EPA 8081A	Esfenvalerate/ Fenvalerate, total	3	2	5	2	5	2	7	2	6													
EPA 8081A	Permethrin, total	3	2	5	2	5	2	7	2	6													
Triazines																							
EPA 547M	Glyphosate					5	2	6	2	6										2		4	
EPA 549.2M	Paraquat dichloride					5	2	6	2	6										2		4	
EPA 619	Atrazine					5	2	6	2	6										2	1	6	2
EPA 619	Cyanazine					5	2	6	2	6										2	1	6	2
EPA 619	Simazine					5	2	6	2	6										2	1	6	2
Metals (Total)																							
EPA 200.8	Arsenic					6	3	6	3	6		2	1	1						2	1	5	
EPA 200.8	Boron					6	3	6	3	6		2	1	2						2	1	6	2
EPA 200.8	Cadmium					6	3	6	3	6		2	1	1						2	1	5	
EPA 200.8	Copper					6	3	9	3	6		2	1	2			2	2		2	1	6	2
EPA 200.8	Lead					6	3	6	3	6		2	1	1						2	1	5	
EPA 200.8	Molybdenum								1			2	1	1						2	1	5	
EPA 200.8	Nickel					6	3	6	3	6		2	1	2						2	1	6	2
EPA 200.8	Selenium					6	3	2	3	6		2	1	2						2	1	5	2
EPA 200.8	Zinc					6	3	7	3	6		2	1	2						2	1	6	2
Metals (Dissolved)																							
EPA 200.8	Cadmium								1			2	1	1						2	1	5	
EPA 200.8	Copper								1			2	1	2			2	2		2	1	6	2
EPA 200.8	Lead								1			2	1	1						2	1	5	
EPA 200.8	Nickel								1			2	1	2						2	1	6	2
EPA 200.8	Zinc								1			2	1	2						2	1	6	2
Nutrients																							
SM 2340 C	Hardness as CaCO3					6	3	9	3	6		2	1	2			2	2		2	1	6	2
EPA 300.0	Nitrate as N					6	3	6	2	6													
EPA 350.2	Ammonia as N					6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
EPA 351.3	Nitrogen, Total Kjeldahl					6	3	6	3	6		2	1	1				3	2	2	1	6	2

Method	Analyte	2004	2005		2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 354.1	Nitrite as N					6	3	6	2	6													
EPA 353.2	Nitrate + Nitrite as N								1			2	2	6	2	1	3	5	2	2	1	6	2
EPA 365.2	OrthoPhosphate as P					6	3	6	3	6		2	1	1				3	2	2	1	6	2
EPA 365.2	Phosphate as P					6	3	6	3	6		2	2	6	2	1	3	5	2	2	1	6	2
Sediment Pesticides																							
EPA 8270M_NCI	Bifenthrin																	1					
EPA 8270M_NCI	Chlorpyrifos																	1					
EPA 8270M_NCI	Cyfluthrin																	1					
EPA 8270M_NCI	Cyhalothrin, lambda																	1					
EPA 8270M_NCI	Cypermethrin																	1					
EPA 8270M_NCI	Deltamethrin: Tralomethrin																	1					
EPA 8270M_NCI	Esfenvalerate/ Fenvalerate																	1					
EPA 8270M_NCI	Fenpropathrin																	1					
EPA 8270M_NCI	Permethrin																	1					
Toxicity																							
EPA 821/R-02-012	*Ceriodaphnia dubia*	3	2	5	4	5	3	7	2	7										2	1	6	2
EPA 821/R-02-012	*Pimephales promelas*	3	2	5	2	5	3	7	2	7										2	1	6	2
EPA 821/R-02-013	*Selenastrum capricornutum*	3	2	5	2	5	3	8	2	7								2		2	1	6	2
EPA 600/R-99-064	*Hyalella azteca*	2		5	1	1	1	1	1	2								1		1		1	

Table VI-4. Duck Slough @ Gurr Rd site subwatershed Management Plan Monitoring schedule (2007-2011).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Copper	Chlorpyrifos	Thiobencarb	*C. dubia*	*S. capricornutum*	*H. azteca*
Duck Slough @ Gurr Rd	19-Jun-07	A	X		X			
Duck Slough @ Gurr Rd	31-Jul-07	A	X	X	X			
Duck Slough @ Hwy 59	24-Jun-08	U	X					
Duck Slough @ Hwy 59	29-Jul-08	U	X				X	
North Slough @ Hwy 59	29-Jul-08	U	X				X	
Duck Slough @ Hwy 59	30-Sep-08	U					X	
North Slough @ Hwy 59	30-Sep-08	U					X	
Duck Slough @ Gurr Rd	19-Jan-10	MPM	X					
Duck Slough @ Gurr Rd	23-Feb-10	MPM	X					
Duck Slough @ Gurr Rd	20-Apr-10	MPM		X				
Duck Slough @ Gurr Rd	15-Jun-10	MPM	X					
Duck Slough @ Gurr Rd	20-Jul-10	MPM	X	X			X	
Duck Slough @ Gurr Rd	14-Sep-10	MPM					X	X
Duck Slough @ Gurr Rd	18-Jan-11	MPM	X					
Duck Slough @ Gurr Rd	17-Feb-11	MPM	X			X		
Duck Slough @ Gurr Rd	15-Mar-11	MPM				X		
Duck Slough @ Gurr Rd	17-May-11	MPM	X					
Duck Slough @ Gurr Rd	21-Jun-11	MPM	X					
Duck Slough @ Gurr Rd	19-Jul-11	MPM	X	X			X	
Duck Slough @ Gurr Rd	13-Sep-11	MPM					X	X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Duck Slough @ Gurr Rd subwatershed (including Duck Slough @ Hwy 59 and North Slough @ Hwy 59) from 2005 through 2011 exceeded the WQTLs for field and physical parameters, *E. coli*, nutrients, metals, pesticides, and water column and sediment toxicity (Table VI-5). During ambient water monitoring several exceedances occurred at the Normal Monitoring and upstream MPM sites, including DO (7), pH (6), SC (3), TDS (1), *E. coli* (22), nitrate + nitrite (1), copper (9), lead (4), carbofuran (1), chlorpyrifos (1), and thiobencarb (2). Toxicity to *C. dubia* (3), *S. capricornutum* (2), *P. promelas* (1), and *H. azteca* sediment (7) occurred (Table VI-5).

During 2011, exceedances detected at the Normal Monitoring site included DO (1), pH (1), and *E. coli* (2). Toxicity to *P. promelas* (1) and *H. azteca* sediment (1) occurred.

All exceedances are listed in Table VI-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Duck Slough @ Gurr Road subwatershed are chlorpyrifos (A/B), copper (C), and toxicity to *C. dubia*, *S. capricornutum* and *H. azteca* (D).

Table VI-5. Duck Slough @ Gurr Rd site subwatershed exceedances (2004-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Nitrate + Nitrite as N, >10 mg/L	Copper, Dissolved[1], µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Carbofuran, >0 µg/L	Chlorpyrifos, >0.015 µg/L	Thiobencarb, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Duck Slough @ Gurr Rd	Irrigation	7/31/2004				350							0.045					
Duck Slough @ Gurr Rd	Irrigation	8/31/2004																36
Duck Slough @ Gurr Rd	Irrigation	9/29/2004			701		540										74	
Duck Slough @ Gurr Rd	Storm	2/16/2005				1600												
Duck Slough @ Gurr Rd	Storm	3/21/2005				1600												
Duck Slough @ Gurr Rd	Irrigation	5/10/2005				1600												
Duck Slough @ Gurr Rd	Irrigation	6/14/2005				300												
Duck Slough @ Gurr Rd	Irrigation	7/12/2005				300												65
Duck Slough @ Gurr Rd	Irrigation	8/16/2005				240												
Duck Slough @ Gurr Rd	Irrigation	9/20/2005																4
Duck Slough @ Gurr Rd	Storm	2/28/2006													37			
Duck Slough @ Gurr Rd	Storm	3/10/2006													35			
Duck Slough @ Gurr Rd	Storm	3/15/2006				300									42			
Duck Slough @ Gurr Rd	Irrigation	5/17/2006		8.6		2000												
Duck Slough @ Gurr Rd	Irrigation	6/14/2006				690				120 (10.9)				5.8				
Duck Slough @ Gurr Rd	Irrigation	7/12/2006	6.18							14 (9.3)				0.29				
Duck Slough @ Gurr Rd	Irrigation	9/13/2006	5.53															

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Nitrate + Nitrite as N, >10 mg/L	Copper, Dissolved[1], µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Carbofuran, >0 µg/L	Chlorpyrifos, >0.015 µg/L	Thiobencarb, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Duck Slough @ Gurr Rd	Storm	2/12/2007				2400				47 (12.4)	13 (4.88)							
Duck Slough @ Gurr Rd	Storm	2/28/2007				2000				11 (8.8)								
Duck Slough @ Gurr Rd	Storm	3/7/2007		9.17														
Duck Slough @ Gurr Rd	Irrigation	5/29/2007				820												
Duck Slough @ Gurr Rd	Irrigation	6/19/2007	5.85							5.4 (3.0)								
Duck Slough @ Gurr Rd	Irrigation	6/26/2007								4.6 (3.7)	1 (0.81)							
Duck Slough @ Gurr Rd	Irrigation	7/24/2007															74	
Duck Slough @ Gurr Rd	Irrigation	9/18/2007				370												
Duck Slough @ Gurr Rd	Storm	1/25/2008				>2400				13 (9.0)	2.7 (2.4)							
Duck Slough @ Gurr Rd	Storm	2/25/2008				>2400				17 (9.3)	3.7 (3.2)							
Duck Slough @ Gurr Rd	Irrigation	4/29/2008										0.05						
Duck Slough @ Hwy 59	*Irrigation*	*6/24/2008*	*4.22*		*841*													
Duck Slough @ Hwy 59	*Irrigation*	*7/29/2008*	*4.83*															
Duck Slough @ Gurr Rd	Sediment	8/28/2008																63
Duck Slough @ Hwy 59	*Irrigation*	*9/30/2008*	*3.33*															
Duck Slough @ Gurr Rd	Sediment	10/2/2008																93
Duck Slough @ Gurr Rd	Storm	2/7/2009						13										
Duck Slough @ Gurr Rd	Winter	3/17/2009		9.7														

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Nitrate + Nitrite as N, >10 mg/L	Copper, Dissolved[1], µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15 µg/L	Carbofuran, >0 µg/L	Chlorpyrifos, >0.015 µg/L	Thiobencarb, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Duck Slough @ Gurr Rd	Irrigation	5/19/2009				>2400			7.3 (6.12)									
Duck Slough @ Gurr Rd	Irrigation	9/22/2009		9.03														
Duck Slough @ Gurr Rd	Fall	11/17/2009			1215	340												
Duck Slough @ Gurr Rd	Storm	12/15/2009				>2400												
Duck Slough @ Gurr Rd	Irrigation	7/20/2010		5.41														
Duck Slough @ Gurr Rd	Irrigation	9/14/2010																70
Duck Slough @ Gurr Rd	Fall	10/19/2010				250												
Duck Slough @ Gurr Rd	Storm	2/17/2011		8.65														
Duck Slough @ Gurr Rd	Winter	3/15/2011	6.78															
Duck Slough @ Gurr Rd	Irrigation	6/21/2011				240												
Duck Slough @ Gurr Rd	Irrigation	8/16/2011				580												
Duck Slough @ Gurr Rd	Irrigation	9/13/2011																90
Duck Slough @ Gurr Rd	Fall	10/11/2011														90		
		Constituent Priority	**E**	**E**	**E**	**E**	**E**	**NP**	**C**	**C**	**E**	**NP**	**A/B**	**NP[R]**	**D**	**NP**	**D**	**D**

[1]Dissolved metals not analyzed until October 2008; WQTL variable based on hardness.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.
NP[R] – Not Prioritized; thiobencarb is only applied to rice and therefore will be managed under the Rice Coalition.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Duck Slough @ Gurr Rd subwatershed are listed in Table VI-6. These constituents include thiobencarb, copper (dissolved and total), chlorpyrifos, *C. dubia*, *S. capricornutum* and *H. azteca* toxicity.

Duck Slough @ Gurr Rd was sampled both upstream and downstream of the bridge on Gurr Rd on June 19, 2007 to determine if a difference in water quality existed between the two waterbodies (Table VI-6). The water upstream of the bridge was dammed and was not flowing downstream although a pipe was discharging water into a pool. Just downstream of this dam is Dean Drain which inputs water from the north. To date, sampling always occurs downstream of Dean Drain. Both samples collected from Duck Slough on June 19, 2007 had detections of copper and no thiobencarb.

A single exceedance of the chlorpyrifos WQTL occurred at Duck Slough @ Gurr Rd in July 2004. Chlorpyrifos was monitored during July 2007 as part of additional MPM and did not exceed the WQTL. In addition to MPM during months of past exceedances, this location was sampled monthly during storm and irrigation monitoring in 2006, 2007 and 2008, chlorpyrifos was analyzed during these events and no exceedances occurred. High priority MPM for chlorpyrifos took place in 2010 (April and July) and Assessment Monitoring was conducted monthly in 2011. There were no exceedances of the chlorpyrifos WQTL in samples collected from Duck Slough @ Gurr Rd 2006, 2007 and 2008 (during the storm and irrigation seasons), 2010 (MPM) or 2011 (monthly Assessment Monitoring). In 2012, Duck Slough @ Gurr Rd will be monitored for Core Monitoring constituents and MPM for chlorpyrifos is scheduled to continue in July.

There were two exceedances of thiobencarb at Duck Slough @ Gurr Rd, both occurred during 2006 (June and July). During 2007, thiobencarb was monitored monthly and additional MPM occurred in both June and July for the constituent (Table VI-6). There were no other instances of thiobencarb exceedances in samples collected from Duck Slough @ Gurr Rd. The Coalition no longer initiates MPM for thiobencarb as the constituent is covered under the Rice Coalition's management plan.

Exceedances of total copper occurred at Duck Slough @ Gurr Rd in 2006 (June and July), 2007 (February and June), 2008 (January and February) and a single exceedance of the dissolved copper fraction occurred in 2009 (May). During 2007, copper was monitored monthly (during the storm and irrigation seasons) and as additional MPM during June and July. The 2007 samples resulted in exceedances of the copper WQTL based on hardness in both MPM and NM samples collected in June (Table VI-6). In 2008, Normal Monitoring and MPM monitoring for copper resulted in detections in every sample including samples collected from the upstream site at Duck Slough @ Hwy 59. In 2009, both the total and dissolved copper fractions were analyzed from January through May and a single exceedance occurred in May. In 2010 and 2011, MPM for copper (both total and dissolved) took place during months of past exceedances and no exceedances occurred during either year (Table VI-6). In 2012, MPM for copper is scheduled to occur during months of past exceedances (January-February and May-July).

Water column toxicity to *C. dubia* occurred in samples collected during storm monitoring in 2006 (February and March) at Duck Slough @ Gurr Rd. Since the last toxicity in March 2006, no other instances of *C. dubia* toxicity occurred at the site from Normal Monitoring in 2008 (storm and irrigation) or 2011 Assessment Monitoring (January-December). In 2012, MPM for *C. dubia* toxicity is scheduled to occur (February and March).

Water column toxicity to *S. capricornutum* occurred in samples collected in 2004 (September) and 2007 (July). Toxicity to *S. capricornutum* combined with exceedances of copper in the past, resulted in *S. capricornutum* toxicity being categorized as a high priority constituent. A TIE was initiated only if algal growth was less than 50% compared to the control. Neither the 2004 or 2007 toxicities required a TIE. The resample collected from the July 2007 event indicated that the toxicity was not persistent. Since the most recent toxicity in July 2007, there were were no more instances of toxicity to *S. capricornutum* in samples collected from Duck Slough @ Gurr Rd. The Coalition monitored for *S. capricornutum* in 2008 (during the storm and irrigation season), during 2010 MPM and 2011 Assessment Monitoring. None of the samples from 2008, 2010 or 2011 were toxic to *S. capricornutum*. In addition to 2008 Normal Monitoring at Duck Slough @ Gurr Rd, MPM for *S. capricornutum* toxicity took place at both upstream locations. The upstream location North Slough @ Hwy 59 was dry during both its scheduled MPM events in July and September, and samples from Duck Slough @ Hwy 59 were not toxic (Table VI-6). In 2012, MPM for *S. capricornutum* toxicity is scheduled to occur (July and September).

Sediment toxicity to *H. azteca* occurred in samples collected from the irrigation season in 2004, 2005, 2008, 2010 and 2011. Management Plan Monitoring for *H. azteca* toxicity was conducted during the 2010 irrigation season and samples were toxic. In 2011, sediment samples were collected during the storm and irrigation events and the MPM for *H. azteca* toxicity collected during the irrigation event tested toxic (Table VI-6). In 2012, MPM for *H. azteca* toxicity will continue in September.

Table VI-6. Duck Slough @ Gurr Rd site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb		Mar	Apr	May	Jun		Jul	Aug	Sep	Oct	Nov	Dec
2007 NM (@ Gurr Rd)	Date	NA	2/12/07	2/28/07	NA	4/24/07	5/29/07	6/26/07		7/24/07	8/21/07	9/18/07	NA	NA	NA
	Copper (µg/L)	NA	**47**	**11**	NA	4.6	5.3	**4.6**		4	4.8	5.5	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	<0.003	<0.003	NA	<0.003	<0.003	<0.003		0.007	<0.003	0.009	NA	NA	NA
	Thiobencarb (µg/L)	NA	<0.06	<0.06	NA	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	NA	NA	NA
2007 MPM A (@ Gurr Rd)	Date	NA	NA		NA	NA	NA	6/19/07	6/19/07[U]	7/31/07	NA	NA	NA	NA	NA
	Copper (µg/L)	NA	NA		NA	NA	NA	**5.4**	15	8.6	NA	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA		NA	NA	NA	NA	NA	0.007	NA	NA	NA	NA	NA
	Thiobencarb (µg/L)	NA	NA		NA	NA	NA	<0.06	<0.06	<0.06	NA	NA	NA	NA	NA
2008 NM (@ Gurr Rd)	Date	1/25/08	2/25/08		NA	4/29/08	5/27/08	6/24/08		7/29/08	8/26/08	9/30/08	NA	NA	NA
	Copper (µg/L)	**13**	**17**		NA	2.7	7.1	4.0		5.4	3.5	6.1	NA	NA	NA
	S. capricornutum toxicity (% Control)	126	97		NA	175	309	459		350	262	263	NA	NA	NA
2008 MPM US (@ Hwy 59)	Date	NA	NA		NA	NA	NA	6/24/08		7/29/08	NA	9/30/08	NA	NA	NA
	Copper (µg/L)	NA	NA		NA	NA	NA	12		18	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA		NA	NA	NA	NA		271	NA	131	NA	NA	NA
2008 MPM US (North Slough @ Hwy 59)	Date	NA	NA		NA	NA	NA	NA		7/29/08	NA	9/30/08	NA	NA	NA
	Copper (µg/L)	NA	NA		NA	NA	NA	NA		Dry	NA	Dry	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA		NA	NA	NA	NA		Dry	NA	Dry	NA	NA	NA
2009 NM (@ Gurr Rd)	Date	1/20/09	2/7/09		3/17/09	4/21/09	5/19/09	6/16/09		7/21/09	8/18/09	9/22/09	NA	NA	NA
	Copper, dissolved (µg/L)	0.2	7.6		4.6	2.6	**7.3**	NA		NA	NA	NA	NA	NA	NA
	Copper, total (µg/L)	0.4	11		6.3	3.3	15	NA		NA	NA	NA	NA	NA	NA
2010 MPM (@ Gurr Rd)	Date	1/19/10	2/23/10		NA	4/20/10	5/18/10	6/15/10		7/20/10	8/17/10	9/14/10	NA	NA	NA
	Copper, dissolved (µg/L)	2	4.4		NA	NA	NA	1.2		1.0	NA	NA	NA	NA	NA
	Copper, total (µg/L)	12	5.4		NA	NA	NA	3.3		3.6	NA	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA		NA	<0.003	NA	NA		<0.003	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA		NA	NA	NA	NA		542	NA	423	NA	NA	NA
	H. azteca toxicity (% Control)	NA	NA		NA	NA	NA	NA		NA	NA	**70**	NA	NA	NA

	MONTH:	JAN	FEB	MAR		APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Date	1/18/11	2/17/11	3/15/11	3/17/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11	10/11/11	11/8/11	12/6/11
2011 NM & MPM (@ Gurr Rd)	Copper, dissolved (µg/L)	1.1*	1.4*	1.3	NA	1.5	0.85*	1.5*	0.89*	0.91	0.50	0.42	0.75	Dry
	Copper, total (µg/L)	2.2*	1.6*	1.9	NA	3.3	2.6*	8.5*	3.0*	4.0	3.1	2.8	1.7	Dry
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	NA	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	Dry
	C. dubia toxicity (% Control)	100	100*	100*	NA	100	100	100	100	95	100	100	100	Dry
	S. capricornutum toxicity (% Control)	953	393	1054	NA	671	652	276	409	980	616*	554	2370	Dry
	H. azteca toxicity (% Control)	NA	NA	NA	98	NA	NA	NA	NA	NA	**90***	NA	NA	NA

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
[U]Upstream of bridge on Gurr Rd
US – Upstream MPM conducted in 2008 only.
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed (Table VI-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table VI-7. Duck Slough @ Gurr Rd site subwatershed instantaneous load calculations for chlorpyrifos, and copper.

Upstream site is italicized. Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Duck Slough @ Gurr Rd	Chlorpyrifos	08/08/06	6.62	0.014	2.62
Duck Slough @ Gurr Rd	Chlorpyrifos	07/24/07	1.78	0.007	0.35
Duck Slough @ Gurr Rd	Chlorpyrifos	07/31/07	3.25	0.007	0.64
Duck Slough @ Gurr Rd	Chlorpyrifos	09/18/07	5.2	0.009	1.33
Duck Slough @ Gurr Rd	Chlorpyrifos	07/29/08	0.4	0.011	0.12
Duck Slough @ Gurr Rd	Chlorpyrifos	01/20/09	0.23	0.012	0.08
Duck Slough @ Gurr Rd	Copper	05/17/06	2.29	2.9	188.05
Duck Slough @ Gurr Rd	Copper	06/14/06	1.61	120	5470.84
Duck Slough @ Gurr Rd	Copper	07/12/06	10.93	14	4333.07
Duck Slough @ Gurr Rd	Copper	08/08/06	6.62	3.8	712.34
Duck Slough @ Gurr Rd*	Copper	09/13/06	0.96	4	108.74
Duck Slough @ Gurr Rd	Copper	09/13/06	0.96	4.1	111.46
Duck Slough @ Gurr Rd*	Copper	02/12/07	298.79	44	372276.80
Duck Slough @ Gurr Rd*	Copper	02/12/07	298.79	46	389198.48
Duck Slough @ Gurr Rd	Copper	02/12/07	298.79	47	397659.31
Duck Slough @ Gurr Rd	Copper	02/28/07	321.45	11	100127.50
Duck Slough @ Gurr Rd	Copper	04/24/07	1.88	4.6	244.89
Duck Slough @ Gurr Rd	Copper	05/29/07	1.02	5.3	153.08
Duck Slough @ Gurr Rd	Copper	06/19/07	0	15	0
Duck Slough @ Gurr Rd	Copper	06/19/07	0.99	5.4	151.38
Duck Slough @ Gurr Rd	Copper	06/26/07	1.12	4.6	145.89
Duck Slough @ Gurr Rd	Copper	07/24/07	1.78	4	201.62
Duck Slough @ Gurr Rd	Copper	07/31/07	3.25	8.6	791.46
Duck Slough @ Gurr Rd	Copper	08/21/07	1.38	4.8	187.57
Duck Slough @ Gurr Rd	Copper	09/18/07	5.2	5.5	809.87
Duck Slough @ Gurr Rd*	Copper	09/18/07	5.2	6.4	942.39
Duck Slough @ Gurr Rd	Copper	04/29/08	0.56	2.7	42.82
Duck Slough @ Gurr Rd	Copper	05/27/08	0.43	7.1	86.45
Duck Slough @ Gurr Rd*	Copper	05/27/08	0.43	7.3	88.89
Duck Slough @ Gurr Rd	Copper	06/24/08	0.65	4	73.62
Duck Slough @ Hwy 59	*Copper*	*06/24/08*	*0.64*	*12*	*217.47*
Duck Slough @ Gurr Rd	Copper	07/29/08	0.4	5.4	61.16
Duck Slough @ Hwy 59	*Copper*	*07/29/08*	*0.47*	*18*	*239.56*

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Duck Slough @ Gurr Rd	Copper	08/26/08	1.1	3.5	109.02
Duck Slough @ Gurr Rd	Copper	09/30/08	0.21	6.1	36.27
Duck Slough @ Gurr Rd	Copper	12/16/08	0.31	1.2	10.53
Duck Slough @ Gurr Rd	Copper	01/20/09	0.23	0.4	2.61
Duck Slough @ Gurr Rd	Copper	02/07/09	2.57	11	800.52
Duck Slough @ Gurr Rd	Copper	03/17/09	0	6.3	0
Duck Slough @ Gurr Rd	Copper	04/21/09	0.67	3.3	62.61
Duck Slough @ Gurr Rd	Copper	05/19/09	0.19	15	80.70
Duck Slough @ Gurr Rd	Copper	01/19/10	0	12	0
Duck Slough @ Gurr Rd	Copper	02/23/10	3.07	5.4	469.44
Duck Slough @ Gurr Rd	Copper	06/15/10	5.97	3.3	557.87
Duck Slough @ Gurr Rd	Copper	07/20/10	21.67	3.6	2209.07
Duck Slough @ Gurr Rd	Copper	01/18/11	58.55	2.2	3647.51
Duck Slough @ Gurr Rd*	Copper	02/17/11	23	1.5	976.94
Duck Slough @ Gurr Rd	Copper	02/17/11	23	1.6	1042.07
Duck Slough @ Gurr Rd	Copper	03/15/11	20.47	1.9	1101.33
Duck Slough @ Gurr Rd*	Copper	03/15/11	20.47	1.9	1101.33
Duck Slough @ Gurr Rd	Copper	06/21/11	2.73	8.5	657.10
Duck Slough @ Gurr Rd	Copper	07/19/11	15.97	3	1356.67
Duck Slough @ Gurr Rd	Copper	09/13/11	52.21	3.1	4583.13
Duck Slough @ Gurr Rd	Copper	10/11/11	79.08	2.8	6270.06
Duck Slough @ Gurr Rd	Copper	11/08/11	5.81	1.7	279.69
Duck Slough @ Gurr Rd	Copper (D)	12/16/08	0.31	0.3	2.63
Duck Slough @ Gurr Rd	Copper (D)	01/20/09	0.23	0.2	1.30
Duck Slough @ Gurr Rd	Copper (D)	02/07/09	2.57	7.6	553.09
Duck Slough @ Gurr Rd	Copper (D)	03/17/09	0	4.6	0
Duck Slough @ Gurr Rd	Copper (D)	04/21/09	0.67	2.6	49.33
Duck Slough @ Gurr Rd	Copper (D)	05/19/09	0.19	7.3	39.28
Duck Slough @ Gurr Rd	Copper (D)	01/19/10	0	2	0
Duck Slough @ Gurr Rd	Copper (D)	02/23/10	3.07	4.4	382.51
Duck Slough @ Gurr Rd	Copper (D)	06/15/10	5.97	1.2	202.86
Duck Slough @ Gurr Rd	Copper (D)	07/20/10	21.67	1	613.63
Duck Slough @ Gurr Rd	Copper (D)	01/18/11	58.55	1.1	1823.76
Duck Slough @ Gurr Rd*	Copper (D)	02/17/11	23	1.2	781.55
Duck Slough @ Gurr Rd	Copper (D)	02/17/11	23	1.4	911.81
Duck Slough @ Gurr Rd*	Copper (D)	03/15/11	20.47	1.1	637.61
Duck Slough @ Gurr Rd	Copper (D)	03/15/11	20.47	1.3	753.54
Duck Slough @ Gurr Rd	Copper (D)	06/21/11	2.73	1.5	115.96
Duck Slough @ Gurr Rd	Copper (D)	07/19/11	15.97	0.89	402.48
Duck Slough @ Gurr Rd	Copper (D)	09/13/11	52.21	0.5	739.22
Duck Slough @ Gurr Rd	Copper (D)	10/11/11	79.08	0.42	940.51
Duck Slough @ Gurr Rd	Copper (D)	11/08/11	5.81	0.75	123.39

Copper (D)-Dissolved Copper
*Field Duplicate

Source Identification and Outreach

To address source identification and determine an outreach strategy, the Coalition focuses its efforts on applied pesticides by considering past monitoring results and associated PUR data. In 2007 and 2008, the Coalition conducted additional MPM and upstream monitoring during the months when exceedances historically occurred to better characterize water quality in the subwatershed. MPM resumed at Duck Slough @ Gurr Rd in 2010 during months when past exceedances historically occurred and continued in 2011 to assess water quality in the subwatershed as outreach in the area progressed. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with high priority constituent applications. Duck Creek @ Gurr Rd subwatershed PUR data are available through October 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Duck Slough @ Gurr Rd subwatershed began in 2010 and continued through 2011. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (6) representing 2,656 acres within the Duck Slough @ Gurr Rd subwatershed. All six growers participated in follow up contacts to determine if additional management practices were implemented and if any are planned to be implemented. MPM will continue in the Duck Slough @ Gurr Rd subwatershed in 2012 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent in the Duck Slough @ Gurr Rd subwatershed management plan.

Chlorpyrifos

Chlorpyrifos exceeded the WQTL of 0.015 µg/L once in July, 2004. Additional MPM occurred for chlorpyrifos in 2007 and starting in 2010 MPM took place in April and July. Monthly Assessment Monitoring for chlorpyrifos was conducted in 2011. No exceedances of the chlorpyrifos WQTL occurred in the Duck Slough @ Gurr subwatershed since 2004. The Coalition evaluates monitoring and PUR data to identify possible sources of past exceedances.

PUR data are reviewed for the number of monthly applications, pounds of active ingredient applied of the constituent of concern, and acres treated by the constituent of concern (Table VI-8, Figure VI-2). The amount of chlorpyrifos applied within the subwatershed fluctuated over the years. The greatest chlorpyrifos use occurred in 2005 (5,293 lbs AI). The lowest use was in 2009 (646 lbs AI) and the month of greatest chlorpyrifos use varied over the years. In 2004 through 2007 the greatest amount of chlorpyrifos was applied in July, in 2008 and 2010 in August, in 2009 was March, and in 2011 the month of greatest use was June (Table VI-8, Figure VI-2). The 2004 exceedance did occur during the month of greatest chlorpyrifos use for that year, but months with greater use have not resulted in chlorpyrifos exceedances in the subwatershed (Figure VI-2).

The Coalition also uses PUR data to assess which crops receive the most applications (Table VI-9). The highest application rates of chlorpyrifos in the Duck Slough @ Gurr Rd subwatershed are associated with almonds (9,661 lbs AI), alfalfa (4,615 lbs AI), and corn (2,713 lbs AI). The most common product containing chlorpyrifos applied within the subwatershed was Lorsban (Table VI-9).

Table VI-8. Duck Slough @ Gurr Road site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2004-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2004	4.0	88.0	43.6
March, 2004	2.0	4.5	97.0
April, 2004	8.0	100.1	236.0
May, 2004	1.0	77.9	60.0
June, 2004	3.0	204.9	128.0
July, 2004	10.0	457.5	375.0
August, 2004	7.0	351.1	486.0
January, 2005	4.0	76.9	38.1
March, 2005	21.0	707.0	1224.5
June, 2005	5.0	209.0	188.0
July, 2005	16.0	4199.8	800.0
August, 2005	2.0	72.4	143.5
September, 2005	1.0	28.0	14.0
January, 2006	6.0	119.7	59.0

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
March, 2006	5.0	105.9	336.0
May, 2006	13.0	706.5	433.0
June, 2006	1.0	137.6	69.0
July, 2006	5.0	570.2	508.0
August, 2006	9.0	402.2	448.0
September, 2006	7.0	359.1	331.5
January, 2007	2.0	29.9	15.0
March, 2007	28.0	694.0	1253.3
April, 2007	3.0	28.8	57.4
May, 2007	3.0	327.3	177.8
June, 2007	2.0	35.7	27.0
July, 2007	5.0	701.7	436.0
August, 2007	12.0	404.0	805.4
March, 2008	29.0	465.2	1038.6
May, 2008	8.0	480.6	297.0
June, 2008	1.0	10.2	8.0
July, 2008	13.0	410.3	861.9
August, 2008	24.0	655.3	1193.0
September, 2008	2.0	34.6	98.0
March, 2009	15.0	356.1	890.0
April, 2009	1.0	31.7	42.2
July, 2009	2.0	70.1	140.0
August, 2009	3.0	131.1	173.0
September, 2009	4.0	57.2	227.4
March, 2010	22.0	389.5	1061.9
June, 2010	13.0	655.7	874.3
July, 2010	15.0	413.3	691.2
August, 2010	11.0	2678.6	1577.1
September, 2010	5.0	79.5	278.0
March, 2011	6.0	63.5	308.5
April, 2011	3.0	42.5	196.0
June, 2011	9.0	425.7	473.0
July, 2011	2.0	36.7	146.8
August, 2011	9.0	306.1	590.2
September, 2011	1.0	87.5	175.0
October, 2011	1.0	102.1	136.0
Summaries by Year			
2004 Total	35.0	1284.0	1425.6
2005 Total	49.0	5293.2	2408.1
2006 Total	46.0	2401.0	2184.5
2007 Total	55.0	2221.4	2772.0
2008 Total	77.0	2056.0	3496.5
2009 Total	25.0	646.1	1472.6
2010 Total	66.0	4216.6	4482.5
2011 Total	31.0	1064.1	2025.5
Total	**384.0**	**19182.5**	**20267.3**

Figure VI-2. Duck Slough @ Gurr Rd site subwatershed lbs chlorpyrifos applied by month (2004-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

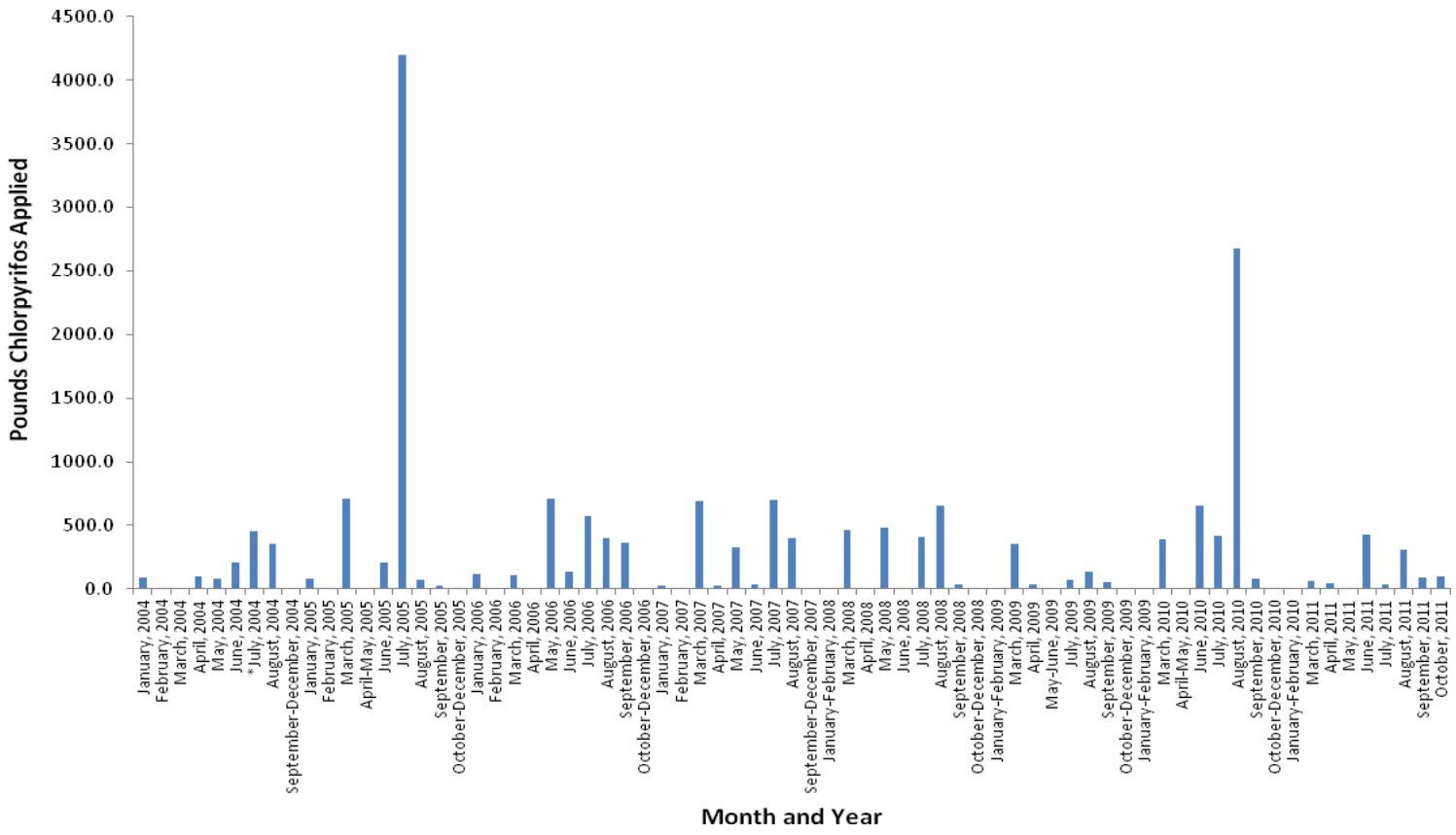


Table VI-9. Duck Slough @ Gurr Rd site subwatershed chlorpyrifos PUR data (2004-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	COBALT	197.5
		GOVERN 4E INSECTICIDE	741.0
		LOCK-ON INSECTICIDE	854.3
		LORSBAN 4E INSECTICIDE	63.9
		LORSBAN 4E-HF	1022.6
		LORSBAN 4E-HF INSECTICIDE	63.4
		LORSBAN ADVANCED	9.4
		LORSBAN-4E	401.0
		NUFOS 4E	744.4
		WARHAWK	19.4
		WHIRLWIND	498.1
	ALMOND	CHLORPYRIFOS 4E AG	207.1
		GOVERN 4E INSECTICIDE	2187.7
		LORSBAN 4E INSECTICIDE	198.5
		LORSBAN 4E-HF	1411.0
		LORSBAN ADVANCED	10.9
		LORSBAN-4E	3592.1
		NUFOS 4E	1357.3
		WARHAWK	20.2
		WHIRLWIND	675.9
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	192.3
		GOVERN 4E INSECTICIDE	287.9
		LORSBAN 15G GRANULAR INSECTICIDE	680.4
		LORSBAN 4E-HF	146.4
		LORSBAN-4E	104.2
		NUFOS 4E	201.3
		SAURUS	1081.4
		WHIRLWIND	18.8
	COTTON (GENERAL)	CHLORPYRIFOS 4E AG	234.4
		LORSBAN ADVANCED	161.1
		LORSBAN-4E	15.8
		NUFOS 4E	234.4
	PEACH	CHLORPYRIFOS 4E AG	164.9
		LORSBAN 4E-HF	121.6
	SUGARBEET (GENERAL)	LORSBAN-4E	159.1
		NUFOS 4E	52.9
		WHIRLWIND	18.8
	WALNUT	GOVERN 4E INSECTICIDE	15.2
		LORSBAN 4E-HF	71.8
		LORSBAN-4E	788.3
		QUALI-PRO CHLORPYRIFOS 4E	155.8
		ALFALFA - Total Pounds Chlorpyrifos Applied	**4615.2**
		ALMOND - Total Pounds Chlorpyrifos Applied	**9660.7**
		CORN - Total Pounds Chlorpyrifos Applied	**2712.8**
		COTTON- Total Pounds Chlorpyrifos Applied	**645.6**
		PEACH - Total Pounds Chlorpyrifos Applied	**286.5**
		SUGARBEET - Total Pounds Chlorpyrifos Applied	**230.7**
		WALNUT - Total Pounds Chlorpyrifos Applied	**1031.0**
		Total Pounds Chlorpyrifos Applied (2004 - 2011)	**19182.5**

The Coalition determined the most probable source of chlorpyrifos in the Duck Slough @ Gurr Rd waterway to be spray drift from adjacent orchards. Growers were encouraged to review their farming operation to determine if their applications could result in spray drift. Operations with row crop were advised of methods to better manage their irrigation tailwater and storm water runoff, whereas outreach efforts to orchard growers focused on encouraging management practices to reduce spray drift and improve orchard and vineyard water management.

Coalition outreach since 2007 has included meetings and the mailing/distribution of information such as funding available for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began in June 2010. Targeted growers were selected based on the potential to drain or drift to the creek and those applying chlorpyrifos. Using these criteria, a list of six targeted growers was created comprising 2,656 acres in the subwatershed. Coalition representatives met with growers on their property to discuss the Duck Slough @ Gurr Rd management plan and offer recommendations specific to the parcel and land owner/operator. Current management practices were assessed by Coalition representatives and additional management practices were discussed and encouraged. Individual contacts focused mainly on chlorpyrifos exceedances; however, all water quality results were reviewed and discussed including copper, DO, *E. coli*, pH, SC, TDS, and lead as well as toxicity to *C. dubia*, *S. capricornutum*, and *H. azteca*.

To date, the Coalition contacted all six targeted members. Of the six members, recommended management practices to acreages in the Duck Slough @ Gurr Rd subwatershed include: recirculation/tailwater return system (34%), drainage basins/sediment ponds (33%), and use of polyacrylamide (33%). Based on the exact timing of each individual meeting and a grower's resources, some owners would not be able to implement recommended management practices until the 2011 irrigation season. In addition, long term structural BMPs (e.g. sediment ponds) will most likely take longer than two years to implement and will require additional tracking to document their implementation.

In April 2011, the Coalition followed up with growers to determine if the management practices recommended by Coalition representatives were implemented in 2010 and if any additional practices were planned for 2011. Implemented management practices in the Duck Slough @ Gurr Rd subwatershed included spraying areas close to waterbodies when the wind is blowing away from them (13%) and shutting off outside nozzles when spraying the outer rows of fields next to sensitive sites (87%). Growers who did not implement recommended practices indicated they had no available resources to do so. The Coalition will continue its strategy of notifying members about available funding opportunities and encourage them to take advantage of the application process.

To evaluate the management practice process, the Coalition monitored for high priority constituents at Duck Slough @ Gurr Rd monthly during 2011 Assessment Monitoring and is scheduled to continue MPM during months of past exceedances in 2012.

There were no chlorpyrifos exceedances for two or more consecutive years of monitoring during months of past exceedances in the Duck Slough @ Gurr subwatershed. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove the constituents from the active Duck Slough @ Gurr management plan.

Priority C Constituents

Copper is listed as the only priority C constituent for the Duck Slough @ Gurr Rd subwatershed.

Copper

Samples containing copper exceeded the hardness based WQTL nine times from 2006 through 2011. Upstream MPM during 2008 at the Hwy 59 location did not result in exceedances of copper. As of October 2008, the Coalition began to analyze for both total and dissolved fractions of copper. Total copper exceedances occurred during June and July 2006, February and June 2007, and in January and February 2008, while the single dissolved copper exceedance occurred in May 2009 (Table VI-5). Duck Slough @ Gurr Rd was not scheduled for MPM in 2009. The site became a high priority subwatershed in 2010 and MPM samples were collected and monthly Assessment Monitoring occurred in 2011. Since becoming a high priority subwatershed in 2010, there have been no other instances of copper exceedances.

PUR data are reviewed for the number of monthly copper applications, pounds of active ingredient applied, and acres treated (Table VI-10, Figure VI-3). The amount of copper applied within the subwatershed decreased continually each year from 2005 to 2009 with a slight increase occurring in 2010 and 2011. The largest amount of copper applied was in 2004 (15,249 lbs AI) while the smallest amount applied was in 2009 (1,949 lbs AI). The amount of copper applied in 2011 (through October) was 6,285 lbs AI. The month with the greatest amount of copper use has varied over time. In 2006, 2007, and 2011, the greatest amount of copper use occurred in January, whereas the greatest use amount occurred in December during 2008 and 2009. The greatest amount of copper use occurred in June in 2005 and January in 2011 (Table VI-10, Figure VI-3). Not all exceedances occurred during months of the greatest use (Figure VI-3).

The Coalition uses PUR data to assess which crops receive the most applications of copper. The largest amount of copper applied from 2004 through 2011 was associated with rice and almonds (Table VI-13). The most common product containing copper applied within the subwatershed was Kocide (Table VI-11).

Table VI-10. Duck Slough @ Gurr Rd site subwatershed copper applications, lbs AI applied, and acres treated by month (2004-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2004	18.0	2239.0	582.6
February, 2004	6.0	428.8	194.0
March, 2004	3.0	407.1	83.0
April, 2004	5.0	350.9	80.3
May, 2004	5.0	3177.9	213.6
June, 2004	6.0	3861.0	259.8
July, 2004	1.0	120.2	75.0
August, 2004	3.0	214.3	191.2
September, 2004	1.0	263.4	143.0
October, 2004	4.0	1328.3	575.0
November, 2004	2.0	550.1	224.0
December, 2004	6.0	2308.6	318.0
January, 2005	12.0	1568.7	376.1
February, 2005	5.0	514.8	159.7
March, 2005	3.0	369.9	81.0
April, 2005	23.0	1236.8	429.3
May, 2005	10.0	513.5	281.5
June, 2005	10.0	7053.8	475.0
August, 2005	3.0	139.8	127.8
September, 2005	2.0	82.4	74.7
October, 2005	1.0	25.8	21.0
November, 2005	1.0	69.1	45.0
December, 2005	5.0	1122.8	153.0
January, 2006	12.0	1872.3	321.0
February, 2006	8.0	466.0	190.0
March, 2006	3.0	248.7	232.0
April, 2006	10.0	919.7	201.5
May, 2006	11.0	892.2	378.7
June, 2006	1.0	105.2	100.0
August, 2006	1.0	113.0	103.0
October, 2006	2.0	255.6	166.0
December, 2006	2.0	539.0	70.0
January, 2007	9.0	1502.7	223.0
February, 2007	9.0	549.1	290.0
March, 2007	3.0	309.2	115.0
April, 2007	13.0	601.1	212.5
May, 2007	1.0	136.8	130.0
September, 2007	1.0	137.2	85.0
December, 2007	5.0	247.0	88.0
January, 2008	4.0	601.0	110.0
February, 2008	2.0	650.3	42.0
March, 2008	1.0	8.1	5.0
April, 2008	2.0	108.3	65.0
May, 2008	3.0	168.3	95.5
September, 2008	1.0	42.4	92.0
November, 2008	1.0	166.0	60.0
December, 2008	3.0	901.0	100.0

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2009	1.0	220.5	70.0
February, 2009	1.0	35.6	58.0
April, 2009	6.0	383.1	179.0
May, 2009	6.0	303.2	170.5
August, 2009	1.0	69.3	30.0
November, 2009	1.0	77.0	10.0
December, 2009	4.0	861.0	73.0
January, 2010	6.0	1178.9	149.3
February, 2010	6.0	119.7	112.5
March, 2010	10.0	222.3	180.5
April, 2010	22.0	1834.0	674.1
May, 2010	18.0	656.5	580.8
January, 2011	16.0	4229.2	1291.0
February, 2011	5.0	196.9	218.0
March, 2011	1.0	234.6	55.0
April, 2011	12.0	734.4	218.0
May, 2011	12.0	492.5	422.3
June, 2011	15.0	314.4	625.9
October, 2011	4.0	83.0	182.2
Summaries by Year			
2004 Total	60.0	15249.6	2939.5
2005 Total	75.0	12697.4	2224.1
2006 Total	50.0	5411.9	1762.2
2007 Total	41.0	3483.2	1143.5
2008 Total	17.0	2645.2	569.5
2009 Total	20.0	1949.7	590.5
2010 Total	62.0	4011.5	1697.2
2011 Total	65.0	6285.0	3012.4
Total	**390.0**	**51733.5**	**13938.8**

Figure VI-3. Duck Slough @ Gurr Rd site subwatershed lbs copper applied by month (2004-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

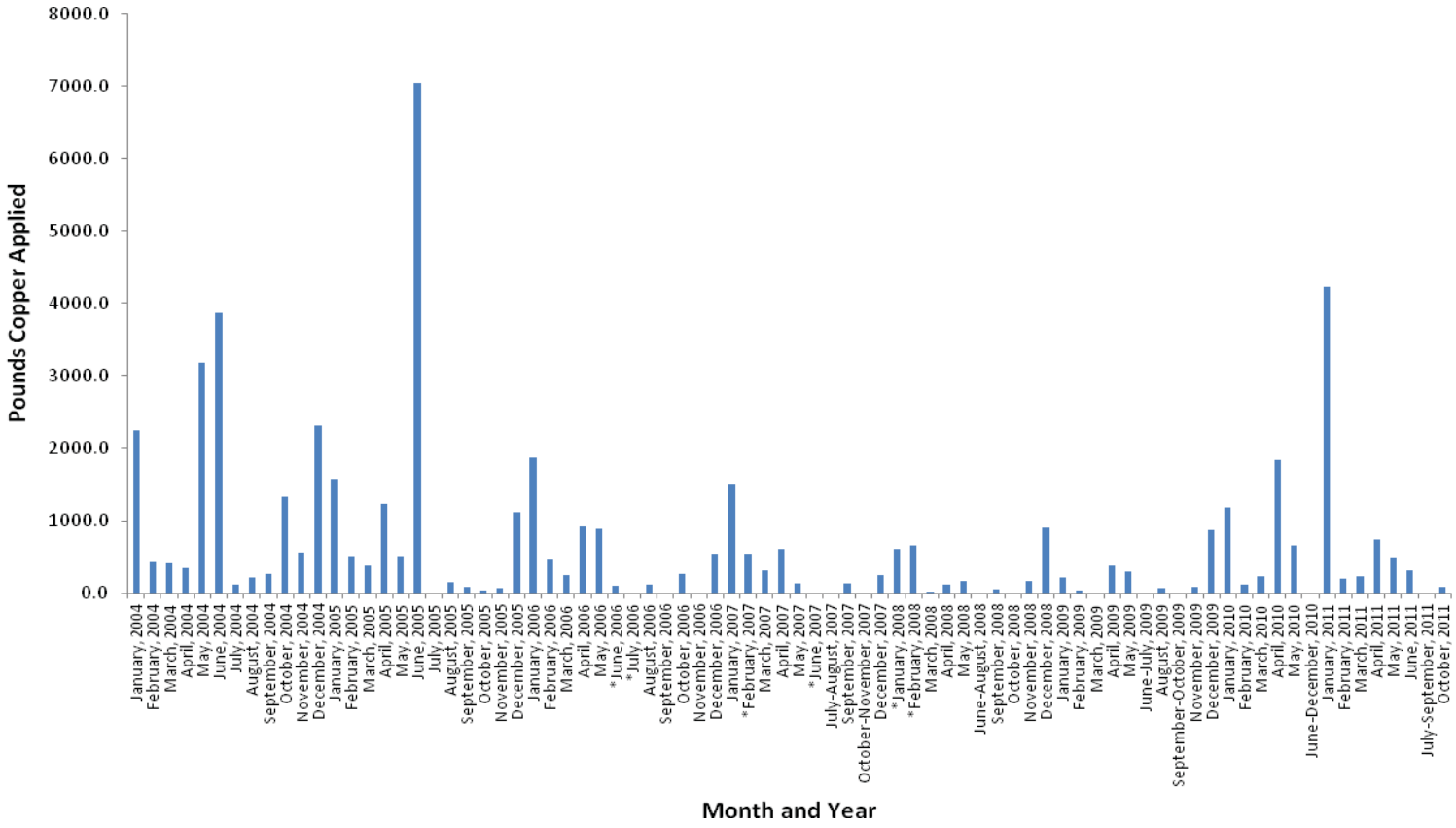


Table VI-11. Duck Slough @ Gurr Rd site subwatershed copper PUR data (2004-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	KOCIDE 2000	77.9
	ALMOND	BASIC COPPER 53	254.8
		BASICOP	307.4
		CHAMPION WETTABLE POWDER	80.1
		CUPROFIX ULTRA 40 DISPERSS	1539.9
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1569.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1015.4
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	35.6
		KOCIDE 101	2750.4
		KOCIDE 2000	470.8
		KOCIDE DF	1899.7
		KOP-HYDROXIDE 50W	468.2
		NORDOX	76.7
		NORDOX 75 WG	2747.2
		NU-COP 50 WP	52.4
	APRICOT	BASIC COPPER 53	58.8
		KOCIDE 2000	118.4
		KOCIDE DF	122.8
	CHERRY	NU-COP 50DF	154.0
	NECTARINE	BASIC COPPER 53	98.0
		CHAMPION WETTABLE POWDER	24.1
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	27.7
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	42.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	23.1
		KOCIDE 101	1155.0
		KOCIDE 2000	201.8
	N-OUTDR CONTAINER/FLD GRWN PLANTS	BASIC COPPER 53	1519.0
		CUPROFIX ULTRA 40 DISPERSS	113.8
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	53.4
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	64.6
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	497.9
		KOCIDE 101	473.6
		KOCIDE DF	306.3
	PEACH	BASIC COPPER 53	2959.6
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	172.2
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	8.7
		KOCIDE 101	154.0
		KOCIDE DF	850.1
	PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	144.0
		KOCIDE 101	21.9
	PISTACHIO (PISTACHE NUT)	CUPROFIX DISPERSS DRY FLOWABLE FUNGICIDE/BACTERCIDE FOR TURF AND ORNAMENTAL USE	8.3
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	80.7
		KOCIDE 101	154.0
		KOCIDE DF	92.8
	PRUNE	KOCIDE DF	110.5

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	PRUNE	NORDOX 75 WG	342.3
	RICE (ALL OR UNSPEC)	COPPER-Z 4/4	492.1
		TRIANGLE BRAND COPPER SULFATE ALGICIDE-HERBICIDE	653.4
		TRIANGLE BRAND COPPER SULFATE CRYSTAL	13439.3
	TOMATO	BLUE SHIELD WP	127.8
		CHAMPION WETTABLE POWDER	155.3
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	202.5
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	677.2
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	385.2
		KOCIDE 101	186.5
		KOCIDE 2000	804.8
		KOCIDE DF	920.1
		NU-COP 50 WP	127.8
		NU-COP 50DF	1578.3
		NU-COP HB	1.2
	WALNUT	CUPROFIX ULTRA 40 DISPERSS	234.6
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1244.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1179.6
		KOCIDE 101	1984.8
		KOCIDE 2000	1669.1
		KOP-HYDROXIDE 50W	396.6
		NORDOX 75 WG	151.0
		NU-COP 50DF	1288.6
		NU-COP HB	334.2

ALFALFA - Total Pounds Copper Applied	**77.9**
ALMOND - Total Pounds Copper Applied	**13267.8**
APRICOT - Total Pounds Copper Applied	**300.0**
CHERRY - Total Pounds Copper Applied	**154.0**
N-OUTDR CONTAINER - Total Pounds Copper Applied	**3028.5**
NECTARINE - Total Pounds Copper Applied	**1571.9**
PEACH - Total Pounds Copper Applied	**4144.6**
PEPPERS - Total Pounds Copper Applied	**165.9**
PISTACHIO - Total Pounds Copper Applied	**8.3**
PLUM - Total Pounds Copper Applied	**327.5**
PRUNE - Total Pounds Copper Applied	**452.8**
RICE - Total Pounds Copper Applied	**14584.7**
TOMATO - Total Pounds Copper Applied	**5166.8**
WALNUT - Total Pounds Copper Applied	**8482.7**
Total Pounds Copper Applied (2004-2011)	**51733.5**

The Coalition determined that outreach should focus on providing information to specific growers located adjacent to Duck Slough @ Gurr Rd to encourage the retention of irrigation water to prevent copper from entering the waterway through runoff. Storm water runoff management is also discussed to prevent winter exceedances. This coincides with the Coalition's Management Plan strategy outlined under the chlorpyrifos Source Identification and Outreach section above.

Priority D Constituents

The following priority D constituents listed under the Duck Slough @ Gurr Rd subwatershed management plan are water column toxicity to *S. capricornutum* and *C. dubia* and sediment toxicity to *H. azteca*.

C. dubia toxicity

Toxicity to *C. dubia* occurred in storm samples collected in February and March of 2006 (Table VI-5). The toxicity events were not associated with any other exceedances or the detection of pesticides or metals. The Coalition did not perform testing for *C. dubia* toxicity in 2009. Management Plan Monitoring for *C. dubia* began in 2011 (February and March) and will continue in 2012. The Coalition discussed toxicity to *C. dubia* and associated pesticides during individual grower meetings and conducted outreach regarding the retention of irrigation and storm water runoff on the property.

S. capricornutum toxicity

Toxicity to *S. capricornutum* only occurred twice at Duck Slough @ Gurr Rd, once in September 2004 and again in July 2007. The July toxicity occurred a month after a copper exceedance. The toxicity was not persistent in the July 2007 resample (Table VI-5).

The Coalition's strategy for eliminating *S. capricornutum* toxicity involves focusing on copper due to the potential association between copper WQTL exceedance and toxicity. If copper can be prevented from entering waterways throughout the irrigation season, the Coalition believes that *S. capricornutum* toxicity can also be eliminated. If copper is no longer detected in the slough but *S. capricornutum* toxicity persists, the Coalition will consider other herbicides as potential sources of the toxicity. The Coalition will conduct MPM in 2012 for *S. capricornutum* during months of past exceedances (July and September).

H. azteca toxicity

Sediment toxicity to *H. azteca* occurred in August 2004, July 2005, and in August 2008. Toxicity was persistent in the 2008 resample that occurred in October 2008. Sediment samples were not toxic during the 2009 sampling event. The Coalition initiated MPM for sediment toxicity in 2010. As of 2010, the Coalition now tests for total organic carbon and grain size in all sediments and pyrethroids and chlorpyrifos in sediment that exhibit 80% or less survival compared to the control. Duck Slough @ Gurr Rd MPM sediment samples collected in September 2010 resulted in toxicity to *H. azteca* with 70% survival compared to the control (Table VI-5). Chemical analysis indicated that the samples contained sediment bound pyrethroids and chlorpyrifos. Pyrethroids have a high sorption rate to sediment particles and can be carried with suspended particles in storm water runoff and irrigation tailwater to waterways. The Coalition believes that addressing storm water and irrigation tailwater management during outreach, movement of pyrethroids to waterways will also be addressed.

H. azteca toxicity occurred in September 2011, with 90% survival compared to the control. In 2012, MPM will take place for *H. azteca* toxicity during months of past exceedances (March and September).

Priority E Constituents

The following priority E constituents listed under the Duck Slough @ Gurr Road subwatershed management plan are DO, pH, SC, TDS, *E. coli* and lead.

The Coalition will continue to collect priority E constituent monitoring data for DO, pH and SC during each monitoring event. These constituents will remain low priority but will be discussed during individual contacts with growers and annual grower meetings. *E.coli* and lead will be monitored during Assessment Monitoring events. Assessment Monitoring took place at this site in 2011 and in 2012 Core Monitoring will resume. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Duck Slough @ Gurr Rd is one of the four second high priority site subwatersheds within the ESJWQC and just completed its second year of focused outreach. Therefore, the Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Duck Slough subwatershed is to target growers with parcels located along or adjacent to the waterway that have the potential to discharge into the waterway. The focus of the outreach is tailwater management and minimizing spray drift. Outreach includes grower notification, management practice outreach and education, tracking the implementation of management practices, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practices and assessing planned implementation were completed and returned representing 100% of targeted growers. The Second Priority Subwatershed Summary of Implemented Management Practices section of this report summarizes the results of these contacts.

During 2012, MPM will continue during months of past exceedances in the Duck Slough @ Gurr Rd subwatershed. In addition to chlorpyrifos, samples monitored for SC, TDS and toxicity to *S. capricornutum* experienced no exceedances/toxicities for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove these constituents from the Duck Slough @ Gurr Rd management plan.

VII. HIGHLINE CANAL @ HWY 99

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper
- Diuron

Priority D

- *Ceriodaphnia dubia* water column toxicity
- *Selenastrum capricornutum* water column toxicity
- *Hyalella azteca* sediment toxicity

Priority E

- Ammonia
- *E. coli*
- Lead
- pH
- Specific Conductivity
- Total Dissolved Solids

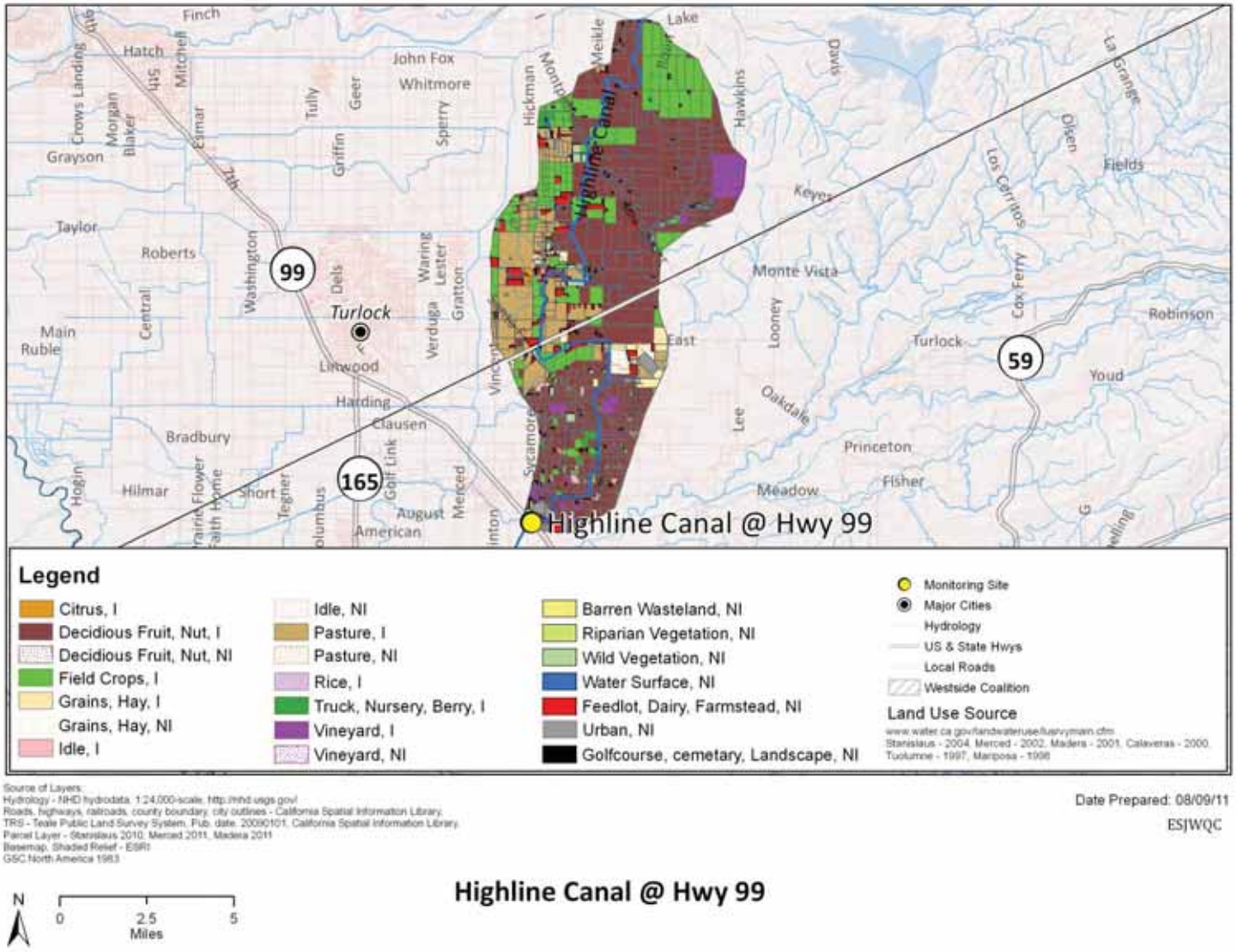
Description of Highline Canal @ Hwy 99 Site Subwatershed

Highline Canal @ Highway 99 (35,476 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District (TID) and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. This site was selected as a downstream companion site to the Highline Canal @ Lombardy Road site. This site subwatershed is monitored to determine the relative contribution of the upstream and downstream site subwatersheds to water quality impairments. The sampling site is located just south of Delhi as the canal crosses the highway (Table VII-1). The irrigated agriculture is primarily deciduous nuts located at the lower end of the site subwatershed as well as small number of vineyards (Figure VII-1).

Table VII-1. Highline Canal site subwatershed sampling location coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Highline Canal @ Hwy 99	535XHCHNN	37.4153	-120.7557

Figure VII-1. Highline Canal @ Hwy 99 site subwatershed land use map.



Highline Canal @ Hwy 99

Subwatershed Monitoring History

The Coalition initiated monitoring at Highline Canal @ Hwy 99 during the irrigation season of 2005 and has monitored continually through 2011(Table VII-2). The Highline Canal @ Hwy 99 site subwatershed is the Core Monitoring location in Zone 3. Only Core Monitoring constituents were sampled at the site from October 2008 through 2010. Assessment Monitoring occurred at the site in 2011 and will occur again every third year (e.g. 2014, 2017). In addition, MPM occurred at the Highline Canal @ Hwy 99 site from 2007 through 2011. Additional MPM occurred at the site in 2007 and 2008, and MPM during months of past exceedances occurred in 2009, 2010, and 2011 (in 2011 Assessment Monitoring occurred). The constituents sampled at this location from 2005 through 2011 are listed in (Table VII-3).

Management Plan Monitoring occurred at Highline Canal for *C. dubia* toxicity only in 2007 then for *C. dubia* toxicity, chlorpyrifos, and copper in 2008 (Table VII-4). The site was also monitored for these constituents from April through September in 2007 and in 2008. Management Plan Monitoring in 2009 occurred for *S. capricornutum* toxicity and chlorpyrifos (Table VII-4). In 2010, MPM took place for chlorpyrifos, diuron, copper, *S. capricornutum* toxicity and sediment toxicity to *H. azteca* (Table VII-4). During 2011 Assessment Monitoring, MPM constituents were analyzed on a monthly basis.

The upstream location, Highline Canal @ Lombardy Rd, allows for an analysis of the contribution of each portion of the subwatershed to loads measured at Highline Canal @ Hwy 99. Highline Canal @ Lombardy Rd is sampled as a separate monitoring location and is not considered an upstream MPM location to Highline Canal @ Hwy 99.

Highline Canal @ Hwy 99 is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos, simazine, sediment toxicity and unknown water column toxicity.

Table VII-2. Highline Canal @ Hwy 99 site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	1	1	**2**
	Irrigation	7	0	**7**
2008	Storm	2	1	**3**
	Irrigation	12	0	**12**
	Fall	0	2	**2**
2009	Winter	0	2	**2**
	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	1	1	**2**
2010	Winter	1	0	**1**
	Storm	3	0	**3**
	Irrigation	5	0	**5**
	Fall	2	1	**3**
2011	Winter	1	1	**2**
	Storm	0	1	**1**
	Irrigation	6	0	**6**
	Fall	2	1	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table VII-3. Highline Canal @ Hwy 99 site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are shown.

Method	Analyte	2005	2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
Field and Physical Parameters																					
EPA 110.2	Color	5	2	5	1	6	2	6													
EPA 160.1	Dissolved Solids	5	2	5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
EPA 160.2	Suspended Solids										2	6	1	1	3	5	2	1		6	2
EPA 180.1	Turbidity	5	2	5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
EPA 405.1	BOD			1	1	2															
EPA 415.1	Total Organic Carbon	5	2	5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
SM 9223	*E. coli*	5	2	5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
Walkley-Black	Total Organic Carbon (sediment)																	1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)																	1		1	
NA	Dissolved Oxygen	6	5	5	1	8	4	13			2	6	1	1	3	5	2	2		7	2
NA	Specific Conductivity	6	5	5	1	8	4	13			2	6	1	1	3	5	2	2		7	2
NA	pH	6	5	5	1	8	4	13			2	6	1	1	3	5	2	2		7	2
Carbamates																					
EPA 8321A	Aldicarb			5	1	6	2	6										1		6	2
EPA 8321A	Carbaryl			5	1	6	2	6										1		6	2
EPA 8321A	Carbofuran			5	1	6	2	6										1		6	2
EPA 8321A	Diuron			5	1	6	2	6							2			1		6	2
EPA 8321A	Linuron			5	1	6	2	6										1		6	2
EPA 8321A	Methiocarb			5	1	6	2	6										1		6	2
EPA 8321A	Methomyl			5	1	6	2	6										1		6	2
EPA 8321A	Oxamyl			5	1	6	2	6										1		6	2
Organochlorines																					
EPA 8081A	DDD(p,p')			5	1	6	2	6										1		4	
EPA 8081A	DDE(p,p')			5	1	6	2	6										1		4	
EPA 8081A	DDT(p,p')			5	1	6	2	6										1		4	
EPA 8081A	Dicofol			5	1	6	2	6										1		4	
EPA 8081A	Dieldrin			5	1	6	2	6										1		4	
EPA 8081A	Endrin			5	1	6	2	6										1		4	

Method	Analyte	2005	2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Methoxychlor			5	1	6	2	6										1		4	
Group A Pesticides																					
EPA 8081A	Aldrin																	1		4	
EPA 8081A	Chlordane																	1		4	
EPA 8081A	Endosulfan I																	1		4	
EPA 8081A	Endosulfan II																	1		4	
EPA 8081A	HCH, alpha																	1		4	
EPA 8081A	HCH, beta																	1		4	
EPA 8081A	HCH, delta																	1		4	
EPA 8081A	HCH, gamma																	1		4	
EPA 8081A	Heptachlor																	1		4	
EPA 8081A	Heptachlor epoxide																	1		4	
EPA 8081A	Toxaphene																	1		4	
Organophosphates																					
EPA 8141A	Azinphos methyl			5	1	6	2	6										1		6	2
EPA 8141A	Chlorpyrifos	5	2	5	1	6	2	7				1			2	1		1		6	2
EPA 8141A	Demeton-s																	1		6	2
EPA 8141A	Diazinon	5	2	5	1	6	2	6										1		6	2
EPA 8141A	Dimethoate			5	1	6	2	6										1		6	2
EPA 8141A	Disulfoton			5	1	6	2	6										1		6	2
EPA 8141A	Malathion			5	1	6	2	6										1		6	2
EPA 8321A	Methamidophos			5	1	6	2	6							2			1		6	2
EPA 8141A	Methidathion			5	1	6	2	6										1		6	2
EPA 8141A	Molinate			5	1	6	2	6													
EPA 8141A	Parathion, Methyl			5	1	6	2	6										1		6	2
EPA 8141A	Phorate			5	1	6	2	6										1		6	2
EPA 8141A	Phosmet			5	1	6	2	6										1		6	2
EPA 8141A	Thiobencarb			5	1	6	2	6													
EPA 8141A	Trifluralin																	1		6	2
Pyrethroids																					
EPA 8081A	Bifenthrin	1	2	5	1	6	2	6													

Method	Analyte	2005	2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 8081A	Cyfluthrin, total	1	2	5	1	6	2	6													
EPA 8081A	Cyhalothrin, lambda, total	5	2	5	1	6	2	6													
EPA 8081A	Cypermethrin, total	5	2	5	1	6	2	6													
EPA 8081A	Esfenvalerate/ Fenvalerate, total	5	2	5	1	6	2	6													
EPA 8081A	Permethrin, total	5	2	5	1	6	2	6													
Triazines																					
EPA 547M	Glyphosate			5	1	6	2	6										1		4	
EPA 549.2M	Paraquat dichloride			5	1	6	2	6										1		4	
EPA 619	Atrazine			5	1	6	2	6										1		6	2
EPA 619	Cyanazine			5	1	6	2	6										1		6	2
EPA 619	Simazine			5	1	6	2	6										1		6	2
Metals (Total)																					
EPA 200.8	Arsenic			5	1	6	2	6										1		5	
EPA 200.8	Boron			5	1	6	2	6										1		6	2
EPA 200.8	Cadmium			5	1	6	2	6										1		5	
EPA 200.8	Copper			5	1	6	2	10							3	3		1		6	2
EPA 200.8	Lead			5	1	6	2	6										1		5	
EPA 200.8	Molybdenum																	1		5	
EPA 200.8	Nickel			5	1	6	2	6										1		6	2
EPA 200.8	Selenium			5	1	2	2	6										1		6	2
EPA 200.8	Zinc			5	1	6	2	6										1		6	2
Metals(Dissolved)																					
EPA 200.8	Cadmium																	1		5	
EPA 200.8	Copper														3	3		1		6	2
EPA 200.8	Lead																	1		5	
EPA 200.8	Nickel																	1		6	2
EPA 200.8	Zinc																	1		6	2
Nutrients																					
SM 2340 C	Hardness as CaCO3			5	1	6	2	10										1		6	2
EPA 300.0	Nitrate as N			5	1	6	2	6							3	3					

Method	Analyte	2005	2006		2007		2008			2009				2010				2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall
EPA 350.2	Ammonia as N			5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
EPA 351.3	Nitrogen, Total Kjeldahl			5	1	6	2	6			1	1				3	2	1		6	2
EPA 353.2	Nitrate + Nitrite as N										2	6	1	1	3	5	2	1		6	2
EPA 354.1	Nitrite as N			5	1	6	2	6													
EPA 365.2	OrthoPhosphate as P			5	1	6	2	6			1	1				3	2	1		6	2
EPA 365.2	Phosphate as P			5	1	6	2	6			2	6	1	1	3	5	2	1		6	2
Toxicity																					
EPA 0821/R-02-012	*Ceriodaphnia dubia*	6	3	6	1	8	2	7										1		6	2
EPA 0821/R-02-012	*Pimephales promelas*	5	2	5	1	7	2	7										1		6	2
EPA 0821/R-02-013	*Selenastrum capricornutum*	5	3	5	1	7	2	7				1			3	1		1		6	2
EPA 600/R-99-064	*Hyalella azteca*	5	1	2		1	1	2								1		1		1	

Table VII-4. Highline Canal @ Hwy 99 site subwatershed Management Plan Monitoring schedule (2007-2011).

Site Name	Sample Date	Monitoring Type	Copper	Chlorpyrifos	Diuron	*C. dubia*	*S. capricornutum*	*H. azteca*
Highline Canal @ Hwy 99	25-Sep-07	A				X		
Highline Canal @ Hwy 99	29-Apr-08	A	X					
Highline Canal @ Hwy 99	7-May-08	A				X		
Highline Canal @ Hwy 99	3-Jun-08	A	X					
Highline Canal @ Hwy 99	8-Jul-08	A	X	X				
Highline Canal @ Hwy 99	5-Aug-08	A	X					
Highline Canal @ Hwy 99	9-Sep-08	A				X		
Highline Canal @ Hwy 99	21-Apr-09	MPM					X	
Highline Canal @ Hwy 99	19-May-09	MPM					X	
Highline Canal @ Hwy 99	21-Jul-09	MPM		X				
Highline Canal @ Hwy 99	19-Jan-10	MPM	X	X	X		X	
Highline Canal @ Hwy 99	23-Feb-10	MPM	X	X	X		X	
Highline Canal @ Hwy 99	20-Apr-10	MPM	X				X	
Highline Canal @ Hwy 99	18-May-10	MPM					X	
Highline Canal @ Hwy 99	15-Jun-10	MPM	X					
Highline Canal @ Hwy 99	20-Jul-10	MPM	X	X				
Highline Canal @ Hwy 99	17-Aug-10	MPM	X					
Highline Canal @ Hwy 99	14-Sep-10	MPM						X
Highline Canal @ Hwy 99	18-Jan-11	MPM	X	X	X			
Highline Canal @ Hwy 99	17-Feb-11	MPM	X	X	X		X	
Highline Canal @ Hwy 99	15-Mar-11	MPM				X	X	
Highline Canal @ Hwy 99	17-Mar-11	MPM						X
Highline Canal @ Hwy 99	19-Apr-11	MPM	X				X	
Highline Canal @ Hwy 99	10-May-11	MPM				X	X	
Highline Canal @ Hwy 99	14-Jun-11	MPM	X					
Highline Canal @ Hwy 99	12-Jul-11	MPM	X	X				
Highline Canal @ Hwy 99	9-Aug-11	MPM	X					
Highline Canal @ Hwy 99	6-Sep-11	MPM				X		X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Highline Canal @ Hwy 99 subwatershed from 2005 through 2011 resulted in exceedances of the WQTLs for field and physical parameters, *E. coli*, nutrients, metals, pesticides, and water column and sediment toxicity (Table VII-5). During ambient water monitoring several exceedances occurred during Normal Monitoring and MPM, including DO (1), pH (15), SC (1), TDS (2), *E. coli* (11), ammonia (2), copper (7), lead (7), DDT (1), chlorpyrifos (5), and diuron (2). Toxicity to *C. dubia* (4), *S. capricornutum* (4), and *H. azteca* sediment (6) occurred (Table VII-5).

During 2011, the WQTL exceedances that occurred were for pH (1), *E. coli* (1), and DDT (1) (Table VII-8).

All exceedances are listed in Table VII-5 by season and date and are based on WQTLs listed in the introduction to the ESJWQC Management Plan. Constituents that are the highest priority in the Highline Canal @ Highway 99 subwatershed are chlorpyrifos (A/B), copper (C), diuron (C), and toxicity to *S. capricornutum*, *C. dubia*, and *H. azteca* (D).

Table VII-5. Highline Canal @ Hwy 99 site subwatershed exceedances (2005-2010).

The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15µg/L	DDT, (p,p'), >0.00059 µg/L	Chlorpyrifos, >0.015 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Highline Canal @ Hwy 99	Irrigation	5/10/2005												47		
Highline Canal @ Hwy 99	Irrigation	5/19/2005												0		
Highline Canal @ Hwy 99	Irrigation	9/20/2005														90
Highline Canal @ Hwy 99	Storm	3/1/2006	5.6									0.021			2	
Highline Canal @ Hwy 99	Storm	3/16/2006				300								0		
Highline Canal @ Hwy 99	Storm	5/2/2006		8.73												
Highline Canal @ Hwy 99	Irrigation	5/17/2006								0.42 (0.36)						
Highline Canal @ Hwy 99	Irrigation	8/9/2006								0.39 (0.31)						90
Highline Canal @ Hwy 99	Irrigation	9/5/2006														80
Highline Canal @ Hwy 99	Irrigation	9/13/2006												67		
Highline Canal @ Hwy 99	Storm	2/11/2007							3 (2.2)	0.52 (0.36)			25			
Highline Canal @ Hwy 99	Irrigation	4/17/2007							11 (10.1)	5.1 (3.59)						
Highline Canal @ Hwy 99	Irrigation	5/15/2007		8.56		250										
Highline Canal @ Hwy 99	Irrigation	6/19/2007				320			2.4 (1.9)	0.5 (0.31)						
Highline Canal @ Hwy 99	Irrigation	7/17/2007				440			3.2 (2.2)	1 (0.36)		0.017				
Highline Canal @ Hwy 99	Irrigation	8/14/2007		8.62					1.9 (1.7)	0.44 (0.26)						
Highline Canal @ Hwy 99	Irrigation	9/25/2007		8.73												

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15µg/L	DDT, (p,p'), >0.00059 µg/L	Chlorpyrifos, >0.015 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Highline Canal @ Hwy 99	Storm	1/24/2008				>2400	500	3.3	37 (14.7)			0.019	3.2			
Highline Canal @ Hwy 99	Storm	2/26/2008			747	>2400	520	8.3	81 (81)						72	
Highline Canal @ Hwy 99	Sediment	3/4/2008														90
Highline Canal @ Hwy 99	Storm	3/4/2008		9.32												
Highline Canal @ Hwy 99	Irrigation	4/22/2008													63	
Highline Canal @ Hwy 99	Irrigation	5/7/2008		8.69												
Highline Canal @ Hwy 99	Irrigation	5/20/2008				240									76	
Highline Canal @ Hwy 99	Irrigation	6/3/2008		8.61												
Highline Canal @ Hwy 99	Irrigation	7/22/2008										0.021				
Highline Canal @ Hwy 99	Irrigation	8/19/2008		9.24												
Highline Canal @ Hwy 99	Sediment	8/28/2008														94
Highline Canal @ Hwy 99	Irrigation	9/9/2008		8.54												
Highline Canal @ Hwy 99	Sediment	10/2/2008														92
Highline Canal @ Hwy 99	Storm	2/7/2009		8.86												
Highline Canal @ Hwy 99	Irrigation	5/19/2009				340										
Highline Canal @ Hwy 99	Irrigation	6/16/2009		8.95												
Highline Canal @ Hwy 99	Irrigation	7/21/2009										0.093				
Highline Canal @ Hwy 99	Irrigation	8/18/2009		9.03												

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	*E. coli*, >235 MPN/100 mL	Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[2], >15µg/L	DDT, (p,p'), >0.00059 µg/L	Chlorpyrifos, >0.015 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Highline Canal @ Hwy 99	Irrigation	9/22/2009		8.61												
Highline Canal @ Hwy 99	Storm	12/15/2009		8.61												
Highline Canal @ Hwy 99	Storm	1/19/2010				1700										
Highline Canal @ Hwy 99	Storm	2/23/2010				790										
Highline Canal @ Hwy 99	Winter	3/15/2011				>2400										
Highline Canal @ Hwy 99	Irrigation	6/14/2011									0.013					
Highline Canal @ Hwy 99	Fall	11/8/2011		8.77												
		Constituent Priority	**NP**	**E**	**E**	**E**	**E**	**E**	**C**	**E**	**NP**	**A/B**	**C**	**D**	**D**	**D**

[1]Ammonia WQTL variable based on pH and temperature.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Highline Canal @ Hwy 99 subwatershed are listed in Table VII-6. These constituents include chlorpyrifos, diuron, copper, water column toxicity to *C. dubia* and *S. capricornutum* and sediment toxicity to *H. azteca*.

Chlorpyrifos exceeded the WQTL five times (Table VII-5) at the Highline Canal @ Hwy 99 monitoring site during both the irrigation season (July 2007, 2008 and 2009) and storm events (two day, single storm event on February 28 and March 1, 2006 and January 2008). However, since the exceedance in July 2009, there were no detections of chlorpyrifos in samples collected from Highline Canal @ Hwy 99. The Coalition conducted MPM during months of past chlorpyrifos exceedances in 2010 and Assessment Monitoring in 2011. In 2012, MPM for chlorpyrifos is scheduled to occur during months of past exceedances (January, February and July).

Diuron exceeded the WQTL twice during two separate storm events (February 2007 and January 2008) at Highline Canal @ Hwy 99 (Table VII-5). Since the exceedance, the Coalition monitored diuron through December 2011. Monitoring for diuron was included in Normal Monitoring during the 2008 storm and irrigation seasons, MPM during 2010 and Assessment Monitoring during 2011. Since the most recent exceedance, there were no other diuron WQTL exceedances (Table VII-6).

Copper exceedances occurred seven times (Table VII-5) in samples collected from Highline Canal @ Hwy 99 in 2007 (February, April, June and August) and 2008 (January and February). However, all copper exceedances were of the total fraction and occurred before the Coalition conducted monitoring for both the total and dissolved fractions of the constituent. The Coalition monitored for copper at Highline Canal @ Hwy 99 since February 2008 and no copper exceedances occurred (the site was dry in January, February and December 2011). Sampling for copper was included in Normal Monitoring during the 2008 irrigation season, MPM during 2010 and Assessment Monitoring during 2011 (Table VII-6). In 2012, the Coalition will continue MPM for copper during months of past exceedances (January, February, April and June-August).

Water column toxicity to *C. dubia* occurred in samples collected during 2005 (May) and 2006 (March and September) at Highline Canal @ Hwy 99 (Table VII-5). The site was monitored monthly for toxicity to *C. dubia* and twice in September as a part of additional MPM in 2007. No toxicity occurred in any sample (Table VII-6). In 2008, Normal Monitoring occurred for all constituents from April through September and MPM for *C. dubia* toxicity took place. None of the samples collected in 2008 resulted in toxicity (Table VII-6). In 2009 and 2010, MPM for *C. dubia* did not take place but resumed in 2011 during Assessment Monitoring when MPM constituents were analyzed monthly. There are no instances of toxicity to *C. dubia* since September 2006. In 2012, MPM for *C. dubia* toxicity will continue during months of past exceedances (March, May and September).

Toxicity to *S. capricornutum* occurred in 2006 (March) and 2008 (February, April, and May), all toxic samples were associated with copper detections. Highline Canal @ Hwy 99 was a Core Monitoring site during 2009, *S. capricornutum* MPM was scheduled in April and May and neither sample resulted in toxicity (Table VII-6). Management Plan Monitoring for *S. capricornutum* toxicity took place in January and February 2010 and during the 2010 irrigation season. The 2010 MPM samples were not toxic (Table VII-6). During 2011 Highline Canal @ Hwy 99 was scheduled for Assessment Monitoring where all high priority constituents were analyzed monthly. In 2011, MPM for *S. capricornutum* toxicity (January and March-May) took place. There are no instances of *S. capricornutum* toxicity in any Normal Monitoring, Assessment Monitoring or MPM samples collected from Highline Canal @ Hwy 99 since May 2008. In 2012, this site will return to Core Monitoring and MPM is scheduled to occur for *S. capricornutum* during months of past exceedances (February-May).

Sediment toxicity to *H. azteca* occurred during the irrigation events of 2005, 2006 and 2008; storm samples from 2008 were also toxic. Management Plan Monitoring for *H. azteca* toxicity took place during the 2010 irrigation season, samples were not toxic. During 2011 Highline Canal @ Hwy 99 was monitored monthly for Assessment Monitoring and sediment samples were collected for MPM for *H. azteca* toxicity (March and September) and did not result in toxicity (Table VII-6). There have been no instances of sediment toxicity at Highline Canal @ Hwy 99 since the irrigation event in 2008 (Table VII-6). In 2012, MPM for *H. azteca* toxicity is scheduled to occur during months of past exceedances (March and September).

Table VII-6. Highline Canal @ Hwy 99 site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec
2007 NM (@ Hwy 99)	Date	NA	NA	NA	4/17/07	5/15/07	6/19/07	7/17/07	8/14/07	9/11/07	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	90	100	100	95	100	100	NA	NA	NA
2007 MPM (@ Hwy 99)	Date	NA	NA	NA	NA	NA	NA	NA	NA	9/25/07	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	100	NA	NA	NA
2008 NM (@ Hwy 99)	Date	1/24/08	2/26/08	NA	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	9/23/08	NA	NA	NA
	Copper (µg/L)	**37**	**81**	NA	1.8	1.6	1.2	1.2	1.0	1.1	NA	NA	NA
	Chlorpyrifos (µg/L)	**0.019**	0.0076	NA	<0.003	<0.003	<0.003	**0.021**	<0.003	<0.003	NA	NA	NA
	C. dubia toxicity (% Control)	100	100	NA	100	100	100	100	100	100	NA	NA	NA
2008 MPM (@ Hwy 99)	Date	NA	NA	NA	4/29/08	5/7/08	6/3/08	7/8/08	8/5/08	9/9/08	NA	NA	NA
	Copper (µg/L)	NA	NA	NA	1.4	NA	1.5	1.7	1.6	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	<0.003	NA	NA	NA	NA	NA
	C. dubia toxicity (% Control)	NA	NA	NA	NA	100	NA	NA	NA	100	NA	NA	NA
2009 MPM (@ Hwy 99)	Date	NA	NA	NA	4/21/09	5/19/09	NA	7/21/09	NA	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	**0.093**	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	428	222	NA	NA	NA	NA	NA	NA	NA
2010 MPM (@ Hwy 99)	Date	1/19/10	2/23/10	NA	4/20/10	5/18/10	6/15/10	7/20/10	8/17/10	9/14/10	NA	NA	NA
	Copper, dissolved (µg/L)	2.5	6.3	NA	0.89	NA	0.65	0.48	0.52	NA	NA	NA	NA
	Copper, total (µg/L)	5.7	7.8	NA	2.2	NA	1.2	1.3	1.2	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	<0.003	<0.003	NA	NA	NA	NA	<0.003	NA	NA	NA	NA	NA
	Diuron (µg/L)	0.86	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	661	543	NA	526	255	NA	NA	NA	NA	NA	NA	NA
	H. azteca toxicity (% Control)	NA	NA	NA	NA	NA	NA	NA	NA	108	NA	NA	NA

	Month:	Jan	Feb	Mar		Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec
	Date	1/18/11	2/17/11	3/15/11	3/17/11	4/19/11	5/10/11	6/14/11	7/12/11	8/9/11	9/6/11	10/11/11	11/8/11	12/6/11
2011 NM & MPM (@ Hwy 99)	Copper, dissolved (µg/L)	Dry*	Dry*	1.1	NA	0.97*	0.3	0.58*	0.53*	0.30*	0.51	0.11	1.4	Dry
	Copper, total (µg/L)	Dry*	Dry*	2.1	NA	1.3	0.89	1.1	1.4	0.82	5.2	0.88	2.2	Dry
	Chlorpyrifos (µg/L)	Dry*	Dry*	<0.003	NA	<0.003	<0.003	<0.003	<0.003*	<0.003	<0.003	<0.003	<0.003	Dry
	Diuron (µg/L)	Dry*	Dry*	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	Dry
	C. dubia toxicity (% Control)	Dry	Dry	100*	NA	100	100*	100	100	100	100*	100	100	Dry
	S. capricornutum toxicity (% Control)	Dry	Dry*	687*	NA	393*	375*	363	195	320	355	450	2296	Dry
	H. azteca toxicity (% Control)	NA	NA	NA	102*	NA	NA	NA	NA	NA	109*	NA	NA	NA

MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for all chlorpyrifos, copper, and diuron detections in the site subwatershed (Table VII-7) based on the following formula:

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table VII-7. Highline Canal @ Hwy 99 site subwatershed instantaneous load calculations for chlorpyrifos, copper, and diuron.

Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Highline Canal @ Hwy 99	Chlorpyrifos	03/01/06	0	0.021	0
Highline Canal @ Hwy 99	Chlorpyrifos	07/12/06	111.81	0.012	37.99
Highline Canal @ Hwy 99*	Chlorpyrifos	07/17/07	56.81	0.015	24.13
Highline Canal @ Hwy 99	Chlorpyrifos	07/17/07	56.81	0.017	27.35
Highline Canal @ Hwy 99	Chlorpyrifos	01/24/08	55.88	0.019	30.06
Highline Canal @ Hwy 99	Chlorpyrifos	02/26/08	6.91	0.0076	1.49
Highline Canal @ Hwy 99	Chlorpyrifos	07/21/09	118.93	0.093	313.20
Highline Canal @ Hwy 99	Copper	05/17/06	82.45	1.8	4202.53
Highline Canal @ Hwy 99	Copper	06/14/06	90.82	1.7	4371.97
Highline Canal @ Hwy 99	Copper	07/12/06	111.81	1.6	5065.80
Highline Canal @ Hwy 99	Copper	08/09/06	162.04	1.3	5965.03
Highline Canal @ Hwy 99	Copper	09/13/06	72.64	1.3	2674.03
Highline Canal @ Hwy 99	Copper	02/11/07	55.43	3	4708.83
Highline Canal @ Hwy 99	Copper	04/17/07	22.54	11	7020.92
Highline Canal @ Hwy 99	Copper	05/15/07	60.6	1.4	2402.41
Highline Canal @ Hwy 99	Copper	06/19/07	84.28	2.4	5727.74
Highline Canal @ Hwy 99*	Copper	07/17/07	56.81	3.1	4986.94
Highline Canal @ Hwy 99	Copper	07/17/07	56.81	3.2	5147.80
Highline Canal @ Hwy 99	Copper	08/14/07	81.98	1.9	4410.71
Highline Canal @ Hwy 99	Copper	09/11/07	33.38	1.5	1417.83
Highline Canal @ Hwy 99	Copper	01/24/08	55.88	37	58547.10
Highline Canal @ Hwy 99	Copper	02/26/08	6.91	81	15849.31
Highline Canal @ Hwy 99	Copper	04/29/08	34.66	1.4	1374.05
Highline Canal @ Hwy 99	Copper	05/20/08	81.42	1.6	3688.91
Highline Canal @ Hwy 99	Copper	06/03/08	57.91	1.5	2459.76
Highline Canal @ Hwy 99	Copper	08/19/08	37.45	1	1060.47
Highline Canal @ Hwy 99	Copper	01/19/10	0	5.7	0
Highline Canal @ Hwy 99	Copper	02/23/10	0	7.8	0
Highline Canal @ Hwy 99	Copper	11/08/11	0.57	2.2	35.51
Highline Canal @ Hwy 99	Copper (D)	01/19/10	0	2.5	0
Highline Canal @ Hwy 99	Copper (D)	02/23/10	0	6.3	0
Highline Canal @ Hwy 99	Copper (D)	11/08/11	0.57	1.4	22.60

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Highline Canal @ Hwy 99	Diuron	02/11/07	55.43	25	39240.28
Highline Canal @ Hwy 99	Diuron	01/24/08	55.88	3.2	5063.53
Highline Canal @ Hwy 99	Diuron	02/26/08	6.91	0.43	84.14
Highline Canal @ Hwy 99	Diuron	01/19/10	0	0.86	0
Highline Canal @ Hwy 99	Diuron	02/23/10	0	1.7	0

Copper (D)-Dissolved Copper
*Field Duplicate

Source Identification and Outreach

The Coalition addressed source identification in the 2011 MPUR and, in the following sections, considers 2011 monitoring results and PUR data as it expands upon that discussion. The Coalition focuses its efforts on applied pesticides. During 2007 and 2008, the Coalition conducted additional MPM and upstream monitoring during the months when exceedances occurred in previous years to better characterize water quality in the subwatershed. From 2009 through 2011, MPM continued at Highline Canal @ Hwy 99 to assess water quality in the subwatershed as outreach in the area progressed. Assessment Monitoring occurred at this site during 2011. The PUR data are reviewed to determine the most frequent crop type and timing associated with applications. Highline Canal @ Hwy 99 subwatershed PUR data are available only through June 2011.

Focused outreach to document current management practices and track implementation of additional management practices in the Highline Canal subwatershed began in 2010 and continued through 2011. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. The Coalition contacted 100% of targeted growers (10) representing 368 acres within the Highline Canal @ Hwy 99 subwatershed. Eight growers participated in follow up contacts to determine if additional management practices were implemented and if any are planned to be implemented, excluding two growers who either dropped their Coalition membership or no longer farmed parcels enrolled within the Highline Canal subwatershed. Management Plan Monitoring will continue in the Highline Canal @ Hwy 99 subwatershed during 2012 to assess water quality improvements that have occurred since the subwatershed became high priority.

Priority A/B Constituents

Chlorpyrifos is the only priority A/B constituent listed in the Highline Canal @ Hwy 99 subwatershed management plan.

Chlorpyrifos

Chlorpyrifos exceeded the WQTL of 0.015µg/L five times in this subwatershed; March 2006, July 2007, 2008, and 2009, and January 2008. In 2011, MPM for chlorpyrifos occurred in January, February and July. There were no exceedances of chlorpyrifos during 2011. The Coalition evaluates monitoring and PUR data to identify possible sources of exceedances of constituents of concern.

All PUR data are reviewed for the number of monthly applications, pounds of active ingredient applied, and acres treated (Table VII-8, Figure VII-2). The PUR data from Highline Canal @ Hwy 99 subwatershed

area were reviewed for chlorpyrifos use. The amount of chlorpyrifos applied within the subwatershed decreased significantly from 2007 (18,201 lbs AI) to 2011 (3,290 lbs AI June 2011). The greatest amount of chlorpyrifos applied in 2005 was during May, while July received the most chlorpyrifos in 2006, 2007, 2008 and 2010 (Table VII-8, Figure VII-2). Exceedances did not always occur during months of the greatest amount of use (Figure VII-2).

The Coalition also uses PUR data to assess which crops received the most applications (Table VII-9). The largest amount of chlorpyrifos applied from 2005 through 2011 was to almonds (52,205 lbs AI), followed by grapes (10,786 lbs AI) and walnuts (8,012 lbs AI). The most common product containing chlorpyrifos applied within the subwatershed was Lorsban (Table VII-9).

Table VII-8. Highline Canal @ Hwy 99 site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2005	16	892.4	608.2
March, 2005	7	261.8	552.2
April, 2005	2	360.2	360.0
May, 2005	15	6077.2	1618.0
June, 2005	17	1184.0	713.0
July, 2005	41	3106.5	1835.0
August, 2005	19	2784.3	2229.0
September, 2005	2	33.9	17.0
November, 2005	4	1444.7	724.6
January, 2006	8	2076.5	1054.0
May, 2006	13	2535.4	2007.0
June, 2006	10	1558.4	1433.9
July, 2006	29	6263.8	3669.2
August, 2006	31	2608.2	2502.5
September, 2006	2	85.1	42.0
January, 2007	1	37.5	19.0
March, 2007	2	114.3	225.4
April, 2007	1	6.2	20.0
May, 2007	19	2056.9	1742.0
June, 2007	8	3971.9	1435.0
July, 2007	43	9411.9	5802.3
August, 2007	12	769.6	667.4
October, 2007	3	1832.5	915.3
January, 2008	1	18.8	10.0
March, 2008	1	4.0	8.0
May, 2008	9	672.4	454.0
June, 2008	2	10.3	15.0
July, 2008	21	1922.0	1565.8
August, 2008	17	1652.5	925.0
September, 2008	2	335.0	170.0
October, 2008	3	1395.9	699.8
January, 2009	6	3831.1	2040.0
February, 2009	1	620.3	306.0

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
March, 2009	4	174.9	300.4
May, 2009	13	606.6	370.0
June, 2009	5	267.0	254.0
July, 2009	22	1738.8	1576.4
August, 2009	14	1664.4	958.0
September, 2009	2	59.6	65.0
October, 2009	4	1778.5	947.0
March, 2010	3	203.8	413.2
May, 2010	6	528.5	375.0
June, 2010	11	909.8	811.0
July, 2010	41	3907.1	2618.5
August, 2010	14	1633.4	1055.0
September, 2010	3	57.1	36.0
October, 2010	1	398.1	212.0
November, 2010	4	1955.0	1041.0
January, 2011	1	42.3	30.0
June, 2011	6	359.5	247.0
July, 2011	15	1040.7	799.0
August, 2011	13	561.7	407.0
September, 2011	6	168.5	101.0
October, 2011	3	1117.5	630.0
Summaries by Year			
2005 Total	123	16145.0	8657.0
2006 Total	93	15127.4	10708.6
2007 Total	89	18200.8	10826.4
2008 Total	56	6010.8	3847.6
2009 Total	71	10741.2	6816.8
2010 Total	83	9592.9	6561.7
2011 Total	44	3290.1	2214.0
Total	**559**	**79108.1**	**49632.1**

Figure VII-2. Highline Canal @ Hwy 99 site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

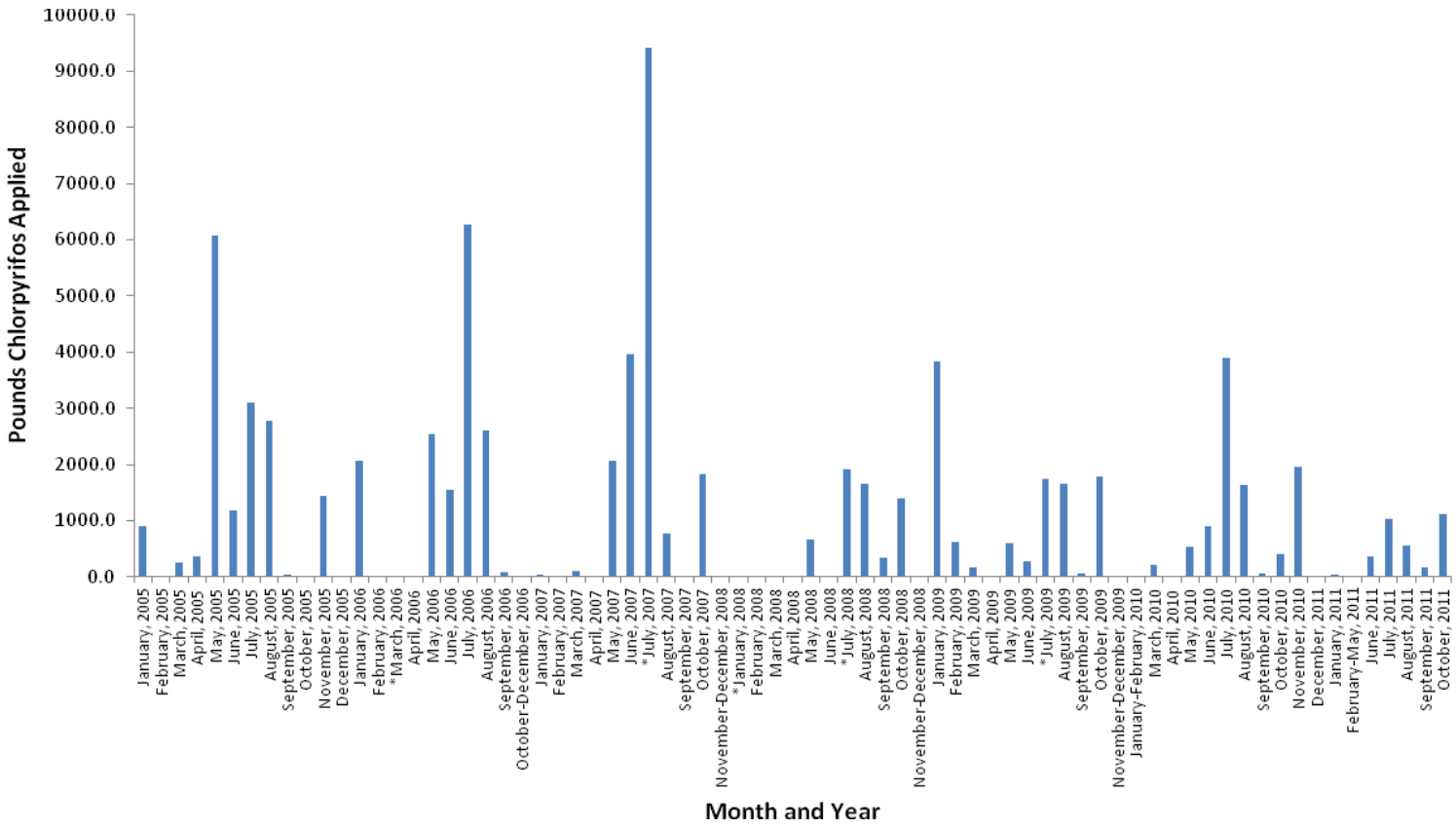


Table VII-9. Highline Canal @ Hwy 99 site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	7.5
		COBALT	93.2
		GOVERN 4E INSECTICIDE	14.7
		LOCK-ON INSECTICIDE	138.2
		LORSBAN 4E-HF	105.2
		LORSBAN-4E	3.7
		NUFOS 4E	553.8
	ALMOND	CHLORPYRIFOS 4E AG	967.5
		DURSBAN 4E INSECTICIDE	20.2
		GOVERN 4E INSECTICIDE	8732.7
		LORSBAN 4E INSECTICIDE	408.6
		LORSBAN 4E-HF	4211.2
		LORSBAN 50W WETTABLE POWDER INSECTICIDE	30.0
		LORSBAN ADVANCED	4538.7
		LORSBAN-4E	29863.4
		NUFOS 4E	2821.3
		WARHAWK	121.2
		WHIRLWIND	489.9
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	200.3
		DREXEL CHLORPYRIFOS 4E-AG	75.2
		GOVERN 4E INSECTICIDE	267.7
		LORSBAN 15G GRANULAR INSECTICIDE	113.5
		LORSBAN 4E INSECTICIDE	120.0
		LORSBAN 4E-HF	1109.4
		LORSBAN ADVANCED	1077.4
		LORSBAN-4E	1364.8
		NUFOS 4E	1572.3
		WARHAWK	757.1
	GRAPES	LORSBAN 4E-HF	5612.5
		LORSBAN ADVANCED	5173.9
	PEACH	CHLORPYRIFOS 4E AG	114.5
		LORSBAN 4E-HF	139.4
		LORSBAN ADVANCED	42.3
		LORSBAN-4E	36.0
	SORGHUM/MILO GENERAL	NUFOS 4E	4.3
	SWEET POTATO	LORSBAN 15G GRANULAR INSECTICIDE	194.4
	WALNUT	CHLORPYRIFOS 4E AG	270.2
		GOVERN 4E INSECTICIDE	426.2
		LORSBAN 4E-HF	679.9
		LORSBAN ADVANCED	1378.5
		LORSBAN-4E	3547.0
		NUFOS 4E	1458.8
		WARHAWK	171.7
		WHIRLWIND	80.0

ALFALFA - Total Pounds Chlorpyrifos Applied	**916.3**
ALMOND - Total Pounds Chlorpyrifos Applied	**52204.7**
CORN - Total Pounds Chlorpyrifos Applied	**6657.6**

Chemical Name	Commodity	Product Name	Lbs AI Applied
		GRAPES - Total Pounds Chlorpyrifos Applied	10786.4
		PEACH - Total Pounds Chlorpyrifos Applied	332.2
		SORGHUM- Total Pounds Chlorpyrifos Applied	4.3
		SWEET POTATO - Total Pounds Chlorpyrifos Applied	194.4
		WALNUT - Total Pounds Chlorpyrifos Applied	8012.3
		Total Pounds Chlorpyrifos Applied (2005 - 2011)	79108.1

The Coalition determined the most probable source of chlorpyrifos in the Highline Canal @ Hwy 99 waterway to be spray drift and irrigation drainage from adjacent fields. In this subwatershed, chlorpyrifos exceedances often occurred in July (2007-2009), but also occurred during storm monitoring (January 2008 and March 2006; Table VII-5). Consequently, outreach efforts focused both on encouraging management practices aimed at reducing spray drift and improving drainage water management. The Coalition targeted growers applying chlorpyrifos and also those owning parcels with the potential to drain to the canal. Growers were encouraged to review their farming operations to determine if irrigation return flows were managed properly. Owners operating orchards were encouraged to evaluate their aerial applications to minimize spray drift.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

In accordance with the Coalition's Management Plan strategy, individual contacts with targeted growers began in November 2009. Targeted growers were selected based on the potential to drain or drift to the canal and those applying chlorpyrifos. Using these criteria, 10 targeted growers, representing 368 acres, were contacted. Coalition representatives met with growers on their property to discuss the Highline Canal management plan and offer recommendations specific to the parcel and land owner/operator. This gave the Coalition a chance to better assess currently used management practices as well as planned management practice implementation. Individual contacts focused mainly on chlorpyrifos exceedances, however, all water quality results were reviewed and discussed including copper, diuron, ammonia, pH, SC, TDS, *E. coli*, and lead WQTLs exceedances as well as toxicity to *C. dubia*, *S. capricornutum* and *H. azteca*.

To date, the Coalition contacted all 10 targeted members representing 33% of the total subwatershed direct drainage acreage. During initial contacts all growers indicated no irrigation drainage took place on their parcels, but in 2010 a single grower reported irrigation drainage. The Coalition representatives recommended three spray-drift management practices: spraying areas close to waterbodies when the wind is blowing away from them, using air blast applications when wind is between three and 10 mph, and using nozzles that provide the largest effective droplet size to minimize drift.

The Coalition followed up with growers in April of 2011 to determine if any practices were implemented during the first irrigation year of high priority monitoring. Of the acres with irrigation drainage, 50% were reported to have reduced surface water use and the other 50% had implemented nozzles that provide the largest effective droplet size to minimize drift. Of the parcels without drainage, 60% reported using less water during surface irrigation, 20% sprayed areas close to waterbodies when the wind was blowing away from them, and the other 20% implemented using air blast applications when the wind was between three and 10 mph. The Coalition's Assessment of implemented management practices is included in the Summary of Implemented Management Practices section of this report.

The Coalition will continue to assess water quality at Highline Canal @ Hwy 99 through MPM during months of past exceedances, and will update its evaluation of management practice effectiveness to including monitoring results from 2012 in the 2013 MPUR.

There have been no exceedances of chlorpyrifos for two or more consecutive years of monitoring during the months of past exceedances in the Highline Canal subwatershed. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove chlorpyrifos from the Highline Canal @ Hwy 99 management plan.

Priority C Constituents

Copper and diuron are listed as priority C constituents for the Highline Canal @ Hwy 99 subwatershed.

Copper

Copper exceeded the hardness based WQTL seven times in this subwatershed from 2005 through 2011. Copper exceedances occurred five times during 2007 (February, April, and June-August), and twice in 2008 (January and February) (Table VII-5). The Coalition began monitoring for both the total and dissolved copper fractions in October 2008 to better characterize copper contamination in the subwatershed.

Samples collected from Highline Canal @ Lombardy Rd (located upstream) exceeded the WQTL for copper numerous times in the past indicating that copper is a water quality concern throughout the canal. Both Highline Canal @ Hwy 99 and Highline Canal @ Lombardy Rd underwent Assessment Monitoring during 2011 and no copper exceedances occurred.

PUR data are reviewed for the number of monthly copper applications, pounds of active ingredient applied, and acres treated (Table VII-10, Figure VII-3). The amount of copper applied within the subwatershed decreased annually from 2006 through 2008 and then increased in 2009 through 2010 (2011 data through June only). The month of January consistently receives the greatest amount of copper applied. Not all exceedances occurred during months of the greatest amount of use (Figure VII-3).

The Coalition also uses PUR data to assess which crops receive the greatest quantity of copper. The largest amount of copper applied from 2005 through 2011 by far was associated with almonds (270,596 lbs AI). Peach and walnut orchards had the next largest amounts of copper applied in the subwatershed (Table VII-11). The most common product containing copper used within this subwatershed is Kocide (Table VII-11).

Table VII-10. Highline Canal @ Hwy 99 site subwatershed copper applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	69	19418.0	4479.3
February, 2005	107	5206.6	4526.7
March, 2005	37	3760.8	1647.0
April, 2005	43	5415.4	2325.7
May, 2005	18	1909.5	605.0
June, 2005	3	112.4	47.0
August, 2005	2	176.3	63.0
September, 2005	1	8.6	4.0
October, 2005	2	9.1	8.0
November, 2005	12	5791.3	1393.1
December, 2005	59	14037.9	1423.1
January, 2006	75	62305.7	9641.4
February, 2006	96	9520.6	4473.0
March, 2006	25	1378.9	1453.1
April, 2006	26	2649.9	683.0
May, 2006	23	2807.0	1563.4
June, 2006	1	144.2	67.0
August, 2006	2	191.1	63.0
November, 2006	8	4308.1	1039.6
December, 2006	19	3360.8	304.6
January, 2007	71	28336.1	5252.2
February, 2007	52	4981.1	2356.1
March, 2007	58	4207.2	2553.5
April, 2007	59	5846.8	1362.1
May, 2007	14	1581.7	416.1
July, 2007	2	210.0	63.0
September, 2007	1	18.5	6.0
November, 2007	12	8678.6	2313.0
December, 2007	26	3182.7	432.1
January, 2008	44	19684.3	3792.4
February, 2008	62	5479.1	2818.1
March, 2008	47	2908.5	2021.0
April, 2008	19	2538.9	1460.2
May, 2008	1	9.2	5.0
July, 2008	2	135.0	63.0
November, 2008	3	1025.6	111.0
December, 2008	13	3475.8	1363.5
January, 2009	42	26062.8	5186.6
February, 2009	77	5671.1	2736.5

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
March, 2009	27	1339.8	1003.0
April, 2009	42	5404.7	2351.0
May, 2009	11	984.4	282.0
June, 2009	3	467.1	139.0
August, 2009	2	162.1	39.8
September, 2009	4	252.3	109.2
October, 2009	1	63.1	27.3
November, 2009	5	1265.2	1081.9
December, 2009	7	2732.3	809.5
January, 2010	47	22280.9	5073.7
February, 2010	140	11829.6	7244.0
March, 2010	62	4568.0	5198.1
April, 2010	56	6644.7	2607.5
May, 2010	19	2612.8	1040.0
June, 2010	5	385.3	188.4
July, 2010	5	366.0	146.0
August, 2010	3	237.0	65.0
October, 2010	1	26.9	25.0
November, 2010	5	1710.4	1560.0
December, 2010	17	13110.0	3478.0
January, 2011	47	22810.4	5547.0
February, 2011	69	6551.8	5078.9
March, 2011	102	4048.6	3326.6
April, 2011	44	6589.5	4585.3
May, 2011	22	3463.6	823.7
June, 2011	10	1488.1	419.1
July, 2011	41	3499.6	1238.2
September, 2011	1	56.4	24.4
October, 2011	1	56.4	24.4
Summaries by Year			
2005 Total	353	55845.9	16521.9
2006 Total	275	86666.3	19288.1
2007 Total	295	57042.7	14754.1
2008 Total	191	35256.6	11634.2
2009 Total	221	44404.7	13765.8
2010 Total	360	63771.5	26625.6
2011 Total	337	48564.4	21067.6
Total	**2032**	**391551.9**	**123657.4**

Figure VII-3. Highline Canal @ Hwy 99 site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

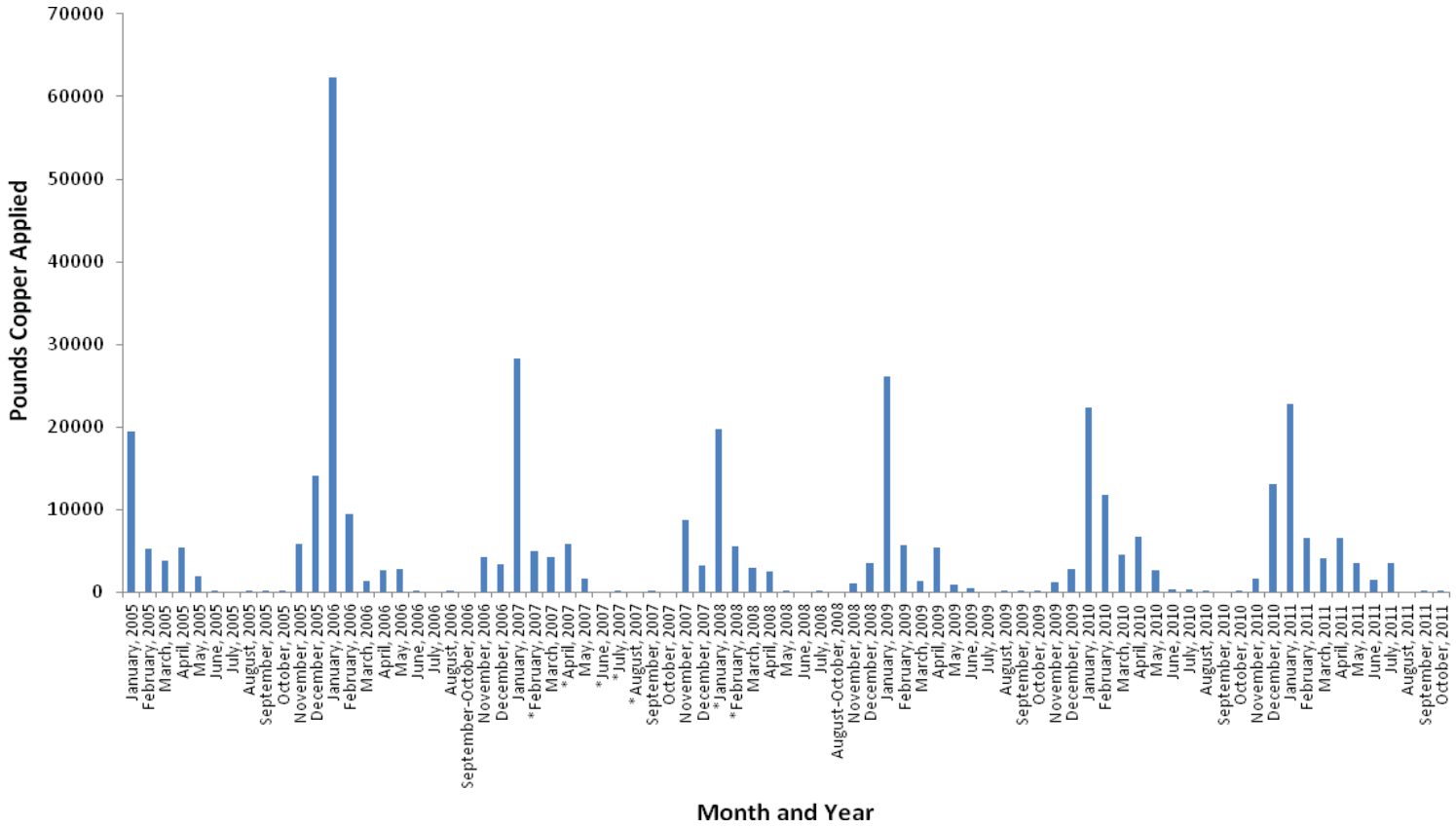


Table VII-11. Highline Canal @ Hwy 99 site subwatershed copper PUR data (2005-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALMOND	BASIC COPPER 53	63644.1
		BASICOP	1229.1
		CHAMP DRY PRILL	1352.2
		CHAMP FORMULA 2 FLOWABLE	13109.7
		CHAMP WG	492.8
		CHAMPION WETTABLE POWDER	1486.9
		COPPER SULFATE CRYSTAL	148.5
		CUPROFIX DISPERSS	7.4
		CUPROFIX ULTRA 40 DISPERSS	34537.8
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	18305.8
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	180.3
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	73.7
		HYDROX	6098.4
		KENTAN DF	2535.3
		KOCIDE 101	12749.3
		KOCIDE 2000	4156.9
		KOCIDE DF	8304.6
		NORDOX	56.4
		NORDOX 75 WG	20156.6
		NU-COP 50 WP	6923.8
		NU-COP 50DF	74622.8
		NU-COP 50WP	374.2
		QUIMAG QUIMICOS AGUILA COPPER SULFATE CRYSTAL	49.5
	APRICOT	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	8.8
		KOCIDE DF	310.1
		NORDOX 75 WG	427.9
	BLUEBERRY	NORDOX 75 WG	109.1
	CHERRY	BASIC COPPER 53	9.8
		CHAMPION WETTABLE POWDER	46.2
	GRAPES	BASIC COPPER 53	230.3
		CHAMP FORMULA 2 FLOWABLE	2351.9
		CHAMPION WETTABLE POWDER	10.8
		CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	712.4
		COCS 15 SULFUR 25 DUST	82.5
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	412.3
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	30.1
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	453.8
		IAP COPPER SULFUR 15-25 DUST	636.7
		KENTAN DF	2041.3
		KOCIDE 4.5 LF	318.4
		KOCIDE 606 FLOWABLE AGRICULTURAL FUNGICIDE	713.8
		NU-COP 50DF	854.7
		WIL-DRY	3488.8
	N-OUTDR CONTAINER/FLD GRWN PLANTS	CHAMPION WETTABLE POWDER	5389.2
		KOCIDE 2000	242.6
		NU-COP 50 WP	139.4
		NU-COP 50DF	46.2
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	CHAMPION WETTABLE POWDER	156.5

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	26.9
		NORDOX 75 WG	60.9
		NU-COP 50 WP	567.6
	PEACH	BASIC COPPER 53	32710.1
		CHAMPION WETTABLE POWDER	735.4
		CUPROFIX ULTRA 40 DISPERSS	792.9
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	796.8
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	368.9
		KOCIDE 101	2459.4
		KOCIDE 2000	164.8
		KOCIDE DF	2246.6
		NORDOX 75 WG	10333.0
		NU-COP 50 WP	80.1
		NU-COP 50DF	2313.1
	PISTACHIO (PISTACHE NUT)	CUPROFIX ULTRA 40 DISPERSS	81.1
	WALNUT	BASIC COPPER 53	1215.2
		CHAMP FORMULA 2 FLOWABLE	2445.5
		CHAMPION WETTABLE POWDER	386.5
		CUPROFIX ULTRA 40 DISPERSS	4075.3
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	18.4
		DUPONT KOCIDE 101 FUNGICIDE/BACTERICIDE	78.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	8058.6
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	965.7
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	1101.5
		KENTAN DF	2306.1
		KOCIDE 101	5889.1
		KOCIDE 2000	6832.6
		KOCIDE DF	2069.8
		NORDOX 75 WG	7998.2
		NU-COP 50 WP	708.4
		NU-COP 50DF	3845.4

ALMOND - Total Pounds Copper Applied	**270596.1**
APRICOT - Total Pounds Copper Applied	**746.7**
BLUEBERRY - Total Pounds Copper Applied	**109.1**
CHERRY - Total Pounds Copper Applied	**56.0**
GRAPES - Total Pounds Copper Applied	**12337.8**
N-OUTDR CONTAINER - Total Pounds Copper Applied	**5817.4**
N-OUTDR GRWN TRNSPLNT - Total Pounds Copper Applied	**811.8**
PEACH - Total Pounds Copper Applied	**53001.0**
PISTACHIO - Total Pounds Copper Applied	**81.1**
WALNUT - Total Pounds Copper Applied	**47995.0**
Total Pounds Copper Applied (2005-2011)	**391551.9**

Outreach efforts focused both on encouraging management practices aimed at reducing spray drift and improving water management, and is consistent with the chlorpyrifos outreach efforts described above. Future outreach will provide information to specific growers located adjacent to Highline Canal and those with the potential for drift to the canal. Orchard and vineyard operators are advised to consider management practices to prevent copper from entering the waterway when applicable. This coincides

with the Coalition's Management Plan strategy outlined in the 2012 MPUR copper outreach section. Individual contacts with growers within this subwatershed are described under the copper outreach, as are discussions of copper exceedances and relevant management practices. The Coalition believes that its outreach strategy and management practice implementation has led to improvements in water quality since no additional copper exceedances occurred since February 2008.

Diuron

Concentrations of diuron exceeded the WQTL twice in this subwatershed (February 2007 and January 2008), see Table VII-6. Core Monitoring took place at Highline Canal @ Hwy 99 during 2009; diuron was not monitored as a part of 2009 MPM. Diuron was monitored during January and February 2010 MPM and monthly during 2011 Assessment Monitoring and was not detected. Highline Canal will return to Core Monitoring in 2012, and diuron MPM will occur during January and February 2012.

PUR data are reviewed for the number of monthly diuron applications, pounds active ingredient applied, and acres treated (Table VII-12, Figure VII-4). Between 2005 and 2010 there was a sharp decline in applications of diuron in the Highline Canal subwatershed (551 lbs AI applied in 2005 and 67 lbs AI applied in 2010), but in 2011 the pounds of diuron applied rose again to 412 lbs AI. The months with the largest amount of pounds applied have consistently been January and December, (Table VII-12, Figure VII-4). Neither diuron exceedance coincided with a month of greatest diuron use.

The Coalition also uses PUR data to determine which crops receive the most applications of diuron (Table VII-13). The highest application rates of diuron in the Highline Canal subwatershed are associated with alfalfa and walnuts (Table VII-13). The largest amount of diuron applied from 2005 through 2011 was to alfalfa (1,780 lbs AI). The most common products containing diuron used within this subwatershed are DuPont Direx and Direx.

Table VII-12. Highline Canal @ Hwy 99 site subwatershed diuron applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
January, 2005	4	106.0	151.0
October, 2005	2	59.1	40.0
November, 2005	2	44.5	73.0
December, 2005	4	341.1	242.4
January, 2006	2	67.2	46.0
October, 2006	1	30.0	20.0
November, 2006	2	27.1	65.0
December, 2006	1	318.8	217.4
January, 2007	3	122.6	104.4
February, 2007	2	66.3	46.0
March, 2007	1	17.8	40.0
April, 2007	2	33.4	75.0
June, 2007	1	0.5	14.0
November, 2007	2	12.6	63.0
December, 2007	1	320.7	217.4
February, 2008	4	73.6	101.0
November, 2008	2	46.1	31.5
December, 2008	1	130.4	217.4
January, 2009	6	152.5	368.9
April, 2009	2	15.3	104.9
June, 2009	1	4.8	1.0
December, 2009	2	146.4	222.4
February, 2010	2	66.9	170.0
January, 2011	4	380.6	539.9
February, 2011	2	31.5	31.5
Summaries by Year			
2005 Total	12	550.7	506.4
2006 Total	6	443.1	348.4
2007 Total	12	573.8	559.8
2008 Total	7	250.0	349.9
2009 Total	11	319.0	697.2
2010 Total	2	66.9	170.0
2011 Total	6	412.1	571.4
Total	**56**	**2615.6**	**3203.1**

.

Figure VII-4. Highline Canal @ Hwy 99 site subwatershed lbs diuron applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

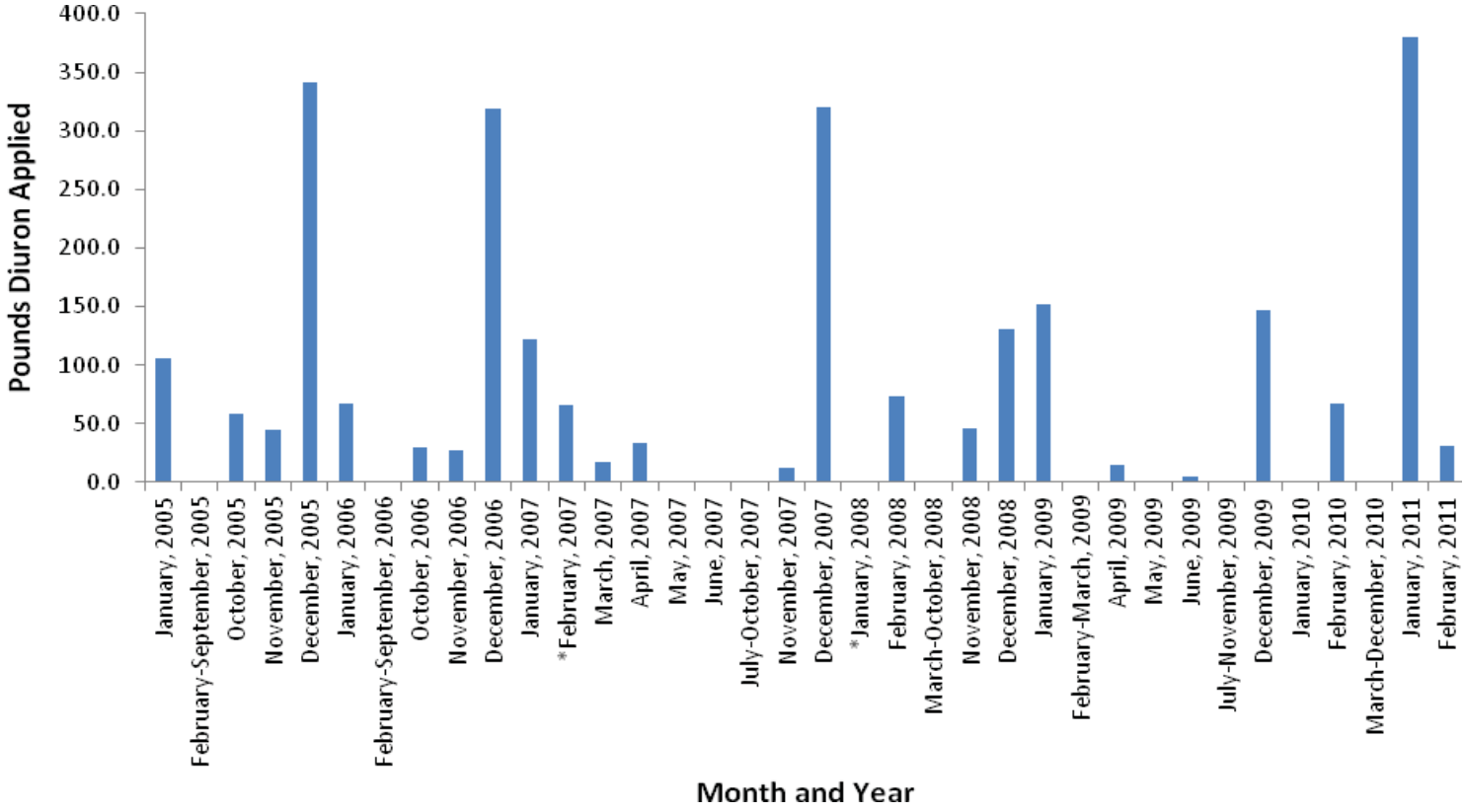


Table VII-13. Highline Canal @ Hwy 99 site subwatershed diuron PUR data (2005-2011).
PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIURON	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DIREX 4L	1300.3
		DUPONT DIREX 4L HERBICIDE	479.9
	CORN (FORAGE - FODDER)	DU PONT KARMEX DF HERBICIDE	0.5
	RIGHTS OF WAY	DU PONT KROVAR I DF HERBICIDE	16.0
	UNCULTIVATED NON-AG AREAS (ALL OR UNSPEC)	DU PONT KROVAR I DF HERBICIDE	20.8
	WALNUT	DIREX 4L	386.7
		DIURON 4L HERBICIDE	165.3
		DREXEL DIURON 4L HERBICIDE	136.5
		DUPONT DIREX 4L HERBICIDE	109.6

ALFALFA -Total Pounds Diuron Applied	**1780.2**
CORN - Total Pounds Diuron Applied	**0.5**
RIGHTS OF WAY - Total Pounds Diuron Applied	**16.0**
UNCULTIVATED NON-AG AREAS - Total Pounds Diuron Applied	**20.8**
WALNUT - Total Pounds Diuron Applied	**798.0**
Total Pounds Diuron Applied (2005-2011)	**2615.6**

Management of diuron in this subwatershed focuses on providing information to the small number of growers whose applications could be associated with the exceedances. The Coalition's Management Plan strategy for addressing diuron exceedances is to include diuron in discussions with individual growers relevant to preventing storm and irrigation discharge to waterways. The Coalition believes that the implementation of improved and additional water management practices have eliminated diuron exceedances in the Highline Canal subwatershed.

Priority D Constituents

The priority D constituents in the Highline Canal @ Hwy 99 subwatershed are water column toxicity to *C. dubia* and *S. capricornutum* and sediment toxicity to *H. azteca*.

C. dubia toxicity

Toxicity to *C. dubia* occurred in May 2005 and in March and September 2006 (Table VII-5). The 2005 toxicity was persistent in the resample a week later; however, this was not the case in any of the 2006 toxicities which were both associated with exceedances of the chlorpyrifos WQTL. Toxicity to *C. dubia* did not occur during 2007 and 2008 during additional MPM and upstream monitoring. There was no MPM for *C. dubia* toxicity scheduled during 2010, but was added in March, May and September 2011 MPM.

The Coalition discussed toxicity to *C. dubia* and associated chlorpyrifos during individual grower meetings, and conducted outreach regarding reducing and/or eliminating spray drift in the subwatershed. If chlorpyrifos can be prevented from entering waterways throughout the irrigation season, the Coalition believes that *C. dubia* toxicity will also be eliminated. The Coalition will conduct MPM in 2012 for *C. dubia* toxicity (March, May, and September).

S. capricornutum toxicity

Water column toxicity to *S. capricornutum* occurred March 2006 and February, April, and May 2008 (Table VII-5). The February 2008 storm toxicity coincided with an exceedance of the copper WQTL.

The Coalition's strategy for eliminating *S. capricornutum* toxicity involves focusing on copper. If copper can be prevented from entering storm water during the winter rainy season and early irrigation season, the Coalition believes that *S. capricornutum* toxicity can also be eliminated. There were no exceedances of the copper WQTL and also no water column toxicity to *S. capricornutum* during 2011 monthly Assessment Monitoring.

H. azteca toxicity

Sediment toxicity to *H. azteca* occurred in the late irrigation months in of 2005 and 2006, and during both the storm and late irrigation seasons of 2008 (Table VII-5). Both the August 2006 and 2008 toxicities were persistent as determined by resampling. Sediment toxicity was monitored as part of MPM during September 2010 and March and September 2011 and no toxicity occurred. In 2012, Highline Canal @ Hwy 99 is scheduled for MPM where sediment will be analyzed during both the March and September sampling events.

Priority E Constituents

The priority E constituents listed under the Highline Canal @ Hwy 99 subwatershed management plan are ammonia, pH, SC, TDS, *E. coli*, and lead.

One *E. coli* exceedance occurred during 2011 monitoring (March). The Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

The Coalition will continue to collect priority E constituent monitoring data for pH and SC during each monitoring event. Total Dissolved Solids, *E.coli* and lead are monitored only during Assessment Monitoring events. Highline Canal @ Hwy 99 is scheduled for Core Monitoring in 2012. These constituents will remain low priority but have been discussed during individual contacts with growers and at annual grower meetings.

Evaluation

Highline Canal @ Hwy 99 is one of the four second high priority site subwatersheds within the ESJWQC and has just completed its second year of focused outreach. The Coalition focused its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments by extending outreach to individual Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Highline Canal subwatershed is to target growers with parcels located adjacent to the waterway and who may discharge or drift into the canal. The Coalition's outreach message continues to be on water retention management practices and minimizing spray drift. Outreach includes grower notification, management practice outreach and education, tracking of management practices, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practice implementations and assessing future planned implementations have been completed and returned representing 100% of targeted growers. The Summary of Implemented Management Practice section of this report summarizes the results of these surveys.

During 2012, Highline Canal @ Hwy 99 is scheduled for Core Monitoring and MPM will continue to take place during months of past exceedances in order to assess water quality improvements that have occurred since the subwatershed became high priority.

In addition to chlorpyrifos, monitoring for copper, diuron, ammonia, SC and TDS resulted in zero exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012, petitioning to remove these constituents from the Highline Canal @ Hwy 99 management plan.

HIGH PRIORITY SITE SUBWATERSHEDS (2011-2013)

VIII. BERENDA SLOUGH ALONG AVE 18 ½

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Selenastrum capricornutum* water column toxicity

Priority E

- DO
- *E. coli*

Description of Berenda Slough along Ave 18 ½ Site Subwatershed

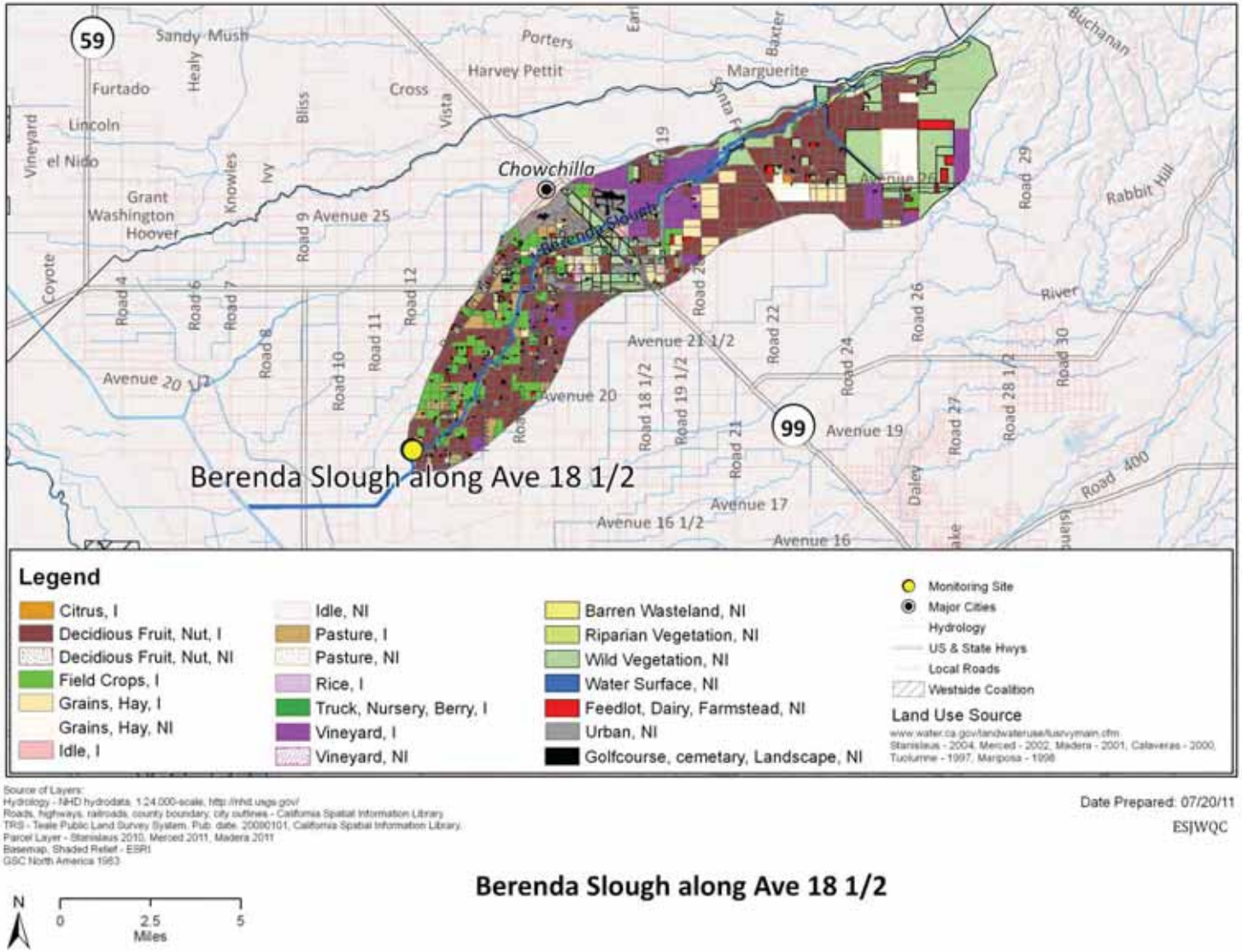
Berenda Slough along Ave 18 ½ (24,452 irrigated acres) –This site subwatershed flows from Berenda Reservoir south and west through northern Madera County and, when flows are sufficient, empties into the Eastside Bypass. However, Berenda Slough typically does not confluence with the Bypass due to insufficient flow. The sampling site is located directly south of the city of Chowchilla. This sampling location also has an upstream site, Berenda Slough @ Rd 19 (Table VIII-1). Primary agriculture in the site subwatershed is orchards and vineyards with small amounts of pasture and field crops (Figure VIII-1).

Table VIII-1. Berenda Slough site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Berenda Slough along Ave 18 1/2*	545XBSAAE	37.0182	-120.3265
Berenda Slough @ Rd 19[U]	545XBSARN	37.1214	-120.2021

[U]Upstream sites
*Original ESJWQC sampling site

Figure VIII-1. Berenda Slough along Ave 18 ½ site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Berenda Slough along Ave 18 ½ first began in May 2006 and continued through the 2008 irrigation season (Table VIII-2). During this period, the site was not sampled for twelve events due to insufficient flows (two 2007 storm events, two 2007 irrigation events, and all 2008 events, Table VIII-2). Under the 2008 MRPP, Berenda Slough along Ave 18 ½ is an Assessment Monitoring location in the Cottonwood Creek @ Rd 20 Zone (Zone 6). The site was not scheduled for Normal Monitoring in 2009 and 2010, but rotated into Assessment Monitoring in 2011 and will continue to be sampled for Assessment Monitoring constituents through 2012. The constituents sampled at this location from 2006 through 2011 are listed in Table VIII-3.

Management Plan Monitoring was scheduled for 2007, 2008, and 2011 (Table VIII-4). Additional MPM occurred in 2007 at Berenda Slough along Ave 18 ½ for chlorpyrifos (July and September) and upstream MPM occurred in 2008 at Berenda Slough @ Rd 19 for chlorpyrifos (July and September) and *S. capricornutum* toxicity (May and July). Berenda Slough became a high priority subwatershed in 2011 and MPM occurred for chlorpyrifos (July and September) and *S. capricornutum* toxicity (May and July).

Berenda Slough is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos.

Table VIII-2. Berenda Slough along Ave 18 ½ site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2006	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2007	Storm	0	2	**2**
	Irrigation	5	3	**8**
2008	Storm	0	2	**2**
	Irrigation	0	6	**6**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	2	0	2
	Storm	1	0	1
	Irrigation	6	0	6
	Fall	3	0	3

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table VIII-3. Berenda Slough along Ave 18 ½ site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate of one are listed.

Method	Analyte	2006	2007		2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
Field and Physical Parameters													
EPA 110.2	Color	5		4									
EPA 160.1	Dissolved Solids	5		4						2	1	6	3
EPA 160.2	Suspended Solids									2	1	6	3
EPA 180.1	Turbidity	5		4						2	1	6	3
EPA 405.1	BOD	1		1									
EPA 415.1	Total Organic Carbon	5		4						2	1	6	3
SM 9223	*E. coli*	5		4						2	1	6	3
Walkley-Black	Total Organic Carbon (sediment)									1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)									1		1	
NA	Dissolved Oxygen	5		7						3	1	6	3
NA	Specific Conductivity	5		7						3	1	6	3
NA	pH	5		7						3	1	6	3
Carbamates													
EPA 8321A	Aldicarb	5		4						2	1	6	3
EPA 8321A	Carbaryl	5		4						2	1	6	3
EPA 8321A	Carbofuran	5		4						2	1	6	3
EPA 8321A	Diuron	5		4						2	1	6	3
EPA 8321A	Linuron	5		4						2	1	6	3
EPA 8321A	Methiocarb	5		4						2	1	6	3
EPA 8321A	Methomyl	5		4						2	1	6	3
EPA 8321A	Oxamyl	5		4						2	1	6	3
Organochlorines													
EPA 8081A	DDD(p,p')	5		4						2	1	4	
EPA 8081A	DDE(p,p')	5		4						2	1	4	
EPA 8081A	DDT(p,p')	5		4						2	1	4	
EPA 8081A	Dicofol	5		4						2	1	4	
EPA 8081A	Dieldrin	5		4						2	1	4	
EPA 8081A	Endrin	5		4						2	1	4	
EPA 8081A	Methoxychlor	5		4						2	1	4	
Group A Pesticides													
EPA 8081A	Aldrin									2	1	4	
EPA 8081A	Chlordane									2	1	4	
EPA 8081A	Endosulfan I									2	1	4	
EPA 8081A	Endosulfan II									2	1	4	
EPA 8081A	HCH, alpha									2	1	4	
EPA 8081A	HCH, beta									2	1	4	
EPA 8081A	HCH, delta									2	1	4	
EPA 8081A	HCH, gamma									2	1	4	
EPA 8081A	Heptachlor									2	1	4	
EPA 8081A	Heptachlor epoxide									2	1	4	
EPA 8081A	Toxaphene									2	1	4	

Method	Analyte	2006	2007		2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
Organophosphates													
EPA 8141A	Azinphos methyl	5		5						2	1	6	3
EPA 8141A	Chlorpyrifos	5		5						2	1	6	3
EPA 8141A	Demeton-s									2	1	6	3
EPA 8141A	Diazinon	5		5						2	1	6	3
EPA 8141A	Dichlorvos									2	1	6	3
EPA 8141A	Dimethoate	5		5						2	1	6	3
EPA 8141A	Disulfoton	5		5						2	1	6	3
EPA 8141A	Malathion	5		5						2	1	6	3
EPA 8321A	Methamidophos	5		4						2	1	6	3
EPA 8141A	Methidathion	5		5						2	1	6	3
EPA 8141A	Molinate	5		5									
EPA 8141A	Parathion, Methyl	5		5						2	1	6	3
EPA 8141A	Phorate	5		5						2	1	6	3
EPA 8141A	Phosmet	5		5						2	1	6	3
EPA 8141A	Thiobencarb	5		5									
EPA 8141A	Trifluralin									2	1	6	3
Pyrethroids													
EPA 8081A	Bifenthrin	5		4									
EPA 8081A	Cyfluthrin, total	5		4									
EPA 8081A	Cyhalothrin, lambda, total	5		4									
EPA 8081A	Cypermethrin, total	5		4									
EPA 8081A	Esfenvalerate/ Fenvalerate, total	5		4									
EPA 8081A	Permethrin, total	5		4									
Triazines													
EPA 547M	Glyphosate	5		4						2		4	
EPA 549.2M	Paraquat dichloride	5		4						2		4	
EPA 619	Atrazine	5		4						2	1	6	3
EPA 619	Cyanazine	5		4						2	1	6	3
EPA 619	Simazine	5		4						2	1	6	3
Metals (Total)													
EPA 200.8	Arsenic									2	1	5	
EPA 200.8	Boron									2	1	6	3
EPA 200.8	Cadmium									2	1	5	
EPA 200.8	Copper									2	1	6	3
EPA 200.8	Lead									2	1	5	
EPA 200.8	Molybdenum									2	1	5	
EPA 200.8	Nickel									2	1	6	3
EPA 200.8	Selenium									2	1	6	3
EPA 200.8	Zinc									2	1	6	3
Metals (Dissolved)													
EPA 200.8	Cadmium									2	1	5	
EPA 200.8	Copper									2	1	6	3
EPA 200.8	Lead									2	1	5	

Method	Analyte	2006	2007		2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
EPA 200.8	Nickel									2	1	6	3
EPA 200.8	Zinc									2	1	6	3
Nutrients													
SM 2340 C	Hardness as CaCO3									2	1	6	3
EPA 350.2	Ammonia as N									2	1	6	3
EPA 351.3	Nitrogen, Total Kjeldahl									2	1	6	3
EPA 353.2	Nitrate + Nitrite as N									2	1	6	3
EPA 365.2	OrthoPhosphate as P									2	1	6	3
EPA 365.2	Phosphate as P									2	1	6	3
Toxicity													
EPA 821/R-02-012	*Ceriodaphnia dubia*	6		4						2	1	6	3
EPA 821/R-02-012	*Pimephales promelas*	5		4						2	1	6	3
EPA 821/R-02-013	*Selenastrum capricornutum*	5		6						2	1	6	3
EPA 600/R-99-064	*Hyalella azteca*	1		1						1		1	

*Site not sampled during the 2008 fall season, and 2009 and 2010 sampling years.

Table VIII-4. Berenda Slough site subwatershed Management Plan Monitoring schedule (2007-2011).

Site Name	Sample Date	Monitoring Type	Chlorpyrifos	*S. capricornutum*
Berenda Slough along Ave 18 ½	24-Jul-07	A	X	
Berenda Slough along Ave 18 ½	18-Sep-07	A	X	
Berenda Slough at Rd 19	27-May-08	U		X
Berenda Slough at Rd 19	29-July-08	U	X	X
Berenda Slough at Rd 19	30-Sep-08	U	X	
Berenda Slough along Ave 18 ½	17-May-11	MPM		X
Berenda Slough along Ave 18 ½	19-Jul-11	MPM	X	X
Berenda Slough along Ave 18 ½	13-Sep-11	MPM	X	

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from Berenda Slough from 2006 through 2011 have exceeded the WQTLs for field parameters, *E. coli*, and pesticides as well as water column and sediment toxicity. Exceedances of WQTLs include DO (11), *E. coli* (7), copper (11), chlorpyrifos (4) and diuron (1). Toxicity to *C. dubia* (1) and to *S. capricornutum* (2) have occurred (Table VIII-5). During 2011, there were exceedances of DO (2), *E. coli* (5), copper (11) and chlorpyrifos (1).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Berenda Slough site subwatershed are chlorpyrifos (A/B), copper (C) and *S. capricornutum* toxicity (D).

Table VIII-5. Berenda Slough site subwatershed exceedances (2006-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	*E. coli*, >235 MPN/100 mL	Copper Dissolved[1], µg/L	Chlorpyrifos, >0.015 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)
Berenda Slough along Ave 18 1/2	Irrigation	5/16/2006							
Berenda Slough along Ave 18 1/2	Irrigation	6/13/2006	5.49	460					
Berenda Slough along Ave 18 1/2	Irrigation	7/11/2006	6.54			0.043			
Berenda Slough along Ave 18 1/2	Irrigation	8/8/2006							
Berenda Slough along Ave 18 1/2	Irrigation	9/12/2006				0.14		40	
Berenda Slough along Ave 18 1/2	Irrigation	5/29/2007	1.75				3.4		78
Berenda Slough along Ave 18 1/2	Irrigation	6/5/2007	3.07						
Berenda Slough along Ave 18 1/2	Irrigation	6/26/2007	5.20	390					
Berenda Slough along Ave 18 1/2	Irrigation	7/24/2007	6.37			0.028			12
Berenda Slough along Ave 18 1/2	Irrigation	7/31/2007	4.72						70
Berenda Slough along Ave 18 1/2	Irrigation	8/21/2007	6.13						
Berenda Slough @ Rd 19	*Irrigation*	*7/29/2008*	*1.10*						
Berenda Slough along Ave 18 1/2	Winter	1/18/2011		520	6.8 (2.65)				
Berenda Slough along Ave 18 1/2	Storm	2/17/2011		400	3.6 (1.87)				
Berenda Slough along Ave 18 1/2	Winter	3/17/2011	6.72						
Berenda Slough along Ave 18 1/2	Irrigation	4/19/2011			3.3 (1.36)	0.021			
Berenda Slough along Ave 18 1/2	Irrigation	5/17/2011			3.8 (1.57)				
Berenda Slough along Ave 18 1/2	Irrigation	6/21/2011			3.6 (1.46)				
Berenda Slough along Ave 18 1/2	Irrigation	7/19/2011			2.6 (1.03)				
Berenda Slough along Ave 18 1/2	Irrigation	8/16/2011		290	2.3 (1.25)				
Berenda Slough along Ave 18 1/2	Irrigation	9/13/2011		370	2.1 (1.46)				
Berenda Slough along Ave 18 1/2	Fall	10/11/2011	5.69	1600	4.2 (1.03)				
Berenda Slough along Ave 18 1/2	Fall	11/8/2011			3.1 (2.46)				
Berenda Slough along Ave 18 1/2	Fall	12/6/2011			3.7 (3.38)				
		Constituent Priority	**E**	**E**	**C**	**A/B**	**NP**	**NP**	**D**

[1]Dissolved metals not analyzed until October 2008; WQTL variable based on hardness.

NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

Table VIII-6 lists all monitoring results for high priority management plan constituents in the Berenda Slough along Ave 18 ½ subwatershed, which includes chlorpyrifos, copper, and *S. capricornutum* toxicity.

Chlorpyrifos exceeded the WQTL twice during Normal Monitoring in 2006 (July and September) and was listed on the Berenda Slough management plan. Additional MPM for chlorpyrifos (July and September) as well as Normal Monitoring occurred in 2007; chlorpyrifos exceeded the WQTL during July Normal Monitoring but was not detected a week later during additional MPM. Upstream MPM for chlorpyrifos occurred during 2008 (July and September) at Berenda Slough @ Rd 19, and the pesticide was not detected. The Berenda Slough along Ave 18 ½ site was dry during all 2008 Normal Monitoring events. The subwatershed was not sampled again until Assessment Monitoring in 2011, during which chlorpyrifos exceedances occurred during April (Table VIII-6).

Metals were not sampled at Berenda Slough until Assessment Monitoring in 2011. Copper has exceeded the WQTL 11 times during 2011 (every month except March, Table VIII-5). Consequently, copper has been added to the Berenda Slough management plan.

Toxicity to *S. capricornutum* was added to the Berenda Slough management plan following two toxicities in 2007. Upstream MPM in 2008 (May and July) resulted in no toxicity, and the Berenda Slough along Ave 18 ½ site was dry during 2008 events (Table VIII-6). Assessment Monitoring during 2011 also resulted in no *S. capricornutum* toxicity.

Since Berenda Slough along Ave 18 ½ is scheduled for Assessment Monitoring during 2012, all high priority management plan constituents will be sampled monthly in 2012.

Table VIII-6. Berenda Slough site subwatershed monitoring results for high priority constituents (2007-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007 NM (along Ave 18 ½)	Date	NA	NA	NA	4/24/2007	5/29/2007	6/26/2007	7/24/2007	8/21/2007	9/18/2007	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	Dry	<0.003	<0.003	**0.028**	<0.003	Dry	NA	NA	NA
2007 MPM A (along Ave 18 ½)	Date	NA	NA	NA	NA	NA	NA	7/31/2007	NA	9/25/2007	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	<0.003	NA	Dry	NA	NA	NA
2008 NM (along Ave 18 ½)	Date	NA	NA	NA	4/29/2008	5/27/2008	6/24/2008	7/29/2008	8/26/2008	9/30/2008	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	Dry	Dry	Dry	Dry	Dry	Dry	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	Dry	Dry	Dry	Dry	Dry	Dry	NA	NA	NA
2008 MPM US (@ Rd 19)	Date	NA	NA	NA	NA	5/27/2008	NA	7/29/2008	NA	9/30/2008	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	<0.003	NA	Dry	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	NA	Dry	NA	283	NA	NA	NA	NA	NA
2011 NM & MPM (along Ave 18 ½)	Date	1/18/11	2/17/11	3/15/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11	10/11/11	11/8/11	12/6/11
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	**0.021**	<0.003	<0.003	<0.003*	<0.003	<0.003*	<0.003	<0.003	<0.003
	S. capricornutum toxicity (% Control)	526	307	914	530	794*	788	443*	917	651	566	3796	442

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 only.
*NM & MPM occurred during this date for this constituent.

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table VIII-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table VIII-7. Berenda Slough site subwatershed instantaneous load calculations for chlorpyrifos and copper. Sorted by analyte and date.

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Berenda Slough along Ave 18 1/2	Chlorpyrifos	07/11/06	0	0.043	0
Berenda Slough along Ave 18 1/2	Chlorpyrifos	09/12/06	18.54	0.14	73.50
Berenda Slough along Ave 18 1/2	Chlorpyrifos	07/24/07	0	0.028	0
Berenda Slough along Ave 18 1/2	Copper	12/06/11	0	4.1	0
Berenda Slough along Ave 18 1/2*	Copper	12/06/11	0	4.3	0
Berenda Slough along Ave 18 1/2*	Copper (D)	12/06/11	0	3.6	0
Berenda Slough along Ave 18 1/2	Copper (D)	12/06/11	0	3.7	0

*Field duplicate

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. During 2007 and 2008, the Coalition conducted additional and upstream MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. Assessment Monitoring occurred at the site during 2011. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with pesticide applications. From these actions, the Coalition derived an outreach strategy, which is detailed in the following sections.

In the Coalition's approved Management Plan, the Berenda Slough along Ave 18 ½ subwatershed is a high priority subwatershed as of 2011 and will remain so through 2013. The Coalition will actively engage in grower outreach and education to address the Berenda Slough management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Grower meetings with targeted members began in early 2011 and continued throughout the 2011 irrigation season to inform growers about management practices as well as to assess current and expected future implementation of additional management practices. Follow up with the targeted members is scheduled to occur during 2012 to determine if additional management practices were implemented

and if any are planned to be implemented in 2013. Management Plan Monitoring will continue through 2013 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent for the Berenda Slough subwatershed.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded four times in the Berenda Slough subwatershed during 2006 (July and September), 2007 (July) and 2011 (April). The September 2006 chlorpyrifos exceedance was associated with toxicity to *C. dubia*.

Orchards and vineyards are the primary crops in the Berenda Slough subwatershed. Chlorpyrifos can be applied throughout the irrigation season to orchards and vineyards, but use often peaks during the latter summer months when chlorpyrifos is applied to almond orchards during the hull split period.

To determine the most appropriate strategy for outreach, the Coalition reviewed PUR data for the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and the acres treated within the subwatershed. The greatest amount of chlorpyrifos use occurred in 2006 (17,521 lbs AI) and use in the subwatershed has significantly decreased since; 3,150 lbs AI were applied in 2010 and PUR data available to date indicate applications in 2011 will most likely total to a similar amount (complete 2011 PUR data only available through June 2011). The greatest chlorpyrifos use consistently occurs during the irrigation season, particularly in the months of May through August, which coincides with the months of past exceedances (Table VIII-8, Figure VIII-2).

The Coalition also uses PUR data to determine which crops received the most chlorpyrifos applications. The largest amount of chlorpyrifos applied from 2006 through 2010 was to almonds (38,690 lbs AI) followed by grapes (1,238 lbs AI). The most common product containing chlorpyrifos used within this subwatershed was Lorsban (Table VIII-9).

Table VIII-8. Berenda Slough along Ave 18 ½ site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2006-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2006	1	109.7	55.0
April, 2006	4	529.7	290.0
May, 2006	20	4291.0	2326.6
June, 2006	12	765.2	469.5
July, 2006	62	7314.2	3736.0
August, 2006	18	4411.6	2240.0
September, 2006	4	99.8	145.0
January, 2007	1	562.9	320.0
March, 2007	8	55.5	253.6

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
May, 2007	9	2305.1	1144.0
July, 2007	30	3392.5	1750.7
August, 2007	3	589.0	298.0
September, 2007	1	38.4	38.0
March, 2008	4	889.0	477.8
April, 2008	3	320.8	160.0
May, 2008	6	1619.8	852.0
June, 2008	4	343.5	347.1
July, 2008	15	533.1	448.0
August, 2008	1	37.4	37.0
March, 2009	1	13.7	6.8
April, 2009	2	24.0	10.0
May, 2009	6	1616.8	801.0
June, 2009	11	694.9	344.0
July, 2009	17	2406.2	1546.9
August, 2009	16	2598.4	1436.8
September, 2009	5	57.6	228.0
October, 2009	3	437.6	233.0
February, 2010	1	223.7	119.1
March, 2010	8	94.4	272.7
April, 2010	3	26.2	44.0
May, 2010	6	2080.8	1064.0
June, 2010	4	672.6	367.5
July, 2010	8	674.9	856.0
August, 2010	4	210.5	238.5
October, 2010	2	283.6	151.0
November, 2010	1	69.5	37.0
February, 2011	1	223.7	119.1
March, 2011	3	30.0	145.0
April, 2011	1	7.8	30.8
May, 2011	5	1057.3	542.0
June, 2011	2	464.6	230.0
Summaries by Year			
2006 Total	121	17521.2	9262.1
2007 Total	52	6943.3	3804.3
2008 Total	33	3743.6	2321.9
2009 Total	61	7849.2	4606.5
2010 Total	37	4336.1	3149.9
2011 Total	12	1783.4	1066.9
Total	**316**	**42176.8**	**24211.5**

Figure VIII-2. Berenda Slough along Ave 18 ½ site subwatershed lbs chlorpyrifos applied by month (2006-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

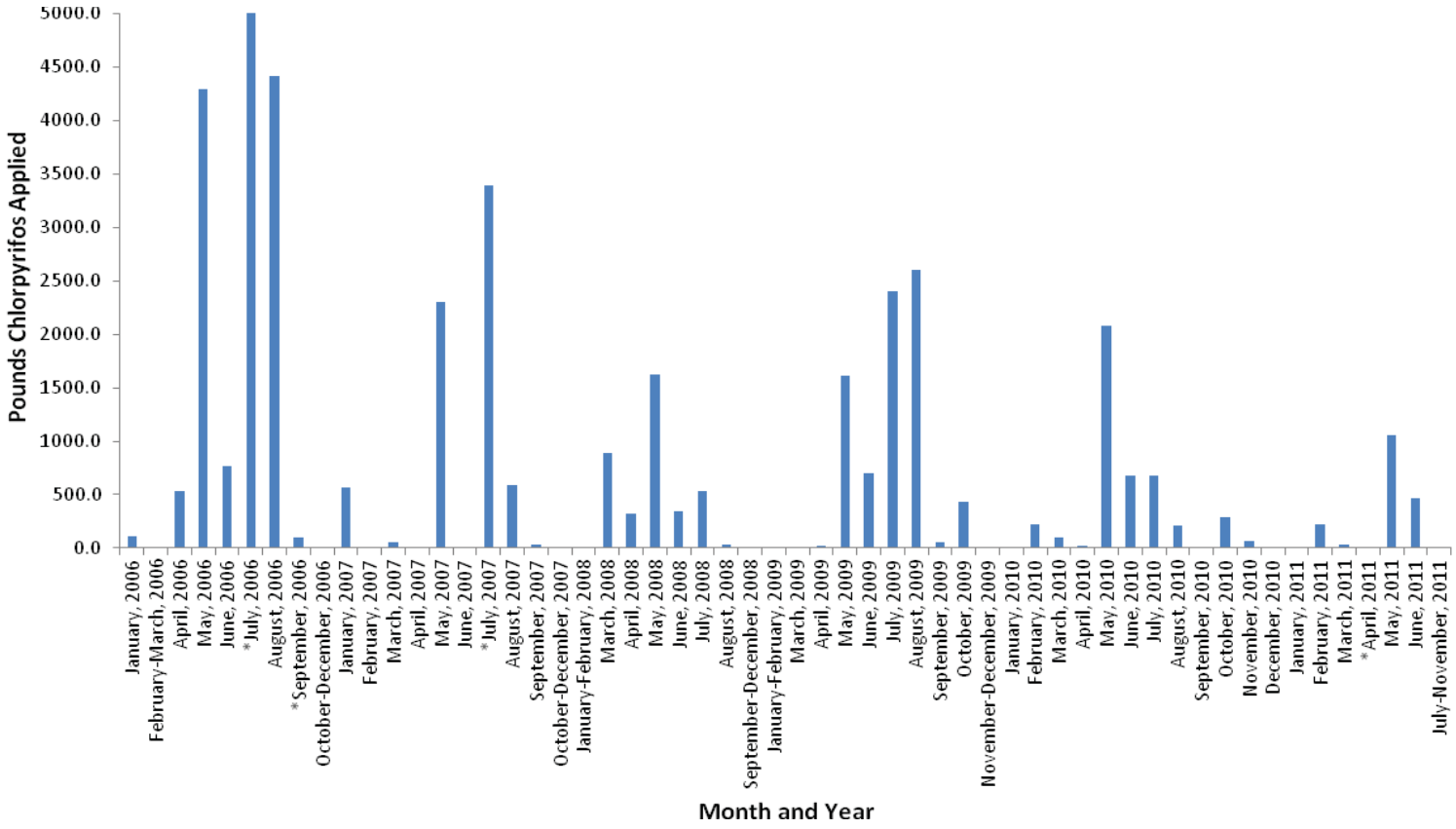


Table VIII-9. Berenda Slough along Ave 18 ½ site subwatershed chlorpyrifos PUR data (2006-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs Al Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	GOVERN 4E INSECTICIDE	91.9
		LOCK-ON INSECTICIDE	290.8
		NUFOS 4E	44.7
		WARHAWK	141.9
	ALMOND	CHLORPYRIFOS 4E AG	703.6
		GOVERN 4E INSECTICIDE	21150.5
		LORSBAN 4E INSECTICIDE	224.6
		LORSBAN 4E-HF	2714.8
		LORSBAN ADVANCED	149.5
		LORSBAN-4E	6757.4
		NUFOS 4E	2764.5
		WARHAWK	2593.2
		WHIRLWIND	1631.7
	CORN (FORAGE - FODDER)	GOVERN 4E INSECTICIDE	148.1
		HATCHET	37.4
		LORSBAN 15G GRANULAR INSECTICIDE	214.3
		LORSBAN-4E	122.1
	COTTON (GENERAL)	GOVERN 4E INSECTICIDE	65.7
	GRAPES (WINE)	LORSBAN ADVANCED	1238.1
	PRUNE	NUFOS 4E	27.5
		WHIRLWIND	10.7
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN 4E-HF	1036.8
		LORSBAN ADVANCED	16.9

ALFALFA-Total Pounds Chlorpyrifos Applied	**569.3**
ALMOND-Total Pounds Chlorpyrifos Applied	**38690.0**
CORN-Total Pounds Chlorpyrifos Applied	**521.8**
COTTON-Total Pounds Chlorpyrifos Applied	**65.7**
GRAPES -Total Pounds Chlorpyrifos Applied	**1238.1**
PRUNE-Total Pounds Chlorpyrifos Applied	**38.2**
WALNUT-Total Pounds Chlorpyrifos Applied	**1053.7**
Total Pounds Chlorpyrifos Applied (2006-2011)	**42176.8**

The Coalition noted in the 2008 Management Plan that the chlorpyrifos concentrations found in Berenda Slough were most likely the result of tailwater transporting chlorpyrifos to the slough. Because the chlorpyrifos concentrations were well above the WQTL, it is unlikely the exceedances were the result of spray drift. Furthermore, as discussed above, PUR data indicated large numbers of applications and large amounts of active ingredient were applied throughout the subwatershed prior to the 2006 and 2007 exceedances. Most likely, several growers contributed to the exceedances in the slough; therefore, the Coalition should focus outreach to growers applying or who have previously applied chlorpyrifos.

Monitoring results and PUR data indicate that management of chlorpyrifos in this subwatershed should direct focused outreach to determine if irrigation return flows are managed properly, especially growers

with direct drainage. The Coalition advised row crop farmers of methods to better manage their irrigation tailwater and storm water runoff, whereas outreach efforts to orchard and vineyard growers has focused mainly on encouraging management practices to reduce spray drift and improve orchard and vineyard water management.

Since 2007, general Coalition outreach included grower meetings and the mailing/distribution of information. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142). Focused outreach is directed at growers whose parcels are in the direct drainage area of the subwatershed and who have applied chlorpyrifos. From these criteria, the Coalition compiled a targeted list of growers.

The Coalition completed individual meetings with targeted growers in the third priority subwatersheds during the fall of 2011. Although meetings focused mainly on chlorpyrifos exceedances, all water quality results are reviewed and discussed including copper, *S. capricornutum* toxicity, *E. coli* and DO. The Coalition contacted 19 members accounting for 4,103 acres of targeted direct drainage.

Grower surveys completed at the meetings documenting members' current practices and indicating which recommended practices growers anticipate implementing in the upcoming years were compiled and assessed by the Coalition in the Summary of Implemented Management Practices section of this report. The Coalition is hopeful growers contacted during the winter of 2011 were able to implement recommended practices during the 2011 irrigation season, and growers contacted during or after the 2011 irrigation season will be able to implement recommended practices during the 2012 irrigation season. Follow up meetings with targeted growers will occur in the winter and/or spring of 2012 (depending on the timing of the initial contact with the grower) to determine what additional management practices were implemented in the subwatershed.

Assessment Monitoring is scheduled to continue at Berenda Slough along Ave 18 ½ through 2012 and MPM during months when exceedances occurred historically will be scheduled for 2013. These data will enable the Coalition evaluate improvements in water quality as recommended management practice implementation occurs.

Priority C Constituents

Copper is the only priority C constituent under the Berenda Slough along Ave 18 ½ management plan.

Copper

Eleven exceedances of the copper WQTL occurred in Berenda Slough during 2011 Assessment Monitoring.

Copper is an algaecide and fungicide often applied to orchards and vineyards. Copper can be applied throughout the year but its peak application periods are prior to and during the dormant season and early in the irrigation season.

The Coalition reviewed PUR data for the number of monthly copper applications, pounds of active ingredient applied, and acres treated (Table VIII -10, Figure VIII-3). The greatest amount of copper applied was in 2007 (24,485 lbs AI) and copper use in the subwatershed has since declined and fewer acres have been treated. Peak use of copper in the subwatershed is typically in January with numerous applications occurring and no or very few applications typically occur after April. However, 2011 was an exception and relatively modest amounts of copper were also applied in June. Copper was monitored for the first time in Berenda Slough during 2011 and according to PUR data available to date, an exceedance occurred in every month copper was applied (no applications nor exceedance in May 2011; complete PUR data only available through June 2011). Yet, the Coalition believes copper use in 2011 will be relatively similar during the summer and fall months as use in years past and anticipates copper exceedances that occurred during July through December 2011 will not coincide with copper applications during the same month. Therefore, copper exceedances are not necessarily related to copper applications.

The Coalition also uses PUR data to assess which crops received the most applications of copper from 2004 to 2011. By far, the most copper applications occur to almond orchards in Berenda Slough (64,966 lbs AI), followed by to grapes (11,105 lbs AI) and walnuts (8,805 lbs AI; Table VIII-11). The most common product used within this subwatershed containing copper was Kocide (Table VIII-11).

Table VIII-10. Berenda Slough along Ave 18 ½ site subwatershed copper applications, lbs AI applied, and acres treated by month (2006-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2006	61	16187.1	4871.0
February, 2006	2	249.8	49.0
March, 2006	9	3267.1	1964.2
April, 2006	25	3661.7	3009.6
June, 2006	1	28.5	9.5
November, 2006	1	122.7	40.0
December, 2006	1	968.4	300.0
January, 2007	24	5479.8	1412.0
March, 2007	11	1638.9	1617.6
April, 2007	9	1948.0	1228.0
May, 2007	1	28.2	35.0
June, 2007	1	28.5	9.5
November, 2007	1	103.3	40.0
January, 2008	45	10010.9	3222.5
February, 2008	19	4123.2	1021.0
March, 2008	4	1209.1	393.0
April, 2008	10	1331.8	951.4

Month/Year	Number of Copper Applications	Pounds of Al Applied	Acres Treated
January, 2009	66	8896.7	4075.1
February, 2009	7	712.8	403.5
April, 2009	12	982.9	1105.0
November, 2009	1	107.6	40.0
January, 2010	36	6712.4	2258.0
February, 2010	2	682.1	249.8
March, 2010	6	921.9	530.0
April, 2010	14	2167.8	1234.0
May, 2010	1	39.6	86.0
December, 2010	1	64.5	35.0
January, 2011	56	9769.6	2887.3
February, 2011	12	898.2	531.0
March, 2011	8	498.8	466.0
April, 2011	6	1347.4	1202.6
June, 2011	2	1251.4	220.0
Summaries by Year			
2006 Total	100	24485.2	10243.3
2007 Total	47	9226.8	4342.1
2008 Total	78	16674.9	5588.0
2009 Total	86	10700.0	5623.6
2010 Total	60	10588.5	4392.8
2011 Total	84	13765.4	5306.9
Total	**455**	**85440.8**	**35496.7**

Figure VIII-3. Berenda Slough along Ave 18 ½ site subwatershed lbs copper applied by month (2006-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

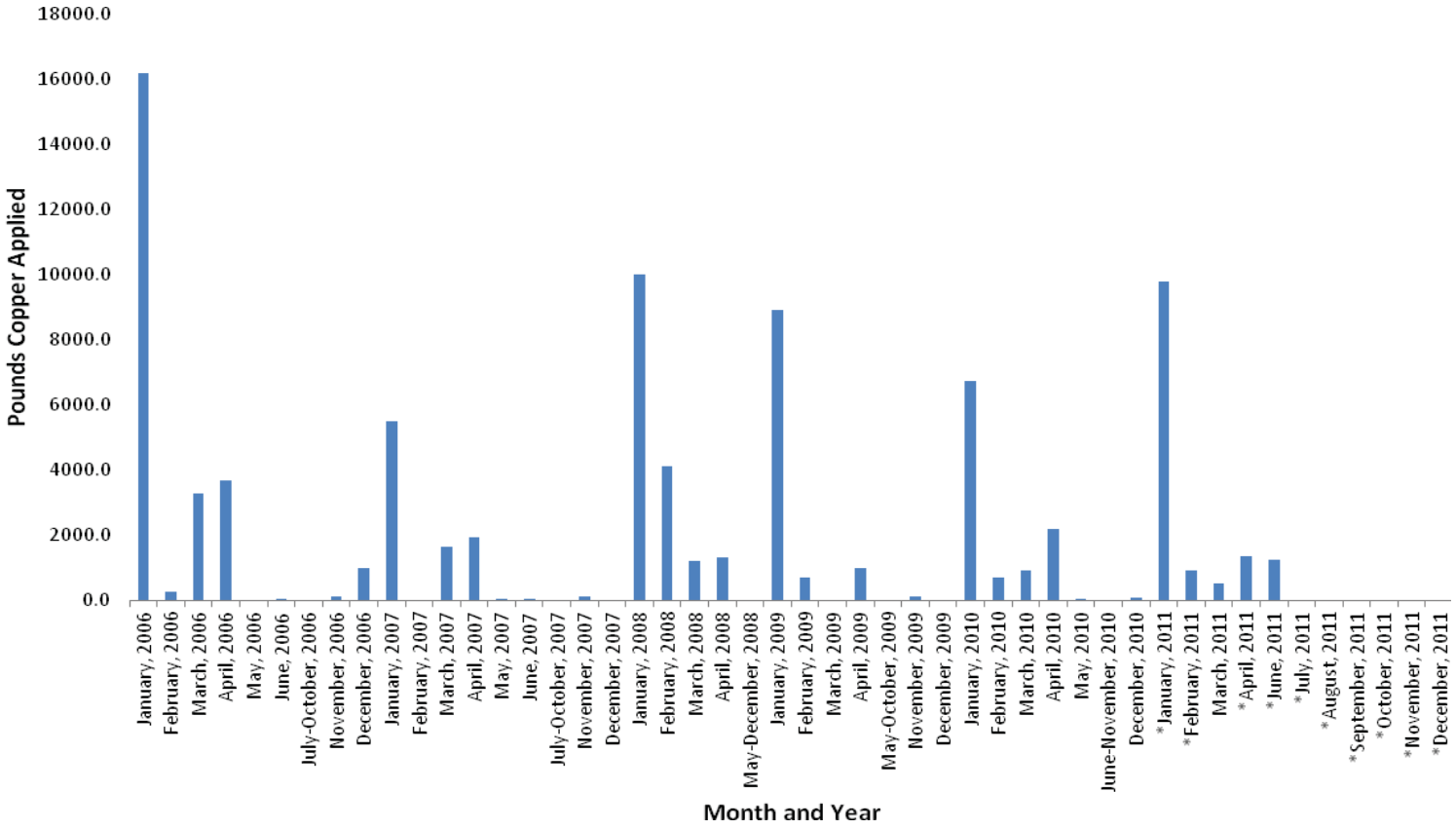


Table VIII-11. Berenda Slough along Ave 18 ½ subwatershed copper PUR data (2006-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs Al Applied
COPPER	ALMOND	BADGE X2	90.3
		CHAMP DP	831.7
		CHAMP DRY PRILL	2526.6
		CHAMP FORMULA 2 FLOWABLE	20725.7
		CUPROFIX ULTRA 40 DISPERSS	1061.5
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	54.2
		DUPONT KOCIDE 101 FUNGICIDE/BACTERICIDE	18.3
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	14844.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	8537.4
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	337.7
		KOCIDE 101	5017.7
		KOCIDE 2000	3326.6
		KOCIDE 2000 T/N/O	516.5
		KOCIDE DF	147.4
		NORDOX	225.6
		NORDOX 75 WG	577.2
		NU-COP 50 WP	326.5
		NU-COP 50DF	308.0
		NU-COP HB	5493.2
	GRAPE (RAISIN)	CUPROFIX ULTRA 40 DISPERSS	209.0
	GRAPES	CUPROFIX ULTRA 40 DISPERSS	28.8
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	40.4
		KOCIDE 2000	71.3
		NU-COP 50DF	77.0
	GRAPES (WINE)	BRITZ COPPER SULFUR 15-25 DUST	28.5
		CHAMP FORMULA 2 FLOWABLE	880.1
		CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	28.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	253.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1086.4
		KENTAN DF	2555.7
		KOCIDE 101	224.8
		KOCIDE 2000	3722.6
		KOCIDE 606 FLOWABLE AGRICULTURAL FUNGICIDE	276.0
		KOCIDE DF	782.8
		NORDOX 75 WG	840.1
	ORANGE (ALL OR UNSPEC)	KOCIDE 2000	456.2
		KOCIDE 2000 T/N/O	107.6
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CHAMP FORMULA 2 FLOWABLE	1255.0
		COPPER-COUNT-N	1068.6
		CUPROFIX ULTRA 40 DISPERSS	2400.3
		KOCIDE 2000	3371.1
		KOCIDE 2000 T/N/O	710.2

ALMOND-Total Pounds Copper Applied	**64966.3**
GRAPES-Total Pounds Copper Applied	**11105.4**
ORANGE-Total Pounds Copper Applied	**563.8**
WALNUT-Total Pounds Copper Applied	**8805.2**
Total Pounds Copper Applied (2006-2011)	**85440.8**

Given the numerous applications of copper that occur in the Berenda Slough subwatershed throughout the year, the Coalition believes it should target outreach to growers with the greatest potential to impact water quality (i.e. with direct drainage) and encourages growers to improve irrigation and storm water management. In 2010, the Coalition compiled a list of targeted growers whose parcels were noted to have the potential to drain to the slough and who applied or may apply constituents of concern, which, at the time, was only chlorpyrifos. Copper management was initially planned to be included in discussions with growers as it could potentially relate to *S. capricornutum* toxicity; however, the Coalition was unaware of copper exceedances and therefore directed outreach to be focused toward preventing chlorpyrifos from entering the waterways. Upon reviewing the first few months of Assessment Monitoring results, the Coalition began to highlight the recent copper exceedances in its discussions with growers. Management practices recommended to prevent chlorpyrifos from entering the slough are also applicable in preventing the offsite movement of copper. In addition, the Coalition reviewed parcels with the potential to drain and found that the targeted grower list included all growers who applied copper in the past.

Priority D Constituents

Water column toxicity to *S. capricornutum* is the only priority D constituent under the Berenda Slough along Ave 18 ½ management plan.

S. capricornutum toxicity

Toxicity to *S. capricornutum* has occurred twice in the subwatershed, during 2007 (May and July). An exceedance of diuron was found to be associated with the May toxicity, but there were no exceedances of diuron associated with the July toxicity. The July toxicity was persistent in the resample that occurred a week later.

Samples were not analyzed for metalsin the Berenda Slough subwatershed until Assessment Monitoring in 2011; hence no copper data for any of the 2007 (May or July) sampling events was collected. The July 2007 TIE indicated that a cationic metal was the cause of toxicity. Of note, despite all the copper exceedances during 2011, toxicity to *S. capricornutum* did not occur.

The Coalition believes managing irrigation return flows and storm water from transporting copper and/or herbicides to the slough should be effective in eliminating *S. capricornutum* toxicity. The Coalition plans to continue outreach efforts as explained above to address the toxicity.

Priority E Constituents

The priority E constituents listed under the Berenda Slough along Ave 18 ½ management plan are DO and *E. coli*.

Although these constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and/or MPM. Dissolved oxygen is a field parameter that will be

sampled during every event, Assessment Monitoring or MPM. *E. coli* will be monitored during Assessment Monitoring which will continue through 2012 and is next scheduled for 2017. The priority E constituents are discussed during individual contacts and will continue to be discussed at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Berenda Slough along Ave 18 ½ is a third priority site subwatershed and is in its second year of focused outreach (2011-2013).

The Coalition's strategy for the Berenda Slough subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows are managed properly. The Coalition targeted growers whose agricultural practices may result in the discharge or drift of pesticides into the waterway and who applied chlorpyrifos and copper. Outreach includes grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practice implementations and assessing future planned implementations were completed and returned to the Coalition representing 100% of targeted growers. The Summary of Implemented Management Practices section of this report summarizes the results of these contacts. The Coalition plans to conduct follow up contacts with all targeted growers to assess the implementation of new management practices. The Coalition will report on newly implemented management practices in the 2013 MPUR.

In 2012, Assessment Monitoring is scheduled to continue and all management plan constituents will be analyzed monthly at that time. Management Plan Monitoring will resume in 2013.

IX. DRY CREEK @ RD 18

Management Plan Constituents

Priority A/B

- Chlorpyrifos
- Diazinon

Priority C

- Copper
- Diuron

Priority D

- *Hyalella azteca* sediment toxicity
- *Selenastrum capricornutum* water column

Priority E

- Dissolved Oxygen
- *E. coli*
- Lead
- pH

Description of Dry Creek @ Road 18 Site Subwatershed

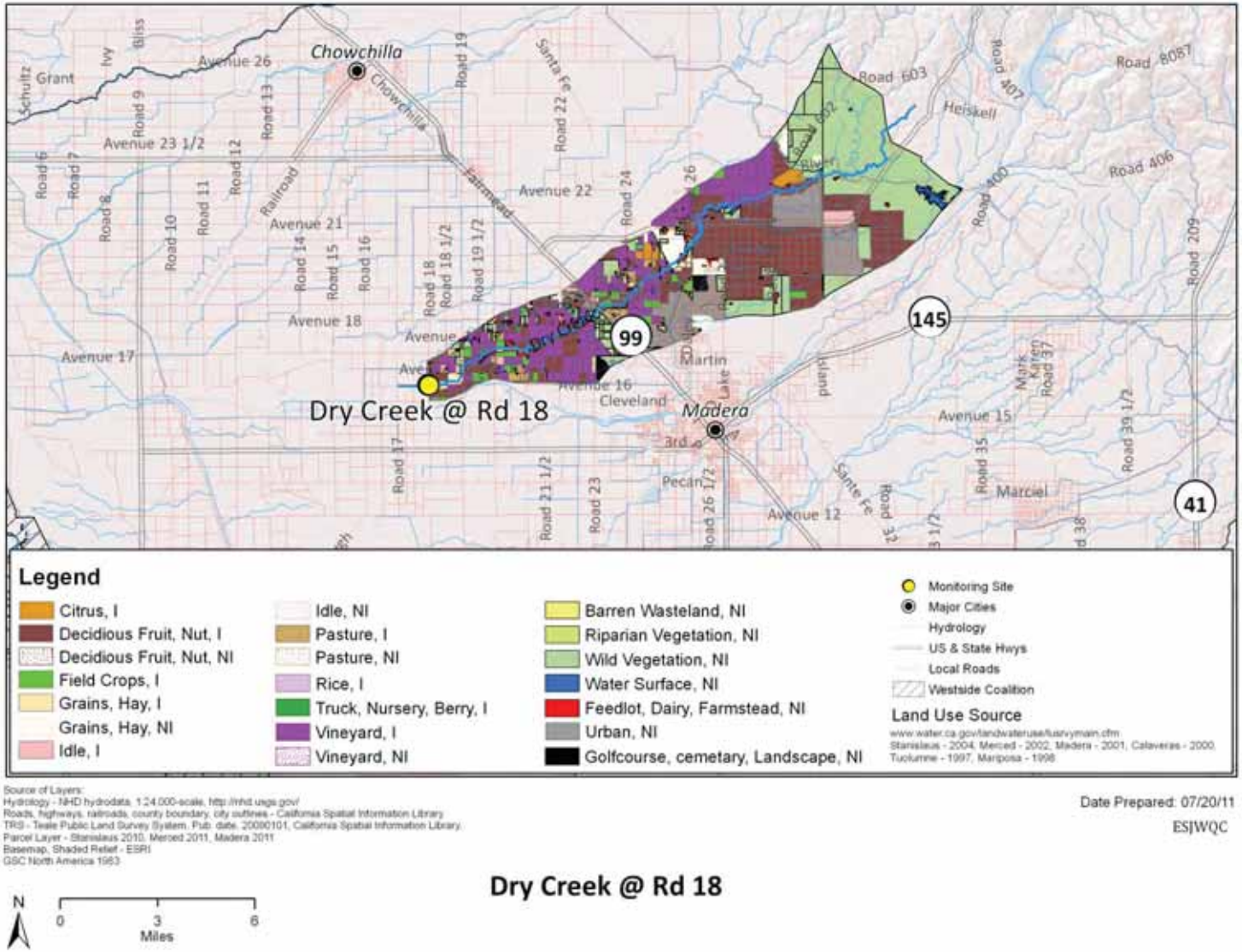
Dry Creek @ Rd 18 (20,779 irrigated acres) –Water that flows into this site subwatershed originates in the Sierra foothills, flows to the north of the city of Madera and eventually drains to the San Joaquin River through various channels and irrigation ditches. The subwatershed contains two upstream locations (Table IX-1). Deciduous orchards are the primary irrigated agriculture in the upper portion of the site subwatershed whereas vineyards are predominately located in the lower portions. A few field crops are scattered throughout the site subwatershed (Figure IX-1).

Table IX-1. Dry Creek @ Rd 18 site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Lat	Target Long
Dry Creek at Rd 18*	545XDCARE	36.9818	-120.2206
Dry Creek @ Rd 22[U]	545XDCART	37.0057	-120.1471
Dry Creek @ Rd 28 1/2[U]	545XDCATE	37.0679	-120.0292

[U]Upstream sites
*Original ESJWQC sampling site

Figure IX-1. Dry Creek @ Rd 18 site subwatershed land use map.



Subwatershed Monitoring History

Dry Creek @ Rd 18 monitoring was initiated during 2005 irrigation season and continued through the 2008 irrigation season. During the four years, the site occasionally had insufficient flows and no samples were collected during a few events (Table IX-2). Under the 2008 MRPP, Dry Creek @ Rd 18 is an Assessment Monitoring location in the Cottonwood Creek @ Rd 20 Zone (Zone 6). The site is scheduled to rotate to the Assessment Monitoring location for the zone in 2013 and 2014. Accordingly, Normal Monitoring did not occur at the site in 2009, 2010, nor 2011, and is not scheduled for 2012; although MPM is scheduled at the site during 2012. The constituents sampled at this location from 2005 through 2011 are listed in Table IX-3.

In 2007, 2008 and 2011 MPM occurred. Additional MPM occurred in 2007 at Dry Creek @ Rd 18 for copper (June-September). In 2008, upstream MPM occurred at Dry Creek @ Rd 22 for chlorpyrifos (April and July) and copper (April -September) and at Dry Creek @ Rd 28 ½ for copper (July and September). Management Plan Monitoring resumed in 2011 at Dry Creek @ Rd 18 for chlorpyrifos (February, April, and July), diazinon (February), copper (January, February, and April-September), diuron (January and February), lead (May, June, August, and September), *H. azteca* toxicity (March and September), and *S. capricornutum* toxicity (January, February and May, Table IX-4).

Dry Creek @ Rd 18 is not listed on California's 2008-2010 303d List of Impaired Waterbodies.

Table IX-2. Dry Creek @ Rd 18 site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	NA	NA	**NA**
	Irrigation	2	0	**2**
2006	Storm	1	1	**2**
	Irrigation	5	0	**5**
2007	Storm	1	1	**2**
	Irrigation	8	2	**10**
2008	Storm	2	0	**2**
	Irrigation	5	1	**6**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table IX-3. Dry Creek @ Rd 18 site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are listed.

Method	Analyte	2005	2006		2007		2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall*
Field and Physical Parameters															
EPA 110.2	Color	2		5	1	5	2	5							
EPA 160.1	Dissolved Solids	2		5	1	5	2	5							
EPA 180.1	Turbidity	2		5	1	5	2	5							
EPA 405.1	BOD			1	1	2									
EPA 415.1	Total Organic Carbon	2		5	1	5	2	5							
SM 9223	*E. coli*	2		6	1	5	2	5							
Walkley-Black	Total Organic Carbon (sediment)											1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)											1		1	
NA	Dissolved Oxygen	2	1	6	1	9	3	6				2	1	6	
NA	Specific Conductivity	2	1	6	1	9	3	6				2	1	6	
NA	pH	2	1	6	1	9	3	6				2	1	6	
Carbamates															
EPA 8321A	Aldicarb			5	1	5	2	5							
EPA 8321A	Carbaryl			5	1	5	2	5							
EPA 8321A	Carbofuran			5	1	5	2	5							
EPA 8321A	Diuron			5	1	5	2	5				1	1		
EPA 8321A	Linuron			5	1	5	2	5							
EPA 8321A	Methiocarb			5	1	5	2	5							
EPA 8321A	Methomyl			5	1	5	2	5							
EPA 8321A	Oxamyl			5	1	5	2	5							
Organochlorines															
EPA 8081A	DDD(p,p')			5	1	5	2	5							
EPA 8081A	DDE(p,p')			5	1	5	2	5							
EPA 8081A	DDT(p,p')			5	1	5	2	5							
EPA 8081A	Dicofol			5	1	5	2	5							
EPA 8081A	Dieldrin			5	1	5	2	5							
EPA 8081A	Endrin			5	1	5	2	5							
EPA 8081A	Methoxychlor			5	1	5	2	5							
Organophosphates															
EPA 8141A	Azinphos methyl			5	1	5	2	5							
EPA 8141A	Chlorpyrifos	2		5	1	5	2	5					1	2	
EPA 8141A	Diazinon	2		5	1	5	2	5					1		
EPA 8141A	Dimethoate			5	1	5	2	5							
EPA 8141A	Disulfoton			5	1	5	2	5							
EPA 8141A	Malathion			5	1	5	2	5							
EPA 8321A	Methamidophos			5	1	5	2	5							
EPA 8141A	Methidathion			5	1	5	2	5							
EPA 8141A	Molinate			5	1	5	2	5							
EPA 8141A	Parathion, Methyl			5	1	5	2	5							
EPA 8141A	Phorate			5	1	5	2	5							
EPA 8141A	Phosmet			5	1	5	2	5							

Method	Analyte	2005	2006		2007		2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall*
EPA 8141A	Thiobencarb			5	1	5	2	5							
Pyrethroids															
EPA 8081A	Bifenthrin	1		5	1	5	2	5							
EPA 8081A	Cyfluthrin, total	1		5	1	5	2	5							
EPA 8081A	Cyhalothrin, lambda, total	2		5	1	5	2	5							
EPA 8081A	Cypermethrin, total	2		5	1	5	2	5							
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2		5	1	5	2	5							
EPA 8081A	Permethrin, total	2		5	1	5	2	5							
Triazines															
EPA 547M	Glyphosate			5	1	5	2	5							
EPA 549.2M	Paraquat dichloride			5	1	5	2	5							
EPA 619	Atrazine			5	1	5	2	5							
EPA 619	Cyanazine			5	1	5	2	5							
EPA 619	Simazine			5	1	5	2	5							
Metals (Total)															
EPA 200.8	Arsenic			5	1	5	2	5							
EPA 200.8	Boron			5	1	5	2	5							
EPA 200.8	Cadmium			5	1	5	2	5							
EPA 200.8	Copper			5	1	8	2	5				1	1	6	
EPA 200.8	Lead			5	1	5	2	5						4	
EPA 200.8	Molybdenum														
EPA 200.8	Nickel			5	1	5	2	5							
EPA 200.8	Selenium			5	1	2	2	5							
EPA 200.8	Zinc			5	1	6	2	5							
Metals (Dissolved)															
EPA 200.8	Copper											1	1	6	
EPA 200.8	Lead													4	
Nutrients															
SM 2340 C	Hardness as CaCO3			5	1	8	2	5				1	1	6	
EPA 300.0	Nitrate as N			5	1	5	2	5							
EPA 350.2	Ammonia as N			5	1	5	2	5							
EPA 351.3	Nitrogen, Total Kjeldahl			5	1	5	2	5							
EPA 354.1	Nitrite as N			5	1	5	2	5							
EPA 365.2	OrthoPhosphate as P			5	1	5	2	5							
EPA 365.2	Phosphate as P			5	1	5	2	5							
Toxicity															
EPA 821/R-02-012	*Ceriodaphnia dubia*	2		6	1	5	2	4							
EPA 821/R-02-012	*Pimephales promelas*	2		5	1	5	2	6							
EPA 821/R-02-013	*Selenastrum capricornutum*	2		5	1	6	3	5				1	1	1	
EPA 600/R-99-064	*Hyalella azteca*	1	1	1		1	1	1				1		1	

*Site not sampled during the 2008 fall season, 2009 and 2010 sampling years, and 2011 fall season.

Table IX-4. Dry Creek @ Rd 18 site subwatershed Management Plan Monitoring schedule (2007-2011).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Copper	Lead	Chlorpyrifos	Diazinon	Diuron	*S. capricornutum*	*H. azteca*
Dry Creek @ Rd 18	26-Jun-07	A	X						
Dry Creek @ Rd 18	24-Jul-07	A	X						
Dry Creek @ Rd 18	21-Aug-07	A	X						
Dry Creek @ Rd 18	18-Sep-07	A	X						
Dry Creek @ Rd 22	29-Apr-08	U	X		X				
Dry Creek @ Rd 22	27-May-08	U	X						
Dry Creek @ Rd 22	24-Jun-08	U	X						
Dry Creek @ Rd 22	29-Jul-08	U	X		X				
Dry Creek @ Rd 28 ½	29-Jul-08	U	X						
Dry Creek @ Rd 22	26-Aug-08	U	X						
Dry Creek @ Rd 22	30-Sep-08	U	X						
Dry Creek @ Rd 28 ½	30-Sep-08	U	X						
Dry Creek @ Rd 18	18-Jan-11	MPM	X				X	X	
Dry Creek @ Rd 18	17-Feb-11	MPM	X		X	X	X	X	
Dry Creek @ Rd 18	17-Mar-11	MPM							X
Dry Creek @ Rd 18	19-Apr-11	MPM	X		X				
Dry Creek @ Rd 18	17-May-11	MPM	X	X				X	
Dry Creek @ Rd 18	21-Jun-11	MPM	X	X					
Dry Creek @ Rd 18	19-Jul-11	MPM	X		X				
Dry Creek @ Rd 18	16-Aug-11	MPM	X	X					
Dry Creek @ Rd 18	13-Sep-11	MPM	X	X					X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from 2005 through 2011 exceeded the WQTLs for field parameters, *E. coli*, metals, and pesticides as well as water column and sediment toxicity. Exceedances at all three sites in the subwatershed include DO (4), pH (5), *E. coli* (4), total copper (28), lead (5), zinc (1), chlorpyrifos (3), diazinon (2), and diuron (2). Toxicity to *C. dubia* (1), *S. capricornutum* (4), and to *H. azteca* sediment (2) occurred (Table IX-5).

During 2011, exceedances of pH (2) and copper (7) occurred (Table IX-5).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Dry Creek @ Rd 18 subwatershed are chlorpyrifos (A/B), diazinon (A/B), copper (C), diuron (C), *S. capricornutum* toxicity (D) and *H. azteca* toxicity (D).

Table IX-5. Dry Creek @ Rd 18 site subwatershed exceedances (2005-2011).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[2] µg/L	Copper, Total[1], >1,300 µg/L	Lead, Total[1], >15 µg/L	Zinc, Total[1], µg/L	Chlorpyrifos, >0.015 µg/L	Diazinon, >0.1 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Rd 18	Irrigation	8/16/2005		6.48											
Dry Creek @ Rd 18	Irrigation	9/20/2005			500										
Dry Creek @ Rd 18	Storm	5/3/2006													84
Dry Creek @ Rd 18	Irrigation	5/16/2006			1600		4.3 (1.9)	0.36 (0.31)							
Dry Creek @ Rd 18	Irrigation	6/13/2006					6.3 (1.5)	0.27 (0.21)					80		
Dry Creek @ Rd 18	Irrigation	7/11/2006					4.1 (2.4)			0.077					
Dry Creek @ Rd 18	Irrigation	8/8/2006					4.6 (2.2)								
Dry Creek @ Rd 18	Irrigation	9/12/2006	5.61				6.1 (1.1)	0.31 (0.13)	18 (14.1)						
Dry Creek @ Rd 18	Storm	2/11/2007					14 (3.9)				0.13				
Dry Creek @ Rd 18	Irrigation	4/24/2007			1400		17 (15.4)			0.017					
Dry Creek @ Rd 18	Irrigation	5/29/2007					4.7 (2.4)							64	
Dry Creek @ Rd 18	Irrigation	6/19/2007					4.9 (1.5)								
Dry Creek @ Rd 18	Irrigation	6/26/2007					3.6 (1.9)								
Dry Creek @ Rd 18	Irrigation	7/24/2007					5.6 (2.2)								
Dry Creek @ Rd 18	Irrigation	7/31/2007					4.5 (1.5)								
Dry Creek @ Rd 18	Irrigation	8/21/2007					5.5 (1.9)	0.34 (0.31)							
Dry Creek @ Rd 18	Irrigation	8/28/2007		8.53			4.3 (1.9)								
Dry Creek @ Rd 18	Storm	1/25/2008			>2400		20 (5.9)					21		36	
Dry Creek @ Rd 18	Storm	2/25/2008					33 (5.5)			0.034	0.24	2		77	
Dry Creek @ Rd 18	Storm, RS	3/4/2008												35	
Dry Creek @ Rd 18	Irrigation	4/29/2008					6.8 (3.0)								
Dry Creek @ Rd 18	Irrigation	5/27/2008					5 (3.5)								
Dry Creek @ Rd 18	Irrigation	6/24/2008					4 (2.6)								

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[2] µg/L	Copper, Total[1], >1,300 µg/L	Lead, Total[1], >15 µg/L	Zinc, Total[1], µg/L	Chlorpyrifos, >0.015 µg/L	Diazinon, >0.1 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Dry Creek @ Rd 18	Irrigation	7/29/2008					5.9 (1.5)								
Dry Creek @ Rd 18	Irrigation	8/26/2008	5.82				5.1 (1.3)	0.36 (0.17)							
Dry Creek @ Rd 18	Sediment	8/28/2008	5.62												89
Dry Creek @ Rd 22	Irrigation	4/29/2008		8.8			5.2 (3.0)								
Dry Creek @ Rd 22	Irrigation	5/27/2008					5.7 (4.1)								
Dry Creek @ Rd 22	Irrigation	6/24/2008					6.5 (2.6)								
Dry Creek @ Rd 22	Irrigation	7/29/2008					7 (2.4)								
Dry Creek @ Rd 28 1/2	Irrigation	7/29/2008					5.3 (1.7)								
Dry Creek @ Rd 22	Irrigation	8/26/2008					6.5 (1.5)								
Dry Creek @ Rd 22	Irrigation	9/30/2008	3.97				36 (8.2)								
Dry Creek @ Rd 18	Winter	1/18/2011				12 (8.65)									
Dry Creek @ Rd 18	Storm	2/17/2011		8.71											
Dry Creek @ Rd 18	Irrigation	4/19/2011				3.9 (3.20)									
Dry Creek @ Rd 18	Irrigation	5/17/2011				2.9 (1.36)									
Dry Creek @ Rd 18	Irrigation	6/21/2011				4.8 (1.03)									
Dry Creek @ Rd 18	Irrigation	7/19/2011		5.88		4.3 (0.81)									
Dry Creek @ Rd 18	Irrigation	8/16/2011				5.0 (0.81)									
Dry Creek @ Rd 18	Irrigation	9/13/2011				4.6 (1.03)									
Constituent Priority			**E**	**E**	**E**	**C**	**C**	**E**	**NP**	**A/B**	**A/B**	**C**	**NP**	**D**	**D**

[1]Total metal WQTL variable based on hardness.
[2]Dissolved metals not analyzed until October 2008; WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Dry Creek @ Rd 18 subwatershed are listed in Table IX-6. These constituents include chlorpyrifos, diazinon, copper, diuron, *S. capricornutum* toxicity, *H. azteca* toxicity, and lead.

Chlorpyrifos first exceeded the WQTL in July 2006. The chlorpyrifos and diazinon TMDL for the Lower San Joaquin River was approved in October o 2007 and chlorpyrifos exceeded the WQTL for a second time in samples collected in April 2007. Consequently, the constituent was added to the Dry Creek management plan. Normal Monitoring and upstream MPM in 2008 (April and July) at Dry Creek @ Rd 22 for chlorpyrifos did not result in any chlorpyrifos exceedances. There was an exceedance of the chlorpyrifos WQTL in samples collected in February 2008 from Dry Creek @ Rd 18. Chlorpyrifos did not exceed the WQTL during 2011 MPM (Table IX-6).

Diazinon first exceeded the WQTL in February 2007 and was added to the Dry Creek management plan the following year. Management Plan Monitoring did not occur for diazinon in 2008, but Normal Monitoring resulted in a second exceedance of diazinon February 2008. The constituent was not detected in samples collected for MPM during February 2011 (Table IX-6).

Copper is a major constituent of concern for the Dry Creek subwatershed as it has exceeded the WQTL during almost every event for which samples were analyzed for copper, beginning in May 2006. Additional MPM for copper occurred during 2007 (June-September); exceedances of the copper WQTL occurred during Normal Monitoring (April-August) and MPM events (June-August); the site was dry during both events in September 2007. Upstream MPM occurred at Dry Creek @ Rd 22 in 2008 (April-September) and Dry Creek @ Rd 28 ½ (July and September) and resulted in copper exceedances in all samples collected from Dry Creek @ Rd 22 and in the July sample collected from Dry Creek @ Rd 28 ½ (@ Rd 28 ½ was dry in September). Normal Monitoring during 2008 resulted in copper exceedances for all months except when the site was dry in September. Management Plan Monitoring in 2011 (January, February, April-September) resulted in exceedances during January and April through September (Table IX-6).

Diuron exceeded the WQTL twice in 2008 (January and February) and was subsequently added to the Dry Creek management plan. Management Plan Monitoring during 2011 (January and February) detected diuron but the concentrations were below the WQTL.

Toxicity to *S. capricornutum* first occurred during May 2007 but did not recur again until 2008 storm season (January and February). The constituent was thereafter added to the Dry Creek @ Rd 18 management plan and MPM was scheduled during 2011 (January, February, and May); no toxicity occurred (Table IX-6).

Sediment toxicity first occurred in samples collected during May 2006 and occurred again in samples collected during August 2008. Management Plan Monitoring occurred during 2011 (March and September) but no toxicity to *H. azteca* occurred (Table IX-6).

Three lead exceedances occurred during 2006, which was the first year samples were analyzed for metals, and lead was consequently added to the Dry Creek @ Rd 18 management plan. Lead is not applied by agriculture, therefore it is categorized as a priority (E) constituent within the Dry Creek @ Rd 18 subwatershed management plan, and MPM for the constituent is not required. Management Plan Monitoring for lead did not occur during 2007 or 2008. Under the 2008 MRPP, the Coalition began analyzing separately for total and dissolved fractions of metals and believes this more accurate description of water quality may reduce the frequency of lead exceedances. To better characterize the water quality in Dry Creek with respect to lead, MPM for lead occurred during 2011 (May, June, August, and September), and there were no exceedances of the WQTL for total or dissolved lead (Table IX-6).

Management Plan Monitoring is scheduled for 2012 for all the above constituents during months of historical exceedances.

Table IX-6. Dry Creek @ Rd 18 site subwatershed monitoring results for high priority constituents (2007-2011).
Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2007 NM (@ Rd 18)	Date	NA	NA	NA	4/24/07	5/29/07	6/26/07	7/24/07	8/21/07	9/18/07
	Copper (µg/L)	NA	NA	NA	**17**	**4.7**	**3.6**	**5.6**	**5.5**	Site dry
2007 MPM A (@ Rd 18)	Date	NA	NA	NA	NA	NA	6/19/07	7/31/07	8/28/07	9/25/07
	Copper (µg/L)	NA	NA	NA	NA	NA	**4.9**	**4.5**	**4.3**	Site dry
2008 NM (@ Rd 18)	Date	NA	NA	NA	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08
	Copper (µg/L)	NA	NA	NA	**6.8**	**5**	**4**	**5.9**	**5.1**	Site dry
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	<0.003	<0.003	<0.003	<0.003	Site dry
2008 MPM US (@ Rd 22)	Date	NA	NA	NA	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08
	Copper (µg/L)	NA	NA	NA	**5.2**	**5.7**	**6.5**	**7**	**6.5**	**36**
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	NA	NA	<0.003	NA	NA
2008 MPM US (@ Rd 28 ½)	Date	NA	NA	NA	NA	NA	NA	7/29/08	NA	9/30/08
	Copper (µg/L)	NA	NA	NA	NA	NA	NA	**5.3**	NA	Site dry
2011 MPM (@ Rd 18)	Date	1/18/11	2/17/11	3/17/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11
	Copper, dissolved (µg/L)	**12**	11	NA	**3.9**	**2.9**	**4.8**	**4.3**	**5.0**	**4.6**
	Copper, total (µg/L)	15	14	NA	5.7	4.8	6.6	5.7	7.4	7.1
	Lead, dissolved (µg/L)	NA	NA	NA	NA	0.05	0.06	NA	<0.03	0.03
	Lead, total (µg/L)	NA	NA	NA	NA	0.17	0.11	NA	0.09	0.08
	Chlorpyrifos (µg/L)	NA	<0.003	NA	<0.003	NA	NA	<0.003	NA	NA
	Diazinon (µg/L)	NA	<0.004	NA	NA	NA	NA	NA	NA	NA
	Diuron (µg/L)	0.3	0.77	NA	NA	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	896	347	NA	NA	718	NA	NA	NA	NA
	H. azteca toxicity (% Control)	NA	NA	98	NA	NA	NA	NA	NA	105

A – Additional MPM conducted in 2007 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 only.

Load Calculations

Loads have been calculated for all chlorpyrifos, copper, diazinon and diuron detections in the site subwatershed based on the following formula (Table IX-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table IX-7. Dry Creek @ Rd 18 site subwatershed instantaneous load calculations for chlorpyrifos, copper, diazinon, and diuron.

Upstream site is italicized. Sorted by analyte and date.

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Rd 18	Chlorpyrifos	07/11/06	11.77	0.077	25.66
Dry Creek @ Rd 18	Chlorpyrifos	04/24/07	0	0.017	0
Dry Creek @ Rd 18	Chlorpyrifos	07/24/07	13.39	0.008	3.03
Dry Creek @ Rd 18	Chlorpyrifos	01/25/08	2.56	0.01	0.72
Dry Creek @ Rd 18	Chlorpyrifos	02/25/08	1.44	0.034	1.39
Dry Creek @ Rd 18	Copper	05/16/06	5.35	4.3	651.43
Dry Creek @ Rd 18*	Copper	06/13/06	4.02	5.5	626.09
Dry Creek @ Rd 18	Copper	06/13/06	4.02	6.3	717.16
Dry Creek @ Rd 18	Copper	07/11/06	11.77	4.1	1366.49
Dry Creek @ Rd 18	Copper	08/08/06	18.85	4.6	2455.37
Dry Creek @ Rd 18	Copper	09/12/06	14.97	6.1	2585.82
Dry Creek @ Rd 18	Copper	04/24/07	0	17	0
Dry Creek @ Rd 18	Copper	05/29/07	12.51	4.7	1664.95
Dry Creek @ Rd 18	Copper	06/19/07	7.33	4.9	1017.06
Dry Creek @ Rd 18	Copper	06/26/07	19.06	3.6	1943.00
Dry Creek @ Rd 18	Copper	07/24/07	13.39	5.6	2123.32
Dry Creek @ Rd 18	Copper	07/31/07	5.29	4.5	674.09
Dry Creek @ Rd 18	Copper	08/21/07	4.7	5.5	731.99
Dry Creek @ Rd 18*	Copper	08/21/07	4.7	6.2	825.16
Dry Creek @ Rd 18	Copper	08/28/07	2.66	4.3	323.89
Dry Creek @ Rd 18	Copper	01/25/08	2.56	20	1449.83
Dry Creek @ Rd 18	Copper	02/25/08	1.44	33	1345.62
Dry Creek @ Rd 18	Copper	04/29/08	5.2	6.8	1001.29
Dry Creek @ Rd 18*	Copper	04/29/08	5.2	6.9	1016.01
Dry Creek @ Rd 18	Copper	05/27/08	16.26	5	2302.17
Dry Creek @ Rd 18	Copper	06/24/08	7.47	4	846.11
Dry Creek @ Rd 18	Copper	07/29/08	44.11	5.9	7369.47
Dry Creek @ Rd 18*	Copper	08/26/08	14.86	4.8	2019.79
Dry Creek @ Rd 18	Copper	08/26/08	14.86	5.1	2146.03
Dry Creek at Road 22	*Copper*	*09/30/08*	*0*	*36*	*0*
Dry Creek @ Rd 18	Copper	01/18/11	2.2	15	934.46
Dry Creek @ Rd 18	Copper	02/17/11	0.3	14	118.93

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Dry Creek @ Rd 18	Copper	04/19/11	22.83	5.7	3684.92
Dry Creek @ Rd 18	Copper	05/17/11	24.25	4.8	3296.10
Dry Creek @ Rd 18	Copper	06/21/11	13.7	6.6	2560.42
Dry Creek @ Rd 18	Copper	07/19/11	18.46	5.7	2979.57
Dry Creek @ Rd 18	Copper	08/16/11	41.86	7.4	8771.59
Dry Creek @ Rd 18	Copper	09/13/11	25.13	7.1	5052.40
Dry Creek @ Rd 18	Copper (D)	01/18/11	2.2	12	747.57
Dry Creek @ Rd 18	Copper (D)	02/17/11	0.3	11	93.45
Dry Creek @ Rd 18	Copper (D)	04/19/11	22.83	3.9	2521.26
Dry Creek @ Rd 18	Copper (D)	05/17/11	24.25	2.9	1991.39
Dry Creek @ Rd 18	Copper (D)	06/21/11	13.7	4.8	1862.13
Dry Creek @ Rd 18	Copper (D)	07/19/11	18.46	4.3	2247.75
Dry Creek @ Rd 18	Copper (D)	08/16/11	41.86	5	5926.75
Dry Creek @ Rd 18	Copper (D)	09/13/11	25.13	4.6	3273.39
Dry Creek @ Rd 18	Diazinon	01/25/08	2.56	0.049	3.55
Dry Creek @ Rd 18	Diazinon	02/25/08	1.44	0.24	9.79
Dry Creek @ Rd 18	Diuron	01/25/08	2.56	21	1522.32
Dry Creek @ Rd 18	Diuron	02/25/08	1.44	2.1	85.63
Dry Creek @ Rd 18*	Diuron	04/29/08	5.2	0.36	53.01
Dry Creek @ Rd 18	Diuron	04/29/08	5.2	0.37	54.48
Dry Creek @ Rd 18	Diuron	01/18/11	2.2	0.3	18.69
Dry Creek @ Rd 18	Diuron	02/17/11	0.3	0.77	6.54

*Field duplicate

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. During 2007 and 2008, the Coalition conducted additional and upstream MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. Management Plan Monitoring occurred at the site during 2011. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with pesticide applications. From these actions, the Coalition developed an outreach strategy, which is detailed in the following sections.

In the Coalition's approved Management Plan, Dry Creek @ Rd 18 is a high priority subwatershed as of 2011 and will remain as such through 2013. The Coalition will actively engage in grower outreach and education to address the Dry Creek management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Grower meetings with targeted members occurred throughout the irrigation season of 2011 to inform growers about management practices as well as to assess current and expected future implementation of additional management practices. Follow up with the targeted members will occur following the 2012 irrigation season to determine if additional management practices were implemented and if any are planned to be implemented in the 2013. Management Plan Monitoring will continue through 2013 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos and diazinon are listed as A/B constituent for the Dry Creek @ Rd 18 subwatershed.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded three times in the Dry Creek subwatershed (July 2006, April 2007, and February 2008, Table IX-5).

Orchards and vineyards are the primary crops in the Dry Creek subwatershed. Chlorpyrifos can be applied to vineyards in the fall during post-harvest applications, to orchards in the winter months during dormant sprays, and throughout the irrigation season to numerous crops.

To determine the most appropriate strategy for outreach, the Coalition reviewed PUR data from the subwatershed for the number of monthly chlorpyrifos applications and pounds of active ingredient applied, and the acres treated (Table IX-8 and Figure IX-2). The greatest amount of chlorpyrifos use occurred in 2007 (4,392 lbs AI) and has since decreased significantly (although PUR data are available only through June 2011). Chlorpyrifos applications typically peak in the months of March, July, and October; though applications do occur throughout the year in the Dry Creek @ Rd 18 subwatershed.

The Coalition also uses PUR data to determine which crops receive the most applications of chlorpyrifos. In the Dry Creek subwatershed, almonds (7,854 lbs AI) and grapes (3,500 lbs AI) received the largest amount of chlorpyrifos from 2005 through 2011 (Table IX-9). The most common product containing chlorpyrifos used within this subwatershed was Lorsban (Table IX-9).

Table IX-8. Dry Creek @ Rd 18 site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Application	Pounds of AI Applied	Acres Treated
January, 2005	4	175.1	92.0
March, 2005	3	124.1	62.0
May, 2005	8	68.1	268.0
June, 2005	2	40.2	40.1
July, 2005	8	523.4	322.0
August, 2005	9	230.0	150.7
May, 2006	4	255.9	155.0
June, 2006	6	165.2	236.8
July, 2006	18	2413.5	1288.8
August, 2006	5	220.8	244.3
September, 2006	2	58.0	58.1
December, 2006	2	1.0	1.1
January, 2007	1	74.3	40.0
February, 2007	2	61.4	30.8
May, 2007	2	236.6	100.0
June, 2007	1	65.8	33.0
July, 2007	21	3218.2	1605.2

Month/Year	Number of Chlorpyrifos Application	Pounds of AL Applied	Acres Treated
August,2007	4	79.8	144.0
October, 2007	5	655.5	328.7
January, 2008	2	70.0	35.0
July, 2008	3	428.8	220.0
March, 2009	2	540.5	270.1
April, 2009	1	37.0	37.0
July, 2009	4	135.0	167.0
August, 2009	1	20.0	16.5
October, 2009	4	217.1	115.6
July, 2010	6	178.7	107.0
August, 2010	3	258.0	126.5
October, 2010	6	1652.6	880.0
November, 2010	5	333.1	177.4
March, 2011	1	37.6	40.0
Summaries by Year			
2005 Total	34	1160.8	934.8
2006 Total	37	3114.3	1984.1
2007 Total	36	4391.5	2281.7
2008 Total	5	498.8	255.0
2009 Total	12	949.6	606.2
2010 Total	20	2422.5	1290.9
2011 Total	1	37.6	40.0
Total	**145**	**12575.1**	**7392.7**

Figure IX-2. Dry Creek @ Rd 18 site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

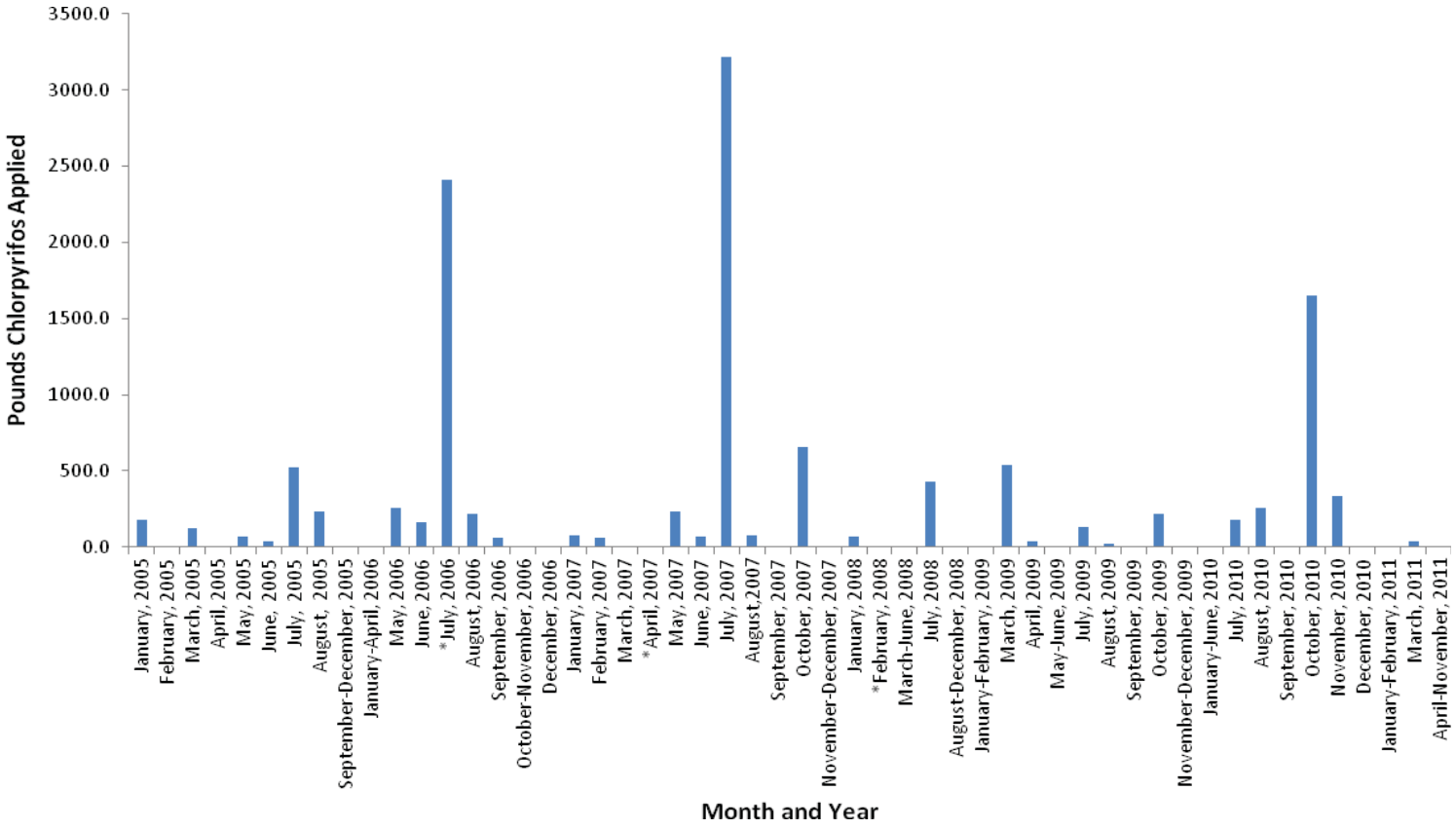


Table IX-9. Dry Creek @ Rd 18 site subwatershed chlorpyrifos PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product name	Lbs Al Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	30.0
		LORSBAN-4E	112.2
	ALMOND	GOVERN 4E INSECTICIDE	1122.1
		LORSBAN 4E INSECTICIDE	320.0
		LORSBAN 4E-HF	748.2
		LORSBAN ADVANCED	37.6
		LORSBAN-4E	2487.2
		NUFOS 4E	1270.1
		WARHAWK	78.8
		WHIRLWIND	1789.7
	CORN (FORAGE - FODDER)	LORSBAN 4E-HF	235.3
		LORSBAN-4E	40.0
	GRAPES (WINE)	LORSBAN 4E-HF	716.9
		LORSBAN ADVANCED	2202.9
		LORSBAN-4E	580.5
	N-GRNHS GRWN CUT FLWRS OR GREENS	WHITMIRE PT 1325 ME DURAGUARD	2.7
	ORANGE (ALL OR UNSPEC)	LORSBAN 4E-HF	340.6
	TANGELO	LORSBAN 4E-HF	119.6
	TANGERINE (MANDARIN, SATSUMA, MURCOTT, ETC.)	LORSBAN ADVANCED	10.3
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	GOVERN 4E INSECTICIDE	43.0
		LORSBAN 4E-HF	164.5
		LORSBAN ADVANCED	36.6
		LORSBAN-4E	86.0

ALFALFA-Total Pounds Chlorpyrifos Applied	**142.3**
ALMOND-Total Pounds Chlorpyrifos Applied	**7853.7**
CORN-Total Pounds Chlorpyrifos Applied	**275.3**
GRAPES -Total Pounds Chlorpyrifos Applied	**3500.2**
N-GRNHS GRWN CUT FLWRS OR GREENS-Total Pounds Chlorpyrifos Applied	**2.7**
ORANGE-Total Pounds Chlorpyrifos Applied	**340.6**
TANGELO-Total Pounds Chlorpyrifos Applied	**119.6**
TANGERINE-Total Pounds Chlorpyrifos Applied	**10.3**
WALNUT-Total Pounds Chlorpyrifos Applied	**330.2**
Total Pounds Chlorpyrifos Applied (2005-2011)	**12575.1**

The Coalition noted in its 2008 Management Plan that the chlorpyrifos concentrations found in Dry Creek @ Rd 18 were most likely the result of tailwater discharging chlorpyrifos to the creek. Pesticide Use Report data indicated that the July 2006 exceedance coincided with a large number of applications, whereas the other two exceedances occurred following periods of comparably little or no applications. Consequently, tailwater runoff is suspected of transporting previously applied chlorpyrifos from fields to the creek. In addition, the relatively large concentration of chlorpyrifos in the July 2006 exceedance indicates the source is not likely to only be spray drift. The Coalition encouraged growers to review their irrigation techniques as well as evaluate their potential for tailwater and/or storm water runoff to transport the pesticide to surface waterways.

Since 2007, general Coalition outreach included grower meetings and the mailing/distribution of information. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142). Focused outreach is directed at growers whose parcels are in the direct drainage area of the subwatershed and who applied chlorpyrifos. From these criteria, the Coalition compiled a list of targeted growers.

The Coalition conducted individual meetings with targeted growers in the third priority subwatersheds during the summer and fall of 2011. Although meetings focused mainly on chlorpyrifos exceedances, all water quality results were reviewed and discussed including diazinon, copper, diuron, *H. azteca* toxicity, *S. capricornutum* toxicity, DO, *E. coli*, lead, and pH. The Coalition contacted 17 members accounting for 4,710 acres of targeted direct drainage.

Grower surveys completed at the meetings documenting members' current practices and indicating which recommended practices growers anticipate implementing in the upcoming years have been compiled and assessed by the Coalition in the Third Priority Subwatersheds Summary of Management Practices section of this report. The Coalition anticipates growers being able to implement recommended practices during the irrigation season of 2012. Follow up meetings with targeted growers who were recommended practices will occur in the winter and/or spring of 2012 (depending on the timing of the initial contact with the grower) to determine what additional management practices were implemented.

Management Plan Monitoring will continue in 2012 at Dry Creek @ Rd 18 during months of historical exceedances. The Coalition plans to conduct MPM through 2013 during months of previous exceedances to evaluate improvements in water quality as recommended management practice implementation occurs.

Diazinon

The WQTL for diazinon (0.10 µg/L) was exceeded twice in this subwatershed (February 2007 and 2008, Table IX-5).

Diazinon is often used for dormant sprays and is applied to orchards during the winter.

The Coalition reviewed PUR data for the number of monthly diazinon applications and pounds of active ingredient applied, and the acres treated (Table IX-10, Figure IX-3). Aside from 2010, diazinon use increased in the Dry Creek @ Rd 18 subwatershed since 2007 and the greatest amount of pounds applied is in 2011 (567 lbs AI), even though PUR data are available only through June 2011. However, the number of acres receiving application is up significantly in 2011, and ratio of lbs AI applied per acre is lower in 2011 compared to 2009, 2007, and 2005. There were no exceedances in 2009 and 2011 despite the increased use (no exceedances in 2010, but use was very minimal). Diazinon use generally occurs between December and March for dormant sprays, but diazinon was applied in the early

irrigation season in the Dry Creek @ Rd 18 subwatershed. Almond orchards receive the most pounds of diazinon (1,099 lbs AI) in the Dry Creek @ Rd 18 subwatershed (Table IX-11).

Table IX-10. Dry Creek @ Rd 18 site subwatershed diazinon applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Diazinon Applications	Pounds of AI Applied	Acres Treated
January, 2005	4	127.9	64.0
February, 2005	2	154.7	77.4
June, 2005	1	100.0	59.0
February, 2006	3	149.9	110.0
May, 2006	2	110.0	94.0
January, 2007	2	179.6	89.0
May, 2007	1	92.5	60.0
January, 2008	1	37.7	19.0
February, 2008	3	387.0	780.0
January, 2009	1	142.9	72.0
December, 2009	3	296.5	149.4
May, 2010	1	16.6	33.3
January, 2011	2	252.0	127.0
May, 2011	3	315.0	635.0
Summaries by Year			
2005 Total	7	382.7	200.4
2006 Total	5	259.9	204.0
2007 Total	3	272.1	149.0
2008 Total	4	424.7	799.0
2009 Total	4	439.3	221.4
2010 Total	1	16.6	33.3
2011 Total	5	567.1	762.0
Total	**29**	**2362.3**	**2369.1**

Figure IX-3. Dry Creek @ Rd 18 site subwatershed lbs diazinon applied by month (2005-2011).
Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

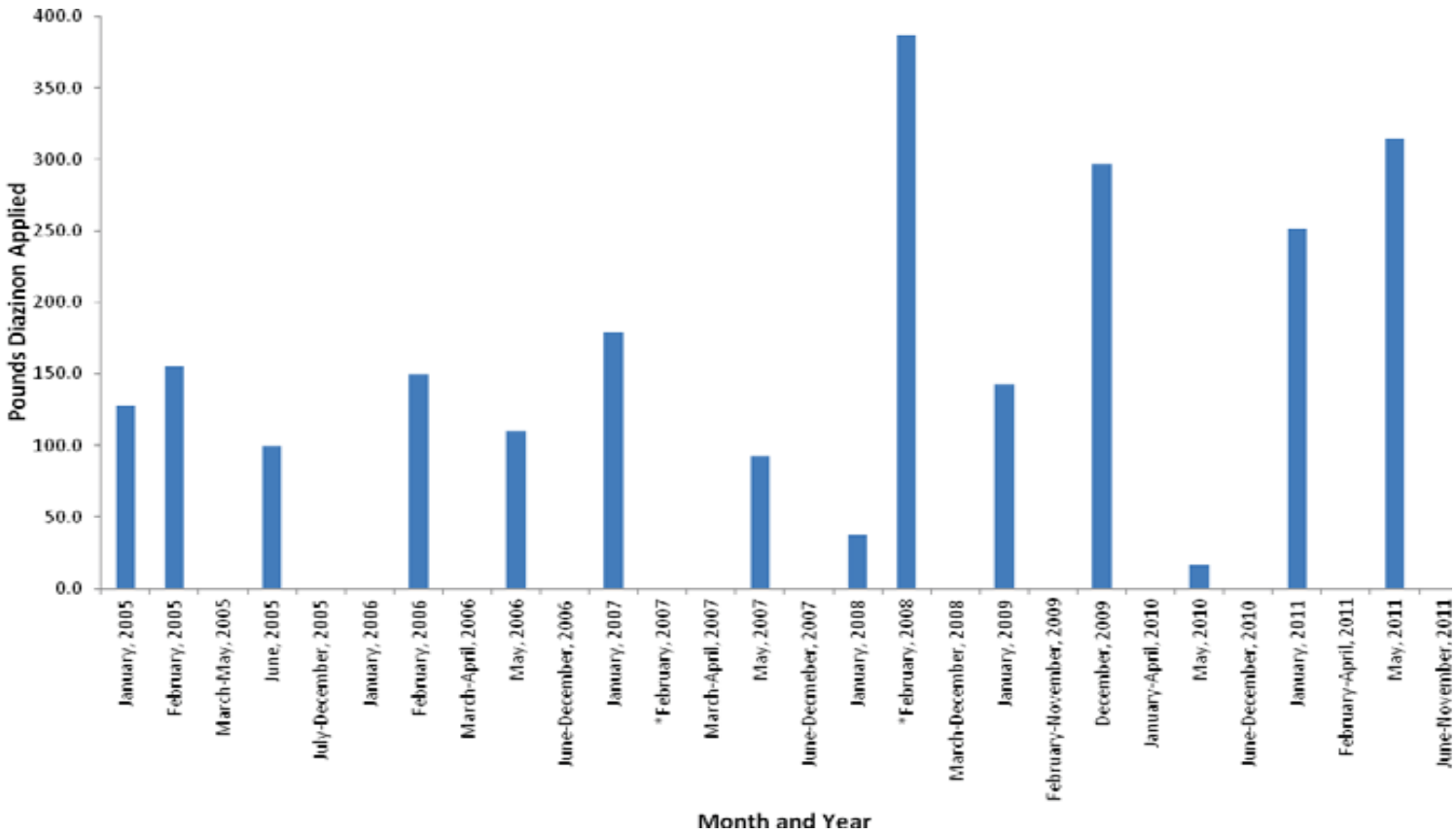


Table IX-11. Dry Creek @ Rd 18 subwatershed diazinon PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs Al Applied
DIAZINON	ALMOND	CLEAN CROP DIAZINON AG500 INSECTICIDE	253.3
		DIAZINON AG 500	691.4
		GOWAN DIAZINON 4E	154.7
	APRICOT	DIAZINON AG 500	75.4
		DIAZINON AG500 INSECTICIDE	37.8
		GOWAN DIAZINON 4E	127.9
	FIG	DIAZINON AG 500	331.6
		DIAZOL AG 500	387.0
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	CLEAN CROP DIAZINON 14G	0.6
	PRUNE	DIAZINON 50W	100.0
		DIAZOL 50 W	192.5
	WATERMELONS	RED-TOP DIAZINON 4 SPRAY	10.0

ALMOND-Total Pounds Diazinon Applied	**1099.4**
APRICOT-Total Pounds Diazinon Applied	**241.2**
FIG-Total Pounds Diazinon Applied	**718.6**
PLUM -Total Pounds Diazinon Applied	**0.6**
PRUNE-Total Pounds Diazinon Applied	**292.5**
WATERMELONS-Total Pounds Diazinon Applied	**10.0**
Total Pounds Diazinon Applied (2005-2011)	**2362.3**

The Coalition suspects the exceedances of diazinon to be most likely due to storm water runoff, but spray drift may also contribute to the concentrations in the waterway. There were two applications, totaling 180 lbs AI, in the month before the February 2007 diazinon exceedance and four applications, totaling 425 lbs AI applied, in January and February prior to the February 2008 exceedance. However there were no exceedances in other months with high application rates indicating the method of application may not be the largest contributor to concentrations in the waterways and other factors, such as storm events, may exert greater influence on the movement of diazinon to the creek. Therefore, the Coalition's focused outreach is to growers with the potential to discharge to the creek (including spray drift) and who have applied diazinon. Individual contacts within this subwatershed are described under the chlorpyrifos outreach section above and include discussions of diazinon exceedances as well as spray drift and storm water runoff management practices.

Priority C Constituents

Copper and diuron are the priority C constituents listed for the Dry Creek @ Rd 18 subwatershed.

Copper

Copper concentrations exceeded the WQTL in almost every event in the Dry Creek subwatershed for which samples were analyzed for metals resulting in a total of 35 exceedances to date.

To determine an outreach strategy, the Coalition reviews PUR data. As is true across the Coalition region, copper is primarily applied in the fall and winter months in the Dry Creek @ Rd 18 subwatershed

(Table IX-12, Figure IX-4). Since copper does not degrade, copper applied during the fall and winter may be available for transport to surface waters during the irrigation season. The amount of copper applied within the subwatershed has decreased since its peak in 2006 (19,833 lbs AI) and, although complete PUR data are only available through June 2011, this trend of declining use appears to continue through 2011.

Almonds, grapes, tangerines and oranges received the most applications of copper in the Dry Creek subwatershed (Table IX-13). The most common product containing copper used within the subwatershed is Kocide (Table IX-13).

Table IX-12. Dry Creek @ Rd 18 site subwatershed copper applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	24	3440.1	1057.1
February, 2005	11	749.4	131.4
March, 2005	27	2374.9	2184.2
April, 2005	39	4393.9	3693.0
May, 2005	1	0.1	0.2
June, 2005	1	0.2	37.0
July,2005	2	32.0	36.0
August, 2005	1	22.5	10.0
September, 2005	4	532.5	180.0
October, 2005	11	2182.3	376.8
November, 2005	1	122.8	40.0
December, 2005	12	2097.2	472.3
January, 2006	24	4345.2	1321.0
February, 2006	7	733.0	127.0
March, 2006	10	46.6	36.1
April, 2006	94	7612.6	6344.0
May,2006	6	201.3	249.9
June, 2006	3	0.6	0.9
August, 2006	1	0.1	0.2
September, 2006	4	1039.6	465.2
October, 2006	27	2362.2	1481.5
November, 2006	4	742.8	155.5
December, 2006	11	2748.7	660.1
January, 2007	30	5416.0	1713.9
February, 2007	14	870.0	673.2
March, 2007	16	412.9	450.0
April, 2007	27	2305.4	1942.2
May, 2007	17	801.7	1182.7
June, 2007	6	312.6	531.3
July, 2007	6	634.9	643.0
September, 2007	4	97.1	60.7
October, 2007	2	67.9	20.5
November, 2007	7	90.9	639.6

Month/Year	Number of Copper Applications	Pounds of Al Applied	Acres Treated
December, 2007	5	1324.7	215.7
January, 2008	28	6009.9	1779.7
February, 2008	13	885.9	682.8
March, 2008	7	105.0	156.4
April, 2008	29	2609.4	2668.9
May, 2008	1	0.5	0.9
June, 2008	2	0.6	1.2
October, 2008	2	0.2	0.1
November, 2008	2	0.2	0.5
December, 2008	3	265.6	123.4
January, 2009	14	1354.2	602.4
February, 2009	5	2.3	2.8
March, 2009	4	1.3	2.2
April, 2009	38	1080.7	1985.5
July, 2009	1	29.7	43.0
September, 2009	1	0.0	0.0
October, 2009	11	3483.9	980.0
December, 2009	6	88.8	64.1
January, 2010	22	2191.4	1401.3
February, 2010	1	0.5	0.9
March, 2010	12	323.7	359.5
April, 2010	47	2019.8	3434.7
May,2010	4	8.2	29.1
June, 2010	2	0.6	0.5
July, 2010	18	1.7	3.6
August, 2010	3	771.5	257.8
September, 2010	2	0.2	0.3
November, 2010	15	3974.9	919.4
December, 2010	3	74.3	40.9
January, 2011	41	4966.5	2135.2
February, 2011	5	2.4	3.9
March, 2011	3	3.7	0.6
April, 2011	13	205.3	532.5
May, 2011	3	0.8	0.7
June, 2011	2	74.4	15.1
Summaries by Year			
2005 Total	134	15948.0	8217.9
2006 Total	191	19832.7	10841.4
2007 Total	134	12334.0	8072.9
2008 Total	87	9877.3	5413.8
2009 Total	80	6041.0	3679.9
2010 Total	129	9366.8	6448.2
2011 Total	67	5253.1	2687.9
Total	**822**	**78652.9**	**45361.9**

Figure IX-4. Dry Creek @ Rd 18 site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes month with exceedances. PUR data available through June 2011 for Madera County.

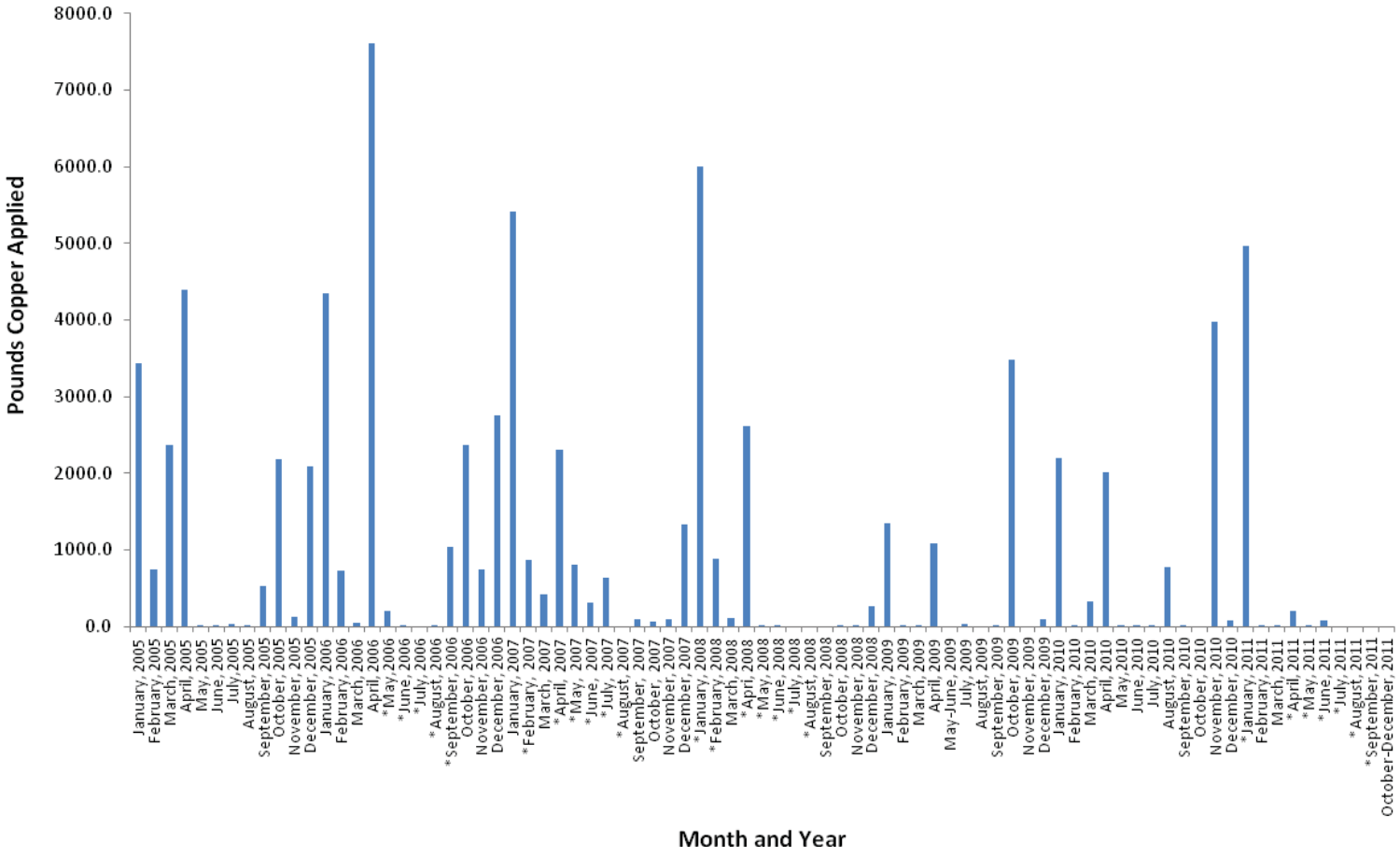


Table IX-13. Dry Creek @ Rd 18 site subwatershed copper PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs Al Applied
COPPER	ALMOND	CHAMP DRY PRILL	140.1
		CHAMP FORMULA 2 FLOWABLE	1059.5
		CHIPCO COPPER SULFATE CRYSTALS	732.6
		COOKE KOP-R-SPRAY	445.3
		COPPER SULFATE CRYSTALS	74.3
		CUPROFIX ULTRA 40 DISPERSS	842.5
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	304.1
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	3769.4
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	5464.3
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	371.5
		HYDROX	2507.1
		KOCIDE 101	762.3
		KOCIDE 2000	2033.0
		KOCIDE DF	5096.2
		NORDOX	662.6
		NORDOX 75 WG	671.2
		NU-COP 50DF	5058.9
		NU-COP HB	2048.2
		STRETCH FUNGICIDE	0.7
		TRIANGLE BRAND BASIC COPPER SULFATE	806.0
		TRIANGLE BRAND COPPER SULFATE INSTANT POWDER	1980.0
	APRICOT	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	138.0
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	35.4
		KOCIDE DF	509.6
	FIG	TRIANGLE BRAND BASIC COPPER SULFATE	442.0
	GRAPE (RAISIN)	BADGE X2	11.9
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	27.4
	GRAPES	BRITZ COPPER SULFUR 15-25 DUST	30.0
		CHAMP FORMULA 2 FLOWABLE	109.8
		CHAMPION WETTABLE POWDER	246.4
		CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	45.0
		CSC COPPER SULFUR DUST	40.7
		CUPROFIX ULTRA 40 DISPERSS	142.9
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	984.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	409.9
		KOCIDE 2000	396.9
		KOCIDE DF	311.9
		NORDOX	65.4
		NORDOX 75 WG	283.0
		NU-COP 50DF	939.4
		STRETCH FUNGICIDE	2.3
	GRAPES (WINE)	BADGE X2	109.3
		CHAMP FLOWABLE	1773.2
		CHAMP FORMULA 2 FLOWABLE	6082.5
		CHAMPION WETTABLE POWDER	47.7
		CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	510.0

Chemical Name	Commodity	Product Name	Lbs Al Applied
COPPER	GRAPES (WINE)	COCS 15 SULFUR 25 DUST	771.0
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	1334.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	2665.3
		KOCIDE 101	3910.8
		KOCIDE 2000	3088.4
		KOCIDE DF	95.8
		NORDOX	24.8
		NORDOX 75 WG	75.5
	N-GRNHS GRWN CUT FLWRS OR GREENS	CAMELOT	2.9
		PHYTON 27 NEW DIMENSION	4.5
		PHYTON-27 BACTERICIDE & FUNGICIDE	55.4
		PRESCRIPTION TREATMENT BRAND CAMELOT FUNGICIDE/BATERICIDE	40.5
	N-OUTDR CONTAINER/FLD GRWN PLANTS	CHAMP FORMULA 2 FLOWABLE	7.3
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	KOCIDE 2000	0.8
	OLIVE (ALL OR UNSPEC)	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	48.4
		KOCIDE 2000	96.8
		NORDOX	67.7
	ORANGE (ALL OR UNSPEC)	BASIC COPPER 53	588.0
		CUPROFIX ULTRA 40 DISPERSS	1137.6
		KOCIDE DF	2387.2
		NORDOX	1071.6
		NU-COP 50DF	1094.0
	PEACH	KOCIDE DF	63.9
		NU-COP 50DF	160.2
	PISTACHIO (PISTACHE NUT)	KOCIDE 2000	100.1
		TRIANGLE BRAND BASIC COPPER SULFATE	79.1
		TRIANGLE BRAND COPPER SULFATE INSTANT POWDER	297.0
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	KOCIDE 2000	444.2
		KOCIDE DF	558.1
		NU-COP 50DF	1755.6
	TANGELO	KOCIDE DF	368.4
		NORDOX	225.6
		NU-COP 50DF	184.8
	TANGERINE (MANDARIN, SATSUMA, MURCOTT, ETC.)	CUPROFIX ULTRA 40 DISPERSS	6676.6
		NORDOX	236.9
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CUPROFIX ULTRA 40 DISPERSS	409.5

ALMOND-Total Pounds Copper Applied	**34829.7**
APRICOT-Total Pounds Copper Applied	**683.0**
FIG-Total Pounds Copper Applied	**442.0**
GRAPES-Total Pounds Copper Applied	**24535.6**
N-GRNHS GRWN CUT FLWRS OR GREENS-Total Pounds Copper Applied	**103.3**
N-OUTDR CONTAINER-Total Pounds Copper Applied	**8.1**
OLIVE-Total Pounds Copper Applied	**212.9**
ORANGE-Total Pounds Copper Applied	**6278.4**
PEACH-Total Pounds Copper Applied	**224.0**
PISTACHIO-Total Pounds Copper Applied	**476.2**
PLUM-Total Pounds Copper Applied	**2757.9**

Chemical Name	Commodity	Product Name	Lbs Al Applied
		TANGELO-Total Pounds Copper Applied	778.8
		TANGERINE-Total Pounds Copper Applied	6913.5
		WALNUT-Total Pounds Copper Applied	409.5
		Total Pounds Copper Applied (2005-2011)	78652.9

In additional to high applications rates of copper, there are a large number of copper mines in the Sierra Nevada Mountains which may contribute to the copper load. The Coalition obtained maps of all mines in the areas above Dry Creek and will sample upstream of agriculture, if there is ever significant flow in the creek, to determine potential copper input from mines.

The Coalition continued with its Management Plan strategy outlined above under the chlorpyrifos outreach section when conducting individual contacts, and added growers applying copper to its initial targeted grower list. Because copper tends to be sediment bound, it is probable that copper is mobilized with sediment during irrigation and/or storms and is transported to surface waters. Orchard and vineyard operators were advised to consider irrigation and storm water management to prevent copper from entering the waterway with runoff.

Diuron

Two exceedances of the diuron WQTL (2 µg/L) occurred in the Dry Creek subwatershed (January and February 2008). Both exceedances coincided with toxicity to *S. capricornutum*.

Diuron is an herbicide often applied during the dormant season to orchards. Diuron use in the Dry Creek @ Rd 18 subwatershed follows this trend; PUR data indicate diuron is only applied during October through March (Table IX-14, Figure IX-5). Diuron use increased in the subwatershed since 2007(3,167 lbs AI) to its peak level in 2009 (2,072 lbs AI; although complete PUR data are only available through June 2011), yet exceedances have not occurred since 2008. Neither of the diuron exceedances in Dry Creek @ Rd 18 occurred during months of the greatest amount of use.

The highest application rates and largest amount of diuron applied from 2005 through 2010 were associated with citrus orchards (oranges and tangerines, Table IX-15).

Table IX-14. Dry Creek @ Rd 18 site subwatershed diuron applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through June 2011 for Madera County. If month is not included in table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
February, 2005	5	142.4	74.0
March, 2005	9	538.9	336.8
May, 2005	4	160.0	200.0
December, 2005	3	146.4	183.0
February, 2006	3	67.2	28.0
March, 2006	1	20.0	13.5
April, 2006	3	47.3	38.0
October, 2006	2	256.0	120.0
February, 2007	5	732.8	391.5
March, 2007	11	709.6	470.3
October, 2007	5	396.8	248.0
November, 2007	8	1327.4	829.6
February, 2008	7	247.1	136.5
March, 2008	14	1938.4	901.0
April, 2008	2	288.0	180.0
November, 2008	1	128.0	80.0
December, 2008	3	902.4	564.0
February, 2009	4	64.0	71.5
March, 2009	12	1600.0	1000.0
October, 2009	2	401.6	194.0
November, 2009	10	1649.6	806.0
February, 2010	3	226.7	192.0
March, 2010	11	2810.4	898.0
April, 2010	2	128.0	40.0
October, 2010	2	160.8	134.0
January, 2011	1	120.1	60.0
March, 2011	9	1504.0	470.0
April, 2011	3	1696.0	530.0
Summaries by Year			
2005 Total	21	987.7	793.8
2006 Total	9	390.5	199.5
2007 Total	29	3166.6	1939.4
2008 Total	27	3503.9	1861.5
2009 Total	28	3715.2	2071.5
2010 Total	18	3325.9	1264.0
2011 Total	13	3320.1	1060.0
Total	**145**	**18409.8**	**9189.7**

Figure IX-5. Dry Creek @ Rd 18 site subwatershed lbs diuron applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through June 2011 for Madera County.

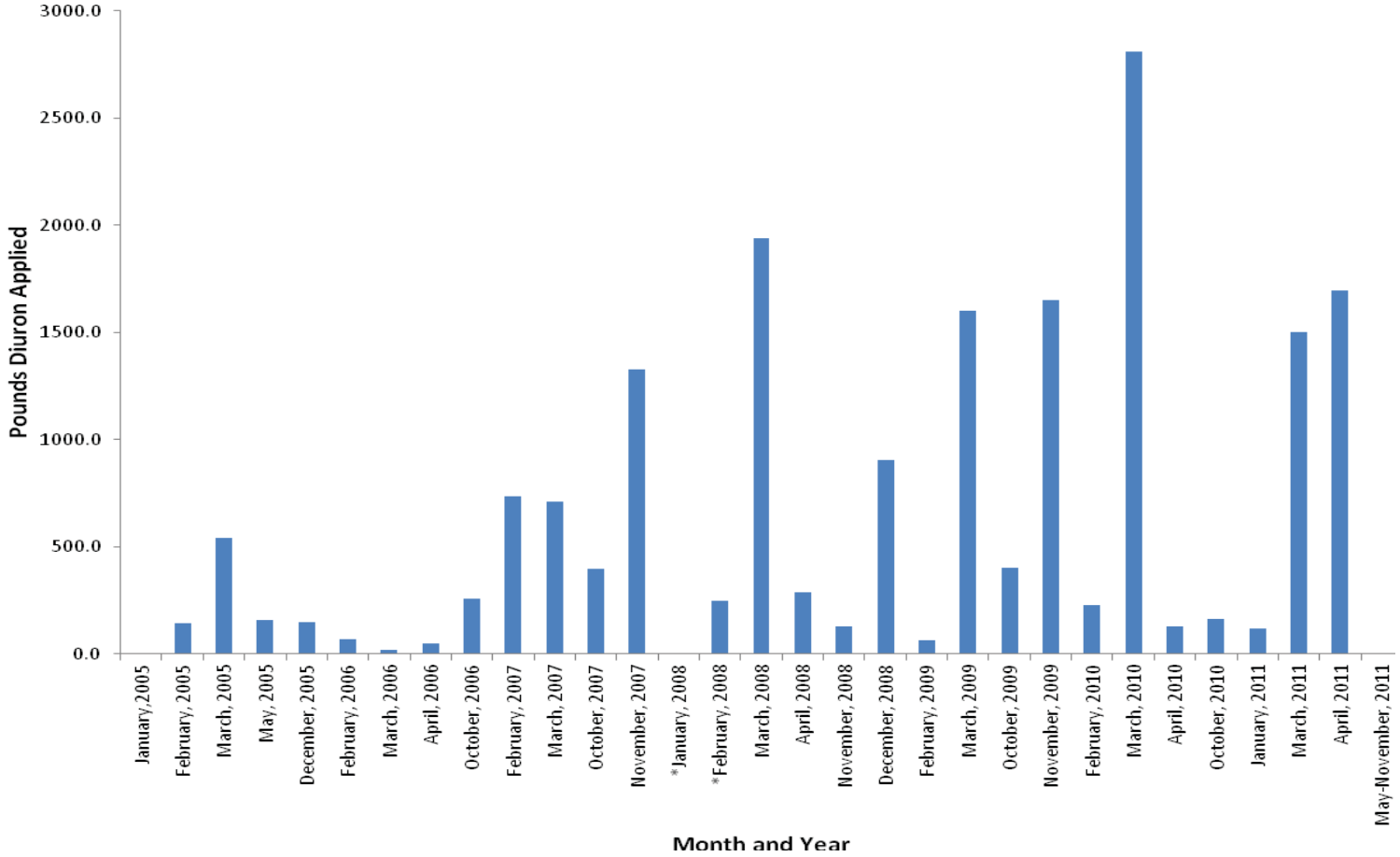


Table IX-15. Dry Creek @ Rd 18 site subwatershed diuron PUR data (2005-2011).

PUR data available through June 2011 for Madera County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIURON	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CLEAN CROP DIURON WETTABLE POWDER WEED KILLER	120.0
		DIURON 4L HERBICIDE	346.7
		DUPONT DIREX 4L HERBICIDE	44.0
	GRAPES	CLEAN CROP DIURON WETTABLE POWDER WEED KILLER	61.6
		DIREX 80DF	52.8
		DIURON 80 DF HERBICIDE	11.6
		DREXEL DIURON 80 HERBICIDE	76.8
		DU PONT KARMEX DF HERBICIDE	52.0
		DUPONT KARMEX DF HERBICIDE	46.4
		DUPONT KARMEX XP HERBICIDE	14.4
		KARMEX DF HERBICIDE	11.0
		KARMEX XP HERBICIDE	117.6
	GRAPES (WINE)	CLEAN CROP DIURON WETTABLE POWDER WEED KILLER	16.8
		DIREX 80DF	14.4
		DREXEL DIURON 80 HERBICIDE	186.7
		DUPONT KARMEX DF HERBICIDE	17.6
		DUPONT KARMEX XP HERBICIDE	5.6
		KARMEX DF HERBICIDE	4.2
	ORANGE (ALL OR UNSPEC)	DIREX 80DF	951.4
		DREXEL DIURON 80 HERBICIDE	384.0
		DU PONT KROVAR I DF HERBICIDE	352.0
		DUPONT KARMEX XP HERBICIDE	624.0
		KARMEX DF HERBICIDE	2554.9
		KARMEX XP HERBICIDE	240.0
	TANGELO	DIREX 80DF	64.0
	TANGERINE (MANDARIN, SATSUMA, MURCOTT, ETC.)	DIREX 80DF	172.8
		DREXEL DIURON 80 HERBICIDE	2816.0
		DU PONT KROVAR I DF HERBICIDE	1130.4
		DUPONT KARMEX XP HERBICIDE	6809.6
		KARMEX XP HERBICIDE	1110.4

ALFALFA-Total Pounds Diuron Applied	**510.7**
GRAPES-Total Pounds Diuron Applied	**689.6**
ORANGE-Total Pounds Diuron Applied	**5106.2**
TANGELO-Total Pounds Diuron Applied	**64.0**
TANGERINE-Total Pounds Diuron Applied	**12039.2**
Total Pounds Diuron Applied (2005-2011)	**18409.8**

The Coalition's strategy for addressing diuron exceedances is to add growers with the potential to drain to the creek who have applied diuron to the targeted growers list. Individual contacts included diuron in discussions and growers are encouraged to implement management practices relevant to preventing storm and irrigation discharge to waterways that may transport diuron. Improved and additional water management practices should reduce or eliminate diuron exceedances.

Priority D Constituents

Priority D constituents in the Dry Creek @ Rd 18 subwatershed are sediment toxicity to *H. azteca* and water column toxicity to *S. capricornutum*.

H. azteca toxicity

Sediment toxicity to *H. azteca* occurred in May 2006 and August 2008. Both toxicities were statically different from the control, but were greater than 80% survival which is not considered ecologically significant. No TIE was conducted on either sample. To better determine the cause of toxicity, the Coalition now analyzes toxic sediment for pesticide concentrations. Management Plan Monitoring for *H. azteca* toxicity was scheduled during 2011, and no toxicity occurred.

S. capricornutum toxicity

Toxicity to *S. capricornutum* occurred in May 2007 and January and February 2008; the February toxicity was persistent in the resample one week later. All three toxicities coincided with exceedances of copper; however, there have been numerous copper exceedances in the subwatershed that have not coincided with *S. capricornutum* toxicity. Diuron exceedances coincided with the January and February 2008 toxicities. A TIE was conducted on the January 2008 toxic sample, but all toxicity was lost and no conclusions could be drawn.

The Coalition believes sediment bound metals and/or pesticides may be contributing to toxicity. The Coalition's strategy for eliminating *S. capricornutum* toxicity is to reduce the offsite movement of agricultural constituents that have the potential to contribute to toxicity by encouraging better management of storm water and irrigation tailwater. This strategy is consistent with the strategies discussed above.

Priority E Constituents

The priority E constituents listed under the Dry Creek @ Rd 18 management plan are DO, *E. coli*, lead, and pH.

The Coalition conducted MPM for lead in 2011 and no exceedances of the WQTL occurred. The Coalition believes this may be because the samples are now analyzed separately for total and dissolved fractions of metals which allows for a more accurate characterization of water quality. The Coalition plans to continue MPM for lead to evaluate if the constituent is still impairing water quality. Although lead is not applied by agriculture, it is possible that offsite movement of irrigation tailwater mobilizes sediment bound lead and transports the metal to the waterbody. Therefore, the Coalition's strategy described above should address potential agriculture-induced movement of lead to waterways.

Although the priority E constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and/or MPM. Dissolved oxygen and pH are field parameters that will be sampled during every event, Assessment or MPM. *E. coli* and lead will be

monitored during Assessment Monitoring as scheduled in 2013 through 2014. In addition, lead will continue to be monitored during MPM. The priority E constituents have been discussed during individual contacts and will continue to be discussed at annual grower meetings.

In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters

Evaluation

Dry Creek @ Rd 18 is a third priority site subwatershed and is in its second year of focused outreach (2011-2013).

The Coalition's strategy for the Dry Creek subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows and storm water are managed properly. The Coalition targeted growers whose agricultural practices may result in the discharge or drift of pesticides into the waterway and who applied chlorpyrifos, diazinon, copper, and/or diuron. Outreach efforts include grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

All individual grower surveys documenting current management practice implementations and assessing future planned implementations were completed and returned to the Coalition representing 100% of targeted growers. The Third Priority Subwatersheds Summary of Management Practices section of this report summarizes the results of these contacts. The Coalition plans to conduct follow up contacts with targeted growers recommended to implement additional management practices to document changes on growers' properties. The Coalition will report on newly implemented management practices in the 2013 MPUR.

In 2012, MPM is scheduled to continue to aid in the evaluation of newly implemented management practices.

X. LATERAL 2 ½ NEAR KEYES RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority E

- pH
- *E. coli*

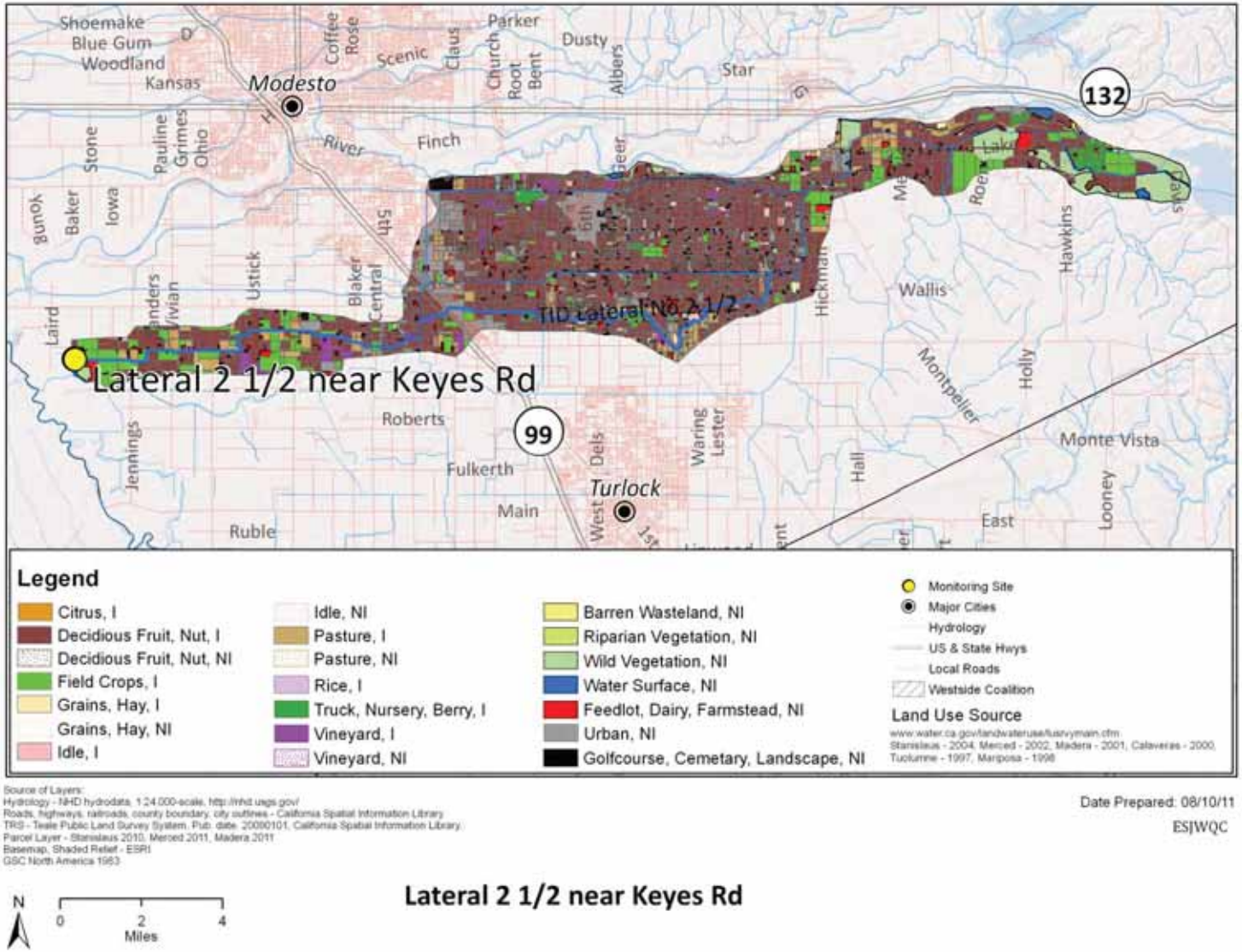
Description of Lateral 2 ½ near Keyes Rd Site Subwatershed

Lateral 2 1/2 near Keyes Rd (31,810 Irrigated acres) – This site subwatershed is located in the western portion of the Coalition region just south of the Tuolumne River and East of the San Joaquin River (Table X-1). The site subwatershed extends east past the City of Modesto to Turlock Lake. Land use is in this site subwatershed is dominated by deciduous fruits and nuts but also includes almost all other crops types and land use found in the Coalition Region (Figure X-1).

Table X-1. Lateral 2 ½ near Keyes Rd site subwatershed sampling location coordinates.

Site Name	Station Code	Target Lat	Target Long
Lateral 2 ½ near Keyes Rd	535LTHNKR	37.5478	-121.0927

Figure X-1. Lateral 2 ½ near Keyes Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring began at the Lateral 2 ½ near Keyes Rd site subwatershed under the 2008 MRPP in the fall of 2008 and continued through 2010 (Table X-2). The constituents sampled at this location from 2008 through 2011 are listed in (Table X-3.) Management Plan Monitoring first occurred at the site in 2011 for chlorpyrifos (April and July, Table X-4).

Lateral 2 ½ near Keyes Rd is an Assessment Monitoring location in the Prairie Flower Zone (Zone 2). Assessment Monitoring occurred 2008 through 2010 and is scheduled again for 2028 and 2029. Accordingly, only MPM occurred at the site in 2011 and MPM will continue through 2013.

Lateral 2 ½ near Keyes Rd is not considered impaired on California's 2008-2010 303d List of Impaired Waterbodies. However, the section of the San Joaquin River which receives water from Lateral 2 ½ near Keyes Rd (Merced River to Tuolumne River) is listed as impaired for boron, BHC-alpha, chlorpyrifos, DDE, DDT, electrical conductance, group A pesticides, mercury, water temperature, and unknown water column toxicity.

Table X-2. Lateral 2 ½ near Keyes Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2006	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2007	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2008	Storm	0	1	**1**
	Irrigation	NA	NA	**NA**
	Fall	2	0	**2**
2009	Winter	0	2	**2**
	Storm	0	2	**2**
	Irrigation	6	0	**6**
	Fall	1	1	**2**
2010	Winter	1	0	**1**
	Storm	1	2	**3**
	Irrigation	5	0	**5**
	Fall	1	2	**3**
2011	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	2	0	**2**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table X-3. Lateral 2 ½ near Keyes Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are listed.

Method	Analyte	2008			2009				2010				2011			
		Storm	Irrigation*	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter*	Storm*	Irrigation	Fall*
Field and Physical Parameters																
EPA 110.2	Color															
EPA 160.1	Dissolved Solids			2			6	1	1	1	5	1				
EPA 160.2	Suspended Solids			2			6	1	1	1	5	1				
EPA 180.1	Turbidity			2			6	1	1	1	5	1				
EPA 405.1	BOD															
EPA 415.1	Total Organic Carbon			2			6	1	1	1	5	1				
Walkley-Black	Total Organic Carbon (sediment)						2		1		1					
SM 9223	*E. coli*			2			6	1	1	1	5	1				
ASTM D422	Grain size (sediment)						2		1		1					
NA	Dissolved Oxygen			2			6	1	1	1	5	1			2	
NA	Specific Conductivity			2			6	1	1	1	5	1			2	
NA	pH			2			6	1	1	1	5	1			2	
Carbamates																
EPA 8321A	Aldicarb			2			6	1	1	1	5	1				
EPA 8321A	Carbaryl			2			6	1	1	1	5	1				
EPA 8321A	Carbofuran			2			6	1	1	1	5	1				
EPA 8321A	Diuron			2			6	1	1	1	5	1				
EPA 8321A	Linuron			2			6	1	1	1	5	1				
EPA 8321A	Methamidophos										3	1				
EPA 8321A	Methiocarb			2			6	1	1	1	5	1				
EPA 8321A	Methomyl			2			6	1	1	1	5	1				
EPA 8321A	Oxamyl			2			6	1	1	1	5	1				
Organochlorines																
EPA 8081A	DDD(p,p')			2			1				3	1				
EPA 8081A	DDE(p,p')			2			1				3	1				
EPA 8081A	DDT(p,p')			2			1				3	1				
EPA 8081A	Dicofol			2			1				3	1				

Method	Analyte	2008			2009				2010				2011			
		Storm	Irrigation*	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter*	Storm*	Irrigation	Fall*
EPA 8081A	Dieldrin			2			1				3	1				
EPA 8081A	Endrin			2			1				3	1				
EPA 8081A	Methoxychlor			2			1				3	1				
Group A Pesticides																
EPA 8081A	Aldrin			2			1				3	1				
EPA 8081A	Chlordane			2			1				3	1				
EPA 8081A	Endosulfan I			2			1				3	1				
EPA 8081A	Endosulfan II			2			1				3	1				
EPA 8081A	HCH, alpha			2			1				3	1				
EPA 8081A	HCH, beta			2			1				3	1				
EPA 8081A	HCH, delta			2			1				3	1				
EPA 8081A	HCH, gamma			2			1				3	1				
EPA 8081A	Heptachlor			2			1				3	1				
EPA 8081A	Heptachlor epoxide			2			1				3	1				
EPA 8081A	Toxaphene			2			1				3	1				
Organophosphates																
EPA 8141A	Azinphos methyl			2			6	1	1	1	5	1				
EPA 8141A	Chlorpyrifos			2			6	1	1	1	5	1			2	
EPA 8141A	Demeton-s			2			6	1	1	1	5	1				
EPA 8141A	Diazinon			2			6	1	1	1	5	1				
EPA 8141A	Dichlorvos			2			6	1	1	1	5	1				
EPA 8141A	Dimethoate			2			6	1	1	1	5	1				
EPA 8141A	Disulfoton			2			6	1	1	1	5	1				
EPA 8141A	Malathion			2			6	1	1	1	5	1				
EPA 8321A	Methamidophos			2			6	1	1	1	2					
EPA 8141A	Methidathion			2			6	1	1	1	5	1				
EPA 8141A	Molinate															
EPA 8141A	Parathion, Methyl			2			6	1	1	1	5	1				
EPA 8141A	Phorate			2			6	1		1	5	1				
EPA 8141A	Phosmet			2			6	1	1	1	5	1				

Method	Analyte	2008			2009				2010				2011			
		Storm	Irrigation*	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter*	Storm*	Irrigation	Fall*
EPA 8141A	Thiobencarb															
EPA 8141A	Trifluralin			2			6	1	1	1	5	1				
Triazines																
EPA 547M	Glyphosate			2			1				3	1				
EPA 549.2M	Paraquat dichloride			2			1				3	1				
EPA 619	Atrazine			2			6	1	1	1	5	1				
EPA 619	Cyanazine			2			6	1	1	1	5	1				
EPA 619	Simazine			2			6	1	1	1	5	1				
Metals (Total)																
EPA 200.8	Arsenic			2			1				3	1				
EPA 200.8	Boron			2			6	1	1	1	5	1				
EPA 200.8	Cadmium			2			1				3	1				
EPA 200.8	Copper			2			6	1	1	1	5	1				
EPA 200.8	Lead			2			1				3	1				
EPA 200.8	Molybdenum			2			1				3	1				
EPA 200.8	Nickel			2			6	1	1	1	5	1				
EPA 200.8	Selenium			2			6	1	1	1	5	1				
EPA 200.8	Zinc			2			6	1	1	1	5	1				
Metals (Dissolved)																
EPA 200.8	Cadmium			2			1				3	1				
EPA 200.8	Copper			2			6	1	1	1	5	1				
EPA 200.8	Lead			2			1				3	1				
EPA 200.8	Nickel			2			6	1	1	1	5	1				
EPA 200.8	Zinc			2			6	1	1	1	5	1				
Nutrients																
SM 2340 C	Hardness as CaCO3			2			6	1	1	1	5	1				
EPA 300.0	Nitrate as N															
EPA 350.2	Ammonia as N			2			6	1	1	1	5	1				
EPA 351.3	Nitrogen, Total Kjeldahl			2			1				3	1				
EPA 353.2	Nitrate + Nitrite as N			2			6	1	1	1	5	1				

Method	Analyte	2008			2009				2010				2011			
		Storm	Irrigation*	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter*	Storm*	Irrigation	Fall*
EPA 354.1	Nitrite as N															
EPA 365.2	OrthoPhosphate as P			2			1				3	1				
EPA 365.2	Phosphate as P			2			6	1	1	1	5	1				
Toxicity																
EPA 821/R-02-012	*Ceriodaphnia dubia*			2			6	1	1	1	5	1				
EPA 821/R-02-012	*Pimephales promelas*			2			6	1	1	1	5	1				
EPA 821/R-02-013	*Selenastrum capricornutum*			2			6	1	1	1	5	1				
EPA 600/R-99-064	*Hyalella azteca*						2		1		1					

*Site not sampled during the 2008 irrigation season, and 2011 winter, storm, and fall seasons.

Table X-4. Lateral 2 ½ near Keyes Rd site subwatershed Management Plan Monitoring schedule (2011).

Site Name	Sample Date	Monitoring Type	Chlorpyrifos
Lateral 2 ½ near Keyes Rd	19-Apr-11	MPM	X
Lateral 2 ½ near Keyes Rd	12-Jul-11	MPM	X

X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from Lateral 2 ½ near Keyes Rd since October 2008 through 2011 exceeded WQTLs for field parameters, nutrients, *E. coli*, and pesticides and toxicity has occurred. These exceedances include pH (5), ammonia (1), nitrate + nitrite (1), *E. coli* (2), chlorpyrifos (3), HCH (1), and delta (1). Toxicity to *S. capricornutum* (1) and to *H. azteca* sediment (1) occurred (Table X-5). The single exceedance in 2011 was of the pH WQTL (1).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituent in the Lateral 2 ½ near Keyes Rd subwatershed is chlorpyrifos (A/B).

Table X-5. Lateral 2 ½ near Keyes Rd site subwatershed exceedances (2008-2011).

The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	pH, <6.5 and >8.5 units	Ammonia[1], >1.5 mg/L	Nitrate + Nitrite as N, >10 mg/L	*E. coli*, >235 MPN/100 mL	Chlorpyrifos, >0.015 µg/L	HCH, delta, >0.0039 µg/L	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Lateral 2 ½ near Keyes Rd	Fall	10/21/2008	9.57			280				
Lateral 2 ½ near Keyes Rd	Fall	11/11/2008	9.09	0.65 (0.57)		370		0.013		
Lateral 2 ½ near Keyes Rd	Irrigation	4/21/2009	9.2							90
Lateral 2 ½ near Keyes Rd	Irrigation	5/19/2009							56	
Lateral 2 ½ near Keyes Rd	Irrigation	7/21/2009					0.049			
Lateral 2 ½ near Keyes Rd	Irrigation	8/18/2009			15					
Lateral 2 ½ near Keyes Rd	Fall	10/20/2009	8.68							
Lateral 2 ½ near Keyes Rd	Storm	4/20/2010					0.076			
Lateral 2 ½ near Keyes Rd	Irrigation	7/20/2010					0.061			
Lateral 2 ½ near Keyes Rd	Irrigation	4/19/2011	8.71							
		Constituent Priority	**E**	**NP**	**NP**	**E**	**A/B**	**NP**	**NP**	**NP**

[1]Ammonia WQTL variable based on pH and temperature.

NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2008-2011 Management Plan Monitoring Results

Chlorpyrifos is the only high priority management plan constituent in the Lateral 2 ½ near Keyes Rd subwatershed. The first exceedance occurred in July 2009, and chlorpyrifos was subsequently added to the Lateral 2 ½ management plan. Two more exceedances occurred the following year during Assessment Monitoring in April and July 2010. Management Plan Monitoring for chlorpyrifos occurred during 2011, and no chlorpyrifos was detected (Table X-6). Chlorpyrifos MPM will continue during 2012 in April and July.

Table X-6. Lateral 2 ½ near Keyes Rd site subwatershed monitoring results for high priority constituents (2010-2011).

Exceedance values are in bold.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010 NM (near Keyes Rd)	Date	1/19/10	2/23/10	3/23/10	4/20/10	5/18/10	6/15/10	7/20/10	8/17/10	9/14/10	10/19/10	11/16/10	12/14/10
	Chlorpyrifos (µg/L)	Dry	Dry	<0.003	**0.076**	<0.003	<0.003	**0.061**	0.013	<0.003	<0.003	Dry	Dry
2011 MPM (near Keyes Rd)	Date	NA	NA	NA	4/19/11	NA	NA	7/12/11	NA	NA	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	<0.003	NA	NA	<0.003	NA	NA	NA	NA	NA

MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table X-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table X-7. Lateral 2 ½ near Keyes Rd site subwatershed instantaneous load calculations for chlorpyrifos.

Sorted by analyte and date.

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Lateral 2 1/2 near Keyes Rd	Chlorpyrifos	04/20/10	10.7	0.076	23.03
Lateral 2 1/2 near Keyes Rd	Chlorpyrifos	07/20/10	9	0.061	15.55
Lateral 2 1/2 near Keyes Rd	Chlorpyrifos	08/17/10	31.92	0.013	11.75

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. During 2011, the Coalition conducted additional MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with pesticide applications. From these actions, the Coalition derived an outreach strategy, which is detailed in the following sections.

In the Coalition's approved Management Plan, the Lateral 2 ½ near Keyes Rd subwatershed is a high priority subwatershed as of 2011 and will remain as such through 2013. The Coalition will actively engage in grower outreach and education to address the Lateral 2 ½ management plan's highest priority constituent, chlorpyrifos. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Grower meetings with targeted members began in the fall of 2010 and continued through the fall of 2011 to inform growers about management practices as well as to assess current and expected future implementation of additional management practices. Follow up with the targeted members who were recommended practices will occur in the winter and/or spring of 2012 (depending on the timing of the initial contact with the grower) to determine what additional management practices were implemented in the subwatershed. Management Plan Monitoring will continue through 2013 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent for the Lateral 2 ½ subwatershed.

Chlorpyrifos

Chlorpyrifos exceeded the WQTL three times in this subwatershed (July 2009, and April and July 2010, Table X-5).

Deciduous fruit and nut trees dominate the land use in the Lateral 2 ½ subwatershed. Chlorpyrifos can be applied to orchards during both the dormant and irrigation seasons, but peak use often occurs during the latter summer months for almond hull split applications and walnut coddling moth applications.

In addition, there are a few row crops immediately upstream of the sampling site and chlorpyrifos can be applied to row crops throughout the season.

To determine an outreach strategy, the Coalition reviews PUR data for the number of monthly chlorpyrifos applications and pounds of active ingredient applied, and the acres treated (Table X-8, Figure X-2). Chlorpyrifos use in the Lateral 2 ½ near Keyes Rd subwatershed peaked in 2008 (12,040 lbs AI) and since decreased. Applications of chlorpyrifos are primarily during the irrigation months in the subwatershed, but dormant sprays also occur. Large numbers of applications occurred in the

subwatershed throughout the years, and it appears that the ratio of pounds of AI applied to acres treated is relatively high in Lateral 2 ½ near Keyes Rd subwatershed compared to other subwatersheds in the Coalition region. Chlorpyrifos is primarily applied to walnut and almond orchards in the subwatershed, but also to a variety of row crops (Table X-9). Lorsban is the most common chlorpyrifos-containing product used in the subwatershed.

Table X-8. Lateral 2 ½ near Keyes Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2008-2011).

PUR data available through November 2011 for Stanislaus County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2008	18	281.2	150.5
March, 2008	22	508.5	773.5
April, 2008	2	80.9	40.5
May, 2008	72	3126.4	1619.3
June, 2008	21	621.8	355.0
July, 2008	117	5326.0	3150.7
August, 2008	48	1670.6	1012.3
September, 2008	6	59.1	59.3
October, 2008	5	82.0	79.8
December, 2008	10	283.7	148.0
January, 2009	8	382.6	203.5
February, 2009	6	583.8	306.0
March, 2009	13	890.2	425.0
April, 2009	8	353.3	269.4
May, 2009	65	2960.1	1465.4
June, 2009	10	375.1	192.1
July, 2009	120	4961.8	3062.5
August, 2009	34	1205.6	816.3
September, 2009	10	46.9	131.5
December, 2009	2	76.6	43.6
February, 2010	1	76.0	38.0
March, 2010	21	535.4	1044.6
April, 2010	9	360.4	201.0
May, 2010	34	1306.5	778.5
June, 2010	43	1930.0	1036.7
July, 2010	89	3066.2	1942.9
August, 2010	42	1404.1	941.7
September, 2010	16	368.6	569.7
October, 2010	4	14.8	10.6
January, 2011	8	131.4	68.5
February, 2011	1	2.3	0.2
March, 2011	13	166.5	327.5
April, 2011	2	62.3	204.0
May, 2011	47	1929.2	1012.0
June, 2011	15	443.4	224.0
July, 2011	63	2098.3	1313.4
August, 2011	36	1044.7	837.2
September, 2011	16	494.0	298.8
October, 2011	4	58.0	3424.0

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
Summaries by Year			
2008 Total	321	12040.3	7388.8
2009 Total	276	11835.9	6915.3
2010 Total	259	9061.9	6563.7
2011 Total	205	6430.2	7709.6
Total	**1061**	**39368.4**	**28577.4**

Figure X-2. Lateral 2 ½ near Keyes Rd site subwatershed lbs chlorpyrifos applied by month (2008-2011).

Asterisk (*) denotes months with exceedances. PUR data available through November 2011 for Stanislaus County.

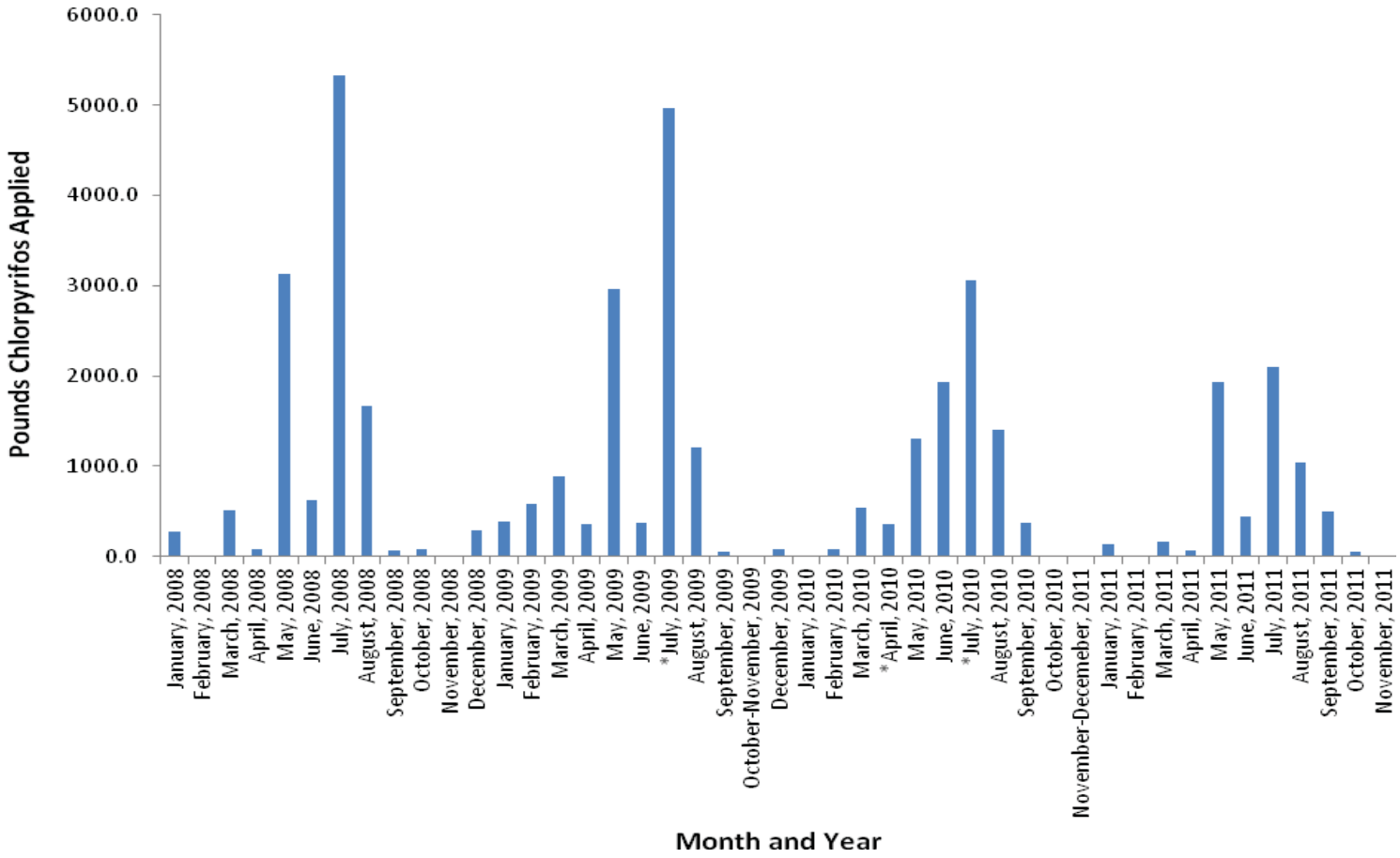


Table X-9. Lateral 2 ½ near Keyes Rd site subwatershed chlorpyrifos PUR data (2008-2011).

PUR data available through November 2011 for Stanislaus County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	18.9
		COBALT	404.0
		GOVERN 4E INSECTICIDE	18.9
		LOCK-ON INSECTICIDE	376.1
		LORSBAN 4E-HF	67.5
		LORSBAN ADVANCED	32.4
		LORSBAN-4E	168.6
		NUFOS 4E	744.9
		WARHAWK	96.5
	ALMOND	CHLORPYRIFOS 4E AG	146.4
		GOVERN 4E INSECTICIDE	2009.7
		LORSBAN 4E INSECTICIDE	236.6
		LORSBAN 4E-HF	895.4
		LORSBAN ADVANCED	2507.2
		LORSBAN-4E	4178.5
		NUFOS 4E	1223.2
		WARHAWK	260.6
		WHIRLWIND	406.4
	APPLE	LORSBAN 4E INSECTICIDE	300.9
		LORSBAN-4E	148.1
		NUFOS 4E	723.9
	CHERRY	LORSBAN 4E-HF	46.4
		LORSBAN ADVANCED	58.2
	CORN (FORAGE - FODDER)	DREXEL CHLORPYRIFOS 4E-AG	85.2
		GOVERN 4E INSECTICIDE	57.6
		LORSBAN 4E-HF	285.6
		LORSBAN ADVANCED	75.1
		LORSBAN-4E	159.1
		NUFOS 4E	881.5
		WARHAWK	264.3
	GRAPES (WINE)	LORSBAN ADVANCED	435.7
	N-GRNHS GRWN PLANTS IN CONTAINERS	DURSBAN 50W INSECTICIDE IN WATER SOLUBLE PACKETS	8.7
	N-OUTDR CONTAINER/FLD GRWN PLANTS	DURSBAN 50W INSECTICIDE IN WATER SOLUBLE PACKETS	61.1
	OP-VINE	DURSBAN 50W INSECTICIDE IN WATER SOLUBLE PACKETS	17.6
		DURSBAN PRO	
		WHITMIRE PT 1325 ME DURAGUARD	2.3
	PEACH	LORSBAN 4E INSECTICIDE	89.8
		LORSBAN 4E-HF	24.9
		LORSBAN ADVANCED	199.1
		LORSBAN-4E	205.4
	SWEET POTATO	LORSBAN 15G GRANULAR INSECTICIDE	347.4
		LORSBAN ADVANCED	157.8
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	CHLORPYRIFOS 4E AG	65.7
		GOVERN 4E INSECTICIDE	950.4
		LORSBAN 4E INSECTICIDE	993.0
		LORSBAN 4E-HF	918.4
		LORSBAN ADVANCED	6274.4

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN-4E	7099.5
		NUFOS 4E	3596.1
		WARHAWK	193.4
		WHIRLWIND	850.3

ALFALFA-Total Pounds Chlorpyrifos Applied	**1927.8**
ALMOND-Total Pounds Chlorpyrifos Applied	**11863.9**
APPLE-Total Pounds Chlorpyrifos Applied	**1172.9**
CHERRY-Total Pounds Chlorpyrifos Applied	**104.6**
CORN-Total Pounds Chlorpyrifos Applied	**1808.3**
GRAPES-Total Pounds Chlorpyrifos Applied	**435.7**
N-GRNHS CONTAINER-Total Pounds Chlorpyrifos Applied	**8.7**
N-OUTDR CONTAINER-Total Pounds Chlorpyrifos Applied	**61.1**
OP-VINE-Total Pounds Chlorpyrifos Applied	**20.0**
PEACH-Total Pounds Chlorpyrifos Applied	**519.1**
SWEET POTATO-Total Pounds Chlorpyrifos Applied	**505.2**
WALNUT-Total Pounds Chlorpyrifos Applied	**20941.2**
Total Pounds Chlorpyrifos Applied (2008-2011)	**39368.4**

The chlorpyrifos in Lateral 2 ½ waterway are most likely the primary result of tailwater transporting chlorpyrifos from fields to the drain. Chlorpyrifos concentrations were well above the WQTL, indicating it is unlikely that spray drift was the sole cause, although it may have contributed. As discussed above, PUR data indicate large numbers of applications and large amounts of AI were applied throughout the subwatershed prior to the 2009 and 2010 exceedances, hence the use of chlorpyrifos is subwatershed-wide and not limited to a few growers.

Focused outreach to reduce the offsite movement of chlorpyrifos in this subwatershed includes providing information to growers regarding the proper management of irrigation tailwater, in both orchards and on fields with row crops. Growers were encouraged to review their operation to determine if irrigation return flows are managed properly and install management practices where necessary. Orchards operators are encouraged to evaluate their application methods to minimize spray drift.

Coalition outreach since 2007 has included grower meetings and the mailing/distribution of information such as available funding for management practice implementation. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142). The Coalition has focused outreach to growers whose parcels are in the direct drainage area of the subwatershed and who have applied chlorpyrifos. From these criteria, the Coalition compiled a targeted list of growers.

The Coalition completed individual meetings with targeted growers in the third priority subwatersheds during the fall of 2010 through 2011. Although meetings focused mainly on chlorpyrifos exceedances,

all water quality results were reviewed and discussed including *E. coli* and pH. The Coalition contacted 25 members accounting for 1,826 acres of direct drainage.

Grower surveys completed at the meetings documenting members' current practices and indicating which recommended practices growers anticipate implementing in the upcoming years were compiled and assessed by the Coalition in the Third Priority Subwatersheds Summary of Management Practices section of this report. The Coalition believes growers will be able to implement recommended practices by the irrigation season of 2012. Follow ups with targeted growers who were recommended additional management practices are scheduled to occur in 2012 to determine what additional management practices were implemented in 2011 and/or are planned for 2012.

Management Plan Monitoring will continue in 2012 at Lateral 2 ½ near Keyes Rd during months of historical exceedances. The Coalition plans to conduct MPM through 2013 to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority E Constituents

The priority E constituents listed under the Lateral 2 ½ near Keyes Rd management plan are *E. coli* and pH.

Although these constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and/or MPM. Field parameters such as pH will be collected during every event, Assessment and/or MPM. *E. coli* will be monitored during Assessment Monitoring as scheduled in 2028 through 2029. The priority E constituents are discussed during individual contacts and will continue to be discussed at annual grower meetings.

The Coalition petitioned to remove *E. coli* from the Lateral 2 ½ near Keyes Rd management plan in a letter to the Regional Board on January 6, 2012. Regardless, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Lateral 2 ½ near Keyes Rd is a third priority site subwatershed and is in its second year of focused outreach (2011-2013).

The Coalition's strategy for the Lateral 2 ½ subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows are managed properly. The Coalition targeted growers whose agricultural practices may result in the discharge or drift of pesticides into the waterway and who applied chlorpyrifos. Outreach includes

grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

Individual grower surveys documenting current management practice implementations and assessing future planned implementations have been completed and returned to the Coalition representing 100% of targeted growers. The Third Priority Subwatersheds Summary of Management Practices section of this report summarizes the results of these contacts. The Coalition plans to conduct follow up contacts with all targeted growers to assess the implementation of new management practices. The Coalition will report on newly implemented management practices in the 2013 MPUR.

In 2012, MPM is scheduled to continue for high priority constituents to aid in the evaluation of newly implemented management practices.

Monitoring for *E. coli* has resulted in zero exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove the constituent from the active Lateral 2 ½ near Keyes Rd management plan.

XI. LIVINGSTON DRAIN @ ROBIN AVE

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Selenastrum capricornutum* water column toxicity

Priority E

- *E. coli*
- Lead
- pH

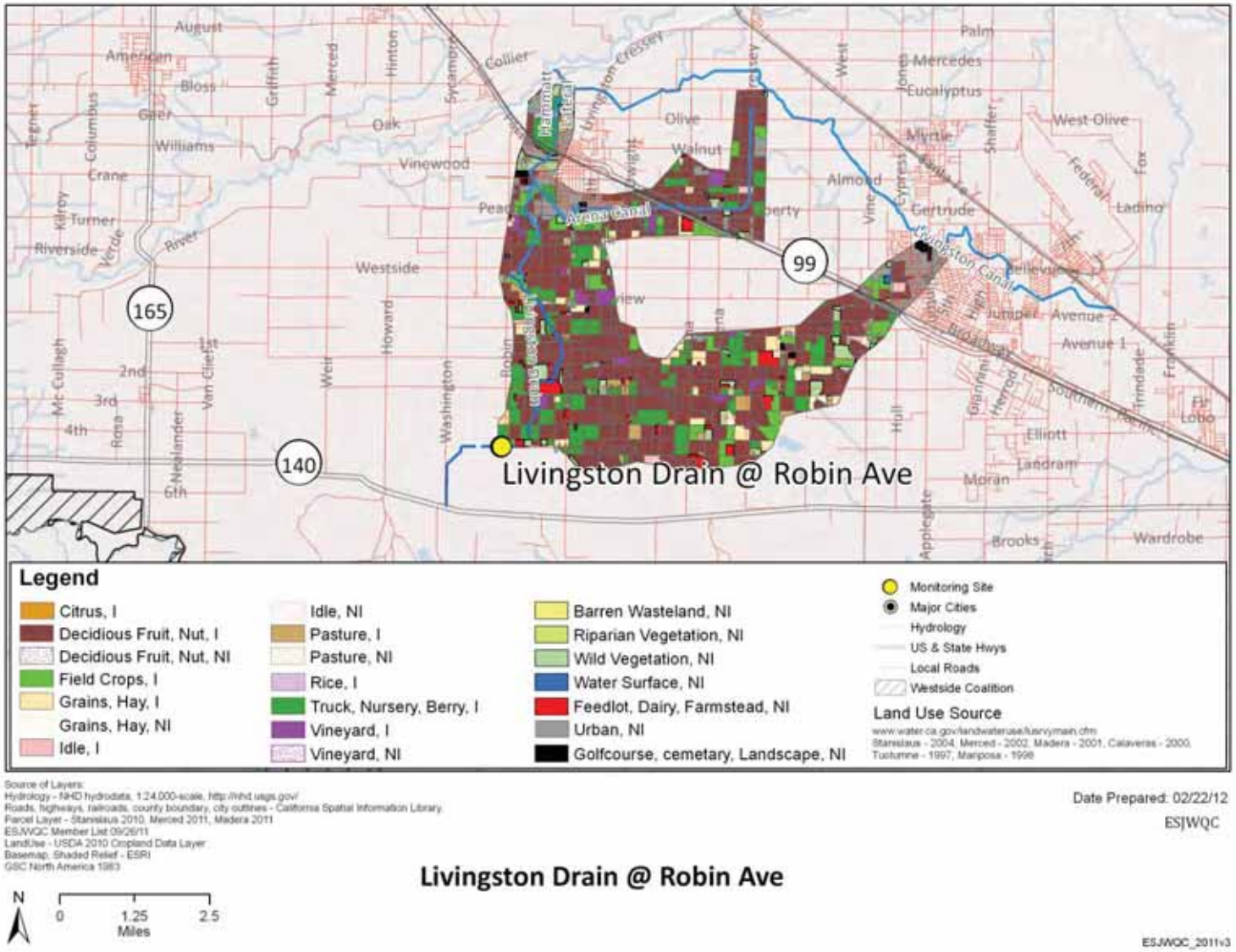
Description of Livingston Drain @ Robin Avenue Site Subwatershed

Livingston Drain @ Robin Ave (11,670 irrigated acres) – This site subwatershed is located in the west, central portion of the Coalition region in Merced County, west of the towns Atwater and Livingston (Table XI-1). Water from Hammatt Lateral and Arena Canal drain into Livingston Drain. Arena Canal receives storm water from the city of Livingston as well as water from Livingston Canal. The agriculture is almost entirely orchards with a small amount of truck crops. Several dairies are present in the subwatershed as well (Figure XI-1).

Table XI-1. Livingston Drain @ Robin Ave site subwatershed sampling location coordinates.

Site Name	Station Code	Target Lat	Target Long
Livingston Drain @ Robin Ave	535XLDARA	37.3169	-120.7423

Figure XI-1. Livingston Drain @ Robin Ave site subwatershed land use map.



Subwatershed Monitoring History

Monitoring within the Livingston Drain subwatershed was initiated in the irrigation season of 2007 and continued through 2008 (Table XI-2). Livingston Drain @ Robin Ave is an Assessment Monitoring location within the Merced River @ Santa Fe Zone (Zone 4). Assessment Monitoring is scheduled to resume at the site in 2021 through 2022. Sampling did not occur in 2009 and 2010. Only MPM occurred in 2011 and will continue through 2013. The constituents sampled at this location from 2007 through 2011 are listed in Table XI-3.

Management Plan Monitoring occurred for copper during 2008 (May-July and September). When the site became a high priority subwatershed, MPM resumed for chlorpyrifos in 2011 (January and June-August), copper (January, February, May-July, and September), lead (January and February), and *S. capricornutum* toxicity (February-May, Table XI-4).

Livingston Drain is not considered impaired on California's 2008-2010 303d List of Impaired Waterbodies; however, the downstream waterbody (Bear Creek from Bear Valley to San Joaquin River, Mariposa and Merced Counties) is listed for *E. coli* and unknown water column toxicity.

Table XI-2. Livingston Drain @ Robin Avenue site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	NA	NA	**NA**
2005	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2006	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2007	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2008	Storm	2	0	**2**
	Irrigation	10	0	**10**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	0	1	**1**
	Storm	0	1	**1**
	Irrigation	6	0	**6**
	Fall	NA	NA	**NA**

[1] If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table XI-3. Livingston Drain @ Robin Ave site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate number of one are listed.

Method	Analyte	2007	2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall*
Field and Physical Parameters											
EPA 110.2	Color	5	2	6							
EPA 160.1	Dissolved Solids	5	2	6							
EPA 160.2	Suspended Solids										
EPA 180.1	Turbidity	5	2	6							
EPA 405.1	BOD	1									
EPA 415.1	Total Organic Carbon	5	2	6							
SM 9223	*E. coli*	5	2	6							
NA	Dissolved Oxygen	6	2	12						6	
NA	Specific Conductivity	6	2	12						6	
NA	pH	6	2	12						6	
Carbamates											
EPA 8321A	Aldicarb	5	2	6							
EPA 8321A	Carbaryl	5	2	6							
EPA 8321A	Carbofuran	5	2	6							
EPA 8321A	Diuron	5	2	6							
EPA 8321A	Linuron	5	2	6							
EPA 8321A	Methiocarb	5	2	6							
EPA 8321A	Methomyl	5	2	6							
EPA 8321A	Oxamyl	5	2	6							
Organochlorines											
EPA 8081A	DDD(p,p')	5	2	6							
EPA 8081A	DDE(p,p')	5	2	6							
EPA 8081A	DDT(p,p')	5	2	6							
EPA 8081A	Dicofol	5	2	6							
EPA 8081A	Dieldrin	5	2	6							
EPA 8081A	Endrin	5	2	6							
EPA 8081A	Methoxychlor	5	2	6							
Organophosphates											
EPA 8141A	Azinphos methyl	5	2	6							
EPA 8141A	Chlorpyrifos	5	2	6						3	
EPA 8141A	Demeton-s										
EPA 8141A	Diazinon	5	2	6							
EPA 8141A	Dichlorvos										
EPA 8141A	Dimethoate	5	2	6							
EPA 8141A	Disulfoton	5	2	6							
EPA 8141A	Malathion	5	2	6							
EPA 8321A	Methamidophos	5	2	6							
EPA 8141A	Methidathion	5	2	6							
EPA 8141A	Molinate	5	2	6							
EPA 8141A	Parathion, Methyl	5	2	6							
EPA 8141A	Phorate	5	2	6							

Method	Analyte	2007	2008			2009	2010	2011			
		Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall*
EPA 8141A	Phosmet	5	2	6							
EPA 8141A	Thiobencarb	5	2	6							
Pyrethroids											
EPA 8081A	Bifenthrin	5	2	6							
EPA 8081A	Cyfluthrin, total	5	2	6							
EPA 8081A	Cyhalothrin, lambda, total	5	2	6							
EPA 8081A	Cypermethrin, total	5	2	6							
EPA 8081A	Esfenvalerate/ Fenvalerate, total	5	2	6							
EPA 8081A	Permethrin, total	5	2	6							
Triazines											
EPA 547M	Glyphosate	5	2	6							
EPA 549.2M	Paraquat dichloride	5	2	6							
EPA 619	Atrazine	5	2	6							
EPA 619	Cyanazine	5	2	6							
EPA 619	Simazine	5	2	6							
Metals (Total)											
EPA 200.8	Arsenic	5	2	6							
EPA 200.8	Boron	5	2	6							
EPA 200.8	Cadmium	5	2	6							
EPA 200.8	Copper	5	2	10						4	
EPA 200.8	Lead	5	2	6							
EPA 200.8	Nickel	5	2	6							
EPA 200.8	Selenium	5	2	6							
EPA 200.8	Zinc	5	2	6							
Metals (Dissolved)											
EPA 200.8	Cadmium										
EPA 200.8	Copper									4	
EPA 200.8	Lead										
EPA 200.8	Nickel										
EPA 200.8	Zinc										
Nutrients											
SM 2340 C	Hardness as CaCO3	5	2	10						4	
EPA 300.0	Nitrate as N	5	2	6							
EPA 350.2	Ammonia as N	5	2	6							
EPA 351.3	Nitrogen, Total Kjeldahl	5	2	6							
EPA 353.2	Nitrate + Nitrite as N										
EPA 354.1	Nitrite as N	5	2	6							
EPA 365.2	OrthoPhosphate as P	5	2	6							
EPA 365.2	Phosphate as P	5	2	6							
Toxicity											
EPA 821/R-02-012	*Ceriodaphnia dubia*	5	2	6							
EPA 821/R-02-012	*Pimephales promelas*	5	2	6							
EPA 821/R-02-013	*Selenastrum capricornutum*	5	2	8						2	
EPA 600/R-99-064	*Hyalella azteca*	1		1							

*Site not sampled during the 2008 fall season, 2009 and 2010 sampling years, and 2011 fall season.

Table XI-4. Livingston Drain @ Robin Ave site subwatershed Management Plan Monitoring schedule (2008-2011).

Site Name	Sample Date	Monitoring Type	Copper	Lead	Chlorpyrifos	*S. capricornutum*
Livingston Drain @ Robin Ave	7-May-08	A	X			
Livingston Drain @ Robin Ave	3-Jun-08	A	X			
Livingston Drain @ Robin Ave	8-Jul-08	A	X			
Livingston Drain @ Robin Ave	9-Sep-08	A	X			
Livingston Drain @ Robin Ave	18-Jan-11	MPM	X	X	X	
Livingston Drain @ Robin Ave	17-Feb-11	MPM	X	X		X
Livingston Drain @ Robin Ave	19-Apr-11	MPM				X
Livingston Drain @ Robin Ave	17-May-11	MPM	X			X
Livingston Drain @ Robin Ave	21-Jun-11	MPM	X		X	
Livingston Drain @ Robin Ave	19-Jul-11	MPM	X		X	
Livingston Drain @ Robin Ave	16-Aug-11	MPM			X	
Livingston Drain @ Robin Ave	13-Sep-11	MPM	X			

A – Additional sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Livingston Drain samples from 2007 through 2011 have exceeded the WQTLs for DO (1), pH (11), nitrate (1), *E. coli* (2), dissolved copper (2), total copper (9), lead (2), and chlorpyrifos (4). Toxicity to *S. capricornutum* occurred four times (Table XI-5). Two exceedances of copper occurred in 2011.

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The constituents of highest concern in the Livingston Drain subwatershed are chlorpyrifos (A/B), copper (C), and *S. capricornutum* toxicity (D).

Table XI-5. Livingston Drain @ Robin Ave site subwatershed exceedances (2007-2011).

The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, >7 mg/L	pH, <6.5 and > 8.5 units	Nitrate as N, >10 mg/L	*E. coli*, >235 MPN/100 mL	Copper, Dissolved[1] µg/L	Copper, Total[2], >1,300 µg/L	Lead, Total[1], >15 µg/L	Chlorpyrifos, > 0.015 µg/L	*S. capricornutum*, (% Control)
Livingston Drain @ Robin Ave	Irrigation	5/15/2007		8.95				18 (13.2)			
Livingston Drain @ Robin Ave	Irrigation	6/19/2007						16 (4.4)			
Livingston Drain @ Robin Ave	Irrigation	7/17/2007		8.82				7.8 (5.3)			
Livingston Drain @ Robin Ave	Irrigation	8/14/2007								0.016	
Livingston Drain @ Robin Ave	Irrigation	9/11/2007		8.57				14 (6.4)			
Livingston Drain @ Robin Ave	Storm	1/24/2008				1700		6.7 (3.1)	2.4 (0.6)	0.02	
Livingston Drain @ Robin Ave	Storm	2/26/2008	5.68					15 (4.1)	1.1 (0.9)		61
Livingston Drain @ Robin Ave	Irrigation	4/22/2008									58
Livingston Drain @ Robin Ave	Irrigation, RS	4/29/2008									63
Livingston Drain @ Robin Ave	Irrigation	5/20/2008		8.79							62
Livingston Drain @ Robin Ave	Irrigation, RS	5/27/2008		8.68							
Livingston Drain @ Robin Ave	Irrigation	6/3/2008		8.61							
Livingston Drain @ Robin Ave	Irrigation	6/17/2008		8.97	11			45 (13)		0.23	
Livingston Drain @ Robin Ave	Irrigation	7/8/2008		8.97				110 (5.7)			
Livingston Drain @ Robin Ave	Irrigation	7/22/2008				440		17 (16.9)		0.025	
Livingston Drain @ Robin Ave	Irrigation	8/19/2008									
Livingston Drain @ Robin Ave	Sediment	8/28/2008		8.67							
Livingston Drain @ Robin Ave	Irrigation	9/9/2008		8.72							
Livingston Drain @ Robin Ave	Irrigation	9/23/2008		9.02							
Livingston Drain @ Robin Ave	Irrigation	7/19/2011					2.6 (1.67)				
Livingston Drain @ Robin Ave	Irrigation	9/13/2011					1.7 (1.25)				
	Constituent Priority		**NP**	**E**	**NP**	**E**	**C**	**C**	**E**	**A/B**	**D**

[1]Dissolved metals not analyzed until October 2008; WQTL variable based on hardness.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TM
RS – Resampling due to toxicity

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Livingston Drain @ Robin Ave subwatershed are listed in Table XI-6, which includes chlorpyrifos, copper, lead, and *S. capricornutum* toxicity.

Chlorpyrifos first exceeded the WQTL in 2007 (August) and was subsequently added to the Livingston Drain management plan. However, no MPM was scheduled for the constituent in 2008. Normal Monitoring resulted in three exceedances of chlorpyrifos during 2008 (January, June, and July). Management Plan Monitoring occurred in 2011 during months of past exceedances and no chlorpyrifos was detected (Table XI-6).

Copper exceedances occurred four times during 2007 Normal Monitoring, and it was added to the Livingston Drain management plan. Additional MPM and Normal Monitoring occurred in 2008 resulted in copper exceedances during January, February, June and July (Normal Monitoring and additional MPM in July, Table XI-6). Two copper exceedances occurred during 2011 MPM.

There were two lead exceedances at Livingston Drain; the exceedances occurred during 2008 (January and February), and consequently lead was added to the Livingston Drain management plan. Because lead is not applied by agriculture, it is a lower priority (E) within the Livingston Drain management plan, and MPM for the constituent is not required. However, the Coalition decided to conduct MPM for lead in 2011 (January and February) in part because, as mentioned above, metals are now analyzed separately for total and dissolved fractions which allows the Coalition to more accurately characterize water quality. There were no exceedances of the lead WQTL in samples collected during 2011 MPM (Table XI-6).

Toxicity to *S. capricornutum* occurred three times during 2008 and the constituent was added to the Livingston Drain management plan. Management Plan Monitoring during 2011 did not find any instances of *S. capricornutum* toxicity (Table XI-6).

Management Plan Monitoring will be conducted during 2012 for all the above constituents during months of historical exceedances.

Table XI-6. Livingston Drain @ Robin Ave site subwatershed monitoring results for high priority constituents (2008-2011).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Apr	May	Jun	Jul	Aug	Sep
2008 MPM A (@ Robin Ave)	Date	NA	NA	NA	5/7/08	6/3/08	7/8/08	NA	9/9/08
	Copper, total (µg/L)	NA	NA	NA	6.9	9.2	**110**	NA	5.3
2008 NM (@ Robin Ave)	Date	1/24/08	2/26/08	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	9/23/08
	Chlorpyrifos (µg/L)	**0.02**	<0.003	<0.003	<0.003	**0.23**	**0.025**	<0.003	0.0051
	Copper, total (µg/L)	**6.7**	**15**	8.7	7.1	**45**	**17**	5.2	4.7
2011 MPM (@ Robin Ave)	Date	1/18/11	2/17/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11
	Chlorpyrifos (µg/L)	Dry	NA	NA	NA	<0.003	<0.003	<0.003	NA
	Copper, dissolved (µg/L)	Dry	Dry	NA	2	2.4	**2.6**	NA	**1.7**
	Copper, total (µg/L)	Dry	Dry	NA	3.3	4.8	4.2	NA	2.8
	Lead, dissolved (µg/L)	Dry	Dry	NA	NA	NA	NA	NA	NA
	Lead, total (µg/L)	Dry	Dry	NA	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	Dry	452	606	NA	NA	NA	NA

A – Additional MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table XI-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XI-7. Livingston Drain @ Robin Ave site subwatershed instantaneous load calculations for chlorpyrifos and copper.

Sorted by analyte and date.

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Livingston Drain @ Robin Ave	Chlorpyrifos	07/17/07	1.4	0.011	0.44
Livingston Drain @ Robin Ave	Chlorpyrifos	08/14/07	7.64	0.016	3.46
Livingston Drain @ Robin Ave	Chlorpyrifos	01/24/08	7.13	0.02	4.04
Livingston Drain @ Robin Ave	Chlorpyrifos	06/17/08	2.91	0.015	1.24
Livingston Drain @ Robin Ave*	Chlorpyrifos	06/17/08	2.91	0.23	18.95
Livingston Drain @ Robin Ave	Chlorpyrifos	07/22/08	3.09	0.025	2.19
Livingston Drain @ Robin Ave	Chlorpyrifos	09/23/08	1.93	0.0051	0.28

Sample Site	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Livingston Drain @ Robin Ave	Copper	05/15/07	8.94	18	4556.77
Livingston Drain @ Robin Ave	Copper	06/19/07	2.25	16	1019.41
Livingston Drain @ Robin Ave	Copper	07/17/07	1.4	7.8	309.22
Livingston Drain @ Robin Ave	Copper	08/14/07	7.64	7	1514.39
Livingston Drain @ Robin Ave	Copper	09/11/07	5.11	14	2025.80
Livingston Drain @ Robin Ave	Copper	01/24/08	7.13	6.7	1352.73
Livingston Drain @ Robin Ave	Copper	02/26/08	0.19	15	80.70
Livingston Drain @ Robin Ave*	Copper	02/26/08	0.19	18	96.84
Livingston Drain @ Robin Ave	Copper	04/22/08	1.07	8.7	263.60
Livingston Drain @ Robin Ave	Copper	05/07/08	1.67	6.9	326.30
Livingston Drain @ Robin Ave	Copper	05/20/08	4.1	7.1	824.31
Livingston Drain @ Robin Ave	Copper	06/03/08	1.58	9.2	411.62
Livingston Drain @ Robin Ave*	Copper	06/17/08	2.91	6	494.41
Livingston Drain @ Robin Ave	Copper	06/17/08	2.91	45	3708.11
Livingston Drain @ Robin Ave	Copper	07/08/08	0	110	0
Livingston Drain @ Robin Ave	Copper	07/22/08	3.09	17	1487.49
Livingston Drain @ Robin Ave	Copper	08/19/08	3.09	5.2	455.00
Livingston Drain @ Robin Ave	Copper	09/09/08	2.45	5.3	367.70
Livingston Drain @ Robin Ave	Copper	09/23/08	1.93	4.7	256.86
Livingston Drain @ Robin Ave	Copper	05/17/11	11.78	3.3	1100.80
Livingston Drain @ Robin Ave	Copper	06/21/11	4.99	4.8	678.25
Livingston Drain @ Robin Ave	Copper	07/19/11	27.51	4.2	3271.80
Livingston Drain @ Robin Ave	Copper	09/13/11	16.93	2.8	1342.34
Livingston Drain @ Robin Ave	Copper (D)	05/17/11	11.78	2	667.15
Livingston Drain @ Robin Ave	Copper (D)	06/21/11	4.99	2.4	339.12
Livingston Drain @ Robin Ave	Copper (D)	07/19/11	27.51	2.6	2025.40
Livingston Drain @ Robin Ave	Copper (D)	09/13/11	16.93	1.7	814.99

*Field Duplicate

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. During 2008, the Coalition conducted additional MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. Management Plan Monitoring occurred at the site during 2011. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with pesticide applications. From these actions, the Coalition derived an outreach strategy, which is detailed in the following sections.

In the Coalition's approved Management Plan, the Livingston Drain @ Robin Ave subwatershed is a high priority as of 2011 and will remain as such through 2013. The Coalition will actively engage in grower outreach and education to address the Livingston Drain management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Grower meetings with targeted members occurred in the fall of 2010 and fall of 2011 to inform growers about

management practices as well as to assess current and expected future implementation of additional management practices. Follow up with the targeted members who received recommendations for management practices will occur in 2012 to determine if additional management practices were implemented. Management Plan Monitoring will continue through 2013 as necessary to assess the effect of outreach on water quality.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent for the Livingston Drain subwatershed.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded four times in this subwatershed: three times during the irrigation season and once during a storm event (Table XI-5).

The Livingston Drain subwatershed is predominantly orchards during dormant sprays in the winter and throughout the irrigation season. Peak use often occurs during the latter summer months prior to almond and walnut harvests, but that trend does not appear true for the Livingston Drain subwatershed.

To determine an outreach strategy, the Coalition reviewed PUR data from the Livingston Drain subwatershed for the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and the acres treated (Table XI -8, Figure XI-2). Chlorpyrifos use in the subwatershed peaked in 2007 (2,335 lbs AI) and declined since, although growers still apply relatively large amounts of chlorpyrifos to relatively small acreages. Applications used to occur mostly in the summer months in the subwatershed, but in recent years there were several more applications earlier in the irrigation season in April. Regardless, exceedances in the waterway do not always coincide with heavy use of chlorpyrifos, indicating mechanisms other than spray drift may be responsible for transporting chlorpyrifos offsite. Chlorpyrifos is primarily applied to almond orchards and sweet potato crops in the subwatershed (Table XI-9).

Table XI-8. Livingston Drain @ Robin Ave site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2007-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos	Pounds of AI Applied	Acres Treated
January, 2007	2	49.0	49.0
February, 2007	8	159.5	169.0
March, 2007	1	59.5	85.0
April, 2007	5	181.4	93.5
May, 2007	11	372.4	196.5
June, 2007	1	18.6	20.0
July, 2007	18	720.8	407.3
August, 2007	17	608.7	439.5
September, 2007	1	28.1	15.0
October, 2007	1	37.2	20.0
March, 2008	2	54.5	57.8

Month/Year	Number of Chlorpyrifos	Pounds of AI Applied	Acres Treated
April, 2008	5	232.4	117.3
May, 2008	16	688.0	351.7
June, 2008	5	83.0	41.0
July, 2008	8	359.5	325.0
August, 2008	19	535.5	444.5
September, 2008	2	97.5	195.0
April, 2009	2	116.0	58.0
May, 2009	4	212.2	105.0
June, 2009	1	40.0	20.0
August, 2009	18	665.9	642.0
April, 2010	6	705.4	624.0
May, 2010	3	135.0	68.0
June, 2010	1	9.0	40.0
July, 2010	6	195.6	147.0
August, 2010	9	248.2	222.6
April, 2011	7	1147.4	779.0
May, 2011	9	237.2	119.0
June, 2011	1	60.3	123.0
July, 2011	1	21.6	11.5
August, 2011	9	287.9	311.9
September, 2011	2	57.6	38.8
Summaries by Year			
2007 Total	65	2235.1	1,494.8
2008 Total	57	2050.5	1,532.3
2009 Total	25	1034.1	825.0
2010 Total	25	1293.2	1,101.6
2011 Total	29	1811.9	1,383.2
Total	**201**	**8424.9**	**6,336.9**

Figure XI-2. Livingston Drain @ Robin Ave site subwatershed lbs chlorpyrifos applied by month (2007-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

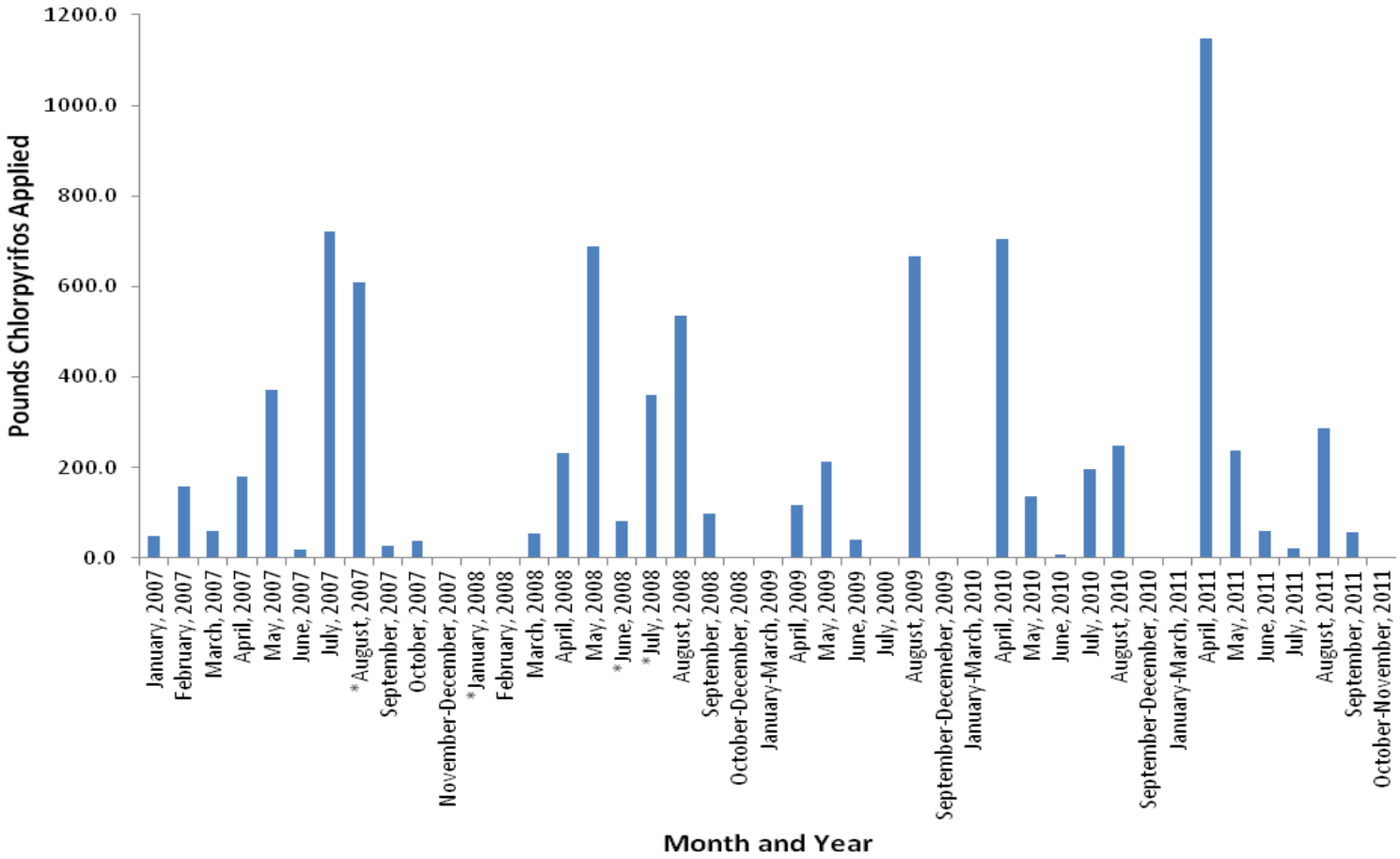


Table XI-9. Livingston Drain @ Robin Ave site subwatershed chlorpyrifos PUR data (2007-2011).
PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	77.6
		LORSBAN-4E	175.6
	ALMOND	CHLORPYRIFOS 4E AG	797.4
		GOVERN 4E INSECTICIDE	1728.3
		LORSBAN 4E-HF	298.3
		LORSBAN ADVANCED	469.7
		LORSBAN-4E	1075.9
		WARHAWK	957.0
	CORN (FORAGE - FODDER)	LORSBAN 4E-HF	92.2
		NUFOS 4E	20.3
	PEACH	LORSBAN-4E	49.0
	SWEET POTATO	CHLORPYRIFOS 4E AG	33.8
		GOVERN 4E INSECTICIDE	329.5
		LORSBAN 15G GRANULAR INSECTICIDE	1714.7
		LORSBAN-4E	87.3
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN 4E-HF	147.5
		LORSBAN ADVANCED	193.4
		LORSBAN-4E	108.1
		NUFOS 4E	69.1

ALFALFA-Total Pounds Chlorpyrifos Applied	**253.2**
ALMOND-Total Pounds Chlorpyrifos Applied	**5326.7**
CORN-Total Pounds Chlorpyrifos Applied	**112.5**
PEACH-Total Pounds Chlorpyrifos Applied	**49.0**
SWEET POTATO-Total Pounds Chlorpyrifos Applied	**2165.2**
WALNUT-Total Pounds Chlorpyrifos Applied	**518.2**
Total Pounds Chlorpyrifos Applied (2007-2011)	**8424.9**

The chlorpyrifos concentrations found in Livingston Drain @ Robin Ave are most likely the result of irrigation tailwater and storm water runoff transporting chlorpyrifos to the creek. Because the chlorpyrifos concentrations were well above the WQTL and exceedances did not always coincide with peak application periods, it is unlikely that exceedances were solely the result of spray drift. The management of chlorpyrifos in this subwatershed included providing information to growers regarding proper management of irrigation tailwater and storm water. Because some exceedances did coincide with several applications, orchard operators were also encouraged to implement additional spray drift management practices.

Since 2007, general Coalition outreach included grower meetings and the mailing/distribution of information. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142). Focused outreach was directed at growers whose parcels are in the direct drainage area of the subwatershed and who applied chlorpyrifos. From these criteria, the Coalition compiled a list of targeted growers.

The Coalition completed individual meetings with targeted growers in the third priority subwatersheds during the fall seasons of 2010 and 2011. Although meetings focused mainly on chlorpyrifos exceedances, all water quality results are reviewed and discussed including copper, *S. capricornutum* toxicity, *E. coli*, lead, and pH. The Coalition contacted 11 members accounting for 335 acres of targeted direct drainage.

Grower surveys completed at the meetings documenting members' current practices and indicating which recommended practices growers anticipate implementing in the upcoming years have been compiled and assessed by the Coalition in the Third Priority Subwatersheds Summary of Management Practices section of this report. The Coalition anticipates some growers were able to begin to implement management practices in 2011 whereas some growers will begin to implement recommended practices during the irrigation season of 2012, depending upon when their initial contact meeting occurred. Follow up meetings with targeted growers who received recommendations for practices will occur in the winter and/or spring of 2012 to determine what additional management practices were implemented in the subwatershed.

Management Plan Monitoring will continue in 2012 at Livingston Drain @ Robin Ave during months of historical exceedances. The Coalition plans to conduct MPM through 2013 to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority C Constituent

Copper is the only priority C constituent listed for the Livingston Drain @ Robin Ave subwatershed management plan.

Copper

There were nine exceedances of the copper WQTL within the Livingston Drain subwatershed (Table XI-5). The 2008 (February) copper exceedance coincided with toxicity to *S. capricornutum*, however algae toxicity also occurred during 2008 (April and May) when there were no copper exceedances.

Copper is an algaecide and fungicide often applied to orchards and vineyards. Copper can be applied throughout the year but its peak application periods are prior to and during the dormant season and early in the irrigation season. Copper is also heavily used by dairies, and the Livingston Drain subwatershed contains relatively several dairies (Figure XI-1). Often copper is applied via ground application, thus mismanaged irrigation tailwater is a more likely source than spray drift.

To determine an outreach strategy, the Coalition reviewed PUR data for the number of monthly copper applications, pounds of active ingredient applied, and acres treated (Table XI-10, Figure XI-3). Pesticide Use Report data indicate copper use began in the subwatershed in 2007 (16,218 lbs AI) and declined since, although the amount applied in 2011 (15,828 lbs AI) was the greatest since 2007. Copper applications typically occur during December through February, although several applications occurred

during July 2011. Exceedances in Livingston Drain do not always coincide with applications in the subwatershed.

The largest amount of copper applied from 2006 through 2011 was associated with almonds (49,277 lbs AI), peaches (8,341 lbs AI) and grapes (6,880 lbs AI). The most common product containing copper used within this subwatershed is Kocide (Table XI-11).

Table XI-10. Livingston Drain @ Robin Ave site subwatershed copper applications, lbs AI applied, and acres treated by month (2007-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2007	66	11202.4	3072.0
February, 2007	43	1938.0	1026.9
March, 2007	22	828.8	565.8
July, 2007	3	419.7	126.5
November, 2007	2	38.7	18.0
December, 2007	11	1789.9	309.5
January, 2008	65	8532.3	1659.8
February, 2008	54	4523.7	1720.3
March, 2008	18	355.2	431.8
July, 2008	3	270.0	126.5
January, 2009	49	9281.7	1897.0
February, 2009	37	1904.0	891.9
March,, 2009	6	86.0	160.0
April, 2009	3	72.4	84.0
June, 2009	2	191.2	64.0
August, 2009	2	220.0	95.2
September, 2009	4	455.8	229.4
October, 2009	4	468.0	202.6
November, 2009	5	615.9	266.6
January, 2010	38	3262.2	842.0
February, 2010	57	3799.3	1492.0
March, 2010	15	351.5	443.0
April, 2010	3	158.9	46.0
July, 2010	5	502.6	198.5
August, 2010	3	375.0	126.5
January, 2011	46	7177.4	1814.7
February, 2011	41	2757.2	1189.5
March, 2011	7	477.0	215.0
April, 2011	1	318.5	35.0
July, 2011	48	4786.1	1676.2
September, 2011	1	155.9	67.5
October, 2011	1	155.9	67.5
Summaries by Year			
2007 Total	147	16217.5	5118.7
2008 Total	140	13681.2	3938.3
2009 Total	112	13294.9	3890.7
2010 Total	121	8449.5	3148.0
2011 Total	145	15828.0	5065.4
Total	**665**	**67471.2**	**21161.0**

Figure XI-3. Livingston Drain @ Robin Ave site subwatershed lbs copper applied by month (2007-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

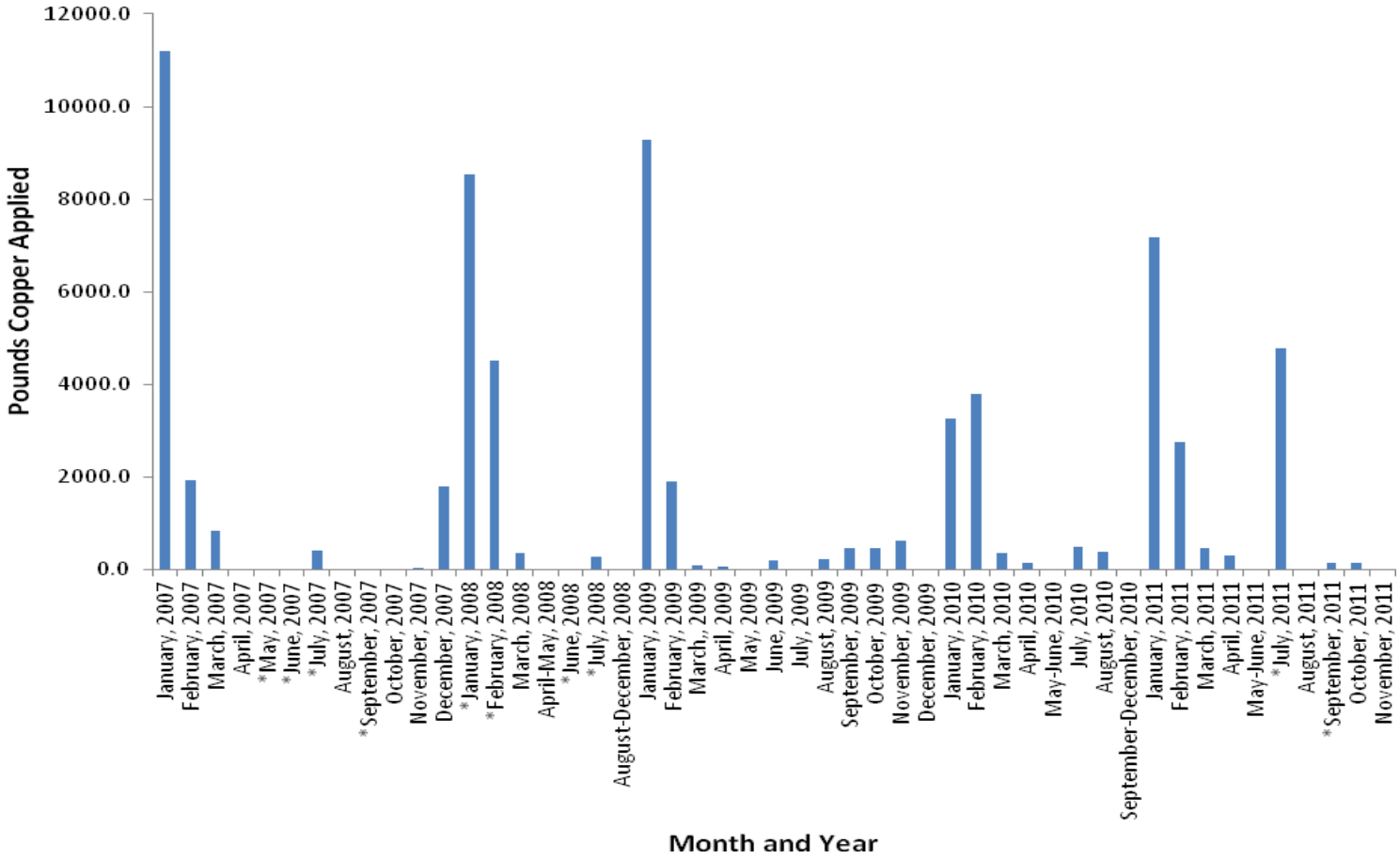


Table XI-11. Livingston Drain @ Robin Ave site subwatershed copper PUR data (2007-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALMOND	BASIC COPPER 53	5658.0
		CHAMP DP	89.9
		CHAMP DRY PRILL	10.9
		CHAMP WG	29.3
		CHAMPION WETTABLE POWDER	45.0
		CLEAN CROP C-O-C-S WDG	178.0
		CUPROFIX DISPERSS	33.2
		CUPROFIX ULTRA 40 DISPERSS	12686.0
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	212.1
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	9286.5
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	877.3
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	585.8
		KOCIDE 2000	1334.7
		KOCIDE DF	425.5
		NORDOX	1019.7
		NORDOX 75 WG	12389.5
		NU-COP 50 WP	590.6
		NU-COP 50DF	3825.0
	GRAPES	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	31.3
	GRAPES (WINE)	CLEAN CROP C-O-C-S 15 SULFUR 25 DUST	554.7
		COCS 15 SULFUR 25 DUST	82.5
		IAP COPPER SULFUR 15-25 DUST	1121.3
		NORDOX 75 WG	304.1
		WIL-DRY	4786.1
	NECTARINE	CHAMP WG	92.4
		CHAMPION WETTABLE POWDER	207.9
	N-OUTDR CONTAINER/FLD GRWN PLANTS	DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	0.4
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	CHAMPION WETTABLE POWDER	311.9
		NU-COP 50 WP	1759.7
	PEACH	CHAMP WG	249.5
		CHAMPION WETTABLE POWDER	271.0
		CUPROFIX ULTRA 40 DISPERSS	177.8
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	3204.8
		KOCIDE 101	840.8
		KOCIDE 2000	443.4
		NORDOX	45.1
		NORDOX 75 WG	2887.0
		NU-COP 50DF	221.8
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	CHAMP WG	55.4
		CHAMPION WETTABLE POWDER	46.2
	SWEET POTATO	NORDOX 75 WG	30.2
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	BASIC COPPER 53	318.5
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	150.6

Chemical Name	Commodity	Product Name	Lbs AI Applied
		ALMOND-Total Pounds Copper Applied	49276.8
		GRAPES-Total Pounds Copper Applied	6880.1
		NECTARINE-Total Pounds Copper Applied	300.3
		N-OUTDR-Total Pounds Copper Applied	2071.9
		PEACH-Total Pounds Copper Applied	8341.2
		PLUM-Total Pounds Copper Applied	101.6
		SWEET POTATO-Total Pounds Copper Applied	30.2
		WALNUT-Total Pounds Copper Applied	469.1
		Total Pounds Copper Applied (2007-2011)	67471.2

The Coalition included growers with the potential to drain and applying copper in their targeted grower contact list. The Coalition continued with its Management Plan strategy outlined above under the chlorpyrifos outreach section when conducting individual contacts. Growers were advised to consider irrigation tailwater and storm water management to prevent copper from entering the waterway with runoff. Orchard and vineyard operators were encouraged to implement additional spray drift management practices.

Priority D Constituents

Water column toxicity to *S. capricornutum* is the only priority D constituent in the Livingston Drain @ Robin Ave subwatershed.

S. capricornutum toxicity

Algae toxicity occurred three times at Livingston Drain in 2008 (February, April and May), and toxicity was persistent once in the resample collected one week later (April 2008). Copper coincided with the 2008 (February) toxicity, but no metals or herbicides were detected above their WQTL during the 2008 (April and May) events. Toxicity Identification Evaluations were not conducted on any of the toxic samples.

Although the exact cause of toxicity could not be isolated, the Coalition believes management practices that prevent irrigation return flows and storm water runoff from carrying agricultural constituents to the waterways is the most effective way to eliminate *S. capricornutum* toxicity. The Coalition will continue with outreach as explained above under the chlorpyrifos section to address the toxicity.

Priority E Constituents

The priority E constituents listed under the Livingston Drain subwatershed management plan are *E. coli*, pH and lead.

The Coalition conducted MPM for lead in 2011 and no exceedances of the WQTL occurred. The Coalition believes this may be because the Coalition is now analyzing separately for total and dissolved fractions of metals which allows for more complete and accurate characterization of water quality. The Coalition plans to continue MPM for lead to evaluate if the constituent is still impairing water quality.

Although lead is not applied by agriculture, it is possible that offsite movement of irrigation tailwater is mobilizing sediment bound lead and transporting the metal to the waterbody. Therefore, the Coalition's strategy described above should address potential agriculture-induced movement of lead to waterways.

Although the other priority E constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and/or MPM. Field parameters such as pH will be monitored during every event, during Assessment Monitoring and/or MPM. *E. coli* and lead will be monitored during Assessment Monitoring as scheduled in 2021 through 2022. In addition, lead will continue to be monitored during MPM. The priority E constituents are discussed during individual contacts and will continue to be discussed at annual grower meetings.

The Coalition also plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Livingston Drain @ Robin Ave is a third priority site subwatershed within the ESJWQC and is in its second year of focused outreach (2011-2013).

The Coalition's strategy for the Livingston Drain subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows and storm water are managed properly. The Coalition targeted growers whose agricultural practices may result in the discharge or drift of pesticides into the waterway and who applied chlorpyrifos and/or copper. Outreach efforts include grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

All individual grower surveys documenting current management practice implementations and assessing future planned implementations were completed and returned to the Coalition representing 100% of targeted growers. The Third Priority Subwatersheds Summary of Management Practices section of this report summarizes the results of these contacts. The Coalition plans to conduct follow up contacts targeted growers who received recommendations for additional management practices in 2012. The Coalition will report on newly implemented management practices in the 2013 MPUR.

In 2012, MPM is scheduled to continue during months of past exceedances.

HIGH PRIORITY SITE SUBWATERSHEDS (2012-2014)

XII. BLACK RASCAL CREEK @ YOSEMITE RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority D

- *Ceriodaphnia dubia* water column toxicity

Priority E

- DO
- *E. coli*
- Lead
- pH

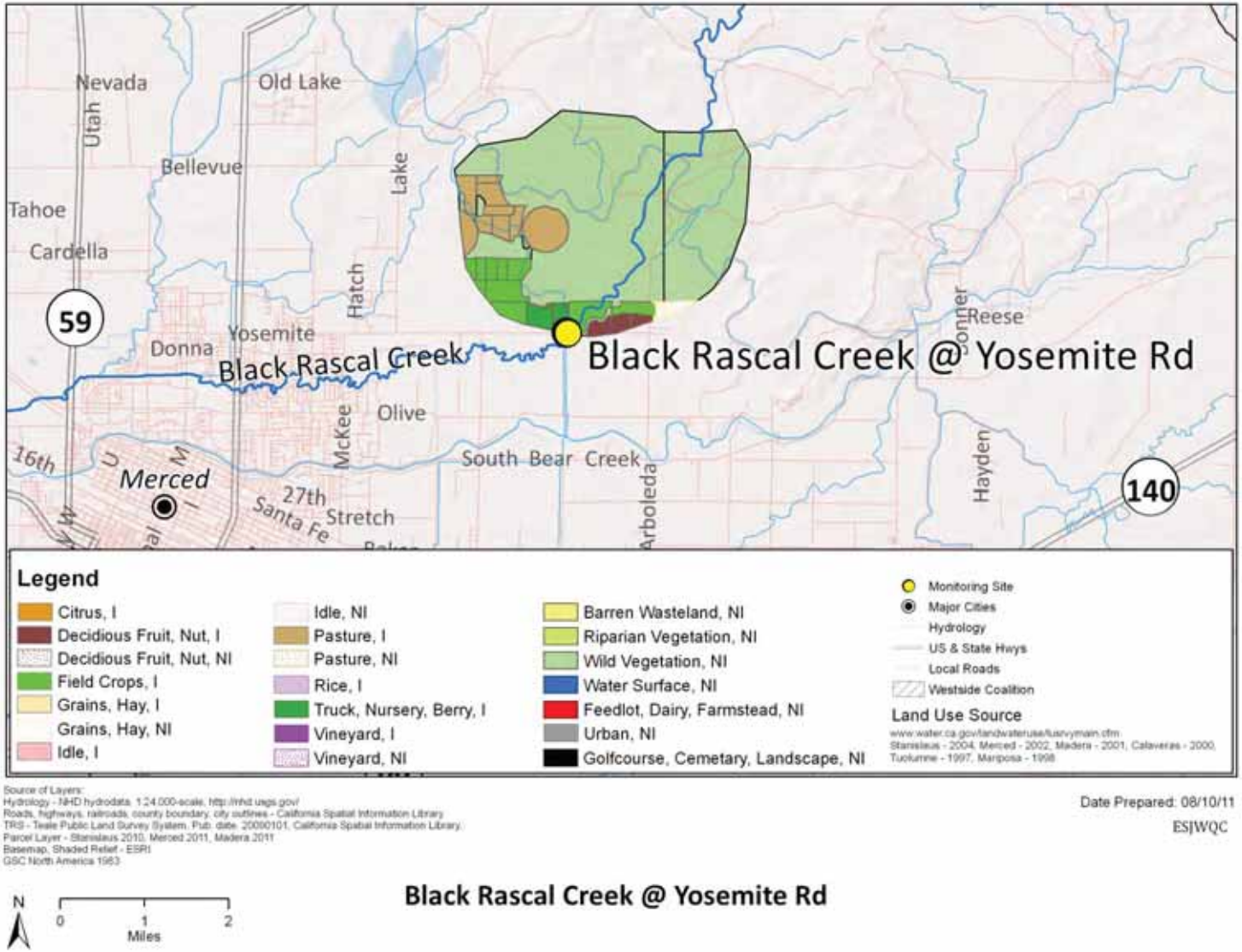
Description of Black Rascal Creek Site Subwatershed

Black Rascal Creek @ Yosemite Rd (997 irrigated acres) –This site subwatershed is located just to the north of the Bear Creek site subwatershed and to the east of the city of Merced (Table XII-1). The headwaters of Black Rascal Creek are located in the Sierra foothills. The primary agriculture in the site subwatershed is pasture and field crops, with small amounts of orchards (Figure XII-1).

Table XII-1. Black Rascal @ Yosemite Rd site subwatershed sampling location coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Black Rascal Creek @ Yosemite Rd	535BRCAYR	37.3321	-120.3947

Figure XII-1. Black Rascal Creek @ Yosemite Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring was initiated at Black Rascal Creek @ Yosemite Rd during the irrigation season of 2006 and continued through the irrigation season of 2008 (Table XII-2). Under the 2008 MRPP, Black Rascal Creek @ Yosemite Rd is within the Merced River @ Santa Fe Zone (Zone 4) and is scheduled for Assessment Monitoring in 2025 through 2026. Sampling at Black Rascal Creek @ Yosemite Rd did not occur during 2009, 2010 nor 2011. The constituents sampled at this location from 2006 through 2008 are listed in Table XII-3.

Management Plan Monitoring occurred during the irrigation season in 2008 for *C. dubia* toxicity (May, July and August) and chlorpyrifos (May, July, August and September, Table XII-4). Since Black Rascal Creek is a fourth priority subwatershed, MPM is scheduled to resume during 2012.

Black Rascal Creek is not considered impaired on California's 2008-2010 303d List of Impaired Waterbodies; however, the downstream waterbody (Bear Creek from Bear Valley to San Joaquin River, Mariposa and Merced Counties) is listed for *E. coli* and unknown water column toxicity.

Table XII-2. Black Rascal Creek @ Yosemite Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2006	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	6	0	**6**
2008	Storm	2	0	**2**
	Irrigation	10	0	**10**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table XII-3. Black Rascal Creek @ Yosemite Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate of one are listed.

Method	Analyte	2006		2007		2008			2009	2010	2011
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter-Fall*
Field and Physical Parameters											
NA	Dissolved Oxygen		5	3	10	3	12				
NA	Specific Conductivity		5	3	10	3	12				
NA	pH		5	3	10	3	12				
EPA 110.2	Color		5	2	6	2	6				
EPA 160.1	Dissolved Solids		5	2	6	2	6				
EPA 160.2	Suspended Solids										
EPA 180.1	Turbidity		5	2	6	2	6				
EPA 415.1	Total Organic Carbon		5	2	6	2	6				
SM 9223	*E. coli*		5	2	6	2	6				
EPA 405.1	BOD		1	2	2						
Carbamates											
EPA 8321A	Aldicarb		5	2	6	2	6				
EPA 8321A	Carbaryl		5	2	6	2	6				
EPA 8321A	Carbofuran		5	2	6	2	6				
EPA 8321A	Diuron		5	2	6	2	6				
EPA 8321A	Linuron		5	2	6	2	6				
EPA 8321A	Methiocarb		5	2	6	2	6				
EPA 8321A	Methomyl		5	2	6	2	6				
EPA 8321A	Oxamyl		5	2	6	2	6				
Organochlorines											
EPA 8081A	DDD(p,p')		5	2	6	2	6				
EPA 8081A	DDE(p,p')		5	2	6	2	6				
EPA 8081A	DDT(p,p')		5	2	6	2	6				
EPA 8081A	Dicofol		5	2	6	2	6				
EPA 8081A	Dieldrin		5	2	6	2	6				
EPA 8081A	Endrin		5	2	6	2	6				
EPA 8081A	Methoxychlor		5	2	6	2	6				
Organophosphates											
EPA 8141A	Azinphos methyl		5	2	6	2	6				
EPA 8141A	Chlorpyrifos		5	2	6	2	10				
EPA 8141A	Demeton-s										
EPA 8141A	Diazinon		5	2	6	2	6				
EPA 8141A	Dichlorvos										
EPA 8141A	Dimethoate		5	2	6	2	6				
EPA 8141A	Disulfoton		5	2	6	2	6				
EPA 8141A	Malathion		5	2	6	2	6				
EPA 8321A	Methamidophos		5	2	6	2	6				
EPA 8141A	Methidathion		5	2	6	2	6				
EPA 8141A	Molinate		5	2	6	2	6				
EPA 8141A	Parathion, Methyl		5	2	6	2	6				
EPA 8141A	Phorate		5	2	6	2	6				

Method	Analyte	2006		2007		2008			2009	2010	2011
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter-Fall*
EPA 8141A	Phosmet		5	2	6	2	6				
EPA 8141A	Thiobencarb		5	2	6	2	6				
EPA 8141A	Trifluralin										
Pyrethroids											
EPA 8081A	Bifenthrin		5	2	6	2	6				
EPA 8081A	Cyfluthrin, total		5	2	6	2	6				
EPA 8081A	Cyhalothrin, lambda, total		5	2	6	2	6				
EPA 8081A	Cypermethrin, total		5	2	6	2	6				
EPA 8081A	Esfenvalerate/ Fenvalerate, total		5	2	6	2	6				
EPA 8081A	Permethrin, total		5	2	6	2	6				
Triazines											
EPA 547M	Glyphosate		5	2	6	2	6				
EPA 549.2M	Paraquat dichloride		5	2	6	2	6				
EPA 619	Atrazine		5	2	6	2	6				
EPA 619	Cyanazine		5	2	6	2	6				
EPA 619	Simazine		5	2	6	2	6				
Metals (Total)											
EPA 200.8	Arsenic						6				
EPA 200.8	Boron						6				
EPA 200.8	Cadmium						6				
EPA 200.8	Copper						6				
EPA 200.8	Lead						6				
EPA 200.8	Molybdenum										
EPA 200.8	Nickel						6				
EPA 200.8	Selenium						6				
EPA 200.8	Zinc						6				
Nutrients											
SM 2340 C	Hardness as CaCO3						6				
EPA 300.0	Nitrate as N			1			6				
EPA 350.2	Ammonia as N						6				
EPA 351.3	Nitrogen, Total Kjeldahl						6				
EPA 354.1	Nitrite as N			1			6				
EPA 353.2	Nitrate + Nitrite as N										
EPA 365.2	OrthoPhosphate as P			1			6				
EPA 365.2	Phosphate as P						6				
Toxicity											
EPA 821/R-02-012	*Ceriodaphnia dubia*		5	2	9	2	9				
EPA 821/R-02-012	*Pimephales promelas*		5	2	6	2	6				
EPA 821/R-02-013	*Selenastrum capricornutum*		5	2	6	3	6				
EPA 600/R-99-064	*Hyalella azteca*		1	1	1	1	2				

*Site not sampled during the 2008 fall season, and 2009, 2010, and 2011 sampling years.

Table XII-4. Black Rascal Creek @ Yosemite Rd site subwatershed Management Plan Monitoring schedule (2008).

Site Name	Sample Date	Monitoring Type	Chlorpyrifos	*C. dubia*
Black Rascal Creek @ Yosemite Rd	7-May-08	A	X	X
Black Rascal Creek @ Yosemite Rd	8-July-08	A	X	X
Black Rascal Creek @ Yosemite Rd	5-Aug-08	A	X	X
Black Rascal Creek @ Yosemite Rd	9-Sep-08	A	X	

A – Additional sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from Black Rascal Creek @ Yosemite Rd from 2005 through 2011 exceeded the WQTLs for field parameters, *E. coli*, pesticides, and metals (Table XII-5). Toxicity in the water column to *C. dubia* and *S. capricornutum* and sediment toxicity to *H. azteca* also occurred (Table XII-5). Constituents that exceeded their respective WQTLs in this subwatershed include: DO (17), pH (2), *E. coli* (11), chlorpyrifos (4), total copper (1), and lead (2). Toxicity to *C. dubia* (3), two of which demonstrated persistent toxicity in the resampling events, to *S. capricornutum* (1), and toxicity to *H. azteca* sediment (1) occurred (Table XII-5).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Black Rascal Creek @ Yosemite Rd subwatershed are chlorpyrifos (A/B) and toxicity to *C. dubia* (D).

Table XII-5. Black Rascal Creek@ Yosemite Rd site subwatershed exceedances (2006-2008).
The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Total[1], >1,300 µg/L	Lead, Total[1], >15 µg/L	Chlorpyrifos, >0.015 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Black Rascal Creek @ Yosemite Rd	Irrigation	5/18/2006	5.41		2400			0.033			
Black Rascal Creek @ Yosemite Rd	Irrigation	6/14/2006			490						
Black Rascal Creek @ Yosemite Rd	Irrigation	7/12/2006	5.53								
Black Rascal Creek @ Yosemite Rd	Irrigation	8/9/2006	5.65								
Black Rascal Creek @ Yosemite Rd	Irrigation	9/12/2006	5.56								
Black Rascal Creek @ Yosemite Rd	Storm	2/12/2007			2400						
Black Rascal Creek @ Yosemite Rd	Storm	3/1/2007			2400						
Black Rascal Creek @ Yosemite Rd	Irrigation	5/29/2007	3.93		770				20		
Black Rascal Creek @ Yosemite Rd	Irrigation	6/26/2007	6.95								
Black Rascal Creek @ Yosemite Rd	Irrigation	7/24/2007			580			3.7	0		
Black Rascal Creek @ Yosemite Rd	Irrigation	7/31/2007							0		
Black Rascal Creek @ Yosemite Rd	Irrigation	8/21/2007	6.42					0.12	0		
Black Rascal Creek @ Yosemite Rd	Irrigation	8/23/2007	5.69								
Black Rascal Creek @ Yosemite Rd	Irrigation	8/28/2007	6.18						0		
Black Rascal Creek @ Yosemite Rd	Irrigation	9/18/2007						0.031			
Black Rascal Creek @ Yosemite Rd	Storm	1/24/2008			>2400						

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 mL	Copper, Total[1], >1,300 µg/L	Lead, Total[1], >15 µg/L	Chlorpyrifos, >0.015 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Black Rascal Creek @ Yosemite Rd	Storm	2/25/2008			>2400					38	
Black Rascal Creek @ Yosemite Rd	Irrigation	4/29/2008		8.8	770	8 (7.7)	2.4 (2.39)				
Black Rascal Creek @ Yosemite Rd	Irrigation	5/27/2008			920						
Black Rascal Creek @ Yosemite Rd	Irrigation	6/24/2008			490						
Black Rascal Creek @ Yosemite Rd	Irrigation	7/8/2008	2.30								
Black Rascal Creek @ Yosemite Rd	Irrigation	7/29/2008	4.49								
Black Rascal Creek @ Yosemite Rd	Irrigation	8/5/2008	5.58								
Black Rascal Creek @ Yosemite Rd	Irrigation	8/26/2008	2.58								
Black Rascal Creek @ Yosemite Rd	Sediment	8/28/2008	2.26								63
Black Rascal Creek @ Yosemite Rd	Irrigation	9/9/2008	4.18								
Black Rascal Creek @ Yosemite Rd	Irrigation	9/30/2008	3.75	5			1.3 (0.75)				
Black Rascal Creek @ Yosemite Rd	Sediment	10/2/2008	5.05								
Constituent Priority			**E**	**E**	**E**	**NP**	**E**	**A/B**	**D**	**NP**	**NP**

[1]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

Monitoring results for high priority management plan constituents in the Black Rascal Creek subwatershed, which are chlorpyrifos, *C. dubia* toxicity and lead, are listed in Table XII-6.

The chlorpyrifos and *C. dubia* toxicity in Black Rascal Creek appear to be associated. Chlorpyrifos first exceeded the WQTL in 2006 (May), but since the chlorpyrifos and diazinon TMDL for the Lower San Joaquin River was not approved, it was not added to the Black Rascal Creek management plan until after 2007 when three more chlorpyrifos exceedances occurred (July, August and September). *C. dubia* toxicity occurred for the first time in the subwatershed in 2007 (May, July, and August). Additional MPM was scheduled for chlorpyrifos in 2008 (May, July, August and September) and *C. dubia* toxicity (May, July, and August), and there were no exceedances of chlorpyrifos or instances of *C. dubia* toxicity during MPM or Normal Monitoring (Table XII-6). The site has not been sampled since 2008; however, MPM is scheduled in 2012 for chlorpyrifos (May, July, August and September) and *C. dubia* toxicity (May, July, and August).

Two exceedances of lead occurred in the subwatershed, during April and September 2008. Accordingly, lead was added to the Black Rascal Creek management plan the following year. Because lead is not applied by agriculture, it is a lower priority (E) constituent, and MPM for the constituent is not required. However, the Coalition decided to schedule MPM for lead in 2012 (April and September) in part because metals are now analyzed separately for total and dissolved fractions which allows for more accurate characterization of water quality.

Table XII-6. Black Rascal Creek @ Yosemite Rd site subwatershed monitoring results for high priority constituents (2008).

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	MONTH:	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
2008 NM	Date	4/29/2008	5/27/2008	6/24/2008	7/29/2008	8/26/2008	9/30/2008
	Chlorpyrifos (µg/L)	0.0078	<0.003	<0.003	<0.003	<0.003	<0.003
	C. dubia toxicity (% Control)	100	100	100	100	100	100
2008 MPM A	Date	NA	5/7/2008	NA	7/8/2008	8/5/2008	9/9/2008
	Chlorpyrifos (µg/L)	NA	<0.003	NA	<0.003	<0.003	<0.003
	C. dubia toxicity (% Control)	NA	100	NA	100	100	NA

A – Additional MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table XII-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XII-7. Black Rascal Creek @ Yosemite Rd site subwatershed instantaneous load calculations for chlorpyrifos.

Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Black Rascal Creek @ Yosemite Rd	Chlorpyrifos	07/24/07	0	3.7	0.00
Black Rascal Creek @ Yosemite Rd	Chlorpyrifos	08/21/07	0	0.12	0.00
Black Rascal Creek @ Yosemite Rd	Chlorpyrifos	09/18/07	0	0.031	0.00
Black Rascal Creek @ Yosemite Rd	Chlorpyrifos	02/25/08	61.02	0.0057	9.85
Black Rascal Creek @ Yosemite Rd	Chlorpyrifos	04/29/08	0.04	0.0078	0.01

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. The two highest priority management plan constituents in Black Rascal Creek, chlorpyrifos (A/B) and *C. dubia* toxicity (D) are both prioritized due to exceedances that occurred during 2007 monitoring. To better characterize water quality in the subwatershed, the Coalition conducted additional MPM in 2008 during months of past exceedances. In an effort to determine the most frequent crop type and timing associated with chlorpyrifos applications, the Coalition also reviews PUR data. From these actions, the Coalition derived an outreach strategy, which is detailed in the following sections.

In the Coalition's approved Management Plan, the Black Rascal Creek subwatershed is a high priority subwatershed as of 2012 and will remain so through 2014. The Coalition will actively engage in grower outreach and education to address the highest priority constituents in the Black Rascal Creek management plan. The Coalition began to organize grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Individual grower meetings with targeted members are planned to inform growers about management practices as well as to assess current and expected future implementation of additional management practices.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent listed in the Black Rascal Creek subwatershed management plan.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded at this site four times in the past, once during 2006 and three times during the summer of 2007 (Table XII-5). Two of the 2007 exceedances, July and August, were associated with *C. dubia* toxicity.

The three exceedances in 2007 are believed to all be the result of a single application by a single grower. When samples were collected from Black Rascal Creek on July 24, 2007, there was no flow in the waterway due a beaver dam immediately downstream (Table XII-7). The measured concentration (3.6 µg/L) of chlorpyrifos in 2007 (July) samples was more than 200 times the WQTL. Given the extremely high environmental concentration and since PUR data would not be available for several months, the Coalition sent representatives to visit the grower immediately upstream of the sampling location to inquire about recent applications. Representatives learned that the grower had applied chlorpyrifos to an almond orchard adjacent to the creek in July, but the grower followed labeling instructions and waited the appropriate number of days before flood irrigating the orchard. The grower did report, however, there was some irrigation drainage from the orchard directly to the creek. The Coalition believes that, because of the absence of flow, the chlorpyrifos remained in the creek until sampling occurred on July 27. Chlorpyrifos exceedances occurred again in 2007 (August and September) monitoring (0.12 and 0.031 µg/L, respectively). Because the beaver dam was still present during August and September resulting in little to no flow, and since there were no applications of pesticides in the subwatershed after July 22, 2007, the Coalition believes the August and September 2007 chlorpyrifos exceedances were also a result of the single application to the adjacent almond orchard in July.

Since Black Rascal Creek @ Yosemite Rd was scheduled to become a high priority subwatershed in 2012, the Coalition reviewed PUR data to determine a strategy for outreach. The Coalition assessed the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and the acres treated and found that no applications of chlorpyrifos have occurred in the Black Rascal Creek subwatershed since 2008 (Table XII-8, Figure XII-2). Chlorpyrifos was applied to almond and walnut orchards and use peaked in 2007 when the exceedance occurred, but there has only been one chlorpyrifos application (Table XII-9) since. There were very few growers who previously applied chlorpyrifos and it appears all have stopped using the chemical.

Table XII-8. Black Rascal Creek @ Yosemite Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2006-2011).

If month is not included in table, no applications were made. No chlorpyrifos PUR data reported for 2009-2011.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
May, 2006	2	173.3	91.0
August, 2006	1	20.1	20.0
May, 2007	2	113.4	61.0
July, 2007	4	351.5	174.0
August, 2007	1	39.9	20.0
June, 2008	1	60.0	30.0
Summaries by Year			
2006 Total	3	193.4	111.0
2007 Total	7	504.7	255.0
2008 Total	1	60.0	30.0
Total	**11**	**758.1**	**396.0**

Figure XII-2. Black Rascal Creek @ Yosemite Rd site subwatershed lbs chlorpyrifos applied by month (2006-2011).
Asterisk (*) denotes months with exceedances. No chlorpyrifos PUR data reported for 2009-2011.

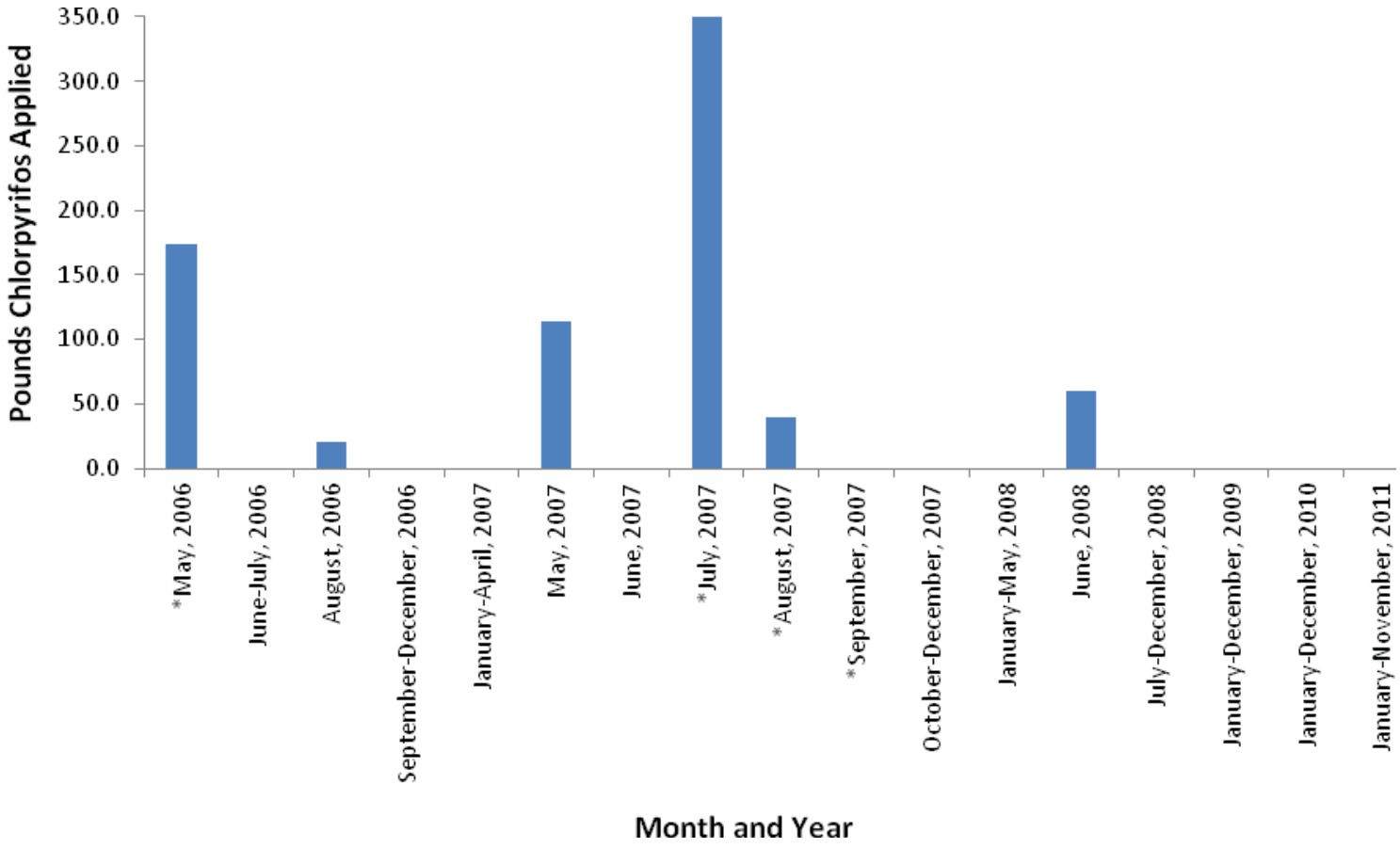


Table XII-9. Black Rascal Creek @ Yosemite Rd site subwatershed chlorpyrifos PUR data (2006-2011).
No chlorpyrifos PUR data reported for 2009-2011.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALMOND	GOVERN 4E INSECTICIDE	351.5
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN 4E INSECTICIDE	20.1
		LORSBAN 4E-HF	101.7
		LORSBAN-4E	284.9

ALMOND - Total Pounds Chlorpyrifos Applied	**351.5**
WALNUT - Total Pounds Chlorpyrifos Applied	**406.6**
Total Pounds Chlorpyrifos Applied (2006-2011)	**758.1**

The Coalition believes that chlorpyrifos exceedances that occurred in the past in the Black Rascal Creek subwatershed are likely the result of a single or a few grower's irrigation tailwater. The 2006 May exceedance of chlorpyrifos was well above the WQTL, which suggests it was most likely the result of irrigation tailwater discharge carrying chlorpyrifos to the creek as opposed to spray drift. All of the chlorpyrifos exceedances in 2007 appear to be the result of a single application by a single grower.

More importantly, PUR data indicate growers in the subwatershed stopped using chlorpyrifos as no applications occurred since 2008. To be sure, the Coalition reviewed the Black Rascal Creek subwatershed and is targeting one grower who applied chlorpyrifos in the past and drains directly to the creek, which accounts for 301 acres of direct drainage in the subwatershed. Monitoring results and PUR data indicate that management of chlorpyrifos in this subwatershed should focus on irrigation return flows. The grower will be advised of methods to improve irrigation and to better manage irrigation tailwater and storm water runoff. In addition, Coalition representatives will discuss and encourage management practices to reduce spray drift. The Coalition recognizes that irrigation and storm water management are often best improved by installation of structural management practices, such as a tailwater return system or drainage basin, which can be expensive. The Coalition is dedicated to providing growers with information about (and include as a part of their discussions) available funding opportunities for management practice implementation.

The Coalition initiated scheduling individual meetings with targeted growers in the fourth priority subwatersheds. Although the meeting with the targeted grower will focus mainly on chlorpyrifos exceedances, all water quality results are reviewed and discussed including *C. dubia* toxicity, and exceedances of DO, *E. coli*, lead, and pH.

Grower surveys completed at the meeting documenting the member's current practices and indicating which recommended practices the grower anticipates implementing in the upcoming years will be compiled and assessed by the Coalition. The Coalition anticipates the grower will be able to implement recommended practices as soon as the irrigation season of 2012, but recognizes that some practices may not be able to be implemented until later. Follow up meetings with the targeted grower will be scheduled after the 2012 irrigation season to determine what additional management practices were implemented.

In 2012, MPM is scheduled at Black Rascal Creek @ Yosemite Rd during months when exceedances occurred historically. The Coalition plans to conduct MPM through 2014 to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority D Constituents

The only priority D constituent listed in the Black Rascal Creek @ Yosemite Rd subwatershed management plan is water column toxicity to *C. dubia.*

C. dubia toxicity

Toxicity to *C. dubia* occurred three times in the past at Black Rascal Creek @ Yosemite Rd and all toxicities occurred during 2007. The May 29, 2007 *C. dubia* toxicity resulted in 20% survival compared to the control but was not persistent (resample on June 5, 2007 was not toxic). A TIE indicated that an interaction between two or more pyrethroids was most likely the cause of toxicity; however, all six of the pyrethroids that were sampled by the Coalition during the event were below their MDLs. The Coalition noted in its 2007 December Semi-Annual Monitoring Report (SAMR) submitted December 31, 2007 that three pyrethroids were applied prior to the May toxicity, and it is possible that, although the amount of each of these three pyrethroids in the water column was below the MDL, two or more of these chemicals may have acted synergistically to cause *C. dubia* toxicity.

The July 24 and August 21, 2007 toxicities are believed to be caused by the same, single application of chlorpyrifos in July to an almond orchard immediately upstream of the sampling location (discussed above, under the Chlorpyrifos section). The TIEs results from both events indicated that an organophosphate pesticide, such as chlorpyrifos, was responsible for causing the toxicity. Both toxicities were persistent in the resampling event one week after the initial sampling date.

Since the 2007 toxicities were associated with chlorpyrifos, the Coalition's strategy for outreach also addresses *C. dubia* toxicity. In addition, the Coalition will educate growers that the offsite movement of irrigation tailwater is known to carry sediment and sediment-bound pesticides such as pyrethroids. Also important is emphasizing that switching from chlorpyrifos to another product may create different water quality concerns and that ultimately preventing a pesticide from entering surface waterways is the most effective management practice.

Priority E Constituents

The priority E constituents listed under the Black Rascal Creek @ Yosemite Rd subwatershed management plan are *E. coli*, DO, lead, and pH.

E. coli exceeded its WQTL during 11 events, DO during 17 events, and lead and pH each during two events. Black Rascal Creek @ Yosemite Rd was not sampled as a part of the 2006 *E. coli* study, and it is unclear what the source of the *E. coli* might be in the subwatershed.

Black Rascal Creek was monitored for Biological Oxygen Demand (BOD) during the September 2006 (February, March, April) and 2007 July monitoring events in an attempt to better understand the DO dynamics in the waterway. The study did not eliminate nor strongly confirm BOD as the cause of DO exceedances, and the contributing factors to DO exceedances remain unknown at this time.

The Coalition will continue to collect monitoring data for the DO and pH field parameters during each monitoring event. *E. coli* is currently monitored only during Assessment Monitoring events at this site, and Black Rascal Creek will rotate into Assessment Monitoring in 2025-2026. Since the Coalition now monitors both total and dissolved fractions of metals, MPM for lead will occur during 2012 (April and September) to better characterize water quality in the creek with respect to lead. Until these constituents become a higher priority, the Coalition will not attempt to determine their sources. These constituents are also discussed during individual contacts with growers and annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Black Rascal Creek @ Yosemite Rd is one of the four fourth priority site subwatersheds within the ESJWQC and is in its first year of focused outreach (2012-2014).

The Coalition will focus its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments, extending outreach to Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Black Rascal Creek subwatershed is to focus on providing information to the single grower determined to have the greatest potential to impact water quality to review their operation and determine if irrigation return flows are managed properly. The Coalition targeted the grower because their crops are located adjacent to the waterway and their agricultural practices may result in the discharge or drift of pesticides, specifically chlorpyrifos, into the waterway. Outreach includes grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

The single targeted grower will complete an individual survey that documents current management practice and assesses future planned management practices. The Coalition will then assess the results and plan the final stages of outreach including follow up contact with the grower to identify newly implemented practices and future monitoring to evaluate water quality improvement.

In 2012, MPM is scheduled for chlorpyrifos (May, July, August, and September), *C. dubia* toxicity (May, July, and August), and lead (April and September).

XIII. DEADMAN CREEK @ GURR RD

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper

Priority D

- *Ceriodaphnia dubia* water column toxicity
- *Pimephales promelas* water column toxicity
- *Selenastrum capricornutum* water column toxicity

Priority E

- Ammonia
- Arsenic
- DO
- *E. coli*
- SC
- Total Dissolved Solids

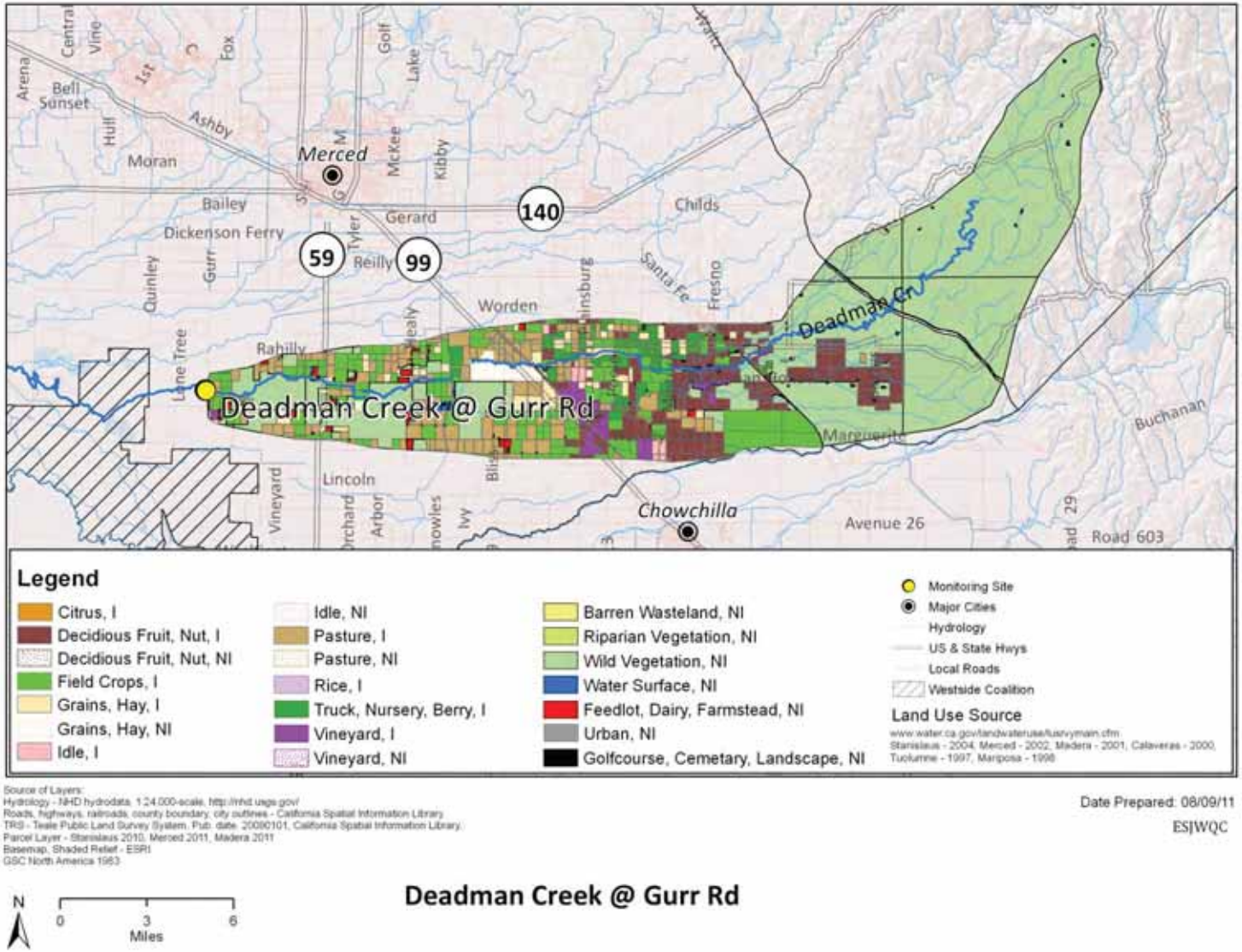
Description of Deadman Creek @ Gurr Rd Site Subwatershed

Deadman Creek @ Gurr Rd (40,418 irrigated acres) - Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59 (Table XIII-1). Orchards and row crops are the primary land use within the subwatershed; irrigated pastureland also makes up a relatively large portion of land use (Figure XIII-1).

Table XIII-1. Deadman Creek @ Gurr Rd site subwatershed sampling location coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Deadman Creek @ Gurr Rd	535XDCAGR	37.1936	-120.5612

Figure XIII-1. Deadman Creek @ Gurr Rd site subwatershed land use map.



Subwatershed Monitoring History

Monitoring was initiated at Deadman Creek @ Gurr Rd in the irrigation season of 2004. The site was not sampled during 2005 or during the storm season of 2006, but monitoring resumed in the irrigation season of 2006 and continued through 2010 (Table XIII-2). Deadman Creek @ Gurr Rd was the Assessment Monitoring location for the Duck Slough @ Gurr Rd Zone (Zone 5) starting in the fall of 2008 through 2010 and therefore has received five years of consecutive monitoring for Assessment constituents (Table XIII-3). Sampling did not occur at Deadman Creek @ Gurr Rd during 2011. Under the 2008 MRPP, Assessment Monitoring is scheduled for 2017 through 2018.

Management Plan Monitoring was initiated during the 2008 irrigation season for *P. promelas* toxicity (May and June) and copper (April and May, Table XIII-4). Management Plan Monitoring occurred in 2010 during January and February for copper and *S. capricornutum* toxicity (Table XIII-4). Since Deadman Creek @ Gurr Rd is a fourth priority subwatershed, MPM is scheduled for 2012.

Deadman Creek is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos and *E. coli*.

Table XIII-2. Deadman Creek @ Gurr Rd site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2004	Irrigation	3	0	**3**
2005	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
2006	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	6	0	**6**
2008	Storm	3	0	**3**
	Irrigation	9	0	**9**
	Fall	2	0	**2**
2009	Winter	2	0	**2**
	Storm	2	0	**2**
	Irrigation	6	0	**6**
	Fall	2	0	**2**
2010	Winter	1	0	**1**
	Storm	3	0	**3**
	Irrigation	5	0	**5**
	Fall	3	0	**3**
2011	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table XIII-3. Deadman Creek @ Gurr Rd site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate of one are listed.

Method	Analyte	2004	2005	2006		2007		2008			2009				2010				2011
		Irrigation	Storm-Irrigation*	Storm*	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter-Fall*
Field and Physical Parameters																			
NA	Dissolved Oxygen	3			6	3	9	4	10	2	2	2	6	2	1	3	5	3	
NA	Specific Conductivity	3			6	3	9	4	10	2	2	2	6	2	1	3	5	3	
NA	pH	3			6	3	9	4	10	2	2	2	6	2	1	3	5	3	
EPA 110.2	Color	3			5	2	6	2	6										
EPA 160.1	Dissolved Solids	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 160.2	Suspended Solids							1		2	2	2	6	2	1	3	5	3	
EPA 180.1	Turbidity	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 415.1	Total Organic Carbon	4			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
SM 9223	*E. coli*	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
Walkley-Black	Total Organic Carbon (sediment)												2		1		1		
ASTM D422 or ASTM D4464	Grain size (sediment)												2		1		1		
EPA 405.1	BOD				1	2	1												
Carbamates																			
EPA 8321A	Aldicarb				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Carbaryl				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Carbofuran				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Diuron				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Linuron				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Methiocarb				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Methomyl				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8321A	Oxamyl				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
Organochlorines																			
EPA 8081A	DDD(p,p')				5	2	6	3	6	2	2	2	1				2	3	
EPA 8081A	DDE(p,p')				5	2	6	3	6	2	2	2	1				2	3	
EPA 8081A	DDT(p,p')				5	2	6	3	6	2	2	2	1				2	3	
EPA 8081A	Dicofol				5	2	6	3	6	2	2	2	1				2	3	

Method	Analyte	2004	2005	2006		2007		2008			2009				2010				2011
		Irrigation	Storm-Irrigation*	Storm*	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter-Fall*
EPA 8081A	Dieldrin				5	2	6	3	6	2	2	2	1				2	3	
EPA 8081A	Endrin				5	2	6	3	6	2	2	2	1				2	3	
EPA 8081A	Methoxychlor				5	2	6	3	6	2	2	2	1				2	3	
Organophosphates																			
EPA 8141A	Azinphos ethyl	1																	
EPA 8141A	Azinphos methyl				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Bolstar	1																	
EPA 8141A	Chlorpyrifos	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Coumaphos	1																	
EPA 8141A	Def	1																	
EPA 8141A	Demeton-s	1						1		2	2	2	6	2	1	3	5	3	
EPA 8141A	Diazinon	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Dichlorvos	1						1		2	2	2	6	2	1	3	5	3	
EPA 8141A	Dimethoate	1			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Disulfoton	1			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	EPN	1																	
EPA 8141A	EPTC	1																	
EPA 8141A	Ethion	1																	
EPA 8141A	Ethoprop	1																	
EPA 8141A	Fenamiphos	1																	
EPA 8141A	Fenchlorphos	1																	
EPA 8141A	Fensulfothion	1																	
EPA 8141A	Fenthion	1																	
EPA 8141A	Malathion	1			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Merphos	1																	
EPA 8321A	Methamidophos				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Methidathion				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Mevinphos	1																	
EPA 8141A	Molinate				5	2	6	2	6										
EPA 8141A	Naled	1																	

Method	Analyte	2004	2005	2006		2007		2008			2009				2010				2011
		Irrigation	Storm-Irrigation*	Storm*	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter-Fall*
EPA 8141A	Parathion, Ethyl	1																	
EPA 8141A	Parathion, Methyl	1			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Phorate	1			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Phosmet				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 8141A	Prowl	1																	
EPA 8141A	Tetrachlorvinphos	1																	
EPA 8141A	Thiobencarb				5	2	6	2	6										
EPA 8141A	Tokuthion	1																	
EPA 8141A	Trichloronate	1																	
EPA 8141A	Trifluralin	1						1		2	2	2	6	2	1	3	5	3	
Pyrethroids																			
EPA 8081A	Bifenthrin				5	2	6	2	6										
EPA 8081A	Cyfluthrin, total				5	2	6	2	6										
EPA 8081A	Cyhalothrin, lambda, total	3			5	2	6	2	6										
EPA 8081A	Cypermethrin, total	3			5	2	6	2	6										
EPA 8081A	Esfenvalerate/ Fenvalerate, total	3			5	2	6	2	6										
EPA 8081A	Permethrin, total	3			5	2	6	2	6										
Triazines																			
EPA 547M	Glyphosate				5	2	6	3	6	2	2	2	1				3	3	
EPA 549.2M	Paraquat dichloride				5	2	6	3	6	2	2	2	1				3	3	
EPA 619	Atrazine				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 619	Cyanazine				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 619	Simazine				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
Metals (Total)																			
EPA 200.8	Arsenic				5	2	6	3	6	2	2	2	1				3	3	
EPA 200.8	Boron				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 200.8	Cadmium				5	2	6	3	6	2	2	2	1				3	3	
EPA 200.8	Copper				5	2	6	3	8	2	2	2	6	2	1	3	5	3	
EPA 200.8	Lead				5	2	6	3	6	2	2	2	1				3	3	
EPA 200.8	Molybdenum							1		2	2	2	1				3	3	

Method	Analyte	2004	2005	2006		2007		2008			2009				2010				2011
		Irrigation	Storm-Irrigation*	Storm*	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter	Storm	Irrigation	Fall	Winter-Fall*
EPA 200.8	Nickel				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 200.8	Selenium				5	2	2	3	6	2	2	2	6	2	1	3	5	3	
EPA 200.8	Zinc				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
Metals (Dissolved)																			
EPA 200.8	Cadmium							1		2	2	2	1				3	3	
EPA 200.8	Copper							1		2	2	2	6	2	1	3	5	3	
EPA 200.8	Lead							1		2	2	2	1				3	3	
EPA 200.8	Nickel							1		2	2	2	6	2	1	3	5	3	
EPA 200.8	Zinc							1		2	2	2	6	2	1	3	5	3	
Nutrients																			
SM 2340 C	Hardness as CaCO3				5	2	6	3	8	2	2	2	6	2	1	3	5	3	
EPA 300.0	Nitrate as N				5	2	6	2	6										
EPA 350.2	Ammonia as N				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	3	6	2	2	1	1				3	3	
EPA 354.1	Nitrite as N				5	2	6	2	6										
EPA 353.2	Nitrate + Nitrite as N							1		2	2	2	6	2	1	3	5	3	
EPA 365.2	OrthoPhosphate as P				5	2	6	3	6	2	2	1	1				3	3	
EPA 365.2	Phosphate as P				5	2	6	3	6	2	2	2	6	2	1	3	5	3	
Toxicity																			
EPA 821/R-02-012	*Ceriodaphnia dubia*	3			5	2	6	3	6	2	2	2	6	2	1	3	5	3	
EPA 821/R-02-012	*Pimephales promelas*	3			6	2	7	3	8	2	2	2	6	2	1	3	5	3	
EPA 821/R-02-013	*Selenastrum capricornutum*	3			5	2	7	4	6	2	2	2	6	2	1	3	5	3	
EPA 600/R-99-064	*Hyalella azteca*	2			1	1	1	1	1				2		1		1		

*Site not sampled during the 2005 sampling year, 2006 storm season, and 2011 sampling year.

Table XIII-4. Deadman Creek @ Gurr Rd site subwatershed Management Plan Monitoring schedule (2008-2010).

Site Name	Sample Date	Monitoring Type	Copper	*P. promelas*	*S. capricornutum*
Deadman Creek @ Gurr Rd	29-Apr-08	A	X		
Deadman Creek @ Gurr Rd	27-May-08	A	X	X	
Deadman Creek @ Gurr Rd	24-Jun-08	A		X	
Deadman Creek @ Gurr Rd	19-Jan-10	MPM	X		X
Deadman Creek @ Gurr Rd	23-Feb-10	MPM	X		X

A – Additional sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from Deadman Creek @ Gurr Rd from 2004 through 2011 exceeded the WQTL for field parameters, *E. coli*, TDS, ammonia, pesticides, and metals, and water column toxicity (Table XIII-5). Constituents that exceeded their respective WQTLs in this subwatershed include DO (27), pH (1), SC (six), TDS (6), *E. coli* (41), ammonia (5), arsenic (11), copper (4), chlorpyrifos (4), DDT (1), dieldrin (1) and malathion (1). Toxicity to *C. dubia* (4), *P. promelas* (7), and *S. capricornutum* (3) occurred (Table XIII-5).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Deadman Creek @ Gurr Rd subwatershed are chlorpyrifos (A/B), copper (C), and toxicity to *C. dubia*, *P. promelas* and *S. capricornutum* (D).

Table XIII-5. Deadman Creek @ Gurr Rd site subwatershed exceedances (2004-2010).

The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	*E. coli*, >235 MPN/100 mL	Arsenic, >10 µg/L	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.015 µg/L	DDT (p,p'), > 0.00059µg/L	Dieldrin, >0.00014 µg/L	Malathion, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)
Deadman Creek @ Gurr Rd	Irrigation	7/31/04	6.85					1600									
Deadman Creek @ Gurr Rd	Irrigation	8/31/04						1600									
Deadman Creek @ Gurr Rd	Irrigation	9/29/04	6.70					500									
Deadman Creek @ Gurr Rd	Irrigation	5/17/06						1200									
Deadman Creek @ Gurr Rd	Irrigation	6/13/06	5.01					310								88	
Deadman Creek @ Gurr Rd	Irrigation	7/11/06	6.50					490									
Deadman Creek @ Gurr Rd	Irrigation	8/8/06	6.96					390						0.19			
Deadman Creek @ Gurr Rd	Irrigation	9/12/06	6.08					2400			0.027						
Deadman Creek @ Gurr Rd	Storm	2/11/07						2400	14	16 (15.4)							
Deadman Creek @ Gurr Rd	Storm	2/28/07						1000	14								
Deadman Creek @ Gurr Rd	Irrigation	4/24/07								9.2 (7.7)							
Deadman Creek @ Gurr Rd	Irrigation	5/29/07	5.11					1400		8.8 (7.5)						87	
Deadman Creek @ Gurr Rd	Irrigation	6/26/07						460									
Deadman Creek @ Gurr Rd	Irrigation	7/24/07	5.38														42
Deadman Creek @ Gurr Rd	Irrigation	9/18/07	5.88					820									
Deadman Creek @ Gurr Rd	Storm	1/25/08						870	15	19 (11.7)		0.0073					
Deadman Creek @ Gurr Rd	Storm	2/25/08		8.51				550	13								47

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	*E. coli*, >235 MPN/100 mL	Arsenic, >10 µg/L	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.015 µg/L	DDT (p,p'), > 0.00059µg/L	Dieldrin, >0.00014 µg/L	Malathion, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)
Deadman Creek @ Gurr Rd	Irrigation	4/29/08						>2400	18				0.028				
Deadman Creek @ Gurr Rd	Irrigation	5/27/08			801	520											
Deadman Creek @ Gurr Rd	Irrigation	6/24/08	4.85														
Deadman Creek @ Gurr Rd	Irrigation	7/29/08	6.87														
Deadman Creek @ Gurr Rd	Irrigation	8/26/08	5.21					330									
Deadman Creek @ Gurr Rd	Sediment	8/28/08	5.90														
Deadman Creek @ Gurr Rd	Irrigation	9/30/08	5.46					330									
Deadman Creek @ Gurr Rd	Fall	10/2108						1400	12								
Deadman Creek @ Gurr Rd	Fall	11/11/08						370	14								
Deadman Creek @ Gurr Rd	Fall	12/16/08						1400									
Deadman Creek @ Gurr Rd	Winter	1/20/09	5.61		762	470	5.5 (3.93)	>2400	18							88	
Deadman Creek @ Gurr Rd	Storm	2/7/09	1.01		1802	1100	50 (3.82)	>2400	30						0	0	7
Deadman Creek @ Gurr Rd	Winter	3/17/09						1600	14						10		
Deadman Creek @ Gurr Rd	Irrigation	5/19/09						490									
Deadman Creek @ Gurr Rd	Irrigation	6/16/09						730									
Deadman Creek @ Gurr Rd	Irrigation	7/21/09	6.04					460									
Deadman Creek @ Gurr Rd	Irrigation	8/18/09	6.94														
Deadman Creek @ Gurr Rd	Fall	10/20/09	6.08					490									
Deadman Creek @ Gurr Rd	Fall	11/17/09						2000									

Site Name	Season	Sample Date	Oxygen, Dissolved, <7mg/L	pH, <6.5 and >8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	*E. coli*, >235 MPN/100 mL	Arsenic, >10 µg/L	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.015 µg/L	DDT (p,p'), > 0.00059µg/L	Dieldrin, >0.00014 µg/L	Malathion, >0 µg/L	*C. dubia*, (% Control)	*P. promelas*, (% Control)	*S. capricornutum*, (% Control)
Deadman Creek @ Gurr Rd	Non-contiguous, Storm	12/15/09	5.02		995	610	15	>2400								75	
Deadman Creek @ Gurr Rd	Storm	1/19/10						>2400									
Deadman Creek @ Gurr Rd	Storm	2/23/10						370									
Deadman Creek @ Gurr Rd	Non-contiguous, Winter	3/23/10	0.20		4023	2100	155.4	>2400			0.14				0	0	
Deadman Creek @ Gurr Rd	Storm	4/20/10						280			0.018						
Deadman Creek @ Gurr Rd	Irrigation	5/18/10						240									
Deadman Creek @ Gurr Rd	Irrigation	6/15/10	4.56					370									
Deadman Creek @ Gurr Rd	Irrigation	7/20/10	6.60					580									
Deadman Creek @ Gurr Rd	Irrigation	8/17/10	6.77								0.024						
Deadman Creek @ Gurr Rd	Sediment	9/14/10	6.82					360									
Deadman Creek @ Gurr Rd	Fall	10/19/10						340									
Deadman Creek @ Gurr Rd	Fall	11/16/10	6.82		1547	840	31 (2.05)	>2400	14						0	0	
Deadman Creek @ Gurr Rd	Non-contiguous, Fall	12/14/10	5.2					>2400									
		Constituent Priority	**E**	**NP**	**E**	**E**	**E**	**E**	**E**	**C**	**A/B**	**NP**	**NP**	**NP**	**D**	**D**	**D**

[1]Ammonia WQTL variable based on pH and temperature.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Deadman Creek @ Gurr Rd subwatershed are listed in Table XIII-6, which includes chlorpyrifos, copper, *C. dubia* toxicity, *P. promelas* toxicity, and *S. capricornutum* toxicity. In the Deadman Creek @ Gurr Rd subwatershed, MPM occurred in 2008 for additional MPM and in 2010 for MPM. Deadman Creek was sampled as an Assessment Monitoring location during 2009 and 2010.

Chlorpyrifos first exceeded the WQTL in Deadman Creek @ Gurr Rd during 2006 September monitoring. The chlorpyrifos and diazinon TMDL for the Lower San Joaquin River was approved in October 2007 and hence chlorpyrifos was added to the Deadman Creek @ Gurr Rd management plan in 2008. However, no MPM for chlorpyrifos in 2008 was scheduled. Chlorpyrifos did not exceed the WQTL during 2008 Normal Monitoring, and no exceedances occurred during 2009 Assessment Monitoring. However, Assessment Monitoring in 2010 resulted in three exceedances of chlorpyrifos (March, April, and August, Table XIII-6). Chlorpyrifos MPM is scheduled to occur in 2012 (March, April, August, and September).

Copper exceeded the WQTL three times during 2007 (February, April and May), therefore the constituent was added to the Deadman Creek @ Gurr Rd management plan as of 2008. Additional MPM for copper in 2008 occurred during April and May but resulted in no exceedances (Table XIII-6). Copper did exceed the WQTL once in 2008 during January Normal Monitoring. However, copper did not exceed the WQTL during 2009 and 2010 Assessment Monitoring. Management Plan Monitoring for copper is scheduled for 2012 (January, February, April and May).

Toxicity to *C. dubia* did not occur in the subwatershed until 2009 (February and March) and in 2010 (March and November). The March 2010 toxicity was associated with a chlorpyrifos exceedance (Table XIII-6). The Coalition is scheduled to conduct MPM for *C. dubia* toxicity in 2012 (February, March, and November).

Toxicity to *P. promelas* first occurred in June 2006, and the second toxicity occurred in May 2007. Toxicity to *P. promelas* was added to the Deadman Creek @ Gurr Rd management plan and additional MPM occurred during 2008 (May and June). In 2008, toxicity to *P. promelas* did not occur during MPM or Normal Monitoring. However, *P. promelas* toxicity occurred in 2009 (January, February, and December) and during 2010 (March and November, Table XIII-6). All five of the *P. promelas* toxicities from 2009 and 2010 coincided with ammonia exceedances—ammonia exceedances did not occur prior to 2009. Management Plan Monitoring for toxicity to *P. promelas* is scheduled to occur during 2012 (January, February, March, May, June, November and December).

Toxicity to *S. capricornutum* occurred in July 2007 and February 2008; consequently, the constituent was added to the 2009 to the Deadman Creek @ Gurr Rd management plan. Assessment Monitoring resulted in *S. capricornutum* toxicity during February 2009 and, both the 2008 and 2009 February

toxicities coincided with arsenic exceedances. There was no toxicity during 2010 Assessment Monitoring, however March 2010 *S. capricornutum* toxicity analysis could not be conducted since pigment and suspended solids precluded measurement of algae cells; however, samples collected from the same event were also toxic to both *C. dubia* and *P. promelas* (Table XIII-6). The Coalition will conduct MPM for *S. capricornutum* toxicity in 2012 (February and July).

Table XIII-6. Deadman Creek @ Gurr Rd site subwatershed monitoring results for high priority constituents.

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008 NM (@ Gurr Rd)	Date	1/25/08	2/25/08	3/4/08	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08	10/21/08	11/11/08	12/16/08
	Copper, dissolved (µg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1.6	1.5
	Copper, total (µg/L)	**19**	3.4	NA	5.8	5	5	7	3.9	4.5	4.4	8.4	4.8
	Chlorpyrifos (µg/L)	<0.003	0.0037	NA	<0.003	<0.003	<0.003	0.0067	<0.003	<0.003	<0.003	<0.003	<0.003
	P. promelas toxicity (% Control)	100	100	NA	98	100	100	98	100	100	95	100	100
2008 MPM A (@ Gurr Rd)	Date	NA	NA	NA	4/22/08	5/20/08	6/17/08	NA	NA	NA	NA	NA	NA
	Copper, total (µg/L)	NA	NA	NA	4.2	6.2	NA	NA	NA	NA	NA	NA	NA
	P. promelas toxicity (% Control)	NA	NA	NA	NA	100	103	NA	NA	NA	NA	NA	NA
2009 NM (@ Gurr Rd)	Date	1/20/09	2/7/09	3/17/09	4/21/09	5/19/09	6/16/09	7/21/09	8/18/09	9/22/09	10/20/09	11/17/09	12/15/2009
	Copper, dissolved (µg/L)	4.3	4.9	0.5	1.3	1.6	1.2	2.1	1	0.62	1.6	4	2.5
	Copper, total (µg/L)	17	51	1.7	2.1	5.3	4	6.2	4.2	4.1	4.3	6.5	12
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	P. promelas toxicity (% Control)	**88**	**0**	100	100	100	100	100	100	100	100	98	**75**
	S. capricornutum toxicity (% Control)	242	**7**	211	578	374	870	1736	760	447	991	600	343
2010 NM & MPM (@ Gurr Rd)	Date	1/19/10	2/23/10	3/23/10	4/20/10	5/18/10	6/15/10	7/20/10	8/17/10	9/14/10	10/19/10	11/16/10	12/14/10
	Copper, dissolved (µg/L)	3.5*	2.3*	8.1	2.4	1.7	1.79	1.8	0.94	1.2	1	12	3.5
	Copper, total (µg/L)	16*	5.7*	106.4	4.3	2.53	3.83	5.9	4.1	5.2	4.1	30	9
	Chlorpyrifos (µg/L)	<0.003	<0.003	**0.14**	**0.018**	<0.003	<0.003	<0.003	**0.024**	<0.003	<0.003	<0.003	<0.003
	C. dubia toxicity (% Control)	100	100	**0**	100	100	100	100	100	100	100	**0**	95
	P. promelas toxicity (% Control)	100	100	**0**	100	100	100	100	100	100	100	**0**	100
	S. capricornutum toxicity (% Control)	547*	1478*	**-88****	2016	417	299	578	415	483	646	102	658

A – Additional MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
*NM and MPM occurred during this date for this constituent
**Test not conducted since pigment and suspended solids precluded measurement of algae cells.

Load Calculations

Loads have been calculated for all chlorpyrifos and copper detections in the site subwatershed based on the following formula (Table VIII-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XIII-7. Deadman Creek @ Gurr Rd site subwatershed instantaneous load calculations for chlorpyrifos and copper.

Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	08/08/06	8.45	0.014	3.35
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	09/12/06	34.18	0.027	26.13
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	07/24/07	7.81	0.005	1.11
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	02/25/08	2.52	0.0037	0.26
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	07/29/08	1.1	0.0067	0.21
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	03/23/10	0	0.14	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Chlorpyrifos	03/23/10	0	0.097	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	04/20/10	0.43	0.018	0.22
Deadman Creek (Dutchman) @ Gurr Rd*	Chlorpyrifos	04/20/10	0.43	0.017	0.21
Deadman Creek (Dutchman) @ Gurr Rd	Chlorpyrifos	08/17/10	18.52	0.024	12.59
Deadman Creek (Dutchman) @ Gurr Rd	Copper	05/17/06	9.95	7.5	2113.16
Deadman Creek (Dutchman) @ Gurr Rd	Copper	06/13/06	13.7	4.6	1784.54
Deadman Creek (Dutchman) @ Gurr Rd	Copper	07/11/06	1.44	9.1	371.07
Deadman Creek (Dutchman) @ Gurr Rd	Copper	08/08/06	8.45	6.9	1651.02
Deadman Creek (Dutchman) @ Gurr Rd	Copper	09/12/06	34.18	7.7	7452.64
Deadman Creek (Dutchman) @ Gurr Rd	Copper	02/11/07	4.77	16	2161.15
Deadman Creek (Dutchman) @ Gurr Rd	Copper	02/28/07	0.87	9.7	238.97
Deadman Creek (Dutchman) @ Gurr Rd	Copper	04/24/07	15.15	9.2	3946.82
Deadman Creek (Dutchman) @ Gurr Rd	Copper	06/26/07	10.21	7.5	2168.37
Deadman Creek (Dutchman) @ Gurr Rd	Copper	07/24/07	7.81	9.2	2034.63
Deadman Creek (Dutchman) @ Gurr Rd	Copper	08/21/07	0	4.2	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	01/25/08	28.58	19	15376.70
Deadman Creek (Dutchman) @ Gurr Rd	Copper	02/25/08	2.52	3.4	242.62
Deadman Creek (Dutchman) @ Gurr Rd	Copper	04/22/08	3.86	4.2	459.08
Deadman Creek (Dutchman) @ Gurr Rd	Copper	04/29/08	1.97	5.8	323.55
Deadman Creek (Dutchman) @ Gurr Rd	Copper	05/20/08	0	6.2	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	05/27/08	2.55	5	361.04
Deadman Creek (Dutchman) @ Gurr Rd	Copper	06/24/08	0	5	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	07/29/08	1.1	7	218.04
Deadman Creek (Dutchman) @ Gurr Rd	Copper	08/26/08	0	3.9	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	09/30/08	2.98	4.5	379.73

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	09/30/08	2.98	4.6	388.17
Deadman Creek (Dutchman) @ Gurr Rd	Copper	10/21/08	0.89	4.4	110.89
Deadman Creek (Dutchman) @ Gurr Rd	Copper	11/11/08	0.57	8.4	135.58
Deadman Creek (Dutchman) @ Gurr Rd	Copper	12/16/08	0.09	4.8	12.23
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	12/16/08	0.09	4.7	11.98
Deadman Creek (Dutchman) @ Gurr Rd	Copper	01/20/09	0	17	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	01/20/09	0	14	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	02/07/09	0.01	51	14.44
Deadman Creek (Dutchman) @ Gurr Rd	Copper	03/17/09	0	1.7	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	04/21/09	0.99	2.1	58.87
Deadman Creek (Dutchman) @ Gurr Rd	Copper	05/19/09	6.74	5.3	1011.54
Deadman Creek (Dutchman) @ Gurr Rd	Copper	06/16/09	5.4	4	611.65
Deadman Creek (Dutchman) @ Gurr Rd	Copper	07/21/09	0	6.2	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	08/18/09	0	4.2	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	09/22/09	5.3	4.1	615.33
Deadman Creek (Dutchman) @ Gurr Rd	Copper	10/20/09	0	4.3	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	11/17/09	0	6.5	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	12/15/09	0	10	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	12/15/09	0	12	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	01/19/10	0.08	14	31.72
Deadman Creek (Dutchman) @ Gurr Rd	Copper	01/19/10	0.08	16	36.25
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	02/23/10	0	4.3	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	02/23/10	0	5.7	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	03/23/10	0	106.4	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	03/23/10	0	86	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	04/20/10	0.43	4.3	52.36
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	04/20/10	0.43	3.9	47.49
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	05/18/10	7.32	2.6	538.93
Deadman Creek (Dutchman) @ Gurr Rd	Copper	05/18/10	7.32	2.53	524.42
Deadman Creek (Dutchman) @ Gurr Rd	Copper	06/15/10	0	3.83	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	06/15/10	0	3.8	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	07/20/10	9.71	5.9	1622.25
Deadman Creek (Dutchman) @ Gurr Rd	Copper	08/17/10	18.52	4.1	2150.17
Deadman Creek (Dutchman) @ Gurr Rd	Copper	09/14/10	9.18	5.2	1351.74
Deadman Creek (Dutchman) @ Gurr Rd	Copper	10/19/10	2.99	4.1	347.14
Deadman Creek (Dutchman) @ Gurr Rd	Copper	11/16/10	0	30	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper	11/16/10	0	28	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper	12/14/10	0	9	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	10/21/08	0.89	1	25.20
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	11/11/08	0.57	1.6	25.83
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	12/16/08	0.09	1.5	3.82
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	12/16/08	0.09	1.6	4.08
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	01/20/09	0	4.3	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	01/20/09	0	4.7	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	02/07/09	0.01	4.9	1.39
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	03/17/09	0	0.5	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	04/21/09	0.99	1.3	36.44
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	05/19/09	6.74	1.6	305.37
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	06/16/09	5.4	1.2	183.49

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	07/21/09	0	2.1	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	08/18/09	0	1	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	09/22/09	5.3	0.62	93.05
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	10/20/09	0	1.6	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	11/17/09	0	4	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	12/15/09	0	2.7	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	12/15/09	0	2.5	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	01/19/10	0.08	3.5	7.93
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	01/19/10	0.08	3.1	7.02
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	02/23/10	0	2.3	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	02/23/10	0	2.3	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	03/23/10	0	8.1	0.00
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	03/23/10	0	28	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	04/20/10	0.43	2.4	29.22
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	04/20/10	0.43	2.2	26.79
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	05/18/10	7.32	1.7	352.38
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	05/18/10	7.32	1.5	310.92
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	06/15/10	0	1.8	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	06/15/10	0	1.79	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	07/20/10	9.71	1.8	494.92
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	08/17/10	18.52	0.94	492.96
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	09/14/10	9.18	1.2	311.94
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	10/19/10	2.99	1	84.67
Deadman Creek (Dutchman) @ Gurr Rd*	Copper (D)	11/16/10	0	9.9	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	11/16/10	0	12	0.00
Deadman Creek (Dutchman) @ Gurr Rd	Copper (D)	12/14/10	0	3.5	0.00

*Field duplicate

Source Identification and Outreach

The Coalition focuses its efforts on applied pesticides and considers past monitoring results and associated PUR data to address source identification and determine an outreach strategy. In 2008, the Coalition conducted additional MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. Assessment Monitoring was initiated at Deadman Creek @ Gurr Rd in the fall of 2008 and continued through 2010. The results from those monitoring years, coupled with a review of PUR data to determine the most frequent crop type and timing associated with pesticide applications, provided the Coalition with enough data to develop an outreach strategy, which is detailed in the following sections.

The Deadman Creek @ Gurr Rd subwatershed is a high priority subwatershed as of 2012 and will remain so through 2014. The Coalition will actively engage in grower outreach and education to address Deadman Creek@ Gurr Rd management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Additionally, in May 2011, the Coalition sent out a mailing to members within the subwatershed to summarize chlorpyrifos water quality concerns in Deadman Creek and urge growers to implement relevant management practices. Individual grower meetings with

targeted members are planned to inform growers about management practices as well as to assess current and expected future implementation of additional management practices.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent for the Deadman Creek @ Gurr Rd subwatershed.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded four times in the Deadman Creek @ Gurr Rd subwatershed, once in 2006 (September) and three times in 2010 (March, April, and August). The exceedance that occurred during March 2010 was associated with toxicity to both *C. dubia* and *P. promelas.*

The land use within this subwatershed has the potential for chlorpyrifos applications throughout the year. Chlorpyrifos may be applied in dormant sprays to orchards during the winter months, and may also be applied to orchards and row crops at various times during the irrigation season.

To determine an outreach strategy, the Coalition reviewed PUR data for the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and the acres treated within the subwatershed (Table XIII-8, Figure XIII-2). Chlorpyrifos use peaked in 2005 (6,556 lbs AI) and declined since; 2,867 lbs AI were applied in 2011 (complete PUR data only available through October 2011). Chlorpyrifos is applied throughout the year, but peak use typically occurs in June and July in the subwatershed; the month of August had the greatest pounds applied in 2011. There were numerous applications of chlorpyrifos in the subwatershed over the years, and the largest amount of chlorpyrifos applied was to almonds and alfalfa (Table XIII-9). The most common product containing chlorpyrifos used within this subwatershed was Lorsban.

Table XIII-8. Deadman Creek @ Gurr Rd site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2004-2011).

PUR data available October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2004	4	88.0	43.6
March, 2004	7	505.2	571.0
April, 2004	2	228.6	121.0
July, 2004	14	2182.4	1309.0
August, 2004	3	127.2	279.0
September, 2004	1	179.8	90.2
January, 2005	4	76.9	38.1
March, 2005	19	602.5	1470.0
May, 2005	3	378.9	217.0
June, 2005	1	39.9	20.0
July, 2005	33	3999.2	2033.5
August, 2005	14	478.8	740.0
September, 2005	3	199.6	280.0

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
October, 2005	1	780.0	391.2
January, 2006	5	91.7	45.0
March, 2006	3	122.9	349.0
April, 2006	1	4.0	29.0
May, 2006	13	1386.1	741.0
June, 2006	1	137.6	69.0
July, 2006	12	2202.8	1097.0
August, 2006	8	473.0	393.0
September, 2006	18	593.9	1153.2
October, 2006	1	723.4	362.8
January, 2007	2	29.9	15.0
March, 2007	21	537.2	1449.7
July, 2007	10	1812.1	1200.5
August, 2007	23	902.7	2025.9
October, 2007	1	780.0	391.2
March, 2008	8	94.1	303.0
May, 2008	11	619.0	633.0
July, 2008	32	746.3	2691.6
August, 2008	35	827.4	2521.8
September, 2008	4	65.1	310.0
March, 2009	6	997.8	928.0
April, 2009	11	213.0	963.0
June, 2009	8	2417.3	1270.0
July, 2009	2	34.1	68.0
August, 2009	1	25.1	53.0
September, 2009	10	319.9	768.9
March, 2010	31	432.3	2150.9
June, 2010	15	1168.0	1599.0
July, 2010	20	824.7	1395.8
August, 2010	33	1075.1	2149.5
September, 2010	15	532.0	1185.2
October, 2010	1	1027.3	547.0
March, 2011	41	677.5	2959.3
April, 2011	4	90.8	341.0
May, 2011	2	437.2	215.0
July, 2011	30	666.8	1817.2
August, 2011	45	960.7	2845.1
September, 2011	1	34.0	68.0
Summaries by Year			
2004 Total	31	3311.2	2413.8
2005 Total	78	6555.7	5189.8
2006 Total	62	5735.4	4239.0
2007 Total	57	4061.9	5082.3
2008 Total	90	2351.9	6459.4
2009 Total	38	4007.1	4050.9
2010 Total	115	5059.3	9027.4
2011 Total	123	2867.1	8245.6
Total	**594**	**33949.6**	**44708.2**

Figure XIII-2. Deadman Creek @ Gurr Rd site subwatershed lbs chlorpyrifos applied by month (2004-2011).

Asterisk (*) denotes months with exceedances. PUR data available October 2011 for Merced County.

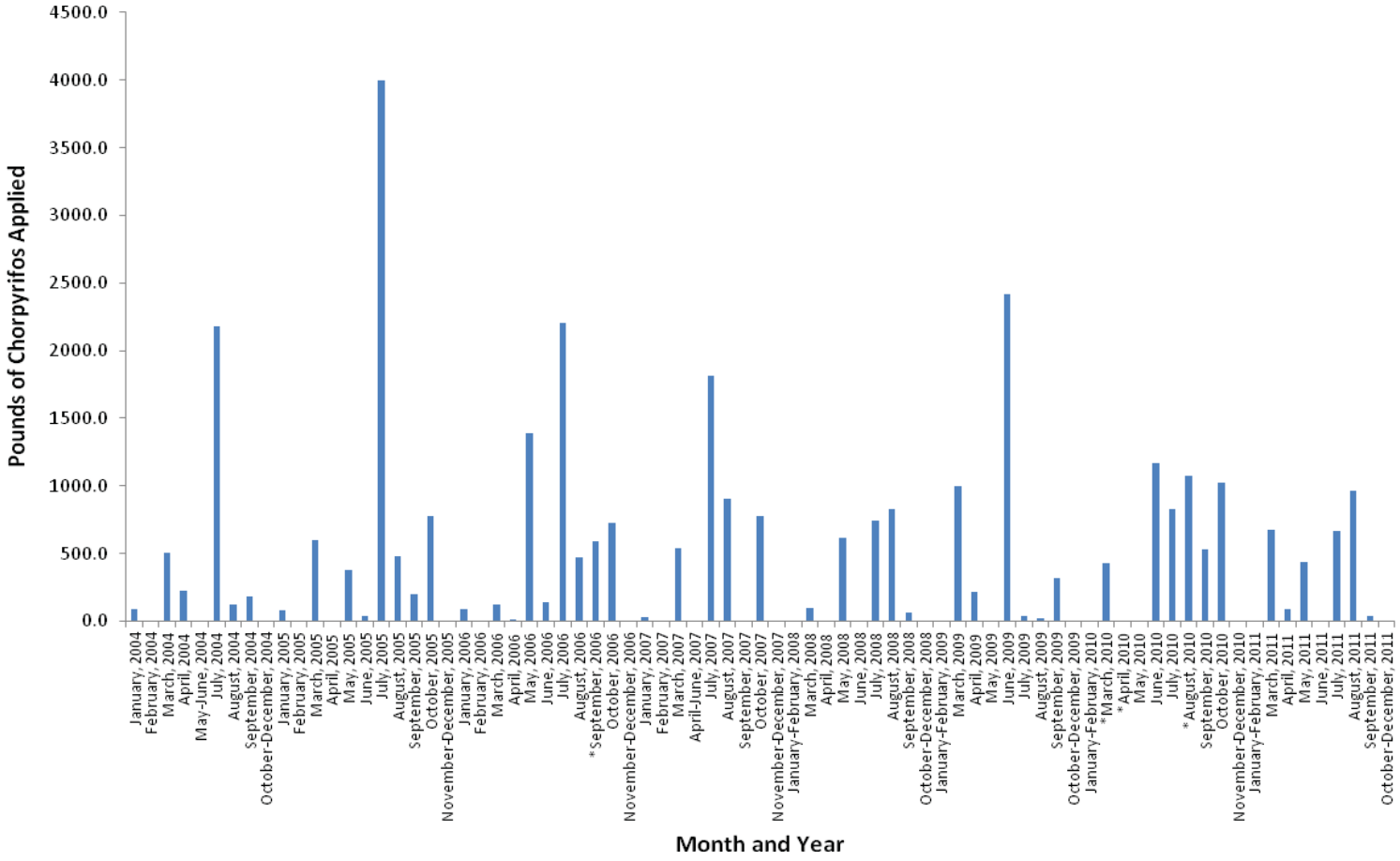


Table XIII-9. Deadman Creek @ Gurr Rd site subwatershed chlorpyrifos PUR data (2004-2011).

PUR data available October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	502.6
		GOVERN 4E INSECTICIDE	1916.0
		LOCK-ON INSECTICIDE	4061.5
		LORSBAN 4E-HF	681.3
		LORSBAN-4E	552.6
		NUFOS 4E	725.7
		WARHAWK	54.8
		WHIRLWIND	2630.7
	ALMOND	CHLORPYRIFOS 4E AG	258.3
		ERASER	97.9
		GOVERN 4E INSECTICIDE	4421.7
		LORSBAN 4E INSECTICIDE	1533.1
		LORSBAN 4E-HF	2974.8
		LORSBAN ADVANCED	10.9
		LORSBAN-4E	1889.4
		NUFOS 4E	3742.7
		WHIRLWIND	579.9
	CORN (FORAGE - FODDER)	CHLORPYRIFOS 4E AG	45.8
		LORSBAN 15G GRANULAR INSECTICIDE	565.5
		LORSBAN 4E-HF	39.9
		LORSBAN-4E	317.4
		NUFOS 4E	181.0
		SAURUS	202.5
		WHIRLWIND	107.7
	COTTON, GENERAL	CHLORPYRIFOS 4E AG	40.3
		LORSBAN 4E-HF	278.0
		LORSBAN-4E	60.5
		WHIRLWIND	30.2
	FIG	WHIRLWIND	160.0
	GRAPES, WINE	LORSBAN 4E-HF	2463.2
		LORSBAN ADVANCED	1027.3
		LORSBAN-4E	900.4
	PEACH	CHLORPYRIFOS 4E AG	164.9
		LORSBAN 4E-HF	121.6
	SUGARBEET, GENERAL	LORSBAN 4E-HF	179.6
		LORSBAN-4E	56.0
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN-4E	187.1
		QUALI-PRO CHLORPYRIFOS 4E	155.8
	WHEAT	LORSBAN ADVANCED	31.0

ALFALFA - Total Pounds Chlorpyrifos Applied	**11125.2**
ALMOND - Total Pounds Chlorpyrifos Applied	**15508.7**
CORN - Total Pounds Chlorpyrifos Applied	**1459.8**
COTTON - Total Pounds Chlorpyrifos Applied	**409.0**
FIG - Total Pounds Chlorpyrifos Applied	**160.0**
GRAPES - Total Pounds Chlorpyrifos Applied	**4390.9**
PEACH - Total Pounds Chlorpyrifos Applied	**286.5**

Chemical Name	Commodity	Product Name	Lbs AI Applied
		SUGARBEET - Total Pounds Chlorpyrifos Applied	235.7
		WALNUT - Total Pounds Chlorpyrifos Applied	342.9
		WHEAT - Total Pounds Chlorpyrifos Applied	31.0
		Total Pounds Chlorpyrifos Applied (2004-2011)	33949.7

Monitoring results and PUR data indicate that management of chlorpyrifos in this subwatershed should focus on applications during the early spring and summer months. Hence, the Coalition's strategy is to provide information on a subwatershed basis to growers to review their operation and determine if storm water runoff and irrigation return flows are managed properly, specifically to growers with the potential to drain to the creek. Vineyard and orchard operators will be provided with information for improving irrigation and better manage irrigation tailwater and storm water runoff. Growers farming row crops will also be advised of the importance of managing irrigation tailwater and storm water runoff. Coalition representatives will discuss and encourage management practices to reduce spray drift. The Coalition recognizes that irrigation and storm water runoff management are often best improved by installation of structural management practices, such as a tailwater return system or drainage basin, which can be expensive. The Coalition will provide growers with information about (and include as a part of their discussions) available funding opportunities for management practice implementation.

Since 2007, Coalition outreach included grower meetings and the mailing/distribution of information. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142). The Coalition is focusing outreach to growers who have parcels in the direct drainage area of the subwatershed and who used chlorpyrifos within recent years. From these criteria, the Coalition compiled a list of targeted growers.

The Coalition initiated scheduling individual contact meetings with targeted growers. Although meetings will focus mainly on chlorpyrifos and copper exceedances, all water quality results will be reviewed and discussed including exceedances of ammonia, arsenic, DO, *E. coli*, SC, and TDS, and toxicity to *C. dubia*, *P. promelas*, and *S. capricornutum*. The Coalition contacted two targeted growers accounting for 240 acres of direct drainage within the subwatershed.

Grower surveys completed at the meetings, documenting members' current practices and indicating which recommended practices growers anticipated implementing in the upcoming years, will be compiled and assessed by the Coalition. Follow up with targeted growers will occur to determine what additional management practices were implemented after the initial meeting with Coalition representatives.

Management Plan Monitoring is scheduled to resume at Deadman Creek @ Gurr Rd in 2012 during months of historical exceedances. The Coalition plans to conduct MPM through 2014 to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority C Constituents

Copper is the only priority C constituent under the Deadman Creek @ Gurr Rd management plan.

Copper

Four exceedances of the copper WQTL occurred in the Deadman Creek @ Gurr Rd site subwatershed in 2007 (February, April, and May) and 2008 (January).

Copper is an algaecide and fungicide that is often applied to orchards and row crops following harvest and throughout the dormant season. High use can also occur early in the irrigation season.

The Coalition reviewed PUR data for the number of monthly copper applications, pounds of active ingredient applied, and acres treated (Table XIII-10 and Figure XIII-3). Numerous copper applications occurred in the subwatershed, with peak use during 2005 (14,773 lbs AI). Copper applications have since declined slightly (9,769 lbs AI in 2011; complete PUR data only available through October 2011). In past years, copper applications were typically been heavy in the early irrigation season; although, more recently, copper applications have peaked during January in the subwatershed. Almonds and grapes receive the most applications of copper, followed by tomatoes and pistachios (Table XIII-11).

Table XIII-10. Deadman Creek @ Gurr Rd site subwatershed copper applications, lbs AI applied, and acres treated by month (2004-2011).

PUR data available October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2004	18	2813.1	891.6
February, 2004	1	52.4	34
March, 2004	9	2525.7	1904.42
April, 2004	10	310.5	134.95
September, 2004	3	399.1	280
October, 2004	3	478.9	230
November, 2004	6	1446.6	327
December, 2004	9	2244.6	291.5
January, 2005	7	754.8	136.1
February, 2005	12	956.5	861.4
March, 2005	20	1781.3	2398.01
April, 2005	34	3049.9	2164.36
May, 2005	26	2299.7	1223.99
June, 2005	1	2672.1	398.11
July, 2005	1	148.5	59
September, 2005	5	330.3	269
October, 2005	3	246.2	167
November, 2005	8	1844.9	239.6
December, 2005	6	689.2	89.5
January, 2006	8	975.5	234
February, 2006	1	44.5	58
March, 2006	5	1724.8	1028.22
April, 2006	22	2346.1	2017.31

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
May, 2006	15	1336.4	1018
November, 2006	14	2433.2	316
January, 2007	5	444.9	51
February, 2007	2	102.6	76
March, 2007	5	530.1	880.61
April, 2007	26	1455.9	1165.8
May, 2007	1	9.2	10
November, 2007	1	94.7	22
December, 2007	7	329.8	107
January, 2008	3	938.0	278
March, 2008	8	701.3	713
April, 2008	3	1054.0	752.79
May, 2008	9	1918.7	494.69
June, 2008	2	83.2	120.34
November, 2008	2	233.2	84.3
December, 2008	2	233.2	84.3
January, 2009	5	1637.5	888
February, 2009	1	35.6	58
April, 2009	17	1382.7	1720.29
May, 2009	5	58.5	107.5
August, 2009	4	739.2	320
October, 2009	3	64.3	186
November, 2009	1	77.0	10
December, 2009	7	270.6	94
January, 2010	17	6326.3	1574
February, 2010	2	140.3	80
March, 2010	5	188.4	261
April, 2010	25	3355.5	1860.5
May, 2010	19	2259.8	1014
June, 2010	1	27.1	47
September, 2010	3	22.1	48
October, 2010	1	14.8	32
January, 2011	31	7114.2	2429.3
February, 2011	4	165.0	122
March, 2011	2	59.9	85
April, 2011	25	1150.7	1937.5
May, 2011	14	382.4	490.5
June, 2011	24	479.0	858
July, 2011	12	413.6	598
October, 2011	1	4.6	10

Summaries by Year

2004 Total	59	10270.8	4093.47
2005 Total	123	14773.3	8006.07
2006 Total	65	8860.5	4671.53
2007 Total	47	2967.2	2312.41
2008 Total	29	5161.6	2527.42

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
2009 Total	43	4265.5	3383.79
2010 Total	73	12334.2	4916.5
2011 Total	113	9769.2	6530.3
Total	**552**	**68402.4**	**36441.49**

Figure XIII-3. Deadman Creek @ Gurr Rd site subwatershed lbs copper applied by month (2004-2011).

(*) denotes months with exceedances. PUR data available October 2011 for Merced County.

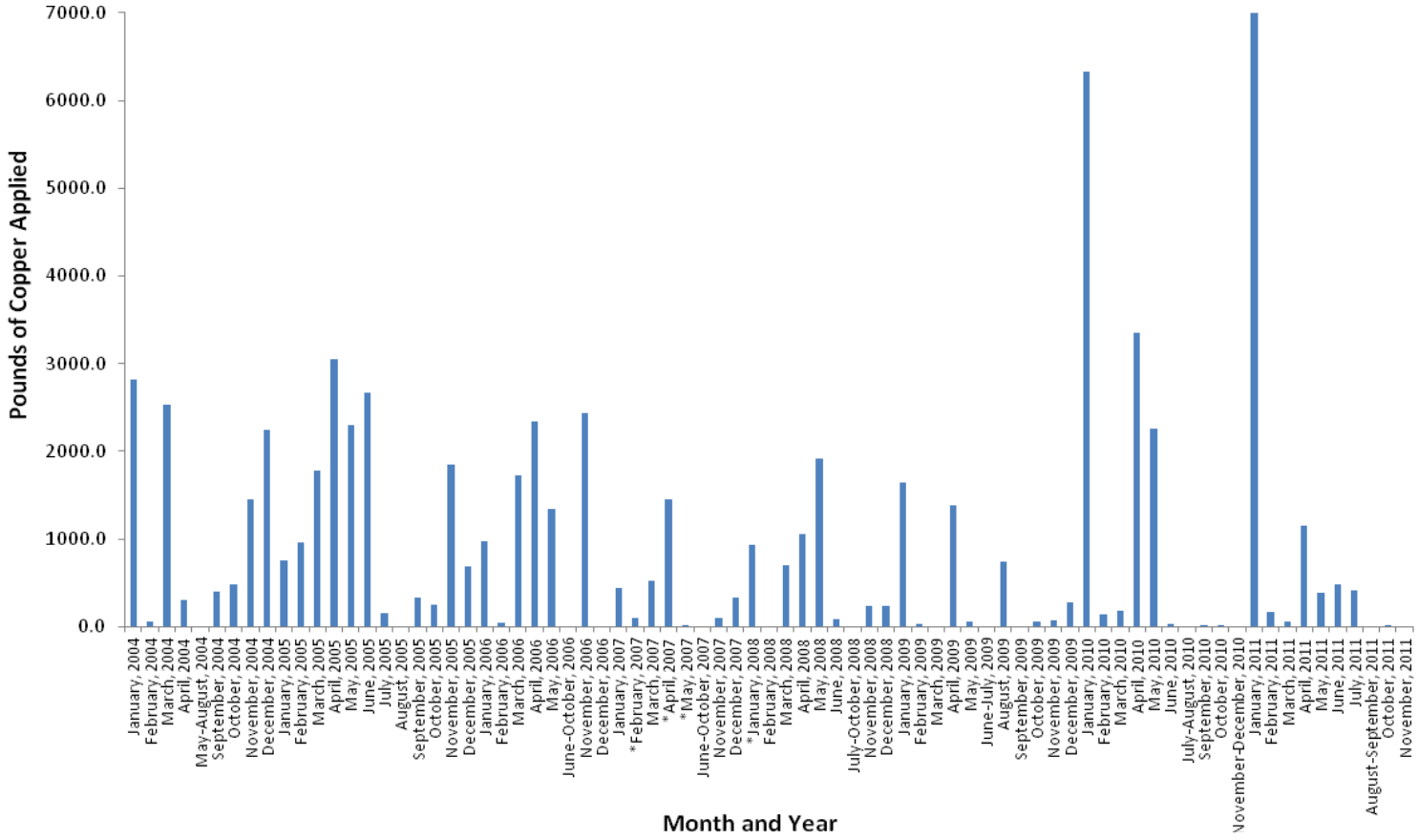


Table XIII-11. Deadman Creek @ Gurr Rd site subwatershed copper PUR data (2004-2011).

PUR data available October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	13.8
	ALMOND	BASIC COPPER 50W HB	172.6
		BASIC COPPER 53	77.4
		BASICOP	307.4
		CHAMP DRY PRILL	1201.0
		CHAMP FORMULA 2 FLOWABLE	1508.3
		CHAMPION WETTABLE POWDER	52.4
		CUPROFIX ULTRA 40 DISPERSS	8795.7
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	896.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	3520.2
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	35.6
		KOCIDE 101	977.9
		KOCIDE 2000	1742.0
		KOCIDE DF	1125.9
		KOP-HYDROXIDE 50W	308.0
		NORDOX	138.2
		NORDOX 75 WG	2120.5
		NU-COP 50 WP	52.4
	APRICOT	BASIC COPPER 53	58.8
		KOCIDE 2000	10.8
		KOCIDE DF	122.8
	CHERRY	NORDOX 75 WG	4.2
		NU-COP 50DF	154.0
	GRAPES	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	266.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	91.3
		KOCIDE 2000	958.7
	GRAPES, WINE	BADGE X2	291.8
		CHAMP DP	641.7
		CHAMP FLOWABLE	866.7
		CHAMP FORMULA 2 FLOWABLE	2385.7
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	980.4
		KENTAN DF	196.2
		KOCIDE 101	251.8
		KOCIDE 2000	2018.6
		NORDOX 75 WG	6966.2
		NU-COP HB	428.9
	NECTARINE	BASIC COPPER 53	98.0
	N-OUTDR CONTAINER/FLD GRWN PLANTS	DUPONT GX-569 FUNGICIDE/BACTERICIDE	135.5
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	588.5
		KOCIDE 101	6588.1
		KOCIDE 2000	189.4
	PEACH	BASIC COPPER 53	196.0
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	99.6
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	192.5
		KOCIDE 101	1062.6
		KOCIDE DF	635.2
	PEPPERS (FRUITING VEGETABLE), (BELL,CHILI, ETC.)	CHAMPION WETTABLE POWDER	23.1
		DUPONT GX-569 FUNGICIDE/BACTERICIDE	8.1

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	115.0
		KOCIDE 101	121.3
		KOCIDE DF	134.5
	PISTACHIO (PISTACHE NUT)	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	603.6
		KOCIDE 101	65.5
		NORDOX 75 WG	7417.6
	RICE (ALL OR UNSPEC)	COPPER-Z 4/4	530.2
	TOMATOES, FOR PROCESSING/CANNING	CHAMPION WETTABLE POWDER	1105.9
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	41.3
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	1628.4
		DUPONT KOCIDE DF FUNGICIDE/BACTERICIDE	327.0
		KOCIDE 101	1678.3
		KOCIDE 2000	795.2
		KOCIDE DF	2577.1
		NU-COP 50DF	181.7
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	195.7
		DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE	229.7
		KOCIDE 2000	639.7
		KOP-HYDROXIDE 50W	173.3
		NORDOX 75 WG	184.6
		NU-COP HB	100.1

ALFALFA - Total Pounds Diazinon Applied	**13.8**
ALMOND - Total Pounds Diazinon Applied	**23031.7**
APRICOT - Total Pounds Diazinon Applied	**192.4**
CHERRY - Total Pounds Diazinon Applied	**158.2**
GRAPES - Total Pounds Diazinon Applied	**16344.1**
NECTARINE - Total Pounds Diazinon Applied	**98.0**
N-OUTDR - Total Pounds Diazinon Applied	**7501.5**
PEACH - Total Pounds Diazinon Applied	**2185.9**
PEPPERS - Total Pounds Diazinon Applied	**401.9**
PISTACHIO - Total Pounds Diazinon Applied	**8086.7**
RICE - Total Pounds Diazinon Applied	**530.2**
TOMATOES - Total Pounds Diazinon Applied	**8334.8**
WALNUT - Total Pounds Diazinon Applied	**1523.0**
Total Pounds Copper Applied (2004-2011)	**68402.4**

The Coalition noted in the 2008 Management Plan that copper appears to be mobilized during winter storm water discharges and through irrigation return flows to Deadman Creek@ Gurr Rd. As discussed above, copper is heavily used in the subwatershed with numerous applications being made across numerous sections. Therefore, the Coalition plans to provide information on a subwatershed basis to growers to review their operation and determine if storm water runoff and irrigation return flows are managed properly, specifically to growers with the potential to drain to the creek. In addition, the Coalition is targeting growers with the potential to drain to the creek and who applied copper in the past. This is consistent with the strategy to address priority A/B constituent exceedances.

In addition, because Assessment Monitoring in 2009 and 2010 demonstrated two consecutive years of monitoring with no copper exceedances since the most recent exceedance in January 2008, the Coalition petitioned to remove copper from the Deadman Creek @ Gurr Rd management plan in a letter submitted to the Regional Board on January 6, 2012.

Priority D Constituents

The priority D constituents listed in the Deadman Creek @ Gurr Rd subwatershed management plan are water column toxicity to *C. dubia*, *P. promelas* and *S. capricornutum*.

C. dubia toxicity

Through analysis of associated monitoring data and TIEs, the Coalition determined ammonia is the most frequent and primary cause of *C. dubia* toxicity in the subwatershed. Toxicity to *C. dubia* occurred four times in the subwatershed in 2009 (February and March) and 2010 (March and November), and, although a chlorpyrifos exceedance was associated with the March 2010 toxicity, ammonia contributed to toxicity in the February 2009 and the 2010 (March and November) events.

P. promelas toxicity

Ammonia concentrations are also responsible for the majority of *P. promelas* toxicities in the Deadman Creek @ Gurr Rd subwatershed 2006 (June), 2007 (May), 2009 (January, February, and December) and 2010 (March and November) and either was the only cause or contributed to all of the most recent toxicities in 2009 and 2010.

Fertilizers applied to agricultural fields can contain ammonium. However, the ammonium is rapidly converted to nitrate in the natural environment, and ammonium-based fertilizer is unlikely to be the source of ammonia detected in surface waterways, especially at relatively high concentrations (Table XIII-5), would be agricultural applications of fertilizer. The Coalition suspects other sources are responsible for the ammonia exceedances, most likely dairies and irrigated pastureland in the subwatershed. The Coalition continues to emphasize the importance of nutrient, irrigation tailwater, and storm water management, which is consistent with the strategy for the subwatershed.

S. capricornutum toxicity

S. capricornutum toxicity occurred three times in the subwatershed 2007 (July), 2008 and 2009 (February). The causes of the first two toxicities were undetermined, but the third toxicity to *S. capricornutum* was due to ammonia. Similar to the strategy for the other two toxicity species, the Coalition believes preventing irrigation return flows carrying agricultural constituents from entering the surface waterway will be effective in eliminating *S. capricornutum* toxicity. The Coalition will continue with outreach as explained under the chlorpyrifos section to address the toxicity.

Priority E Constituents

The priority E constituents listed under the Deadman Creek @ Gurr Rd management plan are ammonia, arsenic, DO, *E. coli*, SC and TDS.

Potential sources of ammonia were discussed in the section above as they relate to toxicities. Although the Coalition suspects sources other than agriculture are the primary contributors to the exceedances, the Coalition will discuss ammonia during outreach according to its strategy described above.

Although these constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and /or MPM. Dissolved oxygen and SC are field parameters that will be collected during every monitoring event, Assessment and MPM. Ammonia, arsenic, *E. coli*, and TDS will be monitored during Assessment Monitoring at this site as scheduled in 2017. The priority E constituents are also discussed during individual contacts and at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Deadman Creek @ Gurr Rd is one of the four fourth priority site subwatersheds within the ESJWQC and is in its first year of focused outreach (2012-2014).

The Coalition will focus its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments, extending outreach to Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Deadman Creek @ Gurr Rd subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows and storm water runoff are managed properly. The Coalition targeted growers with crops located adjacent to the waterway and whose agricultural practices may result in the discharge or drift of pesticides, specifically chlorpyrifos and copper, into the waterway. Outreach efforts include grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

Targeted growers will complete individual surveys to document current management practice and assess future planned practices. The Coalition will review these results and plan the final stages of outreach including follow up contacts with growers to identify newly implemented practices and future monitoring to evaluate water quality improvement.

In 2012, MPM is scheduled for high priority constituents during months of historical exceedances. However, monitoring for copper resulted in zero exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove the constituent from the active Deadman Creek @ Gurr Rd management plan; until the letter is approved, copper will continue to be monitored as scheduled.

XIV. DEADMAN CREEK @ HWY 59

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority D

- *Selenastrum capricornutum* water column toxicity

Priority E

- Arsenic
- DO
- *E. coli*

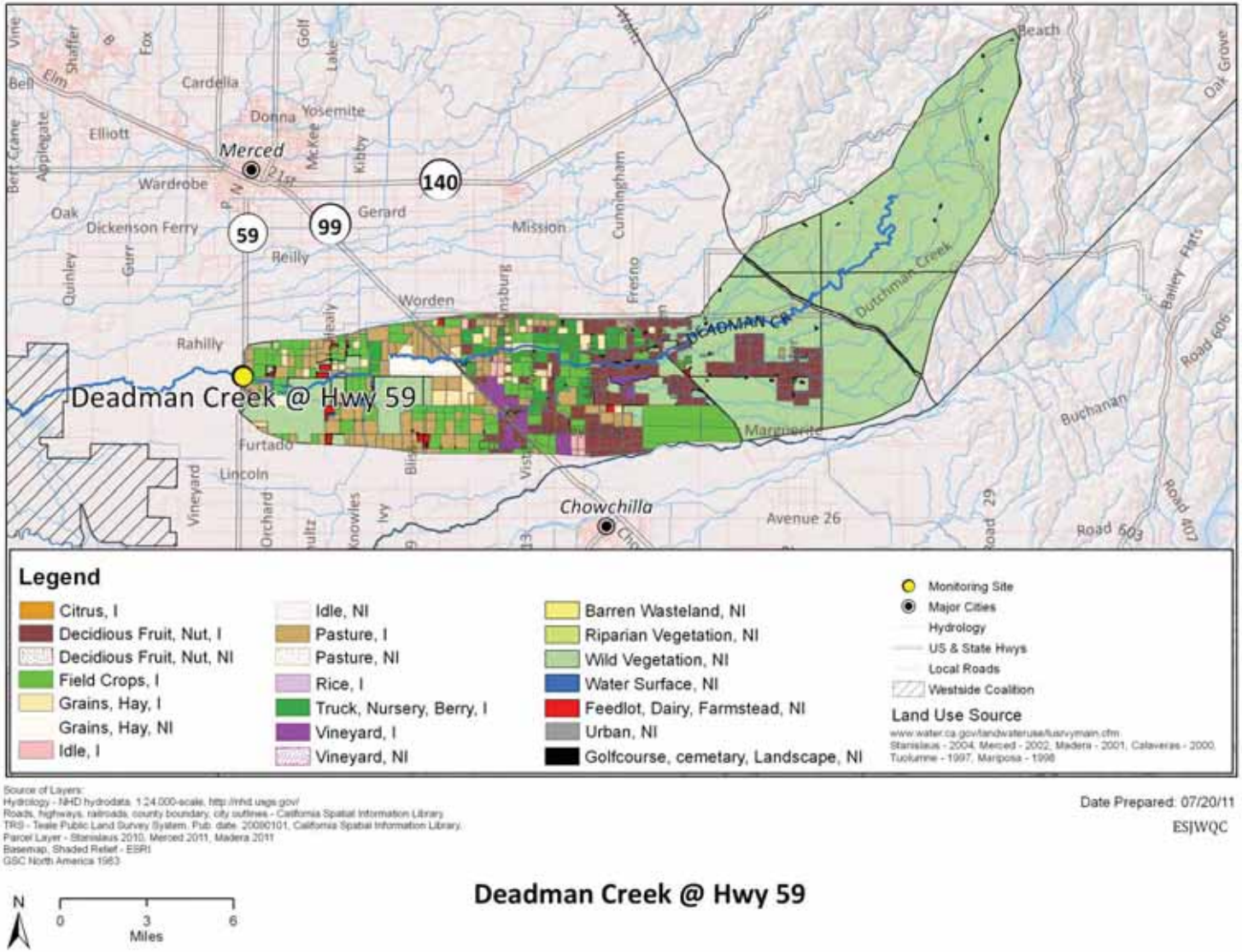
Description of Deadman Creek @ Hwy 59 Site Subwatershed

Deadman Creek @ Hwy 59 (37,400 irrigated acres) –This site is upstream from the Deadman Creek @ Gurr Rd site subwatershed (Table XIV-1). The primary agriculture in the site subwatershed consists of orchards, field crops, and alfalfa (Figure XIV-1).

Table XIV-1. Deadman Creek @ Hwy 59 site subwatershed sampling location coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Deadman Creek @ Hwy 59	535DMCAHF	37.1981	-120.4869

Figure XIV-1. Deadman Creek @ Hwy 59 site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Deadman Creek @ Hwy 59 began in the irrigation season of 2006 and continued through the irrigation season of 2008 (Table XIV-2). Deadman Creek @ Hwy 59 is an Assessment Monitoring location in the Duck Slough @ Gurr Rd Zone (Zone 5), and Assessment Monitoring resumed at the site in 2011 and will continue through 2012. Deadman Creek @ Hwy 59 is scheduled for Assessment Monitoring again in 2019 through 2020. Constituents monitored during sampling years are listed in Table XIV-3.

Management Plan Monitoring in the subwatershed occurred in 2008 through 2010. The Coalition conducted MPM for chlorpyrifos in August and September in 2008 and 2009 (Table XIV-4). Management Plan Monitoring also occurred for *S. capricornutum* in April 2009 and January 2010. The site, however, was dry during all three 2009 events and during the single 2010 monitoring event. Since Deadman Creek @ Hwy 59 is a fourth priority subwatershed, MPM is scheduled to resume during 2012.

Deadman Creek is currently on California's 2008-2010 303d List of Impaired Waterbodies for chlorpyrifos and *E. coli*.

Table XIV-2. Deadman Creek @ Hwy 59 site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2006	Storm	NA	NA	**NA**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	6	0	**6**
2008	Storm	2	0	**2**
	Irrigation	8	0	**8**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	0	3	**3**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	0	1	**1**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	2	0	**2**
	Storm	1	0	**1**
	Irrigation	6	0	**6**
	Fall	3	0	**3**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table XIV-3. Deadman Creek @ Hwy 59 site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate of one are listed.

Method	Analyte	2006		2007		2008			2009	2010	2011			
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
Field and Physical Parameters														
NA	Dissolved Oxygen		5	3	7	4	11				3	1	6	3
NA	Specific Conductivity		5	3	7	4	11				3	1	6	3
NA	pH		5	3	7	4	11				3	1	6	3
EPA 110.2	Color		5	2	6	2	6							
EPA 160.1	Dissolved Solids		5	2	6	2	6				2	1	6	3
EPA 160.2	Suspended Solids										1	2	6	3
EPA 180.1	Turbidity		5	2	6	2	6				2	1	6	3
EPA 415.1	Total Organic Carbon		5	2	6	2	6							
SM 9223	*E. coli*		5	2	6	2	6				2	1	6	3
Walkley-Black	Total Organic Carbon (sediment)										1		1	
ASTM D422 or ASTM D4464	Grain size (sediment)										1		1	
EPA 405.1	BOD		1	2	2									
Carbamates														
EPA 8321A	Aldicarb		5	2	6	2	6				2	1	6	3
EPA 8321A	Carbaryl		5	2	6	2	6				2	1	6	3
EPA 8321A	Carbofuran		5	2	6	2	6				2	1	6	3
EPA 8321A	Diuron		5	2	6	2	6				2	1	6	3
EPA 8321A	Linuron		5	2	6	2	6				2	1	6	3
EPA 8321A	Methiocarb		5	2	6	2	6				2	1	6	3
EPA 8321A	Methomyl		5	2	6	2	6				2	1	6	3
EPA 8321A	Oxamyl		5	2	6	2	6				2	1	6	3
Organochlorines														
EPA 8081A	DDD(p,p')		5	2	6	2	6				2	1	4	
EPA 8081A	DDE(p,p')		5	2	6	2	6				2	1	4	
EPA 8081A	DDT(p,p')		5	2	6	2	6				2	1	4	
EPA 8081A	Dicofol		5	2	6	2	6				2	1	4	

Method	Analyte	2006		2007		2008			2009	2010	2011			
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
EPA 8081A	Dieldrin		5	2	6	2	6				2	1	4	
EPA 8081A	Endrin		5	2	6	2	6				2	1	4	
EPA 8081A	Methoxychlor		5	2	6	2	6				2	1	4	
Group A Pesticides														
EPA 8081A	Aldrin										2	1	4	
EPA 8081A	Chlordane										2	1	4	
EPA 8081A	Endosulfan I										2	1	4	
EPA 8081A	Endosulfan II										2	1	4	
EPA 8081A	HCH, alpha										2	1	4	
EPA 8081A	HCH, beta										2	1	4	
EPA 8081A	HCH, delta										2	1	4	
EPA 8081A	HCH, gamma										2	1	4	
EPA 8081A	Heptachlor										2	1	4	
EPA 8081A	Heptachlor epoxide										2	1	4	
EPA 8081A	Toxaphene										2	1	4	
Organophosphates														
EPA 8141A	Azinphos methyl		5	2	6	2	6				2	1	6	3
EPA 8141A	Chlorpyrifos		5	2	6	8	6				2	1	6	3
EPA 8141A	Demeton-s										2	1	6	3
EPA 8141A	Diazinon		5	2	6	2	6				2	1	6	3
EPA 8141A	Dichlorvos										2	1	6	3
EPA 8141A	Dimethoate		5	2	6	2	6				2	1	6	3
EPA 8141A	Disulfoton		5	2	6	2	6				2	1	6	3
EPA 8141A	Malathion		5	2	6	2	6				2	1	6	3
EPA 8321A	Methamidophos		5	2	6	2	6				2	1	6	3
EPA 8141A	Methidathion		5	2	6	2	6				2	1	6	3
EPA 8141A	Molinate		5	2	6	2	6				2	1	6	3
EPA 8141A	Parathion, Methyl		5	2	6	2	6				2	1	6	3
EPA 8141A	Phorate		5	2	6	2	6				2	1	6	3
EPA 8141A	Phosmet		5	2	6	2	6				2	1	6	3

Method	Analyte	2006		2007		2008			2009	2010	2011			
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
EPA 8141A	Thiobencarb		5	2	6	2	6							
EPA 8141A	Trifluralin										2	1	6	3
Pyrethroids														
EPA 8081A	Bifenthrin		5	2	6	2	6							
EPA 8081A	Cyfluthrin, total		5	2	6	2	6							
EPA 8081A	Cyhalothrin, lambda, total		5	2	6	2	6							
EPA 8081A	Cypermethrin, total		5	2	6	2	6							
EPA 8081A	Esfenvalerate/ Fenvalerate, total		5	2	6	2	6							
EPA 8081A	Permethrin, total		5	2	6	2	6							
Triazines														
EPA 547M	Glyphosate		5	2	6	2	6				2		4	
EPA 549.2M	Paraquat dichloride		5	2	6	2	6				2		4	
EPA 619	Atrazine		5	2	6	2	6				2	1	6	3
EPA 619	Cyanazine		5	2	6	2	6				2	1	6	3
EPA 619	Simazine		5	2	6	2	6				2	1	6	3
Metals (Total)														
EPA 200.8	Arsenic						6				2	1	5	
EPA 200.8	Boron						6				2	1	6	3
EPA 200.8	Cadmium						6				2	1	5	
EPA 200.8	Copper						6				2	1	6	3
EPA 200.8	Lead						6				2	1	5	
EPA 200.8	Molybdenum										2	1	5	
EPA 200.8	Nickel						6				2	1	6	3
EPA 200.8	Selenium						6				2	1	5	3
EPA 200.8	Zinc						6				2	1	6	3
Metals (Dissolved)														
EPA 200.8	Cadmium										2	1	5	
EPA 200.8	Copper										2	1	6	3
EPA 200.8	Lead										2	1	5	
EPA 200.8	Nickel										2	1	6	3

Method	Analyte	2006		2007		2008			2009	2010	2011			
		Storm *	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter	Storm	Irrigation	Fall
EPA 200.8	Zinc										2	1	6	3
Nutrients														
SM 2340 C	Hardness as CaCO3						6				2	1	6	3
EPA 300.0	Nitrate as N						6							
EPA 350.2	Ammonia as N						6				2	1	6	3
EPA 351.3	Nitrogen, Total Kjeldahl						6				2	1	6	3
EPA 354.1	Nitrite as N						6							
EPA 353.2	Nitrate + Nitrite as N										2	1	6	3
EPA 365.2	OrthoPhosphate as P						6				2	1	6	3
EPA 365.2	Phosphate as P						6				2	1	6	3
Toxicity														
EPA 821/R-02-012	*Ceriodaphnia dubia*		5	2	6	2	6				2	1	6	3
EPA 821/R-02-012	*Pimephales promelas*		5	2	6	2	6				2	1	6	3
EPA 821/R-02-013	*Selenastrum capricornutum*		5	2	6	3	7				2	1	6	3
EPA 600/R-99-064	*Hyalella azteca*		1	1	1	1	2				1		1	

*Site not sampled during the 2006 storm season, 2008 fall season, and 2009 and 2010 winter, storm and fall seasons (dry in both irrigation seasons).

Table XIV-4. Deadman Creek @ Hwy 59 site subwatershed Management Plan Monitoring schedule (2008-2010).

Site Name	Sample Date	Monitoring Type	Chlorpyrifos	*S. capricornutum*
Deadman Creek @ Hwy 59	5-Aug-08	A	X	
Deadman Creek @ Hwy 59	9-Sep-08	A	X	
Deadman Creek @ Hwy 59	21-Apr-09	MPM		X
Deadman Creek @ Hwy 59	18-Aug-09	MPM	X	
Deadman Creek @ Hwy 59	22-Sep-09	MPM	X	
Deadman Creek @ Hwy 59	19-Jan-10	MPM		X

A – Additional sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Deadman Creek @ Hwy 59 samples collected from 2006 through 2011 exceeded the WQTLs for field parameters, *E. coli*, pesticides, and metals and water column and sediment toxicity have also occurred (Table XIV-5). Constituents that exceeded their respective WQTLs in this subwatershed include DO (17), *E. coli* (17), arsenic (5), chlorpyrifos (6), diuron (1), DDD (1), DDT (one) and simazine (1). Toxicity to *S. capricornutum* (2), one of which demonstrated persistent toxicity in the resample, and *H. azteca* sediment has occurred once (Table XIV-5).

In 2011, exceedances included pH (4), *E. coli* (5), and chlorpyrifos (2).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Deadman Creek @ Hwy 59 subwatershed are chlorpyrifos (A/B) and toxicity to *S. capricornutum* (D).

Table XIV-5. Deadman Creek @ Hwy 59 site subwatershed exceedances (2006-2011).
The WQTL used to evaluate the data are listed in the header after the analyte.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 ml	Arsenic, >10 µg/L	Chlorpyrifos, >0.015 µg/L	DDD (p,p'), >0.00083 µg/L	DDT (p,p'), >0.00059 µg/L	Diuron, >2 µg/L	Simazine, >4 µg/L	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Deadman Creek @ Hwy 59	Irrigation	6/13/2006	5.65					0.0053	0.05				
Deadman Creek @ Hwy 59	Irrigation	8/8/2006	6.55										
Deadman Creek @ Hwy 59	Irrigation	9/12/2006	6.53				0.059						
Deadman Creek @ Hwy 59	Storm	2/11/2007			400								
Deadman Creek @ Hwy 59	Storm	2/28/2007			490								
Deadman Creek @ Hwy 59	Irrigation	4/24/2007			310								
Deadman Creek @ Hwy 59	Irrigation	5/29/2007	6.13		490								
Deadman Creek @ Hwy 59	Irrigation	6/26/2007	6.78		610								
Deadman Creek @ Hwy 59	Irrigation	7/24/2007	4.31										
Deadman Creek @ Hwy 59	Irrigation	8/21/2007	4.47				0.038						
Deadman Creek @ Hwy 59	Irrigation	8/23/2007	2.65										
Deadman Creek @ Hwy 59	Irrigation	9/18/2007	5.43		330								
Deadman Creek @ Hwy 59	Storm	1/25/2008			>2400					6.2	25	44	
Deadman Creek @ Hwy 59	Storm	2/25/2008			1200								
Deadman Creek @ Hwy 59	Irrigation	4/29/2008			610	16						71	
Deadman Creek @ Hwy 59	Irrigation	5/7/2008										42	

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	*E. coli*, >235 MPN/100 ml	Arsenic, >10 µg/L	Chlorpyrifos, >0.015 µg/L	DDD (p,p'), >0.00083 µg/L	DDT (p,p'), >0.00059 µg/L	Diuron, >2 µg/L	Simazine, >4 µg/L	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Deadman Creek @ Hwy 59	Irrigation	5/27/2008			610	12							
Deadman Creek @ Hwy 59	Irrigation	6/24/2008	3.78		310	17							
Deadman Creek @ Hwy 59	Irrigation	7/29/2008	3.08		490								
Deadman Creek @ Hwy 59	Irrigation	8/5/2008	4.51				0.14						
Deadman Creek @ Hwy 59	Irrigation	8/26/2008	1.78			11							
Deadman Creek @ Hwy 59	Sediment	8/28/2008	1.05										90
Deadman Creek @ Hwy 59	Irrigation	9/9/2008	3.37				0.069						
Deadman Creek @ Hwy 59	Irrigation	9/30/2008	4.45			13							
Deadman Creek @ Hwy 59	Sediment	10/2/2008	4.22										
Deadman Creek @ Hwy 59	Winter	1/18/2011			310								
Deadman Creek @ Hwy 59	Storm	2/17/2011		8.58									
Deadman Creek @ Hwy 59	Winter	3/15/2011			580								
Deadman Creek @ Hwy 59	Irrigation	4/19/2011		9.09	2400		0.016						
Deadman Creek @ Hwy 59	Irrigation	5/17/2011		9.63									
Deadman Creek @ Hwy 59	Irrigation	6/21/2011			410								
Deadman Creek @ Hwy 59	Irrigation	7/19/2011		8.57	460								
Deadman Creek @ Hwy 59	Irrigation	9/13/2011					0.049						
Constituent Priority			**E**	**E**	**E**	**E**	**A/B**	**NP**	**NP**	**NP**	**NP**	**D**	**NP**

NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Deadman Creek @ Hwy 59 subwatershed are listed in Table XIV-6. These constituents include chlorpyrifos and *S. capricornutum* toxicity.

The second exceedance of the chlorpyrifos WQTL occurred at the site during 2007 monitoring (the first chlorpyrifos exceedance occurred during 2006, but the chlorpyrifos and diazinon TMDL for the San Joaquin River was not approved) and additional MPM was scheduled for chlorpyrifos in 2008 (Table XIV-6). Chlorpyrifos was detected in the 2008 (January, August and September) Normal Monitoring samples and exceeded the WQTL in the additional MPM samples collected in 2008 (August and September). Chlorpyrifos MPM was scheduled again for 2009 (August and September) but the site was dry during both months. During 2011 Assessment Monitoring, chlorpyrifos exceeded the WQTL twice (April and September).

Toxicity to *S. capricornutum* first occurred in 2008 (January and April). Management Plan Monitoring was scheduled for *S. capricornutum* toxicity in April 2009 and January 2010, but the Deadman Creek @ Hwy 59 site was dry during both events. There was no toxicity to *S. capricornutum* during 2011 Assessment Monitoring.

Assessment Monitoring is scheduled to continue through 2012 for the Deadman Creek @ Hwy 59 site. In addition, the site becomes a high priority subwatershed in 2012 and will remain as such through 2014. Management Plan Monitoring will occur for chlorpyrifos and toxicity to *S. capricornutum* during the high priority years.

Table XIV-6. Deadman Creek @ Hwy 59 site subwatershed monitoring results for high priority constituents.

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2008 NM (@ Hwy 59)	Date	1/25/08	2/25/08	NA	4/29/08	5/27/08	6/24/08	7/29/08	8/26/08	9/30/08	NA	NA	NA
	Chlorpyrifos (µg/L)	0.012	<0.003	NA	<0.003	<0.003	<0.003	<0.003	0.015	0.015	NA	NA	NA
2008 MPM A (@ Hwy 59)	Date	NA	NA	NA	NA	NA	NA	NA	8/5/08	9/9/08	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	**0.14**	**0.069**	NA	NA	NA
2009 MPM (@Hwy 59)	Date	NA	NA	NA	4/21/09	NA	NA	NA	8/18/09	9/22/09	NA	NA	NA
	Chlorpyrifos (µg/L)	NA	NA	NA	NA	NA	NA	NA	Dry	Dry	NA	NA	NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	Dry	NA	NA	NA	NA	NA	NA	NA	NA
2010 MPM (@ Hwy 59)	Date	1/19/10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	S. capricornutum toxicity (% Control)	Dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 NM (@ Hwy 59)	Date	1/18/11	2/17/11	3/15/11	4/19/11	5/17/11	6/21/11	7/19/11	8/16/11	9/13/11	10/11/11	11/8/11	12/6/11
	Chlorpyrifos (µg/L)	<0.003	<0.003	<0.003	**0.016**	<0.003	<0.003	<0.003	<0.003	**0.049**	<0.003	<0.003	<0.003
	S. capricornutum toxicity (% Control)	865	136	725	415	363	916	562	1259	585	801	2044	358

A – Additional MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring

Load Calculations

Loads have been calculated for all chlorpyrifos detections in the site subwatershed based on the following formula (Table XIV-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XIV-7. Deadman Creek @ Hwy 59 site subwatershed instantaneous load calculations for chlorpyrifos. Sorted by analyte and date.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Deadman Creek @ Hwy 59	Chlorpyrifos	09/12/06	3.06	0.059	5.11
Deadman Creek @ Hwy 59	Chlorpyrifos	08/21/07	5.96	0.038	6.41
Deadman Creek @ Hwy 59	Chlorpyrifos	08/05/08	0.08	0.14	0.32
Deadman Creek @ Hwy 59	Chlorpyrifos	08/26/08	0.55	0.015	0.23
Deadman Creek @ Hwy 59	Chlorpyrifos	09/09/08	3.02	0.069	5.90
Deadman Creek @ Hwy 59	Chlorpyrifos	09/30/08	1.01	0.015	0.43
Deadman Creek @ Hwy 59	Chlorpyrifos	04/19/11	0.86	0.016	0.39
Deadman Creek @ Hwy 59	Chlorpyrifos	09/13/11	2.25	0.049	3.12

Source Identification and Outreach

The Coalition evaluates past monitoring results and associated PUR data to develop a source identification and outreach strategy. The highest priority constituents in the Deadman Creek @ Hwy 59 subwatershed management plan are chlorpyrifos (A/B) and *S. capricornutum* toxicity (D). To better characterize water quality in the subwatershed, the Coalition conducted additional MPM for chlorpyrifos in 2008 and MPM in 2009 and 2010 for both constituents during the months of past exceedances. The Coalition reviews PUR data to determine the most frequent crop type and timing associated with chlorpyrifos applications. From these actions, the Coalition developed an outreach strategy, which is detailed in the following sections.

The Deadman Creek @ Hwy 59 subwatershed is a high priority subwatershed as of 2012 and will remain so through 2014. The Coalition will actively engage in grower outreach and education to address the Deadman Creek @ Hwy 59 management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Individual grower meetings with targeted members are planned to inform growers about management practices as well as to assess current and expected future implementation of additional management practices.

Chlorpyrifos is the only A/B constituent for the Deadman Creek @ Hwy 59 subwatershed.

Chlorpyrifos

Chlorpyrifos exceeded the WQTL of 0.015 µg/L four times in Deadman Creek @ Hwy 59 in 2006 (September), 2007 (August) and 2008 (August and September, Table XIV-5). Chlorpyrifos was also detected at (but did not exceed the WQTL) during Normal Monitoring in 2008 (August and September). The site was dry during scheduled MPM for chlorpyrifos in 2009 (August and September), but was sampled during 2011 Assessment Monitoring and chlorpyrifos exceedances occurred in samples collected during April and September.

Across the ESJWQC region, chlorpyrifos use often peaks during July, August and September when hull split applications to almonds and coddling moth applications to walnuts occur. In addition, chlorpyrifos is applied in the latter summer months to various row crops, in particular alfalfa. The consistent timing of exceedances suggest that chlorpyrifos in the waterways is the result of these applications. However, the relatively high concentrations detected in the waterways suggest that irrigation runoff to the creek is the primary mechanism of transport, as opposed to spray drift from chlorpyrifos applications to orchards.

To determine an outreach strategy, the Coalition reviewed PUR data for the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and the acres treated within the subwatershed (Table XIV-8, Figure XIV-2). Applications of chlorpyrifos typically occur throughout the irrigation season in the subwatershed, with peak use in June, July, or August. The greatest amount of chlorpyrifos use occurred in 2006 (5,735 lbs AI) and has declined since. Applications amounts have declined and acreage has increased, indicating growers are now applying less chlorpyrifos per acre. Exceedances do not necessarily coincide with heavy use, indicating only a few applications may be the cause of water quality impairments. Applications in the subwatershed are largely to almonds (9,170 lbs AI), alfalfa (8,342 lbs AI), and grapes (3,431 lbs AI; Table XIV-9). Of note, growers use aerial as the method of chlorpyrifos application nearly three times as often as they apply from the ground.

Table XIV-8. Deadman Creek @ Hwy 59 site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2006-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2006	5	91.7	45.0
March, 2006	3	122.9	349.0
April, 2006	1	4.0	29.0
May, 2006	13	1386.1	741.0
June, 2006	1	137.6	69.0
July, 2006	12	2202.8	1097.0
August, 2006	8	473.0	393.0
September, 2006	18	593.9	1153.2

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
October, 2006	1	723.4	362.8
January, 2007	2	29.9	15.0
March, 2007	18	422.0	1219.7
July, 2007	10	1812.1	1200.5
August, 2007	22	883.2	1948.9
October, 2007	1	780.0	391.2
March, 2008	7	78.2	240.0
May, 2008	11	619.0	633.0
July, 2008	27	624.1	2365.3
August, 2008	34	808.0	2444.8
September, 2008	3	50.5	252.0
March, 2009	6	997.7	928.0
April, 2009	11	213.0	963.0
June, 2009	8	2417.3	1270.0
July, 2009	2	34.1	68.0
August, 2009	1	25.1	53.0
September, 2009	10	319.9	768.9
March, 2010	31	432.3	2150.9
June, 2010	15	1168.0	1599.0
July, 2010	18	774.7	1295.9
August, 2010	30	946.1	1891.5
September, 2010	14	514.1	1149.3
October, 2010	1	1027.3	547.0
March, 2011	35	521.5	2585.5
April, 2011	3	60.8	281.0
May, 2011	2	437.2	215.0
July, 2011	16	402.9	762.2
August, 2011	29	588.9	1617.1
September, 2011	1	34.0	68.0
Summaries by Year			
2006 Total	62	5735.4	4239.0
2007 Total	53	3927.3	4775.3
2008 Total	82	2179.7	5935.1
2009 Total	38	4007.2	4050.9
2010 Total	109	4862.4	8633.6
2011 Total	86	2045.4	5528.8
Total	**431**	**22757.4**	**33162.7**

Figure XIV-2. Deadman Creek @ Hwy 59 site subwatershed lbs chlorpyrifos applied by month (2006-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

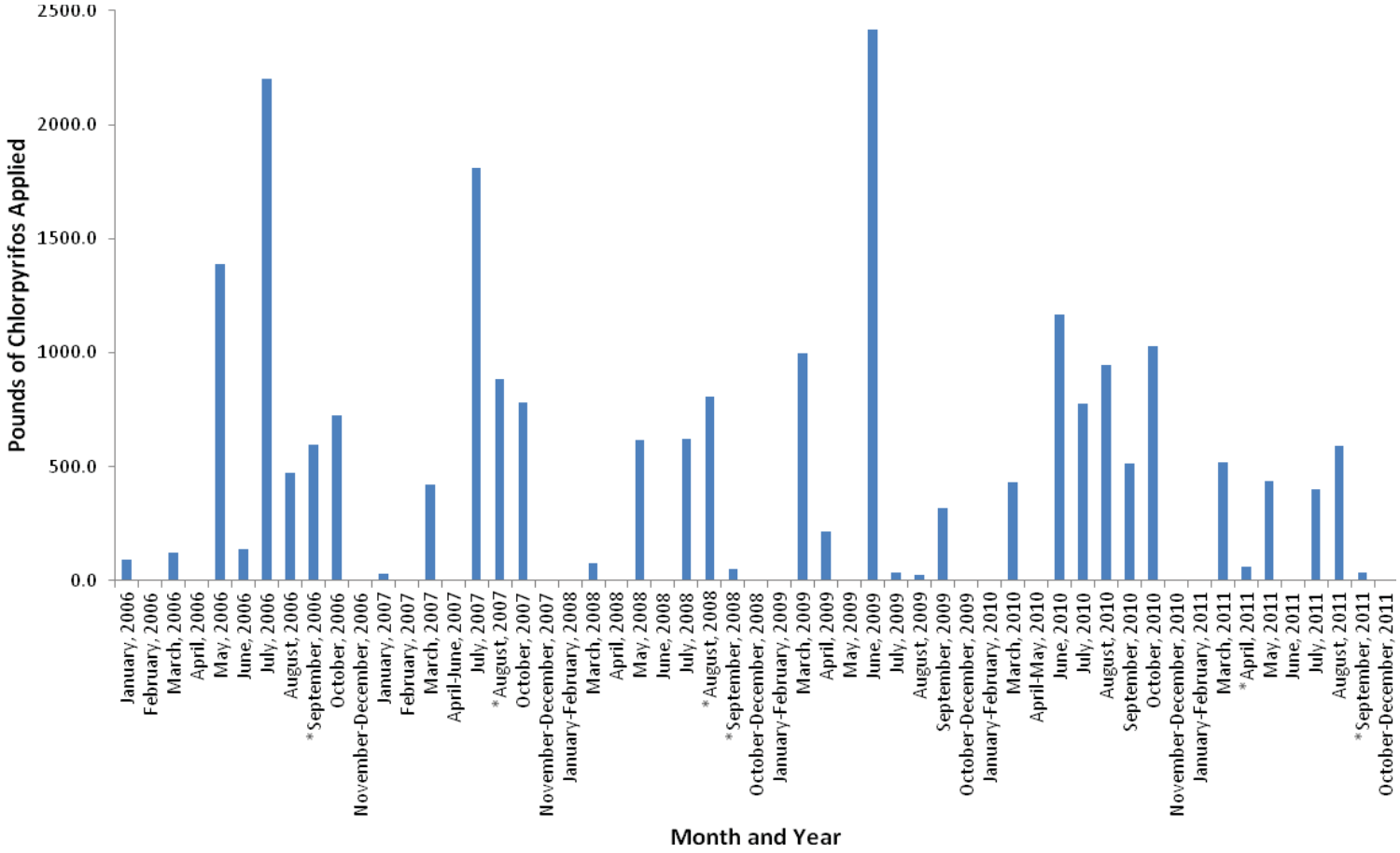


Table XIV-9. Deadman Creek @ Hwy 59 site subwatershed chlorpyrifos PUR data (2006-2011).

PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	CHLORPYRIFOS 4E AG	319.7
		GOVERN 4E INSECTICIDE	1785.6
		LOCK-ON INSECTICIDE	3450.5
		LORSBAN 4E-HF	201.1
		LORSBAN-4E	424.5
		NUFOS 4E	293.6
		WARHAWK	54.8
		WHIRLWIND	1812.5
	ALMOND	ERASER	97.9
		GOVERN 4E INSECTICIDE	2973.3
		LORSBAN 4E-HF	1865.4
		LORSBAN ADVANCED	10.9
		LORSBAN-4E	479.7
		NUFOS 4E	3742.7
	CORN (FORAGE - FODDER)	LORSBAN 15G GRANULAR INSECTICIDE	565.5
		NUFOS 4E	181.0
		SAURUS	202.5
		WHIRLWIND	107.7
	COTTON, GENERAL	LORSBAN 4E-HF	89.6
		WHIRLWIND	12.2
	FIG	WHIRLWIND	160.0
	GRAPES, WINE	LORSBAN 4E-HF	1503.4
		LORSBAN ADVANCED	1027.3
		LORSBAN-4E	900.4
	PEACH	LORSBAN 4E-HF	121.6
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	LORSBAN-4E	187.1
		QUALI-PRO CHLORPYRIFOS 4E	155.8
	WHEAT	LORSBAN ADVANCED	31.0

ALFALFA - Total Pounds Chlorpyrifos Applied	**8342.2**
ALMOND - Total Pounds Chlorpyrifos Applied	**9170.0**
CORN - Total Pounds Chlorpyrifos Applied	**1056.7**
COTTON - Total Pounds Chlorpyrifos Applied	**101.8**
FIG - Total Pounds Chlorpyrifos Applied	**160.0**
GRAPES - Total Pounds Chlorpyrifos Applied	**3431.1**
PEACH - Total Pounds Chlorpyrifos Applied	**121.6**
WALNUT - Total Pounds Chlorpyrifos Applied	**342.9**
WHEAT - Total Pounds Chlorpyrifos Applied	**31.0**
Total Pounds Chlorpyrifos Applied (2006-2011)	**22757.3**

Monitoring results and PUR data indicate that management of chlorpyrifos in this subwatershed should focus on chlorpyrifos applications during the late summer months. Grower's irrigation tailwater management should be closely scrutinized to ensure runoff cannot transport pesticides to the creek, especially for growers with the potential to drain to the creek. Operators of orchards will be advised of methods to improve irrigation and to better manage irrigation tailwater and storm water runoff. Coalition representatives will also discuss and encourage management practices to reduce spray drift.

Farmers of row crops will be directed to evaluate their irrigation and storm water management as well as ensure appropriate practices are used to apply pesticides. The Coalition recognizes that irrigation and storm water management are often best improved by installation of structural management practices, such as a tailwater return system or drainage basin, which can be expensive. The Coalition plans to provide growers with information about (and include as a part of their discussions) available funding opportunities for management practice implementation.

Since 2007, general Coalition outreach included grower meetings and the mailing/distribution of information. A complete list of coalition outreach during 2011 is provided in the Actions Taken to Address Water Quality Exceedances section of the 2012 AMR (Table 46, page 142).

The Coalition began scheduling individual meetings with targeted growers in the fourth priority subwatersheds. Targeted growers farm parcels with the potential to drain to Deadman Creek and they applied chlorpyrifos in the past. Although meetings are focusing mainly on chlorpyrifos exceedances, all water quality results are reviewed and discussed including *S. capricornutum* toxicity, and exceedances of DO, *E. coli*, and arsenic. The Coalition contacted eight members accounting for 3,414 acres of targeted direct drainage.

Grower surveys completed at the meetings documenting members' current practices and indicating which recommended practices growers anticipate implementing in the upcoming years will be compiled and assessed by the Coalition. The Coalition is hopeful growers will be able to implement recommended practices as soon as the irrigation season of 2012, but recognizes that some practices may not be able to be implemented until later. Follow up meetings with targeted growers will occur to determine what additional management practices were implemented.

In 2012, Assessment Monitoring is scheduled at Deadman Creek @ Hwy 59 when all priority constituents will be monitored on a monthly basis. Starting in 2013, MPM for chlorpyrifos will occur during months of past exceedances. The Coalition plans to conduct MPM through 2014 to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority D Constituents

The only priority D constituent listed in the Deadman Creek @ Hwy 59 management plan is water column toxicity to *S. capricornutum*.

S. capricornutum toxicity

Toxicity to *S. capricornutum* occurred in this site subwatershed twice, during 2008 (January and April), the April toxicity was persistent in the May resample. During the January 2008 storm event, relatively high concentrations of diuron (6.2 µg/L) and simazine (25 µg/L) were detected well above their respective WQTLs (Table XIV-5). The TIE indicated nonpolar organics were the cause of toxicity. A TIE was unable to be conducted on the April sample and none of the herbicides analyzed resulted in concentrations of concern. Improved management of irrigation return flows and storm water runoff

should reduce the offsite movement of pesticides which should in turn eliminate *S. capricornutum* toxicity. The Coalition will continue with outreach as explained above to address the toxicity.

Priority E Constituents

The priority E constituents listed under the Deadman Creek @ Hwy 59 management plan are arsenic, DO and *E. coli*.

Although these constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and/or MPM. Dissolved oxygen is a field parameter that will be collected during every monitoring event, Assessment and MPM. Arsenic and *E. coli* will continue to be monitored through 2012 as a part of Assessment Monitoring. The priority E constituents are also discussed during individual contacts and at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Deadman Creek @ Hwy 59 is one of the four fourth priority site subwatersheds within the ESJWQC and is in its first year of focused outreach (2012-2014).

The Coalition will focus its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments, extending outreach to Coalition members, and setting evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Deadman Creek @ Hwy 59 subwatershed is to focus on providing information on a subwatershed level to growers to review their operation and determine if irrigation return flows and storm water runoff are managed properly. The Coalition targeted growers with crops located adjacent to the waterway and whose agricultural practices may result in the discharge or drift of pesticides into the waterway. Outreach includes grower notification, management practice outreach and education, tracking of management practice implementation, and providing information on special studies of management practice efficacy.

Targeted growers will complete their individual surveys documenting current management practices and planned future practices. The Coalition will then assess these results and plan the final stages of outreach including following up with growers to identify newly implemented practices and future monitoring to evaluate water quality improvement.

In 2012, Assessment Monitoring is scheduled for Deadman Creek @ Hwy 59 and all high priority constituents will be sampled monthly.

XV. HILMAR DRAIN @ CENTRAL AVE

Management Plan Constituents

Priority A/B

- Chlorpyrifos

Priority C

- Copper
- Diuron
- Nitrate / Nitrate + Nitrite

Priority D

- *Hyalella azteca* sediment toxicity
- *Selenastrum capricornutum* water column toxicity

Priority E

- Ammonia
- DO
- *E. coli*
- pH
- SC
- TDS

Description of Hilmar Drain @ Central Ave Site Subwatershed

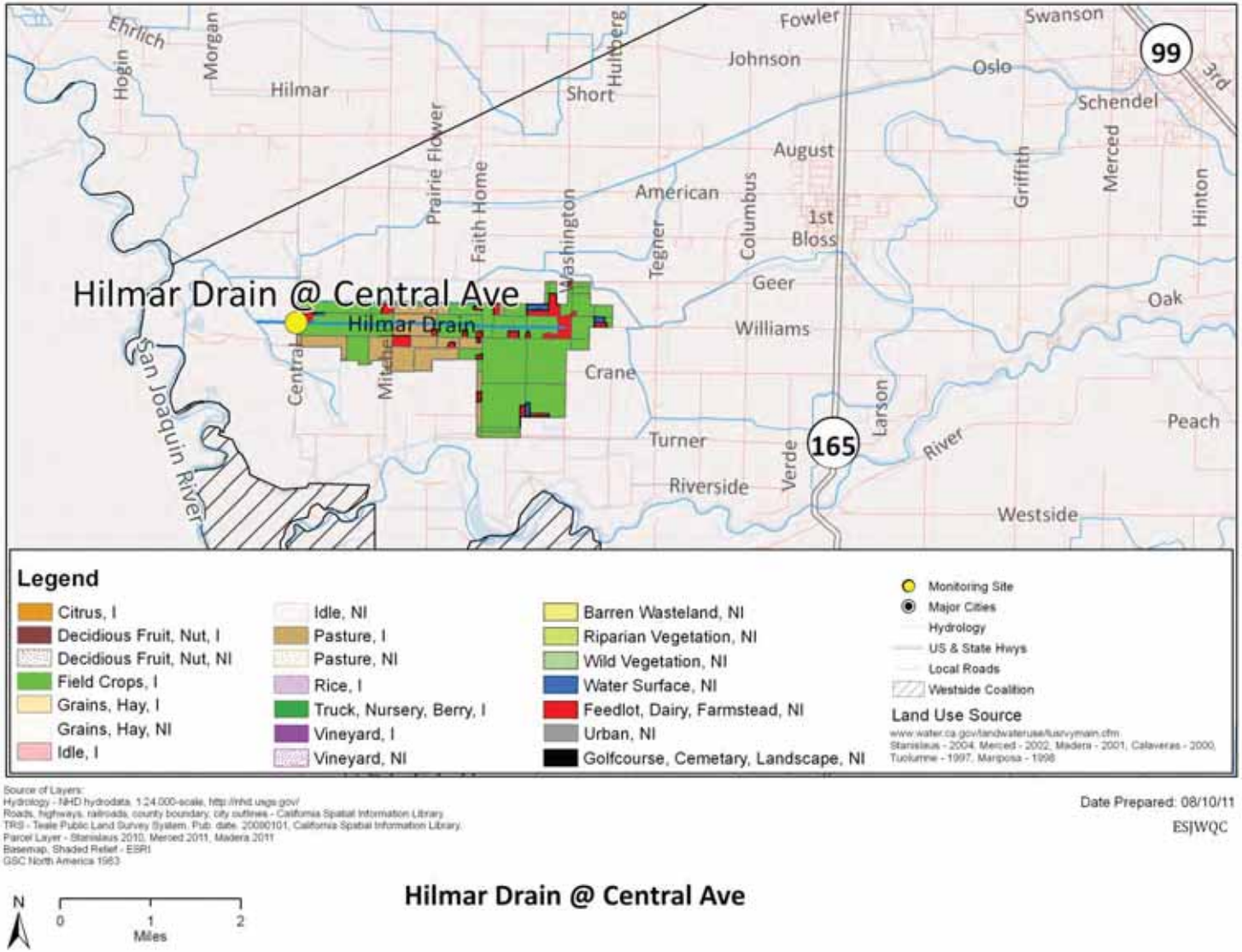
Hilmar Drain @ Central Ave (1,686 irrigated acres) –This site subwatershed is located toward the western edge of the Coalition region near the San Joaquin River (Table XV-1). Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Ave are upstream site locations within the subwatershed. Hilmar Drain originates at Williams Ave and Washington Road and eventually drains into the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture (Figure XV-1).

Table XV-1. Hilmar Drain site subwatershed sampling locations coordinates.

Site Name	Station Code	Target Latitude	Target Longitude
Hilmar Drain @ Central Ave*	535XHDACA	37.3906	-120.9582
Hilmar Drain @ Mitchell Rd[U]	535XHDAMR	37.3907	-120.9408
Reclamation Drain @ Williams Ave[U]	535XRDAWA	37.3907	-120.9409

[U]Upstream sites
*Original ESJWQC sampling site

Figure XV-1. Hilmar Drain @ Central Ave site subwatershed land use map.



Subwatershed Monitoring History

Monitoring at Hilmar Drain @ Central Ave began in the storm season of 2005 and continued through 2008 (Table XV-2). The site was also monitored in 2009, but for MPM only; all monitoring constituents per each year are listed in Table XV-3.

Management Plan Monitoring was initiated during the 2008 irrigation season. Additional MPM occurred for diuron (April and June) at Hilmar Drain @ Central Ave and the two upstream locations (Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Ave), were monitored for ammonia, nitrate, copper and *S. capricornutum* toxicity in July of 2008 (Table XV-4). Water column toxicity to *S. capricornutum* was monitored as part of MPM at Hilmar Drain @ Central Ave in 2009 (April and September).

Hilmar Drain @ Central Ave is an Assessment Monitoring location within the Prairie Flower Drain Zone (Zone 2) and Assessment Monitoring is scheduled for 2020 and 2021. Sampling at Hilmar Drain @ Central Ave did not occur during 2010 or 2011.

Hilmar Drain is not considered impaired on California's 2008-2010 303d List of Impaired Waterbodies; however, its downstream waterbody (San Joaquin River from Merced to Tuolumne) is listed for boron, chlorpyrifos, DDE, DDT, electrical conductance, group A pesticides, BHC, mercury, water temperature and unknown water column toxicity.

Table XV-2. Hilmar Drain @ Central Ave site subwatershed sampling events per season and year (including MPM).

Year	Season	Events Sampled	Events Not Sampled[1]	Total
2005	Storm	2	0	**2**
	Irrigation	5	0	**5**
2006	Storm	2	0	**2**
	Irrigation	5	0	**5**
2007	Storm	2	0	**2**
	Irrigation	6	0	**6**
2008	Storm	2	0	**2**
	Irrigation	8	0	**8**
	Fall	NA	NA	**NA**
2009	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	2	0	**2**
	Fall	NA	NA	**NA**
2010	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**
2011	Winter	NA	NA	**NA**
	Storm	NA	NA	**NA**
	Irrigation	NA	NA	**NA**
	Fall	NA	NA	**NA**

[1]If an event was not sampled during scheduled monitoring, the site was dry.
NA – Not applicable. This site was not scheduled for sampling during this season/year.

Table XV-3. Hilmar Drain @ Central Ave site subwatershed analyses per sampling season and year.

Only environmental samples with a sample replicate and lab replicate of one are listed.

Method	Analyte	2005		2006		2007		2008			2009	2010	2011
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter-Fall*
Field and Physical Parameters													
NA	Dissolved Oxygen	2	6	4	6	3	8	4	14				
NA	Specific Conductivity	2	6	4	6	3	8	4	14				
NA	pH	2	6	4	6	3	8	4	14				
EPA 110.2	Color	2	5	2	5	2	6	2	6				
EPA 160.1	Dissolved Solids	2	5	2	5	2	6	2	6				
EPA 160.2	Suspended Solids												
EPA 180.1	Turbidity	2	5	2	5	2	6	2	6				
EPA 415.1	Total Organic Carbon	2	5	2	5	2	6	2	6				
SM 9223	*E. coli*	2	5	2	5	2	6	2	6				
EPA 405.1	BOD				1	2	2						
Carbamates													
EPA 8321A	Aldicarb				5	2	6	2	6				
EPA 8321A	Carbaryl				5	2	6	2	6				
EPA 8321A	Carbofuran				5	2	6	2	6				
EPA 8321A	Diuron				5	2	6	2	8				
EPA 8321A	Linuron				5	2	6	2	6				
EPA 8321A	Methiocarb				5	2	6	2	6				
EPA 8321A	Methomyl				5	2	6	2	6				
EPA 8321A	Oxamyl				5	2	6	2	6				
Organochlorines													
EPA 8081A	DDD(p,p')				5	2	6	2	6				
EPA 8081A	DDE(p,p')				5	2	6	2	6				
EPA 8081A	DDT(p,p')				5	2	6	2	6				
EPA 8081A	Dicofol				5	2	6	2	6				
EPA 8081A	Dieldrin				5	2	6	2	6				
EPA 8081A	Endrin				5	2	6	2	6				
EPA 8081A	Methoxychlor				5	2	6	2	6				
Organophosphates													
EPA 8141A	Azinphos methyl				5	2	6	2	6				
EPA 8141A	Chlorpyrifos	2	5	2	5	2	6	2	6				
EPA 8141A	Demeton-s												
EPA 8141A	Diazinon	2	5	2	5	2	6	2	6				
EPA 8141A	Dichlorvos												
EPA 8141A	Dimethoate				5	2	6	2	6				
EPA 8141A	Disulfoton				5	2	6	2	6				
EPA 8141A	Malathion				5	2	6	2	6				
EPA 8321A	Methamidophos				5	2	6	2	6				
EPA 8141A	Methidathion				5	2	6	2	6				
EPA 8141A	Molinate				5	2	6	2	6				
EPA 8141A	Parathion, Methyl				5	2	6	2	6				
EPA 8141A	Phorate				5	2	6	2	6				

Method	Analyte	2005		2006		2007		2008			2009	2010	2011
		Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Fall*	Winter-Fall*	Winter-Fall*	Winter-Fall*
EPA 8141A	Phosmet				5	2	6	2	6				
EPA 8141A	Thiobencarb				5	2	6	2	6				
Pyrethroids													
EPA 8081A	Bifenthrin		1	2	5	2	6	2	6				
EPA 8081A	Cyfluthrin, total		1	2	5	2	6	2	6				
EPA 8081A	Cyhalothrin, lambda, total	2	5	2	5	2	6	2	6				
EPA 8081A	Cypermethrin, total	2	5	2	5	2	6	2	6				
EPA 8081A	Esfenvalerate/ Fenvalerate, total	2	5	2	5	2	6	2	6				
EPA 8081A	Permethrin, total	2	5	2	5	2	6	2	6				
Triazines													
EPA 547M	Glyphosate				5	2	6	2	6				
EPA 549.2M	Paraquat dichloride				5	2	6	2	6				
EPA 619	Atrazine				5	2	6	2	6				
EPA 619	Cyanazine				5	2	6	2	6				
EPA 619	Simazine				5	2	6	2	6				
Metals (Total)													
EPA 200.8	Arsenic				5	2	6	2	6				
EPA 200.8	Boron				5	2	6	2	6				
EPA 200.8	Cadmium				5	2	6	2	7				
EPA 200.8	Copper				5	2	6	2	6				
EPA 200.8	Lead				5	2	6	2	6				
EPA 200.8	Molybdenum												
EPA 200.8	Nickel				5	2	6	2	6				
EPA 200.8	Selenium				5	2	2	2	6				
EPA 200.8	Zinc				5	2	6	2	6				
Nutrients													
SM 2340 C	Hardness as CaCO3				5	2	6	2	7				
EPA 300.0	Nitrate as N				5	2	6	2	7				
EPA 350.2	Ammonia as N				5	2	6	2	7				
EPA 351.3	Nitrogen, Total Kjeldahl				5	2	6	2	6				
EPA 354.1	Nitrite as N				5	2	6	2	6				
EPA 353.2	Nitrate + Nitrite as N												
EPA 365.2	OrthoPhosphate as P				5	2	6	2	6				
EPA 365.2	Phosphate as P				5	2	6	2	6				
Toxicity													
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	6	3	5	2	6	2	6				
EPA 821/R-02-012	*Pimephales promelas*	2	5	2	5	2	6	2	6				
EPA 821/R-02-013	*Selenastrum capricornutum*	2	5	2	6	2	7	2	11				
EPA 600/R-99-064	*Hyalella azteca*		5	1	1	1	1		2				

*Site not sampled during the 2008 fall season, and 2009, 2010, and 2011 sampling years.

Table XV-4. Hilmar Drain site subwatershed Management Plan Monitoring schedule (2008-2009).
Upstream locations included.

Site Name	Sample Date	Monitoring Type	Diuron	Ammonia	Nitrate	Copper	*S. capricornutum*
Hilmar Drain @ Central Ave	29-Apr-08	A	X				
Hilmar Drain @ Central Ave	3-Jun-08	A	X				
Hilmar Drain @ Mitchell Rd	22-Jul-08	U		X	X	X	X
Reclamation Drain @ Williams Ave	22-Jul-08	U		X	X	X	X
Hilmar Drain @ Central Ave	21-Apr-09	MPM					X
Hilmar Drain @ Central Ave	22-Sep-09	MPM					X

A – Additional sampling
U – Upstream sampling
X – Constituent sampled for Management Plan Monitoring (MPM)

Exceedance History

Samples collected from the Hilmar Drain subwatershed from 2005 through 2011 exceeded the WQTLs for field parameters, *E. coli*, pesticides, and metals (Table XV-5). Water column and sediment toxicity also occurred. Constituents that exceeded their respective WQTLs in this subwatershed (including upstream sites) are DO (8), pH (3), SC (40), TDS (26), *E. coli* (20), ammonia (2), nitrate (13), chlorpyrifos (1), diuron (3), DDD (1), DDE (1), and copper (2). *C. dubia* toxicity (1), *S. capricornutum* toxicity (9), which resulted in three instances of persistent toxicity in resamples, and *H. azteca* sediment toxicity (3), which resulted in one instance of persistent toxicity in a resample, have also occurred (Table XV-5).

Exceedances are based on WQTLs listed in the introduction to the ESJWQC Management Plan. The highest priority constituents in the Hilmar Drain @ Central Ave subwatershed are chlorpyrifos (A/B), copper (C), diuron (C), nitrate (C), *S. capricornutum* toxicity (D), and *H. azteca* (D).

Table XV-5. Hilmar Drain site subwatershed exceedances (2005-2009).

The WQTL used to evaluate the data are listed in the header after the analyte. Upstream site is italicized.

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	*E. coli*, >235 MPN/100 mL	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.0.15 µg/L	DDD (p,p'), >0.00083 µg/L	DDE (p,p'), >0.00059 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Hilmar Drain @ Central Ave	Storm	2/15/2005			1102	740			240								
Hilmar Drain @ Central Ave	Storm	3/22/2005			1157	760			900								
Hilmar Drain @ Central Ave	Irrigation	5/11/2005			1354	740			1600						74		
Hilmar Drain @ Central Ave	Irrigation	5/19/2005			1214												
Hilmar Drain @ Central Ave	Irrigation	6/15/2005			855	720			500								
Hilmar Drain @ Central Ave	Irrigation	7/13/2005	6.45		826	600			1600								
Hilmar Drain @ Central Ave	Irrigation	8/16/2005			788	500			1600								
Hilmar Drain @ Central Ave	Irrigation	9/21/2005				690			430								32
Hilmar Drain @ Central Ave	Storm	3/1/2006		9.55	1058	670											
Hilmar Drain @ Central Ave	Storm	3/16/2006			1215	710											
Hilmar Drain @ Central Ave	Storm	3/24/2006			1400												
Hilmar Drain @ Central Ave	Storm	5/2/2006		8.58	794												
Hilmar Drain @ Central Ave	Irrigation	5/18/2006	6.28						2400								
Hilmar Drain @ Central Ave	Irrigation	6/15/2006	6.80					12									
Hilmar Drain @ Central Ave	Irrigation	7/13/2006			1096	610	3.8	11	2400	31 (19)	0.016					36	
Hilmar Drain @ Central Ave	Irrigation	8/10/2006						13	1000			0.003					
Hilmar Drain @ Central Ave	Irrigation	9/14/2006			773	510		20									

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	*E. coli*, >235 MPN/100 mL	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.0.15 µg/L	DDD (p,p'), >0.00083 µg/L	DDE (p,p'), >0.00059 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Hilmar Drain @ Central Ave	Storm	2/11/2007					13		2400	84 (10.1)							
Hilmar Drain @ Central Ave	Storm	3/1/2007			1396	790											
Hilmar Drain @ Central Ave	Storm	3/7/2007		8.79	1633												
Hilmar Drain @ Central Ave	Irrigation	4/17/2007			1106	700			1100					3.3		69	
Hilmar Drain @ Central Ave	Irrigation	5/15/2007			1030	640		22	440								
Hilmar Drain @ Central Ave	Irrigation	6/19/2007			869	600		21	1700					6.6			
Hilmar Drain @ Central Ave	Irrigation	7/17/2007			717	460		15	340								
Hilmar Drain @ Central Ave	Irrigation	8/21/2007			793	520		18									
Hilmar Drain @ Central Ave	Irrigation	9/11/2007			703	460		18	2400								
Hilmar Drain @ Central Ave	Storm	1/24/2008			1528	970											
Hilmar Drain @ Central Ave	Storm	2/26/2008			1476	910											
Hilmar Drain @ Central Ave	Sediment	3/4/2008			1429												91
Hilmar Drain @ Central Ave	Sediment	3/28/2008	6.30		1111												
Hilmar Drain @ Central Ave	Irrigation	4/22/2008			1482	960			390							45	
Hilmar Drain @ Central Ave	Irrigation	4/29/2008												3.43		59	
Hilmar Drain @ Central Ave	Irrigation	4/29/2008	4.48		809											59	
Hilmar Drain @ Central Ave	Irrigation	5/20/2008			963	680		20	440								
Hilmar Drain @ Central Ave	Irrigation	6/17/2008			1060	650			1000								
Hilmar Drain @ Central Ave	Irrigation	7/22/2008			1074	710		21	270								

Site Name	Season	Sample Date	Oxygen, Dissolved, <7 mg/L	pH, <6.5 and > 8.5 units	Specific Conductivity, >700 µS/cm	Total Dissolved Solids, >450 mg/L	Ammonia[1], >1.5 mg/L	Nitrate as N, >10 mg/L	*E. coli*, >235 MPN/100 mL	Copper, Total[2], > 1,300 µg/L	Chlorpyrifos, >0.0.15 µg/L	DDD (p,p'), >0.00083 µg/L	DDE (p,p'), >0.00059 µg/L	Diuron, >2 µg/L	*C. dubia*, (% Control)	*S. capricornutum*, (% Control)	*H. azteca*, (% Control)
Hilmar Drain @ Central Ave	Irrigation	8/19/2008			1590	1000							0.0056				
Hilmar Drain @ Mitchell Rd	Irrigation	7/22/2008	6.93		995			28								70	
Reclamation Drain @ Williams Rd	Irrigation	7/22/08			1558												
Hilmar Drain @ Mitchell Rd	Irrigation	7/29/2008	1.81		770											22	
Hilmar Drain @ Central Ave	Sediment	8/28/2008	6.32		1172												0
Hilmar Drain @ Central Ave	Irrigation	9/23/2008			943	640		26								73	
Hilmar Drain @ Central Ave	Irrigation	9/30/2008			733											75	
Hilmar Drain @ Central Ave	Sediment	10/2/2008			1241												0
Hilmar Drain @ Central Ave	Irrigation	4/21/2009			904												
Hilmar Drain @ Central Ave	Irrigation	9/22/2009			934												
		Constituent Priority	**E**	**E**	**E**	**E**	**E**	**C**	**E**	**C**	**A/B**	**NP**	**NP**	**C**	**NP**	**D**	**D**

[1]Ammonia WQTL variable based on pH and temperature.
[2]Total metal WQTL variable based on hardness.
NP – Not Prioritized; less than two exceedances within three consecutive monitoring years and currently no TMDL.

2007-2011 Management Plan Monitoring Results

All monitoring results for high priority management plan constituents in the Hilmar Drain @ Central Ave subwatershed are listed in Table XV-6. These constituents include chlorpyrifos, copper, diuron, nitrate (including ammonia), *S. capricornutum* toxicity, and *H. azteca* toxicity.

Chlorpyrifos exceeded the WQTL in Hilmar Drain once during July 2006. Since the chlorpyrifos and diazinon TMDL for the Lower San Joaquin River was not approved until October of 2007, chlorpyrifos was not listed on the Hilmar Drain management plan until 2008. Normal Monitoring during 2008 did not result in any chlorpyrifos exceedances (Table XV-6). In 2009, MPM was not scheduled at the site.

Copper exceeded the WQTL twice in the Hilmar Drain subwatershed, during 2006 (July) and 2007 (February); therefore, the constituent was listed on the Hilmar Drain management plan in 2008. The July 2006 copper exceedance coincided with toxicity to *S. capricornutum*. Normal Monitoring occurred for copper during 2008 and upstream MPM also occurred during July 2008 at Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Rd. There were no exceedances of copper during 2008. Copper has not been monitored since 2008 in the Hilmar Drain subwatershed, but MPM for *S. capricornutum* toxicity occurred during 2009 and no toxicity occurred (Table XV-6).

Diuron exceeded the WQTL twice during 2007 monitoring (April and June), one of which coincided with *S. capricornutum* toxicity, and additional MPM occurred for the constituent during 2008 (April and June). Diuron exceeded the WQTL once in 2008 during April additional MPM, which occurred the week after April Normal Monitoring, during which time diuron was detected. Toxicity to *S. capricornutum* occurred during April 2008 Normal Monitoring and was persistent in the resample collected a week later; the toxic algae samples coincided with the April diuron exceedance (Tables XV-5 and XV-6). Monitoring for diuron has not occurred within the subwatershed since but MPM in 2009 resulted in no toxicity to *S. capricornutum*.

During 2006, nitrate first exceeded the WQTL (August and September) as well as ammonia (July). In 2007, MPM did not occur at Hilmar Drain, but five exceedances of nitrate (May-September) and the second exceedance of ammonia (February) occurred during Normal Monitoring. Upstream MPM occurred for nitrate and ammonia at Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Rd during July 2008, and nitrate exceeded the WQTL only at the Mitchell Rd site. Nitrate exceedances also occurred during Normal Monitoring at the Hilmar Drain @ Central Ave in 2008 (May, July, and September, Table XV-6). Nitrate and ammonia have not been monitored in the subwatershed since 2008.

The second *S. capricornutum* toxicity in Hilmar Drain occurred during April 2007, and the constituent was listed on the management plan as of 2008. Upstream MPM in July 2008 at Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Rd sites resulted in toxicity at the Mitchell Rd site only (Table XV-6). Toxicity to *S. capricornutum* also occurred during Normal Monitoring in 2008 (April and September).

Toxicity to *S. capricornutum* was the only constituent for which MPM occurred in 2009 (April and September); toxic samples did not occur during either monitoring event. Toxicity to *S. capricornutum* in the Hilmar Drain subwatershed was associated with exceedances of copper 2006 (July) and diuron in 2007 and 2008 (April).

Sediment toxicity to *H. azteca* first occurred in September 2005 and occurred again during Normal Monitoring in both 2008 (March and August) samples. Sediment toxicity was listed in the 2009 management plan for Hilmar Drain, but no MPM has occurred for the constituent.

Management Plan Monitoring will occur for all management plan constituents during months of historical exceedances during 2012.

Table XV-6. Hilmar Drain site subwatershed monitoring results for high priority constituents.

Exceedance values are in bold. Resampling (RS) due to toxicity not included in table.

	Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		Sep
2007 NM (@ Central Ave)	Date	NA	02/11/07	03/01/07	04/17/07	05/15/07	06/19/07	07/17/07	08/21/07		09/11/07
	Nitrate as N (mg/L)	NA	2.9	8.5	8.2	**22**	**21**	**15**	**18**		**18**
2008 NM (@ Central Ave)	Date	1/24/08	2/26/08	3/4/08	4/22/08	5/20/08	6/17/08	7/22/08	8/19/08	8/28/08	9/23/08
	Ammonia as N (mg/L)	0.96	0.14	NA	0.12	0.16	0.23	<0.05	<0.05		<0.05
	Nitrate as N (mg/L)	9.3	5.9	NA	6.7	**20**	6.9	**21**	7.1		**26**
	Copper, total (µg/L)	9.4	4.4	NA	4.6	4.8	6.6	5.9	4.4		5.7
	Chlorpyrifos (µg/L)	<0.003	<0.003	NA	<0.003	<0.003	<0.003	<0.003	<0.003		<0.003
	Diuron (µg/L)	0.52	<0.2	NA	0.23	<0.2	<0.2	<0.2	<0.2		<0.2
	S. capricornutum toxicity (% Control)	173	111	NA	**45**	178	242	105	159		**73**
2008 MPM A (@ Central Ave)	Date	NA	NA	NA	4/29/08	NA	6/3/08	7/22/08	NA		9/30/08
	Diuron (µg/L)	NA	NA	NA	**3.4**	NA	<0.2	NA	NA		NA
2008 MPM US (@ Mitchell Rd)	Date	NA	NA	NA	NA	NA	NA	7/22/08	NA		NA
	Ammonia as N (mg/L)	NA	NA	NA	NA	NA	NA	<0.05	NA		NA
	Nitrate as N (mg/L)	NA	NA	NA	NA	NA	NA	**28**	NA		NA
	Copper, total (µg/L)	NA	NA	NA	NA	NA	NA	5.5	NA		NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	NA	NA	NA	**70**	NA		NA
2008 MPM US (Reclamation Drain @ Williams Ave)	Date	NA	NA	NA	NA	NA	NA	7/22/08	NA		NA
	Ammonia as N (mg/L)	NA	NA	NA	NA	NA	NA	0.2	NA		NA
	Nitrate as N (mg/L)	NA	NA	NA	NA	NA	NA	2.6	NA		NA
	Copper, total (µg/L)	NA	NA	NA	NA	NA	NA	10	NA		NA
	S. capricornutum toxicity (% Control)	NA	NA	NA	NA	NA	NA	108	NA		NA
2009 MPM (@ Central Ave)	Date	NA	NA	NA	4/21/09	NA	NA	NA	NA		9/22/09
	S. capricornutum toxicity (% Control)	NA	NA	NA	316	NA	NA	NA	NA		221

A – Additional MPM conducted in 2008 only.
MPM – Management Plan Monitoring (see Table 4 for MPM schedule)
NA – Not applicable. No monitoring occurred on this date for this constituent.
NM – Normal Monitoring
US – Upstream MPM conducted in 2008 only.

Load Calculations

Loads have been calculated for all chlorpyrifos, copper, diuron and nitrate + nitrite detections in the site subwatershed based on the following formula (Table XV-7):

Load = Discharge (cfs) X 28.317L/ft^3 X Concentration (mg/L X 1000 or µg/L).

The load values for constituents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide a normalization of the concentrations by flow for various constituents at the time the samples were collected.

Table XV-7. Hilmar Drain @ Central Ave site subwatershed instantaneous load calculations for chlorpyrifos, copper, diuron, and nitrate + nitrite.

Sorted by analyte and date. Upstream sites are italicized.

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Hilmar Drain @ Central Ave	Chlorpyrifos	07/13/06	0.73	0.016	0.33
Hilmar Drain @ Central Ave	Chlorpyrifos	07/17/07	3.54	0.015	1.50
Hilmar Drain @ Central Ave	Copper	05/18/06	1.22	5.8	200.37
Hilmar Drain @ Central Ave	Copper	06/15/06	31.75	4.4	3955.88
Hilmar Drain @ Central Ave	Copper	07/13/06	0.73	31	640.81
Hilmar Drain @ Central Ave	Copper	08/10/06	25.87	4.1	3003.50
Hilmar Drain @ Central Ave	Copper	09/14/06	14.18	6.8	2730.44
Hilmar Drain @ Central Ave	Copper	02/11/07	22.5	84	53519.13
Hilmar Drain @ Central Ave	Copper	03/01/07	0	7.2	0
Hilmar Drain @ Central Ave	Copper	04/17/07	1.33	8.5	320.12
Hilmar Drain @ Central Ave	Copper	05/15/07	3.98	5.5	619.86
Hilmar Drain @ Central Ave*	Copper	06/19/07	5.27	13	1940.00
Hilmar Drain @ Central Ave	Copper	06/19/07	5.27	11	1641.54
Hilmar Drain @ Central Ave	Copper	07/17/07	3.54	9.1	912.20
Hilmar Drain @ Central Ave	Copper	08/21/07	8.34	5	1180.82
Hilmar Drain @ Central Ave	Copper	09/11/07	13.12	4.4	1634.68
Hilmar Drain @ Central Ave	Copper	01/24/08	0.38	9.4	101.15
Hilmar Drain @ Central Ave	Copper	02/26/08	0.13	4.4	16.20
Hilmar Drain @ Central Ave	Copper	04/22/08	2.11	4.6	274.84
Hilmar Drain @ Central Ave	Copper	05/20/08	3.44	4.8	467.57
Hilmar Drain @ Central Ave	Copper	06/17/08	1.21	6.6	226.14
Hilmar Drain @ Central Ave	Copper	07/22/08	4.48	5.9	748.47
Hilmar Drain @ Mitchell Rd	*Copper*	*07/22/08*	*2.98*	*5.5*	*464.12*
Reclamation Drain @ Williams Ave	*Copper*	*07/22/08*	*0.45*	*10*	*127.43*
Hilmar Drain @ Central Ave	Copper	08/19/08	2.03	4.4	252.93
Hilmar Drain @ Central Ave*	Copper	09/23/08	12.47	6.1	2153.99
Hilmar Drain @ Central Ave	Copper	09/23/08	12.47	5.7	2012.74
Hilmar Drain @ Central Ave	Diuron	04/17/07	1.33	3.3	124.28
Hilmar Drain @ Central Ave*	Diuron	06/19/07	5.27	3.2	477.54
Hilmar Drain @ Central Ave	Diuron	06/19/07	5.27	6.6	984.92
Hilmar Drain @ Central Ave	Diuron	01/24/08	0.38	0.52	5.60

Site Name	Analyte Name	Sample Date	Discharge cfs	Concentration µg/L	Loading Rate µg/sec
Hilmar Drain @ Central Ave	Diuron	04/22/08	2.11	0.23	13.74
Hilmar Drain @ Central Ave	Diuron	04/29/08	0.29	3.4	27.92

*Field duplicate

Source Identification and Outreach

The Coalition evaluates past monitoring results and associated PUR data to develop a source identification and outreach strategy. During 2008 and 2009, the Coalition conducted MPM during the months when exceedances historically occurred to better characterize water quality in the subwatershed. The Coalition also monitored high priority constituents at two upstream locations (Hilmar Drain @ Mitchell Rd and Reclamation Drain @ Williams Ave) during 2008 to attempt to partition constituent loads to specific parcels within the subwatershed. The Coalition also reviews PUR data to determine the most frequent crop type and timing associated with pesticide applications. From these actions, the Coalition derived an outreach strategy, which is detailed in the following sections.

The Hilmar Drain @ Central Ave subwatershed is a high priority subwatershed as of 2012 and will remain so through 2014. The Coalition will actively engage in grower outreach and education to address the Hilmar Drain management plan's highest priority constituents. The Coalition organized grower meetings and mailings to educate growers about management practices and their importance in achieving acceptable water quality. Individual grower meetings with targeted members are planned to inform growers about management practices as well as to assess current and expected future implementation of additional management practices.

Priority A/B Constituents

Chlorpyrifos is the only A/B constituent for the Hilmar Drain subwatershed.

Chlorpyrifos

The WQTL for chlorpyrifos (0.015 µg/L) was exceeded once in the Hilmar Drain subwatershed during July 2006. A detection of chlorpyrifos (0.015 µg/L) during July 2007 monitoring also occurred. Neither was associated with *C. dubia* toxicity.

To determine an outreach strategy, the Coalition reviewed PUR data for the number of monthly chlorpyrifos applications, pounds of active ingredient applied, and acres treated (Table XV-8 and Figure XV-2). Chlorpyrifos is applied in mid to late summer in the Hilmar Drain to alfalfa and corn as well as almond orchards (Table XV-9). However, after August 2005, there were no chlorpyrifos applications prior to the July 2006 exceedance. Historically, chlorpyrifos use in the subwatershed is low (48 lbs AI in 2007), but use increased in recent years as 467 lbs AI were applied in 2011, 386 lbs AI of which were applied in July alone (complete PUR data only available through October 2011).

Table XV-8. Hilmar Drain @ Central Ave site subwatershed chlorpyrifos applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Chlorpyrifos Applications	Pounds of AI Applied	Acres Treated
January, 2005	1	3.0	9.0
March, 2005	3	59.6	133.0
July, 2005	4	233.4	260.0
August, 2005	1	3.0	4.0
August, 2006	1	21.5	43.0
July, 2007	2	48.3	60.0
March, 2008	3	50.8	108.0
July, 2008	6	155.5	240.0
August, 2008	1	21.5	43.0
July, 2009	1	30.0	60.0
April, 2010	1	34.4	17.0
June, 2010	1	10.2	20.0
July, 2010	2	19.5	38.0
July, 2011	7	386.8	409.0
August, 2011	2	80.1	94.0
Summaries by Year			
2005 Total	9	299.0	406.0
2006 Total	1	21.5	43.0
2007 Total	2	48.3	60.0
2008 Total	10	227.9	391.0
2009 Total	1	30.0	60.0
2010 Total	4	64.1	75.0
2011 Total	9	467.0	503.0
Total	**36**	**1157.8**	**1538.0**

Figure XV-2. Hilmar Drain @ Central Ave site subwatershed lbs chlorpyrifos applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

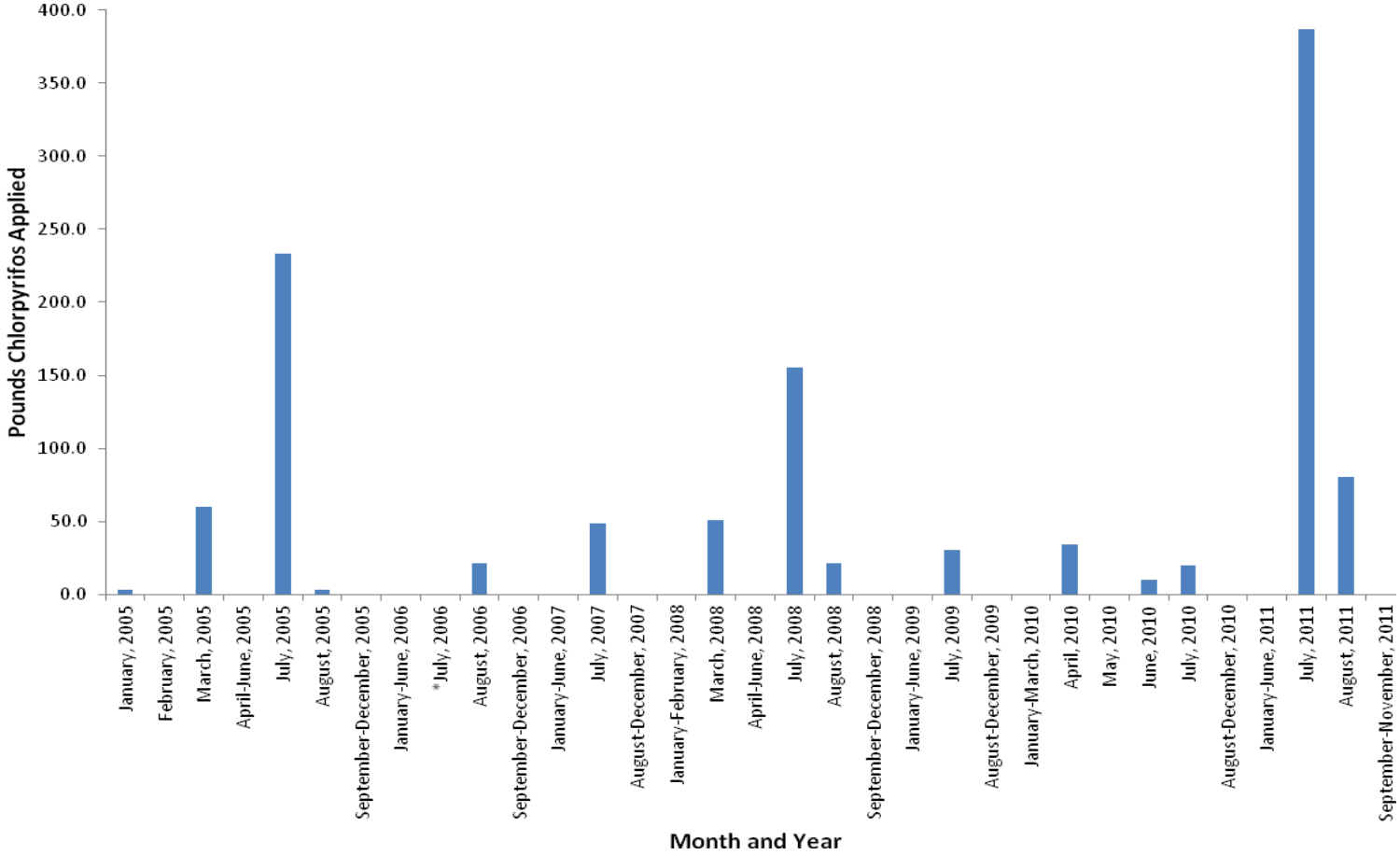


Table XV-9. Hilmar Drain @ Central Ave site subwatershed chlorpyrifos PUR data (2005-2011).
PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
CHLORPYRIFOS	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	LOCK-ON INSECTICIDE	154.7
		NUFOS 4E	110.4
	ALMOND	LORSBAN 4E-HF	6.0
	CORN (FORAGE - FODDER)	LORSBAN ADVANCED	318.3
		NUFOS 4E	402.6
		WARHAWK	131.3
	SWEET POTATO	LORSBAN 15G GRANULAR INSECTICIDE	34.4

ALFALFA - Total Pounds Chlorpyrifos Applied	**265.1**
ALMOND - Total Pounds Chlorpyrifos Applied	**6.0**
CORN - Total Pounds Chlorpyrifos Applied	**852.2**
SWEET POTATO - Total Pounds Chlorpyrifos Applied	**34.4**
Total Pounds Chlorpyrifos Applied (2005-2011)	**1157.8**

Given the increased use of chlorpyrifos in recent years, proper management of irrigation tailwater and also storm water runoff are more necessary than ever. The Coalition will focus outreach efforts to growers applying chlorpyrifos during the irrigation season to row crops and orchards; spray drift management will also be discussed. Relatively, few growers apply chlorpyrifos, and the Coalition's strategy will be to focus on growers with the potential to drain (including spray drift) to Hilmar Drain.

Since 2007, Coalition outreach included grower meetings and the mailing/distribution of information to all members in the subwatershed. While the subwatershed is a high priority, outreach will be targeted to specific growers farming parcels adjacent to the waterway and applying or have applied chlorpyrifos. From these criteria, the Coalition compiled a list of targeted growers.

The Coalition began scheduling individual contact meetings with targeted growers. Although meetings are focused mainly on chlorpyrifos exceedances, all water quality results are reviewed and discussed including exceedances of DO, *E. coli*, SC, TDS, pH, copper, diuron, ammonia, nitrate, *S. capricornutum* and *H. azteca* toxicity. The Coalition encourages the implementation of practices to improve management of irrigation and storm water runoff as well as to reduce spray drift. The Coalition plans to contact three targeted growers accounting for 1,230 acres of direct drainage within the subwatershed.

Management Plan Monitoring is scheduled to occur during months of past exceedances for 2012 through 2014 in the Hilmar Drain subwatershed. These data will allow the Coalition to evaluate improvements in water quality as recommended management practice implementation occurs.

Priority C Constituents

Copper and diuron are listed as priority C constituents for the Hilmar Drain management plan.

Copper

Copper exceeded the WQTL twice in the subwatershed (July 2006 and February 2007). The July 2006 exceedance coincided with toxicity to *S. capricornutum*. However, Normal Monitoring and MPM during 2008 did not result in any additional copper exceedances, despite the occurrence of *S. capricornutum* toxicity.

The Coalition reviews PUR data for the number of applications of copper, amount of active ingredient applied (pounds applied), and acres treated within the Hilmar Drain subwatershed (Table XV-10, Figure XV-3). Copper use peaked in 2006 (734 lbs AI) and has since declined (355 lbs AI in 2011; complete PUR data only available through October 2011). Relatively few copper applications occur in the subwatershed, but the ratio of lbs AI applied to acres is relatively high. Prior to the July 2006 exceedance, the most recent application of copper was in April 2005. However, the exceedance in February 2007 coincided with heavy applications in January and February 2007 (months which accounted for the bulk of applications in 2007). Copper is primarily applied in the dormant season (November-February) and start of the irrigation season (March) in this subwatershed (Table XV-11). Almonds orchards are the only crop with copper applications in the Hilmar Drain subwatershed.

Table XV-10. Hilmar Drain @ Central Ave site subwatershed copper applications, lbs AI applied, and acres treated by month (2005-2011).

PUR data available through October 2011 for Merced County. If month is not included in table, no applications were made.

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
January, 2005	2	442.0	64.0
February, 2005	3	104.0	95.0
January, 2006	2	508.2	70.0
February, 2006	3	99.9	79.0
March, 2006	3	87.8	114.0
April, 2006	1	38.5	50.0
January, 2007	2	420.8	70.0
February, 2007	2	76.1	64.0
March, 2007	1	8.6	14.0
February, 2008	1	12.1	15.0
March, 2008	1	4.0	10.0
February, 2009	2	92.4	60.0
February, 2010	4	188.2	95.0
March, 2010	2	47.0	61.0
January, 2011	2	132.2	25.5
February, 2011	4	156.2	109.0
March, 2011	3	66.1	84.0
Summaries by Year			
2005 Total	5	545.9	159.0
2006 Total	9	734.4	313.0
2007 Total	5	505.4	148.0
2008 Total	2	16.1	25.0
2009 Total	2	92.4	60.0
2010 Total	6	235.2	156.0

Month/Year	Number of Copper Applications	Pounds of AI Applied	Acres Treated
2011 Total	9	354.6	218.5
Total	**38**	**2484.0**	**1079.5**

Figure XV-3. Hilmar Drain @ Central Ave site subwatershed lbs copper applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. PUR data available through October 2011 for Merced County.

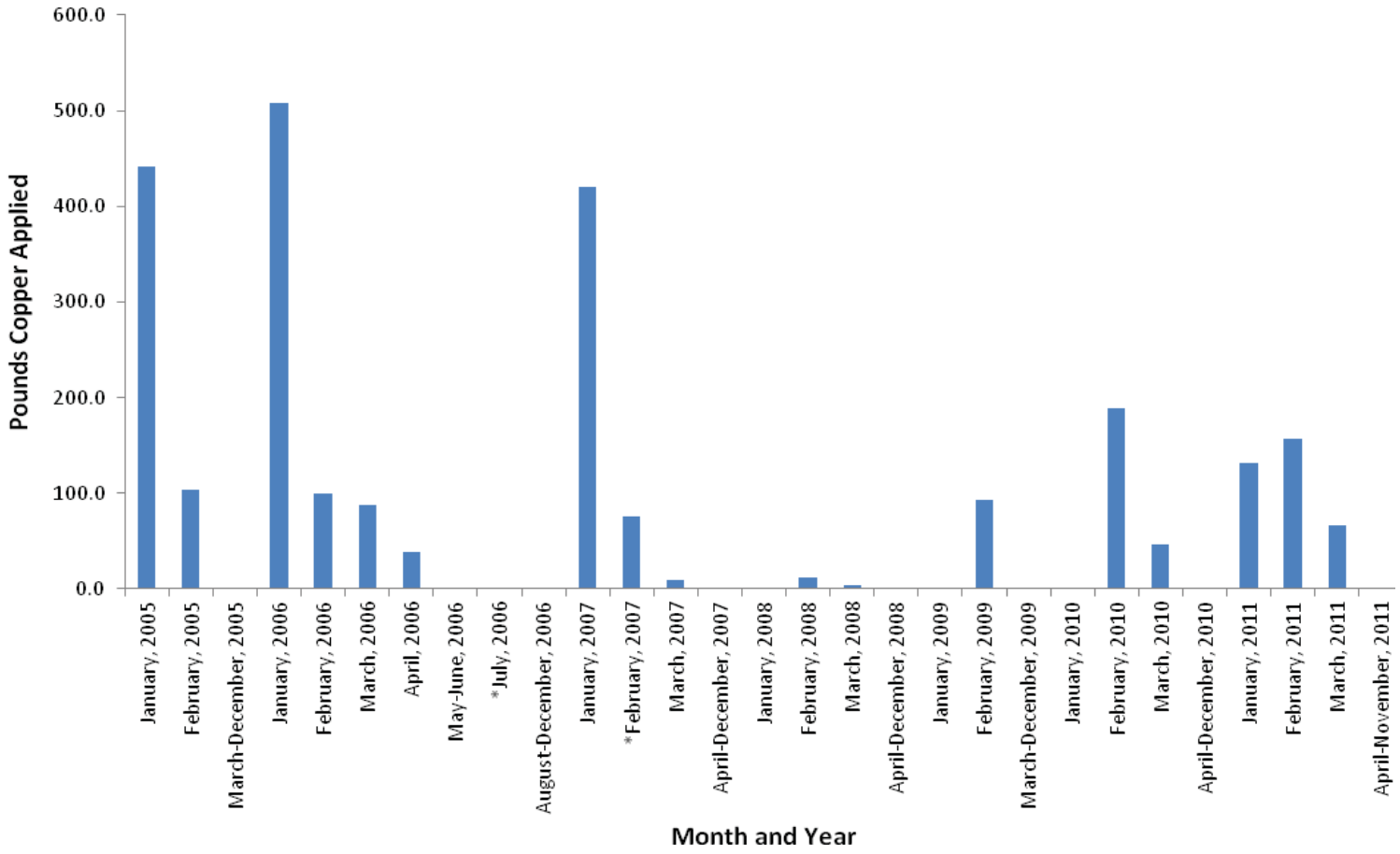


Table XV-11. Hilmar Drain @ Central Ave site subwatershed copper PUR data (2005-2011).
PUR data available through October 2011 for Merced County.

Chemical Name	Commodity	Product Name	Lbs AI Applied
COPPER	ALMOND	CHAMPION WETTABLE POWDER	423.5
		CUPROFIX ULTRA 40 DISPERSS	246.0
		DUPONT KOCIDE 2000 FUNGICIDE/BACTERICIDE	16.1
		KOCIDE 101	692.2
		KOCIDE DF	377.0
		NORDOX 75 WG	107.7
		NU-COP 50 WP	69.3
		NU-COP 50DF	552.1
		ALMOND - Total Pounds Copper Applied	**2484.0**
		Total Pounds Copper Applied (2005-2011)	**2484.0**

It appears that only a few growers within the Hilmar Drain subwatershed are responsible for the offsite movement of copper to the waterway. The Coalition noted in the 2008 Management Plan that a single TRS was most likely the source of both copper exceedances (page 359, Table XVI-6). In addition, as discussed above, copper is heavily used in the subwatershed but has few applications, indicating that only a few growers may be contributing to the exceedances of copper. The Coalition also noted in the 2008 Management Plan that although copper is applied to agriculture in the winter and spring months, it is also applied heavily by dairy operations which will not receive outreach from the Coalition. The Coalition is targeting growers with potential to drain who applied copper and encourages them to review their operations to improve irrigation and storm water management and eliminate spray drift. This is consistent with the strategy to address priority A/B constituent exceedances.

Diuron

Diuron exceeded the WQTL three times in the subwatershed, in 2007 (April and June) and 2008 (April). Both April exceedances coincided with toxicity to *S. capricornutum*.

The Coalition reviewed PUR data for the number of applications of diuron, amount of active ingredient applied (pounds applied), and acres treated (Tables XV-12 and XV-13, Figure XV-4). Diuron use on alfalfa and corn in the Hilmar Drain subwatershed has tapered off since 2007 (321 lbs AI), and there were only a few, if any, applications per year in 2008 through 2011 (complete PUR data only available through October 2011). The exceedances occurred several weeks after previous applications, indicating diuron is most likely being transported to the drain several weeks after applications either via storm or irrigation runoff.

Table XV-12. Hilmar Drain @ Central Ave site subwatershed diuron applications, lbs AI applied, and acres treated by month (2005-2011).
No diuron PUR reported for 2005 and 2011. If month is not included in table, no applications were made.

Month/Year	Number of Diuron Applications	Pounds of AI Applied	Acres Treated
January, 2006	4	196.8	123.0

December, 2006	3	241.7	124.0
January, 2007	1	62.9	43.0
February, 2007	1	1.6	4.0
June, 2007	1	0.7	18.0
December, 2007	6	255.3	233.0
February, 2008	1	62.8	43.0
January, 2009	3	102.4	128.0
January, 2010	3	35.3	59.0
Summaries by Year			
2006 Total	7	438.5	247.0
2007 Total	9	320.5	298.0
2008 Total	1	62.8	43.0
2009 Total	3	102.4	128.0
2010 Total	3	35.3	59.0
Total	**23**	**959.4**	**775.0**

Figure XV-4. Hilmar Drain @ Central Ave site subwatershed lbs diuron applied by month (2005-2011).

Asterisk (*) denotes months with exceedances. No diuron PUR reported for 2005 and 2011.

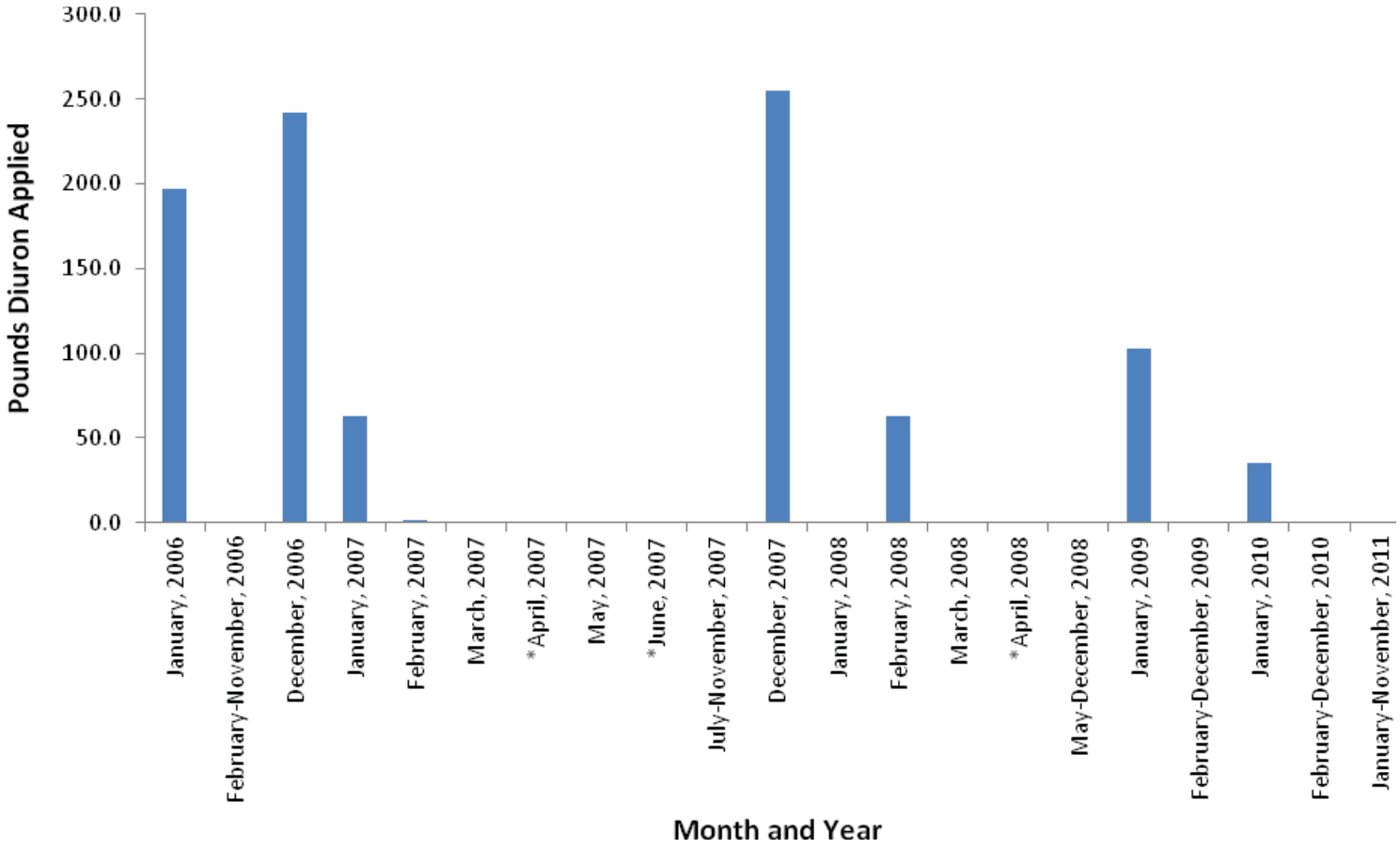


Table XV-13. Hilmar Drain @ Central Ave site subwatershed diuron PUR data (2005-2011).
No diuron applications reported for 2005 and 2011.

Chemical Name	Commodity	Product Name	Lbs AI Applied
DIURON	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	DIREX 4L	484.3
		DIREX 80DF	196.8
		DUPONT DIREX 4L HERBICIDE	276.1
	CORN (FORAGE - FODDER)	KARMEX DF HERBICIDE	0.7
	RIGHTS OF WAY	DU PONT KROVAR I DF HERBICIDE	1.6

ALFALFA - Total Pounds Diuron Applied	**957.2**
CORN - Total Pounds Diuron Applied	**0.7**
RIGHTS OF WAY - Total Pounds Diuron Applied	**1.6**
Total Pounds Diuron Applied (2005-2011)	**959.4**

Similar to copper, it appears that only a few growers within the Hilmar Drain subwatershed are responsible for the offsite movement of diuron to the waterway. The Coalition noted in the 2008 Management Plan that only one TRS had an application in the month prior to the June 2007 exceedance (page 361, Table XVI-8). As discussed above, the Coalition believes diuron is moving to the waterway via mismanaged irrigation tailwater and storm water. The Coalition's strategy is targeting growers with the potential to drain that have applied or are applying diuron and encouraging them to review their operations to improve irrigation and storm water management. This is consistent with the strategy to address priority A/B constituent exceedances.

Nitrate + Nitrite / Nitrate

There were 13 nitrate exceedances in the Hilmar Drain subwatershed (including one exceedance at the subwatershed's upstream sampling location at Mitchell Rd).

Nitrate exceedances typically occur during the late spring through summer months (May, June, July, August, and September). Nitrate has not been monitored in the subwatershed since September 2008. In October 2008, the Coalition replaced separate analysis of nitrate and nitrite with the combined analysis of nitrate + nitrite; as such, all future monitoring of nitrate in the Hilmar Drain subwatershed will be for the combined analysis.

Sources of nitrate in the subwatershed were discussed in the Hilmar Drain Source Identification section of the 2008 Management Plan. Fertilizers and/or organic matter from irrigated pasture, dairies, leaking septic systems, and effluent from waste treatment facilities are all possible sources of nitrate that have the potential to enter surface waters through above ground runoff or shallow subsurface flows. In the Hilmar Drain subwatershed, there are a relatively large number of dairy operations, and pastureland is located adjacent to the Central Ave sampling location. The Coalition suspects that these dairy operations and pastureland are contributing significantly to the high concentrations of nitrate in the drain. The Coalition is addressing nitrate during the subwatershed target and general grower outreach efforts by encouraging growers to improve management of nutrient and irrigation tailwater.

Priority D Constituents

Sediment toxicity to *H. azteca* and water column toxicity to *S. capricornutum* are the priority D constituents in the Hilmar Drain subwatershed.

H. azteca toxicity

Sediment toxicity to *H. azteca* occurred three times in the Hilmar Drain subwatershed in 2005 (September) and 2008 (March and August); toxicity was persistent only once following the August 2008 toxicity (resample collected in October 2008). The Coalition did not perform TIEs on any of the toxic samples, but did evaluate in previous SAMRs the potential causes based on water column sampling results and PUR data. The Coalition will conduct MPM for sediment toxicity during 2012 and will analyze for pyrethroids and chlorpyrifos in toxic sediment samples to better determine the causes of toxicity.

During outreach, the Coalition discusses the importance of preventing erosion and offsite movement of sediment to waterways. A wide range of potential causes of sediment toxicity were identified in past SAMRs such as, metals, organophosphates and pyrethroids; the Coalition believes eliminating irrigation and storm water runoff to Hilmar Drain will address many of the potential causes of sediment toxicity in the subwatershed.

S. capricornutum toxicity

Toxicity to *S. capricornutum* occurred five times in the Hilmar Drain subwatershed (during the months of April, July, and September); three of these were persistent in the resamples collected one week later. Twice *S. capricornutum* toxicity was associated with diuron exceedances and once it was associated with a copper exceedance. Toxicity Identification Evaluations were performed on the 2008 (April and July) upstream @ Mitchell Rd toxicities, however no data were gained from either resampling events as all toxicity was lost (April) and toxicity could not be determined (July). Associated sample results and PUR data were evaluated by the Coalition in past SAMRs and it was concluded that there could be a wide range of potential causes for the toxicities, including metals, herbicides, and organochlorines.

The Coalition believes that reducing or eliminating the offsite movement of agricultural constituents via mismanaged irrigation and storm water will eliminate *S. capricornutum* toxicity. In addition, specifically targeting growers who apply metals and herbicides will aid in addressing the toxicity. This is consistent with the Coalition's strategy for outreach in the Hilmar Drain subwatershed.

Priority E Constituents

The priority E constituents listed under the Hilmar Drain Site Subwatershed management plan are ammonia, DO, *E. coli*, pH, SC and TDS.

The Coalition conducted upstream MPM for ammonia at both the Mitchell Rd and Reclamation Drain locations in July of 2008. Two relatively high concentrations of ammonia occurred prior to 2008 (Table XV-5) and the Coalition was attempting to determine the source of the ammonia by collecting more data. The Coalition believes the ammonia exceedances are primarily from the same source responsible

for the nitrate exceedances (dairies and irrigated pastureland in the subwatershed). The Coalition believes its strategy for addressing the nitrate exceedances in Hilmar Drain the Coalition will also address the ammonia exceedances.

Although these constituents will remain low priority, the Coalition will continue to collect monitoring data as a part of Assessment Monitoring and /or MPM. Dissolved oxygen, pH, and SC are field parameters that will be collected during every monitoring event, Assessment and MPM. Ammonia, *E. coli*, and TDS will be monitored during Assessment Monitoring at this site as scheduled in 2020. The priority E constituents are also discussed during individual contacts and will continue to be discussed at annual grower meetings. In addition, the Coalition plans to participate in a focus group along with other Coalitions and Regional Board staff to develop a joint Work Plan to address *E. coli* exceedances by determining the potential agricultural sources of *E. coli* and identifying management practices to prevent discharges to surface waters.

Evaluation

Hilmar Drain @ Central Ave is one of the four fourth priority site subwatersheds within the ESJWQC and is in its first year of focused outreach (2012-2014).

The Coalition petitioned to remove chlorpyrifos from the Hilmar Drain management plan in a letter to the Regional Board on January 6, 2012 because the most recent chlorpyrifos exceedance was in 2006 and the Coalition has since demonstrated during 2007 and 2008 Normal Monitoring two consecutive years with no exceedances. Outreach has proceeded as planned to date and, regardless of the status of chlorpyrifos, will occur for other management plan constituents.

The Coalition plans to focus its resources on identifying sources of agricultural discharge within this subwatershed that could result in water quality impairments and extend outreach to Coalition members as well as set evaluation goals based on the effectiveness of management practices (by considering changes in water quality over time).

The Coalition's strategy for the Hilmar Drain subwatershed is to focus on providing information to growers to review their operation and determine if irrigation return flows and storm water runoff are managed properly. The Coalition targeted growers with crops located adjacent to the waterway and whose agricultural practices may result in the discharge or drift of pesticides, specifically chlorpyrifos, copper, and diuron, into the waterway. Outreach efforts include grower notification, management practice outreach and education, tracking of management practice implementation and providing information on special studies of management practice efficacy.

Targeted growers will complete individual surveys documenting current management practices and assessing future planned practices. The Coalition will assess these results and plan the final stages of outreach, including following up with growers to identify newly implemented practices and future monitoring to evaluate water quality improvement.

In 2012, MPM is scheduled for high priority constituents during months of historical exceedances. However, monitoring for chlorpyrifos resulted in zero exceedances for two or more consecutive years of monitoring during months of past exceedances. A letter was submitted to the Regional Board on January 6, 2012 petitioning to remove the constituent from the active Hilmar Drain @ Central Ave management plan; until the letter is approved, chlorpyrifos will continue to be monitored as scheduled.

LOW PRIORITY SUBWATERSHEDS

The following section describes low priority management plan site subwatersheds at which MPM occurred during 2011. Low priority sites are sampling locations that were not sampled by the Coalition until the 2008 MRPP was approved, and therefore the Coalition does not have a long historical record of water quality data at the site. Management plans were recently initiated at these sites as a result of monitoring and, in order for the Coalition to gain two years of monitoring data for high priority constituents prior to the site rotating to high priority, the Coalition conducts additional monitoring as needed. Figures 1, 2 and 4 in the MPUR (pages 18, 19 and 23) further outline the Coalition's processes for Management Plan evaluation and prioritization of exceedances.

Howard Lateral @ Hwy 140

Howard Lateral @ Hwy 140 is an Assessment Monitoring location in the Merced River @ Santa Fe Zone (Zone 4). The lateral is located just south and west of Livingston Drain, in the central portion of the Coalition region in Merced County. Agricultural land use is predominantly truck/nursery/berry crops and deciduous fruit, but also includes field crops, pasture, grains/hay, vineyard and dairy.

Monitoring was initiated at the site under the current 2008 MRPP. Assessment Monitoring occurred from October 2008 through December 2010. The site rotates to Assessment Monitoring again in 2029.

Results from Assessment Monitoring in October 2008 through December 2010 required the Coalition to establish a management plan for Howard Lateral, which now includes chlorpyrifos, copper, *E. coli*, pH, SC and TDS. The second copper exceedance occurred in April 2010 and the single chlorpyrifos exceedance occurred in June 2010, hence the Coalition is required to conduct two years of additional monitoring for those two constituents in Howard Lateral before the site can become a high priority subwatershed. The Coalition conducted MPM for chlorpyrifos and copper in 2011 and the site is scheduled for MPM in 2012. During 2011 MPM, copper exceeded the calculated WQTL (based on associated hardness concentration) in samples collected in October (1.1 µg/L of copper detected in samples; calculated WQTL was 1.03 µg/L). Howard Lateral @ Hwy 140 is scheduled to become a high priority management plan site in 2015, at which time MPM and focused outreach will occur.