East San Joaquin Water Quality Coalition

Semi-Annual Monitoring Report

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Above photo from www.livingstoncity.com

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List of Acronyms

AI	Active Ingredient
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BU	Beneficial Uses
CEDEN	California Environmental Data Exchange Network
COC	Chain of Custody
CVRWQCB	Central Valley Regional Water Quality Control Board
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane-+
DF	Dilution Factor
DFG	(California) Department of Fish and Game
DHS	(California) Department of Health Services
DO	Dissolved Oxygen
DPR	(California) Department of Pesticide Regulation
DQO	Data Quality Objective
DWR	Department of Water Resources
E	Environmental sample
EC	Electrical Conductance (Specific Conductivity)
EPA	Environmental Protection Agency
ESJWQC	East San Joaquin Water Quality Coalition
FB	Field Blank
FD	Field Duplicate
IRIS	Integrated Risk Information Systems
K_{oc}	Organic Carbon Partioning Coefficient
L	Liter
LC_{50}	Lethal Concentration to 50% of Population
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg	Milligram
MLJ-LLC	Michael L. Johnson, LLC.
MPM	Management Plan Monitoring
MPN	Most Probable Number
MRP	Monitoring and Reporting Program

MS	Matrix Spike
MSD	Matrix Spike Duplicate
MUN	Municipal and Domestic Supply Beneficial Use
NA	Not Applicable
ND	Not Detected
NM	Normal Monitoring
NONAG	The sample was provided by a project other than the Coalition to the laboratory and was included in the QA report from the laboratory to meet their QA criteria
NSG	Not significantly different than control; greater than 80% threshold
NSL	Not significantly different than control; less than 80% threshold
NTU	Nephelometric Turbidity Unit
OP	Organophosphate
PBO	Piperonyl butoxide
PCA	Pesticide Control Advisor
pH	Power of Hydrogen (measure of acidity)
PR	Percent Recovery
PUR	Pesticide Use Reports
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RfD	Reference Dose
RL	Reporting Limit
RPD	Relative Percent Difference
RS	Resample
SG	Statistically significantly different from control; Greater than 80% threshold
SJR	San Joaquin River
SL	Statistically significantly different from control; Less than 80% threshold
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TRS	Township, Range, Section
TUa	Toxic Unit (acute)
µg	Microgram
USEPA	United States Environmental Protection Agency
WER	Watershed Evaluation Report

WQT	Water Quality Trigger
WQG	Water Quality Guidelines

List of Terms

ArcGIS – Geographic Information Systems mapping software

Central Valley or Valley – California Central Valley

Coalition – East San Joaquin Water Quality Coalition

Coalition/ESJWQC region – The region within the Central Valley that is monitored by the East San Joaquin Water Quality Coalition.

drainage –water that moves horizontally across the surface or vertically into the subsurface from land

landowners – one or more persons responsible for the management of the irrigated land

Regional Board – Central Valley Regional Water Quality Control Board

site subwatershed – Starting from the sampling site, all water bodies that drain, directly or indirectly, into the water body before the point where sampling occurs.

subwatershed – The topographic perimeter of the catchment area of a stream tributary. (EPA terms of environment: (http://www.epa.gov/OCEPAterms/sterms.html)

Waiver – Central Valley Regional Water Quality Control Board Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, Order No. R5-2006-0077, amending Order No. R5-2006-0053.

water body –standing or flowing water of any size that may or may not move into a larger body of water, including lakes, reservoirs, ponds, rivers, streams, tributaries, creeks, sloughs, canals, laterals and drainage ditches.

watershed – The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point. (EPA terms of environment: http://www.epa.gov/OCEPAterms/wterms.html)

Executive Summary

The East San Joaquin Water Quality Coalition (ESJWQC) region includes the counties of Stanislaus, Merced, Madera, Tuolumne, and Mariposa and the portion of Calaveras County that drains into the Stanislaus River. Apart from the San Joaquin River which forms the south and east boundary of the Coalition, there are five major rivers in the watershed: the Fresno River, Chowchilla River, Merced River, Tuolumne River and Stanislaus River. In addition, the Eastside Bypass is considered a major water body. These east side tributaries of the San Joaquin River drain the Sierra Nevada range from east to west. Irrigated agriculture is the predominant land use in the Coalition area although the growing urban areas in the Central Valley are also a significant land use. Other non-irrigated land uses include dairies with some acreage in feedlots.

Water quality monitoring was conducted by the ESJWQC during the 2007 irrigation season between the months of April and September. Ambient water was sampled at least once per month at 24 monitoring sites and sediment was collected for analysis at these same sites during the month of August. Several sites were dry at one or several of the monitoring trips. The primary objective of the irrigation season monitoring program was to characterize discharge from agriculture during the months when irrigation was taking place. Field data were recorded during each sampling event unless otherwise noted and ambient water samples were analyzed for pesticides, *E. coli*, metals, bacteria, inorganic and organic parameters, as well as toxicity to three test species: *Ceriodaphnia dubia, Pimephales promelas, and Selenastrum capricornutum*. During sediment sampling events field parameters were measured and toxicity samples were collected to test for *Hyalella azteca* toxicity. All water and sediment sample analyses are based on requirements specified in Table 1 of the Monitoring and Reporting Program Order No. R5-2005-0833 for Coalition Groups under Resolution No. R5-2003-0105 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. For samples that experienced toxicity, follow-up sampling occurred within 48 hours from the time that the laboratory reported the toxicity.

In addition to the normal monitoring that occurred during the irrigation season, supplemental monitoring was implemented for special studies or to fulfill requirements of management plans. Management plan monitoring was conducted to determine if outreach was effective in reducing exceedances. These additional monitoring events were conducted during months in which exceedances were experienced in the past. Special studies occurred when exceedances could not be directly attributed to agricultural practices, but were occurring frequently at a site. These studies helped to narrow the sources of exceedances to determine if and where agricultural management practices could be effective.

Samples collected during the 2007 irrigation season experienced exceedances of six pesticides including aldicarb, chlorpyrifos, DDE, diuron, dimethoate and methoxychlor. Exceedances of aldicarb, DDE, dimethoate and methoxychlor were experienced one time each, as well as three exceedances of diuron and 18 exceedances of chlorpyrifos. Water column toxicity was experienced in 16 samples. All sites showing toxicity were resampled to determine the persistence of the toxicity, and three sample sites experienced toxicity again in the resamples. Of the sixteen samples that experienced toxicity, six were toxic to *Ceriodaphnia*, one to *Pimephales* and nine to *Selenastrum*. Two additional toxicities, one to *Ceriodaphnia* and one to *Selenastrum*, occurred during management plan monitoring in the month of July. Four sediment samples were found to be toxic to *Hyalella* and all but one showed persistent toxicity in the resamples. Exceedances of Specific Conductance (EC) and Total Dissolved Solids (TDS), both measures of salts in the water, were often correlated during the irrigation monitoring events when both parameters were measured. In total, 23 exceedances of TDS and 24 exceedances of EC were experienced in samples collected from four of the Coalition monitoring sites. There were 45 exceedances of the Dissolved Oxygen (DO) water quality objective experienced across half of the Coalition monitoring sites (12 sites). Four samples sites showed consistently low DO and five additional exceedances were experienced during management plan monitoring. Ten exceedances of pH occurred during the irrigation season, all of which were above the upper water quality objective. Exceedances of the color water quality objective were experienced at most sites during every monitoring event of the irrigation season. There were 50 exceedances of the *E. coli* water quality objective experienced at 17 of the 24 sites sampled. Four metals, including arsenic, cadmium, copper and lead, were found at concentrations above water quality objectives in water samples. Among the four metals, only copper is currently used by agriculture within the Coalition region.

Outreach and education activities are a central component of the Coalition monitoring program. The Coalition provides information and notification of exceedances in person during grower meetings, through the Coalition website, and by mail. Notification of exceedances was sent to growers by mail in the months of August and September. A Coalition Annual Report was sent to all growers both at the onset and end of the 2007 irrigation season. These mailings occurred in April and in December of 2007 and also included a summary of exceedances experienced, management practices and relevant Coalition information. In 2007, grower meetings to provide information on exceedances and best management practices occurred before the start of the irrigation season on February 5, 20 and 22 in Crows Landing, Modesto and Denair and after the irrigation season, on December 11, 12 and 18 in Madera, Merced and Stanislaus counties (respectively). The Coalition website (www.esjcoalition.org) includes a general description of the Coalition's mission, member information, recommended best management practices, a schedule of Coalition meetings and presentations, Coalition news and newsletters, maps of sample sites and subwatersheds, and links to other sources of relevant information. Management Practice Surveys have been included in mailings and are handed out at all Coalition meetings. To date, there has been a good level of grower response (1161 total surveys returned), and these results have been compiled for all subwatersheds and are amended to this report.

The Coalition has worked with local County Agricultural Commissioners, Pesticide Control Advisors (PCA) and pesticide registrants over the irrigation season to determine where and how exceedances could be addressed. A collaborative effort has been helpful in determining where best management practices are most appropriate and in the dissemination of information to growers. Information on monitoring, outreach and support provided by the Coalition will lead to the implementation of best management practices by individual growers, and over time monitoring results will show improvements in water quality.

Introduction

This document is being submitted by the East San Joaquin Water Quality Coalition to the Central Valley Regional Water Quality Control Board as required by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Resolution No. R5-2003-0105 (Order), Monitoring and Reporting Program Order No. R5-2005-0833, amended by Monitoring and Reporting Program Order No. R5-2006-0053 and Monitoring and Reporting Program Order No. R5-2006-0077 (hereafter referred to as the Conditional Waiver). The document herein reports on the Coalition monitoring program and covers activities associated with the 2007 irrigation season monitoring, reporting, outreach and education.

Data that are too substantial to include in the body of this report are located in separate appendices. Where appropriate, Semi-Annual Monitoring Report sections refer readers to the appendices relevant to that section.

Description of Watershed

The East San Joaquin Water Quality Coalition (ESJWQC) area includes Stanislaus, Merced, Madera, Tuolumne, and Mariposa Counties and the portion of Calaveras County that drains into the Stanislaus River (Table 1). The region that drains into the Coalition area is bordered by the crest of the Sierra Nevada on the east and the San Joaquin River on the west, the Stanislaus River on the north to the San Joaquin River on the south. The southern portion of the Coalition area has been expanded to now include the area that was formerly within the Root Creek Coalition area. Additionally, there are landholdings in the vicinity of the Lone Willow Slough watershed (west of the Eastside Bypass) that have joined the Westside Coalition.

The only surface water export from the Coalition area is northward via the San Joaquin River. This river drains watersheds on the east and west side of the California Central Valley (Valley), though only east side watersheds are relevant with respect to the Coalition area. San Joaquin River water is eventually either exported to the San Francisco Bay through the Delta, or conveyed southward via the State Water Project and the Delta Mendota Canal. The Coalition area also includes within its boundaries portions of all six irrigation districts: Oakdale Irrigation District, Merced Irrigation District, Turlock Irrigation District, Modesto Irrigation District, Chowchilla Irrigation District and Madera Irrigation District. Water bodies may have both irrigation district and Coalition involvement only when they convey both irrigation supply and agriculture return water. Irrigation districts are covered by individual waivers.

Apart from the San Joaquin River, there are five major rivers in the watershed: the Fresno River, Chowchilla River, Merced River, Tuolumne River and Stanislaus River. In addition, the Eastside Bypass is considered a major water body. These east side tributaries of the San Joaquin River drain the Sierra Nevada range from east to west. Typically, only the Stanislaus, Merced, and Tuolumne Rivers maintain flows during the summer months. Flow in the Chowchilla and Fresno Rivers are intermittent to nonexistent as the irrigation season progresses into the fall and remain dry unless major storm events produce sufficient precipitation in the immediate vicinity of the rivers. Intermediate sized water bodies in the Coalition area (e.g. Dry Creek, Duck Slough, and Highline Canal) originate either in the Sierra Nevada foothills or the Valley itself and are tributaries to the major rivers. The remaining water bodies are small in size (e.g. Silva Drain, Mustang Creek) and are primarily agricultural canals and ditches that convey water to one of the larger rivers or intermediate-sized creeks/sloughs.

Although exact acreage is difficult to estimate due to rapidly changing land use, the Coalition area contains 1,186,889 acres that are considered irrigated agriculture (Table 1). For Stanislaus, Merced, Mariposa, Tuolumne, and Madera Counties, the Coalition used the Department of Water Resources (DWR) land use estimates for irrigated agriculture to determine total acreage. DWR does not provide land use data for Calaveras County. Instead, the Coalition used data from the County Agricultural Commissioner's office.

Table 1. Acreage of irrigated land in ESJWQC counties.

Acreage shown for Stanislaus, Merced, Madera, Tuolumne, Calaveras and Mariposa Counties**. Data from 2001 California Department of Water Resources (http://www.landwateruse.water.ca.gov/annualdata/landuse/2001/landuselevels.cfm)**

County	Irrigated Land Area (acres)
Calaveras	976
Madera	295,000
Mariposa	297
Merced	510,500
Stanislaus	378,700
Tuolumne	1,416
Total	***1,186,889***

Note that the estimates of irrigated acres may differ from previous estimates. The Coalition anticipates that as urban development increases over the next several years, the estimates will continue to change.

Land Use

Irrigated agriculture is the predominant land use in the Coalition area although growth of the urban areas in the San Joaquin Valley has been a significant factor impacting water quality. Non-irrigated land uses include urban and dairy with some acreage in feedlots and impoundments.

A variety of crops are grown and are often found in regions specific to microclimate, soil type, and local farming history. A more detailed discussion of crop type occurs in this report within the Sampling Sites Description section. Over 50 types of commercial crops are produced within the Coalition area (Table 2). The most common crops by acres are almonds, tomatoes, hay, sweet potatoes, cotton, silage, beans, wheat, peaches, melons, and grapes. In general agriculture varies geographically as one travels from the north to south and from east to west. In the eastern foothills, deciduous orchards and grapes are the dominant crops, though there is also considerable irrigated pasture and dairy farm. Crop type is more diverse in the northern Coalition area and includes row crops (e.g. tomatoes, sweet potatoes, melons, and leafy green vegetables), alfalfa hay, and orchards. In the relatively drier southern area dominate crops include cotton, vineyards, and orchards (almonds and pistachios).

A map of land use in the Coalition region is provided in Figure 1, and the legend for the map is provided in **Error! Reference source not found.**. Information was obtained from the California Department of Pesticide Regulation database which is current through 2004 (http://calpip.cdpr.ca.gov/cfdocs/calpip/prod/main.cfm). The map shown in Figure 1 is provided as a .jpeg file; however, due to the size of the Coalition area the map does not support a reasonable level of detail in this document. ArcGIS coverage has previously been provided, and can be referred to for more detail on coverage.

Table 2. Crops grown and monthly pesticide use in the ESJWQC region.

Crop information was developed from Pesticide Use Reports from the 2004 DPR PUR database. An X in the month column specifying that there were pesticide use permits filed in those months indicating that applications of chemicals to those crops occurred.

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
CALAVERAS													
	APPLE			x			x						
	BLUEBERRY		x		x						x	x	
	CHERRY			x	x		x		x			x	
	GRAPES, WINE	x	x	x	x	x	x	x	x			x	x
	NECTARINE		x										
	N-OUTDR CONTAINER/FLD GRWN PLANTS		x	x	x	x	x	x		x			
	OATS, GENERAL	x	x	x									
	OLIVE (ALL OR UNSPEC)	x		x			x	x	x	x			x
	PASTURES (ALL OR UNSPEC)		x	x	x	x							
	PEACH		x										
	PISTACHIO (PISTACHE NUT)			x	x	x		x	x				
	VEGETABLES (ALL OR UNSPEC)			x									
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)		x	x	x	x	x	x	x	x			
MADERA													
	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	x	x	x	x	x	x	x	x	x	x	x	x
	ALMOND	x	x	x	x	x	x	x	x	x	x	x	x
	APPLE		x	x	x	x	x	x	x				
	APRICOT	x	x	x	x	x							x
	BARLEY (FORAGE - FODDER)	x	x	x									
	BARLEY, GENERAL	x	x	x									
	BEANS (ALL OR UNSPEC)						x	x	x				
	BEANS, DRIED-TYPE	x					x	x	x				
	BLUEBERRY											x	
	BOYSENBERRY (BOYSENS)												x
	CARROTS, GENERAL		x	x		x	x	x					
	CHERRY	x	x	x	x	x	x	x			x	x	x
	CHRISTMAS TREE PLANTATIONS					x							
	CITRUS FRUITS (ALL OR UNSPEC)		x			x		x		x		x	
	CORN (FORAGE - FODDER)			x	x	x	x	x	x	x		x	
	CORN, HUMAN CONSUMPTION		x	x		x	x	x					
	COTTON, GENERAL	x	x	x	x	x	x	x	x	x	x	x	x

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	FIG	x	x	x	x	x	x	x	x	x		x	x
	GARLIC	x		x	x	x							
	GRAPES	x	x	x	x	x	x	x	x	x	x	x	x
	GRAPES, WINE	x	x	x	x	x	x	x	x	x	x	x	x
	KIWI FRUIT	x	x	x		x		x	x	x			
	MELONS			x									
	NECTARINE	x	x	x	x	x	x	x	x	x	x	x	x
	N-GRNHS GRWN CUT FLWRS OR GREENS	x	x	x	x	x	x	x	x	x	x	x	x
	N-GRNHS GRWN PLANTS IN CONTAINERS						x				x		
	N-OUTDR CONTAINER/FLD GRWN PLANTS	x	x	x		x	x	x	x	x	x	x	x
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL		x	x	x	x	x	x	x	x			
	OATS (FORAGE - FODDER)	x	x	x									x
	OATS, GENERAL	x	x	x									x
	OLIVE (ALL OR UNSPEC)	x	x	x		x	x	x	x	x	x	x	x
	ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)			x	x						x	x	
	ORANGE (ALL OR UNSPEC)	x	x	x	x	x	x	x	x	x	x	x	x
	PASTURES (ALL OR UNSPEC)		x	x								x	x
	PEACH	x	x	x	x	x	x	x	x	x	x	x	x
	PEAR	x		x				x				x	
	PECAN			x		x		x				x	
	PERSIMMON			x		x		x	x	x			
	PISTACHIO (PISTACHE NUT)	x	x	x	x	x	x	x	x	x	x	x	x
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	x	x	x	x	x	x	x	x	x	x	x	x
	POMEGRANATE (MISCELLANEOUS FRUIT)				x	x		x	x	x			x
	PRUNE	x	x	x	x	x	x	x		x	x		x
	SOIL APPLICATION, PREPLANT-OUTDOOR (SEEDBEDS, ETC.)	x	x	x	x	x	x		x	x	x	x	x
	STONE FRUITS (ALL OR UNSPEC)		x							x			
	STRAWBERRY (ALL OR UNSPEC)	x			x							x	
	SUGARBEET, GENERAL	x		x	x	x	x	x	x	x			x
	TANGELO		x	x	x	x	x	x	x	x	x	x	x
	TANGERINE (MANDARIN, SATSUMA, MURCOTT, ETC.)			x	x	x		x		x	x	x	
	TOMATO			x				x	x	x	x		
	TOMATOES, FOR PROCESSING/CANNING	x		x	x	x	x	x	x		x	x	
	UNCULTIVATED AGRICULTURAL AREAS (ALL OR UNSPECIFIED)	x	x	x	x	x	x	x	x		x	x	x

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	x	x	x	x	x	x	x	x	x		x	
	WATERMELONS					x							
	WHEAT (FORAGE - FODDER)	x	x	x			x	x	x	x			x
	WHEAT, GENERAL	x	x	x	x							x	x
MARIPOSA													
	APPLE			x	x	x							
	GRAPES, WINE		x	x	x	x	x	x	x				
	N-OUTDR CONTAINER/FLD GRWN PLANTS	x	x	x	x	x	x	x	x	x	x	x	x
MERCED													
	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	x	x	x	x	x	x	x	x	x	x	x	x
	ALMOND	x	x	x	x	x	x	x	x	x	x	x	x
	APPLE	x						x					x
	APRICOT	x	x	x	x	x	x	x	x		x		
	ASPARAGUS (SPEARS, FERNS, ETC.)				x			x	x		x		
	BARLEY (FORAGE - FODDER)												x
	BARLEY, GENERAL	x	x	x									x
	BEANS, DRIED-TYPE		x		x	x	x	x	x	x	x		
	BEANS, SUCCULENT (OTHER THAN LIMA)				x	x	x	x	x	x	x		
	BLUEBERRY		x	x	x		x	x			x	x	
	BOYSENBERRY (BOYSENS)				x		x						
	BROCCOLI										x	x	
	CANTALOUPE			x		x	x	x	x	x		x	x
	CAULIFLOWER							x	x	x			
	CHERRY	x	x	x	x	x		x				x	x
	CHICORY (ALL OR UNSPEC)				x				x	x	x		
	CHINESE CABBAGE (NAPPA, WON BOK, CELERY CABBAGE)				x						x		
	CHINESE GREENS, CHINESE LEAFY VEGETABLES					x							
	CHRISTMAS TREE PLANTATIONS	x	x					x					
	CITRUS FRUITS (ALL OR UNSPEC)	x				x							x
	COLE CROPS (ALL OR UNSPEC)												x
	CORN (FORAGE - FODDER)	x	x	x	x	x	x	x	x	x	x	x	x
	CORN, HUMAN CONSUMPTION	x	x	x	x	x	x	x	x	x			x
	COTTON, GENERAL	x	x	x	x	x	x	x	x	x	x	x	x
	CUCUMBER (PICKLING, CHINESE, ETC.)	x			x				x	x			
	FIG		x	x	x	x	x	x	x	x		x	x
	FORAGE - FODDER GRASSES (ALL OR UNSPEC) (HAY)	x	x	x									

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	GRAPES		x	x	x	x	x	x					
	GRAPES, WINE	x	x	x	x	x	x	x	x	x	x	x	x
	LEAFY VEGETABLES (ALL OR UNSPEC)								x	x	x	x	
	LETTUCE, HEAD (ALL OR UNSPEC)				x								
	MELONS							x	x				
	MUSTARD, GENERAL									x			
	NECTARINE	x	x	x	x	x	x	x				x	
	N-GRNHS GRWN PLANTS IN CONTAINERS	x	x	x	x	x	x	x	x	x	x		
	N-OUTDR CONTAINER/FLD GRWN PLANTS	x	x	x	x	x	x	x	x	x	x	x	x
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	x	x	x	x	x	x	x	x		x	x	x
	OATS (FORAGE - FODDER)	x	x	x	x	x			x	x		x	x
	OATS, GENERAL	x	x	x								x	
	OLIVE (ALL OR UNSPEC)											x	
	ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)		x	x	x	x						x	x
	ORNAMENTAL TURF (ALL OR UNSPEC)	x	x	x	x		x	x	x	x		x	
	PASTURES (ALL OR UNSPEC)	x	x	x	x	x	x	x	x		x		
	PEACH	x	x	x	x	x	x	x	x	x	x	x	x
	PEAR	x			x		x	x					
	PEAS, GENERAL	x	x	x									
	PECAN					x	x	x		x			
	PEPPERS (CHILI TYPE) (FLAVORING AND SPICE CROP)			x	x	x		x	x	x	x	x	
	PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	x		x	x	x	x	x	x	x	x		
	PISTACHIO (PISTACHE NUT)	x	x	x	x	x	x	x	x	x	x	x	x
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	x	x	x	x	x		x	x	x		x	x
	PRUNE	x	x	x		x	x	x	x	x			x
	PUMPKIN						x	x	x	x			
	RADISH					x		x					
	RICE (ALL OR UNSPEC)					x	x	x	x				
	RYE (ALL OR UNSPEC)		x										
	SAFFLOWER, GENERAL	x											
	SOIL APPLICATION, PREPLANT-OUTDOOR (SEEDBEDS, ETC.)	x	x	x								x	x
	SORGHUM (FORAGE - FODDER) (SORGO, ETC.)						x		x	x			
	SQUASH (ALL OR UNSPEC)							x	x				
	SQUASH (WINTER) (HUBBARD SQUASH, CALABAZA, ETC.)							x	x	x			

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	STONE FRUITS (ALL OR UNSPEC)			x									
	STRAWBERRY (ALL OR UNSPEC)	x	x	x	x		x	x	x				x
	SUDANGRASS (FORAGE - FODDER) (SORGHUM SUDANESE)					x	x	x	x	x			
	SUGARBEET, GENERAL	x	x	x	x	x	x	x	x	x	x		
	SWEET POTATO	x	x	x	x	x	x	x	x	x		x	x
	TOMATILLO						x	x					
	TOMATO	x	x	x	x	x	x	x	x	x	x	x	x
	TOMATOES, FOR PROCESSING/CANNING	x	x	x	x	x	x	x	x	x	x	x	x
	UNCULTIVATED AGRICULTURAL AREAS (ALL OR UNSPEC)	x	x	x	x					x	x	x	x
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	x	x	x	x	x	x	x	x	x	x	x	x
	WATERMELONS			x	x	x	x	x	x		x	x	
	WHEAT (FORAGE - FODDER)	x	x	x							x	x	x
	WHEAT, GENERAL	x	x	x	x		x			x		x	x
STANISLAUS													
	ALFALFA (FORAGE - FODDER) (ALFALFA HAY)	x	x	x	x	x	x	x	x	x	x	x	x
	ALMOND	x	x	x	x	x	x	x	x	x	x	x	x
	APPLE	x	x	x	x	x	x	x	x	x	x	x	x
	APRICOT	x	x	x	x	x	x	x	x	x	x	x	x
	ARRUGULA (ROQUETTE, ROCKET SALAD)							x					
	ASPARAGUS (SPEARS, FERNS, ETC.)						x		x				
	BARLEY (FORAGE - FODDER)		x										
	BARLEY, GENERAL										x		x
	BASIL (BUSH, GARDEN, SWEET)		x	x	x	x	x	x	x	x	x	x	
	BEANS, DRIED-TYPE	x	x	x	x	x	x	x	x	x	x	x	
	BEANS, SUCCULENT (OTHER THAN LIMA)			x	x	x	x	x	x	x			
	BEETS, GENERAL	x	x	x	x	x	x	x	x	x	x	x	x
	BOK CHOY (WONG BOK)	x	x	x	x	x	x	x	x	x	x	x	x
	BOYSENBERRY (BOYSENS)	x		x		x		x				x	
	BROCCOLI	x		x	x	x	x	x	x	x	x	x	x
	CABBAGE	x	x	x	x	x	x	x	x	x	x	x	x
	CANTALOUPE			x		x	x	x	x	x			
	CAULIFLOWER			x		x		x	x	x	x		
	CELERIAC (CELERY ROOT)	x	x					x	x	x		x	
	CELERY, GENERAL		x	x	x	x	x	x	x	x	x	x	x
	CHERRY	x	x	x	x	x	x	x	x	x	x	x	x
	CHESTNUT		x		x	x	x	x	x		x		x

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	CHICORY (ALL OR UNSPEC)	x							x	x	x	x	
	CHINESE GREENS, CHINESE LEAFY VEGETABLES										x	x	
	CHINESE RADISH/DAIKON (LOBOK, JAPANESE RADISH)	x	x	x	x	x	x	x	x	x	x	x	x
	CILANTRO (CHINESE PARSLEY, CORIANDER LEAVES)	x	x	x	x	x	x	x	x	x	x	x	x
	CITRUS FRUITS (ALL OR UNSPEC)		x	x	x	x	x	x	x		x	x	
	COLLARDS	x	x	x	x	x	x	x	x	x	x	x	x
	CORN (FORAGE - FODDER)		x	x	x	x	x	x	x	x	x		x
	CORN, HUMAN CONSUMPTION						x	x				x	
	COUNTY AG. COMM. SALES											x	
	CUCUMBER (PICKLING, CHINESE, ETC.)			x	x	x	x	x	x				
	DANDELION (CHINESE DANDELION, GOW GAY)	x	x	x	x	x	x	x	x	x	x	x	x
	DILL	x	x	x	x	x	x	x	x	x			x
	ENDIVE (ESCAROLE)	x								x		x	
	FENNEL (ALL OR UNSPEC)		x	x	x	x	x	x	x	x			
	FIG										x		
	FLAVORING AND SPICE CROPS (ALL OR UNSPEC)				x		x		x		x		
	FORAGE - FODDER GRASSES (ALL OR UNSPEC) (HAY)	x		x									
	GRAPES	x		x	x	x	x	x	x		x	x	x
	GRAPES, WINE	x	x	x	x	x	x	x	x	x	x	x	x
	KALE	x	x	x	x	x	x	x	x	x	x	x	x
	KIWI FRUIT		x	x		x			x	x			
	KOHLRABI	x	x	x	x	x	x	x	x	x	x	x	x
	LEEK			x	x	x	x	x	x	x	x	x	
	LETTUCE, LEAF (ALL OR UNSPEC)	x	x	x	x	x	x	x	x	x	x	x	x
	MELONS						x	x	x			x	
	MINT (ALL OR UNSPEC)	x		x	x	x	x	x	x	x	x	x	
	MUSTARD, GENERAL	x	x	x	x	x	x	x	x	x	x	x	x
	NECTARINE	x	x	x	x	x	x	x		x	x	x	x
	N-GRNHS GRWN PLANTS IN CONTAINERS	x	x	x	x	x	x	x	x	x	x	x	x
	N-GRNHS GRWN TRNSPLNT/PRPGTV MTRL	x	x	x	x	x	x	x	x	x			
	N-OUTDR CONTAINER/FLD GRWN PLANTS	x	x	x	x	x	x	x	x	x	x	x	x
	N-OUTDR GRWN CUT FLWRS OR GREENS												x
	N-OUTDR GRWN TRNSPLNT/PRPGTV MTRL	x	x	x	x	x	x	x	x	x	x	x	x
	OATS (FORAGE - FODDER)	x	x	x	x		x	x			x	x	x

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	OATS, GENERAL		x	x									
	OLIVE (ALL OR UNSPEC)					x	x	x	x	x			
	ORNAMENTAL TURF (ALL OR UNSPEC)	x	x	x	x	x	x	x	x	x			
	PARSLEY (LEAFY VEGETABLE)	x	x	x	x	x	x	x	x	x	x	x	x
	PASTURES (ALL OR UNSPEC)	x	x	x	x	x	x	x	x	x	x		x
	PEACH	x	x	x	x	x	x	x	x	x	x	x	x
	PEAR		x					x			x	x	x
	PEAS, GENERAL	x	x	x									
	PECAN			x	x	x		x					x
	PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	x		x	x	x							
	PERSIMMON		x	x		x		x			x		
	PISTACHIO (PISTACHE NUT)	x	x		x	x	x	x	x				x
	PLUM (INCLUDES WILD PLUMS FOR HUMAN CONSUMPTION)	x	x	x	x	x	x	x	x		x	x	x
	POMEGRANATE (MISCELLANEOUS FRUIT)							x			x		
	PRUNE	x	x									x	x
	PUMPKIN						x	x	x	x			
	QUINCE											x	
	RICE (ALL OR UNSPEC)			x	x	x	x	x					
	RYE (ALL OR UNSPEC)		x										
	RYEGRASS, PERENNIAL (FORAGE - FODDER)		x										
	SOIL APPLICATION, PREPLANT-OUTDOOR (SEEDBEDS, ETC.)		x										
	SORGHUM (FORAGE - FODDER) (SORGO, ETC.)								x				
	SPINACH	x	x	x	x	x	x	x	x	x	x	x	x
	STRAWBERRY (ALL OR UNSPEC)		x	x	x			x	x	x			x
	SUDANGRASS (FORAGE - FODDER) (SORGHUM SUDANESE)							x	x				
	SUGARBEET, GENERAL			x	x	x	x		x	x			
	SWEET POTATO	x		x	x	x							x
	SWISS CHARD (SPINACH BEET)	x	x	x	x	x	x	x	x	x	x	x	x
	TOMATO				x	x	x	x	x	x	x	x	
	TOMATOES, FOR PROCESSING/CANNING	x	x	x	x	x	x	x	x	x	x		x
	TURNIP, GENERAL	x	x	x	x	x	x	x	x	x	x	x	x
	WALNUT (ENGLISH WALNUT, PERSIAN WALNUT)	x	x	x	x	x	x	x	x	x	x	x	x
	WATERMELONS				x	x	x	x	x	x			
	WHEAT (FORAGE - FODDER)	x	x	x	x							x	x
	WHEAT, GENERAL	x	x	x	x								

COUNTY NAME	CROP	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
TUOLUMNE													
	APPLE		x	x	x	x	x	x					
	BLACKBERRY				x								
	BOYSENBERRY (BOYSENS)		x	x	x								
	CHERRY		x	x	x								
	GRAPES						x						
	GRAPES, WINE					x							
	NECTARINE				x								
	N-OUTDR CONTAINER/FLD GRWN PLANTS	x	x	x	x	x	x						
	N-OUTDR GRWN CUT FLWRS OR GREENS			x			x						
	PASTURES (ALL OR UNSPEC)			x	x	x	x	x					
	PEACH		x	x		x	x						

Figure 1. Agriculture lands in the ESJWQC region.

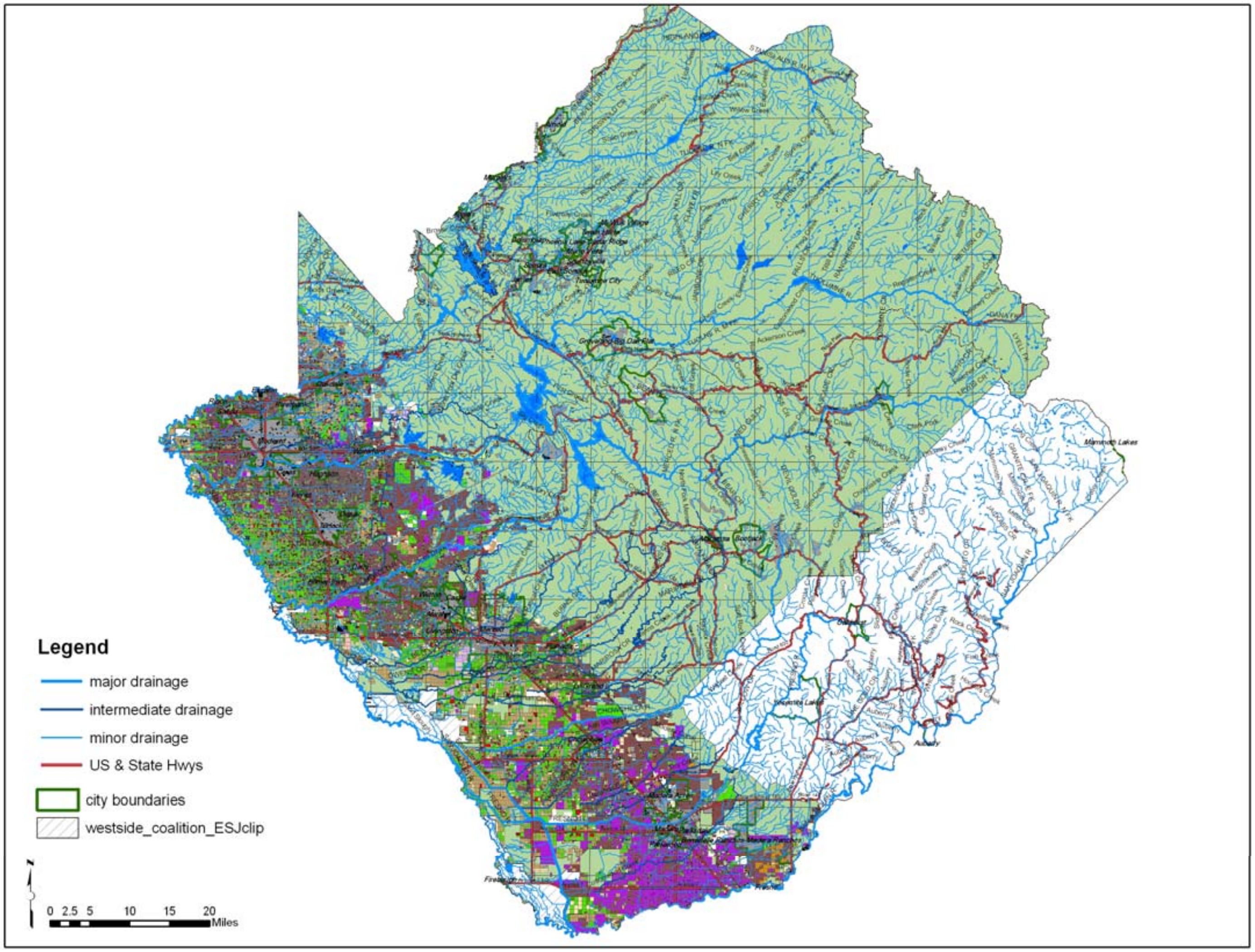


Figure 2. Legend for agriculture lands in the ESJWQC region.

Climate

Summer temperatures are usually hot in the San Joaquin Valley, ranging from the mid 80's to mid 90's (^{o}F) for average daily high temperatures and the mid to upper 50's for average summer daily low temperatures. In the summer the northern area is subject to pulses of cool coastal air that can provide relief from summertime highs and allow for the farming of crops requiring cooler temperatures. The upland areas are slightly cooler at night but generally remain hot throughout the summer. In the winter, temperatures are usually moderate with average daily high temperatures in the mid to upper 50's and average daily low temperatures in the low 40's. Freezing is common; this generally prevents farming of perennial crops susceptible to frost. Annual precipitation on the San Joaquin Valley floor in the Coalition area is variable, averaging 13-15 inches per year (City of Merced). Rainfall occurs predominantly during the winter and is heterogeneously distributed throughout this period (typical for a Mediterranean climate). Winter seasons are characterized by several small storms with one or two major events (increased rain due to several larger storms) providing the bulk of the precipitation. December, January and February are historically the months with greatest precipitation. There appears to be no discernible pattern as to when during the winter these large storms occur.

Soils

Soils maps reveal a complicated mosaic of soil types in the Coalition area. Generally, the Coalition area has sandy, well-drained soils. Soil type interacts with other factors such as slope, soil saturation, rainfall/irrigation water amount, and drainage patterns to control runoff. Soils maps and ArcGIS soils coverages have been delivered to the Central Valley Regional Water Quality Control Board (CVRWQCB) previously and will not be provided as part of this document.

Hydrology

As indicated above, there are several main rivers that cross the Coalition area from east to west. These rivers have complex hydrologic systems due to both seasonal influence of precipitation, and management systems for water use (reservoirs, basin transfers, hydropower, municipal and irrigation supply, and anadromous fisheries). In general, flows are greatest during the winter and spring due to wintertime precipitation and subsequent springtime snowmelt. Summertime flows are now greater than flows were historically due to reservoir releases during this period. The numerous small creeks that have their headwaters in the foothills and western portion of the Sierra Nevada mountain range are primarily ephemeral with no flow from early summer through the first rains of the winter. Later discussion of hydrology will be specific to each subwatershed.

There is an increased propensity for runoff with increased slope, soil water saturation, and volume of water, conditions that arise primarily due to large amounts of rainfall and are more likely in the relatively greater sloped valley margins. During the winter, runoff is drained through the myriad of creeks, rivers, and drains for flood management and may be subject to efforts of larger geographic flood control programs. Runoff can also occur during the irrigation season if water entering the field is greater than the amount that can infiltrate the soil. Recent sampling efforts indicate that many of the drainages in the southern portion of the Coalition region do not always carry runoff even during substantial rainfall events. Immediately after a storm in March of 2005, Ash Slough did not maintain sufficient flows to be sampled even when adjacent orchards were flooded. Also, the watersheds throughout the Coalition region tend to be "flashy" in that water from runoff events moves through the systems very quickly leaving very little flow shortly after the storm ends. For example, there was no flow remaining when crews visited the site for persistence sampling in the Lone Willow Slough watershed approximately a week after a winter 2005 storm event.

A complex system for water transfer, use, and re-use is utilized for irrigation purposes. Without precise methods of applying water for irrigation purposes some water may return to the source after being used on the field. In some cases, the volume of water applied to a field for irrigation may represent not only what is needed by the vegetative crop, but also a greater quantity used either to push the water over the field, or as a method of reducing the negative effects of evapotranspiration and consequent accumulation of salts. The system is designed to allow downstream irrigators to reuse water that was previously used upstream.

Valuable Aquatic Resources

Aquatic resources for water bodies within the Coalition area have been defined in part as those assigned as beneficial use (BU) by the CVRWQCB. Using the tributary rule, BUs were applied to upstream tributaries based on the currently assigned BU (Table 3) in downstream water bodies. Important aquatic resources exist in the Coalition area, including cold water and warm water stream aquatic habitat, wetlands and fisheries resources.

Wetlands are an important aquatic resource within the Coalition area. These habitats are associated with riparian areas along many of the water bodies in the region (particularly in the Sandy Mush Country area of southern Merced County) and savannah step region of the lower Sierra Foothills. Because vernal pools are isolated mini-watersheds they are found heterogeneously distributed across the Coalition in upland areas. They receive winter rains and require an aquatard to maintain their characteristic pools into the spring. These wetlands maintain a unique flora and fauna and are protected by the Clean Water Act. Generally, vernal pools and irrigated agriculture are not found together, although there are exceptions.

Several fisheries are considered important in the Coalition area. Steelhead trout (*Oncorhynchus mykiss*) were common in the region prior to the construction of dams on all of the major tributaries of the San Joaquin River. Once the dams were built, historic spawning grounds were eliminated and with them, most of the wild salmonids in the San Joaquin Valley. Currently, no permanent steelhead stocks exist in the drainages of the San Joaquin Valley despite occasional reports of fish in the Tuolumne and Merced Rivers. The California Department of Fish and Game considers the Tuolumne River to have suitable habitat to support a steelhead run if one could become established.

Chinook salmon (*Oncorhynchus tshawytscha*) are present in the San Joaquin system and are found in all major tributaries in the region. All of the major tributaries are considered to be impaired for salmonid spawning and/or migration habitat as is the main stem of the San Joaquin River (Table II-1 of the Sacramento/San Joaquin River Basin Plan).

Table 3. Primary water bodies that drain directly into the major rivers of the ESJWQC region and the beneficial use for each of the major river reaches. A list of beneficial uses is listed below the table.

Water bodies that were sampled during the 2007 irrigation season are bolded. For water bodies that may exist in multiple counties, the county is specified in parenthesis.

Water Body	Immediate Downstream Water Body	Beneficial Use of Immediate Downstream Water Body *
Root Creek @ Rd 35 **	San Joaquin River[1]	1-4, 7-15
Cottonwood Creek (Madera County)**	None[6]	-
Ash Slough**	San Joaquin River[2]	1-4, 7-9, 11-15
Cottonwood Creek (Stanislaus County)		
Bear Creek**		
Dry Creek (Madera County)**		
Duck Slough		
Mattos Drain		
Black Rascal Creek		
Berenda Slough		
Miles Creek		
Mariposa Creek		
Deane Drain		
Owens Creek		
Dutchman Creek		
Berenda Creek**		
Deadman Creek		
Livingston Drain		
Mustang Creek	San Joaquin River[3]	1-4, 7-9, 11-13, 15
August Rd. Drain[7]		
Highline Canal		
Hilmar Drain		
Cavill Drain		
Prairie Flower Drain		
Hatch Drain		
Western States Drain		
Westport Drain		
Dry Creek (Stanislaus County)	Tuolumne River[4]	1-3, 7-10, 12-15
Jones Drain	Merced River[5]	1, 3-15
Merced River		
Silva Drain		
South Slough		

[1] Friant Dam to Mendota Pool reach

[2] Sack Dam to Merced River reach (all waterbodies that drain to this reach enter via the East Side Bypass with the exception of Livingston Drain)

[3] Merced River to Delta reach

[4] New Don Pedro Reservoir to San Joaquin River reach
[5] McSwain Reservoir to San Joaquin River reach
[6] There is no natural course by which Cottonwood Creek flows to the San Joaquin River. Its course is diverted in any number of ways, generally through canals or to open areas for percolation, depending upon the current situation
[7] August Rd. Drain @ Crows Landing subwatershed has been removed from the sampling plan due to safety concerns for the sampling crews
** Surface water flow in these water bodies terminates in subterranean flow except for periods of increased runoff during large winter storms
* Beneficial Use code list:

1 - Municipal and Domestic Supply
2 - Agriculture Supply (irrigation)
3 - Agriculture Supply (stock watering)
4 - Industrial Process Supply
5 - Industrial Service Supply
6 - Hydropower Generation
7 - Water Contact Recreation
8 - Non-contact Water Recreation
9 - Warm Freshwater Habitat
10 - Cold Freshwater Habitat
11 - Migration of Aquatic Organisms (warm)
12 - Migration of Aquatic Organisms (cold)
13 - Spawning, Reproduction, and/or Early Development (warm)
14 - Spawning, Reproduction, and/or Early Development (cold)
15 - Wildlife Habitat

ESJWQC Subwatersheds and Water Bodies

There are 237 water bodies in the Coalition area that are classified into four categories (large, intermediate, small, or lake/reservoir) based on water flow and water body size. The seven large water bodies within the Coalition region are the Chowchilla River, Eastside Bypass, Fresno River, Merced River, San Joaquin River, Tuolumne River and Stanislaus River. With the exception of the Merced River, none of the large rivers are sampled. The Merced River is sampled but relatively high in the watershed to allow the integration of the sampling results from smaller water bodies that drain into the river upstream. Though the amount of irrigated agriculture within these watersheds is similar or even less than some of the watersheds classified as medium sized, water flow in these relatively larger watersheds is primarily a function of source water originating upstream of irrigated agriculture. These rivers have relatively greater base water flow due to snowmelt and reservoir releases. There are 16 intermediate sized water bodies in the Coalition Region. These are primarily natural creeks and sloughs that drain a large portion of the Coalition area. The 164 smaller water bodies in the Coalition area are small-sized natural creeks, agriculture canals, and/or drains. Current, past or potential monitoring sites are provided in Table 4 below. The site subwatershed size (listed as irrigated acres) may have changed due to updated information on the boundary of each subwatershed.

Table 4 contains what have been designated as site subwatersheds. The “site subwatershed” is the watershed formed from the location of the sample site, not the location where the subwatershed has its confluence with a downstream water body. Consequently, site subwatersheds may be smaller than the subwatershed in which they are found. For example, Black Rascal Creek @ Yosemite Road is a small site subwatershed although Black Rascal Creek is classified as an intermediate sized water body. (See glossary of terms for full definition.) Some watersheds do not connect to downstream water bodies except under exceptional conditions such as major flood events.

Table 4. Site subwatersheds within the ESJWQC area listed by size designation (small, intermediate, and large).

Site Subwatershed	Size Designation	Size (Irrigated Acres)
Ash Slough @ Avenue 21	Intermediate	27,704
Bear Creek @ Kibby Rd	Intermediate	6,715
Berenda Creek @ Road 19	Intermediate	25,006
Berenda Slough along Road 18 ½ [2]	Intermediate	19,834
Cottonwood Creek @ Road 20	Intermediate	40,699
Deadman Creek @ Gurr Road	Intermediate	52,091
Deadman Creek @ Highway 59	Intermediate	38,231
Dry Creek @ Road 18	Intermediate	23,299
Dry Creek @ Wellsford Road	Intermediate	23,339
Duck Slough @ Gurr Road	Intermediate	28,712
Duck Slough @ Hwy 99 [3]	Intermediate	15,622
Dutchman Creek @ Highway 99	Intermediate	8,734
Highline Canal @ Hwy 99	Intermediate	35,003
Highline Canal @ Lombardy Ave	Intermediate	29,941
Mustang Creek @ East Ave	Intermediate	12,400
Merced River @ Santa Fe	Large	27,796
August Rd Drain @ Crows Landing Road[1]	Small	1,467
Black Rascal Creek @ Yosemite Rd [4]	Small	744
Cavill Drain @ McGee Road	Small	13,751
Cottonwood Creek @ Sixmile road	Small	442
Deane Drain @ Gurr Road	Small	4,701
Hatch Drain @ Tuolumne Ave	Small	553
Hilmar Drain @ Central Ave	Small	2,106
Jones Drain @ Oakdale Road	Small	2,817
Livingston Drain @ Robin Ave	Small	3,656
Mariposa Creek @ Simonson Way	Small	496
Mattos Drain @ Range Road	Small	1,130
Miles Creek @ Reilly Rd	Small	664
Owens Creek @ Kibby Road	Small	4,828
Prairie Flower Drain @ Crows Landing Road	Small	4,080
Root Creek @ Rd 35	Small	8,378
Silva Drain @ Meadow Drive	Small	69
South Slough @ Quinley Ave	Small	1,137

Site Subwatershed	Size Designation	Size (Irrigated Acres)
Western States Drain @ Central Ave	Small	6,109
Westport Drain @ Vivian Road	Small	1,474

[1] August Rd. Drain @ Crows Landing subwatershed has been removed from the sampling plan due to safety concerns for the sampling crews.
[2] Site subwatershed was previously named Berenda Slough @ Dairyland Road
[3] Site subwatershed was previously named Duck Slough @ Pioneer Rd
[4] Site subwatershed was previously named Black Rascal Creek @ Kibby Road

Watershed Drainage Maps

An overall map detailing the Coalition drainage designation for all site subwatersheds is provided in Figure 3. Maps showing drainage designation for each of the subwatersheds in the Merced, Madera and Stanislaus counties are provided in Figure 4 - Figure 6.

Figure 3. Site subwatershed size designation for all subwatersheds in the Coalition region.

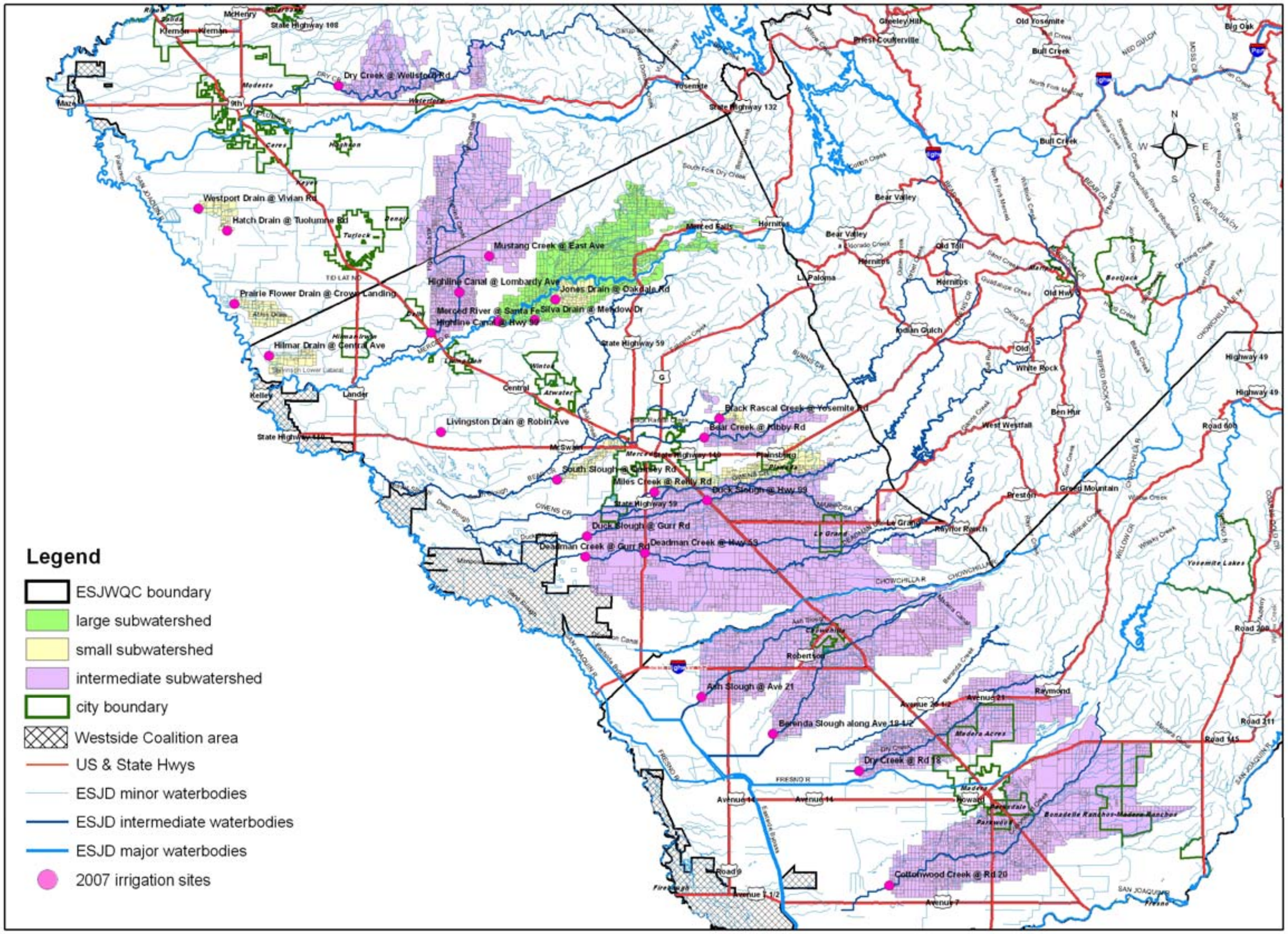


Figure 4. Site subwatershed size designation for Stanislaus County.

A size designation legend is included in Figure 3.

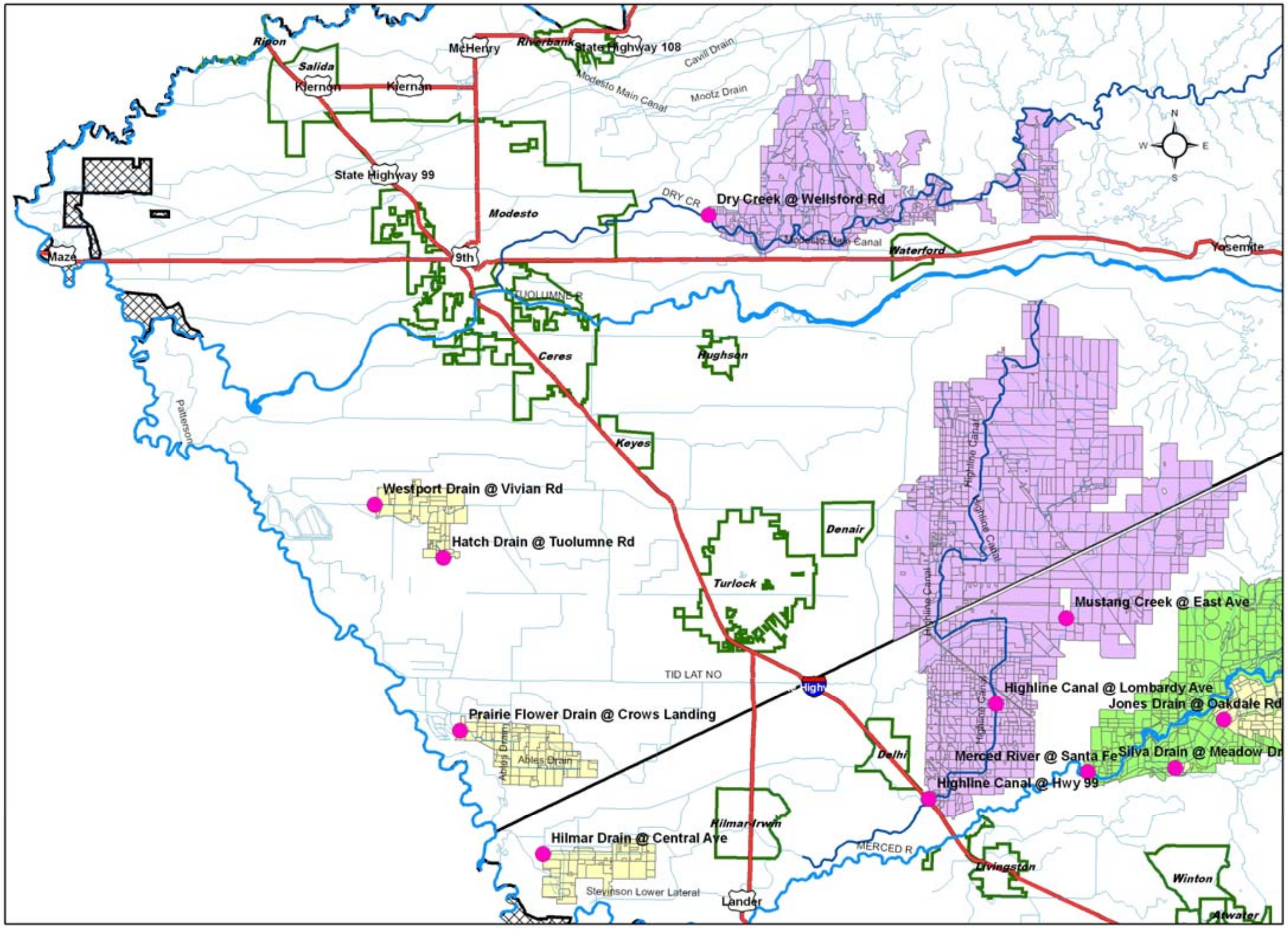


Figure 5. Site subwatershed size designation for Merced County.

A size designation legend is included in Figure 3.

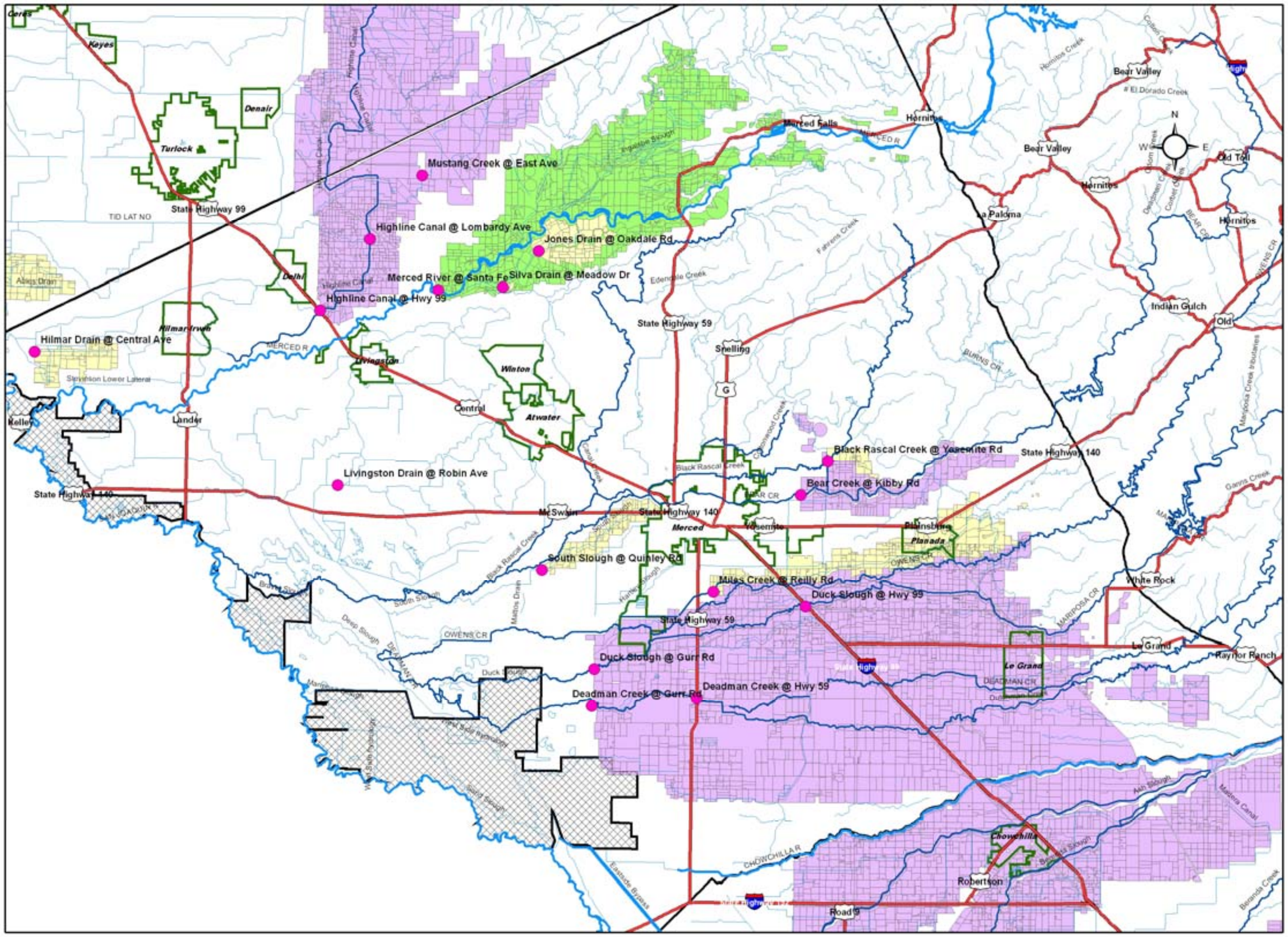
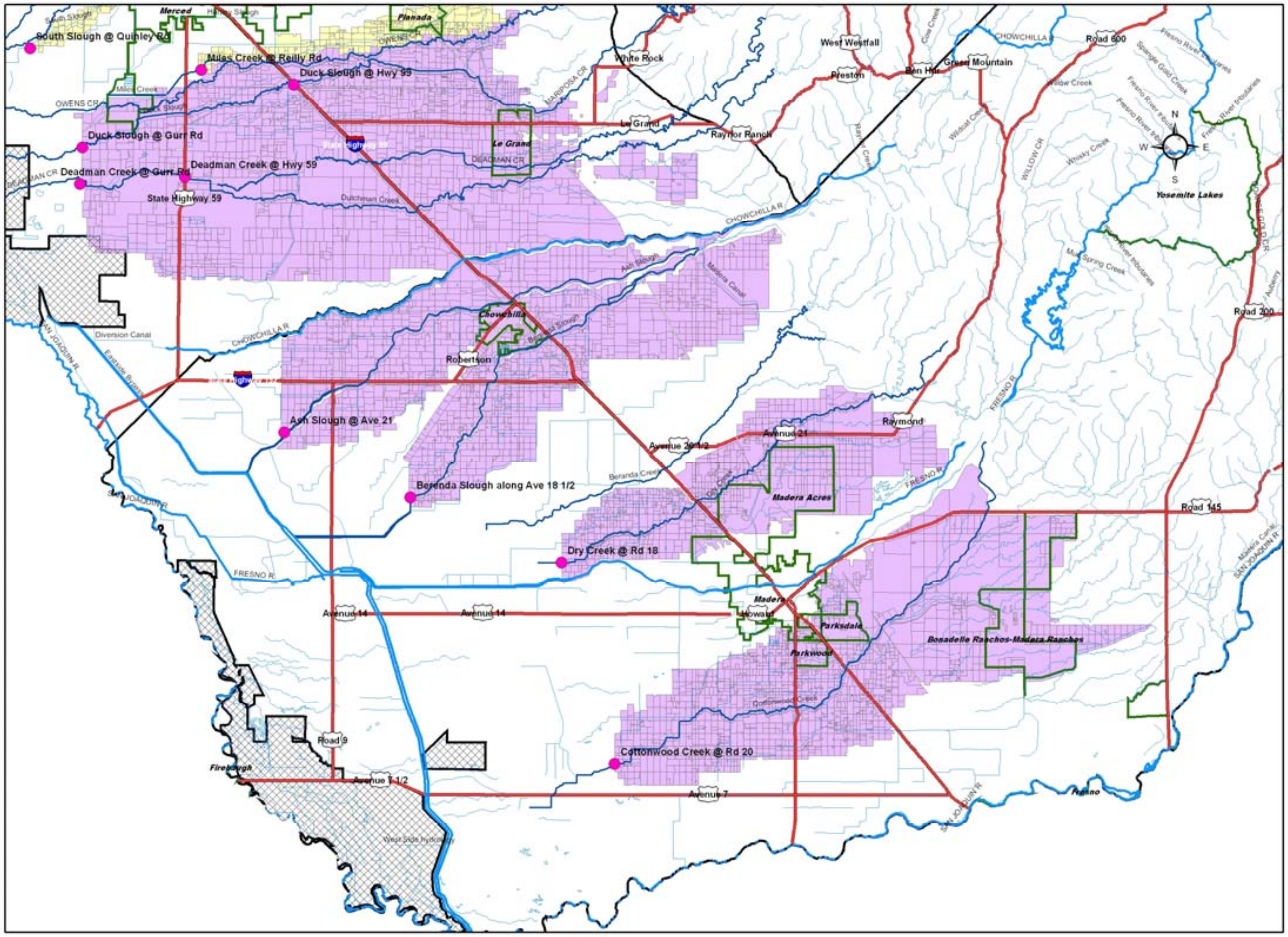


Figure 6. Site subwatershed size designation for Madera County.

A size designation legend is included in Figure 3.



Monitoring Objectives

Coalition monitoring is conducted in both the winter storm runoff season and the summer irrigation season. This report covers only monitoring conducted between the months of April and September 2007, during the irrigation season. Irrigation season sampling is designed to characterize the discharge from agriculture when irrigation is taking place. The objectives of the ESJWQC monitoring program are to:

- Determine the concentration and waste loads in discharges to surface waters
- Evaluate compliance with existing narrative and numeric water quality triggers to determine if implementation of additional management practices is necessary to improve and protect water quality
- Assess the impact of waste discharges from irrigated agriculture to surface water
- Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in watersheds within the Coalition region
- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality

In order to achieve the objectives listed above, the ESJWQC monitored water quality at 24 sites in the Coalition region during the 2007 irrigation season. The Coalition sampled for numerous water quality variables and constituents including 39 pesticides, *E. coli*, physical parameters (TDS, color and turbidity), eight metals, TOC, nutrients, field parameters (DO, pH, EC), water toxicity to three test species including *Ceriodaphnia dubia*, *Pimephales promelas* and *Selenastrum capricornutum* and sediment toxicity to *Hyalella azteca*. Monitoring constituents are established by Coalition Group Monitoring and Reporting Program Order No. R5-2006-0077 and are discussed in more detail below.

Pesticides and Toxicity

Pesticide applications occur throughout the year when return flows can move sediment and chemicals to surface waters. Water collected for chemical analysis can identify those chemicals that may have been transported to surface waters. The concentrations can be compared to numeric and narrative water quality triggers to determine if exceedances have been experienced. Toxicity testing is complementary to chemical analyses and can provide an independent and more direct assessment of the level of impairment in the water body. The objective of the Coalition is to use the results of toxicity testing along with water chemistry analysis to assess the impact of discharges from irrigated agriculture.

Nutrients and Physical Parameters

Excessive nutrients can cause eutrophication of surface waters resulting in elevated total organic carbon, color content, and turbidity. All of these factors can independently cause impairment of surface waters. The Coalition's objective is to determine if exceedances are occurring and to determine if potential sources can be identified through analysis of monitoring data. However, sources of nutrients, organic carbon, color, and low dissolved oxygen are difficult to identify. If current monitoring data are not sufficient, the Coalition may conduct further investigations to identify sources. Such investigations may include special studies where they are determined to be cost effective. By understanding the sources of constituents responsible for the exceedances, the Coalition can properly recommend management practices to address exceedances of nutrients and physical parameters.

Field Parameters

Much like physical parameters, exceedances of water quality objectives for pH, DO, and EC are difficult to track to sources. All of these parameters are non-conserved meaning that they can increase or decrease in value as water moves downstream. These parameters are the result of processes occurring in the water column and sediment, and can vary diurnally. As with nutrients and physical parameters, the Coalition's objective is to determine if exceedances are occurring and to investigate potential sources through analysis of monitoring data and special studies where they are cost effective. By understanding the sources of constituents that may affect field parameters, the Coalition can properly recommend management practices to address the exceedances.

E. coli

E. coli inhabits the intestinal tracts of animals and is voided in fecal material. *E. coli* may persist in the presence of oxygen in the environment for periods of time after being voided. The bacteria are also known to reproduce and magnify in the environment. However, conditions under which this occurs are not well understood and require additional research. Any species of vertebrate that voids feces can contribute *E. coli* to surface waters, including humans, companion animals such as dogs and cats, cows, chickens, waterfowl (ducks and geese), raccoons, otters, ground squirrels, feral pigs, and in some locations deer. Consequently, there may be a large amount of bacteria in any environmental sample that is collected.

As a result of *E. coli* detections in samples collected for Coalition monitoring, a special study was conducted in 2006 to identify the contributing sources of *E. coli* in Coalition water bodies. Results from this study indicated that the most prominent source of bacteria being discharged into water bodies is human, with smaller contributions coming from bovine and chicken. A further explanation of the *E. coli* special study is provided in this document under "Actions Taken to Address Water Quality Impacts."

E. coli from humans can enter aquatic systems from leaky septic systems, leaky sanitary sewer lines, improperly treated discharge from waste water treatment plants, application of biosolids to agricultural land, and direct inputs from individuals who defecate in or near water bodies. Input from cows can occur from dairies, grazing in irrigated pastures, and various manure sources. *E. coli* from chickens can enter from poultry operations or manure sources. Irrigated agriculture is responsible for management if *E. coli* contamination is the result of runoff from irrigated pasture or manure applications for fertilizer.

Metals

The Coalition samples for four basic classes of metals; 1) those that are naturally present because of underlying geologic materials but generally not applied by agriculture (boron, selenium), 2) those that are naturally present because of underlying geologic materials but are applied by agriculture (copper, zinc, nickel), 3) those that may be legacy pesticides but also have numerous nonagricultural sources (lead, arsenic), and 4) those that are found solely as a result of nonagricultural anthropogenic sources (cadmium). These categories are not all mutually exclusive and in fact, all metals belong to the first category. For example, nickel is a plant micronutrient that may be incorporated into fertilizer mixes, although normally there is a sufficient quantity of nickel in soils to supply the needs of crops. As a result, although it may be applied by agriculture, exceedances would be expected to primarily be a result of natural weathering of soils.

Natural weathering of geologic materials can release to surface waters metals and metalloid elements such as selenium, arsenic, and boron. Selenium salts are naturally elevated in the southwest portion of the San Joaquin Valley and are transported to surface waters during storm runoff. These salts are so problematic that there is a prohibition of discharge of irrigation return flows in some locations in the Valley. Arsenic appears to be naturally elevated in several locations in the San Joaquin Valley.

Zinc and nickel are also found in soils and can be found in surface waters at levels that reflect background concentrations. Both of these metals can be applied during agricultural operations as well, and the difference between applications and natural weathering must be understood to properly manage the amounts reaching surface waters. Understanding background levels of these elements will be an important task for the Coalition when trying to understand the impacts of agricultural inputs to surface waters.

While all other metals can be released as a result of the weathering of geologic materials, elevated levels of most metals are a result of anthropogenic inputs. Lead was used as a pesticide during the last century but was used in declining amounts over the last several decades before being prohibited in the 1990s. Lead was also used in gasoline until the early 1980s when it was replaced by other fuel oxygenates. Lead-based paint was routinely used until the latter parts of the last century but is still present in many old buildings and structures. Lead is also a component of batteries, and is the material in solder in numerous electronic devices including televisions, computers, and cell phones. These sources can be distinguished through sophisticated analytical tests that are beyond the capabilities of the Coalition. Copper is routinely used by agriculture on a number of crops and could be found in surface waters as a result of applications. Additional sources include road surfaces where wearing of brake pads can result in substantial loading to surface waters.

Because fertilizer applications and the micronutrient constituents included in fertilizer mixes are not reported, there is no way the Coalition can distinguish between natural and anthropogenic sources with normal monitoring data. Several of these metals can be identified to source using sophisticated analytical equipment and techniques, but these tests are beyond the capabilities of the Coalition. Consequently, the Coalition will use monitoring data to determine if exceedances are occurring, and will attempt to establish background concentrations of some metals in surface waters to determine if concentrations are a result of natural or anthropogenic inputs to the water. In addition, if it is concluded that it is necessary to determine if the metals are bioavailable, additional analyses may be used to determine the amount of soluble metals as compared to particulate bound metals.

Sampling Site Descriptions

The site names, codes and locations of the 24 sites monitored during the 2007 irrigation season are provided in Table 5. A narrative description of each site subwatershed with respect to hydrology and agricultural production follows below.

Table 5. ESJWQC irrigation 2007 sampling locations.

Site Name	Station Code	Latitude	Longitude
Ash Slough @ Ave 21	545XASAAT	37.0545	-120.4158
Bear Creek @ Kibby Rd†	535XBCAKR	37.3128	-120.4138
Berenda Slough along Ave 18 1/2	545XBSAAE	37.0182	-120.3265
Black Rascal Creek @ Yosemite Rd	535BRCAYR	37.33208	-120.3947
Cottonwood Creek @ Rd 20†	545XCCART	36.8686	-120.1818
Deadman Creek @ Gurr Rd	535XDCAGR	37.1936	-120.5612
Deadman Creek @ Hwy 59	535DMCAHF	37.1981	-120.4869
Dry Creek @ Rd 18	545XDCARE	36.9818	-120.2195
Dry Creek @ Wellsford Rd†	535XDCAWR	37.6602	-120.8743
Duck Slough @ Gurr Rd†	535XDSAGR	37.2142	-120.5596
Duck Slough @ Hwy 99†	535XDSAHN	37.2501	-120.4100
Hatch Drain @ Tuolumne Rd*	535XHDATR	37.5149	-121.0122
Highline Canal @ Hwy 99†	535XHCHNN	37.4153	-120.7557
Highline Canal @ Lombardy Ave†	535XHCALR	37.4556	-120.7207
Hilmar Drain @ Central Ave†	535XHDACA	37.3906	-120.9582
Jones Drain @ Oakdale Rd†	535XJDAOR	37.4495	-120.6007
Livingston Drain @ Robin Ave*	535XLDARA	37.3169	-120.7423
Merced River @ Santa Fe†	535XMRSFD	37.4271	-120.6721
Miles Creek @ Reilly Rd*	535XMCARR	37.2582	-120.4755
Mustang Creek @ East Ave	535XMCAEA	37.4918	-120.6839
Prairie Flower Drain @ Crows Landing Rd†	535XPFDCL	37.4422	-121.0024
Silva Drain @ Meadow Dr	535XSDAMD	37.4291	-120.6261
South Slough @ Quinley Rd	535XSSAQR	37.2699	-120.5971
Westport Drain @ Vivian Rd*	535XWDAVR	37.5368	-121.0486

* indicates new sites for irrigation 2007
† indicates sites that have been monitored for at least two years

Site Subwatershed Descriptions

Descriptions of the 24 site subwatersheds are provided below alphabetically.

Ash Slough @ Avenue 21 (27,704 irrigated acres) – Agriculture upstream includes vineyards, field crops, and deciduous nuts. Ash Slough flows just north of Chowchilla but there appears to be a buffer of agricultural land between Ash Slough and Chowchilla. Dairies are located upstream.

Bear Creek @ Kibby Road (6,715 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. The primary irrigated agriculture in the site subwatershed includes deciduous nuts, field crops, truck crops, and irrigated pasture.

Berenda Slough along Road 18 ½ (25,006 irrigated acres) – Berenda Slough flows through the northern portion of Madera County and empties into the Eastside Bypass. The primary agriculture is orchards and vineyards with small amounts of pasture and field crops.

Black Rascal Creek @ Yosemite Road (744 irrigated acres) – The headwaters of Black Rascal Creek originate in the Sierra foothills. It is located just to the north of the Bear Creek site subwatershed and to the east of the city of Merced. Citrus and field crops make up the majority of the agriculture in the site subwatershed.

Cottonwood Creek @ Road 20 (40,699 irrigated acres) – This site subwatershed is at the very southern edge of the Coalition region in Madera County and drains into the Eastside Bypass. The immediate upstream agriculture is vineyards and there are deciduous nuts farther to the east. There are only a few dairies in the Cottonwood Creek site subwatershed.

Deadman Creek @ Gurr Rd (52,091 irrigated acres) - This site subwatershed is a downstream site from Deadman Creek @ Hwy 59. The primary agriculture in the site subwatershed is orchards and row crops with some irrigated pasture upstream.

Deadman Creek @ Highway 59 (38,231 irrigated acres) – Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59. The primary agriculture in the site subwatershed is orchards and row crops with some irrigated pasture upstream.

Dry Creek @ Road 18 (23,299 irrigated acres) – Dry Creek originates in the Sierra foothills and flows to the north of the city of Madera eventually draining into the San Joaquin River through various channels and irrigation ditches. Deciduous crops are the primary irrigated agriculture in the upper portion of the site subwatershed whereas vineyards predominate in the lower portions. There are field crops scattered throughout the site subwatershed.

Dry Creek @ Wellsford Road (23,339 irrigated acres) – This site subwatershed is in the northern part of the Coalition region and drains a combination of field crops, deciduous nuts, and vineyards. 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. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal.

Duck Slough @ Gurr Road (28,712 irrigated acres) – This site subwatershed is a monitoring location downstream from Duck Slough @ Hwy 99. 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. The city of Merced delivers treated water to Duck Slough a few miles upstream of the Gurr Road site. 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.

Duck Slough @ Hwy 99 (15,622 irrigated acres) – This site subwatershed is located upstream of the Duck Slough @ Gurr Road site and was selected to determine relative contribution of water quality impairments in the upstream portion of the Duck Slough subwatershed. 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. Irrigated agriculture in this site subwatershed is primarily deciduous nuts, with truck crops and irrigated pasture the next most common land uses.

Hatch Drain @ Tuolumne Rd (553 irrigated acres) – This small site subwatershed is located in the western portion of the Coalition region in Stanislaus County. The two major crops are citrus and field crops.

Highline Canal @ Highway 99 (35,003 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District 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. The irrigated agriculture is primarily deciduous nuts, and these are located at the lower end of the site subwatershed. A small number of vineyards are also present.

Highline Canal @ Lombardy Road (29,941 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. The main upstream tributary of the Highline Canal is Mustang Creek. The Highline Canal flows west and eventually drains into the Merced River. Dairies are present upstream and Mustang Creek, a major tributary during the dormant season, passes immediately to the southeast of the Turlock Airport. The main agricultural crop upstream is deciduous nuts.

Hilmar Drain @ Central Ave (2,106 irrigated acres) – This site subwatershed is located toward the western edge of the Coalition region near the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture. Hilmar Drain originates at Williams Ave and Washington Road and eventually drains into the San Joaquin River.

Jones Drain @ Oakdale Road (2,819 irrigated acres) – Based on information obtained from recent maps, the Coalition established a monitoring site at what was thought to be Jones Drain @ Oakdale Road. However, based on recent discussions with local landowners and information from old maps indicate that the monitoring site is actually located on the Shaffer-Griffith ditch which does not flow into the Merced River. The S-G Ditch obtains water from the Merced River and routes the water to the irrigated land in the vicinity. The Coalition has petitioned for the removal of the site due to this new information about flow and recirculation of irrigation water. This site subwatershed will no longer be sampled after the 2007 irrigation season.

Livingston Drain @ Robin Ave (3,656 irrigated acres) – Livingston Drain is located in the west central portion of the Coalition region in Merced County. It is located west of Atwater and Livingston. The agriculture is almost entirely citrus.

Merced River @ Santa Fe Drive (27,796 irrigated acres) – This water body is designated as a major water body and is 303d listed. It was selected as an integrator site for several of the drains and tributaries in the vicinity. The Merced River originates in the high Sierra encountering several dams and impoundments as it flows west. The Merced River eventually drains into the San Joaquin River near Hatfield State Park. Upstream agriculture includes some field crops in the immediate vicinity of the river and deciduous nuts, primarily almonds.

Miles Creek @ Reilly Rd. (9,664 irrigated acres) – Miles Creek is located just north of Duck Slough and drains into Owen's Creek. The primary agriculture includes field crops, deciduous nut & fruit, pasture and truck, nursery and berry. Within the subwatershed are also urban drainages, dairies and hay and pasture lands.

Mustang Creek @ East Ave (12,400 irrigated acres) – Mustang Creek originates in the foothills of the Sierra Nevada and flows into the upper portion of the Highline Canal. Mustang Creek is ephemeral with flow found primarily during winter runoff events. Summer flows are intermittent. Citrus and deciduous nut crops are the main agriculture with smaller amounts of field crops and grains and hay.

Prairie Flower Drain @ Crows Landing Road (4,080 irrigated acres) – Relative to other drains in the western portion of the Coalition region, Prairie Flower Drain is longer and appears to drain mostly irrigated agriculture. Dairies and feedlots are ubiquitous in this part of the Coalition region and this drain may receive runoff from several dairies immediately upstream. Upstream agriculture is field crops.

Silva Drain @ Meadow Drive (69 irrigated acres) – This is a very small site subwatershed that joins with Jones Drain just upstream of the confluence of Jones Drain with the Merced River. The primary agriculture is citrus orchards with small amounts of field crops and irrigated pasture. Large dairies are found in the site subwatershed.

South Slough @ Quinley Road (1,137 irrigated acres) – South Slough begins just west of Merced and eventually flows into Bear Creek. Pasture, deciduous nuts, and citrus are the primary crops in the site watershed.

Westport Drain @ Vivian Road (1,474 irrigated acres) – This site subwatershed is located adjacent to the Hatch Drain subwatershed in the western portion of the Coalition region. The primary agriculture in this site subwatershed is citrus and field crops.

Monitoring and Analysis

Table 6 and Table 7 specify the constituents monitored at each site subwatershed. The Coalition monitoring program consists of a mix of Phase I and Phase II monitoring elements at various sites. As a result, the sites added to the Coalition monitoring program in May 2006 (e.g. Berenda Slough, Black Rascal Creek, Deadman Creek @ Hwy 59, Mustang Creek, Silva Drain and South Slough) do not require sampling for metals or nutrients as outlined in Table 1 of the CVRWQCB's MRP document. Four sites were also added for the 2007 irrigation season, however all constituents were monitored at those sites. Although pesticides other than those identified by 303d listings are not required to be monitored, the Coalition is monitoring all Phase II pesticides during Phase I and Phase II.

Additionally, because two years of sampling resulted in no exceedances of *E. coli* or sediment toxicity at the Merced River @ Santa Fe sample site, both of these tests were withdrawn from the suite of analytes monitored at that site in 2006.

Table 6. ESJWQC irrigation 2007 sampling constituents.

Constituents listed below include field parameters (pH, DO, EC and temperature), biological oxygen demand (BOD), metals, nutrients, physical parameters (color, turbidity, total dissolved solids), total organic carbon (TOC), *E. coli*, water column toxicity (WCT) and sediment (sed) toxicity. Metals, nutrients, and physical parameters are provided in Table 30.

Site Name	Field Parameters	BOD[1]	Metals	Nutrients	TOC	Physical Parameters	*E. coli*	WCT	Sed Toxicity
Ash Slough @ Ave 21	x	x	x	x	x	x	x	x	x
Berenda Slough along Ave 18 1/2	x	x			x	x	x	x	x
Bear Creek @ Kibby Rd	x	x	x	x	x	x	x	x	x
Black Rascal Creek @ Yosemite Rd	x	x			x	x	x	x	x
Cottonwood Creek @ Rd 20	x	x	x	x	x	x	x	x	x
Deadman Creek @ Gurr Rd†	x	x	x	x	x	x	x	x	x
Deadman Creek @ Hwy 59	x	x			x	x	x	x	x
Dry Creek @ Rd 18	x	x	x	x	x	x	x	x	x
Dry Creek @ Wellsford Rd	x	x	x	x	x	x	x	x	x
Duck Slough @ Gurr Rd†	x	x	x	x	x	x	x	x	x
Duck Slough @ Hwy 99	x	x	x	x	x	x	x	x	x
Hatch Drain @ Tuolumne Rd*	x	x	x	x	x	x	x	x	x
Highline Canal @ Hwy 99	x	x	x	x	x	x	x	x	x
Highline Canal @ Lombardy Ave	x	x	x	x	x	x	x	x	x
Hilmar Drain @ Central Ave	x	x	x	x	x	x	x	x	x
Jones Drain @ Oakdale Rd	x	x	x	x	x	x	x	x	x
Livingston Drain @ Robin Ave*	x	x	x	x	x	x	x	x	x
Merced River @ Santa Fe†	x	x	x	x	x	x		x	
Miles Creek @ Reilly Rd*	x	x	x	x	x	x	x	x	x
Mustang Creek @ East Ave	x	x			x	x	x	x	x
Prairie Flower Drain @ Crows Landing Rd	x	x	x	x	x	x	x	x	x
Silva Drain @ Meadow Dr	x	x			x	x	x	x	x
South Slough @ Quinley Rd	x	x			x	x	x	x	x
Westport Drain @ Vivian Rd*	x	x	x	x	x	x	x	x	x

[1] Only collected/analyzed during the first irrigation and fourth sampling event
† indicates sites that have been monitored for at least two years

* sites that were added during the 2007 irrigation season

Table 7. ESJWQC irrigation 2007 sampling constituents.

Constituents listed below include the five major pesticide groups including organophosphates, pyrethroids, carbamates, herbicides/triazines, and organochlorines. In addition, glyphosate and paraquat were analyzed at all sampling sites and are listed separately because of different analytical procedures. Pesticides are provided in Table 30.

Site Name	Organo-phosphates	Pyrethroids	Carbamates	Herbicides	Organo-chlorines	Glyphosate and Paraquat
Ash Slough @ Ave 21	x	x	x	x	x	x
Berenda Slough along Ave 18 1/2	x	x	x	x	x	x
Bear Creek @ Kibby Rd	x	x	x	x	x	x
Black Rascal Creek @ Yosemite Rd	x	x	x	x	x	x
Cottonwood Creek @ Rd 20	x	x	x	x	x	x
Deadman Creek @ Gurr Rd	x	x	x	x	x	x
Deadman Creek @ Hwy 59	x	x	x	x	x	x
Dry Creek @ Rd 18	x	x	x	x	x	x
Dry Creek @ Wellsford Rd	x	x	x	x	x	x
Duck Slough @ Gurr Rd†	x	x	x	x	x	x
Duck Slough @ Hwy 99	x	x	x	x	x	x
Hatch Drain @ Tuolumne Rd*	x	x	x	x	x	x
Highline Canal @ Hwy 99	x	x	x	x	x	x
Highline Canal @ Lombardy Ave	x	x	x	x	x	x
Hilmar Drain @ Central Ave	x	x	x	x	x	x
Jones Drain @ Oakdale Rd	x	x	x	x	x	x
Livingston Drain @ Robin Ave*	x	x	x	x	x	x
Merced River @ Santa Fe†	x	x	x	x	x	x
Miles Creek @ Reilly Rd*	x	x	x	x	x	x
Mustang Creek @ East Ave	x	x	x	x	x	x
Prairie Flower Drain @ Crows Landing Rd	x	x	x	x	x	x
Silva Drain @ Meadow Dr	x	x	x	x	x	x
South Slough @ Quinley Rd	x	x	x	x	x	x
Westport Drain @ Vivian Rd*	x	x	x	x	x	x

† indicates sites that have been monitored for at least two years
* sites that were added during the 2007 irrigation season

Location Maps of Sample Sites and Land Use

All site subwatersheds in Table 11 drain agricultural land in the Coalition region. The tables provided include the land use acreage for each major crop or land use type and indicate whether the land area is irrigated or non-irrigated. Land use maps are provided in Figure 7 - Figure 10, (a legend for land use is provided in Figure 11), and included parcel specific land use data in each of the site subwatersheds as well as the hydrology within the site subwatershed that drains those parcels. Not included are roadside ditches that may drain fields to the nearest surface water body. Ditches are constructed to move water draining from roads adjacent to the fields and are not generally constructed to move water draining from agricultural fields. The site subwatershed sizes (listed as total and irrigated acres) may have changed due to updated information on the boundary of each subwatershed. Land use information was obtained from data provided by California Department of Water Resources (http://www.landwateruse.water.ca.gov/annualdata/landuse/2001/landuselevels.cfm).

Table 8. Land use acreage of site subwatersheds monitored during the 2007 irrigation season. The land uses are designated as irrigated/non-irrigated (I/NI). Sites are listed alphabetically from Ash Slough to Hatch Drain.

Land Use	I/NI	Ash Slough @ Ave 21	Bear Creek @ Kibby Rd	Beranda Slough along Ave 18 1/2	Black Rascal Creek @ Yosemite Rd	Cottonwood Creek @ Rd 20	Deadman Creek @ Gurr Rd	Deadman Creek @ Hwy 59	Dry Creek @ Wellsford Rd	Dry Creek @ Rd 18	Duck Slough @ Gurr Rd	Duck Slough @ Hwy 99	Highline Canal @ Hwy 99	Highline Canal @ Lombardy Ave.	Highline Canal (Stanislaus)	Hilmar Drain @ Central Ave.	Hatch Drain @ Tuolumne Rd
Citrus	I		48.1	96.7		570.6	7.3	7.3	7.6	421.7					76.7		
Deciduous nut and fruit	I	6,888.9	2,934.7	15,573.5	53.9	10,325.6	11,333.2	10,246.3	8,064.3	12,103.0	8,766.3	8,290.2	7,988.6	4,012.0	12,563.6	31.7	210.6
Field crop	I	9,101.3	1,581.2	3,048.0	241.1	3,724.4	16,221.1	11,457.9	4,515.7	1,105.3	7,974.9	2,768.3	929.8	684.9	5,976.4	1,365.2	169.6
Field crop	NI					314.2											
Grain and hay	I	726.5	223.0	1,803.7		664.1	3,120.9	2,366.3	216.0	1,657.3	1,271.0	415.8	550.7	550.7	75.6		
Grain and hay	NI		242.4	1,413.1		2,009.0	1,164.7	1,152.7	2,179.0		321.6	258.6					
Idle	I	33.0		261.0		1,172.5	671.7	665.6	238.5	495.4	831.6	314.7	221.4	80.4			
Idle	NI																
Wild vegetation	NI	998.8	237.7	3,791.6	12.5	11,329.5	12,060.0	7,318.2	39,705.9	3,916.7	3,153.7	422.5	184.6	142.0	365.2		
Water surface	NI	274.2		267.0		615.1	392.5	295.6	204.1	104.3	172.0	94.4	18.9	18.9	163.8	11.7	
Pasture	I	4,935.9	1,414.2	1,695.0	389.9	846.8	14,833.4	8,740.0	7,346.4	637.5	7,378.4	2,444.6	791.4	734.6	4,034.6	708.6	169.7
Pasture	NI						21.5		1,310.3		75.7	66.0	335.7	335.7	16.4		
Rice	I						913.9		1,187.9		318.1						
Feedlot, dairy, farmstead	NI	712.1	66.8	720.1		561.5		626.1	1,414.3	446.1	1,056.4	438.7	353.8	189.9	993.7	223.0	16.5
Truck, nursery, berry	I	635.0	514.2	115.7	59.3	85.3	3,393.0	3,328.8		169.4	2,171.8	1,388.4	261.1		110.0		2.7
Urban	NI	1,310.8	10.1	1,621.6		10,061.8	389.6	312.3	486.2	4,614.4	675.7	474.3	456.7	192.1	146.1		55.0
Golfcourse, cemetery, landscape	NI	32.8		23,334.9		25.0					17.0		4.1	1.2			
Vineyard	I	5,383.2		2412.1		23,309.9	1,596.5	1,418.2	1,762.3	6,709.7			599.2	217.0	824.0		
Total acres		**31,032.4**	**7,272.4**	**56,154.1**	**756.8**	**65,615.3**	**66,119.4**	**47,935.4**	**68,638.3**	**32,380.6**	**34,184.0**	**17,376.5**	**12,695.9**	**7,159.4**	**25,346.2**	**2,340.2**	**624.1**
irrigated acres		**27,703.8**	**6,715.4**	**25,005.7**	**744.3**	**40,699.2**	**52,091.1**	**38,230.5**	**23,338.6**	**23,299.2**	**28,711.8**	**15,622.1**	**11,342.2**	**6,279.5**	**23,660.9**	**2,105.5**	**552.6**

Table 9. Land use acreage of site subwatersheds selected for monitoring during the 2007 irrigation season. The land uses are designated as irrigated/non-irrigated (I/NI). Sites are listed alphabetically from Highline Canal to Westport Drain.

Land Use	I/NI	Highline Canal @ Hwy 99	Highline Canal @ Lombardy Ave.	Highline Canal - Stanislaus County portion	Hilmar Drain @ Central Ave.	Jones Drain @ Oakdale Rd	Livingston Drain @ Robin Ave	Merced River @ Santa Fe	Miles Creek @ Reilly Rd	Mustang Creek @ East Ave.	Mustang Creek - Stanislaus County portion	Prairie Flower Drain @ Crows Landing Rd.	Silva Drain @ Meadow Dr	South Slough @ Quinley Ave.	Westport Drain @ Vivian Rd
Citrus	I			76.7				45.4	3.3					299.2	
Deciduous nut and fruit	I	7,988.6	4,012.0	12,563.6	31.7	1,270.2	2,366.7	14,109.4	1,767.0	3,304.2	695.9			593.2	432.0
Field crop	I	929.8	684.9	5,976.4	1,365.2	649.2	58.3	5,421.8	3,927.4	1,595.4	194.9	2,673.6	60.7		575.3
Field crop	NI							140.1						330.7	
Grain and hay	I	550.7	550.7	75.6			176.1	700.3	547.5	701.3	343.9				
Grain and hay	NI							226.3	535.9					62.0	
Idle	I	221.4	80.4				17.9	141.1	144.8						
Idle	NI							276.2							
Wild vegetation	NI	184.6	142.0	365.2		1,560.8	130.9	5,005.6	568.1	193.4					
Water surface	NI	18.9	18.9	163.8	11.7	21.9	2.3	256.2	81.7	5.0		30.4		645.3	
Pasture	I	791.4	734.6	4,034.6	708.6	455.0	57.5	4,483.5	2,200.7	320.0		1,406.3	7.9		264.1
Pasture	NI	335.7	335.7	16.4			19.8	100.9							
Rice	I													201.5	
Feedlot, dairy, farmstead	NI	353.8	189.9	993.7	223.0	190.0	145.7	1,098.9	474.9	31.1		442.6		145.7	126.3
Truck, nursery, berry	I	261.1		110.0		44.0	921.9	278.4	1,072.8					42.7	
Urban	NI	456.7	192.1	146.1		88.6	37.1	338.6	860.3						
Golfcourse, cemetery, landscape	NI	4.1	1.2					3.9	15.0						7.0
Vineyard	I	599.2	217.0	824.0		400.6	57.8	2,616.0		1,327.7	3,916.5				202.4
Total acres		**12,695.9**	**7,159.4**	**25,346.2**	**2,340.2**	**4,680.1**	**3,991.8**	**35,242.5**	**12,199.6**	**7,478.1**	**5,151.1**	**4,552.8**	**68.7**	**2,320.2**	**1,607.1**
irrigated acres		**11,342.2**	**6,279.5**	**23,660.9**	**2,105.5**	**2,818.9**	**3,656.1**	**27,795.8**	**9,663.5**	**7,248.6**	**5,151.1**	**4,079.9**	**68.7**	**1,136.6**	**1,473.8**

Figure 7. Coalition map showing all site subwatersheds identified for sampling in 2007 irrigation season.

Land use designations are provided in Figure 11.

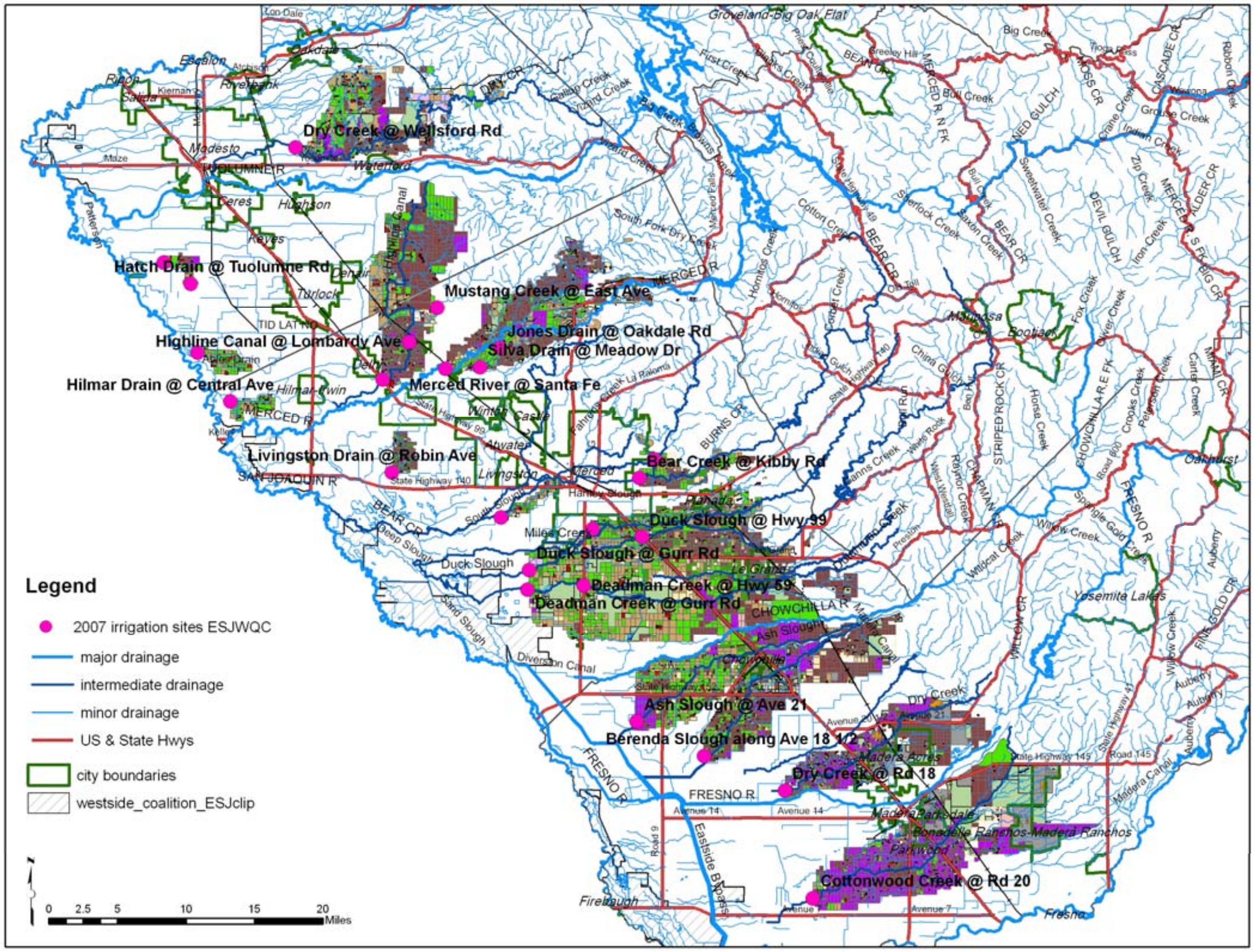


Figure 8. Land use for sampling sites in Stanislaus County.

Land use designations are provided in Figure 11.

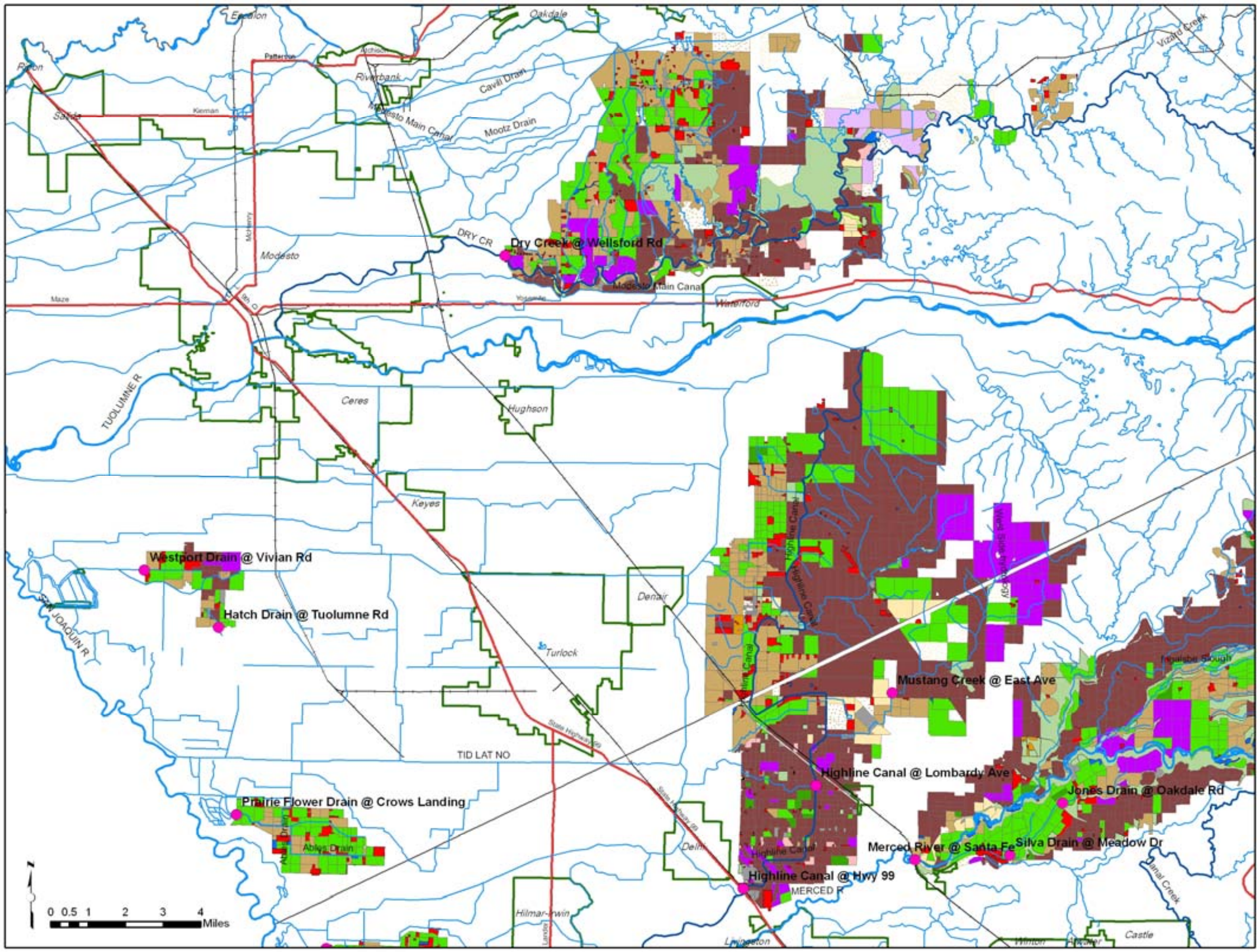


Figure 9. Land use for sampling sites in Merced County.

Land use designations are provided in Figure 11.

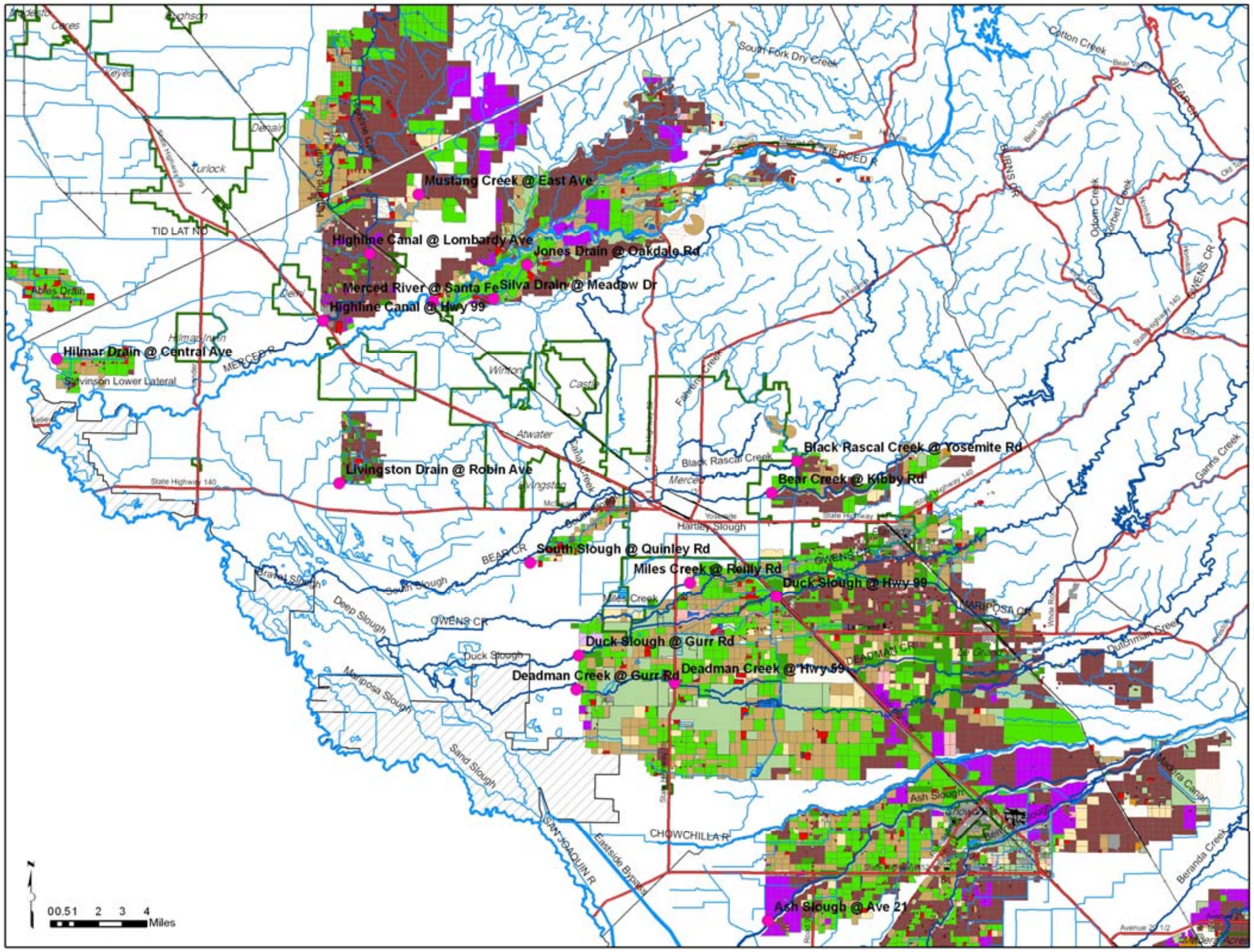


Figure 10. Land use for sampling sites in Madera County.

Land use designations are provided in Figure 11.

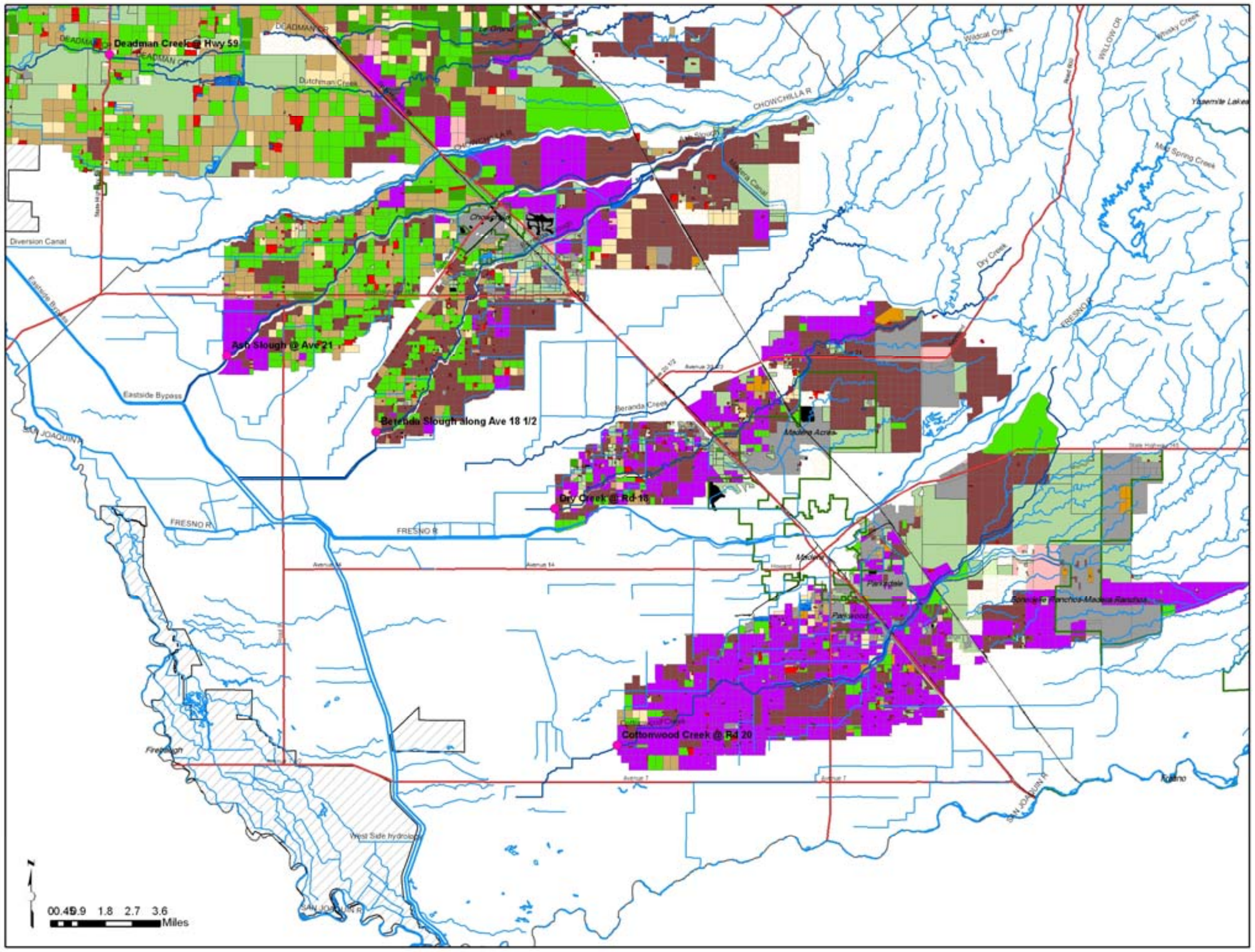


Figure 11. Legend for land use data.

Monitoring Results

Full monitoring results from the 2007 irrigation season are included in Appendix I. The results include field parameters, organics, inorganics including metals and *E. coli*, toxicity and calculated loads for any detectable analyte with corresponding site flow. Monitoring results include samples taken for normal monitoring (including resampling due to toxicity), management plan monitoring and special studies (TDS, metals and BOD). Each sampling location, sampling date, sampling time and type of monitoring is listed in Table 10.

Table 10. Sample details for all 2007 irrigation season sorted by station name, sample date and monitoring event.

NM = Normal Monitoring (water column) including resampling due to toxicity. MPM = Management Plan Monitoring. Sediment = Sediment sampling including resampling due to toxicity.

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation1	04/24/07	12:30	Dry	
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation2	05/29/07	12:05	Dry	
Ash Slough @ Ave 21	545XASAAT	MPM	Irrigation3	06/19/07	9:00	Dry	
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation3	06/26/07	12:30	Dry	
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation4	07/24/07	16:10	Dry	
Ash Slough @ Ave 21	545XASAAT	MPM	Irrigation4	07/31/07	13:32	Dry	
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation5	08/21/07	15:10	Dry	
Ash Slough @ Ave 21	545XASAAT	Sediment	Irrigation5	08/23/07	13:20	Dry	
Ash Slough @ Ave 21	545XASAAT	MPM	Irrigation5	08/28/07	13:00	Dry	
Ash Slough @ Ave 21	545XASAAT	NM	Irrigation6	09/18/07	10:47	Dry	
Ash Slough @ Ave 21	545XASAAT	MPM	Irrigation6	09/25/07	14:30	Dry	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation1	04/17/07	16:10	none	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation2	05/29/07	9:20	none	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation3	06/26/07	11:00	none	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation4	07/24/07	17:30	none	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation4	07/31/07	16:40	none	Resampling event due to *Ceriodaphnia* toxicity on 07/24/07.
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation5	08/21/07	17:00	none	
Bear Creek @ Kibby Rd	535XBCAKR	Sediment	Irrigation5	08/23/07	14:00	none	
Bear Creek @ Kibby Rd	535XBCAKR	NM	Irrigation6	09/18/07	13:00	none	
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation1	04/24/07	13:00	Dry	
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation2	05/29/07	12:40	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation2	06/05/07	14:30	none	Resampling event due to *Selenastrum* toxicity on 05/29/07.
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation3	06/26/07	13:00	none	
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation4	07/24/07	9:50	none	
Berenda Slough along Ave 18 1/2	545XBSAAE	MPM	Irrigation4	07/31/07	12:50	none	Resampling event due to *Selenastrum* toxicity on 07/24/07. Management plan monitoring: chlorpyrifos
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation5	08/21/07	14:10	none	
Berenda Slough along Ave 18 1/2	545XBSAAE	Sediment	Irrigation5	08/23/07	12:40	none	
Berenda Slough along Ave 18 1/2	545XBSAAE	NM	Irrigation6	09/18/07	10:20	Dry	
Berenda Slough along Ave 18 1/2	545XBSAAE	MPM	Irrigation6	09/25/07	14:17	Dry	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation1	04/17/07	19:10	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation2	05/29/07	10:30	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation2	06/05/07	11:20	none	Resampling event due to *Ceriodaphnia* toxicity on 05/29/07.
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation3	06/26/07	10:00	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation4	07/24/07	17:20	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation4	07/31/07	16:20	none	Resampling event due to *Ceriodaphnia* toxicity on 07/24/07.
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation5	08/21/07	16:10	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	Sediment	Irrigation5	08/23/07	13:30	none	
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation5	08/28/07	14:20	none	Resampling event due to *Ceriodaphnia* toxicity on 08/21/07.
Black Rascal Creek @ Yosemite Rd	535BRCAYR	NM	Irrigation6	09/18/07	12:00	none	
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation1	04/24/07	15:20	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation2	05/29/07	15:20	none	
Cottonwood Creek @ Rd 20	545XCCART	MPM	Irrigation3	06/19/07	9:50	none	Management plan monitoring: copper
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation3	06/26/07	15:30	none	
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation4	07/24/07	13:00	none	
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation5	08/21/07	13:00	none	
Cottonwood Creek @ Rd 20	545XCCART	Sediment	Irrigation5	08/23/07	10:30	none	
Cottonwood Creek @ Rd 20	545XCCART	NM	Irrigation6	09/18/07	9:35	Dry	
Cottonwood Creek @ Rd 20	545XCCART	MPM	Irrigation6	09/25/07	13:40	Dry	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation1	04/24/07	14:00	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation2	05/29/07	11:30	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation2	06/05/07	12:50	none	Resampling event due to *Pimephales* toxicity on 05/29/07.
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation3	06/26/07	11:20	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation4	07/24/07	11:30	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation4	07/31/07	14:00	none	Resampling event due to *Selenastrum* toxicity on 07/24/07.
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation5	08/21/07	12:20	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	Sediment	Irrigation5	08/23/07	11:30	none	
Deadman Creek (Dutchman) @ Gurr Rd	535XDCAGR	NM	Irrigation6	09/18/07	11:00	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation1	04/24/07	15:00	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation2	05/29/07	13:40	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation3	06/26/07	12:20	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation4	07/24/07	12:40	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation5	08/21/07	11:20	none	
Deadman Creek @ Hwy 59	535DMCAHF	Sediment	Irrigation5	08/23/07	11:00	none	
Deadman Creek @ Hwy 59	535DMCAHF	NM	Irrigation6	09/18/07	11:40	none	
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation1	04/24/07	13:30	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation2	05/29/07	13:50	none	
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation2	06/05/07	15:30	none	Resampling event due to *Selenastrum* toxicity on 05/29/07.
Dry Creek @ Rd 18	545XDCARE	MPM	Irrigation3	06/19/07	8:50	none	Management plan monitoring: copper
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation3	06/26/07	14:10	none	
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation4	07/24/07	11:20	none	
Dry Creek @ Rd 18	545XDCARE	MPM	Irrigation4	07/31/07	12:00	none	Management plan monitoring: copper
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation5	08/21/07	10:00	none	
Dry Creek @ Rd 18	545XDCARE	Sediment	Irrigation5	08/23/07	11:50	none	
Dry Creek @ Rd 18	545XDCARE	MPM	Irrigation5	08/28/07	12:10	none	Management plan monitoring: copper
Dry Creek @ Rd 18	545XDCARE	NM	Irrigation6	09/18/07	9:56	Dry	
Dry Creek @ Rd 18	545XDCARE	MPM	Irrigation6	09/25/07	14:01	Dry	
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation1	04/17/07	9:10	none	
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation2	05/15/07	8:30	none	
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation3	06/19/07	14:50	none	
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation4	07/17/07	9:20	none	
Dry Creek @ Wellsford Rd	535XDCAWR	MPM	Irrigation4	07/31/07	11:30	none	Management plan monitoring: organophosphates
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation5	08/14/07	9:10	none	
Dry Creek @ Wellsford Rd	535XDCAWR	Sediment	Irrigation5	08/16/07	9:40	none	
Dry Creek @ Wellsford Rd	535XDCAWR	MPM	Irrigation5	08/28/07	11:20	none	Management plan monitoring: organophosphates
Dry Creek @ Wellsford Rd	535XDCAWR	NM	Irrigation6	09/11/07	9:00	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Dry Creek @ Wellsford Rd	535XDCAWR	MPM	Irrigation6	09/25/07	10:40	none	Management plan monitoring: *Ceriodaphnia*
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation1	04/24/07	12:40	none	
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation2	05/29/07	10:10	none	
Duck Slough @ Gurr Rd	535XDSAGR	MPM	Irrigation3	06/19/07	9:30	none	Management plan monitoring: copper
Duck Slough @ Gurr Rd	535XDSAGR	MPM	Irrigation3	06/19/07	10:30	none	Management plan monitoring: copper
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation3	06/26/07	10:20	none	
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation4	07/24/07	10:20	none	
Duck Slough @ Gurr Rd	535XDSAGR	MPM	Irrigation4	07/31/07	14:40	none	Resampling event due to *Selenastrum* toxicity on 07/24/07. Management plan monitoring: chlorpyrifos, thiobencarb, bifenthrin, copper
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation5	08/21/07	13:10	none	
Duck Slough @ Gurr Rd	535XDSAGR	Sediment	Irrigation5	08/23/07	12:00	none	
Duck Slough @ Gurr Rd	535XDSAGR	NM	Irrigation6	09/18/07	9:00	none	
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation1	04/24/07	9:40	none	
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation2	05/29/07	15:50	none	
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation3	06/26/07	16:30	none	
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation4	07/24/07	15:30	none	
Duck Slough @ Hwy 99	535XDSAHN	MPM	Irrigation4	07/31/07	16:00	none	Management plan monitoring: organophosphates
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation5	08/21/07	8:50	none	
Duck Slough @ Hwy 99	535XDSAHN	Sediment	Irrigation5	08/23/07	9:50	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Duck Slough @ Hwy 99	535XDSAHN	MPM	Irrigation5	08/28/07	13:50	none	Management plan monitoring: copper
Duck Slough @ Hwy 99	535XDSAHN	NM	Irrigation6	09/18/07	14:00	none	
Duck Slough @ Hwy 99	535XDSAHN	MPM	Irrigation6	09/25/07	15:00	none	Management plan monitoring: copper
Hatch Drain @ Tuolumne Rd	535XHDATR	NM	Irrigation2	05/15/07	12:50	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	NM	Irrigation3	06/19/07	16:50	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	NM	Irrigation4	07/17/07	12:10	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	NM	Irrigation5	08/14/07	12:00	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	Sediment	Irrigation5	08/16/07	11:30	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	NM	Irrigation6	09/11/07	10:40	none	
Hatch Drain @ Tuolumne Rd	535XHDATR	Sediment	Irrigation5	09/11/07	10:40	none	Resampling event due to *Hyalella azteca* toxicity on 08/16/07.
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation1	04/17/07	16:50	none	
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation2	05/15/07	10:50	none	
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation3	06/19/07	20:10	none	
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation4	07/17/07	16:40	none	
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation5	08/14/07	14:20	none	
Highline Canal @ Hwy 99	535XHCHNN	Sediment	Irrigation5	08/16/07	11:00	none	
Highline Canal @ Hwy 99	535XHCHNN	NM	Irrigation6	09/11/07	12:10	none	
Highline Canal @ Hwy 99	535XHCHNN	MPM	Irrigation6	09/25/07	13:20	none	Management plan monitoring: *Ceriodaphnia*
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation1	04/17/07	12:40	none	
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation2	05/15/07	12:30	none	
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation3	06/19/07	18:20	none	
Highline Canal @ Lombardy Rd	535XHCALR	MPM	Irrigation3	06/26/07	8:50	none	Management plan monitoring: *Ceriodaphnia*

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation4	07/17/07	12:30	none	Not analyzed for Hardness due to lab error.
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation5	08/14/07	16:10	none	
Highline Canal @ Lombardy Rd	535XHCALR	Sediment	Irrigation5	08/16/07	12:00	none	
Highline Canal @ Lombardy Rd	535XHCALR	MPM	Irrigation5	08/28/07	14:40	none	Management plan monitoring: *Selenastrum*
Highline Canal @ Lombardy Rd	535XHCALR	NM	Irrigation6	09/11/07	13:30	none	
Highline Canal @ Lombardy Rd	535XHCALR	Sediment	Irrigation5	09/11/07	13:30	none	Resampling event due to *Hyalella azteca* toxicity on 08/16/07.
Highline Canal @ Lombardy Rd	535XHCALR	MPM	Irrigation6	09/25/07	14:00	none	Management plan monitoring: zinc, *Ceriodaphnia*
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation1	04/17/07	11:00	none	
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation1	04/24/07	11:10	none	Resampling event due to *Selenastrum* toxicity on 04/17/07.
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation2	05/15/07	9:30	none	
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation3	06/19/07	13:00	none	
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation4	07/17/07	9:40	none	
Hilmar Drain @ Central Ave	535XHDACA	Sediment	Irrigation5	08/16/07	10:10	none	
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation5	08/21/07	16:30	none	
Hilmar Drain @ Central Ave	535XHDACA	NM	Irrigation6	09/11/07	10:40	none	
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation1	04/17/07	12:30	none	
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation2	05/15/07	15:50	none	
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation3	06/19/07	12:20	none	
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation4	07/17/07	14:00	none	
Jones Drain @ Oakdale Rd	535XJDAOR	MPM	Irrigation4	07/31/07	15:10	none	Management plan monitoring: copper

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation5	08/14/07	14:40	none	
Jones Drain @ Oakdale Rd	535XJDAOR	Sediment	Irrigation5	08/16/07	13:10	none	
Jones Drain @ Oakdale Rd	535XJDAOR	MPM	Irrigation5	08/28/07	13:40	none	Management plan monitoring: organophosphates
Jones Drain @ Oakdale Rd	535XJDAOR	NM	Irrigation6	09/11/07	14:00	none	
Jones Drain @ Oakdale Rd	535XJDAOR	MPM	Irrigation6	09/25/07	11:10	Dry	
Livingston Drain @ Robin Ave	535XLDARA	NM	Irrigation2	05/15/07	17:50	none	
Livingston Drain @ Robin Ave	535XLDARA	NM	Irrigation3	06/19/07	11:30	none	
Livingston Drain @ Robin Ave	535XLDARA	NM	Irrigation4	07/17/07	15:20	none	
Livingston Drain @ Robin Ave	535XLDARA	NM	Irrigation5	08/14/07	17:00	none	
Livingston Drain @ Robin Ave	535XLDARA	Sediment	Irrigation5	08/16/07	13:30	none	
Livingston Drain @ Robin Ave	535XLDARA	NM	Irrigation6	09/11/07	16:40	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation1	04/17/07	14:20	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation2	05/15/07	15:20	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation3	06/19/07	19:50	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation4	07/17/07	13:50	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation5	08/14/07	17:00	none	
Merced River @ Santa Fe	535XMRSFD	NM	Irrigation6	09/11/07	15:10	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation2	05/29/07	14:50	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation3	06/26/07	13:20	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation3	07/03/07	13:10	none	Resampling event due to *Selenastrum* toxicity on 06/26/07.
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation4	07/24/07	13:50	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation5	08/21/07	10:00	none	
Miles Creek @ Reilly Rd	535XMCARR	Sediment	Irrigation5	08/23/07	10:30	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation6	09/18/07	12:50	none	
Miles Creek @ Reilly Rd	535XMCARR	NM	Irrigation6	09/18/07	12:50	none	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Miles Creek @ Reilly Rd	535XMCARR	Sediment	Irrigation5	09/19/07	09:40	Sample outside of temperature criteria due to lab error	Resampling event due to *Hyalella azteca* toxicity on 08/23/07. Due to sample not being refrigerated at the laboratory, another resample was collected on 9/25/07.
Miles Creek @ Reilly Rd	535XMCARR	Sediment	Irrigation5	09/25/07	12:20	none	Resampling event due to *Hyalella azteca* toxicity on 08/23/07.
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation1	04/17/07	11:30	Dry	
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation2	05/15/07	14:40	none	
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation3	06/19/07	13:30	none	
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation4	07/17/07	13:00	Dry	
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation5	08/14/07	15:45	Dry	
Mustang Creek @ East Ave	535XMCAEA	Sediment	Irrigation5	08/16/07	13:30	Dry	
Mustang Creek @ East Ave	535XMCAEA	NM	Irrigation6	09/11/07	13:05	Dry	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation1	04/17/07	9:00	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation2	05/15/07	8:30	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation2	05/23/07	12:00	none	Resampling event due to *Selenastrum* toxicity on 05/15/07.
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation3	06/19/07	15:40	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation4	07/17/07	8:40	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	MPM	Irrigation4	07/31/07	13:00	none	Management plan monitoring: *Pimephales*

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation5	08/14/07	10:30	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	Sediment	Irrigation5	08/16/07	9:40	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	MPM	Irrigation5	08/28/07	12:30	none	Management plan monitoring: organophosphates
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation6	09/11/07	9:10	none	
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	Sediment	Irrigation5	09/11/07	9:10	none	Resampling event due to *Hyalella azteca* toxicity on 08/16/07.
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	NM	Irrigation6	09/18/07	16:40	none	Resampling event due to *Ceriodaphnia* toxicity on 09/11/07.
Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	MPM	Irrigation6	09/25/07	12:20	none	Management plan monitoring: chlorpyrifos
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation1	04/17/07	13:50	none	
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation2	05/15/07	17:20	none	
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation3	06/19/07	11:40	none	
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation4	07/17/07	15:20	none	
Silva Drain @ Meadow Dr	535XSDAMD	MPM	Irrigation4	07/31/07	14:50	none	Management plan monitoring: organophosphates
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation5	08/14/07	13:50	none	
Silva Drain @ Meadow Dr	535XSDAMD	Sediment	Irrigation5	08/16/07	12:40	none	
Silva Drain @ Meadow Dr	535XSDAMD	MPM	Irrigation5	08/28/07	14:10	none	Management plan monitoring: organophosphates
Silva Drain @ Meadow Dr	535XSDAMD	NM	Irrigation6	09/11/07	15:40	none	
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation1	04/17/07	18:00	Dry	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation2	05/29/07	9:00	none	
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation3	06/26/07	9:00	none	
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation4	07/24/07	9:20	none	
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation5	08/21/07	14:10	none	
South Slough @ Quinley Rd	535XSSAQR	Sediment	Irrigation5	08/23/07	12:20	none	
South Slough @ Quinley Rd	535XSSAQR	NM	Irrigation6	09/18/07	8:30	Dry	
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation2	05/15/07	11:20	none	
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation2	05/23/07	11:00	none	Resampling event due to *Selenastrum* toxicity on 05/15/07.
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation3	06/19/07	17:50	none	
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation4	07/17/07	11:00	none	
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation5	08/14/07	11:00	none	
Westport Drain @ Vivian Rd	535XWDAVR	Sediment	Irrigation5	08/16/07	10:50	none	
Westport Drain @ Vivian Rd	535XWDAVR	NM	Irrigation6	09/11/07	12:00	none	

Sampling and Analytical Methods Used

Sample collection criteria and field instruments are provided in Table 11 and Table 12. Analytical methods and reporting limits are provided in Table 13. All field sampling methods were performed as outlined in the SOPs provided in the Quality Assurance Project Plan (QAPP). All analytical methods were performed as described in the QAPP. The analytical method for biological oxygen demand (BOD) was added to Table 13 due to additional monitoring conducted during the 2007 irrigation season for low dissolved oxygen source identification.

Table 11. Sampling procedures, containers, sample volumes, preservation and storage techniques, and holding times.

Parameter	Sample Container	Sample Volume[1]	Immediate Processing and Storage	Holding Time[2]
Physical Parameters[3]				
Color	Glass or polyethylene	500 mL	Store at 4°C	48 hours
Turbidity	Glass or polyethylene	150 mL	Store at 4°C	48 hours
Total Dissolved Solids	Polyethylene	500 mL	Store at 4°C	7 days
Drinking Water				
E. coli (pathogens)	Polyethylene (sterile)	100 mL	Store at 4°C	24 hours[4]
Total Organic Carbon	Amber Glass VOA, PTFE-lined cap	125 mL	Preserve w/HCL; Store at 4°C	28 days
Toxicity				
Aquatic bioassays	Amber glass	5 gallons	Store at 4°C	36 hours
Sediment bioassays	Glass	1 liter (x2)	Store at 4°C	14 days
Pesticides				
Carbamates	Amber Glass	1 liter	Store at 4°C; Extract within 7 days	40 days
Organochlorines	Amber Glass	1 liter		
Organophosphates	Amber Glass	1 liter		
Pyrethroids	Amber Glass	1 liter		
Herbicides (general)	Amber Glass	1 liter		
Herbicides (paraquat)	Polyethylene	1 liter		
Herbicides (glyphosate)	Amber Glass VOA	40 ml (x2)	Store at 4°C, freeze within 2 weeks	6 months
Nutrients				
TKN, Ammonia, and Total Phosphorus	Polyethylene	500 mL	Preserve to $\leq$ pH 2 with H_2SO_4; Store at 4°C	28 days
Nitrate as NO3, Nitrite as N, and Soluble Ortho-Phosphate	Polyethylene	1000 mL	Store at 4°C	48 hours
Metals/Trace Elements				
Trace elements[5]	Polyethylene	500 mL	Filter as necessary; Preserve to $\leq$ pH 2 with HNO_3	40 days

1. Additional volumes may be required for QC analyses; NA = Not Applicable
2. Holding time after initial preservation or extraction.
3. Volume of water necessary to analyze the physical parameters is typically combined in multiple 1L polyethylene bottles, which provides sufficient volume for re-analyses and lab spike duplicates. This is only possible when the same laboratory provides the analyses for all of the physical parameters.
4. Samples for bacteria analyses should be set up as soon as possible.
5. To include arsenic, boron, cadmium, copper, lead, nickel, selenium, and zinc.

Table 12. Field parameters and instruments used to collect measurements.

Parameter	Instrument
Dissolved oxygen	YSI Model 556
Temperature	YSI Model 556
pH	YSI Model 556
Specific Conductance	YSI Model 556
Discharge	Marsh-McBirney Flow Meter
Discharge	Swoffer Model 2100 Current Velocity Meter

Table 13. Analytical methods, target reporting limits (RL) and units.

Analyte	Method	RL	Units
Physical Parameters			
Color	EPA 100.2	5.0	color units
Turbidity	EPA 180.1	1.0	NTU
Biological Oxygen Demand[1]	EPA 405.1	5	mg/L
Dissolved Solids, Total	EPA 160.1	10	mg/L
Drinking Water Parameters			
Escherischia coli (*E. coli*)	SM 9223	2	MPN/100 mL
Total Organic Carbon	EPA 415.1	0.5	mg/L
Nutrients			
Total Kjeldahl Nitrogen	EPA 351.3	0.5	mg/L
Nitrate as NO_3	EPA 300.0	0.05	mg/L
Nitrite as Nitrogen	EPA 354.1	0.05	mg/L
Ammonia	EPA 350.2	0.10	mg/L
Hardness	EPA 130.2	10	mg/L
Total Phosphorus	EPA 365.2	0.01	mg/L
Soluble Orthophosphate	EPA 365.2	0.01	mg/L
Metals			
Arsenic	EPA 200.8	1	µg/L
Boron	EPA 200.8	10	µg/L
Cadmium	EPA 200.8	0.1	µg/L
Copper	EPA 200.8	0.5	µg/L
Lead	EPA 200.8	0.5	µg/L
Nickel	EPA 200.8	1	µg/L
Selenium	EPA 200.8	1	µg/L
Zinc	EPA 200.8	1	µg/L
Carbamate Pesticides			
Aldicarb	EPA 8321	0.5	µg/L
Carbaryl	EPA 8321	0.5	µg/L
Carbofuran	EPA 8321	0.5	µg/L
Methiocarb	EPA 8321	0.5	µg/L
Methomyl	EPA 8321	0.5	µg/L
Oxnamyl	EPA 8321	0.5	µg/L
Organochlorine Pesticides			
DDD	EPA 8081A	0.02	µg/L
DDE	EPA 8081A	0.01	µg/L
DDt	EPA 8081A	0.01	µg/L

Analyte	Method	RL	Units
Dicofol	EPA 8081A	0.1	µg/L
Dieldrin	EPA 8081A	0.01	µg/L
Endrin	EPA 8081A	0.01	µg/L
Methoxychlor	EPA 8081A	0.05	µg/L
Organophosphorus Pesticides			
Azinphos-methyl	EPA 8141A	0.1	µg/L
Chlorpyrifos	EPA 8141A	0.02	µg/L
Diazinon	EPA 8141A	0.02	µg/L
Dimethoate	EPA 8141A	0.1	µg/L
Disulfoton	EPA 8141A	0.1	µg/L
Malathion	EPA 8141A	0.1	µg/L
Methamidophos	EPA 8141A	0.2	µg/L
Methidathion	EPA 8141A	0.1	µg/L
Parathion-methyl	EPA 8141A	0.1	µg/L
Phorate	EPA 8141A	0.2	µg/L
Phosmet	EPA 8141A	0.2	µg/L
Pyrethroid Pesticides			
Biphenthrin	EPA 8081A	0.05	µg/L
Cyfluthrin	EPA 8081A	0.05	µg/L
Cypermethrin	EPA 8081A	0.05	µg/L
Esfenvalerate	EPA 8081A	0.05	µg/L
Lambda-Cyhalothrin	EPA 8081A	0.05	µg/L
Permethrin	EPA 8081A	0.05	µg/L
Herbicides			
Atrazine	EPA 619	0.5	µg/L
Cyanazine	EPA 619	0.5	µg/L
Diuron	EPA 8321	0.5	µg/L
Glyphosate	EPA 547	5	µg/L
Linuron	EPA 8321	0.5	µg/L
Molinate	EPA 8141A	0.5	µg/L
Paraquat dichloride	EPA 549.1	0.5	µg/L
Simazine	EPA 619	0.5	µg/L
Thiobencarb	EPA 8141A	0.5	µg/L

[1]Analyzed only for special source studies and is not included in the QAPP

Copy of Chain of Custody Forms

Original chain of custody (COC) forms were scanned, converted to pdf, and included as printed pdfs (Appendix II). COCs were faxed by the contract laboratories to Michael L Johnson - LLC after the receipt of samples by the laboratory. As such, they are complete and accurate records of sample handling and processing and reflect the timing of sample collection and delivery to the laboratories. Sample collection and delivery was performed according to the QAPP and submitted to the Regional Board. If there were any discrepancies between the COC and sample delivery, the issues were resolved and documented either directly on the COC or on an anomaly form filled out by the laboratory. Documentation of COC anomalies is included in Table II-1 of Appendix II.

Lab and Field QC Results

Laboratory and field quality control (QC) results are included in Appendix III. Field duplicate and field blank results are included for organics, inorganics (including metals, physical parameters, nutrients and *E. coli*), and toxicity (only field duplicates). Laboratory QC results include matrix spikes (MS) performed on both Coalition and samples from other projects, laboratory control spikes (LCS), laboratory blanks and laboratory duplicates. All control criteria are listed with the result and samples not meeting control criteria are flagged.

Precision and Accuracy

Normal surface water monitoring occurred six times during the irrigation season of 2007 for all but four sites (which were added during the second irrigation season) and with the following exceptions due to lack of water:

- Ash Slough @ Ave 21 (04/24/07, 05/29/07, 06/26/07, 07/24/07, 08/21/07, 09/18/07)
- Berenda Slough along Ave 18 ½ (04/24/07, 9/18/07)
- Cottonwood Creek @ Rd 20 (09/18/07)
- Dry Creek @ Rd 18 (09/18/07)
- Mustang Creek @ East Ave (04/17/07, 07/17/07, 08/14/07, 09/11/07)
- South Slough @ Quinley Rd (04/17/07, 09/18/07)

Resampling to test for water column toxicity persistence occurred at the following sites:

- Bear Creek @ Kibby Rd (07/31/07)
- Berenda Slough along Ave 18 ½ (06/05/07, 07/31/07)
- Black Rascal Creek @ Yosemite Rd (06/05/07, 07/31/07, 08/28/07)
- Deadman Creek @ Gurr Rd (06/05/07, 07/31/07)
- Dry Creek @ Rd 18 (05/29/07)
- Duck Slough @ Gurr Rd (07/31/07)
- Hilmar Drain @ Central Ave (04/24/07)
- Miles Creek @ Reilly Rd (07/03/07)
- Prairie Flower Drain @ Crows Landing Rd (05/23/07, 09/18/07)
- Westport Drain @ Vivian Rd (05/23/07)

Sediment sampling occurred once during the irrigation season during the month of August. The following sites were not sampled due to a lack of water:

- Ash Slough @ Ave 21 (08/23/07)
- Mustang Creek @ East Ave (08/16/07)

Resampling to test for sediment toxicity persistence occurred at the following sites:

- Hatch Drain @ Tuolumne Rd (09/11/07)
- Highline Canal @ Lombardy Rd (09/11/07)
- Miles Creek @ Reilly Rd (09/25/07)
- Prairie Flower Drain @ Crows Landing Rd (09/11/07)

During the irrigation season, 12 sites were sampled in addition to normal monitoring for management plan monitoring (see site subwatershed management plans for details). Management plan sampling occurred 33 times over the 12 sites with the following exceptions due to a lack of water:

- Ash Slough @ Ave 21 (06/19/07, 07/31/07, 08/28/07, 09/25/07)
- Berenda Slough along Ave 18 ½ (09/25/07)
- Cottonwood Creek @ Rd 20 (09/25/07)
- Dry Creek @ Rd 18 (09/25/07)
- Jones Drain @ Oakdale Rd (09/25/07)

Chemistry

Due to the addition of new sites during the irrigation season of 2006, not all sites were sampled for all constituents. For normal monitoring, not including laboratory or field QCs, 124 organic (pesticides), 118 *E. coli*, 124 physical parameter, and 96 nutrient and metal samples were collected and analyzed. There was 100% completeness for environmental samples collected for chemistry analyses except for selenium (69%) and hardness (99%). Samples were collected for metals analysis including arsenic, boron, cadmium, copper, lead, nickel and selenium, however, due to a COC error during June through September sampling, selenium was not analyzed for 66 of the 96 environmental samples. One sample collected from Highline Canal @ Lombardy Rd on 07/17/07 was not analyzed for hardness due to laboratory error.

For each irrigation event, one field duplicate and field blank were collected for each constituent to meet the field QC requirement of 5%. Since management plan sampling was also conducted during the irrigation season, each constituent varies in the percent of field QCs relative to the overall number of samples collected. Field blanks and duplicates comprised 9-10% of organic samples, 10% of *E. coli* samples, 10-12% of physical parameter samples, 11-12% of nutrient samples and 11-13% of metal samples.

For constituents such as color, turbidity, TDS, and metals the values in the environmental sample may exceed the amount that the detector can detect and therefore requires a dilution. The result reported is the amount found in the diluted sample multiplied by the dilution factor to represent the amount of the analyte present in the original sample. The dilution factor is recorded and the RL is generally increased by multiplying the RL for that analyte by the dilution factor. There are times that the RL is increased higher than this value based on method requirements. Therefore, for each dilution that occurs, there is a corresponding increase in the limit of quantification.

For pesticides such as paraquat, co-elution, also referred to as matrix interference, may cause the RL to be raised and the sample is flagged. In such cases the dilution factor (DF) is recorded in the laboratory comments for each sample.

All results are reported in the Monitoring Results section of this report (Appendix I). Each result is flagged if it does not meet data quality objectives (acceptability criteria) using SWAMP codes and can also be found in the SWAMP comparable database managed by the Coalition and posted on the UC Davis Center for Environmental Data Exchange Network (CEDEN) ftp site (ftp://aeal-FTP.ucdavis.edu). A review of the number of samples analyzed and the percentage per analyte that meets acceptability criteria are listed in the tables following this section. A brief overview is listed below to assess overall precision and accuracy per analyte (all pesticides are grouped and discussed together).

- Color: One hundred percent of all field blanks and field duplicates met acceptability criteria. Laboratory control spikes and lab blanks were run with each color batch and all met laboratory QC criteria. Lab duplicates were recorded by the laboratory to access precision and 100% had RPDs less than 25.

- Hardness: One hundred percent of field blanks were less than the RL. One hundred percent of field duplicates had RPDs less than 25. All laboratory QC met quality criteria. Lab control spikes, matrix spikes, matrix spike duplicates, lab duplicates and lab blanks were run with every batch and all met precision and accuracy requirements.

- Total Dissolved Solids (TDS): One hundred percent of field blanks and field duplicates met acceptance criteria. Lab blanks were run with every batch and were less than the RL for 100% of samples. Laboratory duplicates were analyzed with each batch and met acceptance criteria for 88% of samples. Lab control spikes and matrix spikes cannot be performed for TDS.

- Turbidity: One hundred percent of field duplicates and field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Laboratory duplicates were analyzed with each batch and 100% met acceptance criteria. Lab control spikes were run with every batch and met acceptability criteria for 100% of samples. Matrix spikes cannot be performed for turbidity.

- Nitrate as N: One hundred percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL for all samples. Lab control spikes laboratory duplicates were within acceptability criteria for all batches. Matrix spikes were performed in each batch with 94% meeting acceptability requirements and matrix spike duplicates met 100% of acceptability requirement for precision.

- Ammonia as N: One hundred percent of field duplicates and field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Nitrogen, Total Kjeldahl (TKN): One hundred percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes laboratory duplicates were within acceptability criteria for all batches. Matrix spikes were performed in each batch with 98% meeting acceptability requirements and matrix spike duplicates met 100% of acceptability requirement for precision.

- Nitrite as N: One hundred percent of field duplicates and field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Orthophosphate as P: One hundred percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Phosphate as P: One hundred percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Biological Oxygen Demand (BOD): One hundred percent of field duplicates and field blanks collected met acceptance criteria. Lab control spikes and lab duplicates were run each batch and met all acceptance criteria for accuracy and precision.

- Total Organic Carbon (TOC): One hundred percent of field duplicates and field blanks collected met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes laboratory duplicates were within acceptability criteria for all batches. Matrix spikes were performed in each batch with 95% meeting acceptability requirements and matrix spike duplicates met 100% of acceptability requirement for precision.

- Total Metals: One hundred percent of field duplicates met field precision criteria. All field blanks, except for boron and zinc, met acceptance criteria. Seventy-five percent of boron and 92% of zinc field blanks were less than the reporting limit or one fifth of the environmental sample. Due to detections in field blanks during the irrigation and storm season, travel blanks were sent from the lab and traveled with the sampling crew from beginning to end. All travel blanks met acceptability criteria of being less than the RL except for the following metals (percent within acceptability criteria is noted within parenthesis): boron (60%), copper (90%), selenium (75%) and zinc (73%). Laboratory blanks were run for each metals batch and 100% of samples met acceptability criteria except for zinc (96%). Laboratory control spikes were within acceptable recovery limits for 100% of samples run. Matrix spike recovery was within control limits for all samples except for boron and zinc. Ninety percent of the boron and 98% of the zinc matrix spikes were within control limits (PR 75-125). All matrix spike duplicates met acceptability criteria except for zinc (96%). To meet batch requirements a lab duplicate may also have been performed on a sample other than a matrix spike. For the irrigation season, two metal batches contained lab duplicates for samples collected in the field and all met precision requirements except for boron (0%) and zinc (50%).

- *E. coli:* Sterility checks, or laboratory blanks, negative control and positive control samples were run for each batch. One hundred percent of lab blanks performed by the laboratory were less than the RL. One hundred percent of field blanks collected had *E. coli* numbers less than the RL of 1. R_{log}s were performed on *E. coli* laboratory duplicates by Caltest Laboratories. The mean R_{log} for the laboratory was calculated to be 0.40. This value multiplied by 3.27 resulted in a precision criterion of 1.30. All laboratory duplicates had R_{log}s below the criteria acceptance level. RPDs were also calculated for E. coli laboratory duplicates and 100% were less than 25. Due to the nature of the analysis method and *E. coli* distribution within the water column, it is not possible to use RPDs to assess precision however field duplicate RPDs have been recorded to monitor the variation in duplicates over time analyzed by the lab.

- Pesticides: One hundred percent of field blanks and field duplicates collected met acceptability criteria except for diuron (92%) and chlorpyrifos (92%). For the irrigation season, pesticides were analyzed in 8 different groups: pyrethroids (EPA 8081A), organochlorines (EPA 8081A), organophosphates (EPA 8141A), carbamates (EPA 8321A), methamidophos (EPA 8141A), paraquat (EPA 549.2), glyphosate (EPA 547), and triazines (EPA 619). Lab blanks were performed for each batch and met acceptability criteria for contamination for all analysis. Matrix spikes and lab control spikes were performed for each batch to assess both precision and accuracy as well as possible matrix interference. Either a matrix spike duplicate and/or a lab control spike duplicate were performed per batch to assess precision. Surrogates were run for each analysis except for paraquat and glyphosate. Surrogate recoveries were within specific acceptance criteria for 95% of all samples analyzed. Laboratory control spikes and laboratory control spike duplicates were within acceptability criteria for 99% of all analytes. Laboratory precision, assessed by the RPD of laboratory duplicates, met acceptability criteria in 96% of lab control spike samples for all analytes and 99% of matrix spike duplicates for all samples. Matrix spikes were within acceptability criteria and analyte. Ninety-three percent of surrogates were within acceptability requirements. All batches with laboratory QCs outside of acceptability criteria have been flagged in addition to the specific sample acceptability criteria. If a surrogate was outside of acceptability criteria, the surrogate was flagged as well as the associated sample within that batch. Batches are approved by evaluating all measures of precision and accuracy such that although a single QC sample may be outside of acceptability criteria, the entire batch may be accepted due to other QCs within that batch meeting acceptability criteria.

Hold times for all chemistry analysis were met except for one sample for each of the following constituents: paraquat dichloride, DDD, DDE, DDT, dieldrin, endrin and methoxychlor. Paraquat dichloride was re-extracted and re-analyzed outside of hold time due to 0% recoveries in both the matrix and lab control spikes in the original analysis. DDD, DDE, DDT, dieldrin, endrin and methoxychlor were re-extracted and re-analyzed due to possible laboratory contamination.

Toxicity

For aquatic toxicity tests, the acceptability of test results is determined primarily by performance-based criteria for test organisms, culture and test conditions, and the results of control bioassays. Control bioassays include monthly reference toxicant testing and negative and solvent controls (for TIEs). Test acceptability requirements are documented in the method documents for each bioassay method and are included in the QAPP. In addition to the QA requirements for the toxicity testing methods, a minimum of 5% of the samples collected are required to be collected as field duplicates. Field duplicates were collected every sampling event such that the overall rate of field duplicates would be at least 5% of all samples including management plan samples and resamples due to toxicity during normal monitoring. The overall percentage of field duplicates are as follows: *Ceriodaphnia* 9%, *Pimephales* 10%, *Selenastrum* 9% and *Hyallela* 8%.

- Water Column Toxicity: Field duplicates were collected during each irrigation event and were tested for *Ceriodaphnia, Selenastrum, and Pimephales*. For these three species RPDs for all field duplicates were within acceptability criteria (RPD < 25). All tests met holding time requirements (<36 hrs), water quality requirements and control requirements (as listed in the EPA method guidelines).

- Sediment Toxicity: Sediment was collected on August 16 and 26, 2007 and resampled on September 11 and 25, 2007. Two field duplicates were collected and were within acceptability criteria. One hundred percent of the sediment samples had laboratory controls within acceptability criteria. All sediment samples met holding time criteria. The holding temperature for *Hyallela* samples is 4°C. All samples collected on August 16 were received at 7°C by the laboratory (11 total). Three samples collected on September 11 were received at 8°C by the laboratory. The laboratory does not feel that this affected the toxicity testing performed on these samples. Once received the samples were moved into a 4°C refrigerator.

Table 14. ESJWQC summary of field blank quality control sample evaluations.

Samples were collected during the irrigation season of 2007 and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Carbaryl	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Carbofuran	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Methiocarb	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Methomyl	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Oxamyl	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Diuron	<RL or < (env sample/5)	12	12	100.00
EPA 8321A CARB	Linuron	<RL or < (env sample/5)	12	12	100.00
EPA 619	Atrazine	<RL or < (env sample/5)	12	12	100.00
EPA 619	Cyanazine	<RL or < (env sample/5)	12	12	100.00
EPA 619	Simazine	<RL or < (env sample/5)	12	12	100.00
EPA 547M	Glyphosate	<RL or < (env sample/5)	12	12	100.00
EPA 549.2M	Paraquat dichloride	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	DDD(p,p')	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	DDE(p,p')	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	DDT(p,p')	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	Dicofol	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	Dieldrin	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	Endrin	<RL or < (env sample/5)	12	12	100.00
EPA 8081A OCH	Methoxychlor	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Bifenthrin	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Cyfluthrin, total	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Cypermethrin, total	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	<RL or < (env sample/5)	12	12	100.00
EPA 8081A PYR	Permethrin, total	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Azinphos methyl	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Chlorpyrifos	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Diazinon	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Dimethoate	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Disulfoton	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Malathion	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Methidathion	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Parathion, Methyl	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Phorate	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Phosmet	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Molinate	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Thiobencarb	<RL or < (env sample/5)	12	12	100.00
EPA 8141A OP	Methamidophos	<RL or < (env sample/5)	12	12	100.00
EPA 110.2	Color	<RL or < (env sample/5)	12	12	100.00
EPA 130.2	Hardness as CaCO3	<RL or < (env sample/5)	12	12	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	<RL or < (env sample/5)	12	12	100.00
EPA 180.1	Turbidity	<RL or < (env sample/5)	12	12	100.00
EPA 300.0	Nitrate as N	<RL or < (env sample/5)	12	11	91.67
EPA 350.2	Ammonia as N	<RL or < (env sample/5)	12	12	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	<RL or < (env sample/5)	12	11	91.67
EPA 354.1	Nitrite as N	<RL or < (env sample/5)	12	12	100.00
EPA 365.2	OrthoPhosphate as P	<RL or < (env sample/5)	12	11	91.67
EPA 365.2	Phosphate as P	<RL or < (env sample/5)	12	11	91.67
EPA 405.1	BOD	<RL or < (env sample/5)	4	4	100.00
EPA 415.1	Total Organic Carbon	<RL or < (env sample/5)	12	12	100.00
SM 9223	*E. coli*	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Arsenic	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Boron	<RL or < (env sample/5)	12	9	75.00
EPA 200.8	Cadmium	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Copper	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Lead	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Nickel	<RL or < (env sample/5)	12	12	100.00
EPA 200.8	Selenium	<RL or < (env sample/5)	4	4	100.00
EPA 200.8	Zinc	<RL or < (env sample/5)	12	11	91.67
		TOTAL	**704**	**696**	**98.86**

Table 15. ESJWQC summary of field duplicate quality control sample evaluations.

Samples were collected during the irrigation season of 2007 and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Carbaryl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Carbofuran	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Methiocarb	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Methomyl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Oxamyl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Diuron	RPD ≤ 25	12	11	91.67
EPA 8321A CARB	Linuron	RPD ≤ 25	12	12	100.00
EPA 619	Atrazine	RPD ≤ 25	12	12	100.00
EPA 619	Cyanazine	RPD ≤ 25	12	12	100.00
EPA 619	Simazine	RPD ≤ 25	12	12	100.00
EPA 547M	Glyphosate	RPD ≤ 25	12	12	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	DDD(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	DDE(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	DDT(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Dicofol	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Dieldrin	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Endrin	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Methoxychlor	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Bifenthrin	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cyfluthrin, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cypermethrin, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Permethrin, total	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	12	11	91.67
EPA 8141A OP	Diazinon	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Malathion	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Phosmet	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Molinate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Thiobencarb	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Methamidophos	RPD ≤ 25	12	12	100.00
EPA 110.2	Color	RPD ≤ 25	12	12	100.00
EPA 130.2	Hardness as CaCO3	RPD ≤ 25	12	12	100.00
EPA 160.1	Total Dissolved Solids	RPD ≤ 25	12	12	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 180.1	Turbidity	RPD ≤ 25	12	12	100.00
EPA 300.0	Nitrate as N	RPD ≤ 25	12	12	100.00
EPA 350.2	Ammonia as N	RPD ≤ 25	12	12	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25	12	12	100.00
EPA 354.1	Nitrite as N	RPD ≤ 25	12	12	100.00
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25	12	12	100.00
EPA 365.2	Phosphate as P	RPD ≤ 25	12	12	100.00
EPA 405.1	BOD	RPD ≤ 25	4	4	100.00
EPA 415.1	Total Organic Carbon	RPD ≤ 25	12	12	100.00
SM 9223	*E. coli*	RPD ≤ 25	12	12	100.00
EPA 200.8	Arsenic	RPD ≤ 25	12	12	100.00
EPA 200.8	Boron	RPD ≤ 25	12	12	100.00
EPA 200.8	Cadmium	RPD ≤ 25	12	12	100.00
EPA 200.8	Copper	RPD ≤ 25	12	12	100.00
EPA 200.8	Lead	RPD ≤ 25	12	12	100.00
EPA 200.8	Nickel	RPD ≤ 25	12	12	100.00
EPA 200.8	Selenium	RPD ≤ 25	4	4	100.00
EPA 200.8	Zinc	RPD ≤ 25	12	12	100.00
		TOTAL	**704**	**702**	**99.72**

Table 16. ESJWQC summary of method blank quality control sample evaluations.

Samples were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	<RL	12	12	100.00
EPA 8321A CARB	Carbaryl	<RL	12	12	100.00
EPA 8321A CARB	Carbofuran	<RL	12	12	100.00
EPA 8321A CARB	Methiocarb	<RL	12	12	100.00
EPA 8321A CARB	Methomyl	<RL	12	12	100.00
EPA 8321A CARB	Oxamyl	<RL	12	12	100.00
EPA 8321A CARB	Diuron	<RL	12	12	100.00
EPA 8321A CARB	Linuron	<RL	12	12	100.00
EPA 619	Atrazine	<RL	12	12	100.00
EPA 619	Cyanazine	<RL	12	12	100.00
EPA 619	Simazine	<RL	12	12	100.00
EPA 547M	Glyphosate	<RL	18	18	100.00
EPA 549.2M	Paraquat dichloride	<RL	13	13	100.00
EPA 8081A OCH	DDD(p,p')	<RL	13	13	100.00
EPA 8081A OCH	DDE(p,p')	<RL	13	13	100.00
EPA 8081A OCH	DDT(p,p')	<RL	13	13	100.00
EPA 8081A OCH	Dicofol	<RL	12	12	100.00
EPA 8081A OCH	Dieldrin	<RL	13	13	100.00
EPA 8081A OCH	Endrin	<RL	13	13	100.00
EPA 8081A OCH	Methoxychlor	<RL	13	13	100.00
EPA 8081A PYR	Bifenthrin	<RL	13	13	100.00
EPA 8081A PYR	Cyfluthrin, total	<RL	13	13	100.00
EPA 8081A PYR	Cypermethrin, total	<RL	13	13	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	<RL	13	13	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	<RL	13	13	100.00
EPA 8081A PYR	Permethrin, total	<RL	13	13	100.00
EPA 8141A OP	Azinphos methyl	<RL	13	13	100.00
EPA 8141A OP	Chlorpyrifos	<RL	15	15	100.00
EPA 8141A OP	Diazinon	<RL	13	13	100.00
EPA 8141A OP	Dimethoate	<RL	13	13	100.00
EPA 8141A OP	Disulfoton	<RL	13	13	100.00
EPA 8141A OP	Malathion	<RL	13	13	100.00
EPA 8141A OP	Methidathion	<RL	13	13	100.00
EPA 8141A OP	Parathion, Methyl	<RL	13	13	100.00
EPA 8141A OP	Phorate	<RL	13	13	100.00
EPA 8141A OP	Phosmet	<RL	13	13	100.00
EPA 8141A OP	Molinate	<RL	13	13	100.00
EPA 8141A OP	Thiobencarb	<RL	13	13	100.00
EPA 8141A OP	Methamidophos	<RL	12	12	100.00
EPA 110.2	Color	<RL	16	16	100.00
EPA 130.2	Hardness as CaCO3	<RL	21	21	100.00
EPA 160.1	Total Dissolved Solids	<RL	16	16	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 180.1	Turbidity	<RL	16	16	100.00
EPA 300.0	Nitrate as N	<RL	18	18	100.00
EPA 350.2	Ammonia as N	<RL	19	19	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	<RL	23	23	100.00
EPA 354.1	Nitrite as N	<RL	18	18	100.00
EPA 365.2	OrthoPhosphate as P	<RL	14	14	100.00
EPA 365.2	Phosphate as P	<RL	18	18	100.00
EPA 405.1	BOD	<RL			NA
EPA 415.1	Total Organic Carbon	<RL	18	18	100.00
SM 9223	*E. coli*	<RL	12	12	100.00
EPA 200.8	Arsenic	<RL	20	20	100.00
EPA 200.8	Boron	<RL	20	20	100.00
EPA 200.8	Cadmium	<RL	20	20	100.00
EPA 200.8	Copper	<RL	23	23	100.00
EPA 200.8	Lead	<RL	20	20	100.00
EPA 200.8	Nickel	<RL	20	20	100.00
EPA 200.8	Selenium	<RL	7	7	100.00
EPA 200.8	Zinc	<RL	23	22	95.65
		TOTAL	**863**	**862**	**99.88**

Table 17. ESJWQC summary of lab control spike quality control sample evaluations.

Laboratory control spikes and laboratory control spike duplicates were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	PR 31-133	12	12	100.00
EPA 8321A CARB	Carbaryl	PR 44-133	12	12	100.00
EPA 8321A CARB	Carbofuran	PR 36-165	12	12	100.00
EPA 8321A CARB	Methiocarb	PR35-142	12	12	100.00
EPA 8321A CARB	Methomyl	PR 23-152	12	12	100.00
EPA 8321A CARB	Oxamyl	PR 10-117	12	12	100.00
EPA 8321A CARB	Diuron	PR 52-136	12	12	100.00
EPA 8321A CARB	Linuron	PR 49-144	12	12	100.00
EPA 619	Atrazine	PR 39-156	12	12	100.00
EPA 619	Cyanazine	PR 22-172	12	12	100.00
EPA 619	Simazine	PR 21-179	12	12	100.00
EPA 547M	Glyphosate	PR 76-117	36	36	100.00
EPA 549.2M	Paraquat dichloride	PR 50-126	26	23	88.46
EPA 8081A OCH	DDD(p,p')	PR 38-135	13	13	100.00
EPA 8081A OCH	DDE(p,p')	PR 21-134	13	13	100.00
EPA 8081A OCH	DDT(p,p')	PR 18-145	13	13	100.00
EPA 8081A OCH	Dicofol	PR 40-135	12	12	100.00
EPA 8081A OCH	Dieldrin	PR 18-121	13	13	100.00
EPA 8081A OCH	Endrin	PR 24-143	13	13	100.00
EPA 8081A OCH	Methoxychlor	PR 30-163	13	13	100.00
EPA 8081A PYR	Bifenthrin	PR 52-117	14	14	100.00
EPA 8081A PYR	Cyfluthrin	PR 53-125	14	14	100.00
EPA 8081A PYR	Cypermethrin	PR 55-107	14	14	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	PR 52-117	14	14	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	PR 62-104	14	14	100.00
EPA 8081A PYR	Permethrin, total	PR 24-166	14	14	100.00
EPA 8141A OP	Azinphos methyl	PR 36-189	14	14	100.00
EPA 8141A OP	Chlorpyrifos	PR 61-125	18	18	100.00
EPA 8141A OP	Diazinon	PR 57-130	14	14	100.00
EPA 8141A OP	Dimethoate	PR 68-202	14	14	100.00
EPA 8141A OP	Disulfoton	PR 47-117	14	14	100.00
EPA 8141A OP	Malathion	PR 47-125	14	14	100.00
EPA 8141A OP	Methidathion	PR 50-150	14	14	100.00
EPA 8141A OP	Parathion, Methyl	PR 55-164	14	14	100.00
EPA 8141A OP	Phorate	PR 44-117	14	14	100.00
EPA 8141A OP	Phosmet	PR 50-150	14	14	100.00
EPA 8141A OP	Molinate	PR 50-150	14	14	100.00
EPA 8141A OP	Thiobencarb	PR 50-150	14	14	100.00
EPA 8141A OP	Methamidophos	PR 40-135	12	12	100.00
EPA 110.2	Color	PR 80-120	13	13	100.00
EPA 130.2	Hardness as CaCO3	PR 80-120	21	21	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	PR 80-120	16	16	100.00
EPA 180.1	Turbidity	PR 80-120	14	14	100.00
EPA 300.0	Nitrate as N	PR 80-120	18	18	100.00
EPA 350.2	Ammonia as N	PR 80-120	19	19	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	PR 80-120	23	23	100.00
EPA 354.1	Nitrite as N	PR 80-120	18	18	100.00
EPA 365.2	OrthoPhosphate as P	PR 80-120	15	15	100.00
EPA 365.2	Phosphate as P	PR 80-120	18	18	100.00
EPA 405.1	BOD	PR 80-120	4	4	100.00
EPA 415.1	Total Organic Carbon	PR 80-120	18	18	100.00
SM 9223	*E. coli*	PR 80-120			NA
EPA 200.8	Arsenic	PR 75-125	20	20	100.00
EPA 200.8	Boron	PR 75-125	20	20	100.00
EPA 200.8	Cadmium	PR 75-125	20	20	100.00
EPA 200.8	Copper	PR 75-125	23	23	100.00
EPA 200.8	Lead	PR 75-125	20	20	100.00
EPA 200.8	Nickel	PR 75-125	20	20	100.00
EPA 200.8	Selenium	PR 75-125	7	7	100.00
EPA 200.8	Zinc	PR 75-125	23	23	100.00
		TOTAL	**851**	**849**	99.67

Table 18. ESJWQC summary of lab control spike duplicate quality control sample evaluations.

Laboratory control spikes and laboratory control spike duplicates were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25			NA
EPA 8321A CARB	Carbaryl	RPD ≤ 25			NA
EPA 8321A CARB	Carbofuran	RPD ≤ 25			NA
EPA 8321A CARB	Methiocarb	RPD ≤ 25			NA
EPA 8321A CARB	Methomyl	RPD ≤ 25			NA
EPA 8321A CARB	Oxamyl	RPD ≤ 25			NA
EPA 8321A CARB	Diuron	RPD ≤ 25			NA
EPA 8321A CARB	Linuron	RPD ≤ 25			NA
					NA
EPA 619	Atrazine	RPD ≤ 25			NA
EPA 619	Cyanazine	RPD ≤ 25			NA
EPA 619	Simazine	RPD ≤ 25			NA
EPA 547M	Glyphosate	RPD ≤ 25	18	18	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25	13	12	92.31
EPA 8081A OCH	DDD(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	DDE(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	DDT(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	Dicofol	RPD ≤ 25			NA
EPA 8081A OCH	Dieldrin	RPD ≤ 25			NA
EPA 8081A OCH	Endrin	RPD ≤ 25			NA
EPA 8081A OCH	Methoxychlor	RPD ≤ 25			NA
EPA 8081A PYR	Bifenthrin	RPD ≤ 25	1	1	100.00
EPA 8081A PYR	Cyfluthrin	RPD ≤ 25	1	1	100.00
EPA 8081A PYR	Cypermethrin	RPD ≤ 25	1	1	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	1	1	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	RPD ≤ 25	1	1	100.00
EPA 8081A PYR	Permethrin, total	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	3	3	100.00
EPA 8141A OP	Diazinon	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	1	0	0.00
EPA 8141A OP	Malathion	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Phosmet	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Molinate	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Thiobencarb	RPD ≤ 25	1	1	100.00
EPA 8141A OP	Methamidophos	RPD ≤ 25			NA
EPA 110.2	Color	RPD ≤ 25			NA

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 130.2	Hardness as CaCO3	RPD ≤ 25			NA
EPA 160.1	Total Dissolved Solids	RPD ≤ 25			NA
EPA 180.1	Turbidity	RPD ≤ 25			NA
EPA 300.0	Nitrate as N	RPD ≤ 25			NA
EPA 350.2	Ammonia as N	RPD ≤ 25			NA
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25			NA
EPA 354.1	Nitrite as N	RPD ≤ 25			NA
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25			NA
EPA 365.2	Phosphate as P	RPD ≤ 25			NA
EPA 405.1	BOD	RPD ≤ 25			NA
EPA 415.1	Total Organic Carbon	RPD ≤ 25			NA
SM 9223	*E. coli*	RPD ≤ 25			NA
EPA 200.8	Arsenic	RPD ≤ 25			NA
EPA 200.8	Boron	RPD ≤ 25			NA
EPA 200.8	Cadmium	RPD ≤ 25			NA
EPA 200.8	Copper	RPD ≤ 25			NA
EPA 200.8	Lead	RPD ≤ 25			NA
EPA 200.8	Nickel	RPD ≤ 25			NA
EPA 200.8	Selenium	RPD ≤ 25			NA
EPA 200.8	Zinc	RPD ≤ 25			NA
		TOTAL	51	49	96.08

Table 19. ESJWQC summary of matrix spike quality control sample evaluations.

Matrix spikes and matrix spike duplicates were collected during the irrigation season of 2007. Included in the following table are NONAG matrix spikes included for batch quality assurance purposes. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	PR 31-133	24	24	100.00
EPA 8321A CARB	Carbaryl	PR 44-133	24	24	100.00
EPA 8321A CARB	Carbofuran	PR 36-165	24	24	100.00
EPA 8321A CARB	Methiocarb	PR 35-142	24	24	100.00
EPA 8321A CARB	Methomyl	PR 23-152	24	24	100.00
EPA 8321A CARB	Oxamyl	PR 10-117	24	24	100.00
EPA 8321A CARB	Diuron	PR 56-136	24	22	91.67
EPA 8321A CARB	Linuron	PR 49-144	24	24	100.00
EPA 619	Atrazine	PR 39-156	24	24	100.00
EPA 619	Cyanazine	PR 22-172	24	24	100.00
EPA 619	Simazine	PR 21-179	24	23	95.83
EPA 547M	Glyphosate	PR 76-117	36	34	94.44
EPA 549.2M	Paraquat dichloride	PR 50-126	26	17	65.38
EPA 8081A OCH	DDD(p,p')	PR 38-135	24	24	100.00
EPA 8081A OCH	DDE(p,p')	PR 21-134	24	24	100.00
EPA 8081A OCH	DDT(p,p')	PR 18-145	24	24	100.00
EPA 8081A OCH	Dicofol	PR 40-135	24	24	100.00
EPA 8081A OCH	Dieldrin	PR 18-121	24	24	100.00
EPA 8081A OCH	Endrin	PR 24-143	24	24	100.00
EPA 8081A OCH	Methoxychlor	PR 30-163	24	24	100.00
EPA 8081A PYR	Bifenthrin	PR 52-117	24	24	100.00
EPA 8081A PYR	Cyfluthrin	PR 53-125	24	20	83.33
EPA 8081A PYR	Cypermethrin	PR 55-107	24	15	62.50
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	PR 52-117	24	17	70.83
EPA 8081A PYR	Cyhalothrin, lambda, total	PR 62-104	24	15	62.50
EPA 8081A PYR	Permethrin, total	PR 24-166	24	24	100.00
EPA 8141A OP	Azinphos methyl	PR 36-189	24	24	100.00
EPA 8141A OP	Chlorpyrifos	PR 61-125	24	24	100.00
EPA 8141A OP	Diazinon	PR 57-130	24	24	100.00
EPA 8141A OP	Dimethoate	PR 68-202	24	24	100.00
EPA 8141A OP	Disulfoton	PR 47-117	24	24	100.00
EPA 8141A OP	Malathion	PR 47-125	24	24	100.00
EPA 8141A OP	Methidathion	PR 50-150	24	16	66.67
EPA 8141A OP	Parathion, Methyl	PR 55-164	24	24	100.00
EPA 8141A OP	Phorate	PR 44-117	24	23	95.83
EPA 8141A OP	Phosmet	PR 50-150	24	22	91.67
EPA 8141A OP	Molinate	PR 50-150	24	22	91.67
EPA 8141A OP	Thiobencarb	PR 50-150	24	22	91.67
EPA 8141A OP	Methamidophos	PR 40-135	24	18	75.00
EPA 110.2	Color	PR 80-120			NA
EPA 130.2	Hardness as CaCO3	PR 80-120	42	42	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	PR 80-120			NA
EPA 180.1	Turbidity	PR 80-120			NA
EPA 300.0	Nitrate as N	PR 80-120	35	33	94.29
EPA 350.2	Ammonia as N	PR 80-120	38	38	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	PR 80-120	46	45	97.83
EPA 354.1	Nitrite as N	PR 80-120	36	36	100.00
EPA 365.2	OrthoPhosphate as P	PR 80-120	30	30	100.00
EPA 365.2	Phosphate as P	PR 80-120	36	36	100.00
EPA 405.1	BOD	PR 80-120			NA
EPA 415.1	Total Organic Carbon	PR 80-120	44	42	95.45
SM 9223	*E. coli*	PR 80-120			NA
EPA 200.8	Arsenic	PR 75-125	40	40	100.00
EPA 200.8	Boron	PR 75-125	38	34	89.47
EPA 200.8	Cadmium	PR 75-125	40	40	100.00
EPA 200.8	Copper	PR 75-125	46	46	100.00
EPA 200.8	Lead	PR 75-125	40	40	100.00
EPA 200.8	Nickel	PR 75-125	40	40	100.00
EPA 200.8	Selenium	PR 75-125	14	14	100.00
EPA 200.8	Zinc	PR 75-125	46	45	97.83
		TOTAL	1561	1487	95.26

Table 20. ESJWQC summary of matrix spike duplicate quality control sample evaluations.

Matrix spikes and matrix spike duplicates were collected during the irrigation season of 2007. Included in the following table are NONAG matrix spikes included for batch quality assurance purposes. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Carbaryl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Carbofuran	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Methiocarb	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Methomyl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Oxamyl	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Diuron	RPD ≤ 25	12	12	100.00
EPA 8321A CARB	Linuron	RPD ≤ 25	12	12	100.00
EPA 619	Atrazine	RPD ≤ 25	12	12	100.00
EPA 619	Cyanazine	RPD ≤ 25	12	11	91.67
EPA 619	Simazine	RPD ≤ 25	12	11	91.67
EPA 547M	Glyphosate	RPD ≤ 25	18	18	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25	13	11	84.62
EPA 8081A OCH	DDD(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	DDE(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	DDT(p,p')	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Dicofol	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Dieldrin	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Endrin	RPD ≤ 25	12	12	100.00
EPA 8081A OCH	Methoxychlor	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Bifenthrin	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cyfluthrin	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cypermethrin	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	RPD ≤ 25	12	12	100.00
EPA 8081A PYR	Permethrin, total	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Diazinon	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	12	11	91.67
EPA 8141A OP	Malathion	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Phosmet	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Molinate	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Thiobencarb	RPD ≤ 25	12	12	100.00
EPA 8141A OP	Methamidophos	RPD ≤ 25	12	12	100.00
EPA 110.2	Color	RPD ≤ 25			NA

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 130.2	Hardness as CaCO3	RPD ≤ 25	21	21	100.00
EPA 160.1	Total Dissolved Solids	RPD ≤ 25			NA
EPA 180.1	Turbidity	RPD ≤ 25			NA
EPA 300.0	Nitrate as N	RPD ≤ 25	17	17	100.00
EPA 350.2	Ammonia as N	RPD ≤ 25	19	19	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25	23	23	100.00
EPA 354.1	Nitrite as N	RPD ≤ 25	18	18	100.00
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25	15	15	100.00
EPA 365.2	Phosphate as P	RPD ≤ 25	18	18	100.00
EPA 405.1	BOD	RPD ≤ 25			NA
EPA 415.1	Total Organic Carbon	RPD ≤ 25	22	22	100.00
SM 9223	*E. coli*	RPD ≤ 25			NA
EPA 200.8	Arsenic	RPD ≤ 25	20	20	100.00
EPA 200.8	Boron	RPD ≤ 25	19	19	100.00
EPA 200.8	Cadmium	RPD ≤ 25	20	20	100.00
EPA 200.8	Copper	RPD ≤ 25	23	23	100.00
EPA 200.8	Lead	RPD ≤ 25	20	20	100.00
EPA 200.8	Nickel	RPD ≤ 25	20	20	100.00
EPA 200.8	Selenium	RPD ≤ 25	7	7	100.00
EPA 200.8	Zinc	RPD ≤ 25	23	22	95.65
		TOTAL	780	774	99.23

Table 21. ESJWQC summary of lab duplicate quality control sample evaluations.

Samples were analyzed in batches with samples collected during the irrigation season of 2007, and also include NONAG matrix spikes included for batch quality assurance purposes, and are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25			NA
EPA 8321A CARB	Carbaryl	RPD ≤ 25			NA
EPA 8321A CARB	Carbofuran	RPD ≤ 25			NA
EPA 8321A CARB	Methiocarb	RPD ≤ 25			NA
EPA 8321A CARB	Methomyl	RPD ≤ 25			NA
EPA 8321A CARB	Oxamyl	RPD ≤ 25			NA
EPA 8321A CARB	Diuron	RPD ≤ 25			NA
EPA 8321A CARB	Linuron	RPD ≤ 25			NA
EPA 619	Atrazine	RPD ≤ 25			NA
EPA 619	Cyanazine	RPD ≤ 25			NA
EPA 619	Simazine	RPD ≤ 25			NA
EPA 547M	Glyphosate	RPD ≤ 25			NA
EPA 549.2M	Paraquat dichloride	RPD ≤ 25			NA
EPA 8081A OCH	DDD(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	DDE(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	DDT(p,p')	RPD ≤ 25			NA
EPA 8081A OCH	Dicofol	RPD ≤ 25			NA
EPA 8081A OCH	Dieldrin	RPD ≤ 25			NA
EPA 8081A OCH	Endrin	RPD ≤ 25			NA
EPA 8081A OCH	Methoxychlor	RPD ≤ 25			NA
EPA 8081A PYR	Bifenthrin	RPD ≤ 25			NA
EPA 8081A PYR	Cyfluthrin, total	RPD ≤ 25			NA
EPA 8081A PYR	Cypermethrin, total	RPD ≤ 25			NA
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	RPD ≤ 25			NA
EPA 8081A PYR	Cyhalothrin, lambda, total	RPD ≤ 25			NA
EPA 8081A PYR	Permethrin, total	RPD ≤ 25			NA
EPA 8141A OP	Azinphos methyl	RPD ≤ 25			NA
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25			NA
EPA 8141A OP	Diazinon	RPD ≤ 25			NA
EPA 8141A OP	Dimethoate	RPD ≤ 25			NA
EPA 8141A OP	Disulfoton	RPD ≤ 25			NA
EPA 8141A OP	Malathion	RPD ≤ 25			NA
EPA 8141A OP	Methidathion	RPD ≤ 25			NA
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25			NA
EPA 8141A OP	Phorate	RPD ≤ 25			NA
EPA 8141A OP	Phosmet	RPD ≤ 25			NA
EPA 8141A OP	Molinate	RPD ≤ 25			NA
EPA 8141A OP	Thiobencarb	RPD ≤ 25			NA
EPA 8141A OP	Methamidophos	RPD ≤ 25			NA
EPA 110.2	Color	RPD ≤ 25	16	16	100.00
EPA 130.2	Hardness as CaCO3	RPD ≤ 25	2	2	NA

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	RPD ≤ 25	16	14	87.50
EPA 180.1	Turbidity	RPD ≤ 25	16	16	100.00
EPA 300.0	Nitrate as N	RPD ≤ 25			NA
EPA 350.2	Ammonia as N	RPD ≤ 25			NA
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25			NA
EPA 354.1	Nitrite as N	RPD ≤ 25			NA
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25			NA
EPA 365.2	Phosphate as P	RPD ≤ 25			NA
EPA 405.1	BOD	RPD ≤ 25	4	4	100.00
EPA 415.1	Total Organic Carbon	RPD ≤ 25			NA
SM 9223	*E. coli*	RPD ≤ 25	12	12	100.00
EPA 200.8	Arsenic	RPD ≤ 25	2	2	100.00
EPA 200.8	Boron	RPD ≤ 25	2	0	0.00
EPA 200.8	Cadmium	RPD ≤ 25	2	2	100.00
EPA 200.8	Copper	RPD ≤ 25	2	2	100.00
EPA 200.8	Lead	RPD ≤ 25	2	2	100.00
EPA 200.8	Nickel	RPD ≤ 25	2	2	100.00
EPA 200.8	Selenium	RPD ≤ 25	2	2	100.00
EPA 200.8	Zinc	RPD ≤ 25	2	1	50.00
		TOTAL	82	77	93.90

Table 22. ESJWQC summary of surrogate recovery quality control sample evaluations.

Surrogates were run with water samples collected and LABQAs analyzed during the irrigation season of 2007 for all organics except paraquat and glyphosate. Included are NONAG samples. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Isoxaben(Surrogate)	RPD ≤ 25; PR 36-140	196	191	97.45
EPA 8321A CARB	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 36-140	196	177	90.31
EPA 8321A CARB	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 36-140			NA
EPA 619	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 36-148	196	177	90.31
EPA 619	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 36-148	196	196	100.00
EPA 8081A OCH	Decachlorobiphenyl(Surrogate)	RPD ≤ 25; PR 16-146	201	201	100.00
EPA 8081A OCH	Tetrachloro-m-xylene(Surrogate)	RPD ≤ 25; PR 24-114	201	196	97.51
EPA 8081A PYR	Decachlorobiphenyl(Surrogate)	RPD ≤ 25; PR 15-98	67	67	100.00
EPA 8081A PYR	Tetrachloro-m-xylene(Surrogate)	RPD ≤ 25; PR 38-113	67	67	100.00
EPA 8141A OP	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 56-150	413	382	92.49
EPA 8141A OP	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 56-150	413	394	95.40
		TOTAL	**2146**	**2048**	**95.43**

Table 23. ESJWQC summary of holding time evaluations for environmental, field blank, field duplicate and matrix spike samples collected during the irrigation season of 2007; sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	7 days	159	159	100.00
EPA 8321A CARB	Carbaryl	7 days	159	159	100.00
EPA 8321A CARB	Carbofuran	7 days	159	159	100.00
EPA 8321A CARB	Methiocarb	7 days	159	159	100.00
EPA 8321A CARB	Methomyl	7 days	159	159	100.00
EPA 8321A CARB	Oxamyl	7 days	159	159	100.00
EPA 8321A CARB	Diuron	7 days	159	159	100.00
EPA 8321A CARB	Linuron	7 days	159	159	100.00
EPA 619	Atrazine	7 days	159	159	100.00
EPA 619	Cyanazine	7 days	159	159	100.00
EPA 619	Simazine	7 days	159	159	100.00
EPA 547M	Glyphosate	14 days	165	165	100.00
EPA 549.2M	Paraquat dichloride	7 days	160	159	99.38
EPA 8081A OCH	DDD(p,p')	7 days	159	158	99.37
EPA 8081A OCH	DDE(p,p')	7 days	159	158	99.37
EPA 8081A OCH	DDT(p,p')	7 days	159	158	99.37
EPA 8081A OCH	Dicofol	7 days	159	159	100.00
EPA 8081A OCH	Dieldrin	7 days	160	159	99.38
EPA 8081A OCH	Endrin	7 days	160	159	99.38
EPA 8081A OCH	Methoxychlor	7 days	160	159	99.38
EPA 8081A PYR	Bifenthrin	7 days	162	162	100.00
EPA 8081A PYR	Cyfluthrin	7 days	160	160	100.00
EPA 8081A PYR	Cypermethrin	7 days	160	160	100.00
EPA 8081A PYR	Esfenvalerate/Fenvalerate, total	7 days	160	160	100.00
EPA 8081A PYR	Cyhalothrin, lambda, total	7 days	160	160	100.00
EPA 8081A PYR	Permethrin, total	7 days	160	160	100.00
EPA 8141A OP	Azinphos methyl	7 days	164	164	100.00
EPA 8141A OP	Chlorpyrifos	7 days	169	169	100.00
EPA 8141A OP	Diazinon	7 days	164	164	100.00
EPA 8141A OP	Dimethoate	7 days	164	164	100.00
EPA 8141A OP	Disulfoton	7 days	164	164	100.00
EPA 8141A OP	Malathion	7 days	164	164	100.00
EPA 8141A OP	Methidathion	7 days	164	164	100.00
EPA 8141A OP	Parathion, Methyl	7 days	164	164	100.00
EPA 8141A OP	Phorate	7 days	164	164	100.00
EPA 8141A OP	Phosmet	7 days	164	164	100.00
EPA 8141A OP	Molinate	7 days	164	164	100.00
EPA 8141A OP	Thiobencarb	7 days	166	166	100.00
EPA 8141A OP	Methamidophos	7 days	159	159	100.00
EPA 110.2	Color	48 hours	147	147	100.00
EPA 130.2	Hardness as CaCO3	6 months	150	150	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	48 hours	147	147	100.00
EPA 180.1	Turbidity	48 hours	147	147	100.00
EPA 300.0	Nitrate as N	48 hours	139	139	100.00
EPA 350.2	Ammonia as N	Field acidify, 28 days	138	138	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	Field acidify, 28 days	142	142	100.00
EPA 354.1	Nitrite as N	48 hours	139	139	100.00
EPA 365.2	OrthoPhosphate as P	48 hours	136	136	100.00
EPA 365.2	Phosphate as P	Field acidify, 28 days	137	137	100.00
EPA 405.1	BOD	48 hours	44	44	100.00
EPA 415.1	Total Organic Carbon	28 days	169	169	100.00
SM 9223	*E. coli*	24 hours	141	141	100.00
EPA 200.8	Arsenic	Field acidify, 40 days	139	139	100.00
EPA 200.8	Boron	Field acidify, 40 days	138	138	100.00
EPA 200.8	Cadmium	Field acidify, 40 days	139	139	100.00
EPA 200.8	Copper	Field acidify, 40 days	152	152	100.00
EPA 200.8	Lead	Field acidify, 40 days	139	139	100.00
EPA 200.8	Nickel	Field acidify, 40 days	139	139	100.00
EPA 200.8	Selenium	Field acidify, 40 days	44	44	100.00
EPA 200.8	Zinc	Field acidify, 40 days	146	146	100.00
		TOTAL	**9096**	**9089**	**99.92**

Table 24. ESJWQC summary of toxicity retest evaluations due to failed toxicity criteria for samples collected during the irrigation season of 2007; sorted by method and species.

Method	Toxicity Species	Total Environmental Samples	Total Number Retested	Percent Samples Within Acceptable Criteria
EPA 821/R-02-012	*Ceriodaphnia dubia*	146	0	100.00
EPA 821/R-02-012	*Pimephales promelas*	138	0	100.00
EPA 821/R-02-013	*Selenastrum capricornutum*	146	0	100.00
EPA 600/R-99-064	*Hyalella azteca*	27	0	100.00

Table 25. ESJWQC summary of toxicity field duplicate sample evaluations collected during the irrigation season of 2007; sorted by method and species.

Method	Toxicity Species	Total Field Duplicate Samples	Data Quality Objective (DQO)	Total Number Sample Within DQO	Percent Samples Within Acceptable Criteria
EPA 821/R-02-012	*Ceriodaphnia dubia*	2	RPD ≤ 25	12	100.00
EPA 821/R-02-012	*Pimephales promelas*	2	RPD ≤ 25	12	100.00
EPA 821/R-02-013	*Selenastrum capricornutum*	2	RPD ≤ 25	12	100.00
EPA 600/R-99-064	*Hyalella azteca*	1	RPD ≤ 25	2	100.00

Pesticide Use Information

All exceedances for the 2007 irrigation sampling are provided in Table 31 to Table 35 under the next section of this report, Data Interpretation. Pesticide use reports for April - September 2007 were requested from all the counties within the Coalition region. These PUR data can be found in Appendix IV. PUR data for Madera County were available only up to the end of May for the irrigation season by October 29, 2007. The additional PUR data will be included as an amendment to this report as soon as the Coalition can obtain and process them.

For each sampling period in which chemicals, metals or toxicity were detected, all reported pesticide use for one to six months prior to sampling (depending on the exceedance, Table 26) was collected for the specific site subwatershed based on Township-Range-Section (TRS). All pesticide products that contained the detected chemicals and metals are listed by their active ingredients and application method and are provided in maps in Appendix IV. Pesticide use is reported as amount of product used. Some products may have more than one active ingredient and in this case the product appears more than once with the name of the chemical ingredient. Data are not available for individual fields or parcels except where they coincide with complete sections. Where consecutive exceedances are reported and more than one month of data are provided, only pesticide use from the time of the previous date is provided.

Dieldrin exceedances are not queried since there are no registered products that contain this chemical, and nitrate/nitrite/nitrogen exceedances are not listed since the use of these products are not reported.

Table 26. Pesticide use data collected for reported exceedences.

Exceedance Type	Pesticides Use Data Collected
Pesticides in water column	1 month, except pyrethroids 6 months
Metals in water column	3 months
Sediment Toxicity – *Hyalella azteca*	3 months with 6 months for pyrethroids
Water column toxicity – *Selenastrum capricornutum, Pimephales promelas* and *Ceriodaphnia dubia*	1 month with 6 months for pyrethroids

Data Interpretation

Exceedance Discrepencies

On October 9, 2007 the CVRWQCB provided the Coalition with an updated interim table of WQT limits for agricultural supply which changed the exceedance values used by the Coalition for some constituents. The Coalition is retroactively reporting amended exceedances according to the new limits for constituents for which the limit was reduced (Table 27) and for exceedances of constituents for which the limit was raised (Table 28). Therefore minor discrepancies exist between exceedances reported in this document and those submitted as exceedance reports to the CVRWQCB during the 2007 irrigation monitoring season.

Constituents for which the WQT limit was raised or changed and the Coalition reported exceedances which are no longer considered exceedances under the new interim table of WQT limits include nitrite and nitrate (previous limit was additive objective 10,000 ug/L combined, new limit is 1.0 mg/L for nitrite and 45 mg/L for nitrate), arsenic (previous limit was 0.004 ug/L, new limit is 10 ug/L), aldicarb (previous limit was 1.0 ug/L, new limit is 3.0 ug/L), bifenthrin (previous limit was 0.0004 ug/L, new limit is 110 ug/L), and dimethoate (previous limit was 0.2 ug/L, new limit is 1.0 ug/L). Exceedances that were not reported due to a previous WQT limit higher than the current WQT limit includes diuron (reduced from 14 ug/L to 2 ug/L).

Despite procedures to double check all exceedance and associated lab reports prior to submittal, two color exceedances were not reported and one color exceedance was reported incorrectly due to data entry errors (Table 29).

In addition, there are discrepancies between the initial percentages reported for *Selenastrum capricornutum* toxicity in exceedance reports and those included in this report. *Selenastrum* toxicity test results were reported from the laboratory in both absorbance units and cells/mL (calculated based on absorbance). At the time that the exceedance report was sent in, the amount of growth relative to the control (calculated as a percentage) was calculated based on the reported absorbance. The laboratory later converted the growth originally measured as absorbance units to cells/mL to meet ILRP comparability requirements. As a result, the percent controls reported in the initial exceedance reports may vary slightly from the final percent controls reported in this document. This has no effect on whether toxicity was present.

Table 27. Exceedances for diuron not reported due to a previous WQT limit less than the current WQT limit.

Report date refers to the date that the associated exceedance report was submitted.

Station Name	Sample Date	Report Date	Diuron (ug/L)
Berenda Slough along Ave 18 ½	5/29/2007	NA	3.4
Hilmar Drain @ Central Ave	4/17/2007	6/15/2007	3.3
Hilmar Drain @ Central Ave	6/19/2007	8/7/2007	6.6
Hilmar Drain @ Central Ave (FD)	6/19/2007	8/7/2007	3.2

Table 28. Samples reported as exceeding WQT limits for nitrite, nitrate, arsenic, aldicarb, bifenthrin and dimethoate that are no longer exceedances based on the current WQT limits.

Station Name	Sample Date	Report Date	Analyte	Reported Exceedance	Previous WQT	Current WQT	Unit
Hilmar Drain @ Central Ave	5/15/07	7/6/07	Nitrite	0.1	10	1.0	mg/L
Prairie Flower Drain @ Crows Landing Rd	5/15/07	7/6/07	Nitrite	0.35	10	1.0	mg/L
Westport Drain @ Vivian Rd	5/15/07	7/6/07	Nitrite	0.28	10	1.0	mg/L
Hatch Drain @ Tuolumne Rd	5/15/07	7/6/07	Nitrate	13	10	45	mg/L
Hatch Drain @ Tuolumne Rd	6/19/07	7/30/07	Nitrate	23	10	45	mg/L
Hatch Drain @ Tuolumne Rd	7/17/07	8/31/07	Nitrate	44	10	45	mg/L
Hatch Drain @ Tuolumne Rd	8/14/07	9/20/07	Nitrate	18	10	45	mg/L
Hilmar Drain @ Central Ave	5/15/07	7/6/07	Nitrate	22	10	45	mg/L
Hilmar Drain @ Central Ave	6/19/07	7/30/07	Nitrate	21	10	45	mg/L
Hilmar Drain @ Central Ave	7/17/07	8/31/07	Nitrate	15	10	45	mg/L
Hilmar Drain @ Central Ave	8/21/07	10/1/07	Nitrate	18	10	45	mg/L
Hilmar Drain @ Central Ave (FD)	6/19/07	7/30/07	Nitrate	24	10	45	mg/L
Prairie Flower Drain @ Crows Landing Rd	5/15/07	7/6/07	Nitrate	32	10	45	mg/L
Prairie Flower Drain @ Crows Landing Rd	6/19/07	7/30/07	Nitrate	41	10	45	mg/L
Prairie Flower Drain @ Crows Landing Rd	7/17/07	8/31/07	Nitrate	13	10	45	mg/L
Prairie Flower Drain @ Crows Landing Rd	8/14/07	9/20/07	Nitrate	16	10	45	mg/L
Prairie Flower Drain @ Crows Landing Rd (FD)	8/14/07	9/20/07	Nitrate	16	10	45	mg/L
Westport Drain @ Vivian Rd	5/15/07	7/6/07	Nitrate	24	10	45	mg/L
Westport Drain @ Vivian Rd	6/19/07	7/30/07	Nitrate	27	10	45	mg/L
Westport Drain @ Vivian Rd	8/14/07	9/20/07	Nitrate	32	10	45	mg/L
Bear Creek @ Kibby Rd	5/29/07	7/6/07	Arsenic	0.6	0.004	10	µg/L
Cottonwood Creek @ Rd 20	4/24/07	5/25/07	Arsenic	0.9	0.004	10	µg/L
Cottonwood Creek @ Rd 20	5/29/07	7/6/07	Arsenic	0.8	0.004	10	µg/L
Deadman Creek @ Gurr Rd	4/24/07	5/25/07	Arsenic	3.6	0.004	10	µg/L
Deadman Creek @ Gurr Rd	5/29/07	7/6/07	Arsenic	6.7	0.004	10	µg/L
Deadman Creek @ Gurr Rd (FD)	5/29/07	7/6/07	Arsenic	6.5	0.004	10	µg/L
Dry Creek @ Rd 18	4/24/07	5/25/07	Arsenic	2.5	0.004	10	µg/L
Dry Creek @ Rd 18	5/29/07	7/6/07	Arsenic	1.6	0.004	10	µg/L
Dry Creek @ Wellsford Rd	4/17/07	5/25/07	Arsenic	1.3	0.004	10	µg/L
Dry Creek @ Wellsford Rd	5/15/07	7/6/07	Arsenic	1.8	0.004	10	µg/L
Duck Slough @ Gurr Rd	4/24/07	5/25/07	Arsenic	4.5	0.004	10	µg/L

Station Name	Sample Date	Report Date	Analyte	Reported Exceedance	Previous WQT	Current WQT	Unit
Duck Slough @ Gurr Rd	5/29/07	7/6/07	Arsenic	1.9	0.004	10	µg/L
Duck Slough @ Hwy 99	4/24/07	5/25/07	Arsenic	1.2	0.004	10	µg/L
Duck Slough @ Hwy 99	5/29/07	7/6/07	Arsenic	0.9	0.004	10	µg/L
Highline Canal @ Hwy 99	4/17/07	5/25/07	Arsenic	0.9	0.004	10	µg/L
Highline Canal @ Hwy 99	5/15/07	7/6/07	Arsenic	0.4	0.004	10	µg/L
Highline Canal @ Lombardy Rd	4/17/07	5/25/07	Arsenic	0.9	0.004	10	µg/L
Highline Canal @ Lombardy Rd	5/15/07	7/6/07	Arsenic	0.6	0.004	10	µg/L
Hilmar Drain @ Central Ave	4/17/07	5/25/07	Arsenic	7.8	0.004	10	µg/L
Hilmar Drain @ Central Ave	5/15/07	7/6/07	Arsenic	4.6	0.004	10	µg/L
Jones Drain @ Oakdale Rd	4/17/07	5/25/07	Arsenic	1.2	0.004	10	µg/L
Jones Drain @ Oakdale Rd	5/15/07	7/6/07	Arsenic	3.2	0.004	10	µg/L
Livingston Drain @ Robin Ave	5/15/07	7/6/07	Arsenic	1.6	0.004	10	µg/L
Merced River @ Santa Fe	4/17/07	5/25/07	Arsenic	1	0.004	10	µg/L
Merced River @ Santa Fe	5/15/07	7/6/07	Arsenic	0.3	0.004	10	µg/L
Miles Creek @ Reilly Rd	5/29/07	7/6/07	Arsenic	2.1	0.004	10	µg/L
Prairie Flower Drain @ Crows Landing Rd	4/17/07	5/25/07	Arsenic	8.8	0.004	10	µg/L
Prairie Flower Drain @ Crows Landing Rd	5/15/07	7/6/07	Arsenic	9.6	0.004	10	µg/L
Westport Drain @ Vivian Rd	5/15/07	7/6/07	Arsenic	7.9	0.004	10	µg/L
Deadman Creek @ Gurr Rd	6/26/07	8/7/07	Aldicarb	1.2	1.0	3.0	µg/L
Deadman Creek @ Hwy 59	7/24/07	9/7/07	Bifenthrin	0.014	0.0004	110	µg/L
South Slough @ Quinley Rd	7/24/07	9/7/07	Bifenthrin	0.015	0.0004	110	µg/L
Dry Creek @ Wellsford Rd	7/17/07	9/7/07	Dimethoate	0.66	0.2	1.0	µg/L
Hilmar Drain @ Central Ave	7/17/07	9/7/07	Dimethoate	0.35	0.2	1.0	µg/L

Table 29. Exceedances not reported or reported incorrectly.

Report date refers to the date that the associated exceedance report was submitted.

Station Name	Sample Date	Report Date	Reported Color Value	Correct Color Value
Duck Slough @ Hwy 99 (FD)	4/24/2007	5/25/2007	Not Reported	24
Hilmar Drain @ Central Ave	5/15/2007	6/6/2007	Not Reported	17
Hilmar Drain @ Central Ave	6/19/2007	7/30/2007	80	60

Summary of Exceedances

A summary of exceedances that occurred during monitoring over the 2007 irrigation season is presented in Table 31 – Table 35. Once an exceedance occurred during the irrigation season, an exceedance report was sent to the CVRWQCB reporting the analyte, date and location of that exceedance. WQT limits used to determine exceedances are provided in Table 30 below.

Table 30. WQT limits for constituents and parameters measured during Coalition monitoring.

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Field and Physical Parameters				
pH	6.5 - 8.5 units	Numeric		Sacramento/San Joaquin Rivers Basin Plan (page III.6.00)
Electrical Conductivity (maximum)	700 umhos/cm	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Dissolved Oxygen (minimum)	7 mg/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin.
	5 mg/L		Warm water habitat	Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan
Total Dissolved Solids	450 mg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Turbidity	variable	Numeric	Municipal and Domestic Supply	Basin Plan Objective - increase varies based on natural turbidity
E. coli	235 MPN/100 ml			EPA ambient water quality criteria, single-sample maximum
TOC	NA			
Pesticides - Carbamates				
Aldicarb	3 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health)
Carbaryl	2.53 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game)
Carbofuran	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00 (MUN, human health)
Methiocarb	0.5 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates/Resour.Publ.137, Fish Wildl.Serv., U.S.D.I., Washington, D.C :98 p. (OECDG Data File) -(Detect at .5 ug/L - no limit set)

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Methomyl	0.52 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life)
Oxamyl	50 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan, page III-3.00, under "Chemical constituents." Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL
Pesticides - Organochlorines				
DDD(p,p')	0.00083 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan (page III-6.00, pesticides, third bullet). CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)
DDE(p,p')	0.00059 ug/L			
DDT(p,p')	0.00059 ug/L			
Dicofol	NA			
Dieldrin	0.00014 ug/L	Numeric	Municipal and Domestic Supply	CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)
Endrin	0.036 ug/L	Numeric	Cold Freshwater Habitat, Spawning	CTR, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average
Methoxychlor	0.03 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum (aquatic life)
Pesticides - Organophosphates				
Azinphos methyl	0.01 ug/L	Narrative	Cold Freshwater Habitat, Spawning	National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection (Instantaneous)
Chlorpyrifos	0.015 ug/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan, page III-6.01; San Joaquin River & Delta, pending Sacramento & Feather Rivers (aquatic life); more stringent 4-day average selected over less stringent 1-hour average (Central Valley Regional Water Quality Control Board; recent ammendment for Diazinon and Chlorpyrifos in the Lower San Joaquin River).
Diazinon	0.1 ug/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento San Joaquin Basin Plan, San Joaquin River & Delta numeric standard pending Sacramento & Feather Rivers numeric standard
Dimethoate	1.0 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services)
Disulfoton	0.05 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Malathion	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Methamidophos	0.35 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Methidathion	0.7	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health)
Parathion, Methyl	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00
Phorate	0.7 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Phosmet	140 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.
Pesticides - Pyrethroids				
Bifenthrin	110 ug/L	Narrative		Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (human health)
Cypermethrin, total	0.002 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game)(aquatic life)
Cyhalothrin, lambda, total	35 ug/L	Narrative		Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health)
Permethrin, total	0.03 ug/L	Narrative	Cold Freshwater Habitat, Spawning	Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). USEPA National Ambient Water Quality Criteria, CA DFG, 2000
Cyfluthrin, total	NA			
Esfenvalerate/ Fenvalerate, total	NA			
Pesticides - Herbicides				
Atrazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan, page III-3.00, under "Chemical constituents." California Primary MCL
Cyanazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, USEPA Health Advisory (human health)

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Diuron	2 ug/L	Narrative	Municipal and Domestic Supply	One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment). Value modified using more recent information in USEPA Office of Pesticide Programs Registration Eligibility Decisions Documents. From Reference 36. (August 2007 Update Edition of the WQG)
Glyphosate	700 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, page III-3.00, California Primary MCL (MUN, human health)
Linuron	1.4 ug/L	Narrative	Municipal and Domestic Supply	USEPA IRIS Reference Dose as a drinking water level*
Molinate	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Paraquat dichloride	3.2 ug/L	Narrative	Municipal and Domestic Supply	USEPA IRIS Reference Dose as a drinking water level*
Simazine	4.0 ug/L	Numeric	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, California Primary MCL (MUN, human health)
Thiobencarb	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00
Metals (c)				
Arsenic	10 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health)
Boron	700 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)
Cadmium	variable (see charts at conclusion of table)	Numeric	Cold Freshwater Habitat, Spawning	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness
Copper	variable (see charts at conclusion of table)	Numeric	Cold Freshwater Habitat, Spawning	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness
Lead	variable (see charts at conclusion of table) for hardness values 1-70; 2.0 ug/L for hardness values 71 and greater	Numeric	Cold Freshwater Habitat, Spawning / Municipal and Domestic Supply	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness; CA Public Health Goal

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit
Nickel	variable (see charts at conclusion of table) when hardness is 1-18; when hardness is 19 or higher the maximum nickel limit is 12 ug/L regardless of hardness value	Numeric	Cold Freshwater Habitat, Spawning / Municipal and Domestic Supply	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness; CA Public Health Goal for Drinking Water
Selenium	5 ug/L (4-day average)	Numeric	Cold Freshwater Habitat, Spawning	Table III-1: Trace Element Water Quality Objective. Applicable Water Bodies - San Joaquin River, mouth of the Merced River to Vernalis. Also CTR
Zinc	variable (see charts at conclusion of table)	Numeric	Cold Freshwater Habitat, Spawning	Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness
Nutrients				
Nitrate as NO3	45,000 ug/L as NO3	Numeric	Municipal and Domestic Supply	California Primary MCL
Nitrite as Nitrogen	1,000 ug/L as N	Numeric	Municipal and Domestic Supply	California Primary MCL
Ammonia	1.5 mg/L or variable (check page 17 of WQ Goals for pHs above 7.6)	Numeric	Municipal and Domestic Supply / Cold Freshwater Habitat, Spawning	Taste and Odor Threshold; USEPA Freshwater Aquatic Life Criteria, Continuous Concentration
Hardness	NA			
Phosphorus, total	NA			
Orthophosphate, soluble	NA			
TKN	NA			

NA – Not Available. Until completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.
ND – Not Detected.

Table 31. Exceedances of field parameters; sorted by station name and sample date.

Station Name	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Bear Creek @ Kibby Rd	08/21/07	17:00		8.69	
Berenda Slough along Ave 18 1/2	05/29/07	12:40	1.75		
Berenda Slough along Ave 18 1/2	06/05/07	14:30	3.07		
Berenda Slough along Ave 18 1/2	06/26/07	13:00	5.2		
Berenda Slough along Ave 18 1/2	07/24/07	9:50	6.37		
Berenda Slough along Ave 18 1/2	07/31/07	12:50	4.72		
Berenda Slough along Ave 18 1/2	08/21/07	14:10	6.13		
Black Rascal Creek @ Yosemite Rd	05/29/07	10:30	3.93		
Black Rascal Creek @ Yosemite Rd	06/26/07	10:00	6.95		
Black Rascal Creek @ Yosemite Rd	08/21/07	16:10	6.42		
Black Rascal Creek @ Yosemite Rd	08/23/07	13:30	5.69		
Black Rascal Creek @ Yosemite Rd	08/28/07	14:20	6.18		
Cottonwood Creek @ Rd 20	05/29/07	15:20	6.55		
Cottonwood Creek @ Rd 20	07/24/07	13:00		9.04	
Cottonwood Creek @ Rd 20	08/21/07	13:00	6.81		
Cottonwood Creek @ Rd 20	08/23/07	10:30	3.95		
Deadman Creek (Dutchman) @ Gurr Rd	05/29/07	11:30	5.11		
Deadman Creek (Dutchman) @ Gurr Rd	07/24/07	11:30	5.38		
Deadman Creek (Dutchman) @ Gurr Rd	09/18/07	11:00	5.88		
Deadman Creek @ Hwy 59	05/29/07	13:40	6.13		
Deadman Creek @ Hwy 59	06/26/07	12:20	6.78		
Deadman Creek @ Hwy 59	07/24/07	12:40	4.31		
Deadman Creek @ Hwy 59	08/21/07	11:20	4.47		
Deadman Creek @ Hwy 59	08/23/07	11:00	2.65		
Deadman Creek @ Hwy 59	09/18/07	11:40	5.43		
Dry Creek @ Rd 18	08/28/07	12:10		8.53	
Dry Creek @ Wellsford Rd	06/19/07	14:50	5.77		
Dry Creek @ Wellsford Rd	07/17/07	9:20	6.64		
Dry Creek @ Wellsford Rd	07/31/07	11:30	6.91		
Dry Creek @ Wellsford Rd	08/14/07	9:10	6.58		
Dry Creek @ Wellsford Rd	09/11/07	9:00	6.5		
Duck Slough @ Gurr Rd	06/19/07	10:30	5.85		
Duck Slough @ Hwy 99	07/31/07	16:00		8.8	
Hatch Drain @ Tuolumne Rd	05/15/07	12:50	6.46		1105
Hatch Drain @ Tuolumne Rd	06/19/07	16:50	5.54		1014
Hatch Drain @ Tuolumne Rd	07/17/07	12:10	3.05		1111
Hatch Drain @ Tuolumne Rd	08/14/07	12:00	4.22		
Hatch Drain @ Tuolumne Rd	08/16/07	11:30	5.85		1280
Hatch Drain @ Tuolumne Rd	09/11/07	10:40	3.53		1817

Station Name	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Highline Canal @ Hwy 99	05/15/07	10:50		8.56	
Highline Canal @ Hwy 99	08/14/07	14:20		8.62	
Highline Canal @ Hwy 99	09/25/07	13:20		8.73	
Hilmar Drain @ Central Ave	04/17/07	11:00			1106
Hilmar Drain @ Central Ave	05/15/07	9:30			1030
Hilmar Drain @ Central Ave	06/19/07	13:00			869
Hilmar Drain @ Central Ave	07/17/07	9:40			717
Hilmar Drain @ Central Ave	08/21/07	16:30			793
Hilmar Drain @ Central Ave	09/11/07	10:40			703
Jones Drain @ Oakdale Rd	07/17/07	14:00	6.95		
Jones Drain @ Oakdale Rd	08/28/07	13:40	5.77		
Jones Drain @ Oakdale Rd	09/11/07	14:00	4.17		
Livingston Drain @ Robin Ave	05/15/07	17:50		8.95	
Livingston Drain @ Robin Ave	07/17/07	15:20		8.82	
Livingston Drain @ Robin Ave	09/11/07	16:40		8.57	
Mustang Creek @ East Ave	05/15/07	14:40	1.16		
Mustang Creek @ East Ave	06/19/07	13:30	4.3		
Prairie Flower Drain @ Crows Landing Rd	04/17/07	9:00			2127
Prairie Flower Drain @ Crows Landing Rd	05/15/07	8:30	5.59		2473
Prairie Flower Drain @ Crows Landing Rd	05/23/07	12:00			2390
Prairie Flower Drain @ Crows Landing Rd	06/19/07	15:40		8.54	2304
Prairie Flower Drain @ Crows Landing Rd	07/17/07	8:40	4.3		1067
Prairie Flower Drain @ Crows Landing Rd	08/14/07	10:30			1126
Prairie Flower Drain @ Crows Landing Rd	08/16/07	9:40			2562
Prairie Flower Drain @ Crows Landing Rd	08/28/07	12:30	3.64		1015
Prairie Flower Drain @ Crows Landing Rd	09/11/07	9:10	3.93		1097
Prairie Flower Drain @ Crows Landing Rd	09/18/07	16:40			2262
Prairie Flower Drain @ Crows Landing Rd	09/25/07	12:20			2489
Silva Drain @ Meadow Dr	06/19/07	11:40	4.2		
Silva Drain @ Meadow Dr	07/17/07	15:20	4.71		
Silva Drain @ Meadow Dr	07/31/07	14:50	6.1		
Silva Drain @ Meadow Dr	08/16/07	12:40	6.43		
Silva Drain @ Meadow Dr	09/11/07	15:40	6.12		
South Slough @ Quinley Rd	05/29/07	9:00	2.51		
South Slough @ Quinley Rd	07/24/07	9:20	6.39		
South Slough @ Quinley Rd	08/21/07	14:10		9.29	
South Slough @ Quinley Rd	08/23/07	12:20	5.3	8.87	
Westport Drain @ Vivian Rd	05/15/07	11:20			1054
Westport Drain @ Vivian Rd	05/23/07	11:00			1081
Westport Drain @ Vivian Rd	06/19/07	17:50			991
Westport Drain @ Vivian Rd	07/17/07	11:00			1025
Westport Drain @ Vivian Rd	08/14/07	11:00			1129

Station Name	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Westport Drain @ Vivian Rd	08/16/07	10:50			1147
Westport Drain @ Vivian Rd	09/11/07	12:00			1106

Table 32. Pesticides exceedances in the water column including environmental samples (E) and field duplicates (FD).

Station Name	Sample Type Code	Sample Date	Sample Time	Aldicarb, µg/L	Chlorpyrifos, µg/L	DDE(p,p'), µg/L	Dimethoate, µg/L	Diuron, µg/L	Methoxychlor, µg/L
Bear Creek @ Kibby Rd	E	07/24/07	17:30		0.049				
Berenda Slough along Ave 18 1/2	E	05/29/07	12:40					3.4	
Berenda Slough along Ave 18 1/2	E	07/24/07	9:50		0.028				
Black Rascal Creek @ Yosemite Rd	E	07/24/07	17:20		3.7				
Black Rascal Creek @ Yosemite Rd	E	08/21/07	16:10		0.12				
Black Rascal Creek @ Yosemite Rd	E	09/18/07	12:00		0.031				
Deadman Creek @ Hwy 59	E	08/21/07	11:20		0.038				
Dry Creek @ Rd 18	E	04/24/07	13:30		0.017				
Dry Creek @ Wellsford Rd	E	07/17/07	9:20		0.021				
Dry Creek @ Wellsford Rd	E	09/11/07	9:00		0.043				
Duck Slough @ Hwy 99	E	07/31/07	16:00		0.042				
Hatch Drain @ Tuolumne Rd	E	08/14/07	12:00				2.1		
Hatch Drain @ Tuolumne Rd	E	09/11/07	10:40						0.035
Highline Canal @ Hwy 99	E	07/17/07	16:40		0.017				
Highline Canal @ Lombardy Rd	E	07/17/07	12:30		0.017				
Hilmar Drain @ Central Ave	E	04/17/07	11:00					3.3	
Hilmar Drain @ Central Ave	FD	06/19/07	13:00					3.2	
Hilmar Drain @ Central Ave	E	06/19/07	13:00					6.6	
Jones Drain @ Oakdale Rd	E	07/17/07	14:00		0.055				
Jones Drain @ Oakdale Rd	FD	09/11/07	14:00		0.03				
Jones Drain @ Oakdale Rd	E	09/11/07	14:00		0.049				
Livingston Drain @ Robin Ave	E	08/14/07	17:00		0.016				
Merced River @ Santa Fe	E	07/17/07	13:50		0.018				
Miles Creek @ Reilly Rd	FD	06/26/07	13:20	5.8					
Miles Creek @ Reilly Rd	E	06/26/07	13:20	5.4					
Miles Creek @ Reilly Rd	E	09/18/07	12:50		0.03				
Mustang Creek @ East Ave	E	06/19/07	13:30			0.0073			
Prairie Flower Drain @ Crows Landing Rd	E	08/28/07	12:30		0.094				
Silva Drain @ Meadow Dr	E	07/17/07	15:20		0.031				
Silva Drain @ Meadow Dr	E	08/28/07	14:10		0.055				
Westport Drain @ Vivian Rd	E	07/17/07	11:00		0.018				

Table 33. Metals exceedances that are based on hardness in the water column.

Results are sorted by station name and sample date and include environmental samples (E) and field duplicates (FD).

Station Name	Sample Type Code	Sample Date	Sample Time	Hardness as CaCO3 mg/L	Copper, µg/L	Lead, µg/L
Cottonwood Creek @ Rd 20	E	05/29/07	15:20	54	6.7	
Cottonwood Creek @ Rd 20	E	06/19/07	9:50	42	6.7	
Cottonwood Creek @ Rd 20	E	06/26/07	15:30	38	4.3	
Cottonwood Creek @ Rd 20	FD	07/24/07	13:00	38	5.1	
Cottonwood Creek @ Rd 20	E	07/24/07	13:00	44	5.4	
Cottonwood Creek @ Rd 20	E	08/21/07	13:00	44	5.2	
Deadman Creek (Dutchman) @ Gurr Rd	E	04/24/07	14:00	80	9.2	
Deadman Creek (Dutchman) @ Gurr Rd	FD	05/29/07	11:30	76	9.1	
Deadman Creek (Dutchman) @ Gurr Rd	E	05/29/07	11:30	78	8.8	
Dry Creek @ Rd 18	E	04/24/07	13:30	180	17	
Dry Creek @ Rd 18	E	05/29/07	13:50	20	4.7	
Dry Creek @ Rd 18	E	06/19/07	8:50	12	4.9	
Dry Creek @ Rd 18	E	06/26/07	14:10	16	3.6	
Dry Creek @ Rd 18	E	07/24/07	11:20	18	5.6	
Dry Creek @ Rd 18	E	07/31/07	12:00	12	4.5	
Dry Creek @ Rd 18	FD	08/21/07	10:00	12	6.2	0.35
Dry Creek @ Rd 18	E	08/21/07	10:00	16	5.5	0.34
Dry Creek @ Rd 18	E	08/28/07	12:10	16	4.3	
Dry Creek @ Wellsford Rd	E	04/17/07	9:10	48	5.1	
Duck Slough @ Gurr Rd	E	06/19/07	9:30	26	5.4	
Duck Slough @ Gurr Rd	E	06/26/07	10:20	34	4.6	1
Duck Slough @ Hwy 99	FD	04/24/07	9:40	30	4.7	1.8
Duck Slough @ Hwy 99	E	04/24/07	9:40	34	4.1	1.5
Duck Slough @ Hwy 99	E	06/26/07	16:30	20	3	0.68
Duck Slough @ Hwy 99	E	07/24/07	15:30	26	3.5	0.64
Duck Slough @ Hwy 99	E	08/21/07	8:50	30	5.5	1.1
Duck Slough @ Hwy 99	E	08/28/07	13:50	20	3.1	
Duck Slough @ Hwy 99	E	09/18/07	14:00	24	6.9	1.8
Highline Canal @ Hwy 99	E	04/17/07	16:50	110	11	5.1
Highline Canal @ Hwy 99	E	06/19/07	20:10	16	2.4	0.5
Highline Canal @ Hwy 99	FD	07/17/07	16:40	18	3.1	1
Highline Canal @ Hwy 99	E	07/17/07	16:40	18	3.2	1
Highline Canal @ Hwy 99	E	08/14/07	14:20	14	1.9	0.44
Highline Canal @ Lombardy Rd	FD	05/15/07	12:30	20	2.5	0.43
Highline Canal @ Lombardy Rd	E	05/15/07	12:30	16	2.2	0.49

Station Name	Sample Type Code	Sample Date	Sample Time	Hardness as CaCO3 mg/L	Copper, µg/L	Lead, µg/L
Highline Canal @ Lombardy Rd	E	06/19/07	18:20	16		0.49
Jones Drain @ Oakdale Rd	E	04/17/07	12:30	32	4.7	0.84
Jones Drain @ Oakdale Rd	E	05/15/07	15:50	52	14	2.3
Jones Drain @ Oakdale Rd	E	06/19/07	12:20	24	14	1.8
Jones Drain @ Oakdale Rd	E	07/31/07	15:10	66	17	
Jones Drain @ Oakdale Rd	E	08/14/07	14:40	70	7.8	
Jones Drain @ Oakdale Rd	E	09/11/07	14:00	28	3.2	
Livingston Drain @ Robin Ave	E	05/15/07	17:50	150	18	
Livingston Drain @ Robin Ave	E	06/19/07	11:30	42	16	
Livingston Drain @ Robin Ave	E	07/17/07	15:20	52	7.8	
Livingston Drain @ Robin Ave	E	09/11/07	16:40	64	14	
Miles Creek @ Reilly Rd	E	05/29/07	14:50	32	4.3	
Miles Creek @ Reilly Rd	FD	06/26/07	13:20	38	5.7	1
Miles Creek @ Reilly Rd	E	06/26/07	13:20	40	5.8	1
Miles Creek @ Reilly Rd	E	08/21/07	10:00	42	5.2	

Table 34. Inorganics exceedances in the water column including physical parameters, nutrients and *E .coli*, and metals with WQTs not dependent on hardness.

Results are sorted by station name and sample date and include environmental samples (E) and field duplicates (FD).

Station Name	Sample Type Code	Sample Date	Sample Time	Arsenic, µg/L	Color, color units	*E. coli*, MPN/100 mL	Nitrate as N, mg/L	Nitrite as N, mg/L
Bear Creek @ Kibby Rd	E	09/18/07	13:00		17			
Berenda Slough along Ave 18 1/2	E	05/29/07	12:40		56			
Berenda Slough along Ave 18 1/2	E	06/26/07	13:00		38	390		
Berenda Slough along Ave 18 1/2	E	07/24/07	9:50		28			
Berenda Slough along Ave 18 1/2	E	08/21/07	14:10		18			
Black Rascal Creek @ Yosemite Rd	E	04/17/07	19:10		22			
Black Rascal Creek @ Yosemite Rd	E	05/29/07	10:30		65	770		
Black Rascal Creek @ Yosemite Rd	E	06/26/07	10:00		120			
Black Rascal Creek @ Yosemite Rd	E	07/24/07	17:20		56	580		
Black Rascal Creek @ Yosemite Rd	E	08/21/07	16:10		65			
Black Rascal Creek @ Yosemite Rd	E	09/18/07	12:00		140			
Cottonwood Creek @ Rd 20	E	04/24/07	15:20		17			
Cottonwood Creek @ Rd 20	E	05/29/07	15:20		24			
Cottonwood Creek @ Rd 20	E	06/26/07	15:30		17			
Cottonwood Creek @ Rd 20	FD	07/24/07	13:00		24			
Cottonwood Creek @ Rd 20	E	07/24/07	13:00		24			
Deadman Creek (Dutchman) @ Gurr Rd	E	04/24/07	14:00		40			
Deadman Creek (Dutchman) @ Gurr Rd	FD	05/29/07	11:30		40	1600		
Deadman Creek (Dutchman) @ Gurr Rd	E	05/29/07	11:30		40	1400		
Deadman Creek (Dutchman) @ Gurr Rd	E	06/26/07	11:20		50	460		
Deadman Creek (Dutchman) @ Gurr Rd	E	07/24/07	11:30		70			
Deadman Creek (Dutchman) @ Gurr Rd	E	08/21/07	12:20		25			
Deadman Creek (Dutchman) @ Gurr Rd	E	09/18/07	11:00		30	820		
Deadman Creek @ Hwy 59	E	04/24/07	15:00		35	310		
Deadman Creek @ Hwy 59	E	05/29/07	13:40		40	490		
Deadman Creek @ Hwy 59	E	06/26/07	12:20		30	610		
Deadman Creek @ Hwy 59	E	07/24/07	12:40		34			
Deadman Creek @ Hwy 59	E	08/21/07	11:20		24			
Deadman Creek @ Hwy 59	E	09/18/07	11:40			330		
Dry Creek @ Rd 18	E	04/24/07	13:30		76	1400		
Dry Creek @ Rd 18	E	05/29/07	13:50		17			
Dry Creek @ Rd 18	E	08/21/07	10:00		16			
Dry Creek @ Wellsford Rd	E	04/17/07	9:10		90			
Dry Creek @ Wellsford Rd	E	05/15/07	8:30		60			
Dry Creek @ Wellsford Rd	E	06/19/07	14:50		120			
Dry Creek @ Wellsford Rd	E	07/17/07	9:20		75			

Station Name	Sample Type Code	Sample Date	Sample Time	Arsenic, µg/L	Color, color units	*E. coli*, MPN/100 mL	Nitrate as N, mg/L	Nitrite as N, mg/L
Dry Creek @ Wellsford Rd	E	08/14/07	9:10		85	440		
Dry Creek @ Wellsford Rd	E	09/11/07	9:00		74	420		
Duck Slough @ Gurr Rd	E	04/24/07	12:40		35			
Duck Slough @ Gurr Rd	E	05/29/07	10:10		35	820		
Duck Slough @ Gurr Rd	E	06/26/07	10:20		30			
Duck Slough @ Gurr Rd	E	07/24/07	10:20		30			
Duck Slough @ Gurr Rd	E	08/21/07	13:10		30			
Duck Slough @ Gurr Rd	FD	09/18/07	9:00		30	330		
Duck Slough @ Gurr Rd	E	09/18/07	9:00		40	370		
Duck Slough @ Hwy 99	FD	04/24/07	9:40		24			
Duck Slough @ Hwy 99	E	04/24/07	9:40		30			
Duck Slough @ Hwy 99	E	06/26/07	16:30		25			
Duck Slough @ Hwy 99	E	07/24/07	15:30		25			
Duck Slough @ Hwy 99	E	08/21/07	8:50		24			
Duck Slough @ Hwy 99	E	09/18/07	14:00		22	610		
Hatch Drain @ Tuolumne Rd	E	05/15/07	12:50	12	70	>2400		2.2
Hatch Drain @ Tuolumne Rd	E	06/19/07	16:50	29	40	770		
Hatch Drain @ Tuolumne Rd	E	07/17/07	12:10	18	76	260		
Hatch Drain @ Tuolumne Rd	E	08/14/07	12:00		64	>2400		
Hatch Drain @ Tuolumne Rd	E	09/11/07	10:40	18	70	1600		
Highline Canal @ Hwy 99	E	04/17/07	16:50		16			
Highline Canal @ Hwy 99	E	05/15/07	10:50			250		
Highline Canal @ Hwy 99	E	06/19/07	20:10			320		
Highline Canal @ Hwy 99	FD	07/17/07	16:40		25	310		
Highline Canal @ Hwy 99	E	07/17/07	16:40		25	440		
Hilmar Drain @ Central Ave	E	04/17/07	11:00		100	1100		
Hilmar Drain @ Central Ave	E	05/15/07	9:30		17	440		
Hilmar Drain @ Central Ave	FD	06/19/07	13:00		60	1200		
Hilmar Drain @ Central Ave	E	06/19/07	13:00		60	1700		
Hilmar Drain @ Central Ave	E	07/17/07	9:40		75	340		
Hilmar Drain @ Central Ave	E	08/21/07	16:30		54			
Hilmar Drain @ Central Ave	E	09/11/07	10:40		56	>2400		
Jones Drain @ Oakdale Rd	E	04/17/07	12:30		40	1400		
Jones Drain @ Oakdale Rd	E	05/15/07	15:50		130	1700		
Jones Drain @ Oakdale Rd	E	06/19/07	12:20		120	1300		
Jones Drain @ Oakdale Rd	E	07/17/07	14:00		35	1300		
Jones Drain @ Oakdale Rd	E	08/14/07	14:40		45	2000		
Jones Drain @ Oakdale Rd	FD	09/11/07	14:00		35	980		
Jones Drain @ Oakdale Rd	E	09/11/07	14:00		35	460		
Livingston Drain @ Robin Ave	E	05/15/07	17:50		16			
Livingston Drain @ Robin Ave	E	06/19/07	11:30		16			

Station Name	Sample Type Code	Sample Date	Sample Time	Arsenic, µg/L	Color, color units	*E. coli*, MPN/100 mL	Nitrate as N, mg/L	Nitrite as N, mg/L
Miles Creek @ Reilly Rd	E	05/29/07	14:50		30	290		
Miles Creek @ Reilly Rd	FD	06/26/07	13:20		25	280		
Miles Creek @ Reilly Rd	E	06/26/07	13:20		35	310		
Miles Creek @ Reilly Rd	E	07/24/07	13:50		35	340		
Miles Creek @ Reilly Rd	E	08/21/07	10:00		35			
Miles Creek @ Reilly Rd	E	09/18/07	12:50		25			
Mustang Creek @ East Ave	E	05/15/07	14:40		120	1600		
Mustang Creek @ East Ave	E	06/19/07	13:30		190	410		
Prairie Flower Drain @ Crows Landing Rd	E	04/17/07	9:00		54			
Prairie Flower Drain @ Crows Landing Rd	E	05/15/07	8:30		56	920		
Prairie Flower Drain @ Crows Landing Rd	E	06/19/07	15:40	12	80			
Prairie Flower Drain @ Crows Landing Rd	E	07/17/07	8:40		90			
Prairie Flower Drain @ Crows Landing Rd	FD	08/14/07	10:30		50	260		
Prairie Flower Drain @ Crows Landing Rd	E	08/14/07	10:30		44			
Prairie Flower Drain @ Crows Landing Rd	E	09/11/07	9:10		160	>2400		
Silva Drain @ Meadow Dr	E	04/17/07	13:50		40	420		
Silva Drain @ Meadow Dr	E	05/15/07	17:20		65	1400		
Silva Drain @ Meadow Dr	E	06/19/07	11:40		75	1000		
Silva Drain @ Meadow Dr	E	07/17/07	15:20		55	520		
Silva Drain @ Meadow Dr	E	08/14/07	13:50		85	410		
Silva Drain @ Meadow Dr	E	09/11/07	15:40		140			
South Slough @ Quinley Rd	E	05/29/07	9:00		60			
South Slough @ Quinley Rd	E	06/26/07	9:00		30			
South Slough @ Quinley Rd	E	07/24/07	9:20		35			
South Slough @ Quinley Rd	E	08/21/07	14:10		25			
Westport Drain @ Vivian Rd	E	06/19/07	17:50		25			
Westport Drain @ Vivian Rd	E	07/17/07	11:00		17	330	68	
Westport Drain @ Vivian Rd	E	08/14/07	11:00		30			
Westport Drain @ Vivian Rd	E	09/11/07	12:00		17	330		

Table 35. Toxicity exceedances and results of TIE studies of environmental samples (E), field duplicate samples (FD) and resamples (RS).

Station Name	Sample Type Code	Sample Date	Sample Time	Toxicity Species Name	Toxicity End Point	Mean	Pct Control	Significance	Summary Comments
Bear Creek @ Kibby Rd	E	07/24/07	17:30	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	TIE initiated on 7/30/07; cause of toxicity was not identified. Resampled on 07/31/07; toxicity not persistent.
Berenda Slough along Ave 18 1/2	E	05/29/07	12:40	*Selenastrum capricornutum*	Total Cell Count	413341	78	SL	Resampled on 06/05/07; toxicity not persistent. Absorbance values converted to cells/mL.
Berenda Slough along Ave 18 1/2	E	07/24/07	9:50	*Selenastrum capricornutum*	Total Cell Count	55126	12	SL	TIE initiated on 8/1/07; cause of toxicity was identified as a cationic metal. Resampled on 07/31/07; toxicity was persistent.
Berenda Slough along Ave 18 1/2	RS	07/31/07	12:50	*Selenastrum capricornutum*	Total Cell Count	416597	70	SL	Resampling due to toxicity experience on 07/24/07; toxicity was persistent.
Black Rascal Creek @ Yosemite Rd	E	05/29/07	10:30	*Ceriodaphnia dubia*	Survival (%)	20	20	SL	TIE initiated on 6/2/07. Resampled on 06/05/07; toxicity not persistent.
Black Rascal Creek @ Yosemite Rd	E	07/24/07	17:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	TIE initiated on 7/26/07; cause of toxicity was an OP insecticide. A dilution series was conducted with the finding of 59 TU_a. Resampled on 07/31/07; toxicity was persistent.
Black Rascal Creek @ Yosemite Rd	RS	07/31/07	16:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resample due to toxicity experienced on 07/24/07; toxicity was persistent. TIE conducted on 7/24/07 sample.

Station Name	Sample Type Code	Sample Date	Sample Time	Toxicity Species Name	Toxicity End Point	Mean	Pct Control	Significance	Summary Comments
Black Rascal Creek @ Yosemite Rd	E	08/21/07	16:10	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	A TIE was initiated on 8/23/07, it was concluded that a non-polar organic toxicant(s) was the cause of toxicity. A dilution series was conducted and TU_a was determined to be 3.2. Resampled 08/28/07.
Black Rascal Creek @ Yosemite Rd	RS	08/28/07	14:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resampling due to toxicity experience on 08/21/07; toxicity not persistent. TIE conducted on 8/21/07 sample.
Deadman Creek (Dutchman) @ Gurr Rd	FD	05/29/07	11:30	*Pimephales promelas*	Survival (%)	85	87	SG	Resampled on 06/05/07; toxicity not persistent. Associated environmental sample not toxic.
Deadman Creek (Dutchman) @ Gurr Rd	E	07/24/07	11:30	*Selenastrum capricornutum*	Total Cell Count	234233	42	SL	TIE initiated on 8/1/07; cause of toxicity was not identified. Resampled on 07/31/07; toxicity not persistent.
Dry Creek @ Rd 18	E	05/29/07	13:50	*Selenastrum capricornutum*	Total Cell Count	338441	64	SL	Resampled on 06/05/07; toxicity not persistent. Absorbance values converted to cells/mL.
Duck Slough @ Gurr Rd	E	07/24/07	10:20	*Selenastrum capricornutum*	Total Cell Count	413341	74	SL	Resampled on 07/31/07; toxicity not persistent.
Hatch Drain @ Tuolumne Rd	E	08/16/07	11:30	*Hyalella azteca*	Survival (%)	0	0	SL	Resampled on 09/11/07; toxicity was persistent.

Station Name	Sample Type Code	Sample Date	Sample Time	Toxicity Species Name	Toxicity End Point	Mean	Pct Control	Significance	Summary Comments
Hatch Drain @ Tuolumne Rd	RS	09/11/07	10:40	*Hyalella azteca*	Survival (%)	0	0	SL	Resampling due to toxicity experienced on 08/16/07; toxicity was persistent.
Highline Canal @ Lombardy Rd	E	08/16/07	12:00	*Hyalella azteca*	Survival (%)	90	92	SG	Resampled on 09/11/07; toxicity was persistent.
Highline Canal @ Lombardy Rd	RS	09/11/07	13:30	*Hyalella azteca*	Survival (%)	52	55	SL	Resampling due to toxicity experienced on 08/16/07; toxicity was persistent
Hilmar Drain @ Central Ave	E	04/17/07	11:00	*Selenastrum capricornutum*	Total Cell Count	325415	69	SL	Resampled on 04/24/07; toxicity not persistent. Absorbance values converted to cells/mL.
Miles Creek @ Reilly Rd	FD	06/26/07	13:20	*Selenastrum capricornutum*	Total Cell Count	475214	54	SL	Resampled on 07/03/07; toxicity not persistent. Absorbance values converted to cells/mL.
Miles Creek @ Reilly Rd	E	08/23/07	10:30	*Hyalella azteca*	Survival (%)	93	94	SG	Resampled on 09/25/07. Toxicity not persistent.
Miles Creek @ Reilly Rd	E	09/18/07	12:50	*Ceriodaphnia dubia*	Survival (%)	60	60	SL	Resampled on 09/25/07. Toxicity not persistent.
Prairie Flower Drain @ Crows Landing Rd	E	05/15/07	8:30	*Selenastrum capricornutum*	Total Cell Count	1071154	88	SG	Resampled on 05/23/07; toxicity not persistent. Absorbance values converted to cells/mL.

Station Name	Sample Type Code	Sample Date	Sample Time	Toxicity Species Name	Toxicity End Point	Mean	Pct Control	Significance	Summary Comments
Prairie Flower Drain @ Crows Landing Rd	E	08/16/07	9:40	*Hyalella azteca*	Survival (%)	58	59	SL	Resampled on 09/11/07; toxicity was persistent.
Prairie Flower Drain @ Crows Landing Rd	E	09/11/07	9:10	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resampled on 9/18/07. TIE indicates OPs were responsible for toxicity (3.2 TU_a); no OPs detected in associated chemical analysis. Toxicity was not persistent.
Prairie Flower Drain @ Crows Landing Rd	RS	09/11/07	9:10	*Hyalella azteca*	Survival (%)	16	17	SL	Resampling due to toxicity experience on 08/16/07; toxicity was persistent.
Westport Drain @ Vivian Rd	E	05/15/07	11:20	*Selenastrum capricornutum*	Total Cell Count	778069	73	SL	Resampled on 05/23/07; toxicity not persistent. Absorbance values converted to cells/mL.

Interpretation of Results

Ambient water monitoring is conducted by the Coalition for the purpose of characterizing agricultural discharges in the Coalition area. Over the long term, monitoring data provides insight on the general trends in water quality at each of the sample sites. Results from each event within a monitoring season can help to identify constituents that are found at the monitoring sites, as well as the agricultural lands, crops and/or particular pesticides that contribute to those discharges. A series of actions taken to determine the potential sources of exceedances experienced during each monitoring event include 1) the use of PURs to identify relevant applications that occurred upstream of the sample site and in proximity to the sampling event, 2) an analysis of monitoring data to determine the potential mechanism associated with exceedances of physical and field parameters such as DO, pH, and TDS, 3) special studies where appropriate and cost-effective, to determine the sources of constituents such as *E. coli* or the potential causes of exceedances such as low DO, and 4) additional sampling as listed in site subwatershed management plans. These actions were implemented on a case by case basis over the course of the 2007 irrigation season. All PUR data can be found in Appendix IV.

Toxicity

Water Column Toxicity

Toxicity in the water column can occur as a result of natural or anthropogenic causes, including the discharge, release or re-suspension of metals, pesticides, ammonia or other toxicants in a water body. The three species used in water column toxicity analyses can often be associated with detections of one or more contaminants in the same sample water. Water column toxicity was experienced in 19 samples collected during the 2007 irrigation monitoring season. Of these samples, three were toxic resamples and two were field duplicates without associated toxic environmental samples. Of the 16 samples that experienced toxicity (not including resamples), six were toxic to *Ceriodaphnia*, one to *Pimephales* and nine to *Selenastrum*. Two of these samples were part of management plan sampling conducted in July. One sample was toxic to *Ceriodaphnia* (Black Rascal Creek @ Yosemite Rd, 07/24/07) and the other to *Selenastrum* (Berenda Slough along Ave 18 ½, 07/24/07).

Every time that a sample is toxic to one or more of the above test species, the site is resampled to test for persistence of the toxicity. If a sample had 0% growth or survival compared to the control a dilution series was run and acute toxic units (TU_a) were calculated. Toxicity identification Evaluations (TIEs) were conducted on all samples that had less than 50% growth or survival as compared to the control. A report describing the findings of the TIEs is included in Appendix VII.

Toxicity to Ceriodaphnia dubia

Bear Creek @ Kibby Rd

Bear Creek @ Kibby Rd experienced significant toxicity on July 24, 2007. A TIE was conducted for this sample but the toxicity did not persist through the evaluation and therefore the test was inconclusive. Chemistry analyses of the same sample water collected at the same time resulted in a detection of 0.03 µg/L of chlorpyrifos. This amount is approximately half of the standard LC_{50} value for chlorpyrifos (0.06 µg/L). PUR data indicate chlorpyrifos applications on three TRS upstream of Bear Creek @ Kibby Rd on June 22, July 1 and July 11, 2007. Applications on July 1 were the same applications responsible for the toxicity experienced on July 24 at Black Rascal Creek @ Yosemite Rd. It is unclear if chlorpyrifos applied at this site was also discharged in Bear Creek. Based on these data, it is possible that the *Ceriodaphnia* toxicity experienced in the Bear Creek @ Kibby Rd sample water was due to chlorpyrifos in the sample water; however other factors or constituents may have been involved.

Black Rascal Creek @ Yosemite Rd

Three of the six environmental samples that resulted in toxicity (not including resamples) to *Ceriodaphnia* were collected from Black Rascal Creek @ Yosemite Rd. The toxic sample collected during the second irrigation sampling event (05/29/07) resulted in 20% survival relative to the control. A resample collected on June 5, 2007 resulted in no toxicity and therefore the toxicity was not persistent. TIE results from the May sample indicate that the toxicity was likely due to a pyrethroid however no pyrethroids or any other organic pesticides were detected in sample water collected at this time. TIE results also indicate that the toxicity experienced in this sample is most likely due to more than one pyrethroid. Although no pyrethroids were detected, PURs indicate that three pyrethroids were applied up to two months prior to May 29 including lambda cyhalothrin, esfenvalerate and cyfluthrin. Lambda cyhalothrin was applied on March 31 and April 13, 2007 within the same township, range and section (TRS 7S15E13) for corn. Within this same TRS, esvenvalerate was applied on May 10 for almonds and cyfluthrin on May 21, 24 and 28 for corn. It is possible that although the amount of each of these three pyrethroids in the water column was below the analytical minimum detection limit, two or more of these chemicals may act synergistically to cause *Ceriodaphnia* toxicity.

Water collected from Black Rascal Creek @ Yosemite Rd was again toxic to *Ceriodaphnia* on July 24, 2007 resulting in 0% survival. A resample was collected on July 31 and again resulted in 0% survival to *Ceriodaphnia* indicating persistent toxicity. A TIE conducted on the July 24 sample indicates that the toxicity was due to a metabolically activated, nonpolar organic compound, such as an organophosphate pesticide. The level of toxicity calculated from this sample through a dilution series was 37.5 TU_a. The amount of chlorpyrifos detected in the sample water from this site was 3.7 µg/L which accounts for 123% of the toxicity. Once the Coalition was informed of the high amount of toxicity, representatives went directly to the grower upstream of the site to inquire whether they had recently sprayed chlorpyrifos since PUR data was not yet available. It was determined that the July toxic sample was a result of an almond hull-split application in a field adjacent to the creek in which the grower followed label instructions. After waiting the required time for irrigation, the orchard was flood irrigated and water from the orchard entered Black Rascal Creek directly from the field. Downstream, a beaver dam had been constructed causing the irrigated water to be held in the creek rather than discharged. The combination of the irrigation water directly entering the creek and the absence of flow resulted in the *Ceriodaphnia* toxicity. Since the grower followed label instructions and there was still a water quality exceedance, this information suggests that the label instructions for chlorpyrifos are not adequate to protect water quality, especially coupled with flood irrigation. The label is currently under evaluation by DPR and may result in a longer wating period between application and irrigation. Despite the fact that the grower followed the label instructions, Coalition representatives contacted the grower and discussed management practices to eliminate future exceedances.

Black Rascal Creek @ Yosemite Rd was sampled two more times after the July sampling event: August 21 and September 18, 2007. This site was again toxic in August (0% survival) however not toxic in September. The site was resampled on August 28 and this sample has 0% survival indicating that again toxicity was persistent. The TIE conducted on the August 21 sample concluded that the toxicity was due to an organophosphate. The amount of chlorpyrifos detected in this sample was 0.12 µg/L which accounts for 56% of the toxicity. There were no applications of pesticides after July 22, 2007 and therefore it is concluded that the toxicity in these samples reflects the persistent toxicity due to chlorpyrifos applications in July since the water was dammed downstream by a beaver dam. By September the toxicity had dissipated.

Prairie Flower Drain @ Crows Landing Rd

Complete mortality of *Ceriodaphnia* occurred in water samples collected from Prairie Flower Drain @ Crows Landing Rd on September 11, 2007. TIE results from that sample indicated that the toxicity was likely due to a metabolically activated, non-polar organic such as an organophosphate pesticide. The toxic units calculated from the dilution series was 3.2 TU_a. Chemical analysis of water collected at the same time resulted in no detections of organics. The only organophosphate applied prior to the September sampling event was for dimethoate (24.38 gallons). Both bacteria and chemical processes can break down dimethoate causing the analyte to dissipate. The amount of *E. coli* detected at this site on September 11 was greater than 2400 MPN/100mL and may be viewed as an indicator of the amount of bacteria in the water column. At this time, the LC_{50} for dimethoate on *Ceriodaphnia* is unknown. It is possible that the amount of dimethoate in the water column was enough to contribute to the toxicity at Prairie Flower Drain although undetected in the chemical analysis. However, it is most likely a combination of multiple factors that caused the toxicity.

Miles Creek @ Reilly Rd

Miles Creek @ Reilly Rd experienced toxicity to *Ceriodaphnia* during the sixth irrigation monitoring event conducted on September 18, 2007 resutling in 60% survival when compared to the control. This site was resampled on September 25 and the toxicity was not persistent. A TIE was not conducted for this sample due to greater than 50% survival of the *Ceriodaphnia* compared to the control. Pesticide analysis of the sample water resulted in a detection of chlorpyrifos at 0.03 µg/L which is greater than the water quality trigger (0.015 µg/L). Although the chlorpyrifos concentration detected is below the standard LC_{50} value for *Ceriodaphnia* (approximately 0.06 µg/L), it is possible that the chlorpyrifos in the sample water may have contributed to the toxicity experienced in the lab. Chlorpyrifos was not applied upstream of this location since July 19, 2007. There have been no other reported applications of any pesticides since July 31, 2007.

Toxicity to Pimephales promelas

Deadman Creek @ Gurr Rd

One sample collected during the 2007 irrigation season was toxic to *Pimephales*. Deadman Creek @ Gurr Rd was sampled on May 29, 2007 and experienced 85% survival of *Pimephales* in the field duplicate. Due to extremely low variability in the control replicates, mortality in this sample was determined to be significant. Significant toxicity was not found in the associated environmental sample. *Pimephales* toxicity occurs infrequently in Coalition monitoring and is often correlated with high levels of ammonia, or extremely high levels of pesticides in the sample water. Due to the lack of toxicity to the other test species as well as the associated environmental sample, it is not likely that the mortality experienced in *Pimephales* was a result of pesticides. The concentration of ammonia was 0.48 µg/L in the environmental sample and 0.41 µg/L in the field duplicate sample collected for ammonia analysis. The concentration of ammonia measured in the sample sent to the toxicity testing laboratory was 0.61 µg/L. These concentrations are below the LC_{50} for ammonia for *Pimephales* which have been reported at levels ranging from 0.75 µg/L to 3.0 µg/L. However, the amount of ammonia may have been sufficiently elevated to be toxic to a small number of the organisms in the sample suggesting that the ammonia may be partially responsible for the observed toxicity although it is possible that the amount of mortality experienced in the sample was not ecologically significant.

Toxicity to Selenastrum capricornutum

Toxicity to *Selenastrum* was experienced in nine samples collected during the irrigation season over a total of eight sites. Two of the samples experienced greater than 50% mortality compared to the control and triggered TIEs, however the toxicity in both samples did not persist through the TIEs and therefore results from both evaluations were inconclusive.

Berenda Slough along Ave 18 ½

Berenda Slough along Ave 18 ½ experienced *Selenastrum* toxicity twice during the irrigation season in samples collected during the May and July sampling events (05/29/07 and 07/24/07). The May sample experienced 79% growth compared to the control and the July sample experienced 18% growth compared to the control. Toxicity was persistent only in the July sample (70% growth compared to the control). Berenda Slough is not sampled for metals analysis and therefore it is unknown if metals were present in either the May or the July samples. Applied pesticides from March through May that could contribute to the decrease in *Selenastrum* growth include copper applications, glufosinate-ammonium, trifluralin, paraquat, glyphosate, oxyfluorfen, carfentrazone-ethyl, simazine, s-metolachlor, flumioxazin, and dimethylamine. Of these the Coalition analyzes for glyphosate, paraquat and simazine and the Berenda Slough sample contained the 66 µg/L glyphosate and 0.58 µg/L simazine. In addition, chemical analysis detected 3.4 µg/L diuron in the sample collected in May. The EC_{50} for diuron is recorded as 2.4 µg/L (EPA Reregistration Eligibility Decision for Diuron) and the water quality trigger limit is 2 µg/L. PUR data for the July sample and resample is not available at the time that this report is being submitted. The analytical chemistry results report that the water sample collected on July 24 contained 30 µg/L glyphosate which may have contributed to the reduced *Selenastrum* growth.

Dry Creek @ Rd 18

Samples collected from Dry Creek @ Rd 18 experienced *Selenastrum* toxicity during the May monitoring event (05/29/07). The sample resulted in 64% growth as compared to the control and therefore a TIE was not conducted. A resample was collected on June 5 however the toxicity was not persistent. The sample collected on May 29 contained 4.7 µg/L of copper, which is twice the water quality trigger for that sample based on hardness. This site experienced a copper exceedance every month except September although this was the only *Selenastrum* toxicity. There were no detections of any pesticides within the water column. Copper was applied throughout March, April and May with the most recent application occurring on May 24. Other pesticide applications that could contribute to *Selenastrum* toxicity include glyphosate, dimethylamine, trifluralin, carfentrazone-ethyl, oxyfluorfen, fluazifop-p-butyl, and paraquat. Of these only glyphosate and paraquat are analyzed by the Coalition and both were non-detects within the sample. It appears that copper is the major contributor to the reduction in *Selenastrum* growth although it is possible that other applied pesticides that the Coalition does not analyze for may be contributing factors.

Duck Slough @ Gurr Rd

Samples collected from Duck Slough @ Gurr Rd on July 24, 2007 were toxic to *Selenastrum* (74% growth as compared to the control). The site was resampled on July 31 and the toxicity was not persistent. Simazine was detected in the sample at a concentration of 0.17 µg/L. Metals were detected at this site including arsenic (1.7 µg/L), boron (12µg/L), copper (4 µg/L), nickel (2.4 µg/L), and zinc (7 µg/L) although none were exceedances. Although the metal levels are relatively low compared to other sites with *Selenastrum* toxicity, the amount of hardness is also relatively low (54 mg/L) resulting in greater availability and therefore higher toxicity at lower concentrations. It is possible that metals contributed to the reduced growth of *Selenastrum* although it is doubtful that metals were the major source. The last application of copper was March 11, 2007. In June and July the following pesticides were applied in this site subwatershed: glyphosate, oxyfluorfen, carfentrazone-ethyl, bisyribac-sodium, propanil, trifluralin, imidacloprid, and clethodim. The source of the toxicity is unclear although any of the applied pesticides may have contributed to the reduction of growth.

Hilmar Drain @ Central Ave

The sample collected from Hilmar Drain @ Central Ave on April 17, 2007 resulted in 69% growth of *Selenastrum* compared to the control. A resample was collected on April 24 and was not toxic. A TIE was not initiated due to the percent of growth compared to the control being greater than 50%. The only pesticide detected in the sample water was for diuron (3.3 µg/L) which may have resulted in the reduced growth of *Selenastrum*. Based on PURs, trifluralin was applied to this site subwatershed on April 3 and copper was applied February 20 and March 5. The Coalition does not analyze for trifluralin and therefore it is unknown if this analyte is present in this sample. There were metal detections of arsenic (7.8 µg/L), boron (320 µg/L), copper (8.5 µg/L), nickel (3.9 µg/L) and zinc (31 µg/L). Although none of the above metal detections were exceedances of water quality trigger limits, they may have contributed to the reduced growth of *Selenastrum*.

Miles Creek @ Reilly Rd

Samples collected on June 26, 2007 from Miles Creek @ Reilly Rd resulted in significant toxicity to *Selenastrum* (54% growth as compared to the control). This site was resampled on July 3 however the toxicity was not persistent. A TIE was not conducted. Water samples collected from this site at the same time contained 5.8 µg/L copper and 1.0 µg/L lead; both of these metal detections were exceedances based on hardness values. The last copper application reported in this site subwatershed was on April 13, 2007 although samples collected during the previous monitoring event on May 29 exhibited no toxicity to *Selenastrum* (250% growth as compared to the control). Other applied pesticides that could have contributed to the toxicity include glyphosate, oxyfluorfen, paraquat, dymethylamine, and pyrazon. Of these, the Coalition only analyzes for glyphosate and paraquat, both of which were not detected. Of the pesticides analyzed for, aldicarbm cyanazine and diuron were detected although not at exceedance levels. Therefore the toxicity exhibited in this sample may be due to a combination of herbicides and copper detected within the water column possibly acting synergistically with amounts of applied pesticides that were either below the detection limits of the analytical methods or not analyzed for by the Coalition.

Prairie Flower Drain @ Crows Landing Rd

Prairie Flower Drain @ Crows Landing was sampled on May 15, 2007 and resulted in significant toxicity to *Selenastrum* (88% growth compared to the control). This site was resampled on May 23, 2007 and toxicity was not persistent. There were no detectable pesticides in the sample collected from this site. PURs indicate that trifluralin, glyphosate, and halosulfuron-methyl were applied in April and May. Of these the Coalition only analyzes for glyphosate which was not detectable. Metals were detected in the sample water including arsenic (9.6 µg/L), boron (400 µg/L), copper (9.4 µg/L), nickel (6.3 µg/L), selenium (4 µg/L) and zinc (3 µg/L) although none were exceedances. Due to the low amount of variability between replicates, this sample was significantly toxic although the growth as compared to the control was greater than 80%. Therefore this toxicity may not be ecologically significant.

Westport Drain @ Vivian Ave

Selenastrum growth was significantly reduced in the sample collected from Westport Drain @ Vivian Ave on May 15, 2007 (73% growth as compared to the control). The site was resampled on May 23 and the toxicity was not persistent. No pesticides were detected in the sample water including glyphosate and paraquat. Metals were detected in the sample water including arsenic (7.9 µg/L), boron (160 µg/L), copper (7.5 µg/L), nickel (4.3 µg/L), selenium (2 µg/L) and zinc (20 µg/L) although none were exceedances. Copper, glyphosate, oxyflurofen, paraquat, pendimethalin, and dimethylamine were applied during April and/or May. Copper was only applied in April with the last application occurring on April 29. The source of the toxicity is unclear although any of the applied pesticides may have contributed to the reduction of growth.

Sediment Toxicity

Sediment samples were collected during the fifth irrigation sampling event in August; two days after the ambient water samples were collected. Of the 21 sites sampled for sediment toxicity, samples from Hatch Drain @ Tuolumne Rd, Highline Canal @ Lombardy Rd, Prairie Flower Drain @ Crows Landing Rd and Miles Creek @ Reilly Rd were found to be toxic to *Hyalella*. Sediment resampling showed persistent toxicity at all sites except Miles Creek @ Reilly Rd.

Two of the sites that experienced sediment toxicity were added to the Coalition monitoring program during the 2007 irrigation season. Among the sites that were sampled in the previous year, two sites experienced toxicity in the irrigation season of 2007; the same number of sites that experienced toxicity from the previous irrigation season of 2006. However, the toxicities experienced during the 2006 irrigation season occurred at different sampling sites (Highline Canal @ Hwy 99 and Silva Drain @ Meadow Dr).

Samples collected from Hatch Drain during the 2007 irrigation season experienced complete mortality of *Hyalella*. In water samples collected two days prior to the sediment event, an exceedance of dimethoate was experienced. However, toxicity to *Ceriodaphnia* in the water column, the species that should be the most sensitive to dimethoate, was not experienced. Also, due to the high solubility of dimethoate, it is unlikely that the contaminant would partition to sediment.

The Miles Creek @ Reilly Road sample experienced 93% survival of *Hyalella*. This survival was quite high and was significantly different from the control only because of high survival of the organisms in all control replicates. Water samples collected at the site throughout the irrigation season, including the samples collected two days prior to the sediment monitoring event, experienced exceedances of copper. Due to the tendency of copper to bind to organic material and sediment, it is possible that copper would be found in the sediment, and may have been responsible for the sediment toxicity.

Hyalella survival in samples collected from Prairie Flower Drain @ Crows Landing Road was 58%, while *Hyalella* on the Highline Canal @ Lombardy Road sample experienced 90% survival. Neither of these sites experienced toxicity or exceedances of chemical constituents in the water column that would provide any insight into toxicity in the sediment.

Pesticides

Over the six monitoring events that occurred for the 2007 irrigation season, there were exceedances of aldicarb, chlorpyrifos, DDE, diuron, dimethoate and methoxychlor. Exceedances of aldicarb, DDE, dimethoate and methoxychlor were experienced one time each, as well as three exceedances of diuron and 21 exceedances of chlorpyrifos (not including field duplicates).

Relative to the 2006 irrigation season, there were a greater number of sites monitored (24 compared to 20) as well as a greater number of sampling events (six compared to five), however there were fewer pesticide exceedances experienced during regular monitoring for the irrigation season of 2007. Monitoring results for chlorpyrifos show an increase in exceedances (21 in the 2007 irrigation season compared to 17 in the 2006 irrigation season). However, five of the 21 exceedances occurred at sites not sampled in the previous year and one of the 21 exceedances was experienced during April, a month in which monitoring did not occur the previous year. With the exception of DDE, the other pesticide exceedances experienced during the irrigation season of 2007 were not experienced in the irrigation season of 2006.

Chlorpyrifos was the most common pesticide exceedance in the 2007 irrigation season. Exceedances of chlorpyrifos occurred at 19 of the 24 monitoring sites and, with the exception of one exceedance, occurred between the months of July and September. Water column toxicity to *Ceriodaphnia* appears to be associated with exceedances of chlorpyrifos in four samples (refer to the above section on toxicity for details on these samples). In addition, samples collected for management plan monitoring resulted in three exceedances of chlorpyrifos, one each at Duck Slough @ Hwy 99, Prairie Flower

Drain @ Crows Landing Rd and Silva Drain @ Meadow Dr. Though management plan monitoring occurred within weeks of regular monitoring at each site, no exceedances of chlorpyrifos experienced from management plan monitoring coincided with exceedances during that month's regular monitoring.

Diuron was detected in three samples collected from two sites during the first three irrigation sampling events. At the time of sample analysis, the detections of diuron were below the water quality trigger and therefore not reported as exceedances. Since that time the water quality trigger for diuron has been reduced from 14 µg/L to 2 µg/L. As a result, the three detections of diuron are now considered exceedances. Two of these exceedances were from Hilmar Drain @ Central Ave during the April and June monitoring events. One exceedance occurred in samples collected from Berenda Slough along Ave 18 ½.

One exceedance of aldicarb was experienced at Miles Creek during the June monitoring event. This was the only exceedance of aldicarb in samples collected during the irrigation season. Toxicity to *Selenastrum* was experienced in water collected from Mile Creek in June; however the toxicity is more likely due to other constituents such as copper. One exceedance of dimethoate was experienced at the Hatch Drain monitoring site during the August monitoring event. Toxicity was not experienced in these samples. Methoxychlor was detected above the water quality trigger once in samples collected from Hatch Drain during the September monitoring event. There was no toxicity in these samples.

DDE was detected at a concentration above the water quality trigger once during the 2007 irrigation season. This detection occurred in samples collected from the Mustang Creek site during the June monitoring event. Exceedances of DDE are a result of the legacy pesticide, DDT. This pesticide is no longer registered for use or applied by agriculture, but persists due to the chemical's high K_{oc} and long half life. The K_{oc} for DDT is estimated to be between 100,000 and 1,000,000 years depending on the source, and the half life in aquatic systems can be greater than 150 years (http://www.speclab.com/compound/c50293.htm). The pesticide is most likely bound to sediment in the channels and is mobilized periodically by irrigation flows or the activity of the sampling crews.

Metals

Metals can be divided into two groups: those metals which are currently registered for use by agriculture, and those that are not registered for use or currently applied. During the 2007 irrigation season, exceedances of arsenic, cadmium, copper and lead were experienced. Among the four metals, arsenic and copper are known to be currently used by agriculture within the Coalition region.

A total of 64 metals exceedances were experienced during the 2007 irrigation season. Relative to monitoring results from the irrigation season of 2006 which show a total of 41 exceedances in metals, there were a greater number of metals exceedances from the 2007 monitoring season. The increase in metals exceedances in 2007 is due to the greater number of samples collected and analyzed for copper as a result of an increase in samples collected for the analysis of metals in the 2007 irrigation season.

Arsenic

Five arsenic exceedances were experienced in samples collected during the 2007 irrigation season. Arsenic is found in sodium cacodylate which is applied by agriculture for broadleaf weed control and as a cotton defoliant. The registrations on many of the products with this active ingredient have been cancelled. However, there are four products currently registered for use on citrus, for weed control around ditches, for use on ornamental plants, for nonagricultural weed control, and for weed control around buildings, driveways, sidewalks, rights-of-way, and fencerows. Several products are available for use by homeowners and nonagricultural users (e.g. county road maintenance) (http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC34358&Chem_Name=Sodium%20cacodylate&PC_Code=012502) and the product may have been purchased for use by local homeowners for use on their property. Only cacodylic acid has any recorded use in the Coalition region. The California Department of Pesticide Regulation records show minimal use of sodium cacodylate across the Coalition region between 1996 and 2006, and in areas where exceedances have occurred (Hatch Drain and Prairie Flower Drain), there is no record of sodium cacodylate application.

Copper

Copper exceedances were experienced from 35 samples at 11 of the Coalition monitoring sites during regular monitoring events. As with the total number of metals exceedances, the number of copper exceedances have increased since the previous irrigation season. In the irrigation season of 2006, 22 exceedances of copper were experienced.

Of the eleven sites that experienced exceedances for copper during the 2007 irrigation season, eight sites experienced copper exceedances over four or more monitoring events including Cottonwood Creek @ Rd 20, Deadman Creek @ Gurr Rd, Dry Creek @ Rd 18, Duck Slough @ Hwy 99, Highline Canal @ Hwy 99, Jones Drain @ Oakdale Rd, Livingston Drain @ Robin Ave and Miles Creek @ Reilly Rd. Only three sites, Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd and Highline Canal @ Lombardy Rd experienced one exceedance during the irrigation season.

Copper is widely used in the Coalition region throughout the irrigation season. For the counties and months in which PUR data were available, exceedances of copper were preceded by copper fungicide applications. Two samples collected from Dry Creek @ Rd 18 (sampled May 29) and Miles Creek @ Reilly Rd (sampled June 26) found to contain copper at concentrations above the water quality trigger also experienced toxicity to *Selenastrum*.

Of twenty additional samples collected for the analysis of copper for management plan monitoring, seven samples experienced exceedances. All exceedances were experienced at sites that had experienced copper exceedances during the regular monitoring events, including Cottonwood Creek @ Rd 20, Dry Creek @ Rd 18, Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Duck Slough @ Hwy 99 and Jones Drain @ Oakdale Rd.

Cadmium

One exceedance in cadmium was experienced during the 2007 irrigation season. Elevated concentrations of cadmium in a water body may be a result of agricultural application of sludge fertilizer, but also may arise from the erosion of soils and bedrock, atmospheric deposition, discharge from industrial operations or leakage from landfills and contaminated sites. Cadmium has high tendency to adsorb to sediments (high K_{oc}) and persists indefinitely in the environment. It is therefore uncertain if the exceedance experienced at Jones Drain is a result of a recent or a legacy application in the site subwatershed.

Lead

Exceedances of lead occurred in 17 samples collected from eight monitoring sites in the Coalition region. Lead in surface water can originate from numerous sources including parent geological material, lead-based paint, aerosols including dust, and previous deposition from lead-based gasoline. Currently, there are no pesticides applied that have lead as a material, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991. The most probable source of lead in a water body is contaminated soils that originated from old pesticide applications or the deposition of automobile exhaust along roadways. Lead has been found to be present in samples collected from Duck Slough @ Hwy 99, Highline Canal @ Hwy 99, and Jones Drain @ Oakdale Rd during multiple sampling events and across all seasons. The continued exceedances at these sites suggest that lead may be originating from contaminated soils. Contaminated soils may have caused contaminated sediment and that sediment may be moved into the water body during irrigation or runoff events.

Pesticides and Toxicity – Pesticide Use Reports

Pesticide applications are identifiable to individual parcels through the use of Pesticide Use Reports (PUR). Monitoring results obtained from sampling over the 2007 irrigation season were analyzed against PURs, which were received from the County Agricultural Commissioner's office as soon as they were compiled and made available. Exceedances or toxicity experienced in samples collected from Coalition monitoring sites were compared to applications that occurred on parcels within the subwatershed upstream of the sample site (the site subwatershed). Pesticides were analyzed based on their active ingredients (AI), and chemicals that could contribute to toxicity were separated by their organic carbon partitioning coefficient (K_{oc}). Pesticides with a high K_{oc} value (i.e. those that bind to sediment) are likely to cause sediment toxicity, and those with a low K_{oc} value may contribute to water column toxicity. Specific crops may also correlate with particular exceedances and were also identifiable through PURs. Understanding the potential mechanism by which pesticides are moved to surface waters allowed the Coalition to target management practices effective in eliminating the exceedances.

Metals

The Coalition conducted analyses for eight metals over the 2007 irrigation season, four of which are found in products registered for agricultural use. These four metals include arsenic, boron, copper and zinc. Water quality exceedances of arsenic and copper occurred. Each time an exceedance occurred, PUR data for parcels of land upstream of the sample site were reviewed for applications of products containing the particular metal within three months of the sample date. If relevant applications had occurred then it was assumed that these applications may have contributed to the exceedance experienced at the sample site.

There are numerous sources that have the potential to release metals into the environment, and it is important that the Coalition investigate all possible sources to fully understand how exceedances can be addressed. Special studies are conducted by the Coalition where they are considered useful and cost-effective. As a result of numerous exceedances of arsenic that occurred over the 2007 irrigation season, additional investigations occurred to determine if the product was currently being used in the Coalition region. Cotton farms historically used heavy doses of arsenic-based pesticides to control pests and remove plants leaves before harvest, however in California, cotton is grown mostly in the southern part of the state. The California Department of Pesticide Regulation records show that no arsenic-based pesticides were used in any of the site subwatersheds that experienced arsenic exceedances within the Coalition region between 1994 and 2006. Consequently, it is probable that any arsenic found in water samples are a result of irrigation drainage through native soils and leaching to surface waters.

Field Parameters (pH, DO, EC)

Over regular Coalition monitoring events, there were 45 exceedances of the DO water quality objective across 12 of the Coalition monitoring sites. Nine samples that experienced exceedances of DO were resampled due to toxicity, and four of those samples showed persistently low DO at the sites. Five additional exceedances of DO were experienced during management plan monitoring. Exceedances of DO are common and have been present throughout the Coalition region since monitoring was implemented.

Ten exceedances of pH occurred during the irrigation season, all of which were measured above the upper water quality objective. The Livingston Drain @ Robin Rd site experienced the most pH exceedances during three of the six sampling events. In addition, three pH exceedances were experienced during management plan monitoring.

DO and pH are expected to vary diurnally and can exceed the standards as a result of natural processes in the water column such as changing water temperature, photosynthesis and respiration. These processes can be exacerbated by the addition of nutrients which stimulate productivity and eventually release the organic matter into the water column and sediment where it is broken down by microbial activity. The respiration of the bacteria during the breakdown process is termed Biological Oxygen Demand (BOD). The Coalition conducted a special study focusing on BOD which attempted to determine if BOD was the cause of the low DO. The results of this study are included in Appendix VIII. Only a few samples contained measurable BOD. The reasons for this could be the long holding time prior to initiation of the test or already depleated dissolved oxygen concentrations in the water column. BOD and TOC were moderately positively correlated and TOC was used as a surrogate for BOD in a multiple regression analysis. Water temperature, BOD, and nitrate in the water column were all significant predictors of dissolved oxygen. As water temperature and BOD increased, dissolved oxygen decreased. As nitrate increased, dissolved oxygen increased although the explanation for this latter relationship is not clear. It is clear that both water temperature and BOD are significant factors causing the decrease in DO although other, as yet unknown factors are also important.

There were 24 exceedances of the specific conductance (EC) water quality trigger during the regular Coalition monitoring events. These exceedances occurred during almost every sampling event at four monitoring sites including Hatch Drain @ Tuolumne Rd, Hilmar Drain @ Central Ave, Prairie Flower Drain @ Crows Landing Rd and Westport Drain @ Vivian Rd. Five samples that experienced exceedances in EC were resampled due to toxicity, and exceedances of EC were found to be persistent in every case. Two additional exceedances of EC at Prairie Flower Drain occurred during management plan monitoring. The persistence of elevated EC at these sample sites indicates that EC is a water quality impairment that is a result of the natural conditions in the region. Further discussion of EC, as it is related to total dissolved solids (TDS), is provided in the next section.

Physical Parameters (TDS/EC, TOC, Color)

Exceedance of the color water quality objective was experienced at most sites during every monitoring event through the 2007 irrigation season. Color is a derived parameter in that it is not delivered to surface waters from any source. Color is a result of other constituents (e.g. organic carbon, sediment) or processes (e.g. photosynthesis, turbulent flow and resuspension of particulate matter). Consequently, management of color is not possible unless the process(s) that contribute to color are understood. Color exceedances at different water bodies may be a result of different factors. As the Coalition conducts the special studies to determine the cause(s) of exceedances of constituents such as DO and pH, information may become available that will allow us to address color exceedances.

TDS describes all solids (usually mineral salts) that are dissolved in water and is usually correlated with EC. As expected from the discussion of EC exceedances, exceedances of the TDS water quality objective were often associated with exceedances of EC during the irrigation monitoring events when both parameters were measured. In total, 23 exceedances of TDS were experienced in samples collected from the same four sites that also experienced elevated levels of EC which include Hatch Drain, Hilmar Drain, Prairie Flower Drain and Westport Drain.

Potential sources of EC and TDS are upstream surface water, ground water, or drain water from irrigated agriculture. There are two general sources of EC (or TDS) in agricultural landscapes; fertilizers and native soils. A commercial fertilizer can be made up of dozens of different chemicals each of which ionize, and contribute to the EC of the solution. Different brands of fertilizer can use different chemicals to make up the total formula indicating that there will not be a standard signal for fertilizer-generated EC or TDS.

All four sites shown to contain elevated levels of EC and TDS, Hatch Drain, Hilmar Drain, Prairie Flower Drain and Westport Drain are located very close to the San Joaquin River where depth to ground water is very shallow and local field drains pump high salinity ground water to lower the water table and allow plant growth. In addition, these drains are not concrete lined and can be recharged directly from shallow ground water. In fact, many of the unlined drains were dug to directly drain shallow ground water in the vicinity. Data developed by Modesto Irrigation District suggests that the exceedances of TDS/EC are a function of ground water in the region and have been for almost a century. Geologically, the ground water from both the east and west side of the Valley moves toward the San Joaquin River trough the low point in the Valley and a location that is naturally high in salts. The movement of water down gradient toward the San Joaquin River combines to create a shallow ground water table, as evidenced by the numerous wetlands that are in the vicinity of the river. This shallow ground water appears to be the cause of the salinity problems in the ESJWQC region close to the river.

E. coli

E. coli is an indicator of fecal contamination in surface waters. Although most strains of *E. coli* are not pathogenic, *E. coli* is an indicator that pathogenic bacteria may be present. There were 50 exceedances of the *E. coli* water quality objective during the 2007 irrigation season. Of the 24 monitoring sites sampled, 17 experienced *E. coli* exceedances.

E. coli in a waterway is a general indicator of fecal contamination. Potential sources of *E. coli* include deposition or runoff from irrigated pasture, dairies, leaky sewer lines, leaky septic systems, application of manure, biosolids and liquid dairy waste, and a large array of wildlife. A study designed to identify the source of *E. coli* in Coalition water bodies was initiated on August 22, 2006. Obligatory anaerobic bacteria of the genus *Bacteroides* were extracted from water samples and their DNA analyzed to determine the source(s) of the fecal matter. Anaerobic *Bacteroides* was used because they persist in the environment for only a short period of time (days), meaning any detection of *Bacteroides* DNA in the sample is sure to be from a recent contamination event. As it is a facultative anaerobe, *E. coli* can reproduce and persist in an oxygenated environment for an unknown period of time, thus detecting *E. coli* in a water sample is an indicator of fecal contamination but the timing of the contamination is not possible to determine.

For the study, water sampling occurred at 27 sites (4 baseline and 23 monitoring) within the Coalition region during non-monitoring events. Results of the study indicate that the source of the fecal contamination is a combination of human, cows, and chickens depending on the location. The sampling occurred only during late summer low flow conditions and should be repeated during winter storm events. Samples can be analyzed for additional molecular markers and chemical markers that can confirm the contamination by human sewage, but those analyses will require a much larger research effort that is outside the capabilities of the Coalition.

Summary of Management Practices

The Coalition distributed 5052 management practices surveys to selected growers in the Coalition region (both coalition members and non members). The surveys were sent to landowners who the coalition identified as having fields directly adjacent or near a waterway monitored by the coalition and where exceedances occurred in 2006. Summaries of responses by subwatershed and for the entire Coalition region are found in Appendix VI. Of those, 200 were returned to the Coalition marked as undeliverable, 1161 were completed and returned, and 3691 were not returned. While the February 2007 membership stood at 2486 landowners, more surveys were sent out because single farmers (for example) often had fields located near several waterways and thus were asked to fill out multiple surveys (not all fields are managed the same due to cropping patterns, irrigation type, etc.). Surveys were also sent to non-members whose addresses were obtained through county records. The majority of surveys were completed by Coalition members with a small percentage returned by non members. The acreage reported on the surveys was approximately 296,162 indicating that approximately 47% of the Coalition growers returned surveys covering approximately 48% of the total enrolled acres in the coalition region

Of the returned surveys, 995 responses indicated that there was no discharge from their property during either the storm or irrigation season. A large portion of the responses, 48%, said there was simply no runoff from their property during either season as a result of local conditions or proximity to waterways. Of those who indicated discharge was a possibility, there was a variety of management practices employed to minimize drainage. Each completed survey can contain several management practices and therefore the number of responses is greater than the number of surveys. Drainage management systems included holding basins, bermed fields, recirculating systems, and sediment settling basins. In addition, 651 respondents indicated that they allowed vegetation growth in drainage ditches in either winter or summer, or both as a means of trapping sediment. When asked about practices used to lessen storm or irrigation runoff from fields to ditches, canals, or streams, 1269 responses indicated that they used a variety of practices including grass row centers in orchards, grass waterways, gravity tailwater recapture systems, vegetative filter strips, or irrigation management systems such as drip, microspray, sprinkler, or careful water management. There were 3456 responses that indicated various management practices were employed to protect surface water quality including attending commodity-specific training sessions, getting a soil nutrient analysis, following a crop nutrient management plan, getting an agronomist's advice on practices, laser leveling fields, obtaining PCA recommendations, obtaining Certified Crop Advisor recommendations, or performing sprayer calibrations. Only one respondent indicated no management practices were employed. Over one quarter of the growers (321) indicated that they had employed a new management practice in 2006 indicating that growers were making a substantial effort to protect water quality.

Actions Taken to Address Water Quality Impacts

Once the potential sources of exceedances were identified, results were provided to growers to enable the implementation of management practices that have been proven to reduce discharge of contaminated irrigation water or sediment. Reporting was also conducted to inform the Regional Board and stakeholders of Coalition monitoring results and progress. The monitoring and reporting activities are summarized in Table 36 to Table 40 in the next section. Further detail describing all of the actions explained above is provided in this section.

Outreach and Education

Based on the results of the monitoring, the Coalition held workshops, meetings and made presentations to provide information to growers in the Coalition region. Outreach and education activities are an important component of the Coalition monitoring program and all growers (members or not) can take advantage of Coalition programs. The Coalition continues to make a strong effort to provide information to growers at regular meetings, as well as at meetings conducted by the County Agricultural Commissioner, and by personal contact. Coalition presentations over the past irrigation season provided general information, site subwatershed-specific monitoring results, and management practices that have proven to be effective to reduce the discharge of pesticides to water bodies. Meetings occurred on February 5, 20 and 22 of 2007 in Crows Landing, Modesto, and Denair (respectively). Outreach meetings also occurred after the irrigation season on December 11, 12 and 18 of 2007 in Madera, Merced and Stanislaus counties (respectively).

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Notifications of exceedances were mailed to all growers in the Coalition region between the months of August and September, 2007 and a Coalition Annual Report was also sent in April (for 2006) and December 2007 (for 2007). Information was also available to all growers (or interested parties) at the Coalition website (www.esjcoalition.org). The website maintains the Coalition News, maps, best management practices information, a calendar of meetings and events and links to additional sources of information for growers. Furthermore, three issues of Watershed Coalition News were inserted to local newspapers, including the Stanislaus County Farm Bureau Newspaper, the Merced County Farm Bureau Newspaper and the Madera Tribune.

As specific exceedances demanded or allowed, individual landowners were contacted personally to review monitoring results and discuss management practices that may help prevent discharges. Coalition board members communicate with growers regularly and are effective agents for providing information to growers on a personal basis.

Management practices surveys have been sent to all coalition members with farm land adjacent to waterways were exceedances have occurred. Surveys were also distributed at subwatershed meetings. As of October, 2007, 1161 responses have been received. A database of survey results has been compiled and summaries of these results, separated by subwatershed and by coalition region, are provided in Appendix VI.

Pesticide Control Advisors, Agricultural Commissioners, and Registrants

In order for the Coalition to be most effective in providing recommendations on management practices that will reduce or eliminate discharge, collaboration with local County Agricultural Commissioners, Pest Control Advisors (PCA) and pesticide registrants is critical. During the 2007 irrigation season the Coalition worked with each of these entities on a number of occasions; all activities, events and deliverables, including collaborative work, are described in more detail in the next section. Pesticide registrants have provided the coalition with management practice literature that was distributed to growers on the following products:

- Chlorpyrifos (Lorsban tech sheets for alfalfa, grapes and tree nuts);
- Pyrethroids (orchard and row crops)

- Diazinon (dormant orchard applications)

In development for 2008 are technical literature on management practices for Simazine herbicide and animal manure storage and applications to field and tree/vine crops. Contacts are currently being pursued with copper fungicide manufacturers to develop information on management practices for these materials.

Activities, Events and Deliverables

Table 36 through Table 40 provide Coalition activities, events and deliverables that have occurred during the 2007 irrigation monitoring season.

Table 36. Calendar of events and deliverables for the ESJWQC during the period of March 1 – October 30, 2007.

Entries include the date in each month in which the activity was performed. Exceedance and Communication Reports are listed as are the general class of constituent(s) (i.e. field parameters, pesticides, *E. coli*/metals/physical parameters, water column toxicity, and sediment toxicity) covered by the reports. Irrigation monitoring events are numbered in chronological order starting with Irrigation 1 which occurred on April 17 and 24, 2007.

Date	Action Item
17-Apr-07	Irrigation 1 Regular water sampling event
19-Apr-07	Irrigation 1 Field Parameter Exceedance Report for 17-Apr-07 sampling
23-Apr-07	Irrigation 1 Toxicity Exceedance Report for 17-Apr-07 sampling
24-Apr-07	Irrigation 1 Water resampling event
24-Apr-07	Irrigation 1 Regular water sampling event
15-May-07	Irrigation 2 Regular water sampling event
17-May-07	Irrigation 2 Field Parameter Exceedance Report for 17-Apr-07 sampling
23-May-07	Irrigation 2 Water Column Toxicity Exceedance Report for 15-May-07 sampling
23-May-07	Irrigation 2 Water resampling event
23-May-07	Irrigation 2 Field Parameter Exceedance Report for 23-May-07 resampling
25-May-07	Irrigation 1 *E. coli*/Metals/Physical Parameters Exceedance Report for 17-Apr-07 and 24-Apr-07 sampling
29-May-07	Irrigation 2 Regular water sampling event
30-May-07	Irrigation 2 Field Parameter Exceedance Report for 30-May-07 sampling
4-Jun-07	Irrigation 2 Water Column Toxicity Exceedance Report for 29-May-07 sampling
5-Jun-07	Irrigation 2 Water resampling event
5-Jun-07	Irrigation 2 Field Parameter Exceedance Report for 5-Jun-07 sampling
15-Jun-07	Irrigation 1 Pesticide Exceedance Report for 24-Apr-07 sampling
19-Jun-07	Irrigation 3 Regular water sampling event
19-Jun-07	Irrigation 3 Constituent Specific Sampling event
21-Jun-07	Irrigation 3 Field Parameter Exceedance Report for 19-Jun-07 sampling
26-Jun-07	Irrigation 3 Regular water sampling event
26-Jun-07	Irrigation 3 Constituent Specific sampling
27-Jun-07	Irrigation 3 Field Parameter Exceedance Report for 26-Jun-07 sampling
3-Jul-07	Irrigation 3 Water Column Toxicity Exceedance Report for 26-Jun-07 sampling

Date	Action Item
3-Jul-07	Irrigation 3 Water resampling event
6-Jul-07	Irrigation 2 *E. coli*/Metals/Physical Parameters Exceedance Report for 15-May-07 and 29-May-07 sampling
17-Jul-07	Irrigation 4 Regular water sampling event
18-Jul-07	Irrigation 4 Field Parameter Exceedance Report for 17-Jul-07 sampling
24-Jul-07	Irrigation 4 Regular water sampling event
25-Jul-07	Irrigation 4 Field Parameter Exceedance Report for 24-Jul-07 sampling
30-Jul-07	Irrigation 3 *E. coli*/Metals/Physical Parameters Exceedance Report for 19-Jun-07 and 26-Jun-07 sampling, Irrigation 3 Copper Exceedance Report for 19-Jun-07 Constituent Specific sampling
30-Jul-07	Communication Report for Water Column Toxicity Exceedance on 15-May-07
31-Jul-07	Irrigation 4 Water resampling event
31-Jul-07	Irrigation 4 Constituent Specific sampling event
31-Jul-07	Communication Report for *E. coli*/Metals/Physical Parameters Exceedance on 17-Apr-07 and 24-Apr-07
1-Aug-07	Irrigation 4 Field Parameter Exceedance Report for 31-Jul-07 sampling
6-Aug-07	Communication Report for Water Column Toxicity Exceedance on 15-May-07
7-Aug-07	Irrigation 3 Pesticide Exceedance Report for 19-Jun-07 and 26-Jun-07 sampling
7-Aug-07	Communication Report for Water Column Toxicity Exceedance on 29-May-07
7-Aug-07	Communication Report for Field Parameter Exceedance on 29-May-07
8-Aug-07	Irrigation 4 Water Column Toxicity Exceedance Report for 24-Jul-07 sampling and 31-Jul-07 resampling
14-Aug-07	Irrigation 5 Regular water sampling event
15-Aug-07	Irrigation 5 Field Parameter Exceedance Report for 14-Aug-07 sampling
16-Aug-07	Sediment sampling event
17-Aug-07	Field Parameter Exceedance Report for 16-Aug-07 Sediment sampling
21-Aug-07	Irrigation 4 Copper Toxicity Exceedance Report for 31-Jul-07 Constituent Specific sampling
21-Aug-07	Irrigation 5 Regular water sampling event
22-Aug-07	Irrigation 5 Field Parameter Exceedance Report for 21-Aug-07 sampling
23-Aug-07	Sediment sampling event
24-Aug-07	Field Parameter Exceedance Report for 23-Aug-07 Sediment sampling
24-Aug-07	Communication Report for Field Parameter Exceedance on 19-Jun-07
28-Aug-07	Irrigation 5 Water resampling event
28-Aug-07	Irrigation 5 Constituent Specific sampling event
28-Aug-07	Irrigation 5 Water Column Toxicity Exceedance Report for 21-Aug-07 sampling
29-Aug-07	Irrigation 5 Field Parameter Exceedance Report for 28-Aug-07 resampling
29-Aug-07	Irrigation 5 Field Parameter Exceedance Report for 28-Aug-07 Constituent Specific sampling
31-Aug-07	Irrigation 4 *E. coli*/Metals/Physical Parameters Exceedance Report for 17-Jul-07 and 24-Jul-07 sampling, correction to 21-Aug-07 Copper Water Column Toxicity Exceedance Report for 31-Jul-07 Constituent Specific sampling
5-Sep-07	Communication Report for Water Column Toxicity Exceedance on 26-Jun-07
7-Sep-07	Irrigation 4 Pesticide Exceedance Report for 17-Jul-07 and 24-Jul-07 sampling

Date	Action Item
10-Sep-07	Irrigation 4 Chlorpyrifos Exceedance Report for 31-Jul-07 Constituent Specific sampling
10-Sep-07	Sediment Toxicity Exceedance Report for 16-Aug-07 sediment sampling
10-Sep-07	Irrigation 5 Water Column Toxicity Exceedance Report for 28-Aug-07 resampling
10-Sep-07	Communication Report for *E. coli*/Metals/Physical Parameters Exceedance on 15-May-07
11-Sep-07	Sediment Toxicity resampling event
11-Sep-07	Irrigation 6 Regular water sampling event
12-Sep-07	Irrigation 6 Field Parameter Exceedance Report for 11-Sep-07 water sampling and 11-Sep-07 sediment sampling
18-Sep-07	Sediment Toxicity Exceedance Report for 23-Aug-07 sampling
18-Sep-07	Irrigation 6 Water Column Toxicity Exceedance Report for 11-Sep-07 sampling
18-Sep-07	Irrigation 6 Water resampling event
18-Sep-07	Irrigation 6 Regular water sampling event
19-Sep-07	Irrigation 6 Field Parameter Exceedance Report for 18-Sep-07 sampling
19-Sep-07	Sediment Toxicity resampling event
20-Sep-07	Irrigation 5 *E. coli*/Metals/Physical Parameters Exceedance Report for 14-Aug-07 sampling, Copper Exceedance Report for 28-Aug-07 Constituent Specific sampling
24-Sep-07	Irrigation 6 Water Column Toxicity Exceedance Report for 18-Sep-07 sampling
25-Sep-07	Irrigation 6 Constituent Specific sampling event
25-Sep-07	Irrigation 6 Water resampling event
26-Sep-07	Irrigation 6 Field Parameter Exceedance Report for 25-Sep-07 Constituent Specific sampling
26-Sep-07	Communication Report for Field Parameter Exceedance on 24-Jul-07
1-Oct-07	Sediment Toxicity Exceedance Report for 11-Sep-07 resampling
1-Oct-07	Irrigation 5 *E. coli*/Metals/Physical Parameters Exceedance Report for 21-Aug-07 sampling
2-Oct-07	Communication Report for *E. coli*/Metals/Physical Parameters Exceedances on 19-Jun-07 and 26-Jun-07
9-Oct-07	Irrigation 5 Pesticide Exceedance Report for 14-Aug-07 and 21-Aug-07 sampling
10-Oct-07	Irrigation 5 Chlorpyrifos Exceedance Report for 28-Aug-07 Constituent Specific sampling
10-Oct-07	Irrigation 6 *E. coli*/Metals/Physical Parameters Exceedance Report for 11-Sep-07 sampling
11-Oct-07	Communication Report for Pesticide Exceedance on 26-Jun-07
15-Oct-07	Communication Report for Water Column Toxicity Exceedance on 24-Aug-07
18-Oct-07	Irrigation 6 *E. coli*/Metals/Physical Parameters Exceedance Report for 18-Sep-07 sampling
23-Oct-07	Irrigation 6 Pesticide Exceedance Report for 11-Sep-07 sampling
25-Oct-07	Irrigation 6 Correction to 18-Oct-07 *E. coli*/Metals/Physical Parameters Exceedance Report for 18-Sep-07 sampling
26-Oct-07	Irrigation 6 Pesticide Exceedance Report for 18-Sep-07 sampling
26-Oct-07	Communication Report for Field Parameter Exceedance on 21-Aug-07
6-Nov-07	Communication Report for *E. coli*/Metals/Physical Parameters Exceedance on 24-Aug-07
26-Nov-07	Communication Report for Sediment Toxicity Exceedance on 23-Aug-07

Date	Action Item
29-Nov-07	Communication Report for Water Column Toxicity Exceedance on 18-Sep-07

Table 37. Table of ESJWQC actions and deliverables dealing with grower notification of exceedances and management practices relevant to the 2007 irrigation monitoring season.

Grower Notification			
Date	**County**	**Details**	**Who**
April 4, 2007	All	Annual Report to growers - including monitoring results	Parry Klassen
August, 2007	Merced	Contact growers in Black Rascal Creek subwatershed in person regarding toxicity in sample water.	Parry Klassen
August 30, 2007	Stanislaus	Contact growers in Turlock Irrigation District as a result of ammonia detection in Harding Drain.	Parry Klassen
Aug-Sept, 2007	All	Mailing sent to growers including all exceedances from 2007 Storm season, along with a letter and Management Practices Survey	Parry Klassen
December, 2007	All	Annual Report to growers - including monitoring results	Parry Klassen

Table 38. Table of ESJWQC actions and deliverables pertaining to BMP outreach and education to address exceedances and management practices relevant to the 2007 irrigation monitoring season.

BMP Outreach and Education			
Date	**County**	**Details**	**Who**
April 4, 2007	All	Annual Report to growers - Including Coalition/Ag News and updates and info on BMPs	Parry Klassen
April 10, 2007	Merced	Merced County Farm Bureau Newspaper - sent to all growers in the county by email and mail. Coalition News and BMP information included.	Parry Klassen

BMP Outreach and Education			
Date	**County**	**Details**	**Who**
April 10, 2007	Madera	Madera Tribune - sent to all growers in the county by email and mail. Coalition News and BMP information included.	Parry Klassen
April 10, 2007	Stanislaus	Stanislaus County Farm Bureau Newspaper - sent to all growers in the county by email and mail. Coalition news and BMP information included.	Parry Klassen
August, 2007	Merced	Growers in Black Rascal Creek subwatershed contacted in person regarding BMP implimentation to avoid runnoff of OP pesticides as a result of toxicity to *Ceriodaphnia*.	Parry Klassen
December, 2007	All	Annual Report to growers - Including Coalition/Ag news and updates and info on BMPs	Parry Klassen
December 11, 2007	Madera	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants	Parry Klassen, MLJ-LLC
December 12, 2007	Merced	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants	Parry Klassen, MLJ-LLC
December 18, 2007	Stanislaus	Grower outreach meeting - provided monitoring results and information on BMPs to reduce discharge of pesticides or contaminants	Parry Klassen, MLJ-LLC

Table 39. Table of ESJWQC actions and deliverables pertaining to management practices surveys to address exceedances and management practices relevant to the 2007 irrigation monitoring season.

Management Practices Surveys			
Date	**County**	**Details**	**Who**
April, 2007	All	Approximately 400-500 surveys received (from handouts in October/November 2006 and mailings to growers)	Coalition members
June 15, 2007	All	Surveys results compiled and summarized per subwatershed	Parry Klassen, MLJ-LLC
Ongoing	All	Additional surveys being received from growers and compiled	Parry Klassen
August, September, 2007	All	Surveys included with grower notification mailings	Parry Klassen
November, 2007	All	Surveys results compiled and summarized per subwatershed	Parry Klassen, MLJ-LLC

Table 40. Table of other ESJWQC actions and deliverables to address exceedances and management practices relevant to the 2007 irrigation monitoring season.

Other			
Date	**County**	**Details**	**Who**
August 8-9, 2007	All	Working with Dow Agro Sciences regarding chlorpyrifos results and management practices	Parry Klassen, MLJ-LLC
August, 2007	Stanislaus	Work with Turlock Irrigation District to determine sources of ammonia found in Harding Drain.	Parry Klassen

Exceedance, Communication, and Evaluation Reports

Exceedance and Communication Reports

Exceedance reports were submitted for all exceedances experienced during the 2007 irrigation season monitoring events. Communication Reports have also been submitted for all exceedances that occurred for the first time at a site. A copy of these reports is provided in Appendix V.

Evaluation Reports

Evaluation Reports were not required for exceedances experienced during the 2007 irrigation season events. Management Plans have superceded Evaluation Reports and been submitted for each site subwatershed where two or more exceedances of a specific constituent were experienced during Coalition monitoring. Table 41 summarizes the schedule of Management Plans submitted for each site-subwatershed. Management Plans will be reviewed and edited on a yearly basis to incorporate results from the previous years sampling and special studies. An updated Management Plan that will address the entire Coalition region is scheduled to be submitted by April 1, 2007.

Table 41. Schedule of Management Plans that have been submitted for each site subwatershed.

Sample Site	Management Plan Due Date
Highline Canal @ Hwy 99 Highline Canal @ Lombardy Rd	11/17/2006 Revised 4/2/2007
Dry Creek @ Wellsford Road	4/2/2007
Duck Slough @ Gurr Rd Duck Slough @ Hwy 99	11/17/2006 Revised 4/2/2007
Ash Slough @ Ave 21	11/17/2006 Revised 4/13/2007
Berenda Slough along Rd 18 1/2	4/13/2007
Jones Drain @ Oakdale Rd	4/13/2007
Silva Drain @ Meadow Drive	4/13/2007
Cottonwood Creek @ Road 20	4/27/2007
Bear Creek @ Kibby Rd	4/27/2007
Merced River @ Santa Fe	11/17/2006 Revised 4/27/2007

Sample Site	Management Plan Due Date
Dry Creek @ Rd 18	4/27/2007
Aug Rd Drn upstrm Crows Landing	5/11/2007
Black Rascal Crk @ Yosemite Rd	5/11/2007
Deadman Creek @ Gurr Rd	5/11/2007
Deadman Creek @ Hwy 59	
Mustang Creek @ East Ave	5/11/2007
South Slough @ Quinley Road	5/11/2007
Hilmar Drain @ Central Ave	5/11/2007
Prairie Flower Drain @ Crows Landing	5/11/2007

Conclusions and Recommendations

The Coalition was able to meet its objectives to the following degree:

- Determine the concentration and load of waste in discharges to surface waters.
  - Selenium was not analyzed from 64% of the samples and loads could not be determined from these samples
  - The completeness of the remaining analytical data was sufficient to determine concentration and load for all samples collected where discharge could be measured.
  - Quality control issues were present for a small number of samples, but the batches were evaluated using all LABQA results and were determined to be acceptable.
- Evaluate compliance with existing narrative and numeric water quality objectives to determine if implementation of additional management practices is necessary to improve and/or protect water quality.
  - The data for all constituents for which criteria exist were compared to the appropriate water quality objective which has been reviewed and approved by the Regional Board.
  - If samples existed in which the constituent exceeded the objective, it was determined that outreach would be performed to promote the implementation of additional management practices. In locations for which management plans were implemented, additional monitoring was initiated.
  - A series of meetings with growers was held in which additional management practices were presented and growers were encouraged to implement the practices to protect water quality.
  - For those constituents that could not be readily assigned a potential source, the Coalition completed two special studies to determine the cause of the exceedance of water quality objectives of *E. coli* and dissolved oxygen. The primary source of *E. coli* was determined to be human fecal contamination. BOD, water temperature, and nitrate determined dissolved oxygen although other unmeasured factors are also important.
- Identify discharge points within the Coalition area.
  - A program has been initiated with three County Agricultural Commissioners to identify obvious discharge points along selected waterways in the Coalition region.
  - Country Agricultural Commissioners will obtain this information by walking the banks of selected waterways and recording GPS coordinates of drain

pipes, drainage swails or low areas where storm or irrigation water can potentially enter the waterways. The Coalition then matches the GPS coordinates to landowner information including and address.

  - Beginning in February 2008, landowners on the waterways where creek walking have been completed will be invited to Coalition workshops where their responsibilities for discharges will be outlined. The Coalition will recommend that the conveyances either be removed or gated to prevent discharge containing farm waste from flowing into the waterway.
  - The Coalition Board of Directors has budgeted funding that will allow for walking many but not for all waterways sampled by the Coalition. A "pilot program" approach is being taken to determine the usefulness and effectiveness of approaching discharges in this fashion. The Coalition Board is expected to receive a status report from the three Agricultural Commissioners in June 2008. Once the pilot study results are finalized, the Coalition will work with Regional Board staff to identify landowners who have discharge points but are not coalition members.
- Assess the impact of waste discharges from irrigated agriculture to surface water.
  - Comparisons of monitoring data with water quality triggers allowed an evaluation of whether the water body was impacted by irrigated agriculture.
  - The level of impairment is difficult to determine solely from the data collected as ecosystem function is assumed to be impaired, but the mechanism of impairment is difficult to assess.
- Provide outreach and education to Coalition members and nonmembers.
  - The Coalition will continue to modify its outreach efforts in 2008 by using techniques to increase participation in grower workshops and to speed the level of communication about monitoring results to growers and subsequent adoption of management practices.
  - Several techniques to be tested include:
    - Use of Subwatershed conference calls to relay results to growers;
    - Use of more frequent mailings on monitoring results and potential BMPs to implement;
    - Increased contact by the coalition with farm input suppliers operating near waterways with management plans in place.
- Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in watersheds within the coalition region.
  - The Coalition received surveys from approximately half of member growers accounting for approximately half of the enrolled acres.

- The Coalition will continue to assess the degree of implementation of management practices over time. Additional effort will be allocated to locations as prioritized by the upcoming Management Plan.
- The Coalition will also require in its 2008 membership renewal that any grower operating in a subwatershed where management practices surveys are distributed must fill out a survey before their membership can be renewed (if they had not filled out a survey previously).

- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.
  - Determining effectiveness remains an elusive task; the Coalition is exploring ways to determine effectiveness such as evaluating survey results, initiating personal contacts with growers, and improved awareness of the Coalitions monitoring results.
  - Variability in climatic conditions and pest control needs may result in improvement or degradation water quality despite the management practices implemented.
  - The Coalition is receiving information from organizations such as the University of California, Davis and the Coalition for Urban/Rural Environmental Stewardship on the effectiveness of various new management options.
  - At this time, the Coalition does not have adequate data from a sufficient period of time to evaluate the effectiveness of management practices implemented in the Coalition region and will continue its monitoring strategy to obtain more information to perform a scientifically defensible evaluation in the future.
  - At this time, the Coalition does not have sufficient information returned from growers to characterize the management practices implemented throughout a watershed with regard to specific exceedances. However, the Coalition will continue to send out surveys and hopes to have enough information in the future to be able to characterize management practices implemented in the area.

The monitoring program was a success in that:

- All planned sample events were captured and samples were collected from all sites that had water
- Chemical testing met the Regional Board's Reporting Limit requirements
- Discharge measurements were collected from all sites at which it is possible to collect measurements

- The Coalition contracted with a new toxicity testing laboratory and improved its ability to identify the causes of toxicity
- Pesticide Use Reports were able to be associated with all exceedances of pesticides allowing the Coalition to identify potential sources of exceedances
- All data collected within this monitoring program is in a format that will be accessible to the public and comparable to other water quality data collected across the state via CEDEN.

The monitoring program provided the following technical conclusions:

- In many watersheds, large amounts of pesticides are applied emphasizing the importance of managing water quality from a watershed perspective
  - Multiple applications of pesticides in a watershed make source identification difficult

At this point, it is difficult to determine if water quality measured during the 2007 irrigation season is improved over the 2006 irrigation season. Conditions were very different in 2007. In 2007, there were only a few storms and very little rainfall. Little runoff was generated and several sites never experienced flow during the entire winter. The dryness was evidenced by the early initiation of irrigation in the region, in some locations in mid-March. Overall there were more exceedances of some constituents such as chlorpyrifos in 2007 compared to 2006 although the reasons for this are unknown. Other constituents such as copper experienced a larger number of exceedances in 2007 than 2006 but it is unclear if the greater number of exceedances is a result of greater effort at sampling or a change in application rates.

Obtaining information on management practices in the Coalition region has been a priority over the period covered by this report. The management practices survey distributed by the Coalition has resulted in surprisingly high returns. Surveys were sent to all growers with a potential to contribute to the exceedances in the subwatersheds regardless of whether they belonged to the Coalition. It is unknown if nonresponders are primarily nonmembers of the Coalition. The surveys were coded such that it is possible to determine who did and who did not respond and for specific subwatersheds, the Coalition can identify nonresponding nonmembers. The Coalition is in the process of overlaying a member's parcel map with survey returns and pesticide applications to determine if nonmembers have the potential for contributing disproportionately to exceedances.