San Joaquin River Chlorpyrifos and Diazinon 2011 Water Year Annual Monitoring Report

For Compliance with the Central Valley Regional Water Quality Control Board Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Diazinon and Chlorpyrifos Runoff Into the Lower San Joaquin River (October 2005)

Reporting period: October 1, 2010 – September 30, 2011
Original Report Submitted: May 1, 2012
Amendment Submitted: June 1, 2012

Prepared by the East San Joaquin Water Quality Coalition and the Westside San Joaquin River Watershed Coalition

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

AMR	Annual Monitoring Report
CDEC	California Data Exchange Center
CIMIS	California Irrigation Management Information System
COC	Chain of Custody
DO	Dissolved Oxygen
DWR	(California) Department of Water Resources
ESJWQC	East San Joaquin Water Quality Coalition
FB	Field Blank
FD	Field Duplicate
ILRP	Irrigated Lands Regulatory Program
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MDL	Minimum Detection Limit
MLJ-LLC	Michael L. Johnson, LLC
MPUR	Management Plan Update Report
MRPP	Monitoring and Reporting Program Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not Detected
OP	Organophosphate pesticides
PAM	Polyacrylamide
PCA	Pesticide Control Advisor
pH	Power of Hydrogen
PR	Percent Recovery
PUR	Pesticide Use Report
PFTE	Polytetrafluoroethylene
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
S	Sum
SAMR	Semi-Annual Monitoring Report
SC	Specific Conductance
SJR	San Joaquin River
SOP	Standard Operating Procedure
TIE	Toxicity Identification Evaluation

TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
Westside Coalition	Westside San Joaquin River Watershed Coalition
Westside Coalition MRP	Monitoring and Reporting Program Order No R5-2008-0831
WQO	Water Quality Objective
YSI	Yellow Springs Instruments

LIST OF UNITS

cm	centimeter
cfs	cubic feet per second
°C	degrees Celsius
L	Liter
µg	microgram
µmhos	micromhos
µS	microsiemens
mg	milligram

LIST OF TERMS

ArcGIS – Geographic Information Systems mapping software

Basin Plan – Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fourth Edition

Basin Plan Amendment - Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Diazinon and Chlorpyrifos Runoff into the Lower San Joaquin River (Final Staff Report October 2005)

Coalitions –East San Joaquin Water Quality Coalition and Westside San Joaquin River Watershed Coalition

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

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

Not detected – A constituent within a sample is below the minimum detection limit

Regional Board – Central Valley Regional Water Quality Control Board

Waterbody –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

Water year – the twelve month period from October through September, designated by the calendar year in which it ends and which includes nine of the twelve months

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)

Westside Coalition region – The region within the Central Valley that is monitored by the Westside San Joaquin River Watershed Coalition

REFERENCES

Blake, C., 2009, University California Researchers Measure Movento Insecticide Efficacy in Grapes, Citrus: Western Farm Press, February: http://westernfarmpress.com/management/uc-researchers-measure-movento-insecticide-efficacy-grapes-citrus (accessed April 2012).

University of California Statewide Integrated Pest Management Program (UC IPM), 2012a, UC Pest Management Guidelines: Almond, Navel Orangeworm: http://www.ipm.ucdavis.edu/PMG/r3300311.html (accessed April 2012).

University of California Agriculture and Natural Resources, Statewide Integrated Pest Management Program, 2012b, UC Pest Management Guidelines: Grape, Vine Mealybug: http://www.ipm.ucdavis.edu/PMG/r302301911.html (accessed April 2012).

University of California Agriculture and Natural Resources, Statewide Integrated Pest Management Program, 2012c, UC Pest Management Guidelines: Walnut, Codling Moth: http://www.ipm.ucdavis.edu/PMG/r881300211.html (accessed April 2012).

AMENDMENT SUMMARY

Table A. Chlorpyrifos and diazinon TMDL 2012 AMR amendments summary.

ITEM #	AMENDMENT DATE	AMENDMENT DESCRIPTION	AMENDED ITEM
1	June 1, 2012	Revisions were made to Table 6 to include all ESJWQC and Westside Coalition monitoring sites shown in Figures 6 and 7.	Table 6, pages 14-15
2	June 1, 2012	Revisions were made to Figure 10, Table 27, and associated verbiage to include currently implemented management practice data for ESJWQC third priority subwatersheds per Regional Board staff request.	Figure 10, page 42 Table 27, page 43 Verbiage, pages 41-44

EXECUTIVE SUMMARY

The Lower San Joaquin River (SJR) is divided into seven subareas as described in the Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Diazinon and Chlorpyrifos Runoff into the Lower San Joaquin River (hereafter Basin Plan Amendment). The Central Valley Regional Water Quality Control Board (Regional Board) developed the Basin Plan Amendment (finalized in October 2005) to establish a Total Maximum Daily Load (TMDL) for the organophosphate pesticides chlorpyrifos and diazinon in the lower reaches of the San Joaquin River. As part of the Basin Plan Amendment, a surveillance and monitoring program is required to collect information necessary to assess compliance with six monitoring objectives. The East San Joaquin Water Quality Coalition (ESJWQC) and Westside San Joaquin River Watershed Coalition (Westside Coalition) developed a monitoring strategy to comply with the chlorpyrifos and diazinon TMDL program Monitoring Objectives:

1. Determine compliance with established water quality objectives (WQOs) and the loading capacity applicable to diazinon and chlorpyrifos in the San Joaquin River.
2. Determine compliance with established load allocations for diazinon and chlorpyrifos.
3. Determine the degree of implementation of management practices to reduce off-site movement of diazinon and chlorpyrifos.
4. Determine the effectiveness of management practices and strategies to reduce off-site migration of diazinon and chlorpyrifos.
5. Determine whether alternatives to diazinon and chlorpyrifos are causing surface water quality impacts.
6. Determine whether the discharge causes or contributes to a toxicity impairment due to additive or synergistic effects of multiple pollutants.
7. Demonstrate that management practices are achieving the lowest pesticide levels technically and economically achievable.

The Coalitions submitted a memorandum to the Regional Board on April 29, 2011 that confirmed the same approach would be employed during the 2011 water year as the 2010 water year, with a few modifications. The approach includes compliance monitoring quarterly at the six compliance points in the San Joaquin River, compliance monitoring monthly monitoring at three of the six compliance points (SJR @ Sack Dam, SJR @ Lander Ave, and SJR @ Las Palmas Ave (Patterson)), tributary monitoring based on each Coalitions approved monitoring plan on a monthly basis, and an assessment of the monitoring objectives and results on an annual basis on May 1st. In part due to the change in the report timing, the ESJWQC and Westside Coalition created a decision tree to guide the Coalition's actions when a non compliant load is detected in the San Joaquin River. These compliance points are (from upstream to downstream, Table 4):

- San Joaquin River at Sack Dam,
- San Joaquin River at Highway 165 (Lander Ave) near Stevinson (USGS 11260815),
- San Joaquin River at Hills Ferry,

- San Joaquin River at Las Palmas Avenue near Patterson (USGS 11274570),
- San Joaquin River at the Maze Boulevard (Highway 132) Bridge (USGS 11290500), and
- San Joaquin River at the Airport Way Bridge near Vernalis (USGS 11303500).

Each Coalition sampled three of the six compliance points as well as tributaries within their respective subregions as per each Coalition's monitoring plan. Water samples collected from the San Joaquin River were analyzed for chlorpyrifos and diazinon. Habitat information and field data, including dissolved oxygen (DO), pH, specific conductance (SC), and water temperature were collected at each site during each monitoring event. Discharge was obtained via Department of Water Resources (DWR) gauge readings posted on the California Data Exchange Center (CDEC) Website.

During the reporting period, there were no detections of chlorpyrifos or diazinon in water samples collected from the San Joaquin River. Diazinon was not detected in water samples from either of the Coalitions' tributaries. Chlorpyrifos exceeded the WQOs and load allocations in tributaries during irrigation months in both Coalition regions. Monitoring results indicated one instance in which there was the potential for chlorpyrifos to interact with other constituents in a synergistic or additive manner and cause toxicity in the ESJWQC region; monitoring indicated no such instances in the Westside Coalition region. Potential alternative pesticides to chlorpyrifos and/or diazinon were detected in the ESJWQC and Westside Coalition regions, but it is unknown if the pesticides were used as an alternative or as part of a management rotation.

To address these water quality impairments, the ESJWQC developed an overall management plan for all 27 waterways sampled between 2004 and 2008 and set priorities for both waterways and constituents in those waterways. In setting priorities, the Coalition is focusing first on constituents likely originating from agriculture including pesticides and sediment. The outreach and education strategy focuses on informing growers of impairments in their watershed and providing information on effective management practices. A key component of the Coalition's management strategy is to hold individual member meetings to discuss farm management practices and water quality impairments. The Coalition considers the significant decrease in chlorpyrifos exceedances in 2009 through 2011 an important step in demonstrating the effectiveness of its management plan strategy.

The Westside Coalition is also in the process of evaluating management practice implementation and effectiveness. To accomplish this, the Westside Coalition utilizes its two-pronged strategy guided by the tiered approach described in the Westside Coalition Management Plan. Because there is likely an overlap in effect from practices to address a specific constituent, the Westside Coalition identified a prioritized, tiered list of actions to be taken to address impairments of the most immediate concern (highest tier constituents), and, presumably, those actions will also benefit lower prioritized (tiered) constituents. These actions are then employed under two concurrent approaches (prongs) to improve water quality within the region. The General Approach identifies and employs common, constituent-specific strategies that can be applied throughout the region. Focused Watershed Management Plans, the second prong, identify and employ a subwatershed specific approach to implement management practices and improve water quality. Together, these strategies enable the Westside Coalition to adequately assess water quality and management practice implementation in its region. Management practices assessments are reported in the Westside Coalition Semi-Annual Monitoring Reports (SAMRs).

Both Coalitions monitor chlorpyrifos, diazinon, and several other constituents as a part of tributary monitoring within their respective regions. Results from ESJWQC and Westside Coalition tributary monitoring during the reporting period (October 2010 through September 2011) are discussed as they pertain to the TMDL Objectives 1 through 7. Additional details can be found in the ESJWQC Annual Monitoring Report (AMR) submitted March 1, 2012 and the Westside Coalition SAMRs submitted June 15, 2011 (September 2010 through February 2011 data) and November 30, 2011 (March 2011 through August 2011 data) and to be submitted in the June 15, 2012 SAMR (September 2011 data).

INTRODUCTION

The Lower San Joaquin River (SJR) is divided into seven subareas as described in the Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Diazinon and Chlorpyrifos Runoff into the Lower San Joaquin River (hereafter Basin Plan Amendment). The seven areas include agricultural drainages monitored under the Irrigated Lands Regulatory Program (ILRP) by the East San Joaquin Water Quality Coalition (ESJWQC) and Westside San Joaquin River Watershed Coalition (Westside Coalition). These two Coalitions were formed to ensure growers within those regions were in compliance with the ILRP conditional waiver.

The Central Valley Regional Water Quality Control Board (Regional Board) developed the Basin Plan Amendment (finalized in October 2005) to establish a Total Maximum Daily Load (TMDL) for the organophosphate pesticides chlorpyrifos and diazinon in the lower reaches of the San Joaquin River. As dictated by the Basin Plan Amendment, a surveillance and monitoring program is required to collect information necessary to assess compliance with seven monitoring objectives. Assessment of compliance with the Basin Plan Amendment is addressed at two levels: 1) water quality within the Lower San Joaquin River at six compliance points, and 2) water quality within the subareas that drain to the Lower San Joaquin River.

The ESJWQC and the Westside Coalition conducted monitoring during the 2011 water year (October 2010 through September 2011) to assess compliance with the Lower San Joaquin River concentration based loads at the six compliance points identified in the Basin Plan Amendment. This report summarizes the water quality monitoring conducted at the compliance points during the reporting period and compares those results with the water quality objectives (WQOs) outlined in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Fourth Edition, hereafter referred to as the Basin Plan).

Each Coalition conducts a monitoring program under the ILRP designed to assess water quality within their region. In addition, both Coalitions developed management plans to address exceedances of the chlorpyrifos and diazinon water quality objectives in specific subwatersheds. The results summarized below are for an additional monitoring program put into place by the Coalitions to address the Basin Plan amendments to regulate discharges of organophosphate pesticides. This annual report discusses how the Coalitions are addressing load allocations for the subareas that drain to the San Joaquin River through their monitoring and implementation strategies outlined in their respective monitoring and management plans.

MONITORING OBJECTIVES AND DESIGN

MONITORING OBJECTIVES

The ESJWQC and Westside Coalition developed a monitoring strategy to comply with the chlorpyrifos and diazinon TMDL program Monitoring Objectives. The Monitoring Objectives include:

1. Determine compliance with established water quality objectives (WQOs) and the loading capacity applicable to diazinon and chlorpyrifos in the San Joaquin River.
2. Determine compliance with established load allocations for diazinon and chlorpyrifos.
3. Determine the degree of implementation of management practices to reduce off-site movement of diazinon and chlorpyrifos.
4. Determine the effectiveness of management practices and strategies to reduce off-site migration of diazinon and chlorpyrifos.
5. Determine whether alternatives to diazinon and chlorpyrifos are causing surface water quality impacts.
6. Determine whether the discharge causes or contributes to a toxicity impairment due to additive or synergistic effects of multiple pollutants.
7. Demonstrate that management practices are achieving the lowest pesticide levels technically and economically achievable.

The chlorpyrifos and diazinon WQOs (Basin Plan, 4th Edition, page III-6.01) are used to determine the concentration based loading capacity for the San Joaquin River and load allocations within the upstream tributaries (Table 1). Both the loading capacity of the San Joaquin River and load allocation of any tributary to the river shall not exceed one, as determined from the formula listed in Figure 1.

Table 1. WQOs for chlorpyrifos and diazinon.

PESTICIDE	MAXIMUM CONCENTRATION AND AVERAGE PERIOD
Chlorpyrifos	0.025 µg/L ; 1-hour average (acute) 0.015 µg/L ; 4-day average (chronic) Not to be exceeded more than once in a three year period.
Diazinon	0.16 µg/L ; 1-hour average (acute) 0.10 µg/L ; 4-day average (chronic) Not to be exceeded more than once in a three year period.

Figure 1. Formula used to calculate chlorpyrifos and diazinon loading capacity in San Joaquin River and load allocation for waterways entering the River.

$$S = \frac{C_D}{WQO_D} + \frac{C_C}{WQO_C} \leq 1.0$$

Where

C_D = diazinon concentration in µg/L

C_C = chlorpyrifos concentration in µg/L

WQO_D = diazinon water quality objective; 0.1 µg/L

WQO_C = chlorpyrifos water quality objective; 0.015 µg/L

The WQO used for diazinon and chlorpyrifos reflects the 4-day average (chronic) maximum listed in Table 1. If the measured concentration of either constituent exceeds its WQO in a sample collected from the San Joaquin River, the loading capacity is exceeded. If the measured concentration of either constituent exceeds its WQO in a sample collected from a tributary within one of the seven subareas, the load allocation is exceeded. The chlorpyrifos and diazinon loading capacity or load allocation can be exceeded if the combined concentrations of chlorpyrifos and diazinon cause the sum (S) to be greater than one, even if both concentrations are below the two constituents' respective WQOs.

To assess compliance with Objective 1, the ESJWQC and Westside Coalition conducted monitoring at six designated compliance sites on the San Joaquin River during the 2011 water year. To assess compliance with Objectives 2 through 7, the Coalitions reviewed the results of the San Joaquin River monitoring relative to the monitoring and outreach conducted within their respective Coalition regions as a part of the ILRP. Table 2 is an overview of the ESJWQC and Westside Coalition actions and associated reporting documents, if any, utilized to assess each of the seven Monitoring Objectives. The Comparison with TMDL Objectives section of the report explains each Coalition's strategy to assess compliance with the Objective and the outcomes of their strategies during the reporting period. Table 3 lists all the ESJWQC and Westside Coalition submission dates for each of their reporting elements listed in Table 2; each relevant document is listed below for each Coalition as reference.

Westside Coalition

- Monitoring and Reporting Program Order No R5-2008-0831 (Westside Coalition MRP),
- Westside Coalition Draft Quality Assurance Project Plan (QAPP),
- Semi-Annual Monitoring Reports (SAMR) including management plan status updates,
- Westside Coalition Management Plan and Focused Watershed Plans

ESJWQC

- ESJWQC Monitoring and Reporting Program Plan (MRPP),
- ESJWQC Quality Assurance Project Plan (QAPP),
- Annual Monitoring Reports (AMR),
- ESJWQC Management Plan, and
- ESJWQC Management Plan Update Reports (MPUR).

Table 2. Monitoring Objectives for the control of diazinon and chlorpyrifos runoff into the Lower San Joaquin River and associated ESJWQC and Westside Coalition actions.

Refer to Table 3 for submission dates of all documents listed in this table.

TMDL Objective Number	Coalition	Coalition Actions	Location of Additional Information[1]
1	ESJWQC and Westside Coalition	• Monitor 6 compliance sites on the San Joaquin River. • Assess monitoring results to determine compliance with chlorpyrifos and diazinon WQO. • Assess monitoring results to determine compliance with chlorpyrifos and diazinon loading capacity.	None
2	ESJWQC	• Conduct representative monitoring of the Coalition region according to Monitoring Strategy explained in MRPP. • Assess monitoring results to determine compliance with chlorpyrifos and diazinon load allocations.	ESJWQC MRPP, Management Plan, and MPURs
	Westside Coalition	• Conduct representative monitoring of the Coalition region according to Monitoring Strategy and Schedule explained in the Westside Coalition MRP. • Assess monitoring results to determine compliance with chlorpyrifos and diazinon load allocations	Westside Coalition MRP and Management Plan
3 and 4	ESJWQC	• Adhere to strategy put forth in the ESJWQC Management Plan to determine current management practices to reduce off-site movement of chlorpyrifos and diazinon. • Status reported in MPURs	ESJWQC Management Plan and MPURs
	Westside Coalition	• Adhere to strategy put forth in the Westside Coalition Management Plan to determine current management practices to reduce off-site movement of chlorpyrifos and diazinon. • Status reported in SAMRs.	Westside Coalition Management Plan and SAMRs
5	ESJWQC	• Conduct representative monitoring of Coalition region according to Monitoring Strategy outlined in ESJWQC MRPP to determine whether alternatives to diazinon and chlorpyrifos are causing surface water impairments. • Assess and discuss monitoring results in ESJWQC Management Plan and MPURs.	ESJWQC MRPP, Management Plan, and MPURs
	Westside Coalition	• Conduct representative monitoring of Coalition region according to Monitoring Strategy outlined in Westside Coalition MRP to determine whether alternatives to diazinon and chlorpyrifos are causing surface water impairments. • Assess and discuss monitoring results in Westside Coalition SAMRs.	Westside Coalition MRP and SAMRs
6	ESJWQC	• Conduct representative monitoring of Coalition region according to Monitoring Strategy explained in ESJWQC MRPP to assess toxicity and determine if agricultural discharge contributes to toxicity impairment due to additive or synergistic effects of multiple pollutants. • Assess and discuss monitoring results in ESJWQC Management Plan and MPURs.	ESJWQC MRPP, Management Plan, and MPURs
	Westside Coalition	• Conduct representative monitoring of Coalition region according to Monitoring Strategy explained in Westside Coalition MRP to assess toxicity and determine if agricultural discharge contributes to toxicity impairment due to additive or synergistic effects of multiple pollutants. • Assess and discuss monitoring results in Westside Coalition SAMRs.	Westside Coalition MRP and SAMRs
7	ESJWQC	• The ESJWQC assesses the information collected to meet Objectives 3 and 4 to determine if management practices are achieving the lowest pesticides levels technically and economically achievable in the ESJWQC Management Plan and MPURs.	ESJWQC Management Plan and MPURs
	Westside Coalition	• The Westside Coalition assesses the information collected to meet Objectives 3 and 4 to determine if management practices are achieving the lowest pesticides levels technically and economically achievable in the Westside Coalition Management Plan and SAMRs.	Westside Coalition Management Plan and SAMRs

[1]Information is in addition to the San Joaquin River Chlorpyrifos and Diazinon TMDL AMRs.

Table 3. ESJWQC and Westside Coalition MRP Order/MRPP, QAPP, AMRs/SAMRs, Management Plans, and MPURs submission dates.

Organized by Coalition and submission date.

Coalition	Document Name	Submission Date	Sampling Dates Addressed
ESJWQC	ESJWQC MRPP	August 25, 2008	NA[1]
ESJWQC	ESJWQC QAPP	August 25, 2008	NA[1]
ESJWQC	ESJWQC SAMR	June 30, 2008	October 2007 – March 2008
ESJWQC	ESJWQC Management Plan	September 30, 2008	August 2004 – December 2007
ESJWQC	ESJWQC SAMR	March 1, 2009	April – September 2008
ESJWQC	ESJWQC AMR	March 1, 2010	October 2008 – December 2009
ESJWQC	ESJWQC MPUR	April 1, 2010	October 2008 – December 2009
ESJWQC	ESJWQC AMR	March 1, 2011	January – December 2010
ESJWQC	ESJWQC MPUR	April 1, 2011	January – December 2010
ESJWQC	ESJWQC AMR	March 1, 2012	January – December 2011
ESJWQC	ESJWQC MPUR	April 1, 2012	January – December 2011
Westside Coalition	Westside Coalition MRP Order No.R5-2008-0831	September 15, 2008	NA[1]
Westside Coalition	Westside Coalition Management Plan and Focused Management Plan	October 23, 2008	March 2009 to Present
Westside Coalition	Westside Coalition QAPP (Draft)	June 30, 2009	NA[1]
Westside Coalition	Westside Coalition SAMR	June 15, 2009	September 2008 – February 2009
Westside Coalition	Westside Coalition SAMR	November 30, 2009	March – August 2009
Westside Coalition	Westside Coalition SAMR	June 15, 2010	September 2009 – February 2010
Westside Coalition	Westside Coalition SAMR	November 30, 2010	March – August 2010
Westside Coalition	Westside Coalition SAMR	June 15, 2011	September 2010 – February 2011
Westside Coalition	Westside Coalition SAMR	November 30, 2011	March – August 2011
Westside Coalition	Westside Coalition SAMR	To be submitted June 15, 2012	September 2011 – February 2012

NA[1] – Not Applicable. The document addresses and is applicable to the entire project, not a subset of sampling dates.

MONITORING DESIGN

The monitoring design for the 2011 water year closely followed the monitoring design utilized in 2010. The memorandum submitted to the Regional Board on May 14, 2010 outlined the approach to implement the monitoring component for the San Joaquin River chlorpyrifos and diazinon TMDL. This approach includes compliance monitoring of chlorpyrifos and diazinon in the San Joaquin River at six compliance points on a quarterly basis, monthly tributary monitoring based on each Coalition's approved monitoring plan, and an assessment of the monitoring objectives and results on an annual basis.

The Coalitions submitted a memorandum to the Regional Board on April 29, 2011 that confirmed the same approach would be employed during the 2011 water year, with two modifications. First, results from monthly monitoring by the Westside Coalition of three of the six compliance points (SJR @ Sack Dam, SJR @ Lander Ave, and SJR @ Las Palmas Ave (Patterson)) will be considered as TMDL compliance point monitoring and included in the annual assessment. Second, the Coalitions and Regional Board agreed to move the chlorpyrifos and diazinon AMR due date from October 31 to May 1 to better coordinate and streamline the TMDL program reporting requirements with those of the ILRP.

As a result of these modifications, 2011 San Joaquin River TMDL monitoring data were collected at six of the compliance points on a quarterly basis and three of the compliance points on a monthly basis. This report includes a complete analysis and discussion of all monitoring data collected from October 2010 through September 2011.

In part due to the change in the report timing, the ESJWQC and Westside Coalition created a decision tree to guide the Coalition's actions when a non compliant load is detected in the San Joaquin River (Figure 2). The decision tree enables the Coalitions to adequately and efficiently address water quality impairments found in the San Joaquin River.

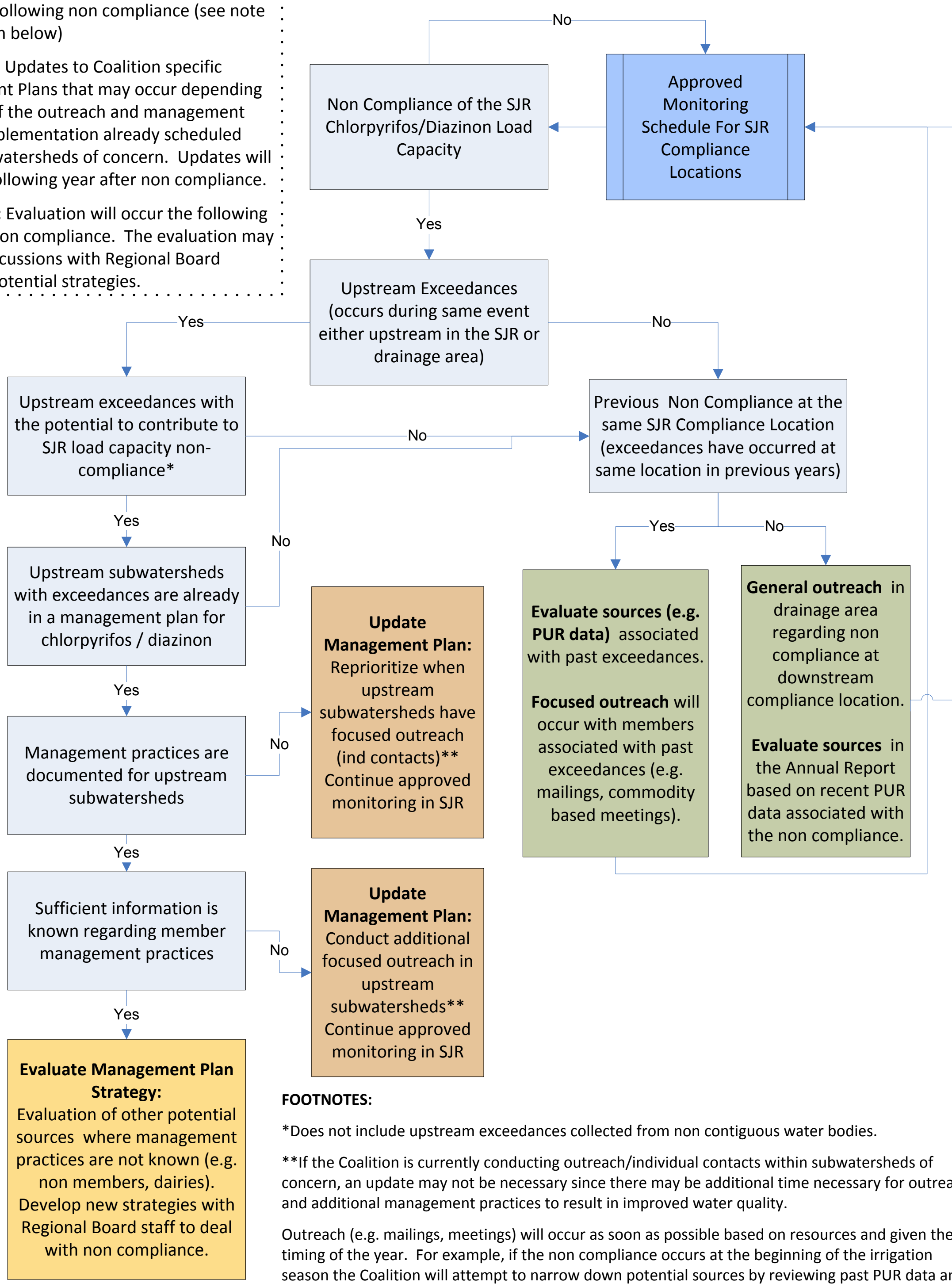
Figure 2. Chlorpyrifos and diazinon San Joaquin River TMDL Decision Tree for compliance monitoring and actions resulting from non compliance of the San Joaquin River load capacity.

COLOR KEY TO ACTION BOXES:

Green box: Actions that will occur within the same year following non compliance (see note on Outreach below)

Brown box: Updates to Coalition specific Management Plans that may occur depending on timing of the outreach and management practice implementation already scheduled within subwatersheds of concern. Updates will occur the following year after non compliance.

Yellow box: Evaluation will occur the following year after non compliance. The evaluation may result in discussions with Regional Board regarding potential strategies.



FOOTNOTES:

*Does not include upstream exceedances collected from non contiguous water bodies.

**If the Coalition is currently conducting outreach/individual contacts within subwatersheds of concern, an update may not be necessary since there may be additional time necessary for outreach and additional management practices to result in improved water quality.

Outreach (e.g. mailings, meetings) will occur as soon as possible based on resources and given the timing of the year. For example, if the non compliance occurs at the beginning of the irrigation season the Coalition will attempt to narrow down potential sources by reviewing past PUR data and inform those growers of the non compliance with the goal of improving SJR water quality during the rest of the high use period.

Sampling Coordination

San Joaquin River TMDL monitoring and Westside Coalition tributary monitoring is typically scheduled for the second Tuesday of the month and is adjusted for storm events as necessary.

From October 2010 through April 2011, the ESJWQC monitored its tributaries on the third Tuesday of every month. From May through September 2011 ESJWQC tributary monitoring occurred two consecutive Tuesdays during each month due to increased workload due to additional monitoring locations. Half of ESJWQC tributary monitoring (northern section) occurred on the second Tuesday of each month and the second half of tributary monitoring (southern section) occurred on the third Tuesday of each month.

Monitoring Frequency and Timing

Monitoring frequency is designed to characterize the concentrations of chlorpyrifos and diazinon in the San Joaquin River. Monitoring occurred monthly at three of the six compliance points (SJR @ Sack Dam, SJR @ Lander Ave, and SJR @ Las Palmas Ave (Patterson)) to evaluate water quality throughout the year. Monitoring occurred quarterly at all six compliance points and was scheduled to coincide with predicted peak pesticide use and, hence, potential peak concentrations in waterways. Peak pesticide use was determined using Pesticide Use Reports (PURs) and past monitoring data. Below is a description of the most common crops for which chlorpyrifos and/or diazinon are applied and the month in which quarterly monitoring is planned. Quarters are assigned based on a calendar year.

Quarter 4: October - December

Chlorpyrifos applications in October and November are mostly due to post harvest applications to grapes for vine mealybug (Figure 4). Quarterly monitoring occurs in October to capture any runoff that may occur during this time. The few dormant applications of diazinon that still occur begin in December prior to the storm season. Dormant spray runoff is captured in the following quarter after a majority of the dormant sprays are expected to occur and when rain events have the potential to result in diazinon and/or chlorpyrifos runoff.

Quarter 1: January - March

Dormant season insecticide applications occur between December and February and the first quarter sampling is scheduled to assess discharges in storm drainage. In general, diazinon use has decreased significantly in recent years. However, when it is applied, use peaks from December through February (Figure 3). Chlorpyrifos use is relatively low from November through February and increases in March due to applications to alfalfa (Figure 4). If the Coalitions are unable to capture a storm event, first quarter monitoring will occur in March.

Quarter 2: April - June

Chlorpyrifos use increases in May (Figure 4) during which time it is applied to permanent crops such as almonds and walnuts and crops such as alfalfa and corn. Minimal use of diazinon occurs from April through June (Figure 3) when it is applied to cherries, tomatoes, cantaloupes and melons. Quarterly monitoring is therefore scheduled for May during this quarter.

Quarter 3: July -September

Chlorpyrifos use increases from July through August (Figure 4) when it is applied to many crops including alfalfa, almonds (hull-split applications), walnuts (coddling moth applications), and corn. During this time, the most use occurs in July which also coincides with the month that chlorpyrifos exceedances are most likely occur. Diazinon use during this time is mostly to cantaloupes and melons. Quarterly monitoring is scheduled in July during this quarter.

Figure 3. Pounds of diazinon applied to the Lower San Joaquin River watershed from 2004 through 2010. Years refer to calendar years.

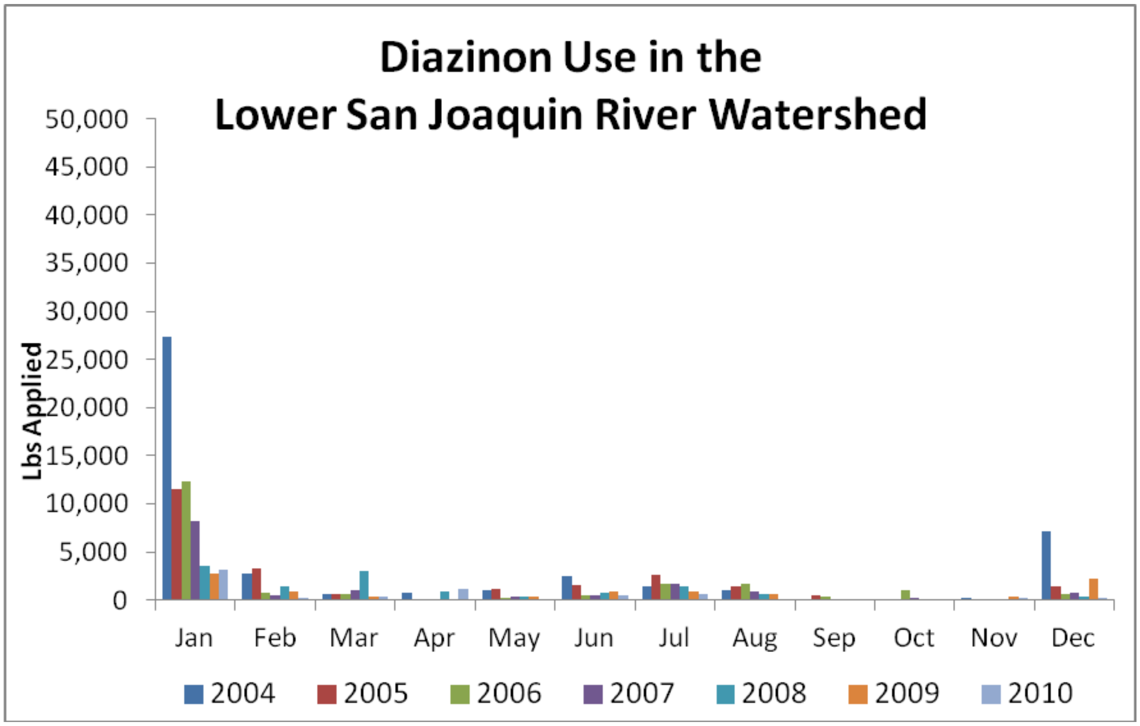
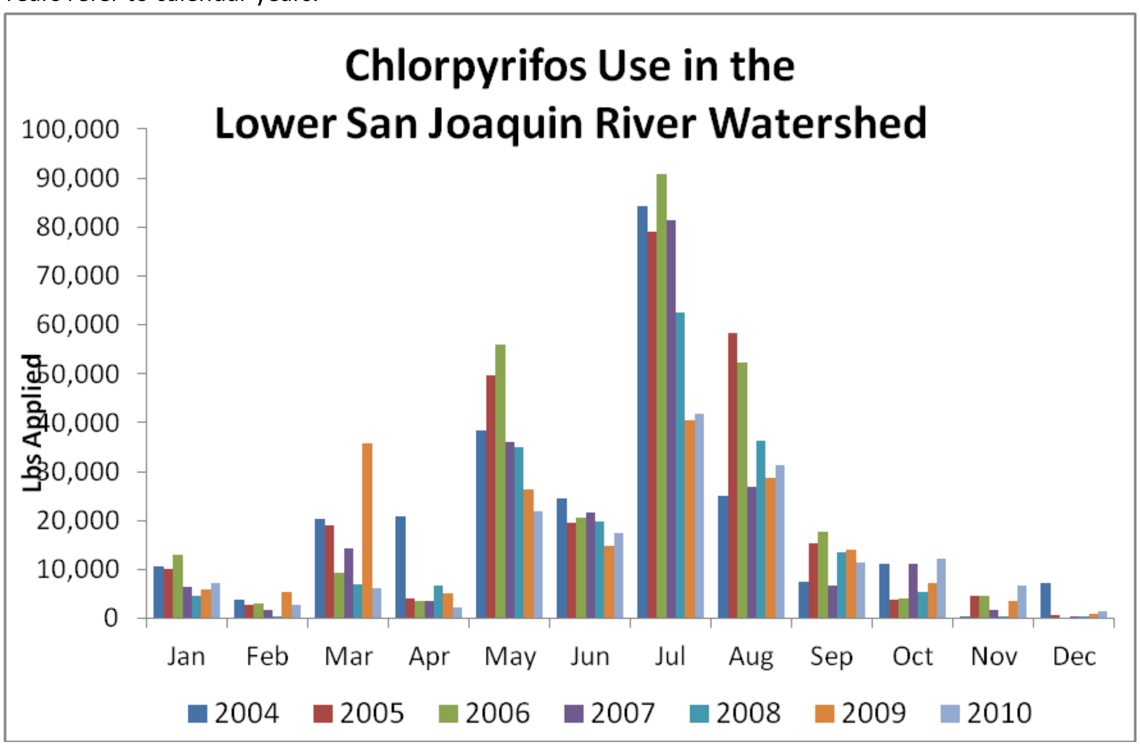


Figure 4. Pounds of chlorpyrifos applied to the Lower San Joaquin River watershed from 2004 through 2010. Years refer to calendar years.



Constituents Monitored

Water samples collected from the San Joaquin River for this TMDL were analyzed for chlorpyrifos and diazinon. Samples collected by the Westside Coalition during their normal monthly monitoring were analyzed for additional constituents for compliance with the ILRP and are described in the Westside Coalition MRP. Results from ILRP monitoring (both additional SJR constituents and tributary monitoring) are reported in the Westside SAMR and the ESJWQC AMR. Habitat information and field data, including dissolved oxygen (DO), pH, specific conductance (SC), and water temperature, were collected at each site during each monitoring event. Discharge calculations were obtained from Department of Water Resources (DWR) gauge readings posted on the California Data Exchange Center (CDEC) website. The sampling procedures and analytical methods are further discussed in the Sampling and Analytical Methods section.

SAMPLE SITE DESCRIPTIONS

The Basin Plan Amendment requires the Coalitions to assess compliance with WQOs and loading capacity for, at a minimum, the six designated water quality compliance points on the San Joaquin River. These compliance points are (from upstream to downstream, Table 4 and Figure 5):

- San Joaquin River at Sack Dam,
- San Joaquin River at Highway 165 (Lander Ave) near Stevinson (USGS 11260815),
- San Joaquin River at Hills Ferry,
- San Joaquin River at Las Palmas Avenue near Patterson (USGS 11274570),
- San Joaquin River at the Maze Boulevard (Highway 132) Bridge (USGS 11290500), and
- San Joaquin River at the Airport Way Bridge near Vernalis (USGS 11303500).

Additionally, the Basin Plan Amendment specifies that compliance with load allocations for nonpoint source discharges into the San Joaquin River must be determined for the following five subareas (from upstream to downstream, Table 5 and Figure 5):

- Bear Creek and Fresno-Chowchilla subareas
- Stevinson and Grassland subareas,
- Turlock, Merced, and Greater Orestimba subareas,
- Tuolumne River, Northeast Bank, and Westside Creek subareas, and
- Stanislaus River, North Stanislaus, and Vernalis North subareas.

Five of the six compliance points on the San Joaquin River monitor drainage from these subareas (Table 5 and Figure 5).

During the 2011 water year, the Coalitions sampled 41 tributaries for chlorpyrifos and diazinon (22 in ESJWQC region and 19 in Westside Coalition region; Table 6 and Figure 6). San Joaquin River compliance sites and the associated tributaries that drain to each compliance point are listed in Table 7. Although there are no tributaries listed that drain into SJR @ Sack Dam, there is the potential for indirect drainage and spray drift to occur in a small area next to the river upstream of this monitoring location (Figure 7).

Results from ESJWQC and Westside Coalition tributary monitoring are discussed in this report as they pertain to San Joaquin River monitoring. Details of ESJWQC tributary monitoring locations and 2010 and 2011 results can be found in the ESJWQC AMRs submitted March 1, 2011 and March 1, 2012. Westside Coalition tributary monitoring locations and October 2010 through August 2011 results were reported in the Westside Coalition SAMRs submitted June 15 and November 30, 2011. Westside Coalition tributary monitoring locations and results from September 2011 will be reported in the Westside Coalition SAMR to be submitted June 15, 2012.

Table 4. ESJWQC and Westside Coalition chlorpyrifos and diazinon TMDL San Joaquin River sampling sites.
Listed in order of upstream to downstream.

Responsible Coalition	Site Name	Monitoring Frequency	Station Code	Latitude	Longitude
Westside	SJR @ Sack Dam	Monthly	541XSJRSD	36.98361	-120.50028
Westside	SJR @ Lander Ave	Monthly	541XSJRLA	37.29528	-120.85028
ESJWQC	SJR @ Hills Ferry Rd	Quarterly	541STC512	37.34250	-120.97722
Westside	SJR @ Las Palmas Ave (Patterson)	Monthly	541STC507	37.49778	-121.08167
ESJWQC	SJR @ Maze Blvd	Quarterly	541STC510	37.64194	-121.22778
ESJWQC	SJR @ Airport Way	Quarterly	541SJC501	37.67556	-121.26417

Table 5. San Joaquin River sampling sites and associated drainage subareas identified in the Basin Plan to be used in assessing compliance with load allocations.
Listed in order of upstream to downstream.

Site Name	Subareas
SJR @ Sack Dam	NA[1]
SJR @ Lander Ave	Bear Creek, Fresno-Chowchilla
SJR @ Hills Ferry Rd	Stevinson, Grassland
SJR @ Las Palmas Ave (Patterson)	Turlock, Merced, Greater Orestimba
SJR @ Maze Blvd	Tuolumne River, Northeast Bank, Westside Creek
SJR @ Airport Way	Stanislaus River, North Stanislaus, and Vernalis North

NA[1] – Not applicable because this station is not identified as having drainage from subareas as listed in the Basin Plan amendment (see Figure 5). However, this report identifies some drainage possible along the river in the Fresno-Chowchilla and Grassland subareas (see Figure 7).

Table 6. ESJWQC and Westside Coalition upstream tributary sites monitored during the 2011 water year.
The most immediate downstream San Joaquin River monitoring site is listed for each tributary. Tributary map key refers to Figures 6 and 7.

Tributary Map Key	SJR Downstream Monitoring Location	Coalition Region	Tributary Site name	Tributary Station Code	Tributary Latitude	Tributary Longitude
1	SJR @ Maze Blvd	Westside	Blewett Drain at Highway 132	541XVH132	37.640520	-121.229600
2	SJR @ Maze Blvd	Westside	Del Puerto Creek at Hwy 33	541XDPCHW	37.514210	-121.158750
3	SJR @ Maze Blvd	Westside	Del Puerto Creek near Cox Road	541XDPCCR	37.539400	-121.122100
5	SJR @ Maze Blvd	Westside	Hospital Creek at River Road	541XHCARR	37.610472	-121.230778
6	SJR @ Maze Blvd	Westside	Ingram Creek at River Road	541XICARR	37.600222	-121.225056
8	SJR @ Hills Ferry Rd	Westside	Los Banos Creek at China Camp Road	541XLBCCC	37.114500	-120.889500
9	SJR @ Hills Ferry Rd	Westside	Los Banos Creek at Hwy 140	541XLBCHW	37.276200	-120.955500
10	SJR @ Hills Ferry Rd	Westside	Los Banos Creek at Sunset Ave.	541XLBCSA	37.027500	-120.889800
11	SJR @ Las Palmas Ave	Westside	Marshall Road Drain near River Road	541XMRDRR	37.436300	-121.036200
12	SJR @ Hills Ferry Rd	Westside	Mud Slough Upstream of San Luis Drain	541XMSUSL	37.263880	-120.906110
13	SJR @ Hills Ferry Rd	Westside	Newman Wasteway near Hills Ferry Road	541XNWHFR	37.320400	-120.983400
14	SJR @ Las Palmas Ave	Westside	Orestimba Creek at Hwy 33	541XOCAHW	37.377150	-121.058120
15	SJR @ Las Palmas Ave	Westside	Orestimba Creek at River Road	541XOCARR	37.413880	-121.014166
16	SJR @ Hills Ferry Rd	Westside	Poso Slough at Indiana Ave	541XPSAIA	37.006200	-120.599600
17	SJR @ Las Palmas Ave	Westside	Ramona Lake near Fig Avenue	541XROLFA	37.478800	-121.068400
18	SJR @ Hills Ferry Rd	Westside	Salt Slough at Lander Ave	541XSSALA	37.247900	-120.852200
19	SJR @ Hills Ferry Rd	Westside	Salt Slough at Sand Dam	541XSSASD	37.136600	-120.761900
20	SJR @ Hills Ferry Rd	Westside	Turner Slough at Edminster Road	541XTSAER	37.304100	-120.900800
21	SJR @ Maze Blvd	Westside	Westley Wasteway near Cox Road	541XWWNCR	37.558200	-121.163700
22	SJR @ Lander Ave	ESJWQC	Ash Slough @ Ave 21	545XASAAT	37.054500	-120.415800
23	SJR @ Lander Ave	ESJWQC	Bear Creek @ Kibby Rd	535XBCAKR	37.312800	-120.413800
24	SJR @ Lander Ave	ESJWQC	Berenda Slough along Ave 18 1/2	545XBSAAE	37.018200	-120.326500
25	SJR @ Lander Ave	ESJWQC	Cottonwood Creek @ Rd 20	545XCCART	36.868600	-120.181800
26	SJR @ Lander Ave	ESJWQC	Deadman Creek @ Gurr Rd	535XDCAGR	37.193600	-120.561200

Tributary Map Key	SJR Downstream Monitoring Location	Coalition Region	Tributary Site name	Tributary Station Code	Tributary Latitude	Tributary Longitude
27	SJR @ Lander Ave	ESJWQC	Deadman Creek @ Hwy 59	535DMCAHF	37.198100	-120.486900
29	SJR @ Lander Ave	ESJWQC	Dry Creek @ Rd 18	545XDCARE	36.981800	-120.219500
30	SJR @ Maze Blvd	ESJWQC	Dry Creek @ Wellsford Rd	535XDCAWR	37.660200	-120.874300
31	SJR @ Lander Ave	ESJWQC	Duck Slough @ Gurr Rd	535XDSAGR	37.214200	-120.559600
32	SJR @ Lander Ave	ESJWQC	Duck Slough @ Hwy 99	535XDSAHN	37.250100	-120.410000
33	SJR @ Las Palmas Ave	ESJWQC	Highline Canal @ Hwy 99	535XHCHNN	37.415300	-120.755700
34	SJR @ Las Palmas Ave	ESJWQC	Highline Canal @ Lombardy Rd	535XHCHNN	37.455600	-120.720700
35	SJR @ Lander Ave	ESJWQC	Howard Lateral @ Hwy 140	535XHLAHO	37.307900	-120.782000
36	SJR @ Maze Blvd	ESJWQC	Lateral 2 1/2 near Keyes Rd	535LTHNKR	37.547800	-121.092740
37	SJR @ Lander Ave	ESJWQC	Livingston Drain @ Robin Ave	535XLDARA	37.316900	-120.742300
38	SJR @ Lander Ave	ESJWQC	McCoy Lateral @ Hwy 140	535XMLAHO	37.309450	-120.787590
39	SJR @ Las Palmas Ave	ESJWQC	Merced River @ Santa Fe	535XMRSFD	37.427100	-120.672100
40	SJR @ Lander Ave	ESJWQC	Miles Creek @ Reilly Rd	535XMCARR	37.258200	-120.475500
41	SJR @ Airport Way	ESJWQC	Mootz Drain Downstream of Langworth Pond	535XMDDLP	37.705510	-120.894380
42	SJR @ Las Palmas Ave	ESJWQC	Mustang Creek @ East Ave	535XMCAEA	37.491800	-120.683900
43	SJR @ Las Palmas Ave	ESJWQC	Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	37.442200	-121.002400
44	SJR @ Airport Way	ESJWQC	Rodden Creek @ Rodden Rd	535XRCARD	37.790420	-120.807900

Table 7. San Joaquin River monitoring sites and associated upstream tributaries monitored during the 2011 water year.

Listed in order from upstream to downstream.

SITE NAME	UPSTREAM TRIBUTARY SITE NAMES
SJR @ Sack Dam	None
SJR @ Lander Ave	All stations listed in the row above and San Joaquin River at Lander Ave, Ash Slough @ Ave 21, Bear Creek @ Kibby Rd, Berenda Slough along Ave 18 1/2, Cottonwood Creek @ Rd 20, Deadman Creek @ Gurr Rd, Deadman Creek @ Hwy 59, Dry Creek @ Rd 18, Duck Slough @ Gurr Rd, Duck Slough @ Hwy 99, Howard Lateral @ Hwy 140, Livingston Drain @ Robin Ave, McCoy Lateral @ Hwy 140, Miles Creek @ Reilly Rd
SJR @ Hills Ferry Rd	All stations listed in the rows above and Los Banos Creek at Sunset Ave., Los Banos Creek at China Camp Road, Los Banos Creek at Hwy 140, Newman Wasteway near Hills Ferry Rd., Mud Slough Upstream of San Luis Drain, Poso Slough at Indiana Ave, Salt Slough at Lander Ave, Salt Slough at Sand Dam, Turner Slough at Edminster Road
SJR @ Las Palmas Ave	All stations listed in the rows above and Marshall Road Drain near River Road, , Orestimba Creek at Hwy 33, Orestimba Creek at River Road, Ramona Lake near Fig Avenue, Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave, Merced River @ Santa Fe, Mustang Creek @ East Ave, Prairie Flower Drain @ Crows Landing Rd
SJR @ Maze Blvd	All stations listed in the rows above and Blewett Drain at Highway 132, Del Puerto Creek at Hwy 33, Del Puerto Creek near Cox Road, Hospital Creek at River Road, Ingram Creek at River Road, Westley Wasteway near Cox Road, Dry Creek @ Wellsford Rd, Lateral 2 1/2 near Keyes Rd
SJR @ Airport Way	All stations listed in the rows above and Mootz Drain Downstream of Langworth Pond, Rodden Creek @ Rodden Rd

Figure 5. San Joaquin River monitoring sites and drainage subareas.

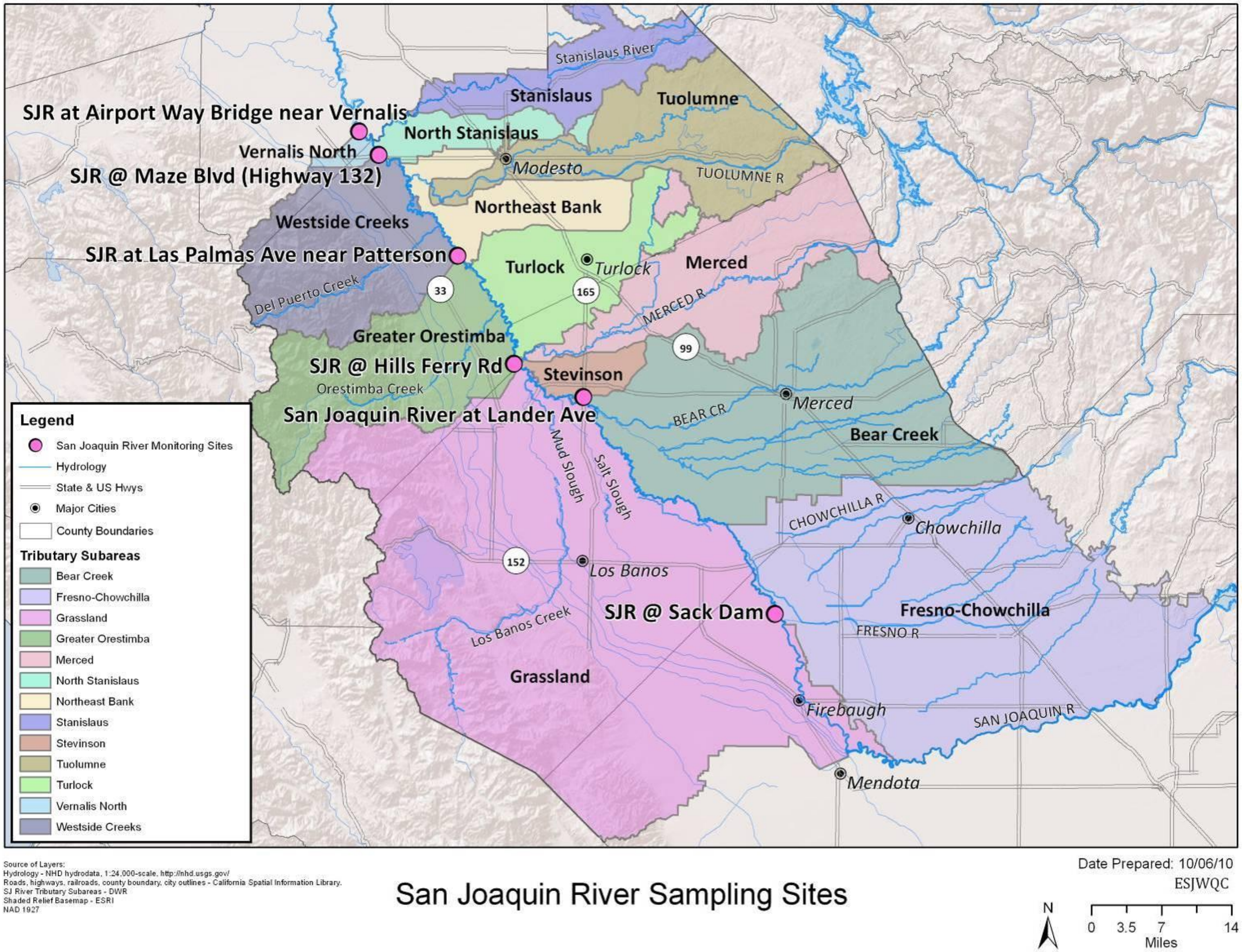


Figure 6. San Joaquin River monitoring sites, associated subareas, and upstream ESJWQC and Westside Coalition tributaries monitored during the 2011 water year. Refer to Table 7 for tributary map key.

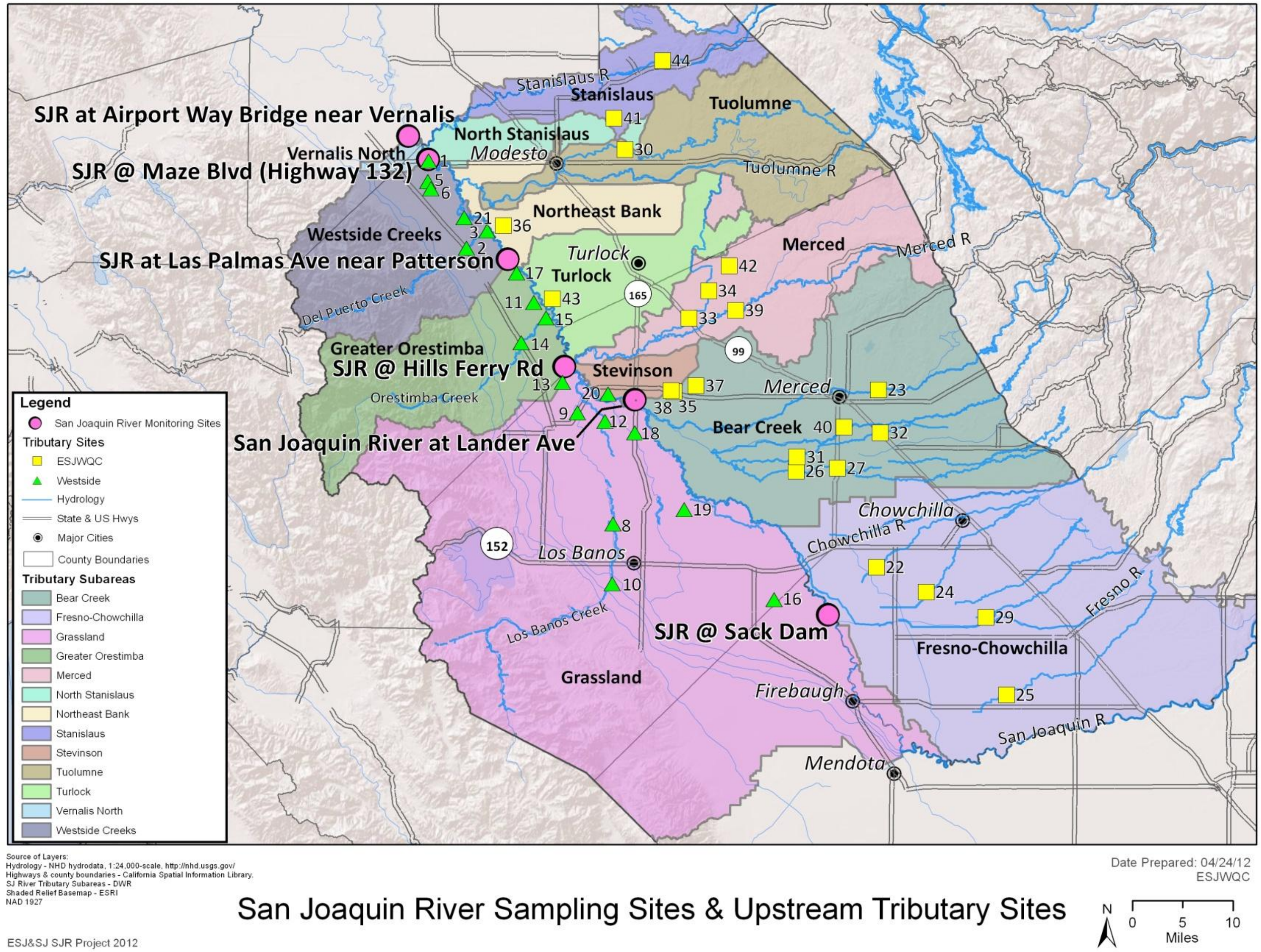
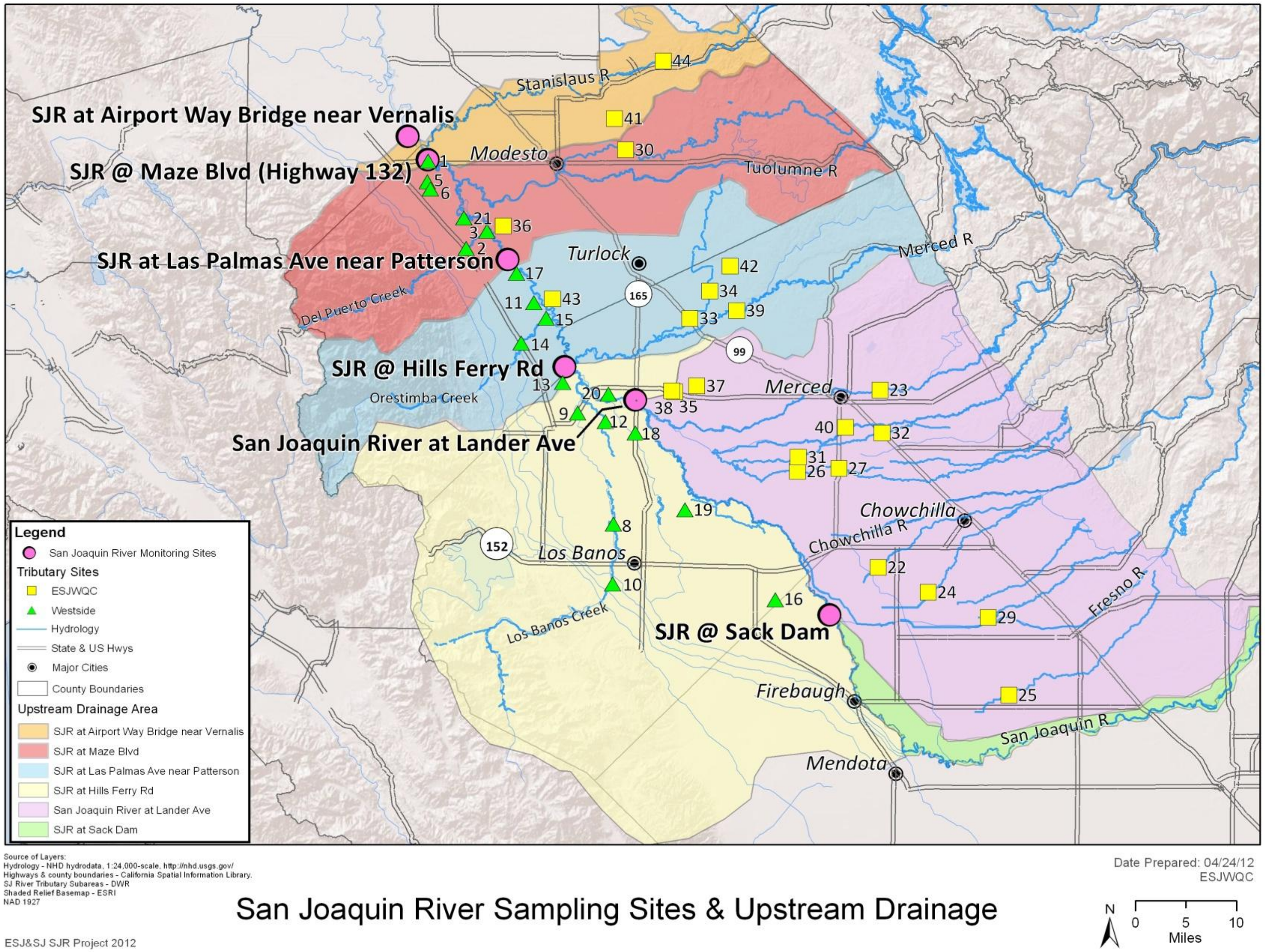


Figure 7. San Joaquin River monitoring sites and associated subwatershed drainage areas (may include multiple subareas) with ESJWQC and Westside Coalition tributaries monitored during the 2011 water year.

Refer to Table 7 for tributary map key.



To better characterize the upstream drainage area for each of the San Joaquin River monitoring compliance points, the Coalitions reviewed land use acreage based on United States Department of Agriculture (USDA) cropland data from 2009 (Table 8). The entire drainage area is estimated to include three and a half million acres with nearly two million acres estimated to be irrigated agriculture. Of the irrigated acreage land uses, field crops account for approximately 50% of estimated acreage. Orchards occupy approximately 25%, followed by pasture land and vineyards accounting for 20% and 4% of the total estimated irrigated acreage, respectively. Overall, estimated irrigated land comprises 51% of the land use within the entire Lower San Joaquin River drainage area according to the 2009 USDA cropland data.

Table 9 identifies the crop types with the largest acreage within each compliance point subwatershed based on the USDA 2009 cropland data. Alfalfa acreage is within the top four in all subwatersheds and almond acreage is within the top two in five of the six subwatersheds (Table 9). Corn, grapes, oats, pasture/grasses, tomatoes, and winter wheat are also all very common in the Lower San Joaquin River drainage area.

Figure 7 provides a map of the six San Joaquin River monitoring locations and their entire associated upstream drainage area (cumulative acres); including upstream tributaries sampled by the Coalitions (refer to the tributary map key in Table 6).

Table 8. Estimated land use acreage upstream of the San Joaquin River sampling sites.
Stations are listed in order of upstream to downstream from left to right. Subwatershed totals reflect the acreages within the subareas that drain to each SJR location. Cumulative totals reflect acreages that drain to each SJR location including any land use of upstream SJR locations. Acreages estimated from 2009 USDA data.

	SJR @ Sack Dam	SJR @ Lander Ave	SJR @ Hills Ferry Rd	SJR @ Las Palmas Ave (Patterson)	SJR @ Maze Blvd	SJR @ Airport Way
Field Crops (I)	18,800	326,200	324,100	163,600	91,900	41,500
Orchard (I)	18,600	177,400	45,900	101,200	101,200	44,600
Pasture (I)	2,400	72,800	137,600	67,400	96,900	11,900
Vineyard (I)	10,100	58,300	4,100	9,000	2,000	500
Estimated Subwatershed Irrigated Acres:	**49,900**	**634,700**	**511,700**	**341,200**	**292,000**	**98,500**
Estimated Cumulative Irrigated Acres:	**49,900**	**684,600**	**1,196,300**	**1,537,500**	**1,829,500**	**1,928,000**
Developed (NI)	8,200	118,200	76,600	55,700	63,900	40,500
Native (NI)	24,300	403,500	497,500	193,000	198,200	47,900
Not Farmed (NI)	1,700	17,100	38,700	6,200	4,500	1,300
Open Water (NI)	1,000	2,100	18,000	1,800	8,800	3,100
Estimated Subwatershed Non-Irrigated Acres:	**35,200**	**540,900**	**630,800**	**256,700**	**275,400**	**92,800**
Estimated Cumulative Non-Irrigated Acres:	**35,200**	**576,100**	**1,206,900**	**1,463,600**	**1,739,000**	**1,831,800**
Estimated Subwatershed Total Acres	**85,100**	**1,175,600**	**1,142,500**	**597,900**	**567,400**	**191,300**
Estimated Cumulative Total Acres	**85,100**	**1,260,700**	**2,403,200**	**3,001,100**	**3,568,500**	**3,759,800**

SJR – San Joaquin River
I – Irrigated
NI – Not Irrigated

Table 9. Top ten crops (based on acreage) upstream of each San Joaquin River sampling site.
Listed in order of largest (first row) to smallest acreage (last row). Acreages estimated from 2009 USDA data.

SJR @ Sack Dam	SJR @ Lander Ave	SJR @ Hills Ferry Rd	SJR @ Las Palmas Ave (Patterson)	SJR @ Maze Blvd	SJR @ Airport Way
Almonds	Alfalfa	Pasture/Grass	Almonds	Pasture/Grass	Almonds
Grapes	Almonds	Alfalfa	Oats	Almonds	Alfalfa
Alfalfa	Pasture/Grass	Tomatoes	Pasture/Grass	Alfalfa	Oats
Pistachios	Grapes	Oats	Alfalfa	Oats	Pasture/Grass
Winter Wheat	Oats	Winter Wheat	Winter Wheat	Walnuts	Walnuts
Pasture/Grass	Winter Wheat	Cotton	Grapes	Tomatoes	Winter Wheat
Oats	Pistachios	Almonds	Tomatoes	Winter Wheat	Corn
Tomatoes	Tomatoes	Corn	Corn	Corn	Other Hays
Corn	Corn	Cantaloupe	Walnuts	Grapes	Tomatoes
Walnuts	Cotton	Grapes	Pistachios	Cotton	Grapes

RAINFALL RECORDS

Daily rainfall records are provided for four locations spread throughout the ESJWQC and Westside Coalition regions: Modesto, Merced, Los Banos and Patterson. Precipitation records were retrieved from the California Irrigation Management Information System (CIMIS). The 2011 water year was the wettest year since 2005 and has been classified as a wet-hydraulic year type. Significant precipitation first occurred in the second half of October and continued throughout the winter months (Figures 8 and 9).

In response to rainfall-induced runoff, storm event samples were collected from the six San Joaquin River compliance points during February. Both the ESJWQC and Westside Coalition also collected storm event samples from their tributary sites during February. In addition, the Westside Coalition collected storm event samples at accessible and flowing monitoring sites, including the three main stem sites monitored by the Westside Coalition, in December and January.

Figure 8. Precipitation history from October 1, 2010 through March 31, 2011.
Data recorded at CIMIS stations in Modesto, Merced, Los Banos and Patterson, CA.

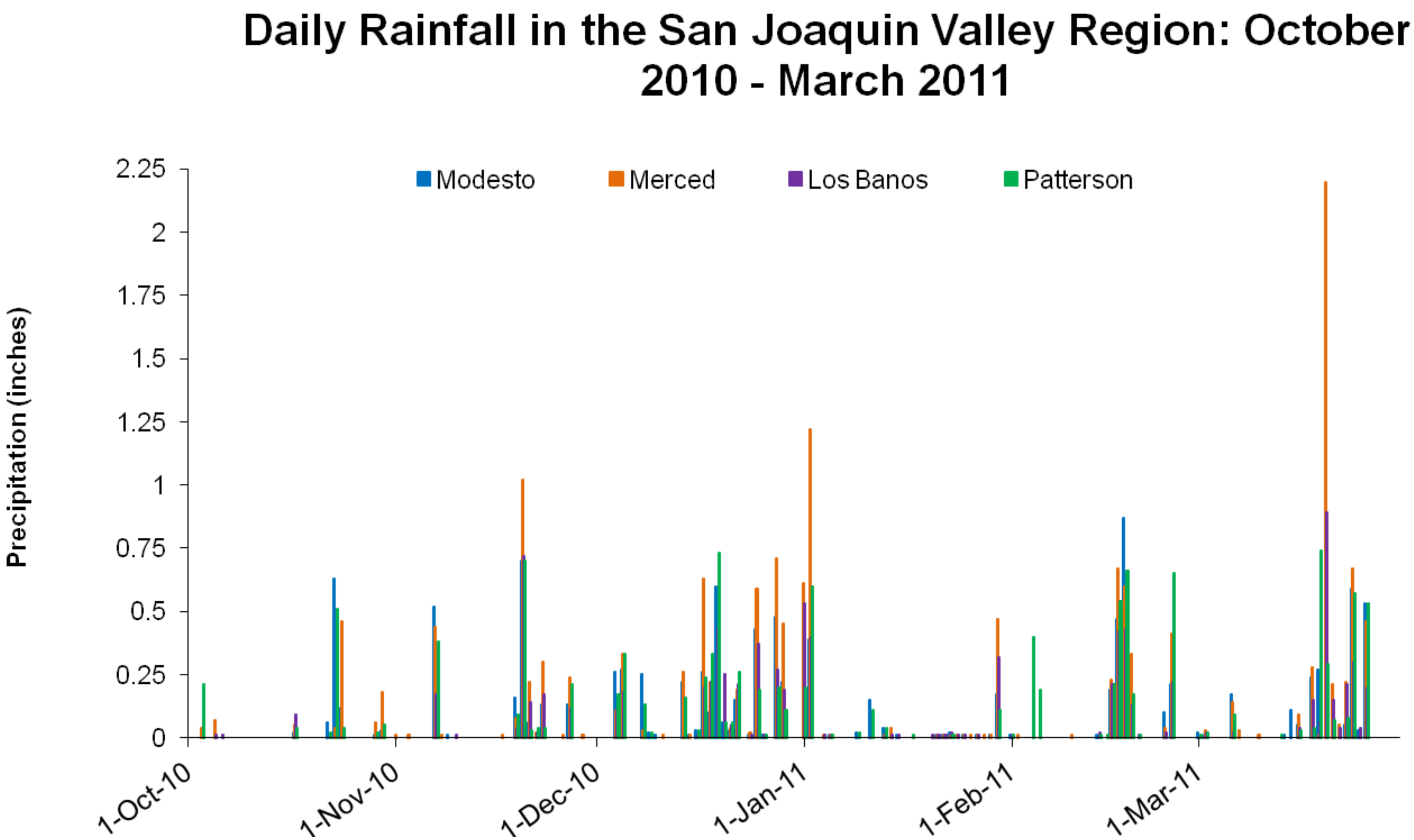
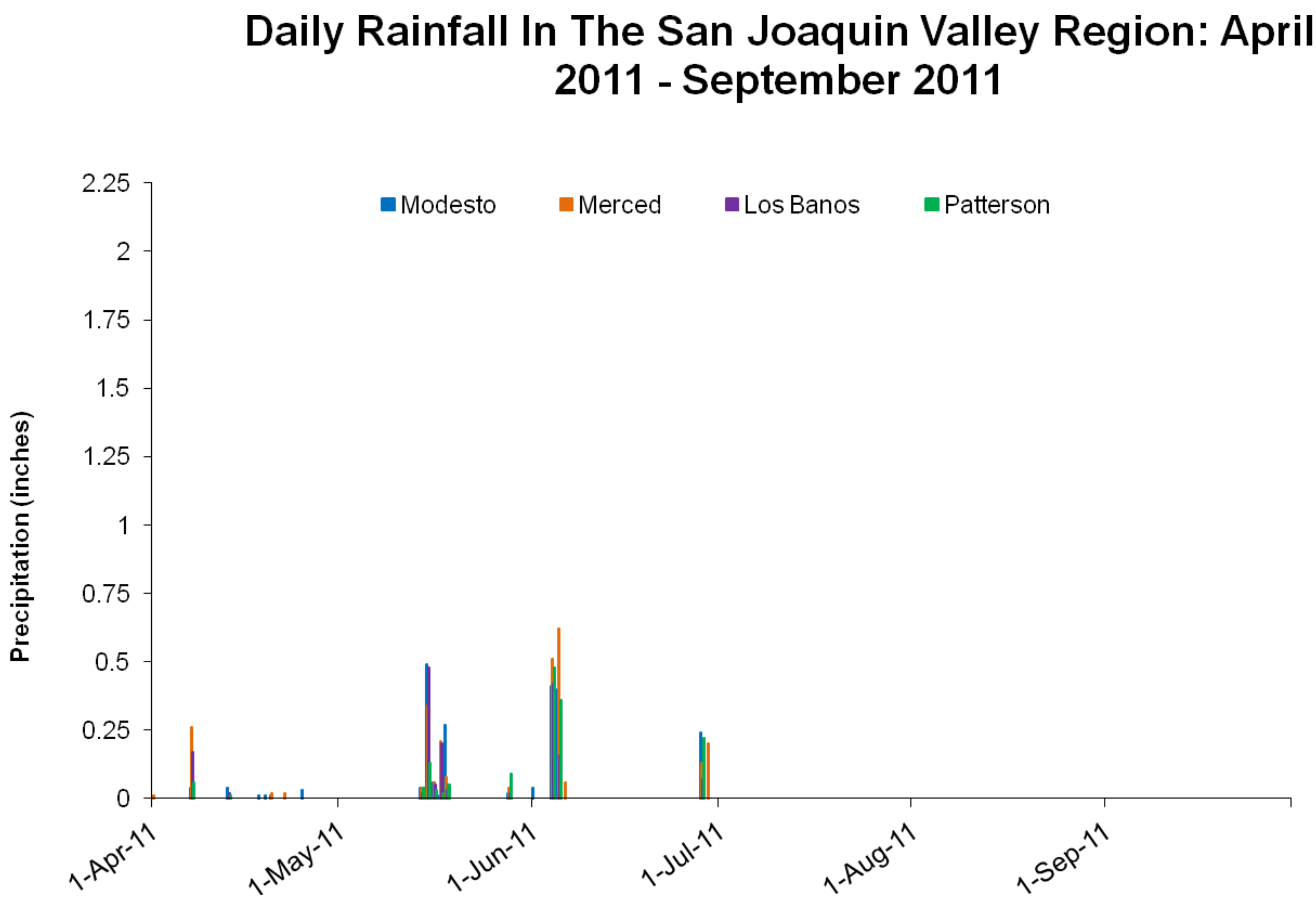


Figure 9. Precipitation history from April 1 through September 30, 2011.
Data recorded at CIMIS stations in Modesto, Merced, Los Banos and Patterson, CA.



SAMPLING AND ANALYTICAL METHODS

Information on sample collection containers, volumes, preservations and holding times is provided in Table 10 and field instrument information in Table 11. Site-specific discharge methods are described in Table 12, and analytical methods and reporting limits (RL) are provided in Table 13.

Field sampling procedures and analytical methods were performed at SJR @ Airport Way, SJR @ Hills Ferry Rd, SJR @ Las Palmas and SJR @ Maze Blvd as outlined in the standard operating procedures (SOPs) provided in the ESJWQC QAPP. ESJWQC field samplers collected an integrated river water sample using a three liter polytetrafluoroethylene (PFTE) bottle from a bridge crossing. Amber glass bottles were filled from the integrated sample collected in the PFTE bottle. The complete ESJWQC field sampling SOPs were included in Appendix I of the San Joaquin River Chlorpyrifos and Diazinon 2010 AMR (submitted October 31, 2010); no deviations from these procedures occurred during the monitoring.

The Westside Coalition sampled the SJR @ Lander Ave, SJR @ Las Palmas and SJR @ Sack Dam according to the field sampling procedures and analytical methods described in the Westside Coalition QAPP. The Westside Coalition field samplers collected sample water directly into amber glass bottles from the San Joaquin River bank at each site. Due to safety concerns, Westside Coalition samplers avoid bridge sampling where possible. The complete Westside Coalition field sampling SOPs were included in Appendix I of the San Joaquin River Chlorpyrifos and Diazinon 2010 AMR (submitted October 31, 2010); no deviations from these procedures occurred during the monitoring.

Table 10. Sampling procedures, containers, sample volumes, preservation and storage techniques, and holding times.

Analytical Parameter	Sample Volume[1]	Sample Container	Initial Preservation/Holding Requirements	Holding Time[2]
Organophosphates	1 L	1 L Amber Glass	Store at 4°C; extract within 7 days	40 Days

[1] Additional volume may be required for QC analyses.
[2] Holding time after initial preservation or extraction.

Table 11. 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	DWR Gauge/CDEC Website

DWR – California Department of Water Resources
CDEC – California Data Exchange Center

Table 12. Site specific discharge methods.

Responsible Coalition	Site name	Discharge Method	Gauge
Westside	SJR @ Sack Dam	DWR Gauge	CDEC San Joaquin River near Dos Palos (SDP)
Westside	SJR @ Lander Ave	DWR Gauge	CDEC San Joaquin River near Stevinson (SJS)[1]

Responsible Coalition	Site name	Discharge Method	Gauge
ESJWQC	SJR @ Hills Ferry Rd	USGS and DWR Gauge	CDEC San Joaquin River Near Newman (NEW)
Westside	SJR @ Las Palmas Ave (Patterson)	DWR Gauge	CDEC San Joaquin River near Patterson (SJP)
ESJWQC	SJR @ Maze Blvd	DWR Gauge	CDEC San Joaquin River at Maze Rd Bridge (MRB)
ESJWQC	SJR @ Airport Way	DWR Gauge	CDEC San Joaquin River near Vernalis (VNS)

[1]The last available discharge data for this gauge station was March 5, 2010. Station SMN (San Joaquin River above Merced River) is used where SJS data are not available.

Table 13. Field and laboratory analytical methods.

Constituent	Matrix	Analyzing Lab	RL	MDL	Analytical Method
Physical Parameters					
pH	Water	Field Measure	0.1 pH units	NA	EPA 150.1
Specific Conductance	Water	Field Measure	100 µmhos/cm	NA	EPA 120.1
Dissolved Oxygen	Water	Field Measure	0.1 mg/L	NA	SM 4500-O
Temperature	Water	Field Measure	0.1 °C	NA	SM 2550
Organophosphates					
Chlorpyrifos	Water	APPL Inc	0.015 µg/L	0.0026 µg/L	EPA 8141A
Diazinon	Water	APPL Inc	0.02 µg/L	0.004 µg/L	EPA 8141A

RL – Reporting Limit
MDL – Minimum Detection Limit
cfs - Cubic Feet per Second

MONITORING RESULTS

As described in the Monitoring Objectives section, this report includes all San Joaquin River monitoring data collected from October 2010 through September 2011.

Original Chain of Custody (COC) forms were scanned and converted to pdf. Copies of the COCs are provided in Appendix I. COCs were faxed by the laboratories to Michael L. Johnson, LLC (MLJ-LLC) and Summers Engineering after the receipt of samples. 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 were performed according to the ESJWQC QAPP and Westside Coalition QAPP. If there were any discrepancies between the COC and sample delivery, the issues were resolved and documented directly on the COC.

Complete monitoring results from sampling conducted at the six compliance points on the San Joaquin River are included in Appendix II (Monitoring Results) and Appendix III (Field and Laboratory Quality Assurance (QA) Results). The results in Appendix II include field parameter results (DO, SC, pH, temperature and discharge) and laboratory analyses for chlorpyrifos and diazinon. Field and laboratory QA data including field duplicate (FD), field blank (FB), laboratory blank, laboratory duplicate, laboratory control spike and matrix spike results are included in Appendix III and are discussed in the Laboratory and Field Quality Assurance Results and Summary of Precision and Accuracy sections.

Loading capacity and compliance were determined for all environmental samples collected from the San Joaquin River during the reporting period. There were no detections of either chlorpyrifos or diazinon at any of the San Joaquin River monitoring sites during the 2011 water year. Loading capacities and compliance status are reported in Appendix IV (Table IV-1) and discussed in the Comparison with TMDL Objectives section of this report.

All field data sheets can be found in Appendix V. Appendix VI contains monitoring site photos from all events. All associated laboratory reports (as pdfs) are submitted along with this report.

SAMPLE DETAILS

Table 14 lists each San Joaquin River sampling location, sample date, sample time and type of monitoring for each sampling event conducted by the Coalitions during the 2011 water year.

As explained in the Monitoring Objectives and Design section of this report, sampling frequency and timing were determined based on the history of chlorpyrifos and diazinon use and the potential for irrigation and/or storm runoff. As a result of significant rainfall in December, January, and February, the Westside Coalition collected two rain event sample sets designated Rain Event 11 (collected December 20 and 21, 2010 and January 3 and 4, 2011) and Quarter1/Rain Event (collected February 22 and 23) at its three San Joaquin River sites (SJR @ Sack Dam, SJR @ Lander Ave, and SJR @ Las Palmas Ave (Patterson)). The ESJWQC also monitored its three San Joaquin River sites on February 18, 2011 to capture rain runoff from winter storms during Quarter1/Rain Event (SJR @ Maze Blvd, SJR @ Hills Ferry Rd, and SJR @ Airport Way).

Table 15 lists the 2011 water year sampling dates of the San Joaquin River sites and sampling dates of each Coalition's tributary monitoring during the same months.

Table 14. Sample details for San Joaquin River samples collected during the 2011 water year.

Responsible Coalition	Site name	Station Code	Event Group	Sample Date	Sample Time	Failure Reason
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Qrt4	12-Oct-10	11:00	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Qrt4	12-Oct-10	13:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Qrt4	12-Oct-10	14:30	None
ESJWQC	SJR @ Airport Way	541SJC501	Qrt4	21-Oct-10	10:40	None
ESJWQC	SJR @ Hills Ferry	541STC512	Qrt4	21-Oct-10	9:10	None
ESJWQC	SJR @ Maze	541STC510	Qrt4	21-Oct-10	10:10	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event73	9-Nov-10	11:05	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event73	9-Nov-10	13:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event73	9-Nov-10	14:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event74	14-Dec-10	10:30	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event74	14-Dec-10	10:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event74	14-Dec-10	13:50	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Rain Event11	20-Dec-10	11:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Rain Event11	21-Dec-10	11:15	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Rain Event11	21-Dec-10	15:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event75	11-Jan-11	11:00	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event75	11-Jan-11	11:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event75	11-Jan-11	14:00	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event76	8-Feb-11	10:30	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event76	8-Feb-11	14:20	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event76	8-Feb-11	14:00	None
ESJWQC	SJR @ Airport Way	541SJC501	Qrt1/Rain Event	18-Feb-11	12:30	None
ESJWQC	SJR @ Hills Ferry	541STC512	Qrt1/Rain Event	18-Feb-11	10:30	None
ESJWQC	SJR @ Las Palmas Ave (Patterson)	541STC507	Qrt1/Rain Event	18-Feb-11	11:20	None
ESJWQC	SJR @ Maze	541STC510	Qrt1/Rain Event	18-Feb-11	12:00	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Qrt1/Rain Event	23-Feb-11	12:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Qrt1/Rain Event	23-Feb-11	15:25	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event77	8-Mar-11	11:15	None

Responsible Coalition	Site name	Station Code	Event Group	Sample Date	Sample Time	Failure Reason
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event77	8-Mar-11	15:30	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event77	8-Mar-11	15:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event78	12-Apr-11	11:00	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event78	12-Apr-11	13:30	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event78	12-Apr-11	15:00	None
ESJWQC	SJR @ Airport Way	541SJC501	Qrt2	10-May-11	8:00	None
ESJWQC	SJR @ Hills Ferry	541STC512	Qrt2	10-May-11	14:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Qrt2	10-May-11	11:35	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Qrt2	10-May-11	12:30	None
ESJWQC	SJR @ Maze	541STC510	Qrt2	10-May-11	9:00	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Qrt2	10-May-11	15:35	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event80	14-Jun-11	11:10	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event80	14-Jun-11	12:30	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event80	14-Jun-11	15:00	None
ESJWQC	SJR @ Airport Way	541SJC501	Qrt3	12-Jul-11	8:00	None
ESJWQC	SJR @ Hills Ferry	541STC512	Qrt3	12-Jul-11	10:00	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Qrt3	12-Jul-11	10:50	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Qrt3	12-Jul-11	17:30	None
ESJWQC	SJR @ Maze	541STC510	Qrt3	12-Jul-11	8:20	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Qrt3	12-Jul-11	14:45	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event82	9-Aug-11	11:00	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event82	9-Aug-11	16:30	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event82	9-Aug-11	15:30	None
Westside Coalition	SJR @ Lander Ave	541XSJRLA	Event83	13-Sep-11	11:00	None
Westside Coalition	SJR @ Las Palmas Ave (Patterson)	541STC507	Event83	13-Sep-11	16:45	None
Westside Coalition	SJR @ Sack Dam	541XSJRSD	Event83	13-Sep-11	15:00	None

Table 15. Monitoring dates of San Joaquin River sample sites and upstream tributaries during 2011 water year. "X" indicates sampling occurred.

Sampling Event	Date	San Joaquin River: @ Sack Dam (WC)	@ Lander Ave (WC)	@ Hills Ferry Rd (ES)	@ Las Palmas Ave (WC)	@ Maze Blvd (ES)	@ Airport Way (ES)	Tributaries: ESJWQC	Westside Coalition
Qrt4	12-Oct-10	X	X		X				X
	19-Oct-10							X	
	21-Oct-10			X		X	X		
Nov	9-Nov-10	X	X		X				X
	16-Nov-10							X	
Dec	14-Dec-10	X	X		X			X	X
Rain Event	20/21-Dec-10 and 3/4-Jan-11	X	X		X				X
Jan	11-Jan-11	X	X		X				X
	18-Jan-11							X	
Feb	8-Feb-11	X	X		X				X
Qrt1/ Rain Event	17-Feb-11							X	
	18-Feb-11			X	X[1]	X	X		
	22/23-Feb-11	X	X						X
Mar	8-Mar-11	X	X		X				X
	15-Mar-11							X	
Apr	12-Apr-11	X	X		X				X
	19-Apr-11							X	
Qrt2	10-May-11	X	X	X	X	X	X	X[2]	X
	17-May-11							X[3]	
Jun	14-Jun-11	X	X		X			X[2]	X
	21-Jun-11							X[3]	
Qrt3	12-Jul-11	X	X	X	X	X	X	X[2]	X
	19-Jul-11							X[3]	
Aug	9-Aug-11	X	X		X			X[2]	X
	16-Aug-11							X[3]	
Sep	6-Sep-11							X[2]	
	13-Sep-11	X	X		X			X[3]	X

WC – Westside Coalition
ES – ESJWQC
[1] ESJWQC sampled this site during the event.
[2] First half (northern section) of ESJWQC tributary monitoring.
[3] Second half (southern section) of ESJWQC tributary monitoring.

LABORATORY AND FIELD QUALITY ASSURANCE RESULTS

During the 2011 water year, all six compliance monitoring locations within the San Joaquin River were accessible at the time of sampling and had continuous flow. Because the ESJWQC and Westside Coalition share sampling responsibilities, each Coalition was responsible for three sites per sampling event and each Coalition collected its own set of field Quality Control (QC) samples. SJR @ Lander Ave, SJR @Sack Dam, and SJR @Las Palmas (Patterson) sites were visited a total of 14 times, and SJR @Maze Boulevard, SJR @Airport Way near Vernalis, and SJR @ Hills Ferry were visited a total of four times.

CHEMISTRY

All results are tabulated in Appendix II and Appendix III. Results were flagged if they did not meet data quality objectives (acceptability criteria). Copies of the ESJWQC database and copies of the Westside Coalition excel spread sheets are submitted to the Regional Board with the hardcopy of this report.

Chemistry Completeness

Chlorpyrifos and diazinon were monitored at all six compliance locations during the report period. Not including laboratory QA or field QC samples, 54 chlorpyrifos and 54 diazinon environmental samples were collected and analyzed. Completeness was 100% for environmental samples collected for analysis.

For each sampling event, a field duplicate and field blank were collected by each Coalition so that each Coalition's three sites had their own set of associated QC samples. Hence, there were two field duplicates and two field blanks per each sampling event. Field blanks and field duplicates each compromised 20% of the total samples analyzed (Table 16).

All chemistry batches were reviewed for completeness. All batches during the reporting period had complete QC or QA. Hold times for all chemistry analysis were met for both Coalitions (Table 17).

Table 16. ESJWQC and Westside Coalition sample counts, field Quality Control counts and percentages.

Method	Analyte	Env. Samples (#)	Env. and Field QC Samples (#)	Field Blanks (#)	Field Blanks (%)	Field Dup. (#)	Field Dup. (%)
EPA 8141A OP	Chlorpyrifos	54	90	18	20.0%	18	20.0%
EPA 8141A OP	Diazinon	54	90	18	20.0%	18	20.0%

Table 17. ESJWQC and Westside Coalition summary of holding time evaluations for environmental, field blank, field duplicate and matrix spike samples.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Chlorpyrifos	7 days	126	126	100%
EPA 8141A OP	Diazinon	7 days	126	126	100%
		Total	**252**	**252**	**100%**

SUMMARY OF PRECISION AND ACCURACY

The Coalitions reviewed the number of samples analyzed and the percentage per analyte of those samples that met acceptability criteria (Table 18). A brief overview is provided below to assess overall precision and accuracy. Precision and accuracy criteria were met for 99.5% of the samples for all analytes and all criteria.

One hundred percent of field blanks and duplicates met acceptability criteria (Table 18).

Lab blanks were run with each batch, and 100% of the samples met acceptability criteria (Table 18).

Surrogates were run with each pesticide analysis. Surrogate recoveries related to chlorpyrifos and diazinon analyses for the San Joaquin River sites were within specific acceptance criteria for 98.8% of all samples analyzed (Table 18). The triphenyl phosphate surrogate run with June 2011 samples recovered above the acceptance limit of 129% in the laboratory control spikes (LCS)/laboratory control spike duplicate (LCSD) pair.

Matrix spikes (MS) and LCS were performed for each batch to assess accuracy and possible matrix interference. One hundred percent of percent recoveries (PR) for MS and LCS samples were within acceptable criteria (Table 18). A duplicate analysis was performed per batch to assess precision on the LCS and/or MS. Laboratory precision assessed by the relative percent difference (RPD) of laboratory duplicates met acceptability criteria in 97.1% of MSDs and 100% of LCSDs samples (Table 18). During July 2011, the chlorpyrifos RPD for a single MS/matrix spike duplicate (MSD) pair was 33.9%, exceeding the data quality objective of less than 25%.

Table 18. ESJWQC and Westside Coalition summary of Quality Assurance and Quality Control evaluations.

Sample Type Code	Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
Field Blank	EPA 8141A OP	Chlorpyrifos	<RL or < (env sample/5)	18	18	100%
Field Blank	EPA 8141A OP	Diazinon	<RL or < (env sample/5)	18	18	100%
			Field Blank Total	**36**	**36**	**100%**
Field Dup	EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	18	18	100%
Field Dup	EPA 8141A OP	Diazinon	RPD ≤ 25	18	18	100%
			Field Dup Total	**36**	**36**	**100%**
Lab Blank	EPA 8141A OP	Chlorpyrifos	<RL	18	18	100%
Lab Blank	EPA 8141A OP	Diazinon	<RL	18	18	100%
			Lab Blank Total	**36**	**36**	**100%**
Surrogate	EPA 8141A OP	Tributylphosphate (Surrogate)	RPD ≤ 25; PR 60-150	179	179	100%
Surrogate	EPA 8141A OP	Triphenyl phosphate (Surrogate)	RPD ≤ 25; PR 56-129	179	177	98.8%
			Surrogate Total	**358**	**356**	**99.4%**
MS and MSD	EPA 8141A OP	Chlorpyrifos	PR 61-125	36	36	100%

Sample Type Code	Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
MS and MSD	EPA 8141A OP	Diazinon	PR 57-130	36	36	100%
			Matrix Spike Total	**72**	**72**	**100%**
MSD	EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	18	17	94.4%
MSD	EPA 8141A OP	Diazinon	RPD ≤ 25	18	18	100%
			Matrix Spike Duplicate Total	**36**	**35**	**97.1%**
LCS and LCSD	EPA 8141A OP	Chlorpyrifos	PR 61-125	32	32	100%
LCS and LCSD	EPA 8141A OP	Diazinon	PR 57-130	32	32	100%
			Laboratory Control Spike Total	**64**	**64**	**100%**
LCSD	EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	14	14	100%
LCSD	EPA 8141A OP	Diazinon	RPD ≤ 25	14	14	100%
			Laboratory Control Spike Duplicate Total	**28**	**28**	**100%**

COMPARISON WITH TMDL OBJECTIVES

The Lower San Joaquin River chlorpyrifos and diazinon TMDL objectives include:

1. Determine compliance with established water quality objectives (WQOs) and the loading capacity applicable to diazinon and chlorpyrifos in the San Joaquin River.
2. Determine compliance with established load allocations for diazinon and chlorpyrifos.
3. Determine the degree of implementation of management practices to reduce off-site movement of diazinon and chlorpyrifos.
4. Determine the effectiveness of management practices and strategies to reduce off-site migration of diazinon and chlorpyrifos.
5. Determine whether alternatives to diazinon and chlorpyrifos are causing surface water quality impacts.
6. Determine whether the discharge causes or contributes to toxicity impairment due to additive or synergistic effects of multiple pollutants.
7. Demonstrate that management practices are achieving the lowest pesticide levels technically and economically achievable.

The monthly monitoring of three compliance points and quarterly monitoring of six compliance points in the San Joaquin River during the 2011 water year was designed to assess compliance with Objective 1. Objectives 2 through 7 are addressed individually by each Coalition through an assessment of results and outcomes of actions taken (e.g. monitoring, outreach, etc.) to meet the specifications of either Coalition's ILRP monitoring program. The following sections assess the ESJWQC's and Westside Coalition's compliance with the seven TMDL objectives.

OBJECTIVE 1: DETERMINE COMPLIANCE WITH ESTABLISHED WATER QUALITY OBJECTIVES AND THE LOADING CAPACITY APPLICABLE TO DIAZINON AND CHLORPYRIFOS IN THE SAN JOAQUIN RIVER.

Water Quality Objectives

Table 1 in the Monitoring Objectives and Design section identifies the WQOs for chlorpyrifos and diazinon (0.015 µg/L and 0.10 µg/L, respectively). All samples collected from the San Joaquin River during the 2011 water year were below detection limits for chlorpyrifos and diazinon and were therefore below WQOs. Complete environmental monitoring results are listed in Appendix II; complete Quality Control monitoring results, including field duplicates, are listed in Appendix III.

Loading Capacity

All samples collected from the six monitoring locations were in compliance with loading capacity since there were no detections of either chlorpyrifos or diazinon (Appendix IV, Table IV-1).

The number of samples meeting the SJR loading capacity is tallied for each compliance location in relation to the number of samples collected (Table 19). Overall, 99% of the samples collected to assess TMDL compliance since January 2010 have been compliant with the loading capacity (Table 19). Since monitoring to assess compliance with the chlorpyrifos and diazinon TMDL in the Lower San Joaquin River began in January 2010, there has been a single non compliant load. On July 22, 2010, the chlorpyrifos WQO objective was exceeded at a concentration of 0.041 µg/L in samples collected from SJR @ Las Palmas Ave (Patterson) and resulted in an exceedance of the loading capacity of the San Joaquin River. There have been no detections of diazinon in samples collected by either Coalition from the San Joaquin River. Potential sources of the non compliant load were discussed in the 2011 MPUR (Status of TMDL Constituents section, pages 117-122).

Table 19. Tally of chlorpyrifos and diazinon TMDL load capacity compliance per each of the six San Joaquin River stations since the inception of San Joaquin River monitoring (January 2010 through September 2011).

Responsible Coalition	Site Name	Sample Dates	Compliant	Out of Compliance	Total Samples Collected	Percent Compliant
Westside	SJR @ Sack Dam	Jan 2010 - Sep 2011	17	0	17	100%
Westside	SJR @ Lander Ave	Jan 2010 - Sep 2011	17	0	17	100%
ESJWQC	SJR @ Hills Ferry Rd	Jan 2010 - Sep 2011	7	0	7	100%
Westside	SJR @ Las Palmas Ave (Patterson)	Jan 2010 - Sep 2011	16	1	17	94%
ESJWQC	SJR @ Maze Blvd	Jan 2010 - Sep 2011	7	0	7	100%
ESJWQC	SJR @ Airport Way	Jan 2010 - Sep 2011	7	0	7	100%
		Total	**71**	**1**	**72**	**99%**

OBJECTIVE 2: DETERMINE COMPLIANCE WITH ESTABLISHED LOAD ALLOCATIONS FOR DIAZINON AND CHLORPYRIFOS.

As discussed above, the ESJWQC and Westside Coalition are required to assess compliance with load allocations for agricultural discharges to the San Joaquin River for each of the five subareas (Figure 2). The two Coalitions each characterize and assess water quality within their respective regions through their own strategies of representative monitoring (described in the ESJWQC MRPP and Westside Coalition MRP). The following sections include a review of results of the Coalition's respective tributary monitoring during the 2011 water year and apply the formula in Figure 1 to assess compliance with chlorpyrifos and diazinon load allocations.

ESJWQC Load Allocation Compliance

The ESJWQC monitored 21 tributaries for chlorpyrifos and diazinon from October 2010 through September 2011 (Table 20). There were three instances where the load allocation was greater than 1; all three instances were due to chlorpyrifos concentrations exceeding the chlorpyrifos WQO (Table 21). All non compliant load allocations occurred in the Bear Creek and Fresno-Chowchilla subarea (Table 21).

Exceedances of the chlorpyrifos WQO occurred in samples collected from Deadman Creek @ Hwy 59 on April 19, 2011 and September 13, 2011, resulting in a load of 1.03 and 3.23, respectively (Table 21). The third non compliant load allocation occurred in samples collected from Berenda Slough along Avenue 18 ½ on April 19, 2011 which resulted in a load of 1.36 (Table 21). Samples collected within the River to assess load capacity compliance had no detections of chlorpyrifos or diazinon in any of the months sampled including May and September. Berenda Slough typically dries up before it reaches the San Joaquin River. The chlorpyrifos detected in Deadman Creek may have been either degraded or diluted prior to entering the River or, since the Deadman Creek @ Hwy 59 site is miles from the San Joaquin River, the water from the creek may have been diverted for irrigation purposes before entering the River.

There were no detections of diazinon during the 2011 water year, and there have been no detections of diazinon in ESJWQC tributaries since the TMDL surveillance and monitoring program began in January 2010. A tabulation of load allocations for all tributary results is included in Appendix IV (Tables IV-2 through IV-5).

Table 20. ESJWQC tributary monitoring schedule for chlorpyrifos and diazinon during the 2011 water year. Only tributary sites scheduled for chlorpyrifos (C) and/or diazinon (D) analysis are listed.

Subarea	Tributary Site Name	Monitoring Type and Year	Oct 2010	Nov 2010	Dec 2010	Jan 2011	Feb 2011	Mar 2011	Apr 2011	May 2011	Jun 2011	Jul 2011	Aug 2011	Sep 2011
Bear Creek, Fresno-Chowchilla	Ash Slough @ Ave 21	A10	C,D	C,D	C,D									
Bear Creek, Fresno-Chowchilla	Bear Creek @ Kibby Rd	MPM11								C		C		
Bear Creek, Fresno-Chowchilla	Berenda Slough along Ave 18 ½	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Cottonwood Creek @ Rd 20	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Deadman Creek (Dutchman) @ Gurr Rd	A10	C,D	C,D	C,D									
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Hwy 59	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Dry Creek @ Rd 18	MPM11					C,D		C			C		
Tuolumne River, Northeast Bank	Dry Creek @ Wellsford Rd	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Duck Slough @ Gurr Rd	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Duck Slough @ Hwy 99	MPM11								C		C		C
Turlock, Merced	Highline Canal @ Hwy 99	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Turlock, Merced	Highline Canal @ Lombardy Rd	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Howard Lateral @ Hwy 140	A10, MPM11	C,D	C,D	C,D						C			
Tuolumne River, Northeast Bank	Lateral 2 ½ near Keyes Rd	A10, MPM11	C,D	C,D	C,D				C			C		
Bear Creek, Fresno-Chowchilla	Livingston Drain @ Robin Ave	MPM11				C					C	C	C	
Bear Creek, Fresno-Chowchilla	McCoy Lateral @ Hwy 140	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Turlock, Merced	Merced River @ Santa Fe	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Stanislaus River, North Stanislaus	Mootz Drain Downstream of Langworth Pond	A10	C,D	C,D	C,D									
Turlock, Merced	Mustang Creek @ East Ave	A10	C,D	C,D	C,D									
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Stanislaus River, North Stanislaus	Rodden Creek @ Rodden Rd	A11				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D

A10- Assessment Monitoring for constituent during 2010 (October—December)
A11- Assessment Monitoring for constituent during 2011 (January—September)
MPM11-Management Plan Monitoring for constituent during 2011 (during months of past exceedances)

Table 21. Chlorpyrifos and diazinon San Joaquin River TMDL load allocation calculations for ESJWQC tributaries sampled during the 2011 water year.
Only positive detections shown.

Subarea	Site Name	Sample Date	Chlorpyrifos (µg/L)	Diazinon (µg/L)	Load	Load Allocation Compliance
Bear Creek, Fresno-Chowchilla	Berenda Slough along Ave 18 1/2	4/19/2011	0.021	<0.004	1.36	Out of compliance
	Deadman Creek @ Hwy 59	4/19/2011	0.016	<0.004	1.0267	Out of compliance
	Deadman Creek @ Hwy 59	9/13/2011	0.049	<0.004	3.2267	Out of compliance

To assess the sources contributing to the exceedances of the chlorpyrifos WQO in samples collected from tributary sites, PUR data four weeks prior to each exceedance in the associated subwatershed were evaluated (Table 22). In the four weeks prior to the three exceedances, the majority of applications and pounds applied were to alfalfa in both subwatersheds in April and September (Table 22). A single application to wheat in April and walnuts in September may have also contributed to exceedances in Deadman Creek @ Hwy 59 site subwatershed (Table 22). PUR data for 2011 are preliminary and may not be complete at the time of this report.

Table 22. Chlorpyrifos applications made four weeks prior in subwatersheds with chlorpyrifos exceedances.

Monitoring Event	Tributary Site Name	Commodity	Number of Applications	Active Ingredient Applied (lbs)	Acres Treated
Apr 19, 2011	Berenda Slough @ Ave 18 ½	Alfalfa	4	38.16	176
Apr 19, 2011	Deadman Creek @ Hwy 59	Alfalfa	25	432.39	2,130
		Wheat	1	30.36	132
Sep 13, 2011	Deadman Creek @ Hwy 59	Alfalfa	1	155.77	78
		Walnut	1	33.99	68

The ESJWQC established a management plan for chlorpyrifos in both the Berenda Slough and Deadman Creek subwatersheds, which includes a focused outreach strategy to address chlorpyrifos water quality impairments; the ESJWQC Management Plan is described under Objective 3. The Coalition is in the beginning stages of outreach in both subwatersheds. Berenda Slough along Ave 18 ½ is a third priority subwatershed (high priority from 2011-2013), and the Coalition conducted individual meetings with targeted growers in the subwatershed during 2011 to review their operations and recommend management practices/strategies to reduce the offsite movement of chlorpyrifos in the future. The Coalition is in the process of following up with these growers to assess changes made to their operations. Deadman Creek @ Hwy 59 is a fourth priority subwatershed (high priority from 2012-2014), and the Coalition started conducting individual meetings with targeted growers in 2012. The Coalition's management plan outreach strategy has been effective in reducing the number of exceedances of the chlorpyrifos WQO in high priority subwatersheds across the Coalition region. Therefore, the Coalition believes its outreach in the Berenda Slough and Deadman Creek subwatersheds will address the chlorpyrifos exceedances in the two waterways.

Overall, 93% of ESJWQC tributary samples have been compliant with load allocations since January 2010 (Table 23). The percent of compliant samples increased from 84% during 2010 (January-September 2010) to 97% during the 2011 water year (October 2010-September 2011; Table 23).

Table 23. Tally of ESJWQC chlorpyrifos and diazinon TMDL load allocation compliance per each of the subareas since the inception of San Joaquin River monitoring (January 2010 through September 2011).

Subarea	Water Year	In Compliance	Out of compliance	Samples Collected	Percent in Compliance
Bear Creek, Fresno-Chowchilla	2010	19	5	24	79%
	2011	56	3	59	95%
Stanislaus River, North Stanislaus	2010	9	0	9	100%
	2011	10	0	10	100%
Tuolumne River, Northeast Bank	2010	7	3	10	70%
	2011	12	0	12	100%
Turlock, Merced	2010	12	1	13	92%
	2011	34	0	34	100%
2010[1] Total		**47**	**9**	**56**	**84%**
2011 Water Year[2] Total		**112**	**3**	**115**	**97%**
Grand Total		**159**	**12**	**171**	**93%**

[1]TMDL monitoring began in January 2010; 2010 data are from January 2010-September 2010.
[2]Data from the 2011 water year are from October 2010-September 2011.

Westside Coalition Load Allocation Compliance

The Westside Coalition collected monthly samples from flowing tributary sites to the San Joaquin River from October 2010 through September 2011, as well as additional rain event samples in December, January, and February. Although there were no detections of either chlorpyrifos or diazinon in any of the San Joaquin River samples, chlorpyrifos was detected in 16 samples over six different monitoring events, all of which were measured in excess of the load criteria. There were no diazinon detections in the water column. Table 24 shows the sites and dates where chlorpyrifos was detected. However, because there were no detections at any of the San Joaquin River samples, it appears that discharge from these tributaries was not entering the river or that the tributary chlorpyrifos load to the river was not significant. Many of the tributary monitoring sites are several miles from the San Joaquin River. Water measured at a tributary site may be further diluted by downstream inputs or diverted for irrigation, preventing discharge to the river entirely. The Westside Coalition November 2011 SAMR discusses these detections, as well as other pesticide detections, in greater detail. A tabulation of load allocations for all tributary results is included in Appendix IV.

Table 25 tabulates load allocation compliance for all Westside Coalition tributaries per each subarea. Overall, there were percentage of load allocation compliance during the 2011 water year (October 2010 – September 2011; 90%) was greater compared to 2010 (January – September; 79%).

Table 24. Chlorpyrifos and diazinon San Joaquin River TMDL load allocation calculations for Westside Coalition tributaries sampled during the 2011 water year.

Only positive detections shown. There were no diazinon detections at any tributary sites during the 2011 water year.

Main Stem Monitoring Point	Tributary Site	Sample Date	Sample Event	Flow (cfs)	SJR Flow (cfs)	Chlorpyrifos (µg/L)	Load	Load Allocation Compliance
SJR @ Hills Ferry Rd	Poso Slough at Indiana Ave	9-Aug-11	82	65	750	1.3	87	Out of compliance
	Poso Slough at Indiana Ave	13-Sep-11	83	21	720	0.12	8.0	Out of compliance
	Salt Slough at Sand Dam	13-Sep-11	83	0	720	0.087	5.8	Out of compliance
SJR @ Las Palmas	Orestimba Creek at River Road	12-Apr-11	78	25	17,875	0.068	4.5	Out of compliance
	Marshall Road Drain near River Rd	10-May-11	79	9.3	6,875	0.09	6.0	Out of compliance
	Orestimba Creek at River Road	10-May-11	79	2	6,875	0.054	3.6	Out of compliance
	Ramona Lake near Fig Avenue	10-May-11	79	NA	6,875	0.065	4.3	Out of compliance
	Marshall Road Drain near River Rd	13-Sep-11	83	5.3	789	0.27	18	Out of compliance
	Orestimba Creek at Hwy 33	13-Sep-11	83	0.15	789	0.09	6.0	Out of compliance
	Ramona Lake near Fig Avenue	13-Sep-11	83	NA	789	0.089	5.9	Out of compliance
SJR @ Maze Blvd	Del Puerto Creek near Cox Road	22-Feb-11	R12	36	10,350	0.023	1.5	Out of compliance
	Del Puerto Creek near Cox Road	10-May-11	79	0	12,375	0.018	1.2	Out of compliance
	Ingram Creek at River Road	10-May-11	79	10.8	12,375	0.067	4.5	Out of compliance
	Del Puerto Creek near Cox Road	14-Jun-11	80	12.5	9,512	0.38	25	Out of compliance
	Westley Wasteway near Cox Road	14-Jun-11	80	2.5	9,512	0.072	4.8	Out of compliance
	Hospital Creek at River Road	13-Sep-11	83	0.5	2,550	0.27	18	Out of compliance

Table 25. Tally of Westside Coalition chlorpyrifos and diazinon TMDL load allocation compliance per each of the subareas.

Subarea	Water Year	In Compliance	Out of Compliance	Samples Collected	Percent in Compliance
Greater Orestimba	2010	18	12	30	60%
	2011	26	7	33	79%
Stevinson, Grassland	2010	70	4	74	95%
	2011	87	3	90	97%
Westside Creeks	2010	18	13	31	58%
	2011	30	6	36	83%
2010 Water Year[1] Total		**106**	**29**	**135**	**79%**
2011 Water Year[1] Total		**143**	**16**	**159**	**90%**
Grand Total		**249**	**45**	**294**	**85%**

[1]Water Year is from October through September. Data in the table represents the complete data sets for both Water Years 2010 and 2011.

As is evident from Table 26, the available PUR data is incomplete and does not provide useful information regarding the timing or location of chlorpyrifos applications. Until a more complete PUR dataset is available, detailed analysis of the PUR data is not warranted.

Table 26. Chlorpyrifos applications made four weeks prior in subwatersheds with chlorpyrifos exceedances. Only listed applications were shown based on available PUR data.

Monitoring Event	Tributary Name	Commodity	Number of Applications	Acres Treated
Feb 22, 2011	Del Puerto Creek	Cherries	1	11
		Almond	1	300
May 11, 2011	Orestimba Creek	Walnut	1	15
Sep 13, 2011	Marshall Road Drain	Alfalfa	1	36
Sep 13, 2011	Orestimba Creek	Citrus	1	19
		Almond	1	40
		Alfalfa	1	80
Sep 13, 2011	Ramona Lake	Alfalfa	3	90
Sep 13, 2011	Salt Slough	Alfalfa	7	434

OBJECTIVE 3: DETERMINE DEGREE OF IMPLEMENTATION OF MANAGEMENT PRACTICES AND STRATEGIES TO REDUCE OFF-SITE MOVEMENT OF DIAZINON AND CHLORPYRIFOS

The Coalitions developed their own management practice tracking and evaluation strategies suitable for their regions and members (ESJWQC Management Plan submitted September 30, 2008 and Westside Coalition Management Plan and Focused Management Plan submitted October 23, 2008). The Coalitions review the results of their respective strategies to determine the degree of implementation of management practices and strategies to reduce the offsite movement of chlorpyrifos and diazinon.

ESJWQC Implementation of Management Practices to Reduce Off Site Movement of Diazinon and Chlorpyrifos

If one exceedance of the chlorpyrifos or diazinon WQOs occurs at a tributary monitoring location in the ESJWQC region, the ESJWQC implements a management plan for the subwatershed. To allow for focused source identification, outreach, and evaluation, the ESJWQC prioritizes subwatersheds based on the number, frequency, and magnitude of chlorpyrifos and diazinon exceedances, among other factors (2012 MPUR, page 25 and Table 6). When a subwatershed rotates to high priority, the ESJWQC initiates a three year process designed to document current management practices (Year 1), encourage and document the implementation of new management practices (Years 1 and 2), and evaluate the effectiveness of outreach in the subwatershed via Management Plan Monitoring (MPM) for management plan constituents (Years 1-3). The ESJWQC targets members with the greatest potential to influence water quality including growers with the potential for direct drainage and with past applications of management plan constituents (e.g. chlorpyrifos or diazinon). The focused outreach and management practice documentation rotates to additional subwatersheds annually. Current high priority subwatersheds include:

First Priority Subwatersheds (2008 – 2010)

- Dry Creek @ Wellsford Rd
- Duck Slough @ Hwy 99
- Prairie Flower Drain @ Crows Landing Rd

Second Priority Subwatersheds (2010 – 2012)

- Bear Creek @ Kibby Rd
- Cottonwood Creek @ Rd 20
- Duck Slough @ Gurr Rd
- Highline Canal @ Hwy 99

Third Priority Subwatersheds (2011-2013)

- Berenda Slough along Ave 18 ½
- Dry Creek @ Rd 18
- Lateral 2 ½ near Keyes Rd
- Livingston Drain @ Robin Ave

The ESJWQC has completed its focused outreach strategy in the first and second priority subwatersheds. The Coalition documented current (in 2008 for first priority and 2009 for second priority) and newly implemented (in 2009-2011 for first priority and 2010-2011 for second priority) management practices on targeted members' parcels. Outreach is ongoing in the third priority subwatersheds. The Coalition has documented current management practices (2010-2011) and is in the process of conducting follow up contacts to document newly implemented practices (2011-2012).

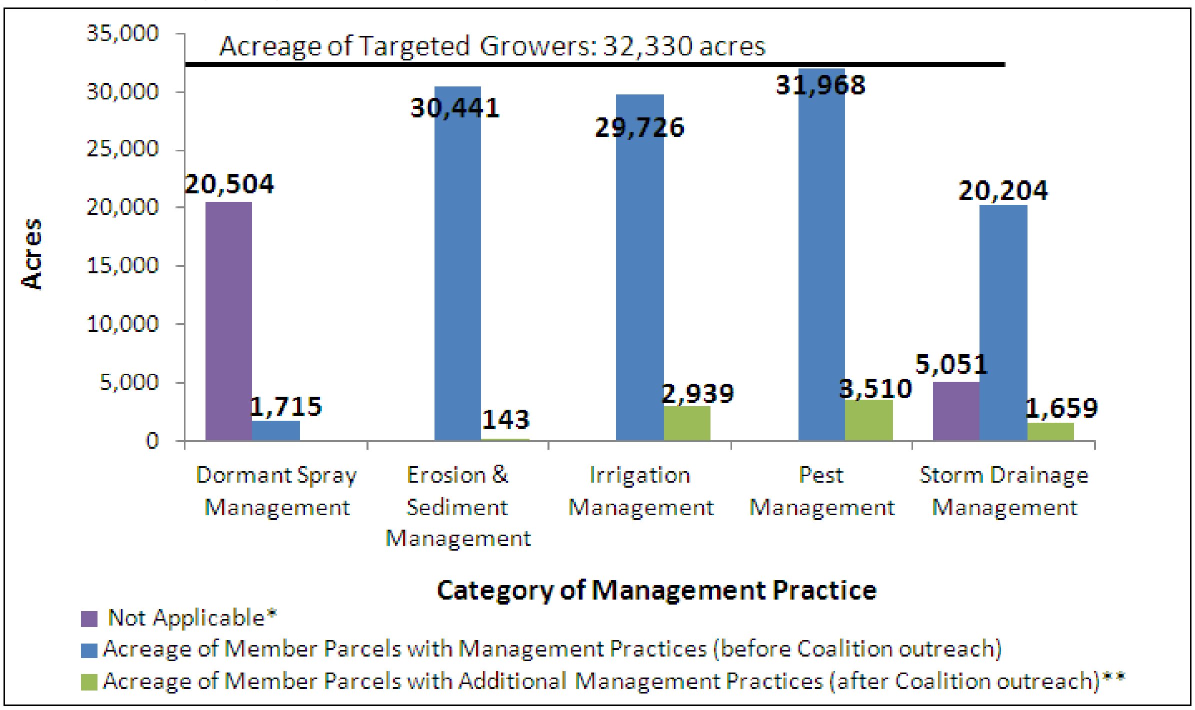
A major goal of ESJWQC outreach is to help growers eliminate the offsite movement of agricultural constituents. The ESJWQC identified five categories of management practices that are effective in reducing the offsite movement of chlorpyrifos and diazinon:

- Irrigation Water Management
- Storm Drainage Management
- Erosion and Sediment Management
- Pest Management
- Dormant Spray Management

Targeted growers in the first, second, and third priority subwatersheds indicated they currently implement management practices within each of the above categories, and several growers in the first and second priority subwatersheds implemented new management practices in each of these categories following focused Coalition outreach. Figure 10 displays the acreage associated with management practices implemented before Coalition outreach (currently implemented) in first, second, and third priority subwatersheds and after ESJWQC outreach (newly implemented) in first and second priority subwatersheds per each of the five categories (the Coalition is in the process of documenting newly implemented management practices in the third priority subwatersheds). Acreage represented in Figure 10 is associated with at least one, but may have multiple implemented management practices within a category (acreage is only counted once per each category). The majority of targeted acreage in the first, second and third priority subwatersheds has at least one management practice designed to address erosion and sediment management, irrigation management, and pest management. Following ESJWQC outreach, newly implemented practices in the first and second priority subwatersheds focused on irrigation management, pest management, and storm drainage management—categories which the ESJWQC believed would result in the greatest reduction of chlorpyrifos runoff.

Within each of the five categories, growers implemented various management practices (Table 27). Pest management practices such as adjusting spray nozzles to match crop canopy profile and using nozzles that provide the largest effective droplet size to minimize drift are utilized by almost every targeted grower. Other common practices include laser leveling fields and grassing row centers (for orchard and vineyards) (Table 27).

Figure 10. Acreage with one or more implemented management practice per each category in the ESJWQC first, second, and third priority subwatersheds.



*Acreage of members parcels where category of management practice is not applicable (either no dormant sprays or no storm drainage).
**Data of management practice implemented after Coalition outreach is only available for first and second priority subwatersheds; the acres presented exclude third priority subwatersheds.

Table 27. Implemented management practices designed to reduce offsite movement of chlorpyrifos and diazinon in the ESJWQC first and second priority subwatersheds (current and new) and third priority subwatersheds (current only) listed by TMDL subarea.

Category	Management Practice	Bear Creek, Fresno-Chowchilla		Tuolumne River, Northeast Bank		Turlock, Merced		Total	
		Growers	Acres	Growers	Acres	Growers	Acres	Growers	Acres
Dormant Spray Management	Check weather conditions prior to spraying (i.e. storm status)	11	1,168	4	346	2	181	17	1,695
	Do not apply dormant spray when moisture is at field capacity	3	654	0	0	2	181	5	835
	Maintain setback zones	11	1,168	3	131	2	181	16	1,480
	Vegetation cover and/or disked	3	654	0	0	3	201	6	855
Erosion & Sediment Management	Constructed wetlands	0	0	1	2,450	0	0	1	2,450
	Grass Row Centers (Orchards, Vineyards)	81	17,097	38	6,510	6	247	125	23,853
	Maintain vegetated filter strips around field perimeter at least 10' wide	72	11,519	24	6,227	10	595	106	18,341
	Riparian vegetation / fences prevents livestock access to water	6	640	2	53	0	0	8	693
	Vegetation is planted along or allowed to grow along ditches	53	12,024	24	6,532	14	941	91	19,497
Irrigation	Determine Irrigation Schedule by Actual Moisture Levels in Soil/Crop Needs	67	13,576	19	5,489	9	377	95	19,442
	Drainage basins (sediment ponds)	24	6,244	5	3,203	3	227	32	9,674
	Drip irrigation, other	1	229	1	77	0	0	2	306
	Laser leveled fields	81	13,874	39	6,743	14	800	134	21,417
	Microirrigation	24	7,062	15	5,645	4	226	43	12,933
	Polyacrylamide (PAM)	1	15	1	2,450	3	227	5	2,692
	Recirculation - Tailwater return system	35	7,456	7	4,046	6	378	48	11,880
	Reduce Amount of Water Used in Surface Irrigation	9	1,595	1	162	4	468	14	2,225
Pest Management	Adjust spray nozzles to match crop canopy profile	110	22,465	47	8,016	19	1,126	176	31,606
	Calibrate spray equipment prior to each application	50	11,674	23	6,326	18	1,132	91	19,132
	Shut off outside nozzles when spraying outer rows next to sensitive sites	98	19,027	44	7,670	16	794	158	27,491
	Spray areas close to waterbodies when the wind is blowing away from them	105	21,221	44	7,588	20	1,202	169	30,011
	Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	80	15,961	30	5,895	9	413	119	22,270
	Use electronic controlled sprayer nozzles	5	771	3	2,555	6	362	14	3,688
	Use nozzles that provide largest effective droplet size to minimize drift	111	22,514	45	7,703	20	1,202	176	31,418
Storm Drainage	Berms Between Field & Waterway	1	71	0	0	0	0	1	71
	Device Controls Timing of Pump/Drain into Waterway	16	5,261	2	3,147	4	512	22	8,920
	Recirculation - Tailwater return system	18	3,848	1	26	0	0	19	3,874
	Settling Pond	20	5,089	3	2,499	3	348	26	7,935
	Total Targeted	**116**	**22,879**	**50**	**8,218**	**21**	**1,233**	**187**	**32,330**

The ESJWQC initiated focused outreach in fourth priority subwatersheds (Black Rascal Creek @ Yosemite Rd, Deadman Creek @ Gurr Rd, Deadman Creek @ Hwy 59 and Hilmar Drain @ Central Ave). Individual meetings are underway with targeted growers to document currently implemented practices. These data will be assessed in the ESJWQC 2013 MPUR.

Westside Coalition Implementation of Management Practices to Reduce Off Site Movement of Diazinon and Chlorpyrifos

In 2008, the Westside Coalition adopted a Management Plan to address water quality exceedances detected by the monitoring order. Although the Management Plan outlined area specific measures based on the exceedances of that region, identified management practices for pesticides (including chlorpyrifos and diazinon) are uniform for the entire Coalition. They include:

- Construct sediment basins to intercept tailwater.
- Install high-efficiency irrigation systems such as sprinkler or drip irrigation, tailwater recirculation, gated pipes, shorter runs, etc., where warranted by the crops that are grown.
- Implement additional use of polyacrylamide (PAM) to address sedimentation discharge.
- Reduce use of pesticides, or incorporate use of pesticides that are less likely to be transported to the State waterways, or which breakdown quickly and are less likely to impact water quality.
- Calibrate ground spray rigs utilized on farmed acres to address possible overspray.
- Address potential aerial overspray by identifying the sensitive regions for all aerial applicators, or elimination of this as an acceptable application procedure.
- Increase size of vegetated buffer zones along the perimeters waterways.

As a mechanism to encourage and track the implementation of management practices, the Westside Coalition implemented an aggressive outreach program that included field meetings with individual growers, workshops, sponsorship of integrated pest management programs (such as the Sustainable Cotton Program) and a detailed management practice inventory survey to determine what management practices have already been implemented. A status update of management plan implementation is included in each SAMR. Table 28 summarizes the management practice inventory data. In addition to these actions, a staff person of the Westside Coalition travels through the Coalition area on a weekly basis to review irrigation activities, drainage conditions, and meet with growers to review management practice implementation.

In response to the May and September 2011 chlorpyrifos exceedances, the Westside Coalition mailed out letters to growers within each of the watersheds where an exceedance was measured. These letters indicated the location and magnitude of chlorpyrifos exceedances and the importance of implementing management practices to prevent pesticide discharge.

All of these management practices are implemented at the farm-level and driven by a variety of factors, including water supply, crop values, soil quality, and regulatory pressures.

Table 28. Management practice inventory data for subwatersheds in the Westside Coalition region.

	Salt Slough (partial) (2011/12)		Westley Wasteway (2010)		Del Puerto Creek (2010)		Orestimba Creek (2010)		Hospital Creek (2009)		Ingram Creek (2009)	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Survey Area	32573	51%	5248		9195		12851					
Surveys Collected	416	36%		100%		100%		100%		100%		100%
Irrigated	32443	100%	4565	87%	7926	86%	11714	91%	5193	69%	5526	96%
Furrow/Flood (% Irrig. Ac.)	24302	75%	1489	33%	3210	41%	4491	38%	1678	32%	4599	83%
Drip/Micro/Sprinkler (% Irrig. Ac.)	8140	25%	2891	63%	3952	50%	5821	50%	3515	47%	927	17%
Fallow/Non Irrigated (% Irrig. Ac.)	130	0%	0	0%	230	3%	1354	12%	1949	26%	3	
Mix of Irrigation Methods (% Irrig. Ac.)			185	4%	535	7%	48	0%				
Tree Crops (% Irrig. Ac.)	394	1%	2891	63%	4237	53%	5481	47%				
Field Crops (% Irrig. Ac.)	32110	99%	1670	37%	3678	46%	5626	48%				
Open / Other (% Irrig. Ac.)	69	<1%	662	15%	325	4%	847	7%				
Sedimentation Ponds (% Field Crops)	0	0%	1092	65%	3331	36%	5019	89%	1085	14%	935	17%
Tailwater Return System (% Field Crops)	0	0%	150	9%	402	4%	2154	38%	205	3%	828	15%
Use of PAM (% Irrig. Ac.)	406	1%	3346	73%	2955	37%	3408	29%	488	7%	4375	79%
Tailwater Leaves Property (% Irrig. Ac.)	28411	88%	2234	49%	3471	44%	4134	35%	1473	20%	4393	79%
Storm water Leaves Property (% Irrig. Ac.)	30520	94%	2517	55%	5050	64%	6384	55%	4118	55%	5204	94%
Dormant Spray Usage (% Tree Crops)	484		905	31%	1147	27%	400	7%	926	12%	22	<1%
Horticultural Oil Usage (% Tree Crops)			905	31%	748	18%	806	15%				

OBJECTIVE 4: DETERMINE DEGREE OF EFFECTIVENESS OF MANAGEMENT PRACTICES AND STRATEGIES TO REDUCE OFF-SITE MOVEMENT OF DIAZINON AND CHLORPYRIFOS

There were no detections of chlorpyrifos or diazinon in the San Joaquin River during the 2011 water year indicating that management practices and strategies implemented by growers in the ESJWQC and Westside Coalition regions were effective at reducing the offsite movement of chlorpyrifos and diazinon. The Coalitions review management practice effectiveness at the subwatershed level within their regions to offer further evidence of management practice effectiveness.

ESJWQC Effectiveness of Management Practices to Reduce Off Site Movement of Diazinon and Chlorpyrifos

As explained under the Monitoring Objective 3 section, the ESJWQC completed its focused outreach process in the first and second priority subwatersheds. Prior to focused outreach, there were five to seven exceedances of chlorpyrifos per year (10-11% of samples collected annually) in the first and second priority subwatersheds (Table 29). There has been only one exceedance of diazinon since 2006 (2% of samples collected in 2008) in the first and second priority subwatersheds (Table 29). The ESJWQC conducted focused outreach from 2009 through 2011 resulting in the implementation of several new management practices designed to address the offsite movement of agricultural constituents, including chlorpyrifos and diazinon (Table 27). Results of Management Plan Monitoring during months of past exceedances and monthly Assessment Monitoring (see monitoring schedule in the ESJWQC MRPP, pages 52-53 and Table 10) indicate the focused outreach and implementation of new management practices in 2009 through 2011 coincided with a decrease in chlorpyrifos and diazinon exceedances (Table 29).

Table 29. Count of exceedances and samples collected for chlorpyrifos and diazinon in the ESJWQC first and second priority subwatersheds.

Years in the table reflect a calendar year, January through December.

Calendar Year	Chlorpyrifos				Diazinon			
	Exceedance	Samples[1]	% Exceedance	Lbs Applied	Exceedance	Samples[1]	% Exceedance	Lbs Applied
2006	5	49	10%	39,184	0	49	0%	1,703
2007	6	60	10%	31,397	0	57	0%	1,361
2008	7	61	11%	18,234	1	58	2%	966
2009	2	12	17%	18,767	0	5	0%	510
2010	2	17	12%	22,064	0	2	0%	404
2011	0	65	0%	7,029[2]	0	60	0%	239[2]
All Years	**22**	**264**	**8%**	**199,938**	**1**	**231**	**<1%**	**7,336**

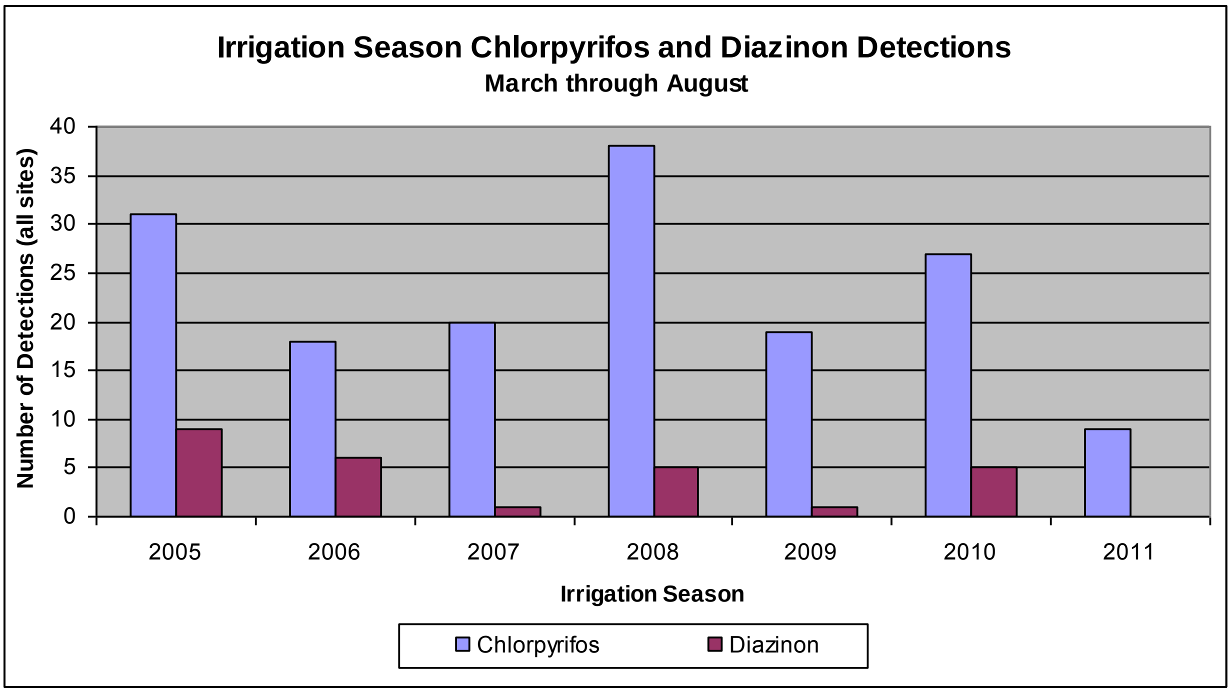
[1] Refers to all samples scheduled for constituent analysis (dry sites are included).
[2] PUR data only available through June 2011 for Madera County, October 2011 for Merced County, and November 2011 for Stanislaus County.

Westside Coalition Effectiveness of Management Practices to Reduce Off Site Movement of Diazinon and Chlorpyrifos

The absence of chlorpyrifos and diazinon exceedances in the San Joaquin River imply that the implemented management practices have been successful in meeting those load allocations. However, the Westside Coalition continues to struggle with chlorpyrifos exceedances at tributary monitoring sites. Since 2010, the Westside Coalition has mailed 300 notices regarding chlorpyrifos exceedances and followed up with field visits to review water quality impairments and farming activities with individual growers.

A review of chlorpyrifos and diazinon detections since the beginning of the Westside Coalition's monitoring program provides a promising trend. Figure 11 shows the number of detections of both materials during irrigation seasons since 2005.

Figure 11. Count of chlorpyrifos and diazinon detections from 2006 through 2011 in the Westside Coalition tributaries.



OBJECTIVE 5: DETERMINE WHETHER ALTERNATIVES TO DIAZINON AND CHLORPYRIFOS ARE CAUSING SURFACE WATER QUALITY IMPACTS

Overall use of diazinon has declined since 2004 and overall chlorpyrifos use has generally declined since 2006 (Figures 3 and 4). In 2004, 45,132 pounds of diazinon were applied in the San Joaquin River watershed. In 2010, the amount of diazinon used within the San Joaquin River watershed decreased approximately 85% to only 6,764 pounds. As in previous years, a majority of the use (53%) occurred between December and February. Chlorpyrifos use also decreased in recent years, from 211,792 pounds in 2007 to 162,786 pounds in 2010 (Figure 4).

Chlorpyrifos continues to be a widely used pesticide mostly due to the large number of crops for which it is registered, its relatively low cost, and its effectiveness in controlling a variety of pest species even when pest pressures are high. Despite the benefits of chlorpyrifos, growers are aware of the water quality implications and have been using alternative products throughout the year to reduce pest pressures and avoid harming beneficial insects.

During grower outreach, Coalition representatives encouraged growers to switch to products that are lower risk alternatives to chlorpyrifos and diazinon, and workshops are offered to educate growers about the selection of these alternatives. Several alternative pesticide and product options exist, such as other organophosphates, carbamates, neonicotinoids, and pyrethroids. However, alternatives to chlorpyrifos and diazinon depend on many factors including but not limited to product registration, commodity type, pest pressures, cost, and timing of pest control.

PUR data can provide insight to the products being applied and how use has changed over time; however, multiple alternatives may be applied on a single crop throughout the year to replace chlorpyrifos applications. In addition, the Coalitions do not monitor for many new pesticides being used due to a lack of methods and, in some cases, relatively limited use.

ESJWQC Assessment of Alternatives to Diazinon and Chlorpyrifos

Chlorpyrifos is used on numerous crops to control several different pests within the ESJWQC region. Diazinon is primarily used during dormant spray applications and the practice of spraying during the dormant season is declining within the ESJWQC region (Figure 10). In the ESJWQC region, grapes, almonds, and walnuts are permanent crops to which large amounts of chlorpyrifos are applied annually. The Coalition reviewed PUR data, Pesticide Control Advisors (PCAs) recommendations and timing of applications for these three permanent crops to determine if trends in the use of alternatives to chlorpyrifos could be determined. A larger review of all crops to which chlorpyrifos is applied is beyond the scope of the time available to prepare this report.

The Coalition evaluated recommended alternatives to control vine mealybug in grapes, navel orangeworms in almonds, and codling moths in walnuts. The PCAs working with growers in the ESJWQC region informed the Coalition they currently recommend pest management strategies that include combinations of alternative products for the control of these pests and follow strategies similar to those recommended by the University of California Statewide Integrated Pest Management Program (UC IPM). Table 30 lists the three commodities, their pests, and the alternatives recommended. This table should not be treated as an all inclusive list of all potential alternatives but does include pesticides that are being widely recommended within this region.

Table 30. Active ingredients of pesticides recommended by PCAs to growers in the ESJWQC region as alternatives to chlorpyrifos for the control of vine mealybug in vineyards, orangeworms in almond orchards, and codling moths in walnut orchards.

Commodity	Pest	Chemical Group	Active Ingredient	Common Product Name	Recommended Application Period / Pest Density
Almond	Naval Orangeworm	Diacyl hydrazine	Methoxyfenozide	Intrepid	Spring spray, hull split sprays
Almond	Naval Orangeworm	Diamide	Chlorantraniliprole	Altacor	Hull split sprays
Almond	Naval Orangeworm	Diamide	Flubendiamide	Belt	Hull split sprays
Almond	Naval Orangeworm	Neonicotinoids	Acetamiprid	Assail	Hull split sprays
Almond	Naval Orangeworm	Neonicotinoids	Imidacloprid	Admire	Hull split sprays
Almond	Naval Orangeworm	Organophosphate	Phosmet	Imidan	Hull split sprays
Almond	Naval Orangeworm	Pyrethroid	Bifenthrin	Bifenture	Hull split sprays
Almond	Naval Orangeworm	Pyrethroid	Esfenvalerate	Asana	Hull split sprays
Grape	Vine Mealybug	Chitin Inhibitor	Buprofezin	Applaud	Delayed dormant, summer
Grape	Vine Mealybug	Neonicotinoids	Acetamiprid	Assail	Summer
Grape	Vine Mealybug	Neonicotinoids	Clothianidin	Clutch	Bloom, summer
Grape	Vine Mealybug	Neonicotinoids	Dinotefuran	Venom	Bloom, summer
Grape	Vine Mealybug	Neonicotinoids	Imidacloprid	Admire	Bloom, summer
Grape	Vine Mealybug	Neonicotinoids	Thiamethoxam	Actara	Summer
Grape	Vine Mealybug	Tetramic acid derivative (ketoenole)	Spirotetramat	Movento	Bloom, summer, post harvest
Walnut	Codling Moth	Carbamate	Carbaryl	Sevin	Moderate populations
Walnut	Codling Moth	Diacyl hydrazine	Methoxyfenozide	Intrepid	Moderate populations
Walnut	Codling Moth	Diamide	Chlorantraniliprole	Altacor	Moderate to high populations
Walnut	Codling Moth	Diamide	Flubendiamide	Belt	Moderate populations
Walnut	Codling Moth	Organophosphate	Methyl Parathion	Penncap-M	High population only
Walnut	Codling Moth	Organophosphate	Phosmet	Imidan	Moderate populations
Walnut	Codling Moth	Pyrethroid	Beta-Cyfluthrin	Baythroid	Moderate to high populations
Walnut	Codling Moth	Pyrethroid	Bifenthrin	Brigade	Moderate to high populations
Walnut	Codling Moth	Pyrethroid	Esfenvalerate	Asana	Moderate populations
Walnut	Codling Moth	Pyrethroid	Lamda-Cyhalothrin	Warrior	Moderate to high populations
Walnut	Codling Moth	Pyrethroid	Permethrin	Pounce	Moderate populations
Walnut	Codling Moth	Spinosyn	Spinetoram	Delegate	Moderate to high populations, supplemental control in organic orchards

UC IPM, 2012a; UC IPM, 2012b; UC IPM, 2012c

For the control of vine mealybug in vineyards, the recommended pest management strategy on the UC IPM website depends on the type of infestation (new/isolated outbreaks or ongoing populations) and soil type (light texture or clay) (UC IPM, 2012b). For new and/or isolated outbreaks of vine mealybug, growers are recommended to apply pesticides during the following time periods:

1. late summer to fall of Year 1,
2. post harvest of Year 1,
3. delayed-dormant season of Year 2,
4. at bloom of Year 2 (for light text soil only), and
5. summer of Year 2.

If outbreaks persist for more than two years, growers are recommended to switch to a yearly management strategy. Application at bloom time should occur in Year 1 and a delayed dormant spray and summer application should occur in Year 2 for light texture soils (alternating spray times/pesticides each year helps avoid pest resistance). In clay soils, a pesticide should be applied in the spring and again post-harvest. The pesticides recommended per each season are identified in Table 30.

Buprofezin, neonicotinoids, and spirotetramat are applied to vineyards in the ESJWQC region (Figure 12). The pounds of buprofezin and neonicotinoids applied in 2010 were both more than five times the amount applied in 2007. Buprofezin is recommended for application during both delayed dormant and summer sprays whereas neonicotinoids can be applied at bloom or in the summer (Table 30). Spirotetramat (Movento) is a relatively new systemic chemical that has been shown to be effective in controlling vine mealybug in grapes while not harming beneficial insects. Studies in 2009 by University of California Cooperative Extension entomology farm advisor David Haviland propose the following strategy for controlling vine mealybug: chlorpyrifos (Lorsban) in February, buprofezin (Applaud) in April, spirotetramat (Movento) from April to June, imidacloprid (Admire) in May or June, clothianidin (Clutch) a little later, and possibly a methomyl (Lannate) application close to harvest. He indicates that one or two of the above options will work in most cases (Blake, 2009). Recently, spirotetramat has been more widely used from April through June and neonicotinoids during boom.

Pesticide Control Advisors and UC IPM recommend spraying once a year for control of navel orangeworm on almonds, either in the spring, typically May, or at the hull split in July through August (Table 30) (UC IPM, 2012a). Of the alternative pesticides PCAs recommend for almonds, phosmet, pyrethroids, methoxyfenozide, diamides, and neonicotinoids are applied in the ESJWQC region. Since chlorpyrifos applications to almonds have decreased, applications of methoxyfenozide, diamides, and neonicotinoids have increased (Figure 13). Methoxyfenozide can be applied either during the spring or hull split. Diamides and neonicotinoids are recommended for hull split applications only. Pyrethroid use on almonds has remained relatively consistent from 2004 through 2010 whereas pounds of phosmet applied decreased over time; both are recommended for hull split applications.

Pest management strategies for the control of codling moth in walnut orchards depend on the population density, and different pesticides are recommended for different densities (Table 30) (UC IPM, 2012). Methyl parathion, phosmet, pyrethroids, methoxyfenozide, diamides, spinetoram, and carbaryl are recommended alternatives applied to walnut orchards in the ESJWQC region. Pounds of pyrethroids, methoxyfenozide, diamides, and spinetoram applied have increased since 2006 while pounds of chlorpyrifos applied decreased during this same time period (Figure 14). Pyrethroids and diamides are applicable for both moderate and moderate to high populations, whereas methoxyfenozide and spinetoram are recommended for moderate populations only (spinetoram is also recommended for supplemental control in organics). Methyl parathion (high) and phosmet (moderate) pounds applied remain high; however, use of both the organophosphates has decreased in recent years. Carbaryl applications to walnuts for control of moderate population densities have been inconsistent in past years.

Figure 12. Pounds of chlorpyrifos and alternative pesticides use on grape vineyards in the ESJWQC region.

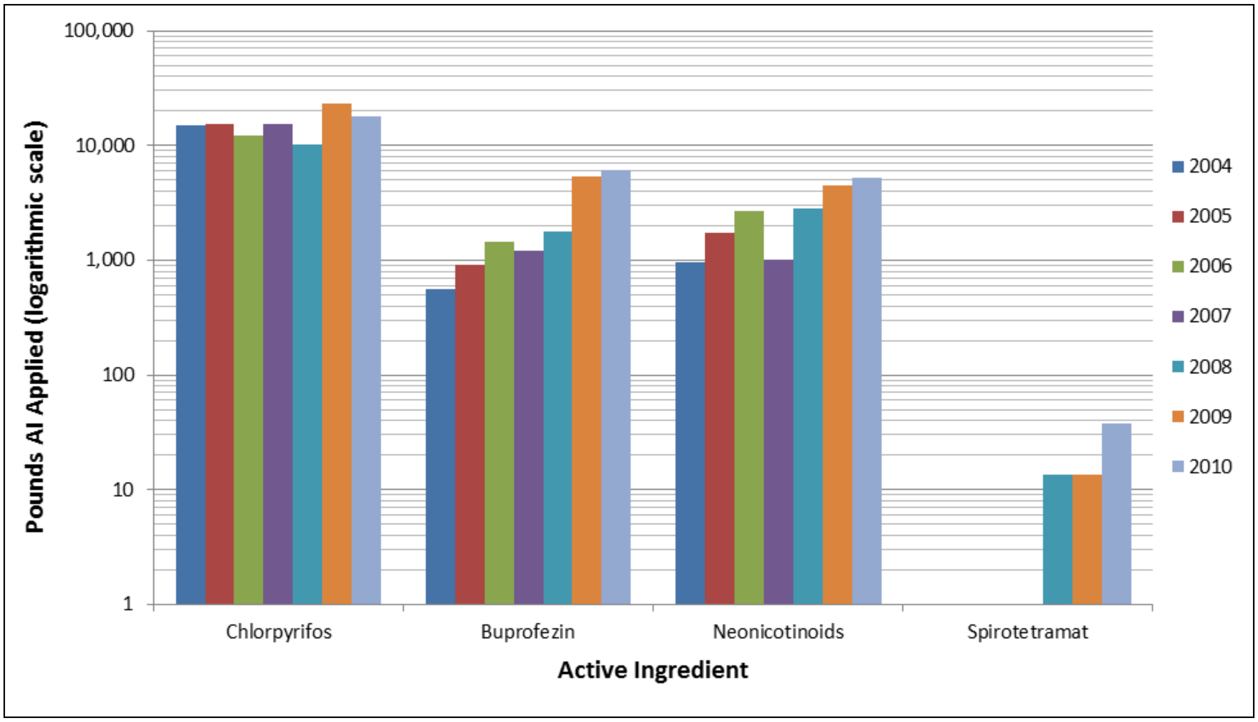


Figure 13. Chlorpyrifos and alternative pesticide use on almond orchards in the ESJWQC region.

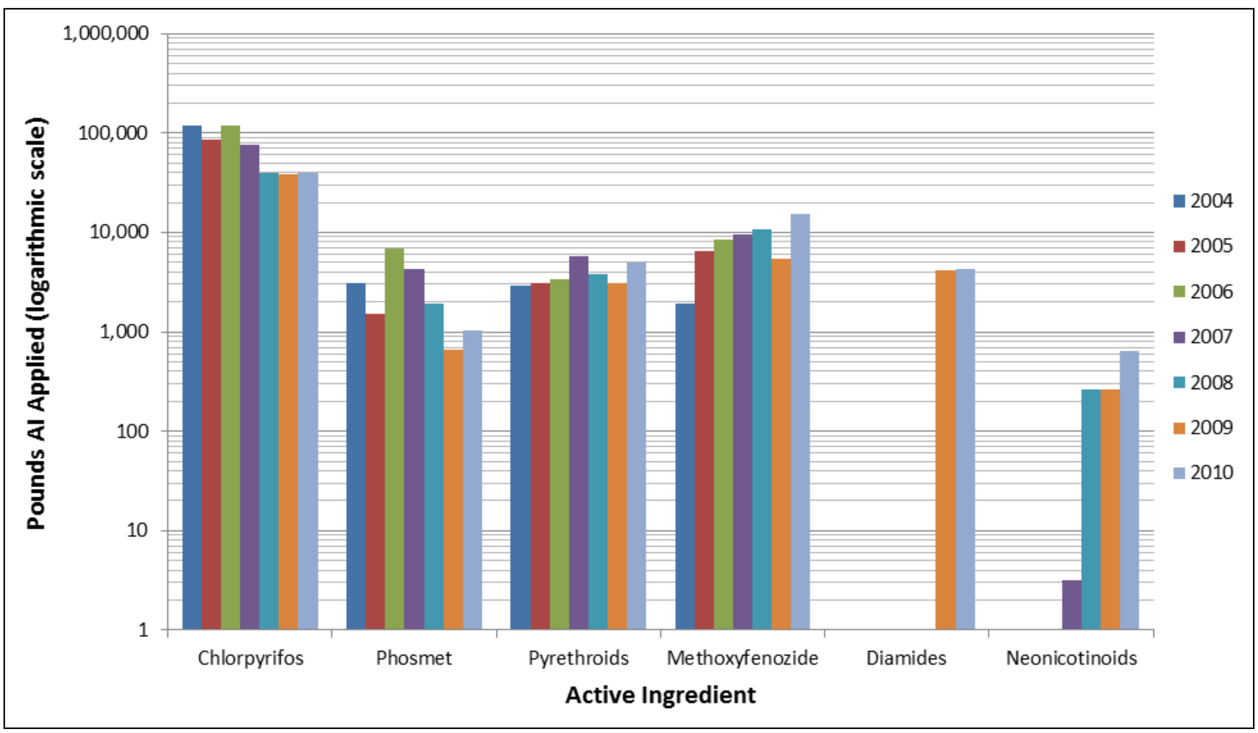
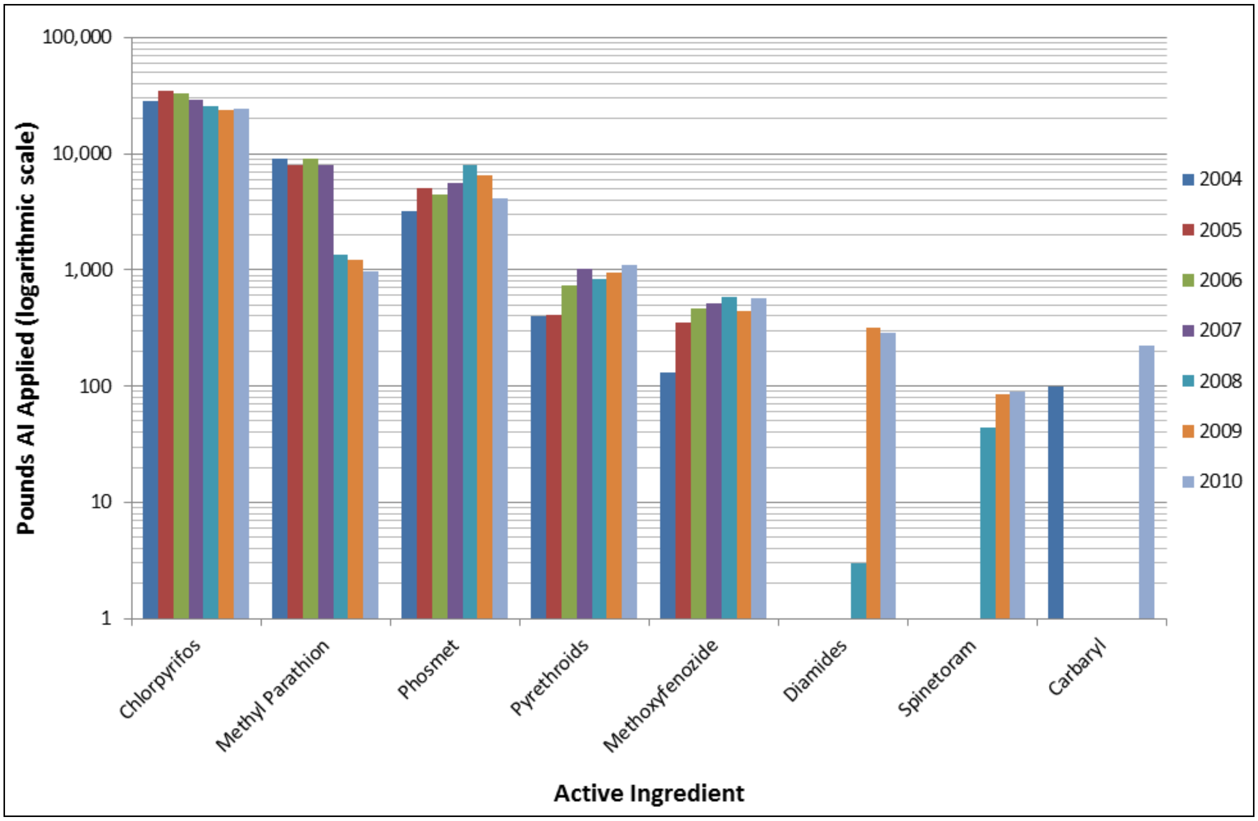


Figure 14. Chlorpyrifos and alternative pesticide use on walnut orchards in the ESJWQC region.



The EJWQC monitors for seven of the PCA recommended alternative pesticides and several other potential alternative pesticides in its tributaries (Table 31). During the 2011 water year, the ESJWQC sampled 19 tributary monitoring locations for potential alternative pesticides and/or for water column and sediment toxicity that may indicate the presence of alternative pesticides. However, the ESJWQC does not analyze for numerous alternative pesticides including but not limited to the active ingredients in products such as Intrepid, Movento, Assail, Altachlor, Belt, Clutch, and Admire.

Table 31. ESJWQC tributary monitoring schedule for potential alternatives to chlorpyrifos and diazinon during the 2011 water year.

Subarea	Tributary Site Name	Organophosphates											Carbamates						Toxicity		
		Azinphos-methyl	Dichlorvos	Dimethoate	Demeton-s	Disulfoton	Malathion	Methamidophos	Methidathion	Parathion, methyl*	Phorate	Phosmet*	Aldicarb	Carbaryl*	Carbofuran	Methiocarb	Methomyl	Oxamyl	*C. dubia*	*P. promelas*	*H.azteca*[1]
Bear Creek, Fresno-Chowchilla	Ash Slough @ Ave 21	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
	Bear Creek @ Kibby Rd																		MPM11		
	Berenda Slough along Ave 18 ½	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Cottonwood Creek @ Rd 20	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Deadman Creek @ Gurr Rd	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
	Deadman Creek @ Hwy 59	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Dry Creek @ Rd 18																				MPM11
	Duck Slough @ Gurr Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Howard Lateral @ Hwy 140	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
	McCoy Lateral @ Hwy 140	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
Stanislaus River, North Stanislaus	Mootz Drain downstream of Langworth Pond	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
Tuolumne River, Northeast Bank	Dry Creek @ Wellsford Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Lateral 2 ½ near Keyes Rd	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
	Rodden Creek @ Rodden Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
Turlock, Merced	Highline Canal @ Hwy 99	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Highline Canal @ Lombardy Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Merced River @ Santa Fe	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Mustang Creek @ East Ave	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	A10	
	Prairie Flower Drain @ Crows Landing Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Total Samples Collected	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**117**	**119**	**117**	**24**

[1]If Hyalella survival is less than 80% compared to the control, the following pesticides will be analyzed for: bifenthrin*, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate*, lambda-cyhalothrin*, permethrin*, fenpropathrin and chlorpyrifos.
A10- Assessment Monitoring for constituent during 2010 (October—December)
A11- Assessment Monitoring for constituent during 2011 (January—September)
MPM11-Management Plan Monitoring for constituent during 2011 (during months of past exceedances)
*Chemical recommended by PCAs as an alternative pesticide for chlorpyrifos applications to grapes, almonds, and/or walnuts in the ESJWQC region.

During the 2011 water year, ESJWQC tributary monitoring indicated carbaryl (carbamate) and dimethoate (organophosphate) impaired water quality, and four pyrethroids may have contributed to water quality impairments. Both carbaryl and dimethoate exceeded their WQTLs (2.53 µg/L and 1 µg/L, respectively) on August 9, 2011 in samples collected from Prairie Flower Drain, and dimethoate also exceeded the WQTL a month later in samples collected from the same site (September 6, 2011; Table 32). Bifenthrin was the only pyrethroid detected in sediment samples toxic to *H. azteca* collected from Dry Creek @ Wellsford Rd on September 9, 2011 and likely contributed to toxicity (Tables 33-34). In addition, water column toxicity to *C. dubia* on August 9, 2011 was also attributed to pyrethroids (Table 33), and, although the ESJWQC does not monitor for pyrethroids in the water column, a review of PUR data identified four pyrethroids that could have contributed to the toxicity: bifenthrin, cypermethrin, deltamethrin, and permethrin.

Carbaryl and pyrethroids are chemicals recommended by PCAs as alternatives to chlorpyrifos applications to grapes, almonds, and walnuts; therefore, alternative pesticides are impairing water quality. However, the percentage of alternative pesticide exceedances and toxicities associated with alternative pesticides is less than 5% for all constituents compared to the number of samples collected (Tables 32-33).

Table 32. Water column detections of potential alternative pesticides in ESJWQC tributaries during the 2011 water year.

Associated WQTLs per each pesticide are listed in parenthesis in the header row; exceedances are bolded.

Subarea	Tributary Site name	Sample Date	Carbaryl (2.53 µg/L)	Dimethoate (1 µg/L)	Methomyl (0.52 µg/L)
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Gurr Rd	16/Nov/2010		0.37	
Bear Creek, Fresno-Chowchilla	Duck Slough @ Gurr Rd	16/Aug/2011			0.066
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	9/Aug/2011	**13**	**10**	
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	6/Sept/2011	2.3	**1.1**	
		Total Exceedances	1	2	0
		Percentage of Exceedances Compared to Total Samples	2%	2%	0%

Table 33. ESJWQC tributary water column and sediment toxicity exceedance summary for the 2011 water year.

Subarea	Site name	Sample Date	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Gurr Rd	11/16/2010	*C. dubia*	Survival (%)	0	0	SL	A TIE was conducted on 11/19/10 and it was concluded that ammonia was the cause of toxicity.
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Gurr Rd	11/16/2010	*P. promelas*	Survival (%)	0	0	SL	A TIE was conducted on 11/19/10 and it was concluded that ammonia was the cause of toxicity.
Bear Creek, Fresno-Chowchilla	Duck Slough @ Gurr Rd	9/13/2011	*H. azteca*[1]	Survival (%)	83	90	SG	
Tuolumne River, Northeast Bank	Dry Creek @ Wellsford Rd	9/6/2011	*H. azteca*[1]	Survival (%)	65	76	SL	Pyrethroids and chlorpyrifos detected.
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	4/19/2011	*P. promelas*	Survival (%)	80	80	SG	
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	8/9/2011	*C. dubia*	Survival (%)	0	0	SL	A TIE was conducted on 8/11/11 and it was concluded that pyrethroid insecticides were the cause of toxicity.
						C. dubia	***P. promelas***	***H. azteca*[1]**
Total Toxicities Caused by/Associated with Alternative Pesticides						**1**	**0**	**1**
Percentage of Toxicities Compared to Total Samples						**<1%**	**0%**	**4%**

[1]For sediment toxicities, if the percent control is 80% or less, additional sediment chemistry analysis for pyrethroids and chlorpyrifos will occur.
SG-Statistically significantly different from control; greater than 80% threshold
SL-Statistically significantly different from control; less than 80% threshold
TIE-Toxicity Identification Evaluation

Table 34. ESJWQC tributary chlorpyrifos and pyrethroid results for toxic sediment samples collected during the 2011 water year.

Subarea	Site name	Sample Date	*H. azteca* (% Control)	Sediment Pesticides µg/kg dw									
				Bifenthrin	Chlorpyrifos	Cyfluthrin	Cyhalothrin, Lambda	Cypermethrin	Deltamethrin:Tralomethrin	Esfenvalerate/Fenvalerate	Fenpropathrin	Permethrin	Tetramethrin
Tuolumne River, Northeast Bank	Dry Creek @ Wellsford Rd	09/06/2011	76	0.32	0.15	ND	ND	ND	ND	ND	ND	ND	ND

ND- Not Detected

The Westside Coalition tests collected samples for a verity of carbamate, organophosphate, and organochlorine insecticides (depending on the site). During the 2011 water year, a total of 102 insecticides were detected at sites monitored by the Westside Coalition. Of these, 102 were comprised of legacy insecticides that are no longer in use (such as DDT and toxaphene). Of the remaining, 29 were organophosphate insecticides (16 detections of chlorpyrifos, eight of dimethoate, and five of malathion), seven were carbamates (five of methomyl and two of carbaryl), and five were current use organochlorines (two of endosulfan sufate and one each of endosulfan I, endosulfan II, and methoxychlor).

Sediment pesticide analyses are performed as a follow up to observations of sediment toxicity. During the 2011 water year and pesticide analyses of sediment samples from seven of the monitoring sites indicated that a variety of pyrethroids and chlorpyrifos were the cause of toxicity. Sediment toxicity and pesticide detections are discussed in greater detail in the Westside Coalition's SAMR.

The Westside Coalition also reviewed available PUR data to evaluate applications of insecticides. These results are tabulated in Table 35. Because of the incomplete nature of PUR data, results shown in Table 35 should be considered a partial snapshot of pesticide use.

Table 35. Insecticide applications within the Westside Coalition in order of highest application area.

Fresno County	Merced County	Stanislaus County
Bifenthrin	Lambda-cyhalothrin	Lambda-cyhalothrin
Lambda-cyhalothrin	Malathion	Dimethoate
Chlorpyrifos	Chlorpyrifos	Esfenvalerate
Esfenvalerate	Bifenthrin	Chlorpyrifos
Ziram	Dimethoate	Bifenthrin
Diazinon	Methomyl	Malathion
Permethrin	Esfenvalerate	Carbaryl
Methomyl	Cyfluthrin	Diazinon
	Permethrin	Ziram
	(S)-Cypermethrin	(S)-Cypermethirn
	Aldicarb	Ethoprop
	Fenpropathrin	Permethrin
	Phorate	Acephate
	Ziram	Dicofol
	Acephate	Methomyl
	Carbaryl	
	Methamidophos	
	Diazinon	

Alternatives Detected

The ESJWQC and Westside Coalition detected several alternative pesticides to chlorpyrifos and/or diazinon, including alternatives recommended by PCAs for use on grapes, almonds, and walnuts. Some of these alternative pesticides were found to impair water quality by either exceeding their respective WQOs or contributing to toxicity. Below is a brief description of the detected pesticides.

- Bifenthrin is a pyrethroid insecticide used to treat a variety of insects in orchards and field crops such as alfalfa, cotton, tomatoes, and corn but also has significant residential use.
- Carbaryl is a wide-spectrum carbamate pesticide used as an insecticide, molluscicide and acaricide on a variety of citrus and nut trees and fruit and fiber crops.
- Cyfluthrin is a pyrethroid insecticide used to treat a variety of insects in orchards and field crops such as alfalfa, corn, tomatoes, and cotton.
- Cypermethrin is a pyrethroid insecticide used to treat a variety of insects in field crops such as alfalfa, cotton, onion, and cabbage.
- Deltamethrin is a pyrethroid insecticide used to treat a variety of insects in orchards and field crops such as almonds, corn, cotton, and walnuts.
- Dimethoate is an organophosphate pesticide used to control a wide range of insects. It is used on a variety of field crops including alfalfa, beans, tomatoes, and cotton.
- Endosulfan sulfate, I, and II are organochlorine insecticides used to control a variety of insects and mites on cotton, tomatoes and other field crops. It is in the process of being phased out.
- Lambda cyhaolthrin is a pyrethroid insecticide used to treat a variety of insects in orchards and field crops such as corn, tomatoes, and cotton.
- Malathion is an organophosphate insecticide used on a variety of crops including alfalfa, walnuts, lettuce, grapes, and cotton.
- Methomyl is a carbamate insecticide used to control a variety of pests on vegetable, fruit, and field crops.
- Methoxychlor is an organochlorine insecticide that was used to control various nuisance pests (such as cockroaches and mosquitoes) and protect vegetables, fruits, ornamentals, and stored grain. Methoxychlor was banned by the U.S. EPA in 2003.
- Permethrin is a pyrethroid insecticide used to treat a variety of insects in orchards and field crops such as corn, tomatoes, and cotton and is also used for mosquito and residential insect control.

Although the Coalitions detected 12 different insecticides in waterways during this reporting period, it is not possible to determine if any of these materials were selected as an alternative to chlorpyrifos or diazinon or simply part of a grower's pesticide management rotation. Pesticide Control Advisors are recommending the use of some of these pesticides, but the PUR and monitoring data do not allow the Coalitions to establish if the detected pesticides were indeed from applications of pesticides used in an alternative capacity. It is a common cultural practice to rotate pesticide selection through specific modes of action (i.e. pyrethroids to organophosphate to carbamate) in order to minimize the risk of pesticide resistance. As a result of this practice, a material other than chlorpyrifos or diazinon may be select simply because it was next in the rotation rather than as a specific alternative. Based on the Coalition's conversations with growers and PCA's, regulatory pressure on diazinon use has phased that material out of the pest management rotation. Chlorpyrifos continues to be a preferred material due to its wide range of allowable use and effectiveness. The Coalitions continue to educate growers through outreach of other applicable alternatives to chlorpyrifos.

OBJECTIVE 6: DETERMINE WHETHER THE DISCHARGE CAUSES OR CONTRIBUTES TO TOXICITY IMPAIRMENT DUE TO ADDITIVE OR SYNERGISTIC EFFECTS OF MULTIPLE POLLUTANTS.

The loading capacity and load allocation for chlorpyrifos and diazinon are based on current understanding of the two pesticides' additive effects (Figure 1). All samples were in compliance with the load capacity; there were no detections of chlorpyrifos or diazinon in the San Joaquin River during the 2011 water year (Appendix IV, Table IV-1). Diazinon was also not detected in any water samples collected from either Coalition's tributaries during the reporting period; only chlorpyrifos was detected (Appendix IV, Tables IV-2 through IV-8). Hence, no incidences of interactions between diazinon and chlorpyrifos could be characterized.

In addition, as part of each Coalition's tributary monitoring strategies, the ESJWQC and Westside Coalition sample for a wide range of pesticides and toxicity. Toxicity Identification Evaluations (TIEs) are conducted on toxic water samples to determine the cause of toxicity (if survival is 50% or less compared to the control), and toxic sediment samples are subject to further analysis for chlorpyrifos and pyrethroids (if survival is 80% or less compared to the control). From these results, the Coalitions are able to consider the additive and/or synergistic effects of multiple pollutants.

ESJWQC Evaluation of Toxicity Impairment Due to Additive or Synergistic Effects of Multiple Pollutants

To assess if toxicity occurred due to the additive or synergistic effects of chlorpyrifos or diazinon and another pollutant, the ESJWQC reviewed toxicity results for *Ceriodaphnia dubia* and *Pimephales promelas* in the water column and *Hyalella azteca* in sediment.

There were two samples collected during the 2011 water year that were toxic to *C. dubia,* two that were toxic to *P. promelas*, and two sediment samples that were toxic to *H. azteca* (Table 33). Of the four water column toxicity samples that had a significant reduction in species survival, three had TIEs performed on them. Water samples collected from Deadman Creek on November 16, 2010 were toxic to both species due to high levels of ammonia. The second *C. dubia* toxicity occurred in August 2011 in samples collected from Prairie Flower Drain and was due to pyrethroids (Table 33). There was no chlorpyrifos or diazinon detected in the same water sample. The second *P. promelas* toxicity occurred at Prairie Flower Drain in April; however, the survival was 80% compared to the control and therefore a TIE was not performed (Table 33).

Sediment samples collected from Dry Creek @ Wellsford Rd on September 6, 2011 were toxic to *H. azteca* (Table 33) and chemistry analysis of the sediment indicated bifenthrin (0.32 µg/kg dw) and chlorpyrifos (0.15 µg/kg dw) were present (Table 34). The two chemicals could have interacted in an additive or synergistic manner to cause the sediment toxicity. The second toxic sediment sample was collected from Duck Slough @ Gurr Rd on September 13, 2011; however, the survival was 83% and therefore no additional chemistry was performed (Table 33).

Diazinon was not detected in any samples collected from October 2010 through September 2011. Chlorpyrifos was detected in three samples from tributaries and several other metals were detected in samples collected at the same time (Table 36). Although these constituents were present in the water column at the same time and there was the potential for interaction, water column toxicity to *C. dubia* or *P. promelas* did not occur during any of these three events (Table 36).

Table 36. Detections of metals and pesticides and toxicity results associated with chlorpyrifos detections in ESJWQC tributaries during the 2011 water year. Water Quality Trigger Limits (WQTLs) are listed with each pesticide and metal. Exceedances/toxicities are bolded. Assessment Monitoring occurred during all events listed.

Site name	Sample Date	Chlorpyrifos (0.015 µg/L)	Metals													Toxicity	
			Arsenic, Total (10 µg/L)	Boron, Total (700 µg/L)	Copper, Dissolved (hardness based trigger limit) µg/L	Copper, Total (1300 µg/L)	Lead, Dissolved (hardness based trigger limit) µg/L	Lead, Total (15 µg/L)	Molybdenum, Total (10 µg/L)	Nickel, Dissolved (hardness based trigger limit) µg/L	Nickel, Total (100 µg/L)	Selenium, Total (5 µg/L)	Zinc, Dissolved(hardness based trigger limit) µg/L	Zinc, Total (NA)	*C. dubia*, % Control	*P. promelas*, % Control
Berenda Slough along Ave 18 1/2	4/19/2011	**0.021**	1.5	18	**3.3 (1.36)**	4.7	0.07	0.21	1.1	0.37	0.41	0.1	1.2	2	100	98
Deadman Creek @ Hwy 59	4/19/2011	**0.016**	6.7	24	2.6	4.2	0.06	0.35	2.4	1.2	2.3	0.27	<0.7	2.5	100	98
Deadman Creek @ Hwy 59	9/13/2011	**0.049**	NT	31	1.2	1.5	NT	NT	NT	1.5	1.8	NT	<0.7	0.7	100	98

NA – Not applicable; WQTL is not established for this constituent.
NT – Not tested; analysis not scheduled for constituent during event.

Westside Coalition Evaluation of Toxicity Impairment Due to Additive or Synergistic Effects of Multiple Pollutants

The Westside Coalition tests San Joaquin River water samples for a variety of organophosphate, organochlorine, carbamate, and herbicide pesticides at each sampling event. During the 2011 water year monitoring period, the only other pesticides detected were diuron (four detections) and prowl (one detection), none of which exceeded the water quality criteria for either material. In addition to water quality analyses, the Westside Coalition analyses water samples for aquatic toxicity at the Lander Avenue site for aquatic toxicity year-round, and at the Sack Dam and Las Palmas sites during rain events. Aquatic toxicity to *C. dubia* was observed during the June 2011 sample event at the Lander Avenue site (20% survival). Despite testing for more than 45 different materials, no pesticides were detected. A TIE was performed but the toxicity was not persistent (there was no toxicity in any of the TIE samples) and the toxicity could not be linked to any cause. There were no other observations of toxicity in the San Joaquin River sites.

Tributary monitoring sites are also tested for pesticides and aquatic toxicity. During this report period, aquatic toxicity to *C. dubia* (the indicator species sensitive to chlorpyrifos and diazinon) was observed in seven San Joaquin River tributaries. However, only one of the observations of toxicity could be associated with a current use pesticide. Table 37 shows the sites with observed toxicity to *C. dubia* along with the apparent cause. The remaining samples showing toxicity either detected very low concentrations of DDE or no insecticides at all and there were no other exceedances of copper or other constituent likely to contribute to *C. dubia* toxicity. Based on these results, there are no apparent additive or synergistic effects that are contributing to aquatic toxicity. The Westside Coalition's SAMR provides a more detailed discussion of these results.

Table 37. Westside Coalition sites showing aquatic toxicity to *Ceriodaphnia dubia*.

SITE NAME	SAMPLE DATE	*C. DUBIA* (% SURVIVAL)	TIE COMMENTS	APPARENT CAUSE
Hospital Cr. @ River Rd.	12/21/2010	40	TIE indicated pesticides are likely cause.	Unknown - DDE only detected insecticide (0.017µg/L)
Orestimba Cr. @ River Rd.	3/8/2011	80	TIE not required	Unknown - DDE only detected insecticide (0.0053j µg/L)
San Joaquin River @ Lander Ave.	6/14/2011	20	Toxicity was not persistent: TIE baseline sample did not have toxicity - TIE inconclusive	Unknown - no detected pesticides
Poso Sl. @ Indiana Ave.	8/9/2011	0	TIE showed toxicity through all treatments with moderate increase in survival in carbon filter treatment. Pesticides likely cause.	chlorpyrifos (1.3µg/L)
Turner Sl near Ediminster Rd.	8/9/2011	55	TIE not required.	Unknown - no detected pesticides
Newman Wasteway near Hills Ferry Rd.	8/9/2011	70	TIE not required.	Unknown - no detected pesticides
Los Banos Cr. @ Highway 140	8/9/2011	70	TIE not required.	Unknown - no detected pesticides

OBJECTIVE 7: DEMONSTRATE THAT MANAGEMENT PRACTICES ARE ACHIEVING THE LOWEST PESTICIDE LEVELS TECHNICALLY AND ECONOMICALLY ACHIEVABLE

A determination of technical and economical feasibility needs to be done at the individual farm level and, consequently, is expected to vary with the specific operation and commodity farmed. The goal of the ESJWQC and Westside Coalitions is for their members to have no discharge of pesticides to surface waters. Economic feasibility is determined by factors outside the control of the Coalitions. Profitable operations can afford to implement management practices such as constructing sediment basins or installing pressurized irrigation, both of which can significantly reduce the runoff of irrigation and storm water carrying agricultural discharges. Marginally profitable operations may not be able to afford these practices. Consequently, efforts by the ESJWQC and Westside Coalition to obtain additional funding for growers have been important to achieving the Coalitions' goal. Both Coalitions have been instrumental in helping growers obtain AWEP funding and publicizing the current funding available through the Proposition 84 grant program run by the Coalition for Urban/Rural Environmental Stewardship (CURES). These programs offer several million dollars towards the implementation of structural management practices within their respective regions. However, these programs are still in their nascent stages and it will take a few years before the funding available through these programs is able to make an improvement in water quality. Also, there remain many growers in the eastside drainage area of the San Joaquin River who are not members of either Coalition and not influenced by the Coalitions' efforts.

It is technically feasible to eliminate all discharges of chemicals to surface waters, although it could require steps that are not economically feasible for even the most profitable operations. It does seem possible, given the success in the ESJWQC and Westside Coalition regions in 2011, to reduce discharges to surface waters to the point that they do not impair beneficial uses. There were no instances of exceedances of the WQOs or loading capacity in the San Joaquin River during 2011.

Within both the ESJWQC and Westside Coalition regions, there was a reduction in the number of exceedances of chlorpyrifos (diazinon exceedances are almost nonexistent) from 2010 to 2011, and in 2011 there were no instances of exceedances of the WQOs or loading capacity in the San Joaquin River compared to one noncompliant load in 2010. Consequently, the management practices implemented by growers appear to be resulting in a reduction of discharges, and Coalition members are in the process of achieving the lowest pesticide levels technically and economically feasible.