May 1, 2013

Pamela Creedon
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Dear Ms. Creedon,

The East San Joaquin Water Quality Coalition (ESJWQC) and Westside San Joaquin River Watershed Coalition (Westside Coalition) are submitting the 2013 Annual Monitoring Report (AMR) for the San Joaquin River Chlorpyrifos and Diazinon TMDL Compliance Monitoring for review by the Central Valley Regional Water Quality Control Board (CVRWQCB).

The attached documents report on the monitoring program for the period of October 1, 2011 to September 30, 2012 and assesses compliance with the monitoring objectives 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 (finalized October 2005).

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations."

This letter will be mailed to the CVRWQCB with an original signature.

Submitted respectfully,

Parry Klassen
Executive Director
East San Joaquin Water Quality Coalition

Joseph C. McGahan
Westside San Joaquin River Watershed Coalition

San Joaquin River Chlorpyrifos and Diazinon 2012 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, 2011 – September 30, 2012

Report Submitted: May 1, 2013

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

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LIST OF ACRONYMS

AI	Active Ingredient
AMR	Annual Monitoring Report
CalPIP	California Pesticide Information Portal
CalTrans	California Department of Transportation
CDEC	California Data Exchange Center
CEDEN	California Environmental Data Exchange Network
CIMIS	California Irrigation Management Information System
COC	Chain of Custody
CVRDC	Central Valley Regional Data Center
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
MPM	Management Plan Monitoring
MPUR	Management Plan Update Report
MRPP	Monitoring and Reporting Program Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not Detected
NONPJ	Non-project
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
SWAMP	Surface Water Ambient Monitoring Program
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

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 monitoring design for the 2012 water year was similar to the monitoring design utilized during the 2011 water year, with a single modification. The monitoring timing and frequency were modified by the Regional Board's Executive Officer in a letter sent on March 27, 2012. Based on the requirements stated in the letter, monitoring at the six San Joaquin River TMDL compliance points for chlorpyrifos and diazinon during the 2012 water year occurred in October 2011, March 2012, and May through August 2012. The monitoring design also includes: monthly monitoring at three of the six compliance points (San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near 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. 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):

- 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).

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 from the Department of Water Resources (DWR) gauge readings posted on the California Data Exchange Center (CDEC) Website.

During the reporting period, access to the San Joaquin River at Highway 165 near Stevinson was not available due to a California Department of Transportation (CalTrans) project and sampling was shifted to the next accessible downstream site (San Joaquin River at Fremont Ford, USGS 11261500) from November 2011 to February 2012. Also during the reporting period, the ESJWQC was approved on April 17, 2012, to temporarily suspend monitoring at Core and Management Plan Monitoring (MPM) sites (with the exception of Bear Creek @ Kibby Rd) as well as reduce monitoring at Assessment Monitoring sites for the remainder of 2012. ESJWQC monitoring schedules were modified in April according to the approved reduced monitoring outline which is discussed in detail in the ESJWQC 2013 AMR (pages 16-20, 37-38).

There were no detections of chlorpyrifos or diazinon in water samples collected from the San Joaquin River. Diazinon was detected in one water sample from the Westside Coalition (Poso Slough at Indiana Avenue, November 2011); diazinon has not been detected in tributaries in the ESJWQC region since February 2009. Chlorpyrifos exceeded the WQOs and load allocations in tributaries during irrigation months in the Westside Coalition region. Chlorpyrifos was not detected in water column samples collected from the ESJWQC tributaries during the 2012 water year. A sediment sample collected from an ESJWQC tributary had a concentration of chlorpyrifos that had the potential to interact with other constituents and cause toxicity. In all of the samples exhibiting aquatic toxicity within the Westside Coalition region, there was no indication of synergistic effects. There were no samples collected within either Coalition either that had both chlorpyrifos and diazinon detected. 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. The management practices implemented by growers in both Coalition regions are achieving the lowest pesticide levels technically and economically feasible.

To address water quality impairments, the ESJWQC developed an overall management plan for 28 waterways sampled since 2004 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 ESJWQC'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 2012 an important step in demonstrating the effectiveness of its management plan strategy. On May 30, 2012, the ESJWQC has received approval to remove constituents from active management plans in 14 site subwatersheds, of those 14 site subwatersheds, seven were approved to have chlorpyrifos removed and one was approved to have diazinon removed. A second letter was sent on November 7, 2010 to remove management plans for constituents in 10 site subwatersheds, of those 10 site subwatersheds, two are pending approval for the removal of chlorpyrifos and one is pending approval for the removal of diazinon.

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 2011 through September 2012) are discussed as they pertain to the TMDL Monitoring Objectives 1 through 7. Additional details can be found in the ESJWQC Annual Monitoring Reports (AMRs) submitted March 1, 2012 and March 1, 2013 and in the Westside Coalition SAMRs submitted June 15, 2012 (September 2011 through February 2012 data) and November 30, 2012 (March 2012 through August 2012 data) and to be submitted in the June 15, 2013 SAMR (September 2012 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 2012 water year (October 2011 through September 2012) 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 water quality objectives for chlorpyrifos and diazinon in specific subwatersheds. The results summarized below are for an additional monitoring program put into place by the Coalitions to address the Basin Plan Amendment 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.

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

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 also 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 2012 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 details each Coalition's strategy to assess compliance with each 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
- 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. • Assess and review results of management plan strategy to determine the degree of implementation and the effectiveness of management practices implemented to reduce off-site movement of chlorpyrifos and diazinon.	ESJWQC Management Plan and MPURs
	Westside Coalition	• Adhere to strategy put forth in the Westside Coalition Management Plan. • Assess and review results of management plan strategy to determine the degree of implementation and the effectiveness of management practices implemented to reduce off-site movement of chlorpyrifos and diazinon.	Westside Coalition Management Plan and SAMRs
5	ESJWQC	• Conduct representative monitoring of Coalition region according to Monitoring Strategy outlined in ESJWQC MRPP. • Assess monitoring results to determine whether alternatives to diazinon and chlorpyrifos are causing surface water impairments.	ESJWQC MRPP, Management Plan, and MPURs
	Westside Coalition	• Conduct representative monitoring of Coalition region according to Monitoring Strategy outlined in Westside Coalition MRP. • Assess monitoring results to determine whether alternatives to diazinon and chlorpyrifos are causing surface water impairments.	Westside Coalition MRP and SAMRs
6	ESJWQC	• Conduct representative monitoring of Coalition region according to Monitoring Strategy explained in ESJWQC MRPP. • Assess monitoring results to assess toxicity and determine if agricultural discharge contributes to toxicity impairment due to additive or synergistic effects of multiple pollutants.	ESJWQC MRPP, Management Plan, and MPURs
	Westside Coalition	• Conduct representative monitoring of Coalition region according to Monitoring Strategy explained in Westside Coalition MRP. • Assess monitoring results to assess toxicity and determine if agricultural discharge contributes to toxicity impairment due to additive or synergistic effects of multiple pollutants.	Westside Coalition MRP and SAMRs
7	ESJWQC	• Assess 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	• Assess 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. The ESJWQC and Westside Coalition MRP Order/MRPP, QAPP, AMRs/SAMRs, Management Plans, and MPURs submission dates.

Coalition	Document Name	Submission Date	Sampling Dates Addressed
ESJWQC	ESJWQC MRPP	August 25, 2008	NA[1]
	ESJWQC QAPP[2]	August 25, 2008	NA[1]
	ESJWQC SAMR	June 30, 2008	October 2007 – March 2008
	ESJWQC Management Plan	September 30, 2008	August 2004 – December 2007
	ESJWQC SAMR	March 1, 2009	April – September 2008
	ESJWQC AMR	March 1, 2010	October 2008 – December 2009
	ESJWQC MPUR	April 1, 2010	October 2008 – December 2009
	ESJWQC AMR	March 1, 2011	January – December 2010
	ESJWQC MPUR	April 1, 2011	January – December 2010
	ESJWQC AMR	March 1, 2012	January – December 2011
	ESJWQC MPUR	April 1, 2012	January – December 2011
	ESJWQC AMR	March 1, 2013	January – December 2012
	ESJWQC MPUR	April 1, 2013	January – December 2012
Westside Coalition	Westside Coalition MRP Order No.R5-2008-0831	September 15, 2008	NA[1]
	Westside Coalition Management Plan and Focused Management Plan	October 23, 2008	March 2009 to Present
	Westside Coalition QAPP (Draft)	June 30, 2009	NA[1]
	Westside Coalition SAMR	June 15, 2009	September 2008 – February 2009
	Westside Coalition SAMR	November 30, 2009	March – August 2009
	Westside Coalition SAMR	June 15, 2010	September 2009 – February 2010
	Westside Coalition SAMR	November 30, 2010	March – August 2010
	Westside Coalition SAMR	June 15, 2011	September 2010 – February 2011
	Westside Coalition SAMR	November 30, 2011	March – August 2011
	Westside Coalition SAMR	June 15, 2012	September 2011 – February 2012
	Westside Coalition SAMR	November 30, 2012	March – August 2012
	Westside Coalition SAMR	To be submitted June 15, 2013	September 2012 – February 2013

NA[1] – Not Applicable. The document addresses and is applicable to the entire project, not a subset of sampling dates.
[2]-Most recent amended ESJWQC QAPP submitted on February 15, 2013.

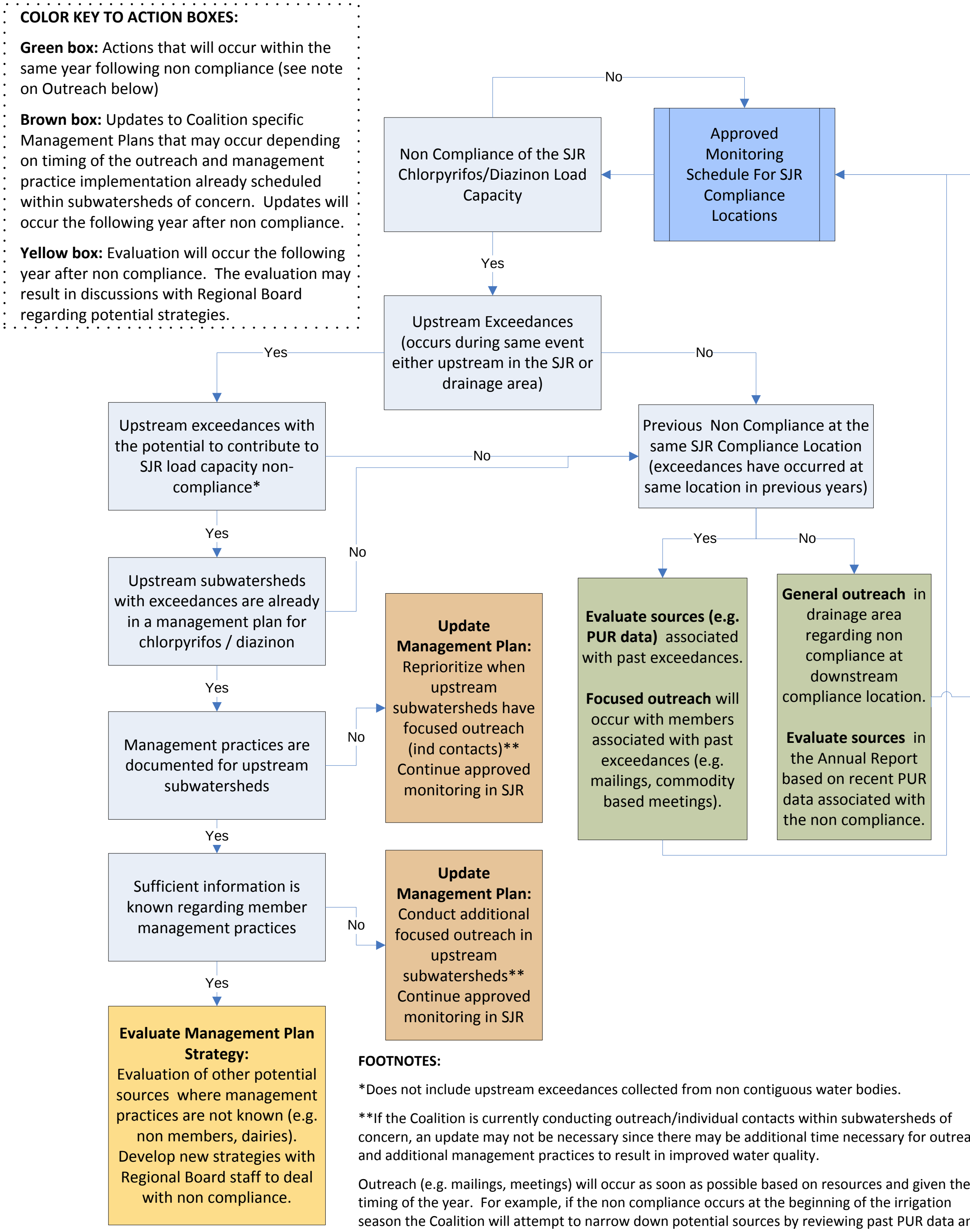
MONITORING DESIGN

The monitoring design for the 2012 water year was similar to the monitoring design utilized during the 2011 water year, with a single modification. As occurred during the 2011 water year, the six San Joaquin River TMDL compliance points were monitored for chlorpyrifos and diazinon on a quarterly basis through March 2012. The monitoring timing and frequency were modified in a letter sent from the Regional Board on March 27, 2012: monitoring at the six San Joaquin River TMDL compliance points was no longer required on a quarterly basis and instead required during the months of May, June, July and August in 2012. Therefore, all six compliance points were monitored for chlorpyrifos and diazinon in October 2011, March 2012, and May through August 2012. In addition, the results of monthly monitoring for chlorpyrifos and diazinon by the Westside Coalition at three of the six compliance points (San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near Patterson) are continued to be considered for TMDL compliance point monitoring.

Both Coalitions conducted monthly tributary monitoring based on each Coalition's approved monitoring plan. On April 17, 2012, the ESJWQC was approved to temporarily suspend monitoring at Core and Management Plan Monitoring (MPM) sites (with the exception of Bear Creek @ Kibby Rd where MPM continued as part of a cost-share for a project funded by Proposition 84 funding) as well as reduce monitoring (for Group A, paraquat, glyphosate, total Kjeldahl nitrogen, total phosphorus (as P), *E. coli* and all metals except copper and zinc) at Assessment Monitoring sites for the remainder of 2012 (ESJWQC AMR, pages 34-38). Monitoring occurred as scheduled from October 2011 through March 2012 in the ESJWQC region; schedules were modified beginning in April 2012 according to the approved reduced monitoring outline.

This report includes a complete analysis and discussion of all monitoring data collected from October 2011 through September 2012 and fulfills the required annual assessment of the monitoring objectives and results. Since the annual assessment is submitted May 1 of each year, the ESJWQC and Westside Coalition created a decision tree to guide the Coalitions' actions when a non compliant load is detected in the San Joaquin River to ensure any water quality impairments are adequately and efficiently addressed (Figure 2).

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.



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, ESJWQC tributary monitoring and Westside Coalition tributary monitoring are typically scheduled for the second Tuesday of the month and are adjusted for storm events as necessary.

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 (San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near Patterson) to evaluate water quality throughout the year. Monitoring at all six of the compliance points is scheduled to coincide with predicted peak pesticide use and therefore potential peak concentrations in waterways. Peak pesticide use was determined using Pesticide Use Reports (PURs) and past monitoring data (Figures 3 and 4).

Monitoring was previously scheduled to occur quarterly at all six compliance points. Monitoring was scheduled during October in the fourth quarter of the year to capture any runoff from chlorpyrifos post-harvest applications to grapes for vine mealybug. Chlorpyrifos and diazinon can be applied during the dormant season of December through February, and the Coalitions attempted to schedule monitoring during the first quarter to capture runoff from a storm event. Chlorpyrifos and, to a lesser extent, diazinon are applied to permanent crops such as almonds and walnuts and row crops such as alfalfa, corn, melons and tomatoes in the second and third quarters, and monitoring was scheduled for May and July when applications typically peak.

The Regional Board dictated in a letter on March 27, 2012 that monitoring at the six compliance points should occur monthly from May through August in 2012 to focus on periods of peak application (Figures 3 and 4). Therefore, during the 2012 water year, the Coalitions monitored the six compliance points in October 2011, March 2012, and May through August 2012.

Figure 3. Pounds of diazinon applied to the lower San Joaquin River watershed from 2004 through 2011. Years refer to calendar years. All PUR data are considered preliminary until received from California Pesticide Information Portal (CalPIP); CalPIP data are available through December 2010. The PUR data from the counties within the lower San Joaquin River watershed are available through 2011.

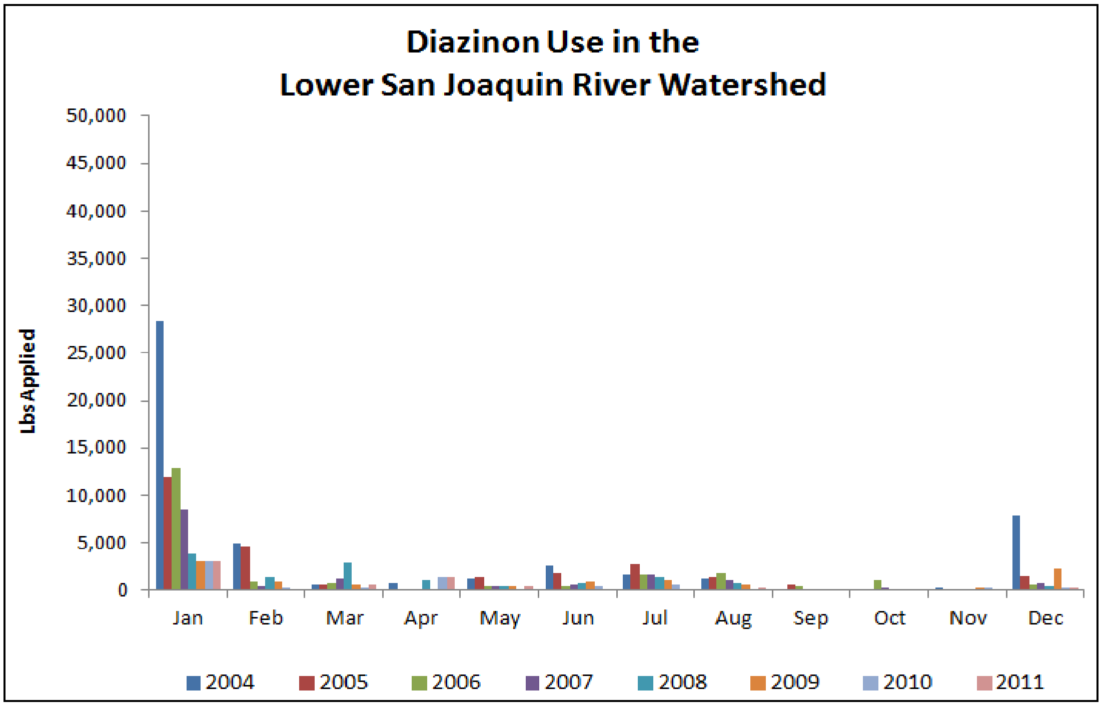
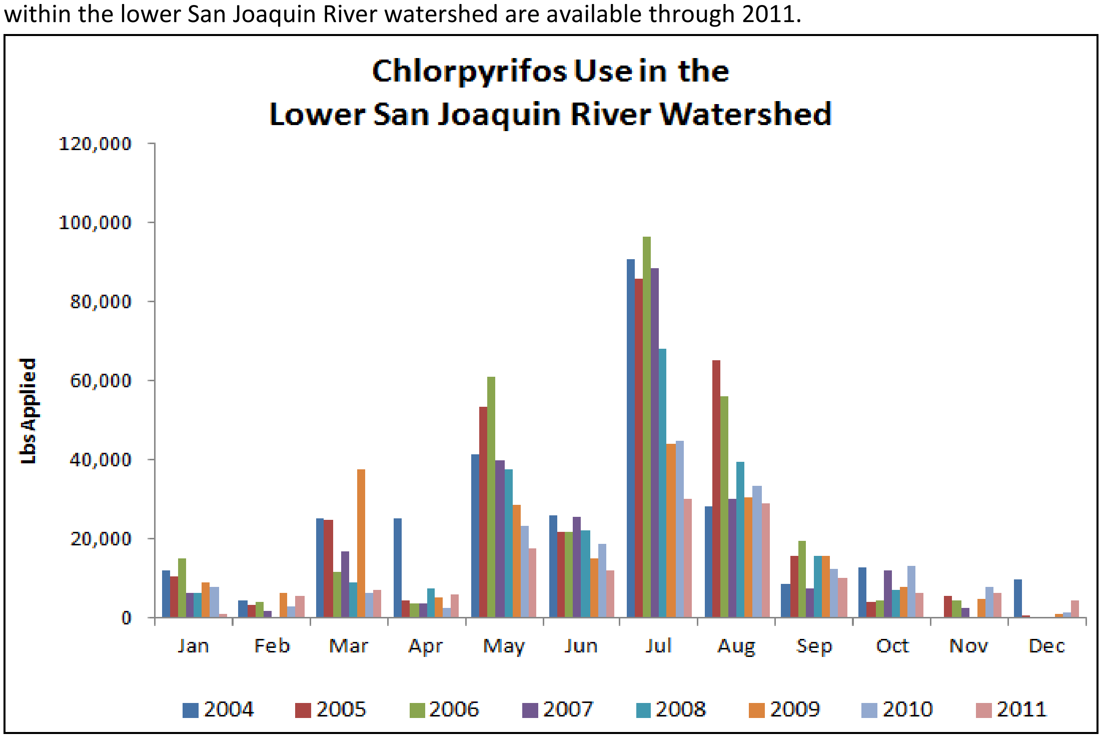


Figure 4. Pounds of chlorpyrifos applied to the lower San Joaquin River watershed from 2004 through 2011. Years refer to calendar years. All PUR data are considered preliminary until received from California Pesticide Information Portal (CalPIP); CalPIP data are available through December 2010. The PUR data from the counties within the lower San Joaquin River watershed are available through 2011.



Constituents Monitored

Water samples collected from the lower San Joaquin River for the TMDL were analyzed for chlorpyrifos and diazinon. Habitat information and field parameter measurements, 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) and/or United Stated Geological Survey (USGS) gauge readings posted on the California Data Exchange Center (CDEC) website. Samples collected by the Westside Coalition during monthly monitoring of the San Joaquin River compliance points were also analyzed for additional constituents for compliance with the ILRP as described in the Westside Coalition MRP. Results from ILRP monitoring (of both additional constituents analyzed in the San Joaquin River and tributary monitoring) are reported in the Westside SAMRs and the ESJWQC AMRs. 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 near Stevinson (USGS 11260815),
- San Joaquin River at Hills Ferry Road,
- 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).

In October 2011, the California Department of Transportation (CalTrans) began a retrofit project on the Lander Avenue bridge at the San Joaquin River, which prevented safe access to the San Joaquin River at Highway 165 near Stevinson site. Consequently, the site was not sampled in October 2011. The Westside Coalition monitored and assessed TMDL compliance by collecting samples from the San Joaquin River at Fremont Ford (USGS 11261500) sampling location in place of the San Joaquin River at Highway 165 near Stevinson compliance location from November 2011 through February 2012. The San Joaquin River at Fremont Ford site is the nearest downstream site with safe access to the river and is approximately 4.5 linear miles downstream. The CalTrans work was completed in March 2012, and samples were collected from the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

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 2012 water year, the Coalitions collected samples from 37 tributaries (19 in ESJWQC region and 18 in Westside Coalition region; Table 6 and Figure 6). The 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 San Joaquin River at 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 2011 and 2012 tributary monitoring locations can be found in the ESJWQC AMRs submitted March 1, 2012 (pages 36-42) and March 1, 2013 (pages 51-59). Westside Coalition tributary monitoring locations from October 2011 through August 2012 were reported in the Westside Coalition SAMRs submitted June 15 and November 30, 2012 (pages 9-14 in both reports). Westside Coalition tributary monitoring locations from September 2012 will be reported in the Westside Coalition SAMR to be submitted June 15, 2013.

Table 4. The ESJWQC and Westside Coalition chlorpyrifos and diazinon TMDL San Joaquin River compliance sites.

Listed in order of upstream to downstream.

Basin Plan Amendment Station Name	TMDL AMR (Report) Station Name	TMDL AMR (Appendices and Electronic Files)		CEDEN		Latitude	Longitude	Coalition
		Station name	Station Code	Station name	Station Code			
San Joaquin River at Sack Dam	San Joaquin River at Sack Dam	SJR @ Sack Dam	SJRSD	SJR @ Sack Dam	541MAD007	36.98361	-120.50028	Westside
San Joaquin River at Highway 165 near Stevinson (USGS ID No. 11260815)	San Joaquin River at Highway 165 near Stevinson	SJR @ Hwy 165	SJRLA	San Joaquin River at Lander Ave	541MER522	37.29528	-120.85028	Westside
None - Not included in Basin Plan (USGS ID No. 11261500)	San Joaquin River at Fremont Ford	SJR @ Fremont Ford	SJRFF	SJR @ Fremont Ford	541MER538	37.30944	-120.92917	Westside
San Joaquin River at Hills Ferry Road	San Joaquin River at Hills Ferry Road	SJR @ Hills Ferry	541STC512	SJR @ Hills Ferry	541STC512	37.34250	-120.97722	ESJWQC
San Joaquin River at Las Palmas Avenue near Patterson (USGS ID No. 11274570)	San Joaquin River at Las Palmas Avenue near Patterson	SJR @ Las Palmas Ave	SJRPP	SJR @ Patterson[1]	541STC507[1]	37.49778	-121.08167	ESJWQC
				San Joaquin River at PID Pumps	541XSJRPP	37.49720	-121.08280	Westside
San Joaquin River at the Maze Boulevard (Highway 132) Bridge (USGS ID No. 11290500	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	SJR @ Maze Blvd	541STC510	San Joaquin River above Maze Boulevard	541STC510	37.64194	-121.22778	ESJWQC
San Joaquin River at the Airport Way Bridge near Vernalis (USGS ID No. 11303500)	San Joaquin River at the Airport Way Bridge near Vernalis	SJR @ Airport Way	541SJC501	San Joaquin River at Airport Way near Vernalis	541SJC501	37.67556	-121.26417	ESJWQC

[1] For coordination purposes, ESJWQC sampled the site on 18-Feb-11 and recorded the results in CEDEN as indicated.

Table 5. San Joaquin River sampling sites and associated drainage subareas identified in the Basin Plan.

Listed in order of upstream to downstream.

Station Name	Subareas
San Joaquin River at Sack Dam	NA[1]
San Joaquin River at Highway 165 near Stevinson	Bear Creek, Fresno-Chowchilla
San Joaquin River at Fremont Ford	Bear Creek, Fresno-Chowchilla, Stevinson[2], Grassland[2]
San Joaquin River at Hills Ferry Road	Stevinson, Grassland
San Joaquin River at Las Palmas Avenue near Patterson	Turlock, Merced, Greater Orestimba
San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Tuolumne River, Northeast Bank, Westside Creek
San Joaquin River at the Airport Way Bridge near Vernalis	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).

[2] Drainage to the site includes a portion of the subarea (see Figures 5 and 7).

Table 6. The ESJWQC and Westside Coalition upstream tributary sites monitored during the 2012 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.

Coalition Region	Tributary Map Key	Tributary Station name	Tributary Station Code	Tributary Latitude	Tributary Longitude	SJR Downstream Monitoring Location
ESJWQC	1	Bear Creek @ Kibby Rd	535XBCAKR	37.31230	-120.41535	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	2	Berenda Slough along Ave 18 1/2	545XBSAAE	37.01820	-120.32650	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	3	Cottonwood Creek @ Rd 20	545XCCART	36.86860	-120.18180	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	4	Deadman Creek @ Gurr Rd	535DCAGR	37.19514	-120.56147	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	5	Deadman Creek @ Hwy 59	535DMCAHF	37.19755	-120.48763	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	6	Dry Creek @ Rd 18	545XDCARE	36.98180	-120.22056	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	7	Dry Creek @ Wellsford Rd	535XDCAWR	37.66000	-120.87526	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
ESJWQC	8	Duck Slough @ Gurr Rd	535XDSAGR	37.21408	-120.56126	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	9	Duck Slough @ Hwy 99	535XDSAHN	37.25031	-120.41043	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	10	Highline Canal @ Hwy 99	535XHCHNN	37.41254	-120.75941	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	11	Highline Canal @ Lombardy Rd	535XHCALR	37.45547	-120.72181	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	12	Hilmar Drain @ Central Ave	535XHDACA	37.39058	-120.95820	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	13	Howard Lateral @ Hwy 140	535XHLAHO	37.30790	-120.78200	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	14	Levee Drain @ Carpenter Rd	535XLDACR	37.48062	-121.03106	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	15	Livingston Drain @ Robin Ave	535XLDARA	37.31693	-120.74229	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	16	McCoy Lateral @ Hwy 140	535XMLAHO	37.30968	-120.78771	San Joaquin River at Highway 165 near Stevinson /San Joaquin River at Fremont Ford[1]
ESJWQC	17	Merced River @ Santa Fe	535XMRSFD	37.42705	-120.67353	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	18	Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	37.44187	-121.00331	San Joaquin River at Las Palmas Avenue near Patterson
ESJWQC	19	Rodden Creek @ Rodden Rd	535XRCARD	37.79053	-120.80886	San Joaquin River at the Airport Way Bridge near Vernalis
Westside	20	Blewett Drain at Highway 132	541XVH132	37.64052	-121.22960	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
Westside	21	Del Puerto Creek at Hwy 33	541XDPCHW	37.51421	-121.15875	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
Westside	22	Del Puerto Creek near Cox Road	541XDPCCR	37.53940	-121.12210	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
Westside	23	Hospital Creek at River Road	541XHCARR	37.61047	-121.23078	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
Westside	24	Ingram Creek at River Road	541XICARR	37.60022	-121.22506	San Joaquin River at the Maze Boulevard (Highway 132) Bridge
Westside	25	Los Banos Creek at China Camp Road	541XLBCCC	37.11450	-120.88950	San Joaquin River at Hills Ferry Road
Westside	26	Los Banos Creek at Hwy 140	541XLBCHW	37.27620	-120.95550	San Joaquin River at Hills Ferry Road
Westside	27	Marshall Road Drain near River Road	541XMRDRR	37.43630	-121.03620	San Joaquin River at Las Palmas Avenue near Patterson
Westside	28	Mud Slough Upstream of San Luis Drain	541XMSUSL	37.26388	-120.90611	San Joaquin River at Hills Ferry Road
Westside	29	Newman Wasteway near Hills Ferry Road	541XNWHFR	37.32040	-120.98340	San Joaquin River at Hills Ferry Road
Westside	30	Orestimba Creek at Hwy 33	541XOCAHW	37.37715	-121.05812	San Joaquin River at Las Palmas Avenue near Patterson
Westside	31	Orestimba Creek at River Road	541XOCARR	37.41388	-121.01417	San Joaquin River at Las Palmas Avenue near Patterson
Westside	32	Poso Slough at Indiana Ave	541XPSAIA	37.00620	-120.59960	San Joaquin River at Hills Ferry Road/ SJR @ Fremont Ford[1]
Westside	33	Ramona Lake near Fig Avenue	541XROLFA	37.47880	-121.06840	San Joaquin River at Las Palmas Avenue near Patterson
Westside	34	Salt Slough at Lander Ave	541XSSALA	37.24790	-120.85220	San Joaquin River at Hills Ferry Road/ SJR @ Fremont Ford[1]
Westside	35	Salt Slough at Sand Dam	541XSSASD	37.13660	-120.76190	San Joaquin River at Hills Ferry Road/ SJR @ Fremont Ford[1]
Westside	36	Turner Slough at Edminster Road	541XTSAER	37.30410	-120.90080	San Joaquin River at Hills Ferry Road/ SJR @ Fremont Ford[1]

Coalition Region	Tributary Map Key	Tributary Station name	Tributary Station Code	Tributary Latitude	Tributary Longitude	SJR Downstream Monitoring Location
Westside	37	Westley Wasteway near Cox Road	541XWWNCR	37.55820	-121.16370	San Joaquin River at the Maze Boulevard (Highway 132) Bridge

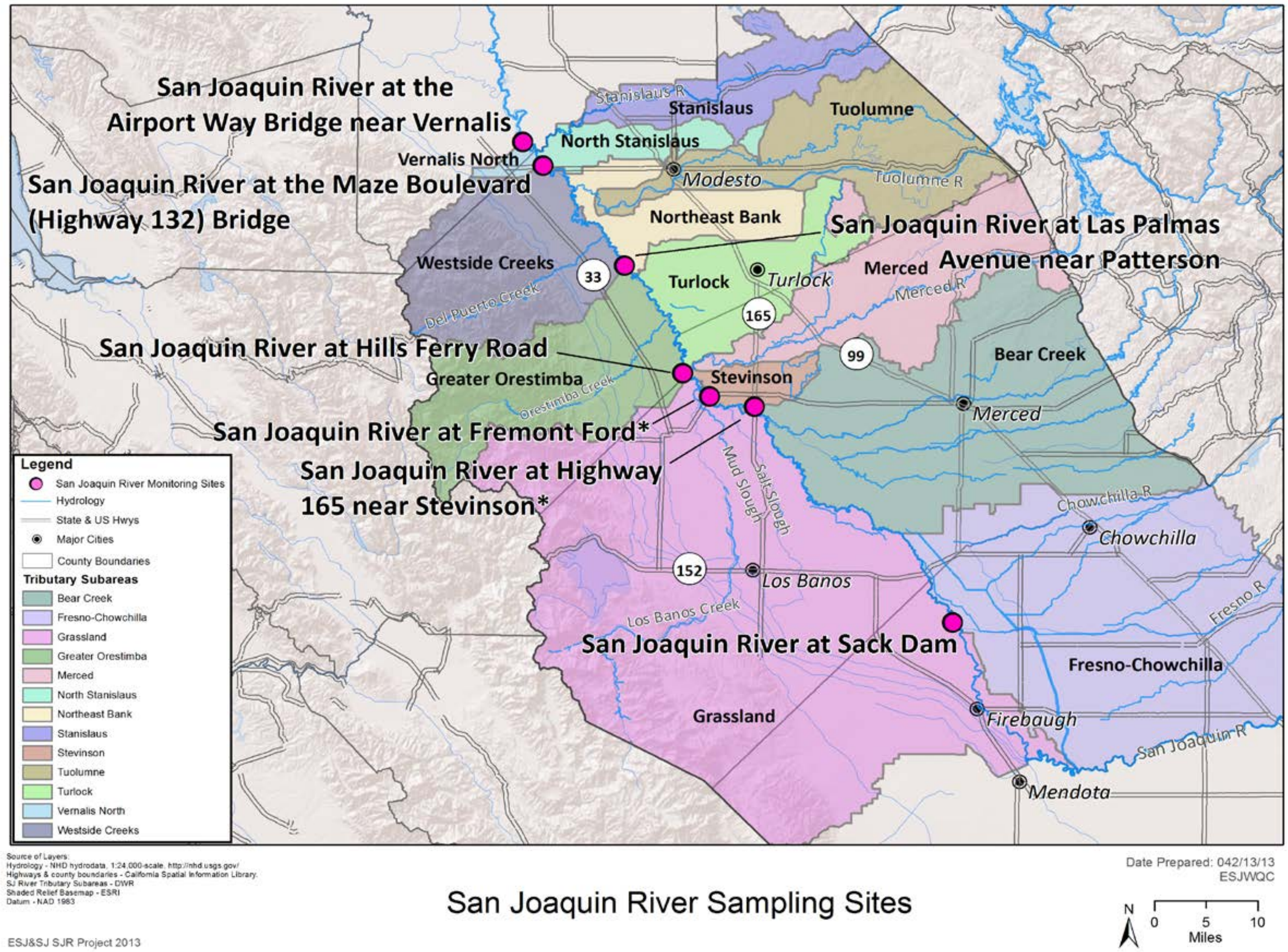
[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

Table 7. San Joaquin River monitoring sites and associated upstream tributaries monitored during the 2012 water year.
Listed in order from upstream to downstream.

Station name	Upstream Tributary Station names
San Joaquin River at Sack Dam	None
San Joaquin River at Highway 165 near Stevinson[1]	All stations listed in the row above and 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
San Joaquin River at Fremont Ford[1]	All stations listed in the rows above and Poso Slough at Indiana Ave, Salt Slough at Lander Ave, Salt Slough at Sand Dam, Turner Slough at Edminster Road
San Joaquin River at Hills Ferry Road	All stations listed in the rows above and Los Banos Creek at China Camp Road, Los Banos Creek at Hwy 140, Mud Slough Upstream of San Luis Drain, Newman Wasteway near Hills Ferry Rd
San Joaquin River at Las Palmas Avenue near Patterson	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, Hilmar Drain @ Central Ave, Levee Drain @ Carpenter Rd, Merced River @ Santa Fe, Prairie Flower Drain @ Crows Landing Rd
San Joaquin River at the Maze Boulevard (Highway 132) Bridge	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
San Joaquin River at the Airport Way Bridge near Vernalis	All stations listed in the rows above and Rodden Creek @ Rodden Rd

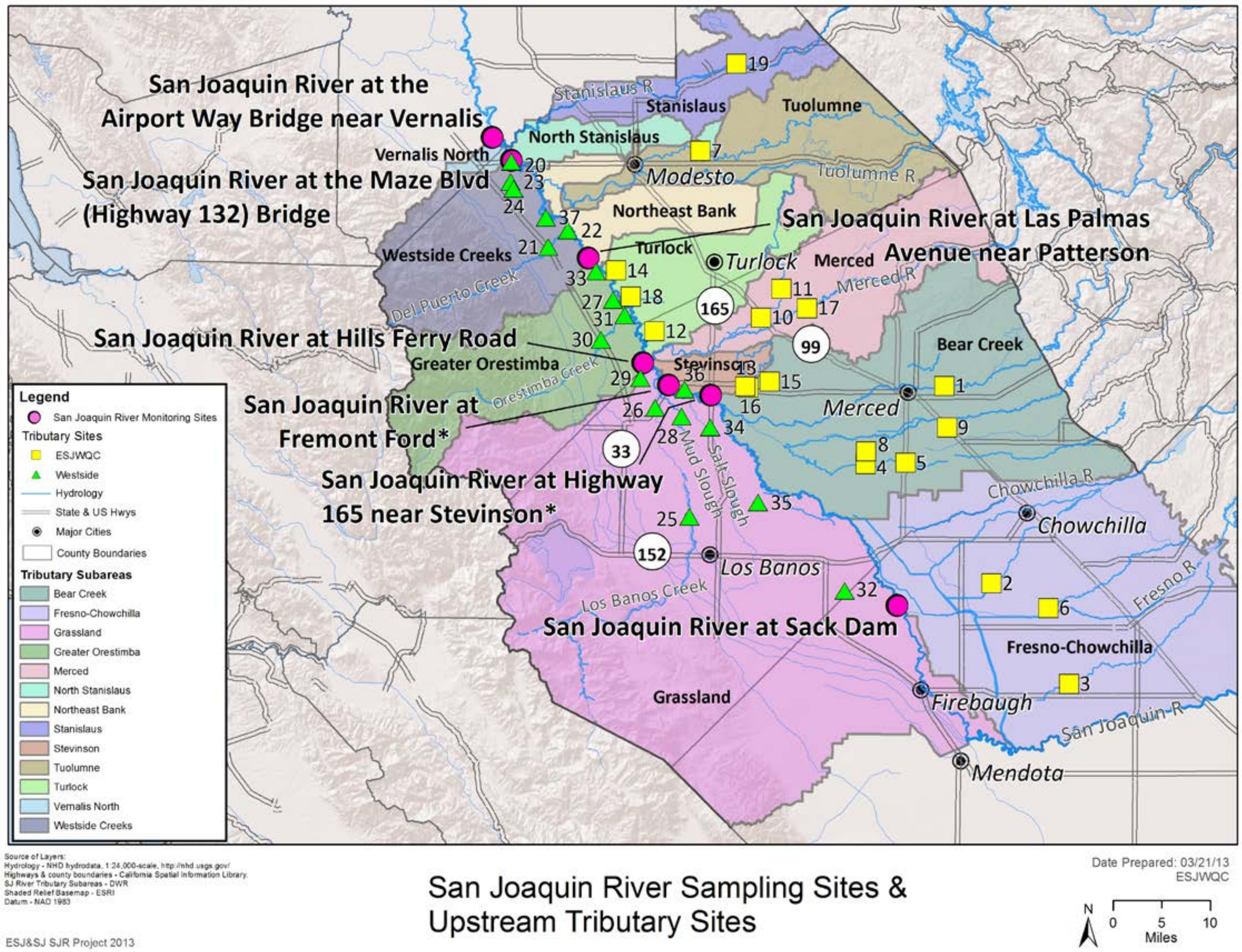
[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

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



* Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

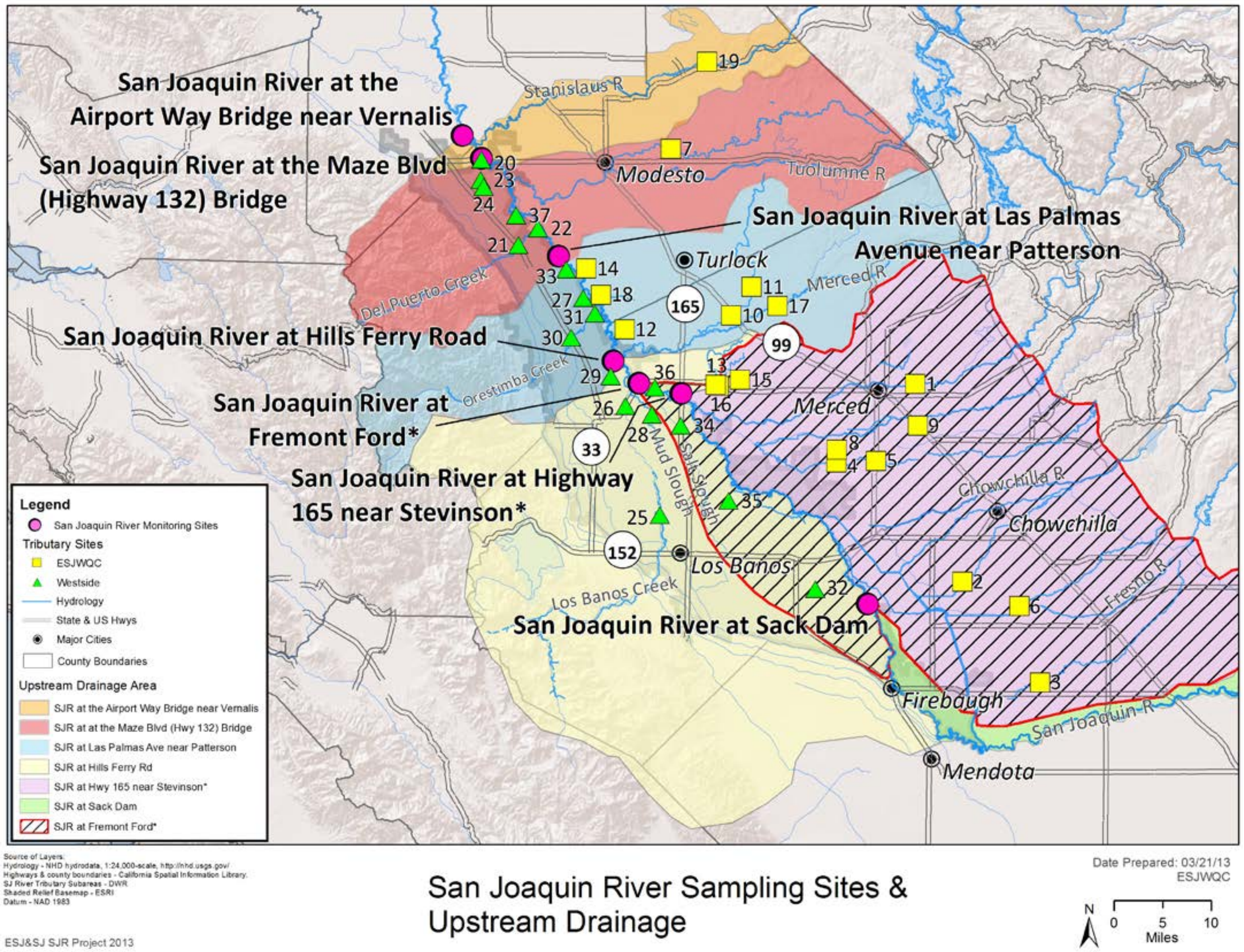
Figure 6. San Joaquin River monitoring sites, associated subareas, and ESJWQC and Westside Coalition tributaries monitored during the 2012 water year. Refer to Table 7 for tributary map key.



* Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

Figure 7. San Joaquin River monitoring sites, associated subwatershed drainage areas (may include multiple subareas), and ESJWQC and Westside Coalition tributaries monitored during the 2012 water year.

Refer to Table 7 for tributary map key.



* Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

The Coalitions reviewed land use acreage based on the United States Department of Agriculture (USDA) cropland data from 2012 to better characterize the upstream drainage area for each of the San Joaquin River monitoring compliance points (Tables 8 and 9). In Table 8, the acreage is tallied two ways: per the immediate upstream drainage of each San Joaquin River site (as shown in Figure 7) and as a cumulative total of the entire drainage to each San Joaquin River site. The immediate upstream drainage to the San Joaquin River at Fremont Ford site is a cumulative total for that site (as shown in Figure 7) and, because its drainage overlaps portions of several subareas, the drainage to the San Joaquin River at Fremont Ford site is not included in the cumulative totals for other compliance monitoring sites. The acreage in Table 9 reflects the immediate upstream drainage of each San Joaquin River site (as shown in Figure 7).

The entire drainage area is estimated to include three million acres. Agricultural land uses include orchard, pasture, rice, row crop, and vineyard. Pasture accounts for 35% of the estimated acreage. Row crops account for a little over 22% of estimated acreage. Orchards occupy approximately 16%, followed by vineyards and rice accounting for 4% and less than 1% of the total estimated acreage, respectively (Table 8).

Table 9 identifies the crop types with the largest acreage within the immediate upstream drainage to each monitoring site on the San Joaquin River. Almond acreage is the top commodity in six of the seven immediate upstream drainages. Alfalfa acreage is within the top three in all immediate upstream drainages. In the upper portion of the lower San Joaquin River watershed, grapes occupy a large portion of acreage whereas various row crops and walnuts are more common in the lower area of the lower San Joaquin River watershed. Corn, cotton, oats, tomatoes, and winter wheat are also all very common in the lower San Joaquin River drainage area.

Figure 7 provides a map of the seven San Joaquin River sites monitored during the 2012 water year and their entire associated upstream drainage area, including upstream tributaries sampled by the Coalitions (refer to the tributary map key in Table 6). Maps of upstream land use of all ESJWQC tributaries can be found in the 2013 AMR (pages 27-31) and of all Westside tributaries in the November 30, 2012 SAMR (pages 14-15).

Table 8. Estimated land use acreage upstream of the San Joaquin River compliance points.
Stations are listed in order of upstream to downstream from left to right. Subwatershed totals reflect only the immediate upstream acreage within the subareas that drains to each San Joaquin River site (Figure 7).

Land Use	San Joaquin River at Sack Dam	San Joaquin River at Highway 165 near Stevinson	San Joaquin River at Hills Ferry Road	San Joaquin River at Las Palmas Avenue near Patterson	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	San Joaquin River at the Airport Way Bridge near Vernalis	San Joaquin River at Fremont Ford[1]
Barren	833	2,277	6,900	4,029	1,525	319	2,779
Developed	3,381	61,202	44,308	35,116	45,453	30,967	67,524
Fallow/Idle Cropland	3,563	23,549	30,122	2,554	2,263	1,404	24,883
Native	959	8,894	174,458	76,616	74,452	5,145	30,803
Open Water	1,126	1,494	16,817	1,979	8,423	2,528	1,884
Orchard	26,561	216,951	45,199	74,001	80,041	36,364	219,711

Land Use	San Joaquin River at Sack Dam	San Joaquin River at Highway 165 near Stevinson	San Joaquin River at Hills Ferry Road	San Joaquin River at Las Palmas Avenue near Patterson	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	San Joaquin River at the Airport Way Bridge near Vernalis	San Joaquin River at Fremont Ford[1]
Pasture	8,146	319,042	316,348	164,131	190,018	52,621	334,595
Rice	0	2,066	2,823	56	346	310	2,183
Row Crop	10,678	211,962	263,245	105,360	46,883	22,230	304,662
Vineyard	12,657	91,168	12,138	13,503	3,711	881	92,322
Estimated Subwatershed Total Acres	**67,904**	**938,607**	**912,357**	**477,345**	**453,115**	**152,771**	**1,081,346**
Estimated Cumulative Total Acres[1]	**67,904**	**1,006,511**	**1,918,868**	**2,396,213**	**2,849,328**	**3,002,098**	**NA**

NA – Not Applicable
[1]Cumulative totals do not include the drainage to the San Joaquin River @ Fremont Ford site. The site was monitored to assess TMDL compliance from November 2011 through February 2012 in place of San Joaquin River at Highway 165 near Stevinson (road construction prevented access to San Joaquin River at Highway 165 near Stevinson). The site is upstream of San Joaquin River at Hills Ferry Rd and downstream of San Joaquin River at Highway 165 near Stevinson but is listed in the furthest right column since acreage is not cumulative.
Source: Acreages estimated from 2012 USDA data.

Table 9. Top ten commodities (based on acreage) upstream of each San Joaquin River sampling site. Stations are listed in order of upstream to downstream from left to right. Commodities are listed in order of largest (first row) to smallest acreage (last row). Drainage reflects the immediate upstream acreage within the subareas that drains to each San Joaquin River site (Figure 7).

San Joaquin River at Sack Dam	San Joaquin River at Highway 165 near Stevinson	San Joaquin River at Fremont Ford	San Joaquin River at Hills Ferry Road	San Joaquin River at Las Palmas Avenue near Patterson	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	San Joaquin River at the Airport Way Bridge near Vernalis
Almonds	Almonds	Almonds	Cotton	Almonds	Almonds	Almonds
Grapes	Grapes	Alfalfa	Alfalfa	Oats/ Corn	Alfalfa	Alfalfa
Alfalfa	Alfalfa	Grapes	Almonds	Alfalfa	Other Hay/ Non Alfalfa	Walnuts
Pistachios	Winter Wheat	Cotton	Tomatoes	Oats	Walnuts	Other Hay/ Non Alfalfa
Winter Wheat	Pistachios	Winter Wheat	Winter Wheat	Grapes	Tomatoes	Oats
Tomatoes	Oats	Pistachios	Oats/Corn	Other Hay/ Non Alfalfa	Oats	Clover/ Wildflowers
Corn	Winter Wheat/ Corn	Tomatoes	Grapes	Tomatoes	Oats/ Corn	Winter Wheat
Oats	Cotton	Corn	Oats	Winter Wheat/ Corn	Winter Wheat	Oats/ Corn
Cotton	Corn	Oats	Corn	Corn	Grapes	Grapes
Olives	Tomatoes	Winter Wheat/ Corn	Other Hay/ Non Alfalfa	Winter Wheat	Clover/ Wildflowers	Winter Wheat/ Corn

Source: Acreages estimated from 2012 USDA data.

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 2012 water year included very few significant storms and has been classified as a dry-hydraulic year type. Measurable precipitation first occurred in the second half of October with periodic storms occurring throughout the winter months interrupted by relatively long dry periods (Figures 8 and 9).

None of the rain events produced significant rainfall-induced runoff across the entire lower San Joaquin River drainage area, and storm event specific sample collections were not made during the report period in the Westside Coalition region. Precipitation occurred between March 13 and 14, 2012 within the ESJWQC region, and the samples collected on March 15, 2012 in the ESJWQC were considered representative of a storm event. Monthly and quarterly samples were collected in accordance with the monitoring plan schedule. See Sample Details section, Table 14.

Figure 8. Precipitation history from October 1, 2011 through March 31, 2012.
Data recorded at CIMIS stations in Modesto, Merced, Los Banos and Patterson, CA.

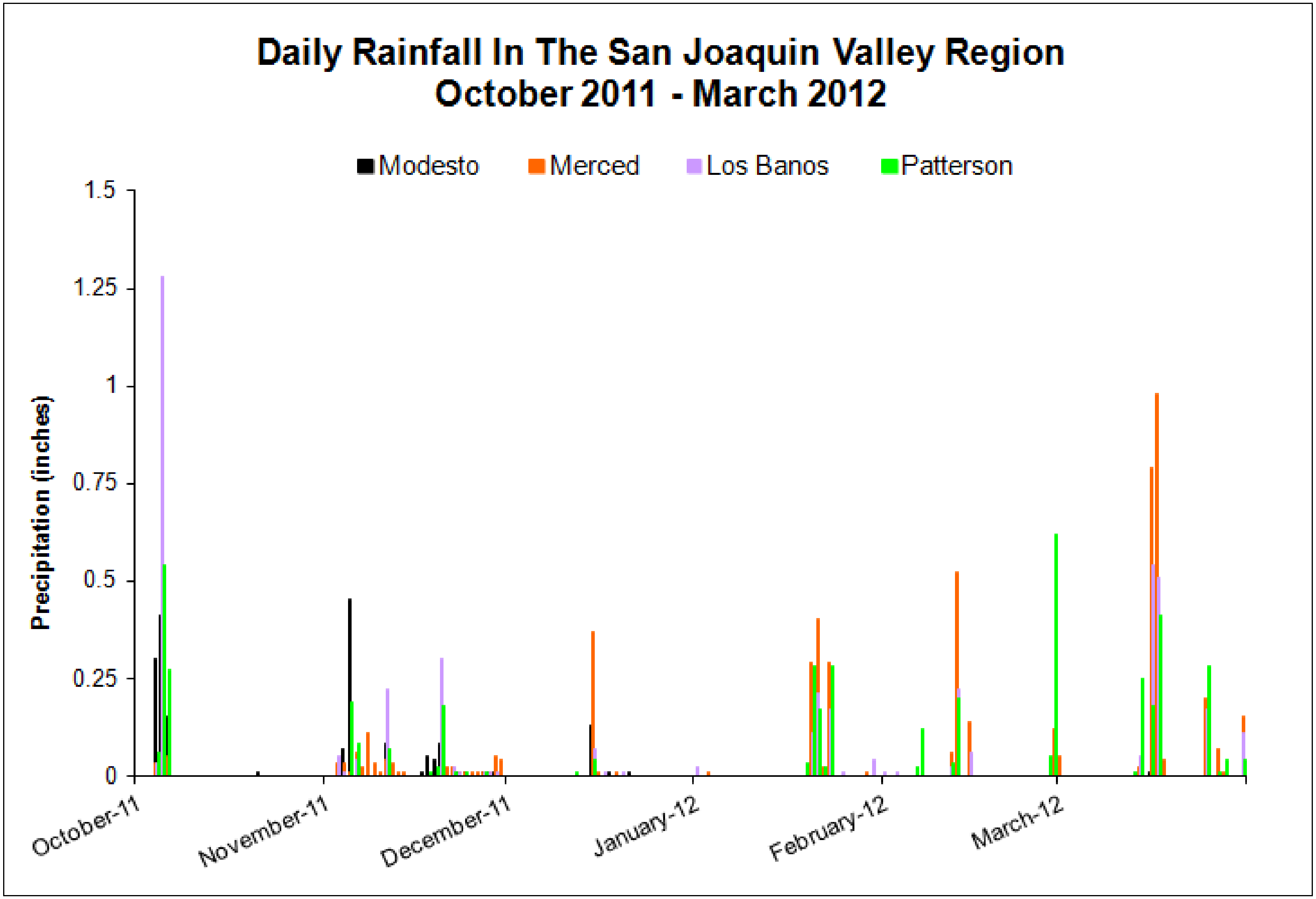
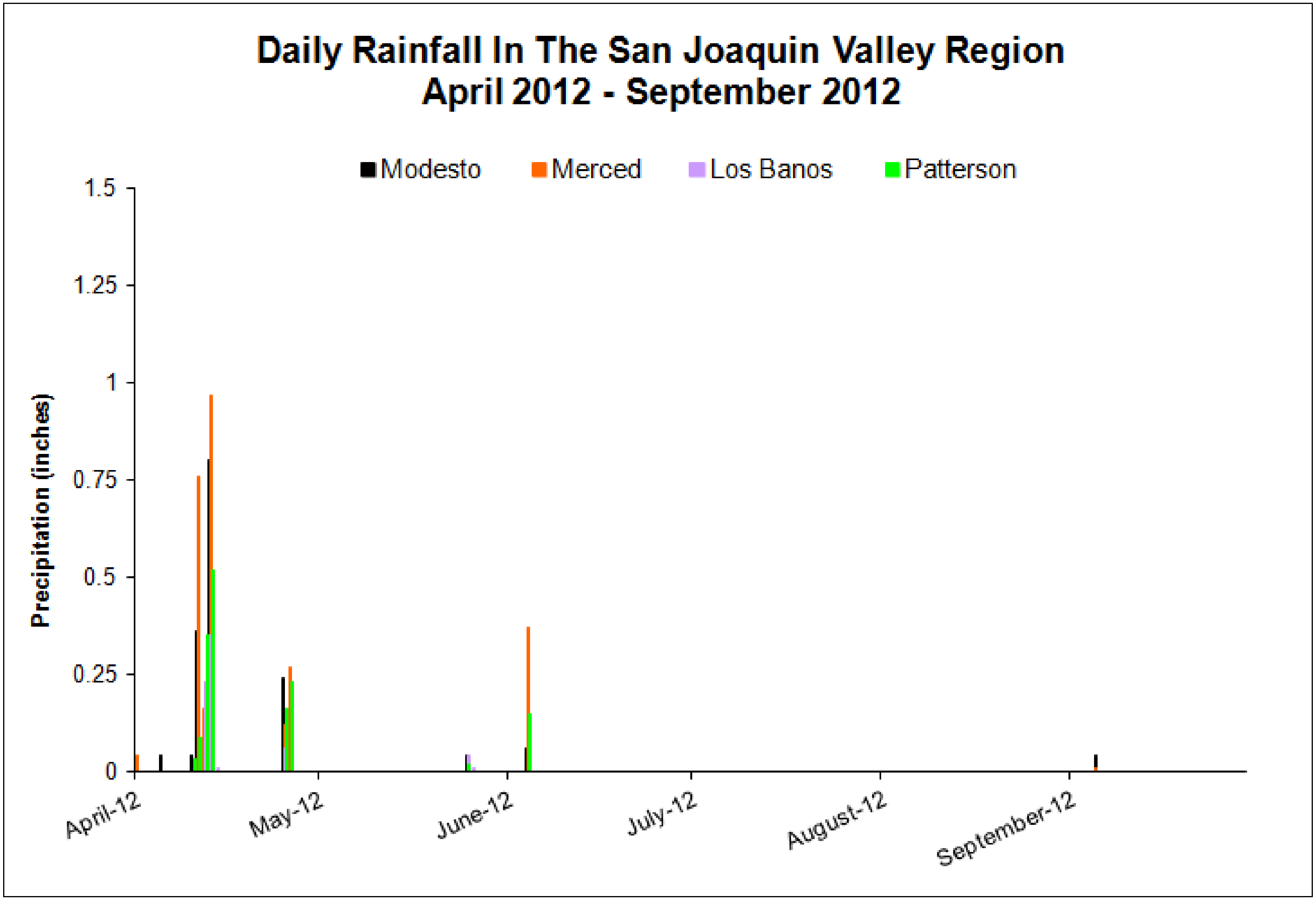


Figure 9. Precipitation history from April 1 through September 30, 2012.
Data recorded at CIMIS stations in Modesto, Merced, Los Banos and Patterson, CA.



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 methods were performed at the San Joaquin River at the Airport Way Bridge near Vernalis, San Joaquin River at Hills Ferry Road and San Joaquin River at the Maze Boulevard (Highway 132) Bridge as outlined in the standard operating procedures (SOPs) provided in the ESJWQC QAPP (amendment submitted on February 15, 2013, Appendices I-X, pages 63-98). The 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 San Joaquin River at Fremont Ford, San Joaquin River at Highway 165 near Stevinson, San Joaquin River at Las Palmas Avenue near Patterson and San Joaquin River at Sack Dam according to the field sampling procedures and methods described in the Westside Coalition QAPP (draft submitted February 13, 2013, pages 24-29). 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.

Samples from both Coalitions were analyzed for chlorpyrifos and diazinon by APPL Inc. according to EPA 8141A. The SOPs for EPA 8141A were submitted with both Coalitions' QAPPs as Appendix XII to the ESJWQC QAPP (pages 133-155) and with the Westside Coalition QAPP (Appendix D, Attachment 7) .

In addition to San Joaquin River monitoring data, both Coalitions use tributary monitoring data as applicable to assess compliance with the TMDL program. The ESJWQC performed field sampling procedures and methods, including discharge measurement, at tributaries as outlined in the SOPs provided with the ESJWQC QAPP (Appendices I-X, pages 63-98); no deviations from these procedures occurred during the monitoring. The Westside conducted field sampling procedures and methods, including discharge measurement, at tributaries as described in the Westside Coalition QAPP (Appendix B); no deviations from these procedures occurred during the monitoring. The laboratory procedures used to analyze samples collected from ESJWQC tributaries are contained in Appendices XI-XXXIII of the ESJWQC QAPP (pages 108-394). The laboratory procedures used to analyze samples collected from Westside Coalition tributaries are contained in the Westside Coalition QAPP (Appendix D, Attachment 7).

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 Quality Control (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/Professional Plus
Temperature	YSI Model 556/Professional Plus
pH	YSI Model 556/Professional Plus
Specific Conductance	YSI Model 556/Professional Plus
Discharge	DWR or USGS Gauge/CDEC Website

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

Table 12. Site specific discharge methods.

Responsible Coalition	Station name	Discharge Method	Gauge
Westside	San Joaquin River at Sack Dam	DWR Gauge	CDEC San Joaquin River near Dos Palos (SDP)
Westside	San Joaquin River at Highway 165 near Stevinson[1]	DWR Gauge	CDEC San Joaquin River near Stevinson (SJS)[2]
Westside	San Joaquin River at Fremont Ford[1]	USGS Gauge	CDEC San Joaquin River at Fremont Ford Bridge (FFB)
ESJWQC	San Joaquin River at Hills Ferry Road	USGS and DWR Gauge	CDEC San Joaquin River Near Newman (NEW)
Westside	San Joaquin River at Las Palmas Avenue near Patterson	DWR Gauge	CDEC San Joaquin River near Patterson (SJP)
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	DWR Gauge	CDEC San Joaquin River at Maze Rd Bridge (MRB)
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	USGS and DWR Gauge	CDEC San Joaquin River near Vernalis (VNS)

[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.
[2] Data for this gauge station is unavailable from March 5, 2010 through December 6, 2011. Station SMN (San Joaquin River above Merced River) is used where SJS data are not available.
DWR – Department of Water Resources
USGS – United States Geological Survey

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 2011 through September 2012.

Original Chain of Custody (COC) forms were scanned and converted to pdf. Copies of the COCs are provided in Appendix I. The 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 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 Precision, Accuracy and Completeness section.

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 2012 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.

Results from ESJWQC and Westside Coalition tributary monitoring and outcomes of each Coalitions' management plan strategies are discussed in this report as they pertain to assessing compliance with the chlorpyrifos and diazinon TMDL. Details of ESJWQC 2011 and 2012 tributary monitoring results can be found in the ESJWQC AMRs submitted March 1, 2012 (pages 49-137) and March 1, 2013 (pages 66-139). The status and most recent results of the ESJWQC management plan strategy were reported in the MPUR submitted April 1, 2013. Westside Coalition tributary monitoring results from October 2011 through August 2012 and management plan status and activities during this period were reported in the Westside Coalition SAMRs submitted June 15 and November 30, 2012 (Attachment 6 in both reports). Westside Coalition tributary monitoring results from September 2012 will be reported in the Westside Coalition SAMR to be submitted June 15, 2013.

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 2012 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. The 2012 water year was a dry year and none of the storms produced sufficient precipitation to cause substantial runoff across the entire lower San Joaquin River watershed. The Westside Coalition collected samples in accordance with its standard monitoring schedule during the winter months, which included a sample event on March 13, 2012 (San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near Patterson). As a result of a weak storm in March 2012, the ESJWQC collected samples during the Quarter1/Storm Event on March 15, 2012 (San Joaquin River at the Maze Boulevard (Highway 132) Bridge, San Joaquin River at Hills Ferry Road, and San Joaquin River at the Airport Way Bridge near Vernalis). This sample set is most representative of a storm event for the 2012 water year. Samples were also collected from all six monitoring compliance points during October 2011 and May through August 2012. The Westside collected monthly samples from the San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near Patterson sites.

Table 15 lists the 2012 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 2012 water year.

Responsible Coalition	Station Name[1]	Event Group	Sample Date	Sample Time	Failure Reason
Westside	San Joaquin River at Highway 165 near Stevinson	Qrt4	11-Oct-11	NA	Unable to access due to road construction
ESJWQC	San Joaquin River at Hills Ferry Road	Qrt4	11-Oct-11	14:30	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Qrt4	11-Oct-11	15:30	None
Westside	San Joaquin River at Sack Dam	Qrt4	11-Oct-11	14:45	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Qrt4	11-Oct-11	8:00	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Qrt4	11-Oct-11	8:30	None
Westside	San Joaquin River at Fremont Ford	NonIrr-Event85	8-Nov-11	11:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	NonIrr-Event85	8-Nov-11	14:30	None
Westside	San Joaquin River at Sack Dam	NonIrr-Event85	8-Nov-11	15:00	None
Westside	San Joaquin River at Fremont Ford	NonIrr-Event86	13-Dec-11	11:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	NonIrr-Event86	13-Dec-11	15:00	None
Westside	San Joaquin River at Sack Dam	NonIrr-Event86	13-Dec-11	15:15	None
Westside	San Joaquin River at Fremont Ford	NonIrr-Event87	10-Jan-12	11:00	None
Westside	San Joaquin River at Sack Dam	NonIrr-Event87	10-Jan-12	15:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	NonIrr-Event87	11-Jan-12	14:30	None
Westside	San Joaquin River at Fremont Ford	NonIrr-Event88	14-Feb-12	10:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	NonIrr-Event88	14-Feb-12	12:00	None
Westside	San Joaquin River at Sack Dam	NonIrr-Event88	14-Feb-12	14:30	None
Westside	San Joaquin River at Highway 165 near Stevinson	Qrt1	13-Mar-12	10:45	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Qrt1	13-Mar-12	17:00	None
Westside	San Joaquin River at Sack Dam	Qrt1	13-Mar-12	14:15	None

Responsible Coalition	Station name[1]	Event Group	Sample Date	Sample Time	Failure Reason
ESJWQC	San Joaquin River at Hills Ferry Road	Qrt1/Storm Event	15-Mar-12	13:30	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Qrt1/ Storm Event	15-Mar-12	16:20	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Qrt1/ Storm Event	15-Mar-12	15:00	None
Westside	San Joaquin River at Highway 165 near Stevinson	Irr-Event90	10-Apr-12	11:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Irr-Event90	10-Apr-12	17:00	None
Westside	San Joaquin River at Sack Dam	Irr-Event90	10-Apr-12	14:50	None
Westside	San Joaquin River at Highway 165 near Stevinson	Irrigation 1	8-May-12	11:00	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Irrigation 1	8-May-12	15:30	None
Westside	San Joaquin River at Sack Dam	Irrigation 1	8-May-12	14:30	None
ESJWQC	San Joaquin River at Hills Ferry Road	Irrigation 1	9-May-12	13:30	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Irrigation 1	9-May-12	11:40	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Irrigation 1	9-May-12	12:20	None
Westside	San Joaquin River at Highway 165 near Stevinson	Irrigation 2	12-Jun-12	10:30	None
ESJWQC	San Joaquin River at Hills Ferry Road	Irrigation 2	12-Jun-12	13:10	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Irrigation 2	12-Jun-12	16:00	None
Westside	San Joaquin River at Sack Dam	Irrigation 2	12-Jun-12	14:30	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Irrigation 2	12-Jun-12	11:10	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Irrigation 2	12-Jun-12	11:50	None
Westside	San Joaquin River at Highway 165 near Stevinson	Irrigation 3	10-Jul-12	11:00	None
ESJWQC	San Joaquin River at Hills Ferry Road	Irrigation 3	10-Jul-12	12:50	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Irrigation 3	10-Jul-12	16:00	None
Westside	San Joaquin River at Sack Dam	Irrigation 3	10-Jul-12	14:40	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Irrigation 3	10-Jul-12	11:10	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Irrigation 3	10-Jul-12	11:40	None
Westside	San Joaquin River at Highway 165 near Stevinson	Irrigation 4	14-Aug-12	10:45	None
ESJWQC	San Joaquin River at Hills Ferry Road	Irrigation 4	14-Aug-12	13:40	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	Irrigation 4	14-Aug-12	17:00	None
Westside	San Joaquin River at Sack Dam	Irrigation 4	14-Aug-12	14:25	None
ESJWQC	San Joaquin River at the Airport Way Bridge near Vernalis	Irrigation 4	14-Aug-12	12:20	None
ESJWQC	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Irrigation 4	14-Aug-12	11:40	None
Westside	San Joaquin River at Highway 165 near Stevinson	NonIrr-Event95	18-Sep-12	11:30	None
Westside	San Joaquin River at Las Palmas Avenue near Patterson	NonIrr-Event95	18-Sep-12	14:30	None
Westside	San Joaquin River at Sack Dam	NonIrr-Event95	18-Sep-12	14:00	None

NonIrr – Non irrigation
Irr – Irrigation
[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

Table 15. Monitoring dates of San Joaquin River sites and upstream tributaries during 2012 water year. "X" indicates sampling occurred.

Sample Date	San Joaquin River							Tributaries	
	at Sack Dam (WC)	at Highway 165 Near Stevenson (WC)[1]	at Fremont Ford (WC)[1]	at Hills Ferry Road (ES)	at Las Palmas Avenue Near Paterson (WC)	at the Maze Boulevard (Highway 132) Bridge (ES)	at the Airport Way Bridge near Vernalis (ES)	ESJWQC	Westside Coalition
11-Oct-11	X			X	X	X	X	X	X
8-Nov-11	X		X		X			X	X
6-Dec-11								X	
13-Dec-11	X		X		X				X
10-Jan-12	X		X					X	X
11-Jan-12					X				X
7-Feb-12								X	
14-Feb-12	X		X		X				X
6-Mar-12								X	

Sample Date	San Joaquin River							Tributaries	
	at Sack Dam (WC)	at Highway 165 Near Stevenson (WC)[1]	at Fremont Ford (WC)[1]	at Hills Ferry Road (ES)	at Las Palmas Avenue Near Paterson (WC)	at the Maze Boulevard (Highway 132) Bridge (ES)	at the Airport Way Bridge near Vernalis (ES)	ESJWQC	Westside Coalition
13-Mar-12	X	X			X				X
15-Mar-12				X		X	X		
10-Apr-12	X	X			X				X
12-Apr-12								X	
8-May-12	X	X			X				X
9-May-12				X		X	X	X	
12-Jun-12	X	X		X	X	X	X	X	X
10-Jul-12	X	X		X	X	X	X	X	X
14-Aug-12	X	X		X	X	X	X	X	X
11-Sep-12								X	
18-Sep-12	X	X			X				X

WC – Westside Coalition
ES – ESJWQC
[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

PRECISION, ACCURACY AND COMPLETENESS

An assessment of precision, accuracy, and completeness is tabulated in Tables 16 through 18. All data are acceptable and useable. In a few instances, some data quality objectives were not met, but this does not affect the usability of data.

All results are tabulated in Appendix II (Monitoring Results) and Appendix III (Field and Laboratory Quality Assurance (QA) Results). Each result is flagged if it does not meet data quality objectives (acceptability criteria) using Surface Water Ambient Monitoring Program (SWAMP) codes. Results are found in the SWAMP comparable database managed by the Central Valley Regional Data Center (CV RDC). The Coalitions work with the CV RDC to ensure all data remain SWAMP comparable and all data are suitable to be uploaded to the California Environmental Data Exchange Network (CEDEN). A copy of the SWAMP comparable database is submitted to the Regional Board with the hardcopy of this report. Some Westside Coalition data have not yet been entered to the database; these data are submitted in Microsoft Office Excel spreadsheets along with the hard copy of this report. The database and spreadsheets include all data from October 2011 through September 2012 sampling.

COMPLETENESS

Completeness is assessed on three levels: field and transport completeness, analytical completeness, and batch completeness. Field and transport completeness assesses how many of the scheduled samples were collected and sent for analysis. Completeness may be less than 100% for field and transport for reasons such as bottle breakage during transportation or inability to access a site. Analytical completeness assesses the number of samples that arrived at a laboratory and were analyzed. Analytical completeness may be less than 100% for various reasons including bottle breakage while the sample was stored at the laboratory or laboratory error resulting in an analysis not being performed. Batch completeness assesses whether chemistry batches have all required laboratory Quality Control (QC). For batch completeness, the number of batches with complete laboratory quality control is compared to the overall number of batches. Table 16 includes an evaluation of completeness for the various levels.

Field and Transport Completeness

Field and transport completeness is calculated by dividing the number of samples collected by the number of samples scheduled to be collected for each analyte. All sites and constituents were monitored as scheduled during the 2012 water year, with the single exception of monitoring at the San Joaquin River at Highway 165 near Stevinson site during the October 2011 event (98% completeness). As discussed in the previous section, a Caltrans retrofit project on the Lander Avenue bridge at the San Joaquin River began in October 2011 and prevented safe access to the San Joaquin River at Highway 165 near Stevinson site at that time. The Westside Coalition monitored and assessed TMDL compliance at the San Joaquin River at Fremont Ford site in place of the San Joaquin River at Highway 165 near Stevinson compliance location for the duration of the retrofit project, from November 2011 through

February 2012. Sampling resumed at the San Joaquin River at Highway 165 near Stevinson site in March 2012. Therefore, the San Joaquin River at Highway 165 near Stevinson site was sampled seven times and the San Joaquin River at Fremont Ford site was sampled four times. Monitoring occurred at the San Joaquin River at Sack Dam and San Joaquin River at Las Palmas Avenue near Patterson sites 12 times each. The San Joaquin River at the Maze Boulevard (Highway 132) Bridge, San Joaquin River at the Airport Way Bridge near Vernalis and San Joaquin River at Hills Ferry Road sites were sampled six times each.

The ESJWQC did not collect a field blank during the March 15, 2013 event. Chlorpyrifos and diazinon were not detected in the environmental and field duplicate samples from the March 15, 2013 event. Overall, field blanks comprised 19% of the samples collected during the 2012 water year by the ESJWQC (Table 16). Field parameter measurements, including DO, discharge, pH, SC and water temperature, were taken at each site during all sampling events. Dissolved oxygen, discharge, pH, SC and water temperature were each measured 53 times. Field parameters were not measured at the San Joaquin River at Highway 165 near Stevinson site during the October 2011 event as the site was not accessible resulting in a field parameter completeness of 98% (Table 16).

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 QC samples. The Westside Coalition and ESJWQC use the same sampling methods to collect samples from the San Joaquin River as they use to collect samples from tributaries in their respective regions (field sampling SOPs included in Appendix I of the San Joaquin River Chlorpyrifos and Diazinon 2010 AMR). Field and lab QC samples collected from tributaries are used as field and lab QC samples for samples collected from the San Joaquin River so long as all samples are collected on the same day during the same sampling event.

Analytical Completeness

All samples collected were preserved and analyzed, resulting in 100% analytical completeness (Table 16).

A field duplicate and field blank were collected by each Coalition such that there is a set of QC samples associated with each Coalition's three sites. Two field duplicates and two field blanks were collected during the sampling events which included all six San Joaquin River sites, with the exception of the ESJWQC March 2012 samples (field blank not collected). Field blanks compromised over 19% of the total samples analyzed, and field duplicates comprised over 20% of the total samples analyzed (Table 16).

Table 16. The ESJWQC and Westside Coalition sample counts, field QC counts, and percentages.

Method	Analyte	Env. Samples Scheduled (#)	Env. Samples Collected (#)	Field and Transport Completeness (%)	Env. Samples Analyzed (#)	Env. Samples Completeness (%)	Env. and Field QC Samples (#)	Field Blanks (#)	Field Blanks (%)	Field Dup. (#)	Field Dup. (%)
EPA 8141A	Chlorpyrifos	54	53	98%	53	100%	89	17	19.3%	18	20.2%

Method	Analyte	Env. Samples Scheduled (#)	Env. Samples Collected (#)	Field and Transport Completeness (%)	Env. Samples Analyzed (#)	Env. Samples Completeness (%)	Env. and Field QC Samples (#)	Field Blanks (#)	Field Blanks (%)	Field Dup. (#)	Field Dup. (%)
OP											
EPA 8141A OP	Diazinon	54	53	98%	53	100%	89	17	19.3%	18	20.2%
USGS R2Cross streamflow	Discharge, cfs	54	53	98%	NA	NA	NA	NA	NA	NA	NA
SM 4500-O	DO, mg/L	54	53	98%	NA	NA	NA	NA	NA	NA	NA
EPA 150.1	pH	54	53	98%	NA	NA	NA	NA	NA	NA	NA
EPA 120.1	SC, µS/cm	54	53	98%	NA	NA	NA	NA	NA	NA	NA
SM 2550	Water Temperature, Deg C	54	53	98%	NA	NA	NA	NA	NA	NA	NA
	Total	**378**	**371**	**98%**	**106**	**100%**	**178**	**34**	**19.3%**	**36**	**20.2%**

DO – Dissolved Oxygen

SC – Specific Conductivity

Batch Completeness

All chemistry batches were reviewed for Quality Assurance/Control (QA/QC) completeness. A complete batch must have a minimum of one laboratory blank (method blank), one laboratory duplicate, one laboratory control spike (LCS) and one matrix spike (MS). Chemistry batch completeness was 100%.

Samples collected by the ESJWQC as part of the MRPP are recorded in the CV RDC database under a different project than the samples collected to be in compliance with the San Joaquin River Chlorpyrifos and Diazinon TMDL. If a sample collected from an ESJWQC tributary site is used as a MS for samples collected from the San Joaquin River, the MS is labeled as a non-project (NONPJ) MS. All NONPJ MS samples listed in Appendix III were collected in ESJWQC tributaries and can be used to evaluate the accuracy and/or precision of a lab batch containing samples collected by the ESJWQC. San Joaquin River samples collected by the Westside Coalition are included as part of the Westside Coalitions ILRP compliance monitoring and are grouped as a single project.

HOLD TIME COMPLIANCE

Hold times for all chemistry analyses were met; hold time compliance for all chemistry analysis was 100% (Table 17).

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

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Chlorpyrifos	7 days	131	131	100%
EPA 8141A OP	Diazinon	7 days	131	131	100%
		Total	**262**	**262**	**100%**

SUMMARY OF PRECISION AND ACCURACY

A review of the number of samples analyzed and the percentage of samples per analyte that meets acceptability criteria are listed in Table 18. Precision and accuracy criteria were met for 99% of the samples for all analytes and all criteria; all data are accepted and useable.

One hundred percent of field blanks and field duplicates met acceptability criteria.

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

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 99% of all samples analyzed (Table 18). From the May 2012 event, the tributylphosphate and triphenyl phosphate surrogates ran with the ESJWQC field duplicate sample and San Joaquin River at the Airport Way Bridge near Vernalis sample recovered below the acceptance limit (Percent Recovery (PR) of 60-150 and 56-129, respectively). The triphenyl phosphate surrogate ran with the ESJWQC NONPJ environmental sample associated with the May 2012 MS sample recovered above the acceptance limit. The laboratory re-extracted and re-analyzed all samples outside of the seven-day hold time; surrogates recovered within limits and all environmental sample results were confirmed. The original results were recorded in the database since the re-analysis occurred outside of hold time. Also from the May 2012 event, the tributylphosphate and triphenyl phosphate surrogates ran with the San Joaquin River at Las Palmas Avenue near Patterson samples recovered below the acceptable limits; samples were re-analyzed within hold time and both surrogates recovered within limits. The surrogates that recovered outside of acceptability criteria and the associated environmental samples were flagged accordingly.

Matrix spikes and LCSs were performed for each batch to assess accuracy and possible matrix interference. Ninety-seven percent of all MS samples analyzed recovered within acceptable criteria. Diazinon MS samples met 100% acceptable criteria, and 95% (36 of 38) of chlorpyrifos MS samples met the acceptance limits (Table 18). A single MS sample associated with the February 2012 Westside Coalition samples and a single NONPJ MS sample associated with the May 2012 ESJWQC samples recovered above the QC limit. In both instances, the associated matrix spike duplicates (MSD) and LCS samples recovered within the QC limit, and the data are acceptable. Ninety-nine percent of all LCS samples analyzed recovered within acceptable criteria. Diazinon LCS samples met 100% acceptable criteria, and 98% (44 of 45) of chlorpyrifos LCS samples met acceptable criteria (Table 18). A single laboratory control spike duplicate (LCSD) sample associated with the April 2012 Westside Coalition samples exceeded the QC limit. The associated LCS sample recovered within the QC limit, and the data are acceptable.

Laboratory precision assessed by the relative percent difference (RPD) of laboratory duplicates met acceptability criteria in 100% of MSDs and 100% of LCSDs samples (Table 18).

Table 18. The ESJWQC and Westside Coalition summary of QA/QC 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	31	31	100%
Lab Blank	EPA 8141A OP	Diazinon	<RL	31	31	100%
			Lab Blank Total	**62**	**62**	**100%**
Surrogate	EPA 8141A OP	Tributylphosphate (Surrogate)	PR 60-150	209	207	99%
Surrogate	EPA 8141A OP	Triphenyl phosphate (Surrogate)	PR 56-129	209	206	99%
			Surrogate Total	**418**	**413**	**99%**
MS and MSD	EPA 8141A OP	Chlorpyrifos	PR 61-125	38	36	95%
MS and MSD	EPA 8141A OP	Diazinon	PR 57-130	38	38	100%
			MS Total	**76**	**74**	**97%**
MSD pairs	EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	19	19	100%
MSD pairs	EPA 8141A OP	Diazinon	RPD ≤ 25	19	19	100%
			MSD Total	**38**	**38**	**100%**
LCS and LCSD	EPA 8141A OP	Chlorpyrifos	PR 61-125	45	44	98%
LCS and LCSD	EPA 8141A OP	Diazinon	PR 57-130	45	45	100%
			LCS Total	**90**	**89**	**99%**
LCSD pairs	EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	14	14	100%
LCSD pairs	EPA 8141A OP	Diazinon	RPD ≤ 25	14	14	100%
			LCSD Total	**28**	**28**	**100%**

Corrective Actions

Corrective actions were performed by the laboratories as outlined in the ESJWQC QAPP (submitted on February 15, 2013) and in the Westside Coalition QAPP (draft submitted February 13, 2013) for QA/QC results that did not meet acceptance criteria for the 2012 water year. The necessary corrective actions are listed in Table 15 and Table 16 of the ESJWQC QAPP (pages 46-51) and in Table B-2a and B-2b of the Westside Coalition QAPP (pages 39-40). If corrective actions occurred (e.g. reanalysis), details are included in the above sections and summarized below.

During the March 15, 2013 monitoring event, the ESJWQC did not collect a field blank due to an oversight by the sampling crew. The QA Officer reviewed with the sampling crew the current ESJWQC QAPP and relevant SOPs; samplers are aware a field blank must be collected during each project sampling event. Chlorpyrifos and diazinon were not detected in the environmental and field duplicate samples from the March 15, 2013 event indicating no field contamination.

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 the six compliance points in the San Joaquin River during the 2012 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 and outreach) 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 (Monitoring Objectives and Design section) identifies the WQOs for chlorpyrifos and diazinon (0.015 µg/L and 0.10 µg/L, respectively). Chlorpyrifos and diazinon were not detected in any samples collected from the San Joaquin River during the 2012 water year; therefore, no exceedances of the WQOs for chlorpyrifos or diazinon occurred. 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 San Joaquin River sites during the 2012 water year 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 in compliance with the San Joaquin River loading capacity is tallied for each compliance location in relation to the number of samples collected (Table 19). The Basin Plan Amendment required compliance with the loading capacity for the chlorpyrifos and diazinon TMDL in the lower San Joaquin River by December 1, 2010. Since the compliance date, all samples collected by the ESJWQC and Westside Coalition from the San Joaquin River have been in compliance with load capacity.

Prior to the compliance date, monitoring results indicate 13 samples collected from the compliance sampling locations in the San Joaquin River were out of compliance with the loading capacity (Table 19). These results are from the Westside Coalition ILRP monitoring program and from the monitoring conducted by the Regional Board to support the development and implementation of the chlorpyrifos and diazinon TMDL in the Lower San Joaquin River (Organophosphate TMDL Monitoring for the San Joaquin River (Region 5) project). Ninety-three percent of the samples collected from the two projects were in compliance with the loading capacity.

Overall, 293 samples have been collected from the San Joaquin River compliance points since July 2004, and 95% have been compliant with the load capacity (Table 19).

Table 19. Tally of chlorpyrifos and diazinon TMDL load capacity compliance per each of the six San Joaquin River stations prior to and since San Joaquin River chlorpyrifos and diazinon TMDL compliance date (Dec. 1, 2010).

Station name	Sample Dates	Compliant	Out of Compliance	Total Samples Collected	Percent Compliant
After TMDL Compliance Date (After Dec. 1, 2010)					
San Joaquin River at Sack Dam	Dec 2010 - Sep 2012	21	0	21	100%
San Joaquin River at Highway 165 near Stevinson[1]	Dec 2010 - Sep 2012	18	0	18	100%
San Joaquin River at Fremont Ford[1]	Nov 2011 - Feb 2012	4	0	4	100%
San Joaquin River at Hills Ferry Road	Dec 2010 - Sep 2012	9	0	9	100%
San Joaquin River at Las Palmas Avenue near Patterson	Dec 2010 - Sep 2012	22	0	22	100%
San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Dec 2010 - Sep 2012	9	0	9	100%
San Joaquin River at the Airport Way Bridge near Vernalis	Dec 2010 - Sep 2012	9	0	9	100%
Prior to TMDL Compliance Date (Before Dec. 1, 2010)[2]					
San Joaquin River at Sack Dam	Jul 2004 - Nov 2010	37	3	40	93%
San Joaquin River at Highway 165 near Stevinson	Jul 2004 - Nov 2010	82	2	84	98%
San Joaquin River at Hills Ferry Road	Mar 2010 - Oct 2010	4	0	4	100%
San Joaquin River at Las Palmas Avenue near Patterson	Apr 2008 - Nov 2010	28	8	36	78%
San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Mar 2010 - Oct 2010	4	0	4	100%

STATION NAME	SAMPLE DATES	COMPLIANT	OUT OF COMPLIANCE	TOTAL SAMPLES COLLECTED	PERCENT COMPLIANT
San Joaquin River at the Airport Way Bridge near Vernalis	Jan 2006 - Aug 2006	32	0	33	97%
	Total (After Compliance Date)	**92**	**0**	**92**	**100%**
	Total (Before Compliance Date)	**187**	**13**	**201**	**93%**
	Grand Total	**279**	**13**	**293**	**95%**

[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.
[2] Monitoring results from the Organophosphate TMDL Monitoring for the San Joaquin River (Region 5) project and the Westside Coalition ILRP monitoring program.

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 (Table 5 and Figure 5). 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 2012 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 16 tributaries for chlorpyrifos and diazinon from October 2011 through September 2012 (Table 21). On April 17, 2012, the ESJWQC was approved to temporarily suspend monitoring at Core and MPM sites (with the exception of Bear Creek @ Kibby Rd) as well as reduce monitoring at Assessment Monitoring sites for the remainder of 2012; schedules were modified in April according to the approved reduced monitoring outline which is discussed in detail in the ESJWQC 2013 AMR (pages 34-38).

One hundred percent of the samples collected from tributaries during the 2012 water year were in compliance with the load allocation (Table 22). There were no detections of chlorpyrifos or diazinon in the ESJWQC tributaries during the 2012 water year. A tabulation of load allocations for all tributary results is included in Appendix IV (Tables IV-2 through IV-5).

Table 20. The ESJWQC tributary monitoring schedule for chlorpyrifos and diazinon during the 2012 water year.
Only tributary sites scheduled for chlorpyrifos (C) and/or diazinon (D) analysis are listed.

Subarea	Tributary Station Name	Monitoring Type and Year	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sep 2012
Bear Creek, Fresno-Chowchilla	Bear Creek @ Kibby Rd	MPM12								C		C		
Bear Creek, Fresno-Chowchilla	Berenda Slough along Ave 18 ½	A11, A12, MPM12	C,D	C,D	C,D	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, MPM12	C,D	C,D	C,D	C	C,D							
Bear Creek, Fresno-Chowchilla	Deadman Creek (Dutchman) @ Gurr Rd	MPM12						C						
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Hwy 59	A11, A12, MPM12	C,D	C,D	C,D	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	MPM12					C,D							
Tuolumne River, Northeast Bank	Dry Creek @ Wellsford Rd	A11	C,D	C,D	C,D									
Bear Creek, Fresno-Chowchilla	Duck Slough @ Gurr Rd	A11	C,D	C,D	C,D									
Turlock, Merced	Highline Canal @ Hwy 99	A11, MPM12	C,D	C,D	C,D	C	C							
Turlock, Merced	Highline Canal @ Lombardy Rd	A11, A12	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Bear Creek, Fresno-Chowchilla	Livingston Drain @ Robin Ave	MPM12				C								
Bear Creek, Fresno-Chowchilla	McCoy Lateral @ Hwy 140	A11, A12	C,D	C,D	C,D	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									
Turlock, Merced	Levee Drain @ Carpenter Rd	A12				C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D
Turlock, Merced	Prairie Flower Drain @ Crows Landing Rd	A11	C,D	C,D	C,D									
Stanislaus River, North Stanislaus	Rodden Creek @ Rodden Rd	A11, A12	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D	C,D

A11- Assessment Monitoring for constituent during 2011 (October—December)
A12- Assessment Monitoring for constituent during 2012 (January—September)
MPM12-Management Plan Monitoring for constituent during 2012 (during months of past exceedances)

Overall, 96% of samples collected from ESJWQC tributaries have been compliant with load allocations since the inception of TMDL monitoring in January 2010. The percent of compliant samples increased from 84% during 2010 (January-September 2010) to 100% during the 2012 water year (October 2011-September 2012; Table 21).

Table 21. 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 2012).

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%
	2012	34	0	34	100%
Stanislaus River, North Stanislaus	2010	9	0	9	100%
	2011	10	0	10	100%
	2012	12	0	12	100%
Tuolumne River, Northeast Bank	2010	7	3	10	70%
	2011	12	0	12	100%
	2012	3	0	3	100%
Turlock, Merced	2010	12	1	13	92%
	2011	34	0	34	100%
	2012	29	0	29	100%
2010[1] Total		**47**	**9**	**56**	**84%**
2011 Water Year Total		**112**	**3**	**115**	**97%**
2012 Water Year Total		**78**	**0**	**78**	**100%**
Grand Total		**237**	**12**	**249**	**96%**

[1]TMDL monitoring began in January 2010; 2010 data are from January 2010-September 2010.

Westside Coalition Load Allocation Compliance

The Westside Coalition collected monthly samples from flowing tributary sites to the San Joaquin River from October 2011 through September 2012 in accordance with its MRP. Beginning in March 2011, the Westside Coalition began an Assessment Monitoring period, during which pesticides and toxicity analyses were performed at all sampled sites. There was not sufficient rainfall during the non-irrigation season to trigger a rain event and no storm samples were collected from tributary sites. Table 22 shows the monitoring schedule for the San Joaquin River and tributary sites monitored by the Westside Coalition.

Table 22. Westside Coalition Monitoring Schedule.

Monitoring Site	Non-Irrigation Season					Irrigation Season						Non-Irr.
	Event 84	Event 85	Event 86	Event 87	Event 88	Event 89	Event 90	Event 91	Event 92	Event 93	Event 94	Event 95
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Discharge Sites												
Hospital Cr at River Road	P, NF	P	P, NF	P, NF	P	P, NF	P	P	P	P	P	N
Ingram Cr at River Road	P	P, NF	P	P, NF	P, NF	P	P	P	P	P	P	N
Westley Wasteway near Cox Road	P	P	P	P	P, NA	P	P	P	P	P	P	N
Del Puerto Cr near Cox Road	P	P	P	P	P, NF	P	P	P	P	P	P	N
Del Puerto Cr at Hwy 33	P, NF	P, NF	P, NF	P, NF	P, NF	P	P, NF	P, NF	P, NF	P, NF	P, NF	N, NF
Ramona Lake near Fig Avenue	P	P, NF	P	P	P	P	P	P	P	P	P	N
Marshall Road Drain near River Road	P, NF	P, NF	P, NF	P, NF	P, NF	P	P	P	P	P	P	N
Orestimba Cr at River Road	P	P, NF	P, NF	P, NF	P, NF	P	P	P, NF	P	P	P	N
Orestimba Cr at Hwy 33	P	P	P	P, NF	P, NF	P	P	P	P	P	P	N
Newman Wasteway near Hills Ferry Road	P	P	P	P	P	P	P	P	P	P	P	N
San Joaquin River at Highway 165 near Stevinson[1]	P, NA	P, NA	P, NA	P, NA	P, NA	P	P	P	P	P	P	P
San Joaquin River at Fremont Ford[1]		P	P	P	P							
Mud Slough u/s San Luis Drain	P	P	P	P	P	P	P	P	P	P	P	P
Salt Slough at Lander Avenue	P	P	P	P	P	P	P	P	P	P	P	P
Salt Slough at Sand Dam	P	P	P	P	P	P	P	P	P	P	P	N
Los Banos Creek at Highway 140	P	P	P	P	P	P	P	P	P	P	P	P
Los Banos Creek at China Camp Road	P	P	P	P	P	P	P	P	P	P	P	N
Turner Slough near Edminster Road	P	P	P	P	P	P	P	P	P	P	P	N
Blewett Drain near Highway 132	P, NF	P, NF	P, NF	P, NF	P, NF	P	P	P	P	P, NF	P	N
Poso Slough at Indiana Avenue	P	P	P	P	P	P	P	P	P	P	P	N
Los Banos Creek at Sunset Ave	N, NF	N, NF	N, NF	N, NF	N, NF	Removed from Monitoring Program in March 2012						
Little Panoche Cr at Western Boundary	N, NF	N, NF	N, NF	N, NF	N, NF	Removed from Monitoring Program in March 2012						
Little Panoche Cr at San Luis Canal	N, NF	N, NF	N, NF	N, NF	N, NF	Removed from Monitoring Program in March 2012						
Russell Ave. Drain at San Luis Canal	N, NF	N, NF	N, NF	N, NF	N, NF	Removed from Monitoring Program in March 2012						
Source Water Sites												
San Joaquin River at Sack Dam	P	P	P	P	P	P	P	P	P	P	P	P
San Joaquin River at Las Palmas Avenue near Patterson	P	P	P	P	P	P	P	P	P	P	P	P
Delta Mendota Canal at Del Puerto WD	P	P	P	P	P	P	P	P	P	P	P	P

N -- Sample not tested for pesticides
NA -- Not Sampled due to lack of safe access
NF -- Not sampled due to lack of flow
P -- Sampled tested for Chlorpyrifos & Diazinon if adequate water is present
[1] Compliance monitoring occurred at the San Joaquin River at Fremont Ford site from November 2011 through February 2012 because road construction prevented access to the San Joaquin River at Highway 165 near Stevinson site. Compliance monitoring occurred at the San Joaquin River at Highway 165 near Stevinson site from March through September 2012.

Although there were no detections of either chlorpyrifos or diazinon in any of the San Joaquin River samples, chlorpyrifos was detected in nine samples over seven different monitoring events, all of which were measured in excess of the load criteria. Diazinon was detected in one sample. Table 23 shows the sites and dates where chlorpyrifos and/or diazinon were 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 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 2012 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 24 tabulates load allocation compliance for all Westside Coalition tributaries for each subarea. Overall, the percentage of load allocation compliance during the 2011 water year (October 2010 – September 2011; 90%) was greater compared to 2010 (January – September; 79%). This trend is continued during the 2012 water year, with 94% of the samples in compliance.

Table 23. Chlorpyrifos and diazinon San Joaquin River TMDL load allocation calculations for Westside Coalition tributaries sampled during the 2012 water year.

Only positive detections shown.

Subarea	Main Stem Monitoring Point	Tributary Site	Sample Date	Sample Event	Flow (cfs)	Chlorpyrifos (µg/L)	Diazinon (µg/L)	Load	Load Allocation Compliance
Greater Orestimba	San Joaquin River at Las Palmas Avenue near Patterson	Marshall Road Drain near River Road	08-May-12	89	3.0	0.17	<0.004	11.33	Out of compliance
Stevinson, Grassland	San Joaquin River at Hills Ferry Road	Poso Slough at Indiana Ave	08-Nov-11	85	19.0	<0.0026	1.2	12.00	Out of compliance
		Poso Slough at Indiana Ave	13-Mar-12	87	25.1	0.0076	<0.004	0.51	Out of compliance
		Poso Slough at Indiana Ave	10-Apr-12	88	6.4	0.66	<0.004	44.00	Out of compliance
		Salt Slough at Sand Dam	13-Mar-12	87	6.3	0.018	<0.004	1.20	Out of compliance
Westside Creek	San Joaquin River at the Maze Boulevard (Highway 132) Bridge	Blewett Drain at Highway 132	10-Apr-12	88	3.0	0.024	<0.004	1.60	Out of compliance
		Blewett Drain at Highway 132	14-Aug-12	94	2.7	0.14	<0.004	9.33	Out of compliance
		Hospital Creek at River Road	10-Apr-12	88	4.2	0.071	<0.004	4.73	Out of compliance
		Ingram Creek at River Road	11-Oct-11	84	1.2	0.28	<0.004	18.67	Out of compliance
		Ingram Creek at River Road	10-Jul-12	93	12.2	0.052	<0.004	3.47	Out of compliance

Table 24. 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%
	2012	30	1	31	96%
Stevinson, Grassland	2010	70	4	74	95%
	2011	87	3	90	97%
	2012	87	4	91	96%
Westside Creeks	2010	18	13	31	58%
	2011	30	6	36	83%
	2012	36	5	41	88%
2010 Water Year[1] Total		**106**	**29**	**135**	**79%**
2011 Water Year[1] Total		**143**	**16**	**159**	**90%**
2012 Water Year[1] Total		**153**	**10**	**163**	**94%**
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, 2011 and 2012.

The PUR data shown in Table 25 has been provided by the county agricultural commissioners and is summarized for the requested sites from October 1, 2011 through September 30, 2012. The PUR data summary is organized by site and material active ingredient (AI), and includes the number of treatments and total acres treated of each commodity. Below is a discussion of the PUR data summary for the relevant sites and dates.

Table 25. Chlorpyrifos and diazinon applications made four weeks prior in subwatersheds with exceedances in the Westside Coalition region.

Only listed applications were shown based on available PUR data.

Tributary Name	Material	Application Month	Commodity	Number of Applications*	Acres Treated*
Marshall Road Drain	Chlorpyrifos	March	Alfalfa	5	175
	Chlorpyrifos	May	Walnuts	1	9
Poso Slough	Chlorpyrifos	March	Alfalfa	17	1170
	Chlorpyrifos	April	Alfalfa	14	940
	Diazinon	August	Cantaloupe	1	16
Salt Slough	Chlorpyrifos	March	Alfalfa	8	449
Blewett Drain	Chlropyrifos	April	Almonds	1	100
	Chlropyrifos	July	Almonds	2	135
	Chlropyrifos	July	Walnuts	4	493
Hospital Creek	Chlorpyrifos	April	Almonds	1	100
Ingram Creek	Chlorpyrifos	May	Walnut	1	85

* Includes duplicate and incomplete records. Data is provisional and subject to change.

- Marshall Road Drain – May 2012 Chlorpyrifos Detection: There was one reported application of chlorpyrifos to 9 acres of walnuts on May 5th. The next prior application is reported in March on Alfalfa (five applications over 175 acres).
- Poso Slough – November 2011 Diazinon detection and March and April 2012 Chlorpyrifos Detections: PUR data reported diazinon applications in August on cantaloupes (one application, 16 acres). Seventeen chlorpyrifos applications were reported in March 2012, all on alfalfa affecting 1170 acres. Fourteen application of chlorpyrifos were reported in April 2012, all on alfalfa affecting 940 acres).
- Salt Slough @ Sand Dam – March 2012 Chlorpyrifos Detection: Eight chlorpyrifos applications were reported in March 2012, along with the aforementioned Poso Slough applications, which also discharges into salt slough.
- Hospital Creek – April 2012 Chlorpyrifos Detection: A single application was reported in April 2012 on almonds (100 acres).
- Ingram Creek Creek – October 2011 and July 2012 Chlorpryifos Detections: No applications prior to May 2012 were reported. The May application (85 acres of walnuts) may or may not have contributed to the July exceedance.
- Blewett Drain – April and August 2012 Chlorpyrifos Detections: One application was reported in April (almonds, 100 acres) and six in July (two for almonds and four for walnuts, 628 acres total).

It should be noted that a detailed review of the PUR data revealed a very large number of duplicate and incomplete records and any use or interpretation of this data should be undertaken with caution.

As is evident from Table 25, the available PUR data is incomplete and does not provide useful information regarding the timing or location of material applications. Until a more complete PUR dataset are available, detailed analysis of the PUR data is not warranted.

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 WQOs for chlorpyrifos or diazinon occurs at a tributary monitoring location in the ESJWQC region, the ESJWQC implements a management plan for the site subwatershed. To allow for focused source identification, outreach, and evaluation, the ESJWQC prioritizes site subwatersheds based on the number, frequency, and magnitude of chlorpyrifos and diazinon exceedances, among other factors (2013 MPUR, pages 23-24). When a site 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 site 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: growers with the potential for direct drainage and growers with past applications of management plan constituents (e.g. chlorpyrifos or diazinon). The focused outreach and management practice documentation rotates to additional site subwatersheds annually. Current high priority site subwatersheds include:

First Priority Site Subwatersheds (2008 – 2010)

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

Second Priority Site Subwatersheds (2010 – 2012)

- Bear Creek @ Kibby Rd
- Cottonwood Creek @ Rd 20
- Duck Slough @ Gurr Rd

- Highline Canal @ Hwy 99

Third Priority Site Subwatersheds (2011-2013)

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

Fourth Priority Site Subwatersheds (2012-2014)

- Black Rascal Creek @ Yosemite Rd
- Deadman Creek (Dutchman) @ Gurr Rd
- Deadman Creek @ Hwy 59
- Hilmar Drain @ Central Ave

The ESJWQC has completed its focused outreach strategy in the first, second, and third priority site subwatersheds. The ESJWQC documented current (in 2008-2009 for first priority, in 2009 for second priority, and in 2010-2011 for third priority) and newly implemented (in 2009-2011 for first priority, in 2010-2011 for second priority, and in 2011-2012 for third priority) management practices on targeted members' parcels. Outreach is not complete in the fourth priority site subwatersheds. The ESJWQC documented current management practices (2012) and is in the process of conducting follow up contacts to document newly implemented practices (2012-2013) in fourth priority site subwatersheds. The ESJWQC outreach activities and actions to address water quality exceedances during the 2012 water year are documented in the 2012 AMR (pages 138-146) and the 2013 AMR (pages 140-147). All ESJWQC outreach activities related to the management practice tracking strategy are documented in the 2013 MPUR (pages 44-48).

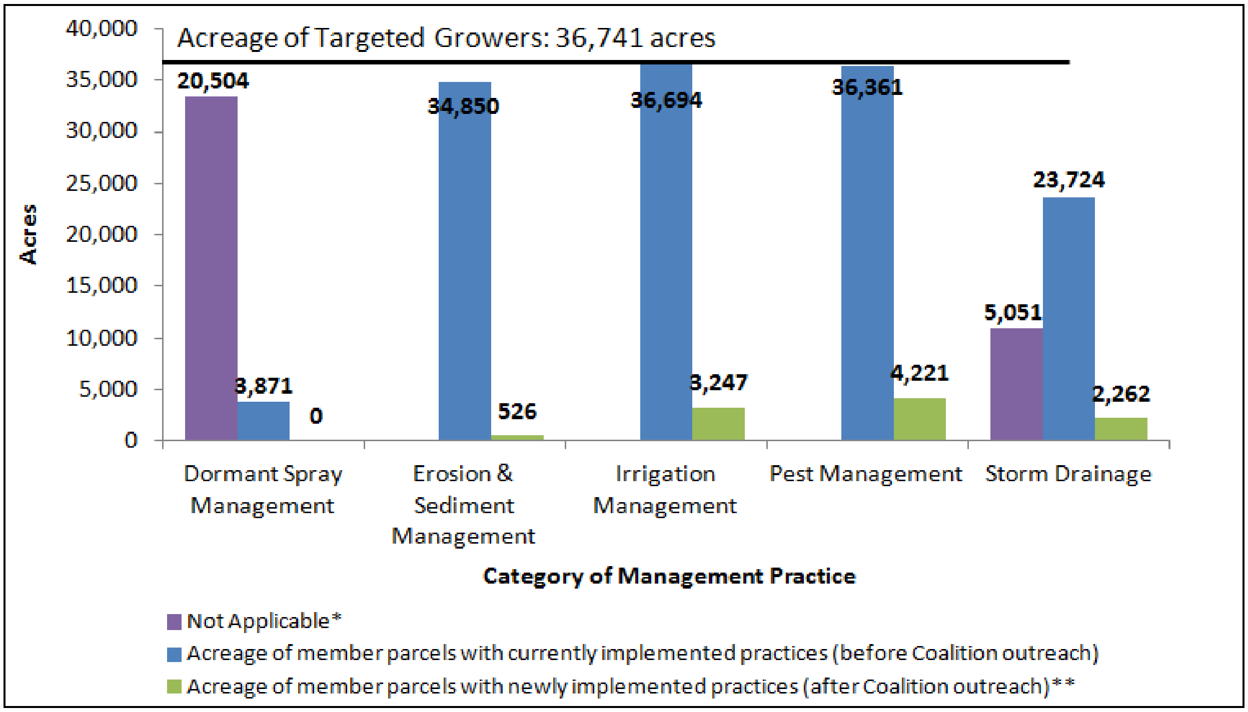
A major goal of ESJWQC outreach is to help growers eliminate the offsite movement of agricultural constituents. The ESJWQC identified five categories of management practices that are effective in reducing the offsite movement of chlorpyrifos and diazinon:

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

Targeted growers in the first, second, third, and fourth priority site subwatersheds indicated they currently implement management practices within each of the above categories. Several growers in the first, second, third, and fourth priority subwatersheds implemented new management practices in each of these categories following focused ESJWQC outreach. Figure 10 displays the acreage associated with management practices implemented before ESJWQC outreach (currently implemented) and after ESJWQC outreach (newly implemented) in the first, second, third, and fourth priority subwatersheds per each of the five categories (the ESJWQC is in the process of documenting newly implemented management practices in the fourth priority subwatersheds and the data presented in Figure 10 is preliminary). The acreage represented in Figure 10 is associated with at least one management practice per each category, but acreage may have multiple practices implemented within a category (acreage is only counted once per each category). The majority of targeted acreage in the first, second, third, and fourth priority subwatersheds have 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, second, third, and fourth priority subwatersheds focused on irrigation management, pest management, and storm drainage management.

Within each of the five categories, growers implemented various management practices (Table 26). 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 planting or allowing vegetation to grow along ditches (Table 26).

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



*Acreage of members parcels where category of management practice is not applicable (either no dormant sprays or no storm drainage).
**Documentation of management practices implemented after ESJWQC outreach is incomplete for fourth priority subwatersheds; only follow up survey responses received before February 28, 2013 are include in the graph.

Table 26. Current and newly implemented management practices designed to reduce offsite movement of chlorpyrifos and diazinon in the ESJWQC first, second, third, and fourth priority subwatersheds listed by TMDL subarea.

Data of newly implemented practices in fourth priority subwatersheds are preliminary; only survey responses received before February 28, 2013 are included.

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)	12	3,314	4	346	2	181	18	3,841
	Do not apply dormant spray when moisture is at field capacity	7	3,105	3	266	2	181	12	3,552
	Maintain setback zones	12	3,314	3	131	2	181	17	3,626
	Vegetation cover and/or disked	15	3,419	10	712	3	201	28	4,332
Erosion & Sediment Management	Constructed wetlands			1	2,450			1	2,450
	Grass Row Centers (Orchards, Vineyards)	87	20,145	38	6,510	6	247	131	26,901
	Maintain vegetated filter strips around field perimeter at least 10' wide	83	15,474	24	6,227	13	1,050	120	22,751
	Riparian vegetation / fences prevents livestock access to water	6	640	2	53			8	693
	Vegetation is planted along or allowed to grow along ditches	64	15,978	24	6,532	17	1,396	105	23,906
Irrigation Management	Determine Irrigation Schedule by Actual Moisture Levels in Soil/Crop Needs	155	35,216	23	5,717	11	534	189	41,466
	Drainage basins (sediment ponds)	28	8,855	5	3,203	3	227	36	12,285
	Drip irrigation, other	6	408	1	77			7	485
	Laser leveled fields	92	17,828	39	6,743	17	1,255	148	25,827
	Microirrigation	96	26,705	25	6,721	4	226	125	33,652
	Polyacrylamide (PAM)	1	15	1	2,450	3	227	5	2,692
	Recirculation - Tailwater return system	40	10,242	7	4,046	6	378	53	14,667
	Reduce Amount of Water Used in Surface Irrigation	12	1,903	1	162	4	468	17	2,533
Pest Management	Adjust spray nozzles to match crop canopy profile	117	25,658	47	8,016	20	1,265	184	34,938
	Calibrate spray equipment prior to each application	138	32,108	68	9,796	21	1,587	227	43,490
	Shut off outside nozzles when spraying outer rows next to sensitive sites	109	22,923	45	7,885	18	1,231	172	32,039
	Spray areas close to waterbodies when the wind is blowing away from them	119	25,349	46	7,848	23	1,657	188	34,853
	Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	84	16,794	30	5,895	9	413	123	23,103
	Use electronic controlled sprayer nozzles	7	1,376	3	2,555	6	362	16	4,292
	Use nozzles that provide largest effective droplet size to minimize drift	121	26,373	46	7,918	23	1,657	190	35,948
Storm Drainage	Berms Between Field & Waterway	8	1,054			1	298	9	1,352
	Device Controls Timing of Pump/Drain into Waterway	20	6,026	2	3,147	5	810	27	9,983
	No Storm Drainage	6	1,214			1	139	7	1,353
	Recirculation - Tailwater return system	23	6,634	1	26	1	139	25	6,800
	Settling Pond	23	7,399	3	2,499	3	348	29	10,245

The ESJWQC initiated focused outreach in fifth priority subwatersheds through mailings in 2012 and individual meetings are scheduled to occur with growers in 2013 (Hatch Drain @ Tuolumne Rd, Highline Canal @ Lombardy Rd, Merced River @ Santa Fe, and Miles Creek @ Reilly Rd). Individual meetings are underway with targeted growers to document currently implemented practices. These data will be assessed in the ESJWQC 2014 MPUR.

On May 30, 2012, the ESJWQC has received approval to remove constituents from active management plans in 14 site subwatersheds, of those 14 site subwatersheds, seven were approved to have chlorpyrifos removed and one was approved to have diazinon removed. A second letter was sent on November 7, 2010 to remove management plans for constituents in 10 site subwatersheds, of those 10 site subwatersheds, two are pending approval for the removal of chlorpyrifos and one is pending approval for the removal of diazinon.

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 Westside 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 (Attachment 6). Table 27 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. 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.

In response to the April and May chlorpyrifos exceedances, the Westside Coalition mailed out newsletters to growers within the entire Coalition. The newsletter emphasized importance of implementing management practices to prevent pesticide discharge.

Table 27. 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	32,573	51%	5,248		9,195		12,851		7,142		5,779	
Surveys Collected	416	36%	70	100%	274	100%	160	100%		100%		100%
Irrigated	32,443	100%	4,565	87%	7,926	86%	11,714	91%	5,193	69%	5,526	96%
Furrow/Flood (% Irrig. Ac.)	24,302	75%	1,489	33%	3,210	41%	4,491	38%	1,678	32%	4,599	80%
Drip/Micro/Sprinkler (% Irrig. Ac.)	8,140	25%	2,891	63%	3,952	50%	5,821	50%	3,515	68%	927	16%
Fallow/Non Irrigated (% Irrig. Ac.)	130	0%	0	0%	230	3%	1,354	12%	1,949	38%	3	<1%
Mix of Irrigation Methods (% Irrig. Ac.)			185	4%	535	7%	48	0%				
Tree Crops (% Irrig. Ac.)	394	1%	2,891	63%	4,237	53%	5,481	47%				
Field Crops (% Irrig. Ac.)	32,110	99%	1,670	37%	3,678	46%	5,626	48%				
Open / Other (% Irrig. Ac.)	69	<1%	662	15%	325	4%	847	7%				
Sedimentation Ponds (% Field Crops)	0	0%	1,092	65%	3,331	36%	5,019	89%	1,085	14%	935	17%
Tailwater Return System (% Field Crops)	0	0%	150	9%	402	4%	2,154	38%	205	3%	828	15%
Use of PAM (% Irrig. Ac.)	406	2%	3,346	73%	2,955	37%	3,408	29%	488	29%	4,375	95%
Tailwater Leaves Property (% Irrig. Ac.)	28,411	88%	2,234	49%	3,471	44%	4,134	35%	1,473	28%	4,393	76%
Stormwater Leaves Property (% Irrig. Ac.)	30,520	94%	2,517	55%	5,050	64%	6,384	55%	4,118	79%	5,204	90%
Dormant Spray Usage (% Tree Crops)	484		905	31%	1,147	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 2012 water year indicating that management practices and strategies implemented by growers in the ESJWQC and Westside Coalition regions are 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, second, and third priority site subwatersheds (outreach is ongoing in the fourth priority site subwatersheds). The ESJWQC uses the results of monitoring (MPM and Assessment) to evaluate the effectiveness of current and newly implemented management practices. Management Plan Monitoring was temporarily suspended in 2012 and only occurred from January through March with the exception of Bear Creek @ Kibby Rd. Sites scheduled for Assessment Monitoring were still monitored for all constituents including MPM constituents. Berenda Slough along Ave 18 ½ (third priority) was the only site within the first, second, or third priority subwatersheds scheduled for Assessment Monitoring in 2012 (Table 20). The following evaluation is based on the monitoring results from 2012.

Prior to focused outreach, there were eight to eleven exceedances of the WQTL for chlorpyrifos per year (11-14% of samples collected annually) in the first, second, and third priority subwatersheds (Table 28). There has been only three exceedances of the diazinon WQTL since 2006 (2% of samples collected in 2008) in the first, second, and third priority subwatersheds (Table 28). The ESJWQC conducted focused outreach from 2009 through 2012, which resulted in the implementation of several new management practices designed to address the offsite movement of agricultural constituents, including chlorpyrifos and diazinon (Figure 10 and Table 26). Results of MPM during months of past exceedances and monthly Assessment Monitoring (see monitoring schedule in the ESJWQC MRPP, pages 51-52) indicate that focused outreach and implementation of new management practices in 2009 through 2012 coincided with a decrease in chlorpyrifos and diazinon exceedances (Table 28).

Table 28. Count of exceedances and samples collected for chlorpyrifos and diazinon in the ESJWQC first, second, and third priority site subwatersheds.

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

Calendar Year	Chlorpyrifos				Diazinon			
	Count of Exceedances	Count of Samples[1]	% of Exceedances	Lbs Applied[2]	Count of Exceedances	Count of Samples[1]	% of Exceedances	Lbs Applied[2]
2006	8	59	14%	77,245	0	59	0%	3,816
2007	9	82	11%	59,912	1	78	1%	4,089
2008	11	88	13%	36,567	2	85	2%	2,355
2009	3	24	13%	40,435	0	17	0%	1,855
2010	4	29	14%	39,178	0	14	0%	1,148
2011	1	86	1%	35,505	0	73	0%	1,131
2012	0	20	0%	37,199	0	14	0%	410
All Years	**36**	**388**	**9%**	**326,041**	**3**	**340**	**1%**	**14,804**

[1] Refers to all samples scheduled for constituent analysis (dry sites are included).

[2] All PUR data are considered preliminary until received from California Pesticide Information Portal (CalPIP); CalPIP data are available through December 2010.

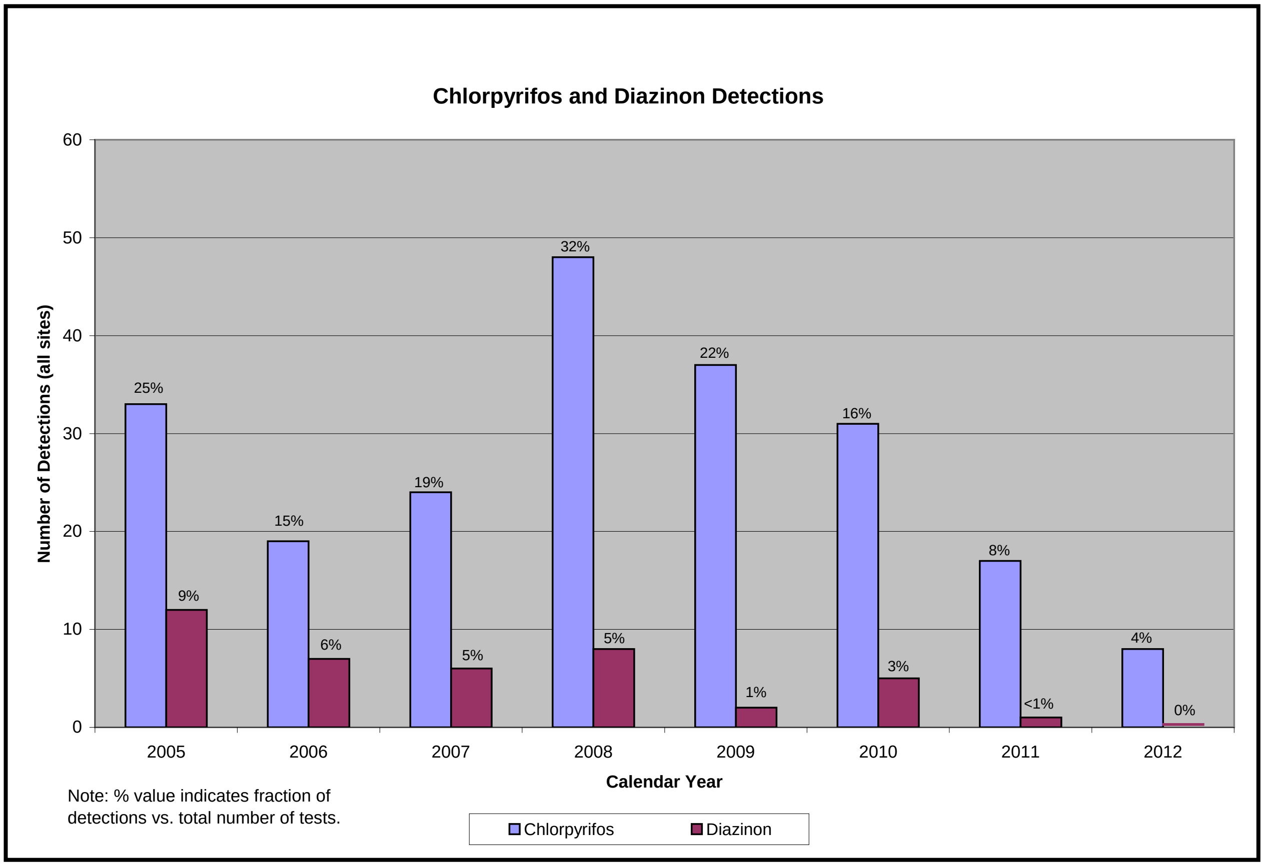
NA – Not applicable, no samples were collected for the constituent during the year.

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 more than 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 since 2005.

Figure 11. Count of chlorpyrifos and diazinon detections from 2006 through 2012 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 2008 (Figures 3 and 4). In 2004, 49,785 pounds of diazinon were applied in the San Joaquin River watershed. In 2011, the amount of diazinon used within the San Joaquin River watershed decreased approximately 87% to only 6,420 pounds (Figure 3). As in previous years, a majority of the use (55%) occurred between December and February. Chlorpyrifos use also decreased in recent years, from 235,194 pounds in 2007 to 135,882 pounds in 2011 (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, ESJWQC and Westside Coalition representatives encourage 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.

Pesticide Use Report 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 due to a lack of analytical methods and, in some cases, relatively limited use.

ESJWQC Assessment of Alternatives to Diazinon and Chlorpyrifos

The pounds of diazinon applied in the ESJWQC region has steadily and considerably declined since 2004 (Figure 12). The commodities in the ESJWQC region with the most pounds of diazinon applied from 2004 through 2012 include:

1. Almonds (44,322 pounds of diazinon applied; 43% of all diazinon applied)
2. Peaches (19,488 pounds of diazinon applied; 19% of all diazinon applied)
3. Prunes (18,791 pounds of diazinon applied; 18% of all diazinon applied)
4. Apples (3,617 pounds of diazinon applied; 4% of all diazinon applied)
5. Nectarines (2,754 pounds of diazinon applied; 3% of all diazinon applied)

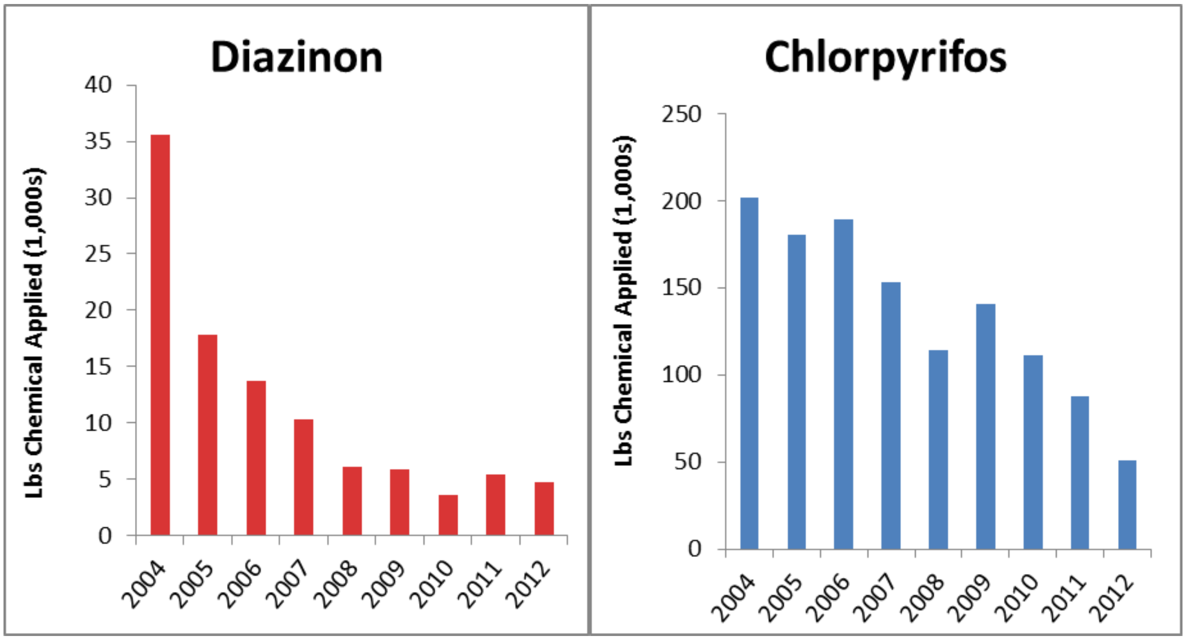
The ESJWQC has not detected diazinon in any samples collected from waterways within the ESJWQC region since February 2009.

Chlorpyrifos use also declined in the region in recent years; growers applied almost four times as many pounds of chlorpyrifos in 2006 compared to 2012 (Figure 12). The commodities in the ESJWQC region with the most pounds of chlorpyrifos applied from 2004 through 2012 include:

1. Almonds (566,844 pounds of chlorpyrifos applied; 44% of all chlorpyrifos applied)
2. Walnuts (235,244 pounds of chlorpyrifos applied; 18% of all chlorpyrifos applied)
3. Alfalfa (136,201 pounds of chlorpyrifos applied; 11% of all chlorpyrifos applied)
4. Grapes (117,747 pounds of chlorpyrifos applied; 9% of all chlorpyrifos applied)
5. Corn (106,986 pounds of chlorpyrifos applied; 8% of all chlorpyrifos applied)

Concentrations of chlorpyrifos have not been detected in samples collected from the water column of tributaries in the ESJWQC region since September 2011. Chlorpyrifos was present in sediment samples collected in March 2012 (Table 34, discussed below).

Figure 12. Pounds of diazinon and chlorpyrifos applied in the ESJWQC region from 2004 through 2012. Years refer to calendar years. All PUR data are considered preliminary until received from California Pesticide Information Portal (CalPIP); CalPIP data are available through December 2010. The PUR data from the counties in the ESJWQC region are available through 2012.



To evaluate the use of alternatives to chlorpyrifos and diazinon, the ESJWQC identified the pests for which diazinon and/or chlorpyrifos applications are recommended for management (UC ANR, 2013). The ESJWQC considered the highest priority pests associated with the commodities to which the greatest pounds of diazinon (almonds, peaches and prunes) and chlorpyrifos (almonds, walnuts, alfalfa, grapes, and corn) are applied in the ESJWQC region (UC ANR, 2013). The highest priority pests are defined as pests that are of major concern for the commodity and are geographically widespread in the ESJWQC region. The ESJWQC reviewed alternative pesticides and other management strategies (i.e. applications of plant growth regulators) for each pest (CA DWR 2013; Elliott et al., 2004; IRAC, 2005; Summers et al., 2007; UC ANR, 2013; Zalom et al., 1999). Table 29 lists the timing of applications of chlorpyrifos, diazinon, and recommended alternatives to chlorpyrifos and/or diazinon to manage high priority pests.

Several alternative options exist to manage pests per each commodity (Table 29). Table 29 lists the alternative pest classes recommended for common pests in alfalfa, almonds, corn, grapes, peaches, prunes, and walnuts. Navel orange worm, peach twig borer, and San Jose scale are the highest priority pests for almonds in the ESJWQC region; over 10 different classes of pesticides, in addition to diazinon and chlorpyrifos, can be used to manage these pests (Elliott et al., 2004; UC ANR, 2013; Zalom et al., 1999). Peach twig borer and San Jose scale are also of high priority for peaches and prunes, and growers can choose from different pesticide classes for management of the pests in peaches (nine pesticide classes) and prunes (seven pesticide classes), respectively (Rice et al., 1972; Daane et al. 1993; UC ANR, 2013). Ten classes of pesticides are recommended to manage codling moths and walnut husk flies in walnuts (UC ANR, 2013). Eight classes of pesticides are recommended for management of alfalfa weevil, blue and pea aphid, and spotted alfalfa aphid which are common pests in alfalfa (Summers et al., 2007; UC ANR, 2013). Vine mealybug is a widespread, major concern for grapes in the ESJWQC region for which chlorpyrifos is applied; there are four different classes of pesticides available to treat the single pest (UC ANR, 2013). Similarly, four classes of pesticides are available to treat corn earworm, a widespread, major pest concern for corn in the ESJWQC region for which chlorpyrifos is often applied (UC ANR, 2013).

In addition to the numerous alternative pesticides available, the timing of application varies both by pesticide choice and target pest (Table 29). Applications of pyrethroids are recommended for almonds in August to treat navel orange worm, but pyrethroids can also be applied in November through February to target peach twig borer in almonds. Applications of spinosyns to walnuts in March through May, August, and October are recommended to treat for codling moth, but spinosyns should be applied in June through August to manage walnut husk fly. Growers can apply organophosphates (other than chlorpyrifos and diazinon) to alfalfa in March through May to target weevils and blue and pea aphids as well as in June through November to target spotted aphids.

Table 29. Timing of application of diazinon and/or chlorpyrifos and alternative pesticides for selected commodities and pests in the ESJWQC region.

Commodity	Pest	Pest Appearance	Alternative Pesticide Class[1]	Alternative AI	Common Product Name	Recommended Application Period
Alfalfa	Alfalfa weevil	Feb-Jun	Organophosphate	Chlorpyrifos	Lorsban	Mar-May
				Malathion	Clean crop	Mar-May
				Phosmet	Imidan	Mar-May
			Oxadiazine	Indoxacarb	Steward	Mar-May
			Pyrethroid	Lambda-cyhalothrin	Warrior II	Mar-May
				Cyfluthrin	Baythroid	Mar-May
	Blue and pea aphid	Feb-Jun, Sep	Botanical	Azadirachtin	NA	Mar-May
			Organophosphate	Chlorpyrifos	Lorsban	Mar-May
				Dimethoate	Drexel	Mar-May
			Pyrethroid	Pyrethrin	NA	Mar-May
	Spotted alfalfa aphid	Jun-Sep	Botanical	Azadirachtin	NA	Jun-Aug, Sept- Nov
			Organophosphate	Chlorpyrifos	Lorsban	Jun-Aug, Sep-Nov
				Dimethoate	Drexel	Jun-Nov
			Pyrethroid	Pyrethrin	NA	Jun-Aug
Almond	Navel orange worm	Year round	Avermectin	Emamectin benzoate	Proclaim	Mar-May
			Bacterium	*Bacillus thuringiensis*	Deliver	Mar-May, Aug
			Diacylhydrazine	Methoxyfenozide	Intrepid	Mar-May, Aug
			Diamide	Chlorantraniliprole	Altacor	Mar-May, Aug
				Flubendiamide	Belt	Mar-May, Aug
			Organophosphate	Chlorpyrifos	Lorsban	Aug
				Diazinon	Gowan	Dec-Feb, May, Jul
				Phosmet	Imidan	Aug
			Pyrethroid	Bifenthrin	Brigade	Aug
				Esfenvalerate	Asana	Aug
				Fenpropathrin	Danitol	Aug
				Lambda-cyhalothrin	Warrior	Aug
			Spinosyn	Spinetoram	Delegate	Mar-May, Aug
				Spinosad	Success	Mar-May, Aug
			Unclassified	Buprofezin	Centaur	Mar-May, Aug
	Peach twig borer	Feb-Oct	Avermectin	Emamectin benzoate	Proclaim	Mar-May
			Bacterium	*Bacillus thuringiensis*	Deliver	Mar-May

Commodity	Pest	Pest Appearance	Alternative Pesticide Class[1]	Alternative AI	Common Product Name	Recommended Application Period
			Benzoylurea	Diflubenzuron	Dimlin	Nov-Mar
			Diacylhydrazine	Methoxyfenozide	Intrepid	Mar-May
			Diamide	Chlorantraniliprole	Altacor	Nov-May
				Flubendiamide	Belt	Mar-May
			Neonicotinoid	Acetamiprid	Assail	Nov-May
			Organophosphate	Chlorpyrifos	Lorsban	Mar-May
				Diazinon	Gowan	Dec-Feb, May, Jul
			Pyrethroid	Bifenthrin	Brigade	Nov-Feb
				Esfenvalerate	Asana	Nov-Feb
				Lambda-cyhalothrin	Warrior	Nov-Feb
				Cyfluthrin	NA	Nov-Feb
			Spinosyn	Spinetoram	Delegate	Nov-May
				Spinosad	Success	Nov-May
			Unclassified	Buprofezin	Centaur	Mar-May
	San Jose scale	Feb-Aug	Carbamate	Carbaryl	Sevin	Nov-Jan
			Hormone	Pyriproxyfen	Seize	Nov-Jan, Apr
			Organophosphate	Chlorpyrifos	Lorsban	May
				Diazinon	Gowan	Dec-Feb, May, Jul
				Methidathion	Supracide	May
			Unclassified	Buprofezin	Centaur	Apr
Corn	Corn earworm	Jun-Oct	Bacterium	*Bacillus thuringiensis*	Xentari	Jun-Oct
			Carbamate	Methomyl	Lannate	Jun-Oct
			Organophosphate	Chlorpyrifos	Lorsban	Jun-Oct
			Pyrethroid	Esfenvalerate	Asana	Jun-Oct
				Permethrin	Perm-up	Jun-Oct
			Spinosyn	Spinosad	Success	Jun-Oct
				Spinetoram	NA	Jun-Oct
Grape	Vine mealybug	May-Oct	Carbamate	Methomyl	Lannate	Jun-Nov
			Neonicotinoid	Acetamiprid	Assail	Jun-Aug
				Imidacloprid	Provado	Apr-Aug
			Organophosphate	Chlorpyrifos	Lorsban	Jun-Nov, Feb
				Dimethoate	Dimethogon	Jun-Nov
			Unclassified	Buprofezin	Applaud	Feb, Jun-Aug
Peach	Apricot (lecanium) scale	Feb-Oct	Organophosphate	Diazinon	Diazinon50W	Nov-Jan
	Peach twig borer	May-Sep	Bacterium	*Bacillus thuringiensis*	Dipel	Mar-May
			Benzoylurea	Diflubenzuron	Dimlin	Jan-May
			Diacylhydrazine	Methoxyfenozide	Intrepid	Jan-May
			Diamide	Chlorantraniliprole	Altacor	Mar-May
				Flubendiamide	Belt	Mar-May
			Organophosphate	Diazinon	Gowan	Jan-Feb
			Pyrethroid	Esfenvalerate	Asana	Jan-Feb
				Permethrin	Perm-up	Jan-Feb
			Spinosyn	Spinetoram	Delegate	Jan-May
				Spinosad	Success	Jan-May
			Unclassified	Buprofezin	NA	Mar-May
	San Jose scale	Apr-Nov	Carbamate	Carbaryl	Sevin	Mar-May
			Hormone	Pyriproxyfen	Seize	Jan-May
			Organophosphate	Diazinon	Gowan	Mar-May
			Unclassified	Buprofezin	NA	Jan-May
Prune	Peach twig borer	Apr-Aug	Bacterium	*Bacillus thuringiensis*	Dipel	Mar-Apr
			Benzoylurea	Diflubenzuron	NA	Jan-Mar
			Diacylhydrazine	Methoxyfenozide	Intrepid	Mar-Apr
			Organophosphate	Chlorpyrifos	Lorsban	Jan-Feb
				Diazinon	Diazinon50W	Mar-Apr
				Methidathion	Supracide	Jan-Feb
				Phosmet	Imidan	Jan-Feb, Apr
			Pyrethroid	Esfenvalerate	Asana	Jan-Apr
				Lambda-cyhalothrin	Silencer	Jan-Apr

Commodity	Pest	Pest Appearance	Alternative Pesticide Class[1]	Alternative AI	Common Product Name	Recommended Application Period
			Spinosyn	Spinosad	Success	Jan-Apr
	San Jose scale	Apr-Sep	Carbamate	Carbaryl	NA	Nov-Feb
			Hormone	Pyriproxyfen	Seize	Nov-Feb
			Organophosphate	Chlorpyrifos	Lorsban	Nov-Feb
				Diazinon	Diazinon50W	Nov-Feb
				Methidathion	Supracide	Nov-Feb
Walnut	Codling moth	May-Nov	Avermectin	Emamectin benzoate	Proclaim	Mar-May, Aug, Oct
			Benzoylurea	Diflubenzuron	Dimlin	Mar-May, Aug, Oct
			Carbamate	Carbaryl	Sevin	Mar-May, Aug, Oct
			Diacylhydrazine	Methoxyfenozide	Intrepid	Mar-May, Aug, Oct
			Diamide	Chlorantraniliprole	Altacor	Mar-May, Aug, Oct
				Flubendiamide	Belt	Mar-May, Aug, Oct
			Organophosphate	Chlorpyrifos	Lorsban	Mar-May, Aug, Oct
				Phosmet	Imidan	Mar-May, Aug, Oct
			Pyrethroid	Bifenthrin	Brigade	Mar-May, Aug, Oct
				Cyfluthrin	Leverage	Mar-May, Aug, Oct
				Esfenvalerate	Asana	Mar-May, Aug, Oct
				Lambda-cyhalothrin	Warrior II	Mar-May, Aug, Oct
				Permethrin	Perm-up	Mar-May, Aug, Oct
			Spinosyn	Spinetoram	Delgate	Mar-May, Aug, Oct
				Spinosad	Naturalyte	Mar-May, Aug, Oct
	Walnut husk fly	Jun-Sep	Neonicotinoid	Imidacloprid	Pasada	Jun-Aug
			Organophosphate	Chlorpyrifos	Lorsban	Jun-Aug
				Malathion	Clean crop	Jun-Aug
				Phosmet	Imidan	Jun-Aug
			Pyrethroid	Cyfluthrin	Leverage	Jun-Aug
				Esfenvalerate	Asana	Jun-Aug
			Spinosyn	Spinetoram	Delgate	Jun-Aug
				Spinosad	Naturalyte	Jun-Aug

[1] For organization purposes, Alternative Pesticide Class includes categories that are not pesticides, such as bacterium.
AI – Active ingredient
NA – Not available; no PUR data available
Source: CA DWR 2013; Daane et al. 1993; Elliott et al., 2004; IRAC , 2005; UC ANR, 2013; Zalom et al., 1999; Summers et al., 2007; Rice et al., 1972.

The ESJWQC reviewed the trends in use of diazinon, chlorpyrifos, and alternative pesticides per each commodity using PUR data. The PUR data includes applications from 2007, the first year that general outreach focused on alternative strategies, through 2012. Table 30 lists the pounds of diazinon, chlorpyrifos, and alternative pesticides (grouped by class of pesticide) applied per year per each commodity for the ESJWQC region.

Pounds of diazinon applied to almonds decreased significantly in the last six years; the pounds applied in 2012 are approximately 25% of the pounds applied in 2007. Pounds of diazinon applied to peaches and prunes also declined considerably. Growers applied 63 pounds to peaches across the entire ESJWQC region in 2012 compared to 2,847 pounds in 2007; there were no applications of diazinon to prunes in 2012. Overall, pounds of pyrethroids, diacylhydrazines, benzoylureas and diamides applied increased from 2007 to 2011 to almonds, peaches, and/or prunes (Table 30).

Overall, annual pounds of chlorpyrifos applied to almonds, walnuts, grapes, and corn declined since 2007. Chlorpyrifos applications to alfalfa are an exception. Although the pounds applied in 2012 is slightly less than the pounds applied in 2007, there was a spike in chlorpyrifos use in 2009. Pounds applied of several class alternatives increased between 2007 and 2012, including carbamates (almonds, grapes, and walnuts) diacylhydrazines (alfalfa, almonds, and walnuts), hormones (almonds), neonicotinoids (almonds, grapes, and walnuts), and pyrethroids (alfalfa, almonds, and corn). Diamides and avermectins emerged as an option for pest management in almonds and walnuts, while growers moved away from using organophosphates (other than chlorpyrifos and diazinon) to manage pests in alfalfa, almonds, grapes and walnuts.

Pesticide use on a year by year level may be too broad to discern meaningful trends for the purpose of evaluating changes in use since use may be crop and pest specific. As displayed in Table 29, many of the pests overlap in timing of appearance and timing of applications may vary by pesticide class. In addition, pest pressures change from year to year. Therefore, it is difficult to detect changes in use based on yearly PUR data and to know for sure the cause of any changes.

Table 30. Pounds of AI applied of diazinon and/or chlorpyrifos and alternative pesticide classes in the ESJWQC region.

AI of each pesticide class is listed in Table 29. Chlorpyrifos and/or diazinon is listed first; classes are then sorted by greatest total AI (all years) applied.

Commodity	Class	Lbs AI Applied						Total AI (all years)
		2007	2008	2009	2010	2011	2012	
Alfalfa	Chlorpyrifos	12,925	15,881	35,189	16,011	8,416	11,786	100,208
	Other Organophosphates[1]	20,351	22,524	15,254	15,299	10,117	19,870	103,416
	Oxadiazines	1,002	5,516	1,877	2,815	1,700	404	13,313
	Pyrethroids	849	903	1,191	1,427	1,184	4,264	9,818
	Diacylhydrazines	21	960	462	493	548	176	2,661
	Bacterium	85	373	225	329	28	16	1,057
Almond	Chlorpyrifos	76,579	39,072	38,539	39,328	32,837	19,213	245,569
	Diazinon	9,113	5,284	5,594	1,582	2,335	2,573	26,481
	Pyrethroids	9,056	8,171	6,941	34,711	27,601	46,216	132,696
	Diacylhydrazines	9,520	10,816	5,367	15,417	12,729	17,585	71,433
	Benzoylureas	7,735	8,858	10,331	10,461	9,558	12,036	58,979
	Diamides	0	0	4,190	4,326	8,114	7,982	24,611
	Bacterium	9,630	4,543	5,020	260	315	893	20,662
	Other Organophosphates[1]	6,174	2,212	669	1,035	225	8	10,323
	Hormones	360	427	710	681	609	1,207	3,993
	Carbamates	60	45	40	1,083	1,648	188	3,063
	Neonicotinoids	0	253	257	597	999	847	2,953
	Spinosyns	409	311	156	41	102	97	1,116
	Buprofezin(unclassified)	428	169	143	0	2	9	752
	Avermectin	0	0	0	1	209	342	552
Corn	Chlorpyrifos	9,790	16,990	12,821	6,995	12,584	6,553	65,733
	Carbamates	2,943	2,134	1,706	756	842	176	8,557
	Pyrethroids	982	543	1,429	1,189	2,185	1,497	7,826
	Bacterium	209	297	0	0	28	210	744
	Spinosyns	10	3	1	2	0	55	72
Grape	Chlorpyrifos	15,556	10,234	23,332	17,743	9,405	4,068	80,338
	Neonicotinoids	3,988	4,986	6,028	9,299	11,716	8,598	44,615
	Buprofezin(unclassified)	1,203	1,761	5,340	6,108	246	223	14,882
	Carbamates	47	0	270	886	0	467	1,669
	Other Organophosphates[1]	42	0	0	0	0	0	42
Peach	Diazinon	2,847	1,237	1,746	561	417	63	6,870
	Pyrethroids	1,179	814	1,172	567	598	1,078	5,407
	Diacylhydrazines	836	679	464	426	498	554	3,457
	Diamides	0	86	233	345	555	627	1,846
	Bacterium	749	198	268	91	90	195	1,591
	Benzoylureas	50	84	137	195	192	153	810
	Carbamates	374	95	202	0	128	0	800

Commodity	Class	Lbs AI Applied						Total AI (All Years)
		2007	2008	2009	2010	2011	2012	
	Spinosyns	204	130	84	94	82	48	**641**
	Hormones	0	0	5	2	3	5	**15**
Prune	Diazinon	1,131	947	596	344	379	0	**3,398**
	Other Organophosphates	76	248	797	250	524	314	**2,210**
	Chlorpyrifos	333	364	383	480	142	0	**1,702**
	Pyrethroids	63	66	53	75	108	123	**489**
	Bacterium	0	54	65	41	0	0	**159**
	Diacylhydrazine	2	0	0	0	0	26	**28**
	Hormones	0	1	7	0	0	0	**8**
	Spinosyns	6	0	0	0	0	0	**6**
Walnut	Chlorpyrifos	29,344	25,479	23,940	24,296	18,564	20,534	**142,158**
	Other Organophosphates[1]	11,879	11,059	9,576	6,911	8,276	2,984	**50,684**
	Pyrethroids	1,034	832	938	1,103	2,087	1,588	**7,582**
	Diacylhydrazines	520	588	443	572	555	1,082	**3,760**
	Diamides	0	3	316	288	613	619	**1,839**
	Neonicotinoids	16	12	151	260	610	603	**1,652**
	Spinosyns	112	61	91	94	173	112	**642**
	Benzoylureas	100	65	66	72	33	129	**465**
	Carbamates	0	0	0	225	99	20	**343**
	Avermectin	0	0	0	0	1	6	**7**

[1] Other organophosphates refers to all pesticides classified as organophosphates except chlorpyrifos and diazinon.
AI – Active ingredient

To isolate trends in use, the ESJWQC used PUR data to compare the pounds of chemicals (AI) applied by month per each commodity to the recommended timing of applications of each chemical or pesticide class to manage pests. The ESJWQC focused its analysis on diazinon, chlorpyrifos, and the four classes of alternative pesticides with the greatest pounds applied per each commodity. The ESWQC determined the relative percent difference (RPD) of pounds applied in the first year that general outreach focused on alternative strategies (2007) and in the most current year with complete PUR data (2012) using the following formula:

$$RPD = \left[\left(\frac{X-Y}{X+Y}\right)/2\right] * -100$$

Where X = pounds applied in 2007
Y = pounds applied in 2012

The ESJWQC linked pesticide applications to pest pressures by evaluating use on a monthly basis (Figure 13 – 19) and whether there was a relative increase or decrease in use between 2007 and 2012.

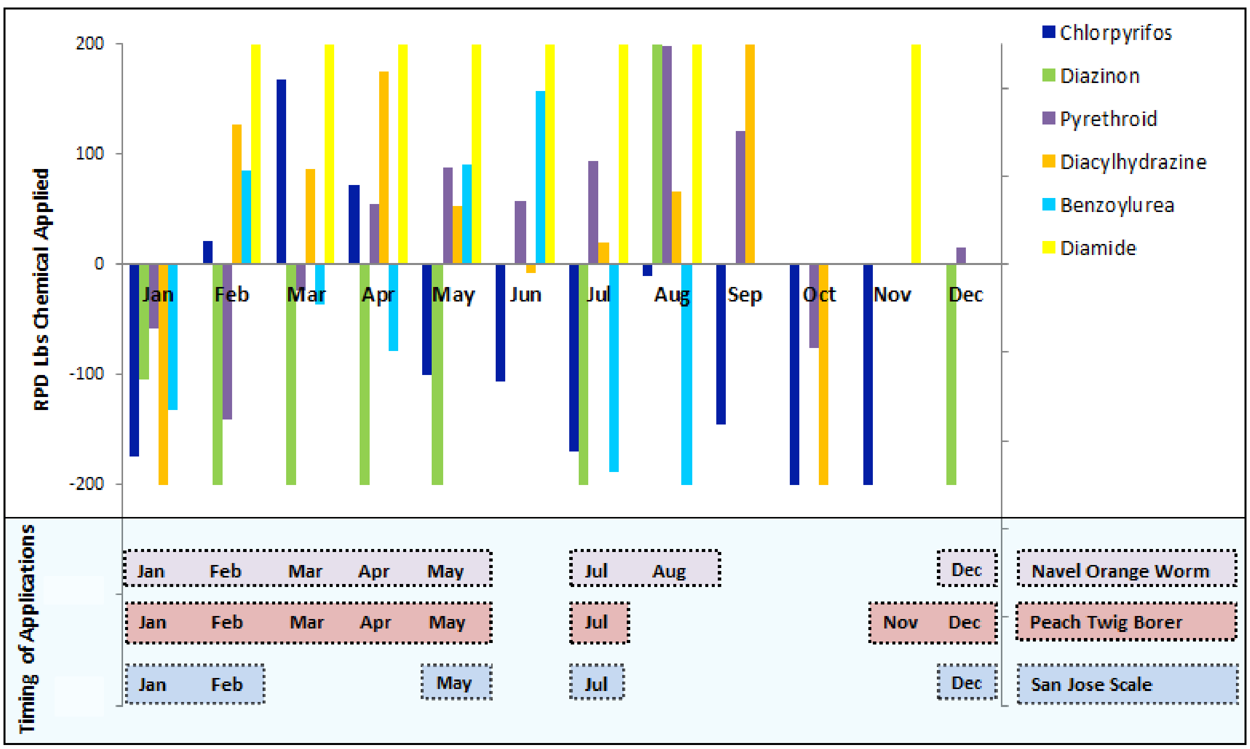
Almonds

Navel orange worm, peach twig borer, and San Jose scale are the highest priority pests for almonds in the ESJWQC region. For control of these three pests, growers can apply diazinon during December through February, May and July (Elliott et al., 2004; UC ANR 2013). During these months, pounds of diazinon applied in 2012 were less compared to pounds applied in 2007. Chlorpyrifos can be applied from March through May to treat for peach twig borer, in May to treat for San Jose scale, and in August to treat for navel orange worm (Table 29; Elliott et al., 2004; UC ANR 2013). More pounds of chlorpyrifos were applied in March and April of 2012 compared to 2007, but chlorpyrifos use was less in May of 2012 compared to 2007 (Figure 13). Pounds of chlorpyrifos applied in August were similar during

2007 and 2012. Growers may apply pyrethroids from November through February to manage peach twig borer. The pounds of pyrethroids applied during January and February was less compared to 2007 (Figure 13). The total pounds of pyrethroids applied in August (associated with navel orange worm) was greater in 2012 compared to 2007. Diacylhydrazines can be applied in March through May to manage peach twig borer and navel orange worm and August to treat for navel orange worm. Figure 13 indicates that diacylhydrazines were applied more in these months in 2012 compared to 2007. Peach twig borer can also be treated by benzoylureas when applied from November through March. The PUR data indicate a relative increase in pounds of benzoylureas applied in February of 2012 compared to 2007 and less relative use in January; this may be due to a change in timing of peach twig borer appearance and/or changes in rain patterns resulting in a shift of application timing. Diamides were not applied in 2007 to almond orchards, but were applied in February through May and November, which is associated with peach twig borer management, and in March through May and in August, which is associated with navel orange worm management, in 2012 (Figure 13).

Figure 13. Relative percent difference of pounds of diazinon, chlorpyrifos and alternative pesticide classes applied in 2007 compared to 2012 to almonds in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.



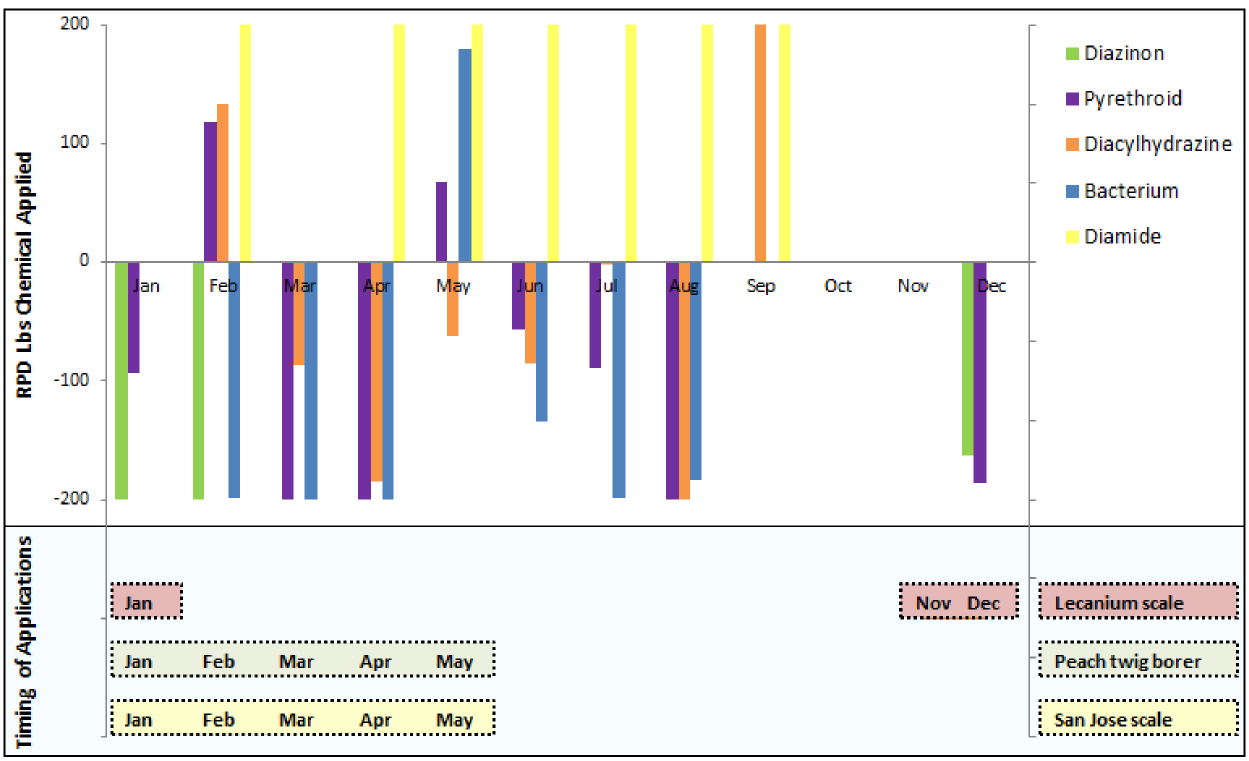
Peaches

Peach twig borer, San Jose scale, and apricot scale (lecanium scale) are the major pests for peach orchards in the ESJWQC region. Growers are recommended to apply diazinon from January through May to treat peach twig borer, and several alternative strategies are also available (Rice et al., 1972;

Daane et al. 1993; UC ANR 2013). Pyrethroids can be applied in January and February, diacylhydrazines can be applied in January through May, and bacterium and diamides can be applied in March through May to treat peach twig borer (Table 29). Less pounds of diazinon were applied in January and February of 2012 compared to 2007. When the pounds applied in applicable months are considered together, the total pounds of pyrethroids and diacylhydrazines applied in 2012 were also less compared to 2007. Diamides were the only pesticide class with more pounds applied in 2012 during months associated with peach twig borer management; there were no applications of diamides to peaches in 2007. Pounds of bacterium applied in March through May in 2012 decreased comparative to 2007 applications (Figure 14). Diazinon is recommended to be applied from March through May to treat San Jose scale and from November through January to treat lecanium scale (Table 29; Rice et al., 1972; Daane et al. 1993; UC ANR 2013). There are few alternative strategies for San Jose scale—carbamates, buprofezin and hormones—all of which are not used widely in the ESJWQC region (Tables 29 and 30). There are no alternative strategies to diazinon for lecanium scale; however, diazinon use has decreased in months during which lecanium scale should be treated (Tables 29, Figure 14).

Figure 14. Relative percent difference of pounds of diazinon and alternative pesticide classes applied in 2007 compared to 2012 to peaches in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.

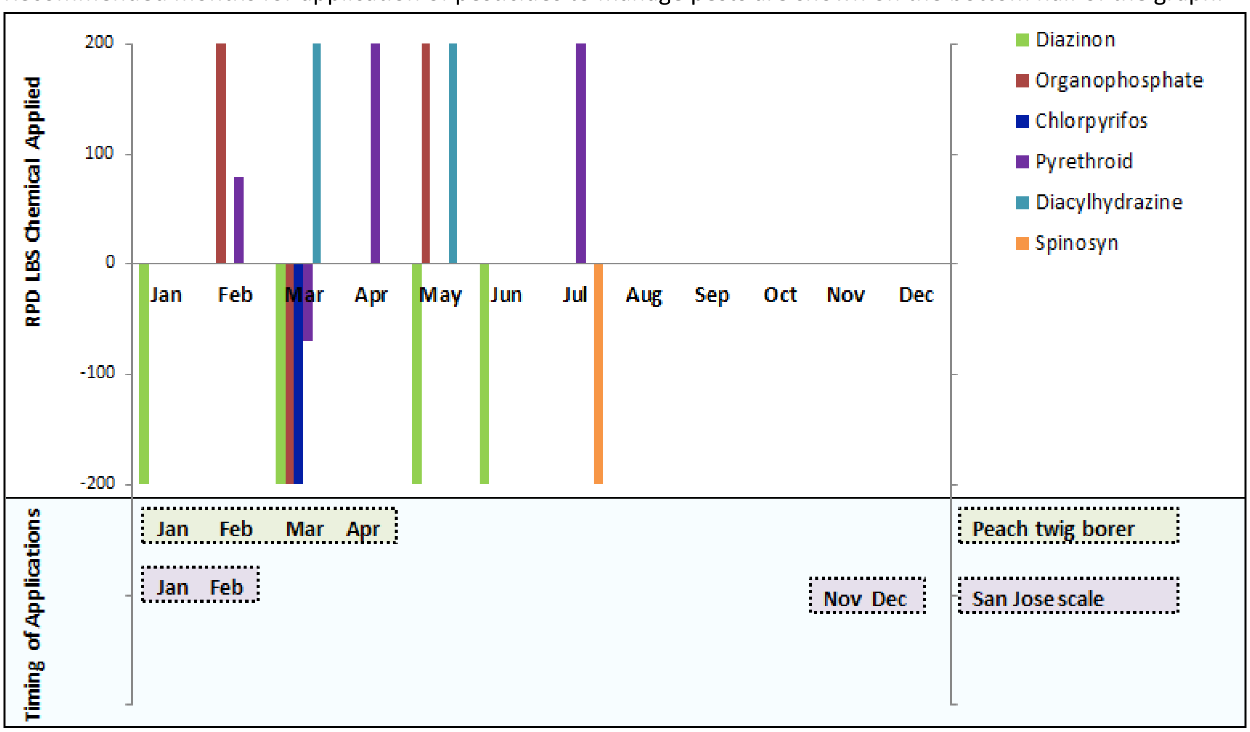


Prunes

Peach twig borer and San Jose scale are the highest priority pests in prunes. Diazinon is recommended to be applied from November through February to treat San Jose scale and from March through April to treat peach twig borer (Table 29, UC ANR 2013). Fewer pounds of diazinon were applied in January (scale) and March (borer) of 2012 compared to 2007 (Figure 15). Diazinon was not applied in February, November or December in either 2007 or 2012 (Figure 15). Applications of chlorpyrifos and other organophosphates are recommended in January and February for management of peach twig borer and for November through February for management of San Jose scale (Table 30). There were no applications of chlorpyrifos during any of these months to prunes. More pounds of other organophosphates were applied in February of 2012 compared to 2007. Spinosyns and pyrethroids are recommended to be applied from January through April to treat peach twig borer (Table 30). Spinosyns were not applied during those months in either year and do not appear to be widely applied to prunes in the ESJWQC region (only six pounds were applied in 2007 and no applications occurred in 2012- Table 31). Overall, pyrethroid use increased slightly during months recommended for treatment of peach twig borer. Diacylhydrazine is also recommended for management of peach twig borer if applied in March and April (Table 29). Between 2004 and 2007 only 28 pounds of diacylhydrazines have been applied to prunes with most of the applications (26 pounds) occurring in 2012 (Table 30, Figure 15).

Figure 15. Relative percent difference of pounds of diazinon and alternative pesticide classes applied in 2007 compared to 2012 to prunes in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.



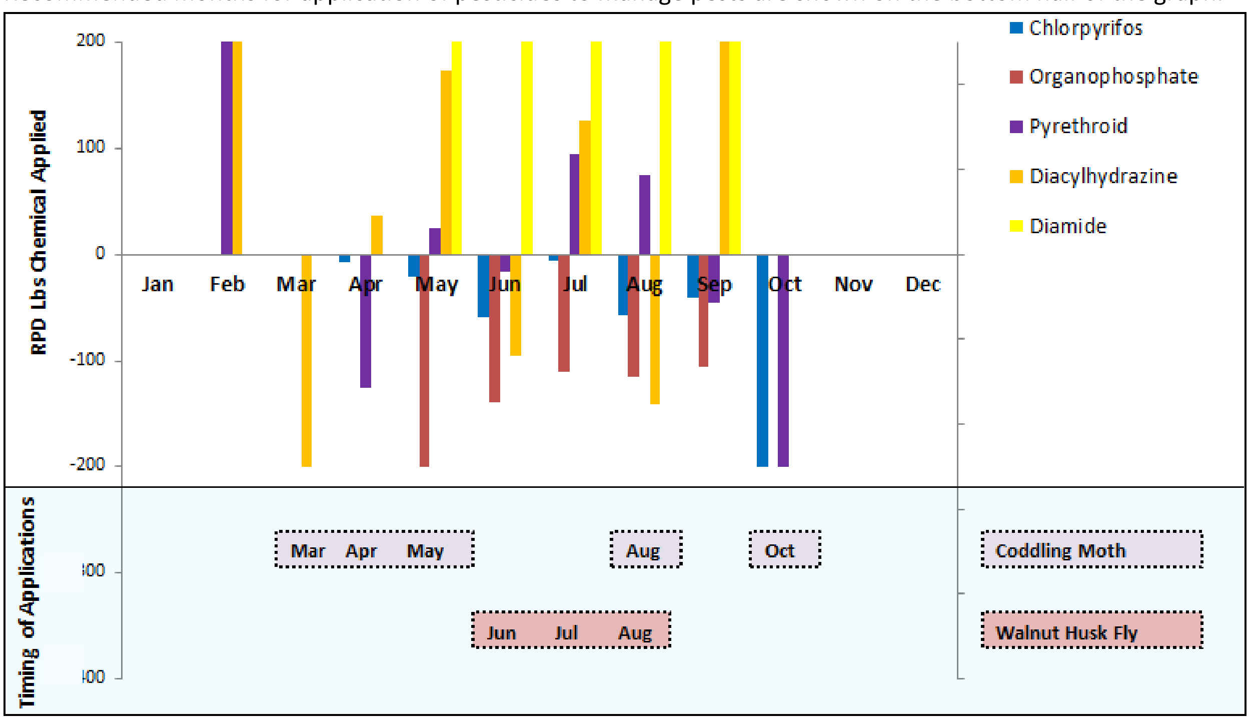
Organophosphate – Refers to all pesticides classified as organophosphates except chlorpyrifos and diazinon.

Codling moth is a major concern for walnuts and is widespread in the ESJWQC region. The UC ANR website (2013) recommends applying chlorpyrifos, diacylhydrazines, diamides, other organophosphates, or pyrethroids during March through May, August, and October for management of codling moth (Table 30). During those months, pounds of chlorpyrifos and other organophosphate applied were either less or about the same in 2012 compared to 2007 (Figure 16). Pounds of pyrethroids and pounds of diacylhydrazines applied in 2012 were greater than pounds applied in 2007 when March through May, August, and October are considered together. Diamides were not applied in 2007, whereas 619 pounds were applied in 2012 (Figure 16).

Walnut husk fly is also a major concern for walnuts and is widespread in the ESJWQC region. Applications of chlorpyrifos, other organophosphates, or pyrethroids are recommended from June through August to manage the pest (UC ANR, 2013; Table 30). During the months recommended for applications, growers applied more pounds of pyrethroids and less pounds of organophosphates, including chlorpyrifos, in 2012 compared to 2007 (Figure 16). This trend is consistent with the information gained from conversations with University of California, Davis Extension personnel: in general, chlorpyrifos is no longer applied to treat walnut husk fly as other alternatives have proven more effective.

Figure 16. Relative percent difference of pounds of chlorpyrifos and alternative pesticide classes applied in 2007 compared to 2012 to walnuts in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.

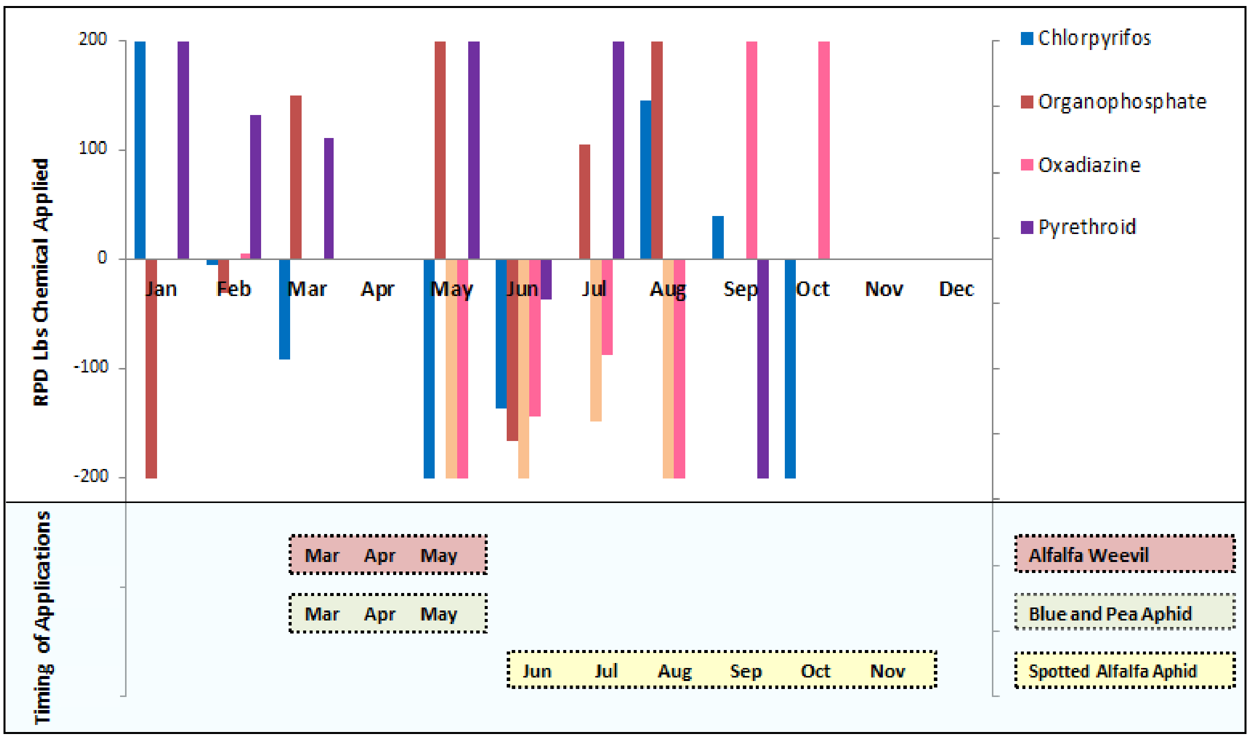


Organophosphate – Refers to all pesticides classified as organophosphates except chlorpyrifos and diazinon.

Alfalfa weevil, blue and pea aphid, and spotted alfalfa aphid are the highest priority pests for alfalfa (Summers et al., 2007; UC ANR, 2013). For management of weevil and blue and pea aphid, the UC ANR website (2013) recommends applying chlorpyrifos, oxadiazines (weevil only), other organophosphates, or pyrethroids during March through May (Table 30). Pounds of chlorpyrifos, other organophosphates, and oxadiazines were relatively consistent in 2012 compared to 2007 during March through May whereas the use of pyrethroids was greater in 2012 compared to 2007 (Figure 17). Chlorpyrifos, other organophosphates, or pyrethroids are recommended to manage spotted alfalfa aphid and should be applied from June through November (Summers et al., 2007; UC ANR, 2013; Table 30). Overall, growers applied fewer pounds of oxadiazines and slightly fewer pounds of chlorpyrifos but applied more pounds of other organophosphates and slightly more pounds of pyrethroids in 2012 compared to 2007 from June through November (Figure 17).

Figure 17. Relative percent difference of pounds of chlorpyrifos and alternative pesticide classes applied in 2007 compared to 2012 to alfalfa in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.



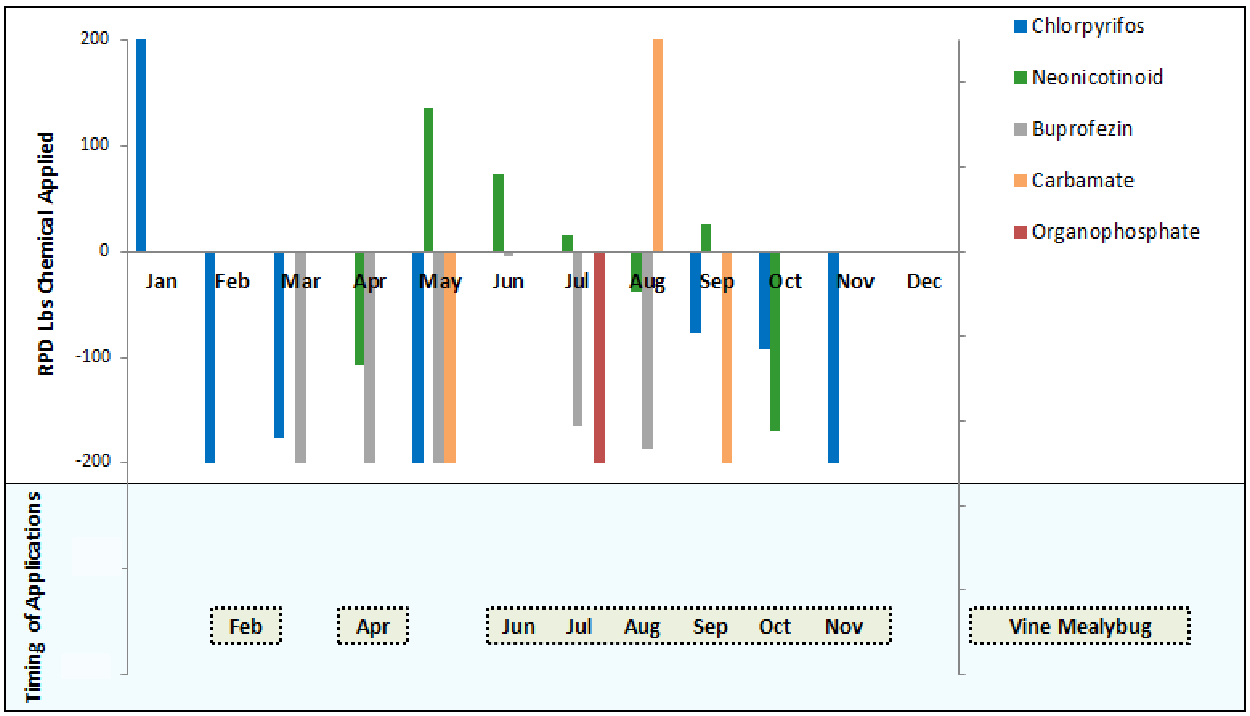
Organophosphate – Refers to all pesticides classified as organophosphates except chlorpyrifos and diazinon.

Grapes

Vine mealybug can harm grapevines from May through October (UC ANR, 2013). The UC ANR website (2013) recommends applying chlorpyrifos, other organophosphates, or carbamates from June through November to manage vine mealybugs; chlorpyrifos applications are also recommended for February (Table 30). Growers can also apply neonicotinoids in April and June through August or buprofezin in February and June through August to manage vine mealybug. Growers used less chlorpyrifos, other organophosphates, and buprofezin during months recommended for applications in 2012 compared to 2007 (Figure 18). Growers applied more carbamates in 2012 compared to 2007, in particular during the month of August. The pounds of neonicotinoids applied in April and June through August increased from 2007 to 2012 (Figure 18).

Figure 18. Relative percent difference of pounds of chlorpyrifos and alternative pesticide classes applied in 2007 compared to 2012 to grapes in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.



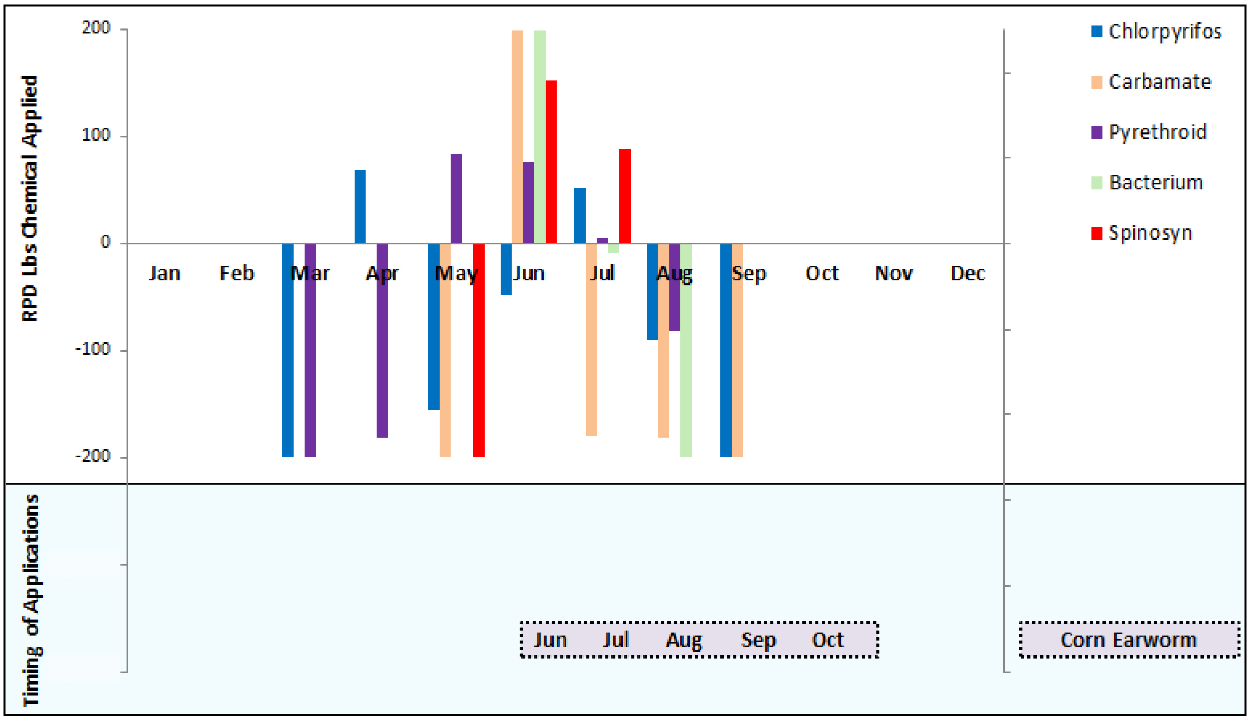
Organophosphate – Refers to all pesticides classified as organophosphates except chlorpyrifos and diazinon.

Corn

Corn earworm is present from August through December. Growers are recommended to apply chlorpyrifos, bacterium, carbamates, pyrethroids, or spinosyns from June through October to manage the pest (UC ANR 2013). More pyrethroids and slightly more spinosyns were applied in 2012 compared to 2007 during the months recommended for applications. Pounds of bacterium applied in 2012 were relatively the same as pounds applied in 2007 (Table 31). Growers applied relatively fewer pounds of chlorpyrifos and carbamates in July through September of 2012 compared to 2007 (Figure 19).

Figure 19. Relative percent difference of pounds of chlorpyrifos and alternative pesticide classes applied in 2007 compared to 2012 to corn in the ESJWQC region.

Recommended months for application of pesticides to manage pests are shown on the bottom half of the graph.



The analysis of pesticide use by month indicates growers relied more heavily on alternative pesticides than diazinon and chlorpyrifos in 2012 compared to 2007 to manage the highest priority pests. Growers applied fewer pounds of diazinon to almonds, peaches, and prunes and fewer pounds of chlorpyrifos to alfalfa, almonds, corn, grapes, and walnuts in 2012 compared to 2007. During the months recommended to target pests, growers applied more benzoylureas, diacylhydrazines, and diamides to almonds. More pounds of diacylhydrazines, diamides, and pyrethroids were applied in 2012 to walnuts than in 2007. Growers also applied more pounds of diamides in 2012 compared to 2007 to peaches to manage peach twig borer. Applications of pyrethroids and other organophosphates to alfalfa to manage weevil (pyrethroids only) and aphid and to prunes to manage peach twig borer and San Jose scale (organophosphates only) were more prevalent in 2012 compared to 2007. More pounds of pyrethroids were also applied in 2012 to corn to manage corn earworm. Carbamates and neonicotinoids were more heavily applied to treat vine mealybug in grapes in 2012 than in 2007.

The ESJWQC monitored for pyrethroids, other organophosphates and carbamates during 2012 (Table 31). The ESJWQC sampled 16 tributary monitoring locations for potential alternative pesticides and/or for water column and sediment toxicity that may indicate the presence of alternative pesticides.

Table 31. The ESJWQC tributary monitoring schedule for potential alternatives to chlorpyrifos and diazinon during the 2012 water year.

Subarea	Tributary Station 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	Bear Creek @ Kibby Rd																		MPM12		
	Berenda Slough along Ave 18 ½	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12
	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																		MPM12	MPM12	
	Deadman Creek @ Hwy 59	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12
	Dry Creek @ Rd 18																				MPM12
	Duck Slough @ Gurr Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11, MPM12	A11	A11
	McCoy Lateral @ Hwy 140	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12
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, MPM12
	Rodden Creek @ Rodden Rd	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12
Turlock, Merced	Highline Canal @ Hwy 99	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11, MPM12	A11	A11, MPM12
	Highline Canal @ Lombardy Rd	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12	A11, A12
	Hilmar Drain @ Central Ave																				MPM12
	Levee Drain @ Carpenter Rd	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12	A12
	Merced River @ Santa Fe	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11
	Prairie Flower Drain @ Crows Landing Rd	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11	A11, MPM12	A11	A11, MPM12
	Total Samples Collected	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**95**	**90**	**17**

[1]If Hyalella survival is less than 80% compared to the control, the following pesticides are analyzed: bifenthrin*, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate*, lambda-cyhalothrin*, permethrin*, fenpropathrin and chlorpyrifos.

A11- Assessment Monitoring for constituent during 2011 (October-December)

A12- Assessment Monitoring for constituent during 2012 (January-September)

MPM12-Management Plan Monitoring for constituent during 2012 (during months of past exceedances)

Samples collected from Deadman Creek @ Hwy 59 indicated the presence of carbaryl (0.20 µg/L) on February 7, 2012 and methomyl (0.36 µg/L) on September 11, 2012 (Table 32). However, the concentrations of the detected pesticides did not exceed their respective WQTLs, and therefore neither carbamate nor methomyl impaired water quality.

Table 32. Water column detections of potential alternative pesticides in ESJWQC tributaries during the 2012 water year.

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

SUBAREA	TRIBUTARY STATION NAME	SAMPLE DATE	CARBARYL (2.53 µG/L)	METHOMYL (0.52 µG/L)
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Hwy 59	07-Feb-12	0.2	
Bear Creek, Fresno-Chowchilla	Deadman Creek @ Hwy 59	11-Sep-12		0.36
		Total Exceedances	0	0
		Percentage of Exceedances Compared to Total Samples	0%	0%

Monitoring indicated two instances of toxicity: water column samples collected from Duck Slough @ Gurr Rd on October 11, 2011 were toxic to *P. promelas* and sediment samples collected from Levee Drain @ Carpenter Rd on March 6, 2012 were toxic to *H. azteca*. The *P. promelas* toxicity was not considered ecologically relevant since survival was 90% compared to the control (Table 33). Pesticide Use Report data indicate applications of pyrethroids were applied on fields that drain into Duck Slough (beta-cyfluthrin, bifenthrin, esfenvalerate, fenpropathrin, lambda-cyhalothrin, permethrin, Table 33); the cause of the toxicity is unknown. Additional sediment chemistry analysis performed on the sediment samples collected from Levee Drain @ Carpenter Rd resulted in detections of bifenthrin (12.8 µg/kg dw), cyhalothrin lambda (0.081 µg/kg dw) and permethrin (0.39 µg/kg dw, Table 34). It is likely the pyrethroids detected in the sediment contributed to the *H. azteca* toxicity.

Monitoring results in 2012 indicate carbaryl, methomyl and pyrethroids were present in tributaries within the ESJWQC region, but only pyrethroids impaired water quality. Pyrethroids are one of the top four applied alternatives on alfalfa, almonds, corn, peaches, prunes, and walnuts crops.

The ESJWQC will continue to inform growers the best way to protect water quality is to prevent the offsite movement of all agricultural constituents including chlorpyrifos, diazinon, and alternative pesticides. The ESJWQC makes growers aware of this and encourages the implementation of management practices designed to prevent spray drift, irrigation tailwater, sediment, and storm water runoff from carrying pesticides to surface waterways (refer to Monitoring Objective 3 section).

Table 33. The ESJWQC tributary water column and sediment toxicity exceedance summary for the 2012 water year.

Subarea	Station Name	Sample Date	Season & Monitoring Type[1]	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Bear Creek, Fresno-Chowchilla	Duck Slough @ Gurr Rd	11-Oct-11	Fall1, NM	*P. promelas*	Survival (%)	90	**90**	SG	PUR data indicate pyrethroid applications of beta-cyfluthrin, bifenthrin, esfenvalerate, fenpropathrin, lambda-cyhalothrin, permethrin occurred on fields that drain into Duck Slough; the cause of the toxicity is unknown.
Turlock, Merced	Levee Drain @ Carpenter Rd	06-Mar-12	Winter3 NM, SED	*H. azteca*	Survival (%)	24	**26**	SL	Pyrethroids and chlorpyrifos detected.

NM-Normal Monitoring
SED-Sediment monitoring
SL-Statistically significantly different from control; less than 80% threshold
SG-Statistically significantly different from control; greater than 80% threshold
[1]Season & Sample Type column includes the type of monitoring the toxic species was undergoing during the month of monitoring.
TIE-Toxicity Identification Evaluation

Table 34. The ESJWQC tributary chlorpyrifos and pyrethroid results for toxic sediment samples collected during the 2012 water year.

Subarea	Station Name	Sample Date	*H. azteca* (% Control)	Sediment Pesticides µg/kg dw									
				Bifenthrin	Chlorpyrifos	Cyfluthrin	Cyhalothrin, Lambda	Cypermethrin	Deltamethrin:Tralomethrin	Esfenvalerate/Fenvalerate	Fenpropathrin	Permethrin	Tetramethrin
Turlock, Merced	Levee Drain @ Carpenter Rd	06-Mar-12	26	12.8	1.7	ND	0.081	ND	ND	ND	ND	0.39	ND

ND- Not Detected

The Westside Coalition tests collected samples for a variety of carbamate, organophosphate, and organochlorine insecticides (depending on the site). During the 2012 water year, a total of 72 insecticides were detected at sites monitored by the Westside Coalition. Of these, 39 were comprised of legacy insecticides that are no longer in use (such as DDT and endrin). Of the remaining, 26 were organophosphate insecticides (nine detections of chlorpyrifos, one diazinon, 12 of dimethoate, and four of malathion), two were carbamates (carbaryl), and five were current use organochlorines (dicofol).

The Westside Coalition collects sediment samples for toxicity testing in March and September of each year, and sediment pesticide analyses are performed as a follow up to observations of sediment toxicity. During the 2012 water year, nine sediment samples from five of the monitoring sites were tested for a variety of pyrethroids, legacy organochlorines and selected organophosphate insecticides. Chlorpyrifos was detected in seven of the samples, along with other materials. Sediment toxicity and pesticide detections are discussed in greater detail in Section 8 and Attachment 4 of the Westside Coalition's SAMRs.

The Westside Coalition also reviewed available PUR data to evaluate applications of insecticides. Table 35 lists the most applied insecticides (based on total application area). 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
Imidacloprid	Thiamethoxam	Esfenvalerate
Indoxacarb	Lambda-cyhalothrin	Lambda-cyhalothrin
Esfenvalerate	Indoxacarb	Azadirachtin
Thiamethoxam	Imidacloprid	Imidacloprid
Cypermethrin	Cyfluthrin	Dimethoate
Chlorpyrifos	Esfenvalerate	Bifenthrin
Bifenthrin	Chlorpyrifos	Chlorpyrifos
Lambda-cyhalotrhin	Bifenthrin	Cypermethrin
Pyriproxyfen	Cypermethrin	Thiamethoxam
Mythomyl	Dimethoate	Spinosad
Acetamiprid	Pyriproxyfen	Pyriproxyfen
Dimethoate	Methomyl	Indoxacarb
Acephate	Acetamiprid	Acetamiprid
Cyfluthrin	Spinosad	Methomyl
Beta-cyfluthrin	Beta-cyfluthrin	Fenpropathrin
Diazinon	Fenpropathrin	Diazinon
Spinosad	Acephate	Pyrethrins
Fenpropathrin	Pyrethrins	Streptomycin sulfate

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.
- 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.
- Esfenvalerate/Fenvalerate is a synthetic pyrethroid insecticide which is used on a wide range of pests on vegetable crops, tree fruits, and nut crops. It may be mixed with a wide variety of other types of pesticides such as carbamate compounds or organophosphates
- Fenpropathrin is a pyrethroid insecticide used on a variety of fruit and vegetable crops.
- 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.
- 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.
- Tetramethrin is a pyrethroid insecticide used in commercial and residential pest control applications and is not registered for any agricultural crops.

Although the Coalitions detected 12 different insecticides in waterways during this reporting period that may be used as alternatives to chlorpyrifos and/or diazinon, it is not possible to determine if any of these materials were selected as an alternative or as 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 provide sufficient information for 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 organophosphates to carbamates) 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 2012 water year (Appendix IV, Table IV-1). Diazinon was detected in one water sample collected from the Coalitions' tributaries during the reporting period; but no chlorpyrifos was detected in the sample (Appendix IV, Tables IV-2 through IV-8). Chlorpyrifos was detected in a few samples collected from tributaries, but there was no diazinon detected in the samples (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). 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 samples. During the 2012 water year, one sample was toxic to *P. promelas* and one sediment sample was toxic to *H. azteca* (Table 33).

Water column samples collected during Assessment Monitoring on October 11, 2011 from Duck Slough @ Gurr Rd were toxic to *P. promelas* (90% survival compared to the control, Table 33). The difference between the sample and the control survival was not considered ecologically relevant. However, PUR data indicate applications of pyrethroids occurred to parcels in the subwatershed prior to the sampling event (Table 33). Assessment Monitoring was scheduled at the Duck Slough @ Gurr Rd during the October event; results indicated no detections of chlorpyrifos or diazinon. A TIE was not performed because the survival compared to the control was greater than 50%.

Sediment samples collected during Assessment Monitoring on March 6, 2012 from Levee Drain @ Carpenter Rd were toxic to *H. azteca* (26% survival compared to the control, Table 33). Since survival was 80% or less than the control, additional sediment chemistry analysis for pyrethroids and chlorpyrifos was performed. Additional sediment chemistry analysis resulted in detections of bifenthrin (12.8 µg/kg dw), chlorpyrifos (1.50 µg/kg dw), cyhalothrin lambda (0.081 µg/kg dw) and permethrin (0.39 µg/kg dw, Table 34). The pyrethroids and chlorpyrifos could have interacted in an additive or synergistic manner to cause the sediment toxicity.

Diazinon and chlorpyrifos were not detected in any samples collected from the water column during October 2011 through September 2012. Chlorpyrifos was only detected in the single toxic sediment sample from Levee Drain @ Carpenter Rd (Table 34).

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

The Westside Coalition reviewed aquatic and sediment toxicity results to assess if toxicity occurred due to the additive or synergistic effects of chlorpyrifos or diazinon and another pollutant. During the 2012 water year, one sample was toxic to *P. promelas*, four samples were toxic to *C. dubia*, 11 samples were toxic to algae, and nine sediment samples were toxic to *H. azteca*. Tables 36 and 37 provide details regarding the survival, follow-up testing, and apparent causes. In all of the samples exhibiting aquatic toxicity, there was no indication of synergistic effects. Chlorpyrifos or diazinon were not detected in combination with other insecticides, or were not present in the sample.

Table 36. Summary of Westside Coalition Aquatic Toxicity Results.

Station Name	Sample Date	Reactive Species	Results	Units	TIE Comments	Apparent Cause
Poso Slough @ Indiana Ave.	8-Nov-11	*Ceriodaphnia dubia*	0	% Survival	TIE indicated pesticides are likely cause.	Diazinon (1.2µg/L)
Orestimba Creek @ Hwy 33	13-Dec-11	*Ceriodaphnia dubia*	60	% Survival	TIE not required.	DDD (0.0059µg/L) and DDE (0.048µg/L)
Poso Slough @ Indiana Ave.	10-Apr-12	*Ceriodaphnia dubia*	0	% Survival	TIE indicated metabolically activated compounds likely cause.	Chlorpyrifos (0.66µg/L)
Del Puerto Creek @ Cox Rd.	8-May-12	*Ceriodaphnia dubia*	5	% Survival	Toxicity was not persistent: TIE inconclusive.	Unknown - no detected pesticides
Turner Slough @ Edminster Rd.	10-Apr-12	*Pimephales promelas*	83	% Survival	TIE not required.	Unknown - no detected pesticides
San Joaquin River @ Fremont Ford	14-Feb-12	*Selenastrum Capricornutum*	52	% Difference	TIE indicated pesticides are likely cause.	Diuron (8.7µg/L) and Prowl (0.26µg/L)
Salt Slough @ Sand Dam	14-Feb-12	*Selenastrum Capricornutum*	46	% Difference	TIE not required.	Diuron (5.5µg/L) and Prowl (1.9µg/L)
Salt Slough @ Lander Ave.	14-Feb-12	*Selenastrum Capricornutum*	55	% Difference	TIE indicated pesticides are likely cause.	Diuron (6.9µg/L) and Prowl (0.46µg/L)
Poso Slough @ Indiana Ave.	14-Feb-12	*Selenastrum Capricornutum*	76	% Difference	TIE indicated pesticides are likely cause.	Diuron (6.8µg/L) and Prowl (1.3µg/L)
Westley Wasteway near Cox Rd.	13-Mar-12	*Selenastrum Capricornutum*	92	% Difference	TIE indicated herbicides are likely cause.	Diuron (19µg/L)
Los Banos Creek @ China Camp Rd.	13-Mar-12	*Selenastrum Capricornutum*	19	% Difference	TIE not required.	Unknown - no detected pesticides
Ingram Creek @ River Rd.	13-Mar-12	*Selenastrum Capricornutum*	80	% Difference	TIE indicated herbicides are likely cause.	Diuron (21µg/L)

Station Name	Sample Date	Reactive Species	Results	Units	TIE Comments	Apparent Cause
Poso Slough @ Indiana Ave.	8-May-12	*Selenastrum Capricornutum*	48	% Difference	TIE not required.	Diuron (3.1µg/L), Prowl (0.78µg/L), and Trifluralin (0.96µg/L)
Orestimba Creek @ Hwy 33	8-May-12	*Selenastrum Capricornutum*	45	% Difference	TIE not required.	Prowl (2.1µg/L)
Orestimba Creek @ Hwy 33	12-Jun-12	*Selenastrum Capricornutum*	52	% Difference	Toxicity was not persistent: TIE inconclusive.	Unkown - no detected herbicides
Los Banos Creek @ China Camp Rd.	12-Jun-12	*Selenastrum Capricornutum*	23	% Difference	TIE not required.	Unknow - no detected pesticides

Sediment samples were collected in March and September 2012 in accordance with the Westside Coalition's Monitoring Order. Four of the sediment samples collected in March 2012 and five of the samples from September 2012 exhibited sufficient toxicity to warrant follow-up pesticide analysis. Table 37 summarizes the sediment toxicity results and detected pesticides. Some of the pesticide follow-up result indicated that chlorpyrifos was present in addition to other materials.

Evaluation of Detected Sediment Pesticides

March 2012 Sediment Toxicity Follow Up

Sediment toxicity tests were performed on 14 samples (including one duplicate) collected in March 2012 (Event 89). Statistically significant toxicity was measured at four sites, and follow up pesticide testing was performed on all four (see Table 37). These results were compared to literature values for the purpose of determining the probable cause of toxicity in each sample. In all cases pesticides were present in sufficient quantity to have caused the toxicity.

- Orestimba Creek at Highway 33 (36.2% Survival): A total of 5.1 sediment toxic units (TUs) were calculated based on the detected pesticides. Bifentrhin accounted for 4.5 toxic units.
- Hospital Creek (81.3% Survival): 0.91 TUs were calculated, with esfenvalerate accounting for 0.53 TUs. Although statistically significant toxicity was observed, the survival at this site was the highest observed since 2006.
- Ingram Creek (60% Survival): 2.18 TUs were calculated, with lambda-cyhalothrin and bifenthrin accouting for 1.65 TUs and 0.4 TUs, respectively. Similar to Hospital Creek, the observed survival in the sample is the highest on record since the Westside Coalition began sediment toxicity monitoring.
- Westley Wasteway near Cox Road (15% Survival): A total of 2.77 TUs, were calculated with lambda-cyhalothrin and bifenthrin accounting for 0.29 TUs and 2.39 TUs respectively.

September 2012 Sediment Toxicity Follow Up

Sediment toxicity test were performed on 13 samples (including one duplicate) collected in September 2012 (Event 95). Statistically significant toxicity was measured at five sites sufficient to required follow up pesticide analysis. These results were compared to literature values for the purpose of determining the probable cause of toxicity in each sample.

- The Blewitt Drain sample had a total of 5.1 TUs, with bifenthrin and esfenvalerate accounting for 2.17 TUs and 2.87 TUs, respectively. There are sufficient pyrethroid TUs to account for the 3.75% amphipod survival observed in the sample.
- The Hospital Creek sample had a total of 1.8 TUs, with bifenthrin and lambda cyhalothrin accounting for 1.07 TUs and 0.72 TUs, respectively. There are sufficient pyrethroid TUs to account for the 2.5% amphipod survival observed in the sample.
- The Ingram Creek sample had a total of 5.7 TUs, with bifenthrin, lambda cyhalothrin, and esfenvalerate accounting for 0.26 TUs, 0.17 TUs, and 5.24 TUs, respectively.There are sufficient pyrethroid TUs to account for the 1.25% amphipod survival observed in the sample.
- The Orestimba Creek sample had a total of 1.1 TUs, with bifenthrin accounting for 1.03 TUs. There are sufficient pyrethroid TUs to account for the 10% amphipod survival observed in the sample.
- The Westley Wasteway sample had a total of 1.3 TUs, with bifenthrin and lambda cyhalothrin accounting for 0.95 TUs and 0.11 TUs, respectively. There are sufficient pyrethroid TUs to account for the 13.75% amphipod survival observed in the sample.

Table 37. Summary of Westside Coalition Sediment Toxicity Results.

Station Name	Sample Date	Reactive Species	% Survival	Detected Pesticides
Hospital Creek @ River Rd.	12-Mar-12	*Hyalella azteca*	81.25	DDD (0.003mg/kg), DDE (0.094mg/kg), DDT (0.022mg/kg), Bifenthrin (0.31µg/kg), Esfenvalerate: Fenvalerate (4.2µg/kg), and Lambda-Cyhalothrin (0.6µg/kg)
Ingram Creek @ River Rd.	12-Mar-12	*Hyalella azteca*	60	DDD (0.0073mg/kg), DDE (0.14mg/kg), DDT (0.037mg/kg), Bifenthrin (2µg/kg), Chlorpyrifos (0.91µg/kg), Esfenvalerate: Fenvalerate (1.2µg/kg), Fenpropathrin (0.15µg/kg), and Lambda-Cyhalothrin (7.1µg/kg)
Orestimba Creek @ Hwy 33	12-Mar-12	*Hyalella azteca*	36.25	DDD (0.017mg/kg), DDE (0.33mg/kg), DDT (0.12mg/kg), Bifenthrin (24.8µg/kg), Chlorpyrifos (0.79µg/kg), Cyfluthrin (0.57µg/kg), Esfenvalerate: Fenvalerate (5.7µg/kg), Lambda-Cyhalothrin (0.61µg/kg), and Permethrin (0.35µg/kg)
Westley Wasteway near Cox Rd.	12-Mar-12	*Hyalella azteca*	15	DDD (0.038mg/kg), DDE (0.1mg/kg), Bifenthrin (21.8µg/kg), Chlorpyrifos (0.61µg/kg), Cyfluthrin (0.12µg/kg), Esfenvalerate: Fenvalerate (1.5µg/kg), and Lambda-Cyhalothrin (2.3µg/kg)
Blewett Drain @ Hwy 132	10-Sep-12	*Hyalella azteca*	3.75	DDE (0.022mg/kg), Bifenthrin (8.7µg/kg), Chlorpyrifos (0.45µg/kg), Esfenvalerate: Fenvalerate (34µg/kg), and Lambda-Cyhalothrin (0.17µg/kg)
Hospital Creek @ River Rd.	10-Sep-12	*Hyalella azteca*	2.5	DDE (0.071mg/kg), DDT (0.013mg/kg), Bifenthrin (5.1µg/kg), Chlorpyrifos (0.22µg/kg), Esfenvalerate: Fenvalerate (0.23µg/kg), and Lambda-Cyhalothrin (3µg/kg)
Ingram Creek @ River Rd.	10-Sep-12	*Hyalella azteca*	1.25	DDE (0.038mg/kg), DDT (0.0074mg/kg), Bifenthrin (1.2µg/kg), Chlorpyrifos (0.18µg/kg), Esfenvalerate: Fenvalerate (71µg/kg), and Lambda-Cyhalothrin (0.69µg/kg)
Orestimba Creek @ Hwy 33	10-Sep-12	*Hyalella azteca*	10	DDD (0.022mg/kg), DDE (0.14mg/kg), DDT (0.025mg/kg), Bifenthrin (5.9µg/kg), Esfenvalerate: Fenvalerate (0.78µg/kg), and Lambda-Cyhalothrin (0.15µg/kg)
Westley Wasteway near Cox Rd.	10-Sep-12	*Hyalella azteca*	13.75	DDE (0.034mg/kg), DDT (0.0044mg/kg), Bifenthrin (5.9µg/kg), Chlorpyrifos (1.6µg/kg), Cypermethrin (0.38µg/kg), Esfenvalerate: Fenvalerate (1.1µg/kg), and Lambda-Cyhalothrin (0.6µg/kg)

In each of the sediment samples where follow up pesticide analyses were performed, at least one pyrethroid insecticide was detected at a level sufficient to cause the observed toxicity itself, without the synergistic effects of chlorpyrifos or other materials.

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

A determination of technical and economic 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) as well as NRCS funding and internal grant/loan funding provided by local water agencies. These programs offer several million dollars towards the implementation of structural management practices within their respective regions. However, 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 the 2012 water year, 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 the 2012 water year.

Within both the ESJWQC and Westside Coalition regions, there was a reduction in the number of exceedances of chlorpyrifos from 2011 compared to the 2012 water year. Diazinon was detected once in a tributary during the 2012 water year, which is more than it was detected in 2011. However, this represents less than 1% detection for the year, and there is no apparent trend in increased diazinon use. 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.

CONCLUSIONS AND RECOMMENDATIONS

The ESJWQC and Westside Coalition assessed compliance with the seven Monitoring Objectives of the chlorpyrifos and diazinon TMDL program by evaluating results collected from their joint chlorpyrifos and diazinon TMDL monitoring program and their individual Coalition tributary monitoring programs. The two Coalitions demonstrated compliance with Monitoring Objective 1 as neither chlorpyrifos nor diazinon exceeded the WQOs in the San Joaquin River, and all samples were in compliance with loading capacity. The ESJWQC was compliant with Monitoring Objective 2 as there was not a single detection of chlorpyrifos or diazinon in water samples collected from ESJWQC tributaries during the 2012 water year. Concentrations of chlorpyrifos exceeded the WQTL in Westside Coalition tributaries in a total of eight samples from six different tributaries and exceedances of the WQTL for diazinon occurred once in one tributary. Of all tributaries with chlorpyrifos or diazinon exceedances, all but one (Marshall Road Drain at River Road) are under a management plan. A focused management plan for the Marshall Road Drain subwatershed is in development. Both Coalitions determined the degree of implementation and evaluated the effectiveness of management practices designed to reduce the off-site movement of chlorpyrifos and diazinon. The ESJWQC and Westside evaluated alternatives to chlorpyrifos and diazinon including use within the two Coalition regions and water quality impairments due to other pesticides. Alternative pesticides may be impairing water quality, and synergistic and/or additive effects may be occurring in ESJWQC and Westside Coalition tributaries. The management practices implemented by growers in both Coalition regions are achieving the lowest pesticide levels technically and economically feasible.

Chlorpyrifos use in recent years has declined (Figure 4). Diazinon use declined dramatically in the Lower San Joaquin River watershed over the past few years (Figure 3). Use patterns are reflected in water quality results. In addition, growers are cognizant of water quality concerns related to organophosphate pesticides and implement management practices to prevent against the off-site movement of chlorpyrifos and diazinon. Both Coalitions include discussions of chlorpyrifos and diazinon during focused outreach to growers.

Regional Board staff were concerned that monitoring was not occurring often enough to completely characterize water quality in the San Joaquin River. The monitoring frequency of the chlorpyrifos and diazinon TMDL program was originally designed to occur quarterly in the San Joaquin River and monitoring would occur during one month of each quarter to coincide with the greatest applications (2010 water year). The monitoring frequency was increased to include monthly samples for three of the six compliance points during the 2011 water year. Monitoring timing was adjusted for the 2012 water year from quarterly monitoring to monthly monitoring from May through August at the six compliance points. Despite the four-fold increase in monitoring frequency, chlorpyrifos and diazinon were not detected in any of the San Joaquin monitoring sites during any of these monitoring events.

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