Annual Report

October 2015 – September 2016

East San Joaquin
WATER QUALITY COALITION

Irrigated Lands Regulatory Program
Central Valley Regional Water Quality Control Board

Submitted May 1, 2017

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ECOSYSTEMS • CONSULTING

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LIST OF ACRONYMS

AG	Agriculture
AI	Active Ingredient
AMR	Annual Monitoring Report
APN	Assessor Parcel Number
AWEP	Agricultural Water Enhancement Program
BMP	Best Management Practice
BU	Beneficial Use
C	Core
CalPIP	California Pesticide Information Portal
CDEC	California Data Exchange Center
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
COC	Chain of Custody
CRM	Certified Reference Materials
CURES	Coalition for Urban and Rural Environmental Stewardship
CVRWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CVSC	Central Valley Salinity Coalition
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved Oxygen
DPR	Department of Pesticide Regulation
DQO	Data Quality Objective
DWR	(California) Department of Water Resources
EC50	Effective Concentration of 50% of the measured endpoint
EDD	Electronic Data Deliverable
EPA	(United States) Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESJHVA	East San Joaquin High Vulnerability Area
ESJWQC	East San Joaquin Water Quality Coalition
F	Field
FE	Farm Evaluation
FD	Field Duplicate
GAR	Groundwater Quality Assessment Report
GCC	MPEP Group Coordinating Committee
HCH	Hexachlorocyclohexane
ILRP	Irrigated Lands Regulatory Program
Koc	Organic Carbon Partitioning Coefficient
LABQA	Laboratory Quality Assurance
LC50	Lethal Concentration at 50% mortality
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MCL	Maximum Contaminant Level

MDL	Minimum Detection Limit
MLJ-LLC	Michael L. Johnson, LLC
MPEP	Management Practice Evaluation Program
MPEP GCC	Management Practice Evaluation Program Group Coordinating Committee
MPM	Management Plan Monitoring
MPN	Most Probable Number
MPU	Monitoring Plan Update
MPUR	Management Plan Update Report
MRP	Monitoring and Reporting Program Order No. R5-2008-0005
MRPP	Monitoring and Reporting Program Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MUN	Municipal and Domestic Supply
NA	Not Applicable
ND	Not Detected
NM	Normal Monitoring
NMP	Nitrogen Management Plan
NMP TAWG	Nitrogen Management Plan Technical Advisory Work Group
NRCS	Natural Resources Conservation Service
OP	Organophosphate Pesticides
PAM	Polyacrylamide
PCA	Pest Control Advisor
pH	Power of Hydrogen
PR	Percent Recovery
PTFE	Polytetrafluoroethylene (Teflon™)
PUR	Pesticide Use Report
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
REC 1	Water Contact Recreation
RfD	Reference Dose
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SC	Specific Conductance
SD	Standard Deviation
SECP	Sediment and Erosion Control Plan
SDEAR	Sediment Discharge and Erosion Assessment Report
SG	Statistically significantly different from control; Greater than 80% threshold
SJCDWQC	San Joaquin County and Delta Water Quality Coalition
SL	Statistically significantly different from control; Less than 80% threshold
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Board Resources Control Board
SVWQC	Sacramento Valley Water Quality Coalition

TDS	Total Dissolved Solids
TID	Turlock Irrigation District
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
VOA	Volatile Organic Analyte
WDR	Waste Discharge General Order R5-2012-0116-R3
WQO	Water Quality Objective
WQTL	Water Quality Trigger Limit
WSJRWC	Westside San Joaquin River Watershed Coalition
WWQC	Westlands Water Quality Coalition
WY	Water Year
YSI	Yellow Springs Instruments

LIST OF UNITS

°C	degrees Celsius
cfs	cubic feet per second
cm	centimeter
dw	dry weight
g	gram
kg	kilogram
L	liter
lbs	pounds
mg	milligram
mL	milliliter
mm	millimeter
mph	miles per hour
MPN/100mL	most probable number per 100 milliliters
ng	nanogram
NTU	Nephelometric Turbidity Units
sec	second
TUa	Toxic Unit (acute)
TUc	Toxic Unit (chronic)
µg	microgram
µm	micrometer
µmhos	micromhos
µS	microsiemens

LIST OF TERMS

Agricultural Commissioner – County Agriculture Commissioner
ArcGIS – Geographic Information Systems mapping software
Central Valley or Valley – California Central Valley
Coalition –East San Joaquin Water Quality Coalition
Coalition/ESJWQC region – The region within the Central Valley that is monitored by the East San Joaquin Water Quality Coalition
Drainage –Water that moves horizontally across the surface or vertically into the subsurface from land
General Order –Waste Discharge General Order R5-2012-0116
Landowners – One or more persons responsible for the management of the irrigated land
Non-project QA sample – Sample results from another project other than the Coalition included to meet laboratory Quality Assurance requirements.
Normal Monitoring –Refers to monitoring at Core and Represented sites based on the WDR.
Regional Board – Central Valley Regional Water Quality Control Board
Site subwatershed – Starting from the sampling site, all waterbodies that drain, directly or indirectly, into the waterbody before the point where sampling occurs.
Special study – A study conducted outside of Normal Monitoring activities that involves monitoring specific constituents in an effort to determine the mechanism responsible for the exceedances; also includes Total Maximum Daily Load (TMDL) monitoring.
Subwatershed – The topographic perimeter of the catchment area of a stream tributary (Environmental Protection Agency (EPA) terms of environment: http://www.epa.gov/OCEPAterms/sterms.html).
Tributary Rule – Beneficial uses for Coalition monitoring sites are applied based on the most immediate downstream waterbody (not applied to constructed agricultural drains such as ones in Delta islands).
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.
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).

ANNUAL REPORT REQUIREMENTS – SECTION KEY

	Annual Monitoring Report and Management Plan Progress Report requirements (Order No. R5-2012-0116-R3)	Section Name/Location – Annual Report
Annual Monitoring Reporting Requirements	1. Signed Transmittal Letter	Cover Letter
	2. Title page	East San Joaquin Water Quality Coalition Annual Report
	3. Table of contents	Table of Contents, List Appendices, List of Tables, List of Figures, List of Acronyms, List of Units, and List of Terms
	4. Executive Summary	Executive Summary
	5. Description of the Coalition Group geographical area with shapefiles	Introduction and Geographical Area, and Shapefiles (attached CD)
	6. Monitoring objectives and design	Monitoring Objectives and Design
	7. Sampling site descriptions and rainfall records for the time period	Sample Site Descriptions and Locations, Rainfall Records
	8. Location map(s) of sampling sites, crops and land uses	Sampling Site Descriptions and Locations, and Appendix IV (Land Use Maps)
	9. Tabulated results of all analyses arranged in readily discernible tabular form	Tabulated Results in Attachment A
	10. Discussion of data relative to water quality objectives, and water quality management plan milestones where applicable	Discussion of Surface Water Monitoring Results, Surface Water Evaluation of Management Practice Effectiveness, Conclusions and Recommendations
	11. Sampling and analytical methods used	Methods
	12. Summary of Quality Assurance Evaluation results (as identified in the most recent approved QAPP for Precision, Accuracy and Completeness)	Quality Assurance Evaluation Results
	13. Specify method used to obtain flow at each monitoring site during each monitoring event	Methods
	14. Summary of Exceedances Reports submitted during reporting period and related pesticide use information	Exceedance Reports, Appendix II (Pesticide Use Reports), and PUR Access Database (attached CD)
	15. Actions taken to address water quality exceedances, including but not limited to, revised or additional management practices implemented	Coalition and Member Actions Taken To Address Water Quality Exceedances, and Appendix III (Meetings, Agendas and Handouts)
	16. Evaluation of monitoring data to identify spatial trends and patterns	Surface Water Evaluation of Management Practice Effectiveness
	17. Summary of Nitrogen Management Plan information	2016 WY Submittals and Approvals, Nitrogen Management Plan Summary Report, Appendix V (NMP Statistical Analysis)
	18. Summary of management practice information collected from Farm Evaluations	Farm Evaluations, 2016 WY Submittals and Approvals
	19. Summary of mitigation monitoring	Mitigation Monitoring
	20. Summary of education and outreach activities	Coalition and Member Actions Taken to Address Exceedances of Water Quality Objectives Management Practices, Appendix III (Meetings, Agendas and Handouts)
	21. Conclusions and recommendations	Conclusions and Recommendations

	Annual Monitoring Report and Management Plan Progress Report requirements (Order No. R5-2012-0116-R3)	Section Name/Location – Annual Report
Management Plan Progress Report Requirements	1. Title page	East San Joaquin Water Quality Coalition Annual Report
	2. Table of contents	Table of Contents, List of Tables, List of Figures, List Appendices, List of Acronyms, List of Units, and List of Terms
	3. Executive Summary	Executive Summary
	4. Location map(s) and a brief summary of management plans covered by the report	Appendix IV (Land Use Maps) and Status of Special Projects
	5. Updated table that tallies all exceedances for the management plans	Attachment A, Appendix I (Sample and Exceedance Counts), Discussion of Surface Water Monitoring Results, Status of Management Plans
	6. List of new management plans triggered since the previous report	Status of Management Plans
	7. Status update on preparation of new management plans and special projects	Status of Management Plans, Status of TMDLs
	8. Summary and assessment of MPM data collected during reporting period	Discussion of Surface Water Monitoring Results, Status of Management Plans, Surface Water Evaluation of Management Practice Effectiveness
	9. Summary of management plan grower education and outreach conducted	Coalition and Member Actions Taken to Address Exceedances of Water Quality Objectives, Surface Water Evaluation of Management Practice Effectiveness
	10. Summary of the degree of implementation of management practices	Coalition and Member Actions Taken To Address Water Quality Exceedances, Surface Water Evaluation of Management Practice Effectiveness
	11. Results from evaluation of management practice effectiveness	Surface Water Evaluation of Management Practice Effectiveness
	12. Evaluation of progress in meeting Performance Goals and Schedules	Coalition Actions Taken to Address Exceedances of Water Quality Objectives: (Performance Goals and Schedules, and Management Practices)
	13. Recommendations for changes to the Management Plan	Status of Management Plans, Conclusions and Recommendations

MPM-Management Plan Monitoring
PUR-Pesticide Use Report
QC- Quality Control
SWAMP- Surface Water Ambient Monitoring Program

PROGRAMMATIC QUESTIONS-SECTION KEY

PROGRAMMATIC QUESTIONS WDR (ATTACHMENT A, PAGE 10)	SECTION NAME/LOCATION – ANNUAL REPORT
1. Are receiving waters to which irrigated lands discharge meeting applicable water quality objectives and Basin Plan provisions?	Protecting Beneficial Uses
2. Are irrigated agricultural operations causing or contributing to identified water quality problems? If so, what are the specific factors or practices causing or contributing to the identified problems?	Discussion of Surface Water Monitoring Results
3. Are water quality conditions changing over time (e.g. degrading or improving as new management practices are implemented)?	Trends in Coalition Monitoring Results
4. Are irrigated operations of Members in compliance with the provisions of the Waste Discharge Requirement?	Grower Compliance with WDR
5. Are implemented management practices effective in meeting applicable receiving water limitations?	Efficacy and Application of Implemented Management Practices
6. Are the applicable surface water quality management plans effective in addressing identified water quality problems?	Status of Management Plans, Effectiveness of Management Plans, Conclusions and Recommendations

EXECUTIVE SUMMARY

The East San Joaquin Water Quality Coalition (ESJWQC or Coalition) is submitting the May 1, 2017 Annual Report which includes an update to the Coalition's Management Plan Progress Report and management plan implementation schedules and timelines, the 2016 WY monitoring results, and a record of Coalition outreach activities, as required by the Waste Discharge Requirements General Order for Growers within the Eastern San Joaquin River Watershed (WDR, No. R5-2012-0116-R3). The primary objectives of the monitoring program are to characterize discharge from irrigated agriculture and to determine if implemented management practices are effective in reducing or eliminating discharge and impairments of beneficial uses.

The 2017 Annual Report includes 1) identification of agricultural sources of discharge resulting in exceedances of Water Quality Trigger Limits (WQTLs), 2) tracking of implemented management practices, and 3) documentation of progress toward meeting performance goals and measures and management plan implementation schedules and timelines as outlined in the Coalition's Surface Water Quality Management Plan (SQMP).

ESJWQC Monitoring Program Summary

Based on the WDR monitoring design, Core and Represented sites are designated for each of the six zones. Core sites establish trends in water quality and are monitored monthly. The Coalition evaluates the potential risk for water quality impairments at Represented sites based on exceedances of WQTLs at the associated Core site. In addition, the Coalition conducts Management Plan Monitoring (MPM) to monitor constituents requiring management plans. Sampling occurred during the 2016 WY at Core, Represented, and MPM sites, including three storm and two sediment monitoring events.

Total Maximum Daily Load (TMDL) monitoring occurred at three compliance points on the San Joaquin River (SJR) for one storm event in January, and from May through September (San Joaquin River at Hills Ferry Road, San Joaquin River at the Maze Boulevard (Highway 132) Bridge, and San Joaquin River at the Airport Way Bridge near Vernalis). The May 1, 2017 San Joaquin River Chlorpyrifos and Diazinon Annual Monitoring Report contains results from the ESJWQC and the Westside San Joaquin River Watershed Coalition's collaborative monitoring plan for assessing compliance with the Lower San Joaquin River chlorpyrifos and diazinon TMDL monitoring at six compliance points as identified in the Basin Plan Amendment.

During the 2016 WY, the Coalition monitored according to the strategy outlined in the Monitoring and Reporting Program (MRP), Attachment B to the WDR, and according to the August 1, 2015 Monitoring Plan Update (MPU) report for the 2016 WY (approved November 13, 2015). During the 2016 WY, the Coalition monitored 29 sites; of these 29 sites, MPM took place at 22 sites. Management Plan Monitoring was conducted for copper, chlorpyrifos, diazinon, dimethoate, diuron, malathion, and water column toxicity to *Ceriodaphnia dubia*, *Pimephales promelas*, *Selenastrum capricornutum*, and sediment toxicity to *Hyalella azteca*.

Results from the 2016 WY include exceedances of WQTLs for the following constituents: dissolved oxygen (DO; 52), pH (27), specific conductivity (SC; 39), *E. coli* (26), nitrate (8) and ammonia (5), dissolved copper (20), arsenic (1) and lead (1), chlorpyrifos (2), diuron (1), and malathion (1). Water column toxicity to *S. capricornutum* (11) occurred during the 2016 WY. The series of actions taken to determine the potential sources causing toxicity and exceedances of the WQTLs include: 1) the use of Pesticide Use Reports (PURs) to identify relevant pesticide applications within the specified time period prior to the sampling event, as well as 2) an analysis of monitoring data and toxicity results.

As a result of the 2016 WY monitoring, several new site/constituent specific management plans are required including:

- Berenda Slough along Ave 18 ½ (pH)
- Canal Creek @ West Bellevue Rd (pH and *E. coli*)
- Highline Canal @ Hwy 99 (reinstated ammonia)
- Lateral 5 ½ @ South Blaker Rd (*E. coli* and Nitrate)
- Livingston Drain @ Robin Ave (DO)
- Merced River @ Santa Fe (reinstated chlorpyrifos)
- Westport Drain @ Vivian Rd (pH)

Management Plan Strategy

When a management plan is developed for a site subwatershed, additional focused effort within the subwatershed is required. The Coalition's 2014 SQMP strategy (approved November 24, 2015) includes the following actions to address management plans:

1. Identify members with the potential to discharge to surface waters causing exceedances of WQTLs of management plan constituents.
2. Review the member's FE survey from the year prior to initiation of Management Plan activities to determine number/type of management practices currently in place, and determine if additional practices are necessary.
3. Hold meetings as necessary to inform members of water quality problems and recommend additional practices.
4. Review the member's FE survey from the year following initiation of Management Plan activities to document number/type of new management practices implemented.
5. Evaluate effectiveness of new management practices.

During the 2016 WY, the Coalition followed up with all growers in the seventh priority site subwatersheds who were recommended management practices and recorded any newly implemented management practice. For 2016 Focused Outreach site subwatersheds, the Coalition completed 100% of individual meetings with 32 targeted growers and documented current and recommended management practices. The Coalition is in the process of initiating the 2017 Focused Outreach in the Dry Creek @ Rd 18, Lateral 2 ½ near Keyes Rd, Livingston Drain @ Robin Ave, and Miles Creek @ Reilly Rd site subwatersheds. Individual meetings with targeted members will take place in 2017 and 2018 to discuss local water quality concerns and recommend additional management practices effective at reducing water quality impairments; preliminary results from 2017 Focused Outreach will be included in the May 1, 2018 Annual Report.

Conclusions

Monitoring results from the 2016 WY indicate that although there are substantial improvements in water quality in many areas, water quality is still not protective of all beneficial uses across the entire Coalition region. Listed below are the conclusions from data provided in the Management Practice Effectiveness, Efficacy of Management Plans and Implemented Practices, Status of TMDL Constituents, and Spatial Trends in Monitoring Results sections of this report:

1. Individual grower visits continue to be an effective method of communicating with members.
2. Implementation of management practices continues to improve water quality in the Coalition region.
3. Growers across the ESJWQC region are aware of water quality impairments and are implementing management practices designed to address these impairments even if the Coalition has yet to conduct focused outreach in the site subwatershed.
4. Growers in the ESJWQC region are taking advantage of available funding resources to implement management practices that improve water quality.
5. Remaining exceedances may be difficult to eliminate because the cause/source of the problems may not be due to agriculture; management practices effective in eliminating exceedances of pesticides are not effective in reducing exceedances of WQTLs for parameters such as DO, SC, *E. coli,* ammonia/nitrates, or pH.
6. Member actions may not be the main cause of water quality impairments associated with elevated concentrations of copper.
7. The Coalition's focused management practice outreach and tracking strategy is effective at improving water quality. The Coalition received approval on April 14, 2017 to remove 10 specific site subwatershed/ constituent pairs from the active management plan of eight site subwatersheds.
8. Continued improvements in water quality are expected in coming years based on results evident from past grower outreach efforts.
9. Future water quality results may be dependent on growers who are not yet members of the Coalition and do not comply with discharge requirements.

Based on the information provided in the response to the programmatic questions, the Coalition will pursue the following during the 2017 WY:

1. Monitor according to the WDR and the monitoring schedule outlined in the Monitoring Plan Update (2017 WY MPU; approved October 7, 2016),
2. Continue to document and assess management practices implemented by Coalition growers, and
3. Continue focused outreach and education efforts around constituents applied by agriculture while also educating growers about non-conserved constituents such as DO, pH, and SC.

Recommendations

The Coalition identified several areas in which Central Valley Regional Water Quality Control Board (CVRWQCB) involvement could result in improvement in water quality in the Coalition region:

1. Review Irrigation District permits for potential source of algae toxicity and contribution to metals exceedances.

2. Identify and regulate dairies in site subwatersheds that are using constituents of concern which may affect the BUs of downstream waterbodies.
3. Develop and deploy methods to monitor illegal dairy discharges and notify the Coalition of any known dairy discharges that may result in water quality impairments including nutrient and *E. coli* exceedances.
4. Continue enforcement actions against non-members who have the potential to discharge.
5. Consider eliminating exceedances that occurred in samples collected from non-contiguous waterbodies as they do not adequately represent water quality within the Coalition region.
6. Move forward with developing management practice implementation criteria within a subwatershed that will allow the Coalition to complete management plans for DO, pH, SC, and *E. coli*.
7. Continue to work with the CV-SALTS process to develop a better understanding of the sources and sinks of salt in surface and groundwater and potential practices that can be effective in preventing exceedances.

INTRODUCTION AND GEOGRAPHICAL AREA

As outlined in the Waste Discharge Requirements General Order for Growers within the Eastern San Joaquin River Watershed (WDR or General Order; Order No. R5-2012-0116-R3), the East San Joaquin Water Quality Coalition (ESJWQC or Coalition) is submitting the Annual Report for monitoring results from October 2015 through September of the 2016 Water Year (WY).

The 2017 Annual Report includes sections which address reporting requirements for the Monitoring and Reporting Program (Attachment B of the WDR) and Management Plan Progress Report (Appendix MRP-1 of the WDR). The Annual Report Requirements Section Key (Page xv) lists the required components of the Annual Report and Management Plan Progress Report and their corresponding sections of this report. The Programmatic Questions Section Key (Page xviii) lists the six programmatic questions outlined in the WDR (Attachment A, Page 10) and where answers to the questions can be found. The Annual Report includes monitoring results and activities from the previous WY as well as the status of management plan implementation schedules and timelines (Attachment A of the WDR, Page 10-11).

The ESJWQC area includes the portions of Stanislaus and Merced Counties east of the San Joaquin River, Madera County, and the portion of Fresno County that drains directly into the San Joaquin River. The eastern counties within the boundary include Tuolumne, Mariposa, and the portions of Alpine Counties that drain into the Stanislaus River. Drainage is determined using the California Watershed Boundary from the United States Geological Survey (USGS). The region that drains into the Coalition area is bordered by the crest of the Sierra Nevada on the east, the San Joaquin River on the west, the Stanislaus River, and its drainage areas on the north, and the San Joaquin River and its drainage areas on the south.

IRRIGATED LAND

Although exact acreage is difficult to estimate due to rapidly changing land use, the Coalition area contains approximately 5,534,854 acres of which 985,287 acres (18%) are considered irrigated agriculture (measured in ArcGIS; Table 1). To obtain information on irrigated acreage, the Coalition uses information from two California Department of Water Resources (DWR) data sources: 1) DWR Agricultural Land and Water Use data, and 2) DWR Land Use Survey.

Agricultural Land and Water Use data (DWR, http://www.water.ca.gov/landwateruse/anaglwu.cfm) were used to estimate the acreage of irrigated crops for each county. Land Use Survey data (http://www.water.ca.gov/landwateruse/lusrvymain.cfm) includes more detailed information regarding specific crop uses (both irrigated and non-irrigated); however, it is updated less often. Because Land Use Survey data are available in GIS shape files, the geographical information data was mapped to the Coalition area and used for estimates of irrigated crop acreage. The data source used depends on: 1) whether or not the entire county is within the Coalition boundary, and 2) which data were developed most recently.

For Stanislaus, Merced, Madera, Fresno, and Alpine Counties, the Coalition utilized DWR Land Use Survey data to determine irrigated land area because 1) only portions of these counties are included in the Coalition boundary, or 2) the data were more current. For Tuolumne and Mariposa Counties, Agricultural Land and Water Use data were used since these counties are included in their entirety within the Coalition boundary (Table 1). Although the entire county of Madera is represented by the Coalition, the DWR Land Use Survey is more current and therefore was utilized. Calculations of total acreage, measurements were made using ArcGIS.

Table 1. Acreage of irrigated land in ESJWQC counties and available DWR data.

County	Total County Acreage (measured in ArcGIS)	County Irrigated Land Acreage	Data Source Year (Agricultural Land and Water Use)[1]	Data Source Year (Land Use Survey)[2]
Alpine	85,638	72		2013
Fresno*	607,560	0		2000*
Madera*	1,377,316	347,613		2011*
Mariposa	936,078	1,100	2010	1998
Merced	667,635	365,444		2002
Stanislaus	467,456	268,924		2010
Tuolumne	1,393,172	2,134	2010	2013
Total	**5,534,854**	**967,999**		

[1]DWR Agricultural Land Use: http://www.water.ca.gov/landwateruse/anaglwu.cfm
[2]DWR Land Use Survey: http://www.water.ca.gov/landwateruse/lusrvymain.cfm
*Land use for Fresno and Madera Counties are only described for 57% and 37% of the county, respectively.

GEOGRAPHICAL CHARACTERISTICS AND LAND USE

The Coalition area is divided into six zones to facilitate the implementation of a comprehensive monitoring program (Figure 1). These zones are based on hydrology, crop types, land use, soil types, and rainfall. Zone acreages were determined using Land Use Survey Data (Table 2). The zones are named for the primary Core site within that area: 1) Dry Creek @ Wellsford Rd Zone, 2) Prairie Flower Drain @ Crows Landing Rd Zone, 3) Highline Canal @ Hwy 99 Zone, 4) Merced River @ Santa Fe Zone, 5) Duck Slough @ Gurr Rd Zone, and 6) Cottonwood Creek @ Rd 20 Zone. Land use maps for each zone are included in Figure 2 through Figure 7.

Figure 1. ESJWQC zone boundaries and Core sites.

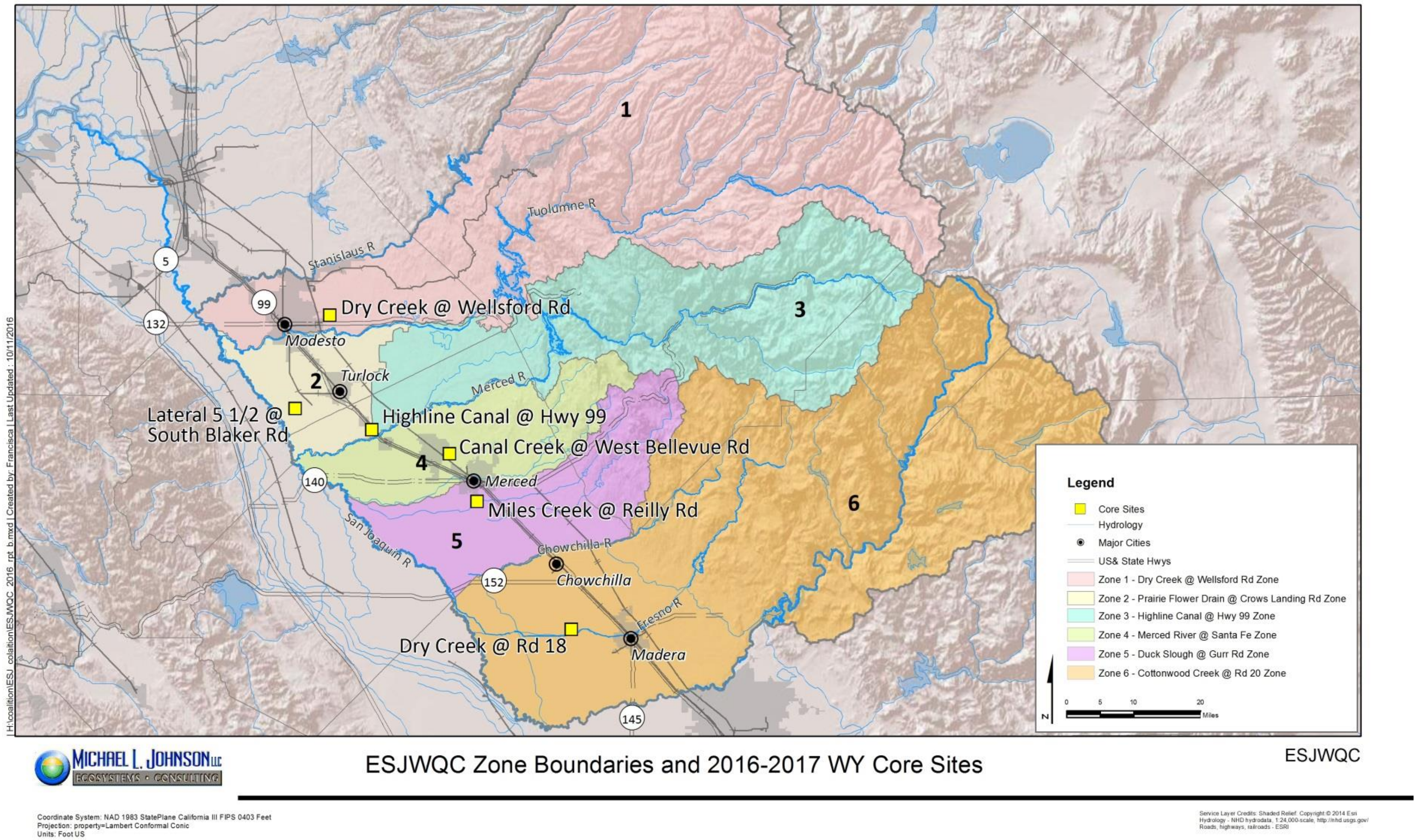


Table 2. ESJWQC total and irrigated acreages for Zones 1-6.

Zones	Total Acres[1] (from ArcGIS)	Irrigated Acres[2] (from Land Use)
Zone 1: Dry Creek @ Wellsford Rd Zone	1,788,476	120,292
Zone 2: Prairie Flower Drain @ Crows Landing Rd Zone	195,781	143,060
Zone 3: Highline Canal @ Hwy 99 Zone	857,618	90,283
Zone 4: Merced River @ Santa Fe Zone	338,904	118,682
Zone 5: Duck Slough @ Gurr Rd Zone	396,497	160,604
Zone 6: Cottonwood Creek @ Rd 20 Zone	2,015,328	349,321
Total	**5,592,603**	**982,241**

[1]Total zone acreages calculated using ArcGIS. Total acres in Table 2 versus the amount reported elsewhere may differ.

[2]Irrigated acreage for each zone does not equal the sum of irrigated acres for all ESJWQC counties due to differences in acreage sources obtained between the county DWR Land Use layers and the Agricultural Land and Water Use estimates for 2010.

Figure 2. Dry Creek @ Wellsford Rd Zone (Zone 1) Land Use.

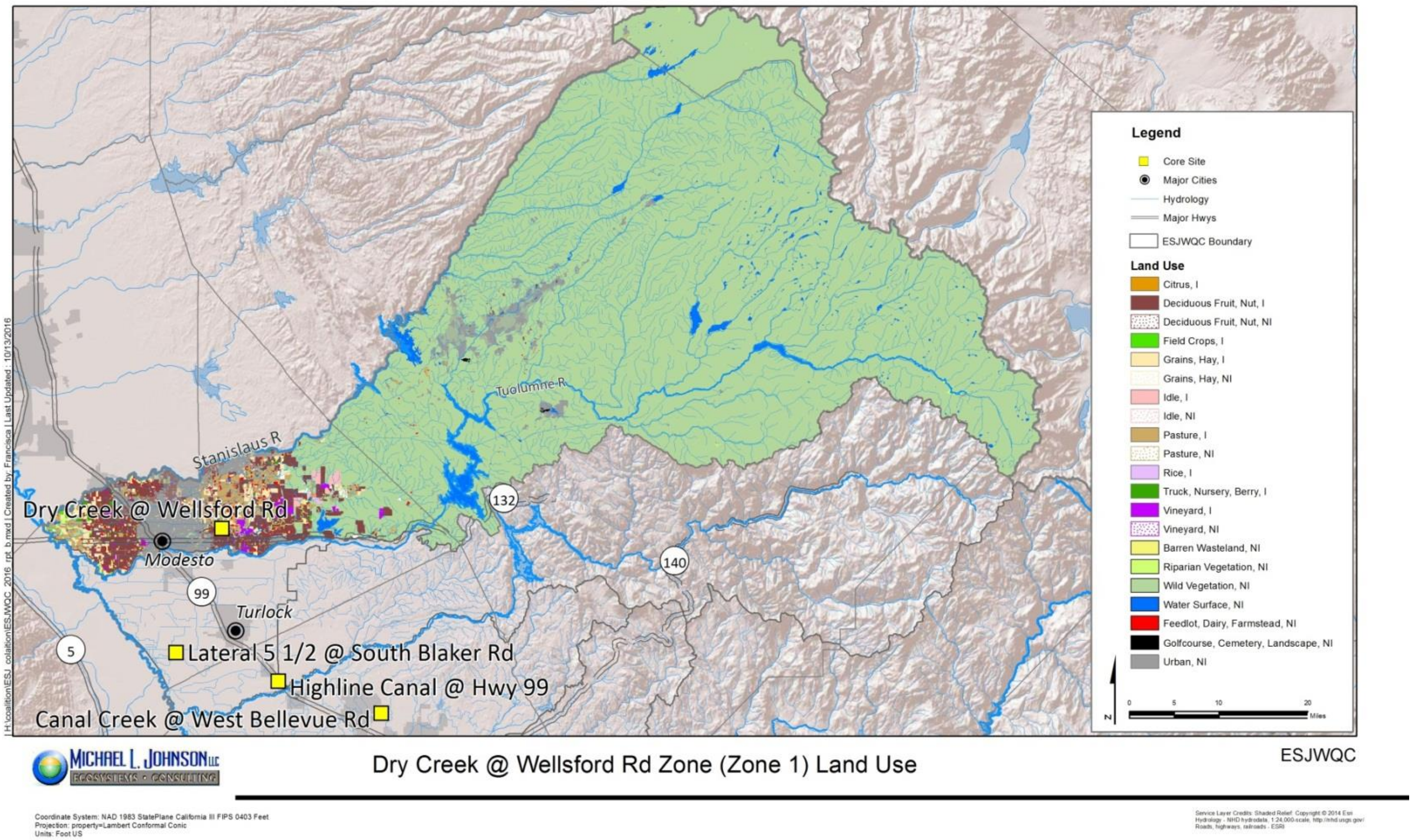


Figure 3. Prairie Flower Drain @ Crows Landing Zone (Zone 2) Land Use.

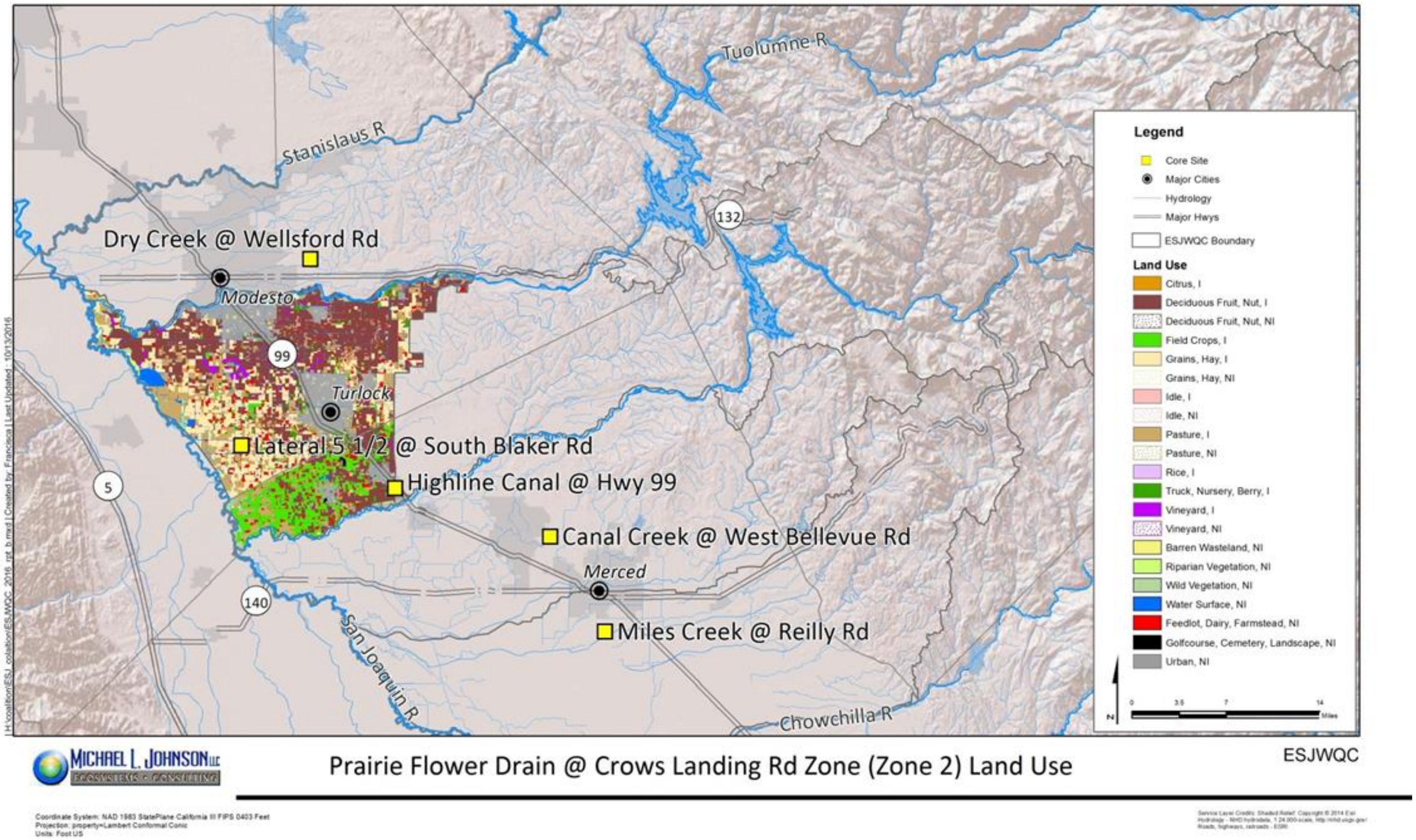


Figure 4. Highline Canal @ Hwy 99 Zone (Zone 3) Land Use.

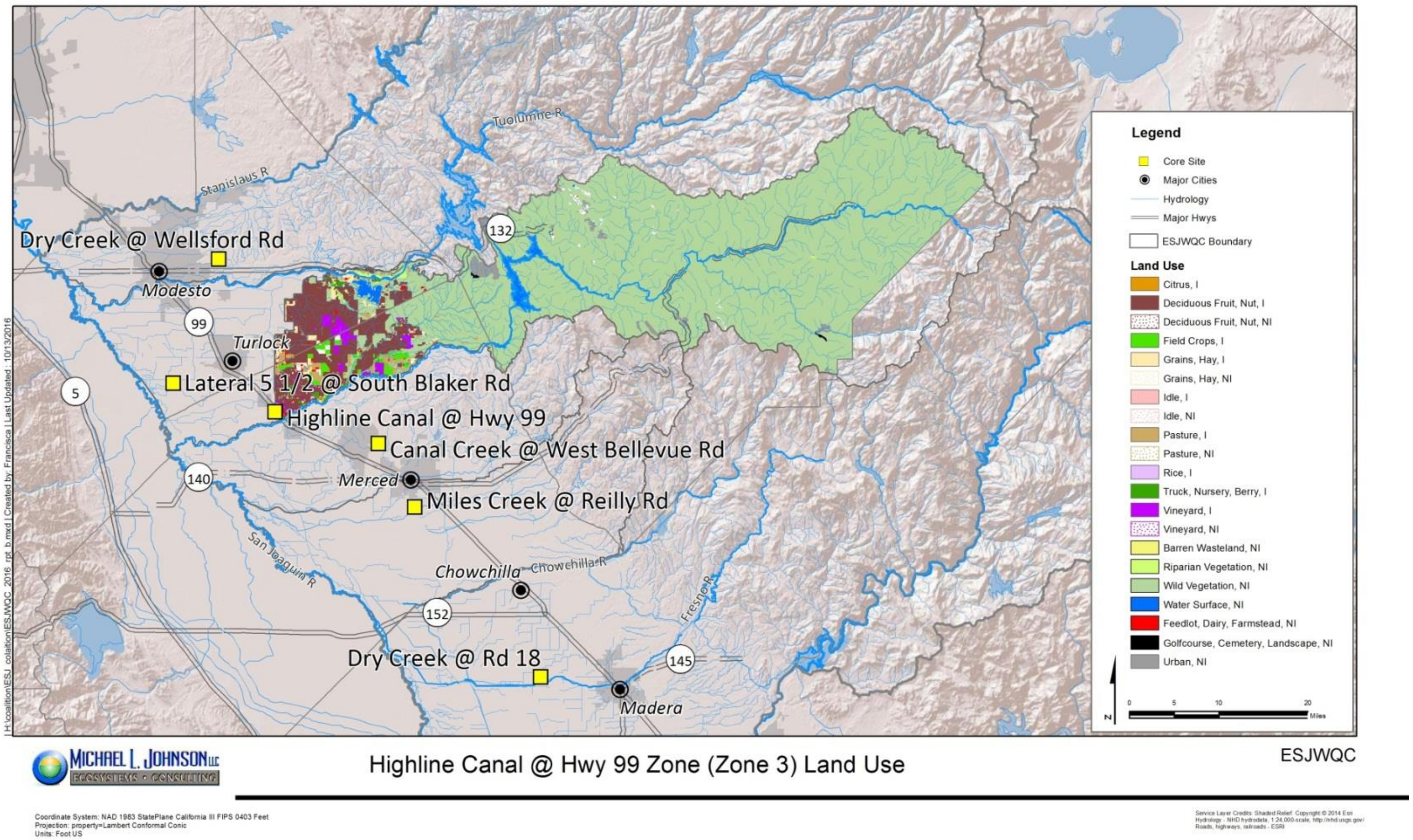


Figure 5. Merced River @ Santa Fe Zone (Zone 4) Land Use.

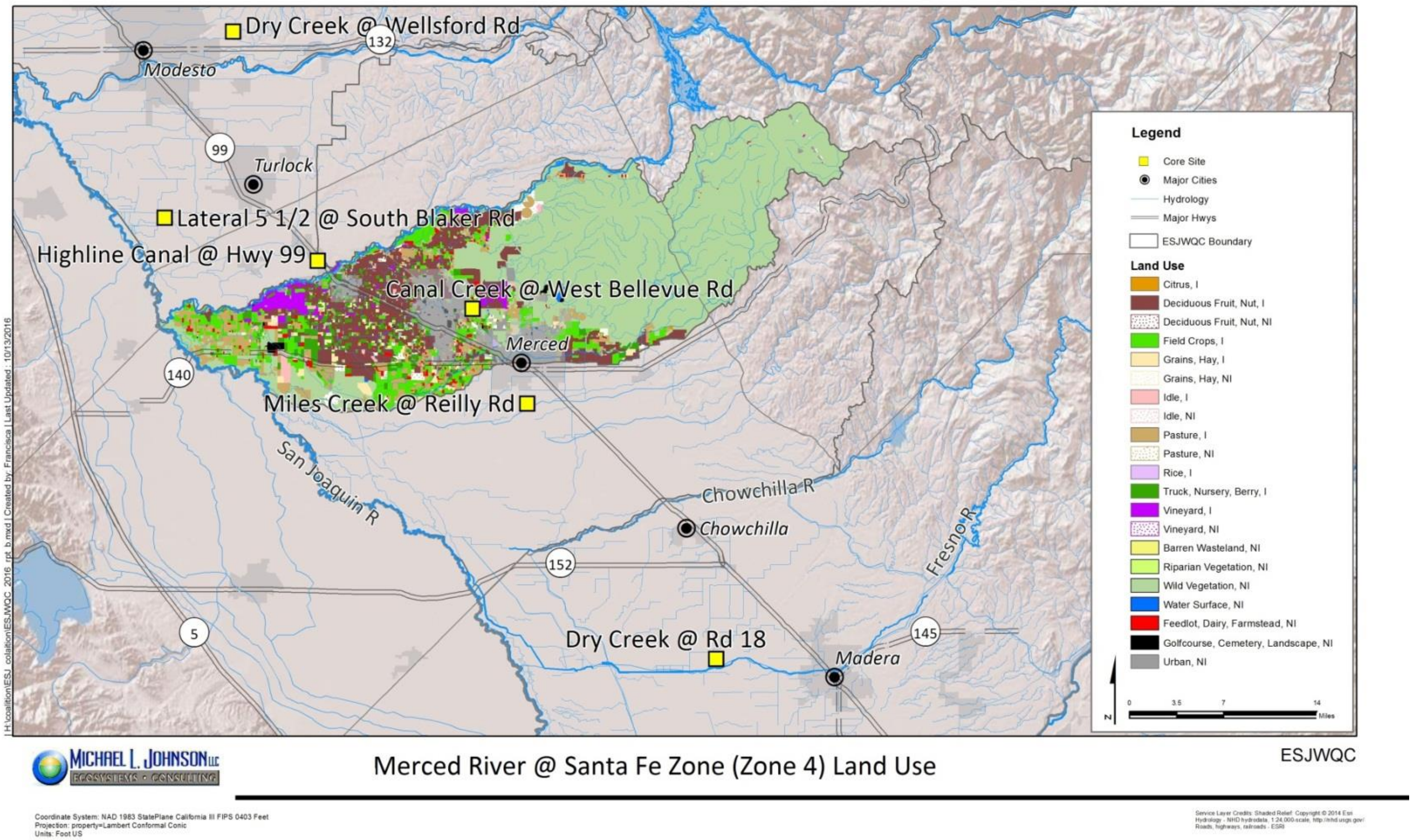


Figure 6. Duck Slough @ Gurr Rd Zone (Zone 5) Land Use.

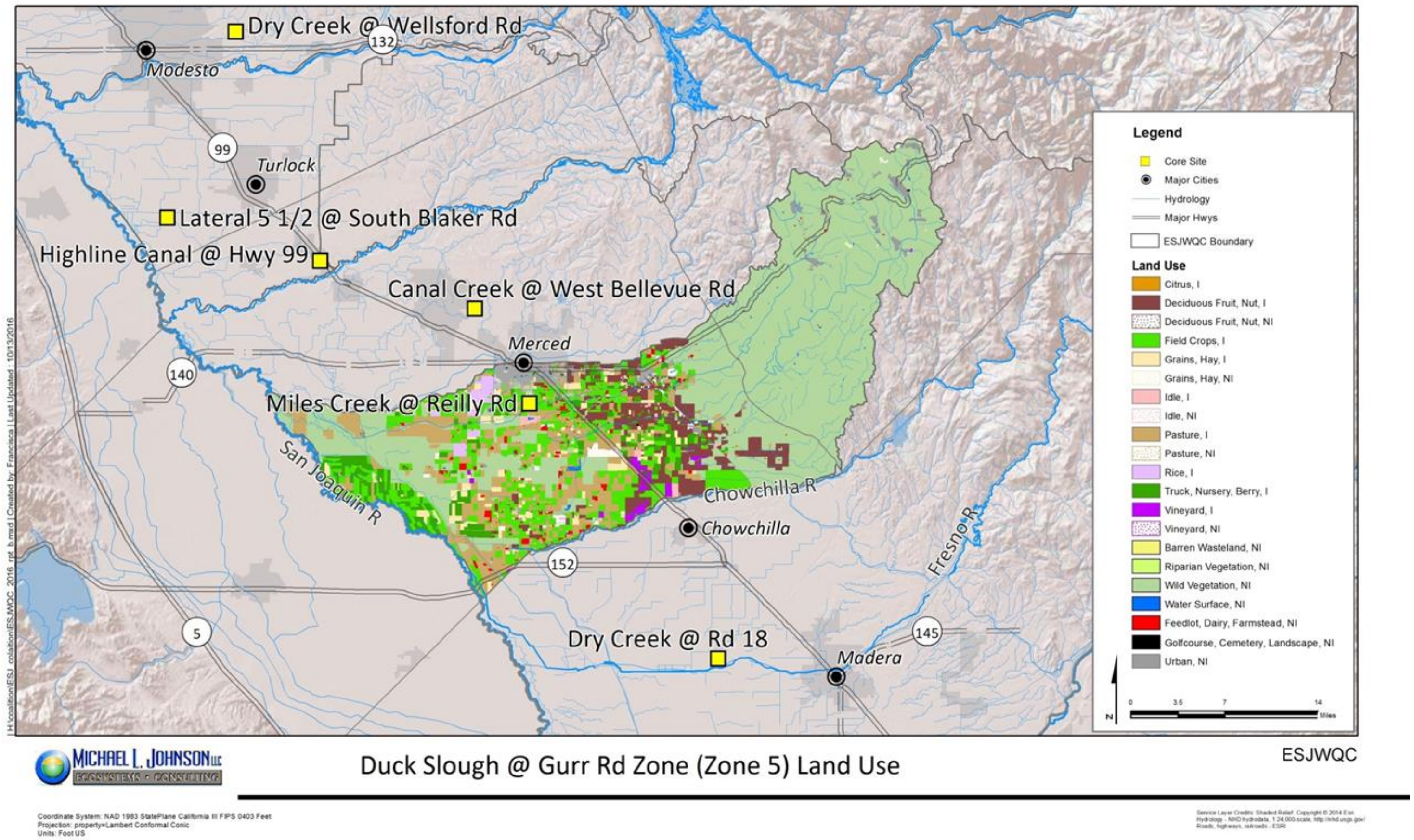
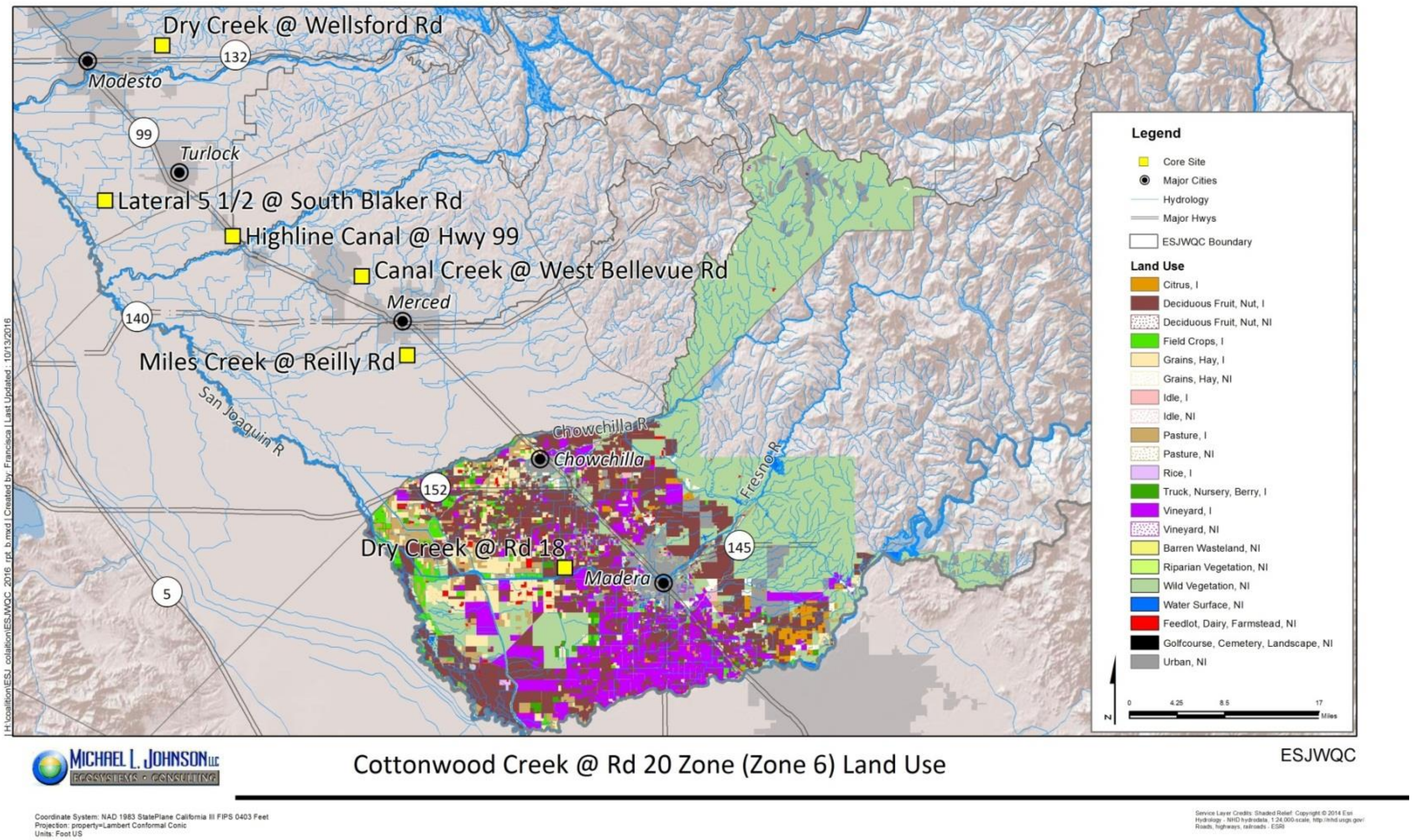


Figure 7. Cottonwood Creek @ Rd 20 Zone (Zone 6) Land Use.
Land use for Madera County is only described for 37% of the county; therefore a portion of the county is missing from the map.



MONITORING OBJECTIVES AND DESIGN

MONITORING OBJECTIVES

The objectives of the ESJWQC monitoring program are:

1. Determine the concentration of waste(s) in discharges to surface waters.
2. Evaluate compliance with existing narrative and numeric water quality objectives to determine if implementation of additional management practices is necessary to improve and/or protect water quality.
3. Assess impact of waste discharges from irrigated agriculture to surface water.
4. Determine degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in watersheds within the Coalition region.
5. Determine effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.

SURFACE WATER MONITORING DESIGN

The Coalition conducts Normal Monitoring (NM) at Core and Represented sites to characterize discharge from irrigated agriculture, Management Plan Monitoring (MPM) for constituents that require management plans and TMDL monitoring to assess TMDL compliance. Normal Monitoring also includes two storm and two sediment monitoring events.

During the 2016 WY, the Coalition monitored according to the general guidelines outlined in the Monitoring and Reporting Program (MRP, Attachment B to the WDR) and according to the specific plan provided in the August 1, 2015 Monitoring Plan Update (MPU) report for the 2016 WY (approved November 5, 2015; amendment approved on March 7, 2016). Sampling occurred monthly from October 2015 through September 2016, including three storm and two sediment monitoring events. The Coalition attempts to sample two storm events per year in order to characterize periods of high flows. Storm sampling occurred on November 10, 2015, January 7, 2016, and on March 8, 2016 (see Rainfall Records section for more details).

Samples are collected for sediment toxicity analysis twice each year at Core sites and during MPM if the site is in a management plan for sediment toxicity. Sediment samples were collected on March 8, 2016 and September 13, 2016. Due to high flows at Dry Creek @ Wellsford Rd on March 8, 2016, sediment was unable to be collected, instead sediment samples were collected on April 12, 2016. Due to lack of sediment accumulation at Lateral 5 ½ @ South Blaker Rd for the September 2016 sediment monitoring event, sediment samples were collected on October 12, 2016 from an alternative site, Lateral 6 and 7 @ Central Ave. Results from the October sediment sampling event are reported in this Annual Report.

2017 WY Monitoring Plan Update

Based on the requirements in the WDR, a monitoring schedule (including MPM) is submitted annually in the Monitoring Plan Update (MPU) which is due August 1 prior to the next monitoring WY. The Coalition submitted the 2017 WY MPU on August 1, 2016 (approved October 7, 2016).

The Coalition reviews previous monitoring results and Pesticide Use Report (PUR) data to determine which sites require monitoring, at what frequency and for which constituents. Due to the submittal of the MPU on August 1, the Coalition is only able to review data through June of that year. An addendum to the 2017 WY MPU is included in Appendix V of this report; the addendum includes updates to the monitoring schedule based on an analysis of monitoring data from July through September of the 2016 WY.

Furthermore, on November 29, 2016, the Regional Board released a new method for determining which pesticides to monitor per site subwatershed. The new method incorporates the use of recent PUR data, toxicity data, monitoring history, and environmental fate data. The Coalition will utilize the new pesticide selection process for the 2018 WY MPU (due August 1, 2017).

Monitoring at Core Sites

Monitoring occurs at Core sites monthly in each zone for two consecutive years. After two years, monitoring rotates to a second set of Core sites in each zone; monitoring continues to alternate between the two Core sites every two years. Monitoring during the 2016 WY was the first of two consecutive years of monitoring for the second set of Core sites. The Coalition is scheduled to rotate Core sites again in the 2018 WY. Table 3 includes a list of the 2016 WY Core sites by zone.

At each Core site, the Coalition monitors physical parameters, nutrients, bacteria, pesticides, metals, water column toxicity, and sediment toxicity, as listed in Table 2, Attachment B of the WDR.

Table 3. ESJWQC 2016 WY tributary and TMDL monitoring locations.

Zone	Site Type	Management Plan Monitoring	Site Name	Station Code	Latitude	Longitude
Zone 1	Core	X	Dry Creek @ Wellsford Rd	535XDCAWR	37.66000	-120.87526
	Represented	X	Mootz Drain Downstream of Langworth Pond	535XMDDLP	37.70539	-120.89569
Zone 2	Represented	X	Hatch Drain @ Tuolumne Rd	535XHDATR	37.51498	-121.01229
	Represented	X	Hilmar Drain @ Central Ave	535XHDACA	37.39058	-120.95820
	Represented	X	Lateral 2 1/2 near Keyes Rd	535LTHNKR	37.54766	-121.08509
	Core		Lateral 5 1/2 @ South Blaker Rd	535LFHASB	37.45827	-120.96730
	Represented		Lateral 6 and 7 @ Central Ave	535LSSACA	37.39779	-120.95960
	Represented	X	Levee Drain @ Carpenter Rd	535XLDACR	37.48062	-121.03106
	Represented		Lower Stevinson @ Faith Home Rd	535LSAFHR	37.37248	-120.92324
	Represented	X	Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	37.44187	-121.00331
	Represented		Unnamed Drain @ Hogin Rd	535XUDAHR	37.43120	-120.99475
	Represented	X	Westport Drain @ Vivian Rd	535XWDAVR	37.53682	-121.04861
Zone 3	Core	X	Highline Canal @ Hwy 99	535XHCHNN	37.41254	-120.75941
	Represented		Highline Canal @ Lombardy Rd	535XHCALR	37.45547	-120.72181
	Represented	X	Mustang Creek @ East Ave	535XMCAEA	37.49180	-120.68390
Zone 4	Core		Canal Creek @ West Bellevue Rd	535CCAWBR	37.36090	-120.54940
	Represented		Bear Creek @ Kibby Rd	535XBCAKR	37.31230	-120.41535
	Represented		Black Rascal Creek @ Yosemite Rd	535BRCAYR	37.33202	-120.39435
	Represented	X	Howard Lateral @ Hwy 140	535XHLAHO	37.30790	-120.78200
	Represented	X	Livingston Drain @ Robin Ave	535XLDARA	37.31693	-120.74229
	Represented		McCoy Lateral @ Hwy 140	535XMLAHO	37.30968	-120.78771
	Represented	X	Merced River @ Santa Fe	535XMRSFD	37.42705	-120.67353
	Represented		Unnamed Drain @ Hwy 140	535XUDAHO	37.31331	-120.89218
Zone 5	Core	X	Miles Creek @ Reilly Rd	535XMCARR	37.25830	-120.47524
	Represented	X	Deadman Creek @ Gurr Rd	535XDCAGR	37.19514	-120.56147
	Represented	X	Deadman Creek @ Hwy 59	535DMCAHF	37.19755	-120.48763
	Represented	X	Duck Slough @ Gurr Rd	535XDSAGR	37.21408	-120.56126
Zone 6	Core	X	Dry Creek @ Rd 18	545XDCARE	36.98180	-120.22056
	Represented	X	Ash Slough @ Ave 21	545XASAAT	37.05448	-120.41575
	Represented	X	Berenda Slough along Ave 18 1/2	545XBSAAE	37.01820	-120.32650
	Represented	X	Cottonwood Creek @ Rd 20	545XCCART	36.86860	-120.18180
Zone 1	TMDL	NA	San Joaquin River at the Maze Boulevard (Hwy 132) Bridge	541STC510	37.64194	-121.22778
	TMDL	NA	San Joaquin River at the Airport Way Bridge near Vernalis	541SJC501	37.67556	-121.26417
Zone 4	TMDL	NA	San Joaquin River at Hills Ferry Rd	541STC5123	37.34250	-120.97722

NA-Not Applicable
TMDL-Total Maximum Daily Load

Monitoring at Represented Sites

Monitoring at Represented sites occurs to evaluate the potential risk for water quality impairments when an exceedance of a WQTL occurs at an associated Core site (Attachment B of the WDR, Page 3).

Represented sites were identified for monitoring during the 2016 WY based on the following criteria:

1. An exceedance of an applied pesticide, applied metal, or toxicity occurred at the Core site in the same zone during the 2015 WY,
2. The Core site is in a management plan for an applied pesticide, applied metal, or toxicity and monitoring at the Represented site is necessary to characterize potential discharge.

Once monitoring is initiated at a Represented site, the Coalition monitors at that site during the time of highest risk for exceedances of the WQTLs for that constituent for a minimum of two years. Table 3 includes a list of the Represented sites in each zone. As outlined in the 2016 WY MPU, the Coalition determined it was necessary to monitor 21 of 24 Represented sites within the ESJWQC boundary during the 2016 WY.

Monitoring at Special Project Sites

Special project sites include MPM sites that are monitored as part of the Coalition's Surface Water Quality Management Plan (SQMP) and sites monitored for Total Maximum Daily Load (TMDL) compliance. Both MPM and TMDL sites are monitored for constituents specific to each site.

Special project sites with MPM are Core or Represented sites monitored according to the Coalition's SQMP in order to:

1. Evaluate commodity and management practice specific effects on water quality, or
2. Evaluate sources of identified water quality impairments.

There are currently three special project sites with TMDL compliance monitoring in the ESJWQC region. Monitoring data are collected from TMDL sites to assess compliance according 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) for chlorpyrifos and diazinon in the lower reaches of the San Joaquin River.

Management Plan Monitoring

Management Plan Monitoring Objectives

The objectives of the ESJWQC Management Plan include:

1. Identification of irrigated agriculture source (general practice or specific location) that may be the cause of the water quality problem or a study design to determine the source,
2. Identification of management practices to be implemented to address the exceedances,
3. Development of a management practice implementation schedule designed to address the specific exceedances,
4. Development of management practice performance goals with a schedule,
5. Development of waste-specific monitoring schedule, and

6. Development of a process and schedule for evaluating management practice effectiveness.

As part of the Coalition's management plan strategy, MPM is conducted to identify contaminant sources and evaluate the effectiveness of newly implemented management practices. For details on 2016 WY MPM results, refer to the Status of Management Plans section of this report.

Management plans are required as a result of a single exceedance of the WQTL of a TMDL constituent (SC, boron, chlorpyrifos, and diazinon), or more than one exceedance of a WQTL within a three-year time period for all other constituents.

Management Plan Monitoring Design

The ESJWQC Surface Water Quality Management Plan (SQMP) which was approved on November 4, 2015, identifies when and where monitoring will occur to identify sources, evaluate effectiveness of management practices, assess performance goals and measures, and report on compliance time schedules. In addition, the SQMP includes management plan implementation schedules and timelines for reporting to the Regional Board on the effectiveness of the Coalition's management plan strategy.

Management Plan Development Timelines

In 2008, the Coalition began addressing site subwatersheds in management plans by conducting additional outreach and education to growers using products that could be contributing to the water quality impairments (Table 4). This focused outreach strategy has been effective in getting growers to implement additional practices, which has led to improved water quality. The Coalition continues to implement the focused outreach strategy within prioritized subwatersheds based on when the WQTL exceedances occurred, the magnitude of the exceedance and the potential sources.

Table 4 includes all site subwatershed that have received focused outreach and education (25 site subwatersheds) and the subwatersheds that will be prioritized in 2017 (four site subwatersheds).

Table 4. Schedule for addressing each site subwatershed with a detailed, focused Management Plan approach.

Management Plan	Site Subwatershed Name	Priority Set	Year for Focused Approach
2008 Management Plan	Dry Creek @ Wellsford Rd	First Priority	2008-2010
	Duck Slough @ Hwy 99[1]		2008-2010
	Prairie Flower Drain @ Crows Landing Rd		2008-2010
	Bear Creek @ Kibby Rd	Second Priority	2010-2012
	Cottonwood Creek @ Rd 20		2010-2012
	Duck Slough @ Gurr Rd		2010-2012
	Highline Canal @ Hwy 99		2010-2012
	Berenda Slough along Ave 18 1/2	Third Priority	2011-2013
	Dry Creek @ Rd 18		2011-2013
	Lateral 2 ½ near Keyes Rd		2011-2013
	Livingston Drain @ Robin Ave		2011-2013
	Black Rascal Creek @ Yosemite Rd	Fourth Priority	2012-2014
	Deadman Creek @ Hwy 59		2012-2014
	Deadman Creek @ Gurr Rd		2012-2014
	Hilmar Drain @ Central Ave		2012-2014
	Hatch Drain @ Tuolumne Rd	Fifth Priority	2013-2015
	Highline Canal @ Lombardy Rd		2013-2015
	Merced River @ Santa Fe		2013-2015

Management Plan	Site Subwatershed Name	Priority Set	Year for Focused Approach
	Miles Creek @ Reilly Rd		2013-2015
	Ash Slough @ Ave 21	Sixth Priority	2014-2016
	Mustang Creek @ East Ave		2014-2016
	Westport Drain @ Vivian Rd		2014-2016
	Mootz Drain downstream of Langworth Pond[2]	Seventh Priority	2015-2017
	Howard Lateral @ Hwy 140		2015-2017
	Levee Drain @ Carpenter Rd		2015-2017
2014 SQMP	Dry Creek @ Wellsford Rd	2016 Focused Outreach	2016-2018
	Duck Slough @ Gurr Rd		2016-2018
	Highline Canal @ Hwy 99		2016-2018
	Prairie Flower Drain @ Crows Landing Rd		2016-2018
	Dry Creek @ Rd 18	2017 Focused Outreach	2017-2019
	Lateral 2 ½ near Keyes Rd		2017-2019
	Livingston Drain @ Robin Ave		2017-2019
	Miles Creek @ Reilly Rd		2017-2019

[1]Duck Slough @ Hwy 99 was approved for removal from the ESJ monitoring program in April 2012.

[2]Mootz Drain downstream of Langworth Pond monitoring included all management plan constituents detected at the upstream location (Mootz Drain @ Langworth Rd).

TMDL Monitoring

During the 2016 WY, TMDL monitoring occurred to evaluate compliance with approved TMDLs for: chlorpyrifos, diazinon, salts (SC), and boron.

In September 2004, the Regional Board adopted the Lower San Joaquin River Salt and Boron Basin Plan Amendment. The Salt and Boron TMDL establishes numeric objectives for the Lower San Joaquin River at the Airport Way Bridge near Vernalis. Participation in a Regional Board approved real-time management program and attainment of salinity and boron WQOs constitutes as compliance with the TMDL control program. The Coalition is an active member of the Central Valley Salinity Coalition (CVSC), contributing annual funding and feedback on salt and nitrate management strategies and technical reports. Coalition representatives are also engaged in the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative. The CV-SALTS group consists of stakeholders working to develop an environmentally and economically sustainable Salt and Nitrate Management Plan (SNMP) for the entire Central Valley. After extensive collaboration, on December 31, 2016, CV-SALTS developed a Salt and Nitrate Management Plan which was accepted by the Regional Water Board in 2017. Managing salt and nitrate in surface and groundwater is expected to take decades; however, the identified actions, policies, and timelines presented in the SNMP demonstrates stakeholders' commitment to ensuring safe drinking water, balanced loadings, and restored groundwater.

In October 2005, the Regional Board finalized the Amendments to the Basin Plan Amendment establishing TMDL objectives for the organophosphate pesticides (OP), chlorpyrifos and diazinon, in the lower reaches of the San Joaquin River outside of the Delta. The TMDL was approved by the US EPA on December 20, 2006. The Basin Plan Amendment divides the Lower San Joaquin River into seven subareas, which include agricultural drainages monitored by the ESJWQC and the Westside San Joaquin River Watershed Coalition (WSJRWC) under the Irrigated Lands Regulatory Program (ILRP). The ESJWQC and the WSJRWC collaborated to develop a monitoring plan for assessing compliance with concentration based loads of chlorpyrifos and diazinon at the six compliance points in the Lower San Joaquin River identified in the Basin Plan Amendment. The ESJWQC conducts monitoring to assess compliance at three of the six compliance points, and the WSJRWC conducts monitoring at the other three. The two Coalitions submit a joint report on monitoring results and their compliance with the TMDL regulations to assess compliance with seven monitoring objectives established in the Basin Plan Amendment:

1. Determine load capacity compliance,
2. Determine load allocation compliance,
3. Determine degree of implemented management practices,
4. Determine effectiveness of implemented management practices,
5. Determine if alternative pesticides are impairing water quality,
6. Determine if additive or synergistic effects of multiple pollutants are causing toxicity, and
7. Demonstrate management practices achieve the lowest pesticide levels technically and economically achievable.

The monitoring design and an assessment of the Coalition's compliance with TMDL Objectives are reported in detail in the 2016 WY San Joaquin River Chlorpyrifos and Diazinon TMDL AMR (submitted May 1, 2017).

GROUNDWATER MONITORING OBJECTIVES AND DESIGN

The Coalition is responsible for collecting "sufficient data to describe irrigated agricultural impacts on groundwater quality and to determine whether existing or newly implemented management practices comply with the groundwater receiving water limitations of the Order" (Attachment B of WDR, Page 16). There are three main elements required for evaluating groundwater quality and protection; the Groundwater Assessment Report (GAR), the Management Practices Evaluation Program (MPEP), and the Groundwater Quality Trend Monitoring Program (GQTMP). The following section provides the monitoring objectives and minimum sampling and reporting requirements for the GQTMP. Information pertaining to the GAR and MPEP can be found in the Coalition Actions Taken to Address Water Quality Impairments section of this report.

Groundwater Quality Trend Monitoring Program

All submittal/approval dates associated with the GQTMP are included in Table 41. The GQTMP Work Plan was submitted in two phases: Phase I was submitted on June 4, 2015 and resubmitted on January 29, 2016 along with Phase II (approval pending). The QAPP will be submitted 30 days after Phase I and Phase II of the GQTM Work Plan are approved. Phase III of the Work Plan will include specific information relating to each of the network wells.

The Coalition used a multi-phase approach in developing a GQTMP Work Plan. Phase I outlines the monitoring design and the anticipated schedule for completion of Phase II. Phase II provides the preliminary determination of specific wells to be included within the monitoring well network. Candidate wells for the network were prioritized based on criteria such as location, construction, historical water quality record, and monitoring status. Candidate wells were determined as highly ranked for inclusion in the GQTMP network by obtaining confidential well completion reports, verifying the well location, verifying the overall site suitability (e.g., depth to water, wellhead and proximity conditions, sample access), and coordination with the well owner or monitoring entity.

The GQTMP Work Plan outlines a monitoring program designed to determine water quality conditions of groundwater and develop information that can be used to evaluate trends in regional water quality. Monitoring objectives identified by the Coalition include:

- Understanding long-term temporal trends in regional groundwater quality, particularly as they relate to effects from irrigated agriculture on potential sources of drinking water for communities,
- Evaluating groundwater quality conditions in the Coalition area, particularly in the groundwater HVAs as identified in the GAR, and identifying differences in groundwater quality spatially, horizontally between areas and vertically in the aquifer system, and
- Distinguishing water quality changes associated with irrigated agriculture compared to other non-agricultural factors.

The GQTM Work Plan emphasizes ongoing evaluation of the monitoring program and incorporation of modifications to the monitoring well network and program as necessary. Data obtained from GQTM activities will be used in conjunction with data from the GQMP and MPEP to understand the connections between irrigated agriculture and groundwater quality.

SAMPLE SITE DESCRIPTIONS AND LOCATIONS

The section below includes a narrative description of each site subwatershed with respect to hydrology and agricultural production. Additional location maps of sampling sites, crops, and land uses are provided in Appendix IV. Land use information and a map of the Coalition monitoring locations and TMDL compliance sites are included in the Sample Site Locations section below.

SITE SUBWATERSHED DESCRIPTIONS

Site descriptions, irrigated acreages, and monitoring histories of ESJWQC sites monitored during the 2016 WY are listed alphabetically below. Water was not present at all sites during every monitoring event and some sites were not scheduled to be sampled every month. Irrigated acres are included in the site subwatershed descriptions; however, the tally of these acreages is subject to change due to updated GIS layers, land entering and leaving cultivation, and subwatershed boundary modifications. Maps of land use in each site subwatershed are included in Appendix IV.

Ash Slough @ Ave 21 (20,388 irrigated acres) – Ash Slough @ Ave 21 is located in the Cottonwood Creek @ Rd 20 Zone (Zone 6). Ash Slough originates from the Chowchilla River in the foothills. Agriculture upstream is mainly deciduous nuts and grains but also includes vineyards, field crops, and pasture. Ash Slough flows just north of Chowchilla but there is a buffer of agricultural land between Ash Slough and Chowchilla. Dairies are located upstream.

Bear Creek @ Kibby Rd (7,784 irrigated acres) – Bear Creek @ Kibby Rd is located in the Merced River @ Santa Fe Zone (Zone 4). This site subwatershed drains an eastern portion of the Coalition region in Merced County. Bear Creek originates in the foothills of the Sierras with Burn's Creek as one of the major tributaries. Bear Creek drains to the east just north of the town of Planada, through Merced and eventually to the San Joaquin River. The primary irrigated agriculture in the site subwatershed includes deciduous fruits and nuts, field crops, truck crops, and irrigated pasture.

Berenda Slough along Ave 18 ½ (24,049 irrigated acres) – Berenda Slough along Ave 18 ½ is located in the Cottonwood Creek @ Rd 20 Zone (Zone 6). This site subwatershed flows from Berenda Reservoir southwest through northern Madera County and is located southwest of the city of Chowchilla. When flows are sufficient, Berenda Slough empties into the Eastside Bypass. However, this waterway does not normally connect with the Bypass due to insufficient flow. The primary agriculture consists of deciduous fruit and nut orchards along with lesser amounts of vineyards, grain and hay, pasture, and field crops.

Black Rascal Creek @ Yosemite Rd (997 irrigated acres) – Black Rascal Creek @ Yosemite Rd is located in the Merced River @ Santa Fe Zone (Zone 4). Black Rascal Creek originates from Le Grand Canal and drains into Bear Creek. The eastern portion of this subwatershed is dominated by native vegetation with some irrigated corn and mixed pastureland in the southern and western portions.

Canal Creek @ West Bellevue Rd (3,808 irrigated acres) – Canal Creek @ West Bellevue Rd is located in the Merced River @ Santa Fe Zone (Zone 4). Canal Creek originates in the lower foothills of Merced County. The primary agriculture consists of pasture and deciduous trees along with some field crops.

Cottonwood Creek @ Rd 20 (36,441 irrigated acres) – Cottonwood Creek @ Rd 20 is one of the Core Sites in the Cottonwood Creek @ Rd 20 Zone (Zone 6). This site subwatershed is at the very southern edge of the Coalition region in Madera County and drains into the Eastside Bypass when flow is sufficient. The immediate upstream agriculture is vineyards with deciduous nuts farther to the east. The eastern portion of the subwatershed is dominated by wild vegetation as the subwatershed extends into the foothills.

Deadman Creek @ Gurr Rd (40,418 irrigated acres) – Deadman Creek @ Gurr Rd is located in the Duck Slough @ Gurr Rd Zone (Zone 5). This site subwatershed is a downstream site from Deadman Creek @ Hwy 59. The primary agriculture in the site subwatershed includes deciduous nuts and fruits, field crops and irrigated pasture.

Deadman Creek @ Hwy 59 (37,400 irrigated acres) – Deadman Creek @ Hwy 59 is located in the Duck Slough @ Gurr Rd Zone (Zone 5) and is upstream of Deadman Creek @ Gurr Rd. Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59. The primary agriculture in the site subwatershed includes orchards, irrigated pasture, and field crops. A large portion of the subwatershed is wild vegetation.

Dry Creek @ Rd 18 (20,237 irrigated acres) – Dry Creek @ Rd 18 is located within the Cottonwood Creek @ Rd 20 Zone (Zone 6). This site subwatershed originates in the Sierra foothills and flows just north of the city of Madera. Although rare, if flow is sufficient Dry Creek eventually drains into the San Joaquin River through various channels and irrigation ditches. The primary irrigated agriculture within the subwatershed is deciduous orchards and vineyards with some scattered field crops.

Dry Creek @ Wellsford Rd (32,919 irrigated acres) – Dry Creek @ Wellsford Rd is a Core Monitoring location in the Dry Creek @ Wellsford Rd Zone (Zone 1). This site subwatershed is in the northern part of the Coalition region and drains field crops, deciduous nuts, mixed pasture, and vineyards. Dry Creek originates to the east of Modesto, flows through Modesto to confluence with the Tuolumne River. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal. The subwatershed extends into the foothills and is dominated in the east by wild vegetation with some rice, row crops, and irrigated pasture.

Duck Slough @ Gurr Rd (22,356 irrigated acres) – Duck Slough @ Gurr Rd is a Core Site located in the Duck Slough @ Gurr Rd Zone (Zone 5). This site subwatershed is located downstream from the Duck Slough @ Hwy 99 site subwatershed. Duck Slough originates in the Sierra foothills and flows west eventually joining with Deadman Creek in the western portion of the Coalition region. The slough eventually flows into the San Joaquin River via Deadman Creek and Deep Slough. Deane Drain, which runs north south and enters Duck Slough on its north banks just east of the sample site, has the potential to overflow into Duck Slough during high water flows and therefore land use associated with the drain have been included in the site subwatershed boundary. Duck Slough @ Gurr Rd is located to the southwest of Merced; this waterbody drains field crops, deciduous nuts, and pastureland. Treated wastewater from the city of Madera enters Duck Slough a few miles upstream of the Gurr Rd sample site.

Hatch Drain @ Tuolumne Rd (247 irrigated acres) – Hatch Drain @ Tuolumne Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). This small site subwatershed is located in the western portion of the Coalition region in Stanislaus County. The subwatershed drains field crops and pasture.

Highline Canal @ Hwy 99 (35,710 irrigated acres) – Highline Canal @ Hwy 99 is a Core Site located in the Highline Canal @ Hwy 99 Zone (Zone 3). The Highline Canal is a conveyance structure of the Turlock Irrigation District (TID) that delivers clean irrigation water to growers and receives irrigation return flow during the summer. Highline Canal also transports urban and agricultural stormwater runoff during the winter. This site was selected as a downstream companion site to the Highline Canal @ Lombardy Rd site. The sampling site is located just south of Delhi as the canal crosses Highway 99. Irrigated agriculture above this location is primarily deciduous nuts with small amounts of field crops, pasture, and vineyards.

Highline Canal @ Lombardy Rd (30,681 irrigated acres) – Highline Canal @ Lombardy Rd is located in the Highline Canal @ Hwy 99 Zone (Zone 3) and is upstream of the Highline Canal @ Hwy 99 site. The Highline Canal is a Turlock Irrigation District (TID) conveyance structure which delivers clean irrigation water receives irrigation return flow during the summer and stormwater runoff during the winter. The Highline Canal flows west and eventually drains into the Merced River. The main upstream tributary of the Highline Canal is Mustang Creek which is a major tributary during the dormant season and passes immediately to the southeast of the Turlock Airport. The predominant crop in this site subwatershed is deciduous nuts with some dairies located upstream.

Hilmar Drain @ Central Ave (1,686 irrigated acres) – Hilmar Drain @ Central Ave is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). This site subwatershed is located toward the western edge of the Coalition region near the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture. Hilmar Drain originates at Williams Ave and Washington Rd and eventually drains into the San Joaquin River. At this location, TID refers to the Hilmar Drain waterbody as "Reclamation Drain."

Howard Lateral @ Hwy 140 (7,317 irrigated acres) – Howard Lateral @ Hwy 140 is located in the Merced River @ Santa Fe Zone (Zone 4). The lateral is located just south and west of Livingston Drain, in the central portion of the Coalition region in Merced County. Agricultural land use is predominantly deciduous nut and fruit orchards, but also includes field crops, pasture, grains/hay, vineyard, and dairy.

Lateral 2 ½ near Keyes Rd (31,971 Irrigated acres) – Lateral 2 ½ near Keyes Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2) with its most upstream region in Highline Canal @ Hwy 99 Zone (Zone 3). The origin of Lateral 2 ½ is Turlock Lake via Turlock main Canal. The site subwatershed extends east past the city of Modesto to Turlock Lake. The primary agriculture in this site subwatershed is deciduous fruits and nuts but also includes almost all other crop types and land use found in the Coalition region.

Lateral 5 ½ @ South Blaker Rd (47,781 Irrigated acres) – Lateral 5 ½ @ South Blaker Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2) with half of its upstream eastern region in Highline Canal @ Hwy 99 Zone (Zone 3). The origin of Lateral 5 ½ is Turlock Lake via Turlock main Canal. The primary agriculture is deciduous fruits and nuts with field crops and pasture and a small amount of truck, nursery, and berry crops. Dairies are scattered throughout the subwatershed area.

Lateral 6 and 7 @ Central Ave (55,205 Irrigated acres) – Lateral 6 & 7 @ Central Ave is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2) with half of its upstream eastern region in Highline Canal @ Hwy 99 Zone (Zone 3). The origin of Lateral 6 & 7 is Turlock Lake via Turlock main Canal. The primary agriculture is deciduous fruits and nuts with field crops and pasture and a small amount of truck, nursery, and berry crops. Dairies are scattered throughout the subwatershed area.

Levee Drain @ Carpenter Rd (1,922 irrigated acres) – Levee Drain @ Carpenter Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). This site subwatershed is located north of Prairie Flower and originates at West Fulkerth Rd and South Carpenter Rd and drains into the San Joaquin River. This is a small subwatershed containing mainly field crops with some irrigated pasture.

Livingston Drain @ Robin Ave (11,670 irrigated acres) – Livingston Drain @ Robin Ave is located in the Merced River @ Santa Fe Zone (Zone 4). This site subwatershed is located in the west central portion of the Coalition region in Merced County, east of Howard Lateral. It is located west of Atwater and Livingston. The water from Hammett Lateral and Arena Canal drains into Livingston Drain. Arena Canal receives stormwater from the city of Livingston as well as water from the Livingston Canal. The agriculture is almost entirely orchards with some truck crops. Several dairies are also present in the watershed.

Lower Stevinson @ Faith Home Rd (83,267 irrigated acres) –– Lower Stevinson @ Faith Home Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2) with half of its upstream eastern region in Highline Canal @ Hwy 99 Zone (Zone 3). The origin of Lateral 6 & 7 is Turlock Lake via Turlock main Canal. The primary agriculture is deciduous fruits and nuts with field crops, pasture and vines, with smaller amounts of truck, nursery, and berry crops. There are dairies scattered throughout the subwatershed area.

McCoy Lateral @ Hwy 140 (10,109 irrigated acres) – McCoy Lateral @ Hwy 140 is located in the Merced River @ Santa Fe Zone (Zone 4). This site subwatershed is located immediately west of Howard Lateral. The water from Hammett Lateral and Arena Canal drains into McCoy Lateral. Arena Canal receives stormwater from the city of Livingston as well as water from Livingston Canal. The agriculture of the McCoy Lateral @ Hwy 140 site subwatershed is a mixture of deciduous fruit and nut orchards, vineyards, truck/nursery/berries, and field crops.

Merced River @ Santa Fe (35,850 irrigated acres) – Merced River @ Santa Fe is a core site located within the Merced River @ Santa Fe Zone (Zone 4). This site subwatershed contains a major waterbody which is 303d listed. It was selected as an integrator site for several of the drains and tributaries in the vicinity. The Merced River originates in the high Sierra encountering several dams and impoundments as it flows west eventually draining into the San Joaquin River near Hatfield State Park. Upstream agriculture in the immediate vicinity of the river includes some field crops and deciduous nuts (primarily almonds). Irrigated pasture and vineyards are also present in the site subwatershed.

Miles Creek @ Reilly Rd (10,183 irrigated acres) – Miles Creek @ Reilly Rd is located in the Duck Slough @ Gurr Rd Zone (Zone 5). Miles Creek is located just north of Duck Slough and drains into Owen's Creek. The primary agriculture within the Miles Creek @ Reilly Rd site subwatershed is field crops in addition to deciduous nuts and fruit, pasture, and truck/nursery/berry production. Urban drainage, dairies, and hay are also present within the subwatershed.

Mootz Drain downstream of Langworth Pond (1,325 irrigated acres) – Mootz Drain downstream of Langworth Pond is located in the Dry Creek @ Wellsford Rd Zone (Zone 1). This site subwatershed is located just downstream of Mootz Drain @ Langworth Rd in the northern portion of the Coalition region. The drain originates to the east of Modesto and drains into Lateral 6 and the Stanislaus River. Land use upstream of the site is predominantly pasture and dairies. A small portion of land is field crops.

Mustang Creek @ East Ave (10,676 irrigated acres) – Mustang Creek @ East Ave is located in the Highline Canal @ Hwy 99 Zone (Zone 3). Mustang Creek originates in the foothills of the Sierra Nevada and flows into the upper portion of the Highline Canal. Mustang Creek is ephemeral with flow found primarily during winter runoff events. Summer flows are rare and intermittent as the upstream orchards utilize microspray irrigation. Citrus and deciduous nut crops are the main agriculture with smaller amounts of field crops and vineyards.

Prairie Flower Drain @ Crows Landing Rd (2,577 irrigated acres) – Prairie Flower Drain @ Crows Landing Rd is a core site located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). Relative to other drains in the western portion of the Coalition region, Prairie Flower Drain is longer and drains mostly irrigated agriculture. Dairies and feedlots are common in this part of the Coalition region and this drain receives runoff immediately upstream from farmland managed by dairies. Agriculture in the upstream vicinity is primarily field crops and pasture. The water table in this site subwatershed is very shallow and the groundwater is high in salt. Prairie Flower Drain intercepts this shallow groundwater and moves it to Harding Drain where it then flows to the San Joaquin River.

San Joaquin River at Airport Way Bridge near Vernalis (84,162 irrigated acres) – San Joaquin River at Airport Way Bridge near Vernalis is monitored for chlorpyrifos and diazinon TMDL compliance. This area drains lands from Airport Way Bridge upstream to Maze Blvd into the San Joaquin River including the northern portion of Stanislaus County with a small portion west of San Joaquin River from Stanislaus and San Joaquin Counties. Agriculture in the area is primarily deciduous nuts and fruits with some field crops, pasture, truck, nursery, and berry crops.

San Joaquin River at Hills Ferry Rd (348,117 irrigated acres) – San Joaquin River at Hills Ferry Rd is monitored for chlorpyrifos and diazinon TMDL compliance. This area drains lands west of the San Joaquin River upstream from Hills Ferry Rd to Fremont Ford and includes the region west of San Joaquin River for Merced and the northern part of Fresno County. Approximately 55% of the land is native vegetation with some field crops, deciduous nuts, fruit, truck, nursery, and berry crops.

San Joaquin River at the Maze Boulevard (Highway 132) Bridge (187,556 irrigated acres) – San Joaquin River at the Maze Boulevard (Highway 132) Bridge is monitored for chlorpyrifos and diazinon TMDL compliance. This area drains lands east and west of the San Joaquin River between Maze Blvd and Las Palmas Ave. Approximately 44% of the land is native vegetation along with field crops, deciduous nuts, fruit, truck, nursery, and berry crops.

Unnamed Drain @ Hogin Rd (990 irrigated acres) – Unnamed Drain @ Hogin Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). It is a small subwatershed that is just east of San Joaquin River. Its water source is both from San Joaquin River and drainage of the surrounding area. The two main crops are field crops and pasture.

Unnamed Drain @ Hwy 140 (416 irrigated acres) – Unnamed Drain @ Hwy 140 is located in the Merced River @ Santa Fe Zone (Zone 4). This waterbody originates from the East Side Irrigation Canal and flows into Old Channel which flows into San Joaquin River. The irrigated agriculture is primarily mixed pasture with a small amount of corn.

Westport Drain @ Vivian Rd (1,540 irrigated acres) – Westport Drain @ Vivian Rd is located in the Prairie Flower Drain @ Crows Landing Rd Zone (Zone 2). The origin Westport Drain is Turlock Lake via Turlock main Canal. The agriculture in this subwatershed is deciduous fruit and nut, field crops, pasture, and some vines and dairies.

SAMPLE SITE LOCATIONS

The site names, zones, site types, station codes, and locations of all sites monitored during the 2016 WY are provided in Table 3. Land use acreage for each subwatershed monitored is listed in Table 5. Land use information was obtained from data provided by DWR, http://www.water.ca.gov/landwateruse/anlwuest.cfm. Data is continuously updated by DWR but is of different age for each county and land use in some areas of the ESJWQC may have changed since that time.

The map in Figure 8 is of all site subwatersheds (Core, Represented, and MPM) monitored during the 2016 WY relative to the six different zone boundaries. Figure 9 is a map of the three Total Maximum Daily Load (TMDL) sites monitored for chlorpyrifos and diazinon by the ESJWQC for load capacity compliance. In order to achieve the monitoring objectives of the ESJWQC monitoring program, the Coalition monitored 27 sites during the 2016 WY. Of these 27 sites, MPM took place at 21 sites (Figure 8). Nine of the 21 sites were scheduled for MPM only and MPM also occurred at all six Core sites.

Table 5. ESJWQC 2016 WY land use acreage of site subwatersheds.

Land uses designated as irrigated/non-irrigated (I/NI), sites listed alphabetically; numbers are rounded to nearest whole number.

Land Use	I/NI	Ash Slough @ Ave 21	Bear Creek @ Kibby Rd	Berenda Slough along Ave 18 1/2	Black Rascal Creek @ Yosemite Rd	Canal Creek @ West Bellevue Rd	Cottonwood Creek @ Rd 20	Deadman Creek @ Gurr Rd	Deadman Creek @ Hwy 59	Dry Creek @ Rd 18	Dry Creek @ Wellsford Rd	Duck Slough @ Gurr Rd	Hatch Drain @ Tuolumne Rd	Highline Canal @ Hwy 99	Highline Canal @ Lombardy Rd	Hilmar Drain @ Central Ave	Howard Lateral @ Hwy 140	Lateral 2 ½ near Keyes Rd	Lateral 5 ½ @ South Blaker Rd	Lateral 6 and 7 @ Central Ave	Levee Drain @ Carpenter Rd	Livingston Drain @ Robin Ave	Lower Stevinson @ Faith Home Rd	McCoy Lateral @ Hwy 140	Merced River @ Santa Fe	Miles Creek @ Reilly Rd	Mootz Drain downstream of Langworth Pond	Mustang Creek @ East Ave	Prairie Flower Drain @ Crows Landing Rd	Unnamed Drain @ Hwy 140	Unnamed Drain @ Hogin Rd	Westport Drain @ Vivian Rd
Citrus	I		48	24			698	7	7	775	19			74	74			30	94	94	6		92		45	3						
Citrus	NI			5			21										4					4		4								
Deciduous nut and fruit	I	9328	3424	18401	85	1745	16329	10609	10598	13336	14426	7315	37	25229	21280		3585	23827	27930	30669		7647	52035	3670	21398	2372	234	6180				455
Field crop	I	1283	1943	542	377	654	806	11876	10400	283	170	5249	34	1024	718	1288	440	275	2205	9490	12	773	10160	1573	5536	4073		1522	47	50		10
Field crop	NI																								139							
Grain and hay	I	4316	233	1336			430	2622	2425	374	5042	766	132	4409	4393		262	2509	9581	187	1598	484	7354	524	778	461	69	230	1866		477	311
Grain and hay	NI	92	195	491	39	83	1864	1166	1161	644	842	232		9				7	2	2			706	35	229	512		699				
Idle	I	280		365		169	984	587	587	147	2760	774		206	107		130	270	137	205		112	338	251	141	145						
Idle	NI					384																			328							
Riparian Vegetation	NI	885		558						6	954							280	281	281			589									
Wild vegetation	NI	2053	16142	8487	3711	7950	47218	55864	52589	20007	50087	27400		389	311		357	1370	1751	1968		559	3839	378	87931	35993		325		95	35	
Water surface	NI	751	70	901		29	817	359	335	762	599	158	3	307	297	22	6	575	787	941	55	13	783	34	675	117	3	5	63		14	2
Pasture	I	2660	1501	413	439	1142	1068	9958	8714	616	6897	5646	44	3096	2967	398	457	3196	5969	6403	306	298	7417	335	4684	2120	1019	156	663	366	514	600
Pasture	NI							39	18			74		335	318		9	12	29	48		106	495	9	101							
Rice	I							8			504	589					25					25		25								
Feedlot, dairy, farmstead	NI	633	93	1134		354	694	839	655	699	1937	728	17	1414	1278	147	126	1807	3229	4131	255	316	4384	375	1149	610	64	187	461	10		192
Truck, nursery, berry	I	345	636	18	96		274	3372	3348	81	28	2017		294	115		2212	647	1053	1080		2082	1315	1525	292	1010						
Urban	NI	3350		4115		38	11670	596	544	5525	718	464	8	812	517		892	4575	2213	3464	22	1330	4376	806	3738	1649	93	26	25		5	11
Golf Course, cemetery, landscape	NI	136		169			52			315				2	2		38	153	19	10		90	14	42		17	2					
Vineyard	I	2039		2783		98	15801	1379	1321	4310	3073			1376	1024		206	564	793	879		249	4542	2206	2976			2588				165
Total acres		28150	24285	39742	4747	12646	98726	99281	92702	47880	88057	51441	275	38975	33402	1855	8749	40588	56073	66046	2253	14088	98446	11792	130169	49082	1485	11918	3126	521	1074	1540
Irrigated acres		20251	7785	23882	997	3808	36390	40418	37400	19922	32919	22356	247	35710	30681	1686	7317	31971	47781	55205	1922	11670	83267	10109	35850	10184	1325	10696	2577	416	990	1745

Figure 8. ESJWQC 2016 WY monitoring sites relative to zone boundaries.

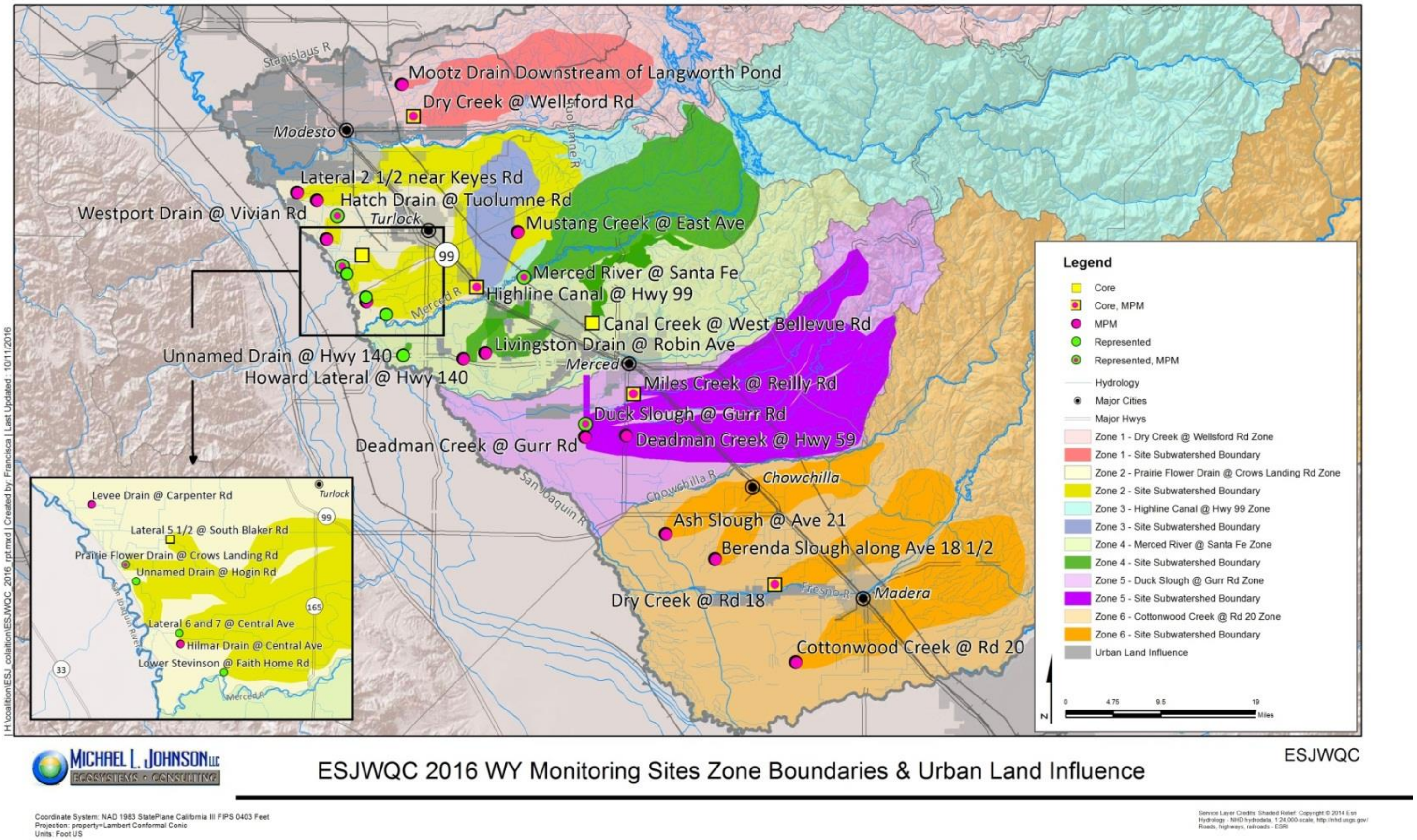
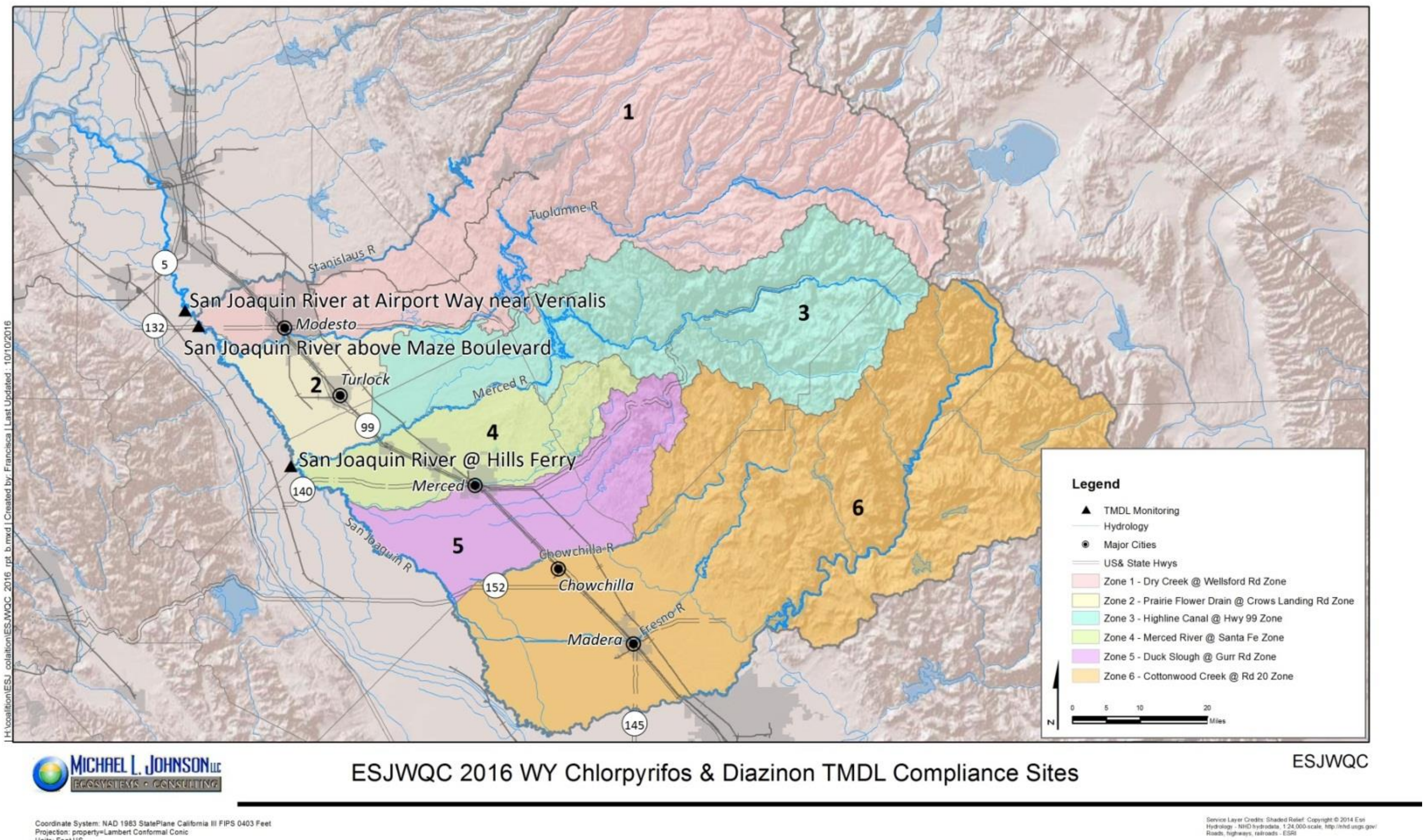


Figure 9. ESJWQC 2016 WY chlorpyrifos and diazinon TMDL compliance locations.
The three TMDL sites are part of six TMDL compliance monitoring locations. Land use information and drainage maps will be submitted in the TMDL AMR.



RAINFALL RECORDS

In the ESJWQC region, a storm that qualifies as a monitoring event is defined as monitoring within three days of a rainfall event that exceeds 0.25 inches within 24 hours. If a storm is forecasted within a week before a scheduled sampling event, or predicted within two days after the scheduled sampling event, the Coalition moves its sampling date to capture the storm. Storm monitoring events must be captured at least twice a year. The collection of storm samples is not contingent on the timing of other prescheduled sampling events and may result in monitoring more than once a month.

During the 2016 WY, the Coalition sampled three storm events from October 2015 through September 2016 (November 10, 2015, January 7, 2016, and March 8, 2016; Table 6). The Coalition may not capture every storm event due to the following reasons; 1) sample dates and laboratory analyses could not be moved to coincide with expected runoff, 2) monitoring schedules were not changed to capture the storm because rainfall was not predicted to reach the rainfall trigger limit, 3) samples were already collected for a storm event during the month, and 4) even though the trigger was met, there was no evidence of runoff due to a lack of moisture in the soils.

During the 2016 WY, the Coalition sampled three storm events. Table 6 lists the date storm monitoring occurred, duration of the storm, and the amount of precipitation that fell within Modesto, Merced and Madera for the duration of the storm. Daily rainfall records are provided below for Modesto, Merced, and Madera, the three major cities in the Coalition region (Figure 10, October through December 2015; Figure 11, January through March 2016; Figure 12, April through June 2016). No rain fell within the Coalition region from July through September 2016.

Table 6. Monitoring events that occurred during the 2016WY to capture stormwater runoff.

Sampling Date	Storm Duration	Precipitation Amounts (inches)		
		Modesto	Merced	Madera
11/10/2015	11/8/2015 – 11/10/2015	0.86	0.36	0.57
1/07/2016	1/4/2016 – 1/6/2016	1.65	1.32	0.92
3/08/2016	3/3/2016 – 3/7/2016	2.30	1.36	1.86

Figure 10. Precipitation history for Modesto, Merced, and Madera, October through December 2015.
The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25”- 0.5” rain in 24 hours. All weather data reported on http://www.wunderground.com/.

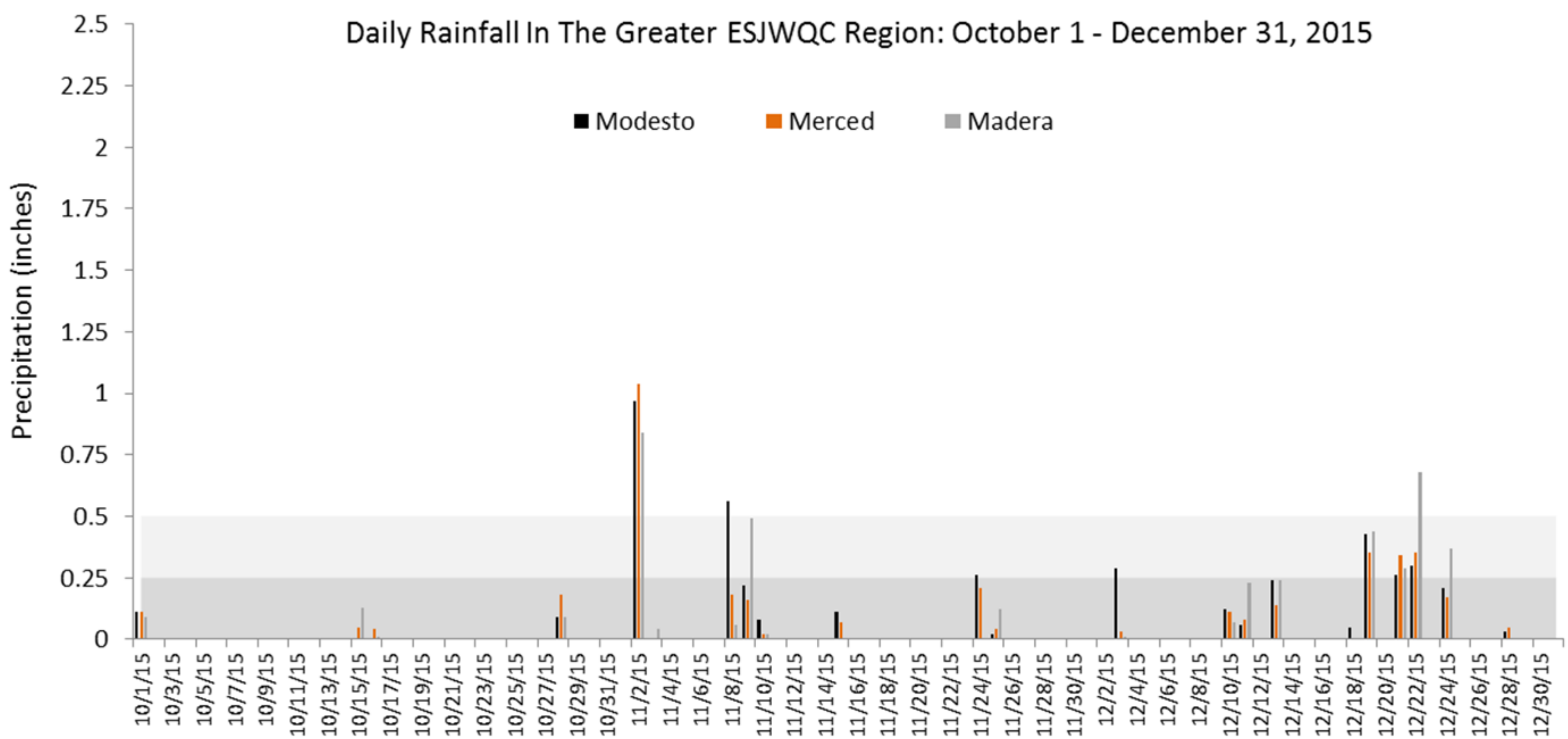


Figure 11. Precipitation history for Modesto, Merced, and Madera, January through March 2016.
The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25" - 0.5" rain in 24 hours. All data reported on http://www.wunderground.com/.

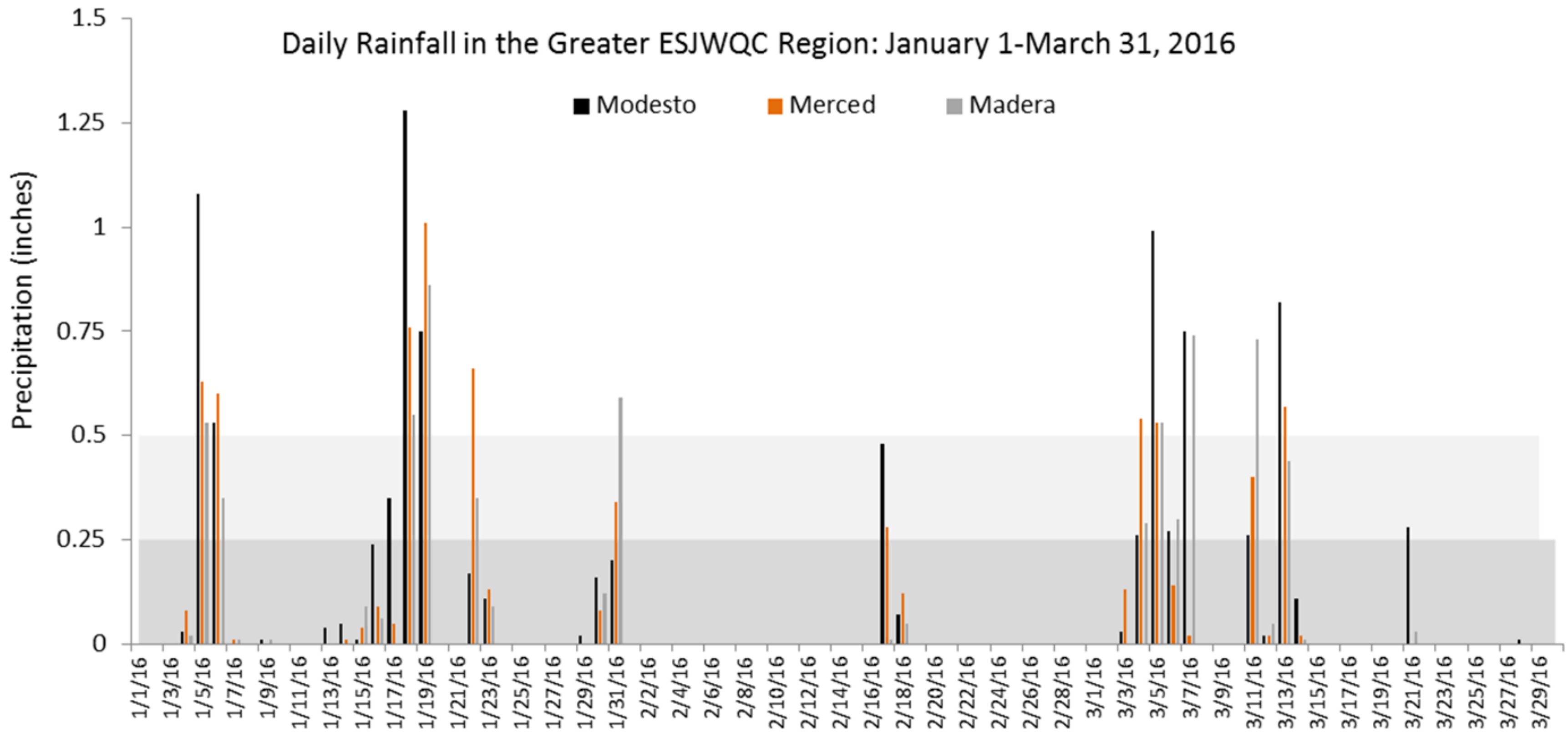
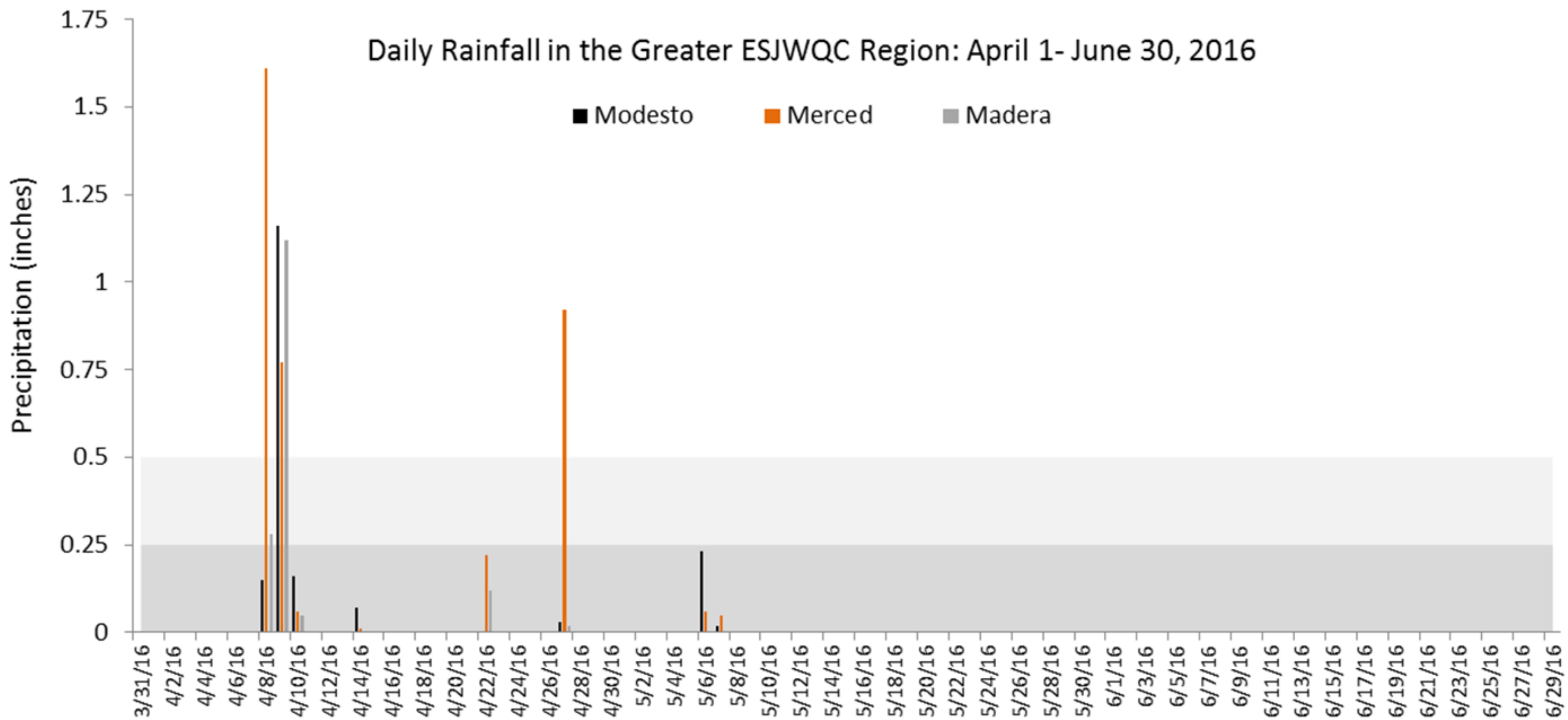


Figure 12. Precipitation history for Modesto, Merced, and Madera, April through June 2016.

The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25" - 0.5" rain in 24 hours. All data reported on http://www.wunderground.com/.



METHODS

In order to achieve the objectives of the ESJWQC monitoring program, the Coalition monitored 29 sites (including three TMDL sites) during the 2016 WY. The sub-sections below describe the sampling, analytical, and sourcing methods utilized during the 2016 WY.

SAMPLE METHODS

Sample containers, volumes, and holding times are provided in Table 7. Table 8 lists the instruments used to measure field parameters and Table 9 references methods and equipment used to measure discharge. When it is safe to wade in the waterbody, discharge is measured at all sites (except Merced River @ Santa Fe and the three TMDL compliance sites), using the USGS R2 Cross Streamflow Method. Discharge measurements for Merced River @ Santa Fe and the TMDL compliance monitoring locations are obtained online through CDEC stations (Table 9). Discharge measurements at the time closest to when the sites were sampled were obtained from CDEC, recorded on the field sheets and entered into the database.

Table 7. Sample container, volume, and holding times for collection.

Groups	Analytical Parameter	Sample Volume[1]	Sample Container	Initial Preservation/Holding Requirements	Holding Time[2]
Physical Parameters	Total Suspended Solids	2000 mL	1x 2000 mL Polyethylene	Store at <6°C	7 Days
	Turbidity	2000 mL			7 Days
	Soluble Orthophosphate	2000 mL			48 Hours
	Total Organic Carbon	120 mL	3x 40 mL Amber glass VOA with PTFE-lined cap	Preserve with HCl, store at <6°C	28 Days
Nutrients	Ammonia and Nitrate-Nitrite as N	500 mL	1x 500 mL Polyethylene	Store at <6°C, preserve to pH $\leq$ 2 with H_2SO_4	28 Hours
Metals	Metals/Trace Elements, Hardness	500 mL	1x 500 mL Polyethylene	Filter as necessary; Store at <6°C, preserve to pH ≤ 2 with HNO_3	180 Days
Drinking Water	*E. coli* (pathogens)[3]	150 mL	1x 150 mL Polyethylene	Preserved with $Na_2S_2O_3$, store at <8 °C	24 hours
Pesticides	Carbamates	1 L	2x 1 L Amber Glass Jar	Store at <6°C; extract within 7 days	40 Days
	Herbicides	1 L	2x 1 L Amber Glass Jar		40 Days
	Organophosphates	1 L	2x 1 L Amber Glass Jar		40 Days
	Paraquat	500 mL	1x 500 mL polyethylene		21 Days
	Glyphosate	80 mL	2x 40 mL Amber glass VOA with PTFE-lined cap		6 Months
Water and Sediment Column Toxicity	Aquatic Toxicity	3 Gallons	3x 1 Gallon Amber Glass Jar	Store at <6°C; freeze (-20°C) within 2 weeks	36 Hours
	Sediment Toxicity	2 L	2x 1L Clear Glass Jar	Store at <6°C, do not freeze	14 Days
	Sediment Grain Size	8 oz.	1x 250 mL Glass Jar		28 Days
	Sediment Total Organic Carbon	8 oz.	1x 250 mL Glass Jar	Store at <6°C (not frozen), analyze or freeze (-20C) within 28 days	28 days (not frozen) 12 Months (frozen)
	Sediment Chemistry	8 oz.	1x 250 mL Amber Glass Jar	Store at <6°C (not frozen), freeze within 48 hours	12 Months
	Sediment Total Solids	8 oz.	1x 250 mL Glass Jar	Store at <6°C	7 Days

[1] Additional volume may be required for Quality Control (QC) analyses. The sample volume listed for aquatic toxicity represents the volume collected for a single species.
[2] Holding time is after initial preservation or extraction.
[3] Samples for *E. coli* analyses should be set up as soon as possible.

Table 8. Field parameters and instruments used to collect measurements.

PARAMETER	INSTRUMENT
Dissolved Oxygen	YSI Model 556 and YSI Professional Plus
Temperature	
pH	
Specific Conductance	
Discharge	Marsh McBirney Flo-Mate 2000

YSI- Yellow Springs Instruments

Table 9. Site specific discharge methods for the 2016 WY.

SITE	DISCHARGE METHOD[1]	METER/ GAUGE
Ash Slough @ Ave 21	USGS R2Cross Streamflow Method	Marsh McBirney Flo-Mate 2000
Berenda Slough along Ave 18 1/2		
Black Rascal Creek @ Yosemite Rd		
Canal Creek @ West Bellevue Rd		
Cottonwood Creek @ Rd 20		
Deadman Creek @ Gurr Rd		
Deadman Creek @ Hwy 59		
Dry Creek @ Rd 18		
Dry Creek @ Wellsford Rd		
Duck Slough @ Gurr Rd		
Hatch Drain @ Tuolumne Rd		
Highline Canal @ Hwy 99		
Highline Canal @ Lombardy Rd		
Hilmar Drain @ Central Ave		
Howard Lateral @ Hwy 140		
Lateral 2 1/2 near Keyes Rd		
Lateral 5 1/2 @ South Blaker Rd		
Lateral 6 and 7 @ Central Ave		
Levee Drain @ Carpenter Rd		
Livingston Drain @ Robin Ave		
Lower Stevinson @ Faith Home Rd		
Miles Creek @ Reilly Rd		
Mootz Drain Downstream of Langworth Pond		
Mustang Creek @ East Ave		
Prairie Flower Drain @ Crows Landing Rd		
Unnamed Drain @ Hogin Rd		
Unnamed Drain @ Hwy 140		
Westport Drain @ Vivian Rd		
Merced River @ Santa Fe	DWR Gauge California Data Exchange Center (CDEC)	Merced River at Cressy (CRS)
San Joaquin River @ Hills Ferry		SJR near Newman (NEW)
San Joaquin River above Maze Boulevard		SJR @ Maze Rd Bridge (MRB)
San Joaquin River at Airport Way near Vernalis		SJR near Vernalis (VNS)

[1]USGS R2 Cross Steamflow Method is only conducted when the stream is safe to wade across. Estimated observed flow is recorded for every site on field sheets.

Sample Collection Details

Complete monitoring results, sample locations, sampling dates, sampling times, and type of monitoring are included in Attachment A. Results are provided for field parameters, organics (pesticides), inorganic constituents, including metals and *E. coli,* toxicity (water and sediment), and sediment chemistry. Monitoring data include results from samples taken for MPM, NM, sediment monitoring, and TMDL compliance monitoring.

The Coalition is required to sample every site scheduled for monitoring, as outlined in the 2016 WY MPU; however, certain field conditions can prevent samples from being collected. Table 10 lists the sampling conditions that can occur and the sampling exceptions that result in no sample collection.

During the 2016 WY, sampling occurred for both sediment and water under both no flow and low flow conditions. If a site had no flow, discharge was recorded as zero. If a waterbody had "puddle-like conditions" the entire sample was categorized as "non-contiguous" in the database. All results associated with samples collected from a non-contiguous waterbody, including field parameters, chemistry and toxicity, are associated with the non-contiguous flag and any water quality data should be evaluated with the understanding that the water was not connected to a downstream waterbody.

Table 10. Description of field sampling conditions.

Sampling Conditions	Definition	Sampling Exceptions	Water Samples Collected	Sediment Samples Collected
Contiguous	Waterbody connected upstream and downstream of the sample site.	None: enough water to collect required samples.	Yes	Yes
		Too Shallow: waterbody is <6 inches deep.	No*	Yes
		Hard Bottom: no sediment present or hardpan sediment only.	Yes	No*
Non-contiguous	Waterbody not connected upstream or downstream of the sample site.	None: water is puddled; however there is enough volume present to collect required samples.	Yes	Yes
		Too Shallow: waterbody is puddled and <6 inches deep.	No*	Yes
		Hard Bottom: no sediment present or hardpan sediment only.	Yes	No*
Dry	No water present or not enough volume present to collect required samples.	None: Sediment has enough moisture to collect required samples.	No*	Yes
		Dry: no water present or not enough volume present to collect required samples.	No*	No*

*If no samples are collected, the sampling event is considered 'Dry'.

ANALYTICAL METHODS

Analytical methods and reporting limits (RLs) are provided in Table 11. All field sampling and analytical methods were performed as outlined in the Standard Operating Procedures (SOPs) provided in the Quality Assurance Project Plan (QAPP; approved on February 23, 2011; SOPs located in Appendix I-XXXVII). Any deviations from these procedures are documented in the Quality Assurance Evaluation Results sections below.

Table 11. Field and laboratory analytical methods.

Group	Constituent	Matrix	Analyzing Laboratory	Reporting Limit	Minimum Detection Limit	Analytical Method
Physical Parameters	Flow	Fresh Water	Field Measure	1 cfs	NA	USGS R2Cross Streamflow Method
	pH	Fresh Water	Field Measure	0.1	NA	EPA 150.1
	Specific Conductivity	Fresh Water	Field Measure	100 µmhos/cm	NA	EPA 120.1
	Dissolved Oxygen	Fresh Water	Field Measure	0.1 mg/L	NA	SM 4500-O
	Temperature	Fresh Water	Field Measure	0.1 °C	NA	SM 2550
	Turbidity	Fresh Water	Caltest	0.05 NTU	0.15 NTU	EPA 180.1
	Total Suspended Solids	Fresh Water	Caltest	3 mg/L	2 mg/L	SM 2540 D
Inorganics	Hardness	Fresh Water	Caltest	5 mg/L	1.7 mg/L	SM2340C
	Total Organic Carbon	Fresh Water	Caltest	0.5 mg/L	0.30 mg/L	SM 5310 B
Bacteria	*E. coli*	Fresh Water	Caltest	1 MPN/100 mL	1 MPN/100 mL	SM 9223 B
Toxicity	Water Column Toxicity	Fresh Water	AQUA-Science	NA	NA	EPA 821-R-02-012
		Fresh Water	AQUA-Science	NA	NA	EPA 821-R-02-013
	Sediment Toxicity	Sediment	AQUA-Science[1]	NA	NA	EPA 600/R-99-064
Carbamates	Aldicarb	Fresh Water	APPL Inc	0.4 µg/L	0.20 µg/L	EPA 8321A
	Carbaryl	Fresh Water	APPL Inc	0.07 µg/L	0.050 µg/L	EPA 8321A
	Carbofuran	Fresh Water	APPL Inc	0.07 µg/L	0.050 µg/L	EPA 8321A
	Methiocarb	Fresh Water	APPL Inc	0.4 µg/L	0.20 µg/L	EPA 8321A
	Methomyl	Fresh Water	APPL Inc	0.07 µg/L	0.050 µg/L	EPA 8321A
	Oxamyl	Fresh Water	APPL Inc	0.4 µg/L	0.20 µg/L	EPA 8321A
Organophosphates	Azinphos-methyl	Fresh Water	APPL Inc	0.1 µg/L	0.02 µg/L	EPA 8141A
	Chlorpyrifos	Fresh Water	APPL Inc	0.015 µg/L	0.0026 µg/L	EPA 8141A
	Diazinon	Fresh Water	APPL Inc	0.02 µg/L	0.004 µg/L	EPA 8141A
	Dichlorvos	Fresh Water	APPL Inc	0.1 µg/L	0.02 µg/L	EPA 8141A
	Dimethoate	Fresh Water	APPL Inc	0.1 µg/L	0.08 µg/L	EPA 8141A
	Demeton-s	Fresh Water	APPL Inc	0.1 µg/L	0.01 µg/L	EPA 8141A
	Disulfoton	Fresh Water	APPL Inc	0.05 µg/L	0.02 µg/L	EPA 8141A
	Malathion	Fresh Water	APPL Inc	0.1 µg/L	0.03 µg/L	EPA 8141A
	Methamidophos	Fresh Water	APPL Inc	0.2 µg/L	0.1 µg/L	EPA 8321A
	Methidathion	Fresh Water	APPL Inc	0.1 µg/L	0.04 µg/L	EPA 8141A
	Parathion, methyl	Fresh Water	APPL Inc	0.1 µg/L	0.075 µg/L	EPA 8141A
	Phorate	Fresh Water	APPL Inc	0.1 µg/L	0.07 µg/L	EPA 8141A
	Phosmet	Fresh Water	APPL Inc	0.2 µg/L	0.06 µg/L	EPA 8141A
Herbicides	Atrazine	Fresh Water	APPL Inc	0.5 µg/L	0.10 µg/L	EPA 8141A
	Cyanazine	Fresh Water	APPL Inc	0.5 µg/L	0.15 µg/L	EPA 8141A
	Diuron	Fresh Water	APPL Inc	0.4 µg/L	0.2 µg/L	EPA 8321A
	Glyphosate	Fresh Water	NCL Ltd	5 µg/L	3.2 µg/L	EPA 547
	Linuron	Fresh Water	APPL Inc	0.4 µg/L	0.2 µg/L	EPA 8321A
	Paraquat	Fresh Water	NCL Ltd	0.4 µg/L	0.19 µg/L	EPA 549.2M
	Simazine	Fresh Water	APPL Inc	0.5 µg/L	0.12 µg/L	EPA 8141A
	Trifluralin	Fresh Water	APPL Inc	0.05 µg/L	0.036 µg/L	EPA 8141
Metals	Arsenic	Fresh Water	Caltest	0.5 µg/L	0.060 µg/L	EPA 200.8 (ICPMS)
	Boron	Fresh Water	Caltest	10 µg/L	2.0 µg/L	EPA 200.8 (ICPMS)
	Cadmium	Fresh Water	Caltest	0.1 µg/L	0.05 µg/L	EPA 200.8 (ICPMS Collision Cell)

Group	Constituent	Matrix	Analyzing Laboratory	Reporting Limit	Minimum Detection Limit	Analytical Method
	Copper	Fresh Water	Caltest	0.5 µg/L	0.15 µg/L	EPA 200.8 (ICPMS Collision Cell)
	Lead	Fresh Water	Caltest	0.25 µg/L	0.03 µg/L	EPA 200.8 (ICPMS Collision Cell)
	Molybdenum	Fresh Water	Caltest	0.25 µg/L	0.07 µg/L	EPA 200.8 (ICPMS Collision Cell)
	Nickel	Fresh Water	Caltest	0.5 µg/L	0.06 µg/L	EPA 200.8 (ICPMS Collision Cell)
	Selenium	Fresh Water	Caltest	1 µg/L	0.07 µg/L	EPA 200.8 (ICPMS)
	Zinc	Fresh Water	Caltest	1 µg/L	0.7 µg/L	EPA 200.8 (ICPMS)
Nutrients	Nitrate + Nitrite (as N)	Fresh Water	Caltest	0.05 mg/L	0.02 mg/L	EPA 353.2
	Total Ammonia	Fresh Water	Caltest	0.1 mg/L	0.040 mg/L	SM 4500-NH3C
	Soluble Orthophosphate	Fresh Water	Caltest	0.01 mg/L	0.006 mg/L	SM 4500-P E
Sediment	Bifenthrin	Sediment	Caltest	0.33 ng/g dw	0.1 ng/g dw	GCIS/NCI/SIM
	Cyfluthrin	Sediment	Caltest	0.33 ng/g dw	0.11 ng/g dw	GCIS/NCI/SIM
	Cypermethrin	Sediment	Caltest	0.33 ng/g dw	0.1 ng/g dw	GCIS/NCI/SIM
	Deltamethrin: Tralomethrin	Sediment	Caltest	0.33 ng/g dw	0.12 ng/g dw	GCIS/NCI/SIM
	Esfenvalerate	Sediment	Caltest	0.33 ng/g dw	0.13 ng/g dw	GCIS/NCI/SIM
	Lambda-Cyhalothrin	Sediment	Caltest	0.33 ng/g dw	0.06 ng/g dw	GCIS/NCI/SIM
	Permethrin	Sediment	Caltest	0.33 ng/g dw	0.11 ng/g dw	GCIS/NCI/SIM
	Fenpropathrin	Sediment	Caltest	0.33 ng/g dw	0.07 ng/g dw	GCIS/NCI/SIM
	Chlorpyrifos	Sediment	Caltest	0.33 ng/g dw	0.12 ng/g dw	GCIS/NCI/SIM
	Piperonyl Butoxide	Sediment	Caltest	0.34 ng/g dw	0.031 ng/g dw	GCIS/NCI/SIM
	Total Organic Carbon	Sediment	Caltest[2]	200 mg/kg	100 mg/kg dw	Walkley Black
	Grain Size	Sediment	Caltest[2]	1% sand, silt, clay, gravel	0.4 µm	ASTM D422, ASTM D4464M-85

cfs- Cubic Feet per Second
MPN- Most Probable Number
NA- Not applicable
[1] Subcontracted to Nautilus Laboratory.
[2] Subcontracted to PTS Laboratory.

SOURCING METHODS

If an exceedance of the WQTL for a constituent occurs, the Coalition attempts to source and identify 1) the location of the applications of the product containing the constituent (PUR data), and 2) the chemical and class of the toxicant in the sample (TIEs and additional sediment chemistry). The sections below explain the methods used for sourcing constituents when exceedances of WQTLs occur.

Pesticide Use Report Data

PUR data are provided to the Coalition by each of the County Agricultural Commissioner's offices. Preliminary PUR data are uploaded to an Access database maintained by the Coalition and associated with WQTL exceedances based on active ingredients. The database links registered products to active ingredients (AI) and calculates pounds of AI per acre based on the use reported by growers to the County Agricultural Commissioner.

Registered products are evaluated for applications relevant to exceedances of WQTLs. To assess possible sources of toxicity, applications of pesticides known to be toxic to the test species are identified based on a variety of factors including the organic carbon partitioning coefficient (K_{oc}), chemical type, mode of action, and solubility. If water column toxicity occurs, pesticides with a relatively low K_{oc} (below 1900) are evaluated and the PUR database is queried for pesticides applied within 30 days prior to water sampling. If sediment toxicity occurs, pesticides with a relatively high K_{oc} (1600 or greater) are considered potential causes and the PUR database is queried for applications within 90 days prior to the date of toxicity. The PUR database is queried for applications of pyrethroids within 180 days prior to the date of toxicity (for water column or sediment toxicity) due to the long half-life of pyrethroids. The database is queried for applications of metals 90 days prior to exceedances (Table 12). If no applications can be associated with the exceedance or toxicity in the specified time period, the PUR database is queried an additional 30 days prior to determine which pesticides were applied within 60 days of the sample date.

The PUR database cannot be queried for applications of chemicals that are no longer applied (aldrin, dieldrin, endrin, hexachlorocyclohexane (HCH), DDD, DDE, DDT, arsenic, lead, or molybdenum) since there are no registered products containing these chemicals.

Table 12. Timeframes of PUR data associated with exceedances of pesticides, metals, sediment toxicity, and water column toxicity.

EXCEEDANCE TYPE	PUR DATA TIMEFRAMES
Pesticides	30 days
Metals	90 days
Sediment Toxicity	90 days with 180 days for pyrethroids
Water Column Toxicity	30 days, with 180 days for pyrethroids and 90 days for metals

Preliminary data may include zeroes or blank cells in the pounds of Active Ingredient (AI) per acre column of the PUR appendix (Appendix II). Preliminary data do not include the pounds of AI per acre and therefore it must be calculated based on the amount applied and area reported. Accurate calculations require proper units for the amount of AI applied and area treated; if there are errors in the data these calculations cannot be performed and the result is a blank cell for AI per acre. Values recorded as ‘zero’ in the pounds AI per acre column are due to values less than 0.0001 being rounded to zero during the calculation process; this occurs when the amount of chemical applied to an acre is extremely small. The original data are not rounded; pounds AI per acre derived from calculations are the only rounded values.

Appendix II includes tables and maps of all pesticide applications relevant to exceedances and toxicity. When PUR data for any county are unattainable, the Coalition makes a note in Appendix II; any outstanding PUR data are submitted in an Addendum to the Annual Report. Information regarding available and outstanding PURs is included in Table 13.

Table 13. Obtained PUR data for 2016 WY exceedances.

County	2016 WY PUR Data Obtained	2016 WY PUR Data Outstanding for 2017 Report
Madera	October 2015 through September 2016	None
Merced	October 2015 through September 2016	None
Stanislaus	October 2015 through September 2016	None

Toxicity Identification Evaluations

Toxicity in samples collected in the Coalition region is primarily caused by pesticides, organic compounds, and cationic metals. The Coalition performs Toxicity Identification Evaluations (TIEs) on water samples when survival (fathead minnows, *Ceriodaphnia*) or growth (algae) of the respective target organism is 50% or less compared to the control in order to identify the chemical class of toxicant(s) in the test sample. Based on the responses to manipulations of the sample performed during the TIE, the Coalition is able to identify causes of toxicity to broad chemical class, e.g. pyrethroids, organophosphates, nonpolar organics, or cationic metals. The original toxicity test or a dilution series test provides an estimate of the Toxic Units (TUa) in the sample. The chemical analyses provide a measurement of concentration which can be combined with known LC50 data for the test organism to estimate the number of TUa's of the chemical in the sample. The number of TUs estimated by the dilution series test and the chemical analysis can be compared to determine if the chemicals detected in the sample can account for the observed toxicity. The Coalition does not conduct TIEs on every sample, and when performed, the samples may lose toxicity and in that case, TIEs would not identify the class of compound responsible for the toxicity.

All TIE results are submitted quarterly with laboratory results. Water column and sediment toxicity results are provided in the Discussion of Surface Water Monitoring Results section of this report and are included in Table 36.

Sediment Chemistry Analysis

The Coalition analyzes sediment samples for the presence of pyrethroids and chlorpyrifos when toxicity to *H. azteca* occurs and survival in the ambient sample is less than 80% compared to the control. Pyrethroids readily bind to sediment and a small portion partitions into pore water becoming bioavailable to *H. azteca*. The additional sediment chemistry results are used to determine if sediment-bound pyrethroids and chlorpyrifos were bioavailable at concentrations that would cause toxicity. The amount of pyrethroids contributing to sediment toxicity can be evaluated using the toxic units for the acute endpoint (TUa) calculation based on the LC50s for pyrethroids determined to cause acute toxicity to *H. azteca* (LC50 = 1 TUa). The LC50 is the lethal concentration at which 50% mortality of the test species occurs. The Coalition utilizes the pyrethroid and chlorpyrifos LC50 concentration values in Table 14 (Amweg et al., 2005 and Weston et al., 2013). During the 2016 WY, no sediment toxicity occurred; therefore no TUa calculations for the chemistry analyses were performed.

Table 14. Pyrethroid and chlorpyrifos LC50 concentrations for sediment analysis.

SEDIMENT PESTICIDE	LC50[1] (µG/G OC)
Bifenthrin	0.52
Chlorpyrifos	4.16
Cyhalothrin, lambda	0.45
Cypermethrin	0.38
Deltamethrin	0.79
Esfenvalerate/Fenvalerate	1.54
Permethrin	10.83

[1]Normalized to TOC measurements in sediments collected for research (Amweg, et al., 2005 and Weston, et al., 2013).
LC50- the lethal concentration at which 50% mortality of the test species occurs.
OC- Organic Carbon

QUALITY ASSURANCE EVALUATION RESULTS

The sections below include an assessment of completeness, precision, and accuracy for data generated from samples collected during the 2016 WY. Precision, accuracy and completeness are evaluated based on Data Quality Objectives (DQOs) as outlined in the QAPP. Table 15 through Table 17 include counts and percentages for completeness per method and analyte for the 2016 WY. Table 28 includes a summary of holding time evaluations and Table 18 through Table 30 include counts of each measure of precision and accuracy evaluated. Data must meet DQOs 90% of the time within the reporting period. When data do not meet DQOs, data are reviewed for overall quality on batch and sample levels for usability. This section details the instances when DQOs did not achieve the 90% requirement and provides rationale for accepting the data.

All results that do not meet DQOs are flagged using California Environmental Data Exchange Network (CEDEN) codes. The Coalition works with the Central Valley Regional Data Center (CV RDC) to ensure all data are CEDEN comparable. Data generated for the 2016 WY are included in Attachment A and Appendix I of this report.

COMPLETENESS

Completeness is assessed on three levels: field and transport, analytical, and batch completeness. Field and transport completeness is based on the number of samples successfully collected and transported to the appropriate laboratories. Field and transport completeness may be less than 100% due to bottle breakage during sample transport to the laboratory or inability to access a site. Dry sites and waterbodies that lack enough water to collect samples are considered "sampled" and are counted toward field and transport completeness. Analytical completeness is based on the number of samples successfully analyzed by the laboratory. Analytical completeness may be less than 100% due to bottles breaking while at the laboratory or if an analysis failed or was not performed due to laboratory error. Batch completeness assesses whether chemistry and toxicity batches were processed with the required QC samples as prescribed in the QAPP.

Field and Transport Completeness

Overall field and transport completeness for environmental samples was 100% for the 2016 WY (Table 15). Field parameter measurements (DO, pH, SC, and water temperature) were taken at each site for all sampling events when there was enough water for sample collection. Field measurement completeness was 100% for all field parameters (Table 16).

Discharge is measured at all sites when sampling crews can safely wade across the waterbody to take flow readings. When a waterbody has no measureable flow or is non-contiguous, discharge is recorded as zero cfs and is counted toward the total number of discharge measurements taken for discharge completeness in Table 16. When samples are only collected for toxicity at a location, discharge is not measured since an instantaneous load does not apply to toxicity; these situations do not count toward the total number of samples scheduled when assessing discharge field and transport completeness Table 16. Discharge may not be measured if the waterbody is too deep to safely take flow readings or equipment failure occurs; these instances are counted against the total number of measurements taken. During the 2016 WY, there were 17 events where discharge could not be calculated because the waterbody was too deep to safely measure flow. Completeness for discharge was 90.1% for the 2016 WY (155 of 172 events, Table 16).

Field duplicate, field blank, and equipment blank samples are collected by sampling crews in the field and transported to the laboratories. These field QC samples are collected during each event, as prescribed by the QAPP. Equipment blanks are collected during monitoring events and are analyzed to assess contamination in the filtration system used to collect dissolved metals samples. If dissolved metals are not scheduled for monitoring, collecting an equipment blank sample is not necessary. Completeness acceptability is met when 5% or more of field QC samples (field duplicates, field blanks, and equipment blanks) are analyzed in a given WY. Completeness for all constituents was above 5% for the 2016 WY (Table 17).

Analytical Completeness

During the 2016 WY, all samples were analyzed as scheduled. Therefore, analytical completeness was 100% (Table 15).

Batch Completeness

Each chemistry and toxicity batch must be processed with a minimum set of QC samples as prescribed in the QAPP. Batch completeness is determined based on whether or not all required QC samples were run with every batch. During the 2016 WY 209 of 211 (99%) chemistry and toxicity batches met completeness requirements.

Hold Time Compliance

Each sample must be stored, extracted (if applicable), and analyzed within a specific timeframe to meet hold time requirements as outlined in Table 28 and the ESJWQC QAPP. Results associated with hold time violations are flagged in the database. On the October 2015 COC, a sample to be analyzed for chlorpyrifos was mistakenly marked for analysis by the wrong method. Due to this error, the sample was extracted outside of the hold time, resulting in the overall compliance of 99.2% for chlorpyrifos samples. With the exception of chlorpyrifos, 100% of all samples for all other constituents were analyzed within hold time during the 2016 WY Table 28.

PRECISION AND ACCURACY

Precision and accuracy are evaluated for each type of QC sample analyzed during the 2016 WY in Table 18 through 32 including.

Briefly, they are addressed as follows:

- Evaluation of blank samples (field blank, equipment blank, and laboratory blank): Table 18, Table 19 and Table 21,
- Evaluation of field duplicate precision for chemistry, toxicity, and grain size: Table 20 and Table 30

- Evaluation of laboratory accuracy (LCS, MS, surrogates) of recovery: Table 22, Table 24, and Table 27
- Evaluation of laboratory precision of duplicate samples (LCSD, MSD, and laboratory duplicate): Table 23, Table 25, and Table 26; and
- Summary of negative control toxicity tests (Table 29).

During the 2016 WY, each batch was processed with a combination of any of the following QC samples: field blank, equipment blank, laboratory blank, matrix spike (MS), laboratory control spike (LCS), laboratory duplicate, field duplicate, and/or an appropriate set of surrogate samples. Blank samples (field blank, equipment blank, and laboratory blank) are analyzed to determine sources of contamination in either the field (field blanks), the equipment (equipment blank) or the laboratory (laboratory blank). Percent recoveries in LCS, MS, and surrogate samples are calculated to assess laboratory accuracy in recovering known concentrations of analytes. Relative percent differences (RPDs) are calculated in duplicate samples (laboratory duplicate, LCS duplicate, MS duplicate) to assess the laboratory's precision of recoveries. In turn, the RPD calculated for field duplicates assesses field sampling precision.

An evaluation of the precision and accuracy for each analyte or group of analytes is discussed in the sections below. Batches are accepted by evaluating all measures of precision and accuracy. Justification for accepting data when DQO acceptability criteria fell below 90% for the WY is provided in each analyte section. Overall, precision and accuracy criteria were met for more than 90% of the samples for all criteria and all data are considered usable.

When a concentration of a chemical constituent in an environmental sample exceeds the highest point on a calibration curve, a dilution of the sample is required. The laboratory reports the result of the diluted sample multiplied by the dilution factor to represent the concentration of the analyte detected in the original sample. All diluted samples are flagged accordingly in the database. The reporting limit (RL) associated with a diluted sample is multiplied by the dilution factor, thereby, increasing the reporting limit. Therefore, for each dilution that occurs, there is a corresponding increase in the limit of quantification.

Reporting limits are established according to QAPP guidelines and set at levels where laboratory instruments can reliably detect analytes in samples. Although instruments can detect analytes below the RL, accurate detections become less reliable and results reported below the RL are associated with variability. Laboratories report all detections, even when analytes are detected at concentrations below the RL. When the concentration of an analyte is reported below the RL and above the Method Detection Limit (MDL), the result is reported as an estimated value and flagged in the laboratory report with a "J Flag" and assigned a "DNQ" code in the database.

Chemistry

E. coli: Quality control samples analyzed for *E. coli* include field and laboratory blanks, and field and laboratory duplicates. In addition, sterility checks, positive/negative controls, and positive/positive controls are analyzed in each batch. Precision for *E. coli* is evaluated using the range of logarithms (R_{log}) for each pair of duplicate. The DQO is determined by calculating the mean of R_{log} of at least 20 duplicate results and multiplying this value by 3.27. The laboratory calculated the range of logarithms using both Coalition and non-coalition samples with the same type of matrix. The *E. coli* mean of R_{log} was 0.40 resulting in an acceptable limit for *E.coli* of R_{log} ≤1.30. All field and laboratory duplicates had an R_{log} ≤1.30 and all results for field and laboratory blanks were non-detect. All *E. coli* results reported were accepted and are useable.

Hardness as CaCO3 (Dissolved): Hardness is analyzed in samples that are also analyzed for dissolved metals and is used to calculate the hardness based WQTLs for dissolved metals. Hardness QC samples include: field and laboratory blanks, LCS, MS, a duplicate (usually a MS or LCS duplicate), and field duplicate samples for QC. Acceptability was met for 100% of QC samples analyzed for hardness and all data are accepted and useable.

Metals (dissolved): The dissolved metals analyzed during the 2016 WY were cadmium, copper, lead, nickel, and zinc. All metals are analyzed following EPA method 200.8. Samples collected for dissolved metals are filtered through a 0.45 µm filter and preserved with nitric acid to measure the dissolved fraction. Dissolved metals are analyzed with the following QC samples: laboratory blanks, field blanks, equipment blanks, LCS, MS, a duplicate (usually a LCS or MS duplicate), and field duplicate samples. Acceptability was met in 100% of laboratory blanks, equipment blanks, LCS, MS, and MSD samples analyzed for dissolved metals. Acceptability for field blanks was met in 4 of 4 (100%) dissolved cadmium samples, 12 of 12 (100%) dissolved copper samples, 5 of 5 (100%) of dissolved lead samples, 4 of 4 (100%) dissolved nickel samples, and 3 of 4 (75%) samples analyzed for dissolved zinc (Table 18). Acceptability criteria for field duplicate RPDs was met in 4 of 4 (100%) dissolved cadmium samples, 12 of 12 (100%) dissolved copper samples, 4 of 5 (80%) of dissolved lead samples, 3 of 4 (75%) dissolved nickel samples, and 4 of 4 (100%) dissolved zinc samples (Table 20).

During the July 12 event, dissolved zinc was detected in the field blank at a concentration (1.9 ug/L) that was greater than the RL (1 ug/L). This result was confirmed by re-analyzing the original sample. The field blank concentration was greater than the environmental concentration which was non-detect; however, the field duplicate had a concentration of 1.2 ug/L. The field duplicate concentration was also confirmed through re-analysis in triplicate, and all three results were reviewed by the laboratory QA Officer. The COCs and labels were triple check and no relevant analytical anomalies could be identified. The laboratory blank run in the same batch was non-detect, and all other batch QC met DQOs. The environmental samples analyzed for dissolved zinc were accepted and are useable based on other batch QC.

One of five field duplicate RPDs exceeded the acceptable limit of ≤25% for dissolved lead during the November 10, 2015 event (FD RPD = 59%). The environmental result was below the RL (0.25 ug/L) with a concentration of 0.19 ug/L, while the associated field duplicate was above the RL at 0.32 ug/L. The environmental sample was flagged as an estimate, which could explain the high RPD between the two samples. All other QC samples analyzed with this batch were within acceptable limits. All lead data were accepted and are useable based on other batch QC that met DQOs.

During the August 9, 2016 event, the field duplicate RPD for dissolved nickel (26%) was above the acceptable limit (≤25%). The results of both the environmental sample (0.35 ug/L) and the duplicate (0.27 ug/L) were below the RL (0.5 ug/L) and flagged as estimates. All other QC samples analyzed with this batch were within acceptable limits. All dissolved nickel data were accepted and are useable based on other batch QC that met DQOs.

Metals (total): During the 2016 WY, the total metals analyzed were arsenic, boron, molybdenum, and selenium. Quality Control samples for total metals include: laboratory blank, field blank, LCS, MS, MSD, and field duplicate samples. Acceptability was met for 100% of field blanks, laboratory blanks, LCS, MS, and MSD samples. For field duplicate samples, acceptability was met for 4 of 4 (100%) samples analyzed for arsenic, 4 of 4 (100%) samples analyzed for boron, 2 of 4 (50%) samples analyzed for molybdenum, and for 1 of 4 (25%) samples analyzed for selenium.

Field duplicate RPDs for molybdenum were above the acceptable limit (≤25%) during the July 12, 2016 (37%) and the August 9, 2016 (48%) sampling events. During the July 12 event, the environmental sample concentration was 0.42 ug/L, and the field duplicate concentration was 0.61 ug/L. All other batch QC met DQOs. For the August 9 event, both samples had results below the RL (0.25 ug/L), with the environmental result at 0.18 ug/L, and the associated field duplicate at 0.11 ug/L. Both results were flagged as estimates, and the high RPD could be the result of variability of an estimated result reported below the RL. All total molybdenum data are acceptable and useable based on other batch QC that met DQOs.

Selenium field duplicate samples were above the acceptable limit (≤25%) during the November 10, 2015, January 7, 2016, and July 12, 2016 events. The RPDs for each of these events were 48%, 29%, and 40%, respectively. For each of these three events, both the environmental and the duplicate results were below the RL of 1 ug/L, and therefore flagged as DNQ. For November 10, the environmental result was 0.08 ug/L and the duplicate was 0.13 ug/L; for January 7 the environmental result was 0.09 ug/L and the duplicate was 0.12 ug/L; for the July 12 event the environmental result was 0.1 ug/L and the duplicate was 0.15 ug/L. These results were flagged as estimates, and all other QC samples for all three batches met DQOs. Based on batch QC acceptability, all selenium data are acceptable and useable.

Nutrients: Nutrients are analyzed in water samples including ammonia as N, nitrate + nitrite as N, and orthophosphate as P. Quality Control samples for nutrients include laboratory blank, field blank, field duplicate, LCS, MS, and laboratory duplicate (usually LCSD or MSD samples) samples. Overall the 90% acceptability requirement was met for laboratory blanks, field blanks, LCS, LCSD, MS, and MSD samples. Field duplicate acceptability was met in 11 of 12 (91.7%) samples analyzed for nitrate + nitrite as N and in 10 of 12 samples (83.3%) analyzed for ammonia as N, and 12 of 12 (100%) samples analyzed for orthophosphate as P (Table 20).

Field duplicate RPDs for ammonia as N did not meet acceptability (≤ 25%) for samples collected during the November 10, 2015 and September 13, 2016 sampling events. The RPDs were 49% and 58.6%, respectively.

During the November 10 event, the environmental sample ammonia as N concentration was 0.48 mg/L, and the field duplicate was 0.29 mg/L. All other batch QC met DQOs. For the September 13 event, both samples had results below the RL (0.1 mg/L), with the environmental result at 0.086 mg/L, and the associated field duplicate at 0.047 mg/L. Both of these results were flagged as estimates, and the high RPD could be the result of variability of an estimated result reported below the RL. All ammonia as N data are accepted and useable based on other batch QC that met DQOs.

Pesticides in water: Pesticides were analyzed in four different methods: organophosphates and triazines by EPA 8141A, carbamates and methamidophos by EPA 8321A, paraquat by EPA 549.2M, and glyphosate by EPA 547M. Paraquat and glyphosate are only monitored twice a year during one storm and one irrigation event.

Acceptability criteria for pesticides in water samples are evaluated per each analyte. For each analyte, 100% of laboratory blank, field blank, field duplicate, and LCSD samples met the acceptability criteria. Although percent recovery acceptability criteria were not achieved in 100% of the LCS, MS, and surrogate samples, most met the 90% acceptability requirement for the WY. The exceptions were paraquat in the LCS (3 of 4, 75%) and paraquat in the MS (2 of 4, 66.7%). For MS/MSD RDPs, 10 of 12 batches (83.3%) were within the acceptable limits for each of the following constituents analyzed by to method 8141A: cyanazine, demeton-s, diazinon, dimethoate, disulfoton, phorate, simazine, and trifluralin. MS/MSD RPDs were within acceptable limits 10 of 12 (83.3%) batches for the following carbamate constituents analyzed by method 8321A: aldicarb, linuron, methiocarb, and methomyl. Oxamyl was within acceptable limits for 9 of 12 (75%) batches for MS/MSD. Each instance is discussed below.

Paraquat was collected and analyzed in samples from one storm (January 7, 2016) and one irrigation event (July 12, 2016) during the 2016 WY. Within the batch processed for the irrigation event on July 12, the LCS duplicate samples recovered paraquat at 66.8%, below the lowest acceptable limit of 70% (Table 22). Within the same batch, the LCS and the MS both recovered within acceptable limits, and paraquat was not detected in any of the environmental samples. Since the LCS and MS recovered within control, it was determined that the any amounts of paraquat within the samples would have been detected, and the data were accepted.

Within the batch processed for the storm event on January 7, the MS and MSD both recovered below the lowest acceptable limit, with recoveries at 60% and 50%, respectively. The RPD for these two samples was within control, as were all other batch QC samples. The low recoveries were most likely due to matrix interference. All paraquat data are data are accepted based on other batch QC that met DQOs.

During the September 13, 2016 event, MS/MSD samples analyzed with method 8141A had RPDs that were above the acceptable limit (≤25%). The low recoveries in the September 13, 2016 batch affected the following analytes: atrazine, azinphosmethyl, chlorpyrifos, cyanazine, demeton-s, diazinon, dichlorvos, dimethoate, disulfoton, malathion, methidathion, parathion-methyl, phorate, phosmet, simazine, and trifluralin. The recoveries of all MS analytes and surrogates from the same batch were low, ranging from 20.2% to 34.0%, with many falling below the lowest acceptable limit. All MS/MSD RPDs in the batch were greater than 25%, with values ranging from 87.6% to 112%. The laboratory re-extracted and reanalyzed the MS and MSD samples in a separate batch; all analytes and surrogates recovered within the acceptable limits. This information is noted in the lab batch comments associated with the original results. Within this batch, all blanks, surrogates, and the LCS met their respective DQOs, and all environmental samples were non-detect for every analyte. All data in the batch are acceptable and usable based on other batch QC that met DQOs.

The following constituents had a second instance of an MS/MSD with an RPD above 25%: cyanazine (January 7 event, RPD = 107%), demeton-s (February 9 event, RPD =40%), diazinon (March 8 event, RPD = 31.5%), dimethoate (December 15 event, RPD = 25.9%), disulfoton (February 9 event, RPD = 79.4%), phorate (February 9 event, RPD = 40%), simazine (January 7 event, RPD =29.1%), and trifluralin (February 9 event, RPD =32.5%). In each of the above samples analyzed for demeton-s, dimethoate, phorate, simazine and trifluralin, MS spike recoveries and all other batch QC samples were within the acceptable limits, and all sample results were non-detect. The cyanazine MS from January 7 recovered below the acceptable limit (22%) at 12.4%. Recoveries for both the diazinon MS (30.2%) and MSD (22.0%) were below the acceptable limit of 45%. Recoveries for both the disulfoton MS (13.8%) and MSD (6%) were also below the acceptable limit of 28%. There were no detections of cyanazine, diazinon, or disulfoton in any of the associated environmental samples, and all other QCs within each batch were within the acceptable limits. Based on batch QC acceptability, all samples analyzed by 8141A are acceptable and useable.

Within the batch analyzed by method 8321A for carbamates for the July 12, 2016 monitoring event, MS/MSD RPDs that were above the acceptable limit of 25% for the following analytes: aldicarb (32.4%), linuron (33.0%), methiocarb (42.0%), methomyl (43.7%), and oxamyl (35.3%). Despite the variability between duplicates, all MS recoveries were within acceptable limits, and all other QC samples met their respective DQOs. All of the environmental samples were non-detects. All data in this batch are acceptable and useable.

The carbamates that had an MS/MSD RPD above 25% in July all had at least one more MS/MSD RPDs above the acceptable limit in the 2016 WY. The dates associated with these events were: April 12 event for aldicarb (25.4%), August 9 event for linuron (31.1%), February 9 event for methiocarb (25.4%), May 10 event for methomyl (29.0%), and both the February 9 and May 10 events for oxamyl (33.6% and 76.0%, respectively). For each of these events, samples analyzed for aldicarb, methiocarb, methomyl, and oxamyl, had MS spike recoveries and all other batch QC samples within the acceptable limits, and all sample results were non-detect. For linuron, the MSD had a recovery of 160%, which is above the acceptable limit of 144%. All other QC samples in the batch met their respective DQOs, and there were no linuron detections in the environmental samples. Based on batch QC acceptability, all carbamate data were accepted and considered useable.

Total Organic Carbon (TOC) in water: Quality Control samples for TOC analyses consist of a laboratory blank, field blank, field duplicate, LCS, MS, and laboratory duplicate sample. Data quality objectives were met in all TOC Quality Control samples during the 2016 WY.

Total Suspended Solids (TSS): Quality Control samples for TSS include field blanks, laboratory blanks, field duplicates, laboratory duplicates, LCS and LCSD. One hundred percent of field and laboratory blanks, LCS, LCSD, and laboratory duplicates met acceptability for the 2016 WY. Nine of 12 (75%) field duplicate samples met acceptability (RPD $\leq$25%). Field duplicate RPDs exceeded the acceptable limit in batches for the October 13, 2015 (RPD = 138%), February 9, 2016 (RPD = 34%), and April 12, 2016 (RPD = 29%) sampling events. The RL for TSS is 3 mg/L. During the October 13 event, the environmental sample concentration (11 mg/L) was above the RL and the duplicate sample (2 mg/L) was below the RL, suggesting the variability between the two results may be due to one of them being an estimated value.

During the February 9 event, the environmental result was 24 mg/L and the duplicate was 17 mg/L. For the April 12 event the environmental sample had a concentration of 8 mg/L, and the duplicate was 6 mg/L. In all three batches, all other QC sample met DQOs; therefore, all TSS are considered acceptable and useable.

Turbidity: Quality Control samples analyzed for turbidity include: laboratory blank, field blank, field duplicate, LCS and laboratory duplicate samples. All DQOs were met in QC samples analyzed for turbidity and all turbidity data were accepted and are useable.

Sediment Pesticides: Sediment samples are collected twice a year to test for toxicity to *H. azteca.* Sediments samples were scheduled to be collected on March 8 and September 13 for the 2016 WY. During the March 8 event, sediment samples could not be collected from Dry Creek @ Wellsford Rd, and were collected on April 12, 2016 instead. Similarly, during the September 13 event, sediments could not be collected from Lateral 6 and 7 @ Central Ave, and were instead collected on October 12, 2016. Even though October is the beginning of a new Water Year, the sediment samples collected on this date are still considered a part of the 2016 WY dataset. During these same sampling events, additional sediment samples were stored at the chemistry laboratory until the Coalition receives the sediment toxicity results. When percent survival is less than 80% and statistically significant compared to the control, the sample requires sediment pesticide analysis and the laboratory is notified to initiate the analysis on those specific samples. During the 2016 WY, this toxicity trigger limit was never reached, and as a result no sediment pesticide analyses were run.

Sediment Grain Size and TOC: Samples were collected for sediment grain size and TOC analyses on March 8, April 12, September 13, and October 12, 2016 for the 2016 WY. The associated QC for inorganics in sediments consist of: laboratory blank (TOC only), CRM (TOC only), field duplicate, and laboratory duplicate samples.

Precision of grain size is measured by the relative standard deviation (RSD) of sediment between environmental and field duplicate samples. This method is more accurate to measure replicability and precision than RPD due to the nature of grain size analysis. With all sediment analyses, sample results may reflect heterogeneous composition rather than homogenous composition due to 1) sediment settling within the sample container (affects laboratory duplicate precision) and 2) heterogeneity of the sediment in the field (affects field duplicate precision).

Individual grain size classes are reported as a percentage of the entire sample composition and are not values that can be evaluated individually (they are not independent from other grain size class percentages in the sample). Therefore, it is more accurate to assess precision of the entire sample rather than each grain size class for both field and laboratory duplicates. The grain size standard deviation (SD) for all classes of a single sample was calculated using the following Folk and Ward (1957) Logarithmic equation:

$$SD = \frac{\phi 84 - \phi 16}{4} + \frac{\phi 95 - \phi 5}{6.6}$$

Where:

$\phi 84$ = phi value of the 84th percentile sediment grain size category

$\phi16$ = phi value of the 16th percentile sediment grain size category

$\phi95$ = phi value of the 95th percentile sediment grain size category

$\phi5$ = phi value of the 5th percentile sediment grain size category

Precision was calculated based on the relative percent difference between the standard deviation of the environmental sample and the standard deviation of a duplicate sample using the following formula:

$$RSD = 200\ x \left|\frac{SDi - SDd}{SDi + SDd}\right|$$

Where SDi is the standard deviation of the initial or environmental sample and SDd is the standard deviation of the field or laboratory duplicate sample.

Acceptability was met in 100% of laboratory blanks, field duplicates, and LCS samples analyzed for grain size and TOC during the 2016 WY. Acceptability was met in 5 of 6 (83.3%) of laboratory duplicates analyzed for grain size and for 2 of 4 (50%) laboratory duplicates analyzed for TOC. Field duplicates analyzed for TOC met acceptability in 2 of 4 (50%) samples.

For the March 8 event samples, the TOC batch had both field duplicate and the lab duplicate with RPDs above the acceptable limit of ≤25%. The field duplicate RPD was 33%, with an environmental result of 2100 mg/Kg and a field duplicate result of 1500 mg/Kg. The lab duplicate had a result of 1550 mg/Kg, resulting in an RPD of 30%. During sample preparation, the laboratory technician made note of the fact that these samples were all predominantly sand, with no visible organic material. The high RPDs for these samples is most likely due to large amount of sand within the sample as well as the gravel sized fragile shells notes within the sample. The field duplicate RPD for TOC was also above the acceptable limit for the event on October 12, 2016 at 51%. The laboratory duplicate for this batch was within the acceptable limits. The lab duplicate RPD for TOC was above the acceptable limit for the April 12 event (27%). The associated laboratory blank and LCS were within control limits in all TOC batches. All TOC are accepted and useable based on other batch QC that met DQOs.

Lab duplicate RSD for grain size was above the acceptable limit of 20% during the March 8, 2016 event (22%). The laboratory indicated the RSD could have been high because the sediment consisted of gravel sized fragile shells, which are hard to classify as they can break from mechanical sieving action or the irregular shape can fall through a sieve on one run but not another. If the shells break down they can skew the data and could be the reason for higher than normal RSDs. The field duplicate was within the acceptable limit. All grain size data are accepted and useable based on other batch QC that met DQOs.

Toxicity

The Coalition collects samples to monitor water column toxicity to three test species (*C. dubia*, *S. capricornutum*, and *P. promelas*) and sediment toxicity to *H. azteca*. Quality Control for toxicity testing is based on the performance of the control tests (CNEG) and RPDs calculated from the environmental and field duplicate samples. Reference tests also occur at the time of toxicity testing to assess the overall health of the organisms and predictability of responses to exposure.

Water Column Toxicity: During the 2016 WY, field duplicate samples were collected from sites scheduled for toxicity monitoring for one or more of the test species. One hundred percent of field duplicates were within the acceptability criterion for all three test species, and all CNEG tests met the acceptability criteria (Table 29).

Sediment Toxicity: Sediment samples were collected to test for toxicity on March 8, 2016 and September 13, 2016. Field duplicate samples were collected for these two events and all RPDs were within 25%. Test acceptability was met in all CNEG tests for sediment.

Corrective Actions

Corrective action is an activity that should be used to stop the re-occurrence of non-conformities. In some cases, the Coalition will address corrective action options to improve QC measures that are consistently demonstrating failure to meet DQOs.

During the 2016 WY, the Coalition was notified that some of the dissolved metals samples scheduled for copper analysis had particulates settled at the bottom of the sample container. These samples were filtered in the field prior to submission to the laboratory; filtration should be removing the particulate matter prior to analysis. After further investigation, the Coalition determined that the particulate in the filtered samples was present due to the high turbidity in the water column which exceeded the capacity of the filters. This resulted in the filter paper lifting, and sample water being pumped directly into the sample container without being filtered. As a corrective action, filters with a higher capacity were purchased and field staff were instructed to perform additional visual checks for particulates in filtered samples while in the field. No additional issues with particulates being present in filtered samples occurred after these actions were initiated.

Grain size and TOC analysis in sediment samples are performed by a subcontracted laboratory. During the September 13, 2016 sediment monitoring event, the environmental sample for Prairie Flower Drain @ Crows Landing Road and the associated lab duplicate were run by method ASTM D422/D446M (laser method), while the associated field duplicate was run by ASTM D422M (dry sieve method). Though a field duplicate was collected and a lab duplicate was performed, as prescribed by the QAPP, the results could not be compared to the parent sample, as they were run by different methods. All results were reported, but no RSD could be calculated due to this error, resulting in an incomplete batch. The laboratory indicated that laboratory oversight led to this error. The Coalition reviewed the requirements of the SOP with the laboratory and discussed ways to avoid this oversight in the future.

Table 15. ESJWQC field and transport and analytical completeness: environmental sample counts and percentages.
Samples collected during the 2016 WY. The table counts environmental grabs only; field duplicates are not included. Each analyte is sorted by method and in alphabetical order. Bolded rows represent analytes that did not meet the acceptability requirement.

Method	Matrix	Analyte	Environmental Samples scheduled	Dry/too shallow	Samples Collected	Field and transport completeness (%)	Total environmental samples Analyzed	Analytical Completeness (%)
ASTM D422/ ASTM D4464M	Sediment	Grain Size	22	2	20	100.0	20	100.0
EPA 180.1	Water	Turbidity	66	7	59	100.0	59	100.0
EPA 200.8	Water	Arsenic	12	0	12	100.0	12	100.0
EPA 200.8	Water	Boron	8	0	8	100.0	8	100.0
EPA 200.8	Water	Dissolved Cadmium	8	0	8	100.0	8	100.0
EPA 200.8	Water	Dissolved Copper	70	24	46	100.0	46	100.0
EPA 200.8	Water	Dissolved Lead	13	0	13	100.0	13	100.0
EPA 200.8	Water	Dissolved Nickel	8	0	8	100.0	8	100.0
EPA 200.8	Water	Dissolved Zinc	8	0	8	100.0	8	100.0
EPA 200.8	Water	Molybdenum	8	0	8	100.0	8	100.0
EPA 200.8	Water	Selenium	8	0	8	100.0	8	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	66	7	59	100.0	59	100.0
EPA 547M	Water	Glyphosate	11	0	11	100.0	11	100.0
EPA 549.2M	Water	Paraquat	11	0	11	100.0	11	100.0
EPA 600/R-99-064	Sediment	*Hyalella azteca*	22	2	20	100.0	20	100.0
EPA 8141A	Water	Atrazine	66	7	59	100.0	59	100.0
EPA 8141A	Water	Azinphos Methyl	66	7	59	100.0	59	100.0
EPA 8141A	Water	Chlorpyrifos	108	14	94	100.0	94	100.0
EPA 8141A	Water	Cyanazine	66	7	59	100.0	59	100.0
EPA 8141A	Water	Demeton-s	66	7	59	100.0	59	100.0
EPA 8141A	Water	Diazinon	66	7	59	100.0	59	100.0
EPA 8141A	Water	Dichlorvos	66	7	59	100.0	59	100.0
EPA 8141A	Water	Dimethoate	72	7	65	100.0	65	100.0
EPA 8141A	Water	Disulfoton	66	7	59	100.0	59	100.0
EPA 8141A	Water	Malathion	69	7	62	100.0	62	100.0
EPA 8141A	Water	Methidathion	66	7	59	100.0	59	100.0
EPA 8141A	Water	Parathion, Methyl	66	7	59	100.0	59	100.0
EPA 8141A	Water	Phorate	66	7	59	100.0	59	100.0
EPA 8141A	Water	Phosmet	66	7	59	100.0	59	100.0
EPA 8141A	Water	Simazine	66	7	59	100.0	59	100.0
EPA 8141A	Water	Trifluralin	66	7	59	100.0	59	100.0

Method	Matrix	Analyte	Environmental Samples Scheduled	Dry/too shallow	Samples Collected	Field and transport completeness (%)	Total environmental samples Analyzed	Analytical Completeness (%)
EPA 821/R-02-012	Water	*Ceriodaphnia dubia*	83	8	75	100.0	75	100.0
EPA 821/R-02-012	Water	*Pimephales promelas*	75	11	64	100.0	64	100.0
EPA 821/R-02-013	Water	*Selenastrum capricornutum*	103	15	88	100.0	88	100.0
EPA 8321A	Water	Aldicarb	66	7	59	100.0	59	100.0
EPA 8321A	Water	Carbaryl	66	7	59	100.0	59	100.0
EPA 8321A	Water	Carbofuran	66	7	59	100.0	59	100.0
EPA 8321A	Water	Diuron	82	7	75	100.0	75	100.0
EPA 8321A	Water	Linuron	66	7	59	100.0	59	100.0
EPA 8321A	Water	Methamidophos	66	7	59	100.0	59	100.0
EPA 8321A	Water	Methiocarb	66	7	59	100.0	59	100.0
EPA 8321A	Water	Methomyl	66	7	59	100.0	59	100.0
EPA 8321A	Water	Oxamyl	66	7	59	100.0	59	100.0
SM 2340 C	Water	Hardness as CaCO3	48	0	48	100.0	48	100.0
SM 2540 D	Water	Total Suspended Solids	66	7	59	100.0	59	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	66	7	59	100.0	59	100.0
SM 4500-P E	Water	OrthoPhosphate as P	66	7	59	100.0	59	100.0
SM 5310 B	Water	Total Organic Carbon	66	7	59	100.0	59	100.0
SM 9223 B	Water	*E. coli*	66	7	59	100.0	59	100.0
Walkley-Black	Sediment	Total Organic Carbon	22	2	20	100.0	20	100.0
		Total	**2719**	**295**	**2424**	**100.0**	**2424**	**100.0**

Table 16. ESJWQC field and transport completeness: field parameter counts and percentages.
Samples collected during the 2016 WY; sorted by method. Each analyte is sorted by method and in alphabetical order. Bolded rows represent analytes that did not meet the completeness requirement.

Method	Analyte	Samples Scheduled	Dry or too shallow Sites	Total Measurements	Completeness (%)
USGS R2Cross streamflow	Discharge[1], cfs	172	30	125	90.1
SM 4500-O	Dissolved Oxygen, mg/L	192	40	152	100.0
EPA 150.1	pH	192	40	152	100.0
EPA 120.1	Specific Conductivity, µS/cm	192	40	152	100.0
SM 2550	Temperature, º C	192	40	152	100.0
	Total	**940**	**190**	**733**	**98.2**

[1]Discharge is excluded from counts for 'samples scheduled' when toxicity is the only constituent scheduled.

Table 17. ESJWQC Field QC batch completeness: Total counts per analyte and completeness percentages.
Samples collected during the 2016 WY. The environmental sample count does not include the field duplicate. Toxicity field duplicate samples are excluded from table. Completeness for each analyte that resulted in less than 5% is bolded.

Method	Matrix	Analyte	Total Environmental Samples	Total Field Duplicate Samples	Total Equipment Blank Samples	Total Field Blank Samples	Total Environmental & Field QC Samples	Field Duplicate Completeness (%)	Equipment Blank Completeness (%)	Field Blank Completeness (%)
ASTM D422/ ASTM D4464M	Sediment	Grain Size	20	4	NA	NA	24	16.7	NA	NA
EPA 180.1	Water	Turbidity	59	12	NA	12	83	14.5	NA	14.5
EPA 200.8	Water	Arsenic	12	4	NA	4	20	20.0	NA	20.0
EPA 200.8	Water	Boron	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Dissolved Cadmium	8	4	4	4	20	20.0	20.0	20.0
EPA 200.8	Water	Dissolved Copper	46	12	12	12	82	14.6	14.6	14.6
EPA 200.8	Water	Dissolved Lead	13	5	5	5	28	17.9	17.9	17.9
EPA 200.8	Water	Dissolved Nickel	8	4	4	4	20	20.0	20.0	20.0
EPA 200.8	Water	Dissolved Zinc	8	4	4	4	20	20.0	20.0	20.0
EPA 200.8	Water	Molybdenum	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Selenium	8	4	NA	4	16	25.0	NA	25.0
EPA 353.2	Water	Nitrate + Nitrite as N	59	12	NA	12	83	14.5	NA	14.5
EPA 547M	Water	Glyphosate	11	2	NA	2	15	13.3	NA	13.3
EPA 549.2M	Water	Paraquat	11	2	NA	2	15	13.3	NA	13.3
EPA 600/R-99-064	Sediment	*Hyalella azteca*	20	4	NA	NA	24	16.7	NA	NA
EPA 8141A	Water	Atrazine	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Azinphos Methyl	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Chlorpyrifos	94	12	NA	12	118	10.2	NA	10.2
EPA 8141A	Water	Cyanazine	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Demeton-s	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Diazinon	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Dichlorvos	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Dimethoate	65	12	NA	12	89	13.5	NA	13.5
EPA 8141A	Water	Disulfoton	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Malathion	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Methidathion	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Parathion, Methyl	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Phorate	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Phosmet	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Simazine	59	12	NA	12	83	14.5	NA	14.5
EPA 8141A	Water	Trifluralin	59	12	NA	12	83	14.5	NA	14.5

Method	Matrix	Analyte	Total Environmental Samples	Total Field Duplicate Samples	Total Equipment Blank Samples	Total Field Blank Samples	Total Environmental & Field QC Samples	Field Duplicate Completeness (%)	Equipment Blank Completeness (%)	Field Blank Completeness (%)
EPA 821/R-02-012	Water	*Ceriodaphnia dubia*	75	12	NA	NA	87	13.8	NA	NA
EPA 821/R-02-012	Water	*Pimephales promelas*	64	12	NA	NA	76	15.8	NA	NA
EPA 821/R-02-013	Water	*Selenastrum capricornutum*	88	12	NA	NA	100	12.0	NA	NA
EPA 8321A	Water	Aldicarb	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Carbaryl	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Carbofuran	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Diuron	75	12	NA	12	99	12.1	NA	12.1
EPA 8321A	Water	Linuron	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Methamidophos	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Methiocarb	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Methomyl	59	12	NA	12	83	14.5	NA	14.5
EPA 8321A	Water	Oxamyl	59	12	NA	12	83	14.5	NA	14.5
SM 2340 C	Water	Hardness as CaCO3	48	12	1	12	73	16.4	NA[1]	16.4
SM 2540 D	Water	Total Suspended Solids	59	12	NA	12	83	14.5	NA	14.5
SM 4500-NH3 C v20	Water	Ammonia as N	59	12	NA	12	83	14.5	NA	14.5
SM 4500-P E	Water	OrthoPhosphate as P	59	12	NA	12	83	14.5	NA	14.5
SM 5310 B	Water	Total Organic Carbon	59	12	NA	12	83	14.5	NA	14.5
SM 9223 B	Water	*E. coli*	59	12	NA	12	83	14.5	NA	14.5
Walkley-Black	Sediment	Total Organic Carbon	20	4	NA	NA	36	11.1	NA	NA
		Total	**2,424**	**493**	**30**	**445**	**3,404**	**14.5**	**17.6**	**14.6**

NA; Not applicable, analysis was not conducted or the QC is not required for the constituent listed.

Table 18. ESJWQC summary of field blank QC sample evaluations.
Samples collected during the 2016 WY, sorted by method and analyte. Each analyte is sorted by method and in alphabetical order. Bolded rows represent analytes that did not meet the acceptability requirement.

Method	Matrix	Analyte[1]	FB Data Acceptability Criteria	Total FB Samples	FB Samples within Acceptability	Acceptability Met (%)
EPA 180.1	Water	Turbidity	<RL or (environ. concentration/5)	12	12	100.0
EPA 200.8	Water	Arsenic	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Boron	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Dissolved Cadmium	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Dissolved Copper	<RL or (environ. concentration/5)	12	12	100.0
EPA 200.8	Water	Dissolved Lead	<RL or (environ. concentration/5)	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	**Water**	**Dissolved Zinc**	**<RL or (environ. concentration/5)**	**4**	**3**	**75.0**
EPA 200.8	Water	Molybdenum	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Selenium	<RL or (environ. concentration/5)	4	4	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	<RL or (environ. concentration/5)	12	12	100.0
EPA 547M	Water	Glyphosate	<RL or (environ. concentration/5)	2	2	100.0
EPA 549.2M	Water	Paraquat	<RL or (environ. concentration/5)	2	2	100.0
EPA 8141A	Water	Atrazine	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Azinphos methyl	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Chlorpyrifos	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Cyanazine	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Demeton-s	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Diazinon	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Dichlorvos	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Dimethoate	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Disulfoton	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Malathion	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Methidathion	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Parathion, Methyl	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Phorate	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Phosmet	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Simazine	<RL or (environ. concentration/5)	12	12	100.0
EPA 8141A	Water	Trifluralin	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Aldicarb	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Carbaryl	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Carbofuran	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Diuron	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Linuron	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Methamidophos	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Methiocarb	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Methomyl	<RL or (environ. concentration/5)	12	12	100.0
EPA 8321A	Water	Oxamyl	<RL or (environ. concentration/5)	12	12	100.0
SM 2340 C	Water	Hardness as CaCO3	<RL or (environ. concentration/5)	12	12	100.0
SM 2540 D	Water	Total Suspended Solids	<RL or (environ. concentration/5)	12	12	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	<RL or (environ. concentration/5)	12	12	100.0
SM 4500-P E	Water	OrthoPhosphate as P	<RL or (environ. concentration/5)	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	<RL or (environ. concentration/5)	12	12	100.0
SM 9223 B	Water	*E. coli*	<RL or (environ. concentration/5)	12	12	100.0
			Total	**445**	**444**	**99.8**

[1]Field blanks (FB) are not analyzed for sediment grain size, pesticides, and TOC and water column and sediment toxicity analyses and are not included in table.

Table 19. ESJWQC summary of equipment blank QC sample evaluations.
Samples collected during the 2016 WY, sorted by method and analyte. Bolded rows represent analytes that did not meet the equipment blank (EB) acceptability requirement.

Method	Matrix	Analyte	Equipment Blank Data Acceptability Criteria	Total EB Samples	EB within Acceptability	Acceptability Met (%)
EPA 200.8	Water	Dissolved Cadmium	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Dissolved Copper	<RL or (environ. concentration/5)	12	12	100.0
EPA 200.8	Water	Dissolved Lead	<RL or (environ. concentration/5)	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	<RL or (environ. concentration/5)	4	4	100.0
EPA 200.8	Water	Dissolved Zinc	<RL or (environ. concentration/5)	4	4	100.0
SM 2340 C	Water	Hardness as CaCO3	<RL or (environ. concentration/5)	1	1	100.0
			Total	**30**	**30**	**100.0**

Table 20. ESJWQC summary of field duplicate QC sample evaluations.
Samples collected during the 2016 WY, sorted by method and analyte. Bolded rows represent analytes that did not meet the acceptability requirement.

Method	Matrix	Analyte	Duplicate Data Acceptability Criteria	Total Field Duplicate Samples	Field Duplicate Samples within Limit	Acceptability Met (%)
ASTM D422/ ASTM D4464M	Sediment	Grain Size	RSD ≤20	4	4	100.0
EPA 180.1	Water	Turbidity	RPD ≤25	12	12	100.0
EPA 200.8	Water	Arsenic	RPD ≤25	4	4	100.0
EPA 200.8	Water	Boron	RPD ≤25	4	4	100.0
EPA 200.8	Water	Dissolved Cadmium	RPD ≤25	4	4	100.0
EPA 200.8	Water	Dissolved Copper	RPD ≤25	12	12	100.0
EPA 200.8	**Water**	**Dissolved Lead**	**RPD ≤25**	**5**	**4**	**80.0**
EPA 200.8	**Water**	**Dissolved Nickel**	**RPD ≤25**	**4**	**3**	**75.0**
EPA 200.8	Water	Dissolved Zinc	RPD ≤25	4	4	100.0
EPA 200.8	**Water**	**Molybdenum**	**RPD ≤25**	**4**	**2**	**50.0**
EPA 200.8	**Water**	**Selenium**	**RPD ≤25**	**4**	**1**	**25.0**
EPA 353.2	Water	Nitrate + Nitrite as N	RPD ≤25	12	11	91.7
EPA 547M	Water	Glyphosate	RPD ≤25	2	2	100.0
EPA 549.2M	Water	Paraquat	RPD ≤25	2	2	100.0
EPA 600/R-99-064	Sediment	*Hyalella azteca*	RPD ≤25	4	4	100.0
EPA 8141A	Water	Atrazine	RPD ≤25	12	12	100.0
EPA 8141A	Water	Azinphos methyl	RPD ≤25	12	12	100.0
EPA 8141A	Water	Chlorpyrifos	RPD ≤25	12	12	100.0
EPA 8141A	Water	Cyanazine	RPD ≤25	12	12	100.0
EPA 8141A	Water	Demeton-s	RPD ≤25	12	12	100.0
EPA 8141A	Water	Diazinon	RPD ≤25	12	12	100.0
EPA 8141A	Water	Dichlorvos	RPD ≤25	12	12	100.0
EPA 8141A	Water	Dimethoate	RPD ≤25	12	12	100.0
EPA 8141A	Water	Disulfoton	RPD ≤25	12	12	100.0
EPA 8141A	Water	Malathion	RPD ≤25	12	12	100.0
EPA 8141A	Water	Methidathion	RPD ≤25	12	12	100.0
EPA 8141A	Water	Parathion, Methyl	RPD ≤25	12	12	100.0
EPA 8141A	Water	Phorate	RPD ≤25	12	12	100.0
EPA 8141A	Water	Phosmet	RPD ≤25	12	12	100.0
EPA 8141A	Water	Simazine	RPD ≤25	12	12	100.0
EPA 8141A	Water	Trifluralin	RPD ≤25	12	12	100.0
EPA 821/R-02-012	Water	*Ceriodaphnia dubia*	RPD ≤25	12	12	100.0
EPA 821/R-02-012	Water	*Pimephales promelas*	RPD ≤25	12	12	100.0
EPA 821/R-02-013	Water	*Selenastrum capricornutum*	RPD ≤25	12	12	91.7
EPA 8321A	Water	Aldicarb	RPD ≤25	12	12	100.0
EPA 8321A	Water	Carbaryl	RPD ≤25	12	12	100.0

Method	Matrix	Analyte	Duplicate Data Acceptability Criteria	Total Field Duplicate Samples	Field Duplicate Samples within Limit	Acceptability Met (%)
EPA 8321A	Water	Carbofuran	RPD ≤25	12	12	100.0
EPA 8321A	Water	Diuron	RPD ≤25	12	12	100.0
EPA 8321A	Water	Linuron	RPD ≤25	12	12	100.0
EPA 8321A	Water	Methamidophos	RPD ≤25	12	12	100.0
EPA 8321A	Water	Methiocarb	RPD ≤25	12	12	100.0
EPA 8321A	Water	Methomyl	RPD ≤25	12	12	100.0
EPA 8321A	Water	Oxamyl	RPD ≤25	12	12	100.0
SM 2340 C	Water	Hardness as CaCO3	RPD ≤25	12	12	100.0
SM 2540 D	**Water**	**Total Suspended Solids**	**RPD ≤25**	**12**	**9**	**75.0**
SM 4500-NH3 C v20	**Water**	**Ammonia as N**	**RPD ≤25**	**12**	**10**	**83.3**
SM 4500-P E	Water	OrthoPhosphate as P	RPD ≤25	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	RPD ≤25	12	12	100.0
SM 9223 B	Water	*E. coli*	R_{log} ≤3.27 x mean R_{log}	12	12	100.0
Walkley-Black	**Sediment**	**Total Organic Carbon**	**RPD ≤20**	**4**	**2**	**50.0**
			Total	493	478	97.0

Table 21. ESJWQC summary of laboratory blank QC sample evaluations.
Samples analyzed in batches with samples collected during the 2016 WY, sorted by method and analyte. Bolded rows represent analytes that did not meet the acceptability requirement.

Method	Matrix	Analyte[1]	LB Data Acceptability Criteria	Total LB Samples	LB Samples within Limits	Acceptability Met (%)
EPA 180.1	Water	Turbidity	< RL	12	12	100.0
EPA 200.8	Water	Arsenic	< RL	4	4	100.0
EPA 200.8	Water	Boron	< RL	4	4	100.0
EPA 200.8	Water	Dissolved Cadmium	< RL	4	4	100.0
EPA 200.8	Water	Dissolved Copper	< RL	13	13	100.0
EPA 200.8	Water	Dissolved Lead	< RL	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	< RL	4	4	100.0
EPA 200.8	Water	Dissolved Zinc	< RL	4	4	100.0
EPA 200.8	Water	Molybdenum	< RL	4	4	100.0
EPA 200.8	Water	Selenium	< RL	4	4	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	< RL	12	12	100.0
EPA 547M	Water	Glyphosate	< RL	2	2	100.0
EPA 549.2M	Water	Paraquat	< RL	2	2	100.0
EPA 8141A	Water	Atrazine	< RL	12	12	100.0
EPA 8141A	Water	Azinphos methyl	< RL	12	12	100.0
EPA 8141A	Water	Chlorpyrifos	< RL	13	13	100.0
EPA 8141A	Water	Cyanazine	< RL	12	12	100.0
EPA 8141A	Water	Demeton-s	< RL	12	12	100.0
EPA 8141A	Water	Diazinon	< RL	12	12	100.0
EPA 8141A	Water	Dichlorvos	< RL	12	12	100.0
EPA 8141A	Water	Dimethoate	< RL	12	12	100.0
EPA 8141A	Water	Disulfoton	< RL	12	12	100.0
EPA 8141A	Water	Malathion	< RL	12	12	100.0
EPA 8141A	Water	Methidathion	< RL	12	12	100.0
EPA 8141A	Water	Parathion, Methyl	< RL	12	12	100.0
EPA 8141A	Water	Phorate	< RL	12	12	100.0
EPA 8141A	Water	Phosmet	< RL	12	12	100.0
EPA 8141A	Water	Simazine	< RL	12	12	100.0
EPA 8141A	Water	Trifluralin	< RL	12	12	100.0
EPA 8321A	Water	Aldicarb	< RL	12	12	100.0
EPA 8321A	Water	Carbaryl	< RL	12	12	100.0
EPA 8321A	Water	Carbofuran	< RL	12	12	100.0
EPA 8321A	Water	Diuron	< RL	12	12	100.0
EPA 8321A	Water	Linuron	< RL	12	12	100.0

METHOD	MATRIX	ANALYTE[1]	LB DATA ACCEPTABILITY CRITERIA	TOTAL LB SAMPLES	LB SAMPLES WITHIN LIMITS	ACCEPTABILITY MET (%)
EPA 8321A	Water	Methamidophos	< RL	12	12	100.0
EPA 8321A	Water	Methiocarb	< RL	12	12	100.0
EPA 8321A	Water	Methomyl	< RL	12	12	100.0
EPA 8321A	Water	Oxamyl	< RL	12	12	100.0
SM 2340 C	Water	Hardness as CaCO3	< RL	13	13	100.0
SM 2540 D	Water	Total Suspended Solids	< RL	13	13	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	< RL	14	14	100.0
SM 4500-P E	Water	OrthoPhosphate as P	< RL	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	< RL	13	13	100.0
SM 9223 B	Water	*E. coli*	< RL	12	12	100.0
Walkley-Black	Sediment	Total Organic Carbon	< MDL or <30% of lowest sample	4	4	100.0
			Total	**456**	**456**	**100.0**

[1]Laboratory blank (LB) are not analyzed for grain size and water column and sediment toxicity analyses and are not included in table.

Table 22. ESJWQC summary of Laboratory Control Spike (LCS) Quality Control sample evaluations. Laboratory control spikes (LCS) and laboratory control spike duplicates analyzed in batches with samples collected from during the 2016 WY, sorted by method and analyte. Bolded rows represent analytes that did not meet the acceptability requirement.

METHOD[1]	MATRIX	ANALYTE[2]	LCS DATA ACCEPTABILITY CRITERIA	TOTAL LCS SAMPLES	LCS SAMPLES WITHIN LIMITS	ACCEPTABILITY MET (%)
EPA 180.1	Water	Turbidity	PR 80-120	12	12	100.0
EPA 200.8	Water	Arsenic	PR 80-120	4	4	100.0
EPA 200.8	Water	Boron	PR 80-120	4	4	100.0
EPA 200.8	Water	Dissolved Cadmium	PR 80-120	4	4	100.0
EPA 200.8	Water	Dissolved Copper	PR 80-120	13	13	100.0
EPA 200.8	Water	Dissolved Lead	PR 80-120	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	PR 80-120	4	4	100.0
EPA 200.8	Water	Dissolved Zinc	PR 80-120	4	4	100.0
EPA 200.8	Water	Molybdenum	PR 80-120	4	4	100.0
EPA 200.8	Water	Selenium	PR 80-120	4	4	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	PR 90-110	12	12	100.0
EPA 547M	Water	Glyphosate	PR 85.7-121	4	4	100.0
EPA 549.2M	**Water**	**Paraquat**	**PR 70-130**	**4**	**3**	**75.0**
EPA 8141A	Water	Atrazine	PR 39-156	12	12	100.0
EPA 8141A	Water	Azinphos methyl	PR 30-172	12	12	100.0
EPA 8141A	Water	Chlorpyrifos	PR 40-144	14	14	100.0
EPA 8141A	Water	Cyanazine	PR 22-172	12	12	100.0
EPA 8141A	Water	Demeton-s	PR 35-130	12	12	100.0
EPA 8141A	Water	Diazinon	PR 45-130	12	12	100.0
EPA 8141A	Water	Dichlorvos	PR 13-161	12	12	100.0
EPA 8141A	Water	Dimethoate	PR 40-170	12	12	100.0
EPA 8141A	Water	Disulfoton	PR 28-131	12	12	100.0
EPA 8141A	Water	Malathion	PR 30-137	12	12	100.0
EPA 8141A	Water	Methidathion	PR 50-150	12	12	100.0
EPA 8141A	Water	Parathion, Methyl	PR 55-164	12	12	100.0
EPA 8141A	Water	Phorate	PR 42-125	12	12	100.0
EPA 8141A	Water	Phosmet	PR 40-153	12	12	100.0
EPA 8141A	Water	Simazine	PR 21-179	12	12	100.0
EPA 8141A	Water	Trifluralin	PR 40-148	12	12	100.0
EPA 8321A	Water	Aldicarb	PR 31-133	12	12	100.0
EPA 8321A	Water	Carbaryl	PR 44-133	12	12	100.0
EPA 8321A	Water	Carbofuran	PR 36-165	12	12	100.0
EPA 8321A	Water	Diuron	PR 52-136	12	12	100.0
EPA 8321A	Water	Linuron	PR 49-144	12	12	100.0
EPA 8321A	Water	Methamidophos	PR 36-124	12	11	91.7
EPA 8321A	Water	Methiocarb	PR 35-142	12	12	100.0

Method[1]	Matrix	Analyte[2]	LCS Data Acceptability Criteria	Total LCS Samples	LCS Samples within Limits	Acceptability Met (%)
EPA 8321A	Water	Methomyl	PR 23-152	12	12	100.0
EPA 8321A	Water	Oxamyl	PR 10-117	12	12	100.0
SM 2340 C	Water	Hardness as CaCO3	PR 80-120	13	13	100.0
SM 2540 D	Water	Total Suspended Solids	PR 80-120	14	14	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	PR 90-110	25	25	100.0
SM 4500-P E	Water	OrthoPhosphate as P	PR 90-110	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	PR 80-120	15	15	100.0
Walkley-Black	Sediment	Total Organic Carbon	PR 75-125	5	5	100.0
			Total	**464**	**462**	**99.6**

[1]Certified Reference Materials (CRMs) are used as the LCS or LCSD for TOC following the Walkley-Black method.

[2]Laboratory control spikes are not analyzed for *E. coli*, grain size and water column and sediment toxicity analyses and are not included in table.

Table 23. ESJWQC summary of laboratory control spike duplicate (LCSD) Quality Control sample evaluations.
Laboratory control spike duplicates analyzed in batches with samples collected for the 2016 WY, sorted by method and analyte. Bolded rows represent analytes that did not meet 90% acceptability requirement.

Method	Matrix	Analyte[1]	Duplicate Data Acceptability Criteria	Total LCSD Samples	LCSD Samples within Limits	Acceptability Met (%)
EPA 547M	Water	Glyphosate	RPD ≤25	2	2	100.0
EPA 549.2M	Water	Paraquat	RPD ≤25	2	2	100.0
EPA 8141A	Water	Chlorpyrifos	RPD ≤25	1	1	100.0
SM 2540 D	Water	Total Suspended Solids	RPD ≤20	1	1	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	RPD ≤20	11	11	100.0
SM 5310 B	Water	Total Organic Carbon	RPD ≤20	2	2	100.0
			Total	**19**	**19**	**100.0**

[1] Laboratory control spike duplicates are not run for all analytes and analytes that do not have laboratory control spike duplicates are not included in table.

Table 24. ESJWQC summary of matrix spike QC sample evaluations.
Matrix spikes and matrix spike duplicates collected for the 2016 WY, sorted by method and analyte. Non project matrix spikes are included for batch Quality Assurance completeness purposes. Bolded rows represent analytes that did not meet the 90% acceptability requirement.

Method	Matrix	Analyte[1]	MS Data Acceptability Criteria	Total MS Samples	MS Samples within Limits	Acceptability Met (%)
EPA 200.8	Water	Arsenic	PR 80-120	8	8	100.0
EPA 200.8	Water	Boron	PR 80-120	8	8	100.0
EPA 200.8	Water	Dissolved Cadmium	PR 80-120	8	8	100.0
EPA 200.8	Water	Dissolved Copper	PR 80-120	28	28	100.0
EPA 200.8	Water	Dissolved Lead	PR 80-120	10	10	100.0
EPA 200.8	Water	Dissolved Nickel	PR 80-120	8	8	100.0
EPA 200.8	Water	Dissolved Zinc	PR 80-120	8	8	100.0
EPA 200.8	Water	Molybdenum	PR 80-120	8	8	100.0
EPA 200.8	Water	Selenium	PR 80-120	8	8	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	PR 90-110	26	25	96.2
EPA 547M	Water	Glyphosate	PR 85.7-121	4	4	100.0
EPA 549.2M	**Water**	**Paraquat**	**PR 70-130**	**3**	**2**	**66.7**
EPA 8141A	Water	Atrazine	PR 39-156	24	23	95.8
EPA 8141A	Water	Azinphos Methyl	PR 30-172	24	24	100.0
EPA 8141A	Water	Chlorpyrifos	PR 40-144	26	25	96.2
EPA 8141A	Water	Cyanazine	PR 22-172	24	23	95.8

Method	Matrix	Analyte[1]	MS Data Acceptability Criteria	Total MS Samples	MS Samples within Limits	Acceptability Met (%)
EPA 8141A	Water	Demeton-s	PR 35-130	24	23	95.8
EPA 8141A	Water	Diazinon	PR 45-130	24	22	91.7
EPA 8141A	Water	Dichlorvos	PR 13-161	24	24	100.0
EPA 8141A	Water	Dimethoate	PR 40-170	24	23	95.8
EPA 8141A	Water	Disulfoton	PR 28-131	24	22	91.7
EPA 8141A	Water	Malathion	PR 30-137	24	23	95.8
EPA 8141A	Water	Methidathion	PR 50-150	24	23	95.8
EPA 8141A	Water	Parathion, Methyl	PR 55-164	24	23	95.8
EPA 8141A	Water	Phorate	PR 42-125	24	23	95.8
EPA 8141A	Water	Phosmet	PR 40-153	24	23	95.8
EPA 8141A	Water	Simazine	PR 21-179	24	24	100.0
EPA 8141A	Water	Trifluralin	PR 40-148	24	23	95.8
EPA 8321A	Water	Aldicarb	PR 31-133	24	24	100.0
EPA 8321A	Water	Carbaryl	PR 44-133	24	24	100.0
EPA 8321A	Water	Carbofuran	PR 36-165	24	24	100.0
EPA 8321A	Water	Diuron	PR 52-136	24	23	95.8
EPA 8321A	Water	Linuron	PR 49-144	24	24	100.0
EPA 8321A	Water	Methamidophos	PR 36-124	24	24	100.0
EPA 8321A	Water	Methiocarb	PR 35-142	24	24	100.0
EPA 8321A	Water	Methomyl	PR 23-152	24	24	100.0
EPA 8321A	Water	Oxamyl	PR 10-117	24	24	100.0
SM 2340 C	Water	Hardness as CaCO3	PR 80-120	26	26	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	PR 90-110	28	28	100.0
SM 4500-P E	Water	OrthoPhosphate as P	PR 90-110	24	24	100.0
SM 5310 B	Water	Total Organic Carbon	PR 80-120	26	26	100.0
			Total	**833**	**815**	**97.8**

[1]Matrix spikes are not analyzed for *E. coli*, grain size, turbidity, and TSS, and water column and sediment toxicity analyses and are not included in table.

Table 25. ESJWQC summary of matrix spike duplicate QC sample evaluations.
Matrix spike duplicates collected for the 2016 WY. Non project matrix spike duplicates are included for batch Quality Assurance completeness purposes. Evaluations are sorted by method and analyte. Bolded rows represent analytes that did not meet the 90% acceptability requirement.

Method	Matrix	Analyte[1]	Duplicate Data Acceptability Criteria	Total MSD Samples	MSD Samples within Limits	Acceptability Met (%)
EPA 200.8	Water	Arsenic	RPD ≤20	4	4	100.0
EPA 200.8	Water	Boron	RPD ≤20	4	4	100.0
EPA 200.8	Water	Dissolved Cadmium	RPD ≤20	4	4	100.0
EPA 200.8	Water	Dissolved Copper	RPD ≤20	14	14	100.0
EPA 200.8	Water	Dissolved Lead	RPD ≤20	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	RPD ≤20	4	4	100.0
EPA 200.8	Water	Dissolved Zinc	RPD ≤20	4	4	100.0
EPA 200.8	Water	Molybdenum	RPD ≤20	4	4	100.0
EPA 200.8	Water	Selenium	RPD ≤20	4	4	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	RPD ≤20	13	13	100.0
EPA 547M	Water	Glyphosate	RPD ≤25	2	2	100.0
EPA 549.2M	Water	Paraquat	RPD ≤25	1	1	100.0
EPA 8141A	Water	Atrazine	RPD ≤25	12	11	91.7
EPA 8141A	Water	Azinphos methyl	RPD ≤25	12	11	91.7
EPA 8141A	Water	Chlorpyrifos	RPD ≤25	13	12	92.3
EPA 8141A	**Water**	**Cyanazine**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	**Water**	**Demeton-s**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	**Water**	**Diazinon**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	Water	Dichlorvos	RPD ≤25	12	11	91.7
EPA 8141A	**Water**	**Dimethoate**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	**Water**	**Disulfoton**	**RPD ≤25**	**12**	**10**	**83.3**

Method	Matrix	Analyte[1]	Duplicate Data Acceptability Criteria	Total MSD Samples	MSD Samples within Limits	Acceptability Met (%)
EPA 8141A	Water	Malathion	RPD ≤25	12	11	91.7
EPA 8141A	Water	Methidathion	RPD ≤25	12	11	91.7
EPA 8141A	Water	Parathion, Methyl	RPD ≤25	12	11	91.7
EPA 8141A	**Water**	**Phorate**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	Water	Phosmet	RPD ≤25	12	11	91.7
EPA 8141A	**Water**	**Simazine**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	**Water**	**Trifluralin**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8321A	**Water**	**Aldicarb**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8321A	Water	Carbaryl	RPD ≤25	12	12	100.0
EPA 8321A	Water	Carbofuran	RPD ≤25	12	12	100.0
EPA 8321A	Water	Diuron	RPD ≤25	12	11	91.7
EPA 8321A	**Water**	**Linuron**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8321A	Water	Methamidophos	RPD ≤25	12	12	100.0
EPA 8321A	**Water**	**Methiocarb**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8321A	**Water**	**Methomyl**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8321A	**Water**	**Oxamyl**	**RPD ≤25**	**12**	**9**	**75.0**
SM 2340 C	Water	Hardness as CaCO3	RPD ≤20	13	13	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	RPD ≤20	14	14	100.0
SM 4500-P E	Water	OrthoPhosphate as P	RPD ≤20	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	RPD ≤20	13	13	100.0
			Total	416	380	91.3

[1]Matrix spikes are not analyzed for *E. coli*, grain size, turbidity, and TSS, and water column and sediment toxicity analyses and are not included in table.

Table 26. ESJWQC summary of laboratory duplicate QC sample evaluations.

Laboratory duplicates were analyzed in batches with samples collected for the 2016 WY. Non-project samples are included for batch Quality Assurance completeness purposes. Evaluations sorted by method and analyte. Bolded rows represent analytes that did not meet the 90% acceptability requirement.

Method	Matrix	Analyte[1]	Duplicate Data Acceptability Criteria	Total Laboratory Duplicate Samples	Laboratory Duplicate Samples within Limit	Acceptability Met (%)
ASTM D422/ ASTM D4464M	**Sediment**	**Grain Size**	**RSD ≤20**	**6**	**5**	**83.3**
EPA 180.1	Water	Turbidity	RPD ≤20	12	12	100.0
SM 2540 D	Water	Total Suspended Solids	RPD ≤20	13	13	100.0
SM 9223 B	Water	*E. coli*	R_{log} ≤3.27 x mean R_{log}	12	12	100.0
Walkley-Black	**Sediment**	**Total Organic Carbon**	**RPD ≤20**	**4**	**2**	**50.0**
			Total	47	44	93.6

[1]Laboratory duplicates are not analyzed for water column and sediment toxicity analyses and are not included in table.

NA; Not applicable, analysis was not conducted for constituent.

Table 27. ESJWQC summary of surrogate recovery QC sample evaluations.

Surrogates were run with samples collected and Laboratory Quality Assurance (LABQA) samples analyzed for the 2016WY for all organics except paraquat and glyphosate. Evaluations are sorted by method and analyte. Bolded rows represent analytes that did not meet 90% acceptability requirement.

METHOD	ANALYTE	SURROGATE DATA ACCEPTABILITY CRITERIA	TOTAL SURROGATE SAMPLES	SURROGATES WITHIN LIMITS	ACCEPTABILITY MET
EPA 8141A	Tributylphosphate	PR 60-150	176	172	97.7
EPA 8141A	Triphenyl Phosphate	PR 56-129	176	173	98.3
EPA 8321A	Diphenamid	PR 40-122	131	130	99.2
EPA 8321A	Tributylphosphate	PR 36-140	147	147	100.0
		Total	630	622	98.7

Table 28. ESJWQC summary of holding time evaluations for environmental, field blank, equipment blank, field duplicate and matrix spike samples.

Samples collected during 2016 WY; sorted by method and analyte. Bolded rows represent analytes that did not meet the 90% acceptability requirement. Matrix spike duplicates are not included in the counts.

METHOD	MATRIX	ANALYTE	HOLD TIME	TOTAL SAMPLES ANALYZED	SAMPLES ANALYZED WITHIN HOLD TIME	ACCEPTABILITY MET (%)
ASTM D422/ ASTM D4464M	Sediment	Grain Size	28 days, unfrozen	24	24	100.0
EPA 180.1	Water	Turbidity	48 hours	83	83	100.0
EPA 200.8	Water	Arsenic	180 days	24	24	100.0
EPA 200.8	Water	Boron	180 days	20	20	100.0
EPA 200.8	Water	Dissolved Cadmium	180 days	24	24	100.0
EPA 200.8	Water	Dissolved Copper	180 days	96	96	100.0
EPA 200.8	Water	Dissolved Lead	180 days	33	33	100.0
EPA 200.8	Water	Dissolved Nickel	180 days	24	24	100.0
EPA 200.8	Water	Dissolved Zinc	180 days	24	24	100.0
EPA 200.8	Water	Molybdenum	180 days	20	20	100.0
EPA 200.8	Water	Selenium	180 days	20	20	100.0
EPA 353.2	Water	Nitrate + Nitrite as N	28 days	96	96	100.0
EPA 547M	Water	Glyphosate	6 months	17	17	100.0
EPA 549.2M	Water	Paraquat	Extract within 7 days, analyze within 21 days.	17	17	100.0
EPA 600/R-99-064	Water	*Hyalella azteca*	14 days	24	24	100.0
EPA 8141A	Water	Atrazine	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Azinphos methyl	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Chlorpyrifos	Extract within 7 days, analyze within 40 days	131	130	99.2
EPA 8141A	Water	Cyanazine	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Demeton-s	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Diazinon	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Dichlorvos	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Dimethoate	Extract within 7 days, analyze within 40 days	101	101	100.0
EPA 8141A	Water	Disulfoton	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Malathion	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Methidathion	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Parathion, Methyl	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Phorate	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Phosmet	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Simazine	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8141A	Water	Trifluralin	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 821-R-02-012	Water	*Ceriodaphnia dubia*	36 hours	87	87	100.0
EPA 821-R-02-012	Water	Pimephales promelas	36 hours	76	76	100.0
EPA 821-R-02-013	Water	*Selenastrum capricornutum*	36 hours	100	100	100.0

METHOD	MATRIX	ANALYTE	HOLD TIME	TOTAL SAMPLES ANALYZED	SAMPLES ANALYZED WITHIN HOLD TIME	ACCEPTABILITY MET (%)
EPA 8321A	Water	Aldicarb	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Carbaryl	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Carbofuran	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Diuron	Extract within 7 days, analyze within 40 days	111	111	100.0
EPA 8321A	Water	Linuron	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Methamidophos	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Methiocarb	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Methomyl	Extract within 7 days, analyze within 40 days	95	95	100.0
EPA 8321A	Water	Oxamyl	Extract within 7 days, analyze within 40 days	95	95	100.0
SM 2340 C	Water	Hardness as CaCO3	180 days	86	86	100.0
SM 2540 D	Water	Total Suspended Solids	7 days	83	83	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	28 days	97	97	100.0
SM 4500-P E	Water	OrthoPhosphate as P	48 hours	95	95	100.0
SM 5310 B	Water	Total Organic Carbon	28 days	96	96	100.0
SM 9223 B	Water	*E. coli*	24 hours	83	83	100.0
Walkley-Black	Sediment	Total Organic Carbon	12 months	24	24	100.0
			Total	**3809**	**3808**	**100.0**

Table 29. ESJWQC summary of toxicity laboratory control sample evaluations.
Samples collected for the 2016 WY; sorted by method and species. Bolded rows represent analytes that did not meet the 90% acceptability requirement.

METHOD	TEST SPECIES	CONTROL TEST ACCEPTABILITY	TOTAL CONTROL TESTS	CONTROL TESTS WITHIN LIMIT	ACCEPTABILITY MET (%)
EPA 600/R-99-064	*Hyalella azteca*	Survival ≥ 80%	6	6	100.0
EPA 821/R-02-012	*Ceriodaphnia dubia*	Survival ≥ 90%	12	12	100.0
EPA 821/R-02-012	*Pimephales promelas*	Survival ≥ 80%	12	12	100.0
EPA 821/R-02-013	*Selenastrum capricornutum*	> 200,000 cells/mL, variability of controls <20%,	12	12	100.0
		Total	**42**	**42**	**100.0**

Table 30. ESJWQC summary of calculated sediment grain size RSD results.
Batch calculations based on the relative percent difference (RPDSD) between the standard deviation of the environmental samples and the standard deviation of their duplicate samples. Bolded rows represent analytes that did not meet the acceptability requirement.

SAMPLE TYPE	ANALYSIS MONTH[1]	STATION CODE	Φ5	Φ16	Φ84	Φ95	SD	RSD
Environmental Sample	3/8/2016	535CCAWBR	**-0.08**	**0.43**	**2.97**	**6.28**	**1.60**	**NA**
Field Duplicate	3/8/2016	535CCAWBR	**-0.09**	**0.39**	**1.98**	**5.02**	**1.17**	**30.82**
Lab Duplicate	3/8/2016	535CCAWBR	-0.13	0.36	2.11	5.67	1.32	11.62
Environmental Sample	3/8/2016	535LFHASB	**-1.11**	**0.71**	**3.17**	**4.17**	**1.42**	**NA**
Lab Duplicate	3/8/2016	535LFHASB	**-2.73**	**0.95**	**3.52**	**4.67**	**1.76**	**21.94**
Environmental Sample	4/12/2016	535XDCAWR	**-3.42**	**-0.72**	**1.82**	**3.01**	**1.61**	**NA**
Field Duplicate	4/12/2016	535XDCAWR	**-1.94**	**-0.28**	**1.60**	**2.78**	**1.19**	**30.35**
Lab Duplicate	4/12/2016	535XDCAWR	-2.68	-0.38	1.90	3.13	1.45	10.39
Environmental Sample	9/13/2016	535CCAWBR	0.80	2.17	6.84	8.60	2.35	NA

SAMPLE TYPE	ANALYSIS MONTH[1]	STATION CODE	Φ5	Φ16	Φ84	Φ95	SD	RSD
Lab Duplicate	9/13/2016	535CCAWBR	0.85	2.21	6.85	8.62	2.34	0.51
Environmental Sample	10/12/2016	535LSSACA	**-0.79**	**0.63**	**2.74**	**3.82**	**1.23**	**NA**
Field Duplicate	10/12/2016	535LSSACA	**0.53**	**1.09**	**2.89**	**4.07**	**0.99**	**21.66**
Lab Duplicate	10/12/2016	535LSSACA	0.34	1.02	2.84	3.99	1.01	2.17

[1]For the September 13th 2016 event the field duplicate and one of the laboratory duplicates were not calculated due to the environmental sample and QC sample being performed with different methods.
Φ5 = phi value of the 5th percentile sediment grain size category.
Φ16 = phi value of the 16th percentile sediment grain size category.
Φ84 = phi value of the 84th percentile sediment grain size category.
Φ95 = phi value of the 95th percentile sediment grain size category.

DISCUSSION OF SURFACE WATER MONITORING RESULTS

To address the second programmatic question “Are irrigated agricultural operations causing or contributing to identified water quality problems?” the Coalition assessed 2016 WY monitoring results and the potential sources and mechanisms contributing to water quality impairments. Coalition monitoring during the 2016 WY resulted in exceedances of WQTLs for DO, pH, SC, *E. coli,* ammonia, nitrate, arsenic, copper, lead, chlorpyrifos, diuron, malathion, and water column toxicity to *S. capricornutum* (Appendix I).

Table 31 indicates the months each site was monitored and if a site was reported as ‘Dry’ or ‘Non-contiguous’ during the 2016 WY. All ‘Dry’ events are counted as sampled events and reported as 'no exceedances of the WQTLs.’

The Coalition monitored Core sites on November 10, January 7, July 12, and August 9 during the 2016 WY to capture storm /high TSS events (including additional samples for glyphosate, paraquat, and metals analysis), as outlined in the 2016 WY MPU (approved on November 13, 2015).

A list of all WQTLs used to evaluate monitoring results is included in Table 32. Tallies of exceedances that occurred during the 2016 WY are listed by site and zone in Appendix I, Tables I-III. The tallies in Appendix I represent the number of exceedances per constituent, and the percent of exceedances relative to the number of samples collected (including dry sites). If an exceedance occurred in both the environmental and associated field duplicate sample, only the environmental result was counted.

All exceedances and toxicity that occurred during the 2016 WY are included in Table 33 through Table 40 and discussed by zone in the summary of exceedances discussion sections. Each section includes an analysis of exceedances by zone with an assessment of agricultural pesticide applications that are potential sources of the exceedances. Measures taken to address these exceedances are described in the Member Actions Taken to Address Water Quality Impairments section of this report.

Table 31. ESJWQC Dry and non-contiguous sites during the 2016 WY.

'X' indicates the site was successfully sampled; '**D**' indicates the site was dry or too shallow and no samples were collected; '*N*' indicates the waterbody was non-contiguous at the time of sampling.

Zone	Site Name	Site Type	October	November	December	January	February	March	April	May	June	July	August	September
1	Dry Creek @ Wellsford Rd	Core	X		*N*	X	X	X^1	X	X	X	X	X	X
1	Mootz Drain downstream of Langworth Pond	Represented			X		*N*							
2	Lateral 5 1/2 @ South Blaker Rd	Core	X	X	**D**	X	X	X	X	X	X	X	X	X^1
2	Hatch Drain @ Tuolumne Rd	Represented				**D**	**D**	*N*	**D**	**D**		X	X	X
2	Hilmar Drain @ Central Ave	Represented					X	X^2	X			X		X
2	Lateral 2 1/2 near Keyes Rd	Represented							X	X	X	X	X	
2	Lateral 6 and 7 @ Central Ave	Represented			X	X	X	X	X	X				
2	Levee Drain @ Carpenter Rd	Represented			*N*		X	X			X	X		
2	Lower Stevinson @ Faith Home Rd	Represented			X	X	X	X	X	X				
2	Prairie Flower Drain @ Crows Landing Rd	Represented	X		**D**	X	X	X	X	X	X	X	X	X
2	Unnamed Drain @ Hogin Rd	Represented					X	X						
2	Westport Drain @ Vivian Rd	Represented				X	**D**		X	X		X	X	
3	Highline Canal @ Hwy 99	Core			**D**	X	X	X	X	X	X	X	X	X
3	Mustang Creek @ East Ave	Represented			*N*	X	X	X						
4	Canal Creek @ West Bellevue Rd	Core	X	X	X	X	X	X	X	X	X	X	X	X
4	Howard Lateral @ Hwy 140	Represented	*N*		**D**	X	**D**	**D**	X			X		
4	Livingston Drain @ Robin Ave	Represented			**D**	X	**D**	X	**D**	X	X	X	X	
4	Merced River @ Santa Fe	Represented	X	X								X	X	X
4	Unnamed Drain @ Hwy 140	Represented				X	X							
5	Miles Creek @ Reilly Rd	Core			**D**	X	X	X	X	X	**D**	X	X	X
5	Deadman Creek (Dutchman) @ Gurr Rd	Represented		**D**	**D**	**D**	*N*	X	X	X	X		X	X
5	Deadman Creek @ Hwy 59	Represented	**D**				**D**		*N*				**D**	**D**
5	Duck Slough @ Gurr Rd	Represented	**D**	*N*		X	*N*	X	X		X	X	X	*N*
6	Dry Creek @ Rd 18	Core		**D**	**D**	**D**	X	X	X	X	X	X	X	X
6	Ash Slough @ Ave 21	Represented			**D**	**D**	**D**	*N*	**D**					
6	Berenda Slough along Ave 18 1/2	Represented			**D**	*N*	**D**	*N*	X	**D**	*N*	*N*		
6	Cottonwood Creek @ Rd 20	Represented	**D**	**D**		**D**								**D**

X^1 –The Coalition was unable to collect sediment samples; however, water samples were collected.

X^2– The Coalition was unable to collect water samples; however, sediment samples were collected.

Table 32. Water Quality Trigger Limits.

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
pH	6.5 - 8.5 units	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Page III.6.00)	1
Electrical Conductivity (maximum)	700 µmhos/cm	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Dissolved Oxygen (minimum)	7 mg/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin.	1
	5 mg/L		Warm Freshwater Habitat	Basin Plan Objective, Page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan	
Turbidity	variable	Numeric	Municipal and Domestic Supply	Basin Plan Objective - increase varies based on natural turbidity	1
Total Dissolved Solids	450 mg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcott)	3
Total Suspended Solids	NA				
Temperature	variable	Numeric		Basin Plan Objective (see objectives for COLD, WARM, and Enclosed Bays and Estuaries)	1
E coli	235 MPN/100 ml	Narrative	Water Contact Recreation	EPA ambient water quality criteria, single-sample maximum	3
Fecal coliform	200 MPN/100 ml 400 MPN/100 ml	Numeric	Water Contact Recreation	Sacramento/San Joaquin Rivers Basin Plan (Page III.3.00) Geometric mean of not less than five samples for any 30- day period, nor shall more than 10% of the total number of samples taken during a 30 -day period.	1
TOC	NA				
Pesticides – Carbamates					
Aldicarb	3 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: United States Environmental Protection Agency (USEPA) Primary Maximum Contaminant Level (MCL) (MUN, human health)	1
Carbaryl	2.53 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average	3
Carbofuran	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Methiocarb	0.5 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates	3
Methomyl	0.52 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life)	3
Oxamyl	50 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Department of Health Services. Primary MCL	3
Pesticides – Organochlorines					
DDD(p,p')	0.00083 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
DDE(p,p')	0.00059 µg/L				
DDT(p,p')	0.00059 µg/L				
Dicofol	NA				
Dieldrin	0.00014 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
	0.056 µg/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) / Continuous Concentration 4-day average (total)	1
Endrin	0.036 µg/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-Day Average	1
	0.76 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
Methoxychlor	0.03 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
	30 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Pesticides – Organophosphates					
Azinphos methyl	0.01 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - instantaneous maximum	3
Chlorpyrifos	0.015 µg/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Rivers Basin Plan: Page III-6.01; San Joaquin River & Delta, Sacramento & Feather Rivers; more stringent 4-day average.	1
Diazinon	0.1 µg/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan: San Joaquin River & Delta numeric standard. Sacramento & Feather Rivers numeric standard	1
Dichlorvos	0.085 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. Cal/EPA Cancer Potency Factor as a drinking water level	3
Dimethoate	1.0 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services)	3
Demeton-s	NA				
Disulfoton	0.05 µg/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
Malathion	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Methamidophos	0.35 µg/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Methidathion	0.7 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose (MUN, human health)	3
Parathion, Methyl	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Phorate	0.7 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose as a drinking water level.	3
Phosmet	140 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose as a drinking water level.	3
Group A Pesticides					

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Aldrin	0.00013 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	3 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Instantaneous maximum	
Chlordane	0.00057 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0043 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Heptachlor	0.00021 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Heptachlor Epoxide	0.0001 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Total Hexachlorocyclohexane (including lindane)	0.0039 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.95 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Maximum Concentration (1-hour Average)	
Endosulfan	110 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.056 µg/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR (USEPA) - Continuous Concentration 4-day average (total)	
Toxaphene	0.00073 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0002 µg/L		Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Pesticides – Herbicides					
Atrazine	1.0 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Cyanazine	1.0 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Health Advisory (human health)	3

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Diuron	2 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment).	3
Glyphosate	700 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Linuron	1.4 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3
Molinate	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
Paraquat	3.2 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3
Simazine	4.0 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Thiobencarb	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
Trifluralin	5 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Cancer Risk Level. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water	3
Metals (c)					
Arsenic	10 µg/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health)	1
Boron	700 µg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Cadmium	for aquatic life; variable	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness	1
	5 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Copper	for aquatic life; variable	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/	1
	1,000 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Lead	for aquatic life; variable	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	15 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Molybdenum	15 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan - San Joaquin River, Mouth of the Merced River to Vernalis	1
	50 µg/L			Sacramento/San Joaquin Basin Plan - Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River	
	10 µg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
	35 µg/L		Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level.	

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Nickel	For aquatic life variable	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	100 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Selenium	50 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
	5 µg/L (4-day average)	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR Freshwater Aquatic Life Protection - Continuous Concentration - 4-Day Average	
Zinc	For aquatic life variable	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
Nutrients					
Nitrate as NO3 Nitrate as N	45,000 µg/L as NO3 10,000 µg/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Nitrite as Nitrogen	1,000 µg/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Ammonia	For aquatic life variable	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Freshwater Aquatic Life Criteria, Continuous Concentration	3
	1.5 mg/L (regardless of pH and Temperature values)	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Taste and Odor Threshold (Ammore and Hautala)	3
Hardness	NA				
Phosphorus, total	NA				
Orthophosphate, soluble	NA				
TKN	NA				

Category 1: Constituents that have numeric water quality objectives in the Sac-SJR Basin Plan or other Water Quality Objective (WQO) listed by reference such as MCLs (Page III-3.0)* , CTRs (Page III-10.1)*,
Category 2: Pesticides with discharge prohibitions. Prohibitions apply to any discharges not subject to board-approved management practices (Page IV-25.0)*.
Category 3: Constituent does not have numeric WQO, and does not have a primary MCL. WQTL exceedance is based on implementation of narrative objective. All detections should be tracked. None are default exceedances.
MCL- Maximum Contaminant Level
MPN- Most Probable Number
MUN-Municipal and Domestic Supply
NA-Not Available. Until completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.
ND-Not Detected
USEPA- United States Environmental Protection Agency
(*) -Water Quality Control Plan for the Sacramento and San Joaquin River Basins, revised on July 2016.
Narrative WQTLs are based on Water Quality Goals Database, updated by Jon Marshack on February 14, 2017.

ZONE 1 SUMMARY OF EXCEEDANCES

Zone 1 includes the Core site, Dry Creek @ Wellsford Rd, and one Represented site, Mootz Drain downstream of Langworth Pond.

During the 2016 WY, Dry Creek @ Wellsford Rd was monitored monthly for the full suite of constituents as well as MPM for chlorpyrifos which occurred in October and July through September (as indicated in the 2016 WY MPU). Management Plan Monitoring at Mootz Drain downstream of Langworth Pond occurred for chlorpyrifos in December and diuron in December and February (no exceedances occurred). Exceedances of the WQTLs for field parameters and ammonia occurred during the 2016 WY in Zone 1. Table 33 includes all exceedances that occurred during the 2016 WY in Zone 1.

Samples were collected from a non-contiguous waterbody at Dry Creek @ Wellsford Rd on December 15, 2015. The Coalition was unable to collect sediment samples on March 8, 2016 as scheduled due to high flows and unsafe sampling conditions, samples were collected on April 12, 2016 (Table 31).

Field Parameters and *E. coli*

In Zone 1, field parameters (DO, pH, and SC) were measured 13 times and 11 samples were collected for *E. coli* analysis (Appendix I; Table I). Exceedances of the WQTLs for DO (7), pH (2), and *E. coli* (8) occurred during 2016 WY monitoring at Dry Creek @ Wellsford Rd; no exceedances occurred at Mootz Drain downstream of Langworth Pond (Table 33).

Dissolved Oxygen

Exceedances of Water Quality Objectives (WQOs) for field parameters, such as DO, are not possible to track and source. DO is non-conserved meaning it can increase or decrease as water moves downstream. The concentration of DO is the result of processes occurring in the water column and in the sediment which can vary diurnally and seasonally.

The Coalition conducted a preliminary analysis to evaluate water quality parameters most likely to influence DO (submitted February 2, 2016). Processes affecting DO in waterways include stream flow, fluctuations in temperature, loss of vegetation around streams, excessive nutrients (phosphate), associated field parameters (SC, TOC, TSS), and algae growth, as discussed in the study. Conclusions from the preliminary analysis for DO indicated that low or no flow has the strongest association with exceedances of DO in the Coalition region.

Monitoring during the 2016 WY resulted in seven exceedances of the WQTL for DO (< 7 mg/L) at Dry Creek @ Wellsford Rd. Exceedances occurred in October, December, and from May through September, ranging from 1.13 to 6.14 mg/L (Table 33). Observed flow was measured in October as < 2 cfs and the December exceedance of the WQTL for DO occurred in a non-contiguous sample. There was measurable flow from May through September, observed flow ranged from 8.41 to 22.14 cfs at Dry Creek @ Wellsford Rd. Exceedances of the WQTL for DO occurred frequently at Dry Creek @ Wellsford Rd; however, complex and uncontrollable processes (described in the preliminary analysis) were likely the cause of exceedances of the WQTLs for DO.

pH

The Coalition conducted a preliminary analysis to evaluate water quality parameters most likely to influence pH (submitted February 2, 2016). Findings from the analysis indicate causes of fluctuating pH can have both natural and anthropogenic origins. Low pH is primarily caused by anthropogenic influences such as atmospheric deposition of air pollutants and drainage from mining activities, neither of which is the result of agricultural activities. Conclusions from the analysis indicated that exceedances of the upper pH WQTL were mostly correlated with elevated DO concentrations, suggesting that elevated pH is a result of very high levels of photosynthesis. The preliminary analysis for pH indicated primary agricultural contributors to elevated pH levels are limited to stormwater and irrigation runoffs; runoff of lime-rich fertilizers and nitrogen-rich organic matter can cause fluctuations in pH levels. Furthermore, photosynthesis and decomposition can cause daily and seasonal variation in pH and the bioavailability of some constituents (e.g. copper) are affected by changes in pH. However, since the exceedances of the upper pH objective were only weakly correlated with the concentration of nutrients, it is unclear what factors are driving photosynthesis.

In Zone 1, two exceedances of the upper WQTL for pH (> 8.5) occurred during the 2016 WY at Dry Creek @ Wellsford Rd in January (9.01) and February 2016 (9.05).

E. coli

Elevated levels of *E. coli* in the waterways could be due to 1) stormwater runoff carrying bacteria from dairy facilities in the subwatershed (past instances of direct dairy discharges have been noted in the Coalition region), 2) improper application of manure fertilizer or storage can contribute to elevated levels of bacteria in the waterway, and 3) naturally occurring *E. coli* bacteria in the waterways.

During the 2016 WY, 11 exceedances of the WQTL for *E. coli* (> 235 MPN/100 mL) occurred in samples collected from Dry Creek @ Wellsford Rd, including three field duplicate samples. Sample results ranged from 334.8 to >2419.6 MPN/100 mL (Table 33). There are numerous dairies located upstream of the site and within the subwatershed (1,937 acres of feedlot, dairy, and farmsteads; Table 5). It is possible that the exceedances of the WQTL for *E. coli* and nutrients (ammonia and nitrate) above the WQTLs could be associated with runoff from rainfall events, irrigation drainage, applications of manure on farming operations and/or possible discharges from dairy lagoons. In addition, naturally occurring *E. coli* are always present in the water column. Naturally occurring populations of *E. coli* in the waterbody increase activity with increasing air and water temperatures throughout the year.

Ammonia

Ammonium can enter a waterbody from three sources: 1) direct discharge of agricultural fertilizers (anhydrous ammonia), 2) direct discharge of animal waste, and 3) discharge from wastewater treatment plants. In soils, ammonium from fertilizers is typically converted to nitrite and then to nitrate over a very short period of time. Ammonium is also a positively charged ion and binds to soil particles preventing leaching of the ammonium ion through the soil to surface water. Therefore, ammonium from fertilizers would require a direct discharge to surface waters to detect it in the receiving waters. The method of anhydrous ammonium application to fields is injection into soil which argues against direct discharge to a receiving waterbody. Animal waste from confined animal facilities has a high load of dissolved ammonia and organic material that can easily be transported to surface waters. Dairies are not allowed to discharge lagoon waste into surface waters, although such discharges are known to occur.

One sample collected from Dry Creek @ Wellsford Rd resulted in an exceedance of the WQTL for ammonia during an irrigation event on September 8, 2016 (2.4 mg/L; Table 34). The exceedance of ammonia coincided with an exceedance of the WQTL for *E. coli*. It is possible that runoff from dairy pastures close to the sample site and/or runoff from nearby dairies could have contributed to the ammonia exceedance. The density of pastures and dairies along the waterway suggest animal byproducts are a source of ammonia in the subwatershed.

Table 33. Zone 1 (Dry Creek @ Wellsford Rd) exceedances.
The WQTLs are listed with each constituent. Red bolded values represent MPM exceedances.

Zone 1 Site Name	Site Type	Monitoring Type[1]	Sample Date	DO, <7 mg/L	pH, (<6.5 or >8.5)	*E. coli*, 235 MPN/100 mL	Ammonia (Variable[2] or 1.5 mg/L)
Dry Creek @ Wellsford Rd	Core	MPM, NM	10/13/2015	5.81		920.8	
Dry Creek @ Wellsford Rd-FD	Core	MPM, NM	10/13/2015			980.4	
Dry Creek @ Wellsford Rd	Core	NM, Non-contiguous	12/15/2015	1.13			
Dry Creek @ Wellsford Rd	Core	NM	1/7/2016		9.01	>2419.6	
Dry Creek @ Wellsford Rd-FD	Core	NM	1/7/2016			>2419.6	
Dry Creek @ Wellsford Rd	Core	NM	2/9/2016		9.05		
Dry Creek @ Wellsford Rd	Core	MPM, NM	3/8/2016			>2419.6	
Dry Creek @ Wellsford Rd-FD	Core	MPM, NM	3/8/2016			>2419.6	
Dry Creek @ Wellsford Rd	Core	NM	5/10/2016	5.88		488.4	
Dry Creek @ Wellsford Rd	Core	NM	6/14/2016	6.14		365.4	
Dry Creek @ Wellsford Rd	Core	NM, MPM, High TSS 1-P	7/12/2016	4.60		488.4	
Dry Creek @ Wellsford Rd	Core	NM, MPM	8/9/2016	6.09		488.4	
Dry Creek @ Wellsford Rd	Core	NM, MPM, SED	9/13/2016	4.73		344.8	2.4 (3.16)
Normal Monitoring Exceedances				**7**	**2**	**11**	**1**
Non-contiguous Waterbody Exceedances				**1**	**0**	**0**	**0**
Management Plan Monitoring Exceedances[1]				**NA**	**NA**	**NA**	**0**
Total Exceedances				**7**	**2**	**11**	**1**

[1]MPM not conducted for field parameters or *E. coli* even if they are under a management plan; however, field parameters are measured during every sampling event.
[2]Ammonia WQTL variable based on pH and temperature.
FD-Field Duplicate.
High TSS 1-P – High total suspended solids monitoring event, additional samples collected to test for paraquat and glyphosate.
MPM-Management Plan Monitoring.
NM-Normal Monitoring.
SED-Sediment monitoring.

ZONE 2 SUMMARY OF EXCEEDANCES

During the 2016 WY, Lateral 5 ½ @ South Blaker Rd was monitored monthly as the Core site in Zone 2. Hatch Drain @ Tuolumne Rd, Hilmar Drain @ Central Ave, Lateral 2 ½ near Keyes Rd, Lateral 6 and 7 @ Central Ave, Levee Drain @ Carpenter Rd, Lower Stevinson @ Faith Home Rd, Prairie Flower Drain @ Crows Landing Rd, Unnamed Drain @ Hogin Rd, and Westport Drain @ Vivian Rd were monitored as Represented sites.

Management Plan Monitoring occurred at Hatch Drain @ Tuolumne Rd and Hilmar Drain @ Central Ave for water column toxicity to *S. capricornutum* and sediment toxicity to *H. azteca*. Levee Drain @ Carpenter Rd was monitored for toxicity to *C. dubia* (February and July), *S. capricornutum* (December, February, and June), and *H. azteca* (March) during the 2016 WY. Samples were collected from Lateral 2 ½ near Keyes Rd for chlorpyrifos MPM (May through August) and from May through June for *S. capricornutum* MPM. Management Plan Monitoring occurred at Prairie Flower Drain @ Crows Landing Rd for chlorpyrifos (February through August), dimethoate (July through September), *C. dubia* toxicity (March through August), and *S. capricornutum* toxicity (October and December through August). Westport Drain @ Vivian Rd was monitored for chlorpyrifos MPM in February and July and for *S. capricornutum* toxicity MPM from February through May. Table 34 includes all exceedances that occurred during the 2016 WY in Zone 2.

Hatch Drain @ Tuolumne Rd was dry for monitoring in January, February, April, and May in 2016. Hilmar Drain was dry in March 2016, Prairie Flower Drain @ Crows Landing Rd was dry in December 2015, and Westport Drain @ Vivian Rd was dry in February 2016. The waterbody at Lateral 5 ½ @ South Blaker Rd in December 2015 was too shallow to collect water samples. Lateral 5 ½ @ South Blaker Rd was scheduled for sediment sampling in September 2016; however, there was not enough sediment accumulation for sample collection and therefore samples were collected in October 2016 from Lateral 6 and 7 @ Central Ave (samples were non-toxic). Lateral 6 and 7 @ Central Ave was chosen as the alternative site because it is the only site in Zone 2 that is also an irrigation delivery conveyance structure but is not lined so sediment is more readily available for collection. Samples were collected from a non-contiguous waterbody from Levee Drain @ Carpenter Rd in December 2015 and Hatch Drain @ Tuolumne Rd in March 2016 (Table 31).

Field Parameters and *E. coli*

In Zone 2, the field parameters DO, pH, and SC were scheduled to be monitored 67 times during the 2016 WY; 59 measurements were taken and sites were dry during eight sampling events (Table 31). Eleven samples were collected for *E. coli* analysis. Exceedances of the WQTLs for DO (26), pH (11), SC (36), and *E. coli* (3) occurred (Appendix I; Table I).

Dissolved Oxygen

In Zone 2, exceedances of the WQTL for DO (< 7 mg/L) ranged from 1.06 to 6.94 mg/L and occurred at Hatch Drain @ Tuolumne Rd (4), Hilmar Drain @ Central Ave (2), Levee Drain @ Carpenter Rd (4), Lower Stevinson @ Faith Home Rd (1), Prairie Flower Drain @ Crows Landing Rd (10), Unnamed Drain @ Hogin Rd (1), and Westport Drain @ Vivian Rd (4). The majority of exceedances of the WQTL for DO occurred during the irrigation season when temperatures were elevated (April through September; between 11 to 30°C/52 to 86°F) which could have contributed to the low DO in the waterbody. During the 2016 WY, sites in Zone 2 had an average discharge measurement of 10.3 cfs; discharge measurements ranged from 0 cfs to 50.17 cfs (measurements taken monthly during scheduled sampling events). Exceedances of the lower WQTL for DO occurred frequently in Zone 2 which could be due to fluctuations in temperature, loss of vegetation around streams, excessive nutrients (phosphate), associated field parameters (SC, TOC, TSS), and algae growth.

pH

In Zone 2, 11 exceedances of the WQTL for pH (<6.5 and >8.5) occurred during the 2016 WY, ranging from 6.16 to 9.56 (Table 34). Ten exceedances of the WQTL for pH were above the upper limit of 8.5 and occurred at Lateral 5 ½ @ South Blaker Rd (3), Lateral 6 and 7 @ Central Ave (1), Lower Stevinson @ Faith Home Rd (3), Prairie Flower Drain @ Crows Landing Rd (1), and Westport Drain @ Vivian Rd (2). One exceedance of the WQTL for pH was below the lower limit of 6.5 and occurred at Lateral 2 ½ near Keyes Rd.

Specific Conductivity

Elevated levels of SC are common in Zone 2 because the monitoring sites are located in the western portion of the Coalition region with shallow, salty groundwater. This section of the valley has inadequate subsurface drainage conditions that result in a negative impact on crop productivity. Management of subsurface drainage is necessary to cope with shallow groundwater conditions which result in the accumulation of salts in the root zone (http://www.water.ca.gov/drainage/index.cfm). Tile drains have been installed to intercept rising groundwater and move the water to the larger drains that are sampled by the Coalition.

Detections of SC above the 700 µS/cm WQTL occurred at all sites in Zone 2 (Table 34). Exceedances ranged from 761 to 3149 µS/cm and occurred at: Hatch Drain @ Tuolumne Rd (2), Hilmar Drain @ Central Ave (4), Lateral 2 ½ near Keyes Rd (3), Lateral 5 ½ @ South Blaker Rd (5), Lateral 6 and 7 @ Central Ave (2), Levee Drain @ Carpenter Rd (5), Lower Stevinson @ Faith Home Rd (3), Prairie Flower Drain @ Crows Landing Rd (9), Unnamed Drain @ Hogin Rd (2), and Westport Drain @ Vivian Rd (1).

E. coli

Three samples collected from Lateral 5 ½ @ South Blaker Rd resulted in exceedances of the WQTL for *E. coli*, in October 2015 and January and March of 2016 (Table 34). There are many dairies and pasture land located in the Lateral 5 ½ @ South Blaker Rd site subwatershed (3,229 acres of feedlots, diary, or farmstead, and 5,969 acres of dairy pastureland; Table 5). Two exceedances of the WQTL for *E. coli* at Lateral 5 ½ @ South Blaker Rd coincided with exceedances of the WQTL for nitrate in October 2015 and March 2016 (37 and 23 mg/L; respectively). One exceedance of the WQTL for *E. coli* coincided with an exceedance of the WQTL for ammonia in January 2016 (1.3 mg/L; respectively).

Ammonia

One sample collected from Lateral 5 ½ @ South Blaker Rd resulted in an exceedance of the WQTL for ammonia during storm monitoring on January 7, 2016 (1.3 mg/L; Table 34).

Nitrate

Potential sources of nitrate in surface waters include runoff of fertilizer or organic matter from irrigated fields, leaking septic systems, waste-treatment facility effluent, and inputs from animal waste. Because of their high solubility, nitrate-based fertilizers applied to the soil can easily move to surface waters with storm or irrigation discharge, or leach to groundwater. Total Kjeldahl Nitrogen (TKN) and ammonium in animal waste that enter surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a waterbody include dairies, poultry operations, pasture, and/or wildlife.

From years of movement of nitrate into groundwater, there is a significant amount of nitrate in the aquifers beneath the ESJWQC region. Many of these aquifers are very shallow and many of the drains in the western portion of the Coalition region were constructed in the late 1800s to lower the water table and allow farming. More recently, tile drains have been placed in the area, and these further remove shallow groundwater from the subsurface to surface drainages. As a result, nitrate in shallow groundwater may now be intercepted by the field and surface drains resulting in exceedances of the WQTL for nitrate. Deeper wells contaminated with nitrate can be a source of fertilizer in irrigation water.

In Zone 2, a total of eight exceedances of the WQTL for nitrate-nitrite as N occurred in samples collected from Lateral 5 ½ @ South Blaker Rd from October through September, with the exception of December (dry event), January, April, and August. Exceedances of the nitrogen WQTL (10 mg/L) ranged from 13 mg/L to 37 mg/L (Table 34). Samples collected in October and March also resulted in exceedances of the WQTL for *E. coli*.

Diuron

Diuron is a broad-spectrum herbicide used for weed control on agriculture, highway rights of way, railroads, industrial sites, and by homeowners. Diuron inhibits photosynthesis and also affects seed germination. Diuron has a half-life (in soil) of about 90 days and is very mobile. Diuron inhibits growth of *S. capricornutum* with an Effective Concentration of 50% of the measured endpoint (EC50) of 2.4 µg/L. The WQTL for diuron is 2 µg/L.

In Zone 2, a total of 25 samples were collected and analyzed for diuron. A single exceedance of the WQTL for diuron occurred in samples collected from Lateral 6 and 7 @ Central Ave (22 µg/L) on March 8, 2016 (Table 34).

Samples collected after a storm on March 8, 2016, resulted in an exceedance of the WQTL for diuron (22 µg/L). Discharge was measured at 17.92 cfs at the time of sample collection. The PUR data associated with the exceedance indicate three applications of diuron totaling 39 lbs AI across 40 acres of walnuts was applied on February 9, 2016. The small applications were made almost 30 days prior to the sampling event and the fields are located at such a distance from the monitoring site that it is unlikely that these applications were the source of the exceedance (Appendix II; Figure 30). Since the parcel with the applications is located far from the waterway, it is more likely that the source of this exceedance came from applications of diuron that have not yet been reported. The Coalition followed up with the Turlock Irrigation District (TID) and they indicated no applications coincided with the timeframe associated with the March 8, 2016 event.

This is the first exceedance of the WQTL for diuron to occur at the site; therefore, no management plan is required. During the 2017 WY, Lateral 6 and 7 @ Central Ave is scheduled to be monitored for diuron from December through March (2017 WY MPU).

Water Column Toxicity

Of the 41 samples scheduled to be collected and analyzed for *S. capricornutum* toxicity, sites were dry during seven sampling events and a total of 34 samples were collected and analyzed. All toxicity results are included in Table 34 and Table 35. A summary of the water column phase III TIE results and conclusions are provided in Table 36.

S. capricornutum toxicity

During the 2016 WY, toxicity to *S. capricornutum* occurred in 11 samples collected from Hilmar Drain @ Central Ave (1), Lateral 2 ½ near Keyes Rd (3), Lateral 5 1/2 @ South Blaker Rd (5), and Prairie Flower Drain @ Crows Landing Rd (2; Table 34).

Hilmar Drain @ Central Ave

Samples collected for MPM during the irrigation season from Hilmar Drain @ Central Ave on September 13, 2016 were analyzed for *S. capricornutum* toxicity and resulted in 84% growth compared to the control (Table 34). A TIE was not required since growth was greater than 50% compared to the control. The PUR data associated with the September 13, 2016 toxicity indicate 13 applications of paraquat and glyphosate with 588 lbs AI on 336 acres of almonds and alfalfa occurred from August 17, 2016 through September 13, 2016 (Appendix II). Hilmar Drain @ Central Ave is scheduled for *S. capricornutum* toxicity MPM in April, July, and September during the 2017 WY (2017 WY MPU).

Lateral 2 ½ near Keyes Rd

Samples collected during MPM from Lateral 2 ½ near Keyes Rd on May 10, 2016 were analyzed for *S. capricornutum* toxicity and resulted in 74% growth compared to the control, a TIE was not required (Table 34). The PUR data associated with the May 10, 2016 toxicity indicate 1,272 pesticide applications containing diflubenzuron, copper hydroxide, mineral oil, and mancozeb with 70,240 lbs AI occurred on 40,090 acres of almonds, greenhouse plants, and walnuts from February 16, 2016 through May 10, 2016 (Appendix II). Of the 70,240 lbs associated with the toxicity, 69,380 lbs were applied through ground application methods.

Samples collected on July 12, 2016 and August 9, 2016 during MPM for toxicity to *S. capricornutum* resulted in 50% and 24% growth compared to the control. A TIE was conducted for both samples and concluded cationic metals and non-polar organics as the cause of toxicity. The PUR data associated with the July 12, 2016 toxicity indicate 1,191 applications of mineral oil, copper hydroxide, glyphosate, and mancozeb with 72,998 lbs AI on 30,312 acres of grapevines and orchards occurred from April 19, 2016 through July 12, 2016 (Appendix II). The PUR data associated with the August 9, 2016 toxicity indicate 864 applications of methyl bromide, mineral oil, glyphosate, and paraquat with 77,640 lbs AI across 31,285 acres of row crops and orchards occurred from May 17, 2016 through August 9, 2016 (Appendix II). At the time samples were collected in July and August, discharge was measured at 24.46 cfs and 7.71 cfs.

Lateral 5 ½ @ South Blaker Rd

Toxicity to *S. capricornutum* occurred in five samples collected at Lateral 5 ½ @ South Blaker Rd during the 2016 WY for Core site monitoring.

Samples collected for NM on February 9, 2016 were analyzed for *S. capricornutum* toxicity and resulted in 70% growth compared to the control; a TIE was not required (Table 34). The PUR data associated with the February 9, 2016 toxicity indicate 1,061 applications containing copper hydroxide, glyphosate, and pendimethalin with 121,268 lbs AI across 42,029 acres of orchards occurred from November 18, 2015 through February 9, 2016 (Appendix II). Copper was detected at a concentration of 3.0 µg/L; it was not considered an exceedance of the hardness based WQTL.

Samples collected after a storm on March 8, 2016 resulted in toxicity to *S. capricornutum*, with 31% growth compared to the control (Table 34). The TIE conducted on the toxic sample indicated neither non-polar organics nor cationic metals caused the toxicity. The concentration of copper detected in the sample (2.0 µg/L) was not sufficient enough to cause toxicity (TUa = 0.01-0.20; Table 36). The PUR data associated with the March 8, 2016 toxicity indicate 953 applications containing copper hydroxide, copper sulfate, copper oxide, chlorothalonil, and glyphosate with 99,422 lbs AI across 42,490 acres of nut trees occurred from December 15, 2015 through March 8, 2016 (Appendix II). Prior to monitoring, a significant storm occurred in Stanislaus County from March 3 through March 7, 2016, producing 2.3 inches of precipitation (Table 6). However, it is unlikely that stormwater runoff contributed to the toxicity due to lack of significant flow (3.36 cfs) and the fact that the canal is higher than the surrounding ground level.

Samples collected during the irrigation season on May 10, 2016 were analyzed for toxicity to *S. capricornutum* and resulted in 51% growth compared to the control; a TIE was not required (Table 34). The PUR data associated with the toxicity on May 10, 2016 indicate 895 applications containing copper hydroxide, methyl bromide, mancozeb, and chloropicrin with 109,228 lbs AI across 35,347 acres of fruit and nut trees occurred from February 16, 2016 through March 10, 2016 (Appendix II).

Samples collected during the irrigation season on June 14, 2016 were analyzed for toxicity to *S. capricornutum* and resulted in 15% growth compared to the control (Table 34). A TIE was conducted and concluded that cationic metals was the cause of toxicity. The PUR data associated with the June 14, 2016 toxicity indicate 1,026 applications containing copper hydroxide, glyphosate, and mancozeb with 70,124 lbs AI on 39,380 acres of fruit and nut trees occurred from March 22, 2016 through June 14, 2016 (Appendix II). Flow was measured at 21.65 cfs at the time samples were collected.

Samples collected on September 13, 2016 during NM for toxicity to *S. capricornutum* resulted in 21% growth compared to the control (Table 34). TIE results concluded non-polar organics and cationic metals were the source of the toxicity; however, monitoring results indicated no detections of either chemical class. The PUR data associated with the September 13, 2016 toxicity indicate 178 applications containing methyl bromide, paraquat, and glyphosate with 66,690 lbs AI on 5,018 acres of row crops, sweet potatoes, watermelons, and orchards occurred from June 22, 2016 through September 13, 2016 (Appendix II).

During the 2017 WY, Lateral 5 ½ @ South Blaker Rd is the Core site in Zone 2 and samples will be collected and analyzed for *S. capricornutum* toxicity monthly (2017 WY MPU; Table 1).

Prairie Flower Drain @ Crows Landing Rd

Samples collected for MPM after a storm on March 8, 2016 were analyzed for *S. capricornutum* toxicity and resulted in 69% growth compared to the control, a TIE was not required (Table 34). Samples were also collected and analyzed for diuron. Diuron was detected at a concentration of 0.85 µg/L; however, an exceedance of the WQTL did not occur. The PUR data associated with the March 8, 2016 toxicity indicate 35 applications containing copper sulfate, dimethylamine salt, and glyphosate with 1,741 lbs AI across 2,913 acres of alfalfa, oats, wheat for fodder, and almonds occurred from January 26, 2016 through March 1, 2016 (Appendix II). Prior to monitoring, 1.36 inches of precipitation fell in Merced County; at the time samples were collected discharge was measured at 0.68 cfs.

Samples collected for MPM during the irrigation season on July 12, 2016 were analyzed for *S. capricornutum* toxicity and resulted in 84% growth compared to the control, a TIE was not required (Table 34). The PUR data associated with the July toxicity indicate 1,146 applications containing glyphosate, diglycolamine salt, and 2,4-D, dimethylamine with 3,645 lbs AI across 2,349 acres of almond orchards and corn fields occurred from April 19, 2016 through July 12, 2016 (Appendix II). Samples were collected from a stagnant waterbody covered with green algae.

Table 34. Zone 2 (Hatch Drain @ Tuolumne Rd, Hilmar Drain @ Central Ave, Lateral 2 1/2 near Keyes Rd, Lateral 5 1/2 @ South Blaker Rd, Lateral 6 and 7 @ Central Ave, Levee Drain @ Carpenter Rd, Lower Stevinson @ Faith Home Rd, Prairie Flower Drain @ Crows Landing Rd, Unnamed Drain @ Hogin Rd, and Westport Drain @ Vivian Rd) exceedances.

The WQTLs are listed with each constituent. Red bolded values represent MPM exceedances.

Zone 2 Site Name	Site Type	Monitoring Type[2]	Sample Date	DO, <7 mg/L	pH, <6.5 and > 8.5 units	SC, 700 µS/cm	*E. coli*, 235 MPN/100 mL	Ammonia, Variable[1] or 1.5 mg/L	Nitrate + Nitrite, 10 mg/L	Diuron (2.0 µg/L)	*S. capricornutum*,% Control
Hatch Drain @ Tuolumne Rd	Represented	MPM, Non-contiguous	3/8/2016	3.19							
Hatch Drain @ Tuolumne Rd	Represented	NM, MPM	7/12/2016	1.27							
Hatch Drain @ Tuolumne Rd	Represented	MPM	8/9/2016	2.78		909					
Hatch Drain @ Tuolumne Rd	Represented	MPM, SED	9/13/2016	1.16		761					
Hilmar Drain @ Central Ave	Represented	MPM	2/9/2016			1315					
Hilmar Drain @ Central Ave	Represented	MPM	4/12/2016			1112					
Hilmar Drain @ Central Ave	Represented	MPM	7/12/2016	2.65		1586					
Hilmar Drain @ Central Ave	Represented	MPM, SED	9/13/2016	3.93		1189					**84**
Lateral 2 1/2 near Keyes Rd	Represented	MPM	4/12/2016		8.53						
Lateral 2 1/2 near Keyes Rd	Represented	MPM	5/10/2016			702					**74**
Lateral 2 1/2 near Keyes Rd	Represented	MPM	7/12/2016			725					**50**
Lateral 2 1/2 near Keyes Rd	Represented	MPM	8/9/2016			751					**24**
Lateral 5 1/2 @ South Blaker Rd	Core	NM	10/13/2015		8.94	968	770.1		37		
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS	11/10/2015		9.45				16		
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS	1/7/2016		8.94		866.4	1.3 (0.76)			
Lateral 5 1/2 @ South Blaker Rd	Core	NM	2/9/2016			1156			29		70
Lateral 5 1/2 @ South Blaker Rd	Core	NM	3/8/2016			1029	>2419.6		23		31
Lateral 5 1/2 @ South Blaker Rd	Core	NM	5/10/2016						14		51
Lateral 5 1/2 @ South Blaker Rd	Core	NM	6/14/2016			875			15		15
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 1-M,High TSS 1-P	7/12/2016						13		
Lateral 5 1/2 @ South Blaker Rd	Core	NM	9/13/2016			920			24		21
Lateral 6 and 7 @ Central Ave	Represented	NM	12/15/2015		8.67	1187					
Lateral 6 and 7 @ Central Ave	Represented	NM	3/8/2016			787				22	
Levee Drain @ Carpenter Rd	Represented	MPM, Non-contiguous	12/15/2015			2011					
Levee Drain @ Carpenter Rd	Represented	MPM	2/9/2016	4.71		2287					
Levee Drain @ Carpenter Rd	Represented	MPM	3/8/2016	6.33		1698					
Levee Drain @ Carpenter Rd	Represented	MPM	6/14/2016	1.74		1288					
Levee Drain @ Carpenter Rd	Represented	MPM	7/12/2016	3.52		2072					
Lower Stevinson @ Faith Home Rd	Represented	NM	12/15/2015	4.48		864					

ZONE 2 SITE NAME	SITE TYPE	MONITORING TYPE[2]	SAMPLE DATE	DO, <7 MG/L	PH, <6.5 AND >8.5 UNITS	SC, 700 µS/CM	*E. COLI*, 235 MPN/100 ML	AMMONIA, VARIABLE[1] OR 1.5 MG/L	NITRATE + NITRITE, 10 MG/L	DIURON (2.0 µG/L)	*S. CAPRICORNUTUM*, % CONTROL
Lower Stevinson @ Faith Home Rd	Represented	NM	1/7/2016		8.58						
Lower Stevinson @ Faith Home Rd	Represented	NM	2/9/2016			1340					
Lower Stevinson @ Faith Home Rd	Represented	NM	4/12/2016		8.69						
Lower Stevinson @ Faith Home Rd	Represented	NM	5/10/2016		8.53	887					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	10/13/2015	3.51		2530					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	1/7/2016	6.14							
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	2/9/2016	2.66		3149					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM, NM, SED	3/8/2016	1.99		2327					69
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	4/12/2016	1.34		1671					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	5/10/2016	3.69		1408					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	6/14/2016	3.07	6.16	1236					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	7/12/2016	1.06		2050					84
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	8/9/2016	1.66		2304					
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM, SED	9/13/2016	3.04		2041					
Unnamed Drain @ Hogin Rd	Represented	NM	2/9/2016			1086					
Unnamed Drain @ Hogin Rd	Represented	NM	3/8/2016	4.71		1453					
Westport Drain @ Vivian Rd	Represented	MPM	1/7/2016	6.52	9.56						
Westport Drain @ Vivian Rd	Represented	MPM	4/12/2016	3.65							
Westport Drain @ Vivian Rd	Represented	MPM	5/10/2016			765					
Westport Drain @ Vivian Rd	Represented	MPM	7/12/2016	2.30	8.76						
Westport Drain @ Vivian Rd	Represented	MPM	8/9/2016	6.94							
Normal Monitoring Exceedances				**26**	**11**	**36**	**3**	**1**	**8**	**1**	**5**
Non-contiguous Waterbody Exceedances				**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
Management Plan Monitoring Exceedances[2]				**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0**	**6**
Total Exceedances				**26**	**11**	**36**	**3**	**1**	**8**	**1**	**12**

[1]Ammonia WQTL variable based on pH and temperature.

[2]MPM not conducted for field parameters, nutrients, or *E. coli* even if they are under a management plan; however, field parameters are measured during every sampling event.

High TSS – High total suspended solids monitoring event due to increased flow, additional samples collected for paraquat and glyphosate (1-P).

MPM-Management Plan Monitoring

NM-Normal Monitoring

SED- Sediment monitoring

Table 35. Zone 2 water column toxicity exceedance summary.
The table is organized alphabetically by site. The table only includes field duplicate exceedances if no exceedances occurred in the environmental sample. If an exceedance in the field duplicate sample and not environmental sample occurred, the field duplicate result was included and noted (FD) by the site name. Red bolded values represent MPM exceedances.

Site Name	Sample Date	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Hilmar Drain @ Central Ave	9/13/2016	*S. capricornutum*	Total Cell Count (cells/ml)	1403317	**84**	SG	No TIE was conducted.
Lateral 2 ½ near Keyes Rd	5/10/2016	*S. capricornutum*	Total Cell Count (cells/ml)	1100462	**74**	SL	No TIE was conducted.
Lateral 2 ½ near Keyes Rd	7/12/2016	*S. capricornutum*	Total Cell Count (cells/ml)	328672	**50**	SL	A phase I TIE concluded that cationic metals was the cause of toxicity. A phase III TIE analysis was conducted for chlorpyrifos and it was concluded that chlorpyrifos is likely not the cause of toxicity.
Lateral 2 ½ near Keyes Rd	8/9/2016	*S. capricornutum*	Total Cell Count (cells/ml)	286337	**24**	SL	A phase I TIE concluded that cationic metals and non-polar organics was the cause of toxicity.
Lateral 5 ½ @ South Blaker Rd	2/9/2016	*S. capricornutum*	Total Cell Count (cells/ml)	403571	70	SL	No TIE was conducted. Copper was detected in this sample at a concentration of 3.0 µg/L (not reported as an exceedance of the hardness based WQTL).
Lateral 5 ½ @ South Blaker Rd	3/8/2016	*S. capricornutum*	Total Cell Count (cells/ml)	240746	31	SL	A phase I TIE concluded that non-polar organics or cationic metals were not the cause of toxicity. The concentration of copper (2.0 µg/L) detected in the sample was likely not sufficient enough to cause toxicity.
Lateral 5 ½ @ South Blaker Rd	5/10/2016	*S. capricornutum*	Total Cell Count (cells/ml)	761786	51	SL	No TIE was conducted.
Lateral 5 ½ @ South Blaker Rd	6/14/2016	*S. capricornutum*	Total Cell Count (cells/ml)	139795	15	SL	A phase I TIE concluded that cationic metals was the cause of toxicity.
Lateral 5 ½ @ South Blaker Rd	9/13/2016	*S. capricornutum*	Total Cell Count (cells/ml)	524062	21	SL	A phase I TIE concluded that cationic metals and non-polar organics was the cause of toxicity. A phase III TIE analysis was not conducted since the ammonia detection is well below the level that would produce toxicity to green algae. Chemical analysis of this sampled detected ammonia (0.082 mg/L as N).
Prairie Flower Drain @ Crows Landing Rd	3/8/2016	*S. capricornutum*	Total Cell Count (cells/ml)	553370	**69**	SL	No TIE was conducted.
Prairie Flower Drain @ Crows Landing Rd	7/12/2016	*S. capricornutum*	Total Cell Count (cells/ml)	1403317	**84**	SG	No TIE was conducted.

SL-Statistically significantly different from control; less than 80% threshold.
SG-Statistically significantly different from control; Greater than 80% threshold.

Table 36. Summary of water column phase III TIE results and conclusions.

Phase III analysis results are calculated and provided by Aqua-Science Laboratory. The table includes phase III analyses on toxic samples that have chemical results for the same sample date to calculate TUs. Baseline TUs were calculated using the formula: 100/baseline toxicity EC_{50}. Phase III TUs were calculated using the formula: concentration of analyte detected in the sample/Phase III EC_{50}.

Site Name	Sample Date	Species	Baseline Toxicity Result		Phase III TIE Result			Phase III conclusions
			EC_{50}	TU	Chemical, concentration	EC_{50} (µg/L)	TU	
Lateral 5 ½ @ South Blaker Rd	3/8/2016	*S. capricornutum*	63.1	1.6	Copper, 2.0 µg/L Ammonia, 0.099 mg/L	10-220 NA	0.01-0.2 NA	Copper not likely the cause of toxicity and there is no EC_{50} value for ammonia in the Ecotox database for algae.
Lateral 2 ½ near Keyes Rd	7/12/2016	*S. capricornutum*	58.8	1.7	Chlorpyrifos, 0.004 µg/L	*e*	*e*	Chlorpyrifos likely did not cause toxicity to algae.

EC_{50} = The effective concentration that inhibits 50% of the test population (taken from the USEPA ECOTOCX database).

e – No EC_{50} values for chlorpyrifos are available in the Ecotox database for algae.

ZONE 3 SUMMARY OF EXCEEDANCES

During the 2016 WY, Highline Canal @ Hwy 99 was monitored monthly for the full suite of constituents as the Core site in Zone 3; MPM occurred for chlorpyrifos, copper, lead, and water column toxicity to *S. capricornutum*. Monitoring did not occur at Highline Canal @ Lombardy Rd; management plan constituents for Highline Canal @ Lombardy Rd were monitored instead at Highline Canal @ Hwy 99. Management Plan Monitoring for dissolved copper occurred during the 2016 WY at Mustang Creek @ East Ave from December 2015 through March 2016. Table 37 includes all exceedances that occurred during the 2016 WY in Zone 3.

During the December monitoring event, Highline Canal @ Hwy 99 was dry and samples were collected from a non-contiguous waterbody at Mustang Creek @ East Ave (Table 31).

Field Parameters and *E. coli*

In Zone 3, field parameters were scheduled to be measured 14 times during the 2016 WY; 13 measurements were taken and a site was dry during one sampling event. Nine samples were collected for *E. coli* analysis (Appendix I; Table I). Exceedances of the WQTLs for DO (2), pH (4), SC (3), and *E. coli* (4) occurred (Table 37).

Dissolved Oxygen

Exceedances of the WQTL for DO (<7 mg/L) in Zone 3 occurred at Highline Canal @ Hwy 99 in April (5.5 mg/L), and Mustang Creek @ East Ave in March (6.9 mg/L; Table 37). Observed flow at Mustang Creek @ East Ave on March 8, 2016 was measured at 6.92 cfs and at Highline Canal @ Hwy 99 on April 12, 2016 discharge was 18.99 cfs.

pH

In Zone 3, a total of four exceedances of the upper WQTL for pH (>8.5) occurred during the 2016 WY, results ranged from 8.59 to 9.41 (Table 37). All four exceedances occurred at Highline Canal @ Hwy 99 during the irrigation season, from May through September with the exception of July.

Specific Conductivity

Detections of SC above 700 µS/cm occurred three times, twice at Highline Canal @ Hwy 99 and once at Mustang Creek @ East Ave in January and February (Table 37). Monitoring results ranged from 775 to 1075 µS/cm.

E. coli

Four samples collected from Highline Canal @ Hwy 99 resulted in exceedances of the WQTL for *E. coli*, in January and March through May (Table 37). Two of the four exceedances coincided with exceedances of the WQTL for ammonia in January and March (12 and 3.7 mg/L).

Ammonia

Three samples collected from Highline Canal @ Hwy 99 for NM resulted in exceedances of the WQTL for ammonia during two storm events on January 7, 2016 (12 mg/L) and March 8, 2016 (3.7 mg/L), and one winter monitoring event on February 9, 2016 (11 mg/L). Two of the three samples with concentrations above the ammonia WQTL coincided with exceedances of the WQTL for *E. coli.*

Copper

There are a number of possible sources of copper in waterbodies within the Coalition region. Copper is applied as a fungicide to a variety of vegetable crops, grains, and fruit and nut orchards in forms such as copper hydroxide, copper sulfide, and copper oxide. Copper can also enter drainage systems from sources other than agriculture. Copper is commonly used by dairies and can also enter waterbodies through the weathering of rocks and soils. Automobile components may also contain copper; the wearing of brakes can add substantial amounts of copper to surface waters that pass through urban areas. Some irrigation districts still use copper to treat their conveyance system for algae and emergent vegetation.

The Coalition conducted a preliminary analysis to evaluate water quality parameters most likely to influence copper (submitted March 23, 2016). According to the preliminary analysis, hardness is a main determinant of exceedances, copper concentration is secondary; copper concentration and hardness are related. When water originates in high mineral/high hardness regions and if the copper concentration is sufficiently elevated, exceedances occur. Discharges from agriculture seem to not be a factor, as exceedances are not associated with applications. To determine the WQTL for dissolved copper, the WQTL is calculated based on the hardness of each individual sample. The resulting value is the limit for the bioavailable fraction of copper that could be toxic to aquatic life. Therefore, the WQTL for dissolved copper is uniquely determined by the hardness of each sample.

In Zone 3, 11 samples were scheduled to be collected and analyzed for dissolved copper; 10 samples were collected and Highline Canal @ Hwy 99 was dry for one monitoring event (Table 32; Appendix I; Table I). Five samples, two collected from Highline Canal @ Hwy 99 and three collected from Mustang Creek @ East Ave during MPM and NM, resulted in exceedances of the hardness based WQTL for dissolved copper (Table 37).

Highline Canal @ Hwy 99

Samples collected after two significant storms on January 7 and March 8, 2016 for MPM resulted in exceedances of the hardness based WQTL for dissolved copper with concentrations of 13 µg/L (hardness based WQTL 13.38 µg/L) and 21 µg/L (hardness based WQTL 10.47 µg/L); respectively. The dissolved copper concentration of the March 8, 2016 field duplicate sample also resulted in an exceedance of the hardness based WQTL with a concentration of 20 µg/L (hardness based WQTL 9.72 µg/L). Prior to monitoring on January 7, 2016, 1.32 inches of precipitation fell across Merced County from January 4 through January 9, 2016. From March 3 through March 7, 2016, 1.36 inches of precipitation fell within the area. The PUR data associated with the January 7, 2016 exceedance indicate 53 applications of products containing copper with 17,240 lbs AI on 3,722 acres of orchards occurred from November 18, 2015 through January 2, 2016. The PUR data associated with the March 8, 2016 exceedance indicate 170 applications with 32,850 lbs AI on 9,937 acres of orchards occurred from December 16, 2015 through March 4, 2016 (Appendix II).

Highline Canal is a TID supply canal and therefore does not generally accept drainage from nearby parcels; however, some growers may return irrigation tailwater or stormwater to the canal. During the

2017 WY, Highline Canal @ Hwy 99 will be monitored from December through September, as determined by the Delta Regional Monitoring Program (Delta RMP) reduced monitoring proposal (approved September 29, 2015); MPM for dissolved copper will continue from January through March, and September.

Mustang Creek @ East Ave

Three samples collected from Mustang Creek @ East Ave in December, January, and March were analyzed for dissolved copper and resulted in exceedances the hardness based WQTLs.

Samples collected for MPM from a non-contiguous waterbody on December 15, 2015 had a concentration of 11 µg/L of dissolved copper (hardness based WQTL 10.47 µg/L; Table 37). The PUR data associated with the December 15, 2015 exceedance indicate eight applications of products containing copper (copper sulfate and copper hydroxide) with 4,072 lbs of AI across 1,830 acres of almonds occurred from November 15, 2015 through December 12, 2015 (Appendix II).

Samples collected for MPM after a significant storm on January 7, 2016 resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 13 µg/L (hardness based WQTL 6.12 µg/L; Table 37). Just prior to the January sampling event a storm occurred from January 4 through January 9, 2016 and produced 1.32 inches of precipitation in Merced. The PUR data associated with the January 7, 2016 exceedance indicate 10 applications with 7,152 lbs AI on 3,206 acres of almonds occurred from November 15, 2015 through January 6, 2016 (Appendix II).

Samples collected for MPM after a storm on March 8, 2016 resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 14 µg/L (harness based WQTL 8.03 µg/L). The storm that occurred just prior to the March sampling event started on March 3 and continued through March 7, 2016, producing 1.36 inches of precipitation in Merced. Increased runoff from the storm was observed at the time samples were collected, flow was measured at 6.92 cfs. The PUR data associated with the March 8, 2016 exceedance indicate 20 applications of copper containing products with 12,454 lbs AI across 5,663 acres of almond orchards occurred from December 18, 2015 through March 2, 2016 (Appendix II).

During the 2017 WY, Mustang Creek @ East Ave will be monitored from November through March for dissolved copper MPM.

Chlorpyrifos

Chlorpyrifos is a broad spectrum organophosphate pesticide used for pest control on a wide variety of crops in California. In a waterbody, chlorpyrifos can both bind to sediment and remain in the water column (Koc of 6070). The concentration at which 50% mortality (LC50) to *C. dubia* occurs is 0.055 µg/L. The WQTL to protect aquatic life is 0.015 µg/L. Higher concentrations of chlorpyrifos are often associated with water column toxicity to *C. dubia*. More than 70% of chlorpyrifos applications in California are made to almonds, alfalfa, walnuts, oranges, and cotton (DPR, 2014). Chlorpyrifos is used by growers during the irrigation season and dormant season to prevent a number of pests such as ants, mites, moths, scale, and worms. In July 2015, the California Department of Pesticide Regulation (DPR) designated chlorpyrifos as a restricted use material when used by agriculture as an ingredient in a pesticide product. Chlorpyrifos can only be sold to, purchased by, possessed or used by, a person who holds a restricted materials permit issued by the local County Agriculture Commissioner (CAC). The permit requirement provides an effective mechanism to facilitate CAC oversight of chlorpyrifos use by certified applicators. The CACs will be able to evaluate chlorpyrifos use in the specific local conditions of each application site (DPR Regulation No 14-002).

In Zone 3, 10 samples were scheduled to be collected and analyzed for chlorpyrifos during the 2016 WY; nine samples were collected (Highline Canal @ Hwy 99 was dry during one monitoring event). A single exceedance of the WQTL for chlorpyrifos occurred in samples collected from Highline Canal @ Hwy 99 (Appendix I; Table II).

Samples collected after a storm on January 7, 2016 from Highline Canal @ Hwy 99 resulted in an exceedance of the WQTL for chlorpyrifos (0.018 µg/L; Table 37). All other samples analyzed for chlorpyrifos from February through September were non-detect. The exceedance did not coincide with any water column toxicity. The PUR data associated with the exceedance indicate three applications with 65 lbs of chlorpyrifos on 44 acres of peaches occurred on January 1 and January 2, 2016. Applications were made by a Coalition member who indicated on their most recent FE that their parcels have no potential to discharge to surface waters. This member was not targeted for Focused Outreach in 2010 or 2016 because the parcels have no direct drainage and the proximity to the waterbody was greater than 250 yards. Coalition staff utilized Google Earth to further investigate the likelihood of stormwater runoff entering Highline Canal and concluded it is highly unlikely as there is no drainage connection to Highline Canal from the parcels that received applications. It is more likely that the source of the elevated levels of chlorpyrifos came from non-reported applications.

During the 2017 WY, MPM is scheduled for chlorpyrifos and Highline Canal @ Hwy 99 will be monitored monthly for all constituents as part of Core site monitoring (2017 WY MPU).

Malathion

Malathion is an organophosphate insecticide applied to over 100 crops in the United States; however, over half of the applications occur on alfalfa, rice, cotton, sorghum, wheat, and walnuts (Newhart, 2006). It is also used for structural pest control (mosquito and fruit fly eradication in home settings) and has been used by vector control districts to control mosquitoes over wide areas (golf courses, sewage systems, pastures, and parks). Malathion is easily mixed with water and can be found in both urban and agricultural runoff. Malathion is a prohibited discharge pesticide except under the Rice Coalition Management Plan and any detection is considered to be an exceedance.

An exceedance of the WQTL for malathion with a concentration of 0.031 µg/L occurred in the field duplicate sample collected from Highline Canal @ Hwy 99 on May 10, 2016; the environmental sample analysis for malathion was non-detect. Furthermore, malathion was not detected in any other samples collected from Highline Canal @ Hwy 99 during the 2016 WY. The May sample was the first exceedance of the WQTL for malathion in the site subwatershed; therefore, a management plan is not required. The PUR data associated with the May 10, 2016 exceedance indicate three applications of malathion with 38.25 lbs AI across 30 acres of alfalfa occurred on March 23, 2016 (Appendix II). However, upon further investigation, the Coalition found 1) the parcels with applications that were associated with the exceedance were located outside the Highline Canal @ Hwy 99 site subwatershed boundary and were too far away (approximately 1.5-2.5 miles away) to have impacted the waterway through spray drift or runoff, and 2) the only applications of malathion reported were outside the 30 day timeframe typically used to associate applications to exceedances. The source of the exceedance is unknown and may have been due to unreported applications of malathion.

Growers in the Highline Canal @ Hwy 99 site subwatershed were contacted for 2016 Focused Outreach and the Coalition continues to inform growers about water quality concerns due to chlorpyrifos and malathion applications, and the importance of implementing management practices to reduce irrigation and stormwater runoff. During the 2017 WY, Highline Canal @ Hwy 99 is a Core site; monitoring will occur monthly from December through September 2017 (2017 WY MPU).

Table 37. Zone 3 (Highline Canal @ Hwy 99 and Mustang Creek @ East Ave) exceedances.
The WQTLs are listed with each constituent. Red bolded values represent MPM exceedances.

Zone 3 Site Name	Site Type	Monitoring Type	Sample Date	DO, <7 mg/L	pH, <6.5 and > 8.5 Units	SC, 700 µS/cm	*E. coli*, 235 MPN/100 mL	Ammonia, Variable[1] or 1.5 mg/L	Copper Dissolved, µg/L (hardness based trigger limit)	Chlorpyrifos, 0.015 µg/L	Malathion, 0 µg/L
Highline Canal @ Hwy 99	Core	NM, MPM	1/7/2016			775	>2419.6	12	**19 (13.38)**	**0.018**	
Highline Canal @ Hwy 99	Core	NM, MPM	2/9/2016			1075		11			
Highline Canal @ Hwy 99-FD	Core	NM, MPM	2/9/2016					10			
Highline Canal @ Hwy 99	Core	NM, MPM, SED	3/8/2016				>2419.6	3.7	**21 (10.47)**		
Highline Canal @ Hwy 99-FD	Core	NM, MPM, SED	3/8/2016						**20 (9.72)**		
Highline Canal @ Hwy 99	Core	NM, MPM	4/12/2016	5.50			275.5				
Highline Canal @ Hwy 99	Core	NM, MPM	5/10/2016		9.41		2419.6				
Highline Canal @ Hwy 99-FD	Core	NM, MPM	5/10/2016				362.3				0.031
Highline Canal @ Hwy 99	Core	NM, MPM	6/14/2016		8.93						
Highline Canal @ Hwy 99	Core	NM, MPM	8/9/2016		9.15						
Highline Canal @ Hwy 99	Core	NM, MPM, SED	9/13/2016		8.59						
Mustang Creek @ East Ave	Represented	MPM, Non-contiguous	12/15/2015						**11 (10.47)**		
Mustang Creek @ East Ave	Represented	MPM	1/7/2016						**13 (6.12)**		
Mustang Creek @ East Ave	Represented	MPM	2/9/2016			891					
Mustang Creek @ East Ave	Represented	MPM	3/8/2016	6.9					**14 (8.03)**		
Normal Monitoring Exceedances				**2**	**4**	**3**	**5**	**4**	**0**	**0**	**1**
Non-contiguous Waterbody Exceedances				**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
Management Plan Monitoring Exceedances[2]				**NA**	**NA**	**NA**	**NA**	**NA**	**6**	**1**	**0**
Total Exceedances				**2**	**4**	**3**	**5**	**4**	**6**	**1**	**1**

[1]Ammonia WQTL variable based on pH and temperature.

[2]MPM not conducted for field parameters, nutrients, or *E. coli,* even if they are under a management plan; however, field parameters are measured during every sampling event.

FD- Field Duplicate

MPM-Management Plan Monitoring

NM-Normal Monitoring

SED-Sediment monitoring

ZONE 4 SUMMARY OF EXCEEDANCES

During the 2016 WY, Canal Creek @ West Bellevue Rd was monitored monthly for the full suite of constituents as the Core site in Zone 4. Management Plan Monitoring for dissolved copper occurred at Howard Lateral @ Hwy 140 (October, December through April, July) and Livingston Drain @ Robin Ave (December through March) during the 2016 WY. The Coalition conducted MPM at Livingston Drain @ Robin Ave for chlorpyrifos (February) and toxicity to *S. capricornutum* (February, April, and May). During the 2016 WY, MPM for chlorpyrifos occurred at Merced River @ Santa Fe in October, November, and from July through September. The Merced River @ Santa Fe and Unnamed Drain @ Hwy 140 site subwatersheds were monitored as Represented sites for toxicity to *S. capricornutum* (Merced River in July) and dissolved copper (Livingston Drain in February) during the 2016 WY. Table 38 includes all exceedances that occurred during the 2016 WY in Zone 4.

Two sites in Zone 4 were dry during monitoring: Livingston Drain @ Robin Ave in December, February, and April, and Howard Lateral @ Hwy 140 in December, February, and March. Samples were collected from a non-contiguous waterbody from Howard Lateral @ Hwy 140 in October (Table 31).

Field Parameters and *E. coli*

In Zone 4, field parameters were scheduled to be monitored 35 times during the 2016 WY; measurements were not taken during six sampling events due to dry site conditions (Appendix I; Table I). Exceedances of the WQTLs for DO (5), pH (7), and *E. coli* (2) occurred in Zone 4 (Table 38).

Dissolved Oxygen

Monitoring during the 2016 WY resulted in exceedances of the WQTL for DO (< 7 mg/L) ranging from 3.84 to 6.98 mg/L (Table 38). Exceedances occurred at Canal Creek @ West Bellevue Rd (1), Howard Lateral @ Hwy 140 (1), Livingston Drain @ Robin Ave (1), and Merced River @ Santa Fe (2). A single DO exceedance occurred from a non-contiguous waterbody at Howard Lateral @ Hwy 140 on October 13, 2015 (3.84 mg/L).

pH

In Zone 4, a total of six exceedances of the upper WQTL for pH (> 8.5) occurred and one exceedance of the lower pH WQTL (< 6.5) during the 2016 WY (Table 38). Exceedances of the upper WQTL for pH occurred at Canal Creek @ West Bellevue Rd (2), Howard Lateral @ Hwy 140 (1), Livingston Drain @ Robin Ave (2), Merced River @ Santa Fe (1) and ranged from 8.60 to 9.00. An exceedance of the lower WQTL for pH occurred at Howard Lateral @ Hwy 140 in January (6.09; Table 38).

E. coli

Two samples collected from Canal Creek @ West Bellevue Rd after significant storms in January and March resulted in exceedances of the WQTL for *E. coli* (> 235 MPN/100mL; Table 38).

Copper

In Zone 4, a total of 20 samples were scheduled to be collected and analyzed for dissolved copper; 15 samples were collected and sites were dry during five monitoring events (Appendix I; Table I). Samples collected for NM from Canal Creek @ West Bellevue Rd (1), for MPM from Howard Lateral @ Hwy 140 (1), and Livingston Drain @ Robin Ave (2) resulted in exceedances of the hardness based WQTL for copper (Table 38).

Samples collected for NM after a storm on January 7, 2016 at Canal Creek @ West Bellevue Rd resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 2.90 µg/L (hardness based WQTL 2.83 µg/L; Table 38). The PUR data associated with the January exceedance indicate four applications of copper products (copper sulfate and copper hydroxide) with 643 lbs of AI across 131 acres of peaches and outdoor nursery plants occurred from November 23, 2015 through December 30, 2015 (Appendix II). There was one measurable storm within the Coalition region that occurred just prior to the January sampling event (second storm monitoring event of the season). The storm occurred from January 4 through January 6, 2016 and produced 1.31 inches of precipitation in Merced. At the time samples were collected, Canal Creek was discharging at a rate of 66.46 cfs. This was the first exceedance of the hardness based WQTL for dissolved copper to occur at the site; therefore, a management plan is not required. Monitoring for dissolved copper is scheduled to occur during two storm and two irrigation events during the 2017 WY at Canal Creek @ West Bellevue Rd.

Samples collected for MPM for copper on April 12, 2016 from Howard Lateral @ Hwy 140 resulted in an exceedance of the hardness based WQTL with a concentration of 3.90 µg/L (hardness based WQTL 3.56 µg/L; Table 38). The PUR data associated with the exceedance indicate 64 applications with 8,921 lbs AI across 2,363 acres of almonds occurred from January 19, 2016 through April 7, 2016 (Appendix II). During the 2017 WY, copper MPM is scheduled at Howard Lateral @ Hwy 140 in October, January, February, and April (2017 WY MPU).

Samples collected for NM after a storm on January 7, 2016 from Livingston Drain @ Robin Ave resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 3.2 µg/L (hardness based WQTL 2.83 µg/L; Table 38). The PUR data associated with the exceedance indicate 28 applications with 3,168 lbs AI across 478 acres of peaches and almonds occurred from November 6, 2015 through December 31, 2015 (Appendix II). Prior to monitoring, 1.31 inches of precipitation fell in Merced County. Discharge was 6.60 cfs at the time samples were collected. Focused outreach within the Livingston Drain @ Robin Ave site subwatershed is scheduled to occur from 2017 through 2019. The Coalition will review and discuss all management plan constituents with growers in detail during that time. Monitoring for dissolved copper is scheduled to occur from December through March 2017.

Samples collected for MPM after a storm on March 8, 2016 from Livingston Drain @ Robin Ave resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 3.2 µg/L (hardness based WQTL 2.83 µg/L; Table 38). The PUR data associated with the exceedance indicate 182 applications of copper containing products with 24,993 lbs AI on 5,783 acres of almonds, peaches, and grapes occurred from December 15, 2015 through March 5, 2016 (Appendix II). Prior to sampling a storm occurred within Merced County from March 3 through March 7, 2016 and produced 1.36 inches of precipitation. At the time samples were collected, no flow was observed in the drain, discharge was recorded as zero.

Chlorpyrifos

In Zone 4, a total of 21 samples were scheduled to be collected and analyzed for chlorpyrifos during the 2016 WY; 20 samples were collected and Livingston Drain @ Robin Ave was dry in February 2016 (Table 31; Appendix I; Table II).

Samples collected for MPM after a storm on November 10, 2015 from Merced River @ Santa Fe resulted in an exceedance of the WQTL for chlorpyrifos with a concentration of 0.028 µg/L (WQTL 0.015 µg/L; Table 38). The PUR data associated with the exceedance indicate eight applications totaling 1,577 lbs AI across 840 acres of grapes occurred from November 4, 2015 through November 6, 2015 (Appendix II). Prior to monitoring, the first measurable storm of the season occurred from November 8 through November 10, 2015, producing 0.36 inches of precipitation in Merced. At the time samples were collected, the river was flowing at a rate of 294 cfs. The November 10, 2015 exceedance of the chlorpyrifos WQTL was the first to occur in the site subwatershed since 2008. The chlorpyrifos management plan was approved for completion on December 4, 2015. Due to the November 10, 2015 exceedance, the chlorpyrifos management plan was reinstated for the 2017 WY. All applications associated with the exceedance were made by one member. The Coalition immediately informed the grower of the exceedance and provided information about the exceedance, pesticide use reported, a map showing the parcels that received applications prior to the storm, and management practices effective at reducing constituents entering the waterway.

During the 2017 WY, Merced River @ Santa Fe is a Represented monitoring site; MPM for chlorpyrifos will occur in October and November of 2016 (2017 WY MPU).

Table 38. Zone 4 (Canal Creek @ West Bellevue Rd, Howard Lateral @ Hwy 140, Livingston Drain @ Robin Ave, Merced River @ Santa Fe) exceedances.
The WQTLs are listed with each constituent. Red bolded values represent MPM exceedances.

Zone 4 Site Name	Site Type	Monitoring Type	Sample Date	DO, <7 mg/L	pH (<6.5 or >8.5)	*E. coli* (235 MPN/100 mL)	Copper, Dissolved, µg/L (Hardness Based)	Chlorpyrifos (0.015µg/L)
Canal Creek @ West Bellevue Rd	Core	NM	10/13/2015	6.0				
Canal Creek @ West Bellevue Rd	Core	NM, High TSS	11/10/2015		8.82			
Canal Creek @ West Bellevue Rd	Core	NM	12/15/2015		8.77			
Canal Creek @ West Bellevue Rd	Core	NM, High TSS	1/7/2016			829.6	2.9 (2.83)	
Canal Creek @ West Bellevue Rd	Core	NM, SED	3/8/2016			1553.10		
Howard Lateral @ Hwy 140	Represented	MPM, Non-contiguous	10/13/2015	3.84				
Howard Lateral @ Hwy 140	Represented	MPM	1/7/2016		6.09			
Howard Lateral @ Hwy 140	Represented	MPM	4/12/2016		8.60		**3.90 (3.56)**	
Livingston Drain @ Robin Ave	Represented	MPM	1/7/2016				**5.5 (3.2)**	
Livingston Drain @ Robin Ave	Represented	MPM	3/8/2016	6.45			**3.2 (2.83)**	
Livingston Drain @ Robin Ave	Represented	MPM	5/10/2016		8.61			

Zone 4 Site Name	Site Type	Monitoring Type	Sample Date	DO, <7 mg/L	pH (<6.5 or >8.5)	*E. coli* (235 MPN/100 mL)	Copper, Dissolved ,µg/L (Hardness Based)	Chlorpyrifos (0.015µg/L)
Livingston Drain @ Robin Ave	Represented	MPM	7/12/2016		8.63			
Merced River @ Santa Fe	Represented	MPM	11/10/2015		9.00			0.028
Merced River @ Santa Fe	Represented	MPM, NM	7/12/2016	6.62				
Merced River @ Santa Fe	Represented	MPM	9/13/2016	6.98				
Normal Monitoring Exceedances				**4**	**7**	**2**	**1**	**1**
Non-contiguous Waterbody Exceedances				**1**	**0**	**0**	**0**	**0**
Management Plan Monitoring Exceedances[1]				**NA**	**NA**	**NA**	**3**	**0**
Total Exceedances				**4**	**7**	**2**	**4**	**1**

[1]MPM not conducted for field parameters or *E. coli,* even if they are under a management plan; however, field parameters are measured during every sampling event.
High TSS – High total suspended solids in water column due to increased flows.
FD-Field Duplicate
MPM-Management Plan Monitoring
NM-Normal Monitoring
SED-Sediment monitoring

ZONE 5 SUMMARY OF EXCEEDANCES

During the 2016 WY, Miles Creek @ Reilly Rd was monitored monthly for the full suite of constituents as the Core site in Zone 5, as well as MPM for chlorpyrifos, copper, diazinon, lead, and water column toxicity to *C. dubia* and *S. capricornutum*. Management Plan Monitoring occurred at Deadman Creek @ Hwy 59 for chlorpyrifos (October, February, April, August, and September), Deadman Creek @ Gurr Rd for chlorpyrifos (November, February through April, August, and September) and water column toxicity to *C. dubia* (November, January, and February), *P. promelas* (November through March, May, and June), and *S. capricornutum* (February). The Coalition conducted MPM at Duck Slough @ Gurr Rd for chlorpyrifos (March, July), lead (January, February), malathion (February, March, April), water column toxicity to *C. dubia* (January, February, June, July) and *P. promelas* (October, March), and sediment toxicity to *H. azteca* (September). Represented site monitoring for toxicity to *S. capricornutum* occurred during the 2016 WY at Duck Slough @ Gurr Rd. Table 39 includes all exceedances that occurred during the 2016 WY in Zone 5.

Deadman Creek @ Gurr Rd was dry during the November and December monitoring events. Deadman Creek @ Hwy 59 was dry during the October, February, August, and September sampling events. Duck Slough @ Gurr Rd was dry in October and Miles Creek was dry in December and June. Samples were collected from a non-contiguous waterbody in April at Deadman Creek @ Hwy 59, in November and September at Duck Slough @ Gurr Rd, and in February from Miles Creek @ Reilly Rd (Table 31).

Field Parameters and *E. coli*

In Zone 5, field parameters were scheduled to be monitored 35 times during the 2016 WY; field parameters were measured 25 times and Deadman Creek @ Gurr Rd (3), Deadman Creek @ Hwy 59 (4), Duck Slough @ Gurr Rd (1), and Miles Creek @ Reilly Rd (2) were dry for a total of 10 monitoring events (Table 32). Nine measurements of DO were below water quality objectives and seven exceedances of the WQTL for *E. coli* occurred (Table 39).

Dissolved Oxygen

During the 2016 WY, nine exceedances of the WQTL for DO (< 7 mg/L) occurred within Zone 5. Concentrations of DO below 7 mg/L occurred at Deadman Creek @ Gurr Rd (3), Deadman Creek @ Hwy 59 (1), Duck Slough @ Gurr Rd (2), and Miles Creek @ Riley Rd (3; Table 39). Dissolved oxygen was measured from non-contiguous waterbodies in November at Duck Slough @ Gurr Rd, February at Deadman Creek @ Gurr Rd, and in April at Deadman Creek @ Hwy 59. Discharge is inversely related to exceedances of the WQTL for DO; there is a higher probability of DO concentrations exceeding the WQTL when discharge is low or when the waterbody is not flowing. Measurements of low DO ranged from 1.14 mg/L to 6.90 mg/L and occurred throughout the Water Year.

E. coli

During the 2016 WY, ten samples were scheduled to be collected for the analysis of *E. coli* from Miles Creek @ Reilly Rd; the site was dry during two sampling events (Table 31). Eight samples were analyzed for *E. coli* from Miles Creek @ Reilly Rd and seven exceedances of the WQTL of 235 MPN/100 mL occurred, concentrations ranged from 261.3 to >2419.6 MPN/ 100 mL (Table 39). Exceedances occurred from January through September with the exception of August.

Metals

During the 2016 WY, Duck Slough @ Gurr Rd was monitored for total arsenic during two storm and two irrigation events in November, January, July, and August. Samples collected from Duck Slough @ Gurr Rd resulted in an exceedance of the WQTL for arsenic in November the hardness based WQTL for dissolved lead in January. Management Plan Monitoring for dissolved lead occurred in January and February at Duck Slough @ Gurr Rd. Miles Creek @ Reilly Rd was monitored for dissolved copper and lead in January and February of 2016. A single exceedance of the hardness based WQTL for dissolved copper occurred in samples collected from Miles Creek @ Reilly Rd in January 2016.

Arsenic

Products containing arsenic have not been registered for use by agriculture since the 1980s. However, there are four products currently registered for non-agricultural purposes (arsenic acid, arsenic acid anhydride, arsenic trioxide and chromate copper arsenate) including wood protection, as a household ant killer, ditch weed control, use as weed control on non-agricultural plants, around buildings, driveways, sidewalks, rights-of-way, and fencerows. The Coalition conducted a preliminary analysis to evaluate water quality parameters most likely to influence arsenic (submitted March 23, 2016). As discussed in the preliminary analysis, arsenic is found throughout the Coalition region as evidenced by monitoring data from the 1980s, 1990s, (Westcot 1988, 1990) and with current monitoring by the ESJWQC. The USGS found that elevated concentrations of arsenic near the valley trough are the result of the release of arsenic from reductive dissolution of iron or manganese oxyhydrides under iron or manganese-reducing conditions and from pH dependent desorption of arsenic from aquifer sediments under oxic conditions. As indicated by the USGS, neither of these mechanisms is a result of irrigated agriculture and would occur regardless of the land use. Furthermore, since there are no registered products containing arsenic, the PUR database cannot be queried for associated applications.

In Zone 5, arsenic was monitored during two storm and two irrigation events at Duck Slough @ Gurr Rd. Samples collected from a non-contiguous waterbody on November 10, 2015 resulted in an exceedance of the 10 µg/L WQTL for arsenic with a concentration of 20 µg/L (Table 39). Elevated levels of arsenic are common in Zone 5; from 2007 through the 2016 WY a total of 20 exceedances of the WQTL for arsenic have occurred. In the preliminary analyses submitted on March 23, 2016 to the Regional Board, the Coalition evaluated other potential sources for arsenic and constituents that are not applied by agriculture.

Copper

Samples collected for MPM after a storm on January 7, 2016 from Miles Creek @ Reilly Rd resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 6.1 µg/L (hardness based WQTL 4.44 µg/L). Based on PUR data, there were no applications associated with the copper exceedance. Prior to monitoring a storm occurred in Merced County from January 4 through January 6, 2016, producing 1.32 inches of precipitation. Water levels in the creek were too high to measure discharge at the time samples were collected; however, observed flow was estimated to be between 20 and 50 cfs.

Lead

Samples collected after a storm at Duck Slough @ Gurr Rd on January 7, 2016 resulted in an exceedance of the hardness based WQTL for dissolved lead with a concentration of 4.8 µg/L (hardness based WQTL 3.9 µg/L). Prior to sampling a storm occurred within Merced County. The water was too deep to allow the measurement of discharge when samples were collected; however, observed flow was estimated to be between 20 and 50 cfs. This was the first exceedance to occur since the lead management plan was approved for completion on May 30, 2012; therefore, a management plan is not required.

Table 39. Zone 5 (Deadman Creek @ Gurr Rd, Deadman Creek @ Hwy 59, Duck Slough @ Gurr Rd, and Miles Creek @ Reilly Rd) exceedances.
Red bolded values represent MPM exceedances. The WQTLs are listed with each constituent.

Zone 5 Site Name	Site Type	Monitoring Type	Sample Date	DO, <7 mg/L	*E. coli*, 235 MPN/100 mL	Arsenic, Total 10 µg/L	Copper, Dissolved (hardness based WQTL)	Lead, Dissolved (hardness based WQTL)
Deadman Creek @ Gurr Rd	Represented	MPM, Non-contiguous	2/9/2016	1.14				
Deadman Creek @ Gurr Rd	Represented	MPM	4/12/2016	6.62				
Deadman Creek @ Gurr Rd	Represented	MPM	9/13/2016	6.54				
Deadman Creek @ Hwy 59	Represented	MPM, Non-contiguous	4/12/2016	4.78				
Duck Slough @ Gurr Rd	Represented	NM, Non-contiguous, High TSS	11/10/2015	4.71		20		
Duck Slough @ Gurr Rd	Represented	MPM, High TSS	1/7/2016					**4.8 (3.9)**
Duck Slough @ Gurr Rd	Represented	High TSS 1-M, MPM, NM	7/12/2016	5.20				
Miles Creek @ Reilly Rd	Core	NM	1/7/2016		>2419.6		**6.1 (4.44)**	
Miles Creek @ Reilly Rd	Core	NM, MPM	2/9/2016		261.30			
Miles Creek @ Reilly Rd	Core	NM, MPM, SED	3/8/2016		>2419.6			
Miles Creek @ Reilly Rd	Core	NM, MPM	4/12/2016	6.90	613.1			
Miles Creek @ Reilly Rd	Core	NM	5/10/2016	5.97	>2419.6			
Miles Creek @ Reilly Rd	Core	NM, High TSS	7/12/2016	5.47	387.3			
Miles Creek @ Reilly Rd	Core	NM, SED	9/13/2016		1011.2			
Normal Monitoring Exceedances				**9**	**7**	**1**	**0**	**0**
Non-contiguous Waterbody Exceedances				**3**	**0**	**1**	**0**	**0**
Management Plan Monitoring Exceedances[2]				**NA**	**NA**	**0**	**1**	**1**
Total Exceedances				**9**	**7**	**1**	**1**	**1**

[1]Ammonia WQTL variable based on pH and temperature.
[2] MPM not conducted for field parameters or *E. coli*; however, field parameters are measured during every sampling event.
High TSS – High total suspended solids in water column due to increased flows, additional samples collected for metals analysis (1-M).
MPM- Management Plan Monitoring
NM-Normal Monitoring
SED-Sediment monitoring

ZONE 6 SUMMARY OF EXCEEDANCES

During the 2016 WY, Dry Creek @ Rd 18 was monitored monthly for the full suite of constituents as the Core site in Zone 6, MPM for copper, diuron, and water column toxicity to *S. capricornutum* also occurred. Management Plan Monitoring for copper occurred at Ash Slough @ Ave 21, Berenda Slough along Ave 18 1/2, and Cottonwood Creek @ Rd 20. Table 40 includes all exceedances that occurred during the 2016 WY in Zone 6.

Monitoring sites within Zone 6 are frequently dry due to sandy soils and minimal water supplies. During the 2016 WY, Ash Slough @ Ave 21 was dry in December, January, February, and April. Berenda Slough along Ave 18 ½ was dry in December, February, March, and May. Cottonwood Creek @ Rd 20 was dry October, November, January, and September and Dry Creek @ Rd 18 was dry from November through January. Samples were collected from a non-contiguous waterbody from Ash Slough @ Ave 21 in March and Berenda Slough along Ave 18 ½ in January, March, June, and July (Table 31).

Field Parameters and *E. coli*

In Zone 6, field parameters were scheduled to be monitored 28 times during the 2016 WY; 13 measurements were taken and sites were dry during 15 sampling events. Three measurements of DO were below the Water Quality Trigger Limit of 5 mg/L. Two exceedances of the upper WQTL for pH occurred and one measurement was recorded below the lower WQTL for a total of three pH exceedances (pH WQTL < 6.5 and > 8.5). Eight samples were collected and analyzed for *E. coli*, two samples resulted in an exceedance of the WQTL (Appendix I; Table I).

Dissolved Oxygen

Dissolved oxygen was measured during every sampling event. Dry Creek @ Rd 18 (1) and Berenda Slough along Ave 18 ½ (2) had concentrations of DO below the WQTL of 5 mg/L (Table 40). Dissolved oxygen measurements that resulted in exceedances at Berenda Slough were taken from a stagnant waterbody in April (0.33 mg/L) and from an isolated non-contiguous waterbody in June (3.70 mg/L). Measurements recorded on September 13, 2016 from Dry Creek @ Rd 18 were below the WQTL and resulted in an exceedance (4.91 mg/L).

pH

In Zone 6, two exceedances of the upper WQTL for pH (> 8.5) occurred. Exceedances occurred at Berenda Slough along Ave 18 ½ on January 7, 2016 (8.52; non-contiguous) and Dry Creek @ Rd 18 on May 10, 2016 (8.82). An exceedance of the lower WQTL for pH (< 6.5) occurred at Berenda Slough along Ave 18 ½ on April 12, 2016 (6.46; Table 40).

E. coli

Samples collected from Dry Creek @ Rd 18 on March 8, 2016 and September 13, 2016 resulted in exceedances of the WQTL for *E. coli* with concentrations greater than 235 MPN/100mL (>2419.6 and 517 MPN/100mL; Table 40). Samplers indicated there was no odor to the water samples collected in

March or September. Dry Creek @ Rd 18 is the Core site for Zone 6 during the 2017 WY; samples will be collected and analyzed monthly for *E. coli*.

Copper

In Zone 6, 25 samples were scheduled to be collected and analyzed for dissolved copper; 11 samples were collected and sites were dry for 14 monitoring events. Ten MPM samples, two from Berenda Slough and eight from Dry Creek, resulted in exceedances of the hardness based WQTL for dissolved copper (Table 40).

Berenda Creek, Cottonwood Creek, and Dry Creek are utilized by the Madera Irrigation District (MID) as part of its water conveyance system. Madera Irrigation District is currently covered by an Aquatic Weed Control Permit to control algae and aquatic weeds within MID's service area. The application of copper sulfate into the MID canals is permitted at 14 to 21 day intervals from March through October. Coalition staff reviewed the Mitigated Negative Declaration study submitted by MID to the Regional Board and found significant deficiencies in the design that completely voids the conclusions of the study. The negative declaration study compared upstream sediment samples (instead of water column samples) to downstream sediment samples in three creeks. It would have been more appropriate to compare water column concentrations to conclude if there was a significant difference between upstream and downstream water quality. Additionally, simply comparing upstream samples to downstream samples is not an appropriate study design for evaluating cause and effect. The appropriate design for this type of study is the Before-After-Control-Impact (BACI) which is well documented in the scientific literature.

Growers typically apply copper containing products in April and from November through January, in which we would expect to see exceedances from November through potentially July. However, this year with more water availability, we saw an increase in the frequency of exceedances. Exceedances of dissolved copper occurred from February through September at Dry Creek @ Rd 18. After a thorough review of Coalition monitoring results and MID's Aquatic Weed Control permit, sourcing copper exceedances within Zone 6 will be incomplete without all information about copper inputs.

Berenda Slough along Ave 18 ½

Berenda Slough along Ave 18 ½ was scheduled for five copper MPM sampling events during the 2016 WY. The site was dry for three monitoring events (December, February, and March); two samples collected resulted in exceedances of the WQTL for dissolved copper (January and April). Applications of copper within the Berenda Slough subwatershed typically occur from January through April, after which applications are minimal (Figure 34 of 2017 WY MPU). The Coalition conducted focused outreach from 2011 through 2013 with 19 targeted growers to review farming practices and discuss water quality impairments. Survey results indicate growers are implementing one or more BMPs to manage irrigation, erosion and sediment, storm drainage, and pests across 4,103 acres.

Samples collected for copper MPM from a non-contiguous waterbody after a storm on January 7, 2016 resulted in an exceedance of the hardness based WQTL with a concentration of 7.6 µg/L (hardness based WQTL 6.12 µg/L). The PUR data associated with the exceedance indicate two applications with 577 lbs AI across 260 acres of citrus trees occurred on November 13, 2015 and December 8, 2015

(Figure 1 in Appendix II). However, based on the distance of the parcel/applications from the monitoring site, it is unlikely these applications were the cause of the exceedance.

Samples collected for copper MPM on April 12, 2016 resulted in an exceedance of the WQTL with a concentration of 4.7 µg/L (hardness based WQTL 3.56 µg/L). The PUR data associated with the exceedance indicate 36 applications with 6,208 lbs AI on 2,639 acres of almonds, grapes, citrus, and walnuts occurred from January 22, 2016 through April 8, 2016 (Appendix II). At the time samples were collected, flow was recorded as zero.

Dry Creek @ Rd 18

Management Plan Monitoring for dissolved copper was scheduled to occur from November through September at Dry Creek @ Rd 18. Samples were collected from February through September; the site was dry in November, December, and January (Table 31). Exceedances of the hardness based WQTL for dissolved copper occurred in all eight samples collected and analyzed (Table 40).

Samples collected from Dry Creek @ Rd 18 on February 9, 2016 had a dissolved copper concentration of 19 µg/L (hardness based WQTL 9.72 µg/L) and on March 8, 2016 a concentration of 25 µg/L (hardness based WQTL 4.95 µg/; Table 40). The PUR data associated with the February 9, 2016 exceedance indicate 45 applications with 9,245 lbs AI across 3,386 acres of almonds and citrus occurred from November 17, 2015 through February 5, 2016. The PUR data associated with the March 8, 2016 exceedance indicate 33 applications with 5,124 lbs AI across 2,410 acres of almonds occurred from January 9, 2016 through February 5, 2016.

Three exceedances of the hardness based WQTL for dissolved copper occurred in samples collected for MPM on April 12, 2016 (24 µg/L; hardness based WQTL 6.92 µg/L), May 10, 2016 (5.6 µg/L; WQTL 2.07 µg/L), and June 14, 2016 (3.0 µg/L; WQTL 1.67 µg/L; Table 40). The PUR data associated with all three copper exceedances indicate 74 applications with 3,192 lbs AI on 5,277 acres of grapes and almonds occurred from January 25, 2016 through April 10, 2016 (Appendix II).

Samples collected for MPM in July, August, and September resulted in exceedances of the hardness based WQTLs for dissolved copper. Samples collected on July 12, 2016 had a dissolved copper concentration of 3.0 µg/L (hardness based WQTL 1.25 µg/L). Samples collected on August 9, 2016 had a dissolved copper concentration of 2.9 µg/L (hardness based WQTL 1.03 µg/L). Lastly, samples collected on September 13, 2016 had a dissolved copper concentration of 4.0 µg/L (hardness based WQTL 3.0 µg/L). No PUR data were associated with these exceedances, the last applications to occur within the site subwatershed occurred on April 10, 2016. Copper applications during the months of May through October typically do not occur, and if so are minimal (Figure 9 of 2016 WY MPU). It is unclear exactly what is causing the exceedances.

Table 40. Zone 6 (Berenda Slough along Ave 18 ½ and Dry Creek @ Rd 18) exceedances.
The WQTLs are listed with each constituent. Red bolded values represent MPM exceedances.

Zone 6 Site Name	Site Type	Monitoring Type	Sample Date	DO (<5 mg/L)	pH (<6.5 or >8.5)	*E. coli*, 235 MPN/100 mL	Copper, Dissolved (hardness based WQTL)
Berenda Slough along Ave 18 1/2	Represented	MPM, Non-contiguous, High TSS	1/7/2016		8.52		**7.6 (6.12)**
Berenda Slough along Ave 18 1/2	Represented	MPM	4/12/2016	0.33	6.46		**4.7 (3.56)**
Berenda Slough along Ave 18 1/2	Represented	MPM, Non-contiguous	6/14/2016	3.7			
Dry Creek @ Rd 18	Core	NM, MPM	2/9/2016				**19 (9.72)**
Dry Creek @ Rd 18	Core	MPM, NM, SED	3/8/2016			>2419.6	**25 (4.95)**
Dry Creek @ Rd 18	Core	NM, MPM	4/12/2016				**24 (6.92)**
Dry Creek @ Rd 18	Core	NM, MPM	5/10/2016		8.82		**5.6 (2.07)**
Dry Creek @ Rd 18	Core	NM, MPM	6/14/2016				**3 (1.67)**
Dry Creek @ Rd 18-FD	Core	NM, MPM	6/14/2016				**3 (1.67)**
Dry Creek @ Rd 18	Core	NM, MPM, High TSS	7/12/2016				**3 (1.25)**
Dry Creek @ Rd 18	Core	NM, MPM	8/9/2016				**2.9 (1.03)**
Dry Creek @ Rd 18	Core	NM, MPM, SED	9/13/2016	4.91		517.2	**4 (3.02)**
Dry Creek @ Rd 18-FD	Core	NM, MPM, SED	9/13/2016				**3.9 (3.0)**
Normal Monitoring Exceedances				**3**	**3**	**2**	**0**
Non-contiguous Waterbody Exceedances				**1**	**1**	**0**	**1**
Management Plan Monitoring Exceedances[1]				**NA**	**NA**	**NA**	**12**
Total Exceedances				**3**	**3**	**2**	**12**

[1]Mangement Plan Monitoring (MPM) not conducted for field parameters or *E. coli,* even if they are under a management plan; however, field parameters are measured during every sampling event.
FD-Field Duplicate.
High TSS – High concentration of total suspended solids in water column due to increased flows.
SED-Sediment monitoring

COALITION ACTIONS TAKEN TO ADDRESS WATER QUALITY IMPAIRMENTS

The Coalition notifies members of all exceedances of WQTLs and works with growers to address water quality impairments. Monitoring results are disseminated to Coalition members via grower mailings, at grower outreach meetings, and through individual meetings with growers. Appendix III includes copies of mailings, meeting agendas and handouts; all documents associated with outreach are available from the Coalition upon request. The Coalition encourages growers to be cognizant of water quality concerns and, when applicable, to implement management practices designed to improve water quality.

Coalition actions taken to address exceedances of WQTLs include: 1) determining potential sources of exceedances 2) outreach, education, and collaboration, and 3) meeting performance goals (described in the sections below).

2016 WY SUBMITTALS AND APPROVALS

Summary of Required WDR Submittals and Approvals

The Coalition submitted multiple documents for approval by the Regional Board during the 2016 WY to meet the requirements of the WDR for items pertaining to Farm Evaluations, Groundwater Monitoring, Nitrogen Management, and Sediment and Erosion Control. Table 41 includes a list of all ESJWQC submittals and approvals to date, as well as any upcoming due dates related to specific timetables outlined in Regional Board approval letters and the WDR.

Table 41. ESJWQC WDR related submittals and approvals.
The ESJWQC WDR (R5-2012-0116-R3) was approved December 7, 2012 and revised on October 3, 2013, March 27, 2014, April 17, 2015, October 2, 2015, and February 19, 2016.

Document Description	Submittal/ Due Date[1]	Approval Date
Farm Evaluations		
FE Template	April 11, 2013 and December 6, 2013	December 9, 2013
2014 FE Summary- 2015 Annual Report	May 1, 2015 and September 1, 2015 (amendment)	February 12, 2016
2015 FE Summary- 2016 Annual Report	May 1, 2016 September 1, 2016 (amendment)	September 20, 2016
2016 FE High (small & large farms) and Low (large farm) Vulnerability Areas	March 1, 2017	NA
2016 FE Summary- 2017 Annual Report	May 1, 2017	Approval Pending
FE Low Vulnerability Areas (small farm)	March 1, 2017	NS
FE Low Vulnerability Areas (large farm)	March 1, 2020	NS
Groundwater Monitoring		
GAR Outline	April 11, 2013	May 6, 2013
GAR	January 13, 2014 and November 7, 2014	June 4, 2014 (conditional) December 24, 2014 (official)
GQMP	February 23, 2015 July 29, 2016 March 9, 2017 (resubmittal)	Approval Pending

Document Description	Submittal/ Due Date[1]	Approval Date
GQTM Work Plan Phase I	June 4, 2015 and January 29, 2016 (resubmittal)	12/4/2015 (conditional) Final Approval Pending
GQTM Work Plan Phase II	January 29, 2016	Approval Pending
GQTM QAPP	30 days from GQTM Work Plan (Phase I and II) approval	NS
GQTM Work Plan Phase III Submittal	Upon approval of well monitoring network	NS
GAR Update	June 4, 2019	NS
MPEP Group Agreement	January 14, 2014 and September 23, 2014 (refine plan) June 30, 2015 (notification of additional member coalitions)	March 13, 2014 (conditional) June 17, 2015 (official) March 7, 2016 (approval of additional members)
MPEP Identify Technical Experts	September 23, 2014	NA
MPEP Identify Program Administrator	November 1, 2014	NA
Extension Request and Addition to MPEP GCC	June 30, 2015	March 7, 2016
MPEP Conceptual Study Design	July 31, 2015	NA
MPEP Final Work Plan	June 4, 2016 July 29, 2016 (resubmittal)	Approval Pending
Nitrogen Management		
NMP Template (All Coalitions)	April 11, 2013 and December 18, 2014	December 23, 2014
NMP Technical Advisory Work Group description	March 13, 2015 and May 27, 2015	NA
NMP Summary Report Template (All Coalitions)	November 18, 2015	December 23, 2015
NMP Guidance Documents Timeline	December 18, 2015	January 19, 2016 (conditional)
NMP Crop Nitrogen Knowledge Gap Study Plan	December 18, 2015	January 19, 2016 (conditional)
Response to comments on Study Plan and Guidance Docs.	February 19, 2016	March 29, 2016 (Regional Board memo)
NMP (High Vuln >60 ac)	March 1, 2015[2]	NA
2015 NMP Summary Report (High Vuln >60 ac)	March 1, 2016	NA
2015 NMP Summary Report Analysis- Annual Report	May 31, 2016 August 2, 2016 (resubmittal)	November 9, 2016
NMP Work Plan for expanding/revising Y/R conversions	July 29, 2016 January 13, 2017	Pending Approval
NMP (High Vuln <60 ac)	March 1, 2017	NS
NMP (Low Vuln)	March 1, 2017	NS
2016 NMP Summary Report (High Vuln > 60 acres)	March 1, 2017	NA
2016 NMP Summary Report Analysis- Annual Report	May 1, 2017[3]	NS
NMP Summary Report (High Vuln <60 ac)	March 1, 2018	NS
Sediment and Erosion Control		
SECP Template (All Coalitions)	April 11, 2013, September 3, 2015, and October 9, 2015 (resubmittal)	December 1, 2015
SDEAR	January 13, 2014, December 12, 2014, and May 15, 2015 (resubmittal)	July 24, 2015
SDEAR Proximity to Surface Waters Proposal with Timeline	December 1, 2015	December 24, 2015 (conditional)
SECP (All other Members)	January 22, 2016	NA
SECP (Small Farm < 60 acres)	July 23, 2016	NA
Identify Large Tributaries with potential for sed. discharge	March 24, 2016	September 21, 2016
Identify Secondary Tributaries with potential for sed. discharge	June 24, 2016	September 21, 2016

Document Description	Submittal/ Due Date[1]	Approval Date
SECP- Parcels in proximity to large tributaries	February 28, 2017	NS
Identify Remaining Waterbodies with potential for sediment discharge	June 24, 2017	NS
SECP- Parcels in proximity to secondary tributaries	February 28, 2018	NS
SECP- Parcels in proximity to remaining waterbodies	February 28, 2019	NS

*Approval of the Annual Report for the reporting year will be the approval of the addendum/resubmittal.
NA-Not applicable
NS-Not submitted yet
[1]-Items submitted on March 1 are reported on in the May 1 Annual Report unless otherwise stated.
[2]-On January 20, 2015, the Coalition submitted a request to extend the due date for members in high vulnerability areas to have NMPs certified from March 1, 2015 to March 1, 2016 (approved April 16, 2015).
[3] – On March 22, 2017, the Coalition submitted an extension request to extend the due date of the NMP Summary Report Analysis from May 1, 2017 to July 1, 2017 (approved April 5, 2017).

Exceedance Reports

All exceedances of WQTLs were reported to Regional Board staff via email within five business days upon a sampling event or receipt of laboratory results. If any errors occurred in the original Exceedance Report, the report was amended. During the 2016 WY, one Exceedance Report was amended; the Field Exceedance Report submitted on March 15, 2016 was amended on June 16, 2016 to include a previously overlooked exceedance of the WQTL for specific conductivity.

Quarterly Data Submittal

As required in Attachment B to the WDR R5-2012-0116-R3, the Coalition submits the Quarterly Monitoring Report in electronic format. Table 42 includes the Quarterly Monitoring Report submittal schedule. Each Quarterly Monitoring Report includes the following data for sampling that occurred during the previous monitoring quarter:

1. An Excel workbook containing exported data that was uploaded into the CEDEN comparable database.
2. The most recent eQAPP.
3. Electronic pdf copies of all field sheets.
4. Electronic submittal of site photos labeled with CEDEN comparable station codes and dates.
5. Electronic pdf copies of all laboratory analytical reports including:
    a) Quality Control Reports including all QC samples and narratives describing QC failures, analytical problems and anomalous occurrences,
    b) Laboratory Analytical Reports including units, RLs, MDLs, sample preparation, extraction, and analysis dates,
    c) Chain of Custody (COCs) forms,
    d) Toxicity Reports with raw data including copies of the original bench sheets.

Table 42. ESJWQC Quarterly Monitoring Report submittal schedule.

Quarterly Submittal Due Dates	Reporting Period
March 1	July 1 through September 30 of previous calendar year
June 1	October 1 through December 31 of previous calendar year
September 1	January 1 through March 31 of same calendar year
December 1	April through June 30 of same calendar year

All field data sheets, site photos, laboratory reports, and COCs were submitted quarterly for monitoring that occurred during the 2016 WY. If any discrepancies occurred between the COCs and the samples delivered to the laboratory, each item was resolved and documented either directly on the COC or on an anomaly form completed by the laboratory.

Sample collection and field delivery were performed according to the ESJWQC QAPP (amendment form submitted February 13, 2017; approved April 12, 2017). All COC forms were faxed by the laboratories to Michael L. Johnson, LLC (MLJ-LLC) after samples were received. Table 43 includes a list and description of two instances COC discrepancies occurred during the 2016 WY. With these two exceptions, the COCs are complete and accurate records of sample handling and processing, and they reflect the timing of sample collection as well as delivery to the laboratories (Table 43).

Table 43. ESJWQC COC discrepancies for the 2016 WY.

Sample Date	Laboratory	Anomaly Description	Date of Resolution
10/13/2015	Caltest	Dissolved Hardness as CaCO3 not requested on COC	10/16/2015
3/8/2016	Caltest	Site was crossed off COC and marked as a dry site in error	3/9/2016

SUMMARY OF OUTREACH, EDUCATION, AND COLLABORATION ACTIVITIES

Outreach and education activities including member mailings, meetings, and collaboration activities are an integral component of the Coalition's monitoring program. The Coalition continues to provide information to growers through mailings, large group grower meetings, workshops, meetings conducted by the County Agricultural Commissioners, and individual grower meetings. During the 2016 WY, Coalition representatives informed members of progress in achieving water quality goals, site subwatershed-specific monitoring results, and Best Management Practices (BMPs) proven to be effective at reducing the discharge of pesticides, nutrients, and metals to both surface and groundwater. All outreach and education activities are documented in Table 44.

The Coalition also hosts a website (http://www.esjcoalition.org/home.asp), which houses Coalition activities and outreach on management practices. Information provided through the website can be utilized as a supplement to regular grower contacts and meetings. Growers can view recordings of the annual meetings and download additional forms. The website provides growers with a tool to calculate the pounds of nitrogen in irrigation water to assist with filling out NMP Worksheets. The website also provides access to water quality monitoring results and updates on Coalition news and activities.

Table 44. ESJWQC education and outreach activities during the 2016 WY.

Outreach categories include Management Practice Tracking, Best Management Practice (BMP) Outreach and Education, Grower Notification, and Collaboration.

Area	Date	Category	Details	Who
Coalition Region	10/9/2015	Grower Notification	November Member Meeting Announcement: mailed to 1,326 and emailed to 646 members.	Parry Klassen, Wayne Zipser
Madera Area	11/3/2015	BMP Outreach and Education	November Madera Member Meeting: 77 members attended.	Parry Klassen, Wayne Zipser
Merced Area	11/4/2015	BMP Outreach and Education	November Merced Member Meeting: 133 members attended.	Parry Klassen, Wayne Zipser
Modesto Area	11/5/2015	BMP Outreach and Education	November Modesto Member Meeting: 216 members attended.	Parry Klassen, Wayne Zipser
Coalition Region	11/15/2015	Grower Notification	Last Chance Farm Evaluation Postcard: mailed to 391 members and emailed to 214 members.	Parry Klassen, Wayne Zipser
Coalition Region	12/30/2015	BMP Outreach and Education	Farm Evaluation Survey: mailed and emailed to all members.	Parry Klassen, Wayne Zipser
Coalition Region	1/7/2016	Grower Notification	February Member Meeting Announcement: mailed to 3,509 members.	Parry Klassen, Wayne Zipser
Madera Area	2/9/2016	BMP Outreach and Education	February Madera Member Meeting: 401 members attended.	Parry Klassen, Wayne Zipser
Modesto Area	2/11/2016	BMP Outreach and Education	February Modesto Member Meeting: 1,002 members attended.	Parry Klassen, Wayne Zipser
Merced Area	2/24/2016	BMP Outreach and Education	February Merced Member Meeting: 577 members attended.	Parry Klassen, Wayne Zipser
Coalition Region	2/24/2016	Grower Notification	Nitrogen Management Plan Summary Report: mailed to 1,262 members.	Parry Klassen, Wayne Zipser
Coalition Region	3/9/2016	Grower Notification	Farm Evaluation Survey Reminder: mailed to 1,399 members and emailed to 868 members.	Parry Klassen, Wayne Zipser
Coalition Region	3/9/2016	Grower Notification	Annual Report mailed to 1,497 members and link to Annual Report emailed to 510 members.	Parry Klassen, Wayne Zipser
Coalition Region	3/25/2016	BMP Outreach and Education	Nitrogen Management Plan Worksheet: mailed to 3,514 members.	Parry Klassen, Wayne Zipser
Subwatershed Areas	4/21/2016	BMP Outreach and Education	Letters to growers in priority watersheds requesting an individual meeting to discuss BMPs.	Parry Klassen, Wayne Zipser
Coalition Region	5/4/2016	Grower Notification	May Member Meeting Announcement: mailed to 1,836 members and emailed to 286 members.	Parry Klassen, Wayne Zipser
Modesto Area	5/24/2016	BMP Outreach and Education	May Modesto Member Meeting: 132 members attended.	Parry Klassen, Wayne Zipser
Merced Area	5/25/2016	BMP Outreach and Education	May Merced Member Meeting: 79 members attended. .	Parry Klassen, Wayne Zipser
Madera Area	5/26/2016	BMP Outreach and Education	May Madera Member Meeting: 69 members attended.	Parry Klassen, Wayne Zipser
Coalition Region	7/19/2016	Grower Notification	Nitrogen Management Plan Summary Report Final Notice: mailed to 394 members and emailed to 165 members.	Parry Klassen, Wayne Zipser

SURFACE WATER MANAGEMENT PLAN ACTIVITIES AND PERFORMANCE GOALS

The Coalition conducts activities focused on improving water quality in site subwatersheds with management plans. These activities began with the approval of the original ESJWQC Management Plan (approved November 25, 2008) to meet the following management goal:

"To continue to monitor and analyze the water and sediment quality of ESJWQC site subwatersheds and to facilitate the implementation of management practices by providing outreach and support to growers in order to effectively enhance water quality in the Coalition region."

During the 2016 WY, the Coalition conducted management plan activities in the seventh priority site subwatersheds (prioritized under the original Management Plan) and the 2016 Focused Outreach site subwatersheds (based on the ESJWQC 2014 SQMP strategy). The previous Performance Goals and measures to meet the 10-year compliance deadline required in the WDR were revised in the ESJWQC 2014 SQMP (approved November 4, 2015).

The following sections describe actions taken during the 2016 WY to meet the approved Performance Goals and associated measures/outputs for sites where focused outreach was scheduled.

Focused Outreach Activities in the 2016 WY

During the 2016 WY, the Coalition completed focused outreach in the seventh priority subwatersheds: Howard Lateral @ Hwy 140, Levee Drain @ Carpenter Rd, and Mootz Drain downstream of Langworth Pond. Performance Goals for the seventh priority subwatersheds were approved on January 5, 2015 (Table 45).

The Coalition continued with 2016 Focused Outreach in Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd site subwatersheds during the 2016 WY. Performance Goals for the 2016 Focused Outreach site subwatersheds were approved with the 2016 Annual Report on September 20, 2016 (Table 46). The 2017 Focused Outreach efforts are in progress and status updates will be provided at Quarterly Meetings with the Regional Board and in the May 1, 2018 Annual Report (further details included below).

Performance Goal 1: Identify members with the potential to discharge to surface waters causing exceedances of WQTLs of management plan constituents.

As part of focused outreach, contact letters are mailed to inform targeted growers of member responsibilities, water quality impairments, management plan strategies, and to encourage growers to initiate the scheduling of individual meetings with Coalition representatives.

Seventh Priority:

The Coalition contacted 100% of targeted growers in the seventh priority site subwatersheds. Initial contact letters were mailed to targeted growers in Howard Lateral @ Hwy 140 (12 growers), Levee Drain @ Carpenter Rd (3 growers), and Mootz Drain downstream of Langworth Pond (6 growers) site subwatersheds on February 3, 2015 (Table 45). Since initial contact, one of the targeted growers in the Levee Drain @ Carpenter Rd site subwatershed moved their parcels to the Dairy program and was not contacted for an individual meeting with Coalition representatives due to no longer being a member of the Coalition.

2016 Focused Outreach:

Due to exceedances of the WQTL for chlorpyrifos in 2015, on February 3, 2015, the Coalition sent letters to all members in the Prairie Flower Drain @ Crows Landing Rd site subwatershed (14 growers) encouraging attendance to the meeting scheduled in coordination with Western United Dairymen on October 29, 2015. Since initial contact, three targeted growers are no longer members of the Coalition and therefore were not contacted for individual meetings.

On April 21, 2016, additional site subwatersheds were added to the 2016 Focused Outreach efforts and initial contact letters were mailed to targeted growers in Dry Creek @ Wellsford Rd (6 growers), Duck Slough @ Gurr Rd (9 growers), and Highline Canal @ Hwy 99 (7 growers). Since initial contact, one of the targeted growers in the Duck Slough @ Gurr Rd site subwatershed is no longer a member and therefore was not contacted for an individual meeting with Coalition representatives.

Performance Goal 2: Review the member's FE survey from the year prior to initiation of Management Plan activities to determine number/type of management practices currently in place, and determine if additional practices are necessary.

As part of focused outreach, FE surveys are used to determine current management practices. Members may be contacted for outreach and individual grower meetings with Coalition representatives based on their FE results or lack of FE survey submittal as required in the WDR.

Seventh Priority:

The Coalition met with all seventh priority targeted growers to complete surveys documenting current and recommended management practices (Table 45). An analysis of the current and recommended management practices was provided in the September 1, 2016 addendum to the Annual Report. A complete analysis is included in the Management Practices section below.

2016 Focused Outreach:

The Coalition met with all targeted growers in the 2016 Focused Outreach site subwatersheds to complete surveys recording current and recommended management practices (Table 45). An analysis of the current and recommended management practices is provided in the Management Practices section below. A complete analysis including current, recommended, and implemented management practices will be provided in the May 1, 2018 Annual Report.

Performance Goal 3: Hold meetings as necessary to inform members of water quality impairments and recommend additional practices.

During all individual meetings with growers, Coalition representatives discuss local water quality concerns, and may recommend additional management practices. To address water quality impairments, the Coalition is particularly concerned with effective practices within three main categories of management practices, 1) erosion and sediment management, 2) irrigation water management/storm drainage, and 3) pest management/dormant sprays (Table 49).

Seventh Priority:

The Coalition conducted individual meetings with 100% of targeted growers in the Howard Lateral @ Hwy 140, Levee Drain @ Carpenter Rd, and Mootz Drain downstream of Langworth Pond site subwatersheds. A preliminary analysis of current and recommended management practices was provided in an addendum to the 2016 Annual Report on September 1, 2016.

2016 Focused Outreach:

On October 29, 2015, the Coalition held a meeting in conjunction with Western United Dairymen for ESJWQC members and Dairy Coalition members in the Prairie Flower Drain @ Crows Landing Rd site subwatershed. During this meeting, Coalition representatives discussed local water quality concerns. The 2015 exceedances of the WQTL for chlorpyrifos were specifically addressed and management practices effective at improving water quality were discussed.

Coalition representatives met with 100% of 2016 Focused Outreach targeted growers (Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd) during the 2016 WY and early 2017 WY. Discussions with targeted growers included site specific water quality concerns, as well as current and recommended management practices effective at reducing water quality impairments (Table 46).

Performance Goal 4: Review the member's FE survey from the year following initiation of Management Plan activities to documents number/type of new management practices implemented.

Management practices implemented by members and reported on the FE surveys are stored in an Access database. During individual visits some members may be encouraged to implement additional management practices. The Coalition can utilize the FE survey responses to determine if those practices were implemented. However, since the timeframe for reporting the relevant WYs practices is several years later, the Coalition instead follows up with targeted growers who were recommended additional practices the following year via mailings and phone calls in order to get the most up to date details/responses on implemented practices.

During past follow-up contacts, Coalition representatives noted the most common reason growers were unable to implement recirculation/tailwater return systems and drainage basins/sediment ponds (two of the more expensive recommended management practices) was lack of resources. In an effort to assist growers in securing financial resources, the Coalition provides members with information regarding funding opportunities for management practice implementation including programs such as: Agricultural Water Enhancement Program (AWEP), Environmental Quality Incentives Program (EQIP), and Proposition 84 upon request. Therefore, if growers indicated on their outreach surveys they were interested in additional information about funding, Coalition representatives contact the grower directly to assist with their individual operation's needs.

Seventh Priority:

The Coalition recommended practices to one grower each in the Howard Lateral @ Hwy 140 and Levee Drain @ Carpenter Rd site subwatersheds and three growers (one was removed from the Coalition and only two received follow-up) in the Mootz Drain downstream of Langworth Pond site subwatershed. The Coalition completed follow-up contacts with 100% of targeted growers in the seventh priority site subwatersheds and a complete analysis of current, recommended, and implemented management practices is included in the sections below.

2016 Focused Outreach:

The Coalition is in the process of following up with 2016 Focused Outreach targeted growers that were recommended additional management practices. Results from these follow-ups will be included in the complete 2016 Focused Outreach analysis to be reported in the May 1, 2018 Annual Report.

Performance Goal 5: Evaluate effectiveness of new management practices.

The Coalition conducts MPM in site subwatersheds undergoing focused outreach for three years and assesses water quality improvements. Improved water quality in site subwatersheds where focused outreach has occurred is a result of effective management practices. After three years of monitoring with no exceedances, the Coalition can petition to the Regional Board for management plan completion.

Seventh Priority:

The Coalition continued MPM in the seventh priority sites during the 2016 WY to assess changes in water quality and evaluate the effectiveness of newly implemented management practices. Due to improved water quality as a result of focused outreach efforts and Coalition actions, the chlorpyrifos management plan in the Mootz Drain downstream of Langworth Pond was approved for completion on March 25, 2016. The Coalition will continue MPM in the seventh priority site subwatersheds in the 2017 WY. For more information on the 2017 WY MPM schedule, see the August 1, 2016 MPU and the MPU addendum provided in Appendix V of this report.

2016 Focused Outreach:

The Coalition will continue to conduct MPM at all 2016 Focused Outreach site subwatersheds through the 2018 WY to assess changes in water quality and evaluate the effectiveness of newly implemented management practices.

Planned Focused Outreach Activities for the 2017 WY

Focused Outreach activities planned for the 2017 WY include contacting targeted growers and conducting individual meetings with members in the Dry Creek @ Rd 18, Lateral 2 ½ near Keyes Rd, Livingston Drain @ Robin Ave, and Miles Creek @ Reilly Rd site subwatersheds. The Coalition has initiated the 2017 Focused Outreach process and results will be reported in the May 1, 2018 Annual Report. Table 47 below includes details on the year outreach activities (Performance Goals and Measures) will occur for the 2017 Focused Outreach site subwatersheds.

Table 45. High Priority Performance Goals status for 2015–2017 priority site subwatersheds (Howard Lateral @ Hwy 140, Levee Drain @ Carpenter Rd, Mootz Drain downstream of Langworth Pond), approved on January 5, 2015.

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2015	2016	2017
1	Performance Measure 1.1. – Perform source analysis, when possible, of constituents causing exceedances of WQTLs.	Identification of members with the potential to discharge to surface waters and cause the observed exceedance.	MLJ-LLC	Complete		
	Performance Measure 1.2. – Identify 100% of all members that had the potential to discharge agricultural wastes to surface waters causing exceedances of WQTLs.	Report in Management Plan Progress Report the acreage represented by members with the potential for direct discharge.	MLJ-LLC	Complete		
2	Performance Measure 2.1 – Review FE surveys (or NMP or SECP as appropriate) from 100% of targeted members.	Received management practices recorded in Access database.	MLJ-LLC	Complete		
	Performance Measure 2.2 – Identify management practices used by members that are effective in preventing discharges to surface water.	Record of management practices in place that reduce agricultural impact on water quality.	ESJWQC and MLJ-LLC	Complete		
	Performance Measure 2.3 – Identify management practices not currently used by members that can be recommended to prevent discharges to surface water.	Summary in the Management Plan Progress Report of management practices recommended to members.	ESJWQC and MLJ-LLC		Complete	
3	Performance Measure 3.1 – Provide monitoring results at meetings with members, and discuss practices that can be used to eliminate exceedances.	Agendas and/or reports of all meetings with members.	Parry Klassen and MLJ-LLC		Complete	Complete
	Performance Measure 3.2 – When available and appropriate, provide information on the results of the management practices studies.	Provide reports from studies.	Parry Klassen	NA	NA	NA
	Performance Measure 3.3 - Track attendance at meetings attended by the targeted members.	Report of members attending meetings provided in Management Plan Progress Report.	Parry Klassen and MLJ-LLC		Complete	Complete
4	Performance Measure 4.1 – Document management practice implementation, if needed, by targeted members.	Summary in the Management Plan Progress Report of management practices implemented by members at site subwatershed level.	MLJ-LLC			Complete
5	Performance Measure 5.1 – Monitoring at sites with exceedances after implementation of management practices to evaluate effectiveness.	MPM results in Monitoring Plan Progress Report.	MLJ-LLC		Complete	Complete

NA–Not applicable, no studies proposed for these site subwatersheds.

Table 46. Performance Goals status for 2016–2018 focused outreach site subwatersheds (Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd).

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2016	2017	2018
1	Performance Measure 1.1. – Perform source analysis, when possible, of constituents causing exceedances of WQTLs.	Identification of members with the potential to discharge to surface waters and cause the observed exceedance.	MLJ-LLC	Complete		
	Performance Measure 1.2. – Identify 100% of all members that had the potential to discharge agricultural wastes to surface waters causing exceedances of WQTLs.	Report in Management Plan Progress Report the acreage represented by members with the potential for direct discharge.	MLJ-LLC	Complete		
2	Performance Measure 2.1 – Review FE surveys (or NMP or SECP as appropriate) from 100% of targeted members.	Received management practices recorded in Access database.	MLJ-LLC	Complete		
	Performance Measure 2.2 – Identify management practices used by members that are effective in preventing discharges to surface water.	Record of management practices in place that reduce agricultural impact on water quality.	ESJWQC and MLJ-LLC	Complete		
	Performance Measure 2.3 – Identify management practices not currently used by members that can be recommended to prevent discharges to surface water.	Summary in the Management Plan Progress Report of management practices recommended to members.	ESJWQC and MLJ-LLC		Complete	
3	Performance Measure 3.1 – Provide monitoring results at meetings with members, and discuss practices that can be used to eliminate exceedances.	Agendas and/or reports of all meetings with members.	Parry Klassen and MLJ-LLC		Complete	X
	Performance Measure 3.2 – When available and appropriate, provide information on the results of the management practices studies.	Provide reports from studies.	Parry Klassen	NA	NA	NA
	Performance Measure 3.3 - Track attendance at meetings attended by the targeted members.	Report of members attending meetings provided in Management Plan Progress Report.	Parry Klassen and MLJ-LLC		Complete	X
4	Performance Measure 4.1 – Document management practice implementation, if needed, by targeted members.	Summary in the Management Plan Progress Report of management practices implemented by members at site subwatershed level.	MLJ-LLC			X
5	Performance Measure 5.1 – Monitoring at sites with exceedances after implementation of management practices to evaluate effectiveness.	MPM results in Monitoring Plan Progress Report.	MLJ-LLC		Complete	X

Table 47. Performance Goals status for 2017–2019 focused outreach site subwatersheds (Dry Creek @ Rd 18, Lateral 2 ½ near Keyes Rd, Livingston Drain @ Robin Ave, and Miles Creek @ Reilly Rd).

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2017	2018	2019
1	Performance Measure 1.1. – Perform source analysis, when possible, of constituents causing exceedances of WQTLs.	Identification of members with the potential to discharge to surface waters and cause the observed exceedance.	MLJ-LLC	Complete		
	Performance Measure 1.2. – Identify 100% of all members that had the potential to discharge agricultural wastes to surface waters causing exceedances of WQTLs.	Report in Management Plan Progress Report the acreage represented by members with the potential for direct discharge.	MLJ-LLC	Complete		
2	Performance Measure 2.1 – Review FE surveys (or NMP or SECP as appropriate) from 100% of targeted members.	Received management practices recorded in Access database.	MLJ-LLC	Complete		
	Performance Measure 2.2 – Identify management practices used by members that are effective in preventing discharges to surface water.	Record of management practices in place that reduce agricultural impact on water quality.	ESJWQC and MLJ-LLC	In Progress		
	Performance Measure 2.3 – Identify management practices not currently used by members that can be recommended to prevent discharges to surface water.	Summary in the Management Plan Progress Report of management practices recommended to members.	ESJWQC and MLJ-LLC		X	
3	Performance Measure 3.1 – Provide monitoring results at meetings with members, and discuss practices that can be used to eliminate exceedances.	Agendas and/or reports of all meetings with members.	Parry Klassen and MLJ-LLC		X	X
	Performance Measure 3.2 – When available and appropriate, provide information on the results of the management practices studies.	Provide reports from studies.	Parry Klassen	NA	NA	NA
	Performance Measure 3.3 - Track attendance at meetings attended by the targeted members.	Report of members attending meetings provided in Management Plan Progress Report.	Parry Klassen and MLJ-LLC		X	X
4	Performance Measure 4.1 – Document management practice implementation, if needed, by targeted members.	Summary in the Management Plan Progress Report of management practices implemented by members at site subwatershed level.	MLJ-LLC			X
5	Performance Measure 5.1 – Monitoring at sites with exceedances after implementation of management practices to evaluate effectiveness.	MPM results in Monitoring Plan Progress Report.	MLJ-LLC		X	X

NA–Not applicable, no studies proposed for these site subwatersheds.

GROUNDWATER MANAGEMENT PLAN ACTIVITIES AND PERFORMANCE GOALS

Groundwater Quality Management Plan

All submittal/approval dates associated with the GQMP are included in Table 41. With the final approval of the GAR and identification of HVAs, the Coalition submitted its GQMP on February 23, 2015 and a revised submission on July 29, 2016. Suggested changes to the GQMP were provided during the December 1, 2016 Regional Board Quarterly Meeting. The Coalition revised the GQMP accordingly and resubmitted it on March 9, 2017 (approval pending).

The purpose of the GQMP is to develop a strategy for eliminating/reducing impairments of beneficial uses (BUs) of groundwater due to agricultural practices. The GQMP approach involves three processes:

- Identifying potential sources of discharges that impair beneficial uses,
- Providing education to those growers on management practices to minimize/eliminate their discharge, and
- Monitoring to verify the water quality is improved.

The Coalition will evaluate the effectiveness of the GQMP strategy by documenting nitrate and wellhead management practices of members from FEs, using NMP Summary Report information to assess nitrogen use, assessing the need for additional management practices, and analyzing monitoring data generated by the GQTMP.

Nitrogen Use Outreach and Education Activities

In early 2017, the Coalition provided growers with results from the 2015 NMP Summary Report Analysis (submitted August 2, 2016 and approved November 9, 2016). Outreach packets were mailed on February 1, 2017 to 1,148 members. The Coalition notified members through the outreach packets if they had management units determined to be statistical outliers (383 outlier management units). Outreach packets included the information that the member submitted for the 2015 crop year, a nitrogen use evaluation based on crop type for each reported management unit, and information on how to interpret the nitrogen use evaluation(s).

Members with management units that are A/Y outliers are required to attend NMP Focused Outreach meetings on crop specific nitrogen needs and management practices. Growers with outlier management units will be asked to complete a NMP Focused Outreach survey. The survey collects additional information on more specific management practices such as what types of nitrogen fertilizers are applied (e.g. synthetic, compost, manure, or irrigation water), use of split applications, timing of applications, and more details about irrigation practices. Based on additional information obtained from the NMP Focused Outreach surveys, the Coalition will re-evaluate each member's outlier A/Y ratio and the Coalition will determine which members may need to implement practices to improve their A/Y ratios.

In February and March of 2017, the Coalition held six NMP Focused Outreach crop-specific meetings in Merced, Madera, and Stanislaus County. The Coalition provided fertilizer recommendation guidelines for almonds, walnuts, pistachios, grapevines, tomatoes, and sweet potatoes using information from CDFA. The crop-specific meetings covered basic regulatory background information, a summary of the

NMP Summary Report Analysis, and information on how to improve A/Y ratios. Coalition representatives discussed the importance of applying the 4Rs Nutrient Stewardship approach (The Fertilizer Institute, 2017), utilizing crop nitrogen consumption curves, and key items growers should discuss with agronomists or certified crop advisors.

Management Practice Evaluation Program

All submittal/approval dates associated with the MPEP are included in Table 41. The goal of the MPEP program is to determine which management practices are likely to be protective of groundwater. The primary constituent of concern for the MPEP studies is nitrate. The objectives of the MPEP, as stated in the Waste Discharge Requirements for each Coalition within the Central Valley, are:

1. Identify whether site-specific and/or commodity-specific management practices are protective of groundwater quality within high vulnerability areas.
2. Determine if commonly implemented management practices are improving or may result in improving groundwater quality.
3. Develop an estimate of the effect of Member's discharge of constituents of concern on groundwater quality in high vulnerability areas. A mass balance and conceptual model of the transport, storage, and degradation/chemical transformation mechanisms for the constituents of concern or equivalent method approved by the Executive Officer, must be provided.
4. Utilize the results of evaluated management practices to determine whether practices implemented at represented Member farms (i.e., those not specifically evaluated, but having similar site conditions), need to be improved.

The MPEP process includes activities of the MPEP Group Coordination Committee (MPEP GCC), a Technical Advisory Committee, and an Administrative Coordinator. The MPEP GCC includes the Executive Directors of each Coalition, a grower/member of each Coalition's Board of Directors, and an alternate for each member of the respective Board of Directors. The participating coalitions include the East San Joaquin Water Quality Coalition, Sacramento Valley Water Quality Coalition (SVWQC), San Joaquin County and Delta Water Quality Coalition (SJCDWQC), Westlands Water Quality Coalition (WWQC), and the Westside San Joaquin River Watershed Coalition (WSJWQC).

MEMBER ACTIONS TAKEN TO ADDRESS WATER QUALITY IMPAIRMENTS

Every year coalition members are responsible for completing numerous surveys on farm management practices, sediment and erosion control practices, and nitrogen use (Table 48). Each member is required to attend an annual grower meeting and pay annual membership dues. Growers who are selected for Focused Outreach have to complete annual reporting requirements in addition to filling out extra surveys and scheduling an individual meeting with Coalition staff to review farm management practices.

In addition to completing and returning surveys to the Coalition, growers in high vulnerability areas are required to have their NMP Worksheets and Sediment Erosion Control Plans (SECPs) certified by industry professionals. To assist growers with certifying their on farm documents, the Coalition collaborated with the Coalition for Urban/Rural Environmental Stewardship (CURES) and UC Extension staff to develop self-certification courses for self-certifying NMP Worksheets and SECPs.

Table 48. Member Reporting Requirements

Upcoming Due Date	Member Requirement	WDR Reference	Small Farming Operations (<60 acres)		All Other Members (≥60 acres)		Submitted To
			Low Vulnerability	High Vulnerability	Low Vulnerability	High Vulnerability	
As Needed	Notice of Confirmation	Pg 23	Once				ESJWQC
March 1	Annual Dues ($4/acre + $50)	Pg 21	Annually				ESJWQC
NA	Grower Meeting	Pg 21	Annually				ESJWQC
January 22, 2016	SECP[1]	Pg 25				Required*	Kept on Farm
July 23, 2016	SECP[1]	Pg 23		Required*			Kept on Farm
March 1	Farm Evaluation Plan[2]	Pg 24		Annually		Annually	ESJWQC
March 1, 2018	Farm Evaluation Plan	Pg 24	Every 5 yrs				ESJWQC
March 1, 2020[4]	Farm Evaluation Plan	Pg 24			Every 5 yrs		ESJWQC
March 1	NMP Worksheet[3]	Pg 26	Annually	Annually*	Annually	Annually*	Kept on Farm
March 1	NMP Summary Report[3]	Pg 26				Annually	ESJWQC
March 1, 2018	NMP Summary Report[3]	Pg 26		Annually			ESJWQC

*Certification required.
[1]Updated as farm conditions change
[2]High Vulnerability- either surface or groundwater.
[3]High Vulnerability- groundwater only.
[4]Last due on March 1, 2015.

MANAGEMENT PRACTICES

The Coalition conducts meetings and mails information to inform members about various management practices that are designed to: 1) reduce stormwater runoff and manage discharge of irrigation tailwater, 2) avoid mobilization of sediment that could impact receiving waters, and 3) manage spray applications (Table 49). During the 2016 WY, growers were also provided with information regarding nutrient management practices and sediment and erosion control practices.

The Coalition has conducted focused outreach in priority site subwatersheds since 2008. The purpose of focused outreach is to:

1. Review local water quality concerns and document practices implemented prior to focused outreach (current practices),
2. Recommend additional practices if applicable, and
3. Document practices implemented following focused outreach (newly implemented practices).

The Coalition followed the strategy outlined in the 2014 SQMP for seventh priority and 2016 Focused Outreach and will continue to follow this strategy for 2017 Focused Outreach and all other outreach activities moving forward.

Table 49. Management practice categories and associated recommended management practices.

Category	Recommended Management Practice
Irrigation Water Management/ Storm Drainage	Install and/or Improve Berms Between Field & Waterway
	Install Device to Control Timing of Pump/Drain into Waterway
	Install drainage basins (sediment ponds)
	Recirculation - Tailwater return system
	Reduce amount of water used in surface irrigation
	Use of Polyacrylamide (PAM)
Erosion and Sediment Management	Grass Row Centers (Orchards, Vineyards)
	Maintain vegetated filter strips around field perimeter at least 10' wide
	Vegetation is planted along or allowed to grow along ditches
Pest Management/ Dormant Spray Management	Calibrate spray equipment prior to every application
	Nozzles Provide Largest Effective Droplet Size
	Outside nozzles shut off when spraying outer rows next to sensitive sites
	Spray Areas Close to Waterbodies when Wind is Blowing Away
	Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site

Seventh Priority Summary of Implemented Management Practices (2015-2017)

Focused outreach in seventh priority site subwatersheds began in February 2015. Follow-up mailings were sent on August 18, 2016 and included a survey with instructions for growers to record any newly implemented management practices in the Howard Lateral @ Hwy 140 (one grower), Levee Drain @ Carpenter Rd (one grower), and Mootz Drain downstream of Langworth Pond (three growers) site subwatersheds. Since initial contact with growers, one of the three growers scheduled for follow-up in the Mootz Drain downstream of Langworth Pond is no longer a member of the Coalition and therefore only two of the three follow-ups were required, completed, and included in the analysis below (Table 50. All recommended and newly implemented management practices are discussed below.

Table 50. Tally of growers who participated in focused outreach in the seventh set of priority site subwatersheds (2015-2017).

Focused Outreach Actions	Howard Lateral @ Hwy 140	Levee Drain @ Carpenter Rd	Mootz Drain downstream of Langworth
Targeted Growers	12	3	6
Completed Individual Meeting	12	3	6
Growers with Recommended Practices	1	1	3

Focused Outreach Actions	Howard Lateral @ Hwy 140	Levee Drain @ Carpenter Rd	Mootz Drain downstream of Langworth
Completed Follow-up Contact	1	1	2*
Percent Complete (Initial Contact)	**100%**	**100%**	**100%**
Percent Complete (Follow-up Contact)	**100%**	**100%**	**100%**

*One of the three follow-ups was dropped and therefore only two follow-ups were required.

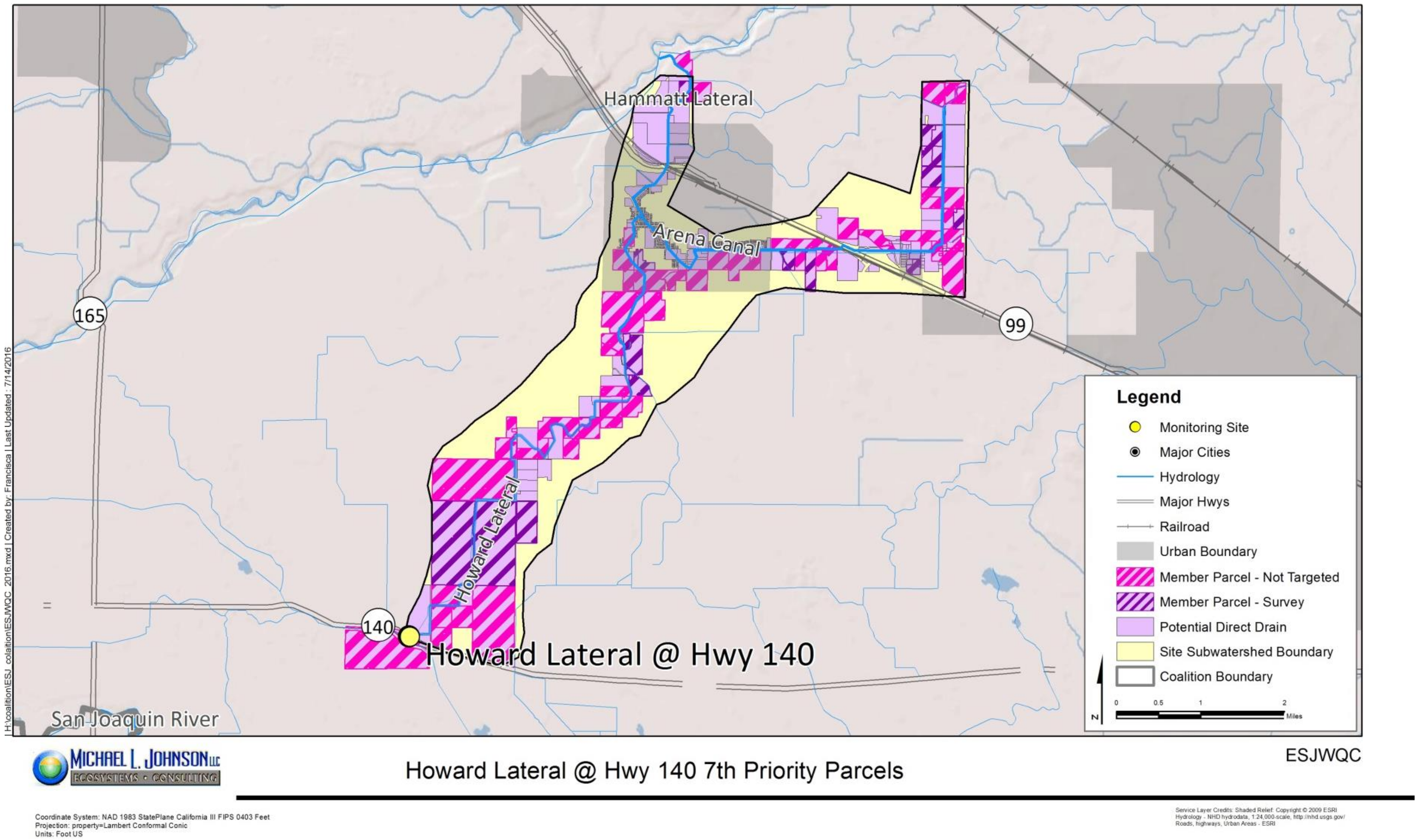
Howard Lateral @ Hwy 140

Management practices were documented for 100% of the total irrigated acres with direct drainage in the Howard Lateral @ Hwy 140 site subwatershed (934 irrigated acres; Figure 13). Management practices were documented for all 12 growers farming 20% of the acreage identified as having direct drainage or parcels located within 200 yards from the waterbody (934 irrigated acres of 4,785; Figure 13). The Coalition followed up with one targeted grower farming 513 acres within the site subwatershed. Coalition representatives discussed local water quality concerns and the importance of preventing offsite movement of agricultural constituents and recommended the management practice of 'spraying areas close to waterbodies when the wind is blowing away from them'. The grower indicated on their follow-up survey that they implemented the recommended management practice (Table 51).

Table 51. Comparison of recommended and implemented practices in the Howard Lateral @ Hwy 140 site subwatershed.

Management Practice	Recommended Practices		Implemented Practices		% Recommended Acreage with Implemented Practices
	# Growers	Acres	# Growers	Acres	
No irrigation drainage from property					
Spray areas close to waterbodies when the wind is blowing away from them	1	513	1	513	100%

Figure 13. Howard Lateral @ Hwy 140 contacted member parcels with direct drainage potential.

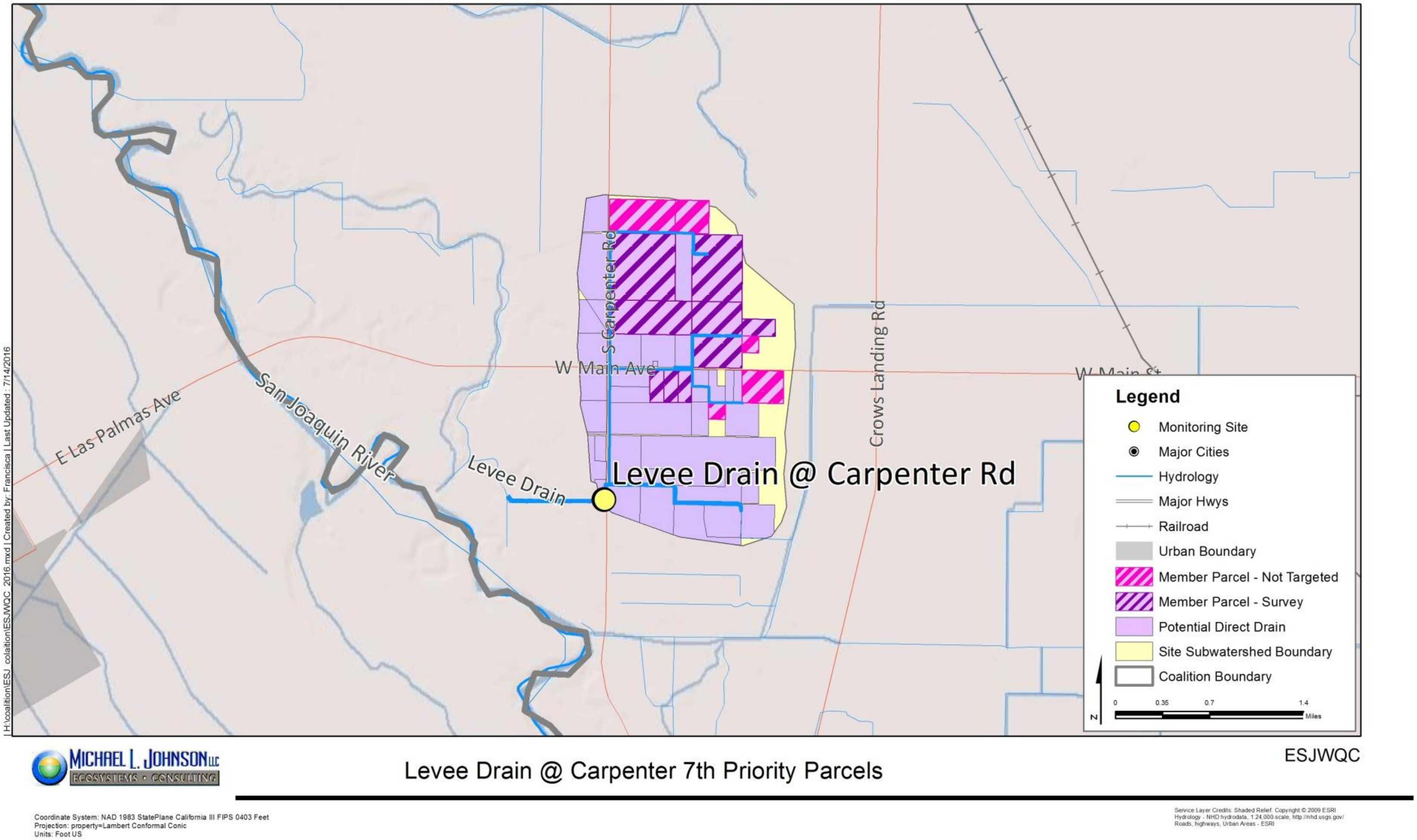


Management practices were documented for 100% of the total irrigated acres with direct drainage in the Levee Drain @ Carpenter Rd site subwatershed (542 irrigated acres; Figure 14). Management practices were documented for all four growers farming 28% of the acreage identified as having direct drainage or parcels located within 200 yards from the waterbody (542 irrigated acres of 1,920; Figure 14). The Coalition followed up with one targeted grower farming 48 acres within the site subwatershed. Coalition representatives discussed local water quality concerns and the importance of preventing offsite movement of agricultural constituents and recommended two management practices, 'tailwater return system' and 'spraying areas close to waterbodies when the wind is blowing away from them'. The grower indicated on their follow-up survey that they implemented the two recommended management practices (Table 52).

Table 52. Comparison of recommended and implemented management practices in the Levee Drain @ Carpenter Rd site subwatershed.

Management Practice	Recommended Practices		Implemented Practices		% Recommended Acreage with Implemented Practices
	# Growers	Acres	# Growers	Acres	
Yes irrigation drainage from property					
Tailwater return system	1	48	1	48	100%
Spray areas close to waterbodies when the wind is blowing away from them	1	48	1	48	100%

Figure 14. Levee Drain @ Carpenter Rd contacted member parcels with direct drainage potential.



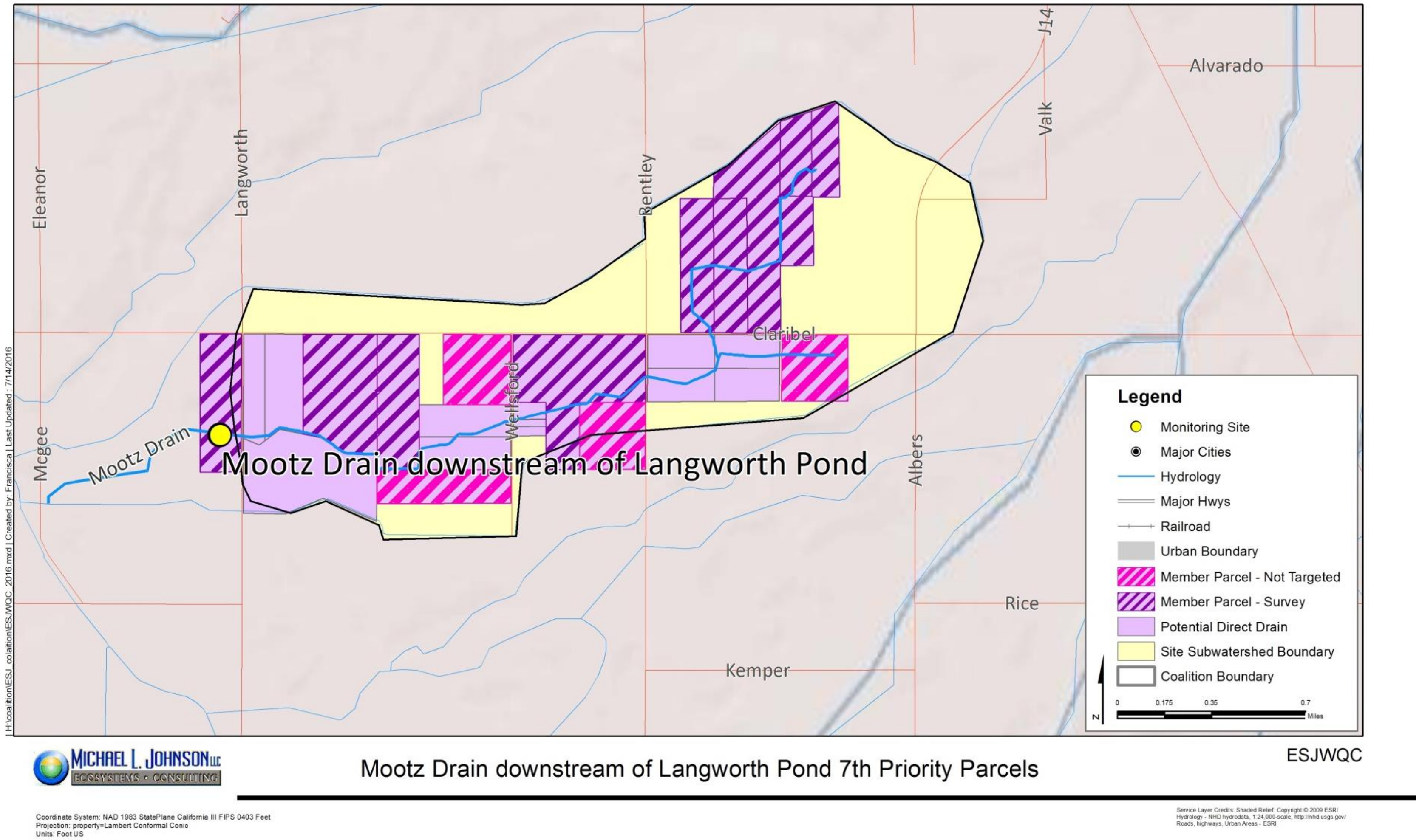
Mootz Drain downstream of Langworth Pond

Management practices were documented for 100% of the total irrigated acres with direct drainage in the Mootz Drain downstream of Langworth Pond site subwatershed (482 irrigated acres; Figure 15). Management practices were documented for all six growers farming 53% of the acreage identified as having direct drainage or parcels located within 200 yards from the waterbody (482 irrigated acres of 917; Figure 15). The Coalition identified three growers requiring follow-ups, however; one of the three growers was dropped from the Coalition for not paying dues. The Coalition followed up with the two targeted growers who were recommended additional practices (farming 147.50 acres). Coalition representatives recommended four management practices, 1) install or improve berms, 2) tailwater return system, 3) sediment ponds, and 4) spray areas close to waterbodies when the wind is blowing away from them. Both growers now spray areas near waterbodies when the wind is blowing away from them and instead of installing a tailwater return system, sprinklers were installed (Table 53).

Table 53. Comparison of recommended and implemented management practices in the Mootz Drain downstream of Langworth Pond site subwatershed.

Management Practice	Recommended Practices		Implemented Practices		% Recommended Acreage with Implemented Practices
	# Growers	Acres	# Growers	Acres	
No irrigation drainage from property					
Berms between field and waterway (install and/or improve)	1	48	0	0	0%
Install sprinklers	0	0	1	48	NA
Spray areas close to waterbodies when the wind is blowing away from them.	2	147.50	2	147.50	100%
Tailwater return system	1	48	0	0	0%
Use drainage basins (sediment ponds) to capture and retain runoff	1	48	0	0	0%

Figure 15. Mootz Drain downstream of Langworth Pond contacted member parcels with direct drainage potential.



2016 Focused Outreach Subwatersheds Summary of Management Practices (2016-2018)

Summary of Current Management Practices (2016)

The Coalition extended 2016 Focused Outreach efforts to members who may or may not have had parcels located outside the site subwatershed boundaries (refer to drainage parcel maps in the section below). The Coalition began focused outreach in the 2016 Focused Outreach site subwatersheds on February 3, 2015 when all members, including dairy members, were sent mailings requiring them to attend a meeting with Western United Dairymen on October 29, 2015 concerning water quality impairments due to 2015 exceedances of the WQTL for chlorpyrifos. Individual meetings with 11 targeted growers in the Prairie Flower Drain @ Crows Landing Rd site subwatershed continued in 2016. The Coalition also targeted members in the Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, and Highline Canal @ Hwy 99 site subwatersheds for 2016 Focused Outreach. The Coalition sent initial contact letters to targeted growers in Dry Creek @ Wellsford Rd (6 growers), Duck Slough @ Gurr Rd (8 growers), and Highline Canal @ Hwy 99 (7 growers) on April 22, 2016. The letters informed growers of member responsibilities, management plan strategies, and directed growers to call Coalition representatives to initiate the scheduling of individual meetings. During individual meetings with targeted growers, Coalition representatives recommended additional management practices designed to address water quality impairments (Table 54).

A follow-up survey was mailed to one targeted grower in the Highline Canal @ Hwy 99 site subwatershed on April 4, 2017 who was recommended the additional management practice of laser leveling their field (Table 54). Follow-up mailings include a survey with instructions for growers to record newly implemented management practice. The Coalition is in the process of following up with this member and the results will be reported during meetings with Regional Board staff and in the May 1, 2018 Annual Report. An additional follow-up survey will be mailed to a single targeted grower in the Prairie Flower Drain @ Crows Landing Rd site subwatershed that was recommended a tailwater return system. The grower is seeking assistance from the 2014 Farm Bill and the Coalition will contact this grower in 2017 to see if the system was implemented.

All MPM is scheduled to occur as outlined in the 2017 WY MPU at all 2016 Focused Outreach site subwatersheds to assess changes in water quality and evaluate the effectiveness of newly implemented management practices.

Table 54. Tally of 2016 Focused Outreach targeted growers and those with recommended management practices.

Focused Outreach Actions	Dry Creek @ Wellsford Rd	Duck Slough @ Gurr Rd	Highline Canal @ Hwy 99	Prairie Flower Drain @ Crows Landing Rd
Targeted Growers	6	8	7	11
Completed Individual Meeting	6	8	7	11
Growers with Recommended Practices	0	0	1	1
Percent Complete (Initial Contact)	**100%**	**100%**	**100%**	**100%**

Dry Creek @ Wellsford Rd

The Dry Creek @ Wellsford Rd site subwatershed consists of 32,919 irrigated acres with 22,845 acres having the potential for direct drainage and/or within 200 yards of the waterbody. The Coalition expanded its outreach efforts to members inside and outside the site subwatershed boundary (Figure 17). The Coalition completed individual meetings with the six targeted growers in the site subwatershed who farm a total of 1,010 irrigated acres. Figure 16 includes crop acreages of the targeted growers. Management practices were documented for all six growers farming 4% of the acreage identified as having direct drainage or their parcel is located within 200 yards of the waterbody (Figure 17). During individual contacts, none of the six targeted growers were recommended additional management practices. Table 55 lists all management practices recorded as currently implemented by targeted growers in the Dry Creek @ Wellsford Rd site subwatershed. Results are summarized below.

Irrigation Water Management

Growers in the site subwatershed utilize two irrigation systems, sprinkler irrigation (one grower; 31 acres), and other (two growers; 426 acres). One grower (74 acres) reported laser leveling their fields to manage irrigation runoff. One grower (352 acres) irrigates based on actual moisture levels in the soil or crop needs and two growers (105 acres) receive water based on irrigation district delivery schedules. Three growers (457 acres) implement tailwater return systems, sediment ponds, and PAM management practices.

Storm Drainage

Of the six targeted growers, two growers (426 acres) reported no storm drainage, three (457 acres each practice) manage stormwater runoff with tailwater return systems, settling ponds and timing. One grower (352 acres) indicated storm water drainage occurs only after soil is saturated in late winter and two growers (105 acres) indicated drainage only in 100 year storms.

Erosion & Sediment Management

Two growers farming 426 acres indicated they do not apply herbicides during winter months. To prevent erosion and sediment movement to the waterway growers implemented two management practices: 1) maintained grass row centers in orchards and vineyards (one grower; 74 acres) and 2) constructed wetlands (2 growers; 383 acres).

Pest Management

Practices implemented for spray management include 1) adjusting spray nozzles to match crop canopy profiles, 2) using nozzles that provide the largest effective droplet size to minimize drift, 3) spray areas close to waterbodies when the wind is blowing away, and using air blast applications when wind is between 3-10 mph (one grower; 74 acres), and two growers (426 acres) utilize electronically controlled nozzles. Two growers with 383 acres considered alternative strategies to using diazinon or chlorpyrifos. One grower with 352 acres calibrates their spraying equipment prior to each application, and one grower with 31 acres calibrates the equipment once per year.

Dormant Spray Management

One grower with 31 acres does not apply chlorpyrifos or diazinon during dormant sprays to their fields and one grower does (352 acres). Three growers farming 457 acres reported no dormant sprays.

Figure 16. Dry Creek @ Wellsford Rd targeted member crop acreage information from 2016 surveys.

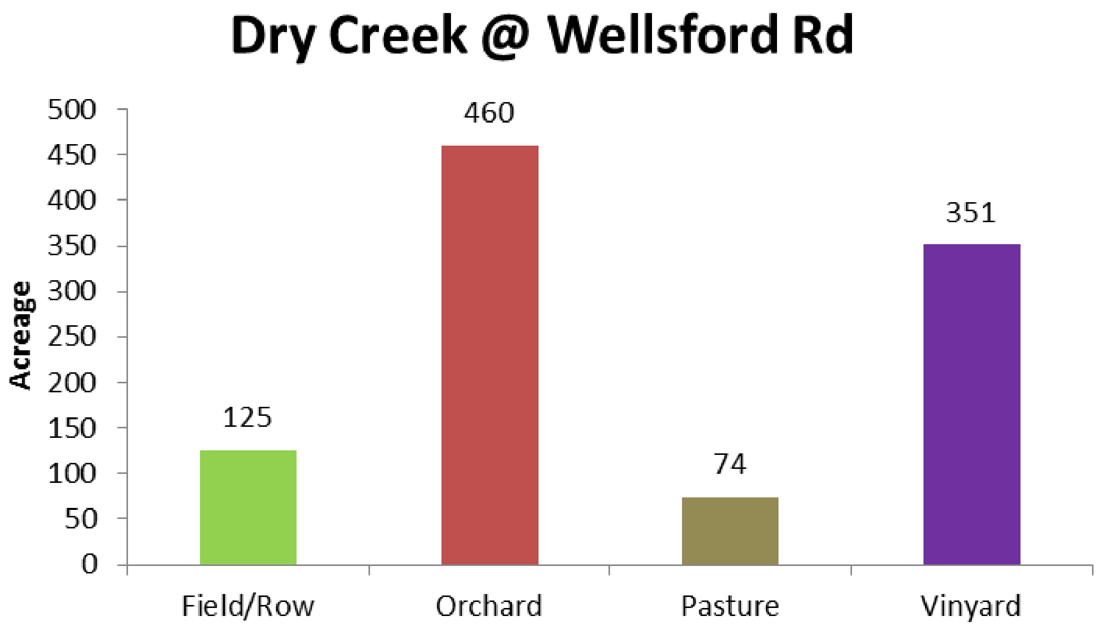


Figure 17. Dry Creek @ Wellsford Rd member parcels with direct drainage potential.

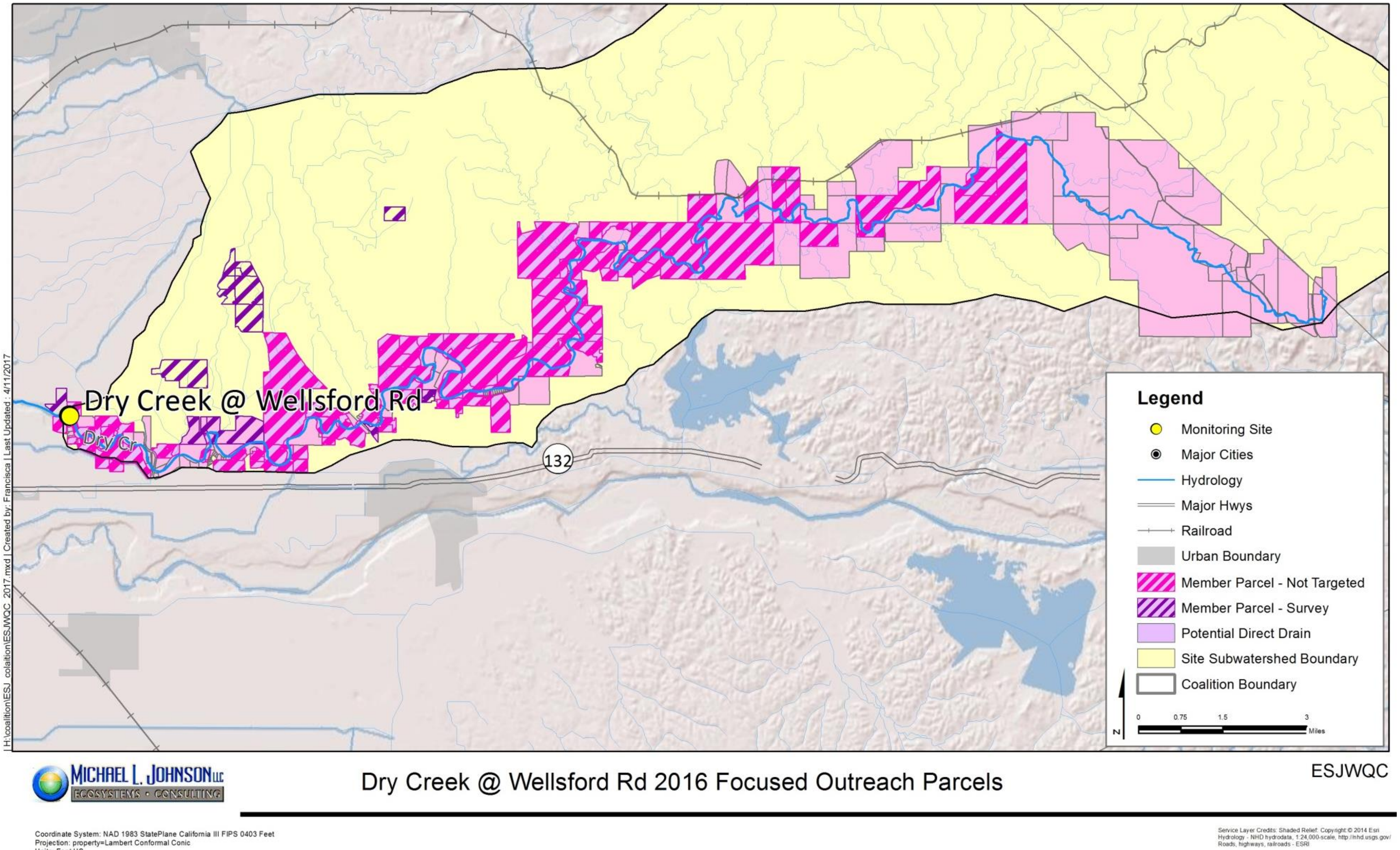


Table 55. Dry Creek @ Wellsford Rd site subwatershed targeted member's current management practices (2016).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Laser leveled fields	1	17%	74
		Recirculation - Tailwater return system	3	50%	457
		Use drainage basins (sediment ponds) to capture and retain runoff	3	50%	457
		Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion	3	50%	457
	Irrigation System	Other	2	33%	426
		Sprinkler	1	17%	31
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	1	17%	352
		Irrigation District Deliveries	2	33%	105
	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	2	33%	383
	Do you plan to use diazinon or chlorpyrifos in the future?	No	1	17%	31
		Yes	1	17%	352
Section 2: Storm Drainage	How are you able to manage storm drainage?	No Storm Drainage	2	33%	426
		Pump/Drain into waterway & able to control timing	3	50%	457
		Pump/Drain into waterway & unable to control timing	3	50%	457
		Recirculation - Tailwater return system	3	50%	457
		Settling Pond	3	50%	457
	When do you have storm water draining from your field?	After soil is saturated-late winter	1	17%	352
		Only in heavy (100 year) storms	2	33%	105
Section 3: Erosion & Sediment Management	Sediment management practices:	Constructed wetlands	2	33%	383
		Grass Row Centers (Orchards, Vineyards)	1	17%	74
	Do you apply herbicides during winter months?	Do not apply	2	33%	426
		Other	1	17%	31
Section 4: Pest Management	Spray management practices:	Adjust spray nozzles to match crop canopy profile	1	17%	74
		Outside nozzles shut off when spraying outer rows next to sensitive sites	1	17%	74
		Spray areas close to waterbodies when the wind is blowing away from them	1	17%	74
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	1	17%	74
		Use electronic controlled sprayer nozzles	2	33%	426

CHECKLIST	QUESTION	ANSWER	COUNT OF RESPONDENTS	PERCENT OF RESPONDENTS	SUM OF ACREAGE
		Uses of nozzles that provide largest effective droplet size to minimize drift	1	17%	74
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	2	33%	383
	How often is spray equipment calibrated?	Once per year	1	17%	31
		Prior to each application	1	17%	352
Section 5: Dormant Spray Management	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	1	17%	31
		Yes	1	17%	352
	How many acres are sprayed with dormant pesticides?	No Dormant Sprays	3	50%	457

Duck Slough @ Gurr Rd

The Duck Slough @ Gurr Rd site subwatershed consists of 16,823 irrigated acres with 16,738 acres with the potential for direct drainage and/or within 200 yards of the waterbody. The Coalition expanded focused outreach into parcels adjacent to Deane's Drain in an effort to contact members not previously included in 2010-2012 outreach in the site subwatershed (Figure 19). The Coalition completed initial contacts with eight targeted growers who farm a total of 5,418 irrigated acres. Figure 16 includes crop acreages of the targeted growers. Management practices were documented for all eight growers farming 32% of the acreage identified as having direct drainage or their parcel is located within 200 yards of the waterbody (Figure 19). None of the eight targeted growers were recommended additional management practices. Table 56 lists all management practices recorded as currently implemented by targeted growers in the Duck Slough @ Gurr Rd site subwatershed.

Irrigation Water Management

One grower in the site subwatershed utilizes surface irrigation (36 acres), and one uses other type of irrigation (1,820 acres). Two of the targeted growers with 1,856 irrigated acres have tailwater return systems and sediment ponds. Seven of the targeted growers with 5,127 acres use PAM to manage irrigation runoff.

Storm Drainage

Of the eight targeted growers, four growers (3,012 acres) reported no storm drainage, two (1,856 acres each practice) manage stormwater runoff with tailwater return systems, three (2,319 acres) have settling ponds, and two (52 acres) have berms between field and waterway. Two growers (907 acres) indicated storm water drainage occurs only after soil is saturated in late winter and four growers (4,220 acres) indicated drainage only in 100 year storms.

Erosion & Sediment Management

One grower farming 224 acres indicated that they do not apply herbicides during winter months. To prevent erosion and sediment movement to the waterway growers implemented three management practices: 1) constructed wetlands (5 growers; 3,674 acres), 2) maintained grass row centers in orchards and vineyards (3 growers; 1,370 acres) and 3)maintained vegetated filter strips around field perimeter at least 10' wide (2 growers; 499 acres).

Pest Management

Five growers (3,307 acres) implement use of electronic controlled sprayer nozzles for spray management. Six growers (5,127 acres) calibrate their spraying equipment prior to each application.

Dormant Spray Management

Seven of the targeted growers (5,351 acres) reported they do not use chlorpyrifos or diazinon during the dormant or growing seasons. Five (3,674 acres) of the seven targeted growers reported they do not apply dormant sprays to their fields.

Figure 18. Duck Slough @ Gurr Rd targeted member crop acreage information from 2016 surveys.

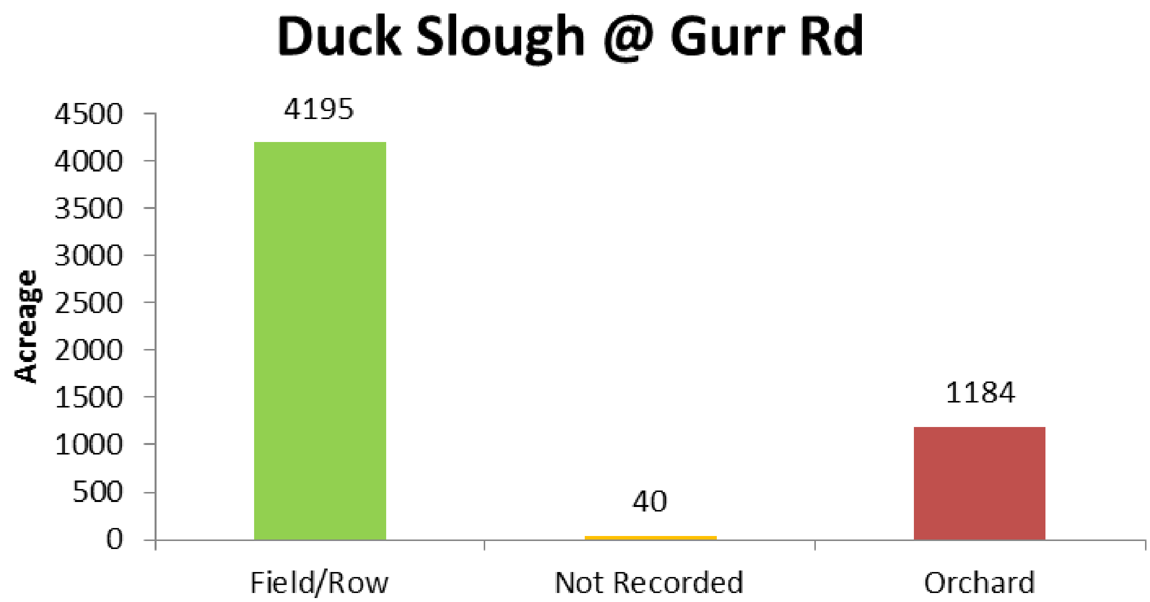


Figure 19. Duck Slough @ Gurr Rd member parcels with direct drainage potential.

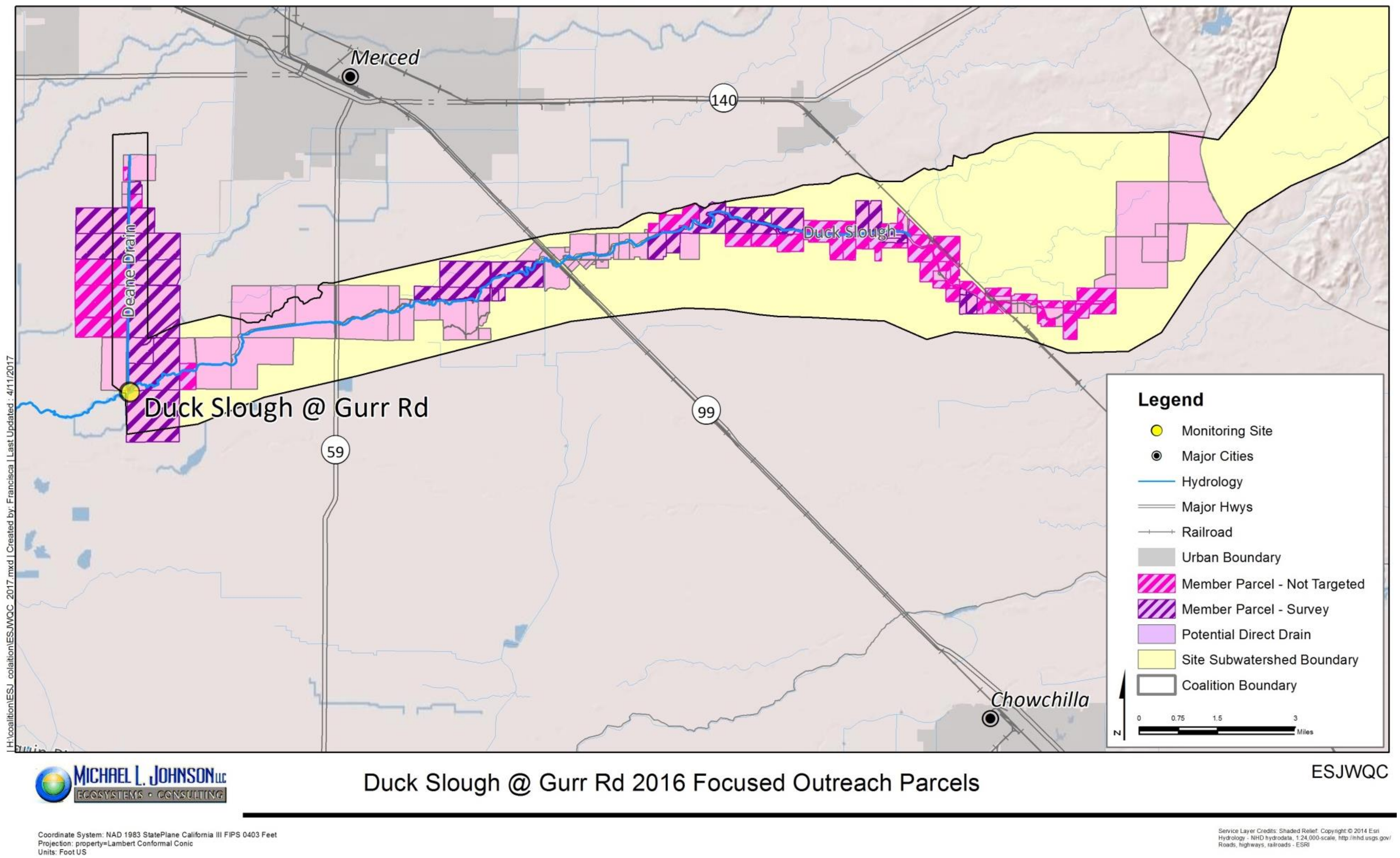


Table 56. Duck Slough @ Gurr Rd site subwatershed targeted member's current management practices (2016).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Recirculation - Tailwater return system	2	25%	1856
		Use drainage basins (sediment ponds) to capture and retain runoff	2	25%	1856
		Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion	7	88%	5127
	Irrigation System	Other	1	13%	1820
		Surface	1	13%	36
	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	7	88%	5351
	Do you plan to use diazinon or chlorpyrifos in the future?	No	7	88%	5351
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	6	75%	5127
Section 2: Storm Drainage	How are you able to manage storm drainage?	Berms Between Field & Waterway (Install and/or Improve)	2	25%	520
		No Storm Drainage	4	50%	3012
		Pump/Drain into waterway & able to control timing	4	50%	3190
		Pump/Drain into waterway & unable to control timing	5	63%	3674
		Recirculation - Tailwater return system	2	25%	1856
		Settling Pond	3	38%	2319
	When do you have storm water draining from your field?	After soil is saturated-late winter	2	25%	907
		Only in heavy (100 year) storms	4	50%	4220
Section 3: Erosion & Sediment Management	Sediment management practices:	Constructed wetlands	5	63%	3674
		Grass Row Centers (Orchards, Vineyards)	3	38%	1370
		Maintain vegetated filter strips around field perimeter at least 10' wide	2	25%	499
	Do you apply herbicides during winter months?	Do not apply	1	13%	224
		Other	1	13%	1820
Section 4: Pest Management	Spray management practices:	Use electronic controlled sprayer nozzles	5	63%	3308
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	No	3	38%	3757
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	3	38%	1131
	How often is spray equipment calibrated?	Prior to each application	6	75%	5127

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 5: Dormant Spray Management	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	7	88%	5351
	How many acres are sprayed with dormant pesticides?	No Dormant Sprays	5	63%	3674

Highline Canal @ Highway 99

The Highline Canal @ Hwy 99 site subwatershed consists of 11,631 irrigated acres with the potential for direct drainage and/or within 200 yards of the waterbody. The Coalition expanded its outreach efforts to members inside and outside the site subwatershed boundary (Figure 21). The Coalition completed initial contacts with seven targeted growers who farm a total of 177 irrigated acres. Figure 16 includes crop acreage of the targeted growers. Management practices were reported for all seven growers farming 2% of the irrigated acreage (Figure 21). Table 57 lists all management practices recorded as currently implemented by targeted growers in the Highline Canal @ Hwy 99 site subwatershed.

Irrigation Water Management

Three growers (81 acres) in the site subwatershed utilize micro irrigation systems and base irrigation schedule on actual moisture levels in soil. One grower (30 acres) was recommended to implement the new management practice (laser level fields).

Storm Drainage

Five growers (144 acres) indicated no stormwater runoff.

Erosion & Sediment Management

One grower (18 acres) reported applying glyphosate, and maintains vegetated filter strips around field perimeters.

Pest Management

Three growers (81 acres) considered alternative strategies to using diazinon or chlorpyrifos and two growers (51 acres) calibrate their spraying equipment prior to each application.

Dormant Spray Management

Five growers (132 acres) do not apply dormant sprays to their fields.

Figure 20. Highline Canal @ Hwy 99 targeted member crop acreage information from 2016 surveys.

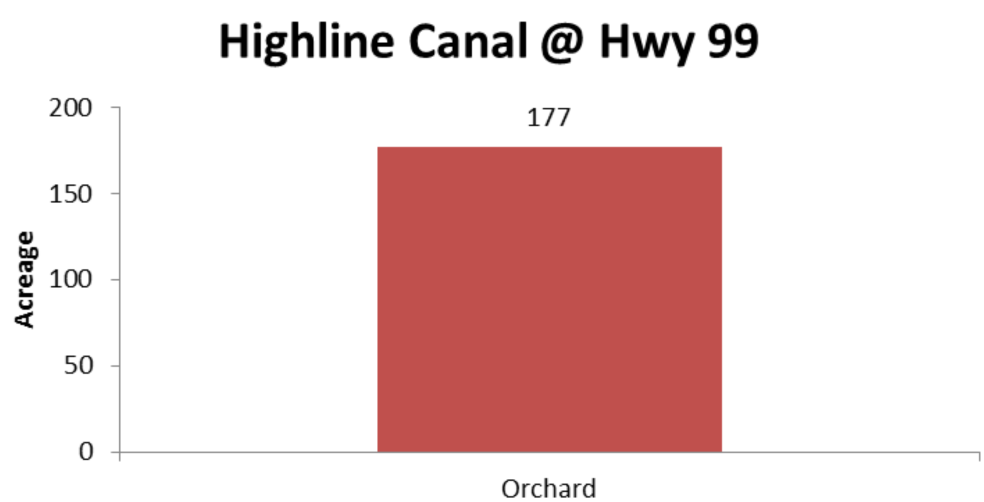


Figure 21. Highline Canal @ Hwy 99 member parcels with direct drainage potential.

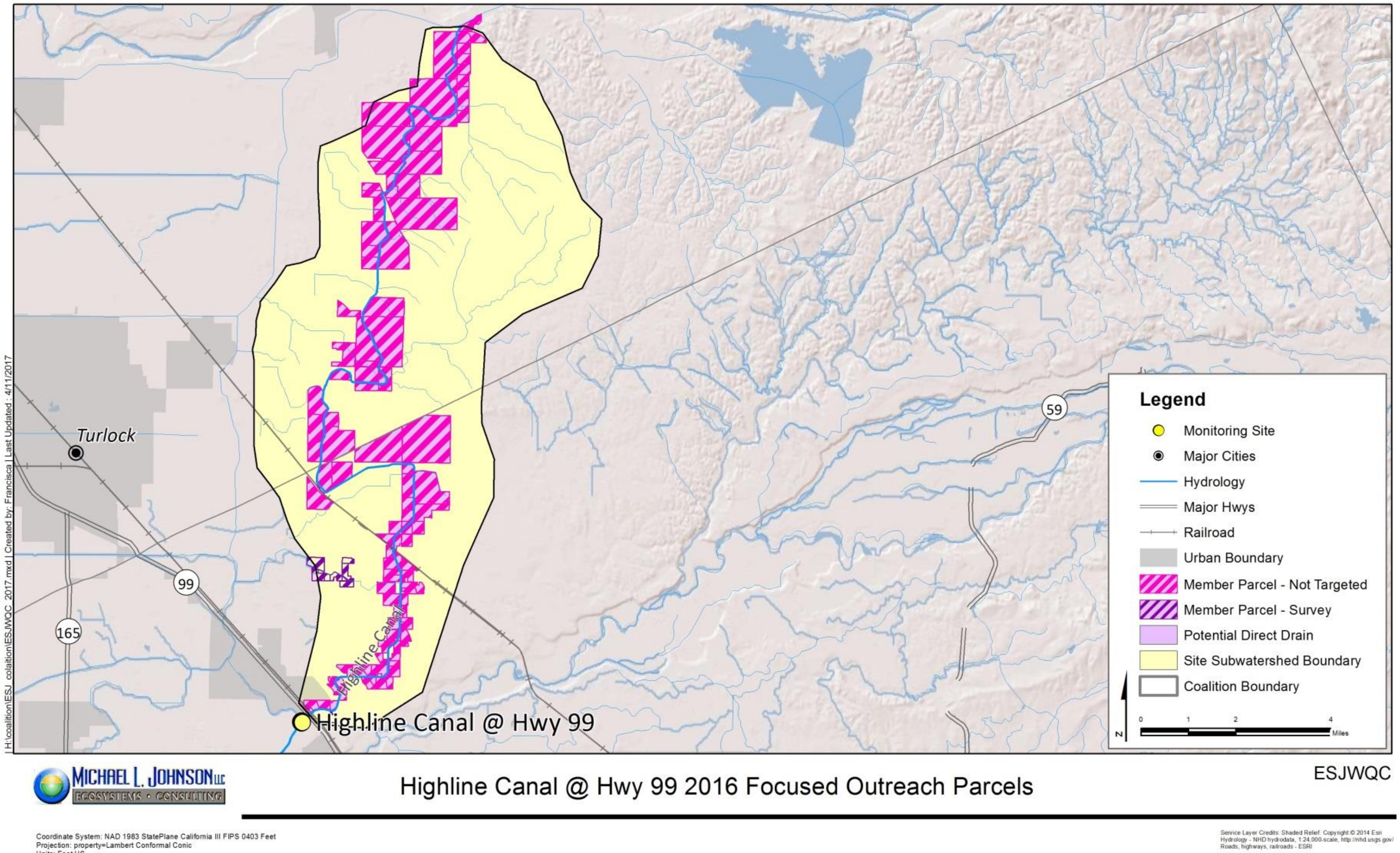


Table 57. Highline Canal @ Hwy 99 site subwatershed targeted member's current management practices (2016).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	3	43%	81
	Do you plan to use diazinon or chlorpyrifos in the future?	No	3	43%	81
	Irrigation System	Micro irrigation	3	43%	81
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	3	43%	81
Section 2: Storm Drainage	How are you able to manage storm drainage?	No Storm Drainage	2	29%	63
	When do you have storm water draining from your field?		3	43%	81
Section 3: Erosion & Sediment Management	Do you apply herbicides during winter months?	Glyphosate (Round-Up)	1	14%	18
	Sediment management practices:	Maintain vegetated filter strips around field perimeter at least 10' wide	1	14%	18
Section 4: Pest Management	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	3	43%	81
	How often is spray equipment calibrated?	Prior to each application	2	29%	51
Section 5: Dormant Spray Management	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	3	43%	81
	Have you been informed of DPR's Dormant Spray Regulations?	Yes	1	14%	30
	How many acres are sprayed with dormant pesticides?	No Dormant Sprays	2	29%	51

Prairie Flower Drain @ Crows Landing Rd

The Prairie Flower Drain @ Crows Landing Rd site subwatershed consists of 2,289 irrigated acres with the potential for direct drainage and/or within 200 yards of the waterbody. The Coalition expanded its outreach efforts to members inside and outside the site subwatershed boundary (Figure 23). The Coalition completed initial contacts with 11 targeted growers who farm a total of 700 irrigated acres. Figure 16 includes crop acreage of the targeted growers. Management practices were reported for all 11 targeted growers farming 31% of the irrigated acreage (Figure 23). Table 58 lists all management practices recorded as currently implemented by targeted growers in the Prairie Flower Drain @ Crows Landing Rd site subwatershed.

Irrigation Water Management

Four growers who farm a total of 290 acres in the site subwatershed utilize surface irrigation systems and base their irrigation schedule on actual moisture levels in soil. One grower (160 acres) indicated no irrigation drainage (Table 58).

Storm Drainage

Three growers (243 acres) indicated no stormwater runoff. Four growers (393 acres) indicated they have berms between fields and waterways, five growers (460 acres) have settling ponds, and four growers (393 acres) have tailwater return systems (Table 58).

Erosion & Sediment Management

One grower (34 acres) reported applying glyphosate, and three growers (243 acres) have constructed wetlands, grass row centers, maintain vegetated filter strips around field perimeters, and have vegetation planted along or allowed to grow along ditches (Table 58).

Pest Management

Four growers (411 acres) have considered alternative strategies to using diazinon or chlorpyrifos and calibrate their spraying equipment prior to each application. Four growers (310 acres) adjust spray nozzles to match crop canopy, shut off outside nozzles when spraying outer rows, and use air blast applications when wind is between 3-10 mph and upwind of sensitive sites. Three growers (243 acres) spray areas close to waterbody when wind is blowing away, use electronic controlled sprayer nozzles, and use nozzles that provide largest effective droplet size to minimize drift (Table 58).

Dormant Spray Management

Four growers (411 acres) do not apply dormant sprays to their fields (Table 58).

Figure 22. Prairie Flower Drain @ Crows Landing Rd targeted member crop acreage information from 2016 surveys.

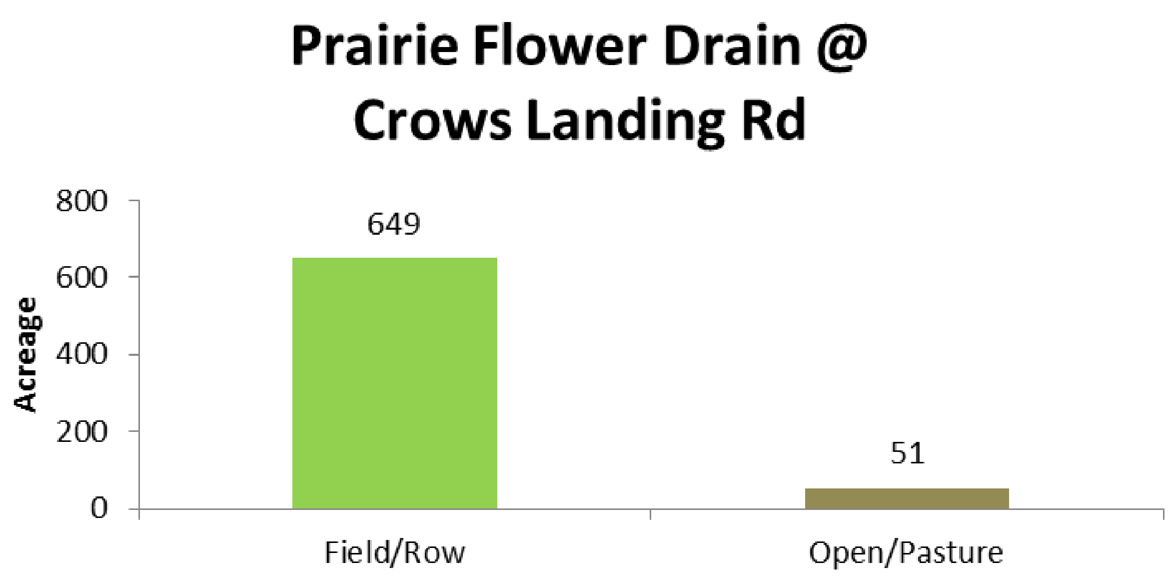


Figure 23. Prairie Flower Drain @ Crows Landing Rd member parcels with direct drainage potential.

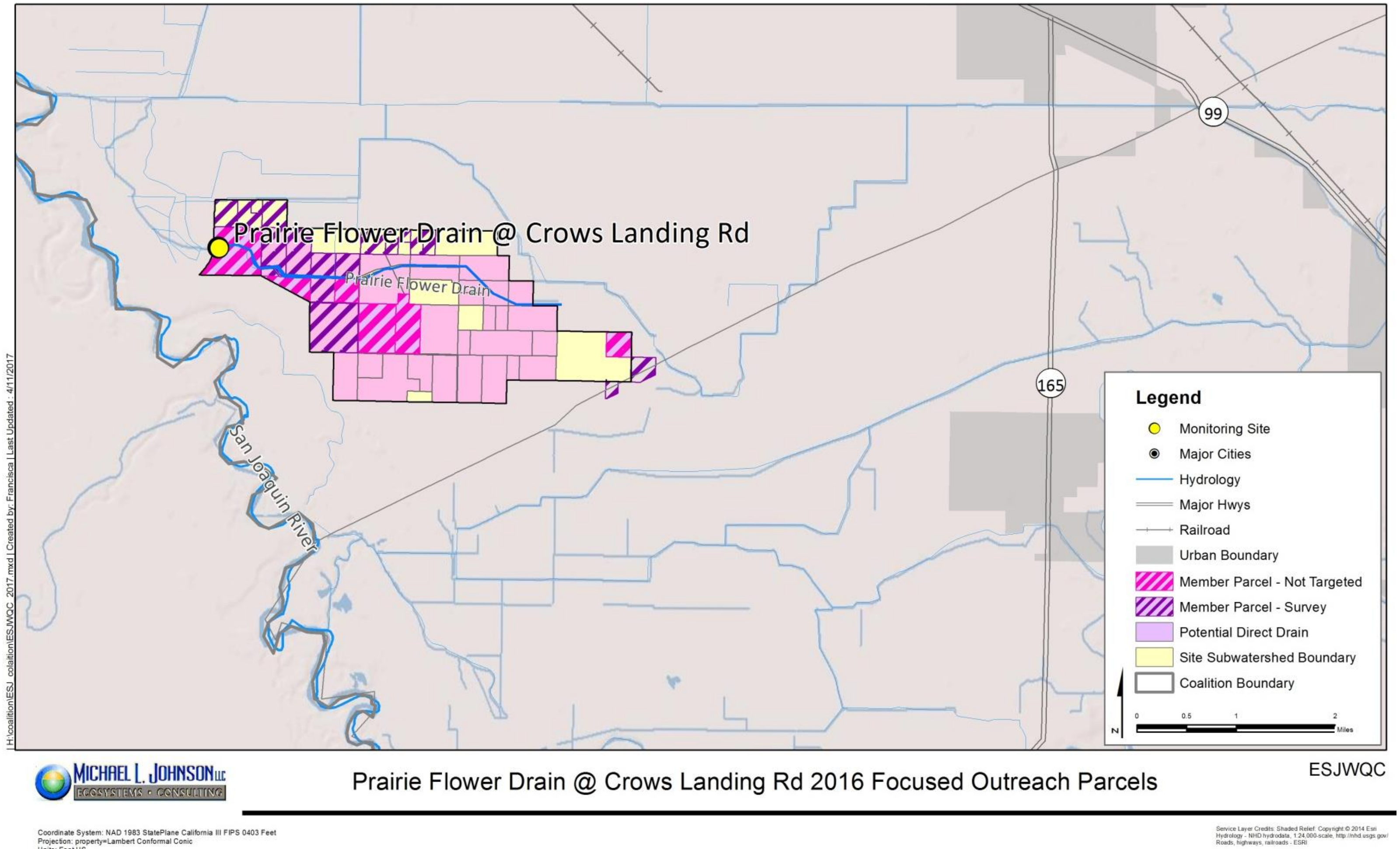


Table 58. Prairie Flower Drain @ Crows Landing Rd site subwatershed current management practices (2016).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum of Sum Of Acreage
Section 1: Irrigation Water Management	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	5	45%	450
	Do you plan to use diazinon or chlorpyrifos in the future?	No	3	27%	266
	Irrigation management practices:	Laser leveled fields	3	27%	243
		Recirculation - Tailwater return system	3	27%	243
		Use drainage basins (sediment ponds) to capture and retain runoff	4	36%	283
		Use of Polyacrylamide (PAM) to increase water infiltration and reduce furrow erosion	4	36%	283
	Irrigation System	Surface	4	36%	290
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	4	36%	290
	Do you have irrigation drainage?	No	1	9%	160
Section 2: Storm Drainage	How are you able to manage storm drainage?	Berms Between Field & Waterway (Install and/or Improve)	4	36%	393
		No Storm Drainage	3	27%	243
		Pump/Drain into waterway & able to control timing	5	45%	460
			5	45%	460
		Recirculation - Tailwater return system	4	36%	393
		Settling Pond	5	45%	460
	When do you have storm water draining from your field?	No Storm Drainage	2	18%	190
Section 3: Erosion & Sediment Management	Do you apply herbicides during winter months?	Do not apply	3	27%	377
		Glyphosate (Round-Up)	1	9%	34
	If waterway crosses or borders pasture, how is livestock managed?	N/A - Not Pasture	3	27%	140
	Sediment management practices:	Constructed wetlands	3	27%	243
		Grass Row Centers (Orchards,Vineyards)	3	27%	243
		Maintain vegetated filter strips around field perimeter at least 10' wide	3	27%	243
		Vegetation is planted along or allowed to grow along ditches	3	27%	243
Section 4: Pest Management	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	4	36%	411
	How often is spray equipment calibrated?	Prior to each application	4	36%	411
	Spray management practices:	Adjust spray nozzles to match crop canopy profile	4	36%	310
		Outside nozzles shut off when spraying outer rows next to sensitive sites	4	36%	310
		Spray areas close to waterbodies when the wind is blowing away from them	3	27%	243
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	4	36%	310
		Use electronic controlled sprayer nozzles	3	27%	243

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum of Sum Of Acreage
		Uses of nozzles that provide largest effective droplet size to minimize drift	3	27%	243
Section 5: Dormant Spray Management	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	4	36%	411
		Yes	1	9%	40
	How many acres are sprayed with dormant pesticides?	No Dormant Sprays	3	27%	140

Summary of Newly Implemented Management Practices

During initial individual contacts, the Coalition documented numerous management practices currently implemented by members targeted for focused outreach. The survey completed during individual contacts is categorized into management practices in five separate sections: Irrigation Water Management, Storm Drainage, Erosion and Sediment Management, Pest Management, and Dormant Spray Management.

Table 59 lists the number of acres associated with each newly implemented management practice. As a result of focused outreach, 43% of the targeted acreage in the first through seventh priority site subwatersheds have newly implemented management practices. The number and type of practices implemented by members varies among site subwatersheds because each is unique in both water quality impairments and sources of the impairments. Overall, growers implemented several new practices in the Irrigation/Storm Runoff Management and Pest/Dormant Spray Management categories to manage spray drift, irrigation tailwater, and storm drainage (Table 59). Figure 24 depicts the percentage of acreage represented by newly implemented management practices in the first through seventh priority site subwatersheds.

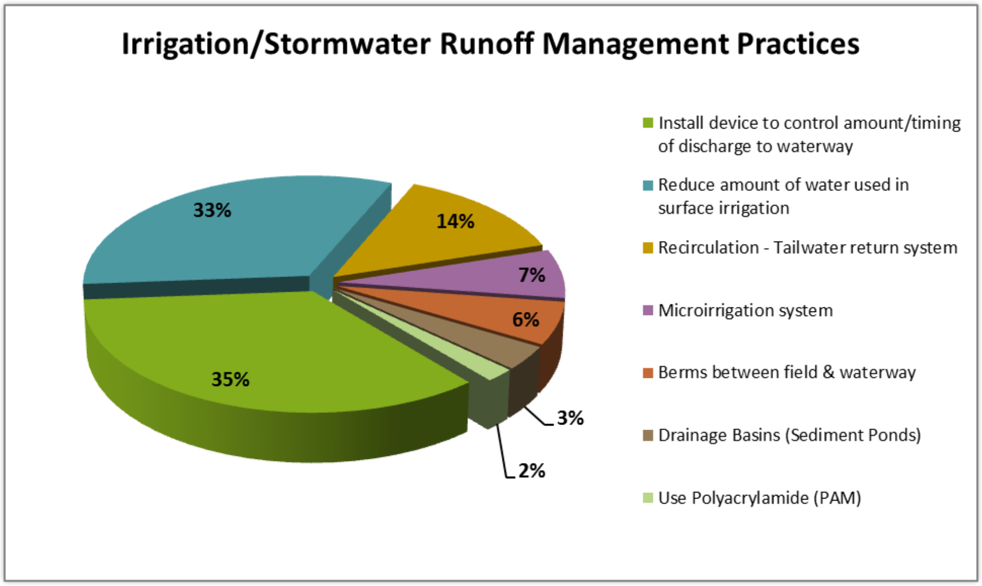
Due to the implementation of management practices by growers, 65 management plan constituents have been approved for completion in 22 of the first through seventh priority site subwatersheds (Table 72).

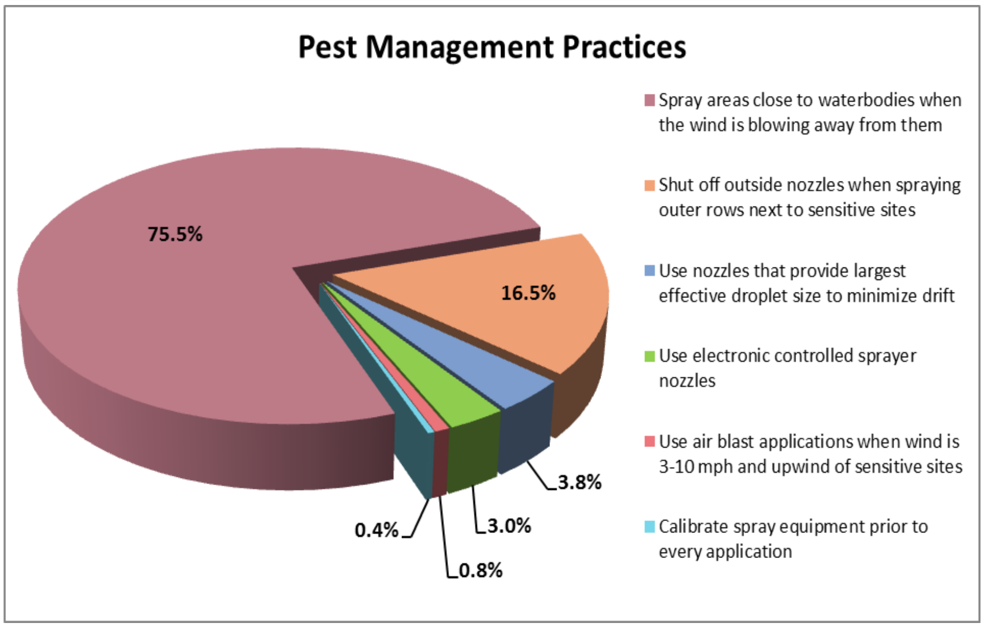
Table 59. Summary of first through seventh priority subwatershed targeted acreage with newly implemented management practices.

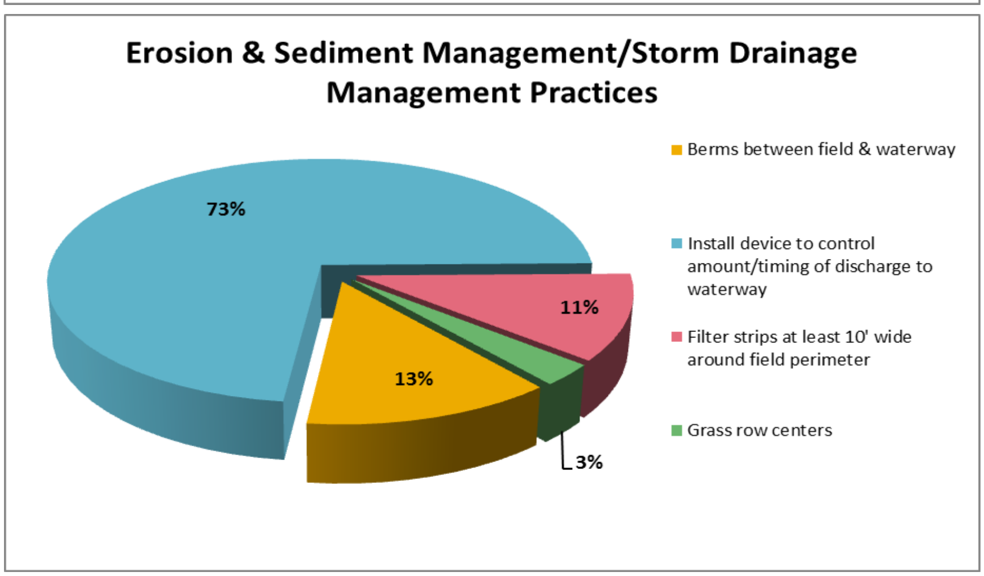
Practice Category		1st Priority Subwatersheds (2008-2010)	2nd Priority Subwatersheds (2010-2012)	3rd Priority Subwatersheds (2011-2013)	4th Priority Subwatersheds (2012-2014)	5th Priority Subwatersheds (2013-2015)	6th Priority Subwatersheds (2014-2016)	7th Priority (2015-2017)			Sum of Targeted Acreage	Percent of Targeted Acreage with New Practices Implemented
								Howard Lateral @ Hwy 140	Levee Drain @ Carpenter Rd	Mootz Drain downstream of Langworth Pond		
	Targeted Acreage:	11,273	10,084	10,974	4,410	9,947	9838	934	542	482	58,484	NA
	Management Practices											
Irrigation, Storm Runoff	Berms between field & waterway			402	80						482	1%
Irrigation, Storm Runoff	Drainage Basins (Sediment Ponds)	271									271	<1%
Irrigation, Storm Runoff	Install device to control amount/timing of discharge to waterway	1,660		402	80	574					2,716	5%
Irrigation, Storm Runoff	Micro irrigation system	279	207	71							557	1%
Irrigation, Storm Runoff	Recirculation - Tailwater return system	443			609				16		1,068	2%
Irrigation, Storm Runoff	Reduce amount of water used in surface irrigation	1,197	1,028	308							2,533	4%
Irrigation, Storm Runoff	Use Polyacrylamide (PAM)	150									150	<1%
Sed. and Erosion	Filter strips at least 10' wide around field perimeter	28	8								419	1%
Sed. and Erosion	Grass row centers	107									107	<1%
Pest, Dormant Spray	Calibrate spray equipment prior to every application			44							44	<1%
Pest, Dormant Spray	Shut off outside nozzles when spraying outer rows next to sensitive sites	1,170	622	251							2,043	4%
Pest, Dormant Spray	Spray areas close to waterbodies when the wind is blowing away from them		1,223	528		3,489	3445	513	16	148	9,362	16%
Pest, Dormant Spray	Use air blast applications when wind is 3-10 mph and upwind of sensitive sites		25			72					97	<1%
Pest, Dormant Spray	Use electronic controlled sprayer nozzles		375								375	1%
Pest, Dormant Spray	Use nozzles that provide largest effective droplet size to minimize drift		121	215	139						475	1%
Other[1]	Other (Not specified)	4,102			303						4,405	8%
	Total Acres of Implemented Management Practices	**9,407**	**3,609**	**2,221**	**1,594**	**4,135**	**3445**	**513**	**32**	**148**	**25,104**	**43%**

[1]Management practices implemented other than those specifically recommended by Coalition representatives for growers.

Figure 24. Percentage of acreage represented by newly implemented management practices in the first through seventh priority site subwatersheds.







FARM EVALUATIONS

FARM EVALUATION SURVEYS

Members are required to complete their Farm Evaluation survey (FE) based on farm size and whether the enrolled parcels are in a high or low vulnerability area (HVA or LVA). Small farming operations are defined as 60 acres or less. High vulnerability areas (HVAs) are the geographic regions within the Coalition area where there are surface water quality management plans in place or the area has been determined to be highly vulnerable for groundwater in the GAR. The FEs for 2016 were required for members with: 1) parcels in surface and/or groundwater HVAs or 2) large farms with parcels in LVAs without prior survey data available. Table 41 includes the Farm Evaluation official submittal deadlines for HVAs and LVAs. The Coalition mailed all growers FEs to complete for the 2016 crop year. Survey responses were recorded in a Coalition maintained Access database and linked to an Assessor Parcel Number (APN) and acreage. The results are being submitted in an Access database along with this report and are identified on a Township-Range level, where the Township is assigned based on the centroid of each parcel. The Coalition is in the process of entering late FEs into the database. Reminder notifications will be mailed to growers for any outstanding Farm Evaluations in the following months to try and get 100% compliance. The Coalition anticipates entering all outstanding Farm Evaluations by August and will submit a Farm Evaluation Analysis Addendum to the 2017 Annual Report on September 1, 2017.

Data from the surveys can be used to evaluate changes in surface water quality relative to changes in management practices. The FE is designed to collect information in four areas of interest:

- Part A: whole farm evaluation,
- Part B: specific field evaluation,
- Part C: irrigation well information, and
- Part D: sediment and erosion control practices.

These survey sections are designed to gather information from growers regarding both surface and groundwater management practices for:

1. Identification of crops grown and the irrigated acreage of each crop,
2. Geographical location of the member's farm,
3. Identification of on-farm management practices implemented to achieve the WDR farm management performance standards,
4. Identification of whether or not there is movement of soil during storm events and/or during irrigation (sediment and erosion risk areas) and a description of where this occurs,
5. Identification of whether or not water leaves the property and is conveyed downstream and a description of where this occurs,
6. Location of active irrigation wells and abandoned wells, and
7. Applied wellhead protection and backflow prevention practices and devices.

Members were offered assistance with completing their surveys by ESJWQC and third-party staff. The following actions were taken to encourage accurate data collection and reporting:

- For members with pre-populated surveys, questions without responses in the prior year were highlighted, marked with an arrow, and noted as necessary.
- Workshops were held at local Farm Bureaus which allowed Coalition representatives to help members with answering questions and ensuring responses accurately reflect the field specific practices implemented on farms.
- Members were contacted by phone or email for follow-up when priority questions that are essential to the survey were unanswered or responses were unclear; not all members could be contacted prior the submission of this report.

Data were reviewed in the database to reduce errors. The review included, comparing acreages provided by the members to acreages enrolled with the Coalition, and ensuring that there is a response for every question on the survey. During the data entry process, reviewing responses indicated several areas where accuracy could be improved:

- Some parcels were new on the 2016 FE and it was unclear which responses applied to them. These surveys were marked for follow-up and as many members as possible were contacted to resolve these issues.
- Some parcels were non-agriculture, but not clearly marked as such on returned FEs. The Coalition added verbiage to the cover letter in an attempt to minimize this issue; however, some surveys still required follow-up calls.
- In situations where members have multiple parcels with different fields and management practices, some members did not divide their APN acreage into each Site ID/Field ID. If acreage was not filled in by the member and they could not be reached for clarification, the enrolled acreage was used.
- Surveys were returned without all questions completed. When surveys were reviewed and missing responses were noted, Coalition representatives called as many members as possible to complete the missing responses.
- Some members did not provide crop information per field. If the crop type was not filled in by the member, and they could not be reached for clarification, the enrollment data were utilized.

Summary

Farm Evaluations for the 2016 crop year were mailed to all Coalition members. A small percentage of members (3%), of the surveys were not required to be completed for one of three possible reasons:

1. the member had no irrigated acreage enrolled in the Coalition during 2016,
2. they did not farm in 2016, or
3. the member is no longer enrolled in the Coalition.

The Coalition received surveys from 71% of members, representing 85% of Coalition acreage by April 1, 2017 (Table 60).

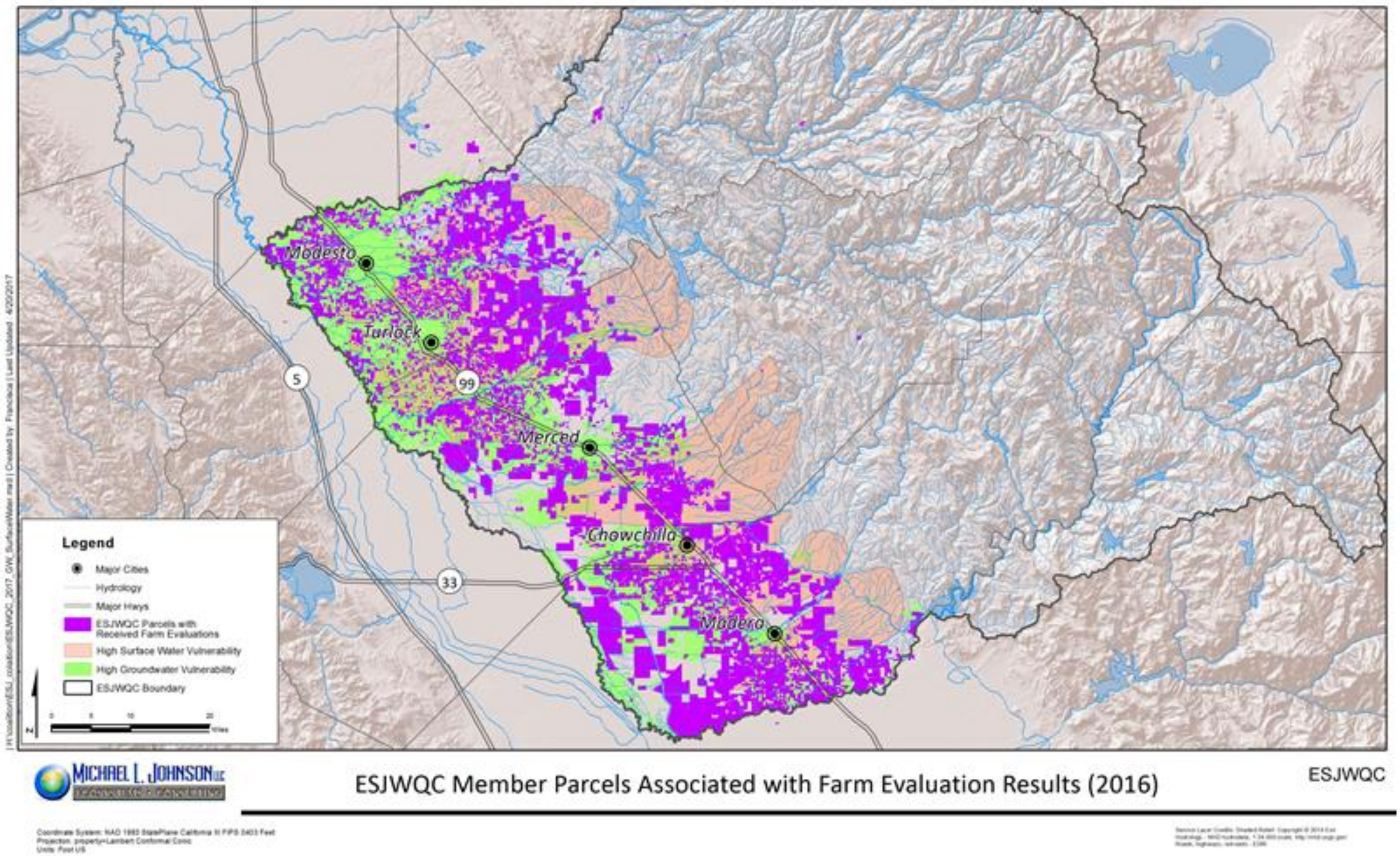
Figure 25 indicates the acreage associated with returned 2016 FEs. Of the 10,610 assessor parcel numbers (APNs) provided on returned FEs, 258 parcels could not be mapped and are therefore associated with an unknown vulnerability (Table 60). Reasons for the inability to map include: 1) the member assigned the parcel to an incorrect county, 2) the parcel number was updated after the mapping layer was updated by the county, 3) the member reported an old parcel number that no longer links to an updated mapping layer, or 4) the member has reported an incorrect parcel number. These parcels are indicated as "unknown" for vulnerability in Table 60.

Table 60. Summary of acreage and membership counts represented by 2016 FEs.

Survey Status	Vulnerability	Overall Vulnerability[1]	Sum of Acreage	Count of Members
Received	Both SW and GW - High	High	383,850	1,096
	GW - High	High	144,192	996
	SW - High	High	12,211	88
	Both SW and GW - Low	Low	48,646	199
	Unknown	Unknown	1,271	18
		Received Total	**590,170**	**2,397**
Not Received	Both SW and GW - High	High	54,390	427
	GW - High	High	29,108	432
	SW - High	High	2,143	47
	Both SW and GW - Low	Low	14,706	59
	Unknown	Unknown	252	8
		Not Received Total	**100,598**	**973**
		Grand Total	**690,768**	**3,370**
		% Received	**85%**	**71%**

[1] When one or more parcels in a membership is located in a surface or groundwater HVA, a survey was required for all parcels enrolled under the membership.
GW – Groundwater
SW – Surface Water

Figure 25. ESJWQC member parcels associated with one or more Farm Evaluation for the 2016 crop year.



Members reported parcel specific crop information on their 2016 Farm Evaluations. Similar to previous analyses, in the case of multiple crops per parcel, the first crop listed was recorded as the primary crop. Primary crops were grouped into general categories and sub categories to look at trends within the Coalition region (Figure 26; Table 61). Figure 26 includes all of the general categories of crops and their acreage percentages. General categories include:

- pasture/hay/grain,
- orchard,
- row crop,
- vineyard,
- not farmed (not agriculture or fallow)
- not recorded (crop type not provided)

Similar to previous years, orchards were the most reported type of crop in the ESJWQC region (398,235 acres; Figure 26). Figure 27 provides a summary of the types of orchards associated with 2016 FEs, with nut trees broken down further into primary crops.

Figure 26. General categories of reported crops in 2016 Farm Evaluations, displayed as percent of total reported acreage.

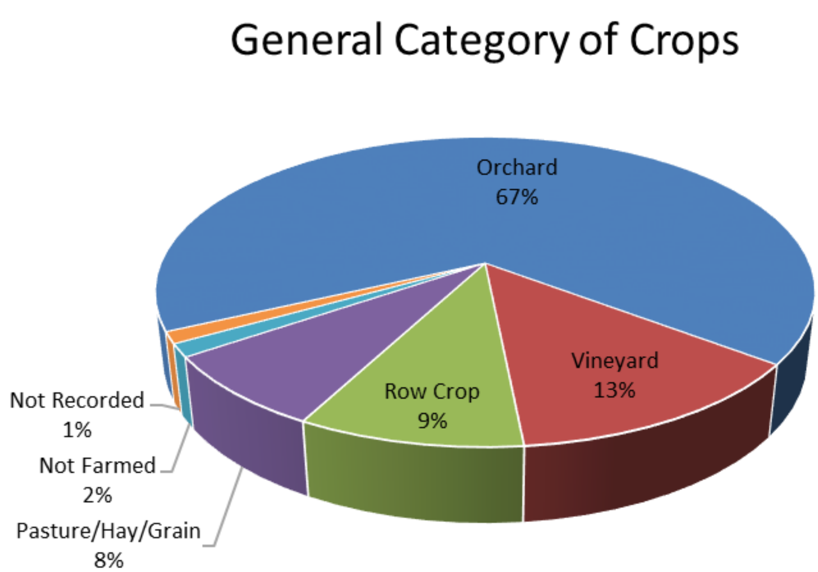


Figure 27. A summary of the type of orchards associated with 2016 Farm Evaluations, displayed as percent of acres reported.

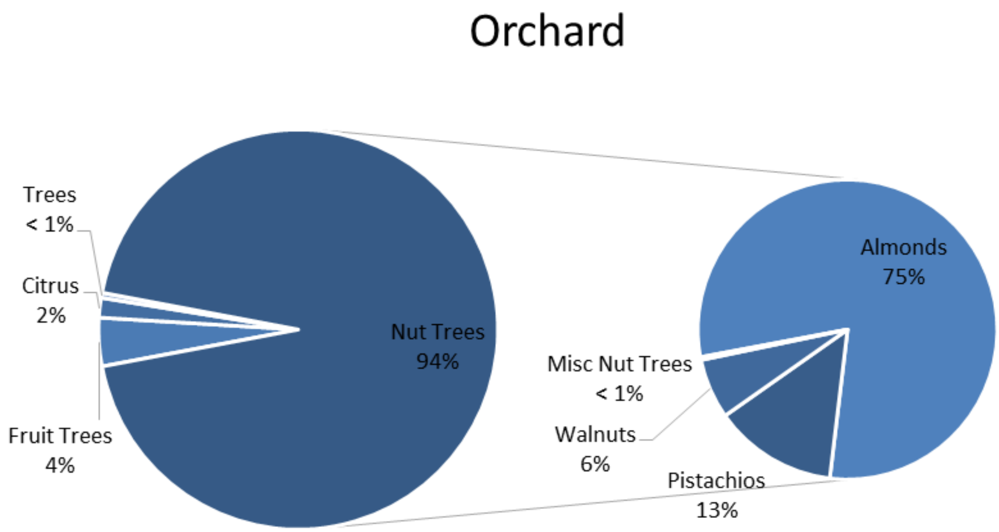


Table 61. Crop standardization table used for analysis of reported crops, shown with the percent of total reported acres per primary crop.

General Category	Sub Category	Primary Crop	Reported Acres	Percent of Total Acres
Not Farmed	Habitat	Forage	332	0.06%
	None	Fallow	4,518	0.76%
		No Crop	6,400	1.07%
		No Irrigation	173	0.03%
		Not Farmed	36	< 0.01 %
		Worm Farm	29	< 0.01 %
Not Recorded	Not Recorded	Not Recorded	7,176	1.20%
Orchards	Citrus	Citrus	2,783	0.47%
		Mandarins	839	0.14%
		Oranges	2,674	0.45%
		Tangelos	19	< 0.01 %
	Fruit Trees	Apples	680	0.11%
		Apricots	211	0.04%
		Cherries	961	0.16%
		Figs	6,983	1.17%
		Fruit Trees	274	0.05%
		Nectarines	32	< 0.01 %
		Olives	648	0.11%
		Peaches	4,700	0.79%
		Pears	40	< 0.01 %
		Persimmons	10	< 0.01 %
		Plums	440	0.07%
		Pomegranates	549	0.09%
		Prunes	20	< 0.01 %
		Stone fruit	48	< 0.01 %
	Nut Trees	Almonds	299,206	50.24%
		Chestnuts	35	< 0.01 %
		Nut Trees	869	0.15%

General Category	Sub Category	Primary Crop	Reported Acres	Percent of Total Acres
		Pecans	228	0.04%
		Pistachios	50,071	8.41%
		Walnuts	24,290	4.08%
	Trees	Christmas Trees	3	< 0.01 %
		Eucalyptus	11	< 0.01 %
		Palm Trees	5	< 0.01 %
		Trees	1,607	0.27%
Pasture/Hay/Grain	Grain	Barley	93	0.02%
		Oats	2,970	0.50%
		Rice	1,777	0.30%
		Rye	451	0.08%
		Sorghum	69	0.01%
		Sudan	85	0.01%
		Wheat	5,823	0.98%
	Hay	Alfalfa	16,729	2.81%
		Hay	1,238	0.21%
		Oats	18	< 0.01 %
	Pasture	Alfalfa	497	0.08%
		Clover	402	0.07%
		Grass	127	0.02%
		Pasture	15,383	2.58%
Row Crop	Berries	Berries	364	0.06%
		Raspberries	108	0.02%
		Strawberries	351	0.06%
	Herbs/Spices	Basil	50	< 0.01 %
		Oregano	28	< 0.01 %
		Parsley	22	< 0.01 %
		Spearmint	1	< 0.01 %
		Thyme	16	< 0.01 %
	Nursery/Ornamental	Decorative Greens	16	< 0.01 %
		Flowers	7	< 0.01 %
		Nursery	1,525	0.26%
	Oil crop	Safflower	667	0.11%
	Row Crop	Artichokes	14	< 0.01 %
		Assorted Crops	1,248	0.21%
		Beans	139	0.02%
		Bell Peppers	102	0.02%
		Carrots	1,197	0.20%
		Corn	21,679	3.64%
		Cotton	3,363	0.56%
		Cover Crop	20	< 0.01 %
		Garlic	494	0.08%
		Onions	315	0.05%
		Peppers	349	0.06%
		Potatoes	240	0.04%
		Pumpkins	28	< 0.01 %
		Radicchio	419	0.07%
		Row Crop	5,362	0.90%
		Silage	293	0.05%
		Squash	90	0.02%
		Sweet Potatoes	10,167	1.71%
		Tomatoes	6,570	1.10%
		Zucchini	10	< 0.01 %
	Seed	Onion	25	< 0.01 %
Vineyard	Grapes	Grapes	77,655	13.04%
	Kiwis	Kiwis	104	0.02%

Irrigation Management Practices

Many members utilize several practices to efficiently manage irrigation (Table 62). Survey responses indicated that fields representing 93% of the reported acreage were irrigated according to need (Table 62; Figure 28). Overall, irrigation practices have remained consistent between years. Drip (45%) and micro sprinkler (44%) pressurized irrigation systems were utilized as primary irrigation methods on much of the Coalition acreage (Table 62; Figure 28). Most members did not report a secondary irrigation method, although flood irrigation was the most commonly reported secondary system (Table 62; Table 63).

Table 62. Acreage associated with 2016 irrigation management questions and responses.

Survey Section	Question	Response	Acreage	Response Count	Percent of Acreage[1]
B	Irrigation Efficiency Practices	Water application scheduled to need	546,950	2,125	29%
		Use of moisture probe	366,132	844	20%
		Use of ET in scheduling irrigations	348,130	732	19%
		Laser Leveling	287,727	1,164	16%
		Pressure Bomb	107,138	214	6%
		Soil Moisture Neutron Probe	84,595	160	5%
		Other	64,253	184	3%
		Other: Drip	59,013	117	3%
		No Selection	3,727	44	< 1%
	Primary Irrigation Practices	Micro Sprinkler	265,017	867	36%
		Drip	257,397	759	35%
		Flood	129,429	1,119	18%
		Sprinkler	43,256	328	6%
		Furrow	31,906	139	4%
		Border Strip	8,383	36	1%
		No Selection	3,099	25	< 1%
	Secondary Irrigation Practices	No Selection	329,224	1,718	53%
		Flood	100,010	473	16%
		Drip	76,072	176	12%
		Micro Sprinkler	71,715	144	11%
		Furrow	21,786	68	3%
		Sprinkler	20,527	83	3%
		Border Strip	6,284	20	1%

[1] Percent of acres reported per question

Figure 28. Reported acreage associated with each irrigation efficiency practice.

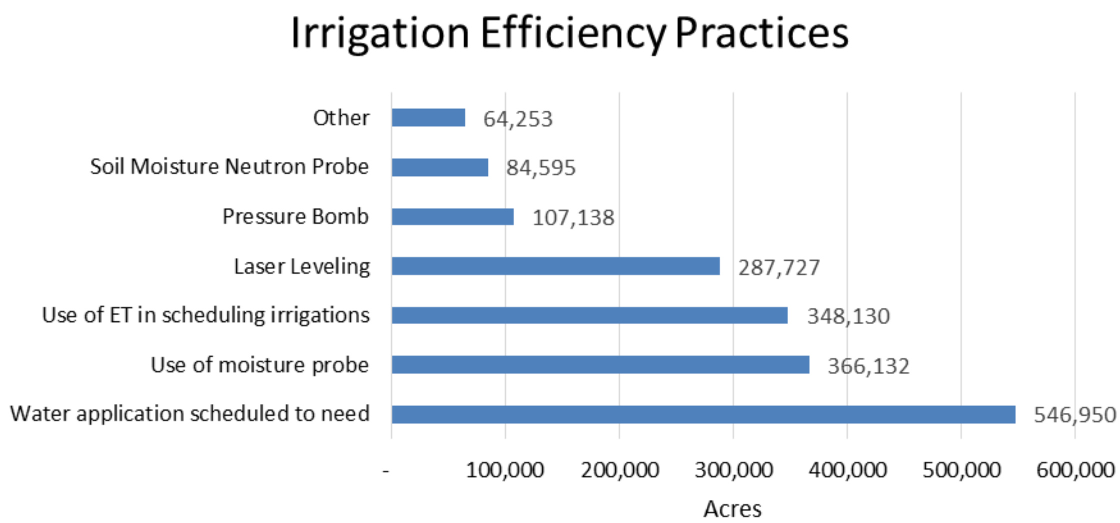


Table 63. Count of management units with secondary irrigation practices reported with primary irrigation practices.

		Secondary Irrigation						
		Border Strip	Drip	Flood	Furrow	Micro Sprinkler	Sprinkler	No Selection
Primary Irrigation	Border Strip	7	4	8	3	2	6	25
	Drip	6	88	206	54	59	48	568
	Flood	13	64	191	25	67	35	975
	Furrow	10	12	24	17	6	9	111
	Micro Sprinkler	4	87	273	16	90	19	640
	Sprinkler	3	31	51	5	22	22	279
	No Selection	-	-	1	1	3	1	23
Management Unit Total		**43**	**286**	**754**	**121**	**249**	**140**	**2,621**

Sediment Management Practices

Coalition members representing 91% of reported acreage note no sediment discharge to off farm surface waters. The majority of Coalition members used management practices to control the discharge of sediment; members typically employed more than one method on a parcel (Table 64). As with prior surveys, members commonly reported increasing water penetration into the soil through amendments such as deep ripping and aeration (456,230 acres), minimizing tillage to allow native vegetation to stabilize soils (391,355), utilizing pressurized irrigation systems to minimize the movement of sediment on their property (461,334 acres), and increasing the time between pesticide applications and irrigation (419,709 acres; Figure 29; Figure 30).

Table 64. Acreage associated with 2016 sediment management practice questions and responses.

Survey Section	Question	Response	Acreage	Response Count	Percent of Acreage
A	Does your farm have the potential to discharge sediment to off-farm surface waters?	No	469,480	2,212	91%
		Yes	118,436	202	8%
		No Selection	4,371	30	1%
D	Cultural Practices to Manage Sediment and Erosion	Soil water penetration has been increased through amendments.	456,230	1,270	16%
		Minimum tillage incorporated to minimize erosion.	391,355	1,430	13%
		Cover crops or native vegetation are used to reduce erosion.	374,795	1,126	13%
		Crop rows are graded, directed and at a length that will optimize the use of rain and irrigation water.	280,291	780	10%
		No storm drainage due to field or soil conditions.	240,948	1,495	8%
		Storm water is captured using field borders.	220,130	849	7%
		Berms capture runoff and trap sediment.	194,299	725	7%
		Vegetative filter strips and buffers are used to capture flows.	125,284	270	4%
		Field is lower than surrounding terrain.	119,754	696	4%
		Vegetated ditches are used to remove sediment as well as water soluble pesticides, phosphate fertilizers and some forms of nitrogen.	114,967	246	4%
		Creek banks and stream banks have been stabilized.	104,573	195	4%
		Subsurface pipelines are used to channel runoff water.	103,098	187	4%
		Hedgerows/trees help stabilize soils & trap sediment movement.	102,833	290	4%
		Sediment basins / holding ponds settle out sediment & pesticides.	101,431	177	3%
		No Selection	6,204	52	< 1%
	Irrigation Practices for Managing Sediment and Erosion	Use drip or micro-irrigation to eliminate irrigation drainage.	461,334	1,289	< 1%
		Time is increased between pesticide applications and irrigation.	419,709	1,395	26%
		No irrigation drainage due to field or soil conditions.	296,946	1,635	24%
		Shorter irrigation runs are used with checks to manage and capture flows.	207,875	716	17%
		Tailwater Return System.	122,294	250	12%
		Catchment Basin.	98,711	195	7%
		Use of flow dissipaters to minimize erosion at discharge point.	70,054	137	6%
		In-furrow dams used to increase infiltration and settle sediment.	53,093	166	4%
		PAM used to bind sediment & increase infiltration.	7,532	27	3%
		No Selection	5,206	38	< 1%
		Other	1,130	14	< 1%

Figure 29. Acreage reported for cultural practices to manage sediment and erosion.

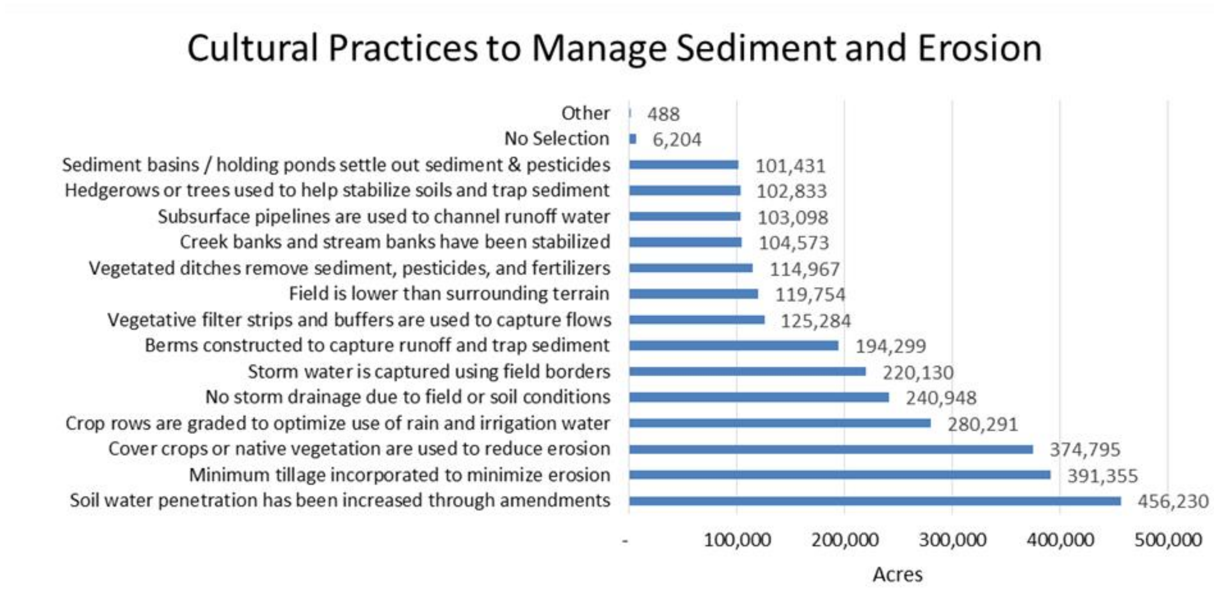
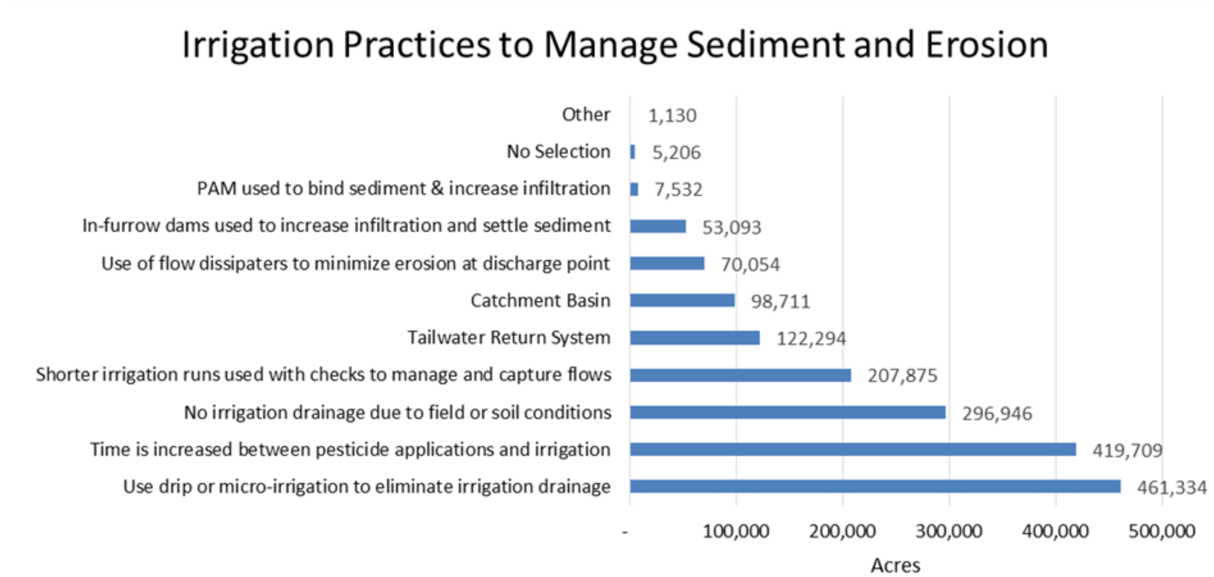


Figure 30. Acreage reported for irrigation practices to manage sediment and erosion.



Pesticide and Nutrient Management

Coalition members continue to employ multiple management practices to reduce the offsite movement of pesticides and nutrients to surface waters (Table 65; Figure 31; Figure 32). On average members employ 11 of the 15 pesticide management practices on the FE survey. Figure 31 represents the acreage associated with each pesticide management practice. Similar to past survey years, following label restrictions, county permit requirements, and monitoring wind conditions were the top reported practices. Many members engage PCAs or CCAs to develop their crop fertility plan (Table 65).

The acreage associated with nitrogen management practices implemented by members in 2016 is provided in Figure 32. Testing soil (17%) and splitting fertilizer applications (17%) continue to be the top reported management practices across the Coalition. The practice of splitting fertilizer applications throughout the season was mainly implemented in orchards.

Table 65. Pesticide and nutrient management practices implemented by members shown in terms of associated parcel acreage and response count.

Survey Section	Question	Response	Acreage	Response Count	Percent of Acreage
A	Pesticide Application Practices	Follow Label Restrictions	575,698	2,205	8%
		County Permit Followed	574,039	2,180	8%
		Monitor Wind Conditions	566,667	2,131	8%
		Use PCA Recommendations	561,140	2,045	8%
		Avoid Surface Water When Spraying	550,603	1,968	8%
		Attend Trainings	548,019	1,864	8%
		End of Row Shutoff When Spraying	547,397	2,011	8%
		Monitor Rain Forecasts	543,016	1,959	8%
		Use Appropriate Buffer Zones	509,861	1,715	8%
		Use Drift Control Agents	471,722	1,416	7%
		Sensitive Areas Mapped	369,772	1,116	5%
		Reapply Rinsate to Treated Field	351,779	1,025	5%
		Chemigation	288,423	606	4%
		Use Vegetated Drain Ditches	141,921	343	2%
		Target Sensing Sprayer used	138,178	380	2%
		Other	17,078	141	< 1%
		No Pesticides Applied	16,114	174	< 1%
		No Selection	2,660	18	< 1%
	Who helps develop the crop fertility plan?	Pest Control Advisor (PCA)	547,418	1,971	34%
		Certified Crop Advisor (CCA)	362,250	1,158	22%
		Professional Agronomist	215,819	422	13%
		Professional Soil Scientist	205,531	506	13%
		UC Farm Advisor	141,891	366	9%
		Independently Prepared by Member	119,386	324	7%
		Certified Technical Service Providers by NRCS	18,287	97	1%
		None of the above	11,682	203	1%
		No Selection	3,050	20	< 1%
B	Nitrogen Management Practices	Soil Testing	529,693	1,756	17%
		Split Fertilizer Applications	511,293	1,778	17%
		Tissue/Petiole Testing	491,909	1,471	16%
		Foliar N Application	424,413	1,300	14%
		Fertigation	401,844	953	13%
		Irrigation Water N Testing	370,915	893	12%
		Cover Crops	226,267	691	7%
		Variable Rate Applications using GPS	55,893	125	2%
		Other	40,011	163	1%
		Do Not Apply Nitrogen	13,463	150	< 1%
		No Selection	3,774	46	< 1%

Figure 31. Pesticide management practices implemented by members, shown in terms of reported parcel acreage.

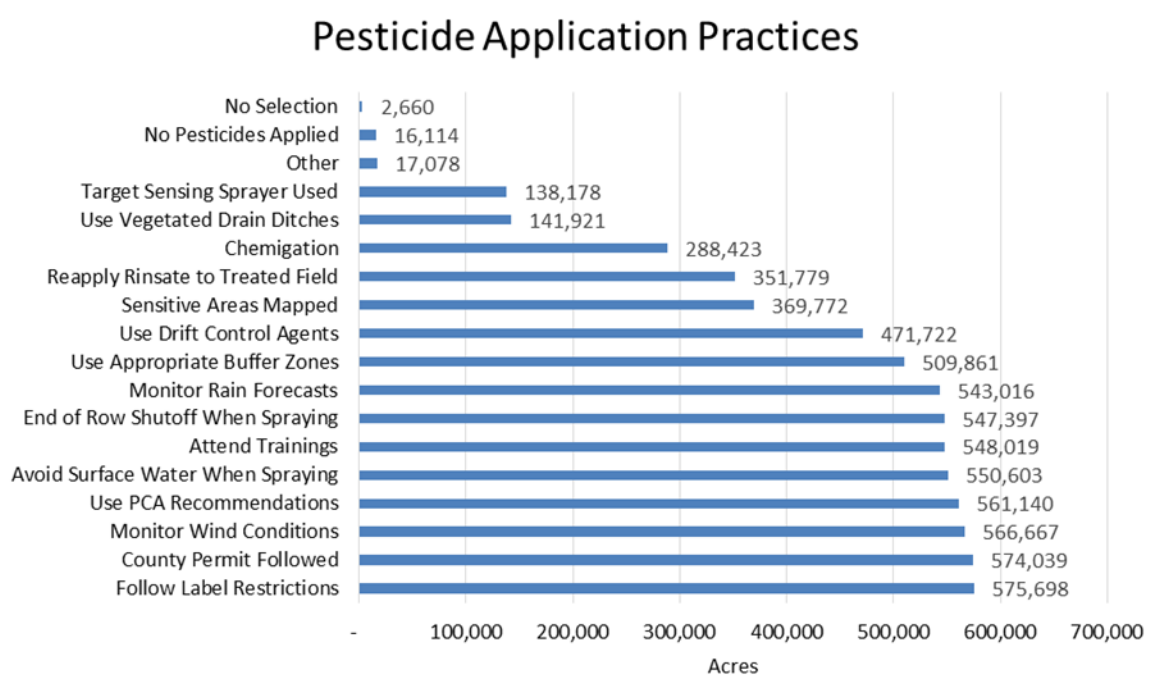
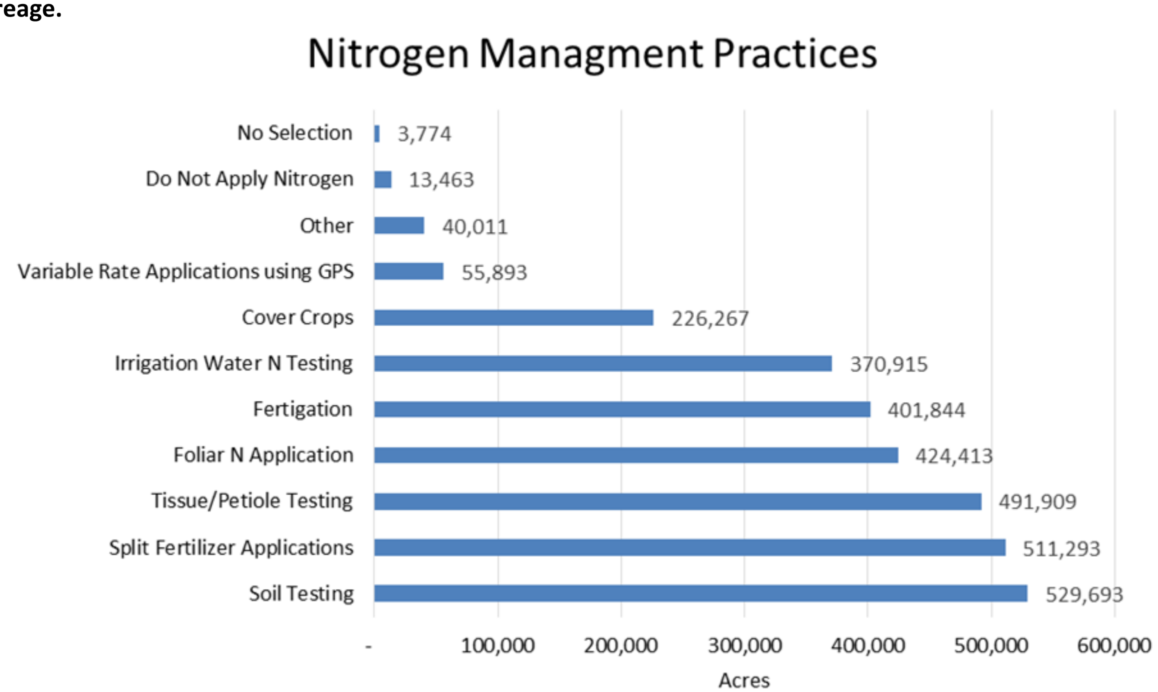


Figure 32. Nitrogen management practices implemented by members, shown in terms of reported parcel acreage.



Well Management Practices

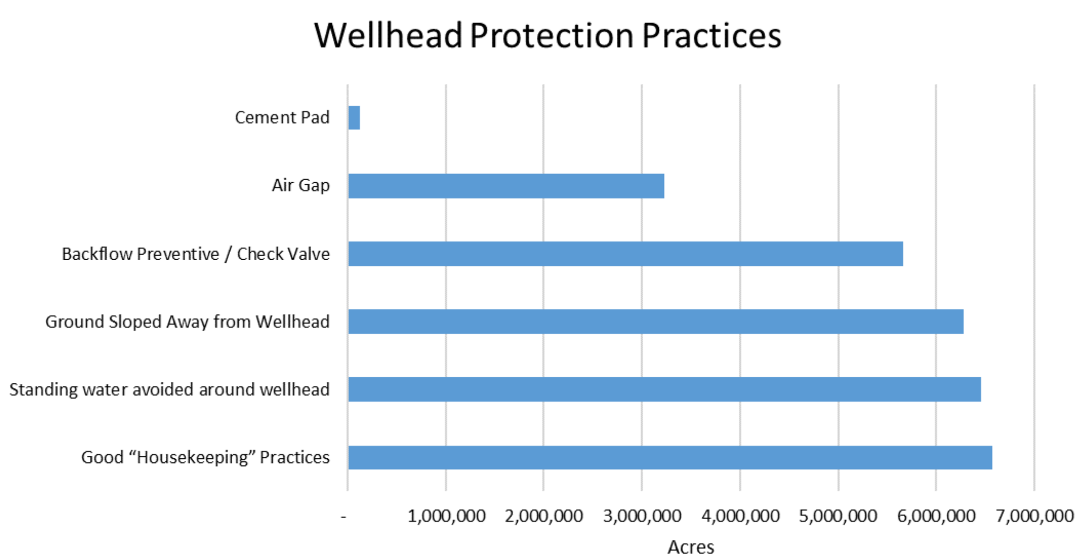
Irrigation Wells

On 2016 FEs, 66% of members reported irrigation wells on their property, representing 93% of the reported acres. A summary of the acreage and count of members who have irrigation wells and wellhead protection practices is listed in Table 66 and Figure 33. On average, four to five wellhead practices were reported for each well to prevent groundwater pollution (Table 66; Figure 33).

Table 66. Irrigation well info by membership acreage, member count, and well count. Acreage is not associated with Wellhead Protection Practices since these are well specific.

Survey Section	Question	Response	Acreage	Count
				Member
C	Do you have any irrigation wells on parcels associated with this Farm Evaluation?	Yes	552,931	1,594
		No	37,135	804
		No Selection	2,048	23
				Well
C	Wellhead Protection Practices	Good "Housekeeping" Practices	-	5,193
		Standing water avoided around wellhead	-	5,015
		Ground Sloped Away from Wellhead	-	4,913
		Backflow Preventive / Check Valve	-	4,157
		Air Gap	-	2,288
		Cement Pad	-	1,534
			Unique Irrigation Wells	**5,343**

Figure 33. Count of wells reported with each wellhead protection practice.



Abandoned Wells

Of the 2016 FEs returned, 2% of members reported having abandoned wells on their parcels and 7% of members left the question blank. A large portion of the abandoned wells have been properly destroyed (Table 67; Figure 34). Member responses on abandoned well practices and acreage associated with abandoned wells are provided in Table 67. The number of wells abandoned over the years has fluctuated (Table 68). In many instances, growers have abandoned wells on their property but are unsure how and when they were destroyed (Table 68).

Table 67. Abandoned well practices to minimize the potential for groundwater pollution by membership acreage, member count, and well count.

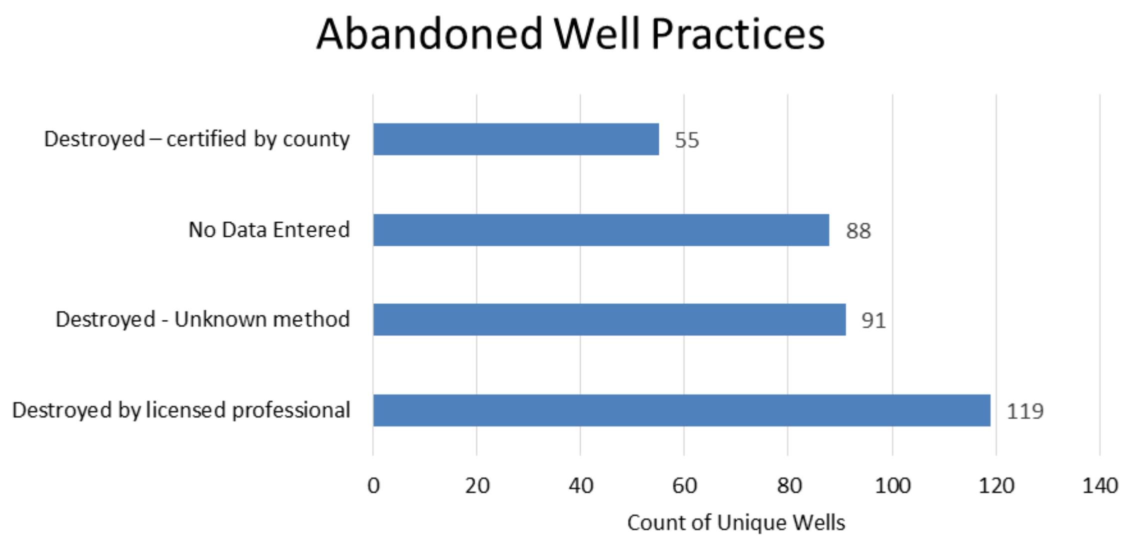
Survey Section	Question	Response	Acreage	Count
				Member
C	Are you aware of any known abandoned wells associated with this Farm Evaluation?	No	505,397	2,198
		Yes	81,245	181
		No Selection	5,471	45
				Well
C	Abandoned Well Practices	Destroyed by licensed professional	-	119
		No Data Entered	-	91
		Destroyed - Unknown method	-	88
		Destroyed – certified by county	-	55

Table 68. Count of wells abandoned by year reported by members.

Well Abandoned Year on the Farm Response (Survey Section C)	Count of Wells
1947	1
1960	3
1962	1
1966	1
1967	1
1968	1
1970	5
1972	1
1975	1
1977	1
1978	1
1980	2
1983	1
1986	1
1987	1
1990	6
1991	2
1994	3
1995	1
1998	2
2000	3
2001	2
2002	3

WELL ABANDONED YEAR ON THE FARM RESPONSE (SURVEY SECTION C)	COUNT OF WELLS
2003	2
2004	3
2005	4
2006	2
2007	1
2008	5
2009	3
2010	8
2011	6
2012	10
2013	15
2014	14
2015	17
2016	18
2017	3
Unknown	73
Unique Wells	228

Figure 34. Count of wells associated with each abandoned well practice.



NITROGEN MANAGEMENT

All submittal and approval dates associated with nitrogen management are included in Table 41. All Coalition members are required to prepare and implement a Nitrogen Management Plan by March 1 of each year. Growers in HVAs are required to have their NMP Worksheets certified either by a nitrogen specialist, a crop specialist, or self-certified if the member passes the NMP self-certification course. The Coalition offers the NMP self-certification courses annually.

In January of 2016, the Coalition mailed 2016 NMP Summary Reports to 1,271 members. Members in HVA groundwater areas with more than 60 acres are required to submit to the Coalition by March 1 annually an NMP Summary Report. On the NMP Summary Report, growers report the total amount of nitrogen applied (pounds), and the ratio of total available nitrogen applied per acre (A) to yield per acre (Y) as the indicator of nitrogen removed from the field at harvest for each parcel. The Coalition converts A/Y to A/R where R is the amount of N-removed in harvested material. In early 2017, the Coalition provided outreach packets to each grower that submitted a 2015 NMP Summary Report. Informative outreach packets will be provided to growers annually that submitted an NMP Summary Report for the previous year.

Outreach packets include:

1. A copy of the previous year's NMP Summary Report
2. Nitrogen Use Evaluation for each Management Unit reported, which includes:
    a. a bell curve graph of the A/Y ratio compared to other farmers growing the same crop.
    b. Graphs of applied nitrogen compared to all other farmer's nitrogen use.
    c. Information on Coalition wide means compared to member's specific information, and
3. Explanations on how to interpret the Nitrogen Use Evaluation

On March 22, 2017, the Coalition submitted a request to the Regional Board for an extension on the submission of the 2016 NMP Summary Report Analysis from May 1, 2017 to July 1, 2017 (approved April 5, 2017). The Coalition requested an additional 60 days to follow-up with growers regarding potentially inaccurate responses. To ensure the highest percentage of returned surveys, the Coalition is sending late reminder emails and postcards to members who have not yet submitted their Summary Report. Additional time to process the data, follow-up with growers, flag incorrect entries, and complete Quality Assurance and control checks will result in a more robust and accurate NMP Summary Report analysis.

SEDIMENT DISCHARGE AND EROSION CONTROL PLAN

All submittal/approval dates associated with sediment and erosion control are included in Table 41. All Coalition members are required to implement sediment discharge and erosion prevention practices. The Coalition submitted a Sediment Discharge and Erosion Assessment Report (SDEAR) on January 13, 2014, revised on December 12, 2014 and May 15, 2015 (conditionally approved July 24, 2015). The SDEAR identified areas within the Coalition region where growers are required to complete Sediment and Erosion Control Plans (SECPs) utilizing the Revised Universal Soil Loss Equation (RUSLE) and responses from returned Farm Evaluations.

In December 2015, the Coalition mailed SECPs to members with parcels that have the potential to discharge sediment based on 1) the results of the RUSLE analysis, 2) self-identified through Farm Evaluations, and 3) failure to complete a Farm Evaluation. Members with parcels identified through RUSLE or Farm Evaluation data were required to complete and implement a SECP by January 22, 2016 or July 23, 2016 (small farm operations less than 60 irrigated acres; Table 69).

The Regional Board explained in the conditional approval letter to the Coalition received on July 24, 2015 that the RUSLE model does not address proximity of farming operations to surface waters. To address this concern, the Coalition submitted a work plan with a timeline to address proximity to surface waters on December 1, 2015 (conditional approval received December 24, 2016). The Coalition submitted the SDEAR Proximity to Major Waterbodies analysis (Phase I) on March 24, 2016 and the SDEAR Proximity to Secondary Waterbodies analysis (Phase II) on June 24, 2016. The Tertiary Waterbodies analysis (Phase III) will be completed by June 24, 2017. These analyses focus on identifying parcels adjacent to waterbodies that were not identified as requiring a SECP based on RUSLE or Farm Evaluation data.

In November 2016, the Coalition reviewed and updated SECP requirements for parcels based on 2015 Farm Evaluation data (Table 69). Members were informed if their SECP requirement had changed or remained the same as the previous year. The Coalition also informed members if any of their parcels were identified in the Phase I proximity analysis. Members were asked to return a response slip to the Coalition to report if parcels did not allow the discharge of sediment due to the presence of a hydraulic barrier, year-round riparian vegetation between farmed land and the waterbody, or land is below the elevation of the adjacent water body. Parcels that do not allow the discharge of sediment based on factors listed above, are exempt from SECP requirements (Table 69).

Table 69. An accounting of member parcels requiring the SECP due to the RUSLE output value, farm evaluation data, and proximity analyses.

SECP Requirement Category	Member Parcel Count[1]	Date Certification Required
RUSLE Model	1,090	January 22, 2016 July 23, 2016 (small farms)
Farm Evaluation Response (Yes to A3)	1,417	
Farm Evaluation Response (No Selection for A3)	377	
Phase I - Proximity to Major Waterbodies	134	February 2017
Phase I - Exempt Parcels (Hydraulic barrier, low field elevation, riparian area)	29	NA

SECP Requirement Category	Member Parcel Count[1]	Date Certification Required
Phase II - Proximity to Secondary Tributaries	439	February 2018
Phase III – Proximity to Tertiary Tributaries	x[2]	February 2019

[1] The counts of member parcels change with enrollment updates and replies to the proximity response card. Data as of March 6, 2017.

x[2] - The Phase III tertiary waterbody analysis is not due until June 24, 2017.

NA – No SECP is required for parcels identified as being exempt.

To assist members with getting their SECPs certified, the Coalition provided a list of qualified professionals and their contact information in the 2015 and 2016 Annual Grower's Report. In addition, the Coalition participated in the development of a SECP Self-Certification class. The duration of the Self-Certification class is four hours followed by an exam, if passed; the grower can self-certify their SECP. Classes were offered in February, March, and April of 2017.

STATUS OF SPECIAL PROJECTS

Special projects in the ESJWQC region include MPM and TMDL compliance monitoring as indicated in the WDR (Attachment A, Page 10). During the 2016 WY, the Coalition monitored in accordance with the Basin Plan requirements for chlorpyrifos and diazinon TMDL monitoring, the 2016 WY MPU (approved on November 13, 2016), the WDR, and the ESJWQC SQMP. The WDR requires that dischargers must comply with the monitoring and management criteria specified by each TMDL. If a single exceedance of the WQTL for a constituent under an EPA approved TMDL occurs (TMDL constituents with a source of agriculture in the ESJWQC region include chlorpyrifos, diazinon, salinity, and boron), a management plan is required for that constituent in the site subwatershed. In addition, if there is no TMDL for a constituent, a management plan is required when more than one exceedance of the WQTL of that constituent occurs at a given location within a three-year period.

SURFACE WATER MANAGEMENT PLAN UPDATES

When a management plan is developed for a site subwatershed, additional focused effort within the subwatershed is required. Coalition efforts include but are not limited to:

1. Continued monitoring as outlined in the Coalition's approved WDR,
2. Analysis of PUR data to identify potential sources,
3. MPM,
4. Conducting site subwatershed grower meetings,
5. Encouraging and evaluating implementation of management practices, and
6. Compliance with approved TMDLs.

A narrative about each monitoring constituent is provided in the Coalition's SQMP as well as the Coalition strategy for prioritizing exceedances to meet the 10-year compliance requirements (approved November 4, 2015). Table 70 includes all updates made to the ESJWQC SQMP for the 2016 WY.

Table 70. Updates to the ESJWQC SQMP.

Item Number	Amendments Descriptions	Date Submitted*	Date Approved
	Revised ESJWQC Surface Water Quality Management Plan	**May 1, 2014 (resubmitted March 10, 2015)**	**November 4, 2015**
1	Request to remove constituents from site specific management plans	September 21, 2015	March 25, 2016
2	Request to remove sediment toxicity management plans based on the updated SWAMP protocol.	February 12, 2016	March 7, 2016
3	Request to remove constituents from site specific management plans	December 7, 2016	April 14, 2017

[1] All deliverables are submitted electronically (Quarterly Data Submittal and Annual Report/ Management Plan Progress Report).

Based on the evaluation provided in the 2016 WY MPU, MPM was conducted for copper, lead, molybdenum, chlorpyrifos, diazinon, dimethoate, diuron, malathion, water column toxicity (*C. dubia*, *P. promelas*, and *S. capricornutum*), and sediment toxicity (*H. azteca*). After three years of monitoring with no exceedances of the WQTL for a specific management plan constituent at a site, the Coalition may petition the Regional Board for completion of the management plan. Three years of monitoring with no exceedances indicates improved water quality which is due to grower reduction/elimination of the offsite movement of agricultural constituents. Table 71 includes the number of management plans requested and approved for completion as well as the submittal and approval dates. Table 72 includes current management plans per site; constituents approved for management plan completion, and reinstated management plans.

The Coalition provided further details on each of the 2008 Management Plan "High Priority" site subwatersheds in the High Priority Site Subwatershed Analysis in Appendix I and II of the 2016 Annual Report. These appendices are no longer included in the Annual Report. All requirements of the WDR (Annual Monitoring Reporting and Management Plan Progress Report requirements) are still met and included in the Annual Report and can be referenced in the Annual Report Requirement Section Key on Page xv.

Table 71. Number of complete management plans and submittal/approval dates.
Management plans approved for removal from Duck Slough @ Hwy 99 reflected in counts below but not included Table 60.

Petition Date	# of Management Plans Petitioned for Completion	# of Management Plans Approved for Completion	Approval Date
1/6/2012	35	33	5/30/2012
11/7/2012	14	8	10/15/2013
6/5/2014	18	12	12/04/2015
9/21/2015	29	18	3/25/2016
12/7/2016	15	10	4/14/2017

Status of Management Plans

The Coalition has received approval to remove 65 constituents from 23 site subwatershed management plans. A total of 10 management plans have been reinstated due to exceedances of the WQTLs. A management plan is reinstated after it is approved for completion if a single exceedance of a WQTL for a TMDL constituent occurs of if more than one exceedance of any other constituent occurs within a three year period. Table 73 is a tally of exceedance counts from 2004 through the 2016 WY. Table 74 is a tally of exceedance counts from the 2016 WY. In both Table 73 and Table 74, cells with blue highlights indicate constituents that are currently in management plans. In Table 73, dark grey cells indicate sites/constituents approved for management plan completion and light grey cells indicate sites/ constituents where management plans were previously completed but were reinstated due to exceedances. In Table 74, green highlights indicate new sites/constituents that have been added to management plans and light green highlights indicate sites/ constituents previously completed management plans but were reinstated due to exceedances during the 2016 WY.

Table 72. Status of ESJWQC management plan constituents per site subwatershed.
Active – X, removed – dark grey cell, and reinstated – light grey cell.

Site Subwatershed	Most Recent Monitoring for Full Suite of Constituents	Dissolved Oxygen	pH	Specific Conductance	Ammonia	Nitrate/Nitrite	*E. coli*	Arsenic	Copper (Total & Dissolved)	Lead (Total & Dissolved)	Molybdenum	Chlorpyrifos	DDE	Diazinon	Dimethoate	Diuron	Malathion	Simazine	*C. dubia* Toxicity	*P. promelas* Toxicity	*S. capricornutum* Toxicity	*H. azteca* Toxicity	Total Removed Per Site
Ash Slough @ Ave 21	2010								X														3
Bear Creek @ Kibby Rd	2008		X				X																4
Berenda Slough along Ave 18 1/2	2012	X	X				X		X			X											1
Black Rascal Creek @ Yosemite Rd	2008	X	X				X																3
Canal Creek @ West Bellevue Rd	2016 WY	X	X				X																0
Cottonwood Creek @ Rd 20	2015 WY						X		X														5
Deadman Creek @ Gurr Rd	2010	X	X	X	X		X	X											X	X			3
Deadman Creek @ Hwy 59	2012	X	X				X	X				X											1
Dry Creek @ Rd 18	2016 WY		X				X		X														6
Dry Creek @ Wellsford Rd	2015 WY	X	X				X																6
Duck Slough @ Gurr Rd*	2015 WY	X	X	X	X		X	X				X					X		X	X		X	3
Hatch Drain @ Tuolumne Rd	2008	X		X		X	X	X													X	X	0
Highline Canal @ Hwy 99	2016 WY	X	X	X	X		X		X			X									X		4
Highline Canal @ Lombardy Rd	2011	X	X	X			X		X												X		4
Hilmar Drain @ Central Ave	2008	X		X	X	X	X														X		5
Howard Lateral @ Hwy 140	2010	X	X	X			X		X														1
Lateral 2 ½ near Keyes Rd	2010		X	X								X									X		1
Lateral 5 ½ @ South Blaker Rd	2016 WY		X	X		X	X														X		0
Lateral 6 and 7 @ Central Ave	NA	X	X	X																	X		0
Levee Drain @ Carpenter Rd	2013	X		X	X	X	X												X		X	X	0
Livingston Drain @ Robin Ave	2008	X	X				X		X												X		2
Lower Stevinson @ Faith Home Rd	NA	X	X	X																	X		0
McCoy Lateral @ Hwy 140	2012		X						X														0
Merced River @ Santa Fe	2015 WY	X					X					X											2
Miles Creek @ Reilly Rd	2016 WY	X	X				X		X														5
Mootz Drain downstream of Langworth Pond	2013	X			X		X									X							1
Mustang Creek @ East Ave	2013	X		X		X	X		X				X										2
Prairie Flower Drain @ Crows Landing Rd	2015 WY	X	X	X	X	X	X				X	X							X		X		2
Unnamed Drain @ Hogin Rd	NA	X		X																			0
Unnamed Drain @ Hwy 140	2013	X	X				X																0
Westport Drain @ Vivian Rd	2008	X	X	X		X	X														X		1
Total Approved Management Plan Completion (Dark Grey Cells)		**3**	**1**	**1**	**0**	**0**	**2**	**0**	**5**	**10**	**0**	**15**	**0**	**3**	**1**	**5**	**0**	**1**	**7**	**1**	**7**	**3**	**65**
Total Reinstated Management Plans		**1**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**
Total Management Plan Constituents Remaining per subwatershed (X)		**24**	**22**	**16**	**7**	**7**	**25**	**4**	**11**	**0**	**1**	**7**	**1**	**0**	**0**	**1**	**1**	**0**	**4**	**2**	**12**	**3**	**148**

*Duck Slough @ Hwy 99 site subwatershed was removed from the Coalitions monitoring schedule; all remaining management plan constituents are monitored at the Duck Slough @ Gurr Rd location.
NA-Represented site, monitoring for full suite of constituents not scheduled.

Table 73. ESJWQC exceedance tally based on results from 2004-2016 WY.

Sites and constituents are listed alphabetically within each of the following groups: field parameters (F), inorganics (I), bacteria (B), metals (M), pesticides (P) and toxicity (T). Management plan constituents are highlighted blue, grey are removed from management plans, and light grey are reinstated management plans. The tally only includes field duplicate exceedances if no exceedance occurred in the environmental sample. Tally excludes toxic samples from resample monitoring events to test for persistence.

	F			I				B	M						P																	T			
Site Name	Dissolved Oxygen	pH	Specific Conductivity	Ammonia	Nitrate as N	Nitrite as N	Nitrate + Nitrite as N	*E. coli*	Arsenic	Copper Dissolved[1]	Copper Total[1]	Lead	Molybdenum	Zinc	Aldicarb	Carbaryl	Carbofuran	Chlorpyrifos	Cyanazine	DDD (p,p')	DDE (p,p')	DDT (p,p')	Diazinon	Dieldrin	Dimethoate	Diuron	HCH	Malathion	Methidathion	Methoxychlor	Simazine	*C. dubia*	*P. promelas*	*S. capricornutum*	*H. azteca*
Ash Slough @ Ave 21								3		2	5	2						4																1	
Bear Creek @ Kibby Rd	2	5						7	1		4							2				1										3		1	
Berenda Slough along Ave 18 ½	7	3						7		15								4								1						1		2	
Black Rascal Creek @ Yosemite Rd	27	3						11			1	2						4														3		1	1
Canal Creek @ West Bellevue Rd	3	2						2		1																									
Cottonwood Creek @ Rd 20	1[2]	1						22		9	12	3						3	1				1			2					1		1	1	
Deadman Creek @ Gurr Rd	39	7	10	5				41	11		4							4				1		1				1				5	9	3	
Deadman Creek @ Hwy 59	21	6						18	6									6		1		1				1					1			2	
Dry Creek @ Rd 18	1[2]	11						8		21	21	5		1				3					2			3						1		4	
Dry Creek @ Wellsford Rd	72	9	1					68			3	1						10								2	1					2		4	2*
Duck Slough @ Gurr Rd	14	14	9	2			1	30	3	1	9	5					1	3										2				7	2	3	6
Hatch Drain @ Tuolumne Rd	48		47	1	13	1		12	12													1			1					1				7	6
Highline Canal @ Hwy 99	5	31	4	5				18		6	7	7						7				1				2						4		8	0
Highline Canal @ Lombardy Rd	4	13	3	1				6		6	5	8		1				6								1		1			1	4	1	7	3
Hilmar Drain @ Central Ave	18	3	64	2	12			20			2							1		1	1					3						1		6	2
Howard Lateral @ Hwy 140	6	8	2				1	3		7								1																1	
Lateral 2 ½ near Keyes Rd		11	4	1			1	2										4									1							6	
Lateral 5 ½ @ South Blaker Rd	1	8	21	1			8	3																										11	
Lateral 6 and 7 @ Central Ave	4	4	18																							1								3	
Levee Drain @ Carpenter Rd	22	1	38	4			18	13																								2	1	3	2
Livingston Drain @ Robin Ave	3	20			1			2		6	9	2						4																3	
Lower Stevinson @ Faith Home Rd	3	10	14																															5	
McCoy Lateral @ Hwy 140		7						1		6																									
Merced River @ Santa Fe	11	2						6			1	2						4				1					1					4		2*	
Miles Creek @ Reilly Rd	17	2						19		1	7	5			1			4					1					1	1			2		3	
Mootz Drain downstream of Langworth Pond[3]	22	1		2				16										2								2								1	
Mustang Creek @ East Ave	17		10	1			2	10		11								2			3										2	1		1	1
Prairie Flower Drain @ Crows Landing Rd	45	9	131	18	18	1	62	65	1				22			1		10				1			3	1		1				9	2	21	2*
Unnamed Drain @ Hogin Rd	13		16																						1										
Unnamed Drain @ Hwy 140	3	2						3		1																									
Westport Drain @ Vivian Rd	20	3	25		13			7										2																3	
Grand Total	453	199	416	44	57	2	93	435	34	93	100	53	22	2	1	1	1	94	1	2	4	7	4	1	5	19	3	6	1	1	5	56	11	126	30

*Not prioritized for MPM; exceedances not within a three year period.

[1] Exceedances of the hardness based WQTL for dissolved and total copper are evaluated under the same management plan.

[2] Due to the approved lower WQTL for DO (SQMP, approved 11/4/2015) a management plan is no longer required.

[3] Exceedances from Mootz Drain @ Langworth Rd count toward management plan for Mootz Drain downstream of Langworth Pond

Management Plans Implemented in 2017

New sites requiring a focused management plan approach are prioritized and addressed based on compliance deadlines for each constituent in a management plan, as outlined in the 2014 SQMP.

As a result of monitoring during the 2016 WY, several new site/constituent specific management plans are required or have been reinstated (see dark and light green highlights in Table 74). Below is a list of sites/constituents with exceedances of WQTLs from the 2016 WY resulting in 1) new management plans or 2) reinstated management plans.

- **Berenda Slough along Ave 18 ½**
  - -pH
- **Canal Creek @ West Bellevue Rd**
  - -pH
  - -*E. coli*
- **Highline Canal @ Hwy 99**
  - -Ammonia (reinstated)
- **Lateral 5 ½ @ South Blaker**
  - -*E. coli*
  - -Nitrate
- **Livingston Drain @ Robin Ave**
  - -DO
- **Merced River @ Santa Fe**
  - -Chlorpyrifos (reinstated)
- **Westport Drain @ Vivian Rd**
  - -pH

Table 74. ESJWQC exceedance tally based on monitoring during the 2016 WY.
Sites and constituents are listed alphabetically within each of the following groups: field parameters (F), inorganics (I), bacteria (B), metals (M), pesticides (P), and toxicity (T). Green cells are new management plans; blue cells are already in a management plan; light green cells are reinstated management plans due to 2016 WY exceedances. The tally only includes field duplicate exceedances if no exceedance occurred in the environmental sample.

	F			I		B	M			P			T
Site Name	**Dissolved Oxygen**	**pH**	**Specific Conductivity**	**Ammonia**	**Nitrate + Nitrite as N**	***E. coli***	**Arsenic, Total**	**Copper, Dissolved[1]**	**Lead, Dissolved**	**Chlorpyrifos**	**Diuron**	**Malathion**	***S. capricornutum***
Berenda Slough along Ave 18 1/2	2	2						2					
Canal Creek @ West Bellevue Rd	1	2				2		1					
Deadman Creek (Dutchman) @ Gurr Rd	3												
Deadman Creek @ Hwy 59	1												
Dry Creek @ Rd 18	1	1				2		8					
Dry Creek @ Wellsford Rd	7	2		1		8							
Duck Slough @ Gurr Rd	2						1		1				
Hatch Drain @ Tuolumne Rd	4		2										
Highline Canal @ Hwy 99	1	4	2	3		4		2		1		1	
Hilmar Drain @ Central Ave	2		4										1
Howard Lateral @ Hwy 140	1	2						1					
Lateral 2 1/2 near Keyes Rd		1	3										3
Lateral 5 1/2 @ South Blaker Rd		3	5	1	8	3							5
Lateral 6 and 7 @ Central Ave		1	2								1		
Levee Drain @ Carpenter Rd	4		5										
Livingston Drain @ Robin Ave	1	2						2					
Lower Stevinson @ Faith Home Rd	1	3	3										
Merced River @ Santa Fe	2	1								1			
Miles Creek @ Reilly Rd	3					7		1					
Mustang Creek @ East Ave	1		1					3					
Prairie Flower Drain @ Crows Landing Rd	10	1	9										2
Unnamed Drain @ Hogin Rd	1		2										
Westport Drain @ Vivian Rd	4	2	1										
Total	**52**	**27**	**39**	**5**	**8**	**26**	**1**	**20**	**1**	**2**	**1**	**1**	**11**

STATUS OF TMDLS

Monitoring to evaluate compliance with approved TMDLs occurred in the Coalition region during the 2016 WY. A management plan for a TMDL constituent results in additional focused monitoring, source identification, and outreach within the site subwatershed. Coalition efforts include: 1) MPM, 2) outreach meetings with growers, 3) encouraging the implementation of and evaluating the efficacy of management practices, and 4) addressing the seven surveillance and monitoring objectives for chlorpyrifos and diazinon as described in the Basin Plan Amendment. Intensive outreach and documentation of implemented management practices occur throughout the Coalition region every year. Furthermore, the Coalition conducts annual meetings to provide growers with information on management practices designed to improve water quality.

Chlorpyrifos and Diazinon TMDL

The TMDL Monitoring subsection of the Monitoring Objectives and Design section of this report outlines the ESJWQC and the WSJRWC collaborative monitoring plan for assessing compliance with the Lower San Joaquin River concentration based loads at the six compliance points identified in the Basin Plan Amendment.

To assess compliance with Objective 1 (loading capacity), the ESJWQC monitored three of the six compliance points (Hills Ferry Rd, Maze Blvd, and Airport Way) in March and from May through August 2016 (5 events). During the 2016 WY, the San Joaquin River at Airport Way near Vernalis compliance point was monitored by the Delta Regional Monitoring Program (Delta RMP). The Delta RMP has provided all monitoring results to ESJWQC for inclusion in the 2016 WY TMDL AMR. To assess compliance with Monitoring Objectives 2-7, the Coalition assesses results and outcomes of actions taken (e.g. monitoring and outreach) to meet the specifications of either Coalitions ILRP monitoring program. Results from the 2016 WY will be reported in the 2016 WY San Joaquin River Chlorpyrifos and Diazinon TMDL AMR (to be submitted May 1, 2017).

Salt and Boron TMDL

The Coalition recognizes that salt and boron water quality impairments are a Central Valley wide concern. Coalition representatives attend CV-SALTS meetings and participate in planning and reviewing studies relevant to the development of a Salt and Nitrate Management Plan for surface and groundwater. Coalition technical consultants participated in several CV-SALTS committees including the Technical Advisory Committee, BMP Subcommittee and Lower San Joaquin River Committee. In addition, the Coalition monitors for salt (SC), nutrients (nitrate) and boron in every zone and includes these constituents in conversations with growers about water quality impairments and applicable management practices.

SURFACE WATER EVALUATION OF MANAGEMENT PRACTICE EFFECTIVENESS

The Coalition implemented its management plan process and focused outreach efforts from 2008 through the 2016 WY in 25 site subwatersheds. The Coalition assesses MPM results from site subwatersheds where focused outreach has occurred in order to determine how effective current and newly implemented management practices are at preventing the offsite movement of agricultural constituents. The following evaluation identifies if BUs are protected, how pesticide applications and monitoring results have changed over time, and what implemented management practices in the Coalition region improved water quality and led to the completion of management plans.

PROTECTING BENEFICIAL USES

To answer the first programmatic question, “Are receiving waters to which irrigated lands discharge meeting applicable water quality objectives and Basin Plan provisions?” the Coalition analyzed monitoring data. Monitoring results from the 2016 WY for the major river tributaries were reviewed to determine whether BUs were protected. As outlined in the Basin Plan and WDR, waters of the State receiving discharge from irrigated lands must be protective of all BUs including: Agricultural Supply (AG), Aquatic Life (AQ Life; including cold freshwater habitat spawning, warm freshwater habitat, and freshwater habitat), Water Contact Recreation (REC 1), and Municipal and Domestic Supply (MUN). In 2008, the Regional Board developed a list of WQTLs based on numeric water quality objectives and standards from the Basin Plan including interpretation of the narrative water quality objectives (Table 32). The Coalition uses this list of WQTLs to determine if concentrations of constituents found in surface waters exceeded their respective WQTLs and resulted in impairments of BUs

Beneficial uses are listed in the Basin Plan by waterbody, however; not all of the waterbodies upstream of the Coalition’s monitoring sites are listed in the Basin Plan. Therefore, BUs of some Coalition waterbodies are applied based on the BU assigned to the immediate downstream waterbody (tributary rule). For example, some of the ESJWQC monitoring sites are tributaries of the Merced, Tuolumne, and San Joaquin Rivers and are assigned the BUs of those major rivers. Exceedances of constituent specific WQTLs that cause impairments to AG, AQ Life, MUN, and REC 1 BUs can have multiple sources that may or may not result from agricultural practices. Until all sources of constituents that impair BUs of waterbodies are addressed, meeting all WQOs and Basin Plan provisions may be difficult to achieve.

Protection of Beneficial Uses

Waters of the State are considered protected if no exceedances of WQTLs occur during monitoring events. During the 2016 WY, multiple exceedances of WQTLs impaired BUs in Waters of the State (Table 75); therefore, not all receiving waters are meeting applicable WQOs and Basin Plan provisions. The Coalition does not monitor any tributaries to the Stanislaus River. The section below provides BU status for Merced, San Joaquin, and Tuolumne rivers and tributaries monitored in the ESJWQC.

In total, the Coalition monitors 32 tributaries to the San Joaquin River, Merced River, and Tuolumne River. Eleven tributaries monitored by the Coalition drain into a section of the San Joaquin River from the mouth of the Merced River to Airport Way Bridge near Vernalis. Additionally, 14 monitored tributaries drain into another section of the San Joaquin River, from Sack Dam to the Merced River reach. Two tributaries monitored by the Coalition drain into the Tuolumne River and five tributaries are monitored that drain into the Merced River from McSwain Reservoir to the San Joaquin River. Table 76 lists each site monitored and the immediate downstream waterbody.

AQ Life

Exceedances of the WQTLs for DO (61%), dissolved copper (24%) ammonia (11%), chlorpyrifos (2%), and malathion (2%) resulted in impairments to the AQ Life BU for all three major waterbodies in the Coalition (Figure 35). Twenty-six tributaries were monitored for constituents that could impair AQ Life BUs; five tributaries were protective of the AQ Life BU (19% protective).

Agriculture Supply

During the 2016 WY, 39 exceedances of the WQTL for SC resulted in impairment of the AG BU for the Merced and San Joaquin Rivers (Table 75). Twenty-seven sites were monitored for SC, 15 of which were protective of the AG BU (56% protective). Thirty-six of the exceedances occurred at monitoring sites located in Zone 2, tributaries to the San Joaquin River (Appendix III, Table 2).

Municipal and Domestic Supply

Exceedances of the WQTL for ammonia (43%), nitrate (38%), chlorpyrifos (9%), arsenic (6%), and diuron (5%) resulted in impairment of the MUN BU (Table 75; Figure 35). Twelve tributaries were monitored for constituents that could impair the MUN BU; seven tributaries were protective of the MUN BU (58% protective). Exceedances of the WQTLs for ammonia and chlorpyrifos also impaired the AQ Life BU; a summary is provided in the AQ Life section above.

Water Contact Recreation

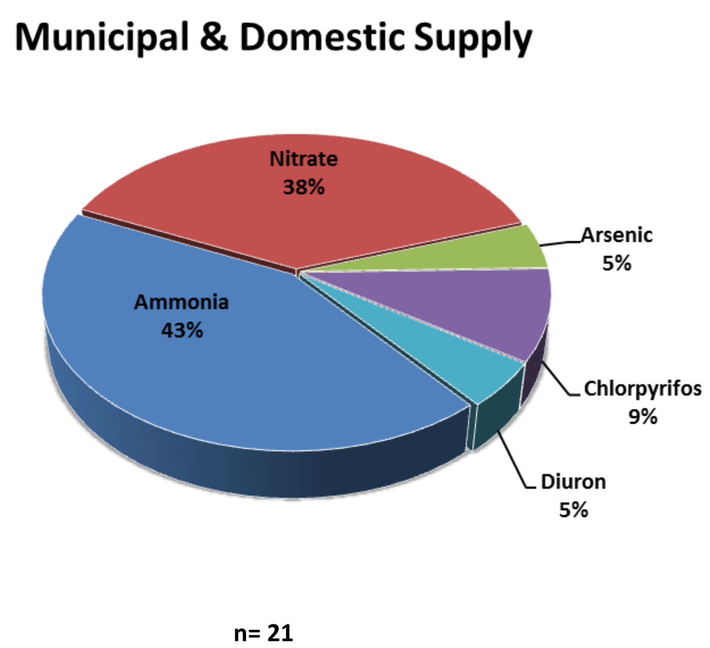
There were numerous exceedances of the WQTL for *E. coli* which resulted in an impaired the REC 1 BU in all major waterbodies (Table 75). All tributaries monitored by the Coalition for *E. coli* were not protective of the REC 1 BU. *E. coli* is the only constituent monitored by the Coalition that can cause impairment to REC 1 BU and therefore *E. coli* is not included in Figure 53 or the discussion below. Even though improvements are evident from the 2016 WY monitoring results, water quality is still not entirely protective of all BUs across the Coalition region.

Table 75. Exceedances of WQOs and number of times beneficial uses were impaired during the 2016 WY.

Major River	Beneficial Use	DO	SC	Ammonia	*E. coli*	Nitrate	Dissolved Metals (Copper)	Total Metals (Arsenic)	Total Metals (Lead)	Herbicides (Diuron and Malathion)	Pesticides (Chlorpyrifos)
Merced River	AQ Life	6		3			6			1	2
	AG		6								
	MUN			3							2
	REC 1				6						
San Joaquin River	AQ Life	39		1			14		1		
	AG		33								
	MUN					8		1		1	
	REC 1				12						
Tuolumne River	AQ Life	7		1							
	AG										
	MUN			1							
	REC 1				8						
	Total Exceedances	**52**	**39**	**9**	**26**	**8**	**20**	**1**	**1**	**2**	**4**

AQ Life-Aquatic Life (includes cold freshwater habitat spawning, warm freshwater habitat, and freshwater habitat).
AG-Agricultural
MUN-Municipal and Domestic Supply
REC 1-Water Contact Recreation

Figure 35. Percentages of impairments of BUs due to exceedances of WQTLs during the 2016 WY.
Aquatic Life includes all categories (cold freshwater habitat spawning, warm freshwater habitat, and freshwater habitat); 'n' represents the total number of exceedances per BU.



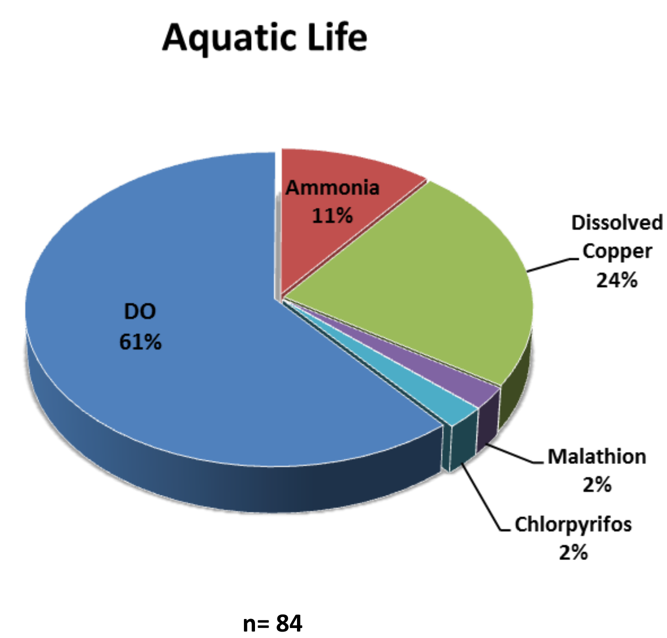


Table 76. Evaluation of beneficial uses applied to 2008-2016 WY monitoring locations (alphabetical by Zone).
'X' indicates no sampling occurred during the years specified. Blue highlights indicate BU was protected in the 2016 WY when the same BU and monitoring site were impaired in one or more previous years.

Zone	Monitoring Site (Focused Outreach Timeline)	Immediate Downstream Waterbody	Beneficial Use Immediate Downstream Waterbody	Water Quality Results Indicate BU Is Protected?								
				2008	2009	2010	2011	2012	2013	2014 WY	2015 WY	2016 WY
1	Dry Creek @ Wellsford Rd (2008-2013, 2016-2018)	Tuolumne River (New Don Pedro Dam to SJ River)	MUN	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
			AG	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
			REC 1	No	No	No	No	Yes	No	No	No	No
			AQ Life	No	No	No	No	No	No	No	No	No
	Mootz Drain downstream of Langworth Pond[1] (2015-2017)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	X	Yes	No	X	X	Yes	X	Yes	Yes
			AG	X	Yes	Yes	X	X	Yes	Yes	Yes	Yes
			REC 1	X	No	No	X	X	No	X	X	X
			AQ Life	X	No	No	X	X	No	No	No	Yes
2	Hatch Drain @ Tuolumne Rd (2013-2015)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	X	X	X	X	X	Yes	X	Yes	X
			AG	X	X	X	X	X	No	No	No	No
			REC 1	X	X	X	X	X	X	X	X	X
			AQ Life	X	X	X	X	X	No	No	No	No
	Hilmar Drain @ Central Ave (2012-2014)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No	Yes	X	X	Yes	Yes	Yes	Yes	X
			AG	No	No	X	X	No	No	No	No	No
			REC 1	No	Yes	X	X	X	X	X	X	X
			AQ Life	No	Yes	X	X	Yes	Yes	No	No	No
	Lateral 2 ½ near Keyes Rd (2011-2013)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No	No	Yes	Yes	X	Yes	X	Yes	X
			AG	Yes	No	Yes	Yes	X	No	No	Yes	No
			REC 1	No	No	Yes	Yes	X	X	X	X	X
			AQ Life	No	No	No	Yes	X	Yes	No	Yes	Yes
	Lateral 5 ½ @ South Blaker Rd (2017-2019)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	X	X	X	X	X	X	X	Yes	No
			AG	X	X	X	X	X	X	No	No	No
			REC 1	X	X	X	X	X	X	X	X	No
			AQ Life	X	X	X	X	X	X	Yes	No	No
	Lateral 6 and 7 @ Central Ave (2017-2019)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	X	X	X	X	X	X	X	Yes	No
			AG	X	X	X	X	X	X	No	No	No
			REC 1	X	X	X	X	X	X	X	X	X
			AQ Life	X	X	X	X	X	X	No	No	Yes
	Levee Drain @ Carpenter Rd (2016-2018)	San Joaquin River (Merced River to Tuolumne River) / Merced River (McSwain Reservoir to SJR)	MUN	X	X	X	X	No	No	X	Yes	X
			AG	X	X	X	X	No	No	No	No	No
			REC 1	X	X	X	X	No	No	X	X	X
			AQ Life	X	X	X	X	No	No	No	No	No
	Lower Stevinson @ Faith	San Joaquin River (Merced	MUN	X	X	X	X	X	X	X	Yes	Yes

Zone	Monitoring Site (Focused Outreach Timeline)	Immediate Downstream Waterbody	Beneficial Use Immediate Downstream	Water Quality Results Indicate BU Is Protected?								
	Home Rd (2017-2019)	River to Tuolumne River) / Merced River (McSwain Reservoir to SJR)	AG	X	X	X	X	X	X	No	No	No
			REC 1	X	X	X	X	X	X	X	X	X
			AQ Life	X	X	X	X	X	X	No	No	No
	Prairie Flower Drain @ Crows Landing Rd (2008-2010, 2016-2018)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No	No	No	No	No	No	No	No	Yes
			AG	No	No	No	No	No	No	No	No	No
			REC 1	No	No	No	No	No	No	No	No	X
			AQ Life	No	No	No	No	No	No	No	No	No
	Unnamed Drain @ Hogin Rd (2017-2019)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	X	X	X	X	X	X	X	No	Yes
			AG	X	X	X	X	X	X	No	No	No
			REC 1	X	X	X	X	X	X	X	X	X
			AQ Life	X	X	X	X	X	X	No	No	No
	Westport Drain @ Vivian Rd (2014-2016)	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No	X	X	X	X	X	X	X	X
			AG	No	X	X	X	X	X	No	No	No
			REC 1	No	X	X	X	X	X	X	X	X
			AQ Life	No	X	X	X	X	X	No	No	No
3	Highline Canal @ Hwy 99 (2010-2012, 2016-2018)	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No	No	Yes	No	Yes	Yes	Yes	Yes	No
			AG	No	No	Yes	Yes	Yes	Yes	Yes	No	No
			REC 1	No	No	No	No	Yes	No	No	Yes	No
			AQ Life	No	No	Yes	Yes	No	No	No	No	No
	Highline Canal @ Lombardy Rd (2013-2015)	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No	Yes	No	Yes	Yes	Yes	X	Yes	X
			AG	No	Yes	Yes	Yes	Yes	Yes	Yes	No	X
			REC 1	No	X	Yes	No	Yes	X	X	X	X
			AQ Life	No	Yes	No	No	No	No	No	No	X
	Mustang Creek @ East Ave (2014-2016)	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No	No	Yes	X	X	Yes	X	No	X
			AG	No	No	No	X	X	Yes	Yes	Yes	No
			REC 1	No	No	No	X	X	Yes	X	X	X
			AQ Life	No	No	No	X	X	No	No	No	No
4	Bear Creek @ Kibby Rd (2010-2012)	San Joaquin River (Bear Creek to SJ River)	MUN	No	X	Yes	Yes	Yes	X	X	X	X
			AG	Yes	X	Yes	Yes	Yes	Yes	Yes	X	X
			REC 1	No	X	X	X	X	X	X	X	X
			AQ Life	No	X	Yes	Yes	Yes	Yes	Yes	X	X
	Black Rascal Creek @ Yosemite Rd (2012-2014)	Merced River (McSwain Reservoir to SJ River)	MUN	No	X	X	X	X	Yes	X	Yes	X
			AG	Yes	X	X	X	X	Yes	Yes	Yes	X
			REC 1	No	X	X	X	X	X	X	X	X
			AQ Life	No	X	X	X	X	No	No	No	X
	Canal Creek @ West Bellevue Rd	Merced River (McSwain Reservoir to SJ River)	MUN	X	X	X	X	X	X	X	X	Yes
			AG	X	X	X	X	X	X	Yes	Yes	Yes
			REC 1	X	X	X	X	X	X	X	X	No
			AQ Life	X	X	X	X	X	X	No	No	No

Zone	Monitoring Site (Focused Outreach Timeline)	Immediate Downstream Waterbody	Beneficial Use Immediate Downstream	Water Quality Results Indicate BU Is Protected?								
	Howard Lateral @ Hwy 140 (2015-2017)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	No	Yes	Yes	X	Yes	X	X	X
			AG	X	No	Yes	Yes	X	Yes	Yes	No	Yes
			REC 1	X	No	No	X	X	X	X	X	X
			AQ Life	X	No	No	No	X	No	Yes	No	No
	Livingston Drain @ Robin Ave (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No	X	X	Yes	Yes	Yes	X	No	X
			AG	Yes	X	X	Yes	Yes	Yes	Yes	Yes	Yes
			REC 1	No	X	X	X	X	X	X	X	X
			AQ Life	No	X	X	No	No	Yes	Yes	No	No
	McCoy Lateral @ Hwy 140 (2016-2018)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	X	X	Yes	Yes	Yes	X	X	X
			AG	X	X	X	Yes	Yes	Yes	X	X	X
			REC 1	X	X	X	Yes	No	X	X	X	X
			AQ Life	X	X	X	No	No	No	X	X	X
	Merced River @ Santa Fe Rd (2013-2015)	Merced River (McSwain Reservoir to SJ River)	MUN	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	X
			AG	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
			REC 1	Yes	Yes	No	No	Yes	No	No	Yes	X
			AQ Life	No	No	Yes	Yes	Yes	No	Yes	No	No
	Unnamed Drain @ Hwy 140 (2016-2018)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	X	X	X	X	Yes	X	X	X
			AG	X	X	X	X	X	Yes	No	Yes	Yes
			REC 1	X	X	X	X	X	No	X	X	X
			AQ Life	X	X	X	X	X	No	No	Yes	Yes
5	Deadman Creek @ Gurr Rd (2012-2014)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No	No	No	X	Yes	Yes	X	X	X
			AG	Yes	No	No	X	Yes	Yes	No	Yes	Yes
			REC 1	No	No	No	X	X	X	X	X	X
			AQ Life	No	No	No	X	Yes	No	No	Yes	No
	Deadman Creek @ Hwy 59 (2012-2014)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No	X	X	Yes	No	Yes	X	X	X
			AG	Yes	X	X	Yes	Yes	Yes	Yes	Yes	Yes
			REC 1	No	X	X	No	No	X	X	X	X
			AQ Life	No	X	X	No	No	Yes	Yes	Yes	No
	Duck Slough @ Gurr Rd (2010-2012)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	No	Yes	Yes	Yes	No	Yes	No	No
			AG	Yes	No	Yes	Yes	Yes	No	No	No	Yes
			REC 1	Yes	No	No	No	No	No	No	No	X
			AQ Life	No*	No	No*	No	Yes	No	No	No	No
	Miles Creek @ Reilly Rd (2013-2015)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	X	X	X	X	Yes	X	Yes+	Yes
			AG	X	X	X	X	X	No	Yes	Yes+	Yes
			REC 1	X	X	X	X	X	No	X	X	No
			AQ Life	X	X	X	X	X	No	No	Yes+	No
6	Ash Slough @ Ave 21 (2015-2017)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	Yes	X	X	X	X	Yes+	X
			AG	Yes	Yes	Yes	X	X	X	Yes	Yes+	Yes
			REC 1	Yes	Yes	Yes	X	X	X	X	X	X

Zone	Monitoring Site (Focused Outreach Timeline)	Immediate Downstream Waterbody	Beneficial Use Immediate Downstream	Water Quality Results Indicate BU Is Protected?								
			AQ Life	Yes	No	No	X	X	X	Yes	Yes+	Yes
	Berenda Slough along Ave 18 ½ (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	X	X	Yes	Yes	Yes	X	Yes+	X
			AG	X	X	X	Yes	Yes	Yes	Yes	Yes+	Yes
			REC 1	X	X	X	No	Yes	X	X	Yes+	X
			AQ Life	No	X	X	No	No	No	Yes	Yes+	No
	Cottonwood Creek @ Rd 20 (2010-2012)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	Yes	Yes	Yes+	Yes	Yes+	Yes	X
			AG	Yes	Yes	Yes	Yes	Yes+	Yes	Yes+	Yes	Yes+
			REC 1	Yes	No	No	No	Yes+	No	Yes+	X	X
			AQ Life	No	Yes	No	No	Yes+	No	Yes+	Yes	X
	Dry Creek @ Rd 18 (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No	X	X	Yes	Yes	Yes	No	Yes	Yes
			AG	Yes	X	X	Yes	Yes	Yes	Yes	Yes	Yes
			REC 1	No	X	X	X	X	No	X	No	No
			AQ Life	No	X	X	No	Yes	No	No	No	No

AG- Agriculture

AQ Life-Aquatic Life (cold freshwater habitat spawning, warm freshwater habitat, and freshwater habitat).

MUN- Municipal and Domestic Supply

REC 1- Water Contact Recreation

*Does not meet BUs requirements due to sediment toxicity to *H. azteca* in one or more occurrences.

Yes+-Site was dry during all monitoring events.

[1]-The evaluation of BUs for Mootz Drain considers results from both the upstream (@ Langworth Pond) and downstream (downstream of Langworth Pond) locations.

TRENDS IN COALITION MONITORING RESULTS

To address the third programmatic question in the WDR, “Are water quality conditions changing over time,” the Coalition evaluated monitoring results to identify potential temporal and spatial trends in surface water quality. Data from 2008 represent water quality in the Coalition region at the beginning of focused outreach when growers began implementing management practices designed to improve water quality. Monitoring data from the 2016 WY reflect water quality eight years after focused outreach began. The Coalition analyzed these data for two types of trends, 1) temporal trends (consistent water quality impairments across time, i.e. same months and/or seasons), and 2) spatial trends (consistent water quality impairments in a specific area).

Temporal Trends of Monitoring Results

The temporal trend analysis (2008 vs. 2016 WY monitoring data) includes an assessment of whether exceedances occur more or less frequently since education and focused outreach efforts began. The time period for the analysis was selected to compare Coalition water quality before and after the initiation of focused outreach. Improvements are a direct result of the Coalitions Management Plan Strategy and the implementation of new management practices designed to reduce discharge of applied agricultural constituents.

Monitoring during the 2016 WY resulted in exceedances of pesticides and metals: chlorpyrifos (2), copper (20), diuron (1), and malathion (1). However, as indicated in the Discussion of Surface Water Monitoring Results section of this report, the majority of exceedances to occur in the Coalition region were nutrients, physical parameters, *E. coli* and field parameters. Consequently, the Coalition submitted preliminary analyses of the sources of these constituents and submitted the results to the Regional Board (pending approval).

The Coalition analyzed monitoring data for the two primary groups of constituents applied by agriculture: applied metals and applied pesticides. Metals applied by agriculture are copper and zinc; however, copper was the only applied metal to be detected above the hardness based WQTL from January 1, 2008 through the 2016 WY and therefore only copper was included in the applied metals analysis below.

Applied Pesticides: 2008-2016WY

The most significant decline in exceedances of applied pesticides occurred directly after focused outreach began between 2008 and 2009 (Table 77). The percent of exceedances of WQTLs for applied pesticides has remained less than 1% since 2009. In 2008, 1.3% of samples collected resulted in exceedances of WQTLs for pesticides compared to the 2016 WY where only 0.2% resulted in exceedances (Table 77).

Of the pesticides, chlorpyrifos remains a constituent of concern and the Coalition continues to focus its outreach efforts on recommending members to implement additional management practices designed to improve water quality. Overall, monitoring results from 2008 through the 2016 WY indicate that individual visits and the implementation of management practices are resulting in improved water quality; hence, numerous management plans have been approved for completion. As of 2016, chlorpyrifos management plans in 15 site subwatersheds have been completed (57% of chlorpyrifos management plans). The Coalition also believes that many exceedances of the chlorpyrifos WQO are the result of discharge from non-member farming operations and it may be difficult to eliminate exceedances in the future.

Applied Metals: 2008-2016WY

The percent of exceedances of the WQTL for copper remained fairly consistent with less than 6% from 2008 through the 2015 WY (Figure 37). However, during the 2016 WY, 20 exceedances of the hardness based WQTL for dissolved copper occurred across the Coalition region (30% of the samples analyzed for copper; Table 77). Figure 37 includes the percent of applied copper exceedances from 2008 through the 2016 WY.

Fewer samples were required to be collected for copper analysis during the 2016 WY (155 during the 2014 WY and 84 during the 2015 WY compared to 67 during the 2016 WY) based on an updated approach for determining the timing and frequency of monitoring (2016 WY MPU).

It is also relevant that during the 2016 WY a higher amount of precipitation occurred within the Coalition region compared to the 2015 and 2014 WYs. During the 2016 WY, an average of 14.86 inches of precipitation fell within the Coalition region compared to 8.14 inches during the 2015 WY and 4.85 inches during the 2014 WY. The availability of more water increased weed control efforts by Coalition members and irrigation districts and the elevated number of exceedances of the hardness based WQTL for copper could have been caused by a number of factors, including:

1. Applications of copper containing herbicides by irrigation districts and growers,
2. Sediment mobilized due to unusually high flows could have transported naturally occurring copper to sampling locations, and
3. As the preliminary analyses suggest, the concentration of the hardness ($CaCO_3$) in the samples collected affect the WQTLs and during the 2016 WY, water was softer compared to the 2015 and 2014 WYs; therefore, an increase in copper exceedances occurred.

The elevated levels of precipitation resulted in runoff to waterbodies in regions of the Coalition where high concentrations of naturally occurring copper exist. Samples were collected in Zones 3-6 more frequently during the 2016 WY than in previous years and therefore a greater number of exceedances of the hardness based WQTL for copper occurred. Increased levels of precipitation allowed rainwater to flow through the sample sites before minerals could be absorbed increasing hardness. Therefore, the hardness of the sample water collected from these sites was very low and resulted in lower hardness WQTLs compared to previous years.

The Coalition looked at the average hardness and dissolved copper concentrations of samples collected in Zones 3-6 to try and determine the underlying cause of exceedances observed during the 2016 WY compared to the 2015 WY. The average hardness of samples collected in Zones 3-6 during the 2016 WY was 73.55 mg/L compared to 119.45 mg/L during the 2015 WY. Dissolved copper concentrations averaged 6.80 µg/L in samples collected during the 2016 WY, compared to 4.01 µg/L during the 2015 WY.

The effect of hardness on the copper WQTL was most evident in Zone 6 where 10 exceedances of the hardness based WQTL for copper occurred during the 2016 WY. For instance, the average dissolved copper concentration of samples collected in Zone 6 was 9.34 µg/L and the average hardness was 36.15 mg/L (2016 WY) compared to 4.00 µg/L and hardness 160 mg/L (2015 WY). When replacing the 2016 WY hardness value with the 2015 WY average harness value for Zone 6 (160 mg/L) and calculating the hardness based WQTL, the value is 13.38 µg/L (which would not be an exceedance). The combination of a slightly higher copper concentration and much lower hardness resulted in significantly more copper exceedances during the 2016 WY compared to the 2015 WY.

In summary, the source of the copper causing the exceedances is not entirely known but the relatively restricted geographic areas of exceedances, and the broader distribution of applications to the same commodities argues for a natural source that is restricted geographically. Exceedances of the hardness based WQTL for copper typically occur after storms at sites located in Madera and Merced County with softer water (Zones 3-6 only). A more detailed discussion on Zone 6 copper exceedance sourcing is provided in the Discussion of Surface Water Monitoring Results section of this report.

Table 77. Percentages of exceedances of WQTLs for applied metals and applied pesticides from 2008-2016 WY.
Table excludes 2008 upstream MPM that was conducted as part of source evaluation.

Monitoring Year	Pesticide Exceedance Trends			Metals Exceedance Trends		
	Exceedances	Sampled	% of Exceedances	Exceedances	Sampled	% of Exceedances
2008	45	3,460	1.3%	39	459	8.5%
2009	6	1,380	0.4%	6	310	1.9%
2010	10	1,249	0.8%	8	318	2.5%
2011	5	2,101	0.2%	30	556	5.4%
2012	0	951	0.0%	9	278	3.2%
Jan-Sept 2013	4	687	0.6%	13	222	5.9%
2014 WY	4	1,893	0.2%	5	155	3.2%
2015 WY	10	1,915	0.5%	4	84	4.8%
2016 WY	4	1,741	0.2%	20	67	29.9%

Figure 36. Percentages of exceedances of WQTLs for applied pesticides from 2008-2016 WY in the ESJWQC.
Sample counts include analyzed and dry monitoring events.

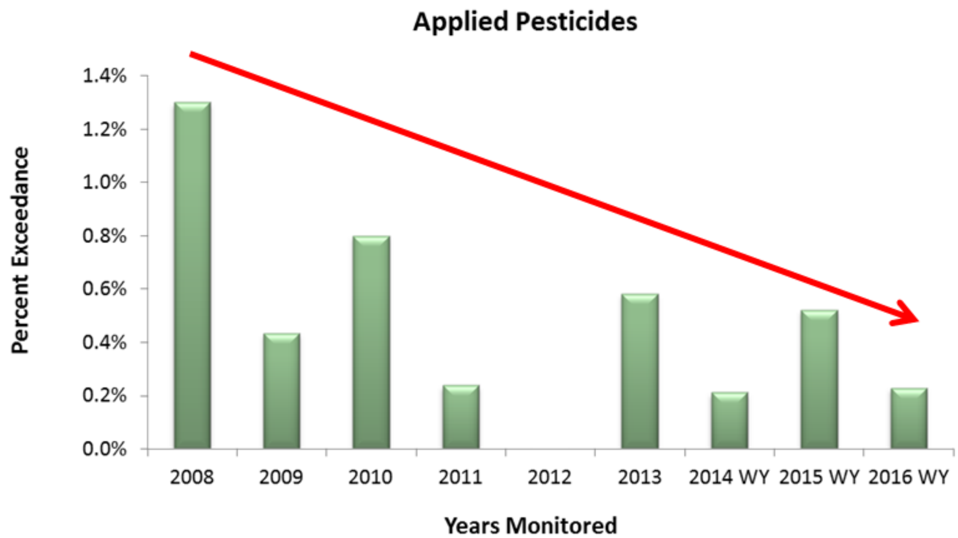
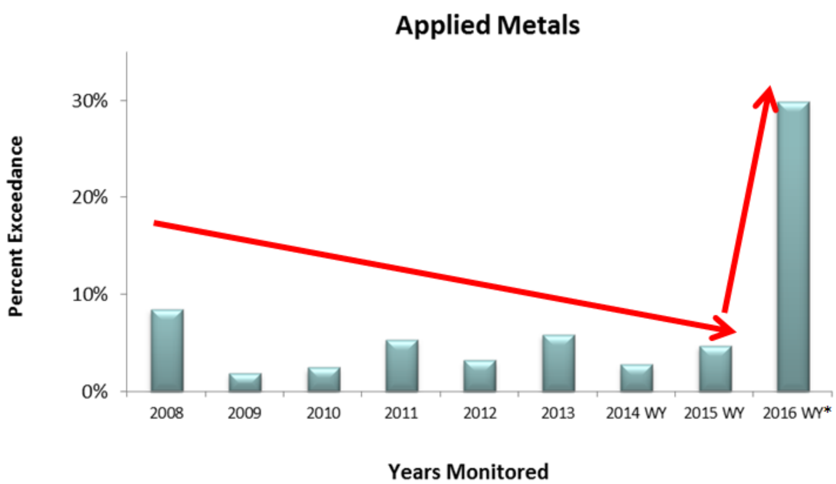


Figure 37. Percentages of exceedances of WQTLs for total and dissolved copper from 2008-2016 WY in the ESJWQC.
The bar graph includes percentages of exceedances of WQTLs for 'applied metals' only (copper). Sample counts include analyzed and dry monitoring events.



*Unusual increase in exceedances in 2016 WY likely due to heavy rainfall throughout the fall and winter.

Spatial Trends in Monitoring Results

The Coalition provided a Spatial Trend analysis in the 2014 and 2015 Annual Reports based on historical monitoring data associated with irrigated lands. The attempt to identify a spatial trend in the Coalition region was unsuccessful because of many different factors. Conclusions from the analysis indicate no apparent spatial trend and the Coalition could not identify any association between exceedances and geographical local.

GROWER COMPLIANCE WITH WDR

Meeting Provisions of the WDR

In order to address the fourth programmatic question, “Are irrigated agriculture operations of members in compliance with the provisions of the Order,” the Coalition tracks and assesses information gathered from members as dictated in the WDR (Page 20) for:

- Meeting attendance (one required annually),
- FEs (completed annually by members in HVAs),
- NMP Worksheets (completed annually and certified if located in HVA),
- NMP Summary Report (annually for growers in HVAs),
- SECPs (as required, evaluated based on individual member information), and
- Implementation of management practices designed to minimize waste discharge to surface and groundwater to protect Waters of the State.

Further information on each piece of the requirements can be found in their subsequent sections of this report.

Efficacy and Application of Implemented Management Practices

In order to address the fifth programmatic question, “Are implemented management practices effective in meeting applicable receiving water limitations?” the Coalition evaluated: 1) what management practices are being implemented to reduce the impacts of irrigated agriculture within the Coalition boundaries, and 2) where the implemented management practices are being applied. The Coalition can assess management practices implemented by growers via their FEs and/or focused outreach results and analyses.

Coalition members implement farm management practices designed to reduce the impacts of offsite movement of pesticides and nutrients. Members are encouraged by the Coalition to improve the efficiency and productivity of their farming operations while protecting water quality and managing sediment erosion which in turn leads to improved water quality.

Results from 2016 FEs were used to determine the scope of implemented management practices by members in the Coalition region. Based off of results from FEs, members in the Coalition region presently implement management practices for pesticide application practices that are protective of water quality across 98 % of the irrigated acreage within the Coalition. Practices implemented include following label restrictions (98% of irrigated acreage), spray drift management (96%), and use of vegetated drain ditches (24%).

Updating irrigation methods on a farm is a costly endeavor; however, growers are making the investment to conserve and reduce the amount of water used on their ranches. In 2016, 78% of the Coalition’s acreage was irrigated using drip or micro spray. Two hundred and fifty members have increased the efficiency of their irrigation practices by having recirculation/tailwater return systems installed on their farm (21% irrigated acreage). There are 177 members who utilize retention ponds/holding basins to prevent irrigation tailwater from entering protected waterways. Implementing these types of practices greatly reduces the amount of irrigation drainage, completely removing a method of transport of farming constituents to major waterways.

The simple but effective practice of allowing grass filter strips to grow between rows of crops and around waterways is highly encouraged and implemented by many members across the Coalition region. Farm Evaluation responses on 2016 surveys indicate 806 members with 343,085 irrigated acreage implement this management practice. Preventing sediment erosion is important to growers, not just for the protection of water quality, but for maintaining a balanced and sustainable farming operation.

The effectiveness of all these practices was evident in 2016 WY monitoring results as no exceedances of the WQTL for diazinon occurred and no toxicity to *P. promelas*, *C. dubia,* or *H. azteca* occurred (Table 78; Table 79). Collectively, there were fewer exceedances of pesticides and herbicides during the 2016 WY compared to past monitoring years. Members have shown an interest in adopting efficient and environmentally responsible management practices. To encourage the implementation of more substantial but perhaps more costly practices, the Coalition informs growers of available funding for projects aimed at reducing the impact of agriculture on water quality. Through the Natural Resource Conservation Service (NRCS), growers received funding from two programs: the Environmental Quality Incentives Program (EQIP) and the Agricultural Water Enhancement Program (AWEP). The Agricultural Act of 2014 repealed funding for AWEP; however, the NRCS still continues to support AWEP contracts entered prior to the Act, but no new projects are being added.

Where Management Practices Are Applied

Management practices designed to protect surface and groundwater are implemented Coalition wide. Management practices are recorded in Farm Evaluations for all members in the Coalition and more thoroughly during focused outreach when representatives meet with targeted growers. Focused outreach allows the Coalition to follow individual growers with recommended practices and track new practices implemented.

A summary of 2016 Farm Evaluation responses and management practices implemented by Coalition members is provided in the Farm Evaluations section of this report. The Member Actions section of this report includes a complete analysis of focused outreach results and implemented management practices. The section includes details on the number of growers implementing practices and the acres associated with these specific management practices implemented. Table 59 includes all of the acreages associated with newly implemented management practices designed to reduce the impacts of irrigated agriculture in the first through seventh priority subwatersheds.

Members are constantly changing membership status and many new members begin farming annually or change the location of their leases. New members may or may not have received focused outreach and water quality impairments could potentially occur due to uninformed new members. Many of the site subwatersheds in the Coalition region have significant acreages occupied by non-members who do not receive focused outreach and could potentially be impairing water quality. Until the Coalition region has 100% of the irrigated acreage enrolled under a membership, management practices implemented by members of the Coalition may not be enough to improve water quality due to discharges by non-members who have not implemented similar practices. In addition, managing constituents that are naturally occurring in the environment (salts, metals) is beyond the scope of what the Coalition can achieve through management practice implementation alone.

Effectiveness of Management Plans

To answer the sixth programmatic question, “Are the applicable surface water quality management plans effective in addressing identified water quality problems?” the Coalition looked at the number of completed management plans approved by the Regional Board and the frequency of exceedances over time.

Monitoring results indicate the Coalition’s management plan strategy along with focused outreach and management practice tracking are effective at improving water quality across the Coalition region. Since the initiation of focused outreach, the Coalition has received approval for the completion of 65 management plans in 23 site subwatersheds. Fifteen of 23 management plans for chlorpyrifos have been completed since the initiation of management plans and focused outreach. Due to the effectiveness of the Coalition’s management plan strategy, there are fewer pesticide, herbicide, and toxicity management plans to complete than ever before (Table 72). Since focused outreach began in 2008, the number and percentage of exceedances for chlorpyrifos, copper, diazinon, and diuron have declined substantially (Table 78-Table 79). Table 78 lists the year of monitoring, the number of samples collected, exceedances that occurred each year, and the pounds of product applied within the Coalition. During the 2016 WY, no water column toxicity occurred to *C. dubia*, *P. promelas* or sediment toxicity to *H. azteca*. Table 79 lists the years monitoring occurred, the number of samples collected and analyzed for each indicator species and a count of samples that resulted in toxicity. Overall, it is apparent that management plans are efficient at improving water quality and are trending toward the protection of BUs. A complete evaluation of the Coalition’s management plans and effectiveness of outreach and implemented management practices is included in the Status of Management Plans section of this report. The Coalition conducts annual grower meetings and individual farm visits to keep growers informed of water quality in the region. These outreach efforts have resulted in additional management practices implemented by members.

Table 78. Count of exceedances of the WQTL and samples collected for pesticides from 2006 through 2016 WY across the ESJWQC region.

Year	Chlorpyrifos				Copper[1]				Diazinon				Diuron				Malathion			
	# of Excd	# of Samples[2]	% Excd	Lbs Applied[3]	# of Excd	# of Samples[2]	% Excd	Lbs Applied[3]	# of Excd	# of Samples[2]	% Excd	Lbs Applied[3]	# of Excd	# of Samples[2]	% Excd	Lbs Applied[3]	# of Excd	# of Samples[2]	% Excd	Lbs Applied[3]
2006	19	115	17%	201924	23	61	38%	936935	0	95	0%	13006	0	75	0%	10582	1	93	1%	20279
2007	21	180	12%	154640	54	119	45%	570981	1	129	1%	9845	7	125	6%	12411	0	191	0%	28394
2008	29	218	13%	116038	51	175	29%	418841	2	145	1%	5751	7	141	5%	35390	2	189	1%	22896
2009	5	97	5%	143579	6	79	8%	348288	0	72	0%	5610	1	72	1%	31860	0	93	0%	19552
2010	9	93	10%	114367	8	100	8%	489424	0	74	0%	3517	1	77	1%	29043	0	84	0%	18850
2011	3	147	2%	94790	30	170	18%	621776	0	145	0%	5172	1	146	1%	41304	0	144	0%	23350
2012	0	82	0%	86390	9	90	10%	455207	0	74	0%	3198	0	79	0%	28641	0	82	0%	23962
2013	1	92	1%	113398	13	129	10%	492922	1	72	1%	4158	1	74	1%	17354	1	66	1%	32635
2014 WY	3	126	3%	112137	5	92	5%	477204	0	75	0%	2411	1	79	1%	38112	1	72	1%	22980
2015 WY	8	119	7%	81066	4	84	5%	704461	0	73	0%	3051	0	93	0%	21596	1	72	1%	17986
2016 WY	2	108	2%	47259	20	67	30	716793	0	66	0%	1967	1	82	1%	23374	1	69	1%	8025

[1] Since October 2008, the Coalition analyzes for both the total and dissolved fraction of copper in every event. For counting exceedances and samples scheduled for copper analysis, this table ignores fraction (e.g. if a site is scheduled for copper total and copper dissolved analysis, only one sample is counted for copper). Concentrations from a single sample collected from one site during one event have never exceeded both the total and dissolved copper WQTLs.

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

[3] All PUR data are considered preliminary until received from California Pesticide Information Portal (CalPIP); CalPIP data are available through December 2014.

Table 79. Count of toxicity and samples collected for toxicity from 2006 through 2016 WY across the ESJWQC region.

Year	*C. dubia* Toxicity			*P. promelas* Toxicity			*S. capricornutum* Toxicity			*H. azteca* Sediment Toxicity		
	Count of Toxicity	Count of Samples[1]	% Toxic	Count of Toxicity	Count of Samples[1]	% Toxic	Count of Toxicity	Count of Samples[1]	% Toxic	Count of Toxicity	Count of Samples[1]	% Toxic
2006	15	119	13%	3	107	3%	4	108	4%	2	30	7%
2007	10	144	7%	1	135	1%	14	146	10%	5	35	14%
2008	10	185	5%	4	174	2%	52	200	26%	11	58	19%
2009	2	74	3%	3	72	4%	5	82	6%	0	12	0%
2010	2	81	2%	2	72	3%	1	88	1%	1	16	6%
2011	1	146	1%	2	144	1%	6	152	4%	1	26	4%
2012	0	90	0%	0	75	0%	2	86	2%	1	17	6%
2013	4	95	4%	1	81	1%	6	106	6%	2	25	8%
2014 WY	2	100	2%	3	89	3%	16	132	12%	3	39	8%
2015 WY	8	97	8%	0	92	0%	18	126	14%	1	39	3%
2016 WY	0	83	0%	0	75	0%	11	103	11%	0	20	0%

[1] Samples refer to all samples collected for constituent analysis (dry sites included)

MITIGATION MONITORING REPORT

As stated on Page 9 of the WDR, environmental impacts may occur as a result of member's compliance activities. Members are therefore required to either avoid impacts where feasible or implement identified mitigation measures, if any, to reduce potential impacts. Where avoidance or implementation of identified mitigation is not feasible, use of the WDR is prohibited and individual WDRs are required. The MRP Order, Attachment B, includes a Mitigation Monitoring and Reporting Program for tracking the implementation of mitigation measures. Any California Environmental Quality Act (CEQA) mitigation measures implemented and reported by ESJWQC members (including the impact measures addressed, location (TRS), and monitoring scheduled to measure the success of mitigation) would be reported May 1, annually. There were no implemented mitigation measures reported by Coalition members during the 2016 WY.

CONCLUSIONS AND RECOMMENDATIONS

Monitoring results from the 2016 WY indicate that although there are substantial improvements in water quality in many areas, water quality is still not protective of all beneficial uses across the entire Coalition region. The BUs impaired during the 2016 WY include:

- Aquatic Life (ammonia, chlorpyrifos, DO, dissolved copper, and malathion),
- Agriculture (SC),
- Municipal and Domestic Supply (ammonia, arsenic, chlorpyrifos, diuron, nitrate),
- Recreational (*E. coli*).

The most common exceedances (DO, SC, and *E. coli*) are constituents for which irrigated agriculture may not be the driving factor despite the fact that the landscape consists primarily of irrigated agriculture.

Discharges from irrigated lands are only one of many possible sources of impaired beneficial uses. For many parameters, it is not clear to what extent exceedances of WQTLs are a result of agricultural activities. Exceedances of WQTLs for field parameters where source identification is difficult, especially for non-conserved constituents (DO and pH) makes it unlikely that all beneficial uses will ever be fully protected. During the 2016 WY, exceedances of the hardness based WQTL for dissolved copper occurred frequently in Zones 3, 4, 5, and 6. Although growers apply copper containing fungicides, all inputs of copper in the watersheds are unknown, making it difficult to know the exact cause of exceedances. Water column toxicity results from the 2016 WY, indicated no toxicity to *Ceriodaphnia dubia* or *Pimephales promelas*. Toxicity to *Selenastrum capricornutum* occurred is samples collected from four monitoring sites within Zone 2.

In the event of exceedances of pesticide WQTLs or the occurrence of toxicity, the Coalition identifies sources through the analysis of preliminary PUR data, assessment of water quality data and evaluation of current management practices of targeted growers.

CONCLUSIONS

Conclusions from data provided in the Surface Water Evaluation of Management Practice Effectiveness, Status of TMDL Constituents, Member and Coalition Actions Taken, and Status of Management Plans sections of this report include:

1. Individual grower visits continue to be an effective method of communicating with members.
2. Implementation of management practices continues to improve water quality in the Coalition region.
3. Growers across the ESJWQC region are aware of water quality impairments and are implementing management practices designed to address these impairments even if the Coalition has yet to conduct focused outreach in the site subwatershed.
4. Growers in the ESJWQC region are taking advantage of available funding resources to implement management practices that improve water quality.

5. Remaining exceedances may be difficult to eliminate because the cause/source of the problems may not be due to agriculture; management practices effective in eliminating exceedances of pesticides are not effective in reducing exceedances of WQTLs for parameters such as DO, SC, *E. coli*, ammonia/nitrate, or pH.
6. Member actions may not be the main cause of water quality impairments associated with elevated concentrations of copper.
7. The Coalition's focused management practice outreach and tracking strategy is effective at improving water quality. The Coalition received approval on April 14, 2017 to remove 10 specific site subwatershed/ constituent pairs from the active management plan of eight site subwatersheds.
8. Continued improvements in water quality are expected in coming years based on results evident from past grower outreach efforts.
9. Future water quality results may be dependent on growers who are not yet members of the Coalition and do not comply with discharge requirements.

Based on the information provided in the response to the programmatic questions, the Coalition will pursue the following during the 2017 WY:

1. Monitor according to the WDR and the monitoring schedule outlined in the Monitoring Plan Update (2017 WY MPU; approved October 7, 2016).
2. Continue to document and assess management practices implemented by Coalition growers.
3. Continue focused outreach and education efforts around constituents applied by agriculture while also educating growers about non-conserved constituents such as DO, pH, and SC.

RECOMMENDATIONS

The Coalition identified several areas in which CVRWQCB involvement could result in improvement in water quality in the Coalition region:

1. Review Irrigation District permits for potential source of algae toxicity and contribution to metals exceedances.
2. Identify and regulate dairies in site subwatersheds that are using constituents of concern which may affect the BUs of downstream waterbodies.
3. Develop and deploy methods to monitor illegal dairy discharges and notify the Coalition of any known dairy discharges that may result in water quality impairments including nutrient and *E. coli* exceedances.
4. Continue enforcement actions against non-members who have the potential to discharge.
5. Consider eliminating exceedances that occurred in samples collected from non-contiguous waterbodies as they do not adequately represent water quality within the Coalition region.
6. Move forward with the processes to develop plans to study contamination of surface waters by *E. coli,* causes of elevated pH, and low dissolved oxygen.
7. Continue to work with the CV-SALTS process to develop a better understanding of the sources and sinks of salt in surface and groundwater and potential practices that can be effective in preventing exceedances.

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