Annual Report

October 2016 – September 2017

East San Joaquin
WATER QUALITY COALITION

Irrigated Lands Regulatory Program
Central Valley Regional Water Quality Control Board

Submitted May 1, 2018

mlj-llc.com |. O 530.756.5200 F 530.756.5225
1480 Drew Ave., Ste. 130 | Davis, CA 95618
MLJ ENVIRONMENTAL

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

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
K_{oc}	Organic Carbon Partitioning Coefficient
LABQA	Laboratory Quality Assurance
LC_{50}	Lethal Concentration at 50% mortality
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate

MCL	Maximum Contaminant Level
MDL	Minimum Detection Limit
MLJ Environmental	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
PBO	Piperonyl Butoxide
PCA	Pest Control Advisor
PEP	Pesticide Evaluation Protocol
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-R4)	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	Sample 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 Impairments, 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. INMP Summary Report Evaluation	**Will be submitted July 1, 2018**
	18. Summary of management practice information collected from Farm Evaluations	**Will be submitted July 1, 2018**
	19. Summary comparison of township Groundwater Protection Targets and actual value achieved for each township.	**Reported on July 1, 2021**
	20. Summary of mitigation monitoring	Mitigation Monitoring
	21. Summary of education and outreach activities	Coalition and Member Actions Taken to Address Water Quality Impairments, Appendix III (Meetings, Agendas and Handouts)
	22. Conclusions and recommendations	Conclusions and Recommendations

	Annual Monitoring Report and Management Plan Progress Report requirements (Order No. R5-2012-0116-R4)	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 including a list of management practices recommended	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 Water Quality Impairments, Surface Water Evaluation of Management Practice Effectiveness
	10. Summary of the degree of implementation of management practices by growers within the management plan area	Coalition and Member Actions Taken to Address Water Quality Impairments, Surface Water Evaluation of Management Practice Effectiveness
	11. Results from evaluation of management practice effectiveness, including the $A/R_{3\ year}$ ratio when evaluating a GQMP.	Reported in May 1, 2019 Annual Report
	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)**	**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, 2018 Annual Report which includes an update to the Coalition's Management Plan Progress Report and management plan implementation schedules and timelines, the 2017 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-R4). 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 2018 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 2017 WY at Core, Represented, and MPM sites, including four 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, 2018 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 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).

During the 2017 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, 2016 Monitoring Plan Update (MPU) report for the 2017 WY (approved October 7, 2016). During the 2017 WY, the Coalition monitored 29 sites; of these 29 sites, MPM took place at 21 sites. Management Plan Monitoring was conducted for copper, lead, chlorpyrifos, diazinon, dimethoate, diuron, malathion, water column toxicity (*C. dubia*, *P. promelas*, and *S. capricornutum*), and sediment toxicity (*H. azteca*).

Results from the 2017 WY include exceedances of WQTLs for the following constituents: dissolved oxygen (DO; 58), pH (15), specific conductivity (SC; 50), *E. coli* (19), nitrate (17) and ammonia (5), dissolved copper (34), chlorpyrifos (2), and methomyl (1). Water column toxicity to *C. dubia* (4), *S. capricornutum* (11), and *P. promelas* (1) occurred during the 2017 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 2017 WY monitoring, several new site/constituent specific management plans are required including:

- Ash Slough @ Ave 21 (SC)
- Canal Creek @ West Bellevue Rd (SC and copper)
- Dry Creek @ Rd 18 (reinstated DO and SC)
- Dry Creek @ Church St (ammonia)
- Lateral 6 and 7 @ Central Ave (nitrate)
- Lower Stevinson @ Faith Home Rd (nitrate)
- Miles Creek @ Reilly Rd (reinstated chlorpyrifos)
- Mootz Drain downstream of Langworth Pond (SC)

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 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 2017 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 2017 Focused Outreach site subwatersheds, the Coalition completed 100% of individual meetings with 34 targeted growers and documented current and recommended management practices. The Coalition is in the process of initiating the 2018 Focused Outreach in the Lateral 5 ½ @ South Blaker Rd site subwatershed. Individual meetings with targeted members will take place in 2018 and 2019 to discuss local water quality concerns and recommend additional management practices effective at reducing water quality impairments; preliminary results from 2018 Focused Outreach will be included in the May 1, 2019 Annual Report.

Conclusions

Monitoring results from the 2017 WY indicate that although there are substantial improvements in water quality in many areas, several waterbodies in the Coalition region are still not protective of all Beneficial Uses, often due to exceedances of field parameters and *E. coli*. 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. The Coalition's focused management practice outreach and tracking strategy is effective at improving water quality. Implementation of management practices continues to improve water quality in the Coalition region.
    a) 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.
3. Member actions may not be the main cause of water quality impairments associated with elevated concentrations of copper.
    a) Increased precipitation and use of surface water for irrigated resulted in a decrease in overall water hardness in Zones 4-6 causing an increase in observed dissolved copper exceedances with low copper concentrations.
4. Remaining exceedances may be difficult to eliminate because the cause/source of the problems may not be due to agriculture.
5. Continued improvements in water quality are expected in coming years based on results evident from past grower outreach efforts.
6. 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 2018 WY:

1. Monitor according to the WDR and the monitoring schedule outlined in the Monitoring Plan Update (2018 WY MPU; approved November 10, 2017).
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.
4. Coalition representatives will continue to emphasize the importance of preventing the off-site movement of constituents of concern.
5. 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.
6. Utilize the PEP to help determine if sources of increased algae toxicity are related to irrigated agriculture

Recommendations

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

1. Review Irrigation District permits for applications that could be a potential source of algae toxicity and contribution to metals exceedances.
2. Come up with a different method for determining dissolved copper exceedances that does not solely rely on the hardness of water.
3. Identify and regulate dairies in site subwatersheds that are using constituents of concern which may affect the BUs of downstream waterbodies.
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. Work with the SWAMP Toxicity Work Group to establish toxicity qualifier thresholds for *S. capricornutum, C. dubia, and P. promelas* as was done for *H. azteca* based on the August 27, 2014 SWAMP Toxicity Work Group Recommendation for Evaluation Toxicity Data (Attachment B).
   a) Allow the Coalitions to review past water column toxicity for *S. capricornutum* and petition to eliminate management plans based on a new threshold value.

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 2016 through September of the 2017 Water Year (WY).

The 2018 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) 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).

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 5,595,243 acres of which 925,494 acres (16.5%) are considered irrigated agriculture (measured in ArcGIS; Table 1). To obtain information on land use acreage, the Coalition used information from the California Department of Water Resources (DWR) Land Use Viewer (https://gis.water.ca.gov/app/CADWRLandUseViewer/). The dataset presents the 2014 agricultural land use, managed wetlands, and urban boundaries for all 58 counties in California. The data is prepared by Land IQ, LLC and provided to the California Department of Water Resources (DWR) and other resource agencies involved in work and planning efforts across the state for current land use information. The data are derived from a combination of remote sensing and agronomic analysis and ground verification. The DWR Land Use Viewer includes data for the Central Valley and not for the whole Coalition area as shown in Figures 2 through 7.

Table 1. Acreage of farmed land in the ESJWQC by county.

County	Total County Acreage (measured in ArcGIS)	Farmed Acreage (From DWR)[1]
Alpine	85,638	0
Fresno	607,560	405
Madera	1,377,316	330,445
Mariposa	936,078	154
Merced	667,635	336,946
Stanislaus	467,456	256,455
Tuolumne	1,453,560	1,140
Total	**5,595,243**	**925,545**

[1] Farmed acreage data from 2014, obtained from: https://gis.water.ca.gov/app/CADWRLandUseViewer/

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). Land use maps for each zone are included in Figure 2 through Figure 7.

Figure 1. ESJWQC zone boundaries and Core sites.

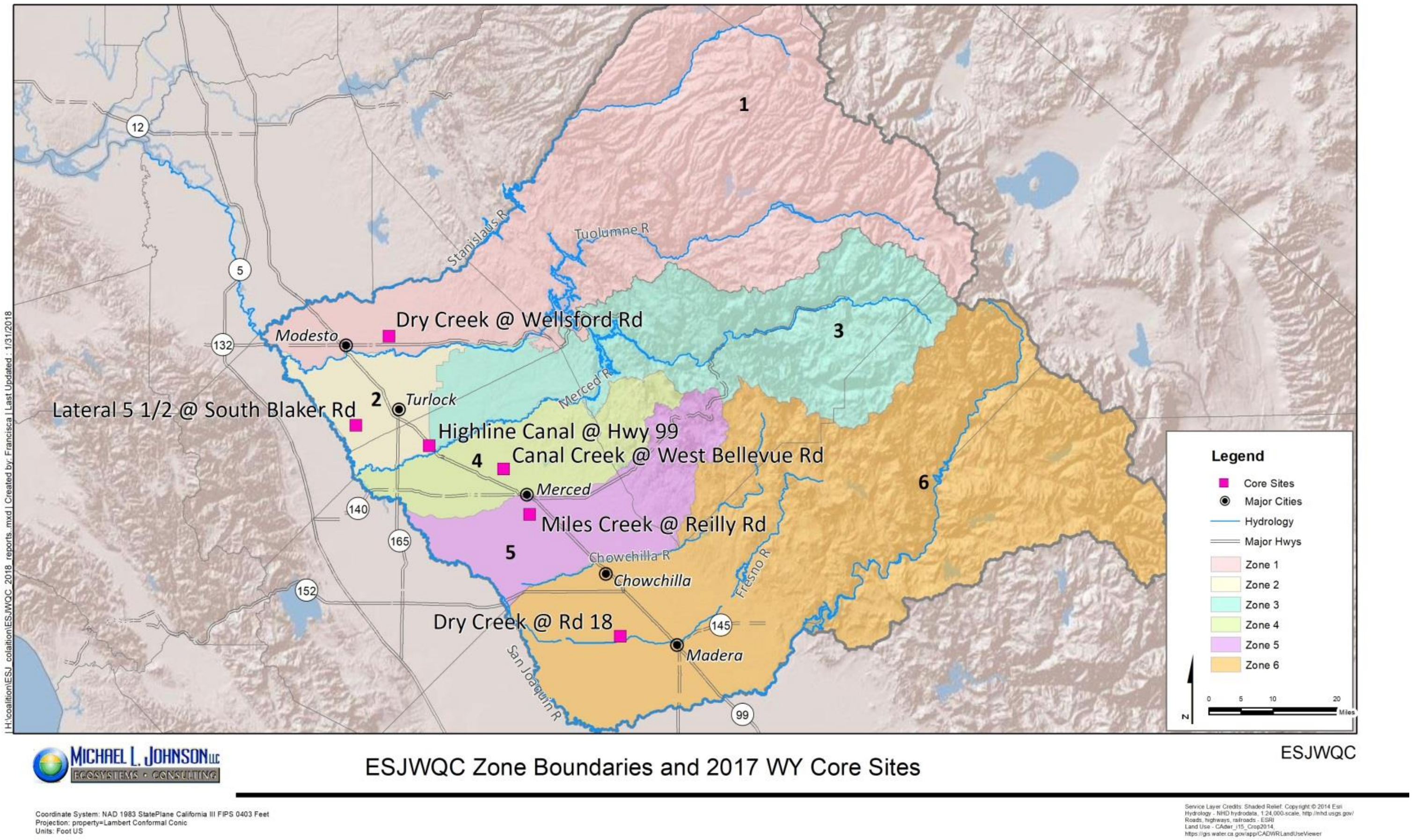


Table 2. ESJWQC total and irrigated acreages for Zones 1-6.

Zones	Total Acres[1] (from ArcGIS)	Farmed Acreage (from DWR)[2]
Zone 1	1,788,476	117,631
Zone 2	195,781	130,943
Zone 3	857,618	91,765
Zone 4	338,904	108,024
Zone 5	396,497	143,994
Zone 6	2,015,328	331,516
Total	**5,592,603**	**923,873**

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

[2] Farmed acreage data from 2014, obtained from: https://gis.water.ca.gov/app/CADWRLandUseViewer/

Figure 2. Zone 1 land use and Core monitoring site during the 2017 WY.

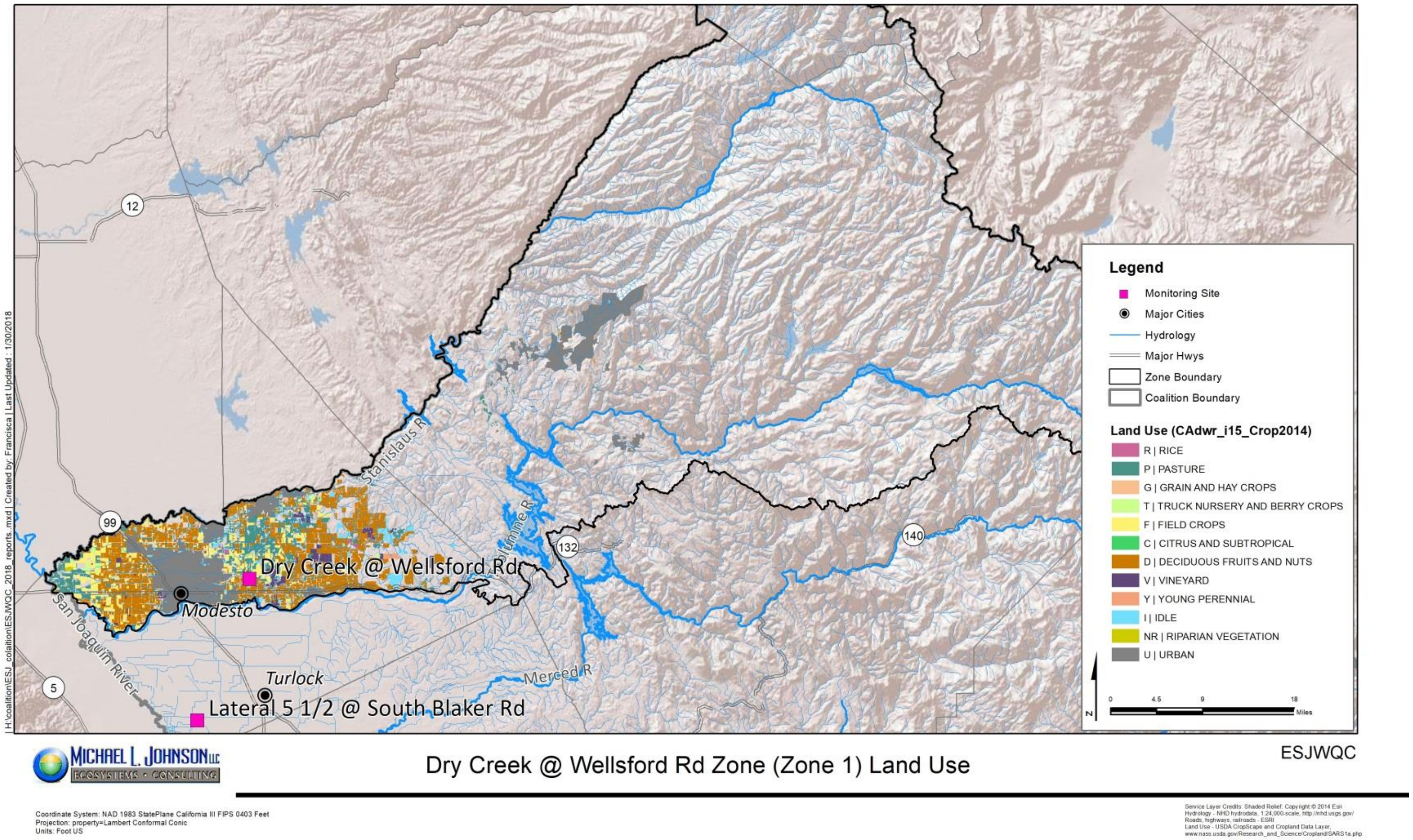


Figure 3. Zone 2 land use and Core monitoring site during the 2017 WY.

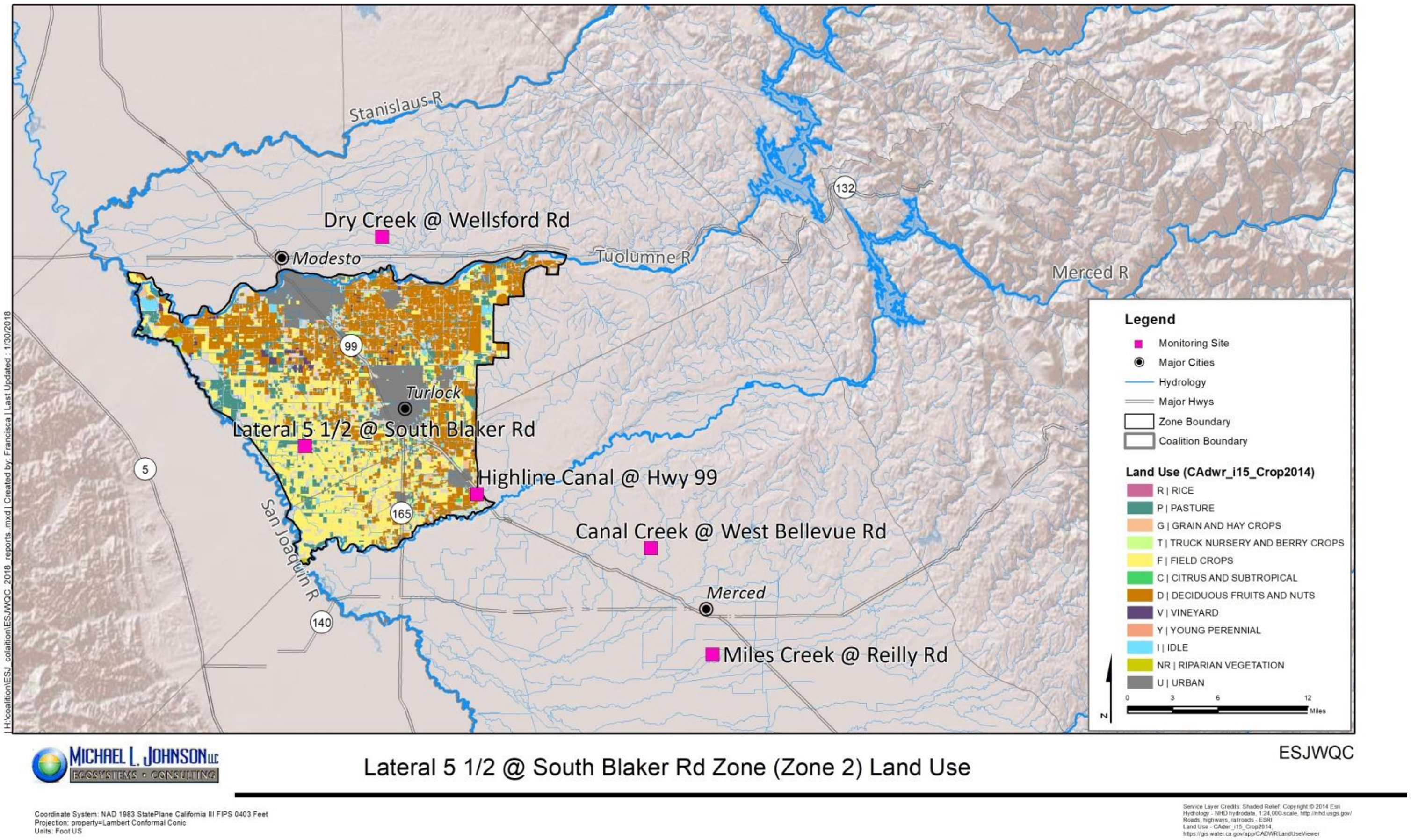


Figure 4. Zone 3 land use and Core monitoring site during the 2017 WY.

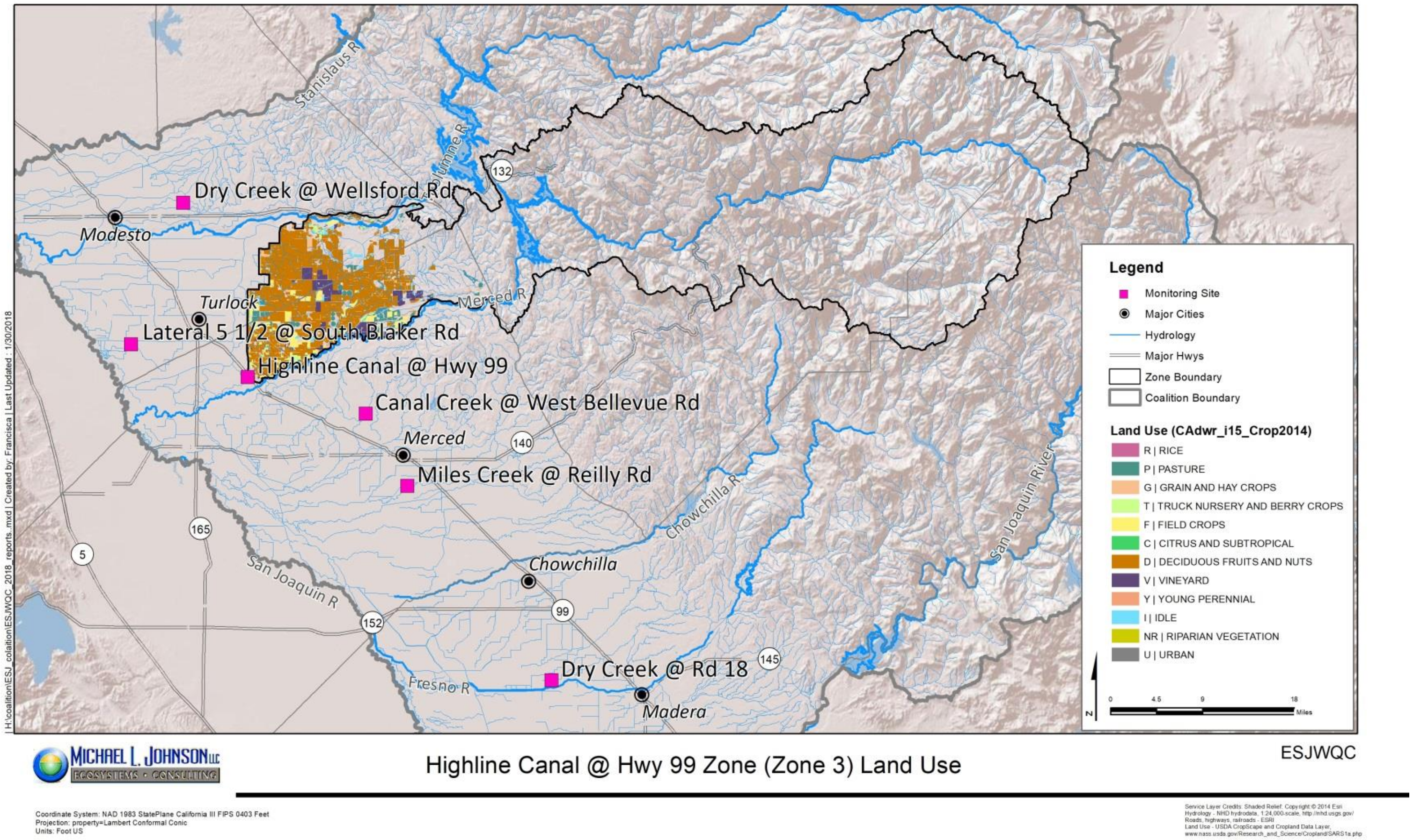


Figure 5. Zone 4 land use and Core monitoring site during the 2017 WY.

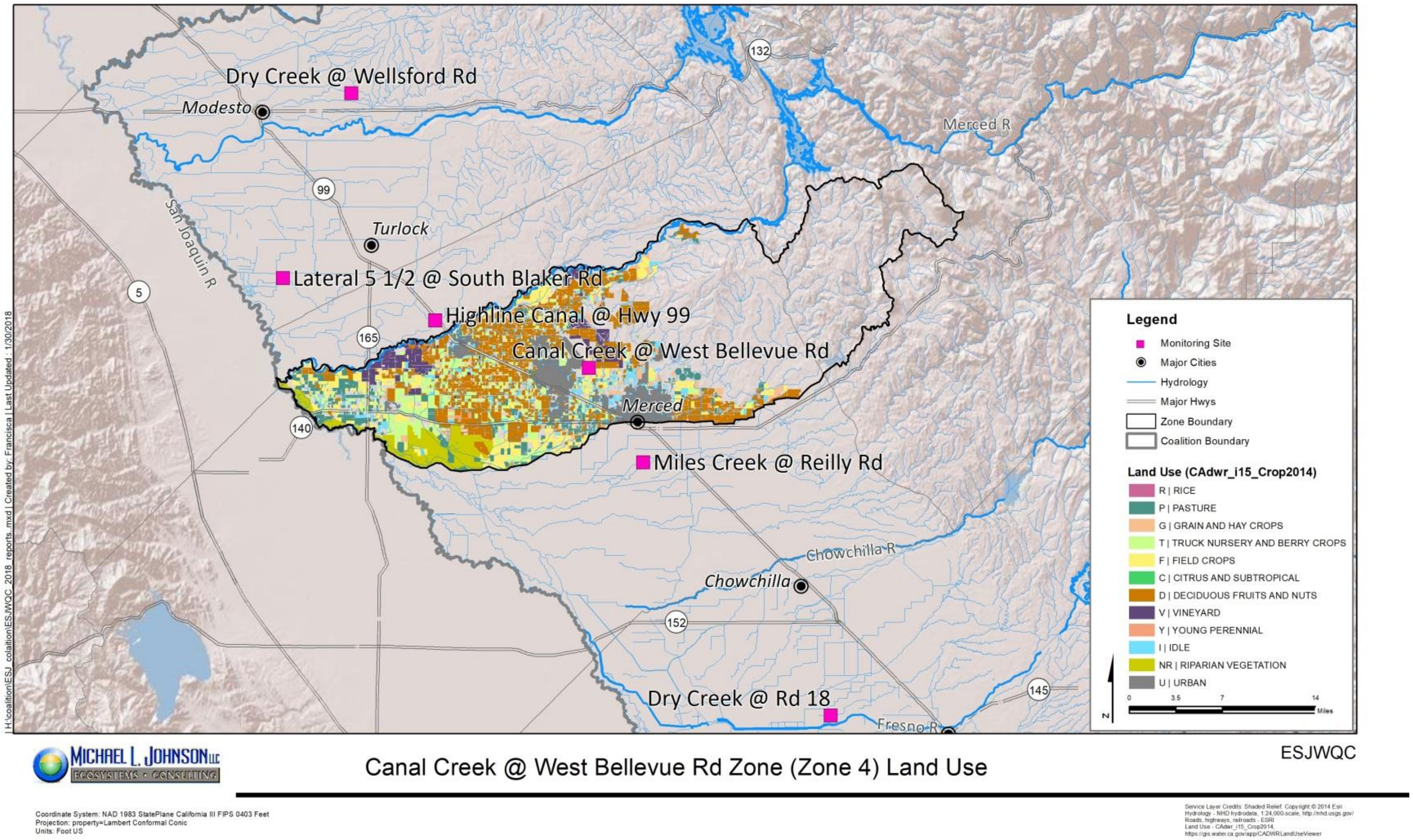


Figure 6. Zone 5 land use and Core monitoring site during the 2017 WY.

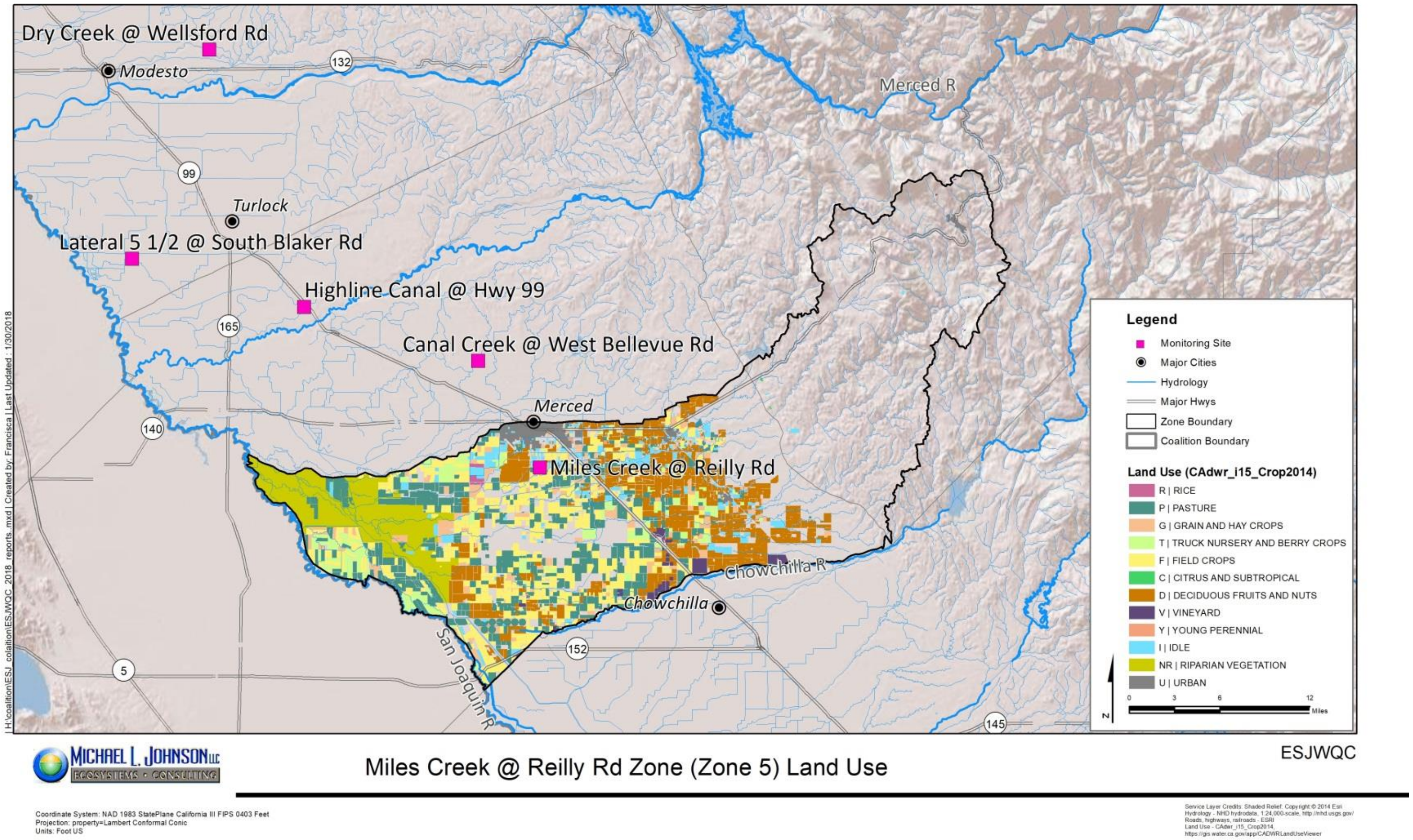
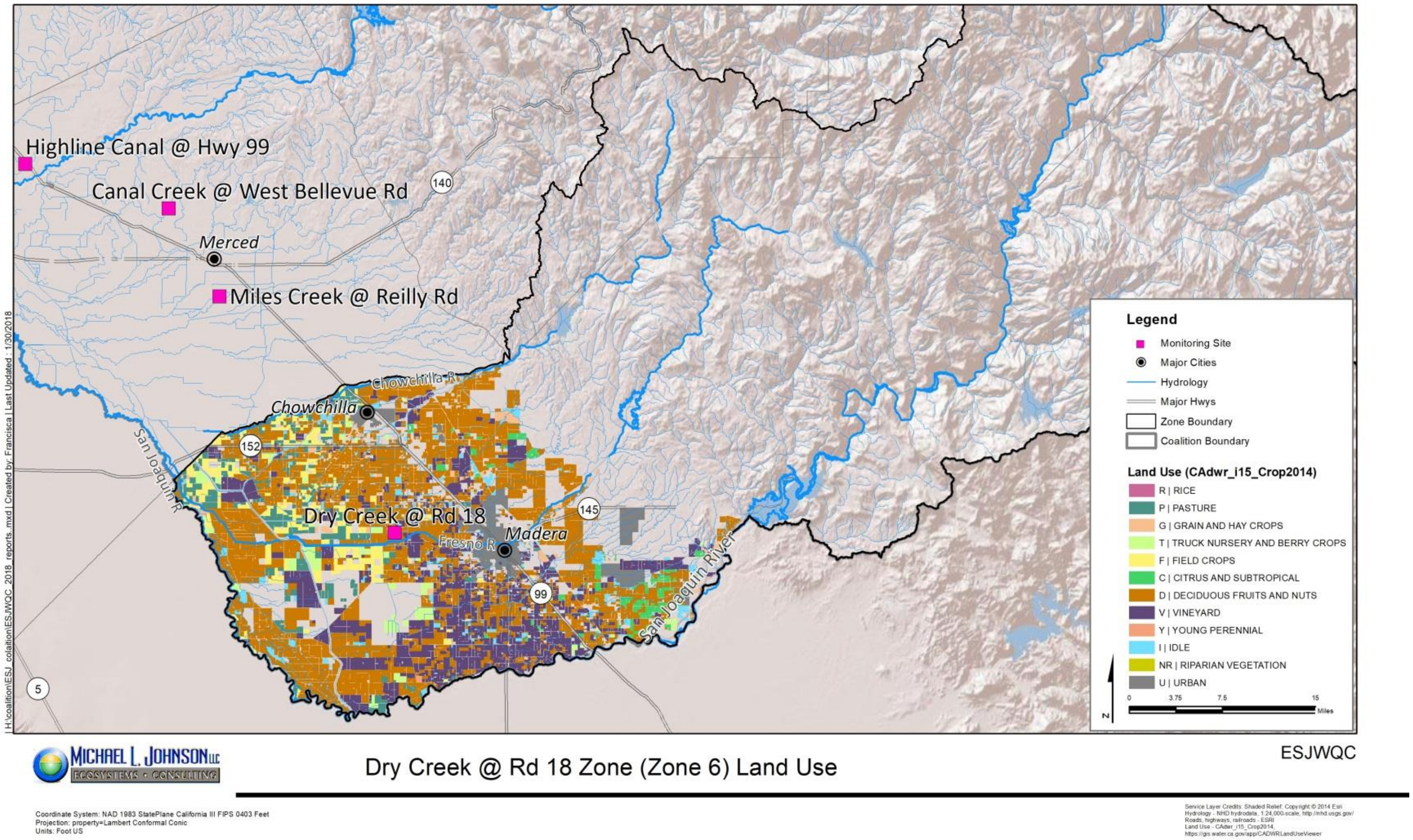


Figure 7. Zone 6 land use and Core monitoring site during the 2017 WY.



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.

During the 2017 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, 2016 Monitoring Plan Update (MPU) report for the 2017 WY (approved October 7, 2016). The Coalition attempts to sample two storm events per year during NM in order to characterize periods of high flows. Four storm events were sampled during the 2017 WY on October 29, 2016, December 9, 2016, January 10, 2017, and on April 11, 2017 (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 14, 2017 and September 12, 2017. Due to lack of sediment accumulation at Lateral 5 ½ @ South Blaker Rd for the September 2017 sediment monitoring event, sediment samples were collected from an alternative site, Lateral 6 and 7 @ Central Ave.

2017 WY 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 2017 WY was the last year of two consecutive years of monitoring for the second set of Core sites. The Coalition is scheduled to rotate back to the first set of Core sites again in the 2018 WY. Table 3 includes a list of the 2017 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.

On June 30, 2017, the Coalition submitted a request to change the monitoring locations for Dry Creek @ Wellsford Rd and Merced River @ Santa Fe Drive due to unsafe sampling conditions and restricted parking access. The Coalition received approval to replace the monitoring locations on July 24, 2017 with Dry Creek @ Church St (Appendix IV, Figure 10) and Merced River @ Oakdale Rd (Appendix IV, Figure 23). Dry Creek @ Church St is located about a mile downstream of the original sampling location and Merced River @ Oakdale Rd is located about four miles upstream from the original sampling site. During the 2017 WY, the Coalition monitored at Dry Creek @ Wellsford Rd and Merced River @ Santa Fe Drive from October 2016 through July 2017. Monitoring at Dry Creek @ Church St occurred in August and September of 2017 and no monitoring at Merced River @ Oakdale Rd occurred during the 2017 WY as all monitoring requirements were completed prior to the site swap approval.

Table 3. ESJWQC 2017 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
	Core*		Dry Creek @ Church St	535XDCCHS	37.66674	-120.89822
	Represented	X	Mootz Drain Downstream of Langworth Pond	535XMDDLP	37.70539	-120.89569
Zone 2	Core		Lateral 5 1/2 @ South Blaker Rd	535LFHASB	37.45827	-120.96730
	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
	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	X	Merced River @ Oakdale Rd	535XMRAOR	37.45417	-120.60778
	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

*On July 24, 2017 the Coalition received approval to replace the Dry Creek @ Wellsford Rd monitoring site with Dry Creek @ Church St. Monitoring at the replacement site occurred in August and September 2017.
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).

Represented sites were identified for monitoring during the 2017 WY based on the following criteria:

1. An exceedance of a pesticide, applied metal, or toxicity occurred at the Core site in the same zone during the 2016 WY,
2. The Core site is in a management plan for a 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 2017 WY MPU, the Coalition determined it was necessary to monitor 20 of 24 Represented sites within the ESJWQC boundary during the 2017 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 (Table 3). Monitoring data are collected from TMDL sites to assess compliance according to the 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 SQMP 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 2017 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 SQMP 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 (approved on November 4, 2015). In addition, the SQMP includes management plan implementation schedules and timelines for reporting to the Central Valley Regional Water Quality Control Board (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 WDR specifies that management plans must be completed in the shortest amount of time as practical and must not exceed 10 years from the date the management plan is reported to the Regional Board. The Coalition continues to implement the focused outreach strategy with targeted members in site subwatersheds based on when exceedances of WQTLs occurred, the magnitude of the exceedances, and the potential sources.

Table 4 includes all focused outreach site subwatersheds (a total of 26 site subwatersheds). The Coalition has contacted members in eight site subwatersheds that were previous focused outreach sites due to new water quality impairments and/or reinstated management plans.

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

Management Plan	Site Subwatershed Name	Priority Set	Year for Focused Approach
	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
	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
	Lateral 5 ½ @ South Blaker Rd	2018 Focused Outreach	2018-2020

[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).

*Coalition conducted focused outreach previously within these site subwatersheds.

TMDL Monitoring

During the 2017 WY, Total Maximum Daily Load (TMDL) monitoring occurred to evaluate compliance with approved TMDLs for chlorpyrifos, diazinon, salts (SC), and boron; no exceedances occurred at compliance monitoring sites. Measurements taken during two monitoring events indicated two exceedances of the WQTL for DO, once at San Joaquin River above Maze Boulevard in June and once at San Joaquin River @ Hills Ferry in January (6.92 and 6.95 mg/L; respectively).

In September 2004, the Regional Board adopted the Lower San Joaquin River (LSJR) Salt and Boron Basin Plan Amendment. The primary source of salinity in the LSJR is irrigation return flows from agricultural lands on the west side of the LSJR. On the west side, growers receive water from the Delta through the U.S. Bureau of Reclamation's Delta Mendota Canal (DMC). Return flows from growers on the west side have high salinity concentrations due to salty water imported from the delta, which is further concentrated by plants that extract the water but leave the salt. On the east side of the LSJR, elevated salinity concentrations are exacerbated by dams constructed in the upper foothills, restricting the release of water to dilute the salty water. The Salt and Boron TMDL establishes numeric objectives for the Lower San Joaquin River at Airport Way Bridge near Vernalis, located at the southern end of the delta. Compliance with the TMDL control programs is attained by either participating in a Regional Board approved real-time management program or attainment of salinity and boron WQOs that are assigned based on specific locations in the Valley. In 2008, the Regional Board and the U.S. Bureau of Reclamation entered into a Management Agency Agreement (MAA), renewed in 2014, to address the salt imports in the DMC from the Delta. In the MAA, the U.S. Bureau of Reclamation agreed to support a real-time management program, lead efforts to reduce overall salt loading, and provide freshwater dilution flows as needed. On December 4, 2014 the Regional Board adopted a resolution approving the Real Time Management Program for meeting salinity water quality objectives in the LSJR.

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. On December 31, 2016, CV-SALTS submitted a Salt and Nitrate Management Plan (SNMP) to the Regional Board which was then submitted for external scientific peer review on January 11, 2018. The Regional Board will hold a public hearing in May and June of 2018 on the proposed amendment to the Basin Plan to establish a Central Valley-wide Salt and Nitrate Control Program. 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.

On June 23, 2006, the Regional Board finalized a Basin Plan Amendment which established 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 10, 2007. 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 locations. 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 San Joaquin River Chlorpyrifos and Diazinon 2017 WY TMDL AMR (submitted May 1, 2018).

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). The strategy for evaluating groundwater as described in the Revised Order (approved February 2018) includes (1) the Groundwater Assessment Report (GAR), (2) the Management Practices Evaluation Program (MPEP), (3) the Groundwater Quality Trend Monitoring Program (GQTMP), and (4) the implementation of Groundwater Quality Management Plans (GQMPs) that include Groundwater Protection Targets. Groundwater Protection Targets will be reported in the July 1, 2021 Management Practice and Nitrogen Use Report. The following section provides the monitoring objectives and minimum sampling and reporting requirements for the GQTMP.

Information pertaining to the MPEP and GQMPs can be found in the Groundwater Management Plan Activities and Performance Goals section of this report.

Groundwater Quality Trend Monitoring Program

All submittal/approval dates associated with the GQTMP are included in Table 45. The GQTMP Work Plan was submitted in three phases. 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. Phase III presents a monitoring network design which includes a targeted set of wells that include domestic wells which will be supplemented by data from Public Water System wells.

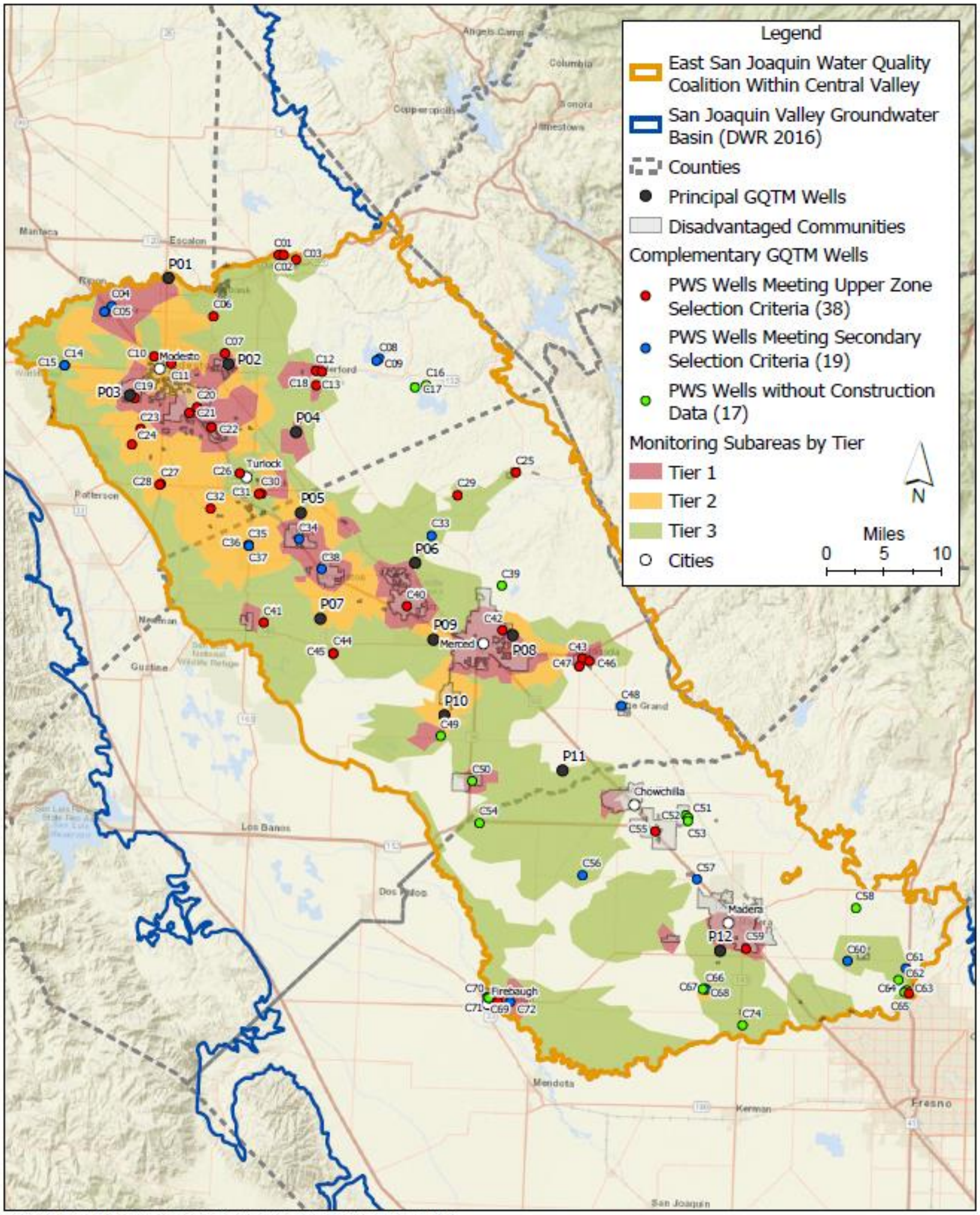
The GQTMP was designed to determine water quality conditions of groundwater and develop information that can be used to evaluate trends in regional water quality. Monitoring objectives identified by the Coalition include:

- 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.

As of March 1, 2018, the Coalition has identified 12-member wells (primary wells) and 74 public supply wells (complementary wells) to be monitored in the fall of 2018 and annually thereafter (Figure 8). The public supply wells will not be monitored by the Coalition; instead the Coalition will utilize the data being collected by the entities who own the 74 public supply wells. Candidate wells for the trend monitoring network were prioritized based on criteria such as location, construction, and historical water quality record. Candidate wells were designated as highly ranked for inclusion in the GQTMP network after obtaining confidential well completion reports, verifying the well location, verifying the overall site suitability (e.g., depth to water, wellhead and well proximity conditions, sample access), and coordination with the well owner or monitoring entity. Additional supplemental monitoring wells are anticipated to be included in the well network throughout the life of the program.

On May 5, 2017, the Regional Board issued a revision to the Monitoring and Reporting Program Orders within the Central Valley to allow for the development of a Regional Groundwater Trend Monitoring Group with multiple Coalitions participating. The ESJWQC along with Buena Vista Coalition, Cawelo Water District Coalition, Grasslands Drainage Area Coalition, Kaweah Basin Water Quality Association, Kern River Watershed Coalition Authority, Kings River Water Quality Coalition, Tule Basin Water Quality Coalition, Westlands Water Quality Coalition, and Westside San Joaquin River Watershed Coalition make up the regional Central Valley Groundwater Monitoring Collaborative (CVGMC). On October 31, 2017, the CVGMC submitted a Conceptual Work Plan to the Regional Board, conditionally approved on November 17, 2017. On December 18, 2017, the CVGMC submitted a timeline with milestones to complete in order to have a technical work plan ready May 16, 2018. In order to facilitate the integration of a regional groundwater trend monitoring program with individual Coalition GQTMPs, the CVGMC has met with the Regional Board to discuss the development of a work plan in January, February, and March of 2018. The technical work plan will have a list of wells each Coalition will monitor for trend monitoring in the fall of 2018.

Figure 8. Map of GQTM wells selected for monitoring within the ESJWQC region.



LUHDORFF & SCALMANINI CONSULTING ENGINEERS

FIGURE 17
All Groundwater Quality Trend Monitoring Wells

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 2017 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 (18,297 irrigated acres) – Ash Slough @ Ave 21 is a Represented site located in 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 (7,840 irrigated acres) – Bear Creek @ Kibby Rd is a Represented site located in 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 (22,859 irrigated acres) – Berenda Slough along Ave 18 ½ is a Represented site located in 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 (1,207 irrigated acres) – Black Rascal Creek @ Yosemite Rd is a Represented site located in 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 (4,681 irrigated acres) – Canal Creek @ West Bellevue Rd is a rotating Core site located in 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 (34,920 irrigated acres) – Cottonwood Creek @ Rd 20 is a rotating Core site located in 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 (37,993 irrigated acres) – Deadman Creek @ Gurr Rd is a Represented site located in 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 (35,067 irrigated acres) – Deadman Creek @ Hwy 59 is a Represented site located in Zone 5 and is upstream of the Deadman Creek @ Gurr Rd monitoring site. 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 (19,271 irrigated acres) – Dry Creek @ Rd 18 is a rotating Core site located in 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 @ Church St (37,671 irrigated acres) – Dry Creek @ Church St is the replacement Core site for the Dry Creek @ Wellsford Rd monitoring location in Zone 1. The monitoring site is located about two miles downstream of Dry Creek @ Wellsford Rd. 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. The subwatershed extends into the foothills and is dominated in the east by wild vegetation with some rice, row crops, and irrigated pasture.

> ***Dry Creek @ Wellsford Rd*** (35,136 irrigated acres) – Dry Creek @ Wellsford Rd was the Core site located in Zone 1 prior to being replaced by Dry Creek @ Church St (approved July 24, 2017). 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 (19,911 irrigated acres) – Duck Slough @ Gurr Rd is a rotating Core site located in Zone 5. 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 (237 irrigated acres) – Hatch Drain @ Tuolumne Rd is Represented site located in 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 (33,832 irrigated acres) – Highline Canal @ Hwy 99 is the Core site located in 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 (29,631 irrigated acres) – Highline Canal @ Lombardy Rd is a Represented site located in 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 (1,592 irrigated acres) – Hilmar Drain @ Central Ave is a Represented site located in 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 (6,039 irrigated acres) – Howard Lateral @ Hwy 140 is a Represented site located in 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 (29,515 Irrigated acres) – Lateral 2 ½ near Keyes Rd is a Represented site located in Zone 2 with its most upstream region in 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 (45,108 Irrigated acres) – Lateral 5 ½ @ South Blaker Rd is rotating Core site located in Zone 2 with half of its upstream eastern region in 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 (51,485 Irrigated acres) – Lateral 6 and 7 @ Central Ave is a Represented site located in Zone 2 with half of its upstream eastern region in 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 (1,842 irrigated acres) – Levee Drain @ Carpenter Rd is a Represented site located in 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 (9,501 irrigated acres) – Livingston Drain @ Robin Ave is a Represented site located in 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 (79,018 irrigated acres) – Lower Stevinson @ Faith Home Rd is a Represented site located in Zone 2 with half of its upstream eastern region in 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 (8,643 irrigated acres) – McCoy Lateral @ Hwy 140 is a Represented site located in 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 @ Oakdale Rd (12,224 irrigated acres) **-** Merced River @ Oakdale Rd is the new rotating Core site located in Zone 4 to replace the Merced River @ Santa Fe monitoring site. Merced River @ Oakdale Rd is located approximately four miles upstream of the Merced River @ Santa Fe monitoring location. 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. The site subwatershed consists of approximately 51,543 acres of which 12,905 are irrigated acres of similar crop types as the original site (citrus, deciduous fruit/nut trees, field crops, grain/hay, pastureland, rice, truck/nursery/berry, and vineyards).

> ***Merced River @ Santa Fe*** (39,450 irrigated acres) – Merced River @ Santa Fe was a rotating Core site located in Zone 4, replaced by Merced River @ Oakdale Rd (approved July 24, 2017). This site subwatershed contains a major waterbody which is 303(d) 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 (8,123 irrigated acres) – Miles Creek @ Reilly Rd is a rotating Core site located in 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 (1,236 irrigated acres) – Mootz Drain downstream of Langworth Pond is a Represented site located in 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 (10,912 irrigated acres) – Mustang Creek @ East Ave is a Represented site located in 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 micro spray irrigation. Citrus and deciduous nut crops are the main agriculture with smaller amounts of field crops and vineyards.

Prairie Flower Drain @ Crows Landing Rd (2,436 irrigated acres) – Prairie Flower Drain @ Crows Landing Rd is a rotating Core site located in 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 (78,267 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 (265,048 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 (177,615 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.

Unnamed Drain @ Hogin Rd (939 irrigated acres) – Unnamed Drain @ Hogin Rd is a Represented site located in Zone 2. It is a small subwatershed that is just east of the San Joaquin River. Its water source is both from the San Joaquin River and drainage of the surrounding area. The two main crops are field crops and pasture.

Unnamed Drain @ Hwy 140 (319 irrigated acres) – Unnamed Drain @ Hwy 140 is a Represented site located in 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 (1,446 irrigated acres) – Westport Drain @ Vivian Rd is a Represented site located in 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 2017 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 the California Department of Water Resources (DWR) Land Use Viewer.

Figure 9 is a map of all site subwatersheds (Core, Represented, and MPM) monitored during the 2017 WY relative to the six different zone boundaries. Figure 10 is a map of the three 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 28 sites during the 2017 WY. Of these 28 sites, MPM took place at 21 sites (Figure 9). Nine of the 21 sites were scheduled for MPM only and MPM also occurred at all six Core sites.

Table 5. ESJWQC 2017 WY land use acreage of site subwatersheds.
Sites listed alphabetically; numbers are rounded to nearest whole number.

Land Use*	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 Cr eek @ Gurr Rd	Deadman Creek @ Hwy 59	Dry Creek @ Rd 18	Dry Creek @ Church St	Dry Creek @ Wellsford Rd	Duck Slough & Deanne Canal @ 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 @ Keyes Rd	Lateral 5 ½ @ South Blaker Rd	Lateral 6 & 7 @ Central Ave	Levee Drain @ Carpenter Rd	Livingston Drain @ Robin Ave	Lower Stevinson @ Faith Home Rd	McCoy Lateral @ Hwy 140	Merced River @ Oakdale Rd	Merced River @ Santa Fe	Miles Creek @ Reilly Rd	Mootz Drain downstream 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 AND SUBTROPICAL	0	0	188	0	0	610	0	0	659	8	8	7	0	0	0	0	0	15	0	0	0	0	69	0	10	79	45	0	0	0	0	0	0
DECIDUOUS FRUITS AND NUTS	10363	4779	18894	208	1773	18182	15208	15090	14342	23734	23248	9511	91	25524	22093	2	2592	23408	28907	31055	18	6189	53221	2919	4174	24788	3622	376	7160	0	9	0	531
FIELD CROPS	2794	943	319	187	950	321	7606	5933	311	3811	2826	4967	17	3978	3910	1454	229	2403	9616	13352	1586	190	13441	873	1939	4621	2061	51	846	1865	111	690	398
GRAIN AND HAY CROPS	559	744	735	227	813	452	2498	2346	120	380	379	1535	0	637	479	0	170	272	669	1059	23	198	1821	201	639	855	836	12	141	13	0	0	0
IDLE	884	225	524	0	484	974	1675	1600	510	2739	2485	1825	5	559	505	0	421	1016	1187	1274	0	704	1438	482	210	643	2162	11	79	22	58	0	0
RIPARIAN VEGETATION	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	8	0
PASTURE	2181	823	299	429	203	483	8311	7372	196	5646	4583	2892	129	1958	1938	134	625	2082	4072	4017	216	349	4346	190	2041	3770	1401	797	219	451	160	238	357
RICE	0	0	0	0	0	0	0	0	0	242	242	192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRUCK NURSERY AND BERRY CROPS	819	333	163	148	18	305	2787	2742	41	123	123	767	0	700	338	0	2320	819	1043	1225	0	2408	2082	2605	225	471	52	0	0	108	39	12	0
URBAN	2010	0	1378	0	0	6795	71	71	2645	0	0	102	0	42	1	0	772	1933	473	1867	0	1149	2350	756	46	58	372	0	0	0	0	0	0
VINEYARD	1580	5	2260	0	906	14537	1581	1581	3603	3261	3261	0	0	935	828	0	66	481	766	746	0	75	3858	1839	3190	4741	0	0	2532	0	0	0	160
YOUNG PERENNIAL	0	214	0	7	18	29	2	2	0	466	465	40	0	99	45	2	37	35	36	31	0	92	179	16	5	125	106	0	14	0	0	0	0
NO CA DWR Data	6962	16218	14978	3540	7481	56036	60042	56476	30081	51057	50341	29558	34	4587	3663	263	1517	8122	9406	11463	411	2734	15746	1912	39062	90297	42546	238	962	638	145	126	299
Total Acres	**28152**	**24283**	**39738**	**4747**	**12646**	**98725**	**99781**	**93213**	**52507**	**91481**	**87977**	**51396**	**275**	**39020**	**33799**	**1855**	**8749**	**40587**	**56175**	**66089**	**2253**	**14088**	**98551**	**11792**	**51543**	**130449**	**53203**	**1485**	**11954**	**3126**	**521**	**1074**	**1745**
Farmed Acres	**18297**	**7840**	**22859**	**1207**	**4681**	**34920**	**37993**	**35067**	**19271**	**37671**	**35136**	**19911**	**237**	**33832**	**29631**	**1592**	**6039**	**29515**	**45108**	**51485**	**1842**	**9501**	**79018**	**8643**	**12224**	**39450**	**8123**	**1236**	**10912**	**2436**	**319**	**939**	**1446**

* Land use information was obtained from The California DWR Land Use Viewer https://gis.water.ca.gov/app/CADWRLandUseViewer

Figure 9. ESJWQC 2017 WY monitoring sites relative to zone boundaries.

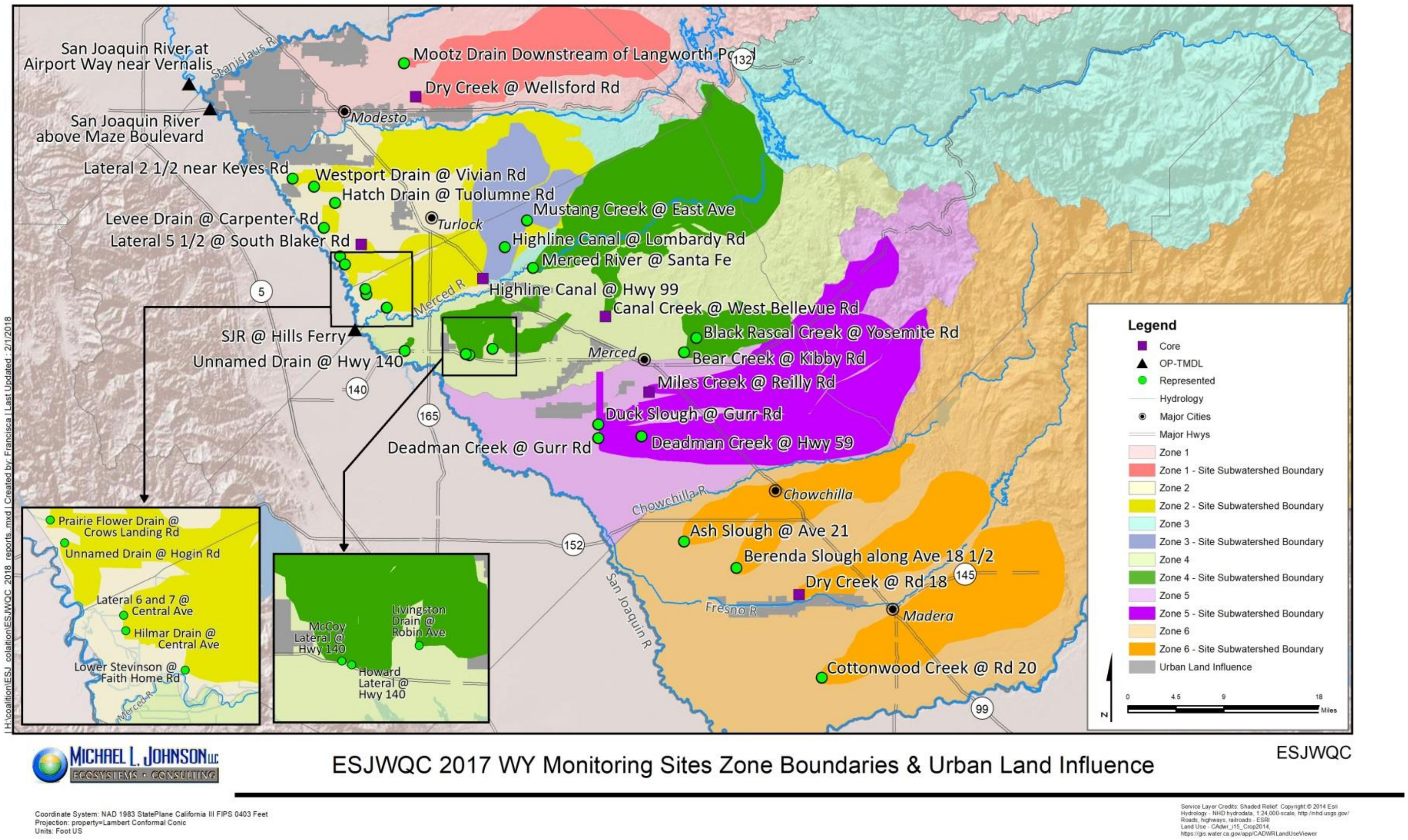
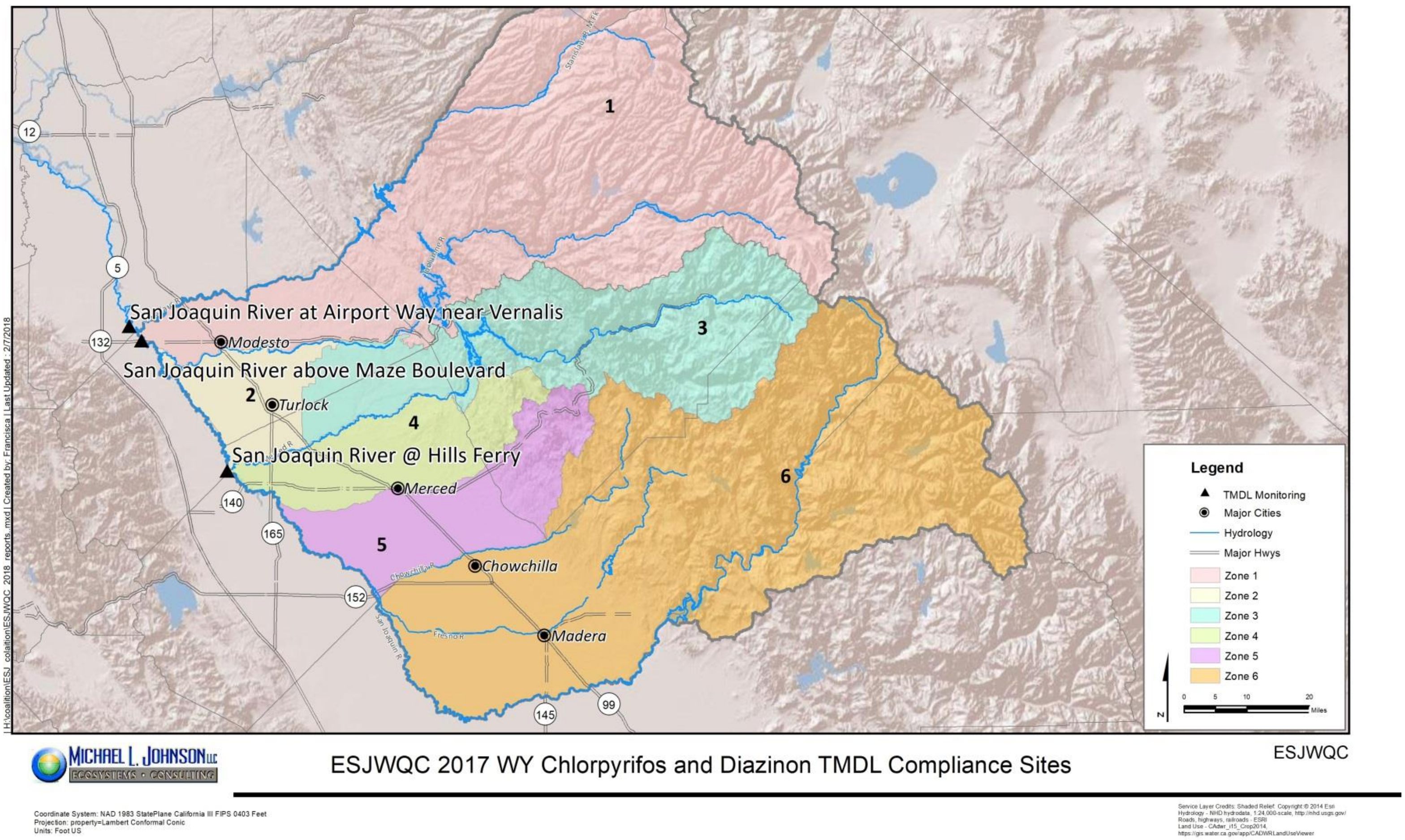


Figure 10. ESJWQC 2017 WY chlorpyrifos and diazinon TMDL compliance monitoring locations.
Land use information and drainage maps submitted in the TMDL AMR.



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. Stormwater monitoring criteria must be identified based on precipitation levels and knowledge of soils or other factors affecting when stormwater runoff is expected to occur. 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 2017 WY, the Coalition sampled four storm events from October 2016 through September 2017 (October 29, 2016, December 9, 2016, January 10, 2017, and April 11, 2017; 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.

Figure 11 through 14 provide daily rainfall records from October 2016 through September 2017 for Modesto, Merced, and Madera, the three major cities in the Coalition region.

Table 6. Monitoring events that occurred during the 2017WY to capture stormwater runoff.

Sampling Date	Storm Duration	Precipitation Amounts (inches)[1]		
		Modesto (city station)	Merced (municipal station)	Madera (Fresno airport Weather Station)
10/29/2016	10/28/2016	1.6	1.03	0.31
12/9/2016	12/8/2016	0.40	0.34	0.39
1/10/2017	1/7/2017 – 1/10/2017	2.47	3.01	1.45
4/11/2017	4/7/2017 – 4/8/2017	0.58	0.43	0.11

[1]Precipitation information obtained from weatherunderground.com from the closest rain gauge to the city.

Figure 11. Precipitation history for Modesto, Merced, and Madera, October through December 2016.
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/.

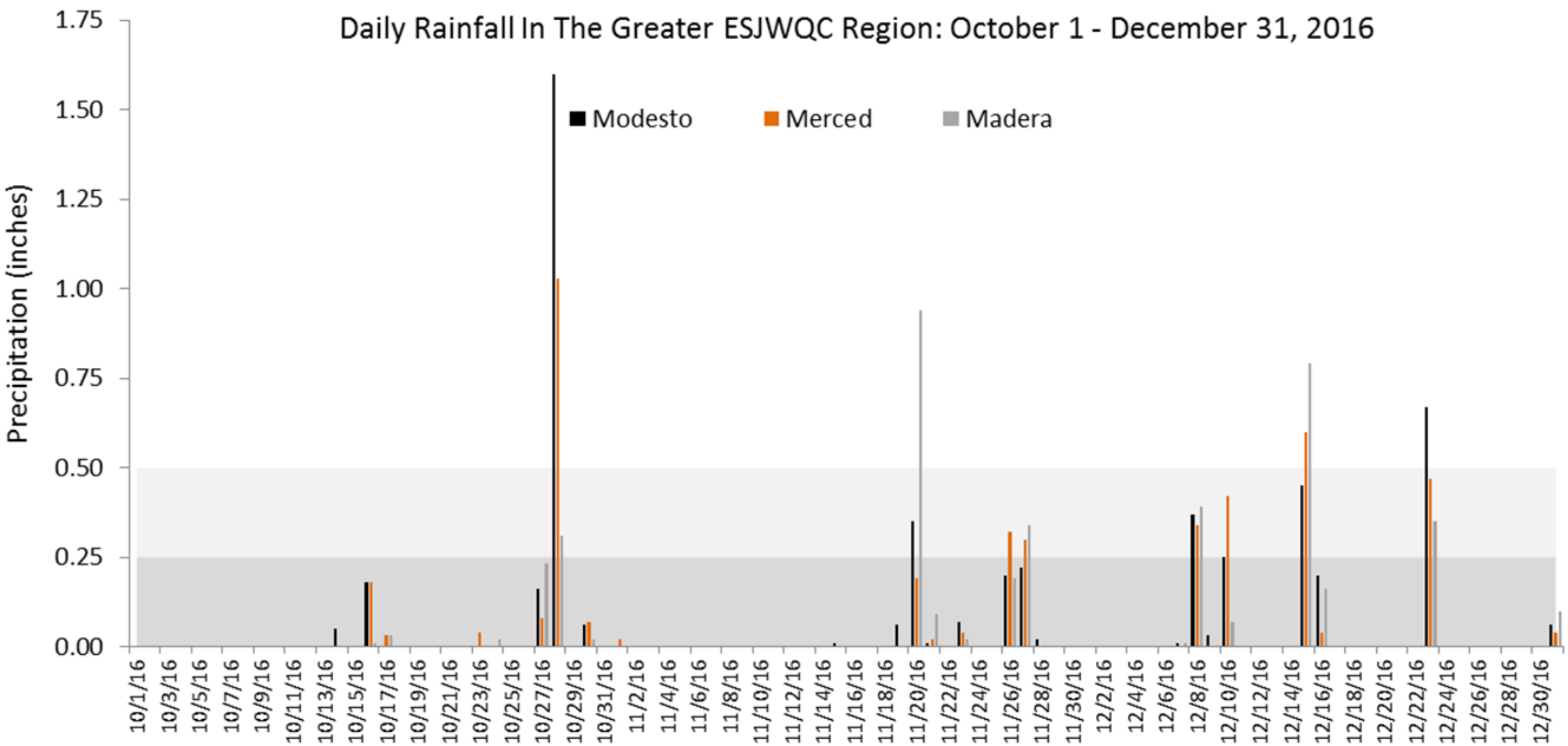


Figure 12. Precipitation history for Modesto, Merced, and Madera, January through March 2017.
The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25" - 0.5" rain in 24 hours. All data reported on http://www.wunderground.com/.

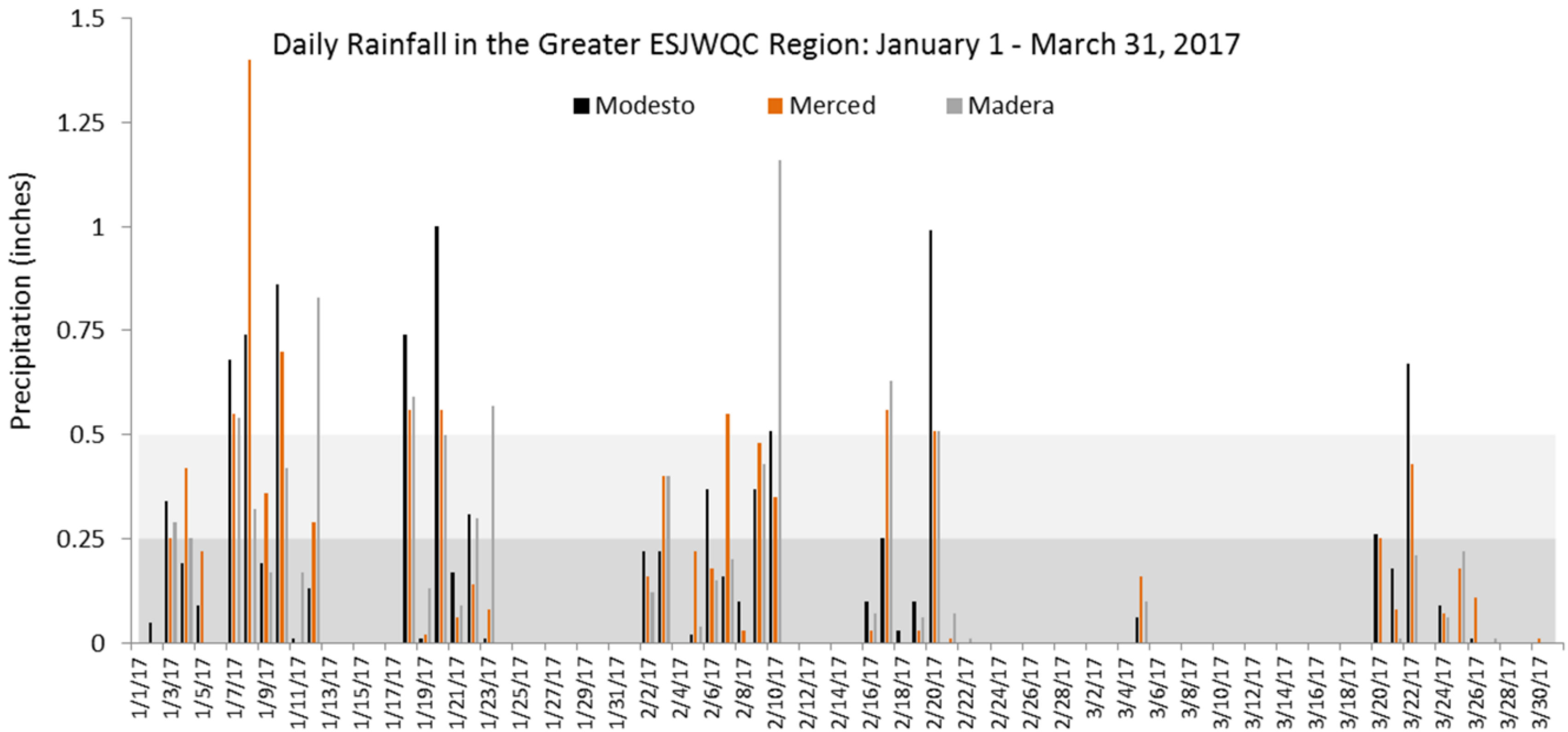


Figure 13. Precipitation history for Modesto, Merced, and Madera, April through June 2017.
The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25" - 0.5" rain in 24 hours. All data reported on http://www.wunderground.com/.

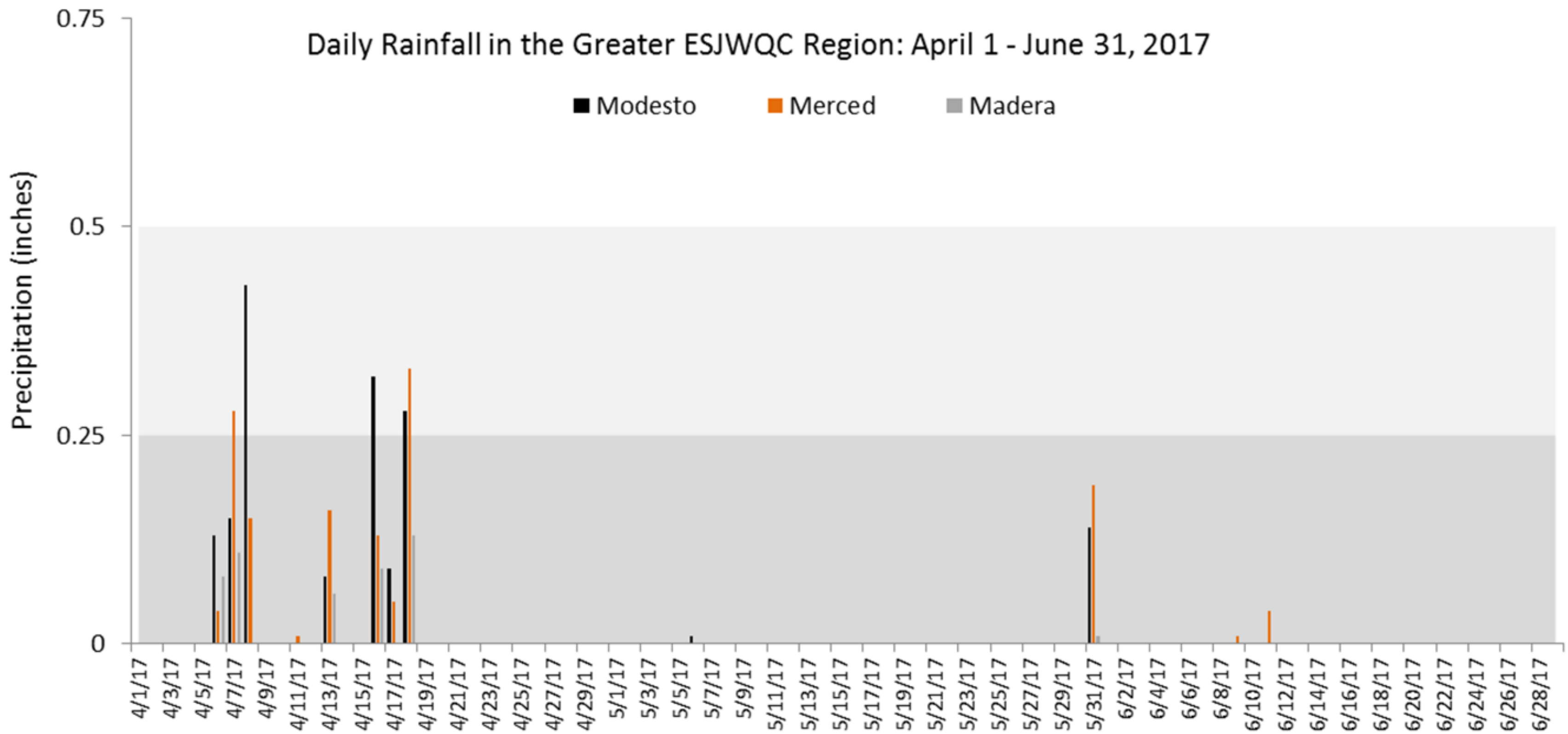
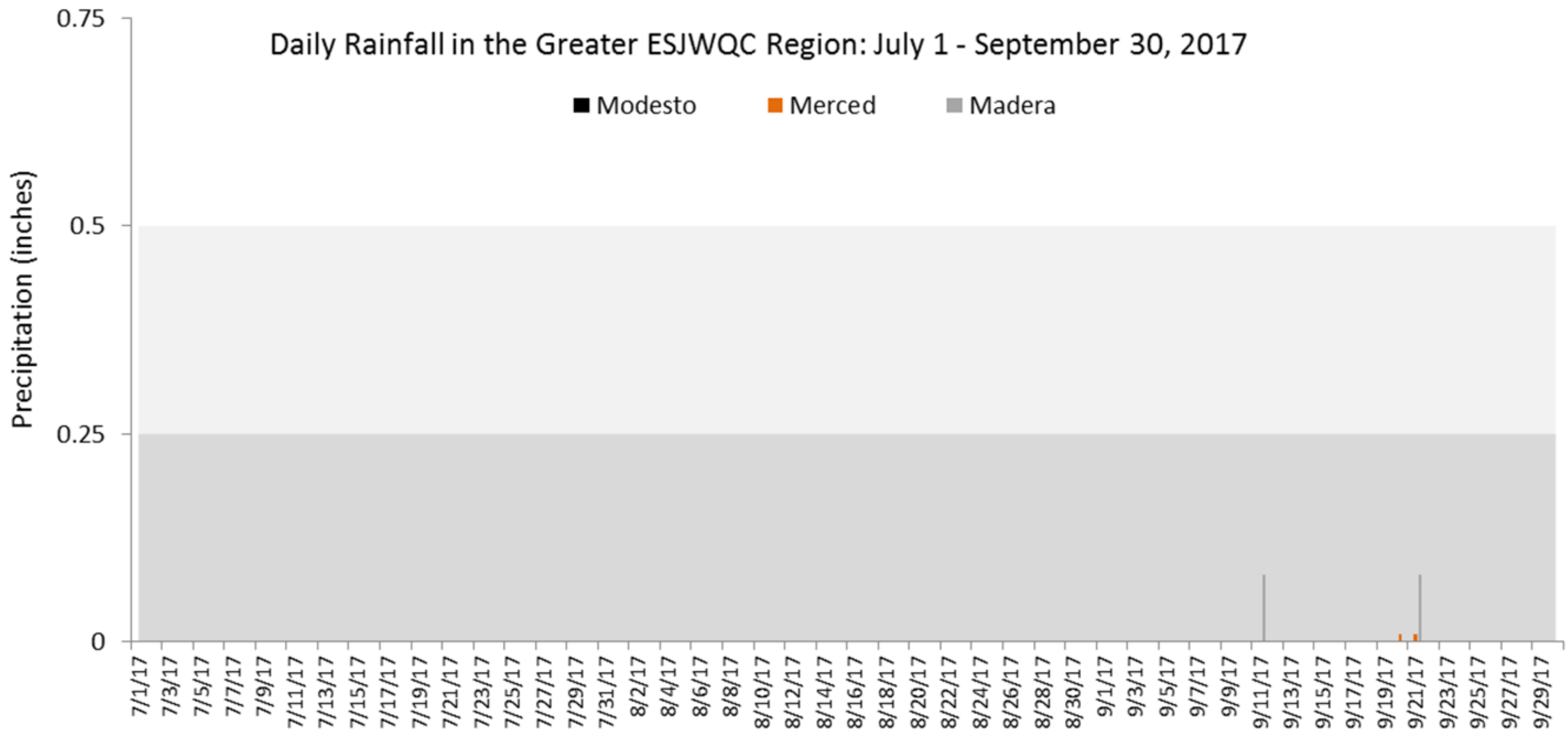


Figure 14. Precipitation history for Modesto, Merced, and Madera, July through September 2017.
The shaded gray area represents the rainfall trigger limit to initiate sampling: 0.25" - 0.5" rain in 24 hours. All data reported on http://www.wunderground.com/.



METHODS

In order to achieve the objectives of the ESJWQC monitoring program, the Coalition monitored 28 sites (including three TMDL sites) during the 2017 WY. The sub-sections below describe the sampling, analytical, and sourcing methods utilized during the 2017 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 and the three TMDL compliance sites), using the USGS R2 Cross Streamflow Method. Discharge measurements for Merced River and the TMDL compliance monitoring locations are obtained online through CDEC stations (Table 9). Measurements obtained from CDEC stations represent discharge at the time closest to when the sites were sampled.

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
	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
	Soluble Orthophosphate	2000 mL	1x 2000 mL Polyethylene	Store at <6°C	48 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 2017 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)
Merced River @ Oakdale Rd		Merced River at Oakdale Rd (MBN)
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 Streamflow 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, nutrients, and *E. coli,* toxicity (water and sediment), and sediment chemistry. Monitoring data include results from samples taken for MPM, NM, sediment monitoring, high total suspended sediment (High TSS), and TMDL compliance monitoring.

The Coalition is required to sample every site scheduled for monitoring, as outlined in the 2017 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.

The Coalition monitored Core sites on October 29, December 9, July 11, and August 15 during the 2017 WY to capture storm/high TSS events (including additional samples for glyphosate, paraquat, and metals analysis), as outlined in the 2017 WY MPU.

During the 2017 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.

On February 13, 2017, the Coalition submitted a Quality Assurance Project Plan (QAPP) Amendment requesting to amend field sampling procedures relating to low flow and no flow conditions (approved April 12, 2017). Beginning in May 2017, the Coalition discontinued collection of samples from non-contiguous waterbodies as described in the approved QAPP amendment (Table 45). The amended sampling procedures ensure the Coalition is collecting high quality and representative samples.

Table 10. Description of field sampling conditions and exceptions from October 2016 through April 2017. If no samples were collected, the sampling event is considered "Dry".

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[1]	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

[1] Starting in May 2017, samples were not collected from non-contiguous waterbodies when the puddle-like condition was not representative of the waterbody.

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 QAPP. 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 µs/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	0.02 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	0.06 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	0.03 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 (Toxicity Identification Evaluations (TIE) and additional sediment chemistry). The sections below explain the methods used for sourcing constituents when exceedances of WQTLs occur.

Pesticide Use Report Data

Pesticide Use Report (PUR) data are provided to the Coalition by each of the County Agricultural Commissioner's offices. Preliminary PUR data are uploaded to a relational database maintained by the Coalition and associated with WQTL exceedances based on active ingredients (AI). The database links registered products to 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 (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.

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; there are no outstanding PURs (Table 13).

Table 13. Obtained PUR data for 2017 WY exceedances.

COUNTY	2017 WY PUR DATA OBTAINED	OUTSTANDING 2017 WY PUR DATA
Madera	October 2016 through September 2017	None
Merced	October 2016 through September 2017	None

County	2017 WY PUR Data Obtained	Outstanding 2017 WY PUR Data
Stanislaus	October 2016 through September 2017	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 TIEs on water samples when survival or growth 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. The TIE results can be analyzed to determine the toxic units (TUs) in the sample. Based on the responses to manipulations of the sample performed during the TIE, the causes of toxicity can be categorized into broad chemical classes, e.g. pyrethroids, organophosphates, nonpolar organics, or cationic metals. A Phase III TIE is performed to further identify the concentrations of constituents present in the samples exhibiting toxicity; a Phase III TIE can only occur if chemistry data is collected in conjunction with toxicity sampling. In cases where toxicity is lost, TIEs are not able to identify the class of compound responsible for the toxicity.

Sediment Chemistry Analysis

Sediment samples are analyzed for the presence of pyrethroids, piperonyl butoxide (PBO), 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 off 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 (100/EC_{50}) based on the LC_{50}s determined to cause acute toxicity to *H. azteca* (LC_{50} = 1 TUa). The LC_{50} is the lethal concentration at which 50% mortality of the test species occurs. The Coalition utilizes the pyrethroid and chlorpyrifos LC_{50} concentration values in Table 14 to determine the TUs in sediment samples where additional chemistry analyses were performed (Amweg et al., 2005 and Weston et al., 2013). During the 2017 WY, no sediment toxicity occurred; therefore, no TUa calculations for the chemistry analyses were performed.

Table 14. Pyrethroid and chlorpyrifos LC_{50} concentrations for sediment analysis.

Sediment Pesticide	LC_{50} (µg/g OC)	Source
Bifenthrin	0.52	Amweg *et al.* 2005
Chlorpyrifos	4.16	Weston *et al.* 2013
Cyfluthrin	1.08	Amweg *et al.* 2005
Cyhalothrin, lambda	0.45	Amweg *et al.* 2005
Cypermethrin	0.38	Weston *et al.* 2013
Deltamethrin	0.79	Weston *et al.* 2013
Esfenvalerate/Fenvalerate	1.54	Amweg *et al.* 2005
Permethrin	10.83	Amweg *et al.* 2005

LC_{50}- 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 2017 WY. Precision, accuracy and completeness are evaluated based on Measurement Quality Objectives (MQOs) as outlined in the QAPP. Table 15 through Table 17 include counts and percentages for completeness per method and analyte for the 2017 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. All flagged data (did not meet MQOs) are reviewed for overall quality on batch and sample levels and assessed for usability. Ninety percent of the samples collected and analyzed must meet the acceptability criteria. This section details the instances when MQOs were not met for at least 90% of the samples and includes rationale for accepting the data.

All results that do not meet MQOs 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 2017 WY are included in Appendices III and IV 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. Waterbodies that lack enough water to collect samples (e.g. dry or non-contiguous) are considered “sampled” and are counted towards 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 quality control (QC) samples as prescribed in the QAPP.

Field and Transport Completeness

Overall field and transport completeness for environmental samples was 100% for the 2017 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 except for a single DO measurement which was not recorded. On July 11, 2017, field crews did not record the DO measurement at Unnamed Drain @ Hogin Rd. Field measurement completeness was 99.4% for all field parameters (Table 18).

Discharge is measured at all sites when sampling crews can safely wade across the waterbody to take flow readings. When a waterbody has no measurable 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. Discharge was not measured at sites due to the waterbody being unsafe to take flow readings a total of 35 times, at 14 sites, one or more times during nine monitoring events. Completeness for discharge was 77.2% for the 2017 WY (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. At a minimum, field QC samples must comprise 5% of the samples collected and be collected with each sampling event. Field QC samples were collected at a frequency greater than 5% ranging from 9.5% to 25% of the environmental samples collected for the 2017 WY (Table 15).

Analytical Completeness

During the 2017 WY, all samples submitted to a laboratory were analyzed. 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 ESJWQC QAPP. Batch completeness is determined based on whether or not all required QC samples were run with every batch. Ninety-nine percent of chemistry and toxicity batches (207 of 209) met batch completeness requirements.

For the July 11, 2017 sampling event, a group of samples were incorrectly logged in by the laboratory and analyzed for the incorrect method. The COC submitted to the laboratory requested that samples from Berenda Slough along Ave 18 ½, Duck Slough @ Gurr Rd, Prairie Flower Drain @ Crows Landing Rd, and Lateral 2 ½ near Keyes Rd be analyzed for chlorpyrifos under method EPA 8141. However, the samples were mistakenly logged-in, prepped, and extracted for methamidophos analysis using method EPA 8321. The samples were re-extracted and re-analyzed under the correct method, but there was not enough sample volume available to run a matrix spike sample with the second batch. Though these samples were extracted by a slightly different method, due to the chemical similarities between chlorpyrifos and methamidophos, the laboratory was able to equip an instrument to analyze the original environmental samples extracted within hold time for chlorpyrifos, the originally requested target analyte. The re-extract results were confirmed by this additional analysis, and the data from the incomplete batch were accepted and are considered useable.

In a different batch, a matrix spike (MS) sample was omitted from a batch analyzed for total organic carbon (TOC) in water due to oversight by the subcontracted laboratory. Although a sample was collected specifically to be the batch MS, the environmental samples were not batched with the MS. The batch was accepted based on other batch QC. See Corrective Actions for more information regarding the TOC in water analyses for the 2017 WY.

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 the ESJWQC QAPP (Table 28). Results associated with hold time violations are flagged in the database. The overall hold time compliance was 97% for the 2017 WY. All Coalition samples were analyzed within hold time, save for the exceptions outlined below.

Ninety-six percent (120 of 125) of samples analyzed for chlorpyrifos were analyzed within the required hold time. A batch of re-extracted chlorpyrifos samples (4 samples) that were incorrectly logged-in by the laboratory for the July 11, 2017 event (discussed above under Batch Completeness) were all analyzed outside of hold time. The results were accepted based on the confirmation of the concentrations of chlorpyrifos between the samples extracted within hold time (method EPA 8321) and the re-extraction outside of hold time (method EPA 8141). Additionally, during the October 29, 2016 sampling event, the field blank for chlorpyrifos was re-extracted and re-analyzed outside of hold time due to contamination concerns. The second analysis was non-detect and the results were accepted. All chlorpyrifos results associated with hold time violations are considered useable.

A batch of samples collected on July 11, 2017 and analyzed by method EPA 8321 were not extracted within seven days of sample collection and were therefore flagged for a hold time violation. This batch contained samples collected from the following locations: Highline Canal @ Hwy 99, Miles Creek @ Reilly Rd, Dry Creek @ Rd 18, Canal Creek @ West Bellevue Rd, Lateral 5 ½ @ South Blaker Rd, and Dry Creek @ Wellsford Rd. The entire suite of method EPA 8321 constituents were affected. The following constituents had an overall hold time compliance of 90.8% (89 of 98): aldicarb, carbaryl, carbofuran, linuron, methiocarb, methomyl, and oxamyl. Diuron, which was also analyzed in the same batch, had an overall hold time compliance of 91.3% (95 of 104).

The original extraction was within hold time; however, all MS samples had 0% recoveries. It is possible that due to technician error the samples were not spiked. All samples in the batch were re-extracted and re-analyzed outside of hold time to assess MS compliance. The Coalition accepted the results reported in the re-extracted batch with sufficient QC samples. Environmental sample results were confirmed by the original batch results and all data for the suite of analytes analyzed by method EPA 8321 were accepted and considered useable.

Ten of 21 (47.6%) sediment grain size samples and zero of 21 (0%) of sediment TOC samples were analyzed within hold time. Due to laboratory oversight, all sediment grain size and TOC samples collected on March 14, 2017 were analyzed two days after the 28-day hold time. Sediment TOC samples collected on September 12, 2017 were analyzed one day outside of hold time. Samples were flagged but considered useable. All sediment grain size and TOC data were accepted and useable.

PRECISION AND ACCURACY

Precision and accuracy are evaluated for each type of QC sample analyzed during the 2017 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 2017 WY, each batch was processed with a combination of any of the following QC samples: field blank, equipment blank, laboratory blank, 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 MQO 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 the "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 MQO 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 $R_{log} \leq 1.30$. All field and laboratory duplicates had a $R_{log} \leq 1.30$ and all results for field and laboratory blanks were non-detect. All *E. coli* results reported were accepted and 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 duplicates. 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 2017 WY were cadmium, copper, lead, nickel, and zinc. All metals are analyzed following EPA 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 an LCS or MS duplicate), and field duplicates. Acceptability was met in 100% of laboratory blanks, equipment blanks, LCS, MS, and MSD samples analyzed for dissolved metals. Acceptability was met in 100% of field blank, equipment blank, laboratory blank, LCS, MS, and MSD samples analyzed for dissolved metals. Field duplicate acceptability was met in 4 of 4 (100%) dissolved cadmium samples, 12 of 13 (92.3%) dissolved copper samples, 5 of 5 (100%) dissolved lead samples, 3 of 4 (75%) dissolved nickel samples, and 3 of 4 (75%) samples analyzed for dissolved zinc (Table 20).

One of four field duplicate RPDs exceeded the acceptable limit of 25% for dissolved nickel during the July 11, 2017 event (FD RPD = 31%). Both the environmental and the field duplicate results were below the RL (0.5 µg/L) with a concentration of 0.27 µg /L and 0.37 µg /L, respectively. The resulting high RPD values are likely due to the variability associated with estimated results reported below the quantifiable limit. All other batch QC for all three sampling events were within acceptable limits. All dissolved nickel data were accepted and useable.

During the December 9, 2016 event, the field duplicate RPD for dissolved zinc was above the acceptable limit of 25%, with an RPD of 26%. The environmental result was reported at 1.0 µg/L and the field duplicate was 1.3 µg/L. All other batch QC samples met MQOs and the data were accepted and useable.

Metals (total): During the 2017 WY, the total metals analyzed with EPA 200.8 were arsenic, boron, molybdenum, and selenium. Quality control samples for total metals include: laboratory blanks, field blanks, equipment blanks, LCS, MS, a duplicate (usually an LCS or MS duplicate), and field duplicates. Acceptability was met for 100% of field blanks, laboratory blanks, LCS, MS, and MSD samples. Field duplicate sample acceptability was met for 4 of 4 (100%) samples analyzed for arsenic, 4 of 4 (100%)

samples analyzed for boron, 3 of 4 (75%) samples analyzed for molybdenum, and for 2 of 4 (50%) samples analyzed for selenium.

The field duplicate RPD for molybdenum was above the acceptable limit of 25% during the July 11, 2017 sampling event, with a calculated RPD of 34%. The environmental result was near the RL of 0.25 µg/L, at 0.27 µg/L, while the field duplicate result was reported at 0.38 µg /L. All other batch QC were within MQOs; all total molybdenum data were accepted and useable.

Selenium field duplicate samples were above the acceptable limit during the December 9, 2016 and August 15, 2017 events. The RPDs for each of these events were 75% and 44%, respectively. For both events, both the environmental and the duplicate results were below the RL of 1 µg/L and flagged as estimates. The resulting high RPD values are likely due to the variability associated with estimated results reported below the quantifiable limit. All other batch QC for all three sampling events were within acceptable limits. All selenium data were accepted 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. Acceptability was met in 100% of field blanks, laboratory blanks, LCS, LCSD, and MSD samples. Field duplicate acceptability was met in 12 of 12 (100%) samples analyzed for nitrate + nitrite as N and in 11 of 12 samples (91.7%) analyzed for ammonia as N, and 10 of 12 (83.3%) samples analyzed for orthophosphate as P (Table 20). Matrix spike recoveries were within the acceptable limits in 22 of 26 (84.6%) of nitrate + nitrite as N samples, 26 of 26 (100%) of ammonia as N samples, and 21 of 24 (87.5%) of samples analyzed for orthophosphate as P.

Field duplicate RPDs for orthophosphate as P did not meet acceptability (≤ 25%) for samples collected during June 13, 2017 and September 12, 2017 sampling events. The RPDs were 43% and 35%, respectively. During the June 13 event, the environmental sample concentration of orthophosphate as P was measured at 0.034 mg/L, and the field duplicate was 0.022 mg/L. All other batch QC met MQOs. For the September 12 event, the environmental result was measured at the RL of 0.01 mg/L, the field duplicate result was 0.007mg/L and flagged as an estimated value. The high RPD is likely the result of variability of an estimated result reported below the RL.

Matrix spike samples analyzed for nitrate + nitrite as N recovered below the acceptable threshold of 90% for both replicates collected during the October 29, 2016 and April 11, 2017 sampling events. The MS and MSD samples recovered at 62% and 70%, respectively, for samples collected on October 29, 2016. For samples collected during the April 11 event, the MS and MSD recovered at 65% and 75%, respectively. In both cases the MS was performed on a sample collected from Lateral 5 ½ and a dilution was performed due to a high concentration of nitrate + nitrite. The LCS associated with the batch recovered within limits in both batches. In all four samples, the low matrix spike recoveries are likely a result of the high concentration of nitrate resulting and not spiking the sample with a high enough concentration. All data were accepted and are considered useable based on other batch QC.

Matrix spike samples analyzed for orthophosphate as P recovered above the acceptable limit of 110% for both replicates collected during the October 18, 2016 event, and for a single replicate collected during the March 14, 2017 sampling event. During the October 18 event, the MS sample recovered at

116%, while the MSD sample recovered at 112%. Both samples diluted due to the high concentration in the environmental sample. The high recoveries are likely the result of the dilution. The associated LCS recovered within limits at 99% and all other batch QC were within acceptable limits.

The MSD sample collected for the March 14 event recovered above the acceptable limit at 118%. The MS sample, however, recovered within limits at 108%; the RPD between the two samples was acceptable at 4.1%. The LCS sample also recovered within acceptable limits at 101%, and the data were accepted based on another batch QC. All orthophosphate data were accepted and useable.

Pesticides in water: Pesticides were analyzed by four different methods: organophosphates and triazines (EPA 8141A), carbamates and methamidophos (EPA 8321A), paraquat (EPA 549.2M), and glyphosate (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 field blank, field duplicate, laboratory blank, 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 analytes met the 90% acceptability requirement for the WY. The exceptions were paraquat in the MS (2 of 4, 50%), demeton-S in the MS (19 of 24, 79.2%) and in the MSD (10 of 12, 83.3%), diazinon in the MS (21 of 24, 87.5%), dichlorvos in the MSD (10 of 12, 83.3%), disulfoton in the MSD (10 of 12, 83.3%), malathion in the MS (20 of 24, 83.3%), and phosmet in the LCS (10 of 12, 83.3%) and MS (20 of 24, 83.3%). Each instance is further discussed below.

Paraquat was collected and analyzed in samples from one storm (January 10, 2017) and one irrigation event (July 11, 2017) during the 2017 WY. Both MS replicates recovered at 0% for the batch analyzed for the January 10 event samples. The MS was re-extracted outside of hold time, with a recovery that still failed to meet the lower acceptance limit of 70% (19.2%). Difficulty with matrix spike recoveries was due to increased sediment observed within the parent sample matrix. Paraquat strongly absorbs to soil particles that are suspended in water, which renders the herbicide chemically inactive. This in turn makes paraquat samples prone to matrix interference from turbid samples. The LCS recovered within limits for this batch and paraquat was not detected in any of the environmental samples. All paraquat data were accepted and useable.

Matrix spike recoveries for demeton-S were above the upper control limit of 130% during the October 29, 2016 and June 13, 2017 events. The MS for the October 29 event recovered at 173%, while both the MS and MSD samples recovered at 159% and 135%, respectively during the June 13 event. In both batches, the RPD calculated between the two samples was acceptable, and the LCS sample recovered within limits. In both batches, all environmental samples were non-detect. The data were accepted based on the fact that non-detect samples were not affected by artificially high recoveries in positive controls.

Demeton-S MS and MSD samples failed below the lowest acceptable limit of 35% for the May 9, 2017 sampling event (17.2% and 10.5%, respectively). The LCS for this batch recovered within limits. All data are accepted based on other batch QC. All demeton-S data were accepted and are considered useable.

Matrix spike recoveries in samples analyzed for diazinon exceeded the acceptable upper control limit of 130% in samples collected on October 29, 2016 and the June 13, 2017. For the October batch, the MS recovered at 132% and the MSD recovered within limits at 95.6%; all LCS samples were within limits. The MS and MSD in the June batch recovered at 156% and 135%, respectively. In both batches, all environmental samples were non-detect. The data were accepted based on the fact that non-detect samples were not affected by artificially high recoveries in positive controls. All diazinon data were accepted and useable.

Malathion MS samples were above the upper acceptable recovery limit of 137% for the October 29, 2016, June 13, 2017, and September 12, 2017 events. For the October and September events, only one of the MS samples recovered above the limit. The MS sample for the October 29, 2016 event recovered at 138%, and the MSD for the September 12 event recovered at 142%. Both the MS and MSD recovered at 157% and 138%, respectively, for the June 13 event. In all three batches the LCS recoveries were within the acceptable limits, and all environmental samples were non-detect. The data were accepted based on the fact that non-detect samples were not affected by artificially high recoveries in positive controls. All malathion samples were accepted and useable.

Phosmet batches with samples collected on October 18, 2016 and October 29, 2016 events had LCS, MS, and MSD samples that recovered below the acceptable limit of 40%. Recoveries for all positive control samples ranged from 21.0% to 32.7% between the two events. For both events, the original samples were re-extracted and re-analyzed for phosmet outside of hold times. All re-extraction results were within the acceptable recovery limits, and all environmental samples for both extractions and both events were non-detect. The results were accepted and are considered useable based on the re-extraction confirmation of original results. All phosmet data for the 2017 WY useable.

Matrix spike RPDs were greater than 25% for samples collected on October 29, 2016 and on May 9, 2017 for the following analytes: demeton-S, dichlorvos, and disulfoton. High demeton-S MS/MSD RPDs occurred in samples collected on October 29, 2016 (RPD = 33.2%) and May 9, 2017 (RPD = 48.0%). Dichlorvos MS/MSD had high RPDs in samples collected on October 29, 2016 (RPD = 58.8%) and May 9, 2017 (RPD = 26.1%). Disulfoton MS/MSD RPDs were above 25% in samples collected on October 29, 2016 (RPD = 35.2%) and May 9, 2017 (RPD = 40.0%). All associated environmental samples were non-detect for each of the above constituents, indicating that variability between positive controls did not affect the environmental results. All results associated with high MSD RPDs were accepted and useable.

For each pesticide sample analyzed, a known amount of a surrogate standard is added to monitor target analyte recovery in each sample. A surrogate is a non-target analyte that is chemically similar to the target analyte(s) and therefore expected to respond similarly to sample preparation and analysis. During the 2017 WY, tributylphosphate, one of the surrogates used for analysis by EPA 8141, recovered within acceptable limits in 151 of the 169 samples analyzed (89.3%). All of the surrogate recovery failures were high recoveries that exceeded the maximum percent recovery limit of 150%. High recoveries for tributylphosphate ranged from 152% to 249%. All environmental results associated with high surrogate results for tributylphosphate by EPA 8141 were non-detect samples that were not affected by artificially high surrogate recoveries. All EPA 8141 data were accepted and useable.

Total Organic Carbon (TOC) in water: Quality Control samples for TOC analyses consist of laboratory blank, field blank, field duplicate, LCS, MS, and laboratory duplicate samples. Measurement quality objectives were met in at least 90% of TOC Quality Control samples during the 2017 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 2017 WY. Eight of 12 (66.7%) field duplicate samples met acceptability (RPD ≤25%). Field duplicate RPDs exceeded the acceptable limit in batches for the May 9, 2017 (RPD = 96%), June 13, 2017 (RPD = 33%), July 11, 2017 (RPD = 40%), and August 15, 2017 (RPD = 29%) sampling events. In all four cases the field duplicates were collected from Highline Canal @ Hwy 99. During the July 11 event, the environmental sample concentration was at the RL of 3 mg/L and the duplicate sample was below the RL (2 mg/L), suggesting the variability between the two results may be due to one of them being an estimated value. During the May 9 event, the environmental result was 6 mg/L and the duplicate was 17 mg/L. For the June 13 event, the environmental sample had a concentration of 5 mg/L, and the duplicate was 7 mg/L. For the August 15 event, the environmental result was 4 mg/L, while the duplicate was at the RL of 3 mg/L. Sampling crews were made aware of the field duplicate RPD issues and sampling procedures were assessed for possible sources of variation. It was confirmed that the environmental sample and field duplicate sample were collected at the same time and near each other in the water column. In all three batches, all other QC sample met MQOs; 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 MQOs were met in QC samples analyzed for turbidity and all turbidity data were accepted and useable.

Pesticides in sediment: Sediment samples are collected twice a year to test for toxicity to *H. azteca.* Sediments samples were scheduled to be collected on March 14, 2017 and September 12, 2017 for the 2017 WY. During these same sampling events, additional sediment samples were stored at the chemistry laboratory until the Coalition received the sediment toxicity results. When percent survival is less than 80% and statistically significant compared to the control, the laboratory is notified to initiate pesticide analysis on those specific samples. During the 2017 WY, this toxicity trigger limit was never reached and there was no analysis of pesticides in sediment.

Sediment grain size and TOC: Samples were collected for sediment grain size and TOC analyses on March 14, 2017 and September 12, 2017 for the 2017 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

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

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

$\phi 5$ = 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 QC samples analyzed for grain size. Acceptability was met in 100% of QC samples for sediment TOC, with the exception of field duplicates. One of two (50%) field duplicate pairs met acceptability criteria of ≤20%. Total organic carbon concentrations in the environmental and field duplicate samples from Canal Creek @ West Bellevue Rd collected on September 12, 2017 were reported at 1,300 mg/kg dw and 1,600 mg/kg dw resulting in an RPD of 21%. Due to the nature of sediment samples, the high RPD could be due to heterogeneous composition of TOC in the sediments. The data were accepted and useable.

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 2017 WY, field duplicate samples were collected from sites scheduled for toxicity monitoring for one or more of the test species. Toxicity field duplicates were within the acceptability criterion in over 90% of 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 14, 2017 and September 12, 2017. 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 MQOs.

During the 2017 WY the laboratory contacted the Coalition to inform them of a failure in their TOC instrument that would require all TOC in water samples to be subcontracted to a secondary laboratory. Though all TOC data remained within the MQOs required by the project, the Coalition noted an increased occurrence of low-level TOC detections in field blank and laboratory blank samples. The Coalition contacted the laboratory regarding these detections. The Coalition worked with both the contracted and subcontracted laboratories to ensure that for blank sample in which the analyte was detected, a re-analysis was run to confirm the results and all results were properly reported. Furthermore, the Coalition noted that while the regular RLs required for TOC remained the same, the subcontract lab utilized lower MDLs than the contract laboratory. As a result, some of the detections reported by the subcontractor were lower than what would usually be reported to the Coalition.

In addition to working with the laboratory, the Coalition also took measures to ensure the field blank TOC detections were not a result of sampling error. Additional training for all field staff occurred regarding proper sample collection and handling technique for TOC samples. Additionally, the Coalition ensured that all sampling personnel take extra precautions with the de-ionized water received from the lab for field blank samples. Additional actions were implemented in which de-ionized blank water containers were required to be placed in clean plastic bags and sealed during transport. De-ionized water containers are now stored in special locations within sampling vehicles to avoid contamination.

The contract laboratory had their replacement TOC instrument fully functional by May of 2017. No further blank detections have been observed with the new instrumentation.

The Coalition also contacted the laboratory regarding concerns about samples analyzed for sediment grain size and TOC. The Coalition has had multiple instances of the subcontract laboratory failing to meet project requirements outlined in the ESJWQC QAPP. Due to the infrequency of the biannual sediment sampling events, the Coalition has observed multiple instances of staff oversight, such as the hold time violations for the sediment samples collected in March of 2017. The Coalition worked with the contract laboratory to review the subcontractor's ability to meet project requirements, and ultimately requested that a new subcontract laboratory be utilized for future sediment samples. As of March 2018, the Coalition will be working with laboratory personnel and a new subcontract laboratory to ensure that the project requirements are met in the future.

Table 15. ESJWQC field and transport and analytical completeness: environmental sample counts and percentages.
Samples collected during the 2017 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	19	0	19	100.0	19	100.0
EPA 180.1	Water	Turbidity	65	3	62	100.0	62	100.0
EPA 200.8	Water	Arsenic	8	0	8	100.0	8	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	61	4	57	100.0	57	100.0
EPA 200.8	Water	Dissolved Lead	9	0	9	100.0	9	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	86	3	83	100.0	83	100.0
EPA 547M	Water	Glyphosate	12	0	12	100.0	12	100.0
EPA 549.2M	Water	Paraquat	12	0	12	100.0	12	100.0
EPA 600/R-99-064	Sediment	*Hyalella azteca*	19	0	19	100.0	19	100.0
EPA 8141A	Water	Atrazine	65	3	62	100.0	62	100.0
EPA 8141A	Water	Azinphos Methyl	65	3	62	100.0	62	100.0
EPA 8141A	Water	Chlorpyrifos	93	4	88	100.0	88	100.0
EPA 8141A	Water	Cyanazine	65	3	62	100.0	62	100.0
EPA 8141A	Water	Demeton-s	65	3	62	100.0	62	100.0
EPA 8141A	Water	Diazinon	65	3	62	100.0	62	100.0
EPA 8141A	Water	Dichlorvos	65	3	62	100.0	62	100.0
EPA 8141A	Water	Dimethoate	65	3	62	100.0	62	100.0
EPA 8141A	Water	Disulfoton	65	3	62	100.0	62	100.0
EPA 8141A	Water	Malathion	67	3	64	100.0	64	100.0
EPA 8141A	Water	Methidathion	65	3	62	100.0	62	100.0
EPA 8141A	Water	Parathion, Methyl	65	3	62	100.0	62	100.0
EPA 8141A	Water	Phorate	65	3	62	100.0	62	100.0
EPA 8141A	Water	Phosmet	65	3	62	100.0	62	100.0
EPA 8141A	Water	Simazine	65	3	62	100.0	62	100.0
EPA 8141A	Water	Trifluralin	65	3	62	100.0	62	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*	80	3	77	100.0	77	100.0
EPA 821/R-02-012	Water	*Pimephales promelas*	74	4	70	100.0	70	100.0
EPA 821/R-02-013	Water	*Selenastrum capricornutum*	101	4	97	100.0	97	100.0
EPA 8321A	Water	Aldicarb	65	3	62	100.0	62	100.0
EPA 8321A	Water	Carbaryl	65	3	62	100.0	62	100.0
EPA 8321A	Water	Carbofuran	65	3	62	100.0	62	100.0
EPA 8321A	Water	Diuron	71	3	68	100.0	68	100.0
EPA 8321A	Water	Linuron	65	3	62	100.0	62	100.0
EPA 8321A	Water	Methamidophos	65	3	62	100.0	62	100.0
EPA 8321A	Water	Methiocarb	65	3	62	100.0	62	100.0
EPA 8321A	Water	Methomyl	65	3	62	100.0	62	100.0
EPA 8321A	Water	Oxamyl	65	3	62	100.0	62	100.0
SM 2340 C	Water	Hardness as CaCO3	62	4	58	100.0	58	100.0
SM 2540 D	Water	Total Suspended Solids	65	3	62	100.0	62	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	68	3	65	100.0	65	100.0
SM 4500-P E	Water	Orthophosphate as P	65	3	62	100.0	62	100.0
SM 5310 B	Water	Total Organic Carbon	65	3	62	100.0	62	100.0
SM 9223 B	Water	*E. coli*	65	3	62	100.0	62	100.0
Walkley-Black	Sediment	Total Organic Carbon	19	0	19	100.0	19	100.0
		Total	**2664**	**116**	**2547**	**100.0**	**2547**	**100.0**

Table 16. ESJWQC field and transport completeness: field parameter counts and percentages.
Samples collected during the 2017 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**	**156**	**7**	**115**	**77.2**
SM 4500-O	Dissolved Oxygen, mg/L	180	8	171	99.4
EPA 150.1	pH	180	8	172	100.0
EPA 120.1	Specific Conductivity, µs/cm	180	8	172	100.0
SM 2550	Temperature, º C	180	8	172	100.0
	Total	**940**	**876**	**39**	**802**

[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 2017 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	19	2	NA	NA	21	9.5	NA	NA
EPA 180.1	Water	Turbidity	62	12	NA	12	86	14.0	NA	14.0
EPA 200.8	Water	Arsenic	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Boron	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Cadmium	8	4	4	4	20	20.0	20.0	20.0
EPA 200.8	Water	Copper	57	13	13	13	96	13.5	13.5	13.5
EPA 200.8	Water	Lead	9	5	5	5	24	20.8	20.8	20.8
EPA 200.8	Water	Molybdenum	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Nickel	8	4	4	4	20	20.0	20.0	20.0
EPA 200.8	Water	Selenium	8	4	NA	4	16	25.0	NA	25.0
EPA 200.8	Water	Zinc	8	4	4	4	20	20.0	20.0	20.0
EPA 353.2	Water	Nitrate + Nitrite as N	83	12	NA	12	107	11.2	NA	11.2
EPA 547M	Water	Glyphosate	12	2	NA	2	16	12.5	NA	12.5
EPA 549.2M	Water	Paraquat	12	2	NA	2	16	12.5	NA	12.5
EPA 600/R-99-064	Sediment	*Hyalella azteca*	19	2	NA	NA	21	9.5	NA	NA
EPA 8141A	Water	Atrazine	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Azinphos Methyl	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Chlorpyrifos	88	12	NA	12	112	10.7	NA	10.7
EPA 8141A	Water	Cyanazine	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Demeton-s	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Diazinon	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Dichlorvos	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Dimethoate	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Disulfoton	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Malathion	64	12	NA	12	88	13.6	NA	13.6
EPA 8141A	Water	Methidathion	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Parathion, Methyl	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Phorate	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Phosmet	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Simazine	62	12	NA	12	86	14.0	NA	14.0
EPA 8141A	Water	Trifluralin	62	12	NA	12	86	14.0	NA	14.0

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*	77	12	NA	NA	89	13.5	NA	NA
EPA 821/R-02-012	Water	*Pimephales promelas*	70	12	NA	NA	82	14.6	NA	NA
EPA 821/R-02-013	Water	*Selenastrum capricornutum*	97	12	NA	NA	109	11.0	NA	NA
EPA 8321A	Water	Aldicarb	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Carbaryl	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Carbofuran	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Diuron	68	12	NA	12	92	13.0	NA	13.0
EPA 8321A	Water	Linuron	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Methamidophos	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Methiocarb	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Methomyl	62	12	NA	12	86	14.0	NA	14.0
EPA 8321A	Water	Oxamyl	62	12	NA	12	86	14.0	NA	14.0
SM 2340 C	Water	Hardness as CaCO3	58	14	NA	14	86	16.3	NA	16.3
SM 2540 D	Water	Total Suspended Solids	62	12	NA	12	86	14.0	NA	14.0
SM 4500-NH3 C v20	Water	Ammonia as N	65	12	NA	12	89	13.5	NA	13.5
SM 4500-P E	Water	Orthophosphate as P	62	12	NA	12	86	14.0	NA	14.0
SM 5310 B	Water	Total Organic Carbon	62	12	NA	12	86	14.0	NA	14.0
SM 9223 B	Water	*E. coli*	62	12	NA	12	86	14.0	NA	14.0
Walkley-Black	Sediment	Total Organic Carbon	19	2	NA	NA	21	9.5	NA	NA
		Total	**2547**	**490**	**30**	**448**	**3515**	**13.9**	**16.7**	**14.1**

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 2017 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)	13	13	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
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)	14	14	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	**448**	**448**	**100.0**

[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 2017 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 Conc. Enviro. Sample/5	4	4	100.0
EPA 200.8	Water	Dissolved Copper	< RL or Conc. Enviro. Sample/5	13	13	100.0
EPA 200.8	Water	Dissolved Lead	< RL or Conc. Enviro. Sample/5	5	5	100.0
EPA 200.8	Water	Dissolved Nickel	< RL or Conc. Enviro. Sample/5	4	4	100.0
EPA 200.8	Water	Dissolved Zinc	< RL or Conc. Enviro. Sample/5	4	4	100.0
				Total	**30**	**30**

Table 20. ESJWQC summary of field duplicate QC sample evaluations.
Samples collected during the 2017 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	2	2	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	13	12	92.3
EPA 200.8	Water	Dissolved Lead	RPD ≤25	5	5	100.0
EPA 200.8	**Water**	**Dissolved Nickel**	**RPD ≤25**	**4**	**3**	**75.0**
EPA 200.8	**Water**	**Dissolved Zinc**	**RPD ≤25**	**4**	**3**	**75.0**
EPA 200.8	**Water**	**Molybdenum**	**RPD ≤25**	**4**	**3**	**75.0**
EPA 200.8	**Water**	**Selenium**	**RPD ≤25**	**4**	**2**	**50.0**
EPA 353.2	Water	Nitrate + Nitrite as N	RPD ≤25	12	12	100.0
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	2	2	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	11	91.7
EPA 8321A	Water	Aldicarb	RPD ≤25	12	12	100.0
EPA 8321A	Water	Carbaryl	RPD ≤25	12	12	100.0
EPA 8321A	Water	Carbofuran	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	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	14	14	100.0
SM 2540 D	**Water**	**Total Suspended Solids**	**RPD ≤25**	**12**	**8**	**66.7**
SM 4500-NH3 C v20	Water	Ammonia as N	RPD ≤25	12	11	91.7
SM 4500-P E	**Water**	**Orthophosphate as P**	**RPD ≤25**	**12**	**10**	**83.3**
SM 5310 B	Water	Total Organic Carbon	RPD ≤25	12	12	100.0
SM 9223 B	Water	*E. coli*	Rlog ≤1.30	12	12	100.0
Walkley-Black	Sediment	Total Organic Carbon	RPD ≤20	2	2	100.0
			Total	490	476	97.1

Table 21. ESJWQC summary of laboratory blank QC sample evaluations.
Samples analyzed in batches with samples collected during the 2017 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	13	13	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	13	13	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	14	14	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
EPA 8321A	Water	Methamidophos	< 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	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	14	14	100.0
SM 2540 D	Water	Total Suspended Solids	< RL	12	12	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	< RL	13	13	100.0
SM 4500-P E	Water	Orthophosphate as P	< RL	12	12	100.0
SM 5310 B	Water	Total Organic Carbon	< RL	20	20	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	2	2	100.0
			Total	**463**	**463**	**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 2017 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 (%)
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	13	13	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	15	15	100.0
EPA 547M	Water	Glyphosate	PR 85.7-121	4	4	100.0
EPA 549.2M	Water	Paraquat	PR 70-130	4	4	100.0
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	15	15	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**	**10**	**12**	**83.3**
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	12	100.0

Method[1]	Matrix	Analyte[2]	LCS Data Acceptability Criteria	Total LCS Samples	LCS Samples within Limits	Acceptability Met (%)
EPA 8321A	Water	Methiocarb	PR 35-142	12	12	100.0
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	14	14	100.0
SM 2540 D	Water	Total Suspended Solids	PR 80-120	12	12	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	PR 90-110	24	24	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	28	28	100.0
Walkley-Black	Sediment	Total Organic Carbon	PR 75-125	2	2	100.0
			Total	**475**	**477**	**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 2017 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 353.2	Water	Nitrate + Nitrite as N	RPD ≤20	2	2	100.0
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 4500-NH3 C v20	Water	Ammonia as N	RPD ≤20	11	11	100.0
SM 5310 B	Water	Total Organic Carbon	RPD ≤20	8	8	100.0
			Total	**26**	**26**	**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 2017 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	32	32	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**	**22**	**84.6**
EPA 547M	Water	Glyphosate	PR 85.7-121	4	4	100.0
EPA 549.2M	**Water**	**Paraquat**	**PR 70-130**	**4**	**2**	**50.0**
EPA 8141A	Water	Atrazine	PR 39-156	24	24	100.0
EPA 8141A	Water	Azinphos Methyl	PR 30-172	24	24	100.0
EPA 8141A	Water	Chlorpyrifos	PR 40-144	26	24	92.3
EPA 8141A	Water	Cyanazine	PR 22-172	24	24	100.0
EPA 8141A	**Water**	**Demeton-s**	**PR 35-130**	**24**	**19**	**79.2**

Method	Matrix	Analyte[1]	MS Data Acceptability Criteria	Total MS Samples	MS Samples within Limits	Acceptability Met (%)
EPA 8141A	**Water**	**Diazinon**	**PR 45-130**	**24**	**21**	**87.5**
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**	**20**	**83.3**
EPA 8141A	Water	Methidathion	PR 50-150	24	22	91.7
EPA 8141A	Water	Parathion, Methyl	PR 55-164	24	24	100.0
EPA 8141A	Water	Phorate	PR 42-125	24	22	91.7
EPA 8141A	**Water**	**Phosmet**	**PR 40-153**	**24**	**20**	**83.3**
EPA 8141A	Water	Simazine	PR 21-179	24	24	100.0
EPA 8141A	Water	Trifluralin	PR 40-148	24	24	100.0
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	24	100.0
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	28	28	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	PR 90-110	26	26	100.0
SM 4500-P E	**Water**	**Orthophosphate as P**	**PR 90-110**	**24**	**21**	**87.5**
SM 5310 B	Water	Total Organic Carbon	PR 80-120	30	27	90.0
			Total	842	805	95.6

[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 2017 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	16	16	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	2	2	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	11	91.7
EPA 8141A	**Water**	**Demeton-s**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	Water	Diazinon	RPD ≤25	12	11	91.7
EPA 8141A	**Water**	**Dichlorvos**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	Water	Dimethoate	RPD ≤25	12	11	91.7
EPA 8141A	**Water**	**Disulfoton**	**RPD ≤25**	**12**	**10**	**83.3**
EPA 8141A	Water	Malathion	RPD ≤25	12	11	91.7

Method	Matrix	Analyte[1]	Duplicate Data Acceptability Criteria	Total MSD Samples	MSD Samples within Limits	Acceptability Met (%)
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	11	91.7
EPA 8141A	Water	Phosmet	RPD ≤25	12	11	91.7
EPA 8141A	Water	Simazine	RPD ≤25	12	11	91.7
EPA 8141A	Water	Trifluralin	RPD ≤25	12	11	91.7
EPA 8321A	Water	Aldicarb	RPD ≤25	12	11	91.7
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	12	100.0
EPA 8321A	Water	Methamidophos	RPD ≤25	12	11	91.7
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 ≤20	14	14	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	RPD ≤20	13	13	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	15	15	100.0
			Total	**421**	**399**	**94.8**

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

Laboratory duplicates were analyzed in batches with samples collected for the 2017 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	3	3	100.0
EPA 180.1	Water	Turbidity	RPD ≤20	13	13	100.0
SM 2540 D	**Water**	**Total Suspended Solids**	**RPD ≤20**	**14**	**12**	**85.7**
SM 9223 B	Water	*E. coli*	Rlog ≤1.30	12	12	100.0
Walkley-Black	**Sediment**	**Total Organic Carbon**	**RPD ≤20**	**2**	**1**	**50.0**
			Total	**44**	**41**	**93.2**

[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**	**169**	**151**	**89.3**
EPA 8141A	Triphenyl Phosphate	PR 56-129	169	154	91.1
EPA 8321A	Diphenamid	PR 40-122	134	126	94.0
EPA 8321A	Tributylphosphate	PR 36-140	140	140	100.0
		Total	**612**	**571**	**93.3**

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

Samples collected during 2017 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	Method	Acceptability Met (%)
ASTM D422/ ASTM D4464M	**Sediment**	**Grain Size**	**28 days, unfrozen**	**21**	**10**	**47.6**
EPA 180.1	Water	Turbidity	48 hours	86	86	100.0
EPA 200.8	Water	Arsenic	180 days	20	20	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	112	112	100.0
EPA 200.8	Water	Dissolved Lead	180 days	29	29	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	120	120	100.0
EPA 547M	Water	Glyphosate	6 months	18	18	100.0
EPA 549.2M	Water	Paraquat	Extract within 7 days, analyze within 21 days.	18	18	100.0
EPA 600/R-99-064	Water	*Hyalella azteca*	14 days	21	21	100.0
EPA 8141A	Water	Atrazine	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Azinphos Methyl	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Chlorpyrifos	Extract within 7 days, analyze within 40 days	125	120	96.0
EPA 8141A	Water	Cyanazine	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Demeton-s	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Diazinon	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Dichlorvos	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Dimethoate	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Disulfoton	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Malathion	Extract within 7 days, analyze within 40 days	100	100	100.0
EPA 8141A	Water	Methidathion	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Parathion, Methyl	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Phorate	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Phosmet	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Simazine	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8141A	Water	Trifluralin	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 821-R-02-012	Water	*Ceriodaphnia dubia*	36 hours	89	89	100.0
EPA 821-R-02-012	Water	*Pimephales promelas*	36 hours	82	82	100.0
EPA 821-R-02-013	Water	*Selenastrum capricornutum*	36 hours	109	109	100.0
EPA 8321A	Water	Aldicarb	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Carbaryl	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Carbofuran	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Diuron	Extract within 7 days, analyze within 40 days	104	95	91.3
EPA 8321A	Water	Linuron	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Methamidophos	Extract within 7 days, analyze within 40 days	98	98	100.0
EPA 8321A	Water	Methiocarb	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Methomyl	Extract within 7 days, analyze within 40 days	98	89	90.8
EPA 8321A	Water	Oxamyl	Extract within 7 days, analyze within 40 days	98	89	90.8
SM 2340 C	Water	Hardness as CaCO3	180 days	100	100	100.0
SM 2540 D	Water	Total Suspended Solids	7 days	86	86	100.0
SM 4500-NH3 C v20	Water	Ammonia as N	28 days	102	102	100.0
SM 4500-P E	Water	Orthophosphate as P	48 hours	98	98	100.0
SM 5310 B	Water	Total Organic Carbon	28 days	101	101	100.0
SM 9223 B	Water	*E. coli*	24 hours	86	86	100.0
Walkley-Black	**Sediment**	**Total Organic Carbon**	**28 days, unfrozen**	**21**	**0**	**0.0**
			Total	**3936**	**3827**	**97.2**

Table 29. ESJWQC summary of toxicity laboratory control sample evaluations.
Samples collected for the 2017 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%	4	4	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	**40**	**40**	**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	3/14/2017	535CCAWBR	0.35	1.48	6.75	9.29	2.67	NA
Field Duplicate	3/14/2017	535CCAWBR	1.16	2.5	7.19	9.57	2.45	8.80
Lab Duplicate	3/14/2017	535CCAWBR	1.17	2.52	7.25	9.61	2.46	0.59
Environmental Sample	3/14/2017	545XDCARE	-1.36	-0.78	0.83	1.26	0.80	NA
Lab Duplicate	3/14/2017	545XDCARE	-1.32	-0.76	0.83	1.28	0.79	1.01
Environmental Sample	9/12/2017	535CCAWBR	2.57	2.88	4.12	4.74	0.64	NA
Field Duplicate	9/12/2017	535CCAWBR	2.57	2.84	4.11	4.74	0.65	1.17
Lab Duplicate	9/12/2017	535CCAWBR	2.56	2.8	4.08	4.71	0.65	1.09

[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? If so, what are the specific factors or practices causing or contributing to the identified problems?" the Coalition assessed 2017 WY monitoring results and the potential sources and mechanisms contributing to water quality impairments. Table 31 shows months when monitoring occurred by site and whether the site was dry or non-contiguous. All exceedances and toxicity that occurred during the 2017 WY are included in Table 33 through Table 44 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 by members and the Coalition to address these exceedances are described in the Member Actions Taken to Address Water Quality Impairments and the Coalition Actions Taken to Address Water Quality Impairments sections of this report.

A list of all WQTLs used to evaluate monitoring results is included in Table 32. Tallies of exceedances that occurred during the 2017 WY are listed by site and zone in Appendix I, Tables I-III. The tallies in Appendix I represent 1) the number of exceedances per constituent, and 2) 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.

Table 31. ESJWQC Dry and non-contiguous sites during the 2017 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 and samples were collected.

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	X	X	X	X	X	X
1	Mootz Drain downstream of Langworth Pond	Represented			*N*		X							
2	Lateral 5 1/2 @ South Blaker Rd	Core	X	X	X	X	X	X	X	X	X	X	X	X
2	Hatch Drain @ Tuolumne Rd	Represented				X	X	X	X	X		X	X	X
2	Hilmar Drain @ Central Ave	Represented						X	X			X		X
2	Lateral 2 1/2 near Keyes Rd	Represented								X	X	X	X	
2	Lateral 6 and 7 @ Central Ave	Represented	X	X	X	X	X	X		X	X	X		X*
2	Levee Drain @ Carpenter Rd	Represented			X		X	X			X	X		
2	Lower Stevinson @ Faith Home Rd	Represented	X	X		X	X	X		X	X	X		
2	Prairie Flower Drain @ Crows Landing Rd	Represented	X		X	X	X	X	X	X	X	X	X	X
2	Unnamed Drain @ Hogin Rd	Represented	X	X		X	X	X		X	X	X		
2	Westport Drain @ Vivian Rd	Represented					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		X	*N*	X	X	X						
4	Canal Creek @ West Bellevue Rd	Core	X	X	*N*	X	X	X	X	X	X	X	X	X
4	Black Rascal Creek @ Yosemite Rd	Represented							X	X				
4	Howard Lateral @ Hwy 140	Represented	X			*N*	X		X					
4	Livingston Drain @ Robin Ave	Represented			X	X	**D**	X	X	X				
4	Merced River @ Santa Fe	Represented	X	X	X									
4	Unnamed Drain @ Hwy 140	Represented				X								
5	Miles Creek @ Reilly Rd	Core			**D**	X	X	X	X	X	X	X	X	X
5	Deadman Creek (Dutchman) @ Gurr Rd	Represented		X	**D**	X	X	X		X	X			
5	Deadman Creek @ Hwy 59	Represented				X		X	**D**				X	X
5	Duck Slough @ Gurr Rd	Represented	X			X	X	X	X		X	X	X	X
6	Dry Creek @ Rd 18	Core			**D**	X	X	X	X	X	X	X	X	X
6	Ash Slough @ Ave 21	Represented				X								
6	Berenda Slough along Ave 18 1/2	Represented				**D**	X	X	X			X	X	X
6	Cottonwood Creek @ Rd 20	Represented				**D**			X			X		

*Sediment samples collected from Lateral 6 and 7 @ Central Ave for Lateral 5 ½ @ South Blaker Rd sediment monitoring due to lack of accumulated sediment.

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 µs/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 (US EPA) 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 (US EPA), 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 (US EPA) / Continuous Concentration 4-day average (total)	1
Endrin	0.036 µg/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (US EPA) - Continuous Concentration 4-Day Average	1
	0.76 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (US EPA), 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: US EPA 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: US EPA 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: US EPA 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. US EPA 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: US EPA 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. US EPA 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. US EPA 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 (US EPA), 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 (US EPA) - Instantaneous maximum	
Chlordane	0.00057 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (US EPA), 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 (US EPA) - 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 (US EPA), 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 (US EPA) - 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 (US EPA), 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 (US EPA) - 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 (US EPA), 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 (US EPA) - Maximum Concentration (1-hour Average)	
Endosulfan	110 µg/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (US EPA), 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 (US EPA) - 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 (US EPA), 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 (US EPA) - 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: US EPA 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. US EPA 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: US EPA 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: US EPA 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: US EPA 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: US EPA 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
	1,300 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: US EPA 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: US EPA 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
US EPA- 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 a Core monitoring location on Dry Creek. From October through July the location was Dry Creek @ Wellsford Rd and from August through September samples were collected from the new downstream monitoring site, Dry Creek @ Church St. For the purpose of the Zone 1 summary, exceedances that occurred at either location are discussed by referring to Dry Creek in general. The specific site names and exceedance tallies are included in Table 33. In Zone 1 there was one Represented site monitored during the 2017 WY, Mootz Drain downstream of Langworth Pond.

During the 2017 WY, the Core site on Dry Creek was monitored monthly for the full suite of constituents and in October for MPM for chlorpyrifos. Management Plan Monitoring at Mootz Drain downstream of Langworth Pond occurred for diuron in December and February. Exceedances of the WQTLs for field parameters, *E. coli*, and ammonia occurred during the 2017 WY. Table 33 includes all exceedances that occurred during the 2017 WY in Zone 1.

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 (6), pH (1), SC (1), and *E. coli* (6) occurred during 2017 WY (Table 33).

Exceedances of water quality objectives for field parameters such as DO, pH, and SC are difficult to source. These parameters are non-conserved, meaning they may fluctuate as water moves downstream. The concentrations of these parameters are the result of processes occurring in the water column and in the sediment, which can vary seasonally and/or diurnally.

Dissolved Oxygen

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 indicate that waterbodies with low or no flow have the strongest association with exceedances of DO in the Coalition region.

Six exceedances of the WQTL for DO (< 7 mg/L) occurred during the 2017 WY at Dry Creek (4) and Mootz Drain downstream of Langworth Pond (2). Exceedances occurred in October, December through February, and May through September, ranging from 0.18 to 6.63 mg/L (Table 33). Exceedances of the WQTL for DO occurred during periods of low and high flow throughout the 2017 WY. Exceedances of the WQTL for DO occurred in December (2.4 mg/L) and February (0.18 mg/L) at Mootz Drain downstream of Langworth Pond.

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, one exceedance of the upper WQTL for pH (> 8.5) occurred at Dry Creek on January 10, 2017 (9.58; Table 33).

Specific Conductivity

A single exceedance of the WQTL for SC in Zone 1 occurred at Mootz Drain downstream of Langworth Pond on February 14, 2017 (787 µs/cm) initiating a management plan for SC in 2018 (Table 33). Elevated levels of SC are uncommon in Zone 1. The last exceedance of the WQTL for SC in Zone 1 occurred in January 2009 at Dry Creek with a detection of 707 µs/cm (WQTL 700 µs/cm).

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) manure from dairies is sold to adjacent farms and if improperly composted and stored can contribute to elevated levels of bacteria in the waterway, and 3) naturally occurring *E. coli* bacteria in the waterways.

During the 2017 WY, seven exceedances of the WQTL for *E. coli* (> 235 MPN/100 mL) occurred in samples collected from Dry Creek, including one field duplicate sample. Sample results ranged from 260.3 to >2419.6 MPN/100 mL (Table 33).

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 had an elevated concentration of ammonia that exceeded the 1.5 mg/L WQTL on September 15, 2017 (4.5 mg/L; Table 33). The exceedance of the WQTL for ammonia coincided with an exceedance of the WQTL for *E. coli*.

Table 33. Zone 1 (Dry Creek and Mootz Drain downstream of Langworth Pond) exceedances.
The WQTLs are listed with each constituent.

Zone 1 Site Name	Site Type	Monitoring Type[1]	Sample Date	DO, <7 mg/L	pH, <6.5 or >8.5	SC, 700 µS/cm	*E. coli*, 235 MPN/100 mL	Ammonia (Variable[2] or 1.5 mg/L)
Dry Creek @ Wellsford Rd	Core	NM, MPM	10/18/2016				260.3	
Dry Creek @ Wellsford Rd	Core	NM, High TSS 1-P	1/10/2017		9.58		1986.3	
Dry Creek @ Wellsford Rd-FD	Core	NM, High TSS 1-P	1/10/2017				>2419.3	
Dry Creek @ Wellsford Rd	Core	NM	5/9/2017				248.1	
Dry Creek @ Wellsford Rd	Core	NM	6/13/2017	6.63			410.6	
Dry Creek @ Wellsford Rd	Core	NM, High TSS 1-P	7/11/2017	5.29				
Dry Creek @ Church St	Core	NM	8/15/2017	4.02			>2419.6	4.5 (3.5)
Dry Creek @ Church St	Core	NM, SED	9/12/2017	4.57			547.5	
Mootz Drain downstream of Langworth Pond	Represented	MPM, Non-contiguous	12/9/2016	2.4				
Mootz Drain downstream of Langworth Pond	Represented	MPM	2/14/2017	0.18		787		
Normal Monitoring Exceedances				**6**	**1**	**1**	**7**	**1**
Non-contiguous Waterbody Exceedances				**1**	**0**	**0**	**0**	**0**
Total Exceedances				**6**	**1**	**1**	**7**	**1**

[1]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.
[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.
SED-Sediment monitoring.

ZONE 2 SUMMARY OF EXCEEDANCES

During the 2017 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 (Table 3). The Coalition conducted MPM and NM at the Represented sites according to the schedule outlined in the 2017 WY MPU. Table 34 includes all exceedances that occurred during the 2017 WY in Zone 2.

Lateral 5 ½ @ South Blaker Rd was scheduled for sediment sampling in September 2017; however, due to a lack of accumulated sediment, samples were collected from Lateral 6 and 7 @ Central Ave instead. Lateral 6 and 7 @ Central Ave was chosen as the alternative site because it is the only site in Zone 2 that is an unlined irrigation delivery conveyance structure where sediment is more readily available for collection (Table 31).

Field Parameters and *E. coli*

In Zone 2, the field parameters DO, pH, and SC were monitored 72 times during the 2017 WY (Appendix I, Table I). Twelve samples were collected for *E. coli* analysis. Exceedances of the WQTLs for DO (35), pH (6), SC (45), and *E. coli* (2) occurred (Appendix I; Table I).

Dissolved Oxygen

In Zone 2, exceedances of the WQTL for DO (< 7 mg/L) ranged from 0.09 to 6.78 mg/L and occurred at Hatch Drain @ Tuolumne Rd (7), Hilmar Drain @ Central Ave (2), Lateral 6 and 7 @ Central Ave (3), Levee Drain @ Carpenter Rd (5), Prairie Flower Drain @ Crows Landing Rd (11), Unnamed Drain @ Hogin Rd (6), and Westport Drain @ Vivian Rd (1; Table 34).

Exceedances of the WQTL for DO occurred throughout the year mainly in waterbodies with no flow or low flow conditions (< 5 cfs). During the 2017 WY, sites with DO exceedances in Zone 2 had an average discharge measurement of 1.92 cfs. Lateral 6 & 7 @ Central Ave was the only site with high flow conditions after two storm events in October and December that still had low DO.

pH

In Zone 2, six exceedances of the upper WQTL for pH (>8.5) occurred during the 2017 WY, ranging from 8.54 to 9.25 (Table 34). Five of the six exceedances occurred at Lower Stevinson @ Faith Home Rd and a single exceedance occurred at Lateral 6 and 7 @ Central Ave.

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. 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 45 times in Zone 2 and occurred at all sites with the exception of Lateral 2 ½ near Keyes Rd (Table 34). Exceedances ranged from 729 to 2763 µs/cm and occurred at: Hatch Drain @ Tuolumne Rd (8), Hilmar Drain @ Central Ave (3), Lateral 5 ½ @ South Blaker Rd (4), Lateral 6 and 7 @ Central Ave (4), Levee Drain @ Carpenter Rd (4), Lower Stevinson @ Faith Home Rd (3), Prairie Flower Drain @ Crows Landing Rd (11), Unnamed Drain @ Hogin Rd (7), and Westport Drain @ Vivian Rd (1).

E. coli

Two samples collected from Lateral 5 ½ @ South Blaker Rd resulted in exceedances of the WQTL for *E. coli*, in June and September of 2017 (Table 34). One exceedance of the WQTL for *E. coli* at Lateral 5 ½ @ South Blaker Rd coincided with an exceedance of the WQTL for nitrate in September 2017 (13 mg/L; respectively).

Ammonia

One sample collected from Lateral 6 and 7 @ Central Ave resulted in an exceedance of the WQTL for ammonia during storm monitoring on January 10, 2017 (8.4 mg/L; Table 34). Due to increased runoff, discharge was unable to be safely measured at the time samples were collected.

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.

In Zone 2, there were a total of 15 exceedances of the WQTL for nitrate-nitrite as N. Exceedances of the WQTL occurred in samples collected from Lateral 5 ½ @ South Blaker Rd (8), Lateral 6 and 7 @ Central Ave (4), and Lower Stevinson @ Faith Home Rd (3). Concentrations of nitrogen ranged from 11 mg/L to 32 mg/L (Table 34).

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 (K_{oc} of 6070). The concentration at which 50% mortality (LC_{50}) 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 2, a total of 24 samples were collected and analyzed for chlorpyrifos. A single exceedance of the WQTL for chlorpyrifos occurred in samples collected from Prairie Flower Drain @ Crows Landing Rd on August 15, 2017 (0.045 µg/L; Table 34). Toxicity to *C. dubia* coincided with the exceedance of the WQTL for chlorpyrifos (0% survival compared to the control). At the time samples were collected, discharge was recorded as zero due to no measurable flow. The PUR data associated with the sample include two applications of chlorpyrifos; 104 lbs AI were applied to corn (60 acres) and alfalfa (150 acres) on July 20 and July 28, 2017 (Appendix II).

During the 2018 WY, Prairie Flower Drain @ Crows Landing Rd is scheduled to be monitored for chlorpyrifos from March through August (2018 WY MPU).

Water Column Toxicity

The Coalition collected 34 samples to test for toxicity to *S. capricornutum*; twelve of the samples collected had significantly reduced algae growth. Twenty samples were collected to test for toxicity to *C. dubia*, two of which resulted in complete mortality. Monitoring for toxicity to *P. promelas* occurred twelve times and no toxicity occurred. All toxicity results are included in Table 34 and Table 35 and precipitation results are in Table 6. A summary of the water column phase III TIE results and conclusions is provided in Table 36.

Water Column Toxicity to C. dubia

During the 2017 WY, toxicity to *C. dubia* occurred in two samples collected from Prairie Flower Drain @ Crows Landing Rd in May and August of 2017.

Samples collected for MPM on May 9, 2017 were analyzed for *C. dubia* toxicity; the sample was toxic with 0% survival compared to the control. A TIE was conducted and concluded ammonia as the sole cause of toxicity with an ammonia concentration of 46.5 mg/L (Table 35). No other exceedances occurred in the May 9, 2017 sample.

Samples collected for MPM on August 15, 2017 were analyzed for *C. dubia* toxicity; the sample was toxic with 0% survival compared to the control. A Phase I TIE was conducted and concluded organophosphate insecticides as the source of toxicity.

A Phase III TIE indicated the sample was toxic to *C. dubia* at a level of 5.6 Toxic Units (TUs). Chlorpyrifos was detected in the sample at a concentration of 0.045 µg/L (about 1.1 TU) which is above the WQTL. The sample was only analyzed for chlorpyrifos since it was MPM; no other pesticides were analyzed for. The PUR data associated with the August 15, 2017 sample indicate 27 applications of products containing pyrethroids, chlorpyrifos, spiromesifen, and methoxyfenozide. In the month prior to the sample collection, 500 lbs of these active ingredients were applied to alfalfa (294 acres) and corn for fodder (1,071 acres) from May 26 through August 12, 2017 (Appendix II). Two applications of chlorpyrifos occurred prior to monitoring; 104 lbs of chlorpyrifos was applied to alfalfa (63 acres) and corn for fodder (150 acres) on July 20 and 28, 2017.

During the 2018 WY, Prairie Flower Drain @ Crows Landing Rd is scheduled to be monitored for *C. dubia* toxicity and chlorpyrifos from March through August (2018 WY MPU).

Water Column Toxicity to S. capricornutum

During the 2017 WY, toxicity to *S. capricornutum* occurred in 12 times; samples collected from Hatch Drain @ Tuolumne Rd (3), Hilmar Drain @ Central Ave (2), Lateral 5 ½ @ South Blaker Rd (4), Levee Drain @ Carpenter Rd (1), and Prairie Flower Drain @ Crows Landing Rd (2) were toxic.

Hatch Drain @ Tuolumne Rd

Samples collected from Hatch Drain @ Tuolumne Rd were collected for MPM to test for algae toxicity; of the six samples, three were toxic. Samples for chemistry analysis were not collected during those times since MPM was only conducted for algae toxicity. Samples were collected for MPM after a storm on January 10, 2017 for toxicity to *S. capricornutum* at Hatch Drain @ Tuolumne Rd. The growth of *S. capricornutum* compared to the control was only 53% and considered toxic. A TIE was not conducted on the sample, as percent growth was greater than 50%. The PUR data associated with the January 10, 2017 sample indicate 55 applications of herbicide products containing pendimethalin, paraquat, mineral oil, and hexazinone. In the month prior to sample collection, 1,740 lbs of these active ingredients were applied to almonds (456), alfalfa (741 acres), and oats for fodder (476 acres) from December 13, 2016 through January 5, 2017. Prior to monitoring, a storm occurred in Modesto from January 7 through January 10, 2017, producing 2.47 inches of precipitation. At the time samples were collected, samplers observed an increase in the amount of water present in the drain and estimated flow to be between one and five cfs.

Samples collected for MPM during the irrigation season from Hatch Drain @ Tuolumne Rd on May 9, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 29% growth compared to the control. A TIE was conducted but results were inconclusive. The PUR data associated with the May 9, 2017 sample indicate 14 applications of copper hydroxide, metolachlor, glyphosate, and 2, 4-D. Of these active ingredients, 364 lbs were applied to almonds (196 acres), corn (76 acres), and rights of way from February 15 through May 9, 2017.

Samples collected for MPM during the irrigation season from Hatch Drain @ Tuolumne Rd on July 11, 2017 were analyzed for *S. capricornutum* toxicity; samples were toxic with 78% growth compared to the control. A TIE was not conducted as percent growth was greater than 50% compared to the control. The PUR data associated with the July 11, 2017 sample indicate 34 applications of herbicide products containing glyphosate, glufosinate-ammonium, spiromesifen, and pendimethalin. In the month prior to sample collection, 1,030 lbs of these active ingredients were applied to almonds (198 acres) and corn (587 acres) from June 13 through July 5, 2017.

During the 2018 WY, Hatch Drain @ Tuolumne Rd is scheduled to be monitored for *S. capricornutum* toxicity in January, May and July (2018 WY MPU).

Hilmar Drain @ Central Ave

Samples collected from Hilmar Drain @ Central Ave were collected for MPM to test for algae toxicity; of the three samples, two were toxic. Samples for chemistry analysis were not collected during those times since MPM was only conducted for algae toxicity.

Samples collected during the irrigation season from Hilmar Drain @ Central Ave on April 11, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 61% growth compared to the control. A TIE was not required since growth was greater than 50% compared to the control. The PUR data associated with the sample include 39 applications of herbicide and fungicide products containing chlorothalonil, copper hydroxide, and glyphosate. In the month prior to sample collection, 825 lbs of these active ingredients were applied to almonds (632 acres) and wheat (190 acres) from February 12 through April 10, 2017. Prior to monitoring, a storm occurred from April 7 through April 8, 2017, producing 0.58 inches of precipitation in Merced County. At the time samples were collected, samplers observed an increase in the amount of water present in the drain and estimated flow to be between one and five cfs. It is possible that herbicide and fungicide products washed into the waterbody during the storm event contributing to the observed toxicity.

Samples collected during the irrigation season from Hilmar Drain @ Central Ave on July 11, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 32% growth compared to the control. A TIE was conducted and results were inconclusive. The PUR data associated with the sample include 97 applications of herbicide products containing glyphosate and diglycolamine salt. Of these active ingredients, 4,866 lbs were applied to almonds (226 acres), alfalfa (268 acres), and corn for fodder (3,870 acres) from June 13 through July 11, 2017.

During the 2018 WY, Hilmar Drain @ Central Ave is scheduled to be monitored for toxicity to *S. capricornutum* in April, July, and September (2018 WY MPU).

Lateral 5 ½ @ South Blaker Rd

Toxicity to *S. capricornutum* occurred in four environmental samples and one field duplicate sample collected from Lateral 5 ½ @ South Blaker Rd during the 2017 WY. Monitoring for toxicity to *S. capricornutum* occurred 12 times.

Samples collected for NM after a storm on December 9, 2016 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 21% growth compared to the control (Table 34). A TIE was conducted but results were inconclusive (Table 35). Copper was detected in the sample at 3.0 µg/L; based on the EC_{50} of copper on algae, this concentration was unlikely to be the cause of the toxicity (Table 36). The PUR data associated with the December 9, 2016 sample include 588 applications of herbicide and fungicide products containing oxyfluorfen, glyphosate, copper, and pendimethalin. The various active ingredients added up to 33,100 lbs applied to almonds (23,100 acres), wheat (1,328 acres), and oats (3,000 acres) from October 7, 2016 through December 9, 2016 (Appendix II).

Samples collected for NM after a storm on January 10, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 37% growth compared to the control. A TIE was conducted but results were inconclusive. Copper was detected in the sample at 3.2 µg/L; based on the EC_{50} of copper on algae, this concentration was unlikely to be the cause of the toxicity. The PUR data associated with the January 10, 2017 sample include 496 applications of fungicide products containing primarily mineral oil, copper hydroxide, and copper sulfate. Of these active ingredients, 104,790 lbs were applied to almonds (13,200 acres), oats for fodder (2,600 acres), and alfalfa (1,700 acres) from November 10, 2016 through January 10, 2017.

Samples collected for NM after a storm on April 11, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 17% growth compared to the control. The field duplicate samples were also toxic to *S. capricornutum* with 25% growth compared to the control. A TIE was conducted but results were inconclusive. Copper was detected in the sample at 3.1 µg/L; based on the EC_{50} of copper on algae, this concentration was unlikely to be the cause of the toxicity. The PUR data associated with the April 11, 2017 sample include 813 applications of fungicide, herbicide, and insecticide products containing copper hydroxide, chlorothalonil, methyl bromide, mancozeb, and copper sulfate. Of these active ingredients, 82,980 lbs were applied to almonds (30,250 acres) and walnuts (4,660 acres) from January 18 through April 11, 2017.

Samples collected during the irrigation season on August 15, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 80% growth compared to the control. A TIE was not conducted since percent growth was greater than 50% compared to the control. The PUR data associated with the August 15, 2017 sample include 577 applications of herbicide and insecticide products containing methyl bromide, mineral oil, glyphosate, and paraquat. Of these active ingredients, 114,500 lbs were applied to almonds (25,000 acres), corn for fodder (3,200 acres), and walnuts (565 acres) from May 31 through August 15, 2017.

During the 2018 WY, Lateral 5 ½ @ South Blaker Rd is scheduled to be monitored for toxicity to *S. capricornutum* in October, December through June, and September (2018 WY MPU).

Prairie Flower Drain @ Crows Landing Rd

Samples collected from Prairie Flower Drain @ Crows Landing Rd were collected for MPM to test for toxicity to *S. capricornutum*; of the ten samples, two were toxic. Samples collected for MPM after a storm on December 9, 2016 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 80% growth compared to the control. A TIE was not conducted on the sample since percent growth was greater than 50% compared to the control. The sample was only analyzed for toxicity since it was MPM; no other chemistry data was analyzed for. The PUR data associated with the December 9, 2016 sample include 36 applications of herbicide products containing glyphosate, pendimethalin, paraquat dichloride, 2,4-DB, and hexazinone. Of these active ingredients, 930 lbs were applied to alfalfa (1,500 acres), wheat (250 acres), and oats (180 acres) from November 14 through December 7, 2016. Prior to monitoring, a storm occurred on December 8, 2016, producing 0.4 inches of precipitation in Merced County. At the time samples were collected, discharge was recorded as zero due to no observed flow. It is likely that products associated with the toxicity washed into the drain and remained in the drain due to no flow conditions.

Samples collected for MPM after a storm on January 10, 2017 were analyzed for toxicity to *S. capricornutum*; samples were toxic with 18% growth compared to the control. A TIE was conducted but results were inconclusive. The sample was only analyzed for toxicity since it was MPM; no other chemistry data was analyzed for. The PUR data associated with the January 10, 2017 sample indicate 37 applications of herbicide products containing MCPA dimethylamine salt, glyphosate, and pendimethalin. Of these active ingredients, 414 lbs were applied to oats for fodder (1,000 acres), wheat for fodder (435 acres), and alfalfa (160 acres) from December 22 through December 30, 2017. Prior to monitoring, a storm occurred in Merced County from January 7 through January 10, 2017, producing 3.01 inches of precipitation. Increased flows were not observed at the time samples were collected, discharge was recorded as zero due to no observed flow. It is likely that products associated with the toxicity washed into the drain and remained in the drain due to no flow conditions and became concentrated.

During the 2018 WY, Prairie Flower Drain @ Crows Landing Rd is scheduled to be monitored for toxicity to *S. capricornutum* in October, and December through August (2018 WY MPU).

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	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	Chlorpyrifos, 0.015 µg/L	*C. dubia*, % Survival	*S. capricornutum*, % Growth
Hatch Drain @ Tuolumne Rd	Represented	MPM	1/10/2017	2.53		1159						**53**
Hatch Drain @ Tuolumne Rd	Represented	MPM	2/14/2017	3.86		957						
Hatch Drain @ Tuolumne Rd	Represented	MPM, SED	3/14/2017			1595						
Hatch Drain @ Tuolumne Rd	Represented	MPM	4/11/2017	1.30		1060						
Hatch Drain @ Tuolumne Rd	Represented	MPM	5/9/2017	0.09		1396						**29**
Hatch Drain @ Tuolumne Rd	Represented	MPM	7/11/2017	2.16		1603						**78**
Hatch Drain @ Tuolumne Rd	Represented	MPM	8/15/2017	3.40		1298						
Hatch Drain @ Tuolumne Rd	Represented	MPM, SED	9/12/2017	0.12		1599						
Hilmar Drain @ Central Ave	Represented	MPM, SED	3/14/2017	2.43								
Hilmar Drain @ Central Ave	Represented	MPM	4/11/2017	5.96		870						**61**
Hilmar Drain @ Central Ave	Represented	MPM	7/11/2017			1337						**32**
Hilmar Drain @ Central Ave	Represented	MPM	9/12/2017			813						
Lateral 5 1/2 @ South Blaker Rd	Core	NM	10/18/2016						14			
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 1-M	10/29/2016						16			
Lateral 5 1/2 @ South Blaker Rd-FD	Core	NM, High TSS 1-M	10/29/2016						15			
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 2-M	12/9/2016			1028			27			21
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 1-P	1/10/2017			1249			30			37
Lateral 5 1/2 @ South Blaker Rd	Core	NM, SED	3/14/2017			815			21			
Lateral 5 1/2 @ South Blaker Rd	Core	NM	4/11/2017			1100			30			17
Lateral 5 1/2 @ South Blaker Rd-FD	Core	NM	4/11/2017						31			25
Lateral 5 1/2 @ South Blaker Rd	Core	NM	6/13/2017				686.7					
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 1-P, High TSS 1-M	7/11/2017						15			
Lateral 5 1/2 @ South Blaker Rd	Core	NM, High TSS 2-M	8/15/2017									80
Lateral 5 1/2 @ South Blaker Rd	Core	NM, SED*	9/12/2017				488.4		13			
Lateral 6 and 7 @ Central Ave	Represented	NM	10/18/2016						14			
Lateral 6 and 7 @ Central Ave	Represented	NM	10/29/2016	6.78								
Lateral 6 and 7 @ Central Ave	Represented	NM	12/9/2016	6.66		1492						
Lateral 6 and 7 @ Central Ave	Represented	NM	1/10/2017			912		8.4 (2.5)				
Lateral 6 and 7 @ Central Ave	Represented	NM	2/14/2017	4.64		1056			32			

Zone 2 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	Nitrate + Nitrite, 10 mg/L	Chlorpyrifos, 0.015 µg/L	*C. dubia*, % Survival	*S. capricornutum*, % Growth
Lateral 6 and 7 @ Central Ave	Represented	NM	3/14/2017						11			
Lateral 6 and 7 @ Central Ave	Represented	NM	5/9/2017			729			23			
Lateral 6 and 7 @ Central Ave	Represented	NM	6/13/2017		9.12							
Levee Drain @ Carpenter Rd	Represented	MPM	12/9/2016	4.08		1990						
Levee Drain @ Carpenter Rd	Represented	MPM	2/14/2017	1.48		2224						
Levee Drain @ Carpenter Rd	Represented	MPM, SED	3/14/2017	3.99		2059						
Levee Drain @ Carpenter Rd	Represented	MPM	6/13/2017	0.25		1476						**61**
Levee Drain @ Carpenter Rd	Represented	MPM	7/11/2017	1.64								
Lower Stevinson @ Faith Home Rd	Represented	NM	10/18/2016		8.89							
Lower Stevinson @ Faith Home Rd	Represented	NM	10/29/2016		9.15				12			
Lower Stevinson @ Faith Home Rd	Represented	NM	1/10/2017			1028						
Lower Stevinson @ Faith Home Rd	Represented	NM	2/14/2017		8.78	1179			19			
Lower Stevinson @ Faith Home Rd	Represented	NM	3/14/2017		9.25							
Lower Stevinson @ Faith Home Rd	Represented	NM	5/9/2017		8.54	948			11			
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	10/18/2016	0.91		2424						
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	12/9/2016	3.91		2524						**80**
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	1/10/2017	0.53		2361						**18**
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	2/14/2017	1.31		2033						
Prairie Flower Drain @ Crows Landing Rd	Represented	NM, MPM, SED	3/14/2017	0.93		2717						
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	4/11/2017	1.79		1963						
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	5/9/2017	0.20		2699					**0**	
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	6/13/2017	0.35		2710						
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	7/11/2017	1.15		1898						
Prairie Flower Drain @ Crows Landing Rd	Represented	MPM	8/15/2017	2.83		1345				**0.045**	**0**	
Prairie Flower Drain @ Crows Landing Rd	Represented	NM, SED	9/12/2017	0.19		1378						
Unnamed Drain @ Hogin Rd	Represented	NM	10/18/2016	1.17		2763						
Unnamed Drain @ Hogin Rd	Represented	NM	10/29/2016	3.54		1484						
Unnamed Drain @ Hogin Rd	Represented	NM	1/10/2017	5.39		2209						
Unnamed Drain @ Hogin Rd	Represented	MPM	3/14/2017	1.47		2263						
Unnamed Drain @ Hogin Rd	Represented	NM	5/9/2017	3.52		2666						
Unnamed Drain @ Hogin Rd	Represented	NM	6/13/2017	5.38		780						
Unnamed Drain @ Hogin Rd	Represented	NM	7/11/2017			2603						
Westport Drain @ Vivian Rd	Represented	MPM	2/14/2017	5.93								
Westport Drain @ Vivian Rd	Represented	MPM	5/9/2017			879						
			Normal Monitoring Exceedances	**35**	**6**	**45**	**2**	**1**	**17**	**0**	**0**	**5**

Zone 2 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	Nitrate + Nitrite, 10 mg/L	Chlorpyrifos, 0.015 µg/L	*C. dubia*, % Survival	*S. capricornutum*, % Growth
			Management Plan Monitoring Exceedances	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**1**	**2**	**8**
			Total Exceedances	35	6	45	2	1	17	1	2	13

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

*Sediment monitoring was scheduled to occur at Lateral 5 ½ @ South Blaker Rd; however, due to no sediment accumulation, samples were collected at the nearest downstream site (Lateral 6 and 7 @ Central Ave).

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

Table 35. Zone 2 water column toxicity exceedance summary.

The table is organized in chronological order by date and 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	Percent Control	Toxicity Significance	Summary Comments
Lateral 5 ½ @ South Blaker Rd	12/9/2016	*S. capricornutum*	Total Cell Count (cells/ml)	21	SG	Phase I and III TIEs were conducted and results were inconclusive. Dissolved copper was present in the sample but not at toxic concentrations (3.0 µg/L).
Prairie Flower Drain @ Crows Landing Rd	12/9/2016	*S. capricornutum*	Total Cell Count (cells/ml)	**80**	SL	A TIE was not conducted.
Prairie Flower Drain @ Crows Landing Rd	1/10/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**18**	SG	The phase I TIE results indicate the cause of toxicity is unknown. Neither EDTA nor SPE treatments reduced sample toxicity, indicating cationic metals and non-polar organics were not the cause of toxicity.
Lateral 5 ½ @ South Blaker Rd	1/10/2017	*S. capricornutum*	Total Cell Count (cells/ml)	37	SG	The phase I TIE results indicate the cause of toxicity is unknown. The concentration of copper (3.2 µg/L) in the sample was not significant enough to have caused the toxicity.
Hatch Drain @ Tuolumne Rd	1/10/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**53**	SG	No TIE was conducted.
Lateral 5 ½ @ South Blaker Rd	4/11/2017	*S. capricornutum*	Total Cell Count (cells/ml)	17	SG	Phase I and III TIEs results indicate the cause of toxicity is unknown. The concentration of copper (3.1 µg/L) in the sample was likely not sufficient enough to cause toxicity.
Hilmar Drain @ Central Ave	4/11/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**61**	SG	A TIE was not conducted.
Hatch Drain @ Tuolumne Rd	4/11/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**29**	SG	The phase I TIE results indicate the cause of toxicity is unknown.
Prairie Flower Drain @ Crows Landing Rd	5/9/2017	*C. dubia*	Percent Survival	**0**	SG	The phase I TIE results indicate the elevated concentration of ammonia was the sole cause of toxicity (46.5 mg/L).

Site Name	Sample Date	Species	Toxicity End Point	Percent Control	Toxicity Significance	Summary Comments
Levee Drain @ Carpenter Rd	6/13/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**61**	SG	A TIE was not conducted.
Hilmar Drain @ Central Ave	7/11/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**32**	SG	The phase I TIE results indicate the cause of toxicity is unknown.
Hatch Drain @ Tuolumne Rd	7/11/2017	*S. capricornutum*	Total Cell Count (cells/ml)	**78**	SG	A TIE was not conducted.
Lateral 5 ½ @ South Blaker Rd	8/15/2017	*S. capricornutum*	Total Cell Count (cells/ml)	80	SL	A TIE was not conducted.
Prairie Flower Drain @ Crows Landing Rd	8/15/2017	*C. dubia*	Percent Survival	**0**	SG	The phase I TIE results indicate organophosphate insecticides caused the toxicity.

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 within Zone 2.

Phase III analysis results are calculated and provided by Aqua-Science Laboratory. The table includes phase III analyses 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	12/9/2016	*S. capricornutum*	71.4	1.4	Copper, 3.0 µg/L Ammonia, 0.12 mg/L	10-220 NA	<0.1 NA	Copper not present at toxic concentrations.
Lateral 5 ½ @ South Blaker Rd	1/10/2017	*S. capricornutum*	76.9	1.3	Copper, 3.2 µg/L	10-220	0.01-0.32	Copper not present at toxic concentrations.
Lateral 5 ½ @ South Blaker Rd	4/11/2017	*S. capricornutum*	71.4	1.4	Copper, 3.1 µg/L	10-220	0.1-0.31	Copper not present at toxic concentrations.
Prairie Flower Drain @ Crows Landing Rd	5/9/2017	*C. dubia*	38.5	2.6	Ammonia, 46.5 mg/L	NA	NA	Toxicity eliminated by zeolite treatment and recovered with ammonia add-back. Ammonia is source of toxicity.
Prairie Flower Drain @ Crows Landing Rd	8/15/2017	*C. dubia*	17.9	5.6	Chlorpyrifos, 0.045 µg/L	0.04	1.1	Chlorpyrifos concentration responsible for approximately 20% of sample toxicity.

EC_{50} = The effective concentration that inhibits 50% of the test population (taken from the US EPA ECOTOCX database).
e – No EC_{50} values for chlorpyrifos are available in the Ecotox database for algae.

ZONE 3 SUMMARY OF EXCEEDANCES

During the 2017 WY, Highline Canal @ Hwy 99 was monitored for the full suite of constituents from December through September as the Core site in Zone 3. Monitoring in October and November did not occur as part of the Delta RMP exchange. Management Plan Monitoring occurred for chlorpyrifos (January, March, July), copper (January – March, August), and water column toxicity to *S. capricornutum* (February – September). Management Plan Monitoring for dissolved copper occurred at Mustang Creek @ East Ave from November 2016 through March 2017. Table 37 includes all exceedances that occurred during the 2017 WY in Zone 3.

During the 2017 WY, monitoring at Highline Canal @ Lombardy Rd did not occur; all MPM for Highline Canal @ Lombardy Rd management plan constituents occurred at Highline Canal @ Hwy 99.

Field Parameters and *E. coli*

In Zone 3, field parameters were scheduled to be measured 15 times during the 2017 WY; 14 measurements were taken and a site was dry during one sampling event. Nine samples were collected for *E. coli* analysis. Exceedances of the WQTLs for DO (5), pH (2), SC (1), and *E. coli* (2) occurred.

Dissolved Oxygen

A single exceedance of the WQTL for DO (<7 mg/L) occurred at Highline Canal @ Hwy 99 in September (6.99 mg/L) and four of the five exceedances occurred at Mustang Creek @ East Ave in October, December, January, and March.

pH

In Zone 3, two exceedances of the upper WQTL for pH (>8.5) occurred during the 2017 WY. Both exceedances occurred at Highline Canal @ Hwy 99 in March and May

Specific Conductivity

During the 2017 WY, a single exceedance of the WQTL for SC (700 µs/cm) occurred. Measurements taken in March at Mustang Creek @ East Ave resulted in an exceedance of the WQTL with a concentration of 1,354 µs/cm.

E. coli

Two samples collected from Highline Canal @ Hwy 99 had concentrations of *E. coli* in exceedance of the WQTL (235 MPN/100mL). Samples collected in January and February after recent storms had concentrations of *E. coli* greater than 2,419 MPN/100mL.

Ammonia

Two samples collected from Highline Canal @ Hwy 99 for NM resulted in exceedances of the WQTL for ammonia after recent storms on January 10, 2017 (7.2 mg/L) and on February 14, 2017 (3.40 mg/L).

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. 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; dissolved 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. Or when the hardness of water is especially low, minimal amounts of copper can result in an exceedance. Discharge from agriculture seem to not be a factor, as exceedances are not correlated 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, nine samples were scheduled to be collected and analyzed for dissolved copper. Four samples were collected from Highline Canal @ Hwy 99 and five collected from Mustang Creek @ East Ave during MPM. Exceedances of the hardness based WQTL for dissolved copper occurred three times at Highline Canal @ Hwy 99 and twice in samples collected from Mustang Creek @ East Ave (Table 37).

Highline Canal @ Hwy 99

A total of four samples were collected from Highline Canal @ Hwy 99 for MPM for copper; three exceedances of the hardness based WQTL occurred. Samples collected after a storm on January 10, 2017 resulted in an exceedance of dissolved copper with a concentration of 10 µg/L (hardness based WQTL of 8.64 µg/L). The PUR data associated with the January 10, 2017 sample include 78 applications of products containing copper hydroxide, copper oxide, and copper sulfate. Of these active ingredients, 22,748 lbs were applied to almonds (3,800 acres), peaches (493 acres), and bare root and container nursery plants (500 acres) from November 14, 2016 through January 10, 2017. From January 7 through January 10, 2017, 3.1 inches of precipitation fell in the area. Increased runoff was observed at the time samples were collected and could have washed copper into the waterway. At the time samples were collected, discharge was measured at 41.0 cfs.

Samples collected for copper MPM on February 14, 2017 resulted in an exceedance of dissolved copper with a concentration of 18 µg/L (hardness based WQTL 11.2 µg/L). The PUR data associated with the February 2017 sample include 130 applications of fungicide products containing copper hydroxide, copper oxide, and copper sulfate. Of these active ingredients, 34,940 lbs were applied to almonds (5,420 acres), peaches (790 acres), and outdoor container nursery plants (330 acres) from November 22, 2016 through February 14, 2017. Increased precipitation in the month prior to monitoring could have contributed to the exceedance by transporting copper residue into the canal. At the time samples were collected, discharge was measured at 13.01 cfs.

Samples collected from a stagnant waterbody for copper MPM on March 14, 2017 resulted in an exceedance of dissolved copper with a concentration of 8.2 µg/L (hardness based WQTL of 6.92 µg/L). The dissolved copper concentration of the March 14, 2017 field duplicate sample was also in exceedance of the hardness based WQTL with a concentration of 8.3 µg/L (hardness based WQTL 6.76 µg/L). The PUR data associated with the March 14, 2017 sample indicate 198 applications of insecticides and fungicides occurred containing copper hydroxide, copper oxide, and copper sulfate. Of these active ingredients, 31,100 lbs were applied to almonds (8,800 acres) and peaches (1,200 acres) from December 20, 2016 through March 11, 2017.

During the 2018 WY, Highline Canal @ Hwy 99 will be monitored monthly and MPM for dissolved copper will continue from January through March, and August (2018 WY MPU).

Mustang Creek @ East Ave

Samples collected from Mustang Creek @ East Ave were collected for MPM to test for dissolved copper; of the five samples, two resulted in exceedances of the hardness based WQTLs. Samples collected after a storm on October 29, 2016 resulted in an exceedance of dissolved copper with a concentration of 23 µg/L (hardness based WQTL of 9.7 µg/L). The PUR data associated with the October 29, 2016 sample indicate one application containing copper sulfate. The application consisted of 930 lbs of copper sulfate applied to 327 acres of almonds on October 25, 2016. Just prior to the October sampling event a storm occurred on October 28, 2016, producing 1.03 inches of precipitation in Merced County. Increased runoff from the storm was observed at the time samples were collected and could have transported copper into the creek. Discharge was measured at 6.19 cfs.

Samples collected for copper MPM after a storm on January 10, 2017 resulted in an exceedance of dissolved copper with a concentration of 13 µg/L (hardness based WQTL of 8.64 µg/L). The PUR data associated with the January 10, 2017 sample include 16 applications of copper containing products. Of these copper active ingredients, 12,530 lbs were applied to almond orchards (3,750 acres) from October 25, 2016 through January 10, 2017. The storm that occurred just prior to the January 10, 2017 sampling event started on January 7 and continued through January 10, 2017, producing 3.01 inches of precipitation in Merced. Increased runoff from the storm was observed at the time samples were collected and could have contributed to increased copper concentrations. Discharge was too deep to be measured during the monitoring event.

During the 2018 WY, Mustang Creek @ East Ave will be monitored from October through January and in March for dissolved copper MPM (2018 WY MPU).

Methomyl

Methomyl is a carbamate insecticide with no residential uses except as fly bait which can be purchased without a permit. The insecticide is registered for use on field vegetables, orchard crops, turf, and is used around poultry houses and dairies. Methomyl does not tend to bind to sediment, with a K_{oc} of 72.

It is highly soluble in water (solubility coefficient of 57.9 g/L) and can be easily mobilized and transported to surface waters (Menconi and Beckman, 1996). In the ESJWQC region, the majority of methomyl applications occur on alfalfa (70% of applications) and tomato (8%) crops. The months of highest use are February, March, and August; however, it is applied in smaller amounts from January through September. Methomyl is classified as a Restricted Use Pesticide by the Environmental Protection Agency (EPA) because of its high acute toxicity to humans (WQTL 0.52 µg/L).

In Zone 3, ten samples were scheduled to be collected and analyzed for methomyl during the 2017 WY; nine samples were collected as Highline Canal @ Hwy 99 was dry in December. Samples collected on February 14, 2017 for NM were in exceedance of the WQTL for methomyl (WQTL 0.52 µg/L) with a concentration of 0.69 µg/L. All other samples collected in January and March through September were non-detect. The exceedance did not coincide with any water column toxicity. The PUR data indicate no applications associated with the exceedance. The last reported use of methomyl within the Highline Canal site subwatershed was in September 2014 to alfalfa.

During the 2018 WY, methomyl was not scheduled to be monitored based on a review of reported methomyl use and evaluation steps required by the Pesticide Evaluation Protocol (PEP, 2018 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 4 Site Name	Site Type	Monitoring Type	Sample Date	DO, <7 mg/L	pH, <6.5 or >8.5	SC, 700 µS/cm	*E. coli*, 235 MPN/100 mL	Ammonia, Variable[1] or 1.5 mg/L	Copper, Dissolved, µg/L (Hardness Based)	Methomyl, 0.52 µg/L
Highline Canal @ Hwy 99	Core	NM, MPM, High TSS 1-P	1/10/2017				>2419.6	7.2 (5.4)	**10**	
Highline Canal @ Hwy 99	Core	NM, MPM	2/14/2017				>2419.6	8.1 (3.4)	**18**	0.69
Highline Canal @ Hwy 99	Core	NM, MPM	3/14/2017		9.04				**8.2**	
Highline Canal @ Hwy 99-FD	Core	NM, MPM	3/14/2017						**8.3**	
Highline Canal @ Hwy 99	Core	NM, MPM	5/9/2017		8.68					
Highline Canal @ Hwy 99	Core	NM, MPM	9/12/2017	6.99						
Mustang Creek @ East Ave	Represented	MPM, High TSS 1-M	10/29/2016	0.66					**23**	
Mustang Creek @ East Ave	Represented	NM, MPM, Non-contiguous	12/9/2016	3.60						
Mustang Creek @ East Ave	Represented	NM, MPM	1/10/2017	5.12					**13**	
Mustang Creek @ East Ave	Represented	NM, MPM	3/14/2017	6.25		1354				
			Normal Monitoring Exceedances	**5**	**2**	**1**	**2**	**2**	**0**	**1**
			Non-contiguous Waterbody Exceedances	**1**	**0**	**0**	**0**	**0**	**0**	**0**
			Management Plan Monitoring Exceedances	**0**	**0**	**0**	**0**	**0**	**6**	**0**
			Total Exceedances	**5**	**2**	**1**	**2**	**2**	**6**	**1**

[1]Ammonia WQTL variable based on pH and temperature.
High TSS – High total suspended solids in water column due to increased flows, additional samples collected for metals analysis (1-M) and pesticides (1-P).
FD-Field Duplicate

ZONE 4 SUMMARY OF EXCEEDANCES

During the 2017 WY, Canal Creek @ West Bellevue Rd was monitored monthly for the full suite of constituents as the Core site in Zone 4. The Coalition conducted MPM at Howard Lateral @ Hwy 140 for dissolved copper in October, and January through March. Management Plan Monitoring for chlorpyrifos (April), dissolved copper (December through March), and toxicity to *S. capricornutum* (February, April, and May) occurred at Livingston Drain @ Robin Ave. Management Plan Monitoring for chlorpyrifos occurred at Merced River @ Santa Fe in October and November. The Black Rascal @ Yosemite Rd site subwatershed was monitored as a Represented site for dissolved copper in April and May. Table 38 includes all exceedances that occurred during the 2017 WY in Zone 4.

Field Parameters and *E. coli*

In Zone 4, field parameters were scheduled to be monitored 28 times during the 2017 WY; measurements were not taken during one sampling event due to dry site conditions. Exceedances of the WQTLs for DO (3), pH (3), and SC (1) occurred in Zone 4. *E. coli* was monitored 12 times and two exceedances of the WQTL for *E. coli* occurred.

Dissolved Oxygen

Three exceedances of the WQTL for DO occurred (< 7 mg/L) and ranged from 3.9 to 6.64 mg/L. Exceedances occurred twice at Black Rascal Creek @ Yosemite Rd in April and once at Howard Lateral @ Hwy 140 in January. A single exceedance of the WQTL for DO occurred in measurements taken from a non-contiguous waterbody at Howard Lateral @ Hwy 140 in January 2017.

pH

Three exceedances of the upper WQTL for pH (> 8.5) occurred during the 2017 WY. Exceedances occurred at Canal Creek @ West Bellevue Rd in December (8.63), Howard Lateral @ Hwy 140 in October (8.87), and Livingston Drain @ Robin Ave in March (8.67).

Specific Conductivity

A single exceedance of the WQTL for SC (>700 µs/cm) occurred at Canal Creek @ West Bellevue Rd on December 9, 2016. Measurements were recorded from a non-contiguous waterbody and SC measured 794 µs/cm.

E. coli

Two samples collected from Canal Creek @ West Bellevue Rd in January and February resulted in exceedances of the WQTL for *E. coli* (> 235 MPN/100mL).

Ammonia

A single exceedance of the variable WQTL for ammonia occurred in samples collected from a non-contiguous waterbody at Canal Creek @ West Bellevue Rd on December 9, 2016 with a concentration of 22 mg/L (variable WQTL 1.02 mg/L).

Copper

In Zone 4, a total of 19 samples were scheduled to be collected for dissolved copper; 18 samples were collected as a site was dry for one monitoring event. Eight exceedances of the hardness based WQTL for dissolved copper occurred in two samples collected from Canal Creek @ West Bellevue Rd, three samples from Howard Lateral @ Hwy 140, and three samples from Livingston Drain @ Robin Ave.

Canal Creek @ West Bellevue Rd

Samples collected from Canal Creek @ West Bellevue Rd were collected for NM to test for dissolved copper; of the four samples collected, two were in exceedance of the hardness based WQTL. Samples collected after a storm on December 9, 2016 resulted in an exceedance of dissolved copper with a concentration of 34 µg/L (hardness based WQTL 16.9 µg/L). There were no associated applications of copper products in the three months prior to the monitoring event. The last reported use of a copper within the site subwatershed was on April 30, 2016. This was the second exceedance of dissolved copper to occur at the site within three years; therefore, a management plan for copper is required.

Samples collected for NM after a storm on January 10, 2017 resulted in an exceedance of the WQTL for dissolved copper with a concentration of 4.1 µg/L (hardness based WQTL 3.38 µg/L). The PUR data associated with the January 10, 2017 sample indicate two applications of copper sulfate. The two applications consisted of 6.1 lbs of active ingredients applied to almonds (45 acres) and bare root nursery plants (18 acres) from November 14, 2016 through December 28, 2016 (Appendix II). Prior to monitoring, a storm occurred from January 7 through January 10, 2017 and produced 3.01 inches of precipitation in Merced). Increased flows were observed at the time samples were collected, discharge was measured at 142.83 cfs. Stormwater runoff could have transported recent applications of copper or naturally occurring copper into the waterway, contributing to the exceedance.

During the 2018 WY, monitoring for dissolved copper at Canal Creek @ West Bellevue Rd is not scheduled to occur. Management Plan Monitoring for dissolved copper will occur once focused outreach is initiated in the site subwatershed.

Howard Lateral @ Hwy 140

Four samples were collected from Howard Lateral @ Hwy 140 for MPM for dissolved copper; of the four samples collected, three samples had concentrations of dissolved copper in exceedance of the hardness based WQTL. Samples collected on October 18, 2016 resulted in an exceedance of dissolved copper with a concentration of 2.2 µg/L (hardness based WQTL 1.7 µg/L). The PUR data associated with the sample indicate six applications of copper products; 883 lbs of active ingredients were applied to 345 acres of wine grapes on July 29 and July 30, 2016 (Appendix II). At the time samples were collected, discharge was measured at 4.74 cfs.

Samples collected for copper MPM from a non-contiguous waterbody after a storm on January 10, 2017 resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 4.4 µg/L (hardness based WQTL 3.74 µg/L). The PUR data associated with the sample indicate 21 applications of fungicide products containing copper oxide and copper sulfate. Of these active ingredients, 3,110 lbs were applied to peaches (320 acres) and almonds (40 acres) from November 30, 2016 through January 8, 2017.

Samples collected from a stagnant waterbody for copper MPM on February 14, 2017 resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 4.1 µg/L (hardness based WQTL 4.09 µg/L). The PUR data associated with the sample indicate 63 applications of fungicides and insecticides containing copper hydroxide, copper sulfate, and copper oxide. Of these active ingredients, 9,647 lbs were applied to almonds (1,800 acres) and peaches (350 acres) from November 30, 2016 through February 14, 2017.

During the 2018 WY, Howard Lateral @ Hwy 140 is scheduled to be monitored for dissolved copper in October, January, February, and April (2018 WY MPU).

Livingston Drain @ Robin Ave

Samples collected from Livingston Drain @ Robin Ave were collected for MPM to test for dissolved copper; of the four events scheduled, three samples were collected and concentrations of copper in the samples were in exceedance of the hardness based WQTLs. Samples collected after a storm on December 9, 2016 resulted in an exceedance of dissolved copper with a concentration of 5.1 µg/L (hardness based WQTL 3.6 µg/L). The PUR data associated with the exceedance include 11 applications of Nordox containing copper oxide. Prior to monitoring, 2,190 lbs of copper oxide were applied to almonds (500 acres) and peaches (24 acres) from November 30, 2016 through December 7, 2016 (Appendix II). Prior to sampling, a storm occurred on December 8, 2016, producing 0.34 inches of precipitation in Merced. Increased flow due to recent precipitation was not observed within the drain and the waterbody was stagnant at the time samples were collected.

Samples collected after a storm on January 10, 2017 resulted in an exceedance of the dissolved copper hardness based WQTL with a concentration of 4.0 µg/L (hardness based WQTL 1.87 µg/L). The PUR data associated with the sample include 36 applications of products containing copper oxide and copper sulfate. Prior to monitoring, 7,465 lbs of these active ingredients were applied to almonds (1,100 acres) and peaches (306 acres) from November 30, 2016 through January 8, 2017. From January 7 through January 10, 2017, 3.01 inches of precipitation fell in Merced County (Table 6). Increased flows were observed at the time samples were collected, discharge was measured at 6.72 cfs, as a result of recent precipitation. Recent precipitation could have contributed to the exceedance by mobilizing copper into the waterways.

Samples collected on March 14, 2017 resulted in an exceedance of the hardness based WQTL for dissolved copper with a concentration of 2.5 µg/L (hardness based WQTL 2.26 µg/L). The PUR data associated with the sample include 113 applications of fungicide products containing copper hydroxide, copper oxide, and copper sulfate. Of these active ingredients, 15,015 lbs were applied to almonds (3,000 acres) and peaches (300 acres) from December 21, 2016 through March 6, 2017.

During the 2018 WY, Livingston Drain @ Robin Ave is scheduled to be monitored for dissolved copper from December through March.

Water Column Toxicity

In Zone 4, monitoring for toxicity for all three test species at Canal Creek @ West Bellevue Rd occurred monthly during the 2017 WY. Toxicity to all three test species occurred in samples collected during the December monitoring event. Three MPM events occurred at Livingston Drain @ Robin Ave for toxicity to *S. capricornutum* in February, April, and May (no toxicity occurred).

Water Column Toxicity to C. dubia, P. promelas, and S. capricornutum

Samples collected from Canal Creek @ West Bellevue Rd were analyzed for toxicity to all test species; of the 12 samples, toxicity occurred to all test species in samples collected from one event. Samples collected from Canal Creek @ West Bellevue Rd on December 9, 2016 from a non-contiguous waterbody were toxic to *C. dubia* (60% survival), *P. promelas* (0% survival), and *S. capricornutum* (88% growth compared to the control). A TIE was conducted for toxicity to *P. promelas* and results indicate the concentration of ammonia in the sample was the sole cause of toxicity (Table 39, Table 40). A TIE was not conducted to determine cause of toxicity to *C. dubia* and *S. capricornutum* as percent survival and growth was greater than 50% compared to the control. The PUR data associated with toxicity to *C. dubia* include 32 applications of fungicide, herbicide, and insecticide products containing sulfur, paraquat, mineral oil, potassium phosphate, and bifenthrin. Of these active ingredients, 652 lbs were applied to almonds (590 acres), walnuts (40 acres), and bare root nursery crops (110 acres) from June 26 through December 2, 2016. The PUR data associated with toxicity to *S. capricornutum* include 58 applications of herbicide products containing pendimethalin, glyphosate, and isoxaben. Of the active ingredients, 3,575 lbs were applied to almonds (2,500 acres) and walnuts (280 acres) from November 12 through December 8, 2016.

During the 2018 WY, monitoring for ammonia and toxicity for all three test species will occur in December at Canal Creek @ West Bellevue Rd.

Table 38. Zone 4 (Black Rascal Creek @ Yosemite Rd, Canal Creek @ West Bellevue Rd, Howard Lateral @ Hwy 140, and Livingston Drain @ Robin Ave) 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)	SC, 700 µS/cm	*E. coli* (235 MPN/100 mL)	Ammonia, Variable[1] or 1.5 mg/L	Copper, dissolved, µg/L (Hardness Based)	*C. dubia* (% Survival)	*P. promelas* (% Survival)	*S. capricornutum* (% Growth)
Black Rascal Creek @ Yosemite Rd	Represented	NM	4/11/2017	5.65								
Black Rascal Creek @ Yosemite Rd	Represented	NM	5/9/2017	3.9								
Canal Creek @ West Bellevue Rd	Core	NM, Non-contiguous, High TSS 2-M	12/9/2016		8.63	794		22 (1.02)	34 (16.9)	60	0	88
Canal Creek @ West Bellevue Rd	Core	NM, High TSS 1-P	1/10/2017				>2419.6		4.1 (3.38)			
Canal Creek @ West Bellevue Rd	Core	NM	2/14/2017				344.8					
Howard Lateral @ Hwy 140	Represented	MPM	10/18/2016		8.87				**2.2 (1.7)**			
Howard Lateral @ Hwy 140-FD	Represented	MPM	10/18/2016						**2.3 (1.7)**			
Howard Lateral @ Hwy 140	Represented	MPM, Non-contiguous	1/10/2017	6.64					**4.4 (3.7)**			
Howard Lateral @ Hwy 140	Represented	MPM	2/14/2017						**4.1 (4.1)**			
Livingston Drain @ Robin Ave	Represented	MPM	12/9/2016						**5.1 (3.6)**			
Livingston Drain @ Robin Ave	Represented	MPM	1/10/2017						**4 (1.9)**			
Livingston Drain @ Robin Ave	Represented	MPM	3/14/2017		8.67				**2.5 (2.3)**			
Normal Monitoring Exceedances				**2**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
Non-contiguous Waterbody Exceedances				**1**	**1**	**1**	**0**	**1**	**2**	**1**	**1**	**1**
Management Plan Monitoring Exceedances				**NA**	**NA**	**NA**	**NA**	**NA**	**7**	**0**	**0**	**0**
Total Exceedances				**3**	**3**	**1**	**2**	**1**	**9**	**1**	**1**	**1**

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

High TSS – High total suspended solids in water column due to increased flows, additional samples collected for metals analysis (1-M).

FD-Field Duplicate

Table 39. Zone 4 water column toxicity exceedance summary.

The table is organized in chronological order by date and 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	Percent Control	Toxicity Significance	Summary Comments
Canal Creek @ West Bellevue Rd	12/9/2016	*S. capricornutum*	Total Cell Count (cells/ml)	88	SL	A TIE was not conducted.
Canal Creek @ West Bellevue Rd	12/9/2016	*P. promelas*	Percent Survival	0	SG	The phase I TIE results indicated the concentration of ammonia in the sample was the sole cause of toxicity (22 mg/L).
Canal Creek @ West Bellevue Rd	12/9/2016	*C. dubia*	Percent Survival	60	SG	A TIE was not conducted.

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

Table 40. Summary of water column phase III TIE results and conclusions within Zone 4.

Phase III analysis results are calculated and provided by Aqua-Science Laboratory. The table includes phase III analyses 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	
Canal Creek @ West Bellevue Rd	12/9/2016	*P. promelas*	71.4	1.4	Ammonia, 22.6 mg/L	NA	NA	Ammonia was the sole cause of effluent toxicity.

ZONE 5 SUMMARY OF EXCEEDANCES

During the 2017 WY, Miles Creek @ Reilly Rd was monitored from December through September for the full suite of constituents as the Core site in Zone 5; MPM occurred for copper, diazinon, and water column toxicity to *S. capricornutum*. Monitoring was not scheduled to occur at the Core in October and November as part of the Delta RMP exchange.

Management Plan Monitoring occurred at Deadman Creek @ Hwy 59 for chlorpyrifos in March, April, August, and September. Deadman Creek @ Gurr Rd was monitored for chlorpyrifos (March) and water column toxicity to *C. dubia* (November, February, March), and *P. promelas* (November through March, May, and June). The Coalition conducted MPM at Duck Slough @ Gurr Rd for chlorpyrifos (March, July), lead (January, February), malathion (March and April), water column toxicity to *C. dubia* (February, March, June, July) and *P. promelas* (October, March), and sediment toxicity to *H. azteca* (September). Represented site monitoring for toxicity to *S. capricornutum* occurred in June at Duck Slough @ Gurr Rd. Table 41 includes all exceedances that occurred during the 2017 WY in Zone 5.

Field Parameters and *E. coli*

In Zone 5, field parameters were scheduled to be monitored 31 times during the 2017 WY; field parameters were measured 28 times due to dry conditions during three monitoring events. Eight measurements of DO were below the WQTL, two measurements were above the pH trigger limit, and four exceedances of the WQTL for *E. coli* occurred.

Dissolved Oxygen

Concentrations of DO below 7 mg/L occurred at Deadman Creek @ Gurr Rd (3), Deadman Creek @ Hwy 59 (2), and Miles Creek @ Reilly Rd (3). Measurements of low DO ranged from 5.12 mg/L to 6.94 mg/L and occurred throughout the irrigation season.

E. coli

During the 2017 WY, ten samples were scheduled to be collected for the analysis of *E. coli* from Miles Creek @ Reilly Rd; the site was dry for one sampling event in December. Nine samples were analyzed for *E. coli* from Miles Creek @ Reilly Rd and four exceedances of the WQTL (235 MPN/100 mL) occurred; in January, February, May, and July. Concentrations ranged from 461.1 to >2419.6 MPN/ 100 mL.

Copper

Management Plan Monitoring for dissolved copper occurred at Deadman Creek @ Gurr Rd (January and March), Deadman Creek @ Hwy 59 (January, March, April, August, and September), and at Miles Creek @ Reilly Rd (January, February, and May - August). Three exceedances of the hardness based WQTL for dissolved copper occurred in January 2017 at each of the three monitoring sites.

Samples collected after a storm on January 10, 2017 from Deadman Creek @ Gurr Rd and Deadman Creek @ Hwy 59 resulted in exceedances of the hardness based WQTLs for dissolved copper. The concentration of dissolved copper in samples collected from Deadman Creek @ Gurr Rd was 6.7 µg/L and 7.1 µg/L at Deadman Creek @ Hwy 59 (hardness based WQTLs 4.95 µg/L and 4.61 µg/L;

respectively). The PUR data associated the samples include 20 applications on copper products containing copper hydroxide. Prior to monitoring, 2,145 lbs of copper hydroxide were applied to almonds (719 acres) and bare root nursery crops (420 acres) from November 2, 2016 through January 10, 2017. Prior to monitoring, a storm occurred in Merced County from January 7 through January 10, 2017, producing 3.01 inches of precipitation. Water levels in the creeks were too high to measure discharge at the time samples were collected at both monitoring sites. Reduced water hardness due to increased precipitation and recent applications of herbicide products could have contributed to the observed exceedances.

Samples were collected from Miles Creek @ Reilly Rd for MPM to test for dissolved copper; of the four samples, one had concentrations of dissolved copper that was in exceedance of the hardness based WQTL. Samples collected after a storm on January 10, 2017 resulted in an exceedance of dissolved copper with a concentration of 5.2 µg/L (hardness based WQTL 4.44 µg/L). No applications of copper products were reported that could have contributed to the exceedance at Miles Creek @ Reilly Rd in January. The last reported application of a copper product within the Miles Creek @ Reilly Rd site subwatershed occurred on May 6, 2016. Prior to monitoring, a storm occurred in Merced County from January 7 through January 10, 2017, producing 3.01 inches of precipitation. Increased flows were observed in the creek at the time samples were collected; water levels were too deep to measure discharge. The recent rain even likely contributed to the mobilization of already present copper in the soils and had an effect on the hardness of the water.

During the 2018 WY, MPM for dissolved copper is scheduled to occur in January at Miles Creek @ Reilly Rd, in April at Deadman Creek @ Hwy 59, and in January, February, and April at Deadman Creek @ Gurr Rd.

Chlorpyrifos

In Zone 5, monitoring for chlorpyrifos was scheduled to occur 18 times, two samples could not be collected due to dry conditions at Deadman Creek @ Hwy 59 (April) and Miles Creek @ Reilly Rd (December). Management Plan Monitoring for chlorpyrifos at Deadman Creek @ Hwy 59 occurred in January, March, August, and September. Management Plan Monitoring for chlorpyrifos occurred in March at Deadman Creek @ Gurr Rd and January through September at Miles Creek @ Reilly Rd for NM.

Samples collected on May 9, 2017 from Miles Creek @ Reilly Rd for NM were analyzed for chlorpyrifos and resulted in an exceedance of the WQTL (0.87 µg/L; Table 41). The PUR data indicate no reported applications during the period of time associated with exceedances. The last reported chlorpyrifos application occurred on September 22, 2016 within the Miles Creek site subwatershed. Non-reported applications are uncommon in the Coalition region and have not been known to occur in this subwatershed. Because chlorpyrifos is heavily regulated by DPR and the County Agricultural Commissioners, non-reporting is extremely rare and generally the result of an oversight. The Coalition is currently conducting a second round of focused outreach in the site subwatershed from 2017 through 2019. Coalition staff held individual meetings with all targeted growers to review currently implemented management practices. More information is provided on Focused Outreach in the Surface Water Management Plan Activities and Performance Goals section of this report.

The chlorpyrifos management plan at Miles Creek was reinstated due to the exceedance in May 2017. Unfortunately, focused outreach to members who applied prior to the exceedance cannot be performed because there were no reported applications. The Coalition believes that the current focused outreach effort will be effective in reaching the grower that did not report applications that could have contributed to the exceedance from May 2017 as it is likely that the member regularly uses chlorpyrifos on their parcel(s). During the 2018 WY, monitoring for chlorpyrifos at Miles Creek @ Reilly Rd is scheduled to occur from May through August (2018 WY MPU).

Water Column Toxicity

The Coalition collected 15 samples to test for toxicity to *C. dubia*; one of the samples collected had significantly reduced survival. During the 2017 WY, monitoring for toxicity to *C. dubia* occurred at Deadman Creek @ Gurr Rd (November, February, and March), Duck Slough @ Gurr Rd (February, March, June, and July), and Miles Creek @ Reilly Rd (January through September). Monitoring for toxicity to *P. promelas* occurred 17 times and *S. capricornutum* 10 times, no toxicity occurred. All toxicity results are included in Table 42. A summary of the water column phase III TIE results and conclusions is provided in Table 43

Water Column Toxicity to C. dubia

Samples collected on May 9, 2017 from Miles Creek @ Reilly Rd were toxic to *C. dubia* with 0% survival compared to the control (Table 42). A Phase I TIE was conducted and concluded non-polar ogranics as the cause of toxicity. A Phase III TIE indicated the sample was toxic to *C. dubia* at a level of 59.1 TUs. Chlorpyrifos was detected in the sample at a concentration of 0.87 µg/L (about 21.8 TUs) which is above the WQTL. The sample was analyzed for all Core site analytes; no additional sources of toxicity were detected. The PUR data associated with sample indicate 98 applications of fungicide and insecticide products containing mancozeb, paraquat dichloride, potassium phosphite, and propiconazo. Of these active ingredients, 2,205 lbs were applied to almonds (4,000 acres), pistachios (360 acres), and tomatoes (300 acres) from February 25 through May 9, 2017.

During the 2018 WY, Miles Creek @ Reilly Rd is scheduled to be monitored for *C. dubia* toxicity from May through August to coincide with MPM for chlorpyrifos (2018 WY MPU).

Table 41. 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	pH, <6.5 and > 8.5 Units	*E. coli*, 235 MPN/100 mL	Copper, Dissolved (Hardness based WQTL)	Chlorpyrifos, 0.015 µg/L	*C. dubia*, % survival
Deadman Creek @ Gurr Rd	Represented	NM, MPM	1/10/2017	6.19			**6.7 (4.95)**		
Deadman Creek @ Gurr Rd	Represented	MPM	3/14/2017		9.34				
Deadman Creek @ Gurr Rd	Represented	MPM	5/9/2017	5.35					
Deadman Creek @ Gurr Rd	Represented	MPM	6/13/2017	5.12					
Deadman Creek @ Hwy 59	Represented	MPM	1/10/2017				**7.1 (4.61)**		
Deadman Creek @ Hwy 59	Represented	MPM	3/14/2017		8.83				
Deadman Creek @ Hwy 59	Represented	MPM	8/15/2017	6.69					
Deadman Creek @ Hwy 59	Represented	MPM	9/12/2017	6.84					
Miles Creek @ Reilly Rd	Core	NM, MPM, High TSS 1-P	1/10/2017			>2419.6	**5.2 (4.44)**		
Miles Creek @ Reilly Rd	Core	NM, MPM	2/14/2017			461.1			
Miles Creek @ Reilly Rd	Core	NM, MPM	5/9/2017	6.94		579.4		0.87	0
Miles Creek @ Reilly Rd	Core	NM, MPM, High TSS 2-P	7/11/2017	6.85		816.4			
Miles Creek @ Reilly Rd	Core	NM, SED	9/12/2017	6.54					
			Normal Monitoring Exceedances	**8**	**2**	**3**	**2**	**1**	**1**
			Management Plan Monitoring Exceedances	**NA**	**NA**	**NA**	**3**	**0**	**0**
			Total Exceedances	**8**	**2**	**3**	**3**	**1**	**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, additional samples collected for pesticide analysis (1-P).
SED-Sediment monitoring

Table 42. Zone 5 water column toxicity exceedance summary.

The table is organized in chronological order by date and 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	Percent Control	Toxicity Significance	Summary Comments
Miles Creek @ Reilly Rd	5/9/2017	*C. dubia*	% Survival	0	SG	The Phase I TIE results indicate non-polar organics as the source of toxicity.

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

Table 43. Summary of water column phase III TIE results and conclusions within Zone 5.

Phase III analysis results are calculated and provided by Aqua-Science Laboratory. The table includes phase III analyses 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	
Miles Creek @ Reilly Rd	5/9/2017	*C. dubia*	1.7	59.1	Chlorpyrifos, 0.87 µg/L	0.040 µg/L	28.1	The concentration of chlorpyrifos was responsible for approximately 40% of the sample toxicity.

ZONE 6 SUMMARY OF EXCEEDANCES

During the 2017 WY, Dry Creek @ Rd 18 was monitored from December through September for the full suite of constituents as the Core site in Zone 6. Monitoring in October and November was not scheduled as part of the Delta RMP exchange. Dry Creek @ Rd 18 was monitored for MPM for copper from December through September and for diuron and toxicity to *S. capricornutum* in January and February. Management Plan Monitoring for dissolved copper occurred in January at Ash Slough @ Ave 21. Management Plan Monitoring occurred at Berenda Slough along Ave 18 ½ for copper (January – April) and chlorpyrifos (April, July, and September). The Coalition conducted MPM for copper at Cottonwood Creek @ Rd 20 in April and July. Table 44 includes all exceedances that occurred during the 2017 WY in Zone 6.

Field Parameters and *E. coli*

In Zone 6, field parameters were scheduled to be monitored 21 times during the 2017 WY; 18 measurements were taken and sites were dry during three sampling events (Appendix I, Table I). Two measurements of DO were below the Zone 6 WQTL of 5 mg/L (7mg/L for Zones 1-5). One exceedance of the lower WQTL for pH occurred and two measurements of SC were above the WQTL. Nine samples were collected and analyzed for *E. coli* and two samples were in exceedance of the WQTL.

Dissolved Oxygen

Dissolved oxygen was measured during every sampling event. Exceedances of the WQTL for DO occurred twice at Dry Creek @ Rd 18. Exceedances occurred on August 15, 2017 (4.01 mg/L) and September 12, 2017 (2.83 mg/L).

pH

In Zone 6, one exceedance of the lower WQTL for pH occurred at Dry Creek @ Rd 18 on September 12, 2017 (5.93).

Specific Conductivity

Two exceedances of the WQTL for SC occurred during the 2017 WY. Measurements recorded from Ash Slough @ Ave 21 on January 10, 2017 (1048 µs/cm) and Dry Creek @ Rd 18 on March 14, 2017 (2270 µs/cm) were in exceedance of the WQTL for SC.

E. coli

Samples collected from Dry Creek @ Rd 18 on January 10 and February 14, 2017 had concentrations of *E. coli* greater than 235 MPN/100mL (1203.3 and 248.9 MPN/100mL).

Copper

In Zone 6, 18 samples were scheduled to be collected and analyzed for dissolved copper; 15 samples were collected and sites were dry for three monitoring events. Thirteen samples collected for MPM were in exceedance of the hardness based WQTL for dissolved copper. Exceedances occurred at Ash

Slough @ Ave 21 (1), Berenda Slough along Ave 18 ½ (2), Cottonwood Creek @ Rd 20 (1), and Dry Creek @ Rd 18 (9). Of the exceedances that occurred, the highest concentrations of dissolved copper were detected from January through April at Dry Creek @ Rd 18 (8.4 µg/L – 13 µg/L) and the lowest occurred from May through September (2.2 µg/L - 5.0 µg/L).

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 MID canals is permitted at 14 to 21-day intervals from March through October. 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.

Ash Slough @ Ave 21

Only one sample was scheduled to be collected for copper MPM during the 2017 WY. Samples collected after a storm on January 10, 2017 resulted in an exceedance of dissolved copper with a concentration of 3.9 µg/L (hardness based WQTL 2.06 µg/L; Table 44). The PUR data associated with the sample indicate a single application of copper hydroxide with 212 lbs of active ingredient was applied to 115 acres of almond orchards on December 30, 2016. Prior to monitoring, a storm occurred from January 7 through January 10, 2017, producing 1.45 inches of precipitation in Madera County. An increase in flow was observed by samplers, discharge was measured at 53.42 cfs at the time samples were collected. It is likely the storm produced enough runoff to transport naturally occurring copper into the waterway.

During the 2018 WY, Ash Slough @ Ave 21 is scheduled to be monitored for dissolved copper for one storm event between January and March (2018 WY MPU).

Berenda Slough along Ave 18 ½

Three samples were collected from Berenda Slough along Ave 18 ½ for dissolved copper; of the three samples, two samples had concentrations of dissolved copper in exceedance of the hardness based WQTL. Because of the amount of precipitation observed during the winter season, the water hardness was reduced and resulted in additional dissolved copper exceedances.

Samples collected on March 14, 2017 resulted in an exceedance of dissolved copper with a concentration of 5.7 µg/L (hardness based WQTL 2.83 µg/L. The PUR data associated with the sample include 24 applications of copper hydroxide and copper oxychloride. Of these active ingredients, 2,732 lbs were applied to 2,000 acres of almond trees from December 30, 2016 through February 3, 2017. At the time samples were collected, discharge was too deep to be measured, but was estimated to be greater than 50 cfs, a direct result of stormwater runoff.

Samples collected after a storm on April 11, 2017 resulted in an exceedance of the WQTL for dissolved copper with a concentration of 4.3 µg/L (hardness based WQTL 2.07 µg/L). The PUR data associated with the sample indicate 53 applications of copper hydroxide and copper oxychloride. Of these active ingredients, 5,577 lbs were applied to grapes (2,000 acres), almonds (1,300 acres), and walnuts (1,200 acres) from January 17 through April 11, 2017. Prior to monitoring, a storm occurred from April 7 through April 8, 2017, producing 0.11 inches in the Madera region. Even though the amount of precipitation was below the storm trigger, the ground was saturated due to frequent rain events that occurred in the few months prior (Table 6). At the time samples were collected, discharge was too deep to be measured but samplers estimated flow to be greater than 50 cfs.

During the 2018 WY, Berenda Slough along Ave 18 ½ is scheduled to be monitored for dissolved copper from January through April.

Cottonwood Creek @ Rd 20

Cottonwood Creek @ Rd 20 was scheduled for three copper MPM sampling events during the 2017 WY. Samples were collected in April and July and the site was dry for monitoring in January (Table 31). An exceedance occurred in samples collected in April 2017.

Samples collected after a storm on April 11, 2017 resulted in an exceedance of dissolved copper with a concentration of 4.5 µg/L (hardness based WQTL 2.3 µg/L). The PUR data associated with the sample include 345 applications containing copper hydroxide, copper hydroxide, and copper sulfate. Of these active ingredients, 17,020 lbs were applied grapes (13,200 acres) and almonds (2,500 acres) from January 17 through April 11, 2017. Prior to monitoring, a storm occurred from April 7 through April 8, 2017, producing 0.11 inches in the Madera region. At the time samples were collected, discharge was measured at 8.27 cfs. This was the first sample to be collected since September 2013 due to dry site conditions and runoff could have contributed to the exceedance.

During the 2018 WY, Cottonwood Creek @ Rd 20 is scheduled to be monitored for dissolved copper in January, April, and July.

Dry Creek @ Rd 18

Management Plan Monitoring for dissolved copper was scheduled to occur from December through September at Dry Creek @ Rd 18. Samples were collected from January through September as the site was dry in December. Exceedances of the hardness based WQTL for dissolved copper occurred in all nine samples collected.

Samples collected after a storm on January 10, 2017 resulted in an exceedance of dissolved copper with a concentration of 11 µg/L (hardness based WQTL 3.02 µg/L). The PUR data associated with the sample include 20 applications containing copper hydroxide, copper oxide, and copper sulfate. Of these active ingredients, 9,717 lbs were applied to tangerine seedlings (1,030 acres), almonds (735 acres), and oranges (100 acres) from November 4, 2016 through January 10, 2017. Prior to monitoring, a storm occurred from January 7 through January 10, 2017, producing 1.45 inches of precipitation in Madera. Increased flows were observed at the time samples were collected, discharge was measured at 4.14 cfs. Monitoring in January at Dry Creek @ Rd 18 usually results in a dry event, as was observed in 2014, 2015, and 2016. The storm likely mobilized copper in and around the channel contributing to the exceedance.

Samples collected on February 14, 2017 resulted in an exceedance of dissolved copper with a concentration of 13 µg/L (hardness based WQTL 10.46 µg/L). The PUR data associated with the sample include 50 applications of products containing copper hydroxide, copper oxide, copper oxychloride, and copper sulfate. Of these active ingredients, 12,260 lbs were applied to almonds (10,000 acres), tangerine seedlings (2,000 acres), and oranges (550 acres) from November 22, 2016 through February 6, 2017. At the time samples were collected, high flows were observed in the creek and discharge was measured at 58.73 cfs. Typically, Dry Creek is non-contiguous or has very minimal flow in February, as observed from 2011 through 2016 (zero to 0.30 cfs observed). Recent rainfall likely mobilized copper in and around the drain contributing the exceedance.

Samples collected on March 14, 2017 resulted in an exceedance of dissolved copper with a concentration of 8.4 µg/L (hardness based WQTL 6.92 µg/L). The PUR data associated with the sample indicate 46 applications of copper products. From January 17 through April 10, 2017, 10,880 lbs of active ingredients were applied to almond orchards (7,100 acres).

Samples collected after a storm on April 11, 2017 resulted in an exceedance of dissolved copper with a concentration of 9.1 µg/L (hardness based WQTL 2.8 µg/L). The PUR data associated with the sample indicate 80 applications of copper products with 8,270 lbs of active ingredients were applied to almond orchards (2,400 acres), grapes (4,600 acres), and oranges (100 acres) from January 17 through April 10, 2017. Prior to monitoring, a storm occurred from April 7 through April 8, 2017 and produced 0.11 inches of precipitation in Madera County. At the time samples were collected, the grade control was up and discharge was unable to be measured due to the high-water level. The hardness of the water was reduced from the frequent and recent rains, contributing to more copper exceedances.

Three exceedances of dissolved copper occurred in samples collected for MPM on May 9 (5.0 µg/L; hardness based WQTL 1.7 µg/L), June 13 (2.9 µg/L; WQTL 1.0 µg/L), and July 11, 2017 (2.4 µg/L; WQTL 1.0 µg/L). The PUR data associated with all three copper exceedances include 47 applications of copper products with 2,740 lbs of active ingredients were applied to grapes (4,900 acres) and almonds (150 acres) from February 17, 2017 through April 20, 2017 (Appendix II). The hardness of the water was reduced from the frequent and recent rains, contributing to more copper exceedances.

Samples collected on August 15, 2017 had a dissolved copper concentration of 2.7 µg/L (hardness based WQTL 1.0 µg/L) and samples collected on September 12, 2017 had a dissolved copper concentration of 2.2 µg/L (hardness based WQTL 1.0 µg/L). No PUR data was associated with these samples. The last reported applications to occur within the site subwatershed occurred on April 20, 2017. Copper applications during the months of May through October typically do not occur, and if so, are minimal. An increase in the number of dissolved copper exceedances could be attributed to a number of reasons, including:

1. Reduced water hardness due to less groundwater use for irrigation,
2. Fewer samples collected and analyzed for dissolved copper,
3. Increased herbicide applications due to algal proliferation during wet years, and
4. Increased precipitation in the last few years.

During the 2018 WY, Dry Creek @ Rd 18 is scheduled to be monitored for dissolved copper from January through April (2018 WY MPU).

Table 44. Zone 6 (Ash Slough @ Ave 21, Berenda Slough along Ave 18 ½, Cottonwood Creek @ Hwy 20, 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)	SC, 700 µS/cm	*E. coli*, 235 MPN/100 mL	Copper, Dissolved (Hardness Based WQTL)
Ash Slough @ Ave 21	Represented	MPM	1/10/2017			1048		**3.9 (2.1)**
Berenda Slough along Ave 18 1/2	Represented	MPM	3/14/2017					**5.7 (2.8)**
Berenda Slough along Ave 18 1/2	Represented	MPM	4/11/2017					**4.3 (2.1)**
Cottonwood Creek @ Hwy 20	Represented	MPM	4/11/2017					**4.5 (2.3)**
Dry Creek @ Rd 18	Core	NM, MPM, High TSS 1-P	1/10/2017				1203.3	**11 (3.0)**
Dry Creek @ Rd 18	Core	NM, MPM	2/14/2017				248.9	**13 (10.5)**
Dry Creek @ Rd 18	Core	NM, MPM, SED	3/14/2017			2270		**8.4 (6.9)**
Dry Creek @ Rd 18	Core	NM, MPM	4/11/2017					**9.1 (2.8)**
Dry Creek @ Rd 18	Core	NM, MPM	5/9/2017					**5 (1.7)**
Dry Creek @ Rd 18-FD	Core	NM, MPM	5/9/2017					**4.5 (1.7)**
Dry Creek @ Rd 18	Core	NM, MPM	6/13/2017					**2.9 (1.0)**
Dry Creek @ Rd 18-FD	Core	NM, MPM	6/13/2017					**2.9 (1.0)**
Dry Creek @ Rd 18	Core	NM, MPM, High TSS 1-P	7/11/2017					**2.4 (1.0)**
Dry Creek @ Rd 18	Core	NM, MPM	8/15/2017	4.01				**2.7 (1.0)**
Dry Creek @ Rd 18	Core	NM, MPM	9/12/2017	2.83	5.93			**2.2 (1.0)**
Dry Creek @ Rd 18-FD	Core	NM, MPM, SED	9/12/2017					**2.4 (1.0)**
			Normal Monitoring Exceedances	**2**	**1**	**1**	**2**	**0**
			Management Plan Monitoring Exceedances	**NA**	**NA**	**NA**	**NA**	**16**
			Total Exceedances	**2**	**1**	**1**	**2**	**16**

High TSS – High concentration of total suspended solids in water column due to increased flows, additional samples collected for paraquat and glyphosate (1-P).
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).

2017 WY SUBMITTALS AND APPROVALS

Summary of Required WDR Submittals and Approvals

The Coalition submitted multiple documents for approval by the Regional Board during the 2017 WY to meet the requirements of the WDR for items pertaining to surface water monitoring, Farm Evaluations, Groundwater Monitoring, Nitrogen Management, and Sediment and Erosion Control. Table 45 includes a list of relevant ESJWQC submittals and approval status since 2013, as well as any upcoming due dates related to specific timetables outlined in Regional Board approval letters and the WDR.

Table 45. ESJWQC WDR related submittals and approvals.
The ESJWQC WDR (R5-2012-0116-R4) was approved December 7, 2012 and last revised on February 7, 2018.

Document Description	Submittal/ Due Date[1]	Approval Date
Surface Water Monitoring		
QAPP Amendment – Sampling Procedures Update	February 13, 2017	April 12, 2017
Dry Creek and Merced River Site Replacement Request	June 30, 2017	July 24, 2017
2018 WY Monitoring Plan Update	August 1, 2017, September 1, 2017 (Delta RMP Reduced Monitoring Swap), November 1, 2017 (updated pesticide guidance) January 16, 2018 (Addendum)	November 10, 2017 January 30, 2018
QAPP Amendment – Modification of Quality Control Sample Frequency	September 21, 2017	March 2, 2018
QAPP Amendment – Updated Constituents and Data Quality Objectives for 2018 WY	October 5, 2017	December 20, 2017
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 (Addendum)	February 12, 2016

Document Description	Submittal/ Due Date[1]	Approval Date
2015 FE Summary- 2016 Annual Report	May 1, 2016 September 1, 2016 (Addendum)	September 20, 2016
2016 FE High (small & large farms) and Low (small farm) Vulnerability Areas	March 1, 2017	NA
2016 FE Summary- 2017 Annual Report	May 1, 2017 and September 1, 2017 (Addendum)	July 14, 2017 January 30, 2018
2017 FE High (small & large farms)	March 1, 2018	NA
2017 FE Summary – 2018 Annual Report	July 1, 2018	NA
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 (final)
GQMP	February 23, 2015 July 29, 2016 March 9, 2017, May 11 & 29, 2017, June 12, 2017 (resubmittal)	July 31, 2017
GQTM Workplan Phase I	June 4, 2015	December 4, 2015 (conditional)
GQTM Workplan Phase II	January 29, 2016	NA
GQTM Workplan Phase III	March 1, 2018	Approval Pending
CVGMC Conceptual Workplan	October 31, 2017	November 17, 2017 (conditional)
CVGMC Technical Workplan Final	May 16, 2018	NS
CVGMC Timeline for Phase I Submittal	December 18, 2017	Approval Pending
GQTM QAPP	30 days from GQTM Work Plan (Phase I and II) approval	NS
GAR Update	June 4, 2019	NS
MPEP Northern Coalition GCC 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 (final) March 7, 2016 (approval of additional members)
MPEP Northern Coalition GCC Identify Technical Experts	September 23, 2014	NA
MPEP Northern Coalition GCC 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 Northern Coalition GCC Work Plan	July 29, 2016, May 18, 2017, and February 15, 2018	Approval Pending
Nitrogen Management		
NMP Template (All Coalitions)	April 11, 2013 and December 18, 2014	December 23, 2014
NMP Technical Advisory Work Group (TAWG) description	March 13, 2015 and May 27, 2015	June 23, 2015
NMP Summary Report Template (All Coalitions)	November 18, 2015	December 23, 2015
NMP TAWG Crop Nitrogen Knowledge Gap Study Plan and Guidance Documents	December 18, 2015	March 29, 2016 (conditional)
NMP TAWG Response to RB Comments on Gap Study and Guidance Documents	February 19, 2016	NA
2016 Certified NMP by Members (High Vul >60 ac)	March 1, 20152 (on Farm)	NA
2015 NMP Summary Report (High Vul >60 ac)	March 1, 2016 (to Coalition)	NA
2015 NMP Summary Report Analysis - Annual Report	May 31, 2016 August 2, 2016 (resubmittal)	November 9, 2016

DOCUMENT DESCRIPTION	SUBMITTAL/ DUE DATE[1]	APPROVAL DATE
NMP TAWG Work Plan for expanding/revising Y/R conversions	July 29, 2016 January 13, 2017	NA
2015 NMP Outreach Packet Mailed to Growers	February 1, 2017	NS
2017 Certified NMP by Members (all growers)	March 1, 2017	NS
2016 NMP Summary Report (High Vul > 60 acres)	March 1, 2017	NA
2016 NMP Summary Report Analysis- Annual Report	July 1, 2017	December 13, 2017
2016 NMP Evaluation Packet Mailed to Growers	February 1, 2018	NS
2018 Certified NMP by Members (all growers)	March 1, 2018	NS
2017 NMP Summary Report (High Vul)	March 1, 2018	NS
2017 NMP Summary Report Analysis- Annual Report	July 1, 2018	NA
2017 NMP Evaluation Packet Mailed to Growers	February 2019	NS
2019 Certified INMP by Members (all growers)	March 1, 2019	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 (High Erosion Areas >60 ac)	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
SECP- Parcels in proximity to large tributaries	February 28, 2017	NS
Identify Tertiary Tributaries with potential for sediment discharge	June 26, 2017	July 28, 2017
SECP- Parcels in proximity to secondary tributaries	February 28, 2018	NS
SECP- Parcels in proximity to remaining waterbodies	February 28, 2019	NS

NA-Not applicable
NS-Not submitted

[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 of a sampling event or receipt of laboratory results. If any errors occurred in the original Exceedance Report, the report was amended. During the 2017 WY, two Exceedance Reports were amended; the Water Column Toxicity Exceedance Report submitted on April 27, 2017 was amended on May 31, 2017 to clarify that the first sampling event of the irrigation season also qualified as the fourth storm event of the 2017 WY. The Field Exceedance Report submitted on July 17, 2017 was amended on July 27, 2017 to exclude previously flagged DO exceedances in Zone 6 based on an incorrect WQTL of 7 mg/L (WQTL of 5 mg/L approved November 4, 2015).

Quarterly Data Submittal

As required in Attachment B to the WDR R5-2012-0116-R4, the Coalition submits the Quarterly Monitoring Report in electronic format. Table 46 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, and
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 46. 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 2017 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 Environmental) after samples were received. As such, 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 47 includes a list and description of six instances when COC discrepancies occurred during the 2017 WY. All six COC discrepancies were promptly resolved and did not affect the integrity of the data.

Table 47. ESJWQC COC discrepancies for the 2017 WY.

Sample Date	Laboratory	Anomaly Description	Date of Resolution
1/10/2017	Appl	Incorrect sample time	1/17/2017
3/14/2017	Caltest	COCs not picked up with samples	3/15/2017

SAMPLE DATE	LABORATORY	ANOMALY DESCRIPTION	DATE OF RESOLUTION
6/13/2017	Aqua Science	Sample identification spelled incorrectly	8/4/2017
7/11/2017	Aqua Science	Sample identification spelled incorrectly	8/4/2017
9/12/2017	Aqua Science	Incorrect relinquish date/time	10/5/2017
9/12/2017	Aqua Science	Incorrect relinquish date/time	10/5/2017

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 implementation of its monitoring and reporting 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 2017 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 48 and all materials provided to growers are included in Appendix III.

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 48. ESJWQC education and outreach activities during the 2017 WY.
Outreach categories include Management Practice Tracking, Best Management Practice (BMP) Outreach and Education, and Grower Notification.

AREA	DATE	CATEGORY	DETAILS	WHO
Coalition Region	10/9/2016	Grower Notification	ESJ Update - October 2016 Newsletter Mailed	Parry Klassen, Wayne Zipser
Coalition Region	11/1/2016	Management Practice Tracking	2017 Member Packet Mailed: Invoice, FE, NMP	Parry Klassen, Wayne Zipser
Coalition Region	11/16/2016	Grower Notification	Membership Requirements Online Access Emailed	Parry Klassen, Wayne Zipser
Coalition Region	1/19/2017	Grower Notification	February Meeting Announcement Postcard Mailed (almonds, walnuts, pistachios)	Parry Klassen, Wayne Zipser
Coalition Region	2/1/2017	BMP Outreach and Education	NMP Summary Report Evaluation Outreach Packet	Parry Klassen, Wayne Zipser
Coalition Region	2/6/2017	BMP Outreach and Education	February 2017 SECP Self Certification Postcard Mailed	Parry Klassen, Wayne Zipser
Coalition Region	2/7/2017	BMP Outreach and Education	NMP Self Certification Postcard Mailed	Parry Klassen, Wayne Zipser
Merced Area	2/8/2017	BMP Outreach and Education	February Merced Member Meeting: 489 members attended	Parry Klassen, Wayne Zipser
Madera Area	2/9/2017	BMP Outreach and Education	February Madera Member Meeting: 382 members attended	Parry Klassen, Wayne Zipser
Modesto Area	2/10/2017	BMP Outreach and Education	February Modesto Member Meeting: 832 members attended	Parry Klassen, Wayne Zipser
Coalition Region	2/17/2017	Grower Notification	March 2017 Crop Specific Meeting Announcement Mailed/Emailed (corn, tomatoes, grapes, and sweet potatoes)	Parry Klassen, Wayne Zipser
Coalition Region	2/27/2017	BMP Outreach and Education	Cal Poly Fertigation Training Flyer Emailed	Parry Klassen, Wayne Zipser
Coalition Region	3/7/2017	BMP Outreach and Education	SECP Self Certification Postcard Mailed	Parry Klassen, Wayne Zipser
Madera Area	3/14/2017	BMP Outreach and Education	March Madera Member Meeting: 61 members attended	Parry Klassen, Wayne Zipser
Merced Area	3/16/2017	BMP Outreach and Education	March Merced Member Meeting: 95 members attended	Parry Klassen, Wayne Zipser
Modesto Area	3/17/2017	BMP Outreach and Education	March Modesto Member Meeting: 110 members attended	Parry Klassen, Wayne Zipser
Coalition Region	3/29/2017	Grower Notification	2016 Annual Report Mailed	Parry Klassen, Wayne Zipser
Coalition Region	3/31/2017	Grower Notification	Late Farm Evaluation Postcard	Parry Klassen, Wayne Zipser
Coalition Region	4/3/2017	Grower Notification	Farm Evaluation and NMP Summary Report Late Postcard Mailed	Parry Klassen, Wayne Zipser
Coalition Region	4/3/2017	Grower Notification	Late NMP Summary Report Postcard Mailed	Parry Klassen, Wayne Zipser
Coalition Region	5/25/2017	Grower Notification	2nd NMP Summary Report Late Reminder Postcard Mailed	Parry Klassen, Wayne Zipser
Coalition Region	7/27/2017	BMP Outreach and Education	SECP Certification Postcard Mailed	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 were initiated with the approval of the original ESJWQC Management Plan (approved November 25, 2008) which focused on meeting the following management plan 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 2017 WY, the Coalition conducted management plan activities in the 2016 and 2017 Focused Outreach site subwatersheds (based on the ESJWQC 2014 SQMP strategy and schedule). 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 2015). The Coalition Performance Goals describe the steps necessary to guarantee that the objectives of the Management Plan program are met and that water quality improves in the Coalition region. The following sections describe actions taken during the 2017 WY to meet the Performance Goals and associated measures/outputs for sites where focused outreach was scheduled.

Focused Outreach Activities in the 2017 WY

During the 2017 WY, the Coalition completed focused outreach in the 2016 Focused Outreach subwatersheds: Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd and 100% of follow-up surveys were returned (Table 49).

The Coalition continued with 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 during the 2017 WY (Table 50).

The 2018 Focused Outreach efforts are in progress; status updates will be provided at Quarterly Meetings with the Regional Board and in the May 1, 2019 Annual Report (further details included below).

The sections below describe 1) Coalition actions to meet the approved Performance Goals, 2) the status of each of the Performance Goals, and 3) the associated measure/outputs for 2016 through 2018 Focused Outreach site subwatersheds.

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, the Coalition identifies site subwatersheds with exceedances that triggered management plans (and the associated upcoming 10-year management plan completion deadlines. The Coalition evaluates PUR data associated with recent exceedances and member parcel information to identify members to be targeted for focused outreach. Once a list of targeted members is compiled, contact letters are mailed to inform targeted growers of their member responsibilities, water quality impairments, management plan strategies, and to encourage them to initiate the scheduling of their focused outreach individual meeting with Coalition representatives. During individual meetings, representatives assist growers with their focused outreach surveys and may recommend additional management practice implementation depending on the grower's parcel and crop needs.

2016 Focused Outreach:

The Coalition contacted 100% of targeted growers in the 2016 Focused Outreach site subwatersheds. Initial notification letters were mailed to targeted growers in Dry Creek @ Wellsford Rd (6 growers), Duck Slough @ Gurr Rd (9 growers), Highline Canal @ Hwy 99 (7 growers), and Prairie Flower Drain @ Crows Landing Rd (16 growers) site subwatersheds on April 21, 2016 (Table 49). Since initial contact, one of the targeted growers in the Duck Slough @ Gurr Rd site subwatershed cancelled their membership and no longer farms on the property. Five members in Prairie Flower Drain @ Crows Landing Rd site subwatershed are no longer members of the Coalition. Three of the five members enrolled under the Dairy Coalition, one member no longer farms on the property, and the fifth member was dropped from the Coalition for unpaid dues.

2017 Focused Outreach:

The Coalition contacted 100% of targeted growers in the 2017 Focused Outreach site subwatersheds. Initial notification letters were mailed to targeted growers in Dry Creek @ Rd 18 (2 growers), Lateral 2 ½ near Keyes Rd (16 growers), Livingston Drain @ Robin Ave (6 growers), and Miles Creek @ Reilly Rd (14 growers) site subwatersheds on July 6 and 11, 2017 (Table 50). The Coalition added one member to the targeted outreach list for Miles Creek @ Reilly Rd site subwatershed due to applications associated with a toxicity that occurred during the 2017 WY; the Coalition sent a notification letter to the grower on January 25, 2018.

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.

2016 Focused Outreach:

The Coalition met with all 2016 Focused Outreach targeted growers to complete surveys documenting current and recommended management practices (Table 49). An analysis of the current and recommended management practices was provided in the May 1, 2017 Annual Report. A complete analysis with implemented practices is included in the Management Practices section below.

2017 Focused Outreach:

Individual meetings with targeted growers in the 2017 Focused Outreach site subwatersheds is still in progress. To date, the Coalition has met with 92% of targeted growers in the 2017 Focused Outreach site subwatersheds to complete surveys recording current and recommended management practices

(Table 50). Three members in the Lateral 2 ½ near Keyes Rd site subwatershed have yet to schedule their meetings with Coalition representatives to review farm practices prior to this report submittal. The Coalition sent final contact notification letters to the three members on April 19, 2018, with a deadline of May 11, 2018. If members fail to meet with Coalition representatives prior to the deadline, their membership will be dropped. A preliminary 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, 2019 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.

2016 Focused Outreach:

The Coalition conducted individual meetings with 100% of targeted growers in the Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd site subwatersheds. An analysis of current and recommended management practices was provided in the 2017 Annual Report. The complete analysis of current, recommended, and implemented management practices is provided in the Management Practices section below.

2017 Focused Outreach:

The Coalition conducted individual meetings with 92% of targeted growers in the Dry Creek @ Rd 18, Lateral 2 ½ near Keyes Rd, Livingston Drain @ Robin Ave, and Miles Creek @ Reilly Rd site subwatersheds. A preliminary analysis of current and recommended management practices is provided in the Management Practices section below. The complete analysis of current, recommended, and implemented management practices will be provided in the May 1, 2019 Annual Report.

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 a relational database. During individual visits, some members may be recommended to implement additional management practices. The Coalition 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 indicate an interest in additional funding information, Coalition representatives contact the grower directly to assist with their individual operation needs.

2016 Focused Outreach:

The Coalition completed follow-up contacts with 100% of targeted growers in the 2016 Focused Outreach site subwatersheds. During individual contacts, one grower in the Highline Canal @ Hwy 99 was recommended to laser level fields and indicated he will implement this practice when the orchards are replanted in the future. One grower in the Prairie Flower Drain @ Crows Landing Rd site subwatershed was recommended to install a tailwater return system, but this practice was unable to be implemented due to financial hardship.

2017 Focused Outreach:

The Coalition is in the process of following up with 2017 Focused Outreach targeted growers that were recommended additional management practices. Three surveys for the Lateral 2 ½ near Keyes Rd site subwatershed are outstanding, the Coalition sent final notices with a deadline of May 11, 2018 for these growers to schedule their individual meetings. If members fail to meet with Coalition representatives, their membership will be dropped. The status of their initial meetings will be provided to Regional Board staff during Quarterly Meetings. With 92% of the initial surveys received, two growers in the Lateral 2 ½ near Keyes Rd site subwatershed have been recommended additional management practices. One grower was advised to check the weather conditions prior to spraying and the other grower was advised to spray areas close to waterbodies when the wind is blowing away from them. Results from follow-up surveys will be included in the May 1, 2019 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 practices have been implemented is the result of newly implemented management practiced designed to improve water quality. After three years of monitoring with no exceedances, the Coalition can petition to the Regional Board for management plan completion.

2016 Focused Outreach:

The Coalition continued MPM in the 2016 Focused Outreach sites during the 2017 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 *H. azteca* and *P. promelas* management plans in the Duck Slough @ Gurr Rd site subwatershed were approved for completion on January 31, 2018. The Coalition will continue MPM in the 2016 Focused Outreach site subwatersheds in the 2018 WY.

2017 Focused Outreach:

The Coalition conducted MPM at all 2017 Focused Outreach site subwatersheds during the 2017 WY and will continue MPM through the and 2020 WY to assess changes in water quality and the efficacy of newly implemented management practices.

Planned Focused Outreach Activities for the 2018 WY

Focused Outreach activities planned for the 2018 WY include continuing with 2017 Focused Outreach activities and meeting with targeted growers in the 2018 Focused Outreach site subwatershed Lateral 5 ½ @ South Blaker Rd site subwatershed. The 2018 Focused Outreach site subwatershed surveys were mailed to growers on March 7, 2018. Preliminary results from individual meetings will be reported in the May 1, 2019 Annual Report. Table 51 below includes details on the focused outreach activities (Performance Goals and Measures) that will occur for the 2018 Focused Outreach site subwatersheds.

Table 49. 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	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 50. 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	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

NA–Not applicable, no studies proposed for these site subwatersheds.
X – Output has not occurred yet.

Table 51. Performance Goals status for 2018–2020 focused outreach site subwatershed (Lateral 5 ½ @ South Blaker Rd).

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2018	2019	2020
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.
X – Output has not occurred yet.

GROUNDWATER MANAGEMENT PLAN ACTIVITIES AND PERFORMANCE GOALS

All submittal/approval dates associated with the Groundwater Quality Management Plan (GQMP) are included in Table 45. With the final approval of the Groundwater Assessment Report and identification of HVAs, the Coalition submitted its GQMP on February 23, 2015 (approved July 31, 2017).

The ESJWQC region is divided into five groundwater management plan zones to facilitate the systematic monitoring of constituents of concern and the implementation of an overall GQMP (GQMP, page 26). The zone boundaries are based on the underlying San Joaquin basin and sub basin boundaries within the San Joaquin River Hydrologic Region. Zone names are based on the primary underlying sub basins from north to south: Modesto, Turlock, Merced, Chowchilla, and Madera as shown in Figure 15. Several entities (other than agricultural landowners/operators) whose management practices could affect groundwater quality are located within the ESJWQC area boundaries including all or portions of several irrigation districts, numerous federal and state water districts, municipal water companies, and sanitation districts. Currently, the Oakdale, Modesto, Turlock, and Merced Irrigation Districts are members of the ESJWQC.

The GQMP includes a strategy for eliminating/reducing impairments of beneficial uses (BUs) of groundwater due to agricultural practices. The GQMP approach involves four processes:

1. Identification of whether constituents of concern are related to agricultural practices,
2. Outreach to member parcels located above groundwater identified as impaired,
3. Members adopting protective practices to reduce nitrate leaching to groundwater, and
4. Monitoring to verify the water quality is improved.

The ESJWQC's GQMP Performance Goals are built on actions essential for successful completion of the Management Plan strategy. The Performance Goals reflect the steps necessary to guarantee that the objectives of the Management Plan program are met and that groundwater quality improves in the ESJWQC region. The effectiveness of the GQMP strategy will be evaluated by documenting nitrate and wellhead management practices from members 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. In the sections below, the Coalition evaluates groundwater protection practices documented on FEs per GQMP Zone and the changes in practices that have occurred over time.

Figure 15. Map of GQMP Zones based on WDR designated groundwater sub basins.

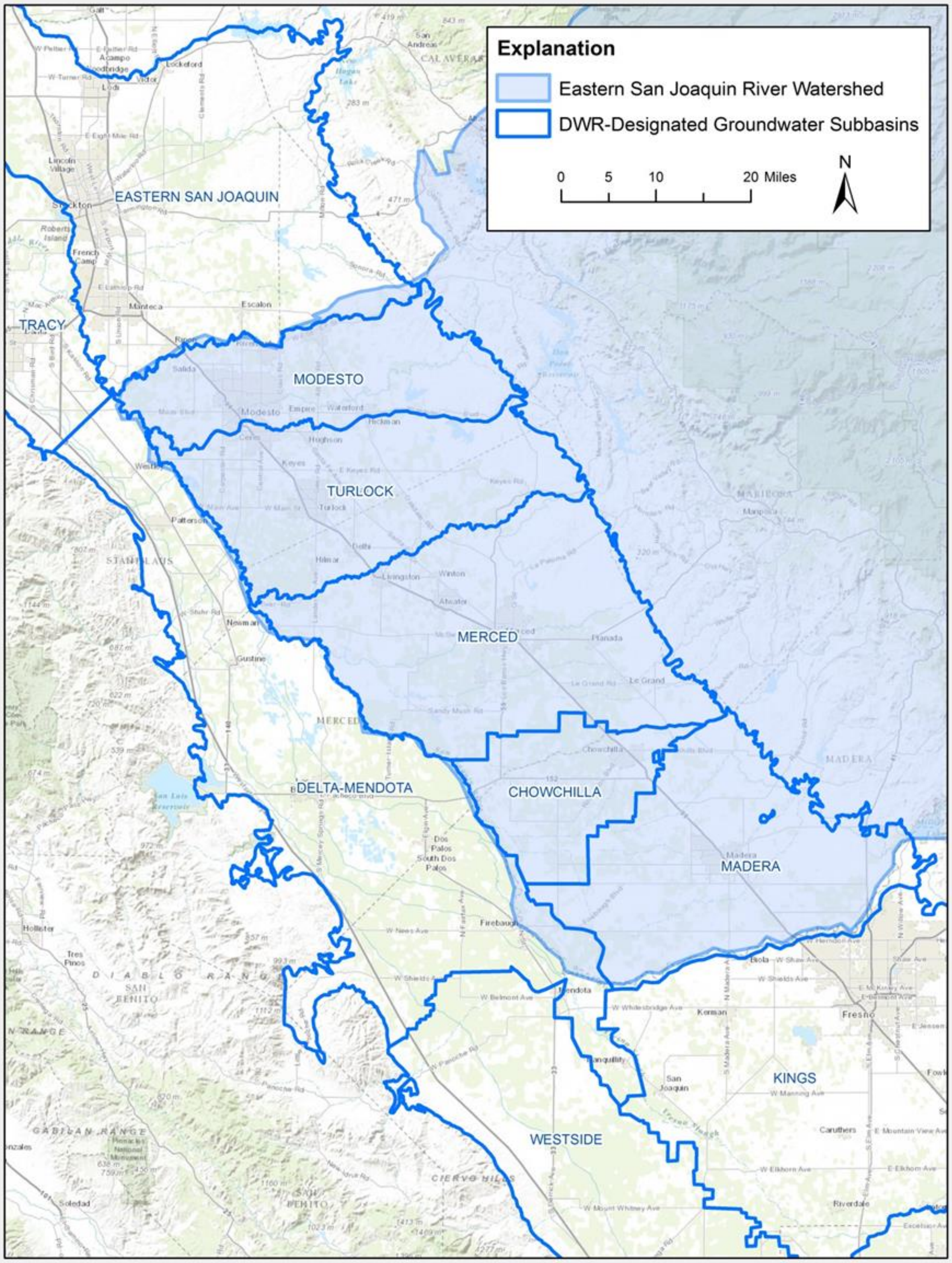


Table 52. Performance goals and measures for the ESJWQC GQMP.

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2018	2019	2020
1	Performance Measure 1.1 - *Annually analyze 100% of FEPs to track implementation of wellhead protection practices on member irrigation supply wells*	Report annually in Management Plan Progress Report per GQMP Zone: the wellhead protection practices on member irrigation supply wells, the number of members who may need additional practices, and an evaluation of changes over time.	ESJWQC	Complete		
	Performance Measure 1.2 - *Annually analyze 100% of FEPs to track destruction of abandoned wells on member management units*	Report annually in Management Plan Progress Report per GQMP Zone: the number of abandoned wells that are destroyed, the number of members associated with wells that have an unknown method of abandonment, and an evaluation of changes over time.	ESJWQC	Complete		
	Performance Measure 1.3 - *Annually analyze 100% of FEPs to track changes in well, irrigation, pesticide, and nitrogen fertilizer management practices*	Report annually in Management Plan Progress Report per GQMP Zone: the changes in member practices that are more protective of groundwater quality.	ESJWQC	Complete	X	
2	Performance Measure 2.1 – *Within two years of the approved GQMP, the ESJWQC will educate all members regarding the need to have adequate wellhead protection measures.*	Report annually the updated abandonment information.	ESJWQC		X	
	Performance Measure 2.2 – All members will have adequate wellhead protection measures in place within 24 months	Report annually in the AMR, the percent of wells with adequate wellhead protection.	ESJWQC Coalition Members		X	
	Performance Measure 2.3 – All members will properly destroy abandoned wells on their property within 24 months of either identifying the abandoned well, or after having abandoned the well.	Report annually in the AMR, the number and percent of abandoned wells known to members that are properly destroyed.	ESJWQC Coalition Members		X	
3	Performance Measure 3.1 – *Within six months of GQMP approval, develop a list of practices associated with the 4 R's that can be distributed to members growing almonds, walnuts, pistachios, tomatoes and grapes.*	A completed information packet ready for member distribution.	ESJWQC	In Progress		
	Performance Measure 3.2 – *Within six months from completion of PM 3.1, provide to ESJWQC members representing at least 50% of the HVA acreage the product output from PM 3.1 (information on practices that are considered to be protective of groundwater).*	Count of members by crop who have received the information packet from PM 3.1.	ESJWQC	In Progress		
	Performance Measure 3.3 - *Within 24 months from GQMP approval, provide to 100% of ESJWQC members within the HVA area that grow those crops, the product output from PM 3.1.*	Count of members by crop who have received the information packet from PM 3.1.	ESJWQC		X	
	Performance Measure 3.4 – *Within one year of GQMP approval, develop a summary of information for growers regarding the use of nitrogen. The summary shall include information regarding how growers should determine appropriate nitrogen application rates for their crops based on available information from CDFA, UCCE and others, determine the right timing for application, and determine the right placement for the crops identified in 3.1, which collectively cover approximately 80% of the acreage in the HVAs.*	A matrix of crop-specific nitrogen application rates, timing, and placement based on guidelines developed by CDFA, UCCE, and commodity groups.	ESJWQC	In Progress		

Performance Goal	Performance Measure	Outputs	Who	Annual Report Year		
				2018	2019	2020
	Performance Measure 3.5 – *Within six months of completion of PM 3.4, distribute the product output from PM 3.4 to 50% of members growing almonds, walnuts, pistachios, tomatoes, grapes, and alfalfa that collectively cover approximately 80% of the HVA acreage.*	Count of members by crop who received the product output of PM 3.4.	ESJWQC		X	
	Performance Measure 3.6 – *Within one year of completion of PM 3.4, distribute the product output from PM 3.4 to 100% of members growing almonds, walnuts, pistachios, tomatoes, grapes, and alfalfa that collectively cover approximately 80% of the HVA acreage.*	Count of members by crop who received the product output of PM 3.4.	ESJWQC		X	
4	*Performance Measure 4.1 – Annually analyze distribution of crop-specific A/Y and A/R (when available) values to evaluate nitrogen management performance of growers for all crops.* Using box-and-whisker plots and supporting statistics, identify individual management units that are statistical outliers in the crop-specific distribution of A/Y values.	Annual Nitrogen Management Plan Summary Report Analysis	ESJWQC	In Progress		
4	*Performance Measure 4.2 – Within 12 months of completing PM 4.1, conduct crop-specific meetings with 100% of members with outlier management units in HVAs and obtain additional information on management practices.*	Member surveys and additional information about nitrogen applications.	ESJWQC		X	
4	Performance Measure 4.3 – *Within 5 years of a member attending the ESJWQC meeting as described in PM 4.2, the ESJWQC will re-evaluate outlier member information to determine if there are improvements/reductions in their running 3-year average A/Y, A/R, or other appropriate approved metric.*	Summary of changes in A/Y and A/R values for growers with management units identified as verified outliers.	ESJWQC			2024
4	Performance Measure 4.4 – *Within 5 years of a member attending the ESJWQC meeting as described in PM 4.2, outlier members will improve their running 3-year average A/Y, A/R, or other appropriate approved metric.*	Summary of changes in A/Y and A/R values for growers with management units identified as verified outliers.	ESJWQC Coalition Members			2024
4	Performance Measure 4.5 – *Within one year of GQMP approval, all members will implement irrigation water N testing or identify recent N concentration data applicable to the parcel for use in planning nitrogen applications.*	Summary of FEPs in AMR will reflect use of N in irrigation water as a MP in Section B.4.	ESJWQC Coalition Members	X		
4	Performance Measure 4.6 – *As management practices are verified as protective through the Management Practices Evaluation Program (MPEP), members will implement these practices as appropriate. Within 5 years of receiving outreach materials, 100% of growers will implement practices on parcels as needed.*	Summary of FEPs in AMR will reflect use of N in irrigation water as a MP in Section B.4.	ESJWQC Coalition Members			2024
5	Performance Measure 5.1 – *Within 5 years from the time a management unit is identified as a verified outlier, evaluate if verified outlier management units are reducing their 3-year running average A/Y or A/R.*	Documented reduction in crop-specific A/Y and A/R statistics.	ESJWQC			2023
5	Performance Measure 5.2 – *Evaluate groundwater quality in wells monitored during the Groundwater Trend Monitoring Program.*	Groundwater quality monitoring results in the Groundwater Trend Monitoring Update Report.	ESJWQC		X	X
5	Performance Measure 5.3 – *Evaluate trends in groundwater quality every five years in the GAR Update.*	Trend in groundwater quality in ESJWQC HVAs analyzed in the GAR Update.	ESJWQC		X	

X - Output has not occurred yet.

Groundwater Protection Practices

Growers can implement numerous practices that are known to prevent the movement of nitrate and other constituents of concern to groundwater, e.g., adequate wellhead protection, backflow prevention on pressurized irrigation systems, and the proper timing of nitrogen applications. The FE lists many protective practices, however; through the Management Practices Evaluation Program, the Coalition hopes to evaluate additional practices that will improve the management of nitrogen and reduce leaching past the root zone.

In the sections below, the Coalition analyzed 100% of FEs by GQMP Zone to track the implementation of groundwater protection practices and determine areas where additional outreach and education are needed. The count of members and their acreage by groundwater vulnerability within each GQMP Zone is provided in Table 53. To address the first performance goal, a summary and comparison of groundwater protection practices is provided below.

Table 53. Count of members the irrigated acreage associated with each GQMP Zone.

GQMP Zone	Groundwater Vulnerability	Acreage	Count of Members
Modesto	Low	56,976	242
	High	63,453	710
	Total	**120,429**	**952**
Turlock	Low	68,496	132
	High	110,452	1,187
	Total	**178,948**	**1,319**
Merced	Low	80,543	190
	High	116,143	662
	Total	**196,686**	**852**
Chowchilla	Low	30,646	86
	High	71,257	178
	Total	**101,903**	**264**
Madera	Low	96,474	268
	High	123,166	417
	Total	**219,639**	**685**

Wellhead Management Practices

The Coalition evaluated all members' FE from 2016 to determine which members have irrigation supply wells and what wellhead protection practices are being implemented for those wells. From previous Coalition outreach all growers should be aware of practices that can be used to keep nitrate and other chemicals away from their active and abandoned wells and eliminate the possibility of backflow or transport downward to groundwater along the outside of the well casing. The Coalition discusses wellhead protection practices at every annual member meeting that every member is required to attend.

A review of members' wellhead protection practices will occur within the first year of GQMP approval and as new farms or systems are installed. If the ESJWQC believes that growers can improve their wellhead protection, they will be encouraged to adopt additional practices. The ESJWQC will follow-up with these growers the next year to determine if those practices were implemented, and if not, why. In 2018 the coalition will contact those members who were identified as needing to implement additional wellhead protection practices and follow-up with those growers in 2019. The timeline for completing the performance goals and measures was pushed back slightly while the WDR was being revised by the SWRCB.

Irrigation Wells

On 2016 FEs, 2,252 members (68%) reported having irrigation wells on their property, representing 8,647 wells in the Coalition region (Table 54). The Madera GQMP Zone has the highest number of reported irrigation wells with 2,421 wells reported on 2016 FEs. A count of members who have irrigation wells and the number of wells reported by GQMP Zone is summarized in Table 54.

More than 90% of wells reported in each GQMP Zone implement good housekeeping practices including avoiding standing water around wellheads and sloping the ground away from the wellhead (Table 55). On average, 81% of irrigation wells have a backflow preventative measure on the well. Only members that fertigate would need to have backflow preventative measures in place. Based on FE results, there is no particular GQMP Zone that stands out compared to other zones that would need to additional outreach, they are all implementing wellhead protection practices throughout the GQMP Zones. Table 55 provides a count of irrigation wells and the percentage of wells by GQMP Zone implementing each wellhead protection practice.

The Coalition identified 453 members as needing to implement additional wellhead practices such as good housekeeping practices and avoiding standing water around wellheads (Table 56). The Coalition plans to provide all growers within the Coalition information on wellhead protection practices in 2018 and provide an update to the Regional Board in the May 1, 2019 Annual Report.

Since 2013 the Coalition has received FEs annually to document and track implemented practices from year to year. Figure 16 depicts the gradual increase of implemented wellhead protection practices overtime, from 2013 through 2016.

Table 54. Count of members with irrigation wells by GQMP Zone.

GQMP Zone	Do you have any irrigation wells on parcels associated with this Farm Evaluation?	Member Responses	Count of Irrigation Wells
Modesto	No	364	980
	Yes	422	
	No Selection	10	
Turlock	No	509	1,782
	Yes	649	
	No Selection	7	
Merced	No	164	2,057
	Yes	509	
	No Selection	9	

GQMP Zone	Do you have any irrigation wells on parcels associated with this Farm Evaluation?	Member Responses	Count of Irrigation Wells
Chowchilla	No	15	1,407
	Yes	188	
	No Selection	1	
Madera	No	29	2,421
	Yes	484	
	No Selection	5	
	Members with Irrigation Wells/# of Wells	**2,252**	**8,647**

Table 55. Count of wells associated with each wellhead protection practice by GQMP Zone.

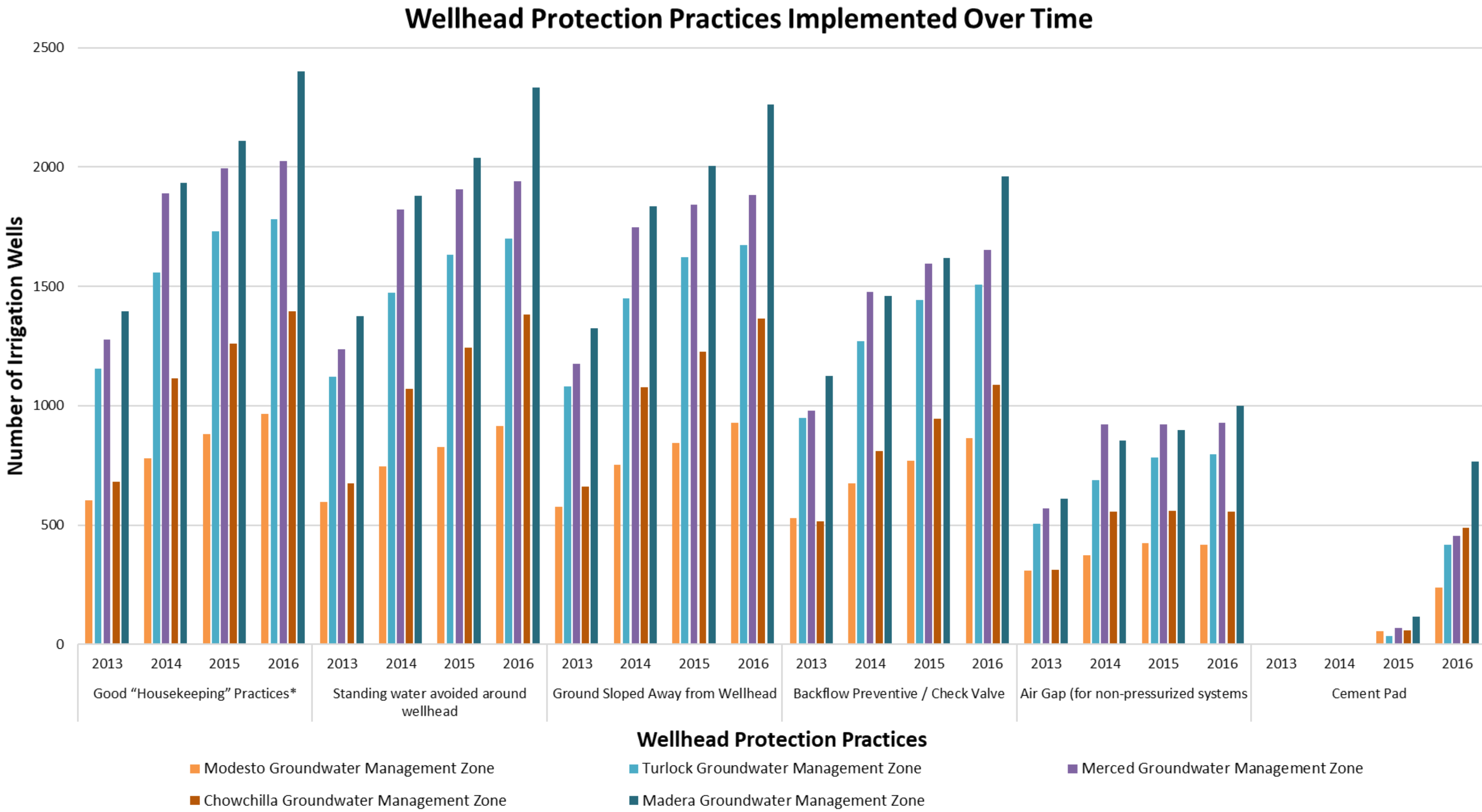
GQMP Zone	Wells	Wellhead Protection Practices					
		Good "Housekeeping" Practices*	Standing water avoided around wellhead	Ground Sloped Away from Wellhead	Backflow Preventive / Check Valve	Air Gap (for non-pressurized systems	Cement Pad
Modesto	Count	954	908	921	852	416	237
	% of wells	97%	93%	94%	87%	42%	24%
Turlock	Count	1,751	1,679	1,649	1,477	789	417
	% of wells	98%	94%	93%	83%	44%	23%
Merced	Count	2,013	1,930	1,872	1,646	921	453
	% of wells	98%	94%	91%	80%	45%	22%
Chowchilla	Count	1,387	1,372	1,355	1,087	554	488
	% of wells	99%	98%	96%	77%	39%	35%
Madera	Count	2,380	2,312	2,243	1,949	983	767
	% of wells	98%	95%	93%	81%	41%	32%
Total Irrigation Wells with Practice		**8,485**	**8,201**	**8,040**	**7,011**	**3,663**	**2,362**

Table 56. Number of members identified as needing to implement additional wellhead protection practices.

GQMP Zone	Wellhead Protection Practice	Number of Members Identified*	Number of Wells
Modesto	Good Housekeeping Practices	55	64
Turlock		72	104
Merced		93	136
Chowchilla		50	112
Madera		76	161
Modesto	Standing water avoided around wellhead	72	115
Turlock		122	198
Merced		139	231
Chowchilla		57	133
Madera		98	226

*Some members are located in two GQMP Zones and are therefore counted twice.

Figure 16. Changes in wellhead protection practices from 2013 through 2016.



Irrigation Management Practices

Members that implement irrigation efficiency practices are able to more accurately determine how much water their crop actually needs. By determining how much water your crop needs at the time of irrigation, there is a smaller possibility that too much water would be applied and not be taken up by the crop. Many members utilize several practices to efficiently manage irrigation (Table 57). Survey responses from 2016 indicated that members in the Chowchilla and Madera GQMP Zones implement the most irrigation efficiency practices based on percent acreage (Table 57). The most reported practice is irrigating based on crop need. The second most commonly reported answers are the use of a moisture probe and use of evapotranspiration in scheduling irrigations (Table 57). Over time, the implementation of irrigation efficiency practices has increased in every GQMP Zone, as shown in Figure 17. The Madera GQMP Zone had the highest increase in implemented irrigation efficiency practices from 2013 through 2016.

Based on 2016 FE results, growers in the Merced and Chowchilla GQMP Zones utilize micro sprinkler and drip irrigation methods more than the other three zones. Overall, changes in irrigation methods occurs very gradually as shown Figure 18. From Figure 18, there has been a slight increase in micro sprinkler and drip irrigation methods, but flood irrigation doesn't seem to have decreased at the same rate.

Table 57. Acreage associated with 2016 Farm Evaluation irrigation efficiency questions within GQMP Zones.

GQMP Zone	Response [1]	Irrigation Efficiency Practices								
		Water Application Scheduled to Need	Use of Moisture Probe	Use of ET in Scheduling Irrigations	Laser Leveling	Pressure Bomb	Soil Moisture Neutron Probe	Other	Other: Drip	No Selection
Modesto	Members	692	273	249	403	108	63	80	32	12
	Acreage	83,117	51,855	55,261	54,090	25,818	16,314	5,716	8,905	711
	% of Acreage	69%	43%	46%	45%	21%	14%	5%	7%	1%
Turlock	Count	1017	326	259	689	84	44	68	35	18
	Acreage	134,038	74,990	68,656	74,492	19,186	9,658	8,921	4,188	1,108
	% of Acreage	75%	42%	38%	42%	11%	5%	5%	2%	1%
Merced	Count	597	228	190	253	48	39	58	41	19
	Acreage	139,587	81,528	78,596	82,218	23,574	19,052	23,110	14,162	1,775
	% of Acreage	71%	41%	40%	42%	12%	10%	12%	7%	1%
Chowchilla	Count	187	107	75	98	20	16	10	11	2
	Acreage	84,064	63,893	52,630	43,546	15,078	8,968	2,835	7,820	602
	% of Acreage	82%	63%	52%	43%	15%	9%	3%	8%	1%
Madera	Count	455	237	216	177	43	50	36	44	11
	Acreage	185,895	132,435	126,736	80,402	31,210	35,850	9,030	28,077	1,020
	% of Acreage	85%	60%	58%	37%	14%	16%	4%	13%	0%

[1] Percent of acres reported per GQMP Zone, includes LV and HV groundwater acreage.

Figure 17. Changes in irrigation efficiency practices from 2013 through 2016.

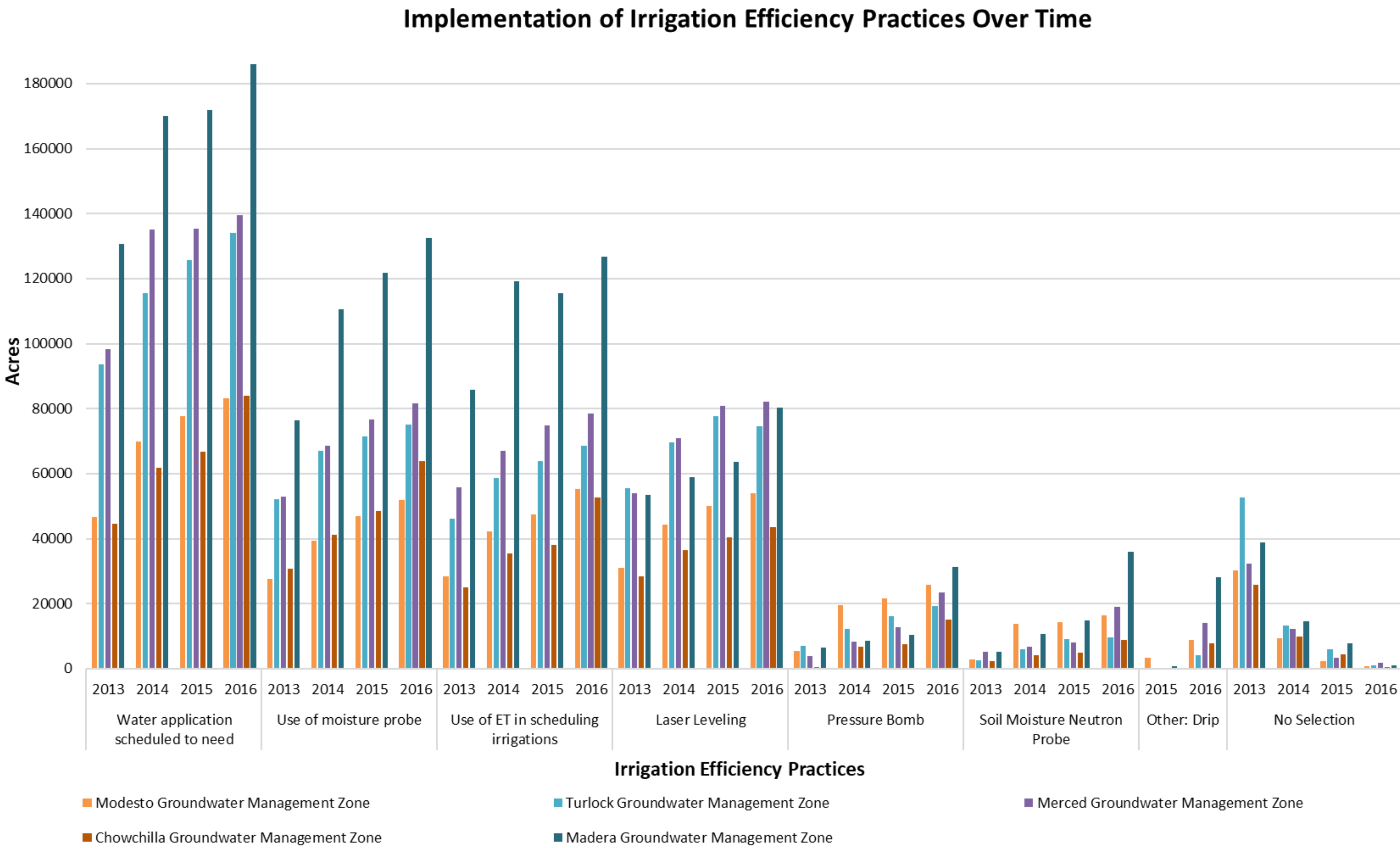
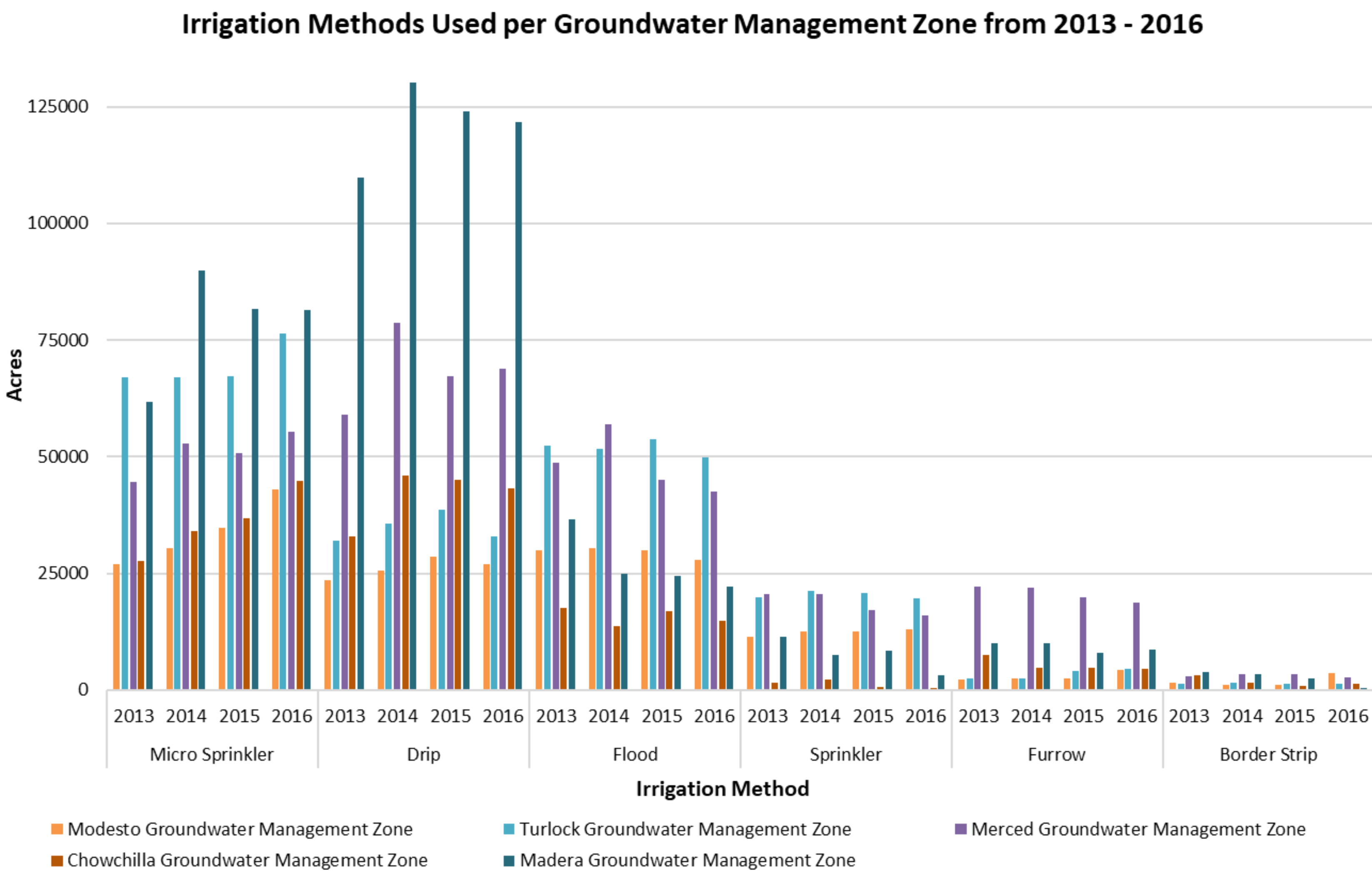


Table 58. Summary of management units with primary and secondary irrigation methods within each GQMP Zone.

GQMP Zone	Response	Primary Irrigation							Secondary Irrigation						
		Micro Sprinkler	Drip	Flood	Sprinkler	Furrow	Border Strip	No Selection	Micro Sprinkler	Drip	Flood	Sprinkler	Furrow	Border Strip	No Selection
Modesto	Count	270	167	430	124	25	13	2	49	54	130	25	6	7	585
	Acreage	42985	26881	27846	13060	4371	3634	347	12236	14493	12004	2810	482	2420	54358
	% of Acreage	36%	22%	23%	11%	4%	3%	0%	10%	12%	10%	2%	0%	2%	45%
Turlock	Count	332	223	721	154	20	12	4	70	78	270	38	8	7	805
	Acreage	76420	32807	49854	19707	4491	1340	46	10488	27240	23425	5665	342	745	89845
	% of Acreage	43%	18%	28%	11%	3%	1%	0%	6%	15%	13%	3%	0%	0%	50%
Merced	Count	298	242	194	149	55	10	13	44	48	87	36	22	7	509
	Acreage	55372	68812	42621	15947	18830	2705	1727	18013	13232	22903	10353	9466	3504	82227
	% of Acreage	28%	35%	22%	8%	10%	1%	1%	9%	7%	12%	5%	5%	2%	42%
Chowchilla	Count	106	106	40	5	18	6	2	20	21	53	9	9	1	121
	Acreage	44735	43125	14740	382	4543	1339	463	9188	10218	17164	2698	5758	80	48842
	% of Acreage	44%	42%	14%	0%	4%	1%	0%	9%	10%	17%	3%	6%	0%	48%
Madera	Count	215	323	110	18	68	6	4	21	56	108	7	39	3	350
	Acreage	81329	121827	22238	3061	8600	451	411	23141	24747	38144	1685	9795	237	108624
	% of Acreage	37%	55%	10%	1%	4%	0%	0%	11%	11%	17%	1%	4%	0%	49%

Figure 18. Changes in irrigation methods from 2013 through 2016.



Pesticide and Nutrient Management

Members within the Coalition implement multiple management practices designed to reduce the offsite movement of at Annual Grower meetings pesticides and nutrients to surface and groundwaters. The Coalition promotes nutrient management practices designed to achieve the desired crop yield but prevent excess nutrients from passing through the root zone leaching to groundwater and through the implementation of the INMP Worksheet. Pesticide management practices apply to groundwater by targeting the minimum amount of pesticide required to achieve the desired crop yield, preventing overspray from entering recharge areas, and by timing the application of the pesticides far enough in advance of irrigation to prevent pesticides from travelling beyond the targeted area through irrigation waters to recharge areas and entering the groundwater

The Coalition evaluated each members' FE for pesticide and nutrient management practices within the GQMP Zones and tracked changes over time. The Chowchilla and Madera GQMP Zones continue to have the highest percentage of acreage implementing pesticide application and nutrient management practices followed by members in the Turlock GQMP Zone (Table 59 and Table 60). The most commonly reported pesticide practices include; following label and county restrictions, monitoring wind conditions, avoiding surface waters, and attend trainings.

Within each of the GQMP Zones, members irrigating over 40% of the acreage noted they test their irrigation wells for nitrates. Within the Madera GQMP Zone, 300 members test their wells and 321 members in Turlock have their wells tested (Table 61).

The Coalition charted the top ten reported pesticide application practices from 2013 and 2016 and found there to be an increasing trend in acreage with pesticide application practices. The observed increase in acreage with more protective practices has been slow and gradual across all the GQMP Zones (Figure 19).

Table 59. Pesticide management practices implemented by members shown in terms of associated parcel acreage and response count within each GQMP Zone.

GQMP Zone	Modesto			Turlock			Merced			Chowchilla			Madera		
Pesticide Application Practices	Count	Acreage	% of Acreage	Count	Acreage	% of Acreage	Count	Acreage	% of Acreage	Count	Acreage	% of Acreage	Count	Acreage	% of Acreage
Follow Label Restrictions	699	88,311	73%	1061	146,856	82%	612	140,531	71%	194	87,055	85%	496	196,687	90%
County Permit Followed	683	87,633	73%	1061	147,296	82%	610	139,794	71%	197	87,151	86%	492	196,441	89%
Monitor Wind Conditions	682	88,054	73%	1012	145,142	81%	584	135,651	69%	193	86,663	85%	484	194,520	89%
Use PCA Recommendations	642	85,871	71%	963	142,991	80%	570	135,949	69%	190	86,151	85%	483	192,279	88%
Avoid Surface Water When Spraying	626	85,447	71%	906	137,985	77%	553	133,206	68%	189	85,627	84%	460	188,608	86%
Attend Trainings	574	83,439	69%	870	135,489	76%	508	129,344	66%	166	80,390	79%	447	188,975	86%
End of Row Shutoff When Spraying	642	86,321	72%	935	137,782	77%	555	128,263	65%	184	83,221	82%	466	189,160	86%
Monitor Rain Forecasts	629	84,653	70%	917	137,459	77%	535	128,619	65%	182	84,630	83%	455	186,213	85%
Use Appropriate Buffer Zones	553	80,416	67%	807	124,690	70%	479	125,986	64%	164	80,050	79%	394	173,943	79%
Use Drift Control Agents	414	71,861	60%	610	106,492	60%	387	109,657	56%	151	65,484	64%	385	172,280	78%
Sensitive Areas Mapped	368	66,024	55%	477	79,216	44%	303	79,024	40%	93	56,603	56%	282	129,834	59%
Reapply Rinsate to Treated Field	324	59,831	50%	426	81,619	46%	287	75,199	38%	114	59,227	58%	270	125,751	57%
Chemigation	182	43,244	36%	213	60,522	34%	171	56,238	29%	78	41,902	41%	202	117,220	53%
Use Vegetated Drain Ditches	133	37,777	31%	126	47,037	26%	130	35,805	18%	28	8,841	9%	58	28,528	13%
Target Sensing Sprayer used	144	32,265	27%	133	21,091	12%	115	34,743	18%	38	19,941	20%	107	47,741	22%
Other	0	-	0%	0	-	0%	1	53	0%	0	-	0%	0	-	0%
No Pesticides Applied	79	2,864	2%	79	2,570	1%	64	10,112	5%	6	1,115	1%	9	2,820	1%
No Selection	3	600	0%	4	89	0%	7	979	0%	1	458	0%	2	699	0%

Table 60. Nutrient management practices implemented by members shown in terms of associated parcel acreage and response count within each GQMP Zone.

GQMP Zone	Response	Nitrogen Management Practices										
		Soil Testing	Split Fertilizer Applications	Tissue/Petiole Testing	Foliar N Application	Fertigation	Irrigation Water N Testing	Cover Crops	Variable Rate Applications using GPS	Other	Do Not Apply Nitrogen	No Selection
Modesto	Count	555	570	437	397	251	253	254	38	62	68	15
	Acreage	80,990	79,378	66,434	63,368	54,321	50,667	45,835	9,495	4,786	2,315	846
	% of Acreage	67%	66%	55%	53%	45%	42%	38%	8%	4%	2%	1%
Turlock	Count	848	854	642	574	376	321	296	41	77	68	22
	Acreage	134,515	131,290	120,297	101,455	92,262	70,417	48,525	5,658	6,757	2,617	1,240
	% of Acreage	75%	73%	67%	57%	52%	39%	27%	3%	4%	1%	1%
Merced	Count	459	475	389	340	281	248	203	39	49	47	20
	Acreage	125,617	123,019	110,135	93,800	87,519	84,253	59,464	21,125	14,375	9,213	1,461
	% of Acreage	64%	63%	56%	48%	44%	43%	30%	11%	7%	5%	1%
Chowchilla	Count	172	167	156	136	126	108	55	18	9	6	3
	Acreage	81,287	76,516	75,218	66,172	65,048	62,920	23,674	12,439	5,178	841	1,064
	% of Acreage	80%	75%	74%	65%	64%	62%	23%	12%	5%	1%	1%
Madera	Count	406	395	412	329	295	300	167	27	18	17	9
	Acreage	180,435	173,449	181,271	146,563	155,005	149,930	80,025	16,784	12,074	562	923
	% of Acreage	82%	79%	83%	67%	71%	68%	36%	8%	5%	0%	0%

Figure 19. Changes in the top 10 reported pesticide application practices per GQMP Zone from 2013 through 2016.

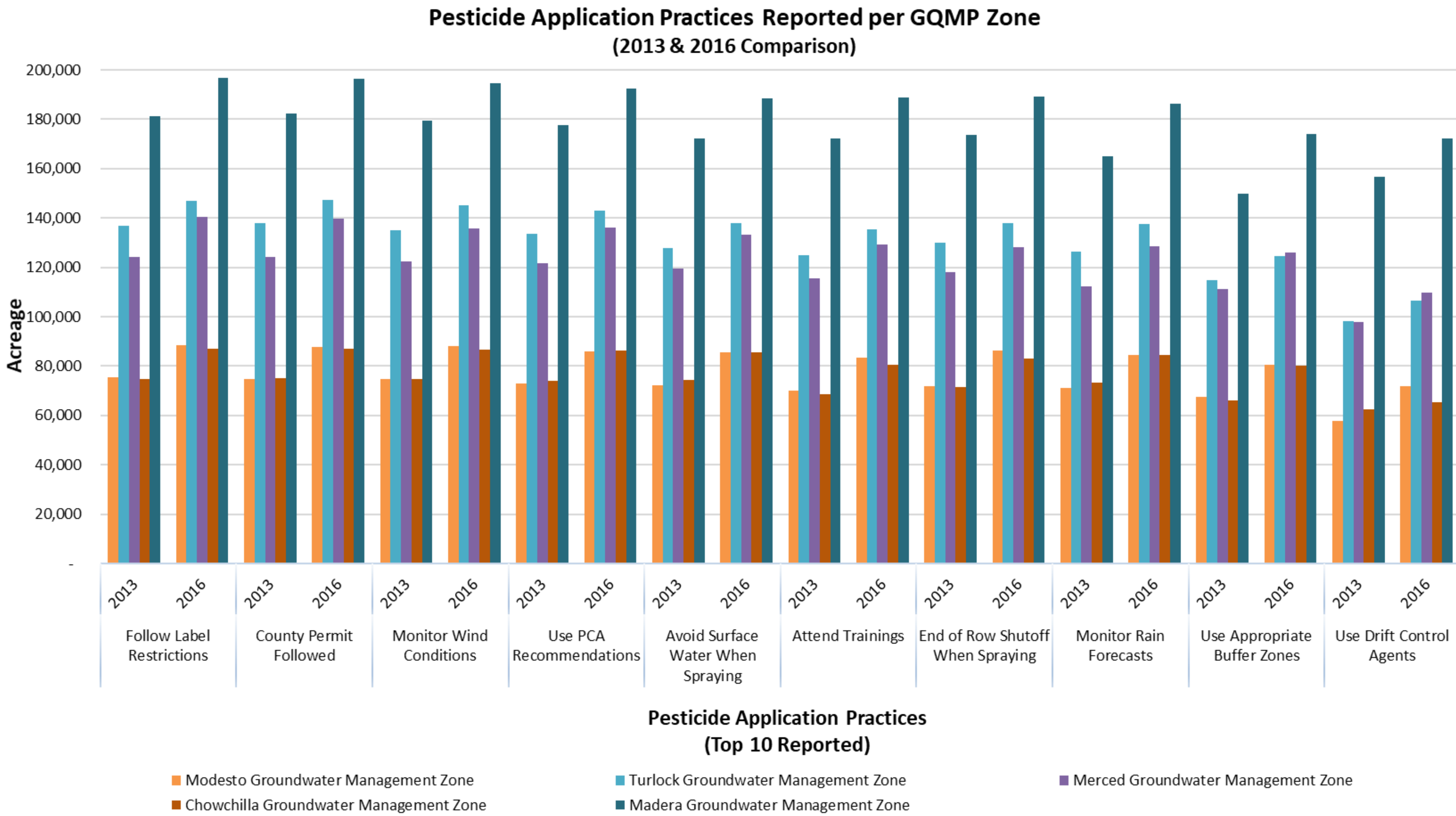
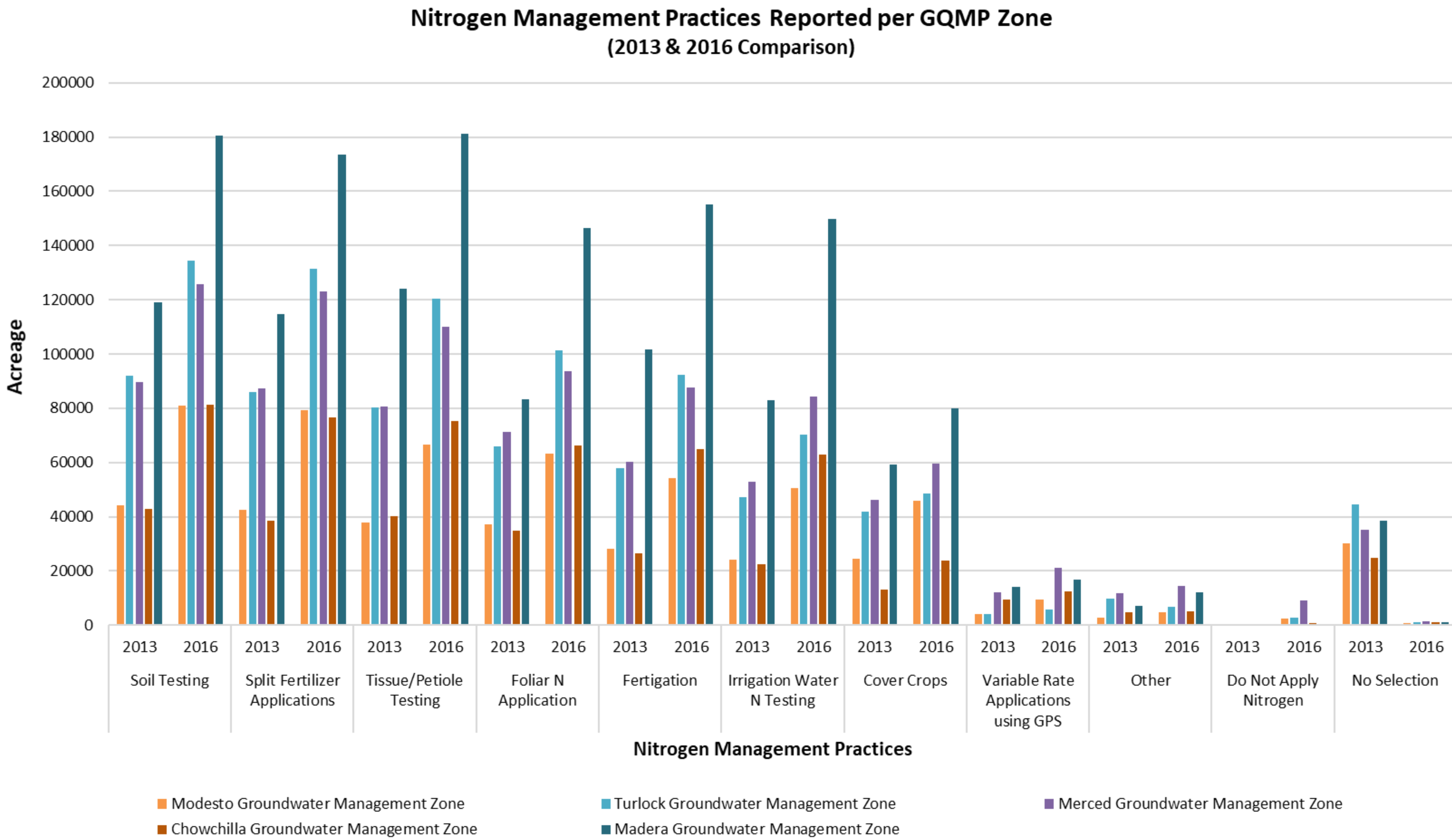


Figure 20. Changes in reported nitrogen management practices per GQMP Zone from 2013 through 2016.



Abandoned Wells

Of the 2016 FEs returned, 10% of members in GQMP Zones reported having abandoned wells on their parcels. The Merced GQMP Zone has the highest reported abandoned wells with 92 members indicating they are aware of abandoned wells on their property (40% of wells). There are thousands of abandoned wells within the Coalition region that many growers are unaware exist on their property (Table 61). Of those known and reported, about half the abandoned wells have been properly destroyed (47% of wells). In many instances, growers have abandoned wells on their property but are unsure how and when they were destroyed (Table 62). A count of members' abandoned wells and the destruction method by GQMP Zone is provided in Table 62. The Coalition will provide information to all members within the Coalition on abandoned or out of service wells protective practices and resources for having wells properly abandoned. An update on the count of members with abandoned wells and their practices will be provided in the May 1, 2019 Annual Report (Table 63).

Individual counties provide guidance on the method for proper destruction, or lacking the county guidance, members can use the information provided by the Department of Water Resources to guide the destruction of their wells. Depending on the method selected, proper destruction of an abandoned well can be expensive. Allowing two years (until 2020) for growers to plan for and attain funding for properly destroying the abandoned well(s) will provide greater assurance that abandoned wells are properly destroyed.

Table 61. Count of members with abandoned wells by GQMP Zone.

GQMP Zone	Are you aware of any known abandoned wells associated with this Farm Evaluation?	Count (Member)
Modesto	No	747
	Yes	50
	No Selection	12
Turlock	No	1,077
	Yes	88
	No Selection	19
Merced	No	591
	Yes	92
	No Selection	19
Chowchilla	No	159
	Yes	45
	No Selection	3
Madera	No	438
	Yes	79
	No Selection	15
	Count of Members w/ Abandoned Wells	**354**

Table 62. Count of abandoned wells associated with the destruction method by GQMP Zone.

Abandoned Well Practices	GQMP Zone					Grand Total
	Modesto	Turlock	Merced	Chowchilla	Madera	
Destroyed – certified by county	6	14	26	11	25	82

Abandoned Well Practices	GQMP Zone					Grand Total
	Modesto	Turlock	Merced	Chowchilla	Madera	
Destroyed by licensed professional	12	28	41	46	70	197
Destroyed - Unknown method	14	32	33	29	35	143
No Data Entered	24	47	40	17	32	160
Grand Total	**56**	**121**	**140**	**103**	**162**	**582**

Table 63. Count of members and their abandoned wells selected for additional outreach and education.

GQMP Zone	Count of Members	Count of Abandoned Wells
Modesto	22	24
Turlock	43	47
Merced	38	40
Chowchilla	15	17
Madera	32	32
Total	**150**	**160**

Outreach and Education Activities

In 2018, the Coalition will prepare to contact and notify members of additional management practices that are recommended to be implemented on irrigation wells. Notifications will be disseminated through mailings and members will be contacted again to see if any recommended practices were implemented. In addition, information brochures on the 4 R's will be provided to growers in 2018.

Nitrogen Use Evaluation and Crop Specific Meetings

In early 2018, the Coalition provided growers with results from the 2016 NMP Summary Report Analysis. Outreach packets were mailed on February 1, 2018 to 1,929 members. The Coalition notified members through the outreach packets if they had management units determined to be statistical outliers (457 outlier management units). Outreach packets included the information that the member submitted for the 2016 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).

In February and March of 2018, the Coalition held six crop-specific member meetings that focused on proper nutrient management practices for almonds, walnuts, pistachios, corn, tomatoes, grapes, and sweet potatoes (Table 48). Over 1,700 members attended the almond, walnut, and pistachio focused annual meetings in February. Only 266 members attended the corn, tomatoes, grapes, and sweet potatoes focused annual meetings in March. The Coalition provided fertilizer recommendation guidelines for almonds, walnuts, pistachios, grapevines, tomatoes, and corn using information from CDFA/UCCE. 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.

Adoption of Additional Management Practices to Protect Groundwater

The implementation of practices reported on FEs per GQMP Zone have been on the rise since the first FE was received in 2013, as shown in the figures above. The Coalition expects that growers will continue to improve their farming practices to be more efficient and protective of surface and groundwater. Between 2013 and 2016, the acreage managed by members that conduct irrigation water nitrate testing has almost doubled (Figure 20). In fact, many of the nutrient-focused management practices have noticeably increased throughout the GQMP Zones since 2013 (Figure 20). In addition, the Coalition mentions the importance of implementing management practices protective of surface and groundwater at all meetings and in newsletters.

In 2018, the Coalition will inform all members within the Coalition about the importance implementing wellhead protection practices such as; good housekeeping practices, avoiding standing water around wellheads, proper storage of fertilizers, and abandoned well practices.

Management Practice Evaluation Program

All submittal/approval dates associated with the MPEP are included in Table 45. 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.

On January 14, 2014, the ESJWQC, along with the San Joaquin County and Delta Water Quality Coalition, and the Westside San Joaquin River Watershed Coalition (WSJRWC), requested approval from the Regional Board to form an MPEP Group (referred hereafter as the MPEP Group Coordinating Committee or MPEP GCC). The request to form the MPEP GCC was revised on May 8, 2014 and September 25, 2014, and final approval was granted on June 17, 2015. The MPEP GCC was formed to prevent a duplication of efforts and increase efficiency in implementing the MPEP. On June 30, 2015, the MPEP GCC requested an expansion of the MPEP GCC to include the Sacramento Valley Water Quality Coalition and the Westlands Water Quality Coalition. On December 21, 2017 the MPEP GCC was expanded to include the Grassland Drainage Area Coalition.

The Northern MPEP GCC submitted a MPEP Work Plan on July 29, 2016, and revised Work Plans on May 18, 2017 and February 15, 2018. During the 2016 and 2017 WYs, the Northern MPEP GCC met with the Southern San Joaquin Valley MPEP Committee to coordinate the two MPEP technical approaches. The Northern MPEP GCC Work Plan proposes a three-phase approach which compliments and integrates the efforts of the Southern San Joaquin Valley MPEP. The three phases of the Northern MPEP GCC Work Plan include a literature review on practices known to be protective of groundwater under some conditions (completed in November 2017), landscape-level modeling and evaluation of management practices using the Surface Water Assessment Tool (SWAT), and an evaluation of the impacts of management practices on groundwater quality. A final Management Practice Evaluation Report will be submitted to the Regional Water Board on May 1, 2023.

MEMBER ACTIONS TAKEN TO ADDRESS WATER QUALITY IMPAIRMENTS

Every year Coalition members are responsible for completing multiple surveys on farm management practices, sediment and erosion control practices, and nitrogen use (Table 64). Each member is required to attend an annual grower meeting and pay their annual membership dues. In addition to completing annual reporting requirements, growers who are selected for focused outreach are responsible for filling out additional surveys and scheduling individual meetings with Coalition staff to review farm management practices.

Furthermore, growers in HVAs 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 Cooperative Extension (UCCE) staff to develop self-certification courses on nitrogen and sediment management that allow members to self-certify their NMP Worksheets and SECPs.

Table 64. Member Reporting Requirements

Upcoming Due Date	Member Requirement	Small Farming Operations		All other Farming Operations		Submitted To
		Low Vulnerability	High Vulnerability	Low Vulnerability	High Vulnerability	
As needed	Notice of Confirmation	Once				Coalition
2/28/2017	Sediment & Erosion Control Plan[1]	Members with parcels in proximity to large tributaries but have SECP certified by due date.				On Farm
2/28/2018	Sediment & Erosion Control Plan[1]	Members with parcels in proximity to secondary tributaries must have SECP certified by due date.				On Farm
3/1/2018	Farm Evaluation Plans[2]	Every 5 Years	Annually		Annually	Coalition
3/1/2018	Nitrogen Management Plan[3] (2018 Crop Year)	Annually	Annually*	Annually	Annually*	On Farm
3/1/2018	Nitrogen Management Plan Summary Report[3] (2017 Crop)		Annually		Annually	Coalition
2/28/2019	Sediment & Erosion Control Plan[1]	Members with parcels in proximity to remaining (tertiary) waterbodies must have SECP certified by due date.				On Farm
3/1/2020	Farm Evaluation Plan[2]			Every 5 years		Coalition

*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 members about various management practices that are designed to: 1) reduce stormwater runoff and manage discharge of irrigation tailwater, 2) control erosion and manage sediment discharge, and, 3) manage pest and dormant spray applications (Table 65).

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 that were implemented following focused outreach.

The 2008 Focused Outreach strategy was modified in the 2014 SQMP as part of the Coalition's approach to completing all management plans. The Coalition followed the strategy outlined in the 2014 SQMP for 2016 and 2017 Focused Outreach and will continue to follow this strategy for 2018 Focused Outreach and all other outreach activities moving forward.

Table 65. 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 the wind is Blowing Away
	Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site

When there are reoccurring water quality impairments in site subwatersheds, the Coalition may initiate additional outreach in the site subwatershed even if outreach has occurred there in the past. Several factors could be responsible for reoccurring water quality impairments in site subwatersheds where focused outreach already occurred including:

1. Changes in land ownership resulting in a grower new to the area who may not have been contacted previously for outreach,
2. New lease agreements where an individual who farms a member's parcels may not have received focused outreach in the past,
3. Changes in the crops grown resulting in inadequate management practice implementation, and
4. Discharge from non-Coalition growers.

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

Outreach and education was initiated in the 2016 Focused Outreach site subwatersheds in April 2016. Follow-up mailings were sent on October 18, 2017. Follow-up mailings for the 2016 Focused Outreach sites included a survey with instructions for growers to record any newly implemented management practices in the Highline Canal @ Hwy 99 (1 grower) and Prairie Flower Drain @ Crows Landing Rd (1 grower) site subwatersheds (Table 66).

Table 66. Count of growers who participated in 2016 Focused Outreach site subwatersheds (2016-2018).

Focused Outreach Actions	Dry Creek @ Wellsford Rd	Duck Slough @ Gurr Rd	Highline Canal @ Hwy 99	Prairie Flower Drain @ Crows Landing Rd
Targeted Growers	6	9	7	16
Completed Individual Meeting	6	8[1]	7	11[2]
Growers with Recommended Practices	0	0	1	1
Completed Follow-up Contacts	0	0	1	1
Percent Complete (Initial Contact)	**100%**	**100%**	**100%**	**100%**
Percent Complete (Follow-up Contact)	**N/A**	**N/A**	**100%**	**100%**

[1]One of the nine members was dropped; therefore, only eight initial surveys were required.

[2]Five of the sixteen members were dropped; therefore, only 11 initial surveys were required.

Table 67. 2016 Focused Outreach targeted grower acreage.

Site Subwatershed	Targeted Growers	Targeted Grower Acreage	Irrigated Acreage within 200 yards of Waterbody	Percent Acreage Contacted
Dry Creek @ Wellsford Rd	6	1,011	22,845	4%
Duck Slough @ Gurr Rd	8	5,391	16,738	32%
Highline Canal @ Hwy 99	7	177	11,174	2%
Prairie Flower Drain @ Crows Landing Rd	11	700	2,289	31%

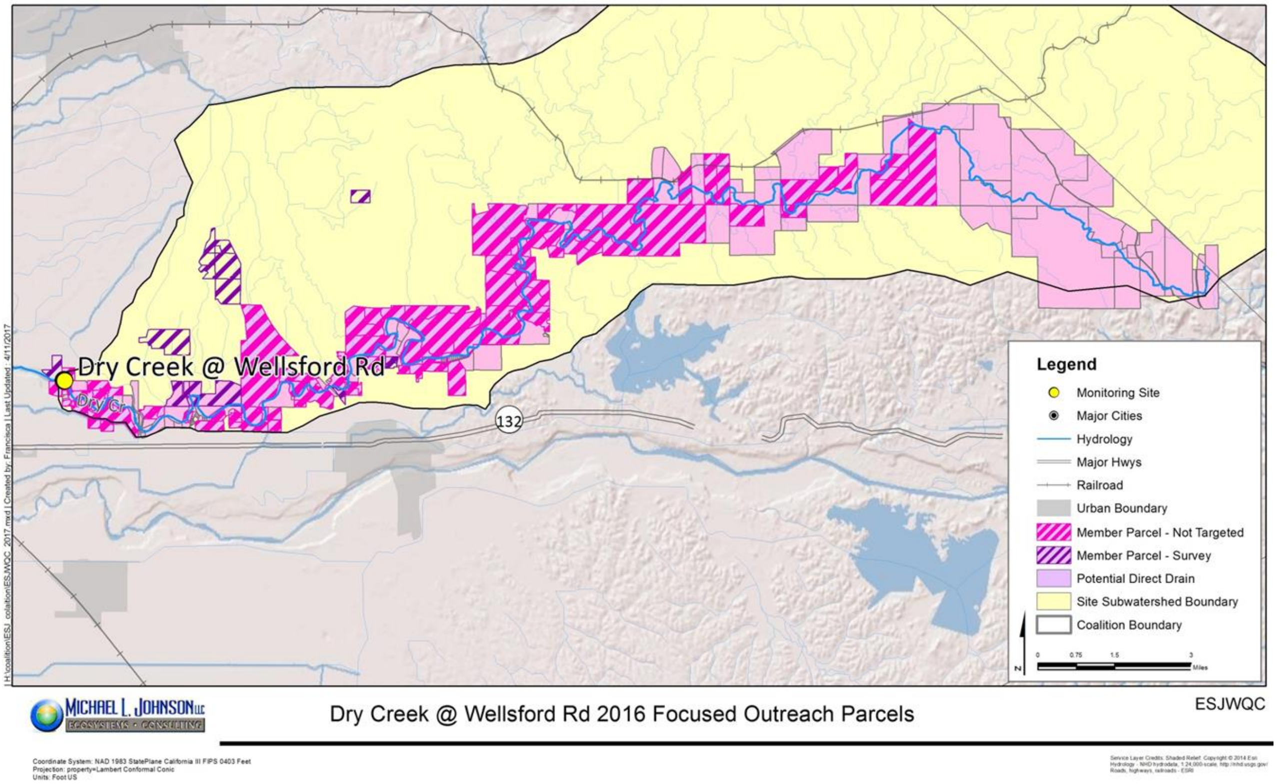
Table 68. Comparison of recommended and implemented management practices in 2016 Focused Outreach site subwatersheds.

Site Subwatershed	Management Practice	Recommended Practices		Implemented Practices	
		# Growers	Acres	# Growers	Acres
Highline Canal @ Hwy 99	Laser leveling fields	1	30	0	0
Prairie Flower Drain @ Crows Landing Rd	Installing tailwater return system	1	40	0	0

Dry Creek @ Wellsford Rd

Management practices were documented for 100% of the targeted irrigated acres in the Dry Creek @ Wellsford Rd site subwatershed (1,011 irrigated acres; Figure 21). Coalition representatives met with six growers farming 4% of the acreage identified as having direct drainage or farming parcels located within 200 yards from the waterbody (Table 67). Additional management practices were not recommended; therefore, follow-ups were not required.

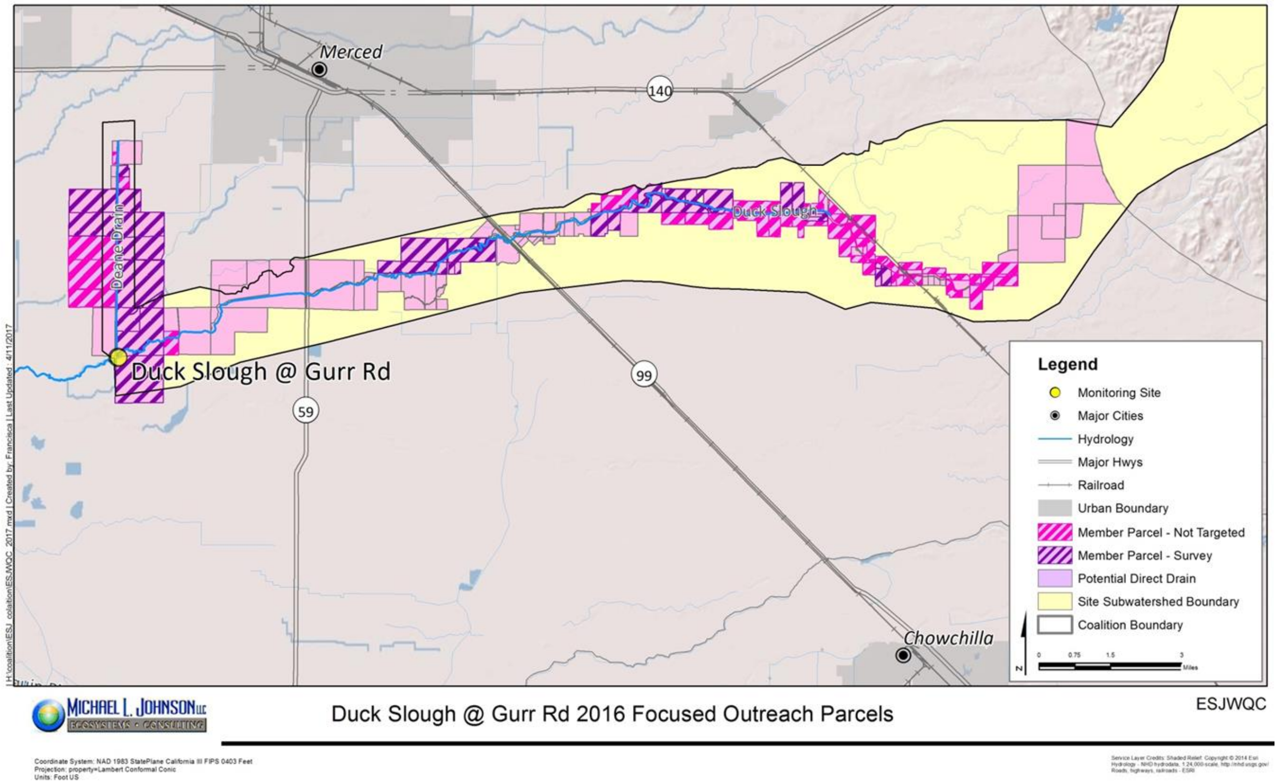
Figure 21. Dry Creek @ Wellsford Rd targeted parcels.



Duck Slough @ Gurr Rd

Management practices were documented for 100% of the targeted irrigated acres in the Duck Slough @ Gurr Rd site subwatershed (5,391 irrigated acres; Figure 22). Coalition representatives met with eight growers farming 32% of the acreage identified as having direct drainage or farming parcels located within 200 yards from the waterbody (Table 67). Additional management practices were not recommended; therefore, follow-ups were not required.

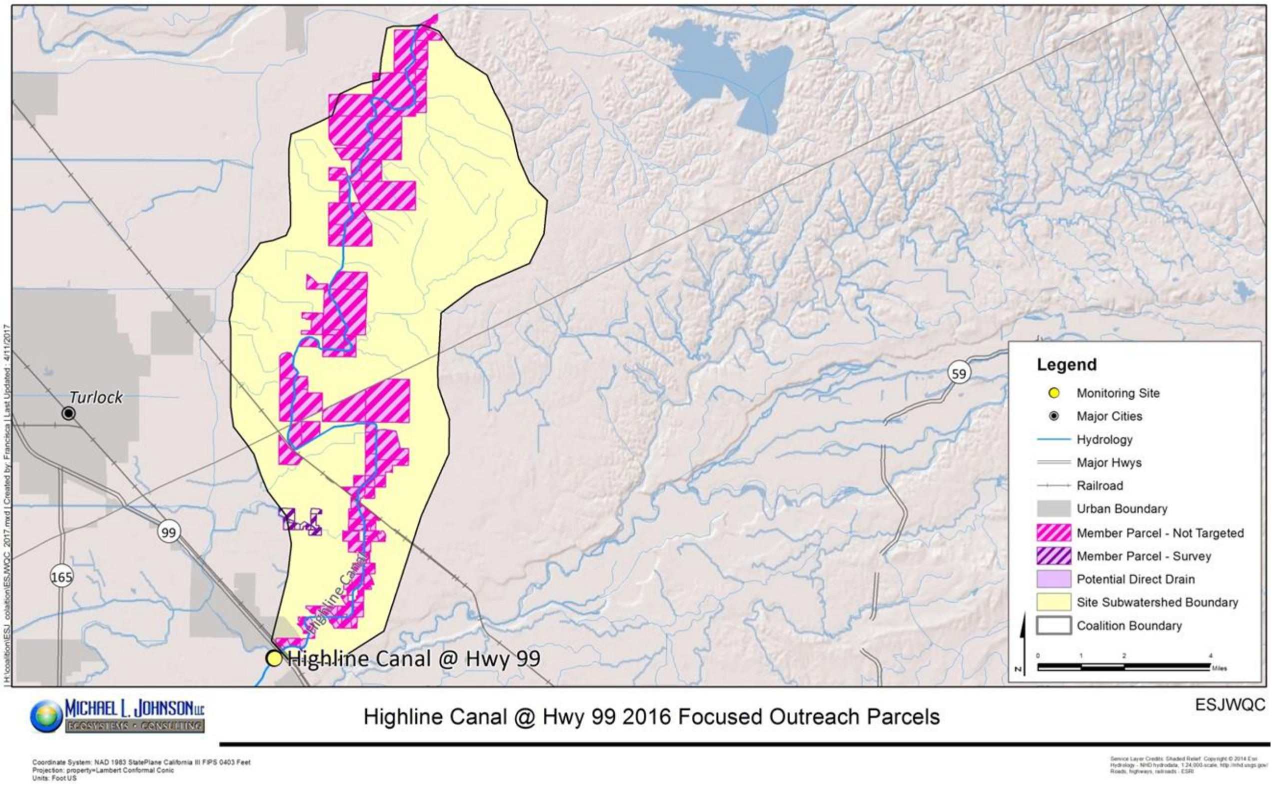
Figure 22. Duck Slough @ Gurr Rd targeted parcels.



Highline Canal @ Hwy 99

Management practices were documented for 100% of the targeted irrigated acres in the Highline Canal @ Hwy 99 site subwatershed (177 irrigated acres; Figure 23). Coalition members met with seven growers farming 2% of the acreage identified as having direct drainage or farming parcels located within 200 yards from the waterbody (Table 67). Coalition representatives recommended laser leveling fields to one grower (farming 30 acres); the grower plans to implement this practice when the fields are redeveloped in the future (Table 68). The Coalition will recontact this grower during the 2018 WY to verify the practice was implemented. Any acreages with implemented practices will be added to the Summary of Newly Implemented Practices analysis in the 2019 Annual Report.

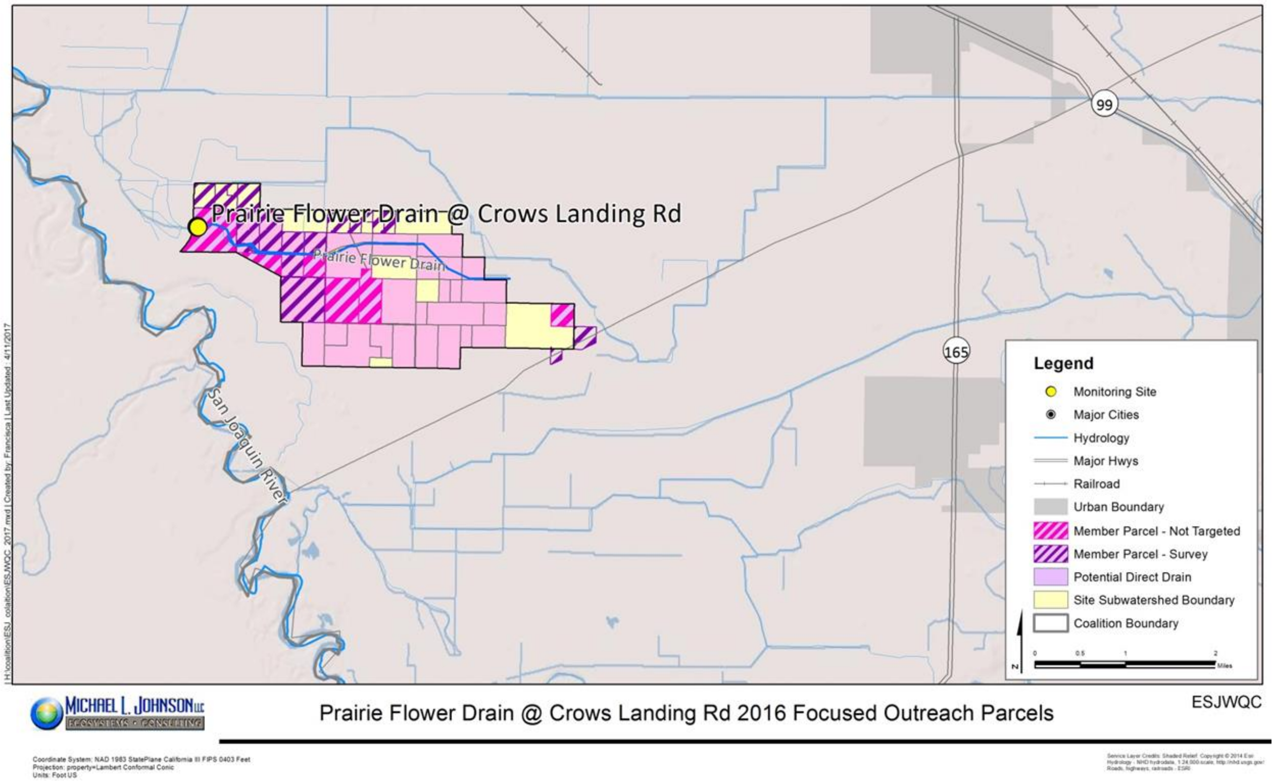
Figure 23. Highline Canal @ Hwy 99 targeted parcels.



Prairie Flower Drain @ Crows Landing Rd

Management practices were documented for 100% of the targeted irrigated acres in the Prairie Flower Drain @ Crows Landing Rd subwatershed (700 irrigated acres; Figure 24). Coalition members met with 11 growers farming 31% of the acreage identified as having direct drainage or farming parcels located within 200 yards from the waterbody (Table 67). The Coalition followed up with one targeted grower (farming 40 acres) who was recommended the additional practice of installing a tailwater return system. Due to a financial hardship, the grower was unable to implement this recommended practice (Table 68).

Figure 24. Prairie Flower Drain @ Crows Landing Rd targeted parcels.



2017 Focused Outreach Summary of Management Practices (2017-2019)

Summary of Current Management Practices (2017)

The Coalition targeted members in the Dry Creek @ Rd 18 (2 growers), Lateral 2 ½ near Keyes Rd (16 growers), Livingston Drain @ Robin Ave (5 growers), and Miles Creek @ Reilly Rd (14 growers) site subwatersheds for 2017 Focused Outreach. Initial contact letters were sent to targeted growers on July 6 and 11, 2017. An additional member in the Miles Creek @ Reilly Rd site subwatershed was added to the targeted grower list due to toxicity that occurred during the 2017 WY (0% survival of *C. dubia*). Initial contact letters informed growers of member responsibilities and management plan strategies and encouraged growers to call Coalition representatives to schedule their individual meetings. During individual meetings with targeted growers, Coalition representatives recommended additional management practices designed to address water quality impairments (Table 69).

The Coalition will mail follow-up surveys in May 2018 to growers who received recommendations for new management practices. Of the 92% of initial surveys received, two growers in the Lateral 2 ½ near Keyes Rd site subwatershed were recommended new management practices. One grower was asked to check the weather conditions prior to spraying and the other grower received a recommendation to spray areas close to waterbodies when the wind is blowing away from the waterbody. Follow-up mailings will include a survey with instructions for growers to record newly implemented management practice.

All MPM is scheduled to occur as outlined in the 2018 WY MPU at all 2017 Focused Outreach site subwatersheds to assess changes in water quality and evaluate the effectiveness of newly implemented management practices. A full analysis of the current, recommended, and implemented management practices for all growers for the 2017 Focused Outreach site subwatershed will be included in the May 1, 2019 Annual Report.

Table 69. Count of growers participating in 2017 Focused Outreach site subwatersheds and those with recommended management practices.

Focused Outreach Actions	Dry Creek @ Rd 18	Lateral 2 ½ near Keyes Rd	Livingston Drain @ Robin Ave	Miles Creek @ Reilly Rd
Targeted Growers	2	16	5	14
Completed Individual Meeting	2	13*	5	14
Growers with Recommended Practices	0	2	0	0
Percent Complete (Initial Contact)	**100%**	**81%**	**100%**	**100%**

* Three surveys outstanding

Table 70. 2017 Focused Outreach targeted grower acreage.

Site Subwatershed	Targeted Growers	Targeted Grower Acreage	Irrigated Acreage within 200 yards of Waterbody	Percent Acreage Contacted
Dry Creek @ Rd 18	2	220	8,129	3%
Lateral 2 ½ near Keyes Rd	16	1,065	17,443	6%
Livingston Drain @ Robin Ave	5	212	917	23%
Miles Creek @ Reilly Rd	14	667	7,354	9%

Dry Creek @ Rd 18

The Dry Creek @ Rd 18 site subwatershed consists of 20,237 irrigated acres with 8,129 acres having the potential for direct drainage and/or within 200 yards of the waterbody (Figure 25). The Coalition completed individual meetings with two targeted growers in the site subwatershed who farm 220 acres of orchard crops (Table 70). Management practices were documented for both growers (Table 71). Additional management practices were not recommended to the two growers.

Irrigation Water Management

Growers in the site subwatershed utilize two irrigation systems: 1) sprinkler irrigation (one grower; 70 acres), and 2) drip (one grower; 150 acres). One grower (150 acres) reported laser leveling their fields to manage irrigation runoff and both targeted growers (220 acres) irrigate based on actual moisture levels in the soil or crop needs. One grower (70 acres) receives water based on irrigation district delivery schedules.

Storm Drainage

Of the two targeted growers, both growers (220 acres) reported no storm drainage. One grower (150 acres) has berms between field and waterway to prevent any possible stormwater runoff.

Erosion & Sediment Management

One grower farming 70 acres indicated they do not apply herbicides during winter months. One grower (150 acres) reports applying glyphosate and simazine. To prevent erosion and sediment movement to the waterway, one grower maintains grass row centers in the orchards and vineyards (70 acres).

Pest Management

Of the two targeted growers, both growers (220 acres) have considered alternative strategies to using diazinon or chlorpyrifos and also calibrate their spraying equipment prior to each application. Two growers (220 acres) adjust spray nozzles to match crop canopy, shut off outside nozzles when spraying outer rows, use nozzles that provide the largest effective droplet size to minimize drift, and also both spray areas close to waterbodies when the wind is blowing away from the water. One grower (150 acres) uses air blast applications only when the wind is between 3-10 mph and upwind of sensitive sites.

Dormant Spray Management

Both of the targeted growers (220 acres) reported that they apply dormant sprays to their fields. They both also check weather conditions prior to spraying and maintain setback zones.

Figure 25. Dry Creek @ Rd 18 targeted parcels.

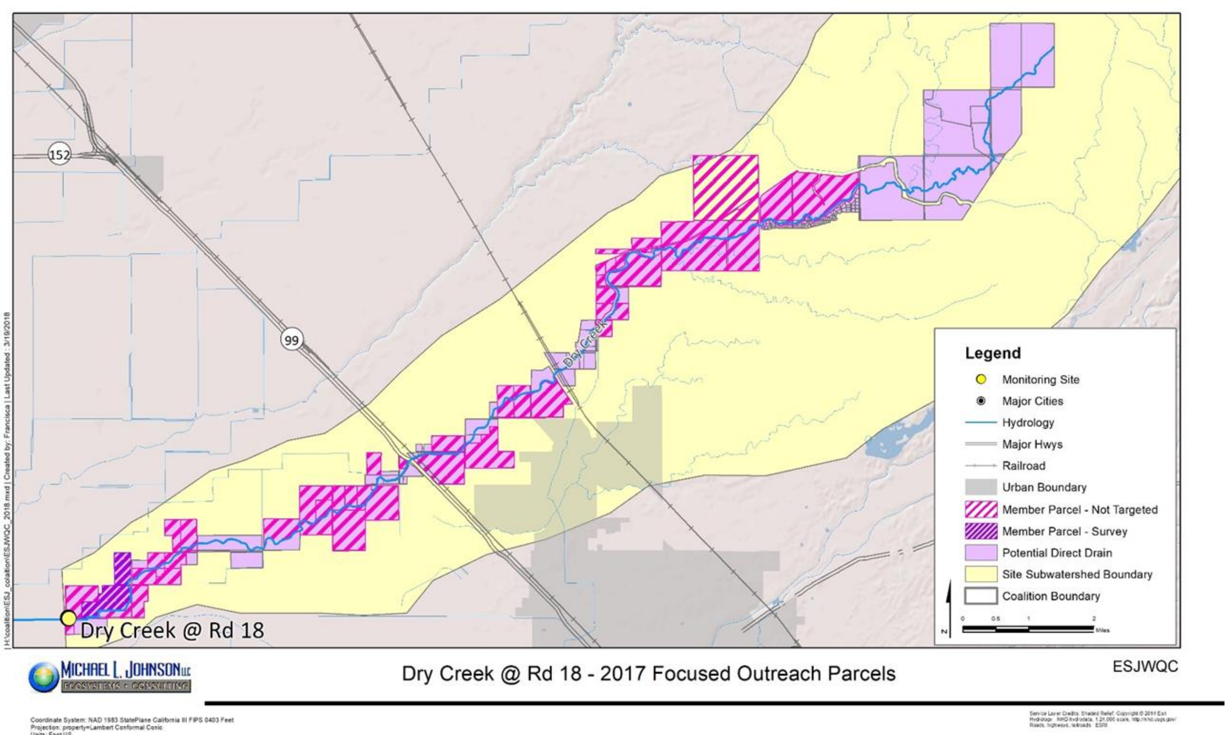


Table 71. Dry Creek @ Rd 18 site subwatershed targeted member's current management practices (2017).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Laser leveled fields	1	50%	150
	Irrigation system:	Sprinkler	1	50%	70
		Drip	1	50%	150
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	2	100%	220
		Irrigation district deliveries	1	50%	70
Section 2: Storm Drainage	When do you have stormwater draining from your field?	No storm drainage	1	50%	70
		Only in heavy (100 year) storms	1	50%	150
	How are you able to manage storm drainage?	No storm drainage	1	50%	150
		Berms between field & waterway (Install and/or Improve)	1	50%	150
Section 3: Erosion & Sediment Management	Do you apply herbicides during winter months?	Do not apply	1	50%	70
		Glyphosate (Round-Up)	1	50%	150
		Simazine (Princep)	1	50%	150
	Sediment management practices:	Vegetation is planted along or allowed to grow along ditches	2	100%	220
		Grass row centers (orchards, vineyards)	1	50%	70
Section 4: Pest Management	Spray management practices:	Adjust spray nozzles to match crop canopy profile	2	100%	220
		Outside nozzles shut off when spraying outer rows next to sensitive sites	2	100%	220
		Spray areas close to waterbodies when the wind is blowing away from them	2	100%	220
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	1	50%	150
		Uses of nozzles that provide largest effective droplet size to minimize drift	2	100%	220
	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	2	100%	220
	Do you plan to use diazinon or chlorpyrifos in the future?	Yes	1	50%	150
	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	1	50%	70
		Yes	1	50%	150
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	2	100%	220

CHECKLIST	QUESTION	ANSWER	COUNT OF RESPONDENTS	PERCENT OF RESPONDENTS	SUM OF ACREAGE
	How often is spray equipment calibrated?	Prior to each application	2	100%	220
Section 5: Dormant Spray Management	Do you apply when soil moisture is at field capacity?	Yes	1	50%	150
	Dormant spray management practices?	Check weather conditions prior to spraying (i.e. storm status)	2	100%	220
		Maintain setback zones	2	100%	220
	Have you been informed of DPR's Dormant Spray Regulations?	Yes	2	100%	220
	How many acres are sprayed with dormant pesticides?	Other	2	100%	220
	Prior to applying winter dormant sprays, what is the condition of your orchard floor?	Some vegetation	1	50%	150
		Vegetated cover with sprayed berms	1	50%	70

Lateral 2 ½ near Keyes Rd

The Lateral 2 ½ near Keyes Rd site subwatershed consists of 31,971 irrigated acres with 17,442 acres with the potential for direct drainage and/or within 200 yards of the waterbody (Figure 26). The 16 growers targeted for focused outreach farm a total of 1,065 acres (Figure 27). The Coalition was able to complete 81% of the initial contacts, three surveys are outstanding (Table 69). The Coalition is in the process of drafting a letter to the three growers, conveying the need for participation or the Coalition will terminate their membership.

Irrigation Water Management

Growers in the site subwatershed utilize four irrigation systems: 1) sprinkler irrigation (one grower; 10 acres), 2) surface (11 growers; 535 acres), 3) micro irrigation (four growers; 270 acres), and 4) drip (four growers; 440 acres). Twelve growers (569 acres) report laser leveling their fields to manage irrigation runoff. Thirteen growers (725 acres) irrigate based on actual moisture levels in the soil (Table 72).

Storm Drainage

Of the 13 targeted growers that completed the initial surveys, twelve growers (715 acres) reported no storm drainage and one grower (156 acres) indicated stormwater drainage only occurs after the soil is saturated in late winter. Five growers (429 acres) have berms between field and waterway.

Erosion & Sediment Management

Seven growers farming 306 acres indicated that they do not apply herbicides during winter months. Five growers (355 acres) report applying glyphosate and three growers (331 acres) report applying Goal. To prevent erosion and sediment movement to the waterway, growers implemented three management practices: 1) maintaining grass row centers in orchards and vineyards (11 growers; 685 acres), 2) maintaining vegetated filter strips around field perimeter at least 10' wide (two growers; 284 acres), and 3) maintaining vegetation along ditches (two growers; 238 acres).

Pest Management

Of the 13 growers that completed the initial surveys, 12 growers (695 acres) adjust spray nozzles to match crop canopy, spray areas close to waterbodies when the wind is blowing away from the water, use nozzles that provide the largest effective droplet size to minimize drift, and also shut off outside nozzles when spraying outer rows. Ten growers (600 acres) use air blast applications only when the wind is between 3-10 mph and upwind of sensitive sites and two growers (127 acres) use electronic controlled sprayer nozzles. Ten growers reported no use of chlorpyrifos or diazinon on their farms (516 acres). Eight growers (592 acres) calibrate prior to each application, one grower (10 acres) calibrates spray equipment once per month and three growers (60 acres) calibrate once per year.

Dormant Spray Management

Of the three growers that apply dormant pesticides (205 acres), all three maintain setback zones and two (191 acres) check weather conditions prior to spraying.

Figure 26. Lateral 2 ½ near Keyes Rd targeted parcels.

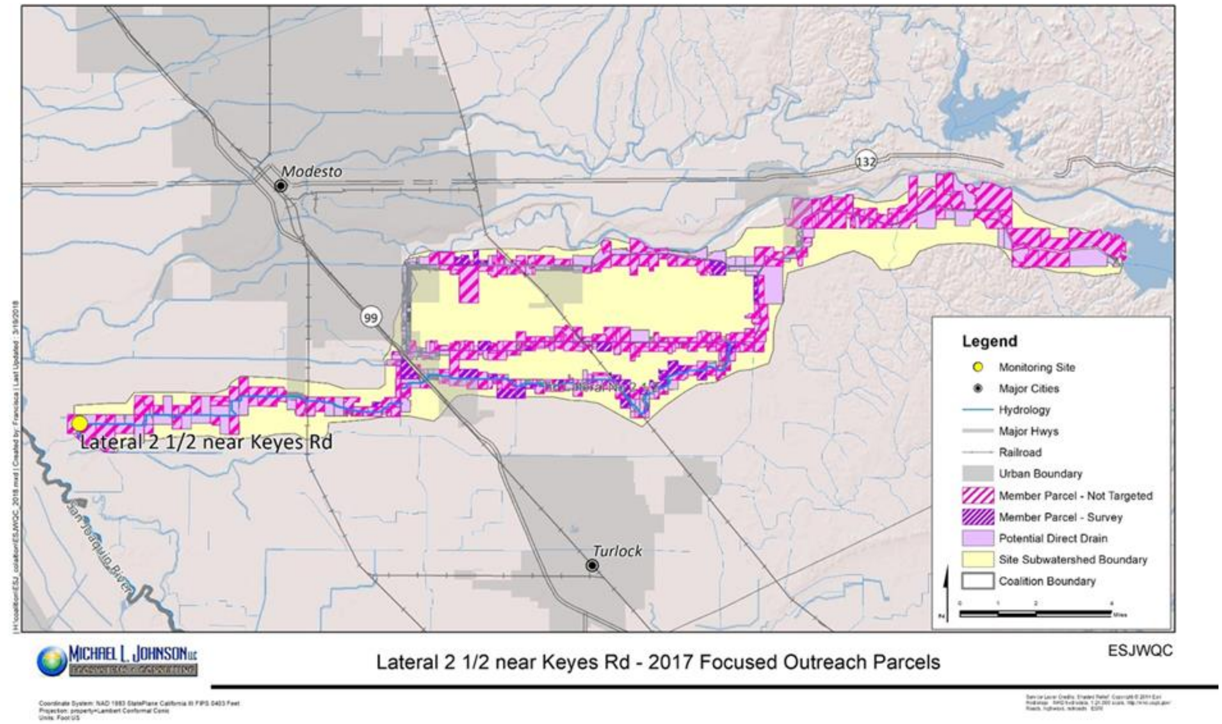


Figure 27. Lateral 2 ½ near Keyes Rd targeted member crop acreage information from 2017 surveys.

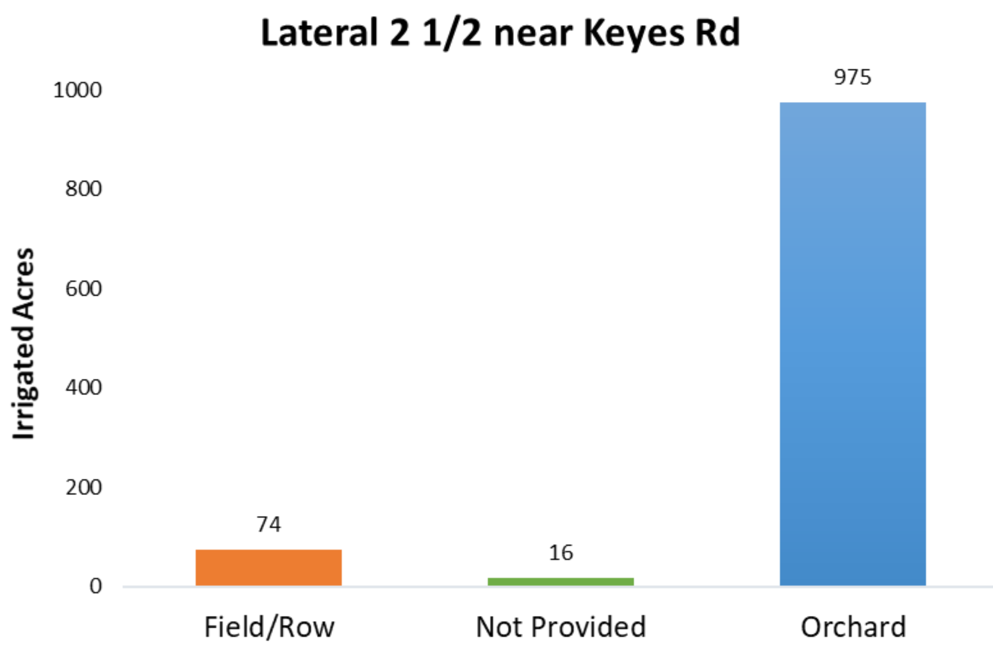


Table 72. Lateral 2 ½ near Keyes Rd site subwatershed targeted member's current management practices (2017).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Laser leveled fields	12	75%	569
	Irrigation System	Drip	4	25%	440
		Micro irrigation	4	25%	279
		Sprinkler	1	6%	10
		Surface	11	69%	535
	Which do you base your irrigation schedule on:	Actual moisture levels in soil/crop needs	13	81%	725
Section 2: Storm Drainage	How are you able to manage storm drainage?	Berms between field & waterway (Install and/or Improve)	5	31%	429
		No storm drainage	12	75%	715
	When do you have stormwater draining from your field?	After soil is saturated-late winter	1	6%	156
		No storm drainage	12	75%	157
Section 3: Erosion & Sediment Management	Sediment management practices:	Vegetation is planted along or allowed to grow along ditches	2	13%	238
		Grass row centers (orchards, vineyards)	11	69%	685
		Maintain vegetated filter strips around field perimeter at least 10' wide	2	13%	284
	Do you apply herbicides during winter months?	Do not apply	7	44%	306
		Glyphosate (Round-Up)	5	31%	355
		Goal	3	19%	331
Section 4: Pest Management	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	13	81%	725
	Do you plan to use diazinon or chlorpyrifos in the future?	No	9	56%	360
		Yes	2	13%	127
	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	10	63%	516
		Yes	2	13%	127

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
	Spray management practices:	Adjust spray nozzles to match crop canopy profile	12	75%	695
		Outside nozzles shut off when spraying outer rows next to sensitive sites	12	75%	695
		Spray areas close to waterbodies when the wind is blowing away from them	12	75%	695
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	10	63%	600
		Uses of nozzles that provide largest effective droplet size to minimize drift	12	75%	695
		Use electronic controlled sprayer nozzles	2	13%	127
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	No	3	19%	54
		Yes	9	56%	661
	How often is spray equipment calibrated?	Once per month	1	6%	10
		Once per year	3	19%	60
		Prior to each application	8	50%	592
Section 5: Dormant Spray Management	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	3	19%	268
	Dormant spray management practices:	Check weather conditions prior to spraying (i.e. storm status)	2	13%	191
		Maintain setback zones	3	19%	205
	Have you been informed of DPR's Dormant Spray Regulations?	Yes	3	19%	268
	How many acres are sprayed with dormant pesticides?	No dormant sprays	3	19%	113
		Other	3	19%	205
	Prior to applying winter dormant sprays, what is the	Vegetated Cover w/Sprayed Berms	1	6%	14

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
	condition of your orchard floor?	Vegetative cover	1	6%	63

Livingston Drain @ Robin Ave

The Livingston Drain @ Robin Ave site subwatershed consists of 11,670 irrigated acres with 917 acres with the potential for direct drainage and/or within 200 yards of the waterbody (Figure 28). The Coalition completed initial contacts with five targeted growers who farm 212 irrigated acres. Figure 29 includes the acreage of the crops farmed targeted growers. Management practices are reported for all five growers farming 23% of the irrigated acreage. Table 73 lists all management practices recorded as currently implemented by targeted growers in the Livingston Drain @ Robin Ave site subwatershed.

Irrigation Water Management

Growers in the site subwatershed utilize three irrigation systems: 1) sprinkler irrigation (one grower; 38 acres), 2) micro irrigation (three growers; 154 acres), and 3) drip (one grower; 20 acres). One grower (31 acres) reported laser leveling their fields to manage irrigation runoff. Five growers (212 acres) irrigate based on actual moisture levels in the soil or crop needs, and one grower (58 acres) receives water based on irrigation district delivery schedules.

Storm Drainage

The five targeted growers (212 acres) reported no storm drainage and four growers (192 acres) prevent stormwater runoff with berms between field and waterway.

Erosion & Sediment Management

One grower farming 20 acres indicated they do not apply herbicides during winter months. To prevent erosion and sediment movement to the waterway, growers implemented three management practices: 1) maintaining grass row centers in orchards and vineyards (two growers; 96 acres), 2) maintaining vegetated filter strips around field perimeter at least 10' wide (one grower; 38 acres), and 3) maintaining vegetation along ditches (one grower; 38 acres).

Pest Management

Of the five targeted growers, four growers (192 acres) adjust spray nozzles to match crop canopy and also shut off outside nozzles when spraying outer rows. All five growers (212 acres) spray areas close to waterbodies when the wind is blowing away from the water, use nozzles that provide the largest effective droplet size to minimize drift, and use air blast applications when wind is between 3-10 mph and upwind of sensitive sites. Three growers (116 acres) use electronic controlled sprayer nozzles. Three of the four growers farming 89 acres do not plan to use chlorpyrifos or diazinon in the future. All four growers farming 174 acres have considered using alternative products to using chlorpyrifos and diazinon. Three growers (116 acres) calibrate prior to each application while two growers (96 acres) calibrated spray equipment once per month.

Dormant Spray Management

Of the three growers that apply dormant pesticides (134 acres), all three maintain setback zones and check weather conditions prior to spraying.

Figure 28. Livingston Drain @ Robin Ave targeted parcels.

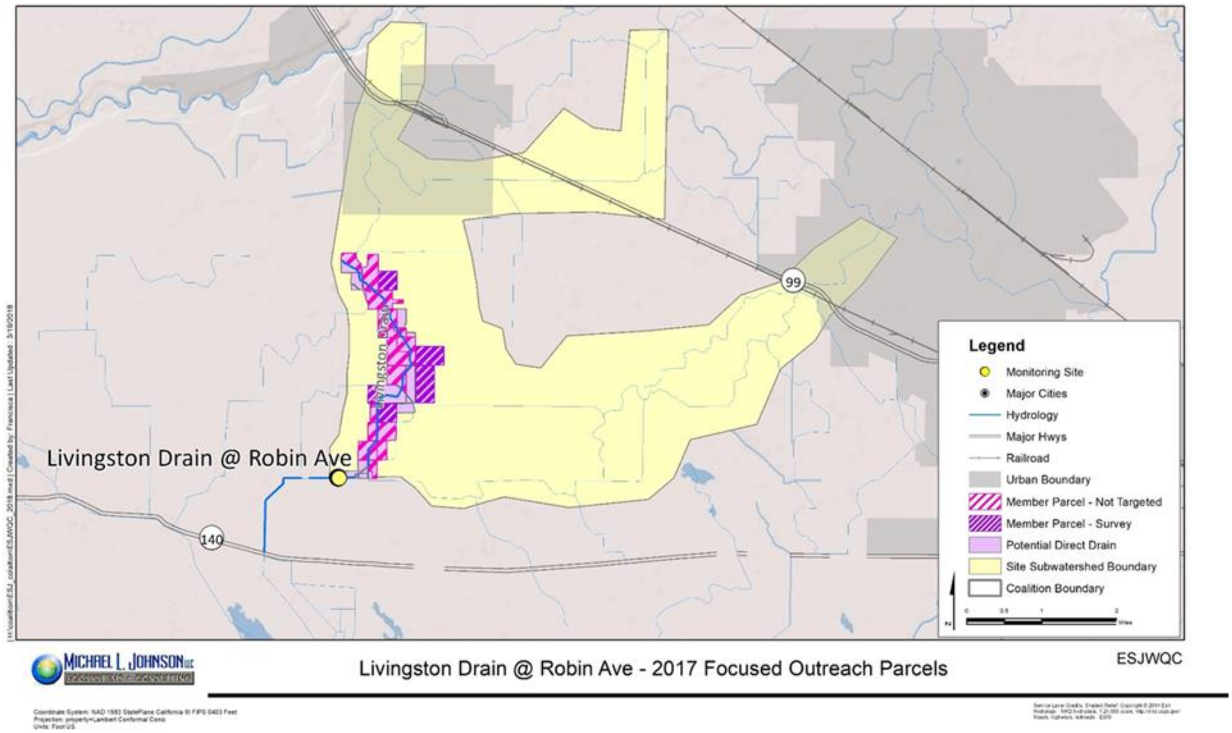


Figure 29. Livingston Drain @ Robin Ave targeted member crop acreage information from 2017 surveys.

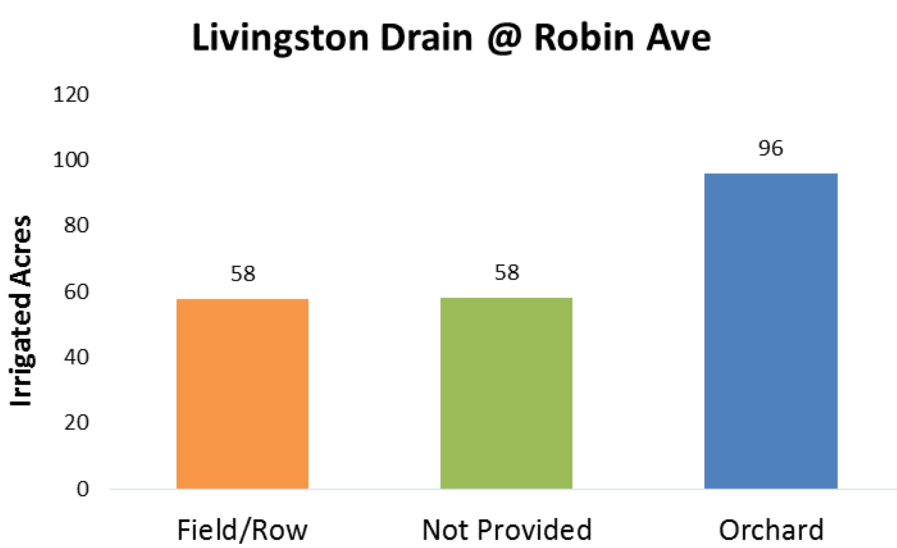


Table 73. Livingston Drain @ Robin Ave site subwatershed targeted member's current management practices (2017).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Laser leveled fields	1	20%	31
	Irrigation system	Sprinkler	1	20%	38
		Drip	1	20%	20
		Micro irrigation	3	60%	154
	Which do you base your irrigation schedule on:	Actual moisture levels in soil/crop needs	5	100%	212
		Irrigation district deliveries	1	20%	58
Section 2: Storm Drainage	How are you able to manage storm drainage?	Berms between field and waterway (install and/or improve)	4	80%	192
		No storm drainage	3	60%	127
	When do you have stormwater draining from your field?	No storm drainage	5	100%	212
Section 3: Erosion & Sediment Management	Do you apply herbicides during winter months?	Glyphosate (Round-Up)	4	80%	192
		Goal	2	40%	96
		Do not apply	1	20%	20
	Sediment management practices:	Maintain vegetated filter strips around field perimeter at least 10' wide	1	20%	38
		Grass row centers (orchards, vineyards)	2	40%	96
		Vegetation is planted along or allowed to grow along ditches	1	20%	38
Section 4: Pest Management	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	Yes	5	100%	212
	Do you plan to use diazinon or chlorpyrifos in the future?	Yes	1	20%	65
		No	3	60%	89
	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	Yes	1	20%	65
		No	3	60%	89
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	4	80%	174
	How often is spray equipment calibrated?	Prior to each application	3	60%	116
		Once per year	2	40%	96
	Spray management practices:	Adjust spray nozzles to match crop canopy profile	4	80%	192
		Outside nozzles shut off when spraying outer rows next to sensitive sites	4	80%	192
		Spray areas close to waterbodies when the wind is blowing away from them	5	100%	212

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	5	100%	212
		Use electronic controlled sprayer nozzles	3	60%	116
		Uses of nozzles that provide largest effective droplet size to minimize drift	5	100%	212
Section 5: Dormant Spray Management	Do you apply when soil moisture is at field capacity?	No	2	40%	96
	Dormant spray management practices:	Check weather conditions prior to spraying (i.e. Storm status)	3	60%	134
		Maintain setback zones	3	60%	134
	Have you been informed of DPR's Dormant Spray Regulations?	Yes	3	60%	134
	How many acres are sprayed with dormant pesticides?	Other	3	60%	114
	Prior to applying winter dormant sprays, what is the condition of your orchard floor?	No vegetation and not disked	1	20%	65
		Vegetated cover with sprayed berms	1	20%	31
		Vegetative cover	1	20%	38

Miles Creek @ Reilly Rd

The Miles Creek @ Reilly Rd site subwatershed consists of 10,183 irrigated acres with 7,354 acres with the potential for direct drainage and/or within 200 yards of the waterbody (Figure 30). The Coalition completed initial contacts with 14 targeted growers who farm a total of 667 irrigated acres. Figure 31 includes the acreage of the crops farmed by targeted growers. Management practices were reported for all 14 targeted growers farming 9% of the irrigated acreage. Table 74 lists all management practices recorded as currently implemented by targeted growers in the Miles Creek @ Reilly Rd site subwatershed.

Irrigation Water Management

Growers in the site subwatershed utilize four irrigation systems: 1) drip irrigation (six growers; 364 acres), 2) micro irrigation (one grower; 18 acres), 3) flood (six growers; 254 acres), and 4) furrow (two growers; 39 acres). Twelve growers (532 acres) reported laser leveling their fields to manage irrigation runoff. One grower (120 acres) implements a tailwater return system and two growers (130 acres) have settling ponds. Twelve growers (522 acres) irrigate based on actual moisture levels in the soil or crop needs and five growers (339 acres) receive water based on irrigation district delivery schedules.

Storm Drainage

Of the 14 targeted growers, nine growers (471 acres) reported no storm drainage, two growers (147 acres) report drainage after soil is saturated in late winter, and two growers (47 acres) report drainage only in 100-year storms. Twelve growers (511 acres) prevent stormwater runoff with berms between field and waterway.

Erosion & Sediment Management

To prevent erosion and sediment movement to the waterway, growers implemented three management practices: 1) maintaining grass row centers in orchards and vineyards (five growers; 129 acres), 2) maintaining vegetated filter strips around field perimeter at least 10’ wide (five growers; 246 acres), and 3) maintaining vegetation along ditches (seven growers; 327 acres).

Pest Management

Of the 14 targeted growers, 12 growers (638 acres) shut off outside nozzles when spraying outer rows, spray areas close to waterbodies when the wind is blowing away from the water and use nozzles that provide the largest effective droplet size to minimize drift. Eleven growers (506 acres) adjust spray nozzles to match crop canopy, eleven growers (615 acres) use air blast applications when wind is between 3-10 mph and upwind of sensitive sites, and eight growers (521 acres) use electronic controlled sprayer nozzles. Eleven growers farming 576 acres (79% of respondents) report that they do not use diazinon or chlorpyrifos on their property. Eight growers (574 acres) calibrate prior to each application while two growers (36 acres) calibrate spray equipment once per month and two growers (36 acres) calibrate once per year.

Dormant Spray Management

Of the three growers that apply pesticides (167 acres) during the dormant season, all three maintain setback zones and check weather conditions prior to spraying. Four growers farming 60 acres indicated they do not apply herbicides during winter months. Nine growers (586 acres) report applying glyphosate and two growers (37 acres) report applying other.

Figure 30. Miles Creek @ Reilly Rd targeted parcels.

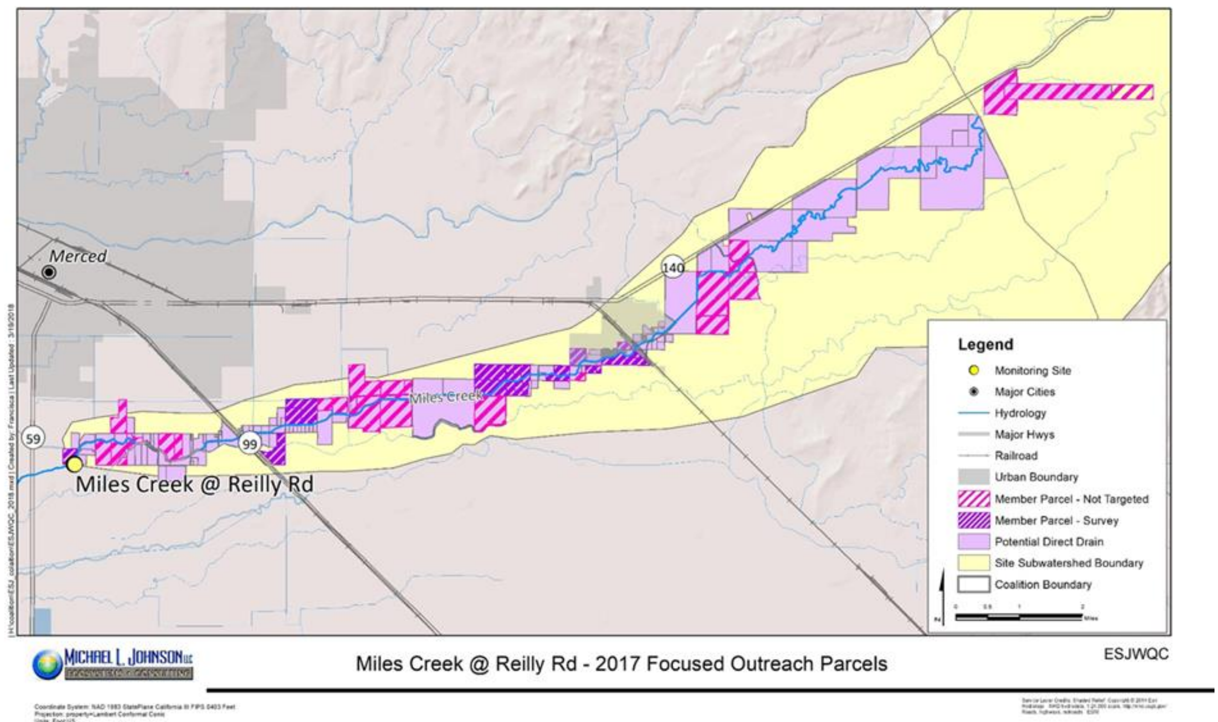


Figure 31. Miles Creek @ Reilly Rd targeted member crop acreage information from 2017 surveys.

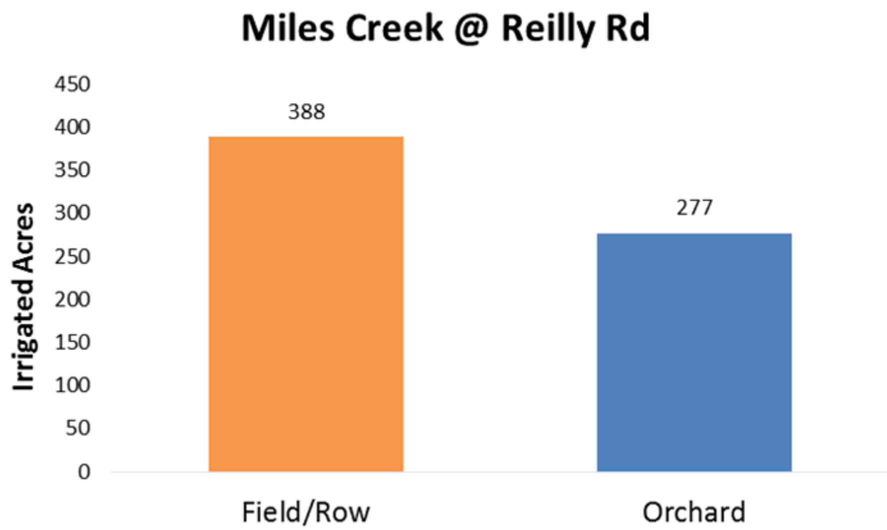


Table 74. Miles Creek @ Reilly Rd site subwatershed current management practices (2017).

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum of Acreage
Section 1: Irrigation Water Management	Irrigation management practices:	Laser leveled fields	12	86%	532
		Recirculation - Tailwater return system	1	7%	120
		Use drainage basins (sediment ponds) to capture and retain runoff	2	14%	130
	Irrigation System	Drip	6	43%	364
		Micro irrigation	1	7%	18
		Flood	6	43%	254
		Furrows	2	14%	39
	Which do you base your irrigation schedule on:	Actual Moisture Levels in soil/crop needs	12	86%	522
		Irrigation district deliveries	5	36%	339
Section 2: Storm Drainage	How are you able to manage storm drainage?	Berms Between Field & Waterway (Install and/or Improve)	12	86%	511
		No Storm Drainage	11	79%	499
	When do you have stormwater draining from your field?	No Storm Drainage	9	64%	471
		After soil is saturated-late winter	2	14%	147
		Only in heavy (100 year) storms	3	21%	47
Section 3: Erosion & Sediment Management	Do you apply herbicides during winter months?	Do not apply	4	29%	60
		Glyphosate (Round-Up)	9	64%	586
		Other	2	14%	37
	Sediment management practices:	Grass Row Centers (Orchards, Vineyards)	5	36%	129
		Maintain vegetated filter strips around field perimeter at least 10' wide	5	36%	246
		Vegetation is planted along or allowed to grow along ditches	7	50%	327
Section 4: Pest Management	Do you follow pesticide label restrictions especially related to timing of application and timing of irrigation?	No	1	7%	18
		Yes	11	79%	620
	Do you plan to use diazinon or chlorpyrifos in the future?	No	10	71%	557
	Do you use diazinon or chlorpyrifos either during the dormant or growing season?	No	11	79%	576
	Have you considered alternative strategies to using diazinon or chlorpyrifos either during the dormant or growing season?	Yes	10	71%	601
	How often is spray equipment calibrated?	Prior to each application	8	57%	574

Checklist	Question	Answer	Count of Respondents	Percent of Respondents	Sum Of Acreage
		Once per year	2	14%	28
		Once per month	2	14%	36
	Spray management practices:	Adjust spray nozzles to match crop canopy profile	11	79%	506
		Outside nozzles shut off when spraying outer rows next to sensitive sites	12	86%	638
		Spray areas close to waterbodies when the wind is blowing away from them	12	86%	638
		Use air blast applications when wind is between 3-10 mph and upwind of a sensitive site	11	79%	615
		Use electronic controlled sprayer nozzles	8	57%	521
		Uses of nozzles that provide largest effective droplet size to minimize drift	12	86%	638
Section 5: Dormant Spray Management	Do you apply when soil moisture is at field capacity?	Yes	3	21%	167
	Dormant spray management practices:	Check weather conditions prior to spraying (i.e. storm status)	3	21%	167
		Maintain setback zones	3	21%	167
	Have you been informed of DPR's Dormant Spray Regulations?	Yes	5	36%	247
	How many acres are sprayed with dormant pesticides?	No dormant sprays	1	7%	18
		Other	2	14%	37
	Prior to applying winter dormant sprays, what is the condition of your orchard floor?	No vegetation & not disked	1	7%	19
		Some vegetation	2	14%	148
		Vegetated cover w/sprayed berms	1	7%	19

Summary of Newly Implemented Management Practices

During individual on-site meetings, the Coalition documented numerous management practices currently implemented by members targeted for focused outreach. The survey completed during individual contacts is separated into management practices within three categories: Irrigation Water Management/Storm Drainage, Erosion and Sediment Management, Pest Management/Dormant Spray Management.

Table 75 lists the number of acres associated with each newly implemented management practice. As a result of focused outreach, 38% of the targeted acreage in the first through seventh priority site subwatersheds and 2016 Focused Outreach sites have newly implemented management practices. The number and type of practices implemented by members varies among site subwatersheds because they are unique in both water quality impairments and sources of the impairments. Figure 32 depicts the percentage of acreage represented by newly implemented management practices in the first through seventh priority and 2016 Focused Outreach site subwatersheds.

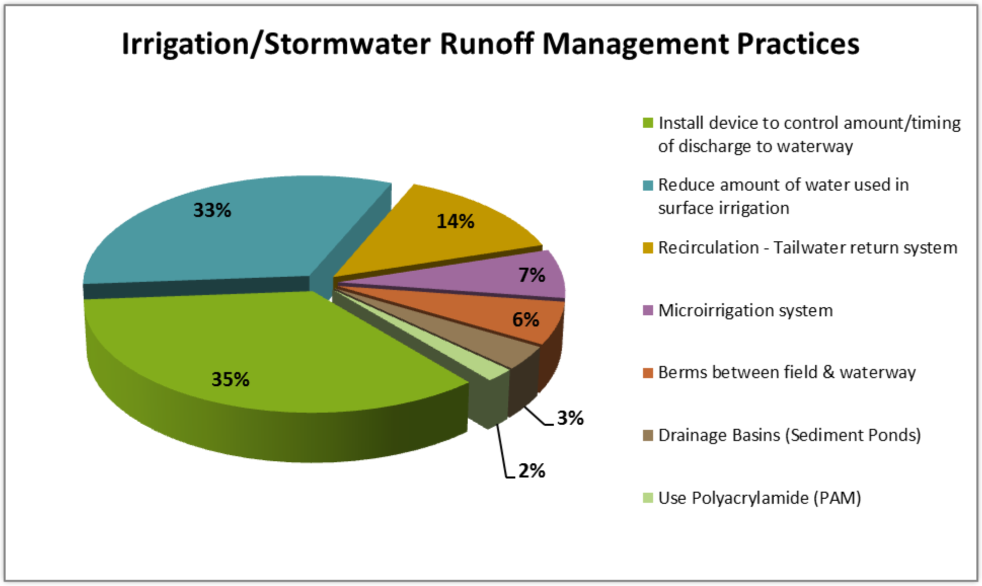
Due to the implementation of management practices by growers, 72 management plan constituents have been approved for completion in 23 of the first through seventh priority and 2016 Focused Outreach site subwatersheds (Table 78).

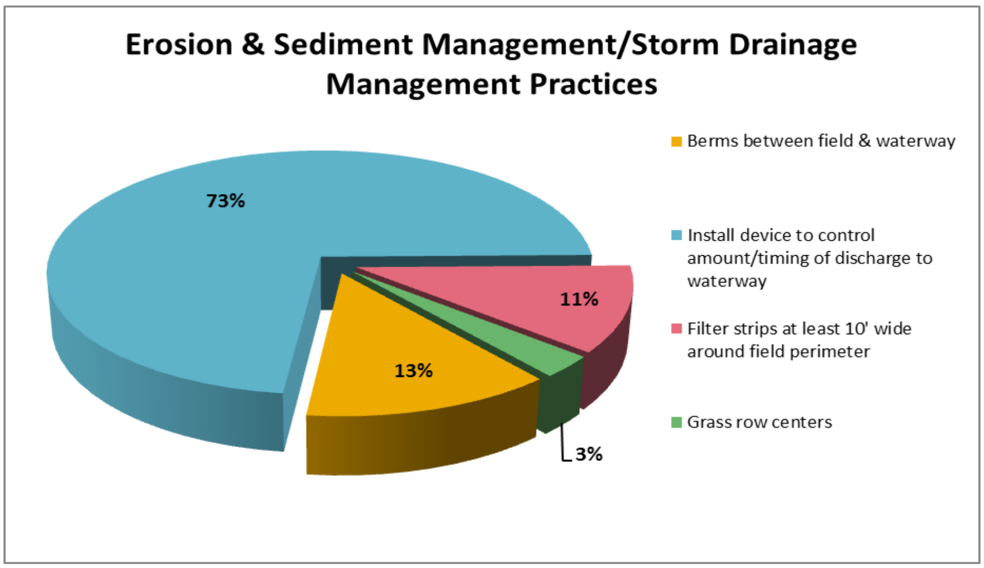
Table 75. Summary of targeted acreage with newly implemented management practices.

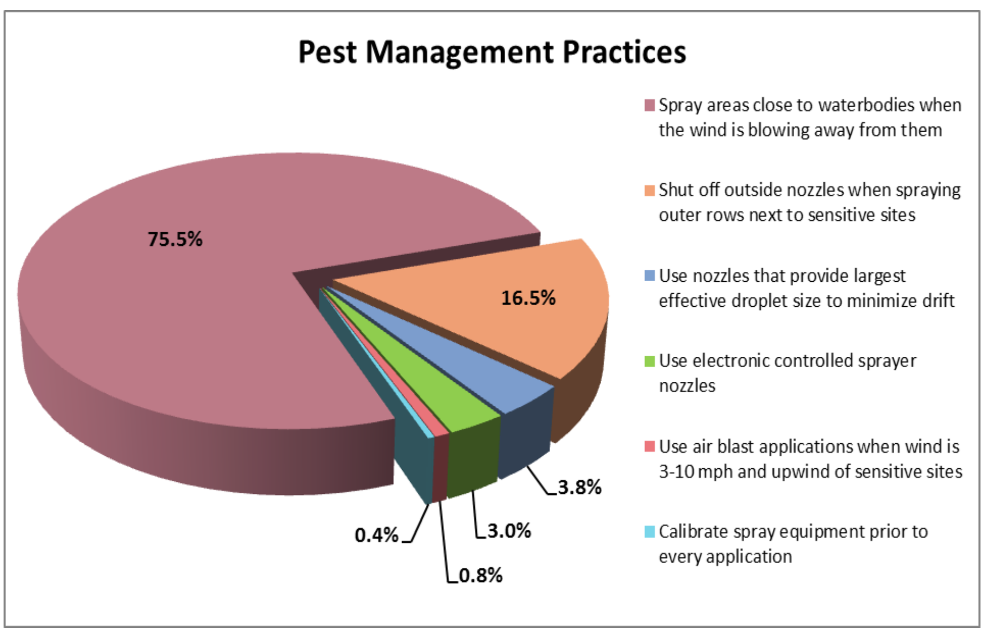
Practice Category		1st (2008-2010)	2nd (2010-2012)	3rd (2011-2013)	4th (2012-2014)	5th (2013-2015)	6th (2014-2016)	7th (2015-2017)	2016 Focused Outreach	Sum of Targeted Acreage
	Targeted Acreage:	11,273	10,084	10,974	4,410	9,947	9838	1,958	7,279	65,763
	Management Practices									
Irrigation, Storm Runoff	Berms between field & waterway			402	80					482
Irrigation, Storm Runoff	Drainage basins (sediment ponds)	271								271
Irrigation, Storm Runoff	Install device to control amount/timing of discharge to waterway	1,660		402	80	574				2,716
Irrigation, Storm Runoff	Micro irrigation system	279	207	71						557
Irrigation, Storm Runoff	Recirculation - tailwater return system	443			609			16	0	1,068
Irrigation, Storm Runoff	Reduce amount of water used in surface irrigation	1,197	1,028	308						2,533
Irrigation, Storm Runoff	Use Polyacrylamide (PAM)	150								150
Irrigation, Storm Runoff	Laser level fields								0	0
Sed. and Erosion	Filter strips at least 10' wide around field perimeter	28	8							419
Sed. and Erosion	Grass row centers	107								107
Pest, Dormant Spray	Calibrate spray equipment prior to every application			44						44
Pest, Dormant Spray	Shut off outside nozzles when spraying outer rows next to sensitive sites	1,170	622	251						2,043
Pest, Dormant Spray	Spray areas close to waterbodies when the wind is blowing away from them		1,223	528		3,489	3445	677		9,362
Pest, Dormant Spray	Use air blast applications when wind is 3-10 mph and upwind of sensitive sites		25			72				97
Pest, Dormant Spray	Use electronic controlled sprayer nozzles		375							375
Pest, Dormant Spray	Use nozzles that provide largest effective droplet size to minimize drift		121	215	139					475
Other[1]	Other (Not specified)	4,102			303					4,405
	Total Acres of Implemented Management Practices	**9,407**	**3,609**	**2,221**	**1,594**	**4,135**	**3445**	**693**	**0**	**25,104**

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

Figure 32. Percentage of acreage represented by newly implemented management practices in the first through seventh priority and 2016 Focused Outreach site subwatersheds.







SEDIMENT DISCHARGE AND EROSION CONTROL PLAN

All submittal/approval dates associated with sediment and erosion control are included in Table 45. 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 and it was 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). These areas were identified utilizing the Revised Universal Soil Loss Equation (RUSLE) and responses from returned Farm Evaluations.

The Regional Water 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 on December 1, 2015 a work plan with a timeline to address proximity to surface waters (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) was completed on June 26, 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 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 for small farm operations less than 60 irrigated acres.

In November 2017, the Coalition reviewed and updated SECP requirements for parcels based on 2016 Farm Evaluation data. 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 waterbody. Parcels that do not allow the discharge of sediment based on factors listed above, are exempt from SECP requirements.

Table 76. 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	1,018	January 22, 2016 July 23, 2016 (small farms)
Farm Evaluation Response (Yes to A3)	1,137	
Farm Evaluation Response (No Selection for A3)	159	
Phase I - Proximity to Major Waterbodies	163	February 2017
Phase I - Exempt Parcels (Hydraulic barrier, low field elevation, riparian area)	98	NA

SECP REQUIREMENT CATEGORY	MEMBER PARCEL COUNT[1]	DATE CERTIFICATION REQUIRED
Phase II - Proximity to Secondary Tributaries	311	February 2018
Phase II - Exempt Parcels (Hydraulic barrier, low field elevation, riparian area)	93	NA
Phase III – Proximity to Tertiary Tributaries	3,524	February 2019

[1] The counts of member parcels change with enrollment updates and replies to the proximity response card. Data as of April 2, 2018.
NA – No SECP is required for parcels identified as being exempt.

To assist members with getting their SECPs certified, the Coalition provides a list of qualified professionals and their contact information in the 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 August of 2017.

STATUS OF SPECIAL PROJECTS

Special projects in the ESJWQC region include MPM and TMDL compliance monitoring as defined in the WDR (Attachment A). During the 2017 WY, the Coalition monitored for chlorpyrifos and diazinon in accordance with the Basin Plan requirements for chlorpyrifos and diazinon TMDL monitoring. If a single exceedance of the WQTL for a constituent under an EPA approved TMDL occurs (chlorpyrifos, diazinon, salinity, and boron), a management plan is required for that constituent in the site subwatershed. 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 TMDL load limits.

A narrative about each monitoring constituent is provided in the Coalition's SQMP as well as the Coalition strategy to meet the 10-year compliance requirements for completing management plans (approved November 4, 2015).

Based on the evaluation provided in the 2017 WY MPU, MPM was conducted for copper, lead, 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 77 includes the number of management plans requested and approved for completion as well as the submittal and approval dates. Table 78 includes current management plans per site; constituents approved for management plan completion, and reinstated management plans.

Table 77. 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

Petition Date	# of Management Plans Petitioned for Completion	# of Management Plans Approved for Completion	Approval Date
12/7/2016	15	10	4/14/2017
11/15/2017	14	10	1/31/2018
Total	**125**	**91**	

Status of Management Plans

The Coalition has received approval to remove 91 constituents from 23 site subwatershed management plans. Overtime, twelve management plans were reinstated due to additional exceedances, one site was removed from monitoring (three completed management plans), and four management plans that were once reinstated were approved for completion a second time. Currently, there are 148 active management plans and 72 completed management plans in 31 site subwatersheds (Table 78). A management plan is reinstated after it is approved for completion when a single exceedance of a WQTL for a TMDL constituent occurs or if more than one exceedance of any other constituent occurs within a three-year period. Table 79 is a tally of exceedances from 2004 through the 2017 WY. Table 80 is a tally of exceedances from the 2017 WY. In both Table 79 and Table 80, cells with blue highlights indicate constituents that are currently in management plans. In Table 79, 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 80, 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 2017 WY.

Table 78. 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					X														3
Bear Creek @ Kibby Rd	2008		X				X																4
Berenda Slough along Ave 18 1/2	2012	X	X				X		X														2
Black Rascal Creek @ Yosemite Rd	2008	X	X				X																3
Canal Creek @ West Bellevue Rd	2017 WY	X	X	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	2017 WY	X	X	X			X		X														5
Dry Creek @ Wellsford Rd/ Church St[1]	2017 WY	X	X		X		X																6
Duck Slough @ Gurr Rd	2015 WY	X	X	X	X		X	X				X					X		X				5
Hatch Drain @ Tuolumne Rd	2008	X		X		X	X	X													X	X	0
Highline Canal @ Hwy 99	2017 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		2
Lateral 5 ½ @ South Blaker Rd	2017 WY		X	X		X	X														X		0
Lateral 6 and 7 @ Central Ave	NA	X	X	X		X															X		0
Levee Drain @ Carpenter Rd	2013	X		X	X	X	X														X		2
Livingston Drain @ Robin Ave	2008	X	X				X		X														3
Lower Stevinson @ Faith Home Rd	NA	X	X	X		X															X		0
McCoy Lateral @ Hwy 140	2012		X						X														0
Merced River @ Santa Fe/ Oakdale Rd[1]	2015 WY	X					X					X											2
Miles Creek @ Reilly Rd	2017 WY	X					X		X			X											4
Mootz Drain downstream of Langworth Pond	2013	X		X	X		X																2
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																2
Total Approved Complete Management Plan (Dark Grey Cells)		**2**	**2**	**1**	**0**	**0**	**2**	**0**	**5**	**10**	**0**	**16**	**0**	**3**	**1**	**6**	**0**	**0**	**8**	**2**	**9**	**5**	**72**
Total Reinstated Management Plans (Light Grey Cells)		**2**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
Total Remaining Management Plans (X)		**25**	**21**	**20**	**8**	**9**	**25**	**4**	**12**	**0**	**1**	**6**	**1**	**0**	**0**	**0**	**0**	**1**	**3**	**1**	**10**	**1**	**148**

[1] The Dry Creek @ Wellsford Rd and Merced River @ Santa Fe site subwatershed were replaced with Dry Creek @ Church St and Merced River @ Oakdale Rd; all management plan constituents are monitored at replacement sites.
NA-Represented site, monitoring for full suite of constituents not scheduled.

Table 79. ESJWQC exceedance tally based on results from 2004-2017 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 is 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 toxicity resampling events.

	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	Methomyl	Methidathion	Methoxychlor	Simazine	Thiobencarb	*C. dubia*	*P. promelas*	*S. capricornutum*	*H. azteca*
Ash Slough @ Ave 21			1					3		3	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		17								4								1								1		2	
Black Rascal Creek @ Yosemite Rd	29	3						11			1	2						4																3		1	1
Canal Creek @ West Bellevue Rd	3	3	1	1				4		3																								1	1	1	
Cottonwood Creek @ Rd 20	1[2]	1						22		11	12	3						3	1				1			2						1			1	1	
Deadman Creek @ Gurr Rd	42	8	10	5				41	11	1	4							4				1		1				1						5	9	3	
Deadman Creek @ Hwy 59	23	7						18	6	1								6		1		1				1						1				2	
Dry Creek @ Rd 18	2	12	1					10		30	21	5		1				3					2			3								1		4	
Dry Creek @ Wellsford Rd/ Church St	76	10	1	2				74			3	1						10								2	1						1	2		4	2*
Duck Slough @ Gurr Rd	14	14	9	2			1	30	3	1	9	5					1	3										2					2	7	2	3	6
Hatch Drain @ Tuolumne Rd	55		55	1	13	1		12	12													1			1						1					10	6
Highline Canal @ Hwy 99	6	33	4	7				20		9	7	7						7				1				2		1	1					4		8	
Highline Canal @ Lombardy Rd	4	13	3	1				6		7	5	8		1				6								1		1				1		4	1	7	3
Hilmar Drain @ Central Ave	20	3	67	2	12			20			2							1		1	1					3								1		8	2
Howard Lateral @ Hwy 140	7	9	2				1	3		10								1																		1	
Lateral 2 ½ near Keyes Rd		11	4	1			1	2										4									1									6	
Lateral 5 ½ @ South Blaker Rd	1	8	25	1			16	5																												15	
Lateral 6 and 7 @ Central Ave	7	5	22	1			4																			1										3	
Levee Drain @ Carpenter Rd	27	1	42	4			18	13																										2	1	4	2
Livingston Drain @ Robin Ave	3	21			1			2		9	9	2						4																		3	
Lower Stevinson @ Faith Home Rd	3	15	17				3																													5	
McCoy Lateral @ Hwy 140		7						1		7																											
Merced River @ Santa Fe	11	2*						6			1	2						4				1					1							4		2*	
Miles Creek @ Reilly Rd	20	2						23		2	7	5			1			5					1					1		1				3		3	
Mootz Drain downstream of Langworth Pond[3]	34	2	1	2				25										2								2										2	
Mustang Creek @ East Ave	21		11	1			2	10		13								2			3											2		1		1	1
Prairie Flower Drain @ Crows Landing Rd	56	9	142	18	18	1	62	65	1				22			1		11				1			3	1		1						11	2	23	2*
Unnamed Drain @ Hogin Rd	19		23																						1												
Unnamed Drain @ Hwy 140	3	2						3		1																											
Westport Drain @ Vivian Rd	21	3	26		13			7										2																		3	
Grand Total	**518**	**212**	**467**	**49**	**57**	**2**	**108**	**450**	**34**	**125**	**90**	**42**	**22**	**2**	**1**	**1**	**1**	**92**	**1**	**2**	**4**	**7**	**4**	**1**	**5**	**19**	**3**	**7**	**1**	**1**	**1**	**5**	**3**	**53**	**17**	**126**	**25**

*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 2018

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 2017 WY, several new site/constituent specific management plans are required or have been reinstated (see dark and light green highlights in Table 80). Below is a list of sites/constituents with exceedances of WQTLs from the 2017 WY resulting in 1) new management plans or 2) reinstated management plans.

- **Ash Slough @ Ave 21**
  - SC
- **Canal Creek @ West Bellevue Rd**
  - SC
  - Copper
- **Dry Creek @ Rd 18**
  - DO (reinstated)
  - SC
- **Dry Creek @ Church St**
  - Ammonia
- **Lateral 6 and 7 @ Central Ave**
  - Nitrate + Nitrite as N
- **Lower Stevinson @ Faith Home Rd**
  - Nitrate + Nitrite as N
- **Miles Creek @ Reilly Rd**
  - Chlorpyrifos (reinstated)
- **Mootz Drain downstream of Langworth Pond**
  - SC

Table 80. ESJWQC exceedance tally based on monitoring during the 2017 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 2017 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***	**Copper, Dissolved[1]**	**Chlorpyrifos**	**Methomyl**	***C. dubia* Toxicity**	***S. capricornutum* Toxicity**	***P. promelas* Toxicity**
Ash Slough@ Ave 21			1				1					
Berenda Slough along Ave 18 1/2							2					
Black Rascal Creek @ Yosemite Rd	2											
Canal Creek @ West Bellevue Rd		1	1	1		2	2			1	1	1
Cottonwood Creek @ Hwy 20							1					
Deadman Creek @ Gurr Rd	3	1					1					
Deadman Creek @ Hwy 59	2	1					1					
Dry Creek @ Rd 18	2	1	1			2	9					
Dry Creek @ Wellsford Rd/Church St	4	1		1		6						
Hatch Drain @ Tuolumne Rd	7		8								3	
Highline Canal @ Hwy 99	1	2		2		2	3		1			
Hilmar Drain @ Central Ave	2		3								2	
Howard Lateral @ Hwy 140	1	1					3					
Lateral 5 1/2 @ South Blaker Rd			4		8	2					4	
Lateral 6 and 7 @ Central Ave	3	1	4	1	4							
Levee Drain @ Carpenter Rd	5		4								1	
Livingston Drain @ Robin Ave		1					3					
Lower Stevinson @ Faith Home Rd		5	3		3							
Miles Creek @ Reilly Rd	3					4	1	1		1		
Mootz Drain downstream of Langworth Pond	2		1									
Mustang Creek @ East Ave	4		1				2					
Prairie Flower Drain @ Crows Landing Rd	11		11					1		2	2	
Unnamed Drain @ Hogin Rd	7		7									
Westport Drain @ Vivian Rd	1		1									
Total	**58**	**15**	**50**	**5**	**17**	**19**	**34**	**2**	**1**	**4**	**14**	**1**

STATUS OF TMDLS

On October 3, 2017, the State Water Resources Control Board (SWRCB) adopted Resolution R5-2017-0059, approving the 303(d) List portion of the 2014 and 2016 California Integrated Report. On February 5, 2018, the SWRCB submitted the 2014 and 2016 California Integrated Report (303(d) and 305(b) Lists to the US EPA. According to the SWRCB's final 303(d) and 305(b) Integrated Report, several waterbody/pollutants have been newly delisted (Table 81).

Table 81. Proposed 2014 SWRCB Integrated Report delisting's from the 2012 Central Valley 303(d) List for waterbodies within the ESJWQC.
Changes listed in Appendix A of the Regional Board's Clean Water Act Section 303(d) and 303(b) Integrated Report for the Central Valley Region, Final Staff Report.

Water Body	Pollutant	Delisted from 303 (d) List:	
		TMDL Required	Addressed by US EPA Approved TMDL
Ash Slough (Madera County)	Chlorpyrifos	X	
Cottonwood Creek (S Madera County)	Toxicity	X	
Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	Diazinon	X	
Merced River, Lower (McSwain Reservoir to San Joaquin River)	Diazinon	X	
	Indicator Bacteria	X	
Miles Creek (Merced County)	Diuron	X	
San Joaquin River (Bear Creek to Mud Slough)	Boron	X	
	Chlorpyrifos		X
	Indicator Bacteria	X	
San Joaquin River (Merced River to Tuolumne River)	Boron		X
Total Delisted		**8**	**2**

Appendix A Proposed Changes to the 2012 Central Valley 303(d) List is available at:
https://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/2014_303d_305b/appendix_a.pdf

Monitoring to evaluate compliance with approved TMDLs from the US EPA approved 2012 303(d) List occurred in the Coalition region during the 2017 WY for chlorpyrifos and diazinon. In subwatersheds where a TMDL constituent management plan is triggered, the Coalition conducts source identification and outreach and education to notify members of the impairment. Coalition efforts include holding outreach meetings with growers, encouraging the implementation of and evaluating the efficacy of management practices, MPM, and addressing the seven surveillance and monitoring objectives for chlorpyrifos and diazinon as described in the Basin Plan. Intensive outreach to individual members and documentation of implemented management practices occur every year. Furthermore, the Coalition conducts annual meetings to provide growers with information on management practices designed to improve water quality.

Pyrethroid Basin Plan Amendment

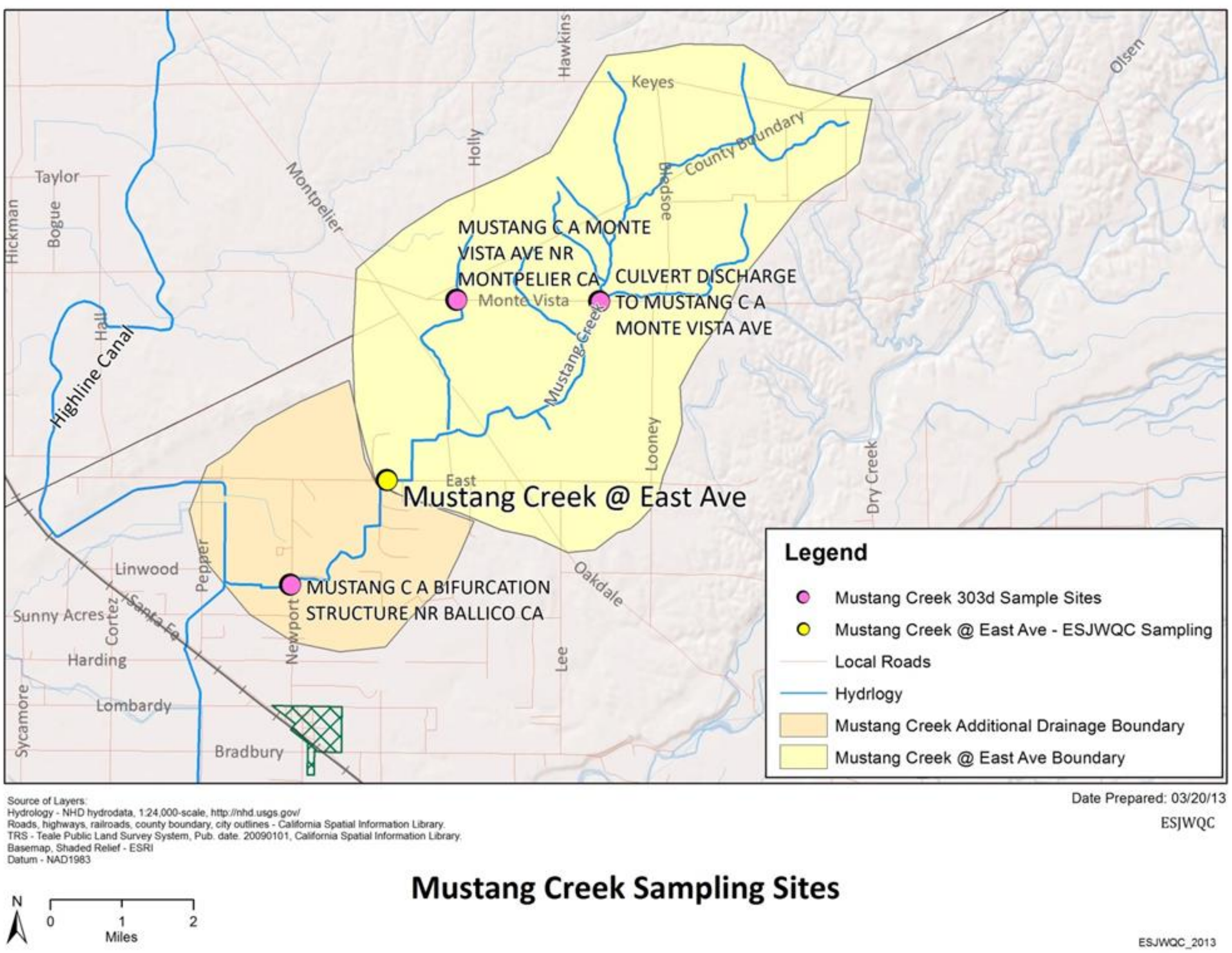
The Pyrethroid Basin Plan Amendment for the Sacramento and San Joaquin River Basins has been in development since 2012. Since 2012, Regional Board staff held nine stakeholder meetings to discuss regulatory approaches and technical issues. On January 25, 2017 a draft Pyrethroid Basin Plan Amendment and Staff Report were released for public review. On June 8, 2017, the Regional Board adopted Resolution R5-2017-0057. Before becoming fully effective, the Pyrethroid Basin Plan Amendment must be approved by the SWRCB, the Office of Administrative Law, and the US EPA.

The amendment for the control of pyrethroid pesticide discharges for the Sacramento River and San Joaquin River Basins addresses waterbodies that are listed as impaired by pyrethroid pesticides on the 303(d) List. There are 14 waterbodies listed as impaired due to pyrethroid pesticide concentrations in sediment and/or surface water. Because pyrethroids have additive toxic effects, the concentration goals proposed for prohibition triggers and TMDL numeric targets are based on the sum of the concentration of six individual pyrethroids relative to their individual water quality criteria. The proposed concentration goals are expressed as "freely dissolved" concentrations and include a formula to calculate the freely dissolved concentrations to account for bioavailability. Because pyrethroids tend to bind to sediments and organic matter they are less bioavailable to aquatic organisms.

Within the ESJWQC region, Mustang Creek is listed as impaired for pyrethroids. Samples collected between November 2002 and March 2004 from Mustang Creek were tested for cis-Permethrin. Exceedances were detected in February 2004 from three locations within the Mustang Creek subwatershed as shown in Figure 33. The ESJWQC monitored for cis-Permethrin from 2006 through 2008, nine samples were analyzed and no exceedances occurred. In addition, ESJWQC monitored for sediment toxicity to *H. azteca* at the Mustang Creek @ East Ave site subwatershed from 2006 through 2010 and again in 2014 and 2015. Of the nine sediment sampling events, one resulted in an exceedance of the WQTL for sediment toxicity to *H. azteca* in March 4, 2008 (78% survival compared to the control). Currently, there is no management plan in place for pyrethroids in the Coalition region.

Once the Pyrethroid Basin Plan amendment is officially approved, the Coalition will monitor for pyrethroids in Coalition surface waters if the results of the PEP indicate that pyrethroids are used in the watershed. If one exceedance of a pyrethroids occurs, the ESJWQC will initiate management plans for these pesticides.

Figure 33. Monitoring sites with exceedances of cis-Permethrin in February 2004 in the Mustang Creek subwatershed.



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 effort for assessing compliance with the LSJR concentration-based loads at the six compliance points identified in the Basin Plan Amendment.

To assess compliance with the loading capacity objective, the ESJWQC monitored three of the six compliance points: San Joaquin River at Hills Ferry Road, San Joaquin River above Maze Boulevard, and the San Joaquin River at the Airport Way Bridge near Vernalis. Monitoring occurred once for storm monitoring in January and from May through September during the 2017 WY. The WSJRWC monitored the remaining three sites identified in the Basin Plan Amendment: San Joaquin River at Highway 165 near Stevinson, San Joaquin River at Las Palmas Avenue near Patterson, and San Joaquin River at Sack Dam. As part of the Delta RMP exchange, the San Joaquin River at the Airport Way Bridge near Vernalis site was monitored by the USGS in January, May, and June. The Delta RMP monitoring exchange ended July 2017; therefore, the ESJWQC monitored the San Joaquin River at the Airport Way Bridge near Vernalis site in July, August, and September of 2017 for TMDL monitoring. To assess compliance with Monitoring Objectives 2-7 (listed in the TMDL Monitoring section of this report); the Coalition assesses results and outcomes of actions taken to meet the specifications of both Coalition's ILRP monitoring programs. Results from the 2017 WY will be reported in the 2017 WY San Joaquin River Chlorpyrifos and Diazinon TMDL AMR (submitted May 1, 2018).

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 has conducted its management plan process and focused outreach efforts from 2008 through the 2017 WY in 25 site subwatersheds (eight sites have been the focus of outreach efforts more than once). 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 Beneficial Uses (BUs) are protected (Protecting Beneficial Uses section below), how pesticide applications and monitoring results have changed over time (Trends In Coalition Monitoring Results section below), and what implemented management practices in the Coalition region improved water quality and led to the completion of management plans (Grower Compliance with WDR section below).

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 2017 WY monitoring data to determine if BUs are 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 and BUs are considered protected if no exceedances of WQTLs occur during monitoring events. During the 2017 WY, multiple exceedances of WQTLs impaired BUs in Waters of the State (Table 82); therefore, not all receiving waters are meeting applicable WQOs. In total, the Coalition monitors 32 tributaries to the San Joaquin River, Merced River, and Tuolumne River. The Coalition does not monitor any tributaries to the Stanislaus 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 83 lists each site monitored and the immediate downstream waterbody. The section below provides BU status for Merced, San Joaquin, and Tuolumne rivers and tributaries monitored in the ESJWQC.

AQ Life

Exceedances of the WQTLs for DO (45%), dissolved copper (45%) ammonia (8%), chlorpyrifos (1%), and methomyl (1%) resulted in impairments to the AQ Life BU for all three major waterbodies in the Coalition (Figure 34). Twenty-eight tributaries were monitored for constituents that could impair AQ Life BUs; seven tributaries were protective of the AQ Life BU (21% protective).

Agriculture Supply

During the 2017 WY, 50 exceedances of the WQTL for SC resulted in impairment of the AG BU for the Merced, Tuolumne, and San Joaquin Rivers. Twenty-eight sites were monitored for SC, 14 of which were protective of the AG BU (50% protective). Forty-seven of the exceedances occurred at monitoring sites located in Zone 2, tributaries to the San Joaquin River (Appendix I, Table 1). Salt is the only constituent monitored by the Coalition that can cause impairment to AG BU and therefore SC is not included in Figure 53 or the discussion below.

Municipal and Domestic Supply

Exceedances of the WQTL for nitrate (54%), ammonia (36%), chlorpyrifos (7%), and methomyl (4%) resulted in impairment of the MUN BU. Eleven tributaries were monitored for constituents that could impair the MUN BU; four tributaries were protective of the MUN BU (50% protective). Exceedances of the WQTLs for ammonia and methomyl 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. Six tributaries were monitored for *E. coli* and half of the tributaries were 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 2017 WY monitoring results, water quality is still not entirely protective of all BUs across the Coalition region.

Table 82. Exceedances of WQOs and number of times beneficial uses were impaired during the 2017 WY.

Major River	Beneficial Use	DO	SC	Ammonia	*E. coli*	Nitrate	Dissolved Metals (copper)	Pesticides (Chlorpyrifos)	Pesticides (Methomyl)
Merced River	AQ Life	5		3			7		1
	AG		5						
	MUN			3		3			1
	REC 1				4				
San Joaquin River	AQ Life	48		1			22	2	
	AG		44						
	MUN			1		12			
	REC 1				8				
Tuolumne River	AQ Life	6		1					
	AG		1						
	MUN			1					
	REC 1				7				
	Total Exceedances	**59**	**50**	**10**	**19**	**15**	**29**	**2**	**2**

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 34. Percentages of impairments of BUs due to exceedances of WQTLs during the 2017 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.

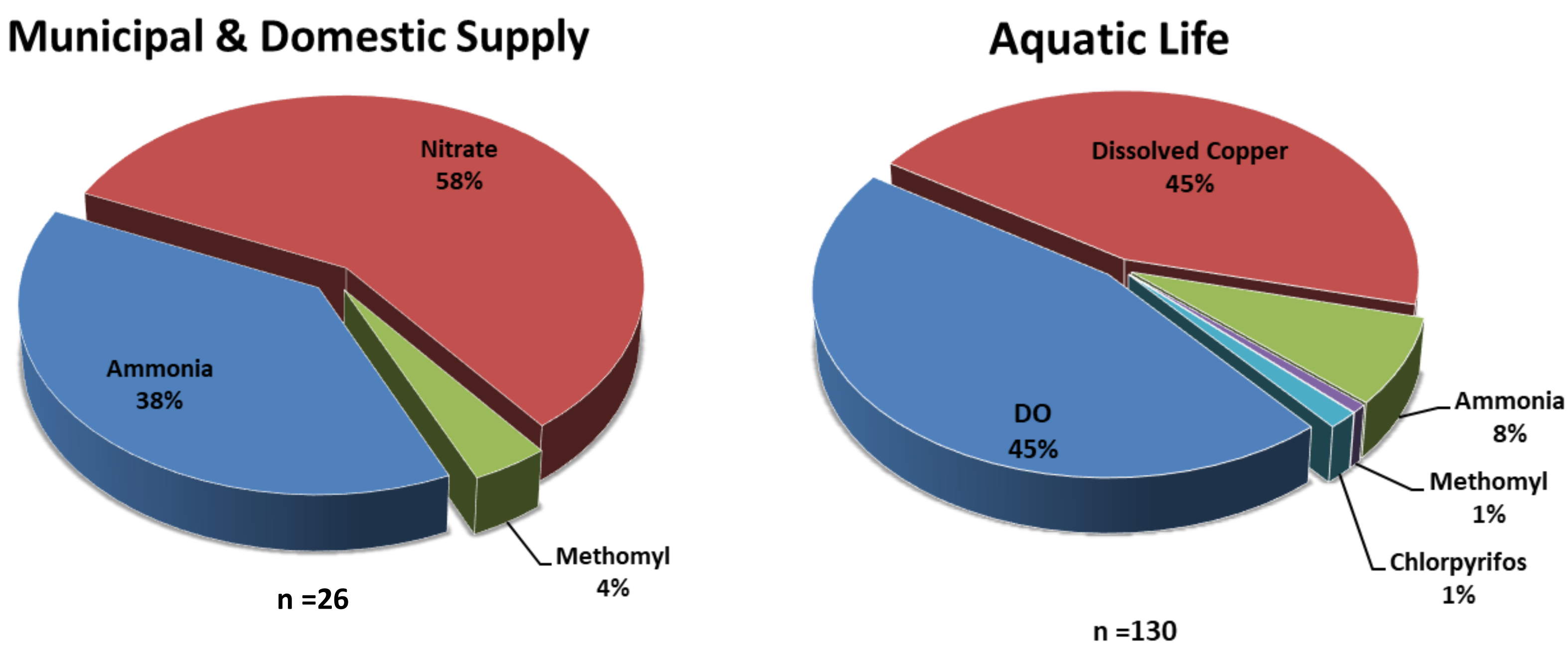


Table 83. Evaluation of beneficial uses applied to 2008-2017 WY monitoring locations (alphabetical by Zone).
'X' indicates no sampling occurred during the years specified. Blue highlights indicate protected BUs in the 2017 WY when the same BU and monitoring site were impaired in one or more previous years.

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

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

Zone	Monitoring Site (Focused Outreach Timeline)	Immediate Downstream Waterbody	Beneficial Use Immediate Downstream Waterbody	Water Quality Results Indicate BU is Protected					
				2012	2013	2014 WY	2015 WY	2016 WY	2017 WY
	Howard Lateral @ Hwy 140 (2015-2017)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	Yes	X	X	X	No
			AG	X	Yes	Yes	No	Yes	X
			REC 1	X	X	X	X	X	Yes
			AQ Life	X	No	Yes	No	No	X
	Livingston Drain @ Robin Ave (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	X	No	X	No
			AG	Yes	Yes	Yes	Yes	Yes	X
			REC 1	X	X	X	X	X	Yes
			AQ Life	No	Yes	Yes	No	No	X
	McCoy Lateral @ Hwy 140 (2016-2018)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	X	X	X	X
			AG	Yes	Yes	X	X	X	X
			REC 1	No	X	X	X	X	X
			AQ Life	No	No	X	X	X	X
	Merced River @ Santa Fe Rd/ Merced River @ Oakdale Rd[3] (2013-2015)	Merced River (McSwain Reservoir to SJ River)	MUN	Yes	Yes	Yes	Yes	X	X
			AG	Yes	No	Yes	Yes	Yes	No
			REC 1	Yes	No	No	Yes	X	X
			AQ Life	Yes	No	Yes	No	No	No
	Unnamed Drain @ Hwy 140 (2016-2018)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	Yes	X	X	X	No
			AG	X	Yes	No	Yes	Yes	No
			REC 1	X	No	X	X	X	X
			AQ Life	X	No	No	Yes	Yes	No
5	Deadman Creek @ Gurr Rd (2012-2014)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	X	X	X	X
			AG	Yes	Yes	No	Yes	Yes	No
			REC 1	X	X	X	X	X	X
			AQ Life	Yes	No	No	Yes	No	Yes
	Deadman Creek @ Hwy 59 (2012-2014)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No	Yes	X	X	X	X
			AG	Yes	Yes	Yes	Yes	Yes	No
			REC 1	No	X	X	X	X	X
			AQ Life	No	Yes	Yes	Yes	No	Yes
	Duck Slough @ Gurr Rd (2010-2012)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	No	Yes	No	No	No
			AG	Yes	No	No	No	Yes	No
			REC 1	No	No	No	No	X	X
			AQ Life	Yes	No	No	No	No	No
	Miles Creek @ Reilly Rd (2013-2015)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	Yes	X	Yes+	Yes	No
			AG	X	No	Yes	Yes+	Yes	Yes
			REC 1	X	No	X	X	No	Yes
			AQ Life	X	No	No	Yes+	No	No
6	Ash Slough @ Ave 21 (2015-2017)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	X	X	X	Yes+	X	X
			AG	X	X	Yes	Yes+	Yes	Yes

ZONE	MONITORING SITE (FOCUSED OUTREACH TIMELINE)	IMMEDIATE DOWNSTREAM WATERBODY	BENEFICIAL USE IMMEDIATE DOWNSTREAM WATERBODY	WATER QUALITY RESULTS INDICATE BU IS PROTECTED					
				2012	2013	2014 WY	2015 WY	2016 WY	2017 WY
			REC 1	X	X	X	X	X	X
			AQ Life	X	X	Yes	Yes+	Yes	Yes
	Berenda Slough along Ave 18 ½ (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	X	Yes+	X	X
			AG	Yes	Yes	Yes	Yes+	Yes	No
			REC 1	Yes	X	X	Yes+	X	X
			AQ Life	No	No	Yes	Yes+	No	Yes
	Cottonwood Creek @ Rd 20 (2010-2012)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes+	Yes	Yes+	Yes	X	X
			AG	Yes+	Yes	Yes+	Yes	Yes+	No
			REC 1	Yes+	No	Yes+	X	X	X
			AQ Life	Yes+	No	Yes+	Yes	X	Yes
	Dry Creek @ Rd 18 (2011-2013)	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes	Yes	No	Yes	Yes	Yes
			AG	Yes	Yes	Yes	Yes	Yes	Yes
			REC 1	X	No	X	No	No	No
			AQ Life	Yes	No	No	No	No	Yes

*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.
X-Site was not scheduled for sampling during the WY.
[1]The evaluation of BUs for Dry Creek considers results from both the upstream (@ Wellsford Rd) and downstream (@ Church St) locations.
[2]The evaluation of BUs for Mootz Drain considers results from both the upstream (@ Langworth Pond) and downstream (downstream of Langworth Pond) locations.
[3]The evaluation of BUs for Merced River considers results from both the downstream (@ Santa Fe) and upstream (@ Oakdale Rd) 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 2017 WY reflect water quality nine 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

The temporal trend analysis (2008 vs. 2017 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 Coalition's Management Plan Strategy and the implementation of new management practices designed to reduce discharge of applied agricultural constituents.

Monitoring during the 2017 WY resulted in exceedances of pesticides and metals: chlorpyrifos (2), copper (29), and methomyl (1). However, 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.

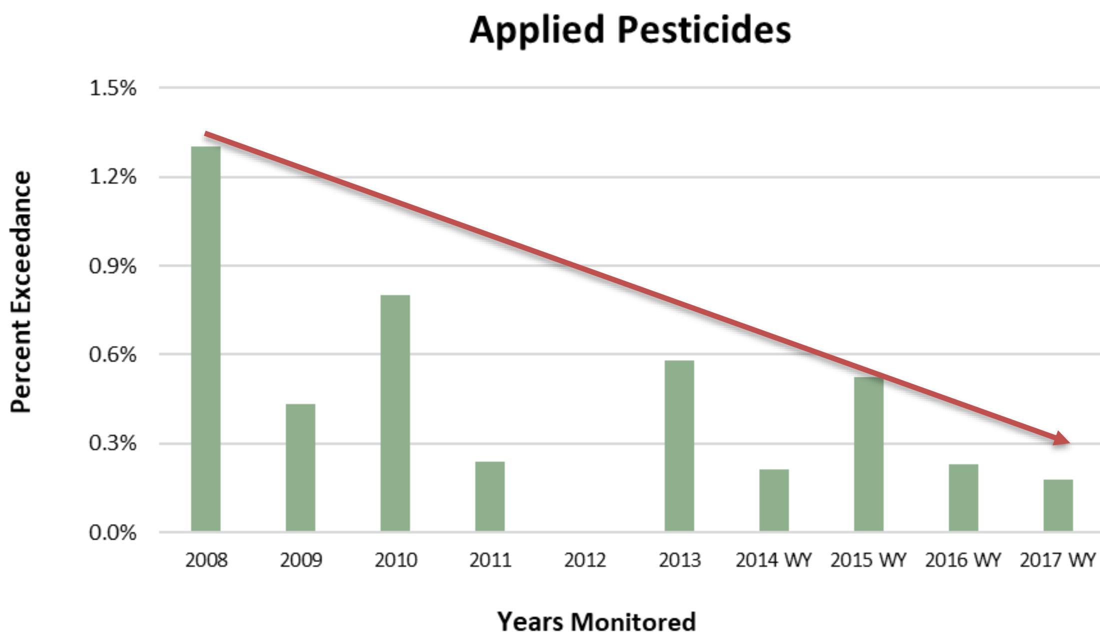
The Coalition analyzed monitoring data for the two primary groups of constituents applied by agriculture: applied metals and pesticides. Metals applied by agriculture are copper and zinc; however, copper was the only applied metal to be detected above the hardness based WQTL from January 1, 2008 through the 2017 WY and therefore only copper was included in the applied metals analysis below.

Pesticides: 2008-2017 WY

The most significant decline in exceedances of pesticides occurred directly after focused outreach began in 2008 and 2009 (Table 84). The percent of exceedances of WQTLs for 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 2017 WY where only 0.2% resulted in exceedances (Figure 35). Figure 35 depicts the change over time of the percentage of exceedances for pesticides from 2008 through the 2017 WY.

Of the pesticides, chlorpyrifos remains a constituent of concern and the Coalition continues to focus its outreach efforts on recommending members implement additional management practices designed to improve water quality. Overall, monitoring results from 2008 through the 2017 WY indicate that focused outreach the implementation of management practices is resulting in improved water quality; hence, numerous management plans have been approved for completion. As of 2017, chlorpyrifos management plans in 16 site subwatersheds have been approved for completion (60% of chlorpyrifos management plans). The Coalition also believes that some exceedances of the chlorpyrifos WQO are the result of discharge from non-member farming operations and it may be difficult to eliminate all exceedances in the future.

Figure 35. Percentages of exceedances of WQTLs for pesticides from 2008-2017 WY in the ESJWQC.
Sample counts include analyzed and dry monitoring events.



Applied Metals: 2008-2017 WY

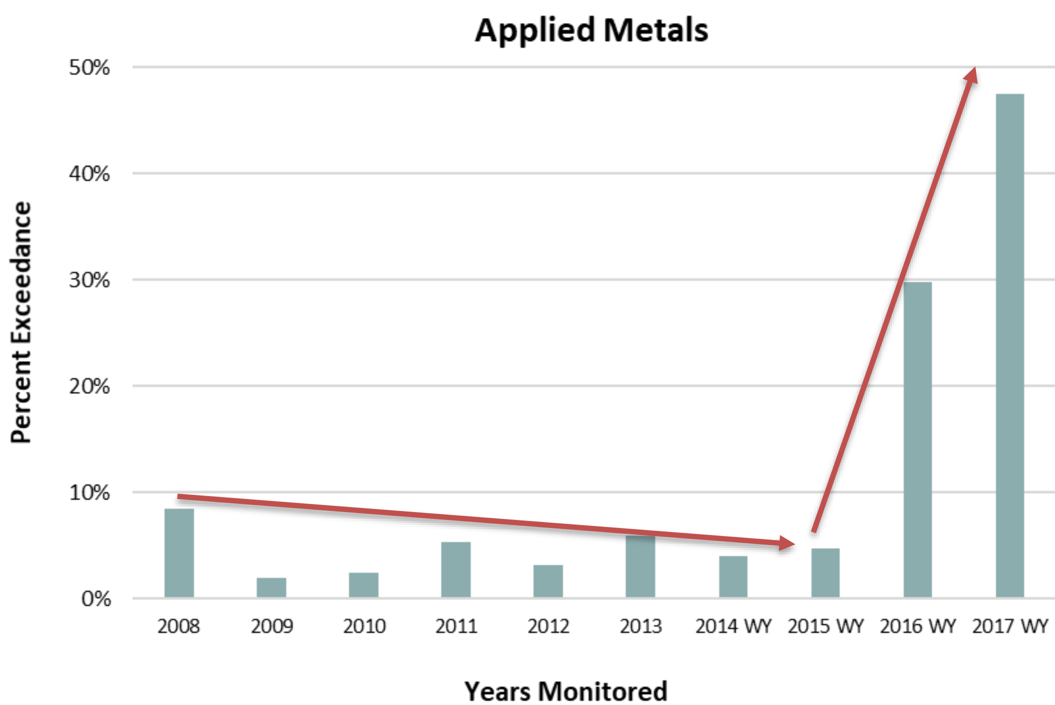
The percentage of exceedances of the WQTL for copper from 2008 through the 2015 WY remained fairly consistent with less than 6% of samples resulting in exceedances of the hardness based WQTLs. Since the 2016 WY, exceedances of the hardness based WQTL for dissolved copper have occurred more frequently. In the 2016 WY, exceedances of dissolved copper occurred 20 times and 29 times during the 2017 WY (47.5 % of samples analyzed). Figure 36 depicts the changes over time in the percentage of exceedances for copper from 2008 through the 2017 WY. An increase in the number of dissolved copper exceedances could be attributed to a number of reasons, including:

1. Reduced water hardness due to less groundwater use for irrigation,
2. Fewer samples collected and analyzed for dissolved copper,
3. Increased herbicide applications due to algal proliferation during wet years, and
4. Increased precipitation in the last few years.

The water used for irrigation during the 2016 and 2017 WYs is different from the water used in the previous several years. During the 2016 and 2017 WYs, increased surface water supplies allowed growers to use surface water rather than groundwater. Groundwater is much harder (see below) than surface water and the use of surface water with lower hardness results in a larger number of exceedances. The Coalition evaluated the potential impact of each one of the factors below.

Figure 36. Percentages of exceedances of WQTLs for total and dissolved copper from 2008-2017 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.



In the past four years of monitoring, exceedances of dissolved copper have occurred in Zones 3 through 6. Most of the sites located in Zone 3 through 6 are utilized for water delivery during the irrigation season and are typically dry or non-contiguous when not in use by irrigation districts. Since the dissolved copper trigger limit is calculated based on the calcium carbonate concentration (hardness) of the water, the Coalition charted the average hardness concentrations of samples collected in Zones 3 through 6 from the 2014 WY through the 2017 WY (Figure 37). The 2014 and 2015 WYs were exceedingly dry and the 2016 and 2017 WYs were wet years. It was observed that the average hardness of samples collected in Zones 3 through 6 decreased during the 2017 WY (64 mg/L) compared to the 2014 WY (89 mg/L). The main changes in hardness concentrations were observed in Zones 5 and 6 and correlate with a rise in dissolved copper exceedances (Figure 38). Exceedances in Zone 5 didn't occur during the 2014 and 2015 WY and started to occur in the 2016 and 2017 WY. The same scenario occurred within Zone 6, one exceedance occurred during the 2014 WY, compared to 13 exceedances during the 2017 WY. The observed change in water hardness and frequency of copper exceedances is explained by the change in the source of the irrigation water. During the drought period, many growers were using groundwater to irrigate their fields, which has an elevated hardness relative to surface water.

Increased precipitation was observed during the 2016 and 2017 WYs compared to the 2014 and 2015 WYs (Modesto, Merced, Madera):

- 2014 WY, 4.85 inches,
- 2015 WY, 8.14 inches
- 2016 WY, 14.86 inches
- 2017 WY, 15.76 inches,

Increased levels of precipitation allow rainwater to flow through the sample sites before minerals can be absorbed increasing hardness. The elevated levels of precipitation also result in runoff to waterbodies in regions of the Coalition (Zones 3-6) where naturally occurring copper exists. Therefore, the hardness of the sample water collected from these sites was very low and natural copper levels were higher in the waterbody resulting in lower hardness WQTLs and an increase in exceedances compared to previous years.

The average dissolved copper concentration in samples collected in Zone 6 during the 2017 WY was 5.77 µg/L and the average hardness was 30 mg/L (2017 WY). Samples collected in Zone 6 during the 2014 WY for dissolved copper had an average concentration of 7.48 µg/L and hardness value of 147.5 mg/L. The concentrations of dissolved copper measured during the 2014 WY were not in exceedance of the hardness based WQTL; however, if the hardness was reduced to 30 mg/L, all concentrations measured during the 2014 WY would have resulted in exceedances. The combination of a slightly higher copper concentration and much lower hardness resulted in significantly more copper exceedances during the 2017 WY compared to the 2014 WY.

Figure 37. The average concentration of $CaCO^3$ (hardness) within Zones 3-6 from 2014 WY through 2017 WY.

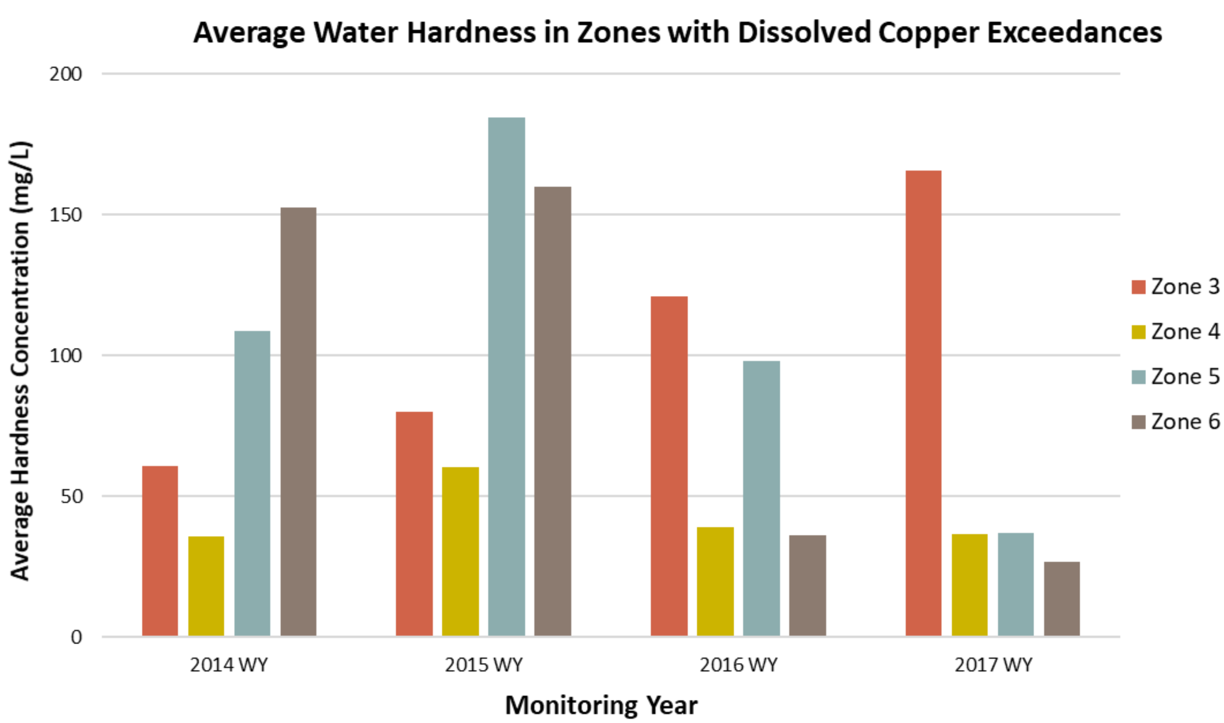
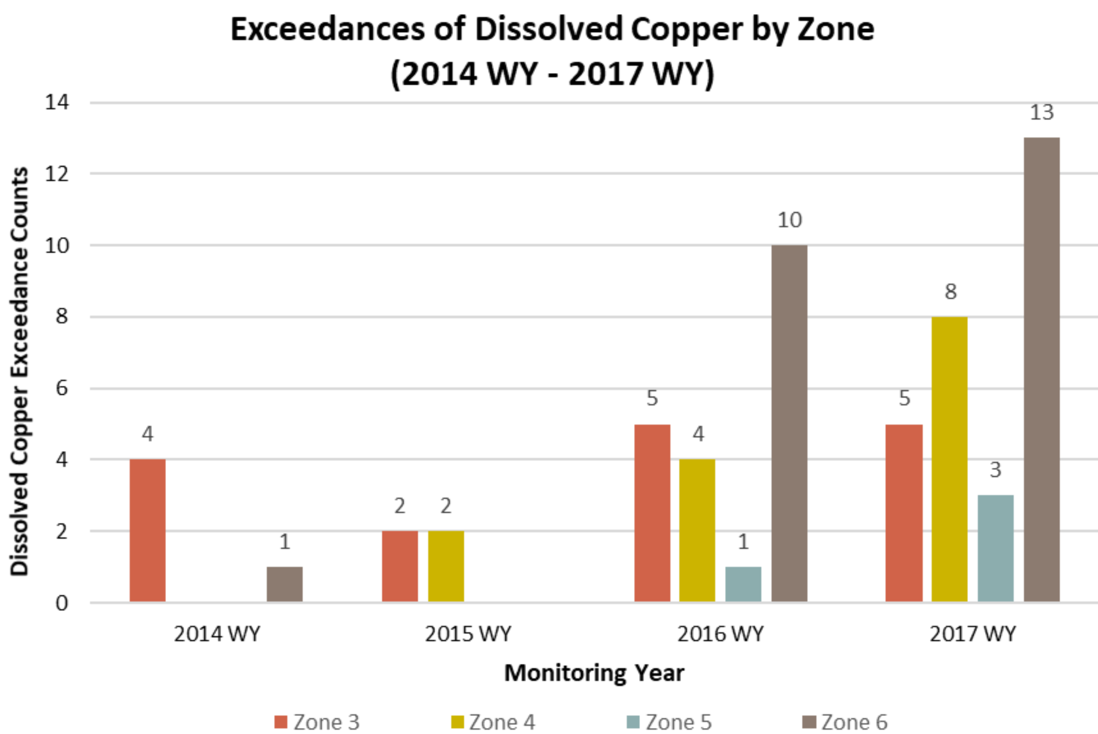


Figure 38. Count of copper exceedances that have occurred by Zone from the 2014 WY through the 2017 WY.



Furthermore, during the 2017 WY fewer samples were required to be collected for copper analysis based on an updated approach for determining the timing and frequency of monitoring (126 during the 2014 WY compared to 61 during the 2017 WY). With fewer samples collected and analyzed each year, the percentage of exceedances each year increases even if the number of exceedances stays the same. Twenty-nine exceedances of hardness based WQTLs for dissolved copper occurred during the 2017 WY, 47.5% of samples collected and analyzed (Table 84). Samples were collected in Zones 3-6 more frequently during the 2017 WY than in previous years and therefore a greater number of exceedances occurred.

Table 84. Percentages of exceedances of WQTLs for applied metals and pesticides from 2008-2017 WYs.
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	220	5.9%
2014 WY	4	1,893	0.2%	5	126	4.0%
2015 WY	10	1,915	0.5%	4	84	4.8%
2016 WY	4	1,741	0.2%	20	67	29.9%
2017 WY	3	1,681	0.2%	29	61	47.5%

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.

Spatial Trends

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 for chlorpyrifos, diuron, nutrients, bacteria, and field parameters was unsuccessful because of many different factors explained in the 2014 and 2015 Annual Reports. It was observed that copper exceedances primarily occurred in Zones 3-5, but it was unclear what was contributing to the exceedances. It was concluded that the Coalition would continue efforts to inform growers on application timing but that ultimately the practices had little effect on the frequency of exceedances.

A spatial trend for dissolved copper exceedances was identified when evaluating the increase in observed copper exceedances in Zones 3-6. Within Zones 3-6, and the recent wet years in the region, it is apparent that copper exceedances are directly linked to the status of water supply. Zones 3-6 rely on water deliveries or groundwater to irrigate their fields. During the drought period (2013-2015 WY), the Coalition had a decrease in copper exceedances within Zones 3-6. However, during times of sufficient surface water availability, the Coalition observed an increase in dissolved copper exceedances within Zones 3-6. During times of drought or insufficient surface water availability, many of these growers utilize groundwater to irrigate their fields, which has higher a higher mineral content, leading to higher hardness based WQTLs for dissolved copper. During times of sufficient water supply, these same growers now receive their irrigation water from irrigation districts delivering surface water. The surface water has a very low mineral content, thereby reducing the hardness based WQTL for dissolved copper.

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 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. The Farm Evaluation summary and NMP Summary Report Analysis are being reported July 1, 2018.

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 reviewed: 1) what management practices are being implemented to reduce the impacts of irrigated agriculture within the Coalition boundaries, and 2) where the management practices are being implemented. The Coalition can assess management practices implemented by growers via their FEs and/or focused outreach results. Based on the revised Order (R5-2012-0116-R4) approved February 7, 2018, the Coalition will provide FE responses on July 1 annually. Therefore, the discussion on the efficacy and application of implemented management practices is based on 2017 FE responses (2016 practices). However, because members do not tend to change successful practices annually, the Coalition expects the responses for each FE question will be consistent from year to year.

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 on results from 2016 FEs, members in the Coalition region implemented pesticide application practices on 94% of irrigated acreage managed by members within the Coalition (690,568 irrigated acres). Practices included following label restrictions (94% of irrigated acreage), spray drift management (73%), and use of vegetated drain ditches (23%; 2016 AMR).

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, 85% of the Coalition's acreage was irrigated using drip or micro spray. Two hundred and ninety-three members have increased the efficiency of their irrigation practices by having recirculation/tailwater return systems installed on their farm (20% irrigated acreage). There are 209 members who utilize retention ponds/holding basins to prevent irrigation tailwater from entering protected waterways (114,247 acres, 17% of irrigated acreage). Implementing these types of practices greatly reduces the amount of irrigation drainage, completely removing a method of transport of farming chemicals to major waterways.

The simple but effective practice of allowing grass filter strips to grow between the rows of crops and around waterways is highly encouraged and implemented by many members across the Coalition region. FE responses on 2016 surveys indicate almost 2,000 members with 680,000 irrigated acreage implement one of the three management practices focused on utilizing native vegetation, filter strips, and vegetated ditches. 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 2017 WY monitoring results as no exceedances of the WQTL for diazinon, diuron, or malathion occurred and no sediment toxicity *H. azteca* occurred (Figure 39; Figure 40). During the 2017 WY, there was an increase in the number of copper exceedances and exceedances of chlorpyrifos occurred in 2% of samples. An evaluation for each exceedance is provided in the Discussion of Surface Water Monitoring Results section of this report. An increase in toxicity to *S. capricornutum* was observed during the 2017 WY; however, due to inconclusive TIEs it is unclear what the exact cause of the toxicity is.

To encourage the implementation of more substantial and 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 across the entire Coalition region. 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 who were asked to implement additional practices and then track whether new practices were implemented.

A summary of 2017 Farm Evaluation responses and management practices implemented by Coalition members will be provided in the July 1, 2018 report on management practices and nitrogen use. 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 75 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 and 2016 Focused Outreach subwatersheds.

Members are constantly changing membership status and 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 72 management plans in 23 site subwatersheds. Sixteen 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 sites and overall management plans remaining than ever before (Table 78). Since focused outreach began in 2008, the number and percentage of exceedances for chlorpyrifos, diazinon, diuron, and malathion have declined substantially (Figure 39). Figure 39 depicts the changes in exceedances and applications of chlorpyrifos, copper, diazinon, diuron, and malathion from 2008 through the 2017. Overall, the use of chlorpyrifos has declined since 2009 and use of diazinon, diuron, and malathion has remained consistently low; with exceedances of the WQTLs for chlorpyrifos, diazinon, diuron, and malathion declining since 2008. Use of copper has increased since 2008, (most considerably during the 2016 and 2017 WYs); the frequency of exceedances has increased with copper use. A detailed explanation of the correlation between copper use and exceedances is provided in the Temporal Trends section of the report.

The Coalition has received approval to completed 24 management plans for water column toxicity and currently 15 management plans for toxicity remain. Ten of the fifteen management plans are for toxicity to *S. capricornutum*. In Figure 40, toxicity is charted by species from 2008 through the 2017 WY. In general, the frequency of toxicity has declined since 2008; however, toxicity to *S. capricornutum* increased from 2014 through the 2017 WY. The increased use of herbicides and fungicides is likely influencing the percentage of copper exceedances and toxicity to *S. capricornutum*. In general, the Coalition's efforts are proving effective at completing management plans and reducing the number of exceedances.

Figure 39. Percent of exceedances for pesticides and copper from 2008 through 2017 WY compared to pounds of active ingredient applied within the Coalition region.

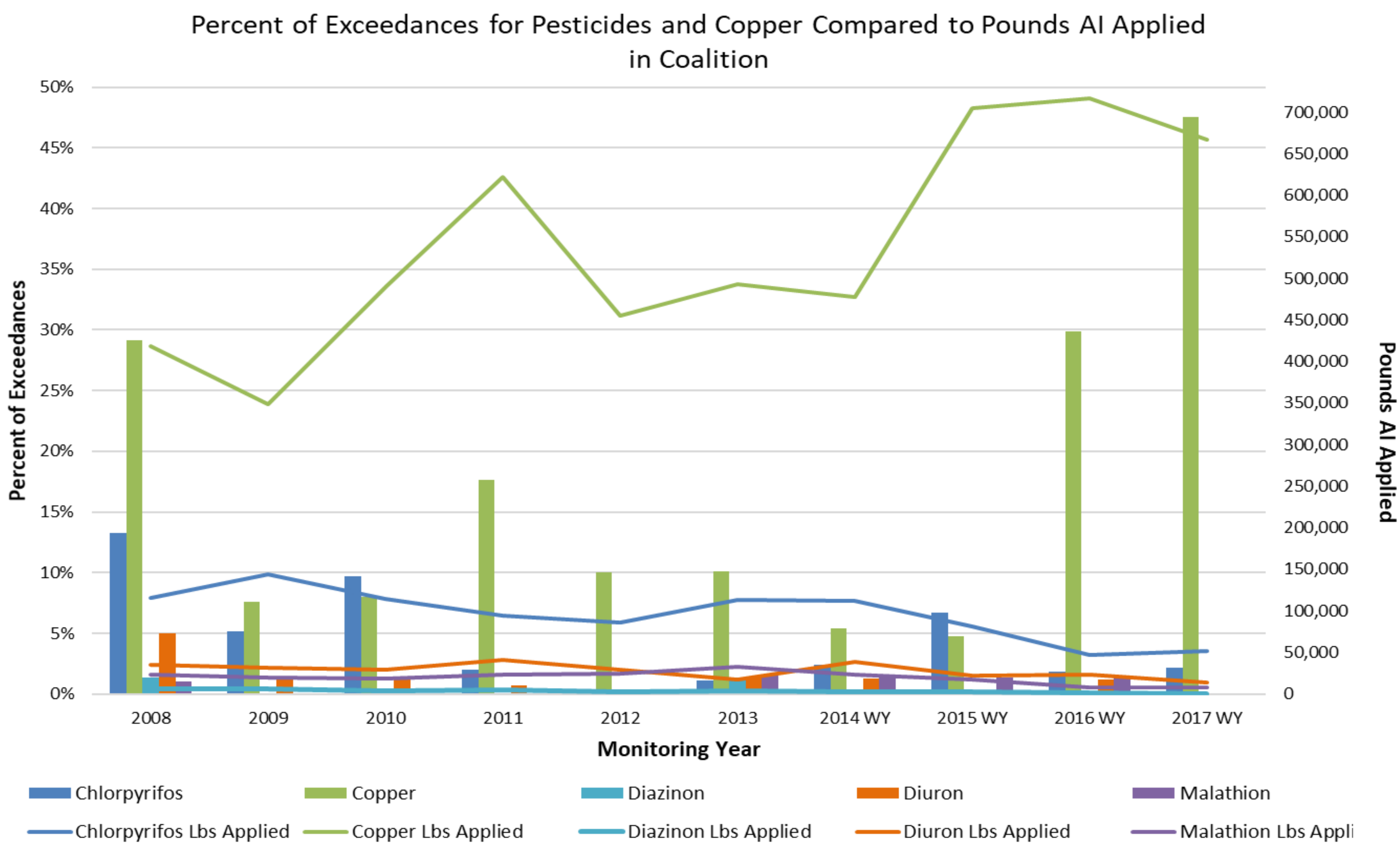
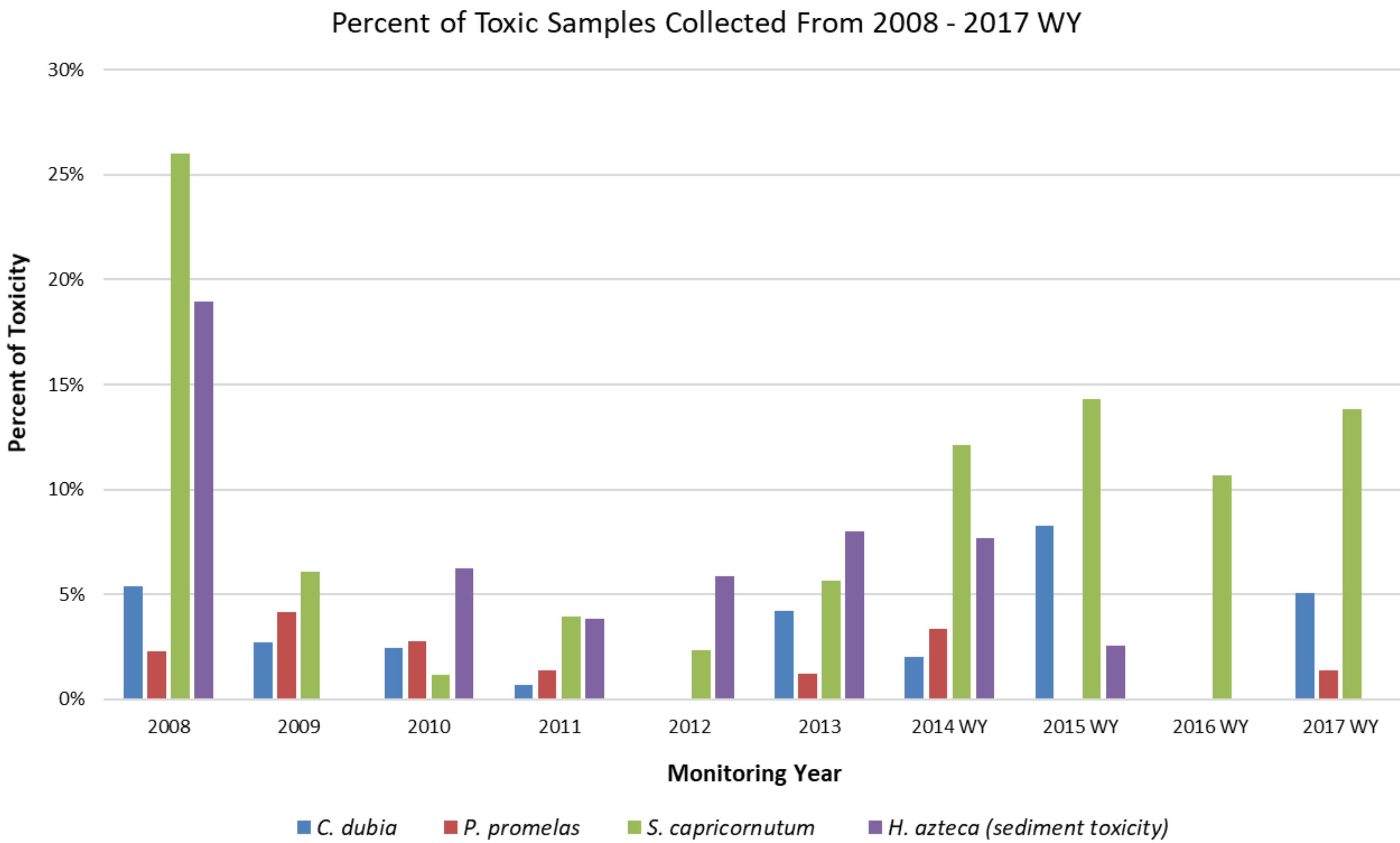


Figure 40. Percent of toxic samples collected from 2008 through the 2017 WY within the Coalition Region.



MITIGATION MONITORING REPORT

As stated in 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 2017 WY.

CONCLUSIONS AND RECOMMENDATIONS

Monitoring results from the 2017 WY indicate that although there are substantial improvements in water quality in many areas, several waterbodies in the Coalition region are still not protective of all BUs, often due to exceedances of field parameters and *E. coli*. The BUs impaired during the 2017 WY include:

- Aquatic Life (ammonia, chlorpyrifos, DO, dissolved copper, and methomyl),
- Agriculture (SC),
- Municipal and Domestic Supply (ammonia, nitrate, and methomyl),
- 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. During the 2017 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 and herbicides, not all inputs of copper in the watersheds are known, making it difficult to know the exact cause of exceedances. Furthermore, it is challenging to document improvements in water quality when the hardness based WQTLs for dissolved copper fluctuates with the use the groundwater or surface waters during periods of wet or dry winters.

Water column toxicity results from the 2017 WY, indicate toxicity to *Ceriodaphnia dubia* occurred in four samples and toxicity to *Pimephales promelas* occurred once (attributed to ammonia). Toxicity to *Selenastrum capricornutum* occurred is samples collected from five monitoring sites within Zone 2 and from Canal Creek in Zone 4. The Coalition plans to review the representativeness of the monitoring site Prairie Flower Drain @ Crows Landing Rd for Zone 2 based on the frequency of exceedances for SC, DO, nitrates, ammonia, *E. coli*, and toxicity. It has become more apparent over the years that the Coalition is attempting to complete management plans in a subwatershed where Coalition members are not the primary source of water quality impairments.

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. The Coalition's focused management practice outreach and tracking strategy is effective at improving water quality. Implementation of management practices continues to improve water quality in the Coalition region.
    a) 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.

3. Member actions may not be the main cause of water quality impairments associated with elevated concentrations of copper.
    a) Increased precipitation and use of surface water for irrigated resulted in a decrease in overall water hardness in Zones 4-6 causing an increase in observed dissolved copper exceedances with low copper concentrations.
4. Remaining exceedances may be difficult to eliminate because the cause/source of the problems may not be due to agriculture.
5. Continued improvements in water quality are expected in coming years based on results evident from past grower outreach efforts.
6. 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 response to each of 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 (2018 WY MPU; approved November 10, 2017).
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.
4. Coalition representatives will continue to emphasize the importance of preventing the off-site movement of constituents of concern.
5. 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.
6. Utilize the PEP to help determine if sources of increased algae toxicity are related to irrigated agriculture.

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 applications that could be a potential source of algae toxicity and contribution to metals exceedances.
2. Come up with a different method for determining dissolved copper exceedances that does not solely rely on the hardness of water.
3. Identify and regulate dairies in site subwatersheds that are using constituents of concern which may affect the BUs of downstream waterbodies.
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. Work with the SWAMP Toxicity Work Group to establish toxicity qualifier thresholds for *S. capricornutum, C. dubia, and P. promelas* as was done for *H. azteca* based on the August 27, 2014 SWAMP Toxicity Work Group Recommendation for Evaluation Toxicity Data (Attachment B).

a) Allow the Coalitions to review past water column toxicity for *S. capricornutum* and petition to eliminate management plans based on a new threshold value.

REFERENCES

Amweg, E. L., Weston, D. P., and Ureda, N. M. (2005). Use and Toxicity of Pyrethroid Pesticides in the Central Valley, California, USA. Environmental Toxicology and Chemistry.

California Department of Pesticide Regulation (DPR). (2014). Proposed regulation to designate chlorpyrifos a restricted material. Available online: http://www.cdpr.ca.gov/docs/dept/pmac/2014/1113_segawa_pmac_chorpyrifos_111314.pdf (Accessed February 13, 2017).

California Department of Water Resources, Division of Flood Management (CA DWR). n.d.1. Dissolved oxygen data for station Rough and Ready Island (RRI). California Data Exchange Center (CDEC). Available online: http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=RRI&dur_code=E&sensor_num=61&start_date=01/01/2012+00:00&end_date=12/31/2012+00:00 (Accessed February 27, 2013).

California Department of Water Resources, Division of Flood Management (CA DWR). n.d.2. Flow data for station Rough and Ready Island (RRI). California Data Exchange Center (CDEC). Available online:http://cdec.water.ca.gov/cgiprogs/selectQuery?station_id=RRI&dur_code=E&sensor_num=20&start_date=01/01/2011+00:00&end_date=01/01/2013+00:00 (Accessed February 27, 2013).

California Department of Water Resources. (2013). Irrigated Crop Acres & Water Use. Retrieved February 12, 2013, from California Department of Water Resources: http://www.water.ca.gov/landwateruse/anaglwu.cfm

California Department of Water Resources. (2013). Land Use Survey Overview. Retrieved February 12, 2013, from California Department of Water Resources:

California Department of Water Resources. (2013). San Joaquin Valley Agricultural Drainage. Retrieved February 12, 2013, from California Department of Water Resources: www.water.ca.gov/drainage/index.cfm

California Department of Water Resources. Department of Fish and Game. US Bureau of Reclamation. US Fish and Wildlife Services. (1990). A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley: http://www.water.ca.gov/wateruseefficiency/docs/RainbowReportIntro.pdf

East San Joaquin Water Quality Coalition. (2013). Retrieved February 12, 2013 from East San Joaquin Water Quality Coalition: http://www.esjcoalition.org/home.asp

Environmental Protection Agency. (2012). Retrieved March 20, 2015. Beef Production: http://www.epa.gov/agriculture/ag101/printbeef.html#bmanure

Extension Toxicology Network. (1996). Extoxnet-Pesticide Information Profiles, Dimethoate. http://extoxnet.orst.edu/pips/dimethoa.htm

Jiang, X., J. Morgan, and M.P. Doyle. 2002. Fate of Escherichia coli O157:H7 in manure-amended soil. Appl.Environ.Microbiol. 68:2605-2609.

M. Menconi, and J. Beckman, 1996. Hazard Assessment of the insecticide Methomyl to aquatic organisms in the San Joaquin River System. California Department of Fish and Game. Rancho Cordova, California. Available at: https://www.waterboards.ca.gov/water_issues/programs/tmdl/records/state_board/2010/ref3725.pdf

Newhart, K. 2006. Environmental Fate of Malathion. Department of Pesticide Regulation, Environmental Monitoring Branch, October 2006.

The Fertilizer Institute. (2017). Retrieved April 14, 2017. Nutrient Stewardship: http://www.nutrientstewardship.com/4rs/.

Weston, D. P., Ding, Y., Zhang, M., Lydy, J. J. (2013). Identifying the cause of sediment toxicity in agricultural sediments: The role of pyrethroids and nine seldom-measured hydrophobic pesticides. Chemosphere 90 (2013): 968-964. Elsevier.

Westcot, D., S. Rosenbaum, B. Grewell, and K. Belden. 1988. Water and sediment quality in evaporation basins used for the disposal of agricultural subsurface drainage water in the San Joaquin Valley, California. California Regional Water Quality Control Board Central Valley Region, July 1988.

Westcot, D. W., B. J. Grewell, and J. E. Chilcott. 1990. Trace element concentration in selected streams in California: a synoptic survey. California Regional Water Quality Control Board Central Valley Region, October 1990.