Monitoring and Reporting Program Plan

East San Joaquin Water Quality Coalition

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Prepared by MLJ-LLC

Table of Contents

LIST OF TABLES III

LIST OF FIGURES IV

LIST OF ACRONYMS V

INTRODUCTION 1

DESCRIPTION OF COALITION GROUP AREA 5

VALUABLE AQUATIC RESOURCES 28

BENEFICIAL USES 29

MONITORING STRATEGY 33

CORE MONITORING 33

ASSESSMENT MONITORING 34

SPECIAL PROJECT MONITORING 34

MONITORING SITES 36

SITE NAMES AND LOCATIONS 36

SITE SUBWATERSHED DESCRIPTIONS AND COALITION AREA MAPS 39

SITE SUBWATERSHED LAND USE 47

WATER AND SEDIMENT QUALITY MONITORING PLAN 50

ASSESSMENT MONITORING 50

CORE MONITORING 50

SPECIAL PROJECT MONITORING 54

MONITORING PARAMETERS 59

MONITORING PROTOCOLS 64

SAMPLE COLLECTION METHODS 64

QUALITY ASSURANCE 65

QUALITY CONTROL 73

REPORTING PLAN 74

EXCEEDANCE REPORTS 74

QUARTERLY DATA DELIVERABLES 74

ANNUAL MONITORING REPORT 75

MANAGEMENT PLANS 76

WATER QUALITY STATUS 79

WATER QUALITY STATUS AND MONITORING BACKGROUND 79

PROTECTION OF BENEFICIAL USES 87

SOURCES OF DISCHARGE **92**
AGRICULTURAL DRAINAGE 92
PESTICIDE USE REPORT DATA 92
AGRICULTURAL PRACTICES SUMMARY **93**
MANAGEMENT PRACTICES TO REDUCE WATER USE AND WASTE DISCHARGE 94
MANAGEMENT PRACTICES IMPLEMENTATION 96
COALITION CONTACT INFORMATION **97**

List of Tables

Table 1. Location of descriptions to address MRP requirements in the ESJWQC MRPP. 2

Table 2. Acreage of irrigated land in ESJWQC counties. 8

Table 3. Land use and soil percentages for ESJWQC zones. Table will be updated yearly; refer to the AMR for the most recent land use and soil percentage data. 10

Table 4. Primary water bodies that drain directly into the major rivers of the ESJWQC region and the beneficial use for each of the major rivers. Sites are sorted alphabetically by name. 30

Table 5. ESJWQC sampling locations for Assessment Monitoring. Two Assessment Monitoring locations will be monitored within each zone and will rotate every two years. Sites are sorted by zone number and site name. 37

Table 6. ESJWQC sampling locations for Core Monitoring (sorted by zone number). 38

Table 7. Acreage of crops grown in site subwatersheds of the ESJWQC region showing irrigated (I) and non-irrigated (NI) acres. Sites are listed alphabetically. 47

Table 8. Assessment Monitoring schedule. 50

Table 9. Core Monitoring schedule. 51

Table 10. Assessment and Core Monitoring schedule. C = Core Monitoring. A = Assessment Monitoring. 52

Table 11. List of water bodies within the ESJWQC that require TMDL monitoring. 56

Table 12. Coalition Monitoring parameters. 60

Table 13. Monitoring schedule for 2008 – 2010 including site name, ID, zone and constituent groups. Table will be updated yearly; see AMR for most recent monitoring schedule. 63

Table 14. Field and laboratory analytical methods. 68

Table 15. Laboratory analytical methods of constituents monitored for CWA 303(d) compliance. 72

Table 16. Annual and quarterly monitoring data submittal schedule. 75

Table 17. Summary tally of historical water quality monitoring data including toxic samples, pesticide detections and metal detections. 83

Table 18. Summary tally of Regional Ag Waiver monitoring results within the ESJWQC area. 85

Table 19. Summary tally of results from the Regional Board Organophosphate TMDL (2007). 86

Table 20. Assessment of beneficial uses protection at Coalition monitoring sites. 88

Table 21. Core Monitoring sites and additional consituents due to previous exceedances of WQTL. 91

Table 22. Table of management practices, target constituents, mechanism and possible improvements to water quality. 95

List of Figures

Figure 1. Boundaries of federal, state and private irrigation and water districts within the Coalition area. 7

Figure 2. Zone boundaries (1-6) within the ESJWQC. 9

Figure 3. Dendrogram of ESJWQC zones based on dissimilarity. See text for details on variables used to construct the dendrogram. 12

Figure 4. Land use for Dry Creek @ Wellsford Rd Zone (Zone 1). See Figure 10 for a land use legend. 15

Figure 5. Land use for Prairie Flower Drain @ Crows Landing Zone (Zone 2). See Figure 10 for a land use legend. 17

Figure 6. Land use for Highline Canal @ Hwy 99 Zone (Zone 3). See Figure 10 for a land use legend..... 19

Figure 7. Land use for Merced River @ Santa Fe Zone (Zone 4). See Figure 10 for a land use legend. 21

Figure 8. Land use for Duck Slough @ Gurr Rd Zone (Zone 5). See Figure 10 for a land use legend. 23

Figure 9. Land use for Cottonwood Creek @ Rd 20 Zone (Zone 6). See Figure 10 for a land use legend. . 26

Figure 10. Land use legend for ESJWQC. 27

Figure 11. Beneficial use designation of water bodies within the Coalition area. 32

Figure 12. Site subwatershed size designation for all subwatersheds in the Coalition region (based on irrigation flows). 40

Attachments

I. ESJWQC Business Rules

II. Site Subwatershed Maps

III. Site Subwatershed PUR Summary (2007)

IV. Quality Assurance Project Plan (QAPP)

LIST OF ACRONYMS

BU	Beneficial Uses
cm	Centimeter
cfs	Cubic Feet Per Second
COC	Chain of Custody
CVRWQCB	Central Valley Regional Water Quality Control Board
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane-+
DO	Dissolved Oxygen
DPR	(California) Department of Pesticide Regulation
DWR	Department of Water Resources
ESJWQC	East San Joaquin Water Quality Coalition
EPA	Environmental Protection Agency
^{o}F	Degrees Farenheit
K_{oc}	Organic Carbon Partioning Coefficient
kg	Kilogram
L	Liter
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg	Milligram
mL	Milliliter
MLJ-LLC	Michael L. Johnson, LLC.
MPN	Most Probable Number
MRP	Monitoring and Reporting Program
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MUN	Municipal and Domestic Supply Beneficial Use

NA	Not Applicable
ND	Not Detected
ng	Nanogram
NRCS	Natural Resource and Conservation Service
NTU	Nephelometric Turbidity Unit
OP	Organophosphate
PCA	Pesticide Control Advisor
pH	Power of Hydrogen (measure of acidity)
PR	Percent Recovery
PUR	Pesticide Use Reports
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SJR	San Joaquin River
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TID	Turlock Irrigation District
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
µg	Microgram
µmhos	Micromhos
USEPA	United States Environmental Protection Agency
WQTL	Water Quality Trigger Limit

INTRODUCTION

The East San Joaquin Water Quality Coalition (hereafter referred to as the Coalition or ESJWQC) Monitoring and Reporting Program Plan (MRPP) has been prepared according to the Monitoring and Reporting Program Order No. R5-2008-0005 (MRP) for Coalition Groups under the Amended Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Resolution No. R5-2006-0053. Together with the ESJWQC Management Plan, the MRPP is a work plan for all aspects of the monitoring and reporting program including environmental monitoring, outreach, reporting and tracking progress in reducing the amount of waste discharged that affects the quality of the waters within the ESJWQC as part of the Irrigated Lands Regulatory Program (ILRP).

The ESJWQC was formed in 2003 as a group of agricultural interests and growers to represent all "dischargers from irrigated lands" with the potential to discharge to waters of the State, who own or operate irrigated lands east of the San Joaquin River within Madera, Merced, Stanislaus, Tuolumne and Mariposa Counties and portions of Calaveras County. The business rules of the ESJWQC, including the ESJWQC Board of Directors responsibilities and a draft membership policy (to be implemented in the 2009-2010 irrigation season), are included in Attachment I. This report contains a description of watershed characteristics within the Coalition area and provides data and information describing the area's hydrology and drainage patterns, land use and crop data. A large portion of this document describes the monitoring program including the monitoring plan, sampling sites, sampling methods, quality assurance and information on each of the site subwatersheds. Pesticide use in each of the site subwatersheds that are or will be monitored is included in this MRPP as well as management practices available to prevent water quality degradation as a result of agricultural discharge. A discussion on management practices, programs and applicable management projects used to reduce or eliminate agricultural discharge of pesticides into receiving water bodies concludes this MRPP. Table 1 lists the MRP requirements as listed under the Conditional Waiver in association with the sections of this MRPP.

This MRPP includes the Coalition's strategy to addresses the five Program questions listed in the Regional Board MRP (Table 1). In addition, the Coalition is working to identify critical gaps in knowledge on a site subwatershed basis through the use of the Coalition's Management Plan. The MRPP creates a framework for which the Coalition can assess water quality impairments due to agricultural discharge and methods by which to ensure and/or improve current water quality conditions.

Table 1. Location of descriptions to address MRP requirements in the ESJWQC MRPP.

MRPP Section	MRP Requirement #	Requirements
1. Introduction	NA	Not a required section.
2. Description of Coalition Area	2,5	**(2)** Geography, topography, hydrology, land use including crop type(s) and other characteristics relevant to the monitoring; **(5)** Provide designated beneficial uses of each of the Coalition water bodies.
3. Monitoring Strategy	1	**(1)** Description of Assessment Monitoring, Core Monitoring and Special Project Monitoring.
4. Monitoring Sites	3,6	**(3)** Including GIS coordinates (Albers Projection, NAD83, and units in meters) and rationale for selection of each site. Rationale should be based on 'representativeness' of the location for dischargers from irrigated agriculture within the Coalition Group's boundaries; **(6)** Detailed map(s) of the Coalition Group's area showing irrigated lands, identifying crop type(s), monitoring sites, main water bodies, tributaries, canals, channels, and drainages. Maps or discussion shall provide details that show which fields are represented by each monitoring site within the Coalition Group's boundaries.
5. Water and Sediment Quality Monitoring Plan	12,17	**(12)** Monitoring periods, including description and frequencies of monitoring events and justification for deviations from the MRP Order requirements; **(17)** Parameters to be monitored including minimum and site specific requirements.
6. Monitoring Protocol	18,19,13,14,15,16	**(18)** Reference to the Coalition Group Quality Assurance Project Plan (QAPP) consistent with the requirements described in Attachment C of the MRP Order; **(19)** Documentation of monitoring protocols including sample collection methods and Laboratory Quality Assurance manual; **(13)** Information (either qualitative or quantitative, depending on the needs of the monitoring design process) about sources of bias and variability that could affect the validity of a monitoring design and/or the reliability of monitoring data; **(14)** Definition of desired levels of spatial and temporal resolution; **(15)** Definition of acceptable levels of uncertainty; **(16)** Description of data analysis methods to be used to evaluate data from each monitoring program component.
7. Reporting Plan	NA	Not a required section.

MRPP Section	MRP Requirement #	Requirements
8. Water Quality Status	4,Q#1,Q#2,7,8	**(4)** Identification of known and potential water quality impairments and water quality limited water bodies; **(Q#1)** Are conditions in waters of the State that receive discharges of wastes from irrigated land within Coalition Group boundaries, as a result of activities within those boundaries, protective of beneficial uses (Identify represented, unrepresented and surrogate monitoring locations)? **(Q#2)** What is the magnitude and extent of water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within the Coalition Group boundaries, as determined using monitoring information? **(7)** Relevant knowledge about the transport, fate, and effects of key pollutants, including best- and worst-case scenarios; **(8)** Relevant knowledge about the action of cumulative and indirect effects, and other factors that impact water quality.
9. Sources of Discharge	Q#3,9	**(Q#3)** What are the contributing sources(s) from irrigated agriculture to the water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition Group boundaries? **(9)** Include a narrative discussion and summary tables of the information contained therein, including type of chemical (fungicide, herbicide, insecticide, and adjuvants), quantity applied, timing of applications, crops to which they were applied, and the geographic locations within the Coalition Group's boundaries in which each type was used.

MRPP Section	MRP Requirement #	Requirements
10. Agricultural Practices Summary	10,11,Q#4,Q#5	**(10)** Discussion of specific management practices in use and available programs to reduce or eliminate water quality impacts from irrigated agricultural discharges and locations where these occur. These practices might include tail water return systems, irrigation efficiency improvements, U.C. Cooperative Extension and NRCS grower outreach, etc. **(11)** Description of water management practices within the Coalition Group's boundaries and crop types in which they are used. Water management practices include, but are not limited to, water application for the purpose of hydrating crops, pre-planting irrigation, water application for the purpose of frost prevention, and water application to address salinity; **(Q#4)** What are the management practices that are being implemented to reduce the impacts of irrigated agriculture on waters of the State within the Coalition Group boundaries and where are they being applied? (reference management plans); **(Q#5)** Are water quality conditions in waters of the State within Coalition Group boundaries getting better or worse through implementation of management practices? Reference management plans.
11. Coalition Contact Information	20	**(20)** Coalition Group contact information.
***Signed Transmittal Letter**	21	**(21)** To be submitted with MRPP.

DESCRIPTION OF COALITION GROUP AREA

The ESJWQC area includes Stanislaus, Merced, Madera, Tuolumne, and Mariposa Counties and the portion of Calaveras County that drains into the Stanislaus River. The region that drains into the Coalition area is bordered by the crest of the Sierra Nevada on the east and the San Joaquin River on the west, the Stanislaus River on the north to the San Joaquin River on the south. The southern portion of the Coalition area has been expanded since the inception of the Coalition and now includes the area that was formerly the Root Creek Coalition area. Landholdings in the vicinity of the Lone Willow Slough drainage area (west of the Eastside Bypass) have joined the Westside Coalition.

The only surface water export from the Coalition area is northward via the San Joaquin River. This river drains watersheds on the east and west side of the San Joaquin Valley, though only east side watersheds are relevant with respect to the Coalition area. San Joaquin River water is eventually either exported to the San Francisco Bay through the Delta, or conveyed southward via the State Water Project and the Delta Mendota Canal. The Coalition area also includes within its boundaries portions of six irrigation districts: Oakdale Irrigation District, Merced Irrigation District, Turlock Irrigation District, Modesto Irrigation District, Chowchilla Irrigation District and Madera Irrigation District (Figure 1). In addition, there are numerous federal and state water districts, municipal water companies, and sanitation districts within the Coalition area. Water bodies may have both irrigation district and Coalition monitoring only when they convey both irrigation supply and agriculture return water. Irrigation districts in the Coalition region are covered by individual waivers and do not belong to the Coalition.

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

Although exact acreage is difficult to estimate due to rapidly changing land use, the Coalition area contains approximately 1,186,889 acres that are considered irrigated agriculture (Table 2). For Stanislaus, Merced, Mariposa, Tuolumne, and Madera Counties, the Coalition used the Department of Water Resources (DWR) land use estimates for irrigated agriculture to

determine total acreage. However, DWR does not provide land use data for Calaveras County and therefore these data were acquired from the County Agricultural Commissioner's office.

Soils maps reveal a complicated mosaic of soil types in the Coalition region. Generally, the Coalition region has sandy, well-drained soils. Soil type and factors such as slope, soil saturation, rainfall/irrigation water amount, and drainage patterns determine runoff.

There is a tendency for increased runoff with increased slope, soil water saturation, and volume of water. These conditions arise primarily due to large amounts of rainfall and are more likely in the relatively greater sloped valley margins. During the winter, runoff is moved for flood control west through the myriad of creeks, rivers, and drains. However, many of the drainages in the southern portion of the Coalition region do not always carry runoff even during substantial rainfall events. In addition, water bodies throughout the Coalition region tend to be "flashy" in that water from runoff events moves through the systems very quickly leaving very little flow shortly after the storm ends. Runoff can also occur during the irrigation season if water entering the field is greater than the amount that can infiltrate into the soil. However, in portions of the Coalition region with sandy soils, there is no irrigation discharge. Drip and microspray irrigation also result in no discharge of irrigation water.

A complex system of conveyances for water transfer, use, and re-use is utilized for irrigation. If a sufficiently large amount of water is applied via flood irrigation, some water may return to the source after being used on the field. In some cases, the volume of water applied to a field for irrigation may represent not only what is needed by the vegetative crop, but also a greater quantity used either to push the water over the field, or as a method of reducing the negative effects of evapotranspiration and consequent accumulation of salts. The conveyance system is designed to allow downstream irrigators to reuse water that was previously used upstream.

Figure 1. Boundaries of federal, state and private irrigation and water districts within the Coalition area.

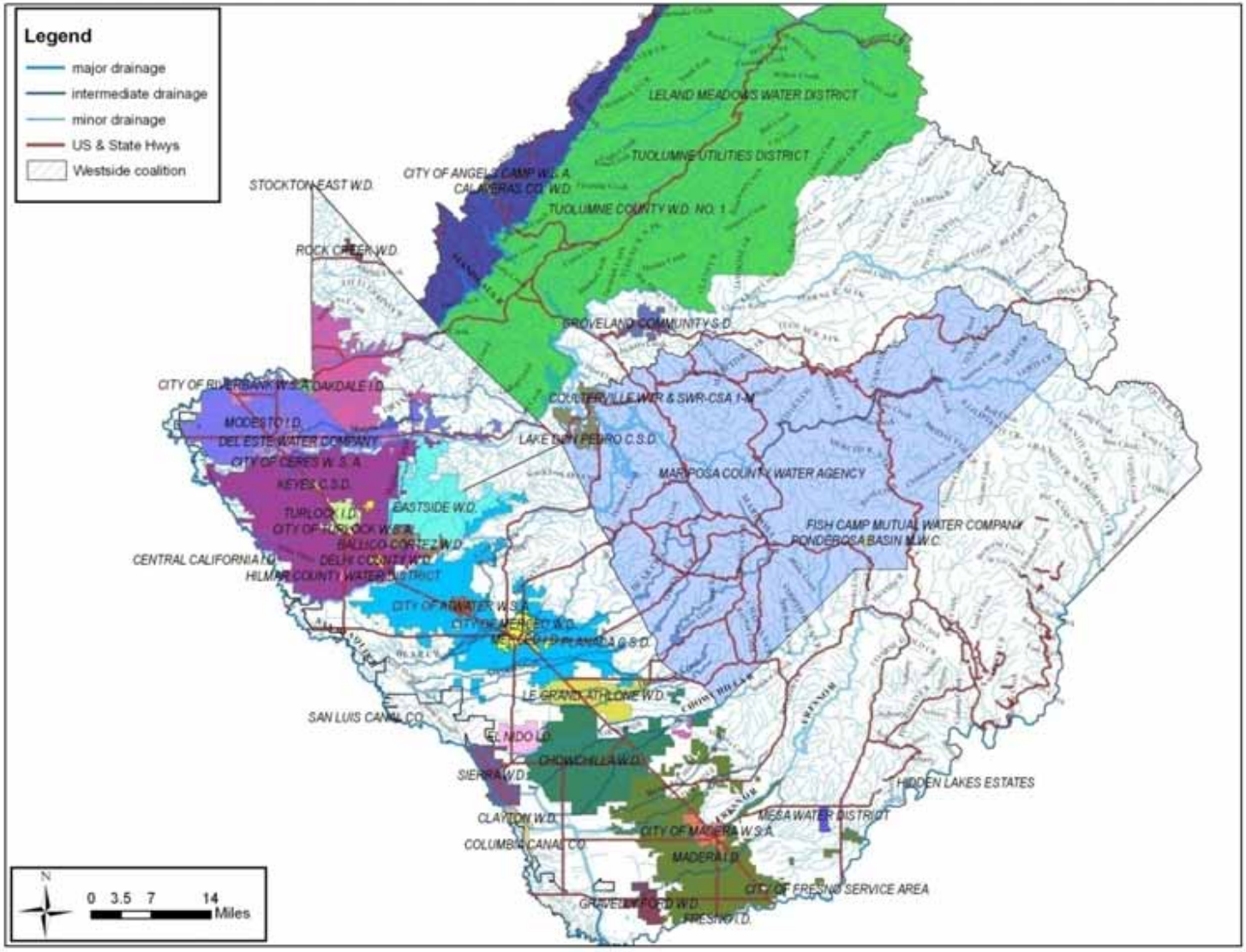


Table 2. Acreage of irrigated land in ESJWQC counties.

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

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

The Coalition area has been divided into six zones to create a comprehensive monitoring program. These zones were designated based on hydrology, crop types, land use, soil types, and rain fall (Table 3). The zone names are based on the Core Monitoring location within that area and include: 1) Dry Creek @ Wellsford Zone, 2) Prairie Flower Drain @ Crows Landing Zone, 3) Highline Canal @ Hwy 99 Zone, 4) Merced River @ Santa Fe Zone, 5) Duck Slough @ Gurr Rd Zone, and 6) Cottonwood Creek @ Rd 20 Zone. The boundaries of each zone are provided in Figure 2. Crop pattern information was obtained from the California Department of Pesticide Regulation database which is current through 2008 (http://calpip.cdpr.ca.gov/main.cfm?redirect=true). Information for river flow data was obtained from the United States Army Corps of Engineers (http://www.spk-wc.usace.army.mil/plots/plot_menu_ca.html) and temperature, rainfall and elevation data was obtained from Department of Water Resources (http://www.water.ca.gov/floodmgmt/hafoo/csc/climate_data/joaquin.cfm).

Figure 2. Zone boundaries (1-6) within the ESJWQC.

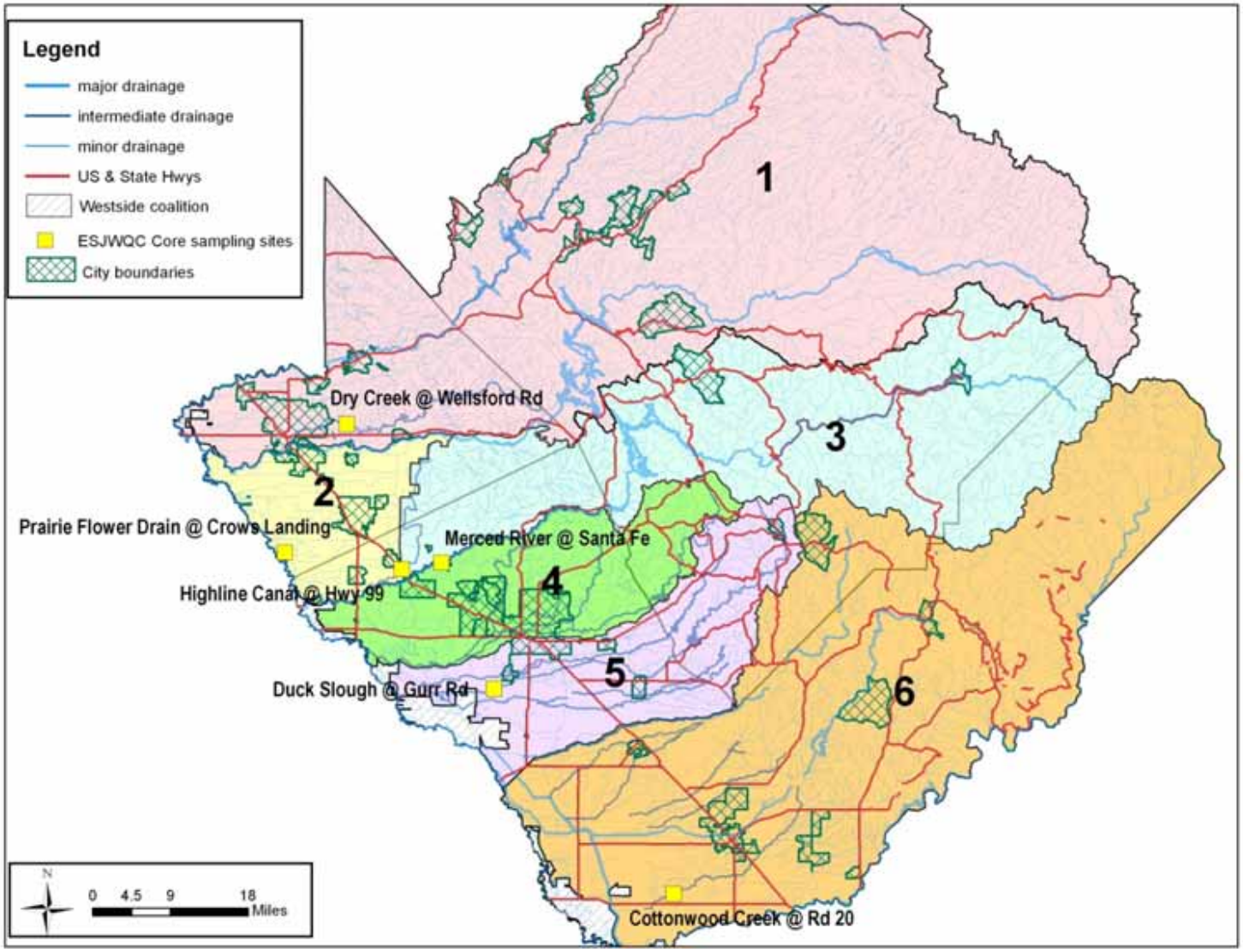


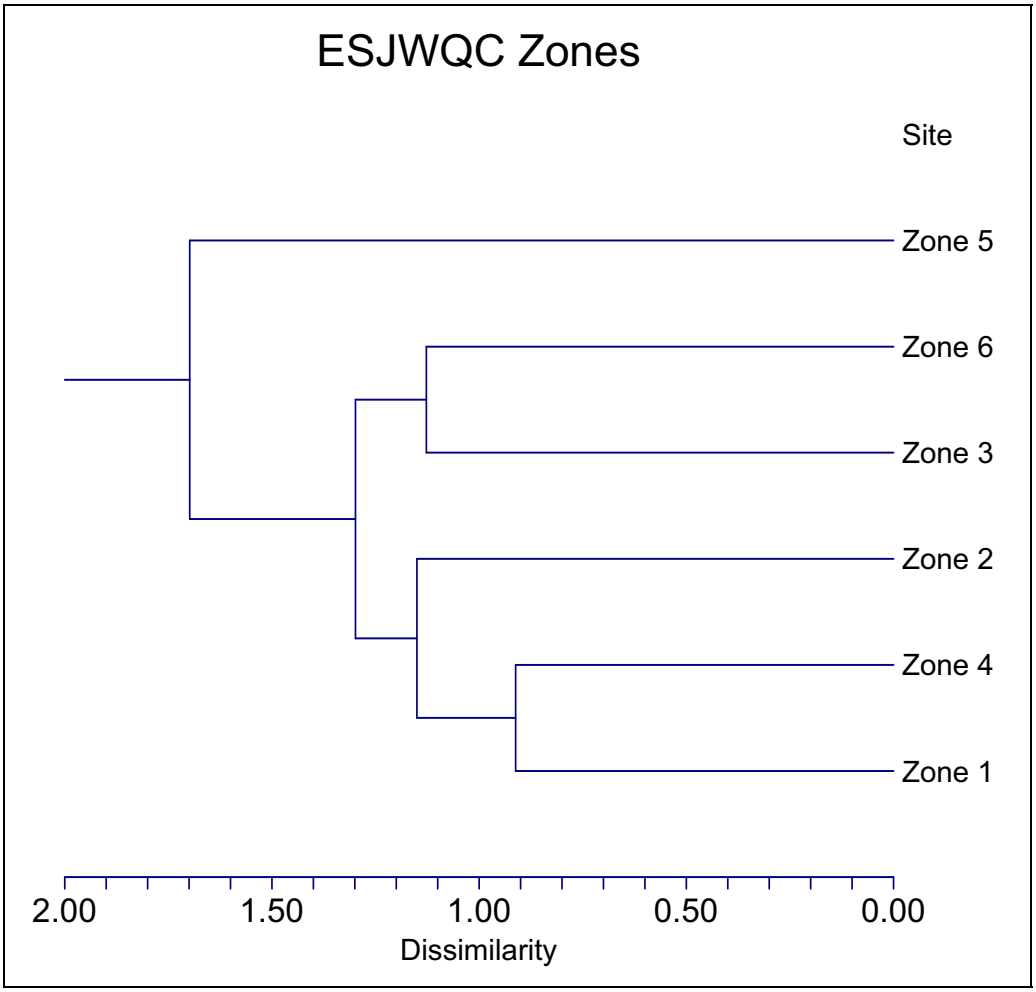
Table 3. Land use and soil percentages for ESJWQC zones. Table will be updated yearly; refer to the AMR for the most recent land use and soil percentage data.

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
	Dry Creek @ Wellsford Zone	Prairie Flower Drain @ Crows Landing Zone	Highline Canal @ Hwy 99 Zone	Merced River @ Santa Fe Zone	Duck Slough @ Gurr Rd Zone	Cottonwood Creek @ Rd 20 Zone
Total Acres	2,739,267.53	757,501.78	1,213,340.09	608,351.75	637,819.21	1,268,513.09
Irrigated Acres	134,306.48	164,632.91	88,616.45	121,746.40	142,686.29	335,069.21
Soil (average %):						
Sand	56.26	71.42	62.03	58.77	39.56	63.66
Silt	25.34	18.83	23.45	25.39	36.05	22.26
Clay	18.40	9.75	14.52	15.83	24.38	14.08
Land Use (% of irrigated acres):						
Deciduous Fruits/Nuts	39.21	37.83	60.73	37.55	18.82	31.63
Field Crops	16.27	22.73	15.84	22.25	32.85	15.29
Grains/Hay	0.89	0.81	1.57	3.87	5.54	4.28
Pasture	35.04	30.88	11.13	19.58	31.42	13.17
Vineyard	3.76	3.27	8.63	5.69	1.69	31.37
Dairies/Feedlots:						
% of total acres	0.34	1.59	0.20	0.80	0.66	0.53
Number of operations	1,903	2,302	273	473	460	1,725
Urban (% of total acres)	2.70	5.77	0.93	3.84	2.01	3.02
Depth to groundwater:						
Weighted average	49.18	30.12	138.17	46.43	68.52	119.98
% area of groundwater	5.7	71.9	7.1	39	43.3	25.1

A dendrogram was created to illustrate the dissimilarities of the zones. The dendrogram in Figure 3 was constructed using a hierarchical algorithm in which the two most similar zones are identified, in this case Zone 1 and Zone 4, and connected at the level of similarity/dissimilarity between the two. In this case the two zones are dissimilar at a level of approximately 0.9. The dissimilarity scale is a unitless measure that is an n-dimensional Euclidean distance. The variables for the two zones are averaged to form a new entity and the analysis is performed again with five zones. The next two most similar zones are identified; in this case Zone 3 and Zone 6, and they are connected at the appropriate level of dissimilarity. The variables are averaged to form a new entity and the process continues with four zones, then three zones, and finally two zones. Although there are no statistical tests for significance of the differences between clusters, it is generally accepted that if the clusters are dissimilar at a level of approximately 0.15, the clusters are distinct. In the analysis above, the zones are all dissimilar at a level that far exceeds 0.15 indicating that they are distinct from each other and each is relatively homogeneous within its boundaries. These results suggest that sites within each zone are representative of other sites within the same zone with respect to soils, land use, and depth to groundwater. Sites would not be representative of other sites outside of their respective zone.

Below is a description of each zone's land use, hydrology, precipitation, soil types and crop patterns.

Figure 3. Dendrogram of ESJWQC zones based on dissimilarity. See text for details on variables used to construct the dendrogram.



Dry Creek @ Wellsford Zone (Zone 1)

Climate and River Flows

Dry Creek @ Wellsford Zone (Zone 1) contains the northern most portion of the ESJWQC and is bordered by the Stanislaus River to the north and the Tuolumne River to the south. This zone consists of low land around the city of Modesto and extends up to the end of irrigated agriculture in the foothills of the Sierra Nevada Mountains. The head waters of the Stanislaus and the Tuolumne rivers start high up in the Sierra Nevada Mountains in the east and drain into the San Joaquin River to the west. The winter temperature in the valley around Modesto averages between 32-65˚F throughout the year with infrequent freezing. The summer is warm with 90-100˚F highs and 60˚F lows. In the 3,000-4,000 foot level of the Sierra Nevada mountains to the east of the Valley, the winter temperature is slightly cooler around 29-50˚F and freezing is more common. In this part of the zone the summer temperatures range from the low 90's in the day and down in the 50's during the night. Within the uppermost crests of the Sierras the summer temperature is only slightly cooler than areas at the 4000 foot level but the winter time temperatures are below freezing most of the time.

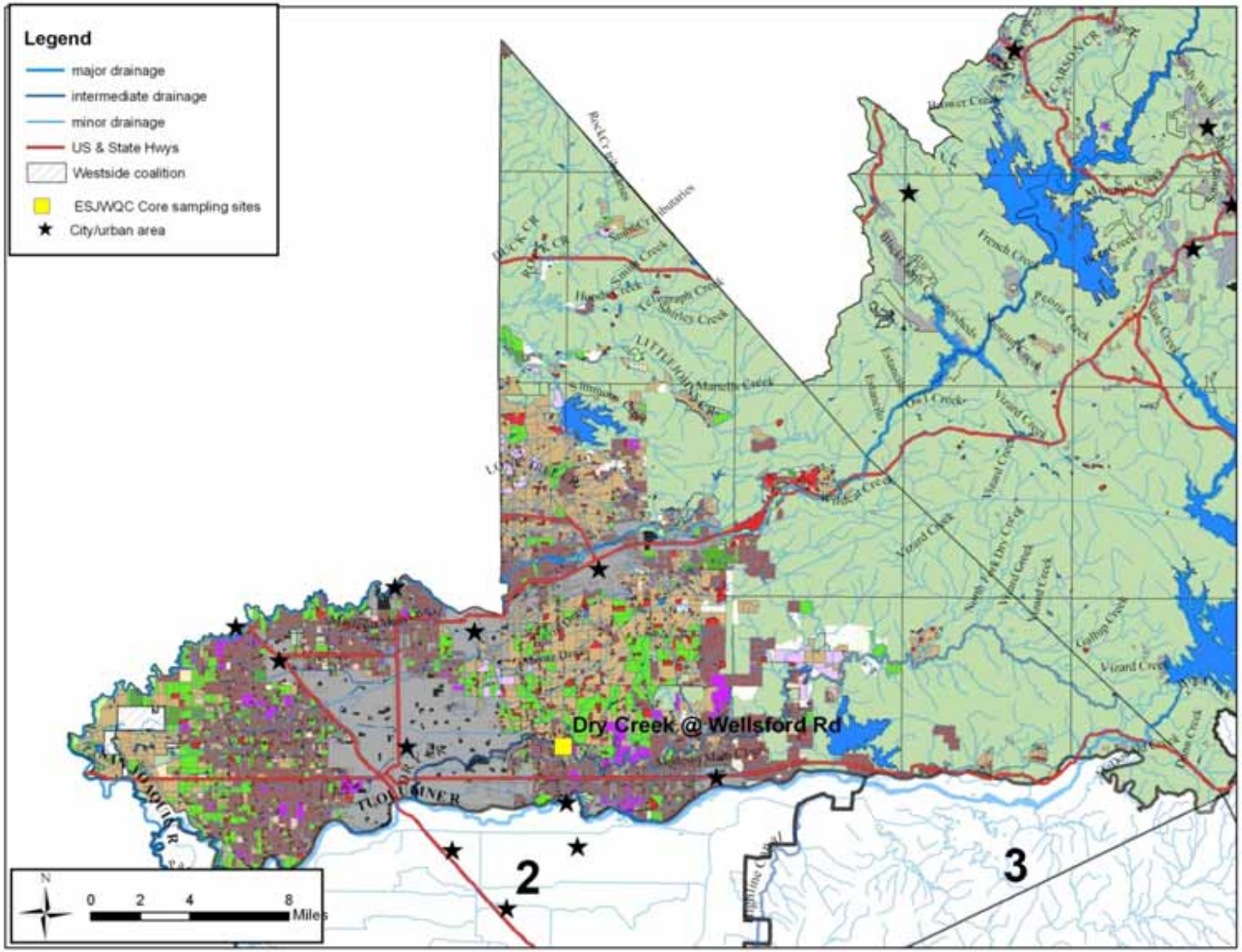
Precipitation on the low valley floor is around 13 inches annually with most of the rain occurring from November through March. Most of the annual rainfall comes from one or more large rain events in January and February. Rainfall levels increase to the east of the zone as elevation increases with more than 30 inches occurring annually around 3800 feet and almost 50 inches at an elevation of 4,800 feet. This precipitation falls as snow in the upper elevation that melts in the spring, providing runoff for the rivers and streams. The Stanislaus River flows through along the northern border of this zone and supplies water from the Sierras to the Delta. New Melones Reservoir in the upper east part of the zone receives the highest flows from the Stanislaus River during the spring when the snow from the higher elevations melts in March through June creating flows up to 1,500-3,500 cfs. The outflows from the dam into the river are highest December through February (up to 2400 cfs during large storms) and stay constant the rest of the year at a 1,000 cfs. The flows from the Stanislaus are substantially greater than flows in rivers to the south. The Tuolumne River, which borders the southern edge of this zone, flows through Don Pedro Reservoir with the highest inflows during winter storms ranging from 6,000-15,000 cfs. Spring runoff provides the rest of the runoff in March through June with flows around 3,000 cfs. Outflows from Don Pedro are highest in March through June between 1,000-3,000 cfs, and around 1,000 cfs for the remainder of the year. Water is supplied to farmers through the Modesto Irrigation District, the Oakdale Irrigation District and in some areas irrigation supply is pumped from groundwater.

Soil Types and Land Use

A majority of the soils within the Dry Creek @ Wellsford Zone are sand (56%) mixed with silt (25%) and clay (18%). There is a mixture of vineyards and deciduous nuts and fruits within this zone with most of these crops on drip irrigation systems. There is an almost equal portion of

irrigated pasture (35%) as deciduous fruits/nuts (39%) and a smaller portion of field crops (16%) and grains/hay (1%). As of 2004, there are 1,903 dairies/feedlots comprising 0.34% of the total acreage in this zone (Table 3, Figure 4).

Figure 4. Land use for Dry Creek @ Wellsford Rd Zone (Zone 1). See Figure 10 for a land use legend.



Prairie Flower Drain @ Crows Landing Zone (Zone 2)

Climate and River Flows

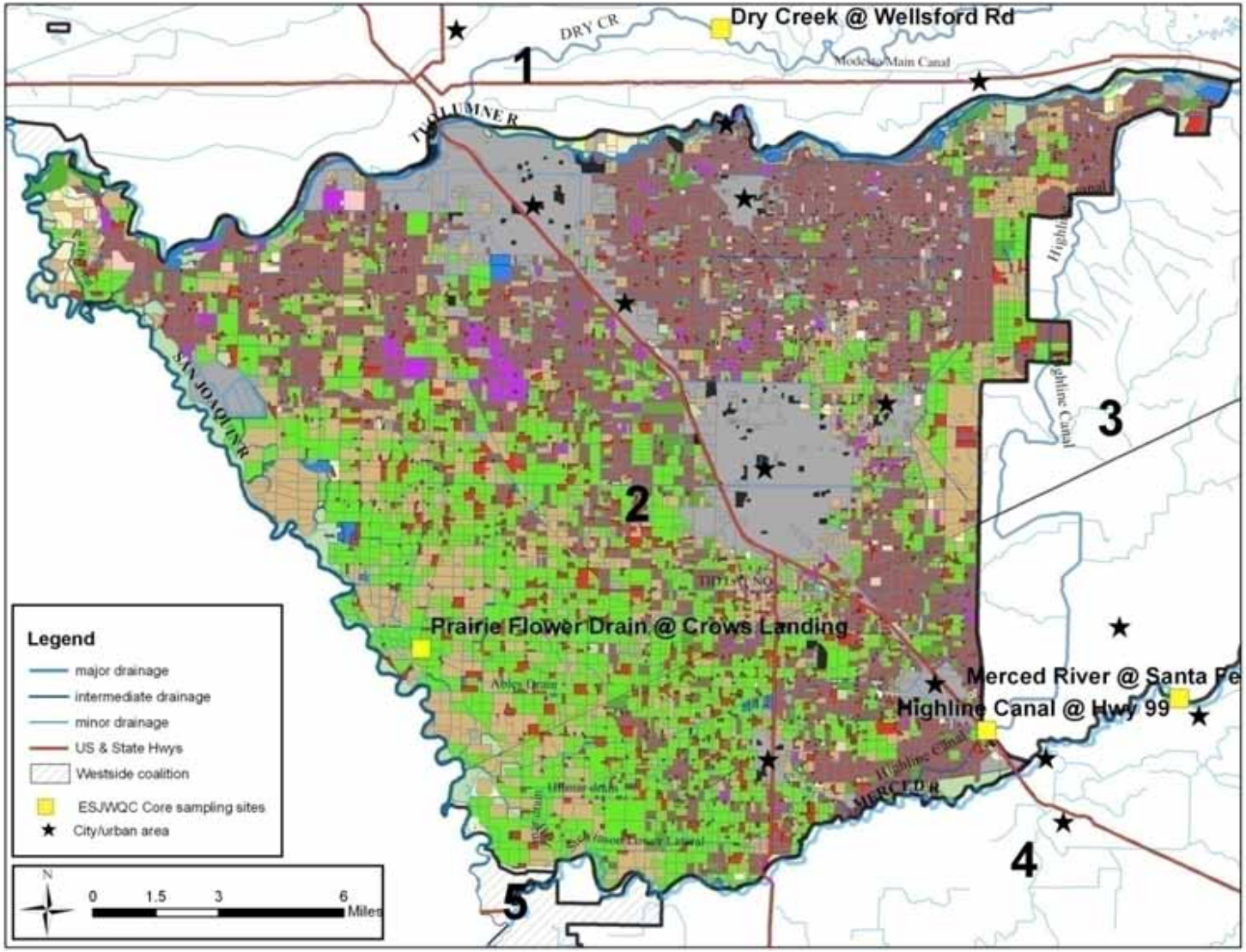
Prairie Flower Drain @ Crows Landing Zone (Zone 2) is bordered by the San Joaquin River to the west, the Tuolumne River to the north and the Merced River to the south. The average rainfall for this zone is between 11-13 inches per season with most of this falling from November through March. The storm season usually consists of many small storms with one or two larger storm events providing the majority of the precipitation. The summers are warm and dry with less than a tenth of an inch of precipitation in June through August. The average winter temperature is 31˚-66˚F with occasional freezing possible. The summer temperature is much warmer with an average in the 90's and a few days going over 100°F and night time lows around 60˚F.

The Tuolumne River flows out of Don Pedro Reservoir with highest flows occurring during the spring after major storm events in addition to snow melt in the Sierra Nevada Mountains. The water supplied to farmers in this area is primarily from the Turlock Irrigation District (TID) which obtains its water from La Grange Dam on the Tuolumne River where water is diverted to Turlock Lake and later released into the Main Canal. The Main Canal runs along the Tuolumne River then south along the city of Turlock and east into the San Joaquin River. Most of the delivery canals (laterals) within the TID convey water and do not receive agricultural runoff.

Soil Types and Land Use

Seventy-one percent of the soils within the Prairie Flower Drain @ Crows Landing Zone are sandy. Due to the large amount of sandy soils, this zone has a propensity to drain into a shallow aquifer resulting in reduced irrigated above ground run-off. During the late winter and early spring, the water table is close to the surface requiring pumping of ground water and discharge into the drains. Many surface water drains were originally constructed to intercept ground water and maintain the water table at a deeper level. This zone contains the largest percentage of acreage of dairies, 1.59%, out of all the six Coalition zones and contains approximately 2,302 operations. Field crops are more common in the sandiest soils (the southwest corner of the zone) whereas the soils higher in clay and silts (the northwest portion) have more deciduous nut and fruit orchards and a small percentage of vineyards. In relation to overall irrigated land use, this zone contains 38% deciduous fruits/nuts, 31% pasture, 23% field crops, 3% vineyards and 1% grains/hay (Table 3, Figure 5). The city of Turlock and part of the city of Modesto are located within the zone and the amount of total urban in this zone comprises 6% of the total acreage, the largest percent of urban of all the zones. The main waterways through these cities are the canals of the TID which drain urban runoff during the storm season and also treated municipal waste.

Figure 5. Land use for Prairie Flower Drain @ Crows Landing Zone (Zone 2). See Figure 10 for a land use legend.



Highline Canal @ Hwy 99 Zone (Zone 3)

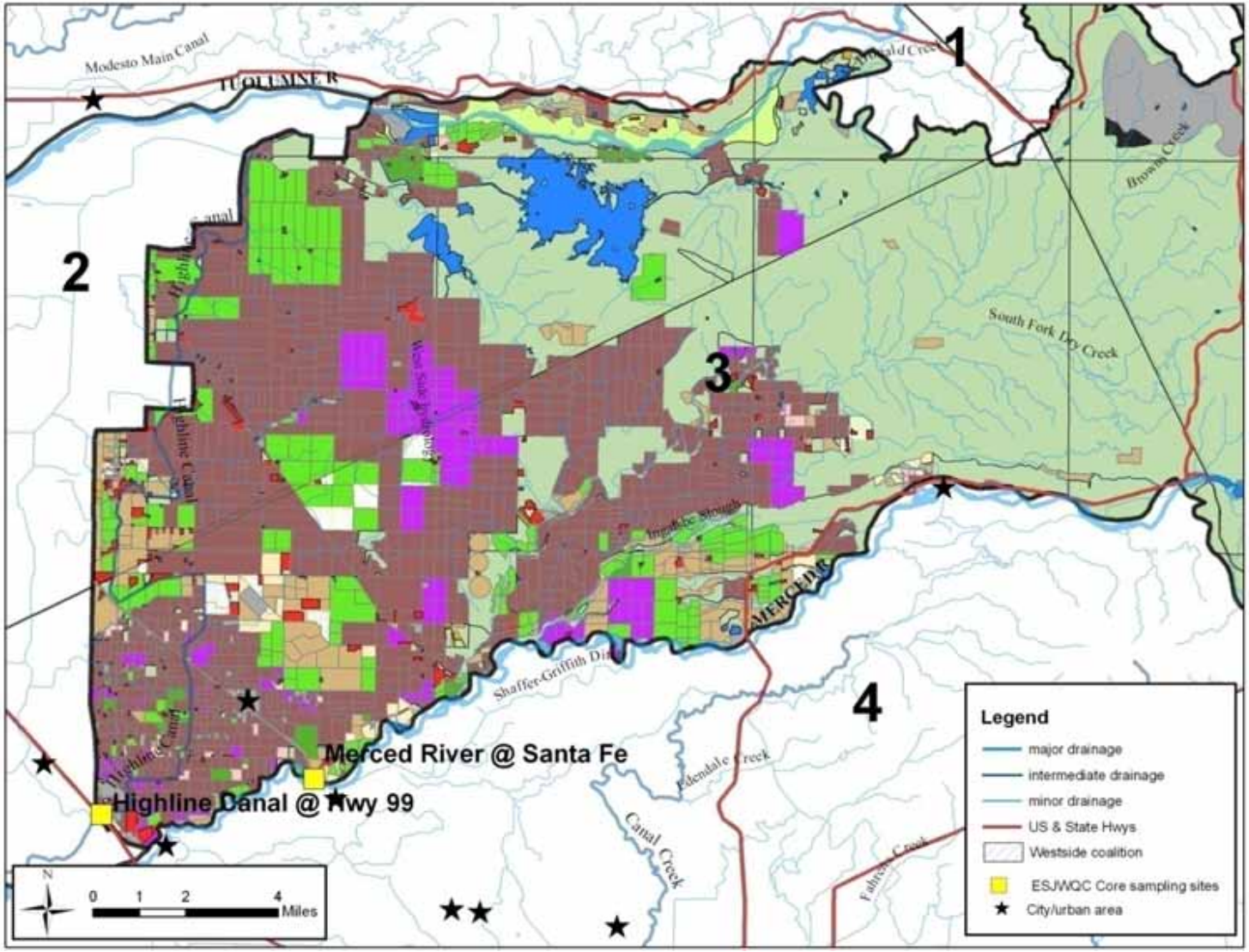
Climate and River Flows

The Highline Canal @ Hwy 99 Zone (Zone 3) is a large zone that covers from the valley floor to the high Sierra crest. This zone borders the Prairie Flower Drain @ Crows Landing Rd Zone on the east. The Merced River is the southern border and the Tuolumne River is the border to the north. The average summer temperature for the valley is around 60˚F at night and up to 100°F in the day. The winter temperatures range from 31˚-65˚F with the possibility of freezing temperatures. T he average temperatures decrease with increasing elevation. The average rainfall for this zone within the valley is between 11-13 inches with a majority of the rain occurring between November and March. The higher elevations receive from 30 to over 50 inches of precipitation. The Merced River flows through Lake McClure which has inflows that varies from 2,500-15,000 cfs during large storm events. The spring runoff is greatest in months between April and June with inflows of 8,000-10,000 cfs. The highest outflows occur in months between March and June with flows around 1,000-2,000 cfs. Water supplied to growers in this region comes from groundwater or the Eastside Water District with a small portion along the eastern edge of the zone being supplied by TID.

Soil Types and Land Use

In comparison to the Prairie Flower Drain @ Crows Landing Zone, the Highline Canal @ Hwy 99 Zone is less sandy (average 62% of the area) however a majority of the soils are relatively sandy and well drained. Moving east in this zone, most of the irrigated agriculture run-off infiltrates into groundwater. A majority of the crops within this zone include deciduous nut and fruit orchards (61% of all irrigated acres) and a few large vineyards (9% of all irrigated acres). In addition, there are row/field crops (16%) and irrigated pasture (11%) and a small portion of grains/hay (2%). Dairies comprise approximately 0.2% of the zone area (Table 3, Figure 6).

Figure 6. Land use for Highline Canal @ Hwy 99 Zone (Zone 3). See Figure 10 for a land use legend.



Merced River @ Santa Fe Zone (Zone 4)

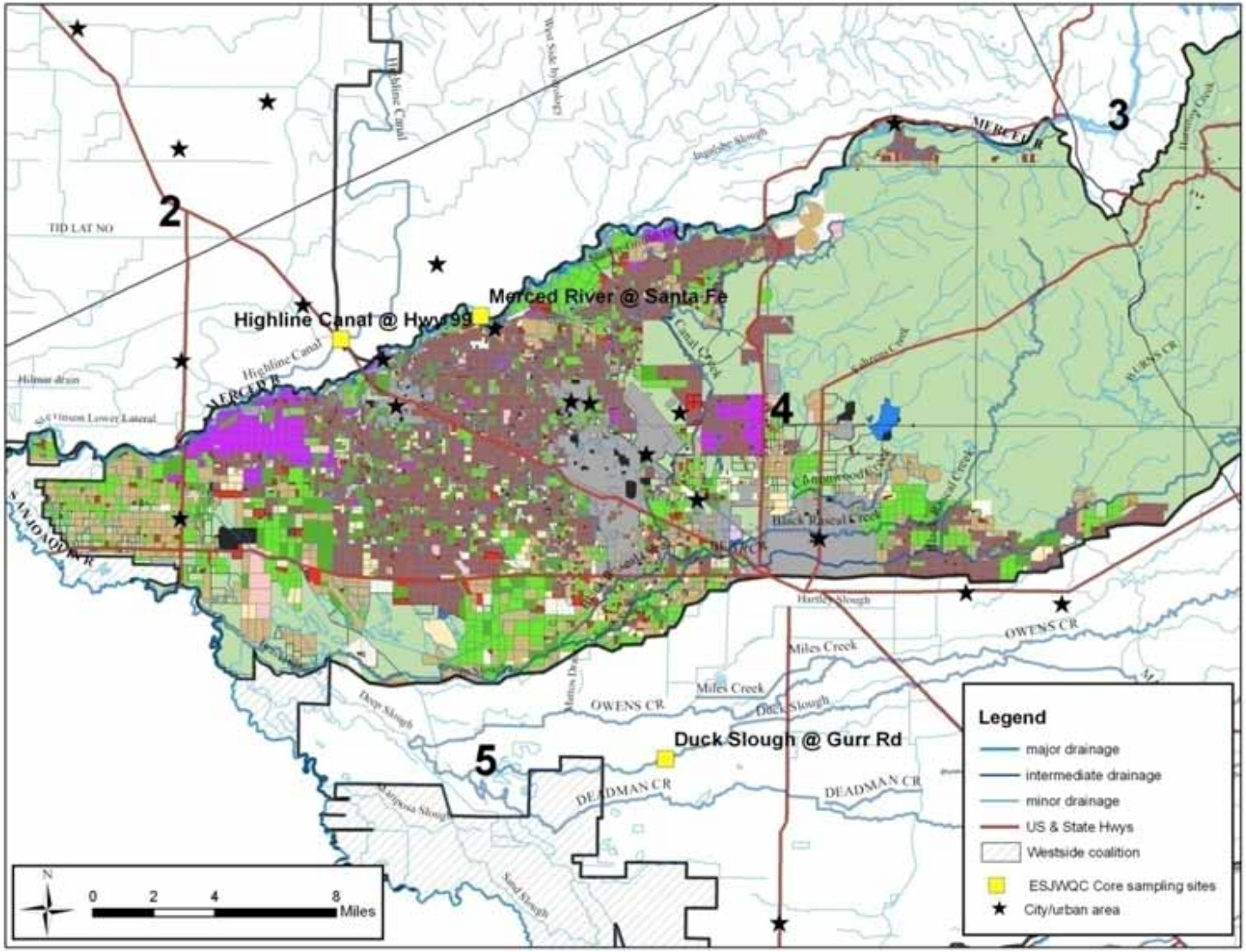
Climate and River Flows

The Merced River @ Santa Fe Zone (Zone 4) is comprised of flat valley floor with some rolling grasslands to the east. This zone is more arid than the zones to the north. Many of the small creeks in this area do not flow except when large rain events produce sufficient storm runoff during the winter. This zone is bordered by the Merced River to the north. The seasonal flows of the Merced River are described in more detail in the Highline Canal @ Hwy 99 Zone description and in general are highest during the spring as snow melt increases the amount of water in Lake McClure. The average rainfall for this area is approximately 12 inches with most of the precipitation occurring between the months of November and March. The foothills in the eastern portion of this zone receive more rainfall than the valley floor. In the 2,100 foot range the average rainfall is approximately 30 inches per season. Winter temperatures for this zone are on average between 31-65˚F with the possibility of freezing. The summers are warm with temperatures in the high 90's common.

Soil Types and Land Use

The soils of this zone are similar to the Dry Creek @ Wellsford Zone and are comprised of 59% sand, 25% silt and 16% clay. This area has less sand and more silt and clay soils than the Highline Canal @ Hwy 99 Zone that this zone borders to the north on the other side of the Merced River. The Merced River runs along the northern edge of the zone and contains irrigated deciduous fruits and nuts, vineyards and a few row crops. Overall, the largest percentage of land use within this zone is deciduous fruits and nuts comprising 38% of the total irrigated acres within the zone. The second largest percentage of irrigated land use within this zone is field crops (22%) followed by pasture (20%) then vineyards (6%) and grains/hay (4%). Merced, Atwater, and Livingston are the major cities within this zone with the total amount of urban area close to 4% (Table 3, Figure 7).

Figure 7. Land use for Merced River @ Santa Fe Zone (Zone 4). See Figure 10 for a land use legend.



Duck Slough @ Gurr Rd Zone (Zone 5)

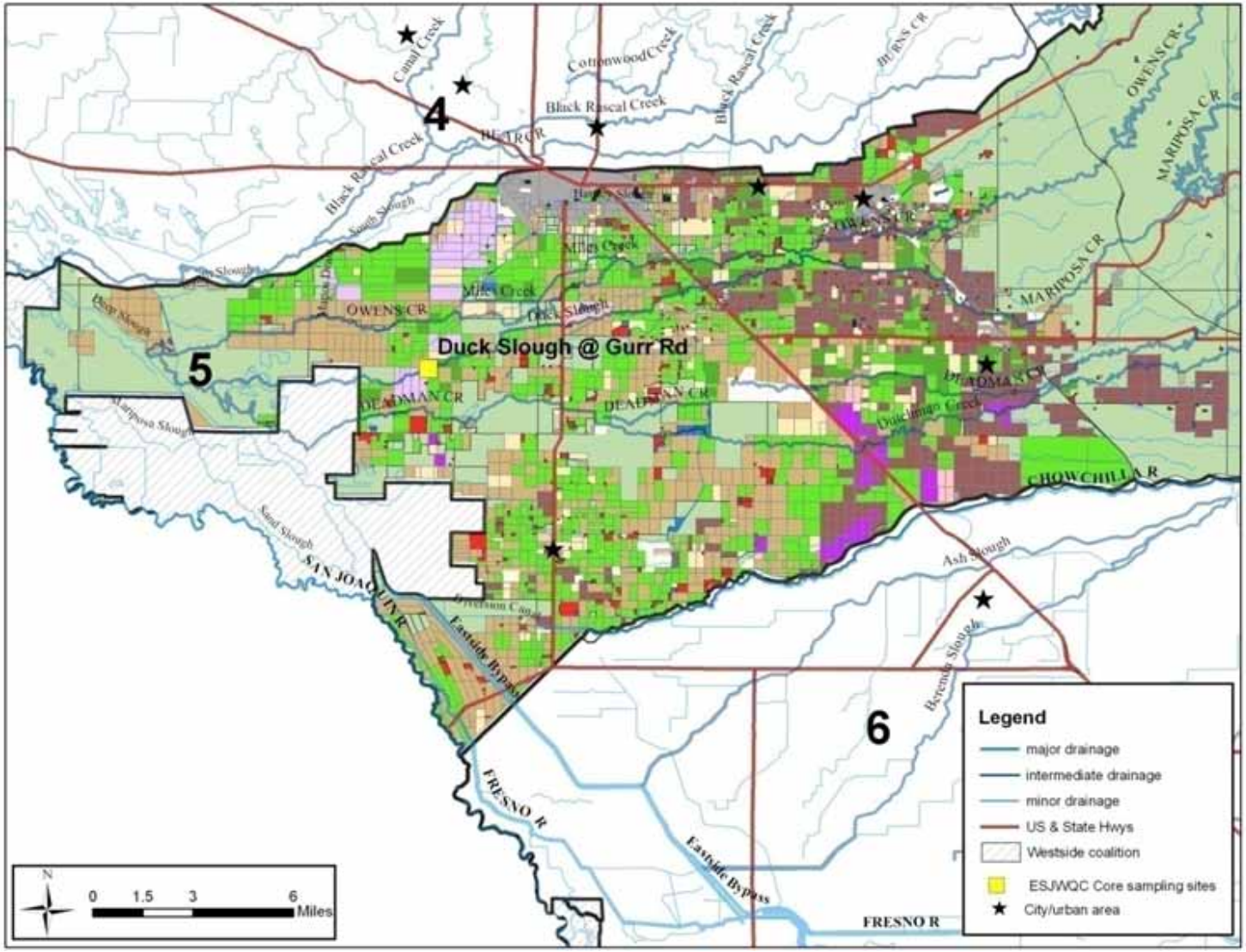
Climate and River Flows

Zone 5 is largely valley floor with the Eastern edge extending into the foothills. The valley floor around Merced receives an average rainfall of 12.5 inches annually with most falling from November through March. All rainfall may occur during one to two large storm events. The summer is warm with highs over 100˚F and a day time average in the 90's. The winter temperature is mild with highs of 65˚F and lows around 30˚F, with an average in the 50's. The Chowchilla River is on the South edge of this zone and is dry for the majority of the year. Flows are low or nonexistent for much of the year (seasonal river flow covered in zone 6 description).

Soil Types and Land Use

Soils within the Duck Slough @ Gurr Rd Zone contain almost equal portions of sandy (40%) and silty (36%) soils. On average soils are comprised of 24% clay. This irrigated agriculture in this area is mostly comprised of field crops (33%) and pasture (31%). There is a small amount of rice in the northwestern section of the zone between Owens Creek and South Slough and some vineyards towards the southern edge of the zone between the Chowchilla River and Dutchman Creek. Deciduous fruits/nuts are more prevalent closer to the foothills of this zone and overall comprise 19% of the irrigated land. There are few dairies/feedlots in this zone (460) which comprise 0.66% of the total zone area. The lower portion of Merced falls within the northern portion of this zone which also contains smaller cities such as Planada and Le Grand. Overall 2% of the total zone area is urban (Table 3, Figure 8).

Figure 8. Land use for Duck Slough @ Gurr Rd Zone (Zone 5). See Figure 10 for a land use legend.



Cottonwood Creek @ Rd 20 Zone (Zone 6)

Climate and River Flows

Zone 6 is a large zone with varying topography from the flat marsh lands to the west and the mountainous Sierras to the east. This zone is bordered by the Chowchilla River on the north and the Fresno River running through the center along with the San Joaquin River bordering the west and south. The majority of the agriculture takes place in the more temperate valley region of the zone. The average temperature in the summer in the lower elevations is 50˚F at night to 100˚F in the day. The average winter temperature has a range of 30˚F to the 60's. The majority of the rain for this area falls in the winter months between November and March with the greatest amount of precipitation in January, February, and March. The lower elevations (150') around the city of Merced receive around 12-14 inches of rainfall annually. The foothills to the East receive 26 inches annually at the 2,000 foot level.

The Chowchilla River originates in the foothills with most of it water coming from rainfall. Eastman Lake is the largest reservoir in the Chowchilla River drainage and generally has little or no discharge. The large storm events in January and February are when the most inflow into this system occurs. The Fresno River in the middle of the zone flows through Lake Hensley which is the largest reservoir in the drainage. The inflow to this reservoir spikes with the large storms in January and February up to 1,000 cfs but is usually around 50-100cfs. March inflows tend to be elevated due to the release of water from reservoirs upstream. Outflows are highest in April through August at approximately 100-200 cfs with lower outflows during the rest of the year. The San Joaquin River that starts high up in the Sierras and flows all along the southern and western portions of the zone. The river flows through Millerton Lake before reaching the valley. This drainage has many smaller reservoirs higher up the San Joaquin River with most being small hydroelectric producers. The small reservoirs upstream make the inflow to Millerton Lake dependant on their outflow releases. The highest inflows to Millerton Lake are in the months of March through May with 2000-4000 cfs common and spikes of 15,000 cfs in some years. The outflows are usually around 2,000 cfs and take place around April through July, with May through July being the highest months at 1,000-8,000 cfs.

Soil Types and Land Use

The Cottonwood Creek @ Rd 20 Zone is the southernmost zone of the Coalition region and has the second sandiest soils (average of 64%) compared to the other zones. Due to the sandy soils, there is little runoff during storm and irrigation seasons and creeks in this area (such as Ash Slough) are often dry. The irrigated agriculture in the area is comprised of deciduous fruits/nuts (32%) and vineyards (31%). This area contains the largest percentage of vineyards of all the zones with a large percentage bordering the San Joaquin River to the south. There are some citrus orchards in the south east portion of the zone. Most orchards and vineyards within this zone are irrigated using drip or microspray which generate little to no runoff. Water is primarily supplied by the Madera Irrigation District and the Gravelly Ford Water District to the

west. Fifteen percent of the irrigated land is used for field crops and 13% for pasture, both of which are scattered in the western portion of the zone. Dairies and feedlots are scattered across the zone with approximately 1,725 operations (3% of total zone acreage). Madera is the largest city in this zone with the amount of urban land comprising 3% of the overall acreage (Table 3, Figure 9).

Figure 9. Land use for Cottonwood Creek @ Rd 20 Zone (Zone 6). See Figure 10 for a land use legend.

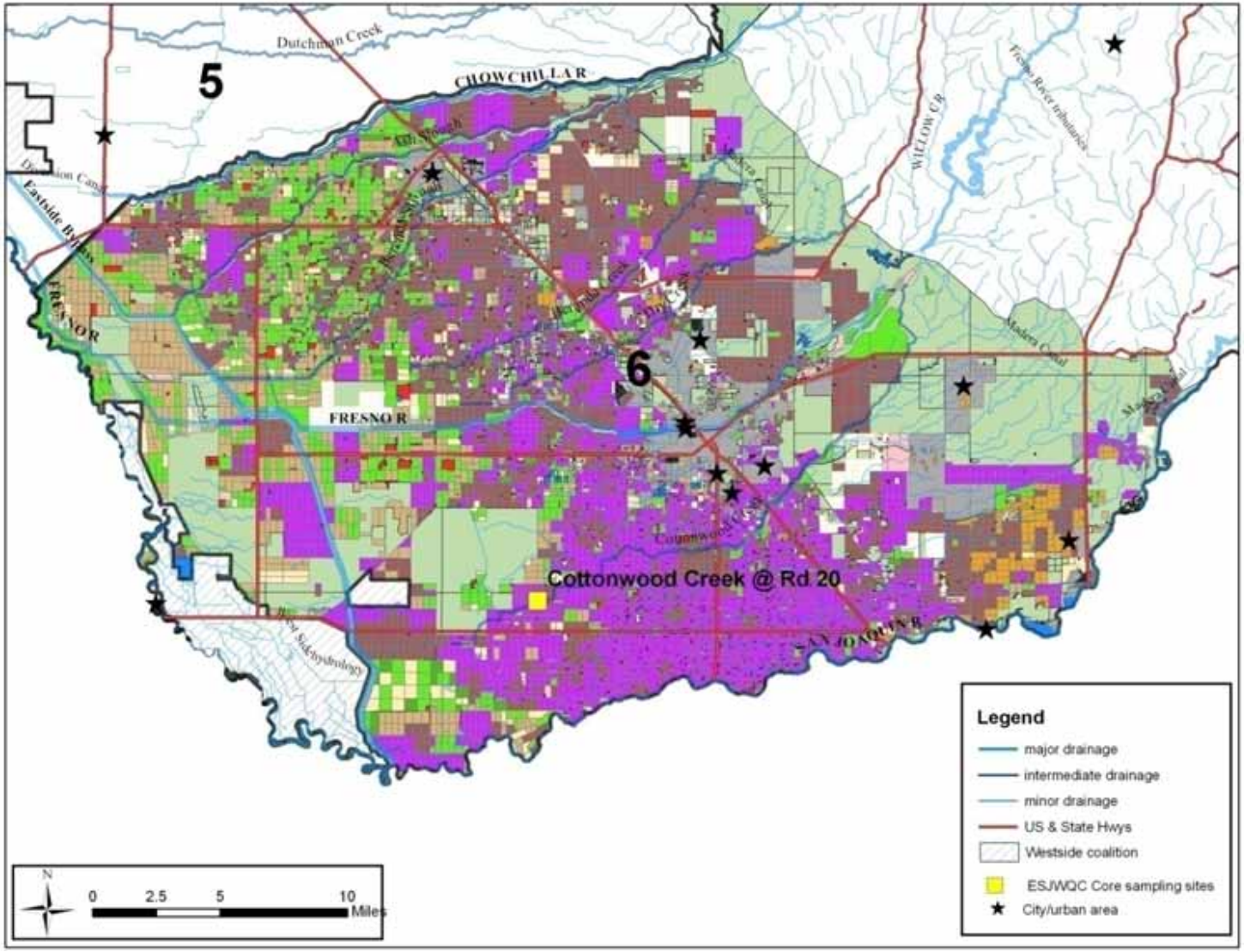


Figure 10. Land use legend for ESJWQC.

Source:
Land use survey data. CA Department of Water Resources (available for each county). Alameda (2006). Contra Costa (1995). Calaveras (2000). Alameda (2006).
US Geological Survey. 1999. California Resources Agency. Statewide coverages. Obtained from California Spatial Information Library.

Valuable Aquatic Resources

Aquatic resources for water bodies within the Coalition area have been defined in part as those assigned as beneficial uses (BU) by the CVRWQCB. Using the tributary rule, BUs can be applied to upstream tributaries based on the currently assigned BU (Table 4) in downstream water bodies. Important aquatic resources exist in the Coalition area, including cold water and warm water stream aquatic habitat, wetlands and fisheries resources.

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

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

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

Beneficial Uses

The CVRWQCB has assigned beneficial uses (BU) to water bodies within the Coalition region, but many water bodies monitored by the Coalition do not have assigned BUs. Using the tributary rule, the Coalition applied BUs for upstream tributaries based on those assigned to downstream water bodies as listed in the Basin Plan (Table 4). Water Quality Trigger Limits (WQTLs) are based on the BUs applied to the specific water body. Figure 11 is a map of the Coalition area with each water body color coded based on the assigned BU.

Table 4. Primary water bodies that drain directly into the major rivers of the ESJWQC region and the beneficial use for each of the major rivers. Sites are sorted alphabetically by name.

ID	Site Subwatershed (site name)	Immediate Downstream River	Beneficial Use of Immediate Downstream River
1	Ash Slough @ Avenue 21**	San Joaquin River[2]	1-4, 7-9, 11-15
2	Bear Creek @ Kibby Rd**	San Joaquin River[2]	1-4, 7-9, 11-15
3	Berenda Slough along Avenue 18 ½	San Joaquin River[2]	1-4, 7-9, 11-15
4	Black Rascal Creek @ Yosemite Rd	San Joaquin River[2]	1-4, 7-9, 11-15
5	Burnett Lateral @ 28 Mile Rd	Sacramento San Joaquin Delta[6]	1-5, 7-13, 15, 16
5	Burnett Lateral @ 28 Mile Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
6	Canal Creek @ West Bellevue Rd	San Joaquin River[2]	1-4, 7-9, 11-15
A	Cottonwood Creek @ Rd 20	San Joaquin River[2]	1-4, 7-9, 11-15
7	Deadman Creek @ Gurr Rd	San Joaquin River[2]	1-4, 7-9, 11-15
7	Deadman Creek @ Gurr Rd	San Joaquin River[2]	1-4, 7-9, 11-15
8	Deadman Creek @ Hwy 59	San Joaquin River[2]	1-4, 7-9, 11-15
8	Deadman Creek @ Hwy 59	San Joaquin River[2]	1-4, 7-9, 11-15
9	Dry Creek @ Rd 18**	San Joaquin River[2]	1-4, 7-9, 11-15
B	Dry Creek @ Wellsford Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
C	Duck Slough @ Gurr Rd	San Joaquin River[2]	1-4, 7-9, 11-15
10	Duck Slough @ Hwy 99	San Joaquin River[2]	1-4, 7-9, 11-15
11	Hatch Drain @ Tuolumne Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
D	Highline Canal @ Hwy 99	Merced River[5]	1, 3-15
D	Highline Canal @ Hwy 99	San Joaquin River[3]	1-4, 7-9, 11-13, 15
12	Highline Canal @ Lombardy Rd	Merced River[5]	1, 3-15
12	Highline Canal @ Lombardy Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
13	Hilmar Drain @ Central Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
14	Howard Lateral @ Hwy 140	San Joaquin River[2]	1-4, 7-9, 11-15
15	Lateral 2 1/2 near Keyes Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
16	Lateral 5 1/2 @ South Blaker Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
17	Lateral 6 and 7 @ Central Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
18	Levee Drain @ Carpenter Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
19	Livingston Drain @ Robin Ave	San Joaquin River[2]	1-4, 7-9, 11-15
20	Lower Stevinson @ Faith Home Rd	Merced River[5]	1, 3-15
21	McCoy Lateral @ Hwy 140	San Joaquin River[2]	1-4, 7-9, 11-15
E	Merced River @ Santa Fe	Merced River[5]	1, 3-15
22	Miles Creek @ Reilly Rd	San Joaquin River[2]	1-4, 7-9, 11-15
35	Mootz Drain downstream of Langworth Pond	San Joaquin River[3]	1-4, 7-9, 11-13, 15
24	Mustang Creek @ East Ave	Merced River[5]	1, 3-15
24	Mustang Creek @ East Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
25	Peaslee Creek @ Lake Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
F	Prairie Flower Drain @ Crows Landing Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
26	Rodden Creek @ Rodden Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
27	Silva Drain @ Meadow Dr	Merced River[5]	1, 3-15

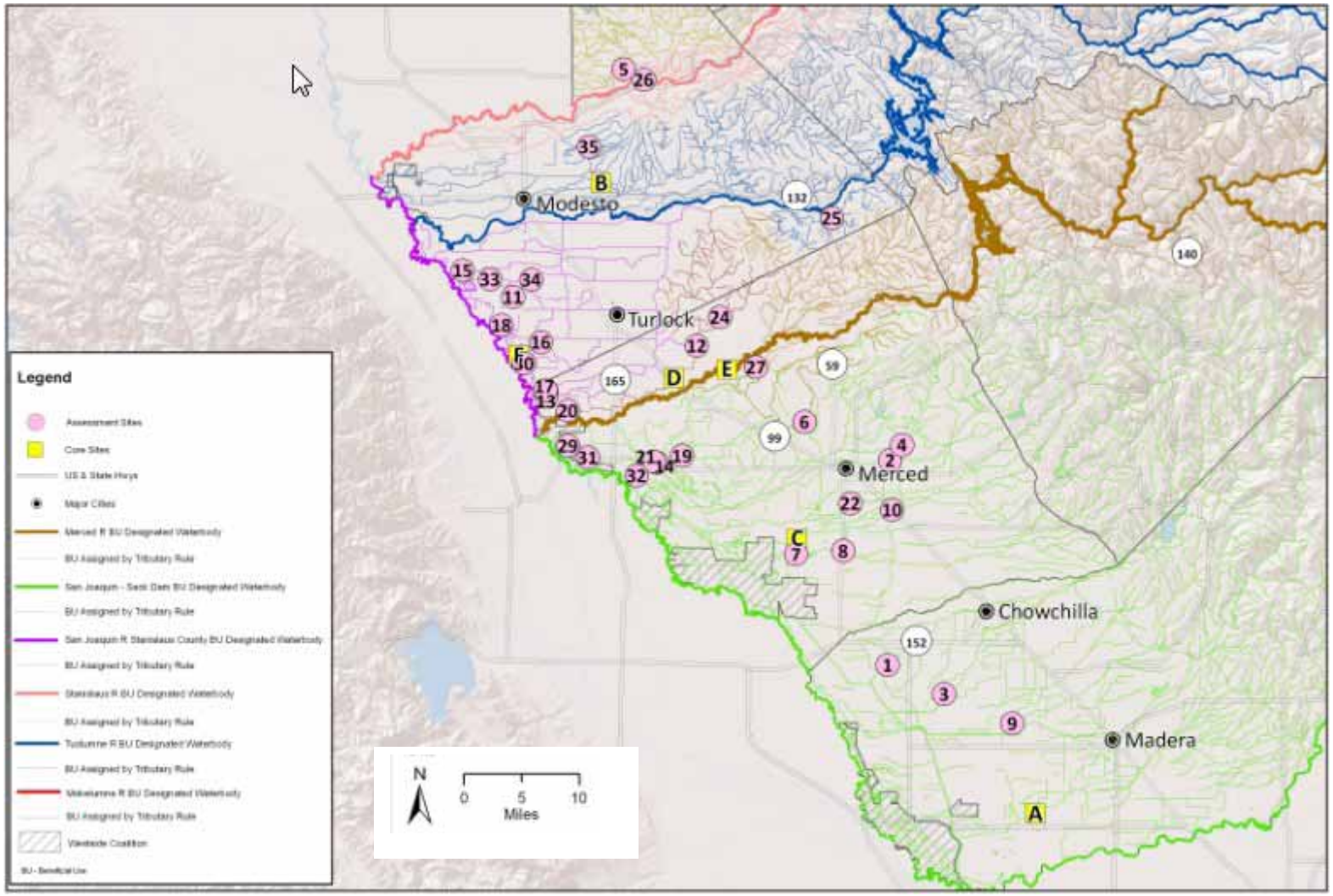
ID	Site Subwatershed (site name)	Immediate Downstream River	Beneficial Use of Immediate Downstream River
29	Unnamed Drain @ Cemetary Rd	San Joaquin River[2]	1-4, 7-9, 11-15
30	Unnamed Drain @ Hogin Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15
31	Unnamed Drain @ Hwy 140	San Joaquin River[2]	1-4, 7-9, 11-15
32	Unnamed Drain near Bear Creek @ West Bose Rd	San Joaquin River[2]	1-4, 7-9, 11-15
33	Westport Drain @ Vivian Ave	San Joaquin River[3]	1-4, 7-9, 11-13, 15
34	Yori Grove Drain @ East Taylor Rd	San Joaquin River[3]	1-4, 7-9, 11-13, 15

[1] Friant Dam to Mendota Pool reach
[2] Sack Dam to Merced River reach (all waterbodies that drain to this reach enter via the East Side Bypass with the exception of Livingston Drain)
[3] Mouth of Merced River to Vernalis
[4] New Don Pedro Reservoir to San Joaquin River reach
[5] McSwain Reservoir to San Joaquin River reach
[6] "Beneficial uses vary throughout the Delta and will be evaluated on a case-by-case basis" (wording from the Basin Plan).
[7] Goodwin Dam to San Joaquin River
** Surface water flow in these water bodies terminates in subterranean flow except for periods of increased runoff during large winter storms
* Beneficial Use code list:

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

Figure 11. Beneficial use designation of water bodies within the Coalition area.

Due to the size of the map, site ID 13 coincides with site ID 17 and site ID 14 coincides with site ID 21. Site ID information is included in Table 4 and 5.



MONITORING STRATEGY

Coalition ambient water and sediment quality monitoring for agricultural discharge will occur with three types of monitoring: Core Monitoring, Assessment Monitoring and Management Plan Monitoring. Combined, these three levels of monitoring are designed to characterize the discharge from irrigated agriculture as a result of irrigation and storm water runoff. Core Monitoring will occur at sites that have undergone intensive monitoring in the past to assess general water quality trends over time. Assessment Monitoring will occur at sites that have not been well characterized by previous monitoring. Samples collected from Assessment Monitoring locations will be analyzed for a large suite of constituents to adequately characterize water quality at those sites. This monitoring strategy allows for comprehensive monitoring in the short term and general trend monitoring over successive years.

The Coalition area has been divided into six zones based on hydrology, crop types, land use, soil types, and rain fall. For a description of each zone in regards to land use, hydrology, precipitation, soil types and crop patterns refer to the Description of Coalition Area section of this MRPP. The zone names are based on the core monitoring location within that area and include: 1) Dry Creek @ Wellsford Zone, 2) Prairie Flower Drain @ Crows Landing Zone, 3) Highline Canal @ Hwy 99 Zone, 4) Merced River @ Santa Fe Zone, 5) Duck Slough @ Gurr Rd Zone, and 6) Cottonwood Creek @ Rd 20 Zone. Each zone contains one Core Monitoring location and one Assessment Monitoring location that will rotate every two years.

Core Monitoring

Core Monitoring sites have been selected from water bodies that have a history of monitoring and are suitable to track water and sediment quality trends over extended periods of time. A list of criteria used to select these sites is provided below. Core sites will undergo assessment monitoring every three years in order to evaluate the effects of changes in land-use and management practices and provide information about long-term trends and effectiveness of the management practices. Management plan monitoring may also occur at Core sites. Core Monitoring is not limited to largest volume water bodies, but includes a diversity of water body size and flows. Data generated from the Core Monitoring sites will be used to establish trend information about the effectiveness of the Coalition's efforts to reduce or eliminate the impact of irrigated agriculture on surface waters.

Core Monitoring Sites Selection Criteria:

1. Core sites have been monitored for at least three years with at least one year of monitoring for all constituents of concern.
2. Core sites include small, intermediate and large site subwatersheds.
3. Core sites include site subwatersheds dominated by field crops and by orchards.

4. Core sites include areas with low flow (irrigation ditches that have flow only when pumps are on), medium flow (increases with irrigation or large storm events), and high flows (natural rivers).

Assessment Monitoring

Assessment Monitoring will focus on a diversity of monitoring sites that are representative of individual zones. Assessment sites were selected based on the sizes and flows of surface water bodies and land uses (e.g., agricultural activities, crops and pesticide use), and include water bodies that carry agricultural drainage into natural water bodies, both directly and indirectly. Sites with known water quality impairments (such as, but not limited to those in the Clean Water Act 303(d) listing) and sites undergoing compliance monitoring for TMDLs will also be included in this monitoring. Assessment sites are selected in order to adequately characterize water quality for all waters of the State within the Coalition region. In conjunction with Core Monitoring for trends and Special Projects focused on specific problems, Assessment Monitoring will demonstrate the effectiveness of management practices and identify locations for implementation of new management practices, as needed.

To allow the Coalition to monitor a large number of waterbodies across the six zones, the Assessment sites will be rotated every two years. Each zone will contain one Assessment site which will represent a specific subwatershed including the crop type, land use and hydrology specific to that subwatershed. If an Assessment Monitoring site exhibits more than one water quality exceedance for the same constituent within the two years of monitoring, it will become part of the ESJWQC Management Plan monitoring which requires additional monitoring beyond the initial two years. For site subwatersheds that are currently under a management plan, the Coalition will continue to monitor at that location for the constituents within the management plan for which it is listed.

Special Project Monitoring

Special project monitoring will occur for the purpose of constituent-specific monitoring or targeted source identification studies as needed. This supplementary monitoring may include, but is not limited to, specific targeted studies to source exceedances or monitoring to provide information about conditions of a water body that predate agricultural inputs that occurred prior to the formation of the Coalition. Pre-existing conditions may include legacy pesticides and metals use by agriculture in the past and which bind to sediments and settled into the bed of the water body. These compounds can result in current water contamination when sediment is mobilized into the water column. Additionally, there are natural background levels of salts and metals in the subwatershed that occur as a result of weathering of local soils. Special Project Monitoring is considered supplemental to the MRPP's requirements and will occur in specific site subwatersheds based on the actions described in the Coalition's Management Plan.

The ESJWQC Management Plan includes a schedule for Management Plan monitoring based on the previous year's monitoring results. Each April, the Management Plan will be updated with new sites and/or constituents that will be included in that year's Management Plan process of sourcing, outreach and education. The ESJWQC Management Plan includes the following eight requirements of the MRP and will be update yearly:

1. Identification of irrigated agriculture source.
2. Identification of management practices implemented to address exceedances.
3. Management practice implementation schedule.
4. Management practice performance goals with a schedule.
5. Waste-specific monitoring schedule.
6. A process and schedule for evaluating management practice effectiveness.
7. Identification of the participants and Coalition Group(s) that will implement the Management Plan.
8. An identified routine schedule of reporting to the Regional Water Board.

MONITORING SITES

Site Names and Locations

The ESJWQC monitoring program includes monitoring at 33 (six in 2008-09) Assessment Monitoring sites (Table 5) and six Core Monitoring sites (Table 6). Core sites will assess trends of water quality within each zone and will undergo assessment monitoring every third year. Assessment sites will rotate to new locations every two years to assess water quality across each zone ensuring that all subwatersheds are being fully characterized by the Coalition over time. Specific criteria used to select monitoring sites are provided in the previous section. In general, to facilitate source identification sites are prioritized according to the size of the water body (intermediate sized water bodies are generally higher priority, although the Coalition attempted to select sites in all water body sizes) and the area of irrigated land in the site subwatershed. Because many of the intermediate water bodies are located in Merced County, some proposed sampling sites are located in smaller water bodies in order to ensure complete coverage across the Coalition region. Alternatively, Coalition counties that have very limited irrigated agriculture may have no sampling sites. In Calaveras, Tuolumne and Mariposa Counties, a very small portion of land is used for agriculture and the agriculture that does occur almost entirely consists of vineyards and orchards on drip or microspray irrigation, or dry-farmed with no irrigation. As such, these areas of the Coalition region are not considered a priority and tentative sites have not been selected in these counties. Sites were selected based on quantity and type of irrigated land and not on representation by county. In some instances the proposed sampling locations are a significant distance upstream of the confluence of the intermediate-sized water body with the San Joaquin River. In these instances, the location of the proposed sample site is established in the most downstream position where agriculture is the predominant land use. Some water bodies cannot be sampled due to inaccessibility or safety concerns to the samplers.

Table 5. ESJWQC sampling locations for Assessment Monitoring. Two Assessment Monitoring locations will be monitored within each zone and will rotate every two years. Sites are sorted by zone number and site name.

ID	Zone	Monitoring Type	Site Name	Station Code	Latitude	Longitude
5	1	Assessment	Burnett Lateral @ 28 Mile Rd	535BLATMR	37.80343	-120.83992
35	1	Assessment	Mootz Drain downstream of Langworth Pond	535XMDDLP	37.70551	-120.89438
26	1	Assessment	Rodden Creek @ Rodden Rd	535XRCARD	37.79042	-120.80790
11	2	Assessment	Hatch Drain @ Tuolumne Rd	535XHDATR	37.51490	-121.01220
13	2	Assessment	Hilmar Drain @ Central Ave	535XHDACA	37.39060	-120.95820
15	2	Assessment	Lateral 2 1/2 near Keyes Rd	535LTHNKR	37.54780	-121.09274
16	2	Assessment	Lateral 5 1/2 @ South Blaker Rd	535LFHASB	37.45823	-120.96726
17	2	Assessment	Lateral 6 and 7 @ Central Ave	535LSSACA	37.39779	-120.95971
18	2	Assessment	Levee Drain @ Carpenter Rd	535XLDACR	37.47903	-121.03012
20	2	Assessment	Lower Stevinson @ Faith Home Rd	535LSAFHR	37.37238	-120.92318
30	2	Assessment	Unnamed Drain @ Hogin Rd	535XUDAHR	37.43129	-120.99380
33	2	Assessment	Westport Drain @ Vivian Rd	535XWDAVR	37.53680	-121.04860
34	2	Assessment	Yori Grove Drain @ East Taylor Rd	535YGDETR	37.53690	-120.98346
12	3	Assessment	Highline Canal @ Lombardy Ave	535XHCHNN	37.45560	-120.72070
24	3	Assessment	Mustang Creek @ East Ave	535XMCAEA	37.49180	-120.68390
25	3	Assessment	Peaslee Creek @ Lake Rd	535XPCALR	37.61769	-120.50733
2	4	Assessment	Bear Creek @ Kibby Rd	535XBCAKR	37.31280	-120.41380
4	4	Assessment	Black Rascal Creek @ Yosemite Rd	535BRCAYR	37.33210	-120.39470
6	4	Assessment	Canal Creek @ West Bellevue Rd	535CCAWBR	37.36075	-120.54941
14	4	Assessment	Howard Lateral @ Hwy 140	535XHLAHO	37.30790	-120.78200
19	4	Assessment	Livingston Drain @ Robin Ave	535XLDARA	37.31690	-120.74230
21	4	Assessment	McCoy Lateral @ Hwy 140	535XMLAHO	37.30945	-120.78759
27	4	Assessment	Silva Drain @ Meadow Dr	535XSDAMD	37.42910	-120.62610
29	4	Assessment	Unnamed Drain @ Cemetary Rd	535XUDACR	37.32835	-120.92290
31	4	Assessment	Unnamed Drain @ Hwy 140	535XUDAHO	37.31370	-120.89110
32	4	Assessment	Unnamed Drain near Bear Creek @ West Bose Rd	535UNDAWB	37.29159	-120.81410
7	5	Assessment	Deadman Creek @ Gurr Rd	535XDCAGR	37.19360	-120.56120
8	5	Assessment	Deadman Creek @ Hwy 59	535DMCAHF	37.19810	-120.48690
10	5	Assessment	Duck Slough @ Hwy 99	535XDSAHN	37.25010	-120.41000
22	5	Assessment	Miles Creek @ Reilly Rd	535XMCARR	37.25820	-120.47550
1	6	Assessment	Ash Slough @ Ave 21	545XASAAT	37.05450	-120.41580
3	6	Assessment	Berenda Slough along Ave 18 1/2	545XBSAAE	37.01820	-120.32650
9	6	Assessment	Dry Creek @ Rd 18	545XDCARE	36.98180	-120.21950

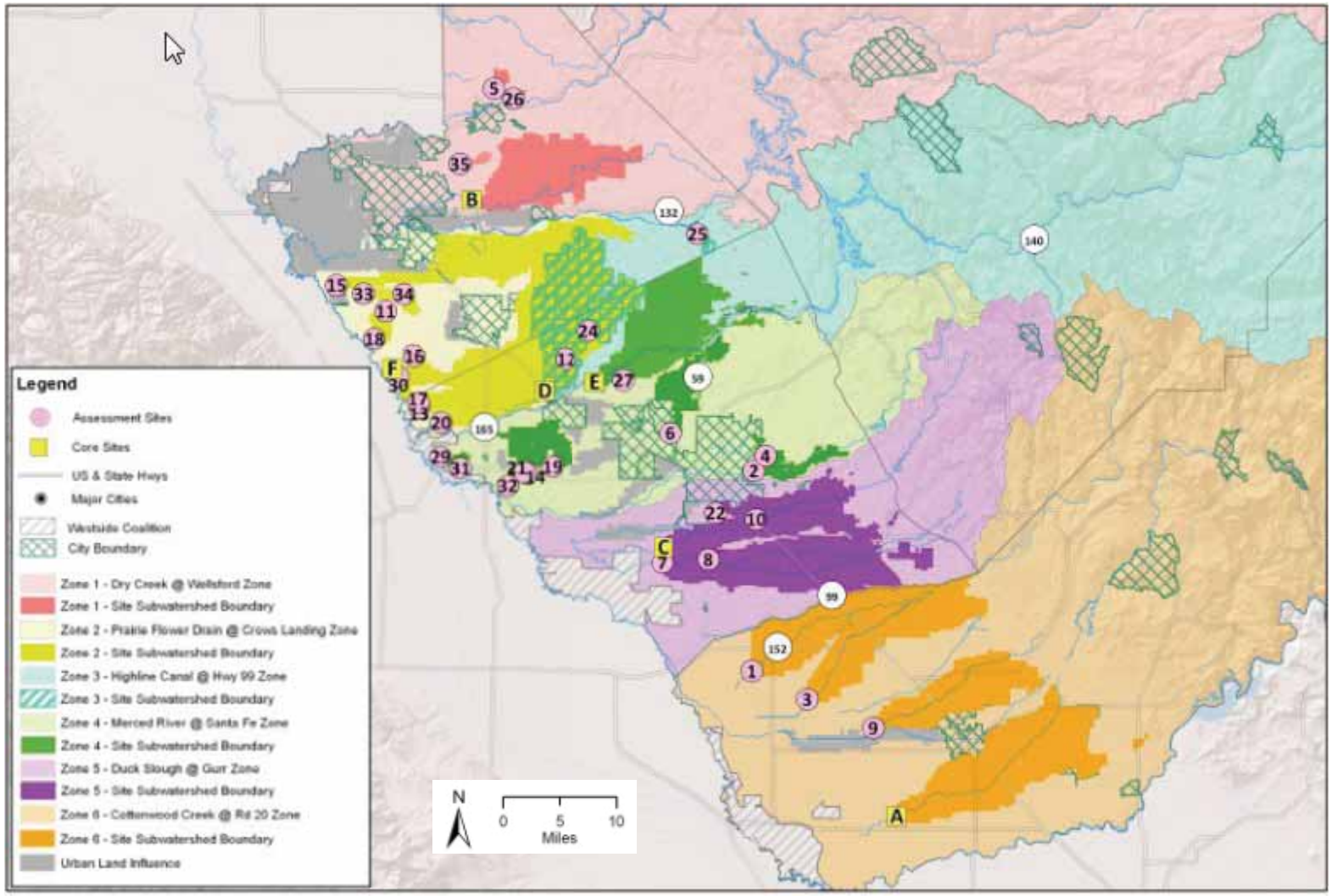
Table 6. ESJWQC sampling locations for Core Monitoring (sorted by zone number).

ID	Zone	Site Name	Station Code	Latitude	Longitude
B	1	Dry Creek @ Wellsford Rd	535XDCAWR	37.6602	-120.8743
F	2	Prairie Flower Drain @ Crows Landing Rd	535XPFDCL	37.4422	-121.0024
D	3	Highline Canal @ Hwy 99	535XHCHNN	37.4153	-120.7557
E	4	Merced River @ Santa Fe	535XMRSFD	37.4271	-120.6721
C	5	Duck Slough @ Gurr Rd	535XDSAGR	37.2142	-120.5596
A	6	Cottonwood Creek @ Rd 20	545XCCART	36.8686	-120.1818

Site Subwatershed Descriptions and Coalition Area Maps

The Coalition area has been divided into site subwatersheds that are monitored either through Assessment or Core Monitoring. Water quality monitoring within the Coalition area will rotate within a zone among the Assessment Monitoring locations to eventually characterize all agricultural discharge. Figure 12 shows all Assessment and Core Monitoring locations. There are some areas of the Coalition region that do not have agricultural discharge, are dominated by urban land uses, or cannot be sampled due to logistic problems (e.g., lack of sampling locations, private property access). Water bodies in these locations are being represented by another site subwatershed within the zone. Land uses for the site subwatersheds are provided in Table 7.

Figure 12. Site subwatershed size designation for all subwatersheds in the Coalition region (based on irrigation flows).
Due to the size of the map and proximity of sampling locations, site IDs 17 and 13 overlap as do 21 and 14. Site ID information is included in Table 5.



Descriptions of the 34 site subwatersheds are provided alphabetically. Maps for each site subwatershed are included in Attachment I.

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

Bear Creek @ Kibby Rd (6,740 irrigated acres) – This site subwatershed drains an eastern portion of the Coalition region in Merced County. Bear Creek originates in the foothills of the Sierras with Burn's Creek as one of the major tributaries. Bear Creek drains to the east just north of the towns of Planada, through Merced and eventually to the San Joaquin River. The primary irrigated agriculture in the site subwatershed includes deciduous nuts, field crops, truck crops, and irrigated pasture.

Berenda Slough along Road 18 ½ (25,006 irrigated acres) – Berenda Slough flows through the northern portion of Madera County and empties into the Eastside Bypass when flows are sufficient. Often there is low flow which disappears prior to the confluence of Berenda Slough and the Bypass. The primary agriculture is orchards and vineyards with small amounts of pasture and field crops.

Black Rascal Creek @ Yosemite Road (535 irrigated acres) – The headwaters of Black Rascal Creek are in the Sierra foothills. It is located just to the north of the Bear Creek site subwatershed and to the east of the city of Merced. Citrus and field crops make up the majority of the agriculture in the site subwatershed.

Burnett Lateral @ 28 Mile Rd (1,163 irrigated acres) – This site is located just north of the Stanislaus River, along the northern border of the Coalition region. Burnett Lateral drains a small site subwatershed to the north and can flow either into the Stanislaus River to the south or through a series of canals to the west and eventually into the San Joaquin River. Agricultural lands are composed of deciduous fruits and nuts, pastures and dairies.

Canal Creek @ West Bellevue Rd (4,241 irrigated acres) – The creek is fed by the Main Canal off of the Merced River, which diverges from the river in the Sierra Nevada foothills only a few miles below Lake McClure. Canal Creek runs west, predominantly along wild vegetation then south along a section of irrigated agricultural land before reaching the sampling site just east of the city of Atwater.

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

Deadman Creek @ Gurr Rd (48,056 irrigated acres) - This site subwatershed is a downstream site from Deadman Creek @ Hwy 59. The primary agriculture in the site subwatershed is orchards and row crops with some irrigated pasture upstream.

Deadman Creek @ Highway 59 (38,230 irrigated acres) – Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59. The primary agriculture in the site subwatershed is orchards and row crops with some irrigated pasture upstream.

Dry Creek @ Road 18 (23,086 irrigated acres) – Dry Creek originates in the Sierra foothills and flows to the north of the city of Madera eventually drains into the San Joaquin River through various channels and irrigation ditches. Deciduous crops are the primary irrigated agriculture in the upper portion of the site subwatershed whereas vineyards predominate in the lower portions. There are field crops scattered throughout the site subwatershed.

Dry Creek @ Wellsford Road (23,115 irrigated acres) – This site subwatershed is in the northern part of the Coalition region and drains a combination of field crops, deciduous nuts, and vineyards. Dry Creek originates to the east of Modesto and drains into the Tuolumne River. This site subwatershed samples Dry Creek at the furthest downstream location that collects agricultural drainage prior to flowing through the urban areas of Modesto. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal.

Duck Slough @ Gurr Road (28,636 irrigated acres) – This site subwatershed is a monitoring location downstream from Duck Slough @ Hwy 99. Located to the south and west of Merced, this site drains field crops immediately upstream and deciduous nuts further upstream as well as some irrigated pasture. The city of Merced delivers treated water to Duck Slough a few miles upstream of the Gurr Road site. Duck Slough flows west eventually becoming Deadman Creek in the western portion of the Coalition region. The slough eventually flows into the San Joaquin River via Deadman Creek and Deep Slough.

Duck Slough @ Hwy 99 (15,622 irrigated acres) – This site subwatershed is located upstream of the Duck Slough @ Gurr Road site and was selected to determine relative contribution of water quality impairments in the upstream portion of the Duck Slough subwatershed. Duck Slough originates in the Sierra foothills and flows west eventually joining with Deadman Creek in the western portion of the coalition region. The monitoring site is located just east of Highway 99 south of Planada and Merced. Irrigated agriculture in this site subwatershed is primarily deciduous nuts, with truck crops and irrigated pasture the next most common land uses.

Hatch Drain @ Tuolumne Rd (259 irrigated acres) – This small site subwatershed is located in the western portion of the Coalition region in Stanislaus County. The two major crops are citrus and field crops.

Highline Canal @ Highway 99 (35,220 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. This site was selected as a downstream companion site to the Highline Canal @ Lombardy Road site. This site subwatershed is monitored to determine the relative contribution of the upstream and downstream site subwatersheds to water quality impairments. The sampling site is located just south of Delhi as the canal crosses the highway. The irrigated agriculture is primarily deciduous nuts, and these are located at the lower end of the site subwatershed. A small number of vineyards are also present.

Highline Canal @ Lombardy Road (30,154 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. The main upstream tributary of the Highline Canal is Mustang Creek. The Highline Canal flows west and eventually drains into the Merced River. Dairies are present upstream and Mustang Creek, a major tributary during the dormant season, passes immediately to the southeast of the Turlock Airport. The main agricultural crop upstream is deciduous nuts.

Hilmar Drain @ Central Ave (2,718 irrigated acres) – This site subwatershed is located toward the western edge of the Coalition region near the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture. Hilmar Drain originates at Williams Ave and Washington Road and eventually drains into the San Joaquin River.

Howard Lateral @ Hwy 140 (3,876 irrigated acres) – 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 truck/nursery/berry crops and deciduous fruit, but also includes field crops, pasture, grains/hay, vineyard and dairy.

Lateral 2 1/2 near Keyes Rd (32,740 Irrigated acres) – This site subwatershed is located in the western portion of the Coalition region just south of the Tuolumne River and East of the San Joaquin River. 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 crops types and land use found in the Coalition Region.

Lateral 5 1/2 @ South Blaker Rd (44,758 irrigated acres, 22,244 acres during storm runoff) – This site is located east of the San Joaquin River and west of the City of Turlock. The site subwatershed extends to the north and east, reaching the Tuolumne River to the north. During irrigation season the area that drains to this location extends east of Turlock, but during the storm season, the water drains to the Highline Canal. Agriculture in the site subwatershed is varied and includes all crop types and land uses found in the Coalition Region.

Lateral 6 and 7 @ Central Ave (71,798 irrigated acres, 29,306 acres during storm runoff) – This site is located on the northern border of Merced County, just to the east of the San Joaquin River. The site subwatershed extends to the north and east past the City of Turlock and Delhi, reaching the Tuolumne River to the north. Agriculture in the site subwatershed is varied and includes all crop types and land uses found in the Coalition Region.

Levee Drain @ Carpenter Rd (2,500 irrigated acres) – Levee Drain is located just south of Hatch Drain, in the western portion of the Coalition Region, and confluences directly with the San Joaquin River. Land use upstream of the sample site to the north and east include truck/nursery/berry crops, pasture and dairy.

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

Lower Stevenson @ Faith Home Rd (74,983 irrigated acres) – This site is located on the northern border of Merced County, along the Merced River. The site subwatershed extends to the north and east through Hilmar-Irwin and Delhi, reaching the Tuolumne River to the north. Agriculture in the site subwatershed is varied and includes all crop types and land uses found in the Coalition Region.

McCoy Lateral @ Hwy 140 (5,759 irrigated acres) – The site is located less than one mile east of the Howard Lateral confluence (Howard Lateral @ Hwy 140 sample site). The lateral receives inputs from north and south drainages. Agricultural land use is predominantly truck/nursery/berry crops and deciduous fruit, but also includes field crops, pasture, grains/hay, vineyard and dairy.

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

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

Mootz Drain downstream of Langworth Pond (1,074 irrigated acres) – This site subwatershed is located in the northern part of the Coalition region. The drain originates to the east of Modesto and drains through Lateral 6 into the Stanislaus River. Land use upstream of the site is

predominantly pastures and dairies. A small portion of land is allocated as field crops. The sample for this site is collected downstream of the retention pond.

Mustang Creek @ East Ave (12,113 irrigated acres) – Mustang Creek originates in the foothills of the Sierra Nevada and flows into the upper portion of the Highline Canal. Mustang Creek is ephemeral with flow found primarily during winter runoff events. Summer flows are intermittent. Citrus and deciduous nut crops are the main agriculture with smaller amounts of field crops and grains and hay.

Peaslee Creek @ Lake Rd (809 irrigated acres) – This site is located on the eastern side of the coalition region just south of the Tuolumne River. The creek confluences with the Tuolumne River just west and north of the sample site. Land use in the site subwatershed includes vineyards and deciduous fruits/nuts. There is also one section of land allocated as feedlot/dairy/farmstead.

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

Rodden Creek @ Rodden Rd (246 irrigated acres) – The site is located just north of the Stanislaus River, along the northern border of the Coalition region. The creek confluences with the Stanislaus River less than one mile south of the sampling site. Rodden Creek drains a small site subwatershed to the northeast. Agricultural lands are composed of deciduous fruits and nuts, pastures and dairies.

Silva Drain @ Meadow Drive (67 irrigated acres) – This is a very small site subwatershed that joins with Jones Drain just upstream of the confluence of Jones Drain with the Merced River. The primary agriculture is citrus orchards with small amounts of field crops and irrigated pasture. Large dairies are found in the site subwatershed.

Unnamed Drain @ Hogin Rd (1,091 irrigated acres) – This drain is located south of the Prairie Flower Drain and confluences with the San Joaquin River west of the sample site. Land use in the site subwatershed consists of truck/nursery/berry crops, pasture and dairy.

Unnamed Drain @ Hwy 140 (444 irrigated acres) – The sample site is located at the southwestern end of the Coalition region. The upstream site subwatershed consists mostly of pasture, dairy and field crops.

Unnamed Drain @ Cemetary Rd (1,102 irrigated acres) – The sample site is located just north of the Unnamed Drain @ Hwy 140 site. Land use in the site subwatershed is predominantly pasture and field crops.

Unnamed Drain near Bear Creek @ West Bose Rd (1,176 irrigated acres) – The unnamed drain is located on the western side of the Coalition region, just east of the San Joaquin River. The site subwatershed is small, extending north to McCoy Lateral. Land use consists of pasture, field crops, truck/nursery/berry crops, dairy and grains/hay.

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

Yori Grove Drain @ East Taylor Rd (1,226 irrigated acres) – The sample site along Yori Grove Drain is just east of the Westport Drain sample site. The site drains irrigated land to the south. Land use includes deciduous fruits/nuts, vineyard, field crops, pasture and dairy. Urban land is also found within the site subwatershed.

Site Subwatershed Land Use

Table 7. Acreage of crops grown in site subwatersheds of the ESJWQC region showing irrigated (I) and non-irrigated (NI) acres. Sites are listed alphabetically.

Site Subwatershed	Citrus	Citrus	Deciduous nut and fruit	Deciduous nut and fruit	Field crop	Field crop	Grain and hay	Grain and hay	Idle	Idle	Wild vegetation*	Water surface	Pasture	Pasture	Rice	Feedlot, dairy, farmstead	Truck, nursery, berry	Urban	Golfcourse, cemetery, landscape	Vineyard	Total Acres	Irrigated Acres
	I	NI	I	NI	I	NI	I	NI	I	NI	NI	NI	I	NI	I	NI	I	NI	NI	I		
Ash Slough @ Ave 21			6889		9101		726		33			1273	4936			712	635	1311	33	5383	31032	27704
Bear Creek @ Kibby Rd			2983		1581		223	242			238		1414			67	539	10			7297	6740
Berenda Slough along Ave 18 1/2	97		15574		3048		1804	1413	261		3792	267	1695			720	116	1622	215	2412	33034	25006
Black Rascal Creek @ Yosemite Rd			180		142		11	167					201			11					712	535
Burnett Lateral @ 28 Mile Rd			452					118	15		29	16	696	19		35		2			1382	1163
Canal Creek @ West Bellevue Rd			1892		634			201	171	633	6967	8	1300			219		13		245	12284	4241
Cottonwood Creek @ Rd 20	571		10326		3724	314	664	2009	1172		11352	615	847			562	85	10062	25	23310	65637	40699
Deadman Creek @ Gurr Rd	7		11333		16221			4286	672		12060	393	14833	21		914	3393	399		1596	66129	48056
Deadman Creek @ Hwy 59	7		10246		11458		2366	1153	666		7318	296	8740	626			3329	312		1418	47935	38230
Dry Creek @ Rd 18	422		12103		1105		444	1213	495		3918	104	637			446	169	4614	314	6710	32697	22086
Dry Creek @ Wellsford Rd		8	8064		4516			2395	239		4606	204	7346	1310	1188	1414		486		1762	33538	23115
Duck Slough @ Gurr Rd			8766		7975		1271	322	832		3154	172	7303	76	318	1056	2172	676	17		34108	28636
Duck Slough @ Hwy 99			8290		2768		416	259	315		422	94	2445	66		439	1388	457	17		17376	15622
Hatch Drain @ Tuolumne Rd					155								104			17		11			286	259
Highline Canal @ Hwy 99	77		20603		7029		661	12	221		550	183	4826	352		1356	371	619	4	1432	38295	35220
Highline Canal @ Lombardy Ave	77		16644		6771		661	12	80		507	179	4769	352		1187	110	345	1	1041	32738	30154

Site Subwatershed	Citrus	Citrus	Deciduous nut and fruit	Deciduous nut and fruit	Field crop	Field crop	Grain and hay	Grain and hay	Idle	Idle	Wild vegetation*	Water surface	Pasture	Pasture	Rice	Feedlot, dairy, farmstead	Truck, nursery, berry	Urban	Golfcourse, cemetery, landscape	Vineyard	Total Acres	Irrigated Acres
	I	NI	I	NI	I	NI	I	NI	I	NI	NI	NI	I	NI	I	NI	I	NI	NI	I		
Hilmar Drain @ Central Ave			87		1968						9	11	664			215					2954	2718
Howard Lateral @ Hwy 140			1260		251		167		114		159	5	377			76	1602	41		105	4158	3876
Lateral 2 ½ near Keyes Rd	26	7	23792		4492		100	3	441		1587	206	2542	20		1290	674	4348	251	672	40452	32740
Lateral 5 ½ @ South Blaker Rd	87		21403		13393		211	55	123		1682	301	7669	37		2484	930	1629	20	942	50965	44758
Lateral 5 ½ @ South Blaker Rd Storm	10		9238		7559		113	44	123		1287	140	4162	20		1583	921	1468	20	118	26806	22244
Lateral 6 & 7 @ Central Ave	96		34615		21008		822	757	173		2471	511	9829	522		4175	1065	2677	257	4191	83167	71798
Lateral 6 & 7 @ Central Ave Storm	19		11539		11575		118	44	92		1556	334	4837	39		2713	921	2340	253	205	36585	29306
Levee Drain @ Carpenter Rd					1675						23	96	826			335		9			2964	2500
Livingston Drain @ Robin Ave			2367		58		176		18		131	2	58	20		146	922	37		58	3992	3656
Lower Stevinson @ Faith Home Rd	106		40000	7	18265		833	784	417		2661	372	9260	532		3827	1510	4020	121	4591	87306	74983
Lower Stevinson @ Faith Home Rd Storm	29		10633		7762		130	44	166		1475	295	3873	38		1888	890	1981	105	184	29493	23668
McCoy Lateral @ Hwy 140			1573		1264		234		214		117	28	222	9		276	924	13		1327	6202	5759
Merced River @ Santa Fe	45		14109		5422	140	700	226	141	276	5006	256	4483	101		1099	278	339	4	2616	35242	27796
Miles Creek @ Reilly Rd	3		1767		3927		548	536	145		568	82	2201			475	1073	860	15		12200	9664
Mootz Drain downstream of Langworth Pond					100				2				972			122		4			1200	1074
Mustang Creek @ East Ave			4095		2053		486	701			374	5	235			86				5244	13279	12113
Peaslee Creek @ Lake Rd			482													20				327	829	809
Prairie Flower Drain @ Crows Landing Rd					2674							30	1406			443					4553	4080
Rodden Creek @ Rodden Rd			80		3			38	5			33	159			4		17			339	246
Silva Drain @ Meadow Dr					59								8	4							70	67

Site Subwatershed	Citrus	Citrus	Deciduous nut and fruit	Deciduous nut and fruit	Field crop	Field crop	Grain and hay	Grain and hay	Idle	Idle	Wild vegetation*	Water surface	Pasture	Pasture	Rice	Feedlot, dairy, farmstead	Truck, nursery, berry	Urban	Golfcourse, cemetery, landscape	Vineyard	Total Acres	Irrigated Acres
	I	NI	I	NI	I	NI	I	NI	I	NI	NI	NI	I	NI	I	NI	I	NI	NI	I		
Unnamed Drain @ Cemetary Rd					269						353		833								1455	1102
Unnamed Drain @ Hogin Rd					515						89	40	576			36					1256	1091
Unnamed Drain @ Hwy 140					43						58		400			20					522	444
Unnamed Drain near Bear Creek @ West Bose Rd					182		56		670				190			35	77				1212	1176
Westport Drain @ Vivian Rd			432		575								264			126		7		202	1607	1474
Yori Grove Drain @ East Taylor Rd			420		355						12		287			63		105		163	1406	1226

Assessment Monitoring

Assessment Monitoring will take place at newly established monitoring site or at sites that have not been fully characterized according to a two-year cycle. Assessment Monitoring will be conducted on a monthly basis for 12 months of the year (Table 8).

Table 8. Assessment Monitoring schedule.

Parameters (See Table 12 for details)	Monitoring Frequency *
303(d) waste constituent to be monitored if Agriculture is identified as contributing source	Monthly
Water Column Toxicity	Monthly
Toxicity Identification Evaluation (as needed based on toxicity results)	Monthly
Pesticides	Monthly
Metals	Monthly
Nutrients	Monthly
General Physical Parameters (including flow)	Monthly
Pathogens	Monthly
Sediment Toxicity Sampling (all)	Twice per year **
Photo monitoring (digital)	Every monitoring site with every monitoring event

* Every third year Core Monitoring will include all Assessment Monitoring parameters and be conducted monthly for a period of 12 months.
**One sample will be collected between 15 August and 15 October and the second between 1 March and 30 April of each year.

Assessment monitoring will consist of monthly sampling for general water quality parameters, nutrients and pathogens from December through September. Assessment Monitoring will also include water column and toxicity monitoring, as well as the series of pesticides, metals and nutrients described in Table 12. Monthly sampling events will be scheduled in the best way possible to capture at least two storm runoff events per year. No more than one complete sample per month will be collected.

Core Monitoring

Core Monitoring will be used to track compliance with specific regulatory water quality standards, and to track trends in water conditions over time. The Core Monitoring sites will include monthly monitoring and is summarized in Table 9.

Table 9. Core Monitoring schedule.

Parameters (See Table 12 for details)	Monitoring Frequency*
Assessment Monitoring	Once every three years*
Nutrients	Monthly
General Physical Parameters (including flow)	Monthly
Pathogens	Monthly
Photo monitoring (digital)	Every monitoring site with every monitoring event
Parameter(s) of Concern**	Monthly

* Every third year Core Monitoring will include all Assessment Monitoring parameters.
**Parameters of Concern may be selected by the Regional Water Board Executive Officer from toxicity, pesticides or metals analyses that result in an exceedance or detection during Assessment Monitoring.

Core monitoring will consist of the general physical, pathogen and nutrient parameters that are listed in more detail in Table 12. Core Monitoring parameters include general water quality measurements that may provide data indicative of water quality impairment. The list of assessment monitoring parameters shall be repeated at the Core Monitoring sites during every third year of monitoring. The Coalition Group may submit written requests for the removal or addition of Core Monitoring sites for approval by the Executive Officer.

Table 10 provides the sequential schedule for monitoring at each site, including Assessment Monitoring and Core Monitoring. Once all locations have been monitored within a zone, the schedule will repeat.

Table 10. Assessment and Core Monitoring schedule. C = Core Monitoring. A = Assessment Monitoring.

Zone	Site ID	Monitoring Location	2008*	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
1	B	Dry Creek @ Wellsford Rd	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
1	35	Mootz Drain downstream of Langworth Pond	A	A	A					A	A					A	A					A	A	
1	26	Rodden Creek @ Rodden Rd				A	A					A	A					A	A					A
1	5	Burnett Lateral @ 28 Mile Rd						A	A					A	A					A	A			
2	F	Prairie Flower Drain @ Crows Landing	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
2	15	Lateral 2 1/2 near Keyes Rd	A	A	A																			A
2	34	Yori Grove Drain @ East Taylor Rd				A	A																	
2	18	Levee Drain @ Carpenter Rd						A	A															
2	16	Lateral 5 1/2 @ South Blaker Rd								A	A													
2	30	Unnamed Drain @ Hogin Rd										A	A											
2	17	Lateral 6 and 7 @ Central Ave												A	A									
2	13	Hilmar Drain @ Central Ave														A	A							
2	20	Lower Stevenson @ Faith Home Rd																A	A					
2	11	Hatch Drain @ Tuolumne Rd																		A	A			
2	33	Westport Drain @ Vivian Rd																				A	A	
3	D	Highline Canal @ Hwy 99	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
3	24	Mustang Creek @ East Ave	A	A	A					A	A					A	A					A	A	
3	12	Highline Canal @ Lombardy Ave				A	A					A	A					A	A					A
3	25	Peaslee Creek @ Lake Rd						A	A					A	A					A	A			
4	E	Merced River @ Santa Fe Rd	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
4	14	Howard Lateral @ Hwy 140	A	A	A																			A
4	21	McCoy Lateral @ Hwy 140				A	A																	
4	31	Unnamed Drain @ Hwy 140						A	A															

Zone	Site ID	Monitoring Location	2008*	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
4	32	Unnamed Drain near Deep Slough @ West Bose Rd								A	A													
4	29	Unnamed Drain @ Cemetary Rd										A	A											
4	6	Canal Creek @ West Bellevue Rd												A	A									
4	19	Livingston Drain @ Robin Ave														A	A							
4	2	Bear Creek @ Kibby Rd																A	A					
4	4	Black Rascal Creek @ Yosemite Rd																		A	A			
4	27	Silva Drain @ Meadow Dr																				A	A	
5	C	Duck Slough @ Gurr Rd	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
5	7	Deadman Creek @ Gurr Rd	A	A	A							A	A							A	A			
5	8	Deadman Creek @ Hwy 59				A	A							A	A							A	A	
5	10	Duck Slough @ Hwy 99						A	A							A	A							A
5	22	Miles Creek @ Reilly Rd								A	A							A	A					
6	A	Cottonwood Creek @ Rd 20	C	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A
6	1	Ash Slough @ Ave 21	A	A	A					A	A					A	A					A	A	
6	3	Berenda Slough along Ave 18 1/2				A	A					A	A					A	A					A
6	9	Dry Creek @ Rd 18						A	A					A	A					A	A			

*Sampling in 2008 will only be for October thru December under this MRPP.

Special Project Monitoring

Special Project monitoring will include specific targeted studies for the implementation of a Management Plan that results from more than one exceedance within three years of either Core or Assessment Monitoring. Monitoring for Management Plans may include more extensive monitoring than what is required in the Core Monitoring or Assessment Monitoring schedules. The schedule for Special Project Monitoring will be determined as outlined in the ESJWQC Management Plan which is updated on a yearly basis.

Special Project monitoring may also occur in areas where Total Maximum Daily Load (TMDL) studies are required. Table 11 lists all water bodies currently listed for TMDLs as well as their EPA TMDL status. The six Coalition zones are distinct by land use, crop type, depth to ground water and climate. Therefore, by monitoring for TMDL constituents at any Assessment Monitoring site within the zone, the Coalition is providing an assessment for the listed constituent through the representativeness of the site within the zone. In addition, the Assessment Monitoring locations within each zone are tributaries to the 303(d) listed water body provided in Table 11. Currently, all TMDLs are within Zone 1 (Dry Creek @ Wellsford Ave Zone), Zone 2 (Prairie Flower Drain @ Crows Landing Zone), Zone 3 (Highline Canal @ Hwy 99 Zone) and Zone 4 (Merced River @ Santa Fe Rd Zone). The Coalition has monitored for all listed TMDL constituents at one or more locations within each of these zones with the exception of Group A pesticides. Starting in October 2008, the Coalition will monitor for Group A pesticides at sites listed in Table 11.

Table 11 does not specifically list sites from Zone 3 due to previous monitoring within that area which has characterized water quality for both chlorpyrifos and diazinon. Both Highline Canal @ Hwy 99 and Highline Canal @ Lombardy Ave have chlorpyrifos management plans and will continue to be monitored for chlorpyrifos according to the management plan schedule. None of the three sites within Zone 3 have experienced exceedances of the diuron WQTL. A new site (Peaslee Creek @ Lake Rd) will be added to the monitoring schedule in Zone 3 and will be monitored for all Assessment Monitoring constituents, including chlorpyrifos and diazinon.

Group A pesticides are considered legacy pesticides and based on pesticide use reports (PUR) the most recent use of any Group A pesticide was in 2006 (endosulfan). Therefore, if the Coalition does not detect any Group A pesticides during 2008/2009 monitoring, the Coalition will have demonstrated that these pesticides are not impacting water quality and will discontinue monitoring for Group A pesticides in 2010. However, starting May 2009, the Coalition only monitored for these constituents during a single high Total Suspended Solids (TSS) event. Sampling resumed for these constituents July 2010 as requested by the CVRWQCB and a full year cycle of monitoring will not be complete until June of 2011. The status of TMDLs and 303(d) listed water bodies and their associated constituents will be reviewed annually at

the time of the Annual Monitoring Report (refer to the most recent AMR for a table listing current water bodies that require TMDL monitoring).

Table 11. List of water bodies within the ESJWQC that require TMDL monitoring.

2008	2006	WATER BODY NAME/SECTION	CONSTITUENT	PREVIOUSLY MONITORED FOR (BY ZONE)	TMDL REQUIREMENT STATUS	Source	Coalition Zone	2011 Monitoring Site	Comments
Updated	Listed	Harding Drain (Turlock Irrigation District Lateral #5)	Unknown Toxicity	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Updated	Listed	Harding Drain (Turlock Irrigation District Lateral #5)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Listed	Not listed	Harding Drain (Turlock Irrigation District Lateral #5)	HCH	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	Group A monitoring until April.
Updated	Listed	Merced River, Lower (McSwain Reservoir to San Joaquin River)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	2, 3, 4	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd, Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave, McCoy Lateral @ Hwy 140, Merced River @ Santa Fe, Bear Creek @ Kibby Rd*, Livingston Drain @ Robin Ave*	Bear Creek @ Kibby Rd, Livingston Drain @ Robin Ave-chlorpyrifos MPM
Updated	Listed	Merced River, Lower (McSwain Reservoir to San Joaquin River)	Diazinon	Yes	Requiring TMDLs	Agriculture	2, 3, 4	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd, Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave, McCoy Lateral @ Hwy 140, Merced River @ Santa Fe	
NC	Listed	Merced River, Lower (McSwain Reservoir to San Joaquin River)	Group A Pesticides	Yes	Requiring TMDLs	Agriculture	2, 3, 4	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd, Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave, McCoy Lateral @ Hwy 140, Merced River @ Santa Fe	Group A monitoring until April.
Updated	Listed	San Joaquin River (Merced River to Tuolumne River)	Unknown Toxicity	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Listed	Listed	San Joaquin River (Merced River to Tuolumne River)	Boron	Yes	Being Addressed by USEPA Approved TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Delisted	Listed	San Joaquin River (Merced River to Tuolumne River)	Selenium	Yes	Being Addressed by USEPA Approved	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows	Delisted in 2008

2008	2006	WATER BODY NAME/SECTION	CONSTITUENT	PREVIOUSLY MONITORED FOR (BY ZONE)	TMDL REQUIREMENT STATUS	Source	Coalition Zone	2011 Monitoring Site	Comments
					TMDLs			Landing Rd	
Updated	Listed	San Joaquin River (Merced River to Tuolumne River)	Electrical Conductivity	Yes	Being Addressed by USEPA Approved TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Listed	Listed	San Joaquin River (Merced River to Tuolumne River)	Chlorpyrifos	Yes	Being Addressed by USEPA Approved TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd, Lateral 2 1/2 near Keyes*	Lateral 2 1/2 near Keyes - chlorpyrifos MPM
NC	Listed	San Joaquin River (Merced River to Tuolumne River)	DDT	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Listed	Not listed	San Joaquin River (Merced River to Tuolumne River)	DDE	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	
Delisted	Listed	San Joaquin River (Merced River to Tuolumne River)	Diazinon	Yes	Being Addressed by USEPA Approved TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	Delisted in 2008
NC	Listed	San Joaquin River (Merced River to Tuolumne River)	Group A Pesticides	Yes	Requiring TMDLs	Agriculture	2	Yori Grove Drain @ Crows Landing Rd, Prairie Flower Drain @ Crows Landing Rd	Group A monitoring until April.
Updated	Listed	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	Unknown Toxicity	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	
Updated	Listed	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	Diazinon	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	
NC	Listed	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	Group A Pesticides	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	Group A monitoring until April.
NC	Listed	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	
Listed	Not listed	Berenda Creek (Madera County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	6	Berenda Slough along Ave 18 1/2, Cottonwood Creek @ Rd 20, Dry Creek @ Rd 18*	Dry Creek @ Rd 18 - chlorpyrifos MPM
Listed	Not listed	Berenda Creek (Madera County)	Unknown Toxicity	Yes	Requiring TMDLs	Agriculture	6	Berenda Slough along Ave 18 1/2, Cottonwood Creek @ Rd 20	
Listed	Not listed	Berenda Slough (Madera County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	6	Berenda Slough along Ave 18 1/2, Cottonwood Creek @ Rd 20, Dry	Dry Creek @ Rd 18 - chlorpyrifos MPM

2008	2006	WATER BODY NAME/SECTION	CONSTITUENT	PREVIOUSLY MONITORED FOR (BY ZONE)	TMDL REQUIREMENT STATUS	Source	Coalition Zone	2011 Monitoring Site	Comments
								Creek @ Rd 18*	
Listed	Not listed	Deadman Creek (Merced County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	5	Deadman Creek @ Hwy 59, Duck Slough @ Gurr Rd, Duck Slough @ Hwy 99*	Duck Slough @ Hwy 99 - chlorpyrifos MPM
Listed	Not listed	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	
Listed	Not listed	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	DIazinon	Yes	Requiring TMDLs	Agriculture	1	Rodden Creek @ Rodden Rd, Dry Creek @ Wellsford Rd	
Listed	Not listed	Duck Slough (Merced County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	5	Deadman Creek @ Hwy 59, Duck Slough @ Gurr Rd, Duck Slough @ Hwy 99*	Duck Slough @ Hwy 99 - chlorpyrifos MPM
Listed	Not listed	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	Simazine	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	Unknown Toxicity	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Miles Creek (Merced County)	Diuron	Yes	Requiring TMDLs	Agriculture	5	Deadman Creek @ Hwy 59, Duck Slough @ Gurr Rd	
Listed	Not listed	Mustang Creek (Merced County)	Chlorpyrifos	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Mustang Creek (Merced County)	Diazinon	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Mustang Creek (Merced County)	Simazine	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	
Listed	Not listed	Mustang Creek (Merced County)	Cis-permethrin	Yes	Requiring TMDLs	Agriculture	3	Highline Canal @ Hwy 99, Highline Canal @ Lombardy Ave	Analyze for permethrin (not specific isomers).

Monitoring Parameters

Monitoring data is used to characterize discharges from irrigated lands to surface waters and to evaluate the effectiveness of management practice implementation efforts. Water quality is evaluated by both field-measured parameters and laboratory analytical data. Field measured parameters include flow, pH, electrical conductivity (specific conductance), water temperature, air temperature and dissolved oxygen. Laboratory analytical data include the list of constituents, parameters, and tests in Table 12 below. Site conditions are documented by taking digital photos and recording weather, site conditions and water conditions at every monitoring site during each monitoring event.

In May of 2009, due to increased monitoring and reporting costs, the Coalition submitted a revision to the Regional Board and omitted the following constituents from its monitoring program (to be sampled once a year during an event with high total suspended solids): metals not applied by agriculture (arsenic, cadmium, lead and molybdenum), sediment bound pesticides (glyphosate, paraquat dichloride), organochlorine pesticides no longer applied by agriculture (including Group A pesticides) and a subset of nutrients (Total Kjeldahl Nitrogen and orthophosphate). Upon denial of the Coalitions request by the Regional Board, the constituents were added back in to the monitoring program in July 2010.

Acceptable methods for laboratory field procedures, quantification limits, and quality control requirements are described in detail in the Coalition Quality Assurance Project Plan (QAPP). Specific collection and handling information for each of the analytical tests is outlined in the QAPP.

All constituents listed in the MRP are included in Table 12 including Group A pesticides except for fecal coliform. The Coalition has been monitoring for *E. coli* since 2004 using the WQTL of 235 MPN/100 mL (a fecal coliform number). *E. coli* is a sub-category of fecal coliform and therefore if the amount of *E. coli* detected in a sample is above the WQTL than it is assumed that the fecal coliform is also above the WQTL and the sample is treated as exceeding a fecal coliform WQTL. It is not necessary therefore to also collect a sample for fecal coliform analysis.

Some TMDL constituents listed in Table 11 are monitored at all assessment locations as per the MRP including unknown toxicity, chlorpyrifos, diazinon, boron, selenium, electrical conductivity (specific conductance), and DDT. Group A pesticides have been added to all Assessment Monitoring in Zone 1, 2, and 3 as described under Special Project Monitoring.

Table 13 includes all monitoring locations (both Assessment and Core) that will be monitored from 2008/2009 to 2011 including the constituents to be monitored for at each site.

Table 12. Coalition Monitoring parameters.

Constituents, Parameters, and Tests	Monitoring Type
TMDL/CWA 303(d) listed*	
Aldrin	As needed to characterize 303d listed waterbodies
Chlordane	As needed to characterize 303d listed waterbodies
Heptachlor	As needed to characterize 303d listed waterbodies
Heptachlor epoxide	As needed to characterize 303d listed waterbodies
Hexachlorocyclohexane (including Lindane) (gamma-BHC)	As needed to characterize 303d listed waterbodies
Hexachlorocyclohexane (alpha-BHC)	As needed to characterize 303d listed waterbodies
Hexachlorocyclohexane (beta-BHC)	As needed to characterize 303d listed waterbodies
Hexachlorocyclohexane (delta-BHC)	As needed to characterize 303d listed waterbodies
Endosulfan I	As needed to characterize 303d listed waterbodies
Endosulfan II	As needed to characterize 303d listed waterbodies
Toxaphene	As needed to characterize 303d listed waterbodies
Photo Monitoring	
Photograph of monitoring location	With every monitoring event
WATER COLUMN SAMPLING	
Physical Parameters and General Chemistry	
Flow (field measure)	Assessment and Core
pH (field measure)	Assessment and Core
Electrical Conductivity (field measure)	Assessment and Core
Dissolved Oxygen (field measure)	Assessment and Core
Temperature (field measure)	Assessment and Core
Turbidity	Assessment and Core
Total Dissolved Solids	Assessment and Core
Total Suspended Solids	Assessment and Core
Hardness	Assessment and Core
Total Organic Carbon	Assessment and Core
Pathogens	
E. coli	Assessment and Core
Water Column Toxicity Test	
Algae -*Selenastrum capricornutum*	Assessment
Water Flea – C*eriodaphnia dubia*	Assessment
Fathead Minnow - *Pimephales promelas*	Assessment
Toxicity Identification Evaluation**	As needed based on criteria described in MRP Part II.E
Pesticides	
Carbamates	

Constituents, Parameters, and Tests	Monitoring Type
Aldicarb	Assessment
Carbaryl	Assessment
Carbofuran	Assessment
Methiocarb	Assessment
Methomyl	Assessment
Oxamyl	Assessment
Organochlorines	
DDD	Assessment
DDE	Assessment
DDT	Assessment
Dicofol	Assessment
Dieldrin	Assessment
Endrin	Assessment
Methoxychlor	Assessment
Organophosphates	
Azinphos-methyl	Assessment
Chlorpyrifos	Assessment
Diazinon	Assessment
Dichlorvos	Assessment
Dimethoate	Assessment
Demeton-s	Assessment
Disulfoton (Disyton)	Assessment
Malathion	Assessment
Methamidophos	Assessment
Methidathion	Assessment
Parathion-methyl	Assessment
Phorate	Assessment
Phosmet	Assessment
Herbicides	
Atrazine	Assessment
Cyanazine	Assessment
Diuron	Assessment
Glyphosate	Assessment
Linuron	Assessment
Paraquat dichloride	Assessment
Simazine	Assessment
Trifluralin	Assessment
Metals	
Arsenic (total)	Assessment
Boron (total)	Assessment

Constituents, Parameters, and Tests	Monitoring Type
Cadmium (total and dissolved)	Assessment
Copper (total and dissolved)	Assessment
Lead (total and dissolved)	Assessment
Nickel (total and dissolved)	Assessment
Molybdenum (total)	Assessment
Selenium (total)	Assessment
Zinc (total and dissolved)	Assessment
Nutrients	
Total Kjeldahl Nitrogen	Assessment and Core
Nitrate plus Nitrite as Nitrogen	Assessment and Core
Total Ammonia	Assessment and Core
Unionized Ammonia (calculated value)	Assessment and Core
Total Phosphorous (as P)	Assessment and Core
Soluble Orthophosphate	Assessment and Core
SEDIMENT SAMPLING	
Sediment Toxicity	
Hyalella azteca	Assessment
Pesticides (as needed based on criteria described in MRP Part II.E.2)	
Bifenthrin	As needed based on criteria described in MRP Part II.E
Cyfluthrin	As needed based on criteria described in MRP Part II.E
Cypermethrin	As needed based on criteria described in MRP Part II.E
Deltamethrin: Tralomethrin	As needed based on criteria described in MRP Part II.E
Esfenvalerate	As needed based on criteria described in MRP Part II.E
Lambda-Cyhalothrin	As needed based on criteria described in MRP Part II.E
Permethrin	As needed based on criteria described in MRP Part II.E
Fenpropathrin	As needed based on criteria described in MRP Part II.E
Chlorpyrifos	As needed based on criteria described in MRP Part II.E
Other sediment parameters	
Total Organic Carbon	Assessment
Grain Size	Assessment

*Group A pesticides used by agriculture were last reported in 2006. If there are no detections in samples collected from each month of the year, the Coalition will request to remove these constituents from monitoring. A one year cycle of monitoring for Group A pesticides will be completed in June 2011.

** Specific TIE manipulations utilized in each test will be reported.

Table 13. Monitoring schedule for 2008 – 2010 including site name, ID, zone and constituent groups. Table will be updated yearly; see AMR for most recent monitoring schedule.

ID	Zone	Monitoring Type	Monitoring Location	Group A Pesticides*	Physical Parameters	Nutrients	Pathogens	Carbamates	Organochlorines	Organophosphates	Herbicides	Metals (total and dissolved)	Water Column Toxicity	Sediment Toxicity/Chemistry
B	1	C	Dry Creek @ Wellsford Rd		x	x	x							
35	1	A	Mootz Drain downstream of Langworth Pond		x	x	x	x	x	x	x	x	x	x
F	2	C	Prairie Flower Drain @ Crows Landing		x	x	x							
15	2	A	Lateral 2 1/2 near Keyes Rd	x	x	x	x	x	x	x	x	x	x	x
D	3	C	Highline Canal @ Hwy 99		x	x	x							
24	3	A	Mustang Creek @ East Ave		x	x	x	x	x	x	x	x	x	x
E	4	C	Merced River @ Santa Fe Rd	x	x	x	x		x	**x**		**x**		
14	4	A	Howard Lateral @ Hwy 140		x	x	x	x	x	x	x	x	x	x
C	5	C	Duck Slough @ Gurr Rd		x	x	x	x	**x**	**x**		**x**		
7	5	A	Deadman Creek @ Gurr Rd		x	x	x	x	x	x	x	x	x	x
A	6	C	Cottonwood Creek @ Rd 20		x	x	x						**X****	**x**
1	6	A	Ash Slough @ Ave 21		x	x	x	x	x	x	x	x	x	x

*Group A pesticides used by agriculture were last reported in 2006. If there are no detections in samples collected from each month of the year, the Coalition will request to remove these constituents from monitoring. A one year cycle of monitoring for Group A pesticides will be completed in June 2011.

**Pimephales promelas* and *Selenastrum capricornutum* only .

Bolded Xs are for additional constituents at Core Monitoring locations due to one exceedance during previous monitoring (see Table 21 for specifics).

MONITORING PROTOCOLS

Full descriptions of the monitoring protocols including sample collection methods, standard operating procedures (SOPs) for all measurements and laboratory quality assurance are available in the Coalition QAPP. A summary of the sampling methods, protocols and quality assurance is provided below.

Sample Collection Methods

Ambient Water Sampling

Sampling generally occurs over one or two days per event, with one event occurring each month. For water sampling, a specified type and quantity of bottles are filled with ambient water based on the requirements of the laboratory analysis and the requirements of the individual sampling site as described in the QAPP (Table 12). After samples are collected, they are stored at a temperature less than or equal to 4°C, and are delivered the same evening or the next morning to their respective laboratories. The timeframe by which samples are delivered to the laboratories is based on the shortest holding time among the constituents analyzed. All bottles collected from a site are considered a single sample and share a common site ID and sample time. Although all bottles are considered a single sample, no volumes are homogenized. Field duplicates and samples for matrix spike analysis are filled as simultaneously as possible. Field blanks are collected in an identical bottle to the environmental sample using an identical process, but bottles are filled with deionized (DI) water and capped. Field quality control (QC) samples are stored at 4°C alongside environmental samples until extraction or analysis. After samples are collected and stored on ice, discharge is measured.

Sediment Sampling

Sediment is collected from the topmost 2 cm of bed substrate and the sample is placed into the appropriate containers for toxicity testing, grain size and total organic carbon (TOC) analyses, and any chemical analyses that may be necessary due to toxicity. Detailed sampling SOPs, collection containers, and holding times are included with the QAPP. As with the ambient water samples, containers are rinsed with DI water and stored away from sunlight and chilled to 4°C. Sediment chemistry and total organic carbon samples are frozen within 48 hours; sediment toxicity and grain size samples are held at 4°C until analysis.

Field Measures

Field parameters are measured at the same time as sample collection. Supplemental field data are collected including weather observations, water and sediment characteristics and site

descriptions at the time of sampling. Information that is supplemental to program requirements is maintained in a SWAMP-comparable database.

Quality Assurance

Water samples are collected during each month that water is discharged from agriculture, including storm season months. Samples will be analyzed for a variety of constituents based on the specific requirements for Assessment and Core Monitoring sites outlined in Table 10. Sediment quality monitoring will occur once during the irrigation season and once during the storm season of each monitoring year at all sites. All quality assurance (QA) criteria are described in the QAPP and include criteria for precision, accuracy, contamination, and completeness and each are briefly described below. Failure to meet any of the criteria will result in notification of the QA Officer by either the field crew or laboratory and all associated data will be appropriately flagged. Review of the failures may result in rejection of the data.

Precision and Accuracy

Precision is assessed through a combination of field and laboratory duplicate samples. Precision is measured as the relative percent difference (RPD) between a sample and its duplicate. Laboratory duplicate samples include a laboratory control spike (LCS) and its associated duplicate (LCSD), a matrix spike sample (MS) and its associated duplicate (MSD) or an environmental sample that is split in the laboratory to create an associated duplicate. Field duplicate samples are two samples collected at the same time at the same location and in the same fashion. To assess precision, only one laboratory duplicate is required per batch which may be met by an LCSD, an MSD or a laboratory duplicate split from an environmental sample.

Accuracy is assessed by spiking a sample with a known quantity of the constituents to be analyzed and calculating the percent recovery (PR). This may be done on laboratory purified water (LCS) or environmental water (MS). The MS should not be used solely to assess precision due the likelihood of matrix interference however if an LCS does not fall within acceptance criteria an MS may be used to validate that batch if it is within criteria. Some constituents are difficult to spike (e.g. turbidity) and therefore a laboratory may chose to use a certified reference material (CRM). A CRM may be used in place of an LCS sample.

If results for any precision or accuracy analyses do not meet the data quality objectives listed in the QAPP, calculations and instruments must be checked and the analyst may be required to repeat the analysis to confirm the results. If the results repeatedly fail to meet the objectives (indicating inconsistent homogeneity, unusually high concentrations of analytes or poor laboratory precision) then the lab is obligated to halt the analysis of samples, identify the source of the imprecision, and make corrections where appropriate before proceeding. If results for any field duplicates and associated environmental samples do not meet the data

quality objectives listed in the QAPP, then the samplers must assess sampling practices and make corrections to their field procedures which will ensure homogeneity in the samples before proceeding.

Representativeness and Completeness

Sampling locations are selected to represent all discharges from a subwatershed and are collected during periods of agricultural discharge, including events during winter storm runoff and irrigation discharge.

Completeness is defined as the amount of valid data obtained from a measurement system as compared to the planned amount. Project completeness is divided into two areas: field and transport completeness and laboratory completeness. The completeness goal of 90% per year is based on the combination of these two areas. If the completeness criteria are not met, the Coalition will review each incomplete sampling event and make adjustments in field and/or laboratory procedures to ensure that completeness is met the following year.

Field and transport completeness requires that samplers successfully visit each site, document the visit, collect the field information and samples, as outlined in the QAPP, and successfully transport the samples to the laboratories. A properly documented dry site does not reduce the completeness of the event.

Laboratory completeness refers to the process of sample reception, COC documentation, storage and in-house preservation, extraction, analysis, and laboratory QA/QC.

Minimizing bias

Bias in sample timing is minimized by using a predetermined sample schedule that rigidly defines the sample dates for each site months in advance. In this way sampling at any given site will not be influenced by temporal factors that risk introducing intentional or unintentional bias, such as irrigation events or weather patterns.

Bias in field sampling quality control monitoring is minimized by randomly distributing QC samples among all sites throughout the year. Additionally, the samplers collecting the QC samples are randomly assigned to minimize the chances of a single site or single sampler exerting more influence on overall sample quality than randomness would predict.

Bias in analysis is minimized through the use of professional, private, objective third-party laboratories. Any potential bias that may be introduced by these labs is assessed with semi-lab-blind QC samples; field QC samples are not overtly identified to the lab. They are not truly lab-blind, however, as they share a sample time with the environmental sample and are distinguished only by a two-letter suffix on their station code/sample ID.

Table 14. Field and laboratory analytical methods.

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/ QAPP Appendix	Modified for Method
Physical Parameters								
Flow	Fresh Water	Field Measure	NA[1]	1 cfs	NA	USGS R2Cross streamflow Method	Appendix IV	Yes
pH	Fresh Water	Field Measure	6.5-8.5	0.1 pH units	NA	EPA 150.1	Appendix IX	No
Electrical Conductivity	Fresh Water	Field Measure	700 µmhos/cm	100 µmhos/cm	NA	EPA 120.1	Appendix IX	No
Dissolved oxygen	Fresh Water	Field Measure	7 mg/L	0.1 mg/L	NA	SM 4500-O	Appendix IX	No
Temperature	Fresh Water	Field Measure	NA[1]	0.1 °C	NA	SM 2550	Appendix IX	No
Turbidity	Fresh Water	Caltest	variable	0.05 NTU	0.020 NTU	EPA 180.1	SOPW-TURB-rev7, Appendix XXIX	No
Total Dissolved Solids	Fresh Water	Caltest	450 mg/L	10 mg/L	4.0 mg/L	SM2540C	SOP W-TDS-rev8, Appendix XXVI	No
Total Suspended Solids	Fresh Water	Caltest	NA[2]	3 mg/L	2.0 mg/L	SM2540D	SOP B-TSS-rev7, Appendix XXX	No
Hardness	Fresh Water	Caltest	NA[1]	5 mg/L	3.0 mg/L	SM2340C	SOP W-HARD-rev8, Appendix XXII	No
Total Organic Carbon	Fresh Water	Caltest	NA[1]	0.5 mg/L	0.30 mg/L	SM5310B	SOP W-TOC/DOC-rev10, Appendix XXVIII	No
Pathogens								
Escherichia coli	Fresh Water	Caltest	235 MPN/100 mL	1 MPN/100 mL	1.0 MPN/100 mL	SM 9223	SOP B-MMOMUG-REV11, Appendix XXI	No
Toxicity								
Water Column Toxicity	Fresh Water	AQUA-Science	No Toxicity	NA	NA	EPA 821-R-02-012	SOP 6.1A-5/Appendix XV, SOP 6.2A-5/Appendix XVI	No
	Fresh Water	AQUA-Science	No Toxicity	NA	NA	EPA 821-R-02-013	SOP 6.3C-4/ Appendix XVII	No
Sediment Toxicity	Sediment	AQUA-Science	No Toxicity	NA	NA	EPA 600/R-99-064	Appendix XVIII	No
Carbamates								
Aldicarb	Fresh Water	APPL Inc	3 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Carbaryl	Fresh Water	APPL Inc	2.53 µg/L	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Carbofuran	Fresh Water	APPL Inc	ND	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methiocarb	Fresh Water	APPL Inc	0.5 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methomyl	Fresh Water	APPL Inc	0.52 µg/L	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Oxamyl	Fresh Water	APPL Inc	50 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Organochlorines								
DDD	Fresh Water	APPL Inc	0.00083 µg/L	0.01 µg/L	0.003 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
DDE	Fresh Water	APPL Inc	0.00059 µg/L	0.01 µg/L	0.004 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
DDT	Fresh Water	APPL Inc	0.00059 µg/L	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Dicofol	Fresh Water	APPL Inc	NA[1]	0.1 µg/L	0.01 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Dieldrin	Fresh Water	APPL Inc	0.00014 µg/L	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Endrin	Fresh Water	APPL Inc	0.036 µg/L	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Methoxychlor	Fresh Water	APPL Inc	0.03 µg/L	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Organophosphates								

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/ QAPP Appendix	Modified for Method
Azinphos-methyl	Fresh Water	APPL Inc	0.01 µg/L	0.1 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Chlorpyrifos	Fresh Water	APPL Inc	0.015 µg/L	0.015 µg/L	0.003 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Diazinon	Fresh Water	APPL Inc	0.1 µg/L	0.02 µg/L	0.004 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Dichlorvos	Fresh Water	APPL Inc	0.085 µg/L	0.1 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Dimethoate	Fresh Water	APPL Inc	1.0 µg/L	0.1 µg/L	0.08 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Demeton-s	Fresh Water	APPL Inc	NA[2]	0.1 µg/L	0.01 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Disulfoton	Fresh Water	APPL Inc	0.05 µg/L	0.05 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Malathion	Fresh Water	APPL Inc	ND	0.1 µg/L	0.05 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Methamidiphos	Fresh Water	APPL Inc	0.35 µg/L	0.2 µg/L	0.08 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methidathion	Fresh Water	APPL Inc	0.7 µg/L	0.1 µg/L	0.04 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Parathion, methyl	Fresh Water	APPL Inc	ND	0.1 µg/L	0.075 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Phorate	Fresh Water	APPL Inc	0.7 µg/L	0.1 µg/L	0.07 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Phosmet	Fresh Water	APPL Inc	140 µg/L	0.2 µg/L	0.06 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Herbicides								
Atrazine	Fresh Water	APPL Inc	1.0 µg/L	0.5 µg/L	0.07 µg/L	EPA 619	SOP ANA619/Appendix XI	No
Cyanazine	Fresh Water	APPL Inc	1.0 µg/L	0.5 µg/L	0.09 µg/L	EPA 619	SOP ANA619/Appendix XI	No
Diuron	Fresh Water	APPL Inc	2 µg/L	0.4 µg/L	0.2 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Glyphosate	Fresh Water	NCL Ltd	700 µg/L	5 µg/L	2.77 µg/L	EPA 547	SOP ME075v08/Appendix XIX	No
Linuron	Fresh Water	APPL Inc	1.4 µg/L	0.4 µg/L	0.2 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Paraquat dichloride	Fresh Water	APPL Inc	3.2 µg/L	0.5 µg/L	0.08 µg/L	EPA 549.1	SOP ME019v10/Appendix XX	No
Simazine	Fresh Water	APPL Inc	4.0 µg/L	0.5 µg/L	0.08 µg/L	EPA 619	SOP ANA619/Appendix XI	No
Trifluralin	Fresh Water	APPL Inc	5 µg/L	0.05 µg/L	0.036 µg/L	EPA 8141	SOP ANA8141A/Appendix XIII	No
Metals								
Arsenic	Fresh Water	Caltest	10 µg/L	0.5 µg/L	0.01 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Boron	Fresh Water	Caltest	700 µg/L	10 µg/L	0.47 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Cadmium	Fresh Water	Caltest	Variable[3] (MUN=2.0 µg/L)	0.1 µg/L	0.011 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Copper	Fresh Water	Caltest	Variable[3] (MUN=170 µg/L)	0.5 µg/L	0.06 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Lead	Fresh Water	Caltest	Variable[3] (MUN=2.0 µg/L)	0.25 µg/L	0.071 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Molybdenum	Fresh Water	Caltest	10 µg/L	0.25 µg/L	0.016 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Nickel	Fresh Water	Caltest	Variable[3] (MUN=12 µg/L)	0.5 µg/L	0.01 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/ QAPP Appendix	Modified for Method
Selenium	Fresh Water	Caltest	50 µg/L (5 µg/L 4 day average)	1 µg/L	0.06 µg/L	EPA 200.8 (ICPMS Reaction Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Zinc	Fresh Water	Caltest	Variable[3.] (MUN=5000 µg/L)	1 µg/L	0.8 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Nutrients								
Total Kjeldahl Nitrogen	Fresh Water	Caltest	NA[1]	0.1 mg/L	0.07 mg/L	SM4500NH3 C	SOP W-NH3-TKN-rev10, Appendix XXVII	No
Nitrate (as N)+ Nitrite (as N)	Fresh Water	Caltest	10,000 µg/L	0.05 mg/L	0.05 mg/L	EPA 353.2	SOP W-NNO3-rev2, Appendix XXIV	No
Total Ammonia	Fresh Water	Caltest	1.5 mg/L or variable[4]	0.1 mg/L	0.060 mg/L	SM4500NH3 C	SOP W-NH3-TKN-rev10, Appendix XXVII	No
Total Phosphorus	Fresh Water	Caltest	NA[1]	0.01 mg/L	0.040 mg/L	SM4500P E	SOP W-PHOS-rev8, Appendix XXV	No
Soluble Orthophosphate	Fresh Water	Caltest	NA[1]	0.01 mg/L	0.010 mg/L	SM4500P E	SOP W-PHOS-rev8, Appendix XXV	No
Sediment								
Bifenthrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.1 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Cyfluthrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.11 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Cypermethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.1 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Deltamethrin: Tralomethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.12 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Esfenvalerate	Sediment	Caltest	NA[5]	0.33 µg/kg	0.13 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Lambda-Cyhalothrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.06 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Permethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.11 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Fenpropathrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.07 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Chlorpyrifos	Sediment	Caltest	NA[5]	0.33 µg/kg	0.12 µg /kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Total Solids	Sediment	Caltest	NA	0.1%	0.1%	SM2540B	SOP W-RESIDUE-rev7, APPENDIX XXXI	No
Total Organic Carbon	Sediment	Caltest[6]	NA[1]	200 mg/kg	100 mg/kg	Walkley Black	PTS SOP #4, Appendix XXXIV	No
Grain Size	Sediment	Caltest[6]	NA[1]	1% sand, silt, clay, gravel	0.4 µm	ASTM D-422-63, ASTM D4464M-85	PTS SOP #3, Appendix XXXIII	No

[1] Not available until completion of evaluation studies or no Water Quality Trigger Limit applicable.
[2] Currently these constituents do not have a WQTL designated by the Regional Board however this may change in the future.
[3] Variable WQTLs based on hardness. Municipal and domestic supply WQTLs in parenthesis are regardless of hardness.
[4] Variable WQTLs based on pH and temperature. Municipal and domestic supply WQTLs in parenthesis are regardless of pH and temperature.

[5] Sediment chemistry result reported if positive sediment toxicity is measured.
[6] Subcontracted to PTS Laboratories.

Table 15. Laboratory analytical methods of constituents monitored for CWA 303(d) compliance.

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/Appendix	Modified for Method
Aldrin	Fresh Water	APPL Inc	0.00013 µg/L[1] 3 µg/L[2]	0.01 µg/L	0.009 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Chlordane	Fresh Water	APPL Inc	0.00057 µg/L[1] 0.0043 µg/L[2]	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Heptachlor	Fresh Water	APPL Inc	0.00021 µg/L[1] 0.0038 µg/L[2]	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Heptachlor epoxide	Fresh Water	APPL Inc	0.0001 µg/L[1] 0.0038 µg/L[2]	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Hexachlorocyclohexane (alpha-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Hexachlorocyclohexane (beta-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Hexachlorocyclohexane (gamma-BHC; Lindane)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Hexachlorocyclohexane (delta-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Endosulfan I	Fresh Water	APPL Inc	110 µg/L[1,4] 0.056 µg/L[2,4]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Endosulfan II	Fresh Water	APPL Inc	110 µg/L[1,4] 0.056 µg/L[2,4]	0.01 µg/L	0.004 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Toxaphene	Fresh Water	APPL Inc	0.00073 µg/L[1] 0.0002 µg/L[2]	0.5 µg/L	0.380 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No

[1] Municipal and domestic supply
[2] Cold freshwater habitat, spawning
[3] WQTL is total Hexachlorocyclohexane
[4] WQTL is total Endosulfan

Quality Control

This project will comply with all current Surface Water Ambient Monitoring Program (SWAMP) QC guidelines to maintain comparability of data quality throughout the ILRP SWAMP Comparable database. Field QC frequencies are calculated to insure that a minimum of 5% of all analyses are for QC purposes. All analytical QCs must be analyzed at a frequency of 5% or 1 per batch whichever is more frequent. A comprehensive summary of QC activities and requirements for this project are provided in the Coalition QAPP.

When control limits are exceeded, the lab QA officer and Project QA Officer must agree on a potential cause and develop an appropriate response. Detections in field or lab blank samples will be sourced to the best of the project's ability and field, analytical, or cleaning practices will be modified to reduce the risk of further contamination. Excessive RPD values or low recovery rates may also require a change of field or laboratory practices. Exceedances of analytical control limits will be reported in the appropriate lab report allowing the data to be flagged as it is entered into the database. These exceedances will also be discussed in the appropriate report from MLJ-LLC to the CVRWQCB together with an assessment of the control actions developed from more recent analyses, if available.

REPORTING PLAN

The Coalition will provide information on monitoring results and Coalition activities to the CVRWQCB over the course of each monitoring year in various reports. There are four types of reporting: Exceedance Reports, Quarterly Monitoring Data Reports, Annual Monitoring Reports and Management Plan Report updates. Immediate reporting on results will occur as Exceedance Reports which will be submitted for every exceedance of water quality trigger limits within five business days of receiving results. Reporting on outreach and actions as follow-up to exceedances will occur through the Coalition's Management Plan update which will be submitted each year for sites that experience more than one exceedance of any water quality trigger limit within a three year period. The Coalition will submit Quarterly Monitoring Data Reports which will include all new data received by the Coalition since the last Quarterly Monitoring Report. Once a year an Annual Monitoring Report will be submitted which will include an in depth analysis of the monitoring and reporting from the previous year.

Exceedance Reports

The Coalition will submit an exceedance report for all monitoring results that show exceedances of water quality standards or trigger limits. The site name, sample date, constituent, exceedance data, the estimated flow at the monitoring location and photographs of the site will be included in all exceedance reports. Laboratory results will be reviewed and exceedances will be summarized within five business days from the time they are received, and an Exceedance Report will be submitted by email within 24 hours thereafter. The Exceedance Report will include a description of the exceedance(s), the follow-up monitoring, and the analysis or other actions the Coalition may take to address the exceedance(s).

For exceedances involving pesticides or toxicity, a description of the investigation of pesticide use within the watershed area that is physically associated with the exceedance location will be provided; including all pesticides applied within the area that drains to the monitoring site during at least the four weeks prior to the exceedance date. Results of the pesticide use investigation will also be summarized and discussed in the Annual Monitoring Report. The development of an approved Management Plan may supersede this requirement.

Quarterly Data Deliverables

Each quarter the Coalition will submit the monitoring results from the previous quarter in electronic format. The time schedule for quarterly submittals is provided in Table 16. The Quarterly Submittal of Monitoring Data Reports will be submitted as electronic copies in Surface Water Ambient Monitoring Program (SWAMP) comparable format. The submittal will also include copies of all field and laboratory data as well as all quality control and quality assurance information as required by the Coalition MRP.

Table 16. Annual and quarterly monitoring data submittal schedule.

Due Date	Type	Reporting Period
1 March	Annual Report*	1 January to 31 December of previous year
1 June	Quarterly Monitoring Data Report*	1 January through 31 March of same calendar year
1 September	Quarterly Monitoring Data Report*	1 April through 30 June of same calendar year
1 December	Quarterly Monitoring Data Report*	1 July through 30 September of same calendar year

*All deliverables will be submitted in an electronic format.

Annual Monitoring Report

The Annual Monitoring Report will be submitted each year by March 1st, covering the monitoring period from the previous calendar year, up to December 31st. Each monitoring report will include all of the components outlined in the Coalition MRP, including:

1. Signed Transmittal Letter;
2. Title page;
3. Table of contents;
4. Executive Summary;
5. Description of the Coalition Group geographical area;
6. Monitoring objectives and design;
7. Sampling site descriptions and rainfall records for the time period covered under the AMR;
8. Location map(s) of sampling sites, crops and land uses;
9. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible (example table is included in (MRP Order Attachment C);
10. Discussion of data to clearly illustrate compliance with the Coalition Group Conditional Waiver, water quality standards, and trigger limits;
11. Electronic data submitted in a SWAMP comparable format;

12. Sampling and analytical methods used;
13. Copy of chain-of-custody forms;
14. Field data sheets, signed laboratory reports, laboratory raw data (as identified in Attachment C);
15. Associated laboratory and field quality control samples results;
16. Summary of Quality Assurance Evaluation results (as identified in Attachment C for Precision, Accuracy and Completeness) ;
17. Specify the method used to obtain flow at each monitoring site during each monitoring event;
18. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date;
19. Summary of Exceedance Reports submitted during the reporting period and related pesticide use information;
20. Actions taken to address water quality exceedances that have occurred, including but not limited to, revised or additional management practices implemented;
21. Status update on preparation and implementation of all Management Plans and other special projects; and
22. Conclusions and recommendations.

Specific information required for each of these components is outlined in the Coalition MRP and will be addressed in the AMR.

Management Plans

Water quality of waters of the State within the Coalition boundaries will be assessed to determine if they are getting better or worse as a result of the implementation of the Coalition Management Plan. If more than one exceedance of the same parameter at the same location occurs within a three-year period, then a schedule for Management Plan development and implementation will be provided to the Regional Board staff within 10 business days. The Executive Officer can require a written Management Plan for an exceedance of any constituent at any time. Management Plans may also be required when monitoring from other Water Board programs result in exceedances. The ESJWQC Management Plan will be updated on an annual basis on April 1 of each year. In the Management Plan Report, all data collected and any actions taken under the Management Plan from the previous year will be reported and reviewed. Any location and constituent combination that resulted in a second exceedance will be added to the Management Plan with a specific site subwatershed assessment.

If a contaminant addressed by the Management Plan can be reasonably assumed through source identification to be caused in whole or in part by irrigated agriculture, then additional Management Plan components will include the following eight requirements identified in Board Order R5-2008-005:

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. Management practice implementation schedule. Implementation may occur through another Water Board regulatory program designed to address the specific exceedances.
4. Management practice performance goals with a schedule.
5. Waste-specific monitoring schedule.
6. A process and schedule for evaluating management practice effectiveness.
7. Identification of the participants and Coalition Group(s) that will implement the Management Plan.
8. An identified routine schedule of reporting to the Regional Water Board.

The ESJWQC has created a prioritization scheme for constituents of concern in coordination with the CVRWQCB which is included as part of the Coalition Management Plan. Sources of exceedances will be investigated using one or more of the following: Pesticide Use Reports (PURs), Toxicity Identification Evaluations (TIEs), review and analysis of historical pesticide applications, or additional monitoring. Prioritization of exceedances will be used to focus outreach. Depending on the priority of the exceedance, the Coalition will identify management practices that will be effective to reduce or eliminate exceedances in the future. Individual grower contacts will occur if necessary to determine current management practices and inform growers of management practices that can be implemented to improve water quality. Management Plans provide information on each of the site subwatersheds outlining the Coalition actions that will be performed in the subsequent monitoring year. The Coalition will keep track of all meetings and contacts and monitoring the following year will evaluate the effectiveness of the outreach and management practice implementation. Management Plan Reporting will occur annually and will provide information regarding achievement of the performance goals, stages when evaluations will occur to determine the effectiveness of the management practice implementation, and if the Management Plan strategies need to be revised. Water quality conditions in waters of the State within the Coalition boundaries will be assessed to determine if they are getting better or worse through implementation of the Coalition Management Plan.

For exceedances that the Coalition determines are not likely to be remedied or addressed by a Management Plan, the Coalition will submit a request of exemption from the development of a Management Plan to the Executive Officer. The Coalition may also submit additional Management Plans and/or monitoring within a current Management Plan as requested by the Executive Officer.

WATER QUALITY STATUS

Water Quality Status and Monitoring Background

Eight water bodies within the Coalition area are listed on the EPA 303(d) list as impaired. Three sections of the San Joaquin River from the Mendota Pool to the Southern border of the San Joaquin Delta are included. Listings contain (but are not limited to) numerous constituents including selenium, boron, legacy pesticides (DDT), ammonia, electrical conductivity, diazinon and chlorpyrifos. Unknown toxicity is also listed as a cause of impairment for several water bodies. All listed water bodies are located downstream of urban regions known to discharge organophosphate pesticides, metals, and other constituents, however municipal discharge is listed as the source of impairment for only one site, Harding Drain. Agriculture is listed as a source of impairment for all water bodies (or sections of water bodies) on the 303(d) list, including chlorpyrifos and/or diazinon (see Table 11).

The Department of Pesticide Regulation's (DPR) Surface Water Database provides information on pesticide concentrations in the Coalition region. This database was created in 1997 by DPR under agreement with the State Water Resources Control Board. This database contains the results from approximately 34,500 samples collected from 40 different sites in Stanislaus and Merced Counties from August 1991 through September 2003. This database was supplemented with information available to the Coalition through recent organophosphate total maximum daily load (OP TMDL) sampling programs. Data from TMDL sampling for 2003 and 2004 are available for analysis. The EPA 303d list of impaired water bodies were used to establish potential causes of impairment, and these were compared to the data available from the two databases.

The DPR database (http://www.cdpr.ca.gov/docs/emon/surfwtr/surfcont.htm) was searched for records of pesticides in the Coalition region. The original focus was on diazinon, chlorpyrifos, and pyrethroids. Diazinon samples were collected at 39 sites listed in the database. Of the total 1370 individual samples tested for either diazinon or the metabolite diazoxon, 197 (14%) samples contained concentrations greater than 80 ng/l. The 197 samples with concentrations greater than 80 ng/l occurred at most of the 39 sites for which sample data were available. There have been exceedances in all years except 2003. The overwhelming majority of exceedances occurred in samples collected during the winter season, but samples collected during the summer also had exceedances.

Based on the DPR database, chlorpyrifos was monitored at 38 sites in the watershed. A total of 1486 samples were collected and analyzed for chlorpyrifos or chlorpyrifos OA. 147 (9.9%) of the samples had concentrations of chlorpyrifos OA over 20 ng/l. There was no measured concentration of chlorpyrifos in 1,200 samples. There have been exceedances of the chlorpyrifos criteria in the DPR database in almost every year. Exceedances in the database occurred during almost every month of the year. Many of the sample locations are

downstream of urban influences and the chlorpyrifos signals at those locations from dates prior to the removal of chlorpyrifos from the retail marked can't be attributed definitively to agricultural sources.

Permethrin was monitored for in 366 water column samples collected from 26 sites. All results were nondetects with a 0.5 ng/l limit of quantification (LOQ). Esfenvalerate was tested in 60 samples with all readings listed as non-detects with a LOQ of 50 ng/l at all sites except a single sample with a concentration of 0.0566 µg/l. Cypermethrin and lambda-cyhalothrin were monitored for in 17 samples, all were nondetects.

The Coalition initiated its monitoring program in July 2004 and has continued to monitor surface waters during the summer irrigation seasons and the winter storm water runoff season. This program is probably the most comprehensive yet undertaken in the Coalition region to characterize water quality with samples analyzed for chemical constituents, fecal indicator bacteria, water column and sediment toxicity, nutrients, physical and field parameters. The results have been provided to the Regional Board in semi-annual monitoring reports (SAMR) submitted in 2005-2008 and includes data from the irrigation season 2004 up to the storm season of 2008.

Sampling has occurred at as many as 24 sites in the Coalition region since 2004. Numerous exceedances of several water quality triggers were experienced during the years of monitoring. The most common exceedance was for color which was experienced at every site followed by exceedances of the *E. coli* trigger which were experienced at every site except one. Chlorpyrifos continues to be a water quality problem with exceedances at all sites except four. However, diazinon exceedances were experienced at only one site over approximately four years of monitoring indicating a decrease in the absolute number of exceedances and the percentage of samples with exceedances relative to the results from the DPR database. Copper, cadmium, lead, and nickel exceedances occurred during all years in which samples were collected for metals analysis. Additional pesticide exceedances were experienced for diuron, malathion, dimethoate, permethrin, and thiobencarb. Legacy pesticides and degradation products DDT, DDE, and DDD were found but not common. Toxicity to all test organisms was experienced during the years of monitoring. Sixteen sites experienced *Selenastrum* and *Ceriodaphnia* toxicity, and ten sites experienced *Hyalella* toxicity. Only two sites experienced *Pimephales*. There are fewer exceedances of nutrients and those exceedances appear to be concentrated in site subwatersheds with large numbers of dairies.

Compared to the results in the DPR database, monitoring by the Coalition indicates that chlorpyrifos is still a problem in the region. Exceedances are commonplace and occur in most months of sampling including exceedances of pesticides, metals, bacteria and field parameters. Toxicity was not included in the DPR database but numerous toxicity exceedances occurred during the years of sampling and coincide with exceedances of chlorpyrifos and diuron. Diuron

and copper are now common exceedances in the Coalition region. Other metals such as cadmium, nickel and lead experienced exceedances but the causes (sources) of those exceedances are unknown. Several legacy pesticide (no longer in use and/or distributed) exceedances were experienced but most were experienced only once with the exception of two exceedances of DDE, the degradation product of DDT. Exceedances of TDS and EC are common in several site subwatersheds close to the San Joaquin River where salty shallow ground water is pumped into drains from fields to lower the water table. The Coalition Management Plan further addresses exceedances of water quality in respect to historical detections, climate trends and probable sources.

Monitoring results from 2004-2007 are summarized in Table 17 and include results for toxicity tests, pesticide detections and metal detections.

Additional monitoring in the Coalition region was conducted under the auspices of the ILRP and the TMDL program by the CVRWQCB. Sampling for both programs was conducted by UC Davis Aquatic Ecosystems Analysis Laboratory. Monitoring was conducted across the entire Central Valley. The ILRP monitoring program, termed the Ag Waiver program, was initiated in July 2004 and was conducted periodically until 2007 although monitoring in the Coalition region was performed only in 2004 and 2005. Sampling was conducted for a larger number of chemical constituents than the Coalition monitored including disinfection byproducts. Water column and sediment toxicity, field parameters, and physical parameters were also monitored. Seven sites within the Coalition region were monitored and there were no sites in common between the Coalition and the Ag Waiver program. Three sites in the Ag Waiver program were on the same water bodies as the Coalition's monitoring program although at different locations.

In the Ag Waiver program, 2 of 34 *Ceriodaphnia* toxicity tests (6%), 0 *Pimephales* toxicity tests, 18 of 33 *Selenastrum* toxicity tests (55%), and 0 of 8 *Hyalella* tests exhibited significant toxicity (Table 18). Detections of occurred in 46 of 470 tests for organophosphates (10%), 0 of 329 tests for organochlorines, 3 of 155 tests for carbamates (2%), 32 of 287 tests for herbicides (11%), 1 of 143 tests for pyrethroids (<1%), and 143 of 241 tests for metals (91%). Compared to Coalition sampling using the same constituents, 9% of the *Ceriodaphnia* tests, <1% of the *Pimephales* tests, 6% of the *Selenastrum* tests and 22% of the *Hyalella* tests were significant. Detections occurred in 3% of the organophosphate tests, <1% of the organochlorine tests, <1% of the carbamate tests, 3% of the herbicide tests, <1% of the pyrethroid tests, and 83% of the metals tests. The Coalition detected fewer organophosphates and herbicides and had a lower percentage of significant Selenastrum toxicity tests, and the remaining test results were relatively similar between the two programs.

Sampling for the TMDL program occurred at only one site in the Coalition region (Table 19), and the sample location was not the same as any Coalition monitoring location. TMDL monitoring

included only organophosphates. There were detections in 9 of 40 organophosphate samples (23%). There were a greater percentage of detections in the TMDL monitoring program relative to either the Ag Waiver program or the Coalition monitoring.

These results indicate that multiple pesticides and metals can be detected at individual sites. Effects of multiple chemicals on toxicity are poorly understood, particularly for those constituents that have different modes of action. Chemicals within the same chemical class, e.g. organophosphates, can be additive in their action. Often, the combined toxicity of two organophosphate chemicals, e.g. chlorpyrifos and diazinon can be estimated using a toxic unit approach where one toxic unit is the concentration of the chemical at its LC_{50}. Unfortunately, for those chemicals that do not have the same mechanism of action, the toxic unit approach is not generally applicable. Consequently, it is unknown if these chemicals are additive or synergistic in their toxicity. A more in-depth discussion of joint toxicity for specific chemicals will be provided in the Management Plan.

Table 17. Summary tally of historical water quality monitoring data including toxic samples, pesticide detections and metal detections.

Monitoring Site	Significant Toxicity Results								Pesticide Detections by Group										Metal Detections	
	Ceriodaphnia dubia		*Pimephales promelas*		*Selenastrum capricornutum*		*Hyalella azteca*		Organo-phosphates		Organo-chlorines		Carbamates		Herbicides		Pyrethroids		Metals	
	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests
Ash Slough @ Ave 21	0	10	0	10	1	10	0	4	4	65	0	35	0	30	0	45	0	54	31	40
August Road Drain upstream of Crows Landing Bridge (Hogin Rd)	0	3	0	3	0	3	0	2	2	11	NA	NA	NA	NA	NA	NA	0	12	NA	NA
Bear Creek @ Kibby Rd	3	24	0	21	0	21	0	9	2	159	1	91	0	78	0	117	0	116	81	100
Berenda Slough along Ave 18 1/2	1	10	0	9	3	11	0	2	4	109	0	63	0	54	4	83	0	54	NA	NA
Black Rascal Creek @ Yosemite Rd	5	16	0	13	0	13	0	3	5	143	0	91	0	78	0	117	0	78	NA	NA
Cottonwood Creek @ Rd 20	0	19	0	19	0	19	1	8	6	128	0	70	0	60	1	90	0	102	61	78
Deadman Creek (Dutchman) @ Gurr Rd	0	16	1	18	1	17	0	5	4	154	0	91	3	78	5	117	0	90	86	100
Deadman Creek @ Hwy 59	0	13	0	13	0	13	0	3	2	143	3	91	2	78	10	117	2	78	NA	NA
Dry Creek @ Rd 18	1	14	0	13	1	14	1	4	5	125	0	77	0	66	4	99	0	76	72	89
Dry Creek @ Wellsford Rd	2	24	0	22	4	24	1	9	11	172	1	91	0	78	10	119	0	120	81	100
Duck Slough @ Gurr Rd	3	27	0	25	2	26	5	11	5	182	0	91	0	78	6	121	4	140	88	104
Duck Slough @ Hwy 99	1	23	0	22	1	24	0	4	4	171	0	91	0	78	2	119	0	120	83	102
Hatch Drain @ Tuolumne Rd	0	5	0	5	0	5	2	2	1	55	2	35	1	30	1	45	0	30	32	36
Highline Canal @ Hwy 99	4	23	0	19	1	20	4	9	4	146	0	84	0	72	2	108	0	106	68	92
Highline Canal @ Lombardy Rd	4	26	0	21	3	27	6	10	7	150	0	84	0	72	3	108	0	114	68	93
Hilmar Drain @ Central Ave	1	24	0	22	2	24	2	9	4	161	1	91	0	78	2	117	0	120	92	100
Jones Drain @ Oakdale Rd	1	23	0	22	1	22	0	9	6	162	1	91	0	78	2	117	0	120	89	102
Livingston Drain @ Robin Ave	0	5	0	5	0	5	0	1	2	55	0	35	0	30	0	45	0	30	31	36
Lone Willow Slough @ Madera Ave	1	5	0	5	1	5	2	4	3	10	NA	NA	NA	NA	NA	NA	1	20	NA	NA
Merced River @ Santa Fe	3	27	0	25	1	26	0	9	3	172	0	91	0	78	3	117	0	132	71	99
Miles Creek @ Reilly Rd	1	6	0	5	1	6	1	2	2	55	0	35	2	30	2	45	0	30	30	36
Mustang Creek @ East Ave	0	7	0	7	0	7	0	2	2	77	2	49	0	42	2	63	0	42	NA	NA
Prairie Flower Drain @ Crows Landing Rd	2	24	2	24	1	23	4	10	7	163	0	91	2	78	7	117	1	120	95	100
Silva Drain @ Meadow Dr	1	14	0	13	0	13	2	4	7	154	0	91	0	78	6	119	0	78	NA	NA

Monitoring Site	Significant Toxicity Results								Pesticide Detections by Group										Metal Detections	
	Ceriodaphnia dubia		*Pimephales promelas*		*Selenastrum capricornutum*		*Hyalella azteca*		Organo-phosphates		Organo-chlorines		Carbamates		Herbicides		Pyrethroids		Metals	
	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests
South Slough @ Quinley Rd	0	6	0	6	0	6	0	2	1	66	3	45	0	36	0	54	1	36	NA	NA
Westport Drain @ Vivian Rd	0	5	0	5	1	6	0	1	1	55	0	35	0	30	0	45	0	30	33	36

NA – Not Applicable; no monitoring was conducted for those constituents.

Table 18. Summary tally of Regional Ag Waiver monitoring results within the ESJWQC area.

Zone	Monitoring Site	Significant Toxicity Results								Pesticide Detections by Group										Metals Detections	
		Ceriodaphnia dubia		*Pimephales promelas*		*Selenastrum capricornutum*		*Hyalella azteca*		Organo-phosphates		Organo-chlorines		Carbamates		Herbicides		Pyrethroids		Metals	
		Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Significant Toxicity Results	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests
1	Dry Creek at J9	0	5	0	5	5	5	0	1	6	50	0	35	1	25	2	35	0	26	35	40
2	Stevison Lower Lateral at Faith Home Road	0	5	0	5	0	5	NA	NA	2	50	0	35	0	25	2	35	1	26	40	40
3	Duck Slough at Arboleda Drive	0	5	0	5	4	5	0	2	2	70	0	49	1	25	0	35	0	28	50	56
	Ingalsbe Slough at J17	0	5	0	5	5	5	0	1	0	50	0	35	0	25	0	35	0	26	34	40
5	Owens Creek at Gurr Road	0	4	0	4	0	4	0	1	3	40	0	28	1	20	6	28	0	4	32	32
6	Berenda Creek at Avenue 17.5 west of Madera	2	7	0	6	1	6	0	2	31	180	0	126	0	20	20	98	0	18	27	32
	Cottonwood Creek at Hwy 145 in Madera County	0	3	0	3	3	3	0	1	2	30	0	21	0	15	2	21	0	15	23	24

NA- Not Applicable; no monitoring was conducted for those results.

Table 19. Summary tally of results from the Regional Board Organophosphate TMDL (2007).

Zone	Monitoring Site	Pesticide Detections by Group									
		Organophosphates		Organochlorines		Carbamates		Herbicides		Pyrethroids	
		Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests	Number of Detections	Number of Tests
2	San Joaquin River @ Crows Landing	9	40	NA	NA	NA	NA	NA	NA	NA	NA

Protection of Beneficial Uses

Beneficial uses assigned to water bodies that are to be monitored by the Coalition are included in Table 4. In order to protect those beneficial uses, a list of water quality trigger limits (WQTLs) is used to determine if and to what magnitude an exceedance of a chemical constituent has occurred. Table 20 lists all sites monitored between 2004 and 2007, providing the current assessment status with regards to the protection of beneficial uses assigned to each water body. The Coalition has developed a method to protect beneficial uses of water bodies within its boundaries by creating a monitoring program to assess water quality in all water bodies that receive agricultural discharge. The monitoring plan includes rotating Assessment Monitoring locations, determining trends and overall status of zones through Core Monitoring locations, notifying growers of exceedances within their areas, identifying for growers possible management practices that can be used to protect beneficial uses of their waterways, and monitoring the effect of newly initiated management practices through additional monitoring and in some cases special studies. The Coalition has actively pursued grant monies (including Proposition 50 and Proposition 84 grants) with the help of CURES to supplement costs to the Coalition for determining suitable MANAGEMENT PRACTICESs for this area and to aid growers in implementing structural management practices.

The ESJWQC Management Plan does not provide for management of single exceedances that have occurred at Core Monitoring locations. Although outside the required constituents to be monitored during Core Monitoring years, constituents in Table 21 will be monitored during the next year at core sites. If no additional exceedances occur in a three year period, the Coalition will cease to monitor for these additional constituents during Core Monitoring years.

Table 20. Assessment of beneficial uses protection at Coalition monitoring sites.

Monitoring Site	Immediate Downstream Water Body	Beneficial Use Immediate Downstream Water Body	Assessment Status 2004-2007 Meets BUs?
Merced River @ Santa Fe	Merced River (McSwain Reservoir to SJ River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Silva Drain @ Meadow Dr	Merced River (McSwain Reservoir to San Joaquin River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Highline Canal @ Hwy 99	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Highline Canal @ Lombardy Ave	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Hilmar Drain @ Central Ave	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No
Mustang Creek @ East Ave	San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR)	MUN	No
		AG	No
		REC 1	No
		AQ Life	Yes
Prairie Flower Drain @ Crows Landing Rd	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No
Westport Drain @ Vivian Rd	San Joaquin River (mouth of Merced River to Vernalis)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No
Ash Slough @ Ave 21	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Bear Creek @ Kibby Rd	San Joaquin River (Sack	MUN	No

Monitoring Site	Immediate Downstream Water Body	Beneficial Use Immediate Downstream Water Body	Assessment Status 2004-2007 Meets BUs?
	Dam to mouth of Merced River)	AG	Yes
		REC 1	No
		AQ Life	No
Berenda Slough along Ave 18 1/2	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Black Rascal Creek @ Yosemite Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Cottonwood Creek @ Rd 20	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Deadman Creek @ Gurr Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Deadman Creek @ Hwy 59	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Dry Creek @ Rd 18	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Duck Slough @ Gurr Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No
Duck Slough @ Hwy 99	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
Hatch Drain @ Tuolumne Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	No
		REC 1	No

Monitoring Site	Immediate Downstream Water Body	Beneficial Use Immediate Downstream Water Body	Assessment Status 2004-2007 Meets BUs?
		AQ Life	No
Livingston Drain @ Robin Ave	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	Yes
		AG	Yes
		REC 1	Yes
		AQ Life	No
Miles Creek @ Reilly Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	Yes
		REC 1	No
		AQ Life	No
South Slough @ Quinley Rd	San Joaquin River (Sack Dam to mouth of Merced River)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No
Dry Creek @ Wellsford Rd	Tuolumne River (New Don Pedro Dam to SJ River)	MUN	No
		AG	No
		REC 1	No
		AQ Life	No

AG- Agricultural beneficial uses.
AQ Life- Aquatic life beneficial uses (includes both cold/warm water spawning and habitat).
MUN- Municipal beneficial uses; for *E. coli* a WQTL of 235 MPN/100mL was used to assess MUN status.
NA- Not Applicable; beneficial use is not applicable to downstream water body.
REC 1- Recreation beneficial uses.

Table 21. Core Monitoring sites and additional consituents due to previous exceedances of WQTL.

Site Name	Toxicity					Metals				Pesticides						Constituents to Add to Core Monitoring Locations
	Ceriodaphnia	*Pimephales*	*Selenastrum*	*Hyalella*	Arsenic	Cadmium	Copper	Lead	Nickel	Chlorpyrifos	Carbofuran	Cyanazine	Diazinon	Diuron	Simazine	
Cottonwood Creek @ Rd 20		1	1	**1**			MP	**MP**		**MP**		**1**	**1**	**MP**	**1**	Pimephales, Selenastrum and Hyalella toxicity testing; herbicides; organophosphates
Dry Creek @ Wellsford Rd	MP		MP	**1**		**MP**	MP	**1**		MP				MP		Hyalella toxicity testing; metals (total and dissolved)
Duck Slough @ Gurr Rd	MP		MP	MP		1	MP	MP	MP	1	**1**					Metals (total and dissolved); organophosphates; carbamates
Highline Canal @ Hwy 99	MP		**MP**	MP		**MP**	MP	MP		MP				**MP**		None
Merced River @ Santa Fe	MP		1*					1		1						Metals (total and dissolved) and organophosphates (including Group A)
Prairie Flower Drain @ Crows Landing Rd	MP	MP	**MP**	MP	1[†]	MP				MP						None

*single exceedance from March 2005; no toxicity in last three years.

[†]single exceedance in June 2007 and associated with cadmium exceedance which is under a management plan. Although arsenic for this site does not require a management plan it will be managed with cadmium due to similar characteristics and transportation methods.

Bolded MP or 1 are due to exceedances occurring between September 2007 and June 2008 and will be assessed in the 2009 Management Plan Report.

SOURCES OF DISCHARGE

Agricultural Drainage

There are five possible sources of discharge within the Coalition region: urban storm or dry weather runoff, discharge from waste water treatment plants, irrigation discharge, agricultural storm water discharge, and discharge to groundwater by agriculture. Waterbodies in the ESJWQC region receive agricultural discharge from storm and irrigation runoff. In addition, in sandy areas a large portion of the discharge does not create surface runoff but rather infiltrates and recharges the groundwater. In the Prairie Flower Drain @ Crows Landing Zone and the Highline Canal @ Hwy 99 Zone most of the waterways consist of irrigation district canals and delivery systems with relatively small amount of surface runoff.

Agricultural impacts on water quality include direct discharge of storm water and irrigation tail water containing constituents in excess of the WQTLs, spray drift, and effects due to water diversions. Water bodies within the ESJWQC have been heavily engineered to move water from sources to end users, generally growers but also urban centers. Many of the urban centers contribute discharge seasonally as storm water (e.g. Turlock, Ceres, and Keyes drain to the Highline Canal). Urban inputs may mix with agricultural inputs especially as the cities of Modesto, Turlock, Atwater, Livingston, and Merced continue to grow. Other delivery canals can accept discharges which are transferred downstream where the water may be reused. Consequently, water bodies can carry clean irrigation water exclusively, a combination of clean water and agricultural discharge, or primarily agricultural discharge depending on the season.

Pesticide Use Report Data

Information gathered for this section is based on data available from the California Department of Pesticide Regulation (DPR) website (http://calpip.cdpr.ca.gov/cfdocs/calpip/prod/main.cfm), GIS data obtained from the California Department of Water Resources (DWR), and the relevant County Agricultural Commissioner (CAC) 2002 Agricultural Crop and Livestock Reports. The information presented is based on the most updated data available at the time this report was written (Attachment II).

AGRICULTURAL PRACTICES SUMMARY

Agricultural practices are targeted at reducing either discharge of sediment and the associated sorbed constituents, or reducing the discharge of water that contains dissolved constituents. Whether these constituents are pesticides, nutrients, or pathogens, management of water and sediment discharges are primarily focused on retaining constituents on the fields rather than moving them to surface waters. The Coalition developed a survey for growers to complete and provide information on their management practices. The surveys were sent to growers during the spring and summer of 2007 and were summarized for the entire Coalition region in the December 31, 2007 SAMR. Growers were allowed to select from a list of management practices used on their operations and were also given an option to provide a written response. Many of the written responses appear to be variations of the listed options and, consequently, a complete, detailed analysis is difficult to provide. Failure of growers to provide survey responses was due to one or more of the following reasons: 1) the grower was not a member of the Coalition, 2) the grower was unable to respond (i.e. wrong address, did not receive mail, did not have enough information to respond) or 3) the grower was unwilling to respond. A review of the survey responses that were received was performed to determine the general status of the management practices in the region.

The Coalition distributed management practices surveys to selected growers in the Coalition region (both coalition members and non members). The surveys were sent to landowners who the coalition identified as having fields directly adjacent or near a waterway monitored by the coalition and where exceedances occurred in 2006.

Of the returned surveys, a large number of growers indicated that there was no discharge from their property during either the storm or irrigation season as a result of local conditions or lack of proximity to waterways. Of those who indicated discharge was a possibility, growers often indicated that several different management practices were utilized to control discharge. Drainage management systems included holding basins, bermed fields, recirculating systems, and sediment settling basins. Many growers indicated that they allowed vegetation to grow in drainage ditches in either winter or summer, or both as a means of trapping sediment. When asked about practices used to lessen storm or irrigation runoff from fields to ditches, canals, or streams, growers indicated that they used a variety of practices including grass row centers in orchards, grass waterways, gravity tailwater recapture systems, vegetated filter strips, or irrigation management systems such as drip, microspray, sprinkler, or careful water management. Additionally growers attended commodity-specific training sessions, obtained a soil nutrient analysis, followed a crop nutrient management plan, received an agronomist's advice on practices, laser leveled their fields, obtained PCA recommendations, obtained Certified Crop Advisor recommendations, or performed sprayer calibrations.

Management Practices to Reduce Water Use and Waste Discharge

One of the primary goals of the Coalition is to gather information on management practices that are demonstrated to benefit water quality and to provide information and support to growers to facilitate the implementation of these management practices. Over the last several years, the Coalition has collaborated with many groups including the University of California Agricultural Cooperative Extension, the Coalition for Urban and Rural Environmental Stewardship (CURES), pesticide registrants and pest control advisors to gather information on the most up-to-date management practices to reduce the potential of pesticide runoff. Information is provided to growers regularly throughout the year by means of Coalition outreach meetings, mailings, personal communication and the Coalition website. Each management practice is viewed as one tool in a collective tool box and the management practices (tools) that are most beneficial to a particular farm will depend on factors such as the size of the farm, the drainage system, soil type, crop type and the agricultural pests that must be controlled.

A working list of management practices is provided in Table 22 below. Management practices are described based on the goal (e.g. water conservation, waste discharge reduction) and the mechanism of the practice. Management practices are continually developing and changing and therefore the information will be updated in the ESJWQC Management Plan. Outreach materials will be included in the Management Plan and AMR where applicable.

Table 22. Table of management practices, target constituents, mechanism and possible improvements to water quality.

Management Practice	Endpoint	Management Practice Target(s)	Management Practice Mechanism	Effected water/sediment quality monitoring parameter(s)
Sediment basin	Reduce discharge	PI, PS, K, S, NP	Settling of sediment, pesticides bound to sediments; allow time for biodegradation of pesticides	Color, turbidity, EC, TDS, metals, short half-life pesticides, high Koc pesticides, total phosphorous
Vegetated buffers	Reduce discharge	PI, PS, K, S, NP, NN	Removal of sediment, nutrients, pesticides bound to sediments, or any contaminants with low solubility	Color, turbidity, EC, TDS, metals, pesticides, nutrients
Cover crop, dormant season vegetation	Reduce discharge	K, S, NP	Removal of sediment, pesticides bound to sediments, or any contaminants with low solubility; protect soils and soil nutrients for growing season	Color, turbidity, EC, TDS, metals, pesticides, nutrients
Sprayer calibration	Reduce discharge	D	Reduce potential for spray drift	All pesticides
Polyacrylamide (PAM)	Reduce discharge	PI, K, S, NP	A surfactant that removes sediment from the water column, thus pulling out pesticides bound to sediments	Color, turbidity, metals, pyrethroid pesticides, total phosphorous
Dormant season field retainers	Reduce discharge	PS, S	Reduce/eliminate storm runoff	Color, turbidity, EC, TDS, copper, pyrethroid pesticides, organophosphate pesticides
Micro irrigation	Reduce water use & discharge	D,W	Increase water efficiency, eliminate potential for spray drift	All pesticides, copper
Tail water return	Reduce water use & discharge	PI , PS, K, S, W, NP, NN	Re-use of irrigation water, eliminate discharge altogether	Color, turbidity, EC, TDS, metals, all pesticides, all nutrients

Management Practice Targets Code:

D: Chemical (pesticide) drift
PS: Dormant spray pesticide storm runoff
S: Sediment runoff
NP: Nutrients: phosphorous
PI: Pesticide runoff from irrigation
K: High K_{oc} pesticide runoff
W: Water use efficiency
NN: Nutrients: nitrate, nitrite or Kjeldhal nitrogen

Management Practices Implementation

Over the course of monitoring, when exceedances occur at a sample site more than once, the Coalition is required to formulate a Management Plan to address those exceedances. The ESJWQC Management Plan contains goals and actions that are designed to address the problems specific to a site subwatershed. Management practices, outreach and implementation are important components of the plan. The Management Plan provides a prioritization scheme and sequence by which management actions occur. Based on this plan, management practices are recommended to growers through general outreach at county and/or subwatershed meetings and in higher priority subwatersheds on an individual grower and/or grower group basis. In some cases, Coalition representatives are able to conduct site visits to individual farms in order to investigate sources of exceedances and to speak with growers or applicators in person. After outreach or contact occurs, management practices are implemented by growers on a voluntary basis. In particular, where exceedances are experienced in a small site subwatershed, it is possible to work closely with growers to encourage the implementation of management practices at an individual site.

The Coalition will attempt to document the implementation of management practices in the Coalition region. Conversations with growers indicate that they are changing practices but often do not report the changes to the Coalition. Changing chemicals, application practices (e.g. timing of application, calibrating nozzles), or implementing structural management practices are occurring in the Coalition region but are difficult to track. The Coalition is developing a process to track new management practices that are implemented in the region. Information regarding management practices will be more completely developed in the Management Plan.

COALITION CONTACT INFORMATION

Parry Klassen

Executive Director

East San Joaquin Water Quality Coalition

559-646-2224

559-288-8125 (cell)

pklassen@unwiredbb.com

Wayne Zipser

Board of Directors, Co-Chairman

East San Joaquin Water Quality Coalition

209-522-7278

209-604-9251 (cell)

waynez@stanfarmbureau.org

Michael L. Johnson, Ph.D.

Technical Program Manager

East San Joaquin Water Quality Coalition

(530) 400-6725 (cell)

(530) 756-5200 (office)

mjohnson@mlj-llc.com