MARCH 2014

SACRAMENTO VALLEY
WATER QUALITY COALITION

Monitoring and Reporting Program

Annual Monitoring Report 2013

Prepared by:

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SVWQC

March 3, 2014

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

RE: 2013 Annual Monitoring Report

Dear Ms. Creedon:

Attached is the Sacramento Valley Water Quality Coalition's (SVWQC) 2013 Annual Monitoring Report (AMR) for the SVWQC Monitoring and Reporting Program (MRP). The SVWQC has developed and implemented the monitoring to meet the MRP requirements of the Conditional Waiver for Irrigated Lands (hereinafter abbreviated as ILRP for Irrigated Lands Regulatory Program) and subsequent amendments to the ILRP requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875). The scope of the monitoring program and the sampling and analytical methods used in the Coalition and subwatershed 2013 monitoring have been approved by the Central Valley Regional Water Quality Control Board (Regional Board).

The AMR summarizes the sampling results and analysis, provides interpretation of the data, and documents the outreach to SVWQC landowners.

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

Should you or your staff have questions on the 2013 AMR, please contact me or Bruce Houdesheldt.

Sincerely,

David J. Guy
President
Northern California Water Association

Cc: Joe Karkoski, Claus Suverkropp, Susan Fregien, Bruce Houdesheldt, Mark Cady

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Executive Summary

SUMMARY OF MONITORING PROGRAM

The Sacramento Valley Water Quality Coalition (Coalition) has developed and implemented a Monitoring and Reporting Program (MRP) to meet the requirements of the original *Conditional Waiver for Irrigated Lands* (hereinafter abbreviated as *ILRP* for *Irrigated Lands Regulatory Program*) and subsequent amendments to the *ILRP* requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875). The scope of the MRP and the sampling and analytical methods used in 2013 Coalition Monitoring have been approved by the Central Valley Regional Water Quality Control Board (Water Board).

In accordance with the *ILRP* requirements, the Coalition is achieving these objectives by implementing an MRP that evaluates samples for the presence of statistically significant toxicity and exceedances of applicable numeric water quality objectives and *ILRP* trigger limits. The Coalition initiates follow-up actions designed to identify constituents causing significant toxicity when toxicity is of sufficient magnitude. Exceedances of numeric objectives and *ILRP* trigger limits for chemical, physical and microbiological biological parameters trigger follow-up actions designed to identify potential sources and to inform potential users of the constituents of concern. Additionally, the Coalition is evaluating the degree of implementation of current management practices in priority watersheds and recommending additional practices as water quality results indicate a need to do so. The Coalition is committed to the principle of adaptive management to control specific discharges of waste that are having an impact on water quality. This iterative approach allows for the most effective use of scarce human and fiscal resources. The 2013 Coalition Monitoring has been conducted in coordination with the Northeastern California Water Association, the Napa County Putah Creek Watershed Group, and the Upper Feather River Watershed Group. Monitoring in the Upper Feather River and Pit River subwatersheds was conducted in coordination the California's Surface Water Ambient Monitoring Program (SWAMP) beginning in 2012. The Coalition is also continues to coordinate with the California Rice Commission (CRC) under the December 2004 Coalition-CRC Memorandum of Understanding. The El Dorado and Napa subwatersheds continued their implementation of the Pilot BMP program, and no routine monitoring was conducted in these watersheds in 2013.

The parameters monitored in 2013 by the Coalition to achieve these objectives are as specified in the current MRP (*R5-2009-0875*), including the following:

- Water column and sediment toxicity
- Physical and conventional parameters in water and sediment
- Organic carbon
- Pathogen indicator organisms in water
- Trace metals in water
- Pesticides in water and sediments
- Nitrogen and phosphorus compounds in water

The MRP also requires testing for 303(d)-listed constituents identified in waterbodies downstream from Coalition sites and discharged within the watershed. Note that not all parameters are monitored at every site for every event. Specific individual parameters measured for 2013 Coalition Monitoring are listed in **Table 2**.

A total of 41 regular sampling sites were monitored by the Coalition and coordinating subwatershed monitoring programs during 2013 (**Table 3**). A map of these sites is presented in **Figure 1**.

As required by the *ILRP*, Coalition monitoring events includes storm season monitoring and irrigation season monitoring. The sites and numbers of samples to be collected for 2013 Coalition Monitoring are summarized in **Table 4**. This *Annual Monitoring Report 2013* (AMR) includes results for October 2012 through September 2013.

Sample collection and analysis has been performed by the following agencies and subcontractors.

- Pacific EcoRisk (Fairfield, California) performs toxicity analyses and conducts sampling for all sites, with the specific exceptions below;
- When monitoring is required for the Napa subwatershed, Napa County Resource Conservation District staff conducts sampling for Napa subwatershed sites;
- Vestra Environmental conducts sampling on behalf of the Northeastern California Water Association for the Pit River subwatershed site;
- Balance Hydrologics, Inc., conducts sampling for the Placer-Nevada-South Sutter-North Sacramento subwatershed;
- Caltest Analytical Laboratory (Napa, California) and Basic Lab (Redding, California), conduct all conventional and microbiological analyses; and
- APPL (Fresno, California) and Physis Environmental Laboratories (Anaheim, California) conduct pesticide analyses.

MANAGEMENT PRACTICES AND ACTIONS TAKEN

RESPONSE TO EXCEEDANCES

To address specific water quality exceedances, the Coalition and its partners developed a Management Plan in 2008, subsequently approved by the Water Board. The Coalition also previously developed a *Landowner Outreach and Management Practices Implementation Communications Process for Monitoring Results (Management Practices Process)* to address exceedances. Implementation of the approved management plan is the primary mechanism for addressing exceedances observed in the Coalition's *ILRP* monitoring.

Management Plan Status Update

The Coalition submitted the most recent Management Plan Progress Report (MPPR) to the Water Board in April 2013. The MPPR that documents the status and progress toward Management Plan requirements for 2013 will be provided to the Water Board at the end of

March 2014. Activities conducted in 2013 to implement the Coalition's Management Plan included addressing exceedances of objectives for registered pesticides, completion of source evaluations for pesticides and toxicity, development of management practice implementation goals, and monitoring required for toxicity and pesticide management plans and TMDLs.

Implementation completed specifically for registered pesticides and toxicity included review and evaluation of pesticide application data, identification of potential sources, and determination of likely agricultural sources. These evaluations were documented in Source Evaluation Reports for each water body and management plan element. For registered pesticides and identified causes of toxicity, surveys of Coalition members operating on high priority parcels were conducted to determine the degree of implementation of relevant management practices. These survey results have been used to establish goals for additional management practice implementation needed to address exceedances of Basin Plan water quality objectives and *ILRP* trigger limits.

The Coalition and its subwatersheds stand committed to working with the Water Board and its staff to implement the Coalition's approved Management Plan to address water quality problems identified in the Sacramento Valley. The primary strategic approach taken is to notify and educate the subwatershed landowners, farm operators, and/or wetland managers about the cause(s) of toxicity and/or exceedance(s) of water quality standards. Notifications are focused on (but not limited to) growers who operate directly adjacent to or within close proximity to the waterway. The broader outreach program, which includes both grower meetings and the notifications distributed through direct mailings, encourages the adoption of BMPs and modification of the uses of specific farm and wetland inputs to prevent movement of constituents of concern into Sacramento Valley surface waters.

CONCLUSIONS AND RECOMMENDATIONS

The Coalition submits this *2013 Annual Monitoring Report* (AMR) as required under the Water Board's Irrigated Lands Regulatory Program (*ILRP*). The AMR provides a detailed description of the Coalition's monitoring results as part of our ongoing efforts to characterize irrigated agricultural and wetlands related water quality in the Sacramento River Basin.

To summarize, the results from the *ILRP* monitoring in 2013 continue to indicate that with few exceptions, there are no major water quality problems with agricultural and managed wetlands discharges in the Sacramento River Basin.

This AMR characterizes potential water quality impacts of agricultural drainage from a broad geographic area in the Sacramento Valley from October 2012 through September 2013. To date, a total of 91 Coalition storm and irrigation season events have been completed, with additional events collected by coordinating programs and for follow-up evaluations. For the period of record in this AMR (October 2012 through September 2013), samples were collected for 10 scheduled monthly events and 2 wet weather ("storm") events.

Pesticides were infrequently detected (~1.1% of 2013 pesticide results), and, when detected, rarely exceeded applicable objectives. Three registered pesticides (chlorpyrifos, dimethoate, and malathion) exceeded applicable water quality objectives or *ILRP* trigger limits in a total of five Coalition monitoring samples (including one field duplicate). In addition, two breakdown products of the legacy pesticide DDT exceeded applicable water quality objectives in a total of six samples from two sites.

Many of the pesticides specifically required to be monitored in the past by the *ILRP* have rarely been detected in Coalition water samples, including glyphosate, paraquat, and all of the pyrethroid pesticides. Glyphosate, one of the most widely used agricultural pesticides, was detected in only seven of 354 analyses (including field duplicates) between 2005-2009 and never approached concentrations likely to cause toxicity to sensitive test species. Over 98.5% of all pesticide analyses performed since 2005 for the Coalition have been below detection.[1] Coalition monitoring of pesticides for the *ILRP* for 2013 was conducted based on management plan requirements, and the reported pesticide use and relative toxicity risks for these pesticides in the subwatersheds. The Coalition has been able to reduce monitoring of trace elements (arsenic, cadmium, lead, molybdenum, nickel, selenium, and zinc) based on the Coalition's monitoring results, which have demonstrated that most of these metals rarely approach or exceed objectives and are not likely to cause adverse impacts to aquatic life or human health in waters receiving agricultural runoff in the Coalition watershed. This focused strategy for monitoring pesticides and trace metals was implemented in 2010 in accordance with the Coalition's 2009 MRP (Order No. R5-2009-0875, CVRWQCB 2009[2]).

The majority of exceedances of adopted numeric objectives continue to consist of conductivity, dissolved oxygen, and *E. coli*. Agricultural runoff and irrigation return flows may contribute to exceedances of these objectives, but these parameters are largely controlled or significantly affected by natural processes and sources that are not controllable by agricultural management practices.

The Coalition has implemented the required elements of the *ILRP* since 2004. The Coalition developed a Watershed Evaluation Report (WER) that set the priorities for development and implementation of the initial Monitoring and Reporting Program Plan (MRPP). The Coalition successfully developed the MRPP, QAPP, and Management Plan as required by the *ILRP,* and these documents have been approved by the Water Board. Subsequent revisions requested by the Water Board and the Coalition have been incorporated into the Coalition's program and implemented through the Coalition's ongoing *ILRP* monitoring efforts. The Coalition also continues to adapt and improve elements of the monitoring program based on the knowledge gained through *ILRP* monitoring efforts.

The Coalition has implemented the approved monitoring program in coordination with its subwatershed partners, has initiated follow-up activities required to address observed exceedances, and continues to implement the approved Management Plan. Throughout this process, the Coalition has kept an open line of communication with the Water Board and has made every effort to fulfill the requirements of the *ILRP* in a cost-effective, scientifically defensible, and management-focused manner. This AMR is documentation of the success and continued progress of the Coalition in achieving these objectives.

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[1] Since 2005, there have been 785 detected pesticide results out of 54,503 total pesticide results (analyses); this total includes field replicates but excludes laboratory replicates. It should be noted that detected pesticides are not equivalent to exceedances (with the exception of malathion, which has a prohibition of discharge in the Basin Plan).

[2] CVRWQCB 2009. Monitoring and Reporting Program Order No. R5-2009-0875 for Sacramento Valley Water Quality Coalition under Amended Order No. R5-2006-0053, Coalition Group Conditional Waiver Of Waste Discharge Requirements For Discharges From Irrigated Lands. California Regional Water Quality Control Board, Central Valley Region.

Introduction

The primary purpose of this report is to document the monitoring efforts and results of the Sacramento Valley Water Quality Coalition (Coalition) Monitoring and Reporting Program (MRP). This Annual Monitoring Report also serves to document the Coalition's progress toward fulfilling the requirements of the Conditional Waiver for Irrigated Lands (hereinafter abbreviated as *ILRP* for Irrigated Lands Regulatory Program) and subsequent amendments to the *ILRP* requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875).

The Annual Monitoring Report includes the following elements, as specified in the *ILRP*:

Table 1. *ILRP* Annual Monitoring Report Requirements

ILRP Annual Report Requirement	Report Section Headings	Page
1. Signed Transmittal Letter	NA	-
2. Title page	Title page	-
3. Table of contents	Table of Contents	*i*
4. Executive Summary	Executive Summary	*v*
5. Description of the Coalition Group geographical area	Description of the Watershed	3
6. Monitoring objectives and design	Monitoring Objectives	4
7. Sampling site descriptions and rainfall records for the time period covered under the AMR	Sampling Site Locations and Land Uses; Summary of Sampling Conditions	6; 42
8. Location map(s) of sampling sites, crops and land uses	Appendix E: Drainage Maps	CD
9. Tabulated results of all analyses	Appendix C: Tabulated Monitoring Results	CD
10. Discussion of data	Data Interpretation	42
11. Electronic data submitted in a SWAMP comparable format	Submitted quarterly; Appendix C	CD
12. Sampling and analytical methods used	Sampling and Analytical Methods	17
13. Copy of chain-of-custody forms	Appendix B: Lab Reports and Chains of Custody	CD
14. Field data sheets, signed laboratory reports, laboratory raw data (as identified in Attachment C)	Appendix A: Field Log Copies; Appendix B: Lab Reports and Chains of Custody	CD
15. Associated laboratory and field quality control samples results	Appendix B: Lab Reports and Chains of Custody	CD
16. Summary of Quality Assurance Evaluation results (as identified in Attachment C for Precision, Accuracy and Completeness)	Monitoring Results	26

ILRP Annual Report Requirement	Report Section Headings	Page
17. Specify the method used to obtain flow at each monitoring site during each monitoring event	Appendix A: Field Log Copies	CD
18. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date	Appendix A: Field Log Copies	CD
19. Summary of Exceedance Reports submitted during the reporting period and related pesticide use information	Exceedances of Relevant Water Quality Objectives; Appendix D: Exceedance Reports	55; CD
20. Actions taken to address water quality exceedances that have occurred, including but not limited to, revised or additional management practices implemented	Management Practices and Actions Taken	73
21. Status update on preparation and implementation of all Management Plans and other special projects	Management Practices and Actions Taken	73
22. Conclusions and recommendations	Conclusions and Recommendations	75

All report elements required by the *ILRP* or subsequently requested by the California Regional Water Quality Control Board, Central Valley Region (Water Board) are included in this report.

Description of the Watershed

The Sacramento River watershed drains over 27,000 square miles of land in the northern part of California's Central Valley into the Sacramento River. The upper watersheds of the Sacramento River region include the Pit River watershed above Lake Shasta and the Feather River above Lake Oroville. The Sacramento Valley drainages include the Colusa, Cache Creek, and Yolo Bypass watersheds on the west side of the valley, and the Feather, Yuba, and American River watersheds on the east side of the valley. The Coalition also monitors in the Cosumnes River watershed, which is not part of the Sacramento River watershed.

Beginning near the city of Redding at its northern terminus, the Sacramento Valley stretches approximately 180 miles to the southeast, where it merges into the Sacramento-San Joaquin River Delta south of the Sacramento metropolitan area at Rio Vista. The valley is 30 to 45 miles wide in the southern to central parts but narrows to about 5 miles wide near Redding. Its elevation decreases from 300 feet at its northern end to near sea level in the Delta. The greater Sacramento River watershed includes sites from 5,000 feet in elevation to near sea level.

The Sacramento River Basin is a unique mosaic of farm lands, refuges, and managed wetlands for waterfowl habitat; spawning grounds for numerous salmon and steelhead trout; and the cities and rural communities that make up this region. This natural and working landscape between the crests of the Sierra Nevada and the Coast Range includes the following:

- More than a million acres of family farms that provide the economic engine for the region; provide a working landscape and pastoral setting; and serve as valuable habitat for waterfowl along the Pacific Flyway. The predominant crops include: rice, general grain and hay, improved pasture, corn, tomatoes, alfalfa, almonds, walnuts, prunes, safflower, and vineyards.
- Habitat for 50% of the threatened and endangered species in California, including the winter-run and spring-run salmon, steelhead, and many other fish species.
- Six National Wildlife Refuges, more than fifty state Wildlife Areas, and other privately managed wetlands that support the annual migration of waterfowl, geese, and water birds in the Pacific Flyway. These seasonal and permanent wetlands provide for 65% of the North American Waterfowl Management Plan objectives.
- The small towns and rural communities that form the backbone of the region, as well as the State Capital that serves as the center of government for the State of California.
- The forests and meadows in the numerous watersheds of the Sierra Nevada and Coast Range.

Monitoring Objectives

The Coalition's monitoring program will achieve the following objectives as a condition of the *ILRP*:

1. Assess the impacts of waste discharges from irrigated lands to surface waters;
2. Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality;
3. Determine the effectiveness of management practices and strategies to reduce discharge of wastes that impact water quality;
4. Determine concentration and load of wastes in these discharges to surface waters; and
5. Evaluate compliance with existing narrative and/or numeric water quality objectives to determine if additional implementation of management practices is necessary to improve and/or protect water quality.

In accordance with the *ILRP* requirements, the Coalition is achieving these objectives by implementing an MRP that evaluates samples for the presence of statistically significant toxicity and exceedances of applicable numeric water quality objectives and *ILRP* trigger limits. The Coalition initiates follow-up actions designed to identify constituents causing significant toxicity when toxicity is of sufficient magnitude. Exceedances of numeric objectives and *ILRP* trigger limits for chemical, physical, and microbiological biological parameters trigger follow-up actions designed to identify potential sources and to inform potential users of the constituents of concern. Additionally, the Coalition is evaluating the degree of implementation of current management practices in priority watersheds and recommending additional practices as water quality results indicate a need to do so. The Coalition is committed to the principle of adaptive management to control specific discharges of waste that are having an impact on water quality. This iterative approach allows for the most effective use of scarce human and fiscal resources.

The parameters monitored by the Coalition in 2013 to achieve these objectives are as specified in the current MRP (R5-2009-0875):

- Water column and sediment toxicity
- Physical and conventional parameters in water and sediment
- Organic carbon
- Pathogen indicator organisms in water
- Trace metals in water
- Pesticides in water and sediment
- Nitrogen and phosphorus compounds in water

The MRP also requires testing for 303(d)-listed constituents identified in waterbodies downstream from Coalition sites and discharged within the watershed. Note that not all parameters are monitored at every site for every event. Specific individual parameters measured for the Coalition monitoring effort are listed in **Table 2**.

Table 2. Constituents Monitored for the 2013 Monitoring Year

Analyte	Quantitation Limit[(a)]	Reporting Unit
Physical Parameters		
Flow	NA	CFS (Ft^3/Sec)
pH	0.1 [(b)]	-log[H^+]
Conductivity	0.1 [(b)]	µmhos/cm
Dissolved Oxygen	0.1 [(b)]	mg/L
Temperature	0.1 [(b)]	˚C
Hardness, total as $CaCO_3$	10	mg/L
Turbidity	1.0	NTU
Total Suspended Solids	3.0	mg/L
Total Organic Carbon	0.5	mg/L
Grain size (in sediment)	1	% fraction
Total Organic Carbon (in toxic sediments)	200	mg/kg d.w.
Pathogen Indicators		
E. coli bacteria	2	MPN/100 mL
Water Column Toxicity		
Ceriodaphnia, 96-h acute	NA	% Survival
Selenastrum, 96-h short-term chronic	NA	Cell Growth
Sediment Toxicity		
Hyalella, 10-day short-term chronic	NA	% Survival
Pesticides		
Benzophenyls	(c)	µg/L
Carbamates	(c)	µg/L
Herbicides	(c)	µg/L
Organochlorine	(c)	µg/L
Organophosphorus	(c)	µg/L
Pyrethroids and chlorpyrifos	(c)	ng/g, d.w.
Trace Elements		
Arsenic	0.5	µg/L
Boron	10	µg/L
Copper	0.5	µg/L
Lead	0.25	µg/L
Nutrients		
Phosphorus, total	0.1	mg/L
Nitrate + Nitrite as N	0.1	mg/L

Notes:

(a) The Quantitation Limit (QL) represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and confidence in both identification and quantitation.

(b) Detection and reporting limits are not strictly defined. Value is required reporting precision.

(c) Limits are different for individual pesticides.

Sampling Site Descriptions

To successfully implement the monitoring and reporting program requirements contained in the *ILRP* adopted by the Water Board in June 2003, the Coalition worked directly with landowners in the 21 county watersheds to identify and develop ten (now 12) subwatershed groups. Representatives from each subwatershed group utilized agronomic and hydrologic data generated by the Coalition in an attempt to prioritize watershed areas for initial evaluation to ultimately select monitoring sites in their respective areas based upon existing infrastructure, historical monitoring data, land use patterns, historical pesticide use, and the presence of 303(d)-listed water bodies.

Coalition members selected sampling sites in priority watersheds based upon the following fundamental assumptions regarding management of non-point source discharges to surface water bodies: 1) Landscape scale sampling at the bottom of drainage areas allows determination of the presence of water quality problems using a variety of analytical methods, including water column and sediment toxicity testing, water chemistry analyses, and bioassessment; 2) Strategic source investigations utilizing Geographic Information Systems can be used to identify upstream parcels with attributes that may be related to the analytical results, including crops, pesticide applications, and soil type; and 3) Management practice effectiveness can best be assessed by coalitions at the drainage and watershed scale to determine compliance with water quality objectives in designated water bodies. Results from farm-level management practices evaluations will be used to complement Coalition efforts on the watershed scale by providing crop-specific information that will support management practice recommendations.

In January 2009, the Coalition implemented an updated MRPP responsive to a revised *ILRP* MRP (*R5-2008-0005*). The Coalition MRPP included an analysis of historical data and basic patterns and processes related to potential water quality impacts from agricultural discharges. Although there were no changes in monitoring objectives, there were several modifications to monitoring strategy in the MRPP, including the following significant revisions in monitoring approach:

- Monitoring conducted at sites in drainages representative of larger regions based on shared agricultural and geographic characteristics;
- A cycle of one year of “Assessment” monitoring for the broader suite of *ILRP* analytes and two years of “Core” monitoring of a reduced set of analytes, plus sampling needed for Management Plan implementation; and
- Customization of monitoring schedules and the analytes monitored based on the characteristics of individual subwatersheds.

These modifications were retained in the current MRP (pages 7-10 of R5-2009-0875) and are addressed with the Coalition’s approved 2013 *ILRP* Monitoring Plan. Monitoring sites for 2013 were continued from previously monitored locations and included ongoing representative sites and sites monitored only for management plans or TMDLs. A total of 17 representative sites were monitored for Assessment and Core monitoring analytes. Additionally, Management Plan sampling was conducted at all 17 of the representative monitoring sites and at 18 additional sites.

SAMPLING SITE LOCATIONS AND LAND USES

The water and sediment sites monitored by the Coalition in 2013 are listed in **Table 3**. All sites monitored in 2013 have been approved by the Water Board as *ILRP* compliance sites. An overall map of Coalition and subwatershed sites is presented in **Figure 1**. Site-specific drainage maps with land use patterns for all monitoring locations are also provided in **Appendix E**.

Table 3. Coalition Monitoring Sites, 2013

Subwatershed	Site Name	Latitude	Longitude	Agency	Site ID & Category (Fig. 1)[1]	
ButteYubaSutter	Butte Slough at Pass Road	39.1873	-121.90847	SVWQC	BTTSL	MP
ButteYubaSutter	Gilsizer Slough at George Washington Rd	39.009	-121.6716	SVWQC	GILSL	MP
ButteYubaSutter	Lower Honcut Creek at Hwy 70	39.30915	-121.59542	SVWQC	LHNCT	REP
ButteYubaSutter	Lower Snake R. at Nuestro Rd	39.18531	-121.70358	SVWQC	LSNKR	REP
ButteYubaSutter	Pine Creek at Nord Gianella Road	39.78114	-121.98771	SVWQC	PNCGR	REP
ButteYubaSutter	Sacramento Slough bridge near Karnak	38.785	-121.6533	SVWQC	SSKNK	REP
ColusaGlenn	Colusa Basin Drain above KL	38.8121	-121.7741	SVWQC	COLDR	REP
ColusaGlenn	Freshwater Creek at Gibson Rd	39.17664	-122.18915	SVWQC	FRSHC	REP
ColusaGlenn	Lurline Creek at 99W	39.21215	-122.18331	SVWQC	LRLNC	MP
ColusaGlenn	Rough & Ready Pumping Plant (RD 108)	38.86209	-121.7927	SVWQC	RARPP	MP
ColusaGlenn	Stone Corral Creek near Maxwell Road	39.2751	-122.1043	SVWQC	SCCMR	MP
ColusaGlenn	Stony Creek on Hwy 45 near Rd 24	39.71005	-122.00404	SVWQC	STYHY	MP
ColusaGlenn	Walker Creek near 99W and CR33	39.62423	-122.19652	SVWQC	WLKCH	REP
ElDorado	Coon Hollow Creek	38.75335	-120.72404	SVWQC	COONH	MP
ElDorado	North Canyon Creek	38.76242	-120.70996	SVWQC	NRTCN	REP
Lake	McGaugh Slough at Finley Road East	39.00417	-122.86233	SVWQC	MGSLU	MP
Lake	Middle Creek u/s from Highway 20	39.17641	-122.91271	SVWQC	MDLCR	REP
PitRiver	Fall River at Fall River Ranch Bridge	41.0351	-121.4864	NECWA	FRRRB	MP
PitRiver	Pit River at Canby Bridge	41.4017	-120.931	NECWA	PRCAN	MP
PitRiver	Pit River at Pittville	41.0454	-121.3317	NECWA	PRPIT	REP
PNSSNS	Coon Creek at Brewer Road	38.93399	-121.45184	PNSSNS	CCBRW	REP
PNSSNS	Coon Creek at Striplin Road	38.8661	-121.5803	PNSSNS	CCSTR	MP
SacramentoAmador	Cosumnes River at Twin Cities Rd	38.29098	-121.38044	SVWQC	CRTWN	REP
SacramentoAmador	Dry Creek at Alta Mesa Road	38.248	-121.226	SVWQC	DCGLT	MP
SacramentoAmador	Grand Island Drain near Leary Road	38.2399	-121.5649	SVWQC	GIDLR	REP
SacramentoAmador	Laguna Creek at Alta Mesa Rd	38.31102	-121.2263	SVWQC	LAGAM	MP
ShastaTehama	Anderson Creek at Ash Creek Road	40.418	-122.2136	SVWQC	ACACR	REP
ShastaTehama	Coyote Creek at Tyler Road	40.09261	-122.15898	SVWQC	COYTR	MP
Solano	Shag Slough at Liberty Island Bridge	38.30677	-121.69337	SVWQC	SSLIB	REP
Solano	Ulatis Creek at Brown Road	38.307	-121.794	SVWQC	UCBRD	REP
Solano	Z-Drain	38.45215	-121.6752	SVWQC	ZDDIX	MP
Solano	Z-Drain Inflow	38.45485	-121.72114	SVWQC	ZDINF	MP
Solano	Z-Drain Supply Site #2	38.45228	-121.70971	SVWQC	ZDTWO	MP

Subwatershed	Site Name	Latitude	Longitude	Agency	Site ID & Category (Fig. 1)[1]	
Solano	Z-Drain Supply Site #3	38.45943	-121.69363	SVWQC	ZDTHR	MP
Solano	Z-Drain Supply Site #4	38.45004	-121.69365	SVWQC	ZDFOR	MP
Solano	Z-Drain Supply Site #5	38.45475	-121.68433	SVWQC	ZDFIV	MP
UpperFeatherRiver	Middle Fk Feather River above Grizzly Cr	39.816	-120.426	UFRW	MFFGR	REP
Yolo	Cache Creek at Capay Diversion Dam	38.7137	-122.0851	SVWQC	CCCPY	MP
Yolo	Tule Canal at I-80	38.5728	-121.5827	SVWQC	TCHWY	MP
Yolo	Willow Slough Bypass at Pole Line	38.59015	-121.73058	SVWQC	WLSPL	REP

Notes:

1. The supplemental sites for ZDDIX (ZDINF, ZDTWO, ZDTHR, ZDFOR and ZDFIV) are not depicted in **Figure 1**. Site categories are Representative (REP) or Management Plan and Special Study sites (MP).
2. The ZDINF site was used for source evaluation to indicate whether pyrethroids were coming into the Z-Drain from outside the drainage.
3. The other supplemental Z-Drain sites (ZDTWO, ZDTHR, ZDFOR, ZDFIV) were sampled to partition the potential sources of sediment toxicity within the Z-Drain system.

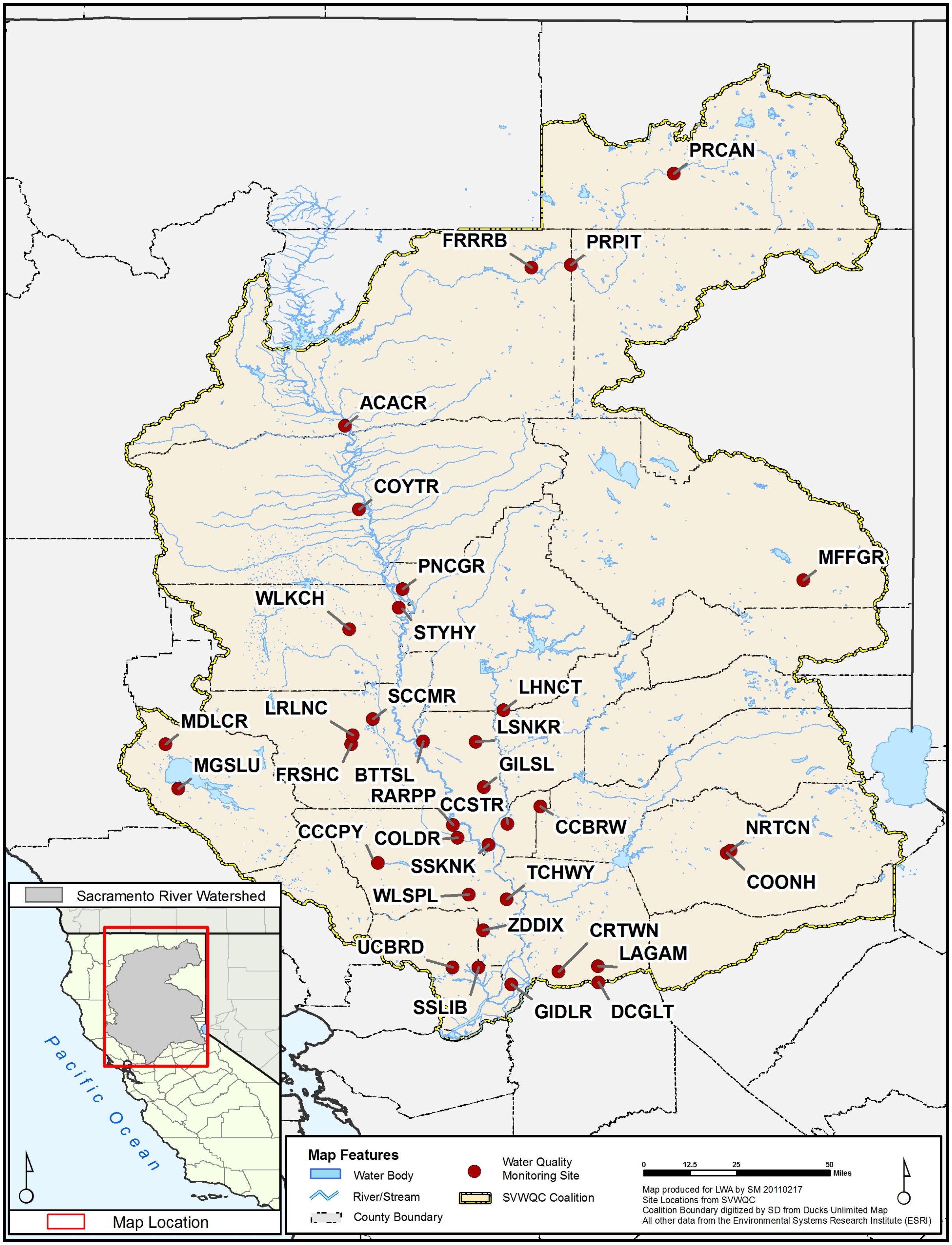

Figure 1. Coalition Monitoring Sites, 2013

SITE DESCRIPTIONS

Butte/Yuba/Sutter Subwatershed

Butte Slough at Pass Road (BTTSL)

Butte Slough is a tributary of Butte Creek. It joins Butte Creek near its outflow to the Sacramento River. The sampling location is approximately 1.5 miles from the confluence with Butte Creek. Butte Creek is a source of water in Butte Slough when irrigation withdrawals are being made. In addition to the water from Butte Creek, Butte Slough receives drainage from the wetlands of Gray Lodge Waterfowl Management Area, Butte Sink Wildlife Management Area, the fields surrounding Cherokee Canal and the orchards and fields west of Gridley and the Buttes.

Gilsizer Slough at George Washington Road (GILSL)

Gilsizer Slough is an unlined storm drainage outfall canal that runs from the Gilsizer County Drainage District's north pump station approximately 15 miles to the Sutter Bypass, draining 6,005 total acres. The monitoring location is located roughly 1.5 drainage miles from its confluence with the Sutter bypass and is a natural drainage channel that historically has drained Yuba City and the area south of town. Principal crops grown in this area include prunes, walnuts, peaches, and almonds.

Lower Honcut Creek at Highway 70 (LHNCT)

Lower Honcut Creek (in the Lower Honcut Creek drainage) was selected to represent the drainages in the eastern part of the Butte-Yuba-Sutter subwatershed. This drainage includes the dominant crops and typically has flows allowing sampling through irrigation season. The sampling site is located approximately 3.5 miles from its confluence with the Feather River. Dominant crops in this drainage include rice, walnuts, prunes, pasture, citrus, olive, and grapes. Lower Honcut receives flows from North Honcut Creek and South Honcut Creek, which extend up into the foothills and include more pasture acreage. This is a representative site for this subwatershed.

Lower Snake River at Nuestro Road (LSNKR)

The Lower Snake River is an unlined irrigation supply and runoff canal that serves approximately 25,000 total acres and includes a relatively high percentage of rice acreage. The other predominant crops include prunes, peaches, idle acreage, and operations producing flowers, nursery stock, and Christmas trees. This is a representative site for this subwatershed.

Pine Creek at Nord-Gianella Road (PNCGR)

The watershed sampled upstream from the monitoring site represents approximately 13,440 acres of varied farmland, riparian habitat and farmsteads. The predominant crops in this area are walnuts, almonds, prunes, wheat, oats, barley, beans, squash, cucumbers, alfalfa, pasture, and safflower. This site frequently has no instream flow and was replaced with a new representative location downstream for 2014 monitoring (Pine Creek at Highway 32, PNCHY). This is a representative site for this subwatershed.

Sacramento Slough Bridge near Karnak (SSKNK)

This site aggregates water from all areas in the subwatershed between the Feather and Sacramento Rivers. The major contributing areas include the areas downstream of the Butte Slough and Wadsworth monitoring sites. These areas include Sutter Bypass and its major inputs from Gilsizer Slough, RD 1660, RD 1500, and the Lower Snake River. Monitoring at this site is coordinated with the California Rice Commission. This is a representative site for this subwatershed.

Colusa Glenn Subwatershed

Colusa Basin Drain above Knights Landing (COLDR)

This site is near the outfall gates of the Colusa Basin Drain before its confluence with the Sacramento River. This site is downstream of all of the other monitoring sites within the basin. The upstream acreage consists of almonds, tomatoes, wetlands, pasture, corn, and walnuts. Monitoring at this site is coordinated with the California Rice Commission. This is a representative site for this subwatershed.

Freshwater Creek at Gibson Road (FRSHC)

The Freshwater Creek drainage includes approximately 83,000 total acres. Irrigated acreage (excluding rice acreage) is approximately 19,000 acres. Predominant crops in the drainage are rice, tomatoes, idle, squash, grain, pasture, and safflower. This is a representative site for this subwatershed.

Lurline Creek at 99W (LRLNC)

The Lurline Creek drainage includes approximately 55,000 total acres. Irrigated acreage (excluding rice acreage) is approximately 19,000 acres. Predominant crops in the drainage are rice, idle acreage, pasture, managed wetland, grain, melons, and squash.

Rough and Ready Pumping plant, RD 108 (RARPP)

The Rough & Ready Pumping Plant aggregates runoff and return flows for the Sycamore drainage. The pumps lift the water into the Sacramento River. This drainage area contains large amounts of tomatoes, safflower, wheat, melons, corn, and pasture.

Stone Corral Creek at Maxwell Road (SCCMR)

This site captures drainage from approximately 10,000 irrigated acres in the Stone Corral Creek drainage area as indicated on the Colusa Basin Subwatershed map. The primary crops include pasture, wheat, rice and safflower.

Stony Creek on Hwy 45 near Rd 24 (STYHY)

This site characterizes water from the contributing area downstream of Black Butte Reservoir just north of the town of Orland and includes approximately 20,000 acres of irrigated lands. The major irrigated crops in the Lower Stony Creek drainage are pasture, almonds, prunes, and wheat.

Walker Creek near 99W and CR33 (WLKCH)

The Walker Creek drainage is located east of Wilson Creek in Glenn County, and the Walker Creek monitoring site is located 1.3 miles north of the Town of Willows. The Walker Creek drainage includes approximately 27,000 total irrigated acres. Predominant crops in this drainage are almonds, rice, corn, and alfalfa. This is a representative site for this subwatershed.

El Dorado Subwatershed

North Canyon Creek (NRTCN)

This site captures representative agricultural drainage from the Camino-"Apple Hill" drainage in El Dorado County. Crops grown in this region include apples, pears, wine grapes, stone fruit, and Christmas trees. This site is approximately one (1) mile upstream from the confluence with the South Fork American River and is a perennial stream. This is a representative site for this subwatershed. This subwatershed is in the BMP Pilot Program. In 2013, this site was only monitored for Management Plan requirements.

Coon Hollow Creek (COONH)

This site is located in the Apple Hill area of Camino, approximately 1 mile north of the intersection of North Canyon Road and Carson Road and 1/2 mile south of the confluence with South Canyon Creek. Agricultural operations within the drainage include silviculture, apples, wine grapes, cherries, and blueberries. Coon Hollow Creek is considered a low-flow perennial stream.

Lake Subwatershed

Middle Creek Upstream from Highway 20 (MDLCR)

The Middle Creek drainage contains approximately 60,732 acres. Over 55,000 acres are listed as Native Vegetation with the US Forest Service controlling the majority of the land. Irrigated agriculture constitutes approximately 1,112 acres participating in the Lake County Watershed group. This includes 374 acres of walnuts, 308 acres of grapes, 186 acres of pears 159 acres of hay/pasture, 10 acres of specialty crops/nursery crops and about 70 acres of wild rice.

The sampling location was chosen to avoid influence for the town of Upper Lake, and captures approximately 60% of irrigated agricultural operations within this drainage. This is a representative site for this subwatershed.

McGaugh Slough at Finley Road East (MGSLU)

McGaugh Slough captures irrigated agricultural drainage from about 10,300 acres of orchard and vineyard crops in Lake County. This site characterizes the most prevalent drain for the Big Valley, which is the most intensive area for agricultural operations in Lake County.

Napa Subwatershed

Pope Creek above Lake Berryessa (PCULB)

The site on Pope Creek in Napa County is downstream of major storm runoff and above Lake Berryessa. Primary crops in the drainage are vineyards and olive orchards. Additional tributaries in the Pope Creek area (Burton Creek, Swartz Creek, Maxwell Creek, and upper Pope Creek) have been sampled to help establish regional characteristics for management plan source evaluations. This site is a representative site for this subwatershed. In 2013, this site was not monitored because this subwatershed is in the BMP Pilot Program.

Pit River Subwatershed

Monitoring in this subwatershed has been conducted in coordination with the Northeastern California Watershed Association (NECWA) and the California's Surface Water Ambient Monitoring Program (SWAMP).

Pit River at Pittville Bridge (PRPIT)

This site captures drainage from Big Valley, Ash Creek and Horse Creek. This site captures drainage from native pasture (the primary land use), as well as alfalfa, oat hay, grain and duck marsh, ultimately incorporating approximately 9,000 acres in the Fall River Valley. This is a representative site for this subwatershed.

Fall River at Fall River Ranch Bridge (FRRRB)

This site is located at the lower end of Fall River before the river is partially diverted for hydroelectric uses at the Pit 1 Power House. The majority of Fall River flow is spring-fed water that emerges in the northern portions of the valley (e.g., Lava Creek Springs, Spring Creek Springs, Crystal Springs, Mallard Springs, Big Lake Springs, Thousand Springs, Hideaway Spring, Rainbow Spring). These springs form the Little Tule River, Tule River, Spring Creek, Lava Creek, Mallard Creek, and Ja She Creek. A major tributary to Fall River (Bear Creek) captures flow mostly from private timberland comprising approximately 27 square miles of watershed. Bear Creek joins the Fall River near Thousand Springs. Finally, small amounts of water enter the Fall River from overland flow during winter and from irrigated lands during the growing season. Pasture, wild rice, and alfalfa are the primary agriculture crops in the northern portion of the valley. Total irrigated acreage draining to this site is approximately 12,000 acres.

Pit River at Canby (PRCAN)

This site captures drainage from the Alturas and Canby drainage areas, as well as drainage from the North and South Fork of Pit River and Hot Springs Valley. Land uses are primarily pasture and grain and hay crops. Approximate irrigated acreage is 50,000.

Placer/Nevada/South Sutter/North Sacramento Subwatershed

Coon Creek at Brewer Road (CCBRW)

This site captures drainage from the Middle Coon Creek drainage areas as identified in the Placer-Northern Sacramento Drainage Prioritization Table in the Coalition's Watershed Evaluation Report (WER). This site is on Coon Creek about six miles northwest of the town of

Lincoln and includes predominantly agricultural acreage. The drainage includes approximately 65,000 irrigated acres of rice, rice, pasture, grains, and sudan grass, with a high percentage of rice acreage. This is a representative site for this subwatershed.

Coon Creek at Striplin Road (CCSTR)

This site captures drainage from the Lower Coon Creek drainage areas and is hydrologically isolated from the Middle Coon Creek drainage. The sampling site is on Coon Creek about one mile downstream of the confluence with Ping Slough. The site drains approximately 25,000 irrigated acres of orchards, pasture, and wheat. There may also be some urban runoff contributions at this site.

Sacramento/Amador Subwatershed

Cosumnes River at Twin Cities Road (CRTWN)

This site characterizes flows from the east via the Cosumnes River and a handful of tributary creeks that originate in the foothills. Contributing agricultural acreage includes pasture, vineyards, corn and grains. This site captures drainage from the two largest drainages in the subwatershed: Lower Cosumnes and Middle Cosumnes, which drain approximately 55,000 irrigated acres. This is a representative site for this subwatershed.

Dry Creek at Alta Mesa Road (DCGLT)

Dry Creek originates in the eastern foothills and flows through considerable agricultural acreage. The drainage includes the southern portion of Amador County, the southeast corner of Sacramento County and the northeast corner of San Joaquin County. Amador County agriculture includes grain and irrigated pasture in the Dry Creek Valley and row crops, irrigated pasture, grain, vineyard, and orchard in the Jackson Valley. Sacramento County agriculture includes vineyard, irrigated pasture, grain, and scattered dairies. Dry Creek drains approximately 329 square miles.

Grand Island Drain near Leary Road (GIDLR)

Grand Island is located in the heart of the Sacramento Delta. Crops include alfalfa, corn, safflower, apples, pears, cherries, blueberries, asparagus, grapes, and pasture land. Water is pumped on to the island at several locations. The monitoring site is located just up-slough from a station that returns water to the Delta. Approximately 8,000 acres drains to the monitoring site. This is a representative site for this subwatershed.

Laguna Creek at Alta Mesa Road (LAGAM)

Laguna Creek is a tributary to the Cosumnes River. Laguna Creek originates in Amador County and flows south-west into Sacramento County, draining Willow, Hadselville, Brown and Griffith Creeks, among others. The primary agricultural uses are vineyards, field crops, grain and hay crops and pasture.

Shasta/Tehama Subwatershed

Anderson Creek at Ash Creek Road (ACACR)

Anderson Creek was identified as the highest priority drainage in the Shasta county portion of the Shasta/Tehama subwatershed. This ranking was based on total irrigated acreage, crop types by acreage, and amount and type of pesticide use. Anderson Creek originates about three miles west of the city of Anderson and then flows into the Sacramento River. Crops are predominantly pasture, followed by walnuts and alfalfa/hay and then smaller amounts of other field and orchard crops. Total irrigated land is 8,989 acres. This is a representative site for this subwatershed.

Coyote Creek at Tyler Road (COYTR)

The Coyote Creek drainage includes approximately 37,000 total acres. Irrigated acreage (excluding rice acreage) is approximately 6,700 acres. Predominant crops in the drainage are pasture, walnuts, prunes, almonds, and olives.

Solano Subwatershed

Shag Slough at Liberty Island Bridge (SSLIB)

Shag Slough drains a large portion of the South Yolo Bypass. Crops grown in this drainage area include corn, safflower, grain, vineyards, tomatoes, and irrigated pasture. The Liberty Island Bridge site is approximately 2.5 to 3 miles southwest of the Toe Drain in Shag Slough. Like the Toe Drain, it is a tidally influenced site and is likely to contain a mixture of Toe Drain water along with water from other sub-drainages within the South Yolo Bypass and the Southwest Yolo Bypass. Due to the difficulty in accessing the Toe Drain for sampling, Shag Slough replaced the original Toe Drain sampling location in late 2005. This is a representative site for this subwatershed.

Ulatis Creek at Brown Road (UCBRD)

Ulatis Creek is a flood control project (FCP) that drains the majority of the central portion of Solano County. The Ulatis Creek FCP monitoring site is approximately 8.5 miles south of Dixon and 1.5 miles east of State Highway 113 on Brown Road. This site drains the Cache Slough area, as designated in the Yolo/Solano subwatershed map, and empties into Cache Slough. The major crops in this area include wheat, corn, pasture, tomatoes, alfalfa, Sudan grass, walnuts and almonds. This is a representative site for this subwatershed.

Z-Drain (ZDDIX)

The Z-Drain is a tributary draining into the Yolo Bypass south of Interstate 80. This site drains the SW Yolo Bypass drainage area. The major crops in this drainage include pasture, wheat, corn, tomatoes, and alfalfa. A secondary site (ZDDSS) is located immediately downstream of ZDDIX and is occasionally sampled for follow-up source evaluations. Several additional sites in the Z-Drain drainage were sampled for management plan source characterization in 2013.

Upper Feather River Watershed

Agriculture in this subwatershed is localized in mountain valleys that are suitable for grazing and growing alfalfa, hay and grain crops. Monitoring in this subwatershed is therefore focused on characterizing drainage from three valleys with considerable agricultural acreage. Monitoring in this subwatershed has been conducted in coordination with the Upper Feather River Watershed (UFRW) group and the California's Surface Water Ambient Monitoring Program (SWAMP).

Middle Fork Feather River above Grizzly Creek (MFFRG)

The Middle Fork above Grizzly Creek is below the last irrigated site in the Sierra Valley sub-watershed and has year-round flow in most years. This site replaced Middle Fork Feather River at County Rd A-23, which lacks year-round flows (often dry by mid-July) and has numerous non-agricultural uses, including recreation and filling water trucks. This is a representative site for this subwatershed.

Yolo Subwatershed

Cache Creek at Capay Diversion Dam (CCCPY)

The diversion dam on Cache Creek near Capay is the main diversion point for irrigation water in the 190,000 acre Yolo County Flood Control and Water Conservation District. The Diversion Dam is located 1.9 miles west of the town of Capay. During the summer irrigation season, the water at this site is released from storage approximately 50-60 miles upstream, from the Clear Lake and Indian Valley Reservoirs. There is no snow pack in this coastal watershed, therefore winter flows are very flashy (rising and falling quickly). Major crops in this drainage include tomatoes, alfalfa, corn, wheat, grapes, and orchards.

Tule Canal at North East corner of I-80 (TCHWY))

This site is near the USGS Gauging Station in the Upper Yolo Bypass and is located just South of Interstate 80. This site characterizes the East Side Canal in the bypass and serves as a major drain for croplands in the North Yolo Bypass drainage as indicated on the Yolo Solano Subwatershed map. This drainage area includes corn, wheat, tomatoes, safflower and pasture.

Willow Slough Bypass at Pole Line Road (WLSPL)

The Willow Slough is a large drainage including approximately 102,000 total acres. Irrigated acreage (excluding rice acreage) is approximately 66,000 acres. Predominant crops in the drainage are grain, pasture, corn, tomatoes, rice, almonds, and walnuts. This is a representative site for this subwatershed.

Sampling and Analytical Methods

The objective of data collection for this monitoring program is to produce data that represent, as closely as possible, *in situ* conditions of agricultural discharges and water bodies in the Central Valley. This objective will be achieved by using standard accepted methods to collect and analyze surface water and sediment samples. Assessing the monitoring program's ability to meet this objective will be accomplished by evaluating the resulting laboratory measurements in terms of detection limits, precision, accuracy, representativeness, comparability, and completeness, as described in the Coalition's QAPP (SVWQC 2010) and approved by the Water Board.

Surface water samples were collected for analysis of the constituents listed in **Table 2** as specified in the Coalition's Monitoring Plans. Surface water and sediment samples were collected for chemical analyses and toxicity testing. All samples were collected and analyzed using the methods specified in the QAPP; any deviations from these methods were explained.

SAMPLE COLLECTION METHODS

All samples were collected in a manner appropriate for the specific analytical methods used and to ensure that water column samples were representative of the flow in the channel cross-section. Water quality samples were collected using clean techniques that minimize sample contamination. Samples were cross-sectional composite samples or mid-stream, mid-depth grab samples, depending on sampling site and event characteristics. When grab sample collection methods were used, samples were taken at approximately mid-stream and mid-depth at the location of greatest flow (where feasible). Where appropriate, water samples were collected using a standard multi-vertical depth integrating method. Abbreviated sampling methods (i.e., weighted-bottle or dip sample) may be used for collecting representative water samples.

Sediment sampling was conducted at sampling sites on an approximately 50-meter reach of the waterbody near the water sampling location. If USGS methods were applicable, sediment sub-samples were collected from five to ten wadeable depositional zones. Depositional zones include areas on the inside bend of a stream or areas downstream from obstacles such as boulders, islands, sand bars, or simply shallow waters near the shore. In low-energy, low-gradient waterbodies, composite samples may be collected from the bottom of the channel using appropriate equipment, as specified in the Coalition's QAPP.

Details of the standard operating procedures (SOPs) for collection of surface water and sediment samples are provided in the Coalition's QAPP. The sites and number of samples for 2013 Coalition Monitoring are summarized in **Table 4**. The Coalition's monitoring strategy for 2013 was designed to characterize high priority drainages that are representative of a subwatershed's dominant agricultural crops and practices. This sampling approach was initially designed to comply with the requirements in *Order No. R5-2008-0005* and with the later adopted *ILRP* MRP (*Monitoring and Reporting Program Order No. R5-2009-0875*). The elements that are key to achieving the Coalition's goals and satisfying the intent of the requirements of the R5-2009-0875 MRP are (1) the Coalition's prioritization process for selecting representative drainages and monitoring sites, and (2) identification of monitoring parameters and schedules appropriate for these representative drainages. This approach is documented in the Coalition's 2009 Monitoring and Reporting Program Plan, as required by *Order No. R5-2008-0005*.

Table 4. 2013 Coalition Monitoring Year: Planned Samples, October 2012 – September 2013

Subwatershed and Site	Water Column Sample Events	Sediment Sample Events	pH, Conductivity, DO, Temperature, Flow	Turbidity, TSS, TOC	Nutrients	Pathogen Indicators: *E. Coli*	Arsenic	Boron	Lead and Hardness	Organophosphate Pesticides	Diuron	Legacy OCLs	*Ceriodaphnia*, 96-h acute	*Pimephales*, 96-hour acute	*Selenastrum*, 96-h short-term chronic	*Hyalella*, 10-day short-term chronic	Grain Size in Sediments	Pyrethroids, Chlorpyrifos, TOC in Sediments
Butte-Yuba-Sutter																		
Butte Slough at Pass Road	5	0	4	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
Gilsizer Sl. at G. Washington Rd	7	0	4	0	0	0	0	0	0	6	0	2	0	0	0	0	0	0
Lower Honcut Creek at Hwy 70	12	0	12	12	12	12	0	0	0	5	0	0	0	0	0	0	0	0
Lower Snake R. at Nuestro Rd	12	0	12	12	12	12	0	0	0	7	0	0	5	0	0	0	0	0
Pine Creek at Nord Gianella Rd	12	0	12	12	12	12	0	0	0	5	0	0	0	0	0	0	0	0
Sacramento Slough bridge near Karnak	12	0	12	12	12	12	0	0	0	5	0	0	0	0	0	0	0	0
Colusa-Glenn																		
Colusa Drain above KL	10	0	10	10	10	10	0	0	0	7	0	0	0	0	0	0	0	0
Freshwater Creek at Gibson Rd	10	0	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0
Lurline Creek at 99W	4	0	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Rough and Ready Pumping Plant (RD 108)	6	0	4	0	0	0	0	0	0	6	0	2	0	0	0	0	0	0
Stone Corral Creek near Maxwell Road	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stony Creek on Hwy 45 near Rd 24	4	2	4	0	0	0	0	0	0	2	0	0	2	0	0	2	2	2
Walker Creek at 99W and CR33	10	0	10	10	10	10	0	0	0	4	0	0	4	0	0	0	0	0
El Dorado																		
Coon Hollow Creek	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
North Canyon Creek	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Lake County																		
McGaugh Slough	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Middle Creek u/s Hwy 20	7	0	7	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0
Napa Co/PCWG																		
Pope Cr u/s from L. Berryessa	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NECWA																		
Fall R. at Fall R. Ranch Bridge	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pit River at Canby Bridge	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pit River at Pittville	2	0	2	2	2	2	0	0	2	0	0	0	0	0	0	0	0	0

Subwatershed and Site	Water Column Sample Events	Sediment Sample Events	pH, Conductivity, DO, Temperature, Flow	Turbidity, TSS, TOC	Nutrients	Pathogen Indicators: *E. Coli*	Arsenic	Boron	Lead and Hardness	Organophosphate Pesticides	Diuron	Legacy OCLs	*Ceriodaphnia*, 96-h acute	*Pimephales*, 96-hour acute	*Selenastrum*, 96-h short-term chronic	*Hyalella*, 10-day short-term chronic	Grain Size in Sediments	Pyrethroids, Chlorpyrifos, TOC in Sediments
PNSSNS																		
Coon Creek at Brewer Rd	8	0	8	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0
Coon Creek at Striplin Rd	5	0	5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
Sacramento-Amador																		
Cosumnes River at Twin Cities Rd	12	2	12	12	12	12	0	0	0	4	0	0	0	0	0	2	2	2
Dry Creek at Alta Mesa Road	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Island Drain near Leary Road	12	0	12	12	12	12	6	0	0	5	0	2	0	0	0	0	0	0
Laguna Creek at Alta Mesa Rd	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shasta-Tehama																		
Anderson Creek at Ash Creek Road	12	0	12	12	12	12	0	0	0	0	0	0	0	0	0	0	0	0
Coyote Creek at Tyler Road	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solano/Dixon RCD																		
Shag Sl. at Liberty Island Bridge	10	0	10	10	10	10	0	0	0	7	0	0	0	0	0	0	0	0
Ulatis Creek at Brown Road	11	0	11	11	11	11	0	0	0	6	3	0	0	0	3	0	0	0
Z Drain	4	2	4	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Yolo Co Farm Bureau																		
Cache Cr. at Diversion Dam	4	0	4	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0
Tule Canal at I-80	4	0	4	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Willow Sl. Bypass at Pole Line	10	0	10	10	10	10	0	4	0	6	3	2	7	0	3	0	0	0
UFRWG																		
Middle Fork Feather River above Grizzly Ck	2	0	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Totals	**242**	**6**	**225**	**164**	**171**	**164**	**6**	**8**	**2**	**84**	**6**	**14**	**22**	**0**	**11**	**6**	**6**	**6**

ANALYTICAL METHODS

Water chemistry samples were analyzed for filtered and unfiltered fractions of the samples. Pesticide analyses were conducted only on unfiltered (whole) samples. Laboratories analyzing samples for this program have demonstrated the ability to meet the minimum performance requirements for each analytical method, including the ability to meet the project-specified quantitation limits (QL), the ability to generate acceptable precision and recoveries, and other analytical and quality control parameters documented in the Coalition's QAPP. Analytical methods used for chemical analyses follow accepted standard methods or approved modifications of these methods, and all procedures for analyses are documented in the QAPP or are available for review and approval at each laboratory.

Toxicity Testing and Toxicity Identification Evaluations

Water quality samples were analyzed for toxicity to *Ceriodaphnia dubia* and *Selenastrum capricornutum*. No samples were analzed for *Pimephales promelas* (fathead minnow) for 2013 monitoring. Sediment samples were analyzed for toxicity to *Hyalella azteca*. Toxicity tests were conducted using standard USEPA methods for these species.

- Determination of acute toxicity to *Ceriodaphnia* was performed as described in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition* (USEPA 2002a). Toxicity tests with *Ceriodaphnia* were conducted as 96-hour static renewal tests, with renewal 48 hours after test initiation.
- Determination of toxicity to *Selenastrum* was performed using the non-EDTA procedure described in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition* (USEPA 2002b). Toxicity tests with *Selenastrum* were conducted as a 96-hour static non-renewal test.

For all initial screening toxicity tests at each site, 100% ambient water and a control were used for the acute water column tests. If 100% mortality to a test species was observed any time after the initiation of the initial screening toxicity test, a multiple dilution test using a minimum of five sample dilutions was conducted with the initial water sample to estimate the magnitude of toxicity.

Procedures in the Coalition's QAPP state that if any measurement endpoint from any of the three aquatic toxicity tests exhibits a statistically significant reduction in survival (*Ceriodaphnia*) or cell density (*Selenastrum*) of greater than or equal to 50% compared to the control, Toxicity Identification Evaluation (TIE) procedures will be initiated using the most sensitive species to investigate the cause of toxicity. The 50% mortality threshold is consistent with the approach recommended in guidance published by USEPA for conducting TIEs (USEPA 1996b), which recommends a minimum threshold of 50% mortality because the probability of completing a successful TIE decreases rapidly for samples with less than this level of toxicity. For samples that met these trigger criteria, Phase 1 TIEs to determine the general class of constituent (*e.g.*, metal, non-polar organics) causing toxicity or pesticide-focused TIEs were conducted. TIE methods generally adhere to the documented USEPA procedures referenced in the QAPP. TIE procedures were initiated as soon as possible after toxicity is observed to reduce the potential for loss of toxicity due to extended sample storage. Procedures for initiating and conducting TIEs are documented in the QAPP.

Detection and Quantitation Limits

The Method Detection Limit (MDL) is the minimum analyte concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero. The Quantitation Limit (QL) represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and confidence in both identification and quantitation. For this program, QLs were established based on the verifiable levels and general measurement capabilities demonstrated by labs for each method. Note that samples required to be diluted for analysis (or corrected for percent moisture for sediment samples) may have sample-specific QLs that exceed the established QLs. This is unavoidable in some cases.

Project Quantitation Limits

Laboratories generally establish QLs that are reported with the analytical results—these may be called *reporting limits*, *detection limits*, *reporting detection limits*, or several other terms by different laboratories. In most cases, these laboratory limits are less than or equal to the project QLs listed in **Table 5** and **Table 6**. Wherever possible, project QLs are lower than the proposed or existing relevant numeric water quality objectives or toxicity thresholds, as required by the *ILRP*.

All analytical results between the MDL and QL are reported as numerical values and qualified as estimates (Detected, Not Quantified (DNQ), or sometimes, "J-values").

Table 5. Laboratory Method Detection Limit (MDL) and Quantitation Limit (QL) Data Quality Objectives for Analyses of Surface Water

Method	Analyte	Fraction	Units	MDL	QL	Note
Physical and Conventional Parameters						
EPA 130.2	Hardness, total as $CaCO_3$	Unfiltered	mg/L	3	5	
EPA 180.1; SM2130B	Turbidity	Unfiltered	NTU	0.1	1.0	
EPA 160.2; SM2540D	Total Suspended Solids (TSS)	Particulate	mg/L	2	3	
EPA 415.1; SM5310C	Organic Carbon, Total (TOC)	Unfiltered	mg/L	0.1	0.5	
Pathogen Indicators						
SM 9223	*E. Coli* bacteria	NA	MPN/100mL	2	2	
Organophosphorus Pesticides						
EPA 625(m)	Chlorpyrifos	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Demeton-S	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Diazinon	Unfiltered	µg/L	0.002	0.004	
EPA 625(m)	Dichlorvos	Unfiltered	µg/L	0.003	0.006	
EPA 625(m)	Disulfoton	Unfiltered	µg/L	0.003	0.006	
EPA 625(m)	Ethoprop	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Fenchlorphos	Unfiltered	µg/L	0.002	0.004	
EPA 625(m)	Fensulfothion	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Fenthion	Unfiltered	µg/L	0.002	0.004	
EPA 625(m)	Malathion	Unfiltered	µg/L	0.003	0.006	
EPA 625(m)	Mevinphos	Unfiltered	µg/L	0.008	0.0016	(a)
EPA 625(m)	Parathion, Methyl	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Phorate	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Sulprofos	Unfiltered	µg/L	0.001	0.002	
EPA 625(m)	Tetrachlorvinphos	Unfiltered	µg/L	0.002	0.004	
EPA 625(m)	Tokuthion	Unfiltered	µg/L	0.003	0.006	
EPA 625(m)	Trichloronate	Unfiltered	µg/L	0.001	0.002	
Organochlorine Pesticides						
EPA 625(m)	4,4'-DDT (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	4,4'-DDE (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	4,4'-DDD (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Aldrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Chlordane	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Dacthal	Unfiltered	µg/L	0.008	0.05	
EPA 625(m)	Dicofol	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Dieldrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan I	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan II	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan sulfate	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin Aldehyde	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin Ketone	Unfiltered	µg/L	0.001	0.005	

Method	Analyte	Fraction	Units	MDL	QL	Note
EPA 625(m)	HCH	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Heptachlor	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Heptachlor epoxide	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Hexachlorobenzene	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Methoxychlor	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Mirex	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Nonachlor	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Oxychlordane	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Perthane	Unfiltered	µg/L	0.001	0.005	
Carbamate and Urea Pesticides						
EPA 8321	Aldicarb	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Aminocarb	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Barban	Unfiltered	µg/L	1.75	3.5	
EPA 8321	Benomyl/Carbendazim	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Carbaryl	Unfiltered	µg/L	0.05	0.07	
EPA 8321	Carbofuran	Unfiltered	µg/L	0.05	0.07	
EPA 8321	Chlorpropham	Unfiltered	µg/L	0.4	0.8	
EPA 8321	Methiocarb	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Methomyl	Unfiltered	µg/L	0.05	0.07	
EPA 8321	Mexacarbate	Unfiltered	µg/L	0.4	0.8	
EPA 8321	Oxamyl	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Propham	Unfiltered	µg/L	1.75	3.5	
EPA 8321	Propoxur	Unfiltered	µg/L	0.2	0.4	
Pyrethroid Pesticides						
GCMS-NCI	Allethrin	Unfiltered	µg/L	0.0001	0.0015	
GCMS-NCI	Bifenthrin	Unfiltered	µg/L	0.0001	0.0015	
GCMS-NCI	Cyfluthrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Cypermethrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Deltamethrin/Tralomethrin	Unfiltered	µg/L	0.0002	0.003	
GCMS-NCI	Esfenvalerate/Fenvalerate	Unfiltered	µg/L	0.0002	0.003	
GCMS-NCI	Fenpropathrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Fluvalinate	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Lambda-Cyhalothrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Permethrin	Unfiltered	µg/L	0.002	0.015	
GCMS-NCI	Tetramethrin	Unfiltered	µg/L	0.0002	0.0015	
Other Herbicides						
EPA 8321	Bromacil	Unfiltered	µg/L	0.2	0.4	(a)
EPA 8321	Chloroxuron	Unfiltered	µg/L	0.2	0.4	
EPA 8081A	Dacthal	Unfiltered	µg/L	0.008	0.05	
EPA 8321	Diuron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Fenuron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Fluometuron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Linuron	Unfiltered	µg/L	0.2	0.4	

Method	Analyte	Fraction	Units	MDL	QL	Note
EPA 625	Merphos	Unfiltered	µg/L	0.001	0.002	(a)
EPA 8321	Monuron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Neburon	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Oryzalin	Unfiltered	µg/L	0.2	0.4	
EPA 8081A	Oxyfluorfen	Unfiltered	µg/L	0.008	0.05	
EPA 8321	Propachlor	Unfiltered	µg/L	0.2	0.4	(a)
EPA 8321	Siduron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Tebuthiuron	Unfiltered	µg/L	0.2	0.4	
Benzophenyls						
EPA 8321	Diflubenzuron	Unfiltered	µg/L	0.2	0.4	
Trace Elements						
EPA 200.8	Arsenic	Unfiltered	µg/L	0.08	0.5	
EPA 2008	Boron	Unfiltered	µg/L	1	10	
EPA 200.8	Copper	Filtered, Unfiltered	µg/L	0.2	0.5	
EPA 200.8	Lead	Filtered, Unfiltered	µg/L	0.02	0.25	
Nutrients						
EPA 353.2	Nitrate + Nitrite as N	Unfiltered	mg/L	0.02	0.05	
EPA 365.2; SM4500-P E	Phosphorus, Total	Unfiltered	mg/L	0.02	0.05	

Note:
(a) No QL target has been established for this analyte.

Table 6. Laboratory Method Detection Limit (MDL) and Quantitation Limit (QL) Data Quality Objectives for Analyses of Sediments for the Coalition Monitoring and Reporting Program Plan

Method	Analyte	Fraction	Units	MDL	QL
Physical and Conventional Parameters					
SM 2560D	Grain Size Analysis	NA	% fraction	NA	1
EPA 160.3	Solids (TS)	Total	%	NA	0.1
EPA 9060	Organic Carbon, Total (TOC)	Total	mg/kg d.w.	50	200
Pyrethroids					
EPA 8270C(m)	Allethrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Bifenthrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Cyfluthrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Cypermethrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Deltamethrin/Tralomethrin	Total	ng/g d.w.	0.15	1
EPA 8270C(m)	Esfenvalerate/Fenvalerate	Total	ng/g d.w.	0.15	1
EPA 8270C(m)	Fenpropathrin	Total	ng/g d.w.	0.15	1
EPA 8270C(m)	Fluvalinate	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Lambda-Cyhalothrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Permethrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Tetramethrin	Total	ng/g d.w.	0.1	1
Organochlorine Pesticides					
EPA 8270C(m)	Chlorpyrifos	Total	ng/g d.w.	0.1	3
EPA 8270C(m)	Diazinon	Total	ng/g d.w.	5	40

Monitoring Results

The following sections summarize the monitoring conducted by the Coalition and its Subwatershed partners in 2013 (October 2012 through September 2013).

SUMMARY OF SAMPLE EVENTS CONDUCTED

This report presents monitoring results from twelve Coalition sampling events (Events 80-91), as well as data for events conducted by coordinating Subwatershed monitoring programs between October 2012 and September 2013. Samples collected for all of these events are listed in **Table 7**.

The Coalition and Subwatershed monitoring events were conducted throughout the year. Analyses included water chemistry and toxicity, with pesticides monitored during months when higher use is typical. Sediment toxicity testing and/or chemistry analyses were also conducted by the Coalition at eight sites as part of the assessment and source evaluation efforts for the Management Plan requirement for sediment toxicity. The sites and parameters for all events were monitored in accordance with the Coalition's current MRP (*Order No. R5-2009-0875*) and QAPP.

The field logs for all Coalition and Subwatershed samples collected for the October 2012 through September 2013 events, as well as associated site photographs, are provided in **Appendix A**.[3]

[3] The Upper Feather River Watershed conducted events in June and July 2013. The field data, field logs, and photographs are not available for these events because the field logs were misplaced during the subwatershed coordinator's office move. Laboratory analyses were completed for these events, and documentation is provided in **Appendix B,** Lab Reports and Chains-of-Custody. These results are also included in **Appendix C,** Tabulated Monitoring Results.

Table 7. Sampling for the 2013 Coalition Monitoring Year

		Sample Count		80	81	82	83	84	85	86	87	88	89	89	91
Subwatershed (Agency)	**Site ID**	**Planned**	**Collected**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
ButteYubaSutter (SVWQC)	BTTSL	7	7	W	W	W	W	-	-	W	-	W	-	W	-
	GILSL	9	9	W	-	-	W	W	W	W	W	W	W	W	-
	LHNCT	12	12	W	W	W	W	W	W	W	W	W	W	W	W
	LSNKR	12	12	W	W	W	W	W	W	W	W	W	W	W	W
	PNCGR	12	8	W	W	W	W	W	W	W	W	D	D	D	D
	SSKNK	12	12	W	W	W	W	W	W	W	W	W	W	W	W
ColusaGlenn (SVWQC)	COLDR	10	10	-	W	W	W	W	W	W	W	W	W	W	-
	FRSHC	10	10	-	W	W	W	W	W	W	W	W	W	W	-
	LRLNC	4	4	-	-	-	-	W	-	W	-	W	-	W	-
	RARPP	6	6	-	-	-	-	W	W	W	W	-	W	W	-
	SCCMR	4	4	-	-	-	-	W	-	W	-	W	-	W	-
	STYHY	5	3	-	-	-	-	W	W	W	-	D	-	D	-
	WLKCH	11	11	-	W	W	W	W	W	W	W	W	W	W	W
ElDorado (SVWQC)	COONH	2	2	-	-	-	-	-	-	-	W	-	-	W	-
	NRTCN	2	2	-	-	-	-	-	-	-	W	-	-	W	-
Lake (SVWQC)	MDLCR	7	7	-	-	-	W	W	W	W	W	W	-	W	-
	MGSLU	7	6	-	-	-	W	W	W	W	W	W	-	D	-
PitRiver (NECWA)	FRRRB	2	2	-	C	-	-	C	-	-	C	W	W	C	-
	PRCAN	2	2	-	C	-	-	C	-	-	C	W	W	C	-
	PRPIT	2	2	-	C	-	-	C	-	-	C	W	W	C	-
PlacerNevadaSSutter NSacramento (PNSSNS)	CCBRW	12	12	W	W	W	W	W	W	W	W	W	W	W	W
	CCSTR	5	5	-	-	-	-	-	-	-	W	W	W	W	W
SacramentoAmador (SVWQC)	CRTWN	12	6	D	D	W	W	W	W	W, S	W	D	D	D	D
	DCGLT	6	5	D	-	-	-	W	-	W	-	W	-	W	W
	GIDLR	11	11	W	W	W	W	W	W	W	W	W	W	W	-
	LAGAM	5	5	W	-	-	-	W	-	W	-	W	-	W	-
ShastaTehama (SVWQC)	ACACR	12	12	W	W	W	W	W	W	W	W	W	W	W	W
	COYTR	5	5	W	-	-	-	W	-	W	-	W	-	W	-
Solano (SVWQC)	SSLIB	12	12	W	W	W	W	W	W	W	W	W	W	W	W
	UCBRD	11	11	-	W	W	W	W	W	W	W	W	W	W	W
	ZDDIX	4	4	-	-	-	-	W	-	S	-	W	-	S	-
	ZDFIV	1	1	-	-	-	-	-	-	-	-	-	-	S	-

Subwatershed (Agency)	Site ID	Sample Count Planned	Sample Count Collected	80 OCT	81 NOV	82 DEC	83 JAN	84 FEB	85 MAR	86 APR	87 MAY	88 JUN	89 JUL	89 AUG	91 SEP
Solano (SVWQC) (cont.)	ZDFOR	1	1	-	-	-	-	-	-	-	-	-	-	S	-
	ZDINF	2	2	-	-	-	-	-	-	S	-	-	-	S	-
	ZDTHR	1	1	-	-	-	-	-	-	-	-	-	-	S	-
	ZDTWO	1	1	-	-	-	-	-	-	-	-	-	-	S	-
Yolo (SVWQC)	CCCPY	6	6	-	-	-	-	W	W	W	-	W	W	W	-
	TCHWY	4	4	-	-	-	-	W	-	W	-	W	-	W	-
	WLSPL	10	10	-	W	W	W	W	W	W	W	W	W	W	-
UpperFeatherRiver (UFRW)	MFFGR	2	2	-	C	-	-	C	-	-	C	W	W	C	-
	Totals	**261**	**247**												

Notes:

NECWA = Northeastern California Watershed Association
PCWG = Putah Creek Watershed Group
PNSSNS = PlacerNevadaSSutterNSacramento
SVWQC = Sacramento Valley Water Quality Coalition
UFRW = Upper Feather River Watershed Group

W = Water sample collected
S = Sediment sample collected
D = Site was dry; no samples collected.
C = Site sampled by coordinating monitoring program (SWAMP)
"-" = no samples planned

SAMPLE CUSTODY

All samples that were collected for the Coalition monitoring effort met the requirements for sample custody. Sample custody must be traceable from the time of sample collection until results are reported. A sample is considered under custody if:

- it is in actual possession;
- it is in view after in physical possession; and
- it is placed in a secure area (i.e., accessible by or under the scrutiny of authorized personnel only after in possession).

The chain-of-custody forms (COCs) for all samples collected by Coalition contractors for the monitoring events conducted from October 2012 through September 2013 are included with the related lab reports and are provided in **Appendix B**. All COCs for *ILRP* monitoring conducted by Coalition partners during this same period are also provided in **Appendix B** with their associated lab reports.

QUALITY ASSURANCE RESULTS

The Data Quality Objectives (DQOs) used to evaluate the results of the Coalition monitoring effort are detailed in the Coalition's QAPP. These DQOs are the detailed quality control specifications for precision, accuracy, representativeness, comparability, and completeness. These DQOs are used as comparison criteria during data quality review to determine if the minimum requirements have been met and the data may be used as planned.[4]

Results of Field and Laboratory QA/QC Analyses

Quality Assurance/Quality Control (QA/QC) data are summarized in **Table 8** through **Table 16** and discussed below. All program QA/QC results are included with the lab reports in **Appendix B** of this document, and any qualifications of the data are presented with the tabulated monitoring data. All program monitoring results discussed are tabulated in **Appendix C**.

Contamination Assessments

Absence of sample contamination from sampling and analytical procedures was assessed by analysis of field blank and method blank samples.

Field Blanks

Field Blanks were collected and analyzed for all analyses (**Table 8**). The data quality objective for field blanks is no detectible concentrations of the analyte of interest above the QL. With the exceptions discussed below, analytes of interest were generally not detected in field blanks:

[4] During the 2013 monitoring year, the data qualification process was modified to accommodate the California Environmental Data Exchange Network (CEDEN) submittal requirements for the *ILRP* data. The discussion of quality assurance results presented herein reflects those changes and may not be directly comparable with those in past AMRs.

- Total phosphorus was detected above the QL in one field blank. One environmental result was affected.
- Total organic carbon was detected above the QL in five field blank analyses. Five environmental results were affected.
- Turbidity was detected above the QL in three field blank analyses. No environmental results were affected.

Method Blanks

Method Blanks were analyzed for all parameters (**Table 9**). The data quality objective for method blanks is no detectible concentrations of the analyte of interest above the QL. With the exceptions discussed below, all method blanks met this data quality objective:

- Total organic carbon was detected above the QL in one method blank analysis. No environmental results were affected.

Accuracy Assessments

Analytical accuracy was assessed based on compliance with analytical hold times, achievement of target analytical reporting limits, and analysis of laboratory control spikes, surrogate spikes, matrix spike samples.

Hold Times

Results were evaluated for compliance with required preparation and analytical hold times. With the exceptions discussed below, analyses met the target DQOs:

- 4 of 154 *E. coli* results were analyzed slightly outside of their 24-hour hold times. This was considered unlikely to affect the outcome of assessment of exceedances.

Method Detection Limits and Quantitation Limits

Target Method Detection Limits (MDL) and Quantitation Limits (QL) were assessed for all parameters. With the exceptions discussed below, analyses met the target DQOs:

- 6 of 160 total Nitrate+Nitrite as N results had MDLs and QLs greater than the project DQO due to dilutions required to analyze the samples. Assessment of exceedances was not affected.
- 3 of 160 total phosphorus as P results had QLs greater than the project DQO due to dilutions required to analyze the samples. Assessment of exceedances was not affected.
- 8 of 8 boron results had MDLs and QLs greater than the project DQO due to dilutions required to analyze the samples. Assessment of exceedances was not affected.
- 51 of 144 turbidity results had MDLs greater than the project DQO due to dilutions required to analyze the samples. Assessment of exceedances was not affected.

Laboratory Control Spikes

Laboratory Control Spike (LCS) recoveries were analyzed for TSS, TOC, hardness, turbidity, trace metals, nutrients, and pesticides (**Table 10**). The data quality objective for an LCS is 80-

120% recovery of the analyte of interest for most analytes. The DQOs for LCS recoveries of pesticides vary by analyte and surrogate and are based on the standard deviation of actual recoveries for the method. In accordance with SWAMP data reporting protocols, the data were not specifically qualified as being high- or low-biased, but these terms are used below for the purpose of discussion. With the exceptions discussed below, all analyses met their specific data quality objective:

- The results of two LCS recovery analyses for carbamate pesticides, benzophenyls and other herbicides were outside the acceptable recovery DQO. The recoveries were high biased, but no environmental results were affected.
- The results of six LCS recovery analyses for organochlorine pesticides were outside the acceptable recovery DQO. These six recoveries were high biased, but no environmental results were affected.
- The results of six LCS recovery analyses for organophosphate pesticides were outside the acceptable recovery DQO. Two recoveries were high biased, and four recoveries were low biased. A total of 14 environmental results were potentially affected.
- The results of six LCS recovery analyses for pyrethroid pesticides were outside the acceptable recovery DQO. These six recoveries were high biased, but no environmental results were affected.

Surrogate Spike Recoveries

Surrogate recoveries were analyzed for pesticide analyses (**Table 11**). The DQOs for surrogate recoveries of pesticides vary by surrogate and are based on the standard deviation of actual recoveries for the method. In accordance with SWAMP data reporting protocols, the data were not specifically qualified as being high- or low-biased, but these terms are used below for the purpose of discussion. With the exceptions discussed below, all analyses met their specific data quality objective:

- The results of 27 surrogate recovery analyses for pesticides by EPA 625 were outside the acceptable recovery DQO, and they were all considered low-biased. Four different surrogates were included with EPA 625 analyses. No samples had more than two of the surrogates exceed the recovery objectives, and results for the target pesticides in environmental samples were not significantly affected.

Matrix Spikes

Matrix Spikes and Matrix Spike Duplicates were analyzed for trace metals, nutrients, TOC and pesticides (**Table 12**). The data quality objective for matrix spikes is 80-120% recovery of most analytes of interest. The data quality objective for matrix spike recoveries of pesticides varies for each analyte or surrogate and is based on the standard deviation of actual recoveries for the method. The data were not specifically qualified as being high- or low-biased, but these terms are used below for the purpose of discussion. With the exceptions discussed below, all analyses met their specific DQOs:

- Matrix Spike recoveries for five Nitrate+Nitrite as N analyses were outside the DQO. Two associated environmental results were considered to be high-biased, and three were considered to be low-biased. Five environmental results were affected. Assessment of exceedances was not affected.

- Matrix Spike recoveries for six organochlorine pesticide analysis were outside the DQO. The six results were considered to be high-biased. No environmental results were affected. Assessment of exceedances was not affected.
- Matrix Spike recoveries for 67 organophosphate pesticide analyses were outside the DQO. A total of 39 results were high-biased, and no environmental results were affected. A total of 28 results were low-biased, and 16 associated environmental results were potentially affected. Assessment of exceedances was not affected.
- Matrix Spike recoveries for four pyrethroid pesticide analysis were outside the DQOs. One environmental result associated with high recoveries was below detection and therefore was not affected. The other three recoveries were low-biased, and the associated environmental results were potentially affected. Assessment of exceedances was not affected.
- Matrix Spike recoveries for two pyrethroid pesticide in sediment analysis were outside the DQOs. One environmental result associated with low recoveries was affected. Assessment of exceedances was not affected.
- Matrix Spike recoveries for one total organic carbon analysis was outside the DQO and was considered to be low-biased. The associated environmental result was potentially affected. Assessment of exceedances was not affected.

Precision

Sampling and analytical precision was assessed by analysis of duplicate field samples and duplicate analysis of environmental samples, laboratory control spikes, and matrix spike samples.

Field Duplicates

Field Duplicate samples were collected and analyzed for all parameters (**Table 13**). The data quality objective for a field duplicate analysis is a Relative Percent Difference (RPD) not exceeding 25% or a difference between the environmental sample and the field duplicate that is less than the QL. With the exceptions discussed below, all field duplicates met this data quality objective:

- Field duplicate RPD results exceeded the DQO for one Nitrate + Nitrite as N analysis. One environmental result was affected. Assessment of exceedances was not affected.
- Field duplicate RPD results exceeded the DQO for two organophosphate pesticide analyses. Both environmental results were affected. Assessment of exceedances was not affected.
- Field duplicate RPD results exceeded the DQO for two total organic carbon analyses. Three environmental results were affected. Assessment of exceedances was not affected.
- Field duplicate RPD results exceeded the DQO for three total suspended solids analyses. Three environmental results were affected. Assessment of exceedances was not affected.

- Field duplicate RPD results exceeded the DQO for two turbidity tests. Two environmental results were affected. Assessment of exceedances was not affected.

Laboratory Duplicates

Laboratory Duplicates were analyzed for Nitrate + Nitrite as N, TOC, TSS, turbidity, and pesticides (**Table 14**). The data quality objective for laboratory duplicates is a Relative Percent difference (RPD) not exceeding 25%. All laboratory replicates met this data quality objective.

Laboratory Control Spike Duplicates

Laboratory Control Spike and Laboratory Control Spike Duplicate Recoveries and their associated Relative Percent Differences (RPDs) were analyzed for trace metals, TSS, turbidity, nutrients, and pesticides (**Table 15**). The data quality objective for matrix spike duplicates is a RPD not exceeding 25%. With the exceptions discussed below, all analyses met these DQOs:

- Laboratory control spike duplicate results exceeded the DQO for one organochlorine pesticide RPD result. Five results were affected, but they were all non-detect. Assessment of exceedances was not affected.
- Laboratory control spike duplicate results exceeded the DQO for 19 organophosphate pesticide RPD results. A total of 134 results were affected, but they were all non-detect. Assessment of exceedances was not affected.
- Laboratory control spike duplicate results exceeded the DQO for one pyrethroid pesticide in sediment RPD results. One environmental result was affected. Assessment of exceedances was not affected.

Matrix Spike Duplicates

Matrix Spike and Matrix Spike Duplicate Recoveries and their associated Relative Percent Differences (RPDs) were analyzed for trace metals, nutrients, TOC and pesticides (**Table 16**). The data quality objective for matrix spike duplicates is an RPD not exceeding 25%. With the exceptions discussed below, all analyses met these DQOs:

- Matrix spike duplicate results exceeded the DQO for one RPD result for carbamate pesticides, benzophenyls, and other herbicides. One environmental result was affected on this basis, but it was non-detect. Assessment of exceedances was not affected.
- Matrix spike duplicate results exceeded the DQO for 23 organophosphate pesticide RPD results. A total of 23 results were affected on this basis, but they were all non-detect. Assessment of exceedances was not affected.
- Matrix spike duplicate results exceeded the DQO for three pyrethroid pesticide RPD results. Three environmental results were affected on this basis, but all three were non-detect. Assessment of exceedances was not affected.

Summary of Precision and Accuracy

Based on the QA/QC data for the 2013 Coalition Monitoring discussed above, the precision and accuracy of the majority of monitoring results met the DQOs adopted for the monitoring program, and there were no systematic sampling or analytical problems. These data are adequate for the purposes of the Coalition's monitoring program.

Of the 219 total qualified environmental data points, 173 results were associated with elevated variability in lab or field replicate analyses, 40 results were associated with *high-biased* or *low-biased* recoveries outside of DQOs, and six results were potentially affected by contamination. Of the results associated with elevated recoveries in QA samples, none were detected above the QL, and none of the data potentially affected by contamination exceeded a water quality standard.

All QC sample types had success rates in excess of 95%. Of the 5,038 environmental analytical results generated from October 2012 through September 2013, 4,816 results required no qualification, resulting in 96% of analytical results having no restrictions on their use.

Completeness

The objectives for completeness are intended to apply to the monitoring program as a whole. As summarized in **Table 7**, 247 of the 261 initial water column and toxicity sample events planned by the Coalition and coordinating programs were conducted, for an overall sample event success rate of approximately 95%. Planned sample collection at five locations did not occur because the monitoring sites were dry or inaccessible. Planned sampling that was not completed successfully is summarized below:

- Samples for six events planned for Cosumnes River (CRTWN) were not collected because the sampling site was dry.
- Samples for one event planned for Dry Creek at Alta Mesa Rd (DCGLT) was not collected because the sampling site was dry.
- Samples for one event planned for McGaugh Slough (MGSLU) were not collected because the sampling site was dry.
- Samples for four events planned for Pine Creek (PNCGR) were not collected because the sampling site was dry.
- Samples for two events planned for Stony Creek (STYHY) were not collected because the sampling site was dry.

Sample containers are occasionally lost or broken in transit due to shipping and handling factors beyond the Coalition's control. Broken containers are relevant to program completeness if the incident prevents the Coalition from completing the required sample analyses or if they are analyzed and may potentially affect analytical quality. In general, broken bottles do not impact completeness of analyses. In most cases, sufficient remaining sample volume is available to complete the planned environmental and quality assurance analyses. If program completeness was affected, the issue of broken bottles is discussed in the AMR. The protocol that is followed if a broken bottle is reported is to contact the sampling crew and let them know of the issue so that they may review their packing and shipping procedures. Any known shipping and handling deficiencies are also noted. If samples lost or broken in shipping affect overall completeness for specific analyses at a specific location and the analyses are relevant to synoptically collected toxicity samples, additional sample volume is preferentially aliquoted from the sample collected for toxicity. If additional sample volume from another appropriately collected and preserved sample container is not available, the analyses are rescheduled for future events to ensure program completeness objectives are met. Sample containers that were received broken are summarized below:

- Four of 10 bottles (collected in January 2013 for Event 83) to be analyzed for OP pesticides was received broken at PHYSIS. There was sufficient sample remaining to complete the scheduled environmental and QA analyses.
- One of 24 bottles (collected in March 2013 for Event 85) to be analyzed for OP pesticides was received broken at PHYSIS. There was sufficient sample remaining to complete the scheduled environmental and QA analyses.
- Three of 20 bottles (collected in June 2013 for Event 88) to be analyzed for OP pesticides was received broken at PHYSIS. There was sufficient sample remaining to complete the scheduled environmental analyses, but there was not enough volume for MS/MSD.
- One of four bottles (collected in July 2013 for Event 89) to be analyzed for OP pesticides was received broken at PHYSIS. There was sufficient sample remaining to complete the scheduled environmental and QA analyses.

In addition, sample containers occasionally arrive at the analytical laboratory at a temperature that is above the recommended maximum for Coalition samples. This may occur when samples do not have sufficient time to cool down to the target temperature or when extended shipping times and higher external temperatures cause sample temperatures to increase above 6˚C. This has proven to be a challenge for toxicity samples because the sample volumes are large (1 gallon containers), require additional shipping protection (bubble wrap), and take longer to cool, particularly when ambient water temperatures exceed 25˚C. However, because toxicity tests are typically conducted at ~20˚C over four days, sample temperatures slightly elevated above 6˚C on receipt are not expected to have a significant impact on the toxicity test results. However, all samples received above recommended temperatures are qualified as required (*BY; Sample received at improper temperature*). In each case, the sampling crews are notified and the conditions and shipping procedures were reviewed to attempt to determine the cause of the elevated temperatures.

Sample shipments received at temperatures above 6˚C are summarized below:

- The samples collected by Kleinfelder at SSKNK and COLDR (May 2013 for Event 87) were received by PHYSIS at 10˚C, which was above the recommended maximum temperature (6˚C). Chemistry analysis was performed according to the original sampling plan, and the results were qualified (*BY*).

- The sample collected by Balance Hydrologics at CCSTR (August 2013 for Event 90) was received by PHYSIS at 7.9˚C, which was above the recommended maximum temperature (6˚C). Chemistry analysis was performed according to the original sampling plan, and the results were qualified (*BY*).

- The samples collected by PER at GILSL and RARPP (August 2013 for Event 90) were received by PHYSIS at 7.2˚C, which was above the recommended maximum temperature (6˚C). Chemistry analysis was performed according to the original sampling plan, and the results were qualified (*BY*).

All samples collected were analyzed, for an analytical success rate of 100%.

As summarized in **Table 7**, all nine sediment samples planned by the Coalition were collected, for an overall sediment sample event success rate of 100%. In addition, all analyses planned for these sediment samples were completed, for an analytical success rate of 100%.

Table 8. Summary of Field Blank Quality Control Sample Evaluations for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	< PQL	79	79	100%
SM20-9223	E. coli	< PQL	13	13	100%
SM20-2340C	Hardness as CaCO3	< PQL	1	1	100%
EPA 353.2	Nitrate+Nitrite, as N	< PQL	15	15	100%
EPA 625 / 8081A	Organochlorine Pesticides	< PQL	58	58	100%
EPA 625 / GCMS-NCI-SIM	Organophosphate Pesticides	< PQL	219	219	100%
SM20-4500-P E	Phosphorus as P, Total	< PQL	15	14	93%
SM20-5310 B/ SM5310C	Total Organic Carbon	< PQL	14	9	50%
SM20-2540D	Total Suspended Solids	< PQL	15	15	100%
EPA 200.8	Trace Metals	< PQL	13	13	100%
EPA 180.1 / SM 2130B	Turbidity	< PQL	15	12	80%
Totals			**457**	**446**	**97.6%**

Table 9. Summary of Method Blank Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	< QL	108	108	100%
SM20-9223	E. coli	< QL	43	43	100%
SM20-2340C	Hardness as CaCO3	< QL	1	1	100%
EPA 353.2	Nitrate+Nitrite, as N	< QL	58	58	100%
EPA 625	Organochlorine Pesticides	< QL	164	164	100%
EPA 625	Organophosphate Pesticides	< QL	300	300	100%
GCMS-NCI-SIM	Organophosphate Pesticides, in Sediment	< QL	6	6	100%
SM20-4500-P E	Phosphorus as P, total	< QL	56	56	100%
GCMS-NCI-SIM	Pyrethroid Pesticides	< QL	99	99	100%
GCMS-NCI-SIM	Pyrethroid Pesticides in Sediment	< QL	30	30	100%
SM20-5310 B/ SM5310C	Total Organic Carbon	< QL	55	54	98%
SM20-2540D	Total Suspended Solids	< QL	47	47	100%
EPA 200.8	Trace Metals	< QL	14	14	100%
EPA 180.1 / SM 2130B	Turbidity	< QL	43	43	100%
Totals			**1024**	**1023**	**99.9%**

Table 10. Summary of Lab Control Spike Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	[1]	109	107	98%
SM20-2340C	Hardness as CaCO3	80 - 120%	1	1	100%
EPA 353.2	Nitrate+Nitrite, as N	90 - 110%	58	58	100%
EPA 625	Organochlorine Pesticides	[1]	304	298	98%
EPA 625	Organophosphate Pesticides	[1]	592	586	99%
GCMS-NCI-SIM	Organophosphate Pesticides, in Sediment	[1]	12	12	100%
SM20-4500-P E	Phosphorus as P, total	90 - 110%	56	56	100%
GCMS-NCI-SIM	Pyrethroid Pesticides	[1]	154	148	96%
GCMS-NCI-SIM	Pyrethroid Pesticides in Sediment	[1]	60	60	100%
SM20-5310 B/ SM5310C	Total Organic Carbon	80 - 120%	53	53	100%
SM20-2540D	Total Suspended Solids	80 - 120%	43	43	100%
EPA 200.8	Trace Metals	85 - 115%	14	14	100%
EPA 180.1 / SM 2130B	Turbidity	90 - 110%	44	44	100%
Totals			**1500**	**1480**	**98.7%**

1. Data Quality Objectives for pesticide LCS recoveries vary by parameter and are based on 3x the standard deviation of the lab's actual recoveries for each parameter.

Table 11. Summary of Surrogate Recovery Results for 2013 Coalition Monitoring

Method	Analytes	DQO	Number of Analyses	Number Passing	% Success
EPA 625	Organophosphorus, Organochlorine, Carbamate, Benzophenyls and other Pesticides	[1]	708	681	96%
EPA 8081		[1]	42	42	100%
EPA 8321		[1]	26	26	100%
SW846 8270 Mod (GCMS-NCI-SIM)	Pyrethroid Pesticides	[1]	148	144	97%
Totals			**924**	**893**	**96.6%**

1. Data Quality Objectives for pesticide surrogate recoveries vary by parameter and are based on 3x the standard deviation of the lab's actual recoveries for each parameter.

Table 12. Summary of Matrix Spike Recovery Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	[1]	160	160	100%
EPA 353.2	Nitrate+Nitrite, as N	90 - 110%	46	41	89%
EPA 625	Organochlorine Pesticides	[1]	174	168	97%
EPA 625	Organophosphate Pesticides	[1]	412	345	84%
GCMS-NCI-SIM	Organophosphate Pesticides, in Sediment	[1]	8	8	100%
SM20-4500-P E	Phosphorus as P, total	90 - 110%	10	10	100%
GCMS-NCI-SIM	Pyrethroid Pesticides	[1]	88	84	95%
GCMS-NCI-SIM	Pyrethroid Pesticides in Sediment	[1]	38	36	95%
SM20-5310 B/ SM5310C	Total Organic Carbon	80 - 120%	60	59	98%
EPA 200.8	Trace Metals	85 - 115%	12	12	100%
Totals			**1027**	**982**	**95.6%**

1. Data Quality Objectives for pesticide matrix spike recoveries vary by parameter and are based on 3x the standard deviation of the lab's actual recoveries for each parameter.

Table 13. Summary of Field Duplicate Quality Control Sample Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	RPD ≤25%	79	79	100%
SM20-9223	E. coli	RPD ≤25%	15	15	100%
SM20-2340C	Hardness as CaCO3	RPD ≤25%	2	2	100%
EPA 353.2	Nitrate+Nitrite, as N	RPD ≤25%	14	13	93%
EPA 625	Organochlorine Pesticides	RPD ≤25%	58	58	100%
EPA 625	Organophosphate Pesticides	RPD ≤25%	219	217	99%
SM20-4500-P E	Phosphorus as P, total	RPD ≤25%	14	14	100%
SM20-5310 B/ SM5310C	Total Organic Carbon	RPD ≤25%	12	10	83%
SM20-2540D	Total Suspended Solids	RPD ≤25%	13	10	77%
EPA 200.8	Trace Metals	RPD ≤25%	14	14	100%
EPA 600/R-99-064M, EPA 821/R-02-013, EPA 821/R-02-012	Toxicity	RPD ≤25%	16	16	100%
EPA 180.1 / SM 2130B	Turbidity	RPD ≤25%	13	11	85%
Totals			**469**	**459**	**97.9%**

Table 14. Summary of Lab Duplicate Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 625	Organochlorine Pesticides	RPD ≤25%	87	87	100%
EPA 625	Organophosphate Pesticides	RPD ≤25%	181	181	100%
SM20-2540D	Total Suspended Solids	RPD ≤25%	6	6	100%
EPA 180.1	Turbidity	RPD ≤25%	20	20	100%
Totals			**294**	**294**	**100%**

Table 15. Summary of Lab Control Spike Duplicate Precision Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	RPD ≤25%	1	1	100%
EPA 625	Organochlorine Pesticides	RPD ≤25%	140	139	99%
EPA 625	Organophosphate Pesticides	RPD ≤25%	292	273	93%
GCMS-NCI-SIM	Organophosphate Pesticides, in Sediment	RPD ≤25%	6	6	100%
GCMS-NCI-SIM	Pyrethroid Pesticides	RPD ≤25%	55	54	98%
GCMS-NCI-SIM	Pyrethroid Pesticides in Sediment	RPD ≤25%	30	30	100%
EPA 180.1 / SM 2130B	Turbidity	RPD ≤25%	1	1	100%
Totals			**525**	**504**	**96.0%**

Table 16. Summary of Matrix Spike Duplicate Precision Results for 2013 Coalition Monitoring

Method	Analyte	DQO	Number of Pairs Analyzed	Number Passing	% Success
EPA 8321A/8081A	Carbamate Pesticides, Benzophenyls and other Herbicides	RPD ≤25%	80	79	99%
EPA 353.2	Nitrate+Nitrite, as N	RPD ≤25%	88	88	100%
EPA 625	Organochlorine Pesticides	RPD ≤25%	87	87	100%
EPA 625	Organophosphate Pesticides	RPD ≤25%	212	189	89%
GCMS-NCI-SIM	Organophosphate Pesticides, in Sediment	RPD ≤25%	4	4	100%
SM20-4500-P E	Phosphorus as P, total	RPD ≤25%	56	56	100%
GCMS-NCI-SIM	Pyrethroid Pesticides	RPD ≤25%	77	74	96%
GCMS-NCI-SIM	Pyrethroid Pesticides in Sediment	RPD ≤25%	19	19	100%
SM20-5310 B/ SM5310C	Total Organic Carbon	RPD ≤25%	78	78	100%
EPA 200.8	Trace Metals	RPD ≤25%	25	25	100%
Totals			**726**	**699**	**96.3%**

TABULATED RESULTS OF LABORATORY ANALYSES

Copies of final laboratory reports and all reported QA/QC data for Coalition monitoring results are provided in **Appendix B**. The tabulated results for all validated and Quality Assurance-evaluated (QA) data are provided in **Appendix C**. These data were previously submitted as part of the quarterly data submittals.

Data Interpretation

SUMMARY OF SAMPLING CONDITIONS

Samples were collected throughout the year for the Coalition (see **Table 7**, Sampling for the 2013 Coalition Monitoring Year). Sample collection for the October 2012 – March 2013 monitoring period was characterized by above-average precipitation during the months of October, November, and December, and below-average precipitation during the months of January, February, and March.[5] The 2013 water year was classified as "Dry" for the Sacramento Valley by the California Department of Water Resources, with an estimated 65% of average total runoff (based on 1961-2010 mean).[6,7]

Sample collection for the April 2013 – September 2013 Coalition Irrigation Season was characterized by predominantly dry weather, and mean temperatures were generally warmer than historical averages. During the 2013 water year, temperatures were warmer than historical mean temperatures (1949-2005) by up to about two and a half degrees (ºF).

The 2012 water year, which was the driest year for the Sacramento Valley since the 2007-2009 drought, was followed by another record dry year. The 2013 water year (October 2012 – September 2013) was recorded as an overall dry year for most of California, despite record wet conditions during late November and early December.[8] Statewide, at the end of the 2013 water year, precipitation was 80 percent of average and reservoir storage was 80 percent of average.[9]

Regional precipitation patterns for October 2012 – September 2013 are illustrated in **Figure 2-a** through **Figure 2-e**. Due to predominantly dry weather beginning in January 2013, storm flows through the watershed exhibited lower than usual wet season variability during the storm season (**Figure 3-a** through **Figure 3-f**). With the exception of some November 2012 and December 2012 events, samples were primarily collected during low-flow hydrological conditions.

Based on climate data available for the Sacramento Executive Airport weather station, with the exception of the month of September, there was less than average rainfall during the April – September 2013 irrigation season (**Table 17**). Only trace amounts of precipitation occurred during the months July and August. Precipitation was below normal from January through May. The maximum temperature exceeded 90 degrees Fahrenheit on three days in October, three days in April, eight days in May, 12 days in June, 21 days in July, 17 days in August, and seven days in September.

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[5] Climate data (general trends) for the Sacramento-Delta region available at: http://www.wrcc.dri.edu/monitor/cal-mon/frames_version.html

[6] http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

[7] Sacramento River Region unimpaired runoff, for water year 2013, was about 11.9 million acre-feet (MAF), approximately 65% of average. During water year 2012, the observed Sacramento River Region unimpaired runoff through September 30, 2012 was about 11.8 MAF, also about 65% of average.

[8] http://www.water.ca.gov/waterconditions/

[9] http://www.water.ca.gov/floodmgmt/hafoo/hb/csm/docs/Monthly_Weather_Summary_092013.pdf

Table 17. Summary of Climate Data[10] at Sacramento Executive Airport, October 2012 – September 2013

Month	Departure from Normal Mean Temperature	Days with Maximum Temperature ≥ 90°F	Precipitation Total (Inches)	Departure from Normal Precipitation
October 2012	1.0	3	1.14	0.19
November 2012	2.0	0	3.97	1.89
December 2012	0.9	0	6.15	2.90
January 2013	-2.2	0	0.96	-2.68
February 2013	-1.7	0	0.36	-3.11
March 2013	2.3	0	1.38	-1.37
April 2013	5.1	3	0.69	-0.46
May 2013	2.9	8	0.30	-0.38
June 2013	2.0	12	0.22	0.01
July 2013	1.0	21	Trace	0.00
August 2013	0.1	17	Trace	-0.05
September 2013	-0.3	7	0.59	0.30

[10] Preliminary monthly climate data (temperature and precipitation) for Sacramento Executive Airport weather station available at: http://www.weather.gov/climate/index.php?wfo=sto

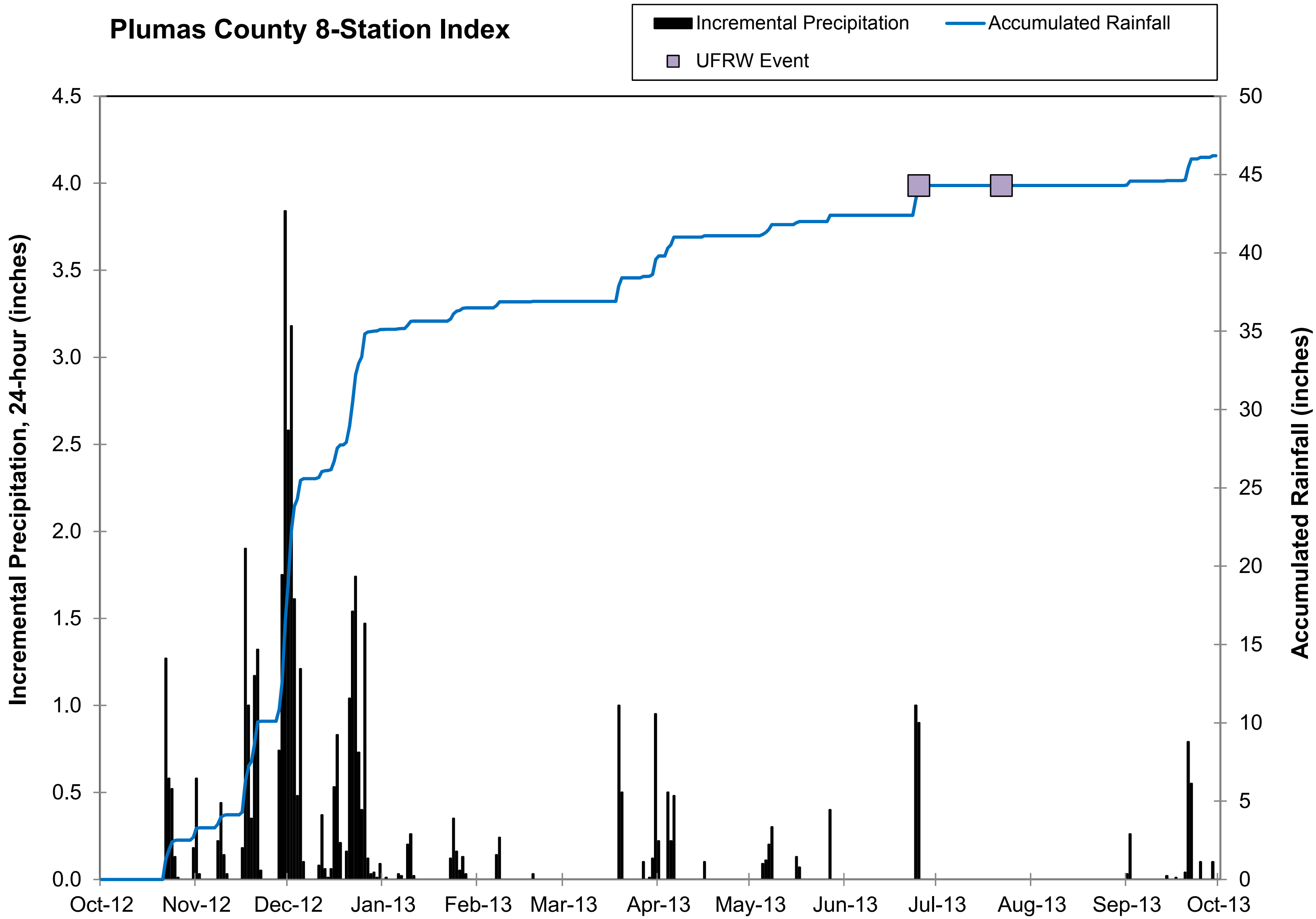

Figure 2-a. Precipitation during 2013 Coalition Monitoring: Plumas County

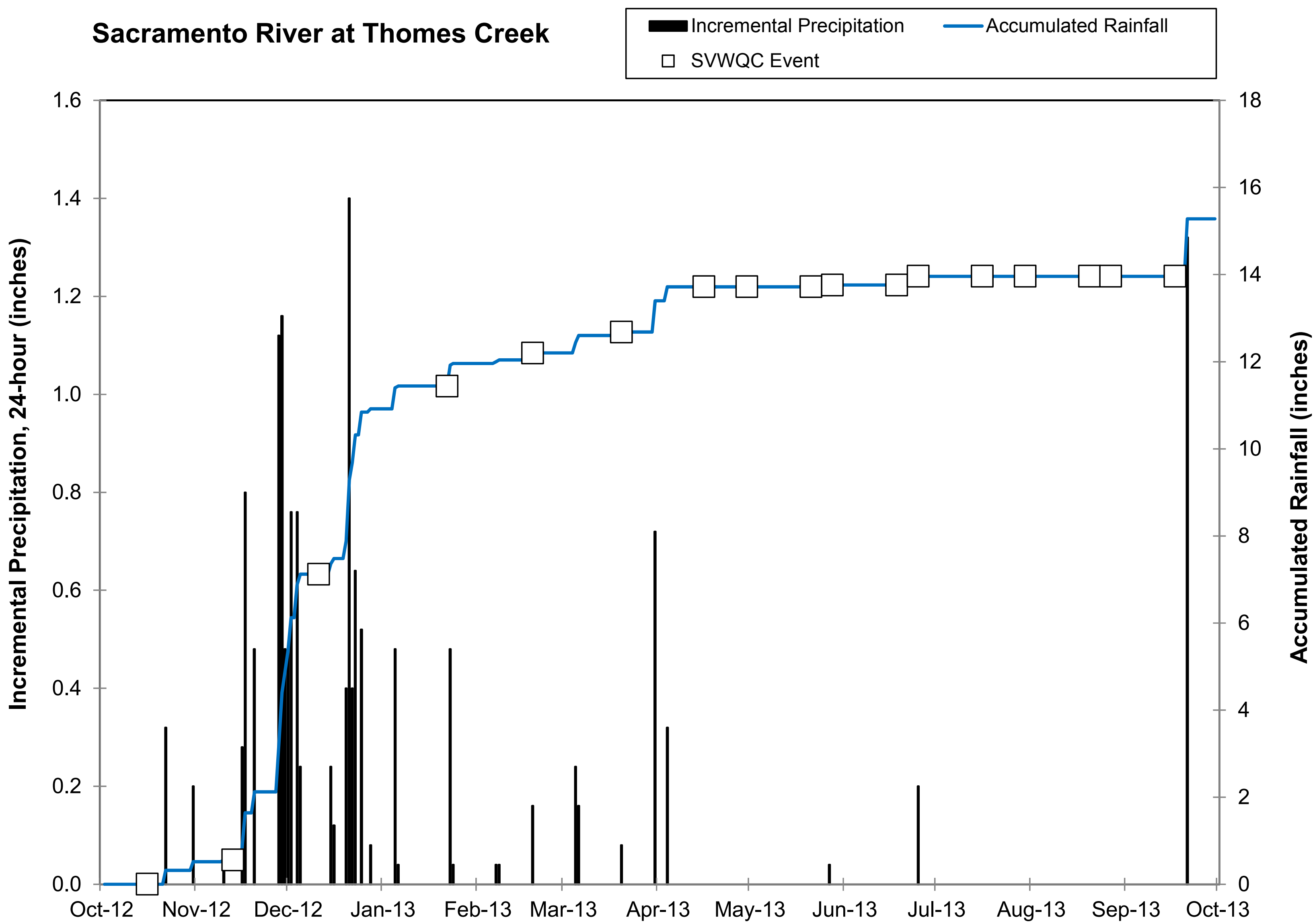

Figure 2-b. Precipitation during 2013 Coalition Monitoring: Upper Sacramento Valley

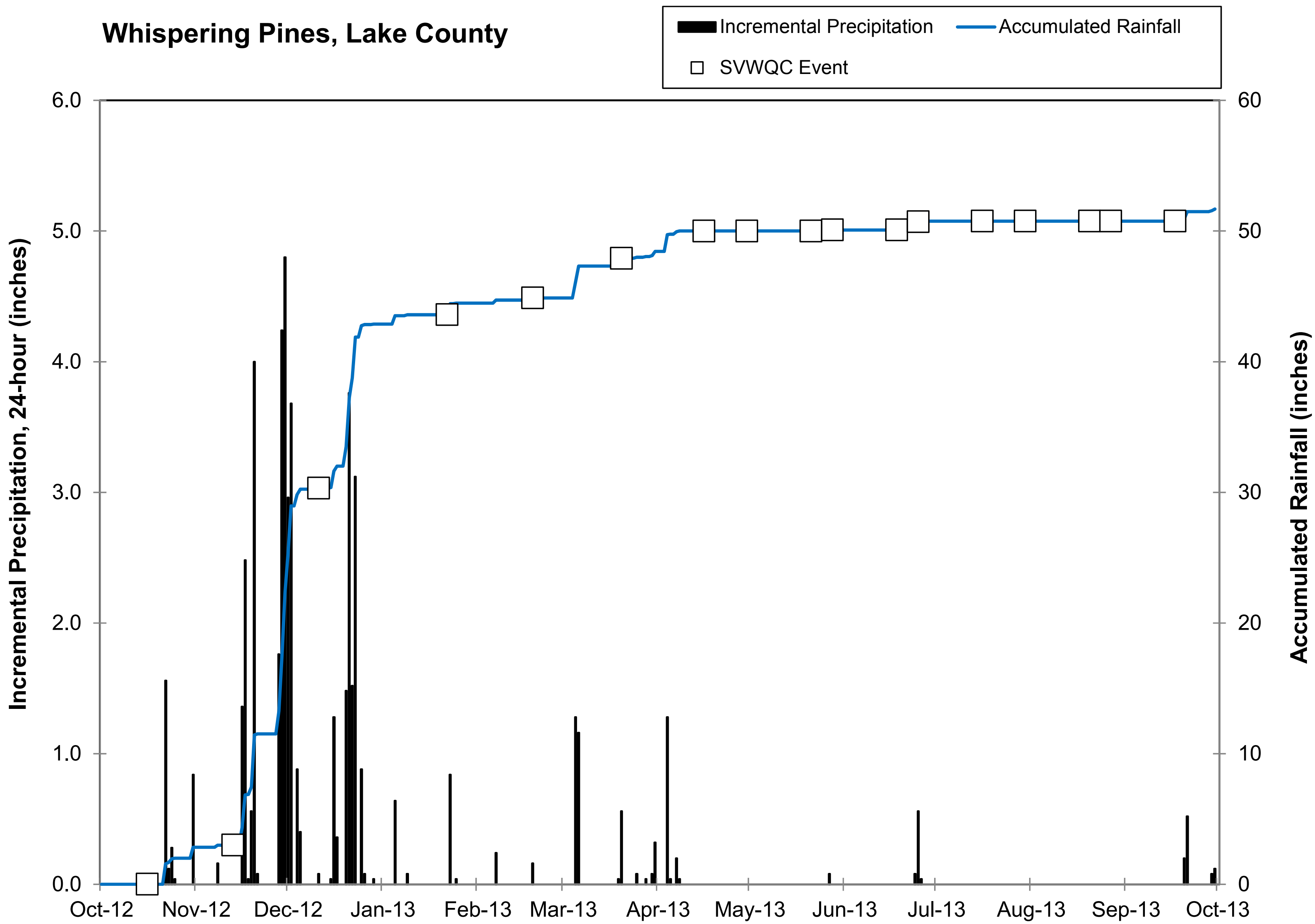

Figure 2-c. Precipitation during 2013 Coalition Monitoring: Lake County

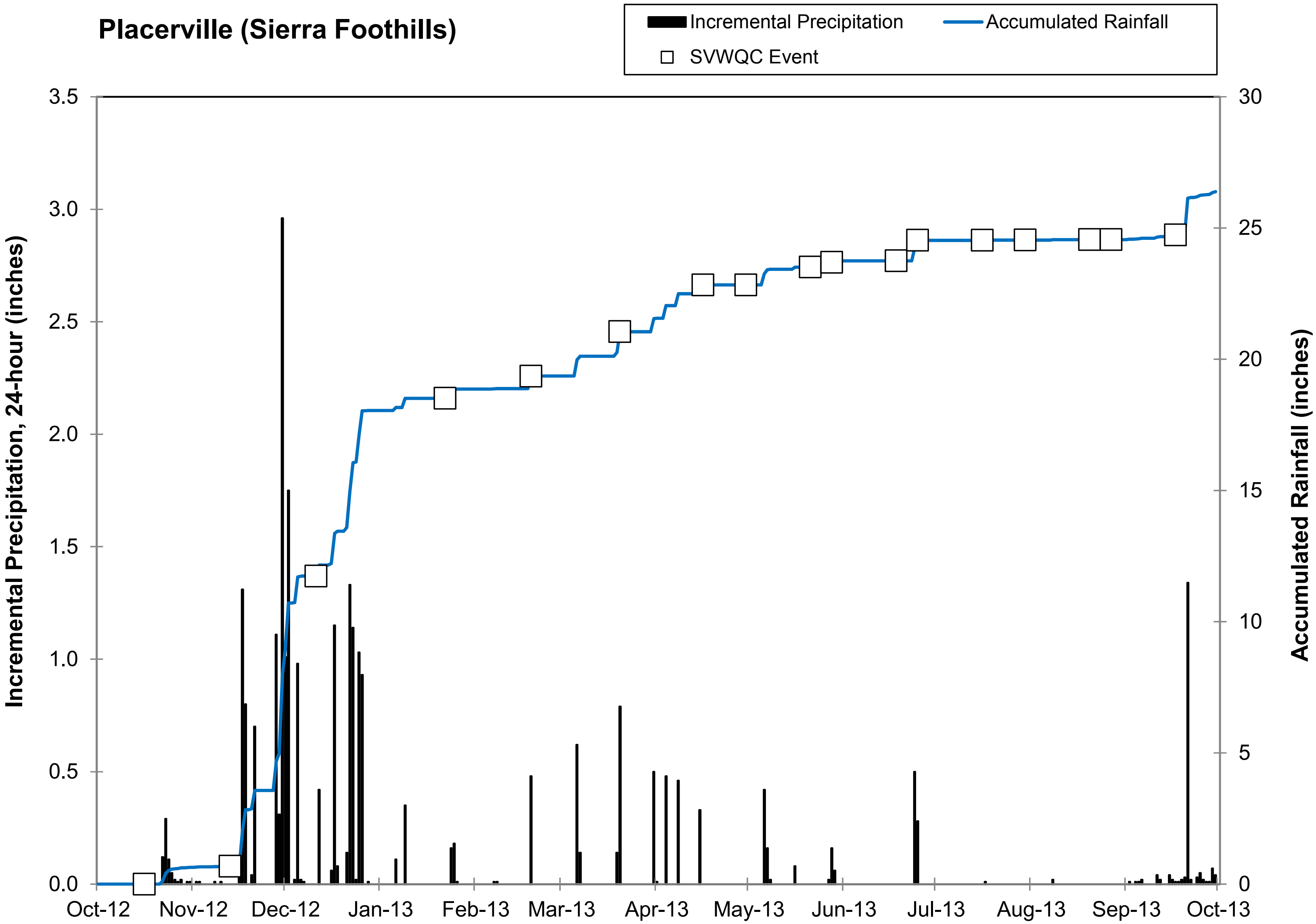

Figure 2-d. Precipitation during 2013 Coalition Monitoring: Sierra Foothills

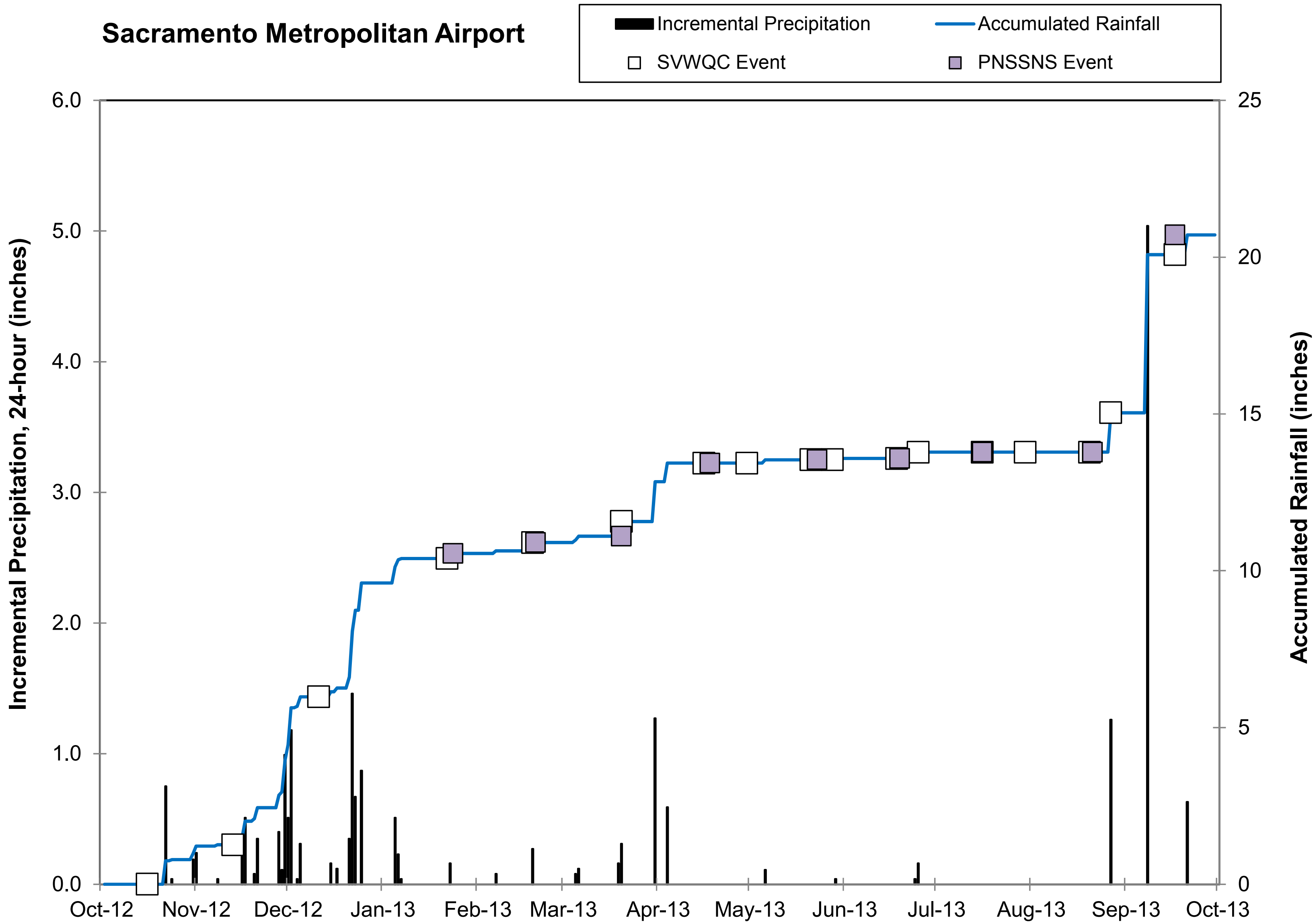

Figure 2-e. Precipitation during 2013 Coalition Monitoring: Lower Sacramento Valley

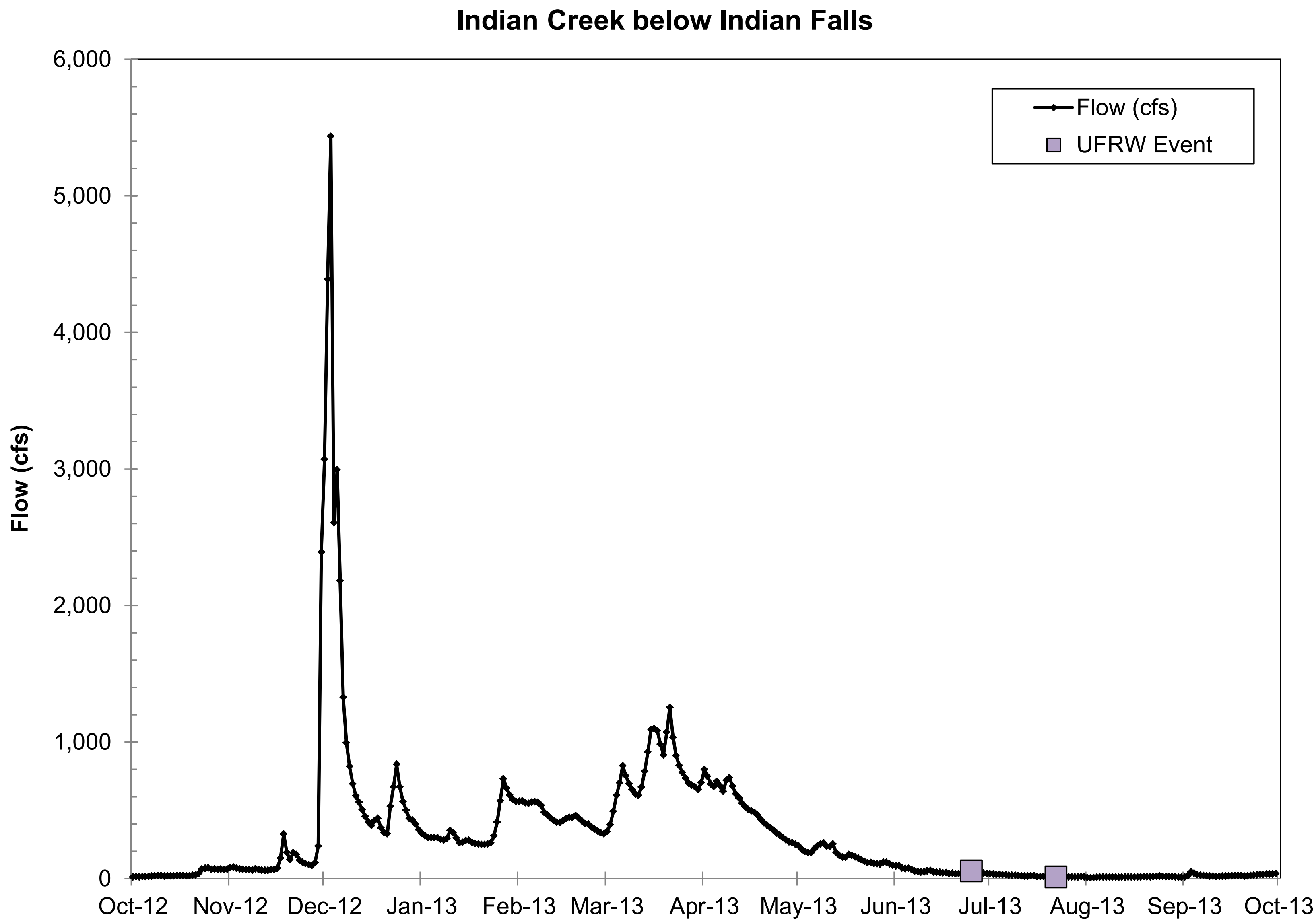

Figure 3-a. Flows during 2013 Coalition Monitoring: Plumas County

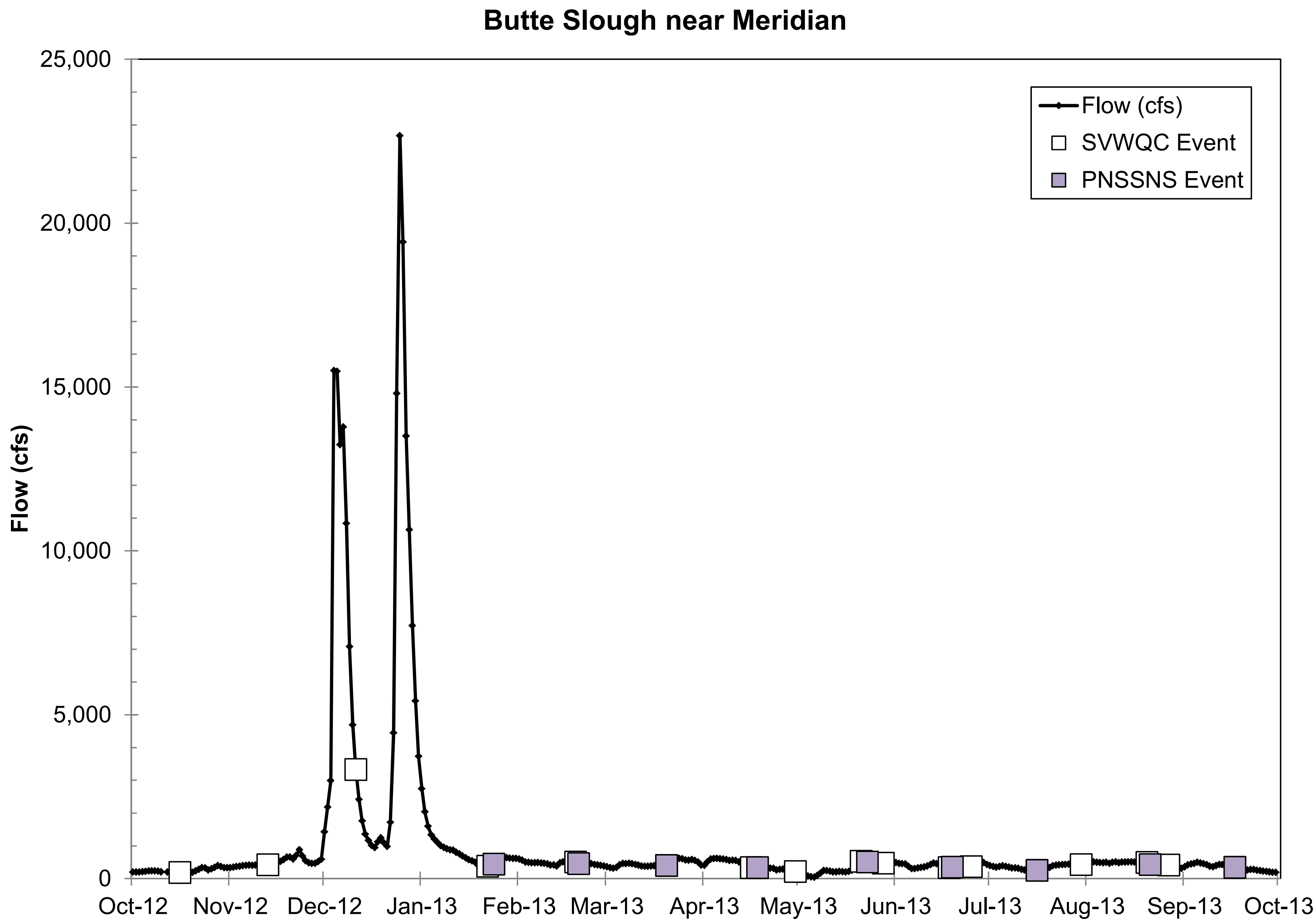

Figure 3-b. Flows during 2013 Coalition Monitoring: East Sacramento Valley

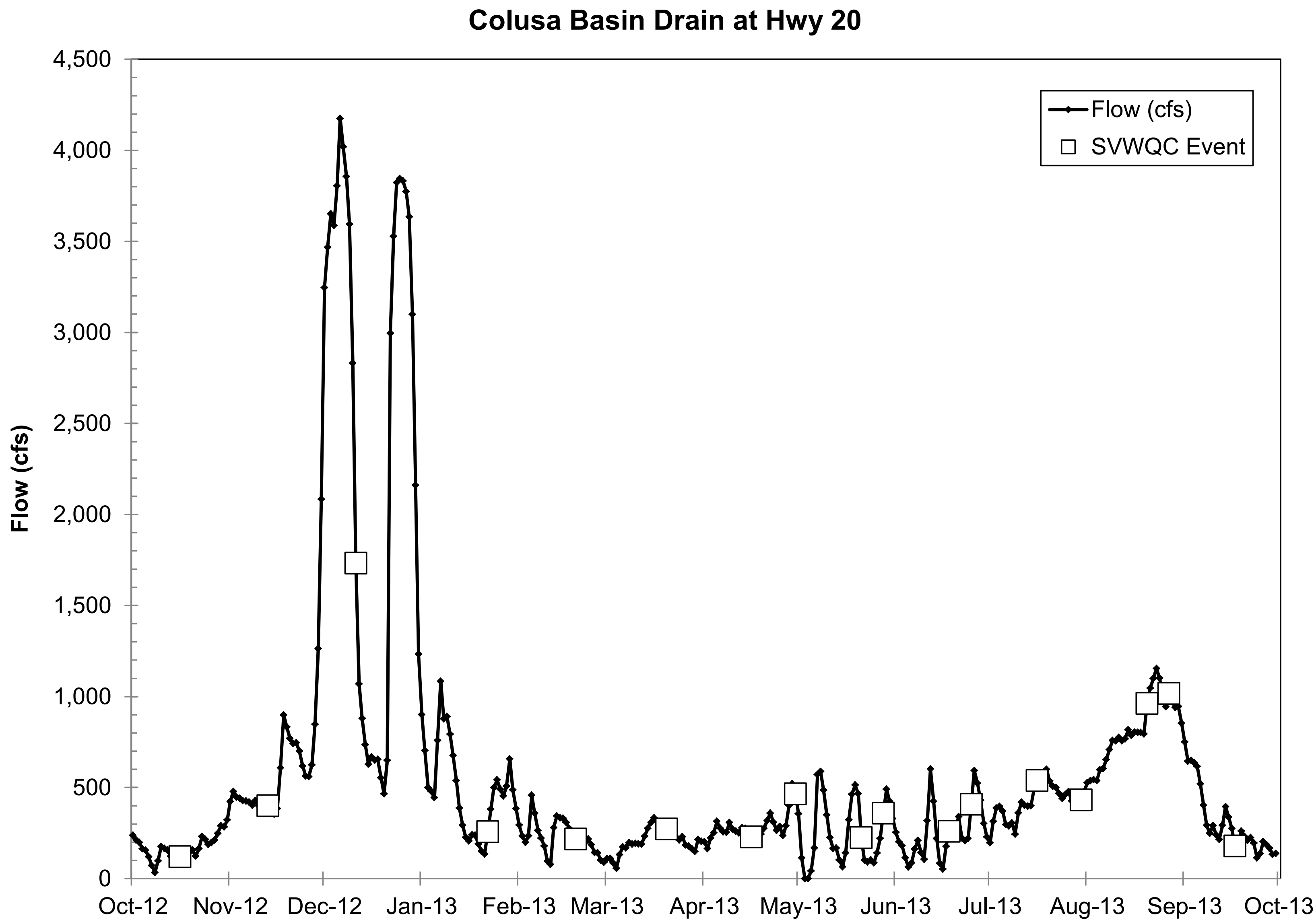

Figure 3-c. Flows during 2013 Coalition Monitoring: West Sacramento Valley

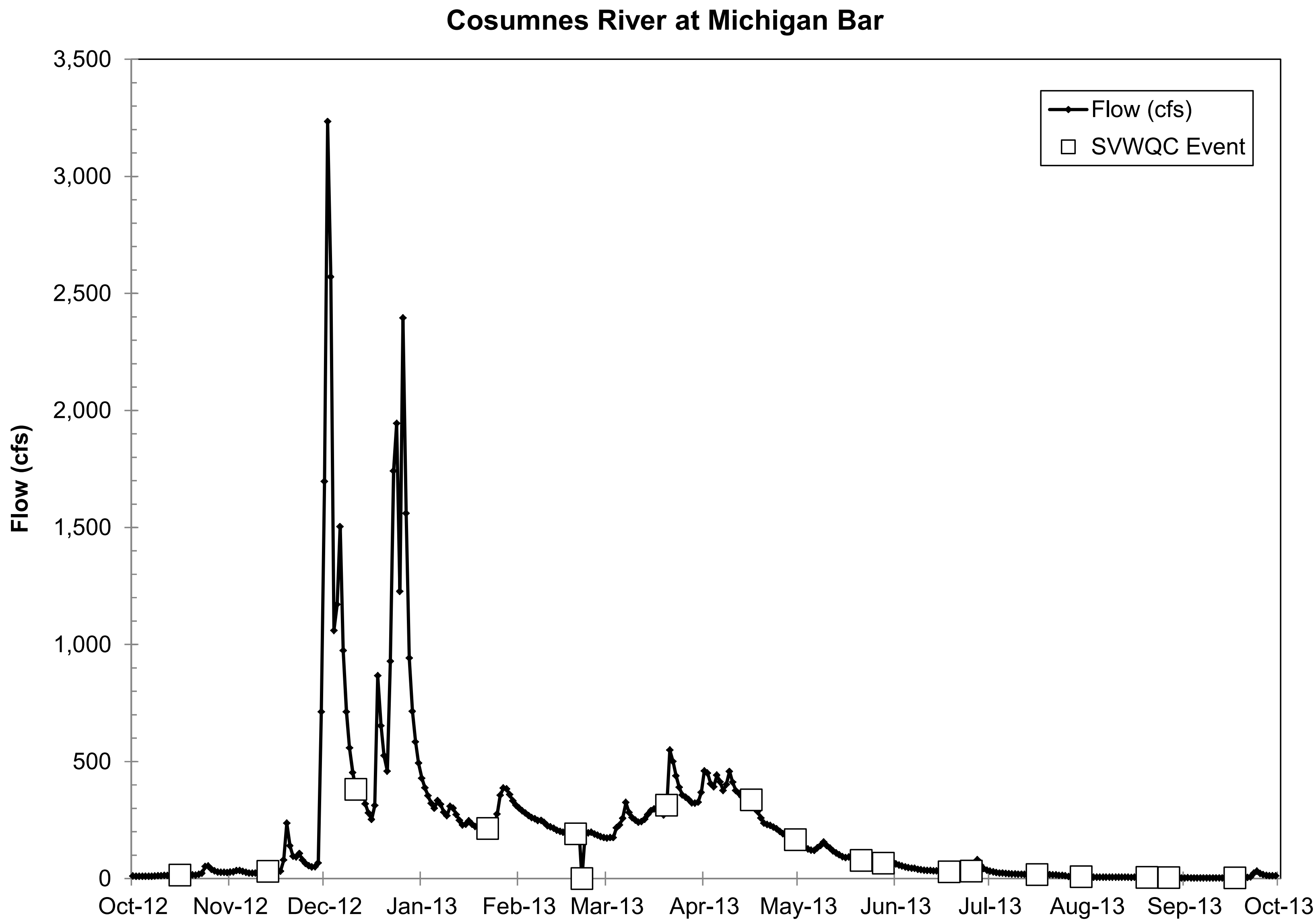

Figure 3-d. Flows during 2013 Coalition Monitoring: Lower Sacramento Valley

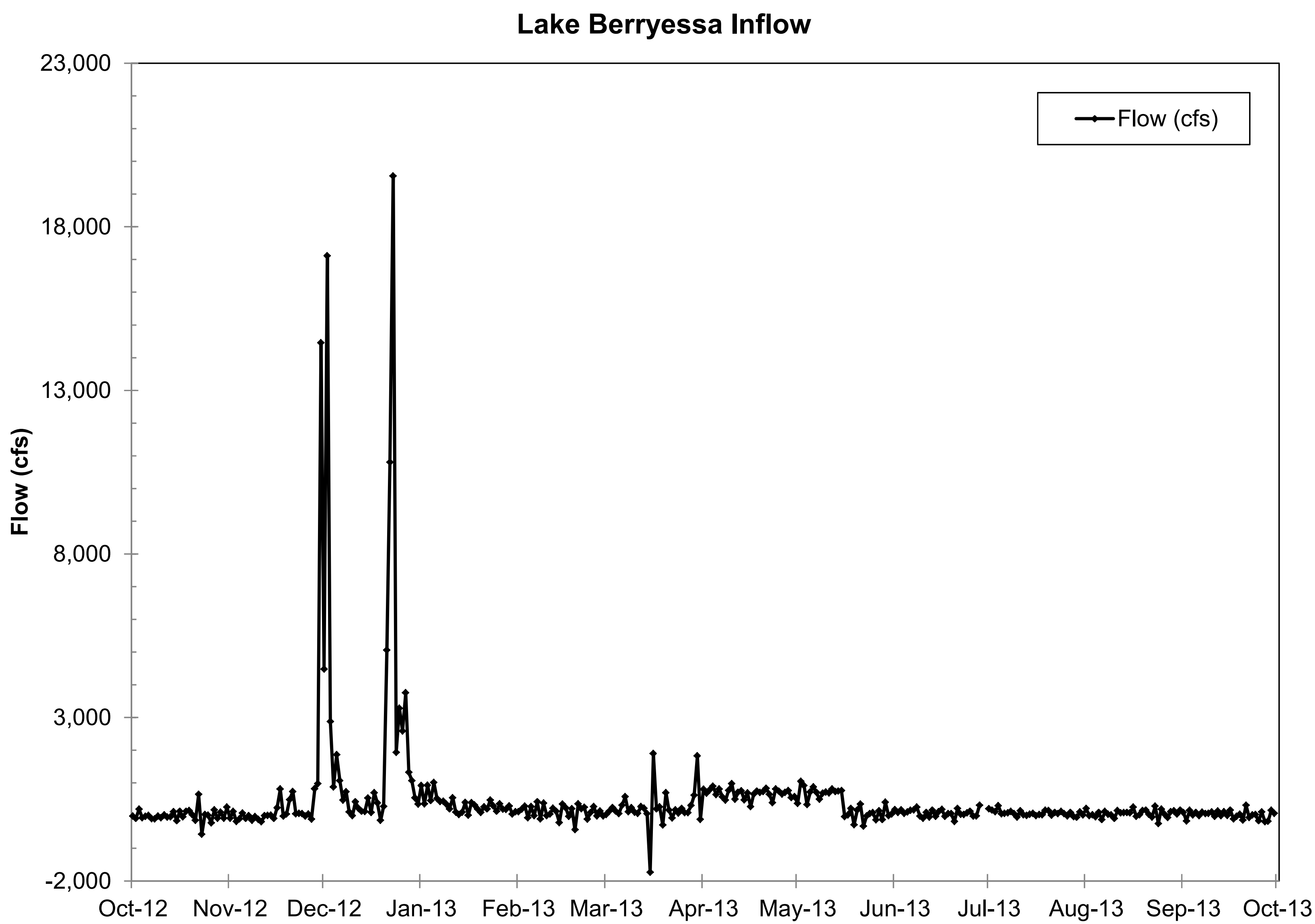

Figure 3-e. Flows during 2013 Coalition Monitoring: Lake Berryessa (Reservoir Inflow)

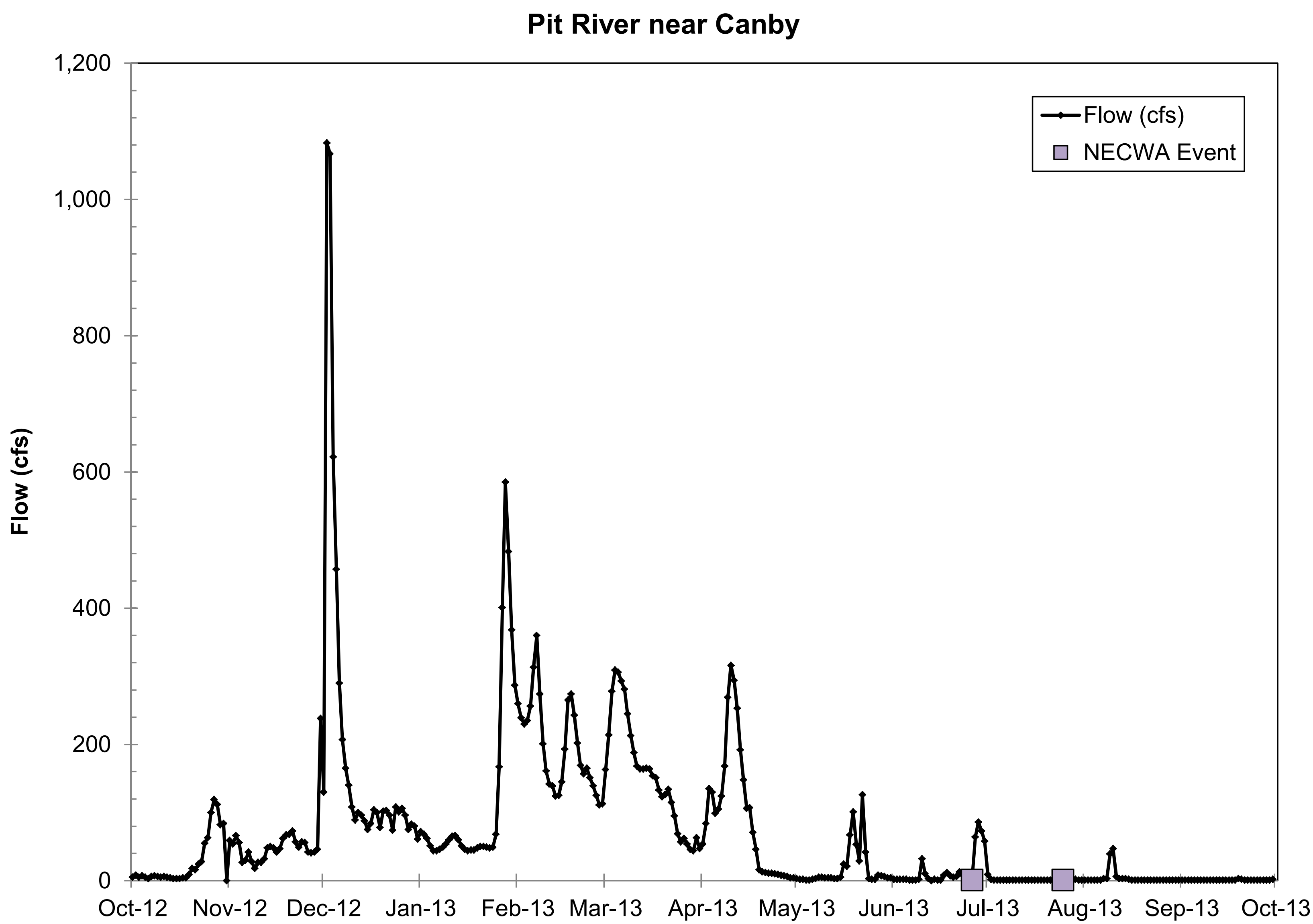

Figure 3-f. Flows during 2013 Coalition Monitoring: Pit River near Canby

ASSESSMENT OF DATA QUALITY OBJECTIVES

The QA/QC data for the Coalition's monitoring program have been evaluated and discussed previously in this document (Quality Assurance Results, beginning **page 29**). Based on these evaluations, the program DQOs of completeness, representativeness, precision, and accuracy of monitoring data have been achieved. These results indicate that the data collected are valid and adequate to support the objectives of the monitoring program, and demonstrate compliance with the requirements of the *ILRP*. The results of these evaluations were summarized previously in **Table 8** through **Table 16**.

EXCEEDANCES OF RELEVANT WATER QUALITY OBJECTIVES

Coalition and subwatershed monitoring data were compared to *ILRP* trigger limits. Generally, these trigger limits are based on applicable narrative and numeric water quality objectives in the Central Valley Basin Plan (CVRWQCB 1995), subsequent adopted amendments, the California Toxics Rule (USEPA 2000), and numeric interpretations of the Basin Plan narrative objectives. Observed exceedances of the *ILRP* trigger limits are the focus of this discussion.

Other relevant non-regulatory toxicity thresholds were also considered for the purpose of identifying potential causes of observed toxicity. It should be noted that these unadopted non-regulatory toxicity thresholds are not appropriate criteria for determining exceedances for the purpose of the Coalition's monitoring program and evaluating compliance with the *ILRP.* The additional toxicity thresholds were acquired from USEPA's Office of Pesticide Programs (OPP) Ecotoxicity database (USEPA 2007).

Water quality objectives and other relevant water quality thresholds discussed in this section are summarized in **Table 18** and **Table 19**. Monitored analytes without relevant water quality objectives or *ILRP* trigger limits are listed in **Table 20**.

The data evaluated for exceedances in this document include all Coalition collected results, as well as the compiled results from the Subwatershed monitoring programs presented in this report. The results of these evaluations are discussed below.

Table 18. Adopted Basin Plan and California Toxics Rule Objectives for Analytes Monitored for 2013 Coalition Monitoring

Analyte	Most Stringent Objective[1]	Units	Objective Source[2]
Aldicarb	3	µg/L	CA 1˚ MCL
Aldrin	0.00013	µg/L	CTR
Ammonia, Total as N	narrative	mg/L	Basin Plan
Arsenic, dissolved	150	µg/L	CTR
Arsenic, total	50	µg/L	CA 1˚ MCL
Chlordane, cis	0.00057	µg/L	CTR
Chlordane, trans	0.00057	µg/L	CTR
Chlorpyrifos	0.015	µg/L	Basin Plan
Copper, dissolved	hardness dependent[3]	µg/L	CTR
DDD (o,p' and p,p')	0.00083	µg/L	CTR
DDE (o,p' and p,p')	0.00059	µg/L	CTR
DDT (o,p' and p,p')	0.00059	µg/L	CTR
Diazinon	0.10	µg/L	Basin Plan
Dieldrin	0.00014	µg/L	CTR
Dissolved Oxygen	5	mg/L	Basin Plan
Endosulfan I	110	µg/L	CTR
Endosulfan II	110	µg/L	CTR
Endrin	0.036	µg/L	CTR
Fecal coliform	400	MPN/100mL	Basin Plan
HCH	0.0039	µg/L	CTR
Heptachlor	0.00021	µg/L	CTR
Heptachlor epoxide	0.0001	µg/L	CTR
Lead, dissolved	hardness dependent[3]	µg/L	CTR
Malathion	0.1[4]	µg/L	Basin Plan
Methoxychlor	30	µg/L	CA 1˚ MCL
Molybdenum	15	µg/L	Basin Plan
Nitrate, as N	10	mg/L	CA 1˚ MCL
Oxamyl	50	µg/L	CA 1˚ MCL
Parathion, Methyl	0.13[4]	µg/L	Basin Plan
pH	6.5-8.5	-log[H+]	Basin Plan
Temperature	narrative	µg/L	Basin Plan
Toxicity, Algae (*Selenastrum*) Cell Density	narrative	µg/L	Basin Plan
Toxicity, Water Flea (*Ceriodaphnia*) Survival	narrative	µg/L	Basin Plan
Turbidity	narrative	µg/L	Basin Plan

Notes:

1. For analytes with more than one limit, the most limiting applicable adopted water quality objective is listed.
2. *CA 1˚ MCLs* are California's Maximum Contaminant Levels for treated drinking water; *CTR* = California Toxics Rule criteria.
3. Objective varies with the hardness of the water.
4. These values are Basin Plan performance goals. The Basin Plan states: "…discharge is prohibited unless the discharger is following a management practice approved by the Board." This has been interpreted as an *ILRP* trigger limit of ND (Not Detected).

Table 19. Unadopted Water Quality Limits Used to Interpret Narrative Water Quality Objectives for Analytes Monitored for 2013 Coalition Monitoring

Analyte	Unadopted Limit[1]	Units	Limit Source
Boron, total	700	µg/L	Ayers and Westcott 1988
Conductivity	900	µS/cm	CA Recommended 2˚ MCL
E. coli [1]	235	MPN/100mL	Basin Plan Amendment
Conductivity	700	µS/cm	Ayers and Westcott 1988
Total Dissolved Solids	500	mg/L	CA Recommended 2˚ MCL
Total Dissolved Solids	450	mg/L	Ayers and Westcott 1988
Azinphos methyl	0.01	µg/L	USEPA NAWQC[2]
Carbaryl	2.53	µg/L	USEPA NAWQC
Dichlorvos	0.085	µg/L	Cal/EPA Cancer Potency Factor
Dimethoate	1	µg/L	CDPH Notification Level[3]
Disulfoton	.05	µg/L	USEPA NAWQC
Diuron	2	µg/L	USEPA Health Advisory
Linuron	1.4	µg/L	USEPA IRIS Reference Dose
Methamidophos	0.35	µg/L	USEPA IRIS Reference Dose
Methidathion	0.7	µg/L	USEPA IRIS Reference Dose
Methomyl	0.52	µg/L	USEPA NAWQC
Phorate	0.7	µg/L	NAS Health Advisory
Phosmet	140	µg/L	USEPA IRIS Reference Dose

Note:

1. Adopted by the Water Board but not approved by State Water Resources Control Board
2. USEPA National Ambient Water Quality Criteria
3. Notification levels (formerly called "action levels") are published by the California Department of Public Health (CDPH) for chemicals for which there is no drinking water MCL.

Table 20. Analytes Monitored for 2013 Coalition Monitoring without Applicable Adopted or Unadopted Limits

Analytes		
Allethrin	Fenchlorphos	Oxychlordane
Aminocarb	Fensulfothion	Oxyfluorfen
Barban	Fenthion	Permethrin
Benomyl/Carbendazim	Fenuron	Perthane
Bifenthrin	Fluometuron	Phosphorus as P, Total
Bromacil	Fluvalinate	Propachlor
Chloroxuron	Hardness as CaCO3	Propham
Chlorpropham	Hexachlorobenzene	Propoxur
Cyfluthrin	L-Cyhalothrin	Siduron
Cypermethrin	Methiocarb	Sulprofos
Dacthal	Merphos	Tebuthiuron
Deltamethrin/Tralomethrin	Mevinphos	Tetrachlorvinphos
Demeton	Mexacarbate	Tetramethrin
Dicofol	Mirex	Tetrachlorvinphos
Diflubenzuron	Monuron	Tokuthion
Discharge (flow)	Neburon	Total Organic Carbon
Endosulfan sulfate	Nitrate+Nitrite, as N	Total Suspended Solids
Endrin	Nonachlor, cis-	Trichloronate
Esfenvalerate/Fenvalerate	Nonachlor, trans-	
Ethoprop	Oryzalin	

Toxicity and Pesticide Results

A summary of the toxicity and pesticide results from 2013 Coalition Monitoring is provided in this section.

Toxicity Exceedances in Coalition Monitoring

There were 59 individual toxicity results (including 18 field duplicates) analyzed in water column and sediment samples collected from nine different sites during 2013 Coalition monitoring. Analyses were conducted for *Selenastrum capricornutum, Pimephales promelas, Ceriodaphnia dubia,* and *Hyalella azteca.* Within these categories, there were three sediment toxicity exceedances. The observations of sediment toxicity to *Hyalella* were considered exceedances of the Basin Plan narrative objective for toxicity ("*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*.").

All statistically significant results for samples collected during 2013 Coalition Monitoring were reported to the Water Board by the Coalition in "Exceedance Reports" as required by the *ILRP* and the Coalition's MRP. The Exceedance Reports detailing these results are provided in **Appendix D**.

Of the 53 individual toxicity results analyzed in water column samples collected from seven different sites in 2013 Coalition Monitoring (37 results plus 16 field duplicates), none had observed toxicity.

There were a total of six sediment toxicity samples (including two duplicate samples) collected from three different sites in 2013 Coalition Monitoring. Three of these samples (including one field duplicate) exhibited statistically significant toxicity to *Hyalella azteca*. The significant toxicity to *Hyalella azteca* was observed at two sites (Cosumnes River and Z-Drain) in April. Samples exhibiting statistically significant sediment toxicity are summarized in **Table 21.**

Table 21. Toxicity Exceedances in Sediment in 2013 Coalition Monitoring

Site ID	Water Body	Sample Date	Analyte	% of Control
CRTWN	Cosumnes River	4/18/2013	*Hyalella azteca* Survival	92
CRTWN	Cosumnes River[1]	4/18/2013	*Hyalella azteca* Survival	94
ZDDIX	Z-Drain	4/16/2013	*Hyalella azteca* Survival	79

Note:
1. Field duplicate

Significantly toxic results and any follow-up evaluations or testing conducted on the samples are summarized by event below.

Event 86, April 2013 – Cosumnes River, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed survival of 92% and 94% in the duplicate sample from the Cosumnes River (compared to survival in the control). The analyses following the flowchart in the EPA method EPA/600/R-99/064 indicated that the primary sample was toxic, but with less than a 10% reduction in survival compared to the control. (Because survival was greater than 90%, both samples would have passed the State's proposed Test of Significant Toxicity (TST)[11] method for assessing significant toxicity and would not be considered toxic.) The low level of toxicity observed in the Cosumnes River samples (<20% reduction compared to control) did not trigger any follow-up evaluations or analyses. No potential causes of the toxicity were investigated.

Event 86, April 2013 – Z-Drain, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed survival of 79% compared to control at Z-Drain. The toxicity observed in the sample (≥20% reduction compared to control) triggered follow-up sediment analyses for pyrethroid and organophosphate pesticides.

Four pesticides were detected in the ZDDIX sample: bifenthrin (8.6 ng/g dw); esfenvalerate/fenvalerate (0.45 ng/g dry weight (dw)); L-cyhalothrin (0.16 ng/g dw); and chlorpyrifos (0.35 ng/g dw). In addition, sediment analyses conducted for the upstream ZDINF sample and duplicate sample resulted in detections of four pesticides: bifenthrin (0.12 and 0.14 ng/g dw); chlorpyrifos (1.2 and 1.6 ng/g dw); cyfluthrin (0.4 ng/g dw (only detected in the field duplicate); and L-cyhalothrin (0.22 and 0.25 ng/g dw).

A total of 1.52 Toxic Units (TUs) of agricultural use pyrethroids and chlorpyrifos were likely responsible for the toxicity observed at ZDDIX. The sample from the upstream inflow location (ZDINF) was unlikely to have been toxic based on the lower estimated TUs (0.195) in the sample. Toxic units were estimated based on published LC50s for pyrethroids and chlorpyrifos in sediment[12], normalized for organic carbon concentrations.

Pesticides Detected in Coalition Monitoring

There were 2,667 individual pesticide results analyzed in 117 water column samples (including 15 duplicates) collected from 21 different sites, including both Representative and Management Plan or Special Study sites, during 2013 Coalition monitoring. Analyses were conducted for organophosphates, carbamates, organochlorines, benzophenyls, pyrethroids, and a variety of herbicides. Within these monitored categories, ten different pesticides were detected (31 total detected results) in 25 separate samples (including three field duplicates) collected for Coalition monitoring. Approximately 79% of samples had no detected pesticides, and more than 98.8% of all pesticide results were below detection.

It should be noted that detected pesticides are not equivalent to exceedances (with the exception of malathion, which has a prohibition of discharge in the Basin Plan). Three registered pesticides (chlorpyrifos, dimethoate, and malathion) exceeded applicable water quality objectives or *ILRP* trigger limits in a total of five Coalition monitoring samples (including one field duplicate). In addition, breakdown products of the legacy pesticide DDT (DDD(p,p) and DDE(p,p)) were detected above applicable water quality objectives in a total of six samples from two sites.

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[11] SWRCB, 2012. Policy for Toxicity Assessment and Control, Public Review Draft, June 2012. Sacramento, California. Available here: http://www.swrcb.ca.gov/water_issues/programs/state_implementation_policy/docs/draft_tox_policy_0612.pdf

[12] Weston, D.P., Jackson, C.J., 2009. Use of engineered enzymes to identify organo- phosphate and pyrethroid-related toxicity in toxicity identification evaluations. Environmental Science and Technology 43, 5514–5520.

There were also 130 individual pesticide results analyzed in 10 sediment samples (including two field duplicates) collected from six different sites during 2013 Coalition monitoring. Analyses were conducted for organophosphate and pyrethroid pesticides in sediment. Within these categories, six different pesticides were detected in seven separate samples (out of 10 total samples) collected for Coalition monitoring. More than 75% of the results were below detection in sediment samples. There are currently no *ILRP* trigger limits or adopted sediment quality objectives for pesticides in sediment.

Discussion of Pesticides Detected in Water Column in Coalition Monitoring

All pesticides detected in water column samples for 2013 Coalition monitoring are listed in **Table 22**. Pesticides were compared to relevant numeric and narrative water quality objectives, and to toxicity threshold concentrations published in USEPA's *ECOTOX Database (USEPA 2007; accessed on multiple occasions in 2014)*. A discussion of these detections and exceedances follow below.

- The insecticide bifenthrin was detected in two samples from two sites (Cache Creek and Lower Snake River). Both of these detections were below the reporting limit. There is currently no *ILRP* trigger limit or adopted water quality objective for bifenthrin. Detected concentrations were also lower than a proposed criterion (0.004 µg/L) recently developed for the Central Valley Regional Water Quality Control Board by the University of California, Davis.
- The insecticide chlorpyrifos was detected in 13 samples, including two field duplicates, from seven different sites. Chlorpyrifos exceeded the Basin Plan Amendment chronic objective (0.015 µg/L) in two of these samples (including one field duplicate) from one site (Pine Creek).
    - There were 13 reported applications of chlorpyrifos in the month prior to the May 22, 2013 exceedance. Chlorpyrifos was applied to approximately 326.5 acres of walnuts and 49 acres of almonds in the Pine Creek drainage during the month of May. There were no registered pesticide applications between April 22 and 30. Although standing water was present in the creek, there was no observable flow at this site. The area received only trace amounts of rain[13] in the month preceding the exceedance. Approximately 89 acres of walnuts were treated aerially (42 on May 5, 2013 (average wind speed = 6.5 mph) and 47 on May 15, 2013 (average wind speed = 6 mph)). Due to the lack of precipitation and flow at this site, the detected chlorpyrifos in this sample was likely due to residual drift from the aerial applications. No toxicity tests were performed for these samples.
- DDD (p,p), a breakdown product of the legacy pesticide DDT, was detected in two samples from Grand Island Drain. DDD (p,p) exceeded the CTR objective (0.00083 µg/L) in both samples. Another DDT breakdown product, DDE (p,p), was detected in four samples from two sites (Grand Island Drain and Coon Hollow Creek). DDE (p,p) exceeded the CTR objective (0.00059 µg/L) in all four samples.

[13] Based on precipitation data from CDEC site "Cohasset (CST)" (http://cdec.water.ca.gov/cgi-progs/nearbymap?staid=cst)

- All uses of DDT have been banned in the United States since 1972, except for control of emergency public health problems.[14] No toxicity tests were performed for these samples.

- The insecticide diazinon was detected in three samples (including one field duplicate) from two different sites. None of these detections exceeded the Basin Plan chronic objective (0.1 µg/L).
- The insecticide dimethoate was detected in two samples (including one field duplicate) from Grand Island Drain. One detection exceeded the California Department of Public Health Notification Level (1.0 µg/L).
    - There were four reported aerial applications of dimethoate to approximately 165 acres of tomatoes in the Grand Island Drain drainage in the month prior to the exceedance observed on August 20, 2013. One application was on August 10, 2013, and three applications were on August 14, 2013. It is likely that these aerial applications were the source of the exceedance. No toxicity tests were performed for these samples.
- The herbicide diuron was detected in one sample from Ulatis Creek. Diuron did not exceed the narrative objective (2 µg/L) in this sample.
- The insecticide L-cyhalothrin was detected in one sample from Cache Creek. This detection was below the reporting limit. There is currently no *ILRP* trigger limit or water quality objective for L-cyhalothrin.
- Malathion was detected in two samples from two sites (Colusa Basin Drain and Willow Slough). Detection of malathion is an exceedance of the Basin Plan prohibition.
    - There were 12 reported applications of malathion to approximately 865 acres of alfalfa in the Colusa Basin Drain drainage (Colusa County portion) in the month prior to the exceedance observed on March 20, 2013. There were no reported applications of malathion in the Yolo County portion in January, February, or March 2013. The detected concentration (0.0967 µg/L) is below concentrations expected to cause toxicity to sensitive invertebrates (0.5 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database). No toxicity tests were performed for this sample.
    - There were no reported applications of malathion in the Willow Slough drainage in the month prior to the exceedance observed on March 20, 2013, and it was concluded that the exceedance was not caused by an agricultural application. The detected concentration (0.0583 µg/L) is below concentrations expected to cause toxicity to sensitive invertebrates (0.5 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database). Toxicity tests for *Ceriodaphnia* and *Selenastrum* were performed with this sample, and no toxicity was observed.
- The insecticide tetrachlorvinphos was detected in one sample from Ulatis Creek. There is currently no *ILRP* trigger limit or water quality objective for tetrachlorvinphos.

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[14] Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT. U.S. Department of Health and Human Services. September 2002.

Table 22. Pesticides Detected in 2013 Coalition Monitoring

SiteID	SampleDate	AnalyteName		Result[(1)] (μg/L)	Trigger Limit[(2)]	Basis for Limit[(3)]
CCCPY	8/21/2013	Bifenthrin	DNQ	0.0003	NA	
LSNKR	9/18/2013	Bifenthrin	DNQ	0.0001	NA	
CCCPY	4/17/2013	Chlorpyrifos	DNQ	0.0002	0.025	BPA (acute)
GIDLR	3/20/2013	Chlorpyrifos[(4)]	=	0.0063	0.025	BPA (acute)
GIDLR	3/20/2013	Chlorpyrifos	=	0.0059	0.025	BPA (acute)
LSNKR	7/17/2013	Chlorpyrifos	DNQ	0.0018	0.025	BPA (acute)
LSNKR	8/20/2013	Chlorpyrifos	DNQ	0.0019	0.025	BPA (acute)
LSNKR	9/18/2013	Chlorpyrifos	DNQ	0.0007	0.025	BPA (acute)
PNCGR	**5/22/2013**	**Chlorpyrifos[(4)]**	**=**	**0.0432**	**0.025**	**BPA (acute)**
PNCGR	**5/22/2013**	**Chlorpyrifos**	**=**	**0.0368**	**0.025**	**BPA (acute)**
RARPP	5/21/2013	Chlorpyrifos	=	0.0026	0.025	BPA (acute)
STYHY	3/21/2013	Chlorpyrifos	DNQ	0.0003	0.025	BPA (acute)
UCBRD	3/20/2013	Chlorpyrifos	=	0.0141	0.025	BPA (acute)
UCBRD	4/16/2013	Chlorpyrifos	=	0.0055	0.025	BPA (acute)
UCBRD	5/21/2013	Chlorpyrifos	=	0.0109	0.025	BPA (acute)
GIDLR	**5/21/2013**	**DDD(p,p) [(5)]**	**DNQ**	**0.0018**	**0.00083**	**CTR**
GIDLR	**8/20/2013**	**DDD(p,p) [(5)]**	**DNQ**	**0.0016**	**0.00083**	**CTR**
COONH	**5/23/2013**	**DDE(p,p) [(5)]**	**DNQ**	**0.003**	**0.00059**	**CTR**
COONH	**8/22/2013**	**DDE(p,p) [(5)]**	**DNQ**	**0.0033**	**0.00059**	**CTR**
GIDLR	**5/21/2013**	**DDE(p,p) [(5)]**	**DNQ**	**0.0028**	**0.00059**	**CTR**
GIDLR	**8/20/2013**	**DDE(p,p) [(5)]**	**DNQ**	**0.0015**	**0.00059**	**CTR**
COLDR	2/19/2013	Diazinon[(4)]	=	0.0195	0.16	BPA (acute)
COLDR	2/19/2013	Diazinon	=	0.0241	0.16	BPA (acute)
UCBRD	7/16/2013	Diazinon	=	0.0061	0.16	BPA (acute)
GIDLR	3/20/2013	Dimethoate[(4)]	=	0.0133	1.0	CDPH Notification Level
GIDLR	**8/20/2013**	**Dimethoate**	**=**	**1.0067**	**1.0**	**CDPH Notification Level**
UCBRD	12/11/2012	Diuron	DNQ	0.32	2	USEPA Health Advisory
CCCPY	8/21/2013	L-Cyhalothrin	DNQ	0.0003	NA	
COLDR	**3/20/2013**	**Malathion**	**=**	**0.0967**	**ND[(6)]**	**BP**
WLSPL	**3/20/2013**	**Malathion**	**=**	**0.0583**	**ND[(6)]**	**BP**
UCBRD	6/18/2013	Tetrachlorvinphos	=	0.0219	NA	

BOLD = Exceedance

1. "DNQ" (Detected Not Quantified) indicates that the detected value was less than the quantitation or reporting limit (QL).
2. Water Quality Objective or Narrative Interpretation Limits for *ILRP*. "NA" if no *ILRP* limit established.
3. Water Quality Objective Basis: BP = Central Valley Basin Plan; BPA = Basin Plan Amendment; Cal/EPA = Cal/EPA Cancer Potency Factor; CDPH Notification Level = Notification levels (formerly called "action levels") are published by the California Department of Public Health (CDPH) for chemicals for which there is no drinking water MCL; CTR = California Toxics Rule; Narrative = unadopted limits used to interpret Basin Plan narrative objectives by the Central Valley Regional Board; USEPA Health Advisory = Drinking water health advisory.
4. Field duplicate sample
5. Detections of the analyte (i.e., above the MDL) that are below the limit of quantitation (QL) are qualified as Detected, Not Quantified or DNQ. Since the MDL for this constituent is greater than the *ILRP* trigger limit, all detections (including DNQ values) are exceedances.
5. The Basin Plan states: "…*discharge is prohibited unless the discharger is following a management practice approved by the Board*." This has been interpreted as an *ILRP* trigger limit of ND (*Not Detected*). The Basin Plan performance goal for malathion is 0.1 μg/L.

Pesticides Detected in Sediment in Coalition Monitoring

All detected pesticide concentrations for sediment chemistry analyses are included in **Table 23**. There are currently no *ILRP* trigger limits or adopted sediment quality objectives for pesticides in sediment.

- Bifenthrin was detected in eight sediment samples from multiple sites at Z-Drain. With one exception (8.6 ng/g dw on April 16, 2013), bifenthrin concentrations detected in the Z-drain samples did not appear to have been elevated sufficiently to cause or contribute significantly to sediment toxicity. The majority of the detected pyrethroid concentration in the ZDDIX sample was bifenthrin. Bifenthrin contributed 1.451 TUs of the total 1.518 TUs estimated for the ZDDIX sample and was likely primarily responsible for the *Hyalella* toxicity observed in the April 2013 sample (see *Toxicity Exceedances in Coalition Monitoring*).
- Chlorpyrifos was detected in nine sediment samples from multiple sites at Z-Drain and probably did not contribute significantly to the sediment toxicity observed in the April 2013 sample based on detected concentrations and known toxicity thresholds for *Hyalella*. Chlorpyrifos contributed an estimated 0.01 TUs at ZDDIX and 0.051 TUs at ZDINF (see *Toxicity Exceedances in Coalition Monitoring*).
- Cyfluthrin was detected in two sediment samples from two sites at Z-Drain and probably did not cause or contribute to sediment toxicity in either sample, based on detected concentrations and known toxicity thresholds for *Hyalella*. Neither of these samples were tested for toxicity. Cyfluthrin contributed 0.046 TUs of the total 0.195 TUs estimated for the April 2013 ZDINF sample (see *Toxicity Exceedances in Coalition Monitoring*). Cyfluthrin contributed 0.015 TUs of the total 0.338 TUs estimated for the August 2013 ZDTHR sample.
- Esfenvalerate/Fenvalerate was detected in two sediment samples from two sites at Z-Drain and likely contributed to the sediment toxicity observed in the April 2013 sample based on detected concentrations and known toxicity thresholds for *Hyalella*.

  Esfenvalerate/Fenvalerate contributed 0.026 TUs of the total 1.518 TUs estimated for the April 2013 ZDDIX sample and likely contributed to the *Hyalella* toxicity observed in the sample (see *Toxicity Exceedances in Coalition Monitoring*).
- L-Cyhalothrin was detected in nine sediment samples from multiple sites at Z-Drain. All but one value were below the reporting limit. L-Cyhalothrin likely contributed to the sediment toxicity observed in the April 2013 ZDDIX sample based on detected concentrations and known toxicity thresholds for *Hyalella* (see *Toxicity Exceedances in Coalition Monitoring*). Although the majority of the detected pyrethroid concentration in the April 2013 ZDINF sample was L-cyhalothrin (0.069 TUs of 0.195 total TUs), the detected concentrations of pyrethroids and chlorpyrifos were unlikely to have caused *Hyalella* toxicity.
- Permethrin was detected at levels below the reporting limit in two sediment samples from two sites at Z-Drain. Detected concentrations were unlikely to have contributed significantly to toxicity.

Table 23. Pesticides Detected in Sediment in 2013 Coalition Monitoring

Site ID	Date Sampled	Analyte	Result(1) (ng/g d.w.)	
ZDDIX	4/16/2013	Bifenthrin	=	8.6
ZDINF	4/16/2013	Bifenthrin	DNQ	0.12
ZDINF	4/16/2013	Bifenthrin	DNQ	0.15
ZDDIX	8/22/2013	Bifenthrin	=	1.1
ZDDIX	8/22/2013	Bifenthrin	=	0.92
ZDFIV	8/22/2013	Bifenthrin	DNQ	0.11
ZDFOR	8/22/2013	Bifenthrin	=	0.55
ZDINF	8/22/2013	Bifenthrin	DNQ	0.33
ZDDIX	4/16/2013	Chlorpyrifos	=	0.35
ZDINF	4/16/2013	Chlorpyrifos	=	1.2
ZDINF	4/16/2013	Chlorpyrifos	=	1.6
ZDDIX	8/22/2013	Chlorpyrifos	DNQ	0.25
ZDDIX	8/22/2013	Chlorpyrifos	DNQ	0.35
ZDFIV	8/22/2013	Chlorpyrifos	DNQ	0.25
ZDFOR	8/22/2013	Chlorpyrifos	=	0.44
ZDINF	8/22/2013	Chlorpyrifos	DNQ	0.19
ZDTHR	8/22/2013	Chlorpyrifos	=	1.7
ZDINF	4/16/2013	Cyfluthrin	=	0.4
ZDTHR	8/22/2013	Cyfluthrin	DNQ	0.15
ZDDIX	4/16/2013	Esfenvalerate/Fenvalerate	=	0.45
ZDTHR	8/22/2013	Esfenvalerate/Fenvalerate	=	1.1
ZDDIX	4/16/2013	L-Cyhalothrin	DNQ	0.16
ZDINF	4/16/2013	L-Cyhalothrin	DNQ	0.22
ZDINF	4/16/2013	L-Cyhalothrin	DNQ	0.25
ZDDIX	8/22/2013	L-Cyhalothrin	DNQ	0.24
ZDDIX	8/22/2013	L-Cyhalothrin	DNQ	0.27
ZDFIV	8/22/2013	L-Cyhalothrin	DNQ	0.067
ZDFOR	8/22/2013	L-Cyhalothrin	DNQ	0.24
ZDTHR	8/22/2013	L-Cyhalothrin	=	1
ZDTWO	8/22/2013	L-Cyhalothrin	DNQ	0.1
ZDDIX	8/22/2013	Permethrin	DNQ	0.14
ZDFIV	8/22/2013	Permethrin	DNQ	0.15

Note:

1. "DNQ" (Detected Not Quantified) indicates that the detected value was greater than the method detection limit (MDL) but less than the quantitation or reporting limit (QL).

Other Coalition-Monitored Water Quality Parameters

Exceedances of adopted Basin Plan objectives, CTR criteria, or *ILRP* trigger limits were observed for conductivity, dissolved oxygen, *E. coli*, nutrients (nitrate + nitrite as N), pH, and trace metals during 2013 Coalition monitoring (**Table 24**).

Conductivity

Conductivity was monitored in 252 samples from 39 Coalition sites. There were a total of 50 conductivity exceedances in samples collected from 17 different sites. Conductivity exceeded unadopted UN Agricultural Goal (700 µS/cm) in a total of 50 samples (including one field duplicate) and also exceeded the California recommended 2˚ MCL (900 µS/cm) for drinking water in 29 of the 50 samples. Eleven of the exceedances were observed at Ulatis Creek (UCBRD), six were observed at Willow Slough (WLSPL), and five were observed at both McGaugh Slough (MGSLU) and Freshwater Creek (FRSHC).

Dissolved Oxygen

During 2013 Coalition monitoring, dissolved oxygen was measured in 252 samples from 39 sites. Dissolved oxygen concentrations were below the Basin Plan lower limit of 5.0 mg/L for waterbodies with a WARM designated beneficial use in 13 samples from five sites (including one field duplicate) and below the Basin Plan lower limit of 7.0 mg/L for waterbodies with a COLD designated beneficial use in an additional 30 samples (including two field duplicates) from 10 sites.

Dissolved oxygen exceedances were caused primarily by low flows, stagnant conditions, or extensive submerged aquatic vegetation in some cases. The low flows and stagnant conditions have the potential to increase diurnal variability or limit oxygen production by instream algae and also to trap organic particulates that contribute to instream oxygen consumption.

E. coli Bacteria

E. coli bacteria were monitored in 169 samples, including 15 field duplicate samples, from 17 sites. *E. coli* results exceeded the single sample maximum objective (235 MPN/100mL) in 33 samples (including one field duplicate) from 11 different Coalition locations. The Basin Plan objectives are intended to protect contact recreational uses where ingestion of water is probable (e.g., swimming). Agricultural lands commonly support a large variety (and very large numbers seasonally) of birds and other wildlife. These avian and wildlife resources are known to be significant sources of *E. coli* and other bacteria in agricultural runoff and irrigation return flows. Other potential sources of *E. coli* include, but are not limited to, cattle, horses, septic systems, treated wastewater, and urban runoff.

Nutrients

Nutrients monitored during 2013 Coalition monitoring included nitrate + nitrite as N and total phosphorus. Nutrients were monitored in 348 samples, including 28 field duplicate samples, from 18 different Coalition sites. Nitrate as N results exceeded the Basin Plan objective (10 mg/L) in two samples from two sites, McGaugh Slough (MGSLU) and Ulatis Creek (UCBRD). There are no applicable water quality objectives (adopted or unadopted) for total phosphorus.

pH

During 2013 Coalition monitoring, pH was measured in 252 samples from 39 Coalition sites. pH exceeded the Basin Plan maximum of 8.5 standard pH units (-log[H+]) in 10 Coalition samples collected from eight different sites and exceeded the Basin Plan minimum of 6.5 pH units in one Coalition sample (a field duplicate) at one site, Colusa Basin Drain (COLDR).

The Basin Plan limit for pH is intended to be assessed based on "…*an appropriate averaging period that will support beneficial uses*" (CVRWQCB 1995). This parameter typically exhibits significant natural diurnal variation over 24 hours in natural waters with daily fluctuations controlled principally by photosynthesis, rate of respiration, and buffering capacity of the water. These processes are controlled by light and nutrient availability, concentrations of organic matter, and temperature. These factors combine to cause increasing pH during daylight hours and decreasing pH at night. Diurnal variations in winter are typically smaller because less light is available and there are lower temperatures and higher flows. Irrigation return flows may influence this variation primarily by increasing or decreasing in-stream temperatures or by increasing available nutrients or organic matter.

Most pH exceedances occurred between April and July, during the irrigation season, although four occurred in January and February. The reason for these pH exceedances was not immediately obvious or easily determined. In most cases, the marginal pH exceedances were likely due primarily to in-stream algal respiration, caused in part by low flows or ponded and stagnant conditions.

Trace Metals

Trace metals monitored during 2013 Coalition monitoring included both unfiltered metals (total arsenic, boron, and lead) and filtered metals (dissolved lead). Total trace metals were monitored in 30 samples (including 14 field duplicates) from four Coalition sites, and dissolved lead was monitored in two samples from one Coalition site.

Arsenic

Arsenic was monitored in eight samples (including four field duplicates) from one Coalition site (Grand Island Drain). Three samples for Grand Island Drain, including one field duplicate, exceeded the Basin Plan objective (10 µg/L).

There are both legacy and a few current sources of arsenic. There is very little remaining agricultural use of arsenic-based pesticide products (based on review of DPR's PUR data), and arsenic has only a few potentially significant sources: (1) natural background from arsenic in the soils, and (2) arsenic remaining from legacy lead arsenate use in orchards, (3) arsenic used in various landscape maintenance and structural pest control applications (non-agriculture), and (4) arsenic used in wood preservatives. One possible source is the wooden bridge structure just upstream of the GIDLR sampling site, if arsenic-based preservatives were used in the wood. A final, but somewhat unlikely, source is an arsenic-based additive that may still be used for chicken feed[15] and which can potentially make its way through the chicken and into agricultural fields and runoff if the poultry litter is used on the field.

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[15] http://water.usgs.gov/owq/AFO/proceedings/afo/pdf/Wershaw.pdf

Boron

Boron was monitored in 14 samples (including six field duplicates) from two different Coalition sites. Eleven samples (including four field duplicates) at two sites (Tule Canal, Willow Slough) exceeded the *ILRP* trigger limit (700 µg/L, based on Ayers and Westcott).

Boron is a naturally-occurring mineral that is not applied by agriculture, but it is elevated in some irrigation supplies (especially groundwater), and soils and concentrations may be elevated through consumptive use of irrigation water. It is known to be naturally elevated in the groundwater and major tributaries supplying irrigation water in the Willow Slough drainage.

Table 24. Other Physical, Chemical, and Microbiological Parameters Observed to Exceed Numeric Objectives in 2013 Coalition Monitoring

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgt Plan(3)
GIDLR	1/22/2013	Arsenic	µg/L	11	10	1° MCL	Active
GIDLR	1/22/2013	Arsenic(6)	µg/L	11	10	1° MCL	Active
GIDLR	8/20/2013	Arsenic	µg/L	14	10	1° MCL	Active
TCHWY	2/19/2013	Boron	µg/L	820	700	Narrative	Active
TCHWY	2/19/2013	Boron(6)	µg/L	830	700	Narrative	Active
TCHWY	6/18/2013	Boron	µg/L	1100	700	Narrative	Active
TCHWY	6/18/2013	Boron(6)	µg/L	1100	700	Narrative	Active
TCHWY	8/20/2013	Boron	µg/L	930	700	Narrative	Active
WLSPL	1/22/2013	Boron	µg/L	1700	700	Narrative	Active
WLSPL	1/22/2013	Boron(6)	µg/L	1800	700	Narrative	Active
WLSPL	2/19/2013	Boron	µg/L	2300	700	Narrative	Active
WLSPL	3/20/2013	Boron	µg/L	2000	700	Narrative	Active
WLSPL	3/20/2013	Boron(6)	µg/L	2000	700	Narrative	Active
WLSPL	4/17/2013	Boron	µg/L	1600	700	Narrative	Active
CCCPY	2/20/2013	Conductivity	µS/cm	880	900, 700(4)	Narrative	Active
COLDR	1/22/2013	Conductivity	µS/cm	793	900, 700(4)	Narrative	Active
COLDR	2/19/2013	Conductivity	µS/cm	1014	900, 700(4)	Narrative	Active
COLDR	5/28/2013	Conductivity	µS/cm	735	900, 700(4)	Narrative	Active
COLDR	5/28/2013	Conductivity(6)	µS/cm	734	900, 700(4)	Narrative	Active
FRSHC	11/14/2012	Conductivity	µS/cm	854	900, 700(4)	Narrative	Active
FRSHC	11/14/2012	Conductivity	µS/cm	854	900, 700(4)	Narrative	Active
FRSHC	1/23/2013	Conductivity	µS/cm	889	900, 700(4)	Narrative	Active
FRSHC	2/20/2013	Conductivity	µS/cm	937	900, 700(4)	Narrative	Active
FRSHC	3/20/2013	Conductivity	µS/cm	713	900, 700(4)	Narrative	Active
GIDLR	12/11/2012	Conductivity	µS/cm	759	900, 700(4)	Narrative	Active
GIDLR	1/22/2013	Conductivity	µS/cm	712	900, 700(4)	Narrative	Active
GILSL	1/22/2013	Conductivity	µS/cm	982	900, 700(4)	Narrative	Active
GILSL	4/16/2013	Conductivity	µS/cm	829	900, 700(4)	Narrative	Active
LRLNC	2/20/2013	Conductivity	µS/cm	1055	900, 700(4)	Narrative	Active
MGSLU	2/20/2013	Conductivity	µS/cm	1001	900, 700(4)	Narrative	Active
MGSLU	3/21/2013	Conductivity	µS/cm	782	900, 700(4)	Narrative	Active
MGSLU	4/17/2013	Conductivity	µS/cm	1009	900, 700(4)	Narrative	Active
MGSLU	5/22/2013	Conductivity	µS/cm	1077	900, 700(4)	Narrative	Active
MGSLU	6/19/2013	Conductivity	µS/cm	1195	900, 700(4)	Narrative	Active
RARPP	2/19/2013	Conductivity	µS/cm	834	900, 700(4)	Narrative	Active
SCCMR	2/20/2013	Conductivity	µS/cm	925	900, 700(4)	Narrative	Active
SSLIB	2/19/2013	Conductivity	µS/cm	767	900, 700(4)	Narrative	Active
SSLIB	4/16/2013	Conductivity	µS/cm	714	900, 700(4)	Narrative	Active
TCHWY	2/19/2013	Conductivity	µS/cm	990	900, 700(4)	Narrative	Active
TCHWY	4/16/2013	Conductivity	µS/cm	723	900, 700(4)	Narrative	Active

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit[1]	Basis for Limit[2]	Mgt Plan[3]
TCHWY	6/18/2013	Conductivity	µS/cm	963	900, 700[4]	Narrative	Active
TCHWY	8/20/2013	Conductivity	µS/cm	829	900, 700[4]	Narrative	Active
UCBRD	11/13/2012	Conductivity	µS/cm	1120	900, 700[4]	Narrative	Active
UCBRD	11/13/2012	Conductivity	µS/cm	1120	900, 700[4]	Narrative	Active
UCBRD	12/11/2012	Conductivity	µS/cm	1054	900, 700[4]	Narrative	Active
UCBRD	1/22/2013	Conductivity	µS/cm	1056	900, 700[4]	Narrative	Active
UCBRD	2/19/2013	Conductivity	µS/cm	1029	900, 700[4]	Narrative	Active
UCBRD	4/16/2013	Conductivity	µS/cm	1521	900, 700[4]	Narrative	Active
UCBRD	5/21/2013	Conductivity	µS/cm	1431	900, 700[4]	Narrative	Active
UCBRD	6/18/2013	Conductivity	µS/cm	1180	900, 700[4]	Narrative	Active
UCBRD	7/16/2013	Conductivity	µS/cm	1084	900, 700[4]	Narrative	Active
UCBRD	8/20/2013	Conductivity	µS/cm	853	900, 700[4]	Narrative	Active
UCBRD	9/17/2013	Conductivity	µS/cm	1105	900, 700[4]	Narrative	Active
WLSPL	11/13/2012	Conductivity	µS/cm	1266	900, 700[4]	Narrative	Active
WLSPL	11/13/2012	Conductivity	µS/cm	1266	900, 700[4]	Narrative	Active
WLSPL	1/22/2013	Conductivity	µS/cm	988	900, 700[4]	Narrative	Active
WLSPL	2/19/2013	Conductivity	µS/cm	1138	900, 700[4]	Narrative	Active
WLSPL	3/21/2013	Conductivity	µS/cm	1032	900, 700[4]	Narrative	Active
WLSPL	7/18/2013	Conductivity	µS/cm	1713	900, 700[4]	Narrative	Active
ZDDIX	2/19/2013	Conductivity	µS/cm	1042	900, 700[4]	Narrative	Active
ZDDIX	6/18/2013	Conductivity	µS/cm	818	900, 700[4]	Narrative	Active
ZDFOR	8/22/2013	Conductivity	µS/cm	744	900, 700[4]	Narrative	Active
ZDTHR	8/22/2013	Conductivity	µS/cm	735	900, 700[4]	Narrative	Active
ZDTWO	8/22/2013	Conductivity	µS/cm	1379	900, 700[4]	Narrative	Active
BTTSL	10/17/2012	Dissolved Oxygen	mgL	6.21	7	BP [SSO COLD]	Active
BTTSL	4/30/2013	Dissolved Oxygen	mg/L	5.57	7	BP [SSO COLD]	Active
BTTSL	4/30/2013	Dissolved Oxygen[6]	mg/L	5.64	7	BP [SSO COLD]	Active
BTTSL	6/25/2013	Dissolved Oxygen	mg/L	6.18	7	BP [SSO COLD]	Active
BTTSL	8/27/2013	Dissolved Oxygen	mg/L	5.66	7	BP [SSO COLD]	Active
CCBRW	3/20/2013	Dissolved Oxygen	µS/cm	5.85	7	BP [SSO COLD]	Active
CCSTR	1/24/2013	Dissolved Oxygen	mg/L	5.38	7	BP [SSO COLD]	Active
CCSTR	3/20/2013	Dissolved Oxygen	µS/cm	3.46	7	BP [SSO COLD]	Active
CCSTR	5/23/2013	Dissolved Oxygen	mg/L	4.75	7	BP [SSO COLD]	Active
CCSTR	7/16/2013	Dissolved Oxygen	mg/L	5.30	7	BP [SSO COLD]	Active
CCSTR	8/21/2013	Dissolved Oxygen	mg/L	5.95	7	BP [SSO COLD]	Active
COLDR	5/28/2013	Dissolved Oxygen	mg/L	5.59	7	BP [SSO COLD]	Active
COLDR	6/25/2013	Dissolved Oxygen	mg/L	6.18	7	BP [SSO COLD]	Active
COLDR	7/30/2013	Dissolved Oxygen	mg/L	4.84	7	BP [SSO COLD]	Active
COLDR	7/30/2013	Dissolved Oxygen[6]	mg/L	4.76	7	BP [SSO COLD]	Active
COLDR	8/27/2013	Dissolved Oxygen	mg/L	6.05	7	BP [SSO COLD]	Active
COYTR	10/18/2012	Dissolved Oxygen	mg/L	3.5	7	BP [SSO COLD]	Active
COYTR	4/17/2013	Dissolved Oxygen	mg/L	6.68	7	BP [SSO COLD]	Active

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit[1]	Basis for Limit[2]	Mgt Plan[3]
COYTR	6/19/2013	Dissolved Oxygen	mg/L	3.20	7	BP [SSO COLD]	Active
COYTR	8/21/2013	Dissolved Oxygen	mg/L	3.20	7	BP [SSO COLD]	Active
GIDLR	10/16/2012	Dissolved Oxygen	mg/L	4.24	5	BP [SSO WARM]	Active
GIDLR	6/18/2013	Dissolved Oxygen	mg/L	4.00	5	BP [SSO WARM]	Active
GILSL	5/21/2013	Dissolved Oxygen	mg/L	3.16	5	BP [SSO WARM]	Active
GILSL	7/17/2013	Dissolved Oxygen	mg/L	2.26	5	BP [SSO WARM]	Active
GILSL	8/20/2013	Dissolved Oxygen	mg/L	1.20	5	BP [SSO WARM]	Active
LAGAM	6/18/2013	Dissolved Oxygen	mg/L	3.00	7	BP [SSO COLD]	Active
LAGAM	8/20/2013	Dissolved Oxygen	mg/L	3.40	7	BP [SSO COLD]	Active
LHNCT	9/18/2013	Dissolved Oxygen	mg/L	3.39	7	BP [SSO COLD]	Active
MDLCR	8/21/2013	Dissolved Oxygen	mg/L	6.60	7	BP [SSO COLD]	No
MGSLU	5/22/2013	Dissolved Oxygen	mg/L	3.3	7	BP [SSO COLD]	Active
MGSLU	6/19/2013	Dissolved Oxygen	mg/L	2.51	7	BP [SSO COLD]	Active
PNCGR	10/18/2012	Dissolved Oxygen	mgL	0.99	7	BP [SSO COLD]	Active
PNCGR	11/15/2012	Dissolved Oxygen	mgL	4.7	7	BP [SSO COLD]	Active
PNCGR	1/23/2013	Dissolved Oxygen	mg/L	5.38	7	BP [SSO COLD]	Active
PNCGR	4/17/2013	Dissolved Oxygen	mg/L	6.6	7	BP [SSO COLD]	Active
SSKNK	6/25/2013	Dissolved Oxygen	mg/L	6.18	5	BP [SSO WARM]	Active
SSKNK	7/30/2013	Dissolved Oxygen	mg/L	4.82	5	BP [SSO WARM]	Active
SSKNK	7/30/2013	Dissolved Oxygen[6]	mg/L	4.71	5	BP [SSO WARM]	Active
UCBRD	9/17/2013	Dissolved Oxygen	mg/L	4.44	5	BP [SSO WARM]	Active
WLKCH	11/15/2012	Dissolved Oxygen	mg/L	3.97	5	BP [SSO WARM]	Active
WLKCH	5/22/2013	Dissolved Oxygen	mg/L	4.97	5	BP [SSO WARM]	Active
WLKCH	6/19/2013	Dissolved Oxygen	mg/L	4.75	5	BP [SSO WARM]	Active
WLKCH	9/18/2013	Dissolved Oxygen	mg/L	3.65	5	BP [SSO WARM]	Active
ACACR	10/17/2012	*E. coli*	MPN/100mL	600	235	BP	Suspended
ACACR	4/17/2013	*E. coli*	MPN/100mL	440	235	BP	Suspended
ACACR	5/22/2013	*E. coli*	MPN/100mL	816.4	235	BP	Suspended
ACACR	6/19/2013	*E. coli*	MPN/100mL	770.1	235	BP	Suspended
ACACR	7/18/2013	*E. coli*[6]	MPN/100mL	1413.6	235	BP	Suspended
ACACR	7/18/2013	*E. coli*	MPN/100mL	1203.3	235	BP	Suspended
ACACR	8/21/2013	*E. coli*	MPN/100mL	290.9	235	BP	Suspended
ACACR	12/13/2013	*E. coli*	MPN/100mL	250	235	BP	Suspended
CCBRW	7/16/2013	*E. coli*	MPN/100mL	2419.6	235	BP	Completed
CCBRW	9/17/2013	*E. coli*	MPN/100mL	235.9	235	BP	Completed
CRTWN	12/11/2013	*E. coli*	MPN/100mL	420	235	BP	Suspended
FRSHC	11/14/2012	*E. coli*	MPN/100mL	290	235	BP	Suspended
FRSHC	2/20/2013	*E. coli*	MPN/100mL	240	235	BP	Suspended
FRSHC	4/16/2013	*E. coli*	MPN/100mL	370	235	BP	Suspended
FRSHC	8/20/2013	*E. coli*	MPN/100mL	307.6	235	BP	Suspended
FRSHC	12/12/2013	*E. coli*	MPN/100mL	240	235	BP	Suspended
GIDLR	1/22/2013	*E. coli*	MPN/100mL	340	235	BP	Suspended

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgt Plan(3)
GIDLR	2/19/2013	*E. coli*	MPN/100mL	330	235	BP	Suspended
LHNCT	6/18/2012	*E. coli*	MPN/100mL	238.2	235	BP	Suspended
LHNCT	10/17/2012	*E. coli*	MPN/100mL	1100	235	BP	Suspended
LHNCT	8/20/2013	*E. coli*	MPN/100mL	410.6	235	BP	Suspended
LSNKR	10/17/2012	*E. coli*	MPN/100mL	820	235	BP	Suspended
LSNKR	9/18/2013	*E. coli*	MPN/100mL	770.1	235	BP	Suspended
PNCGR	10/18/2012	*E. coli*	MPN/100mL	2400	235	BP	Suspended
UCBRD	3/20/2013	*E. coli*	MPN/100mL	920	235	BP	Suspended
WLKCH	2/20/2013	*E. coli*	MPN/100mL	390	235	BP	Suspended
WLKCH	3/21/2013	*E. coli*	MPN/100mL	490	235	BP	Suspended
WLKCH	4/17/2013	*E. coli*	MPN/100mL	580	235	BP	Suspended
WLKCH	5/22/2013	*E. coli*	MPN/100mL	648.8	235	BP	Suspended
WLKCH	8/21/2013	*E. coli*	MPN/100mL	410.6	235	BP	Suspended
WLSPL	11/13/2012	*E. coli*	MPN/100mL	>2400	235	BP	Suspended
WLSPL	3/20/2013	*E. coli*	MPN/100mL	650	235	BP	Suspended
WLSPL	8/21/2013	*E. coli*	MPN/100mL	2419.6	235	BP	Suspended
MGSLU	2/20/2013	Nitrate+Nitrite, as N	mg/L	11	10	1˚ MCL(5)	No
UCBRD	11/13/2012	Nitrate+Nitrite, as N	mg/L	11	10	1˚ MCL(5)	Completed
CCCPY	6/19/2013	pH	-log[H+]	8.66	6.5-8.5	BP	No
COLDR	5/28/2013	pH(6)	-log[H+]	5.48	6.5-8.5	BP	No
FRRRB	6/26/2013	pH	-log[H+]	9.06	6.5-8.5	BP	Active
FRRRB	7/25/2013	pH	-log[H+]	8.82	6.5-8.5	BP	Active
GILSL	1/22/2013	pH	-log[H+]	8.68	6.5-8.5	BP	Active
GILSL	2/21/2013	pH	-log[H+]	8.76	6.5-8.5	BP	Active
LRLNC	4/16/2013	pH	-log[H+]	8.74	6.5-8.5	BP	No
MGSLU	1/23/2013	pH	-log[H+]	8.57	6.5-8.5	BP	No
STYHY	4/17/2013	pH	-log[H+]	8.54	6.5-8.5	BP	Active
WLKCH	4/17/2013	pH	-log[H+]	8.71	6.5-8.5	BP	No
WLSPL	1/22/2013	pH	-log[H+]	8.71	6.5-8.5	BP	Active

Notes:

1. Water Quality Objective or Narrative Interpretation Limits for *ILRP*.
2. Water Quality Objective Basis: BP = Central Valley Basin Plan; BPA = Basin Plan Amendment; CTR = California Toxics Rule; Narrative = unadopted limits used to interpret Basin Plan narrative objectives by the Central Valley Regional Board.
3. Indicates whether sites and parameter are currently being addressed by an ongoing management plan, study, or TMDL
4. Conductivity exceeded the unadopted UN Agricultural Goal (700 µS/cm) and/or the California recommended 2˚ MCL (900 µS/cm) for drinking water.
5. California 1˚ MCL (10 mg/L as N) for drinking water.
6. Field duplicate

Management Practices and Actions Taken

RESPONSE TO EXCEEDANCES

To address specific water quality exceedances, the Coalition and its partners developed a Management Plan in 2008, subsequently approved by the Water Board. The Coalition also previously developed a *Landowner Outreach and Management Practices Implementation Communications Process for Monitoring Results (Management Practices Process)* to address exceedances. Implementation of the approved management plan is the primary mechanism for addressing exceedances observed in the Coalition's *ILRP* monitoring.

Management Plan Status Update

The Coalition submitted the most recent Management Plan Progress Report (MPPR) to the Water Board in April 2013. The MPPR that documents the status and progress toward Management Plan requirements for 2013 will be provided to the Water Board at the end of March 2014. Activities conducted in 2013 to implement the Coalition's Management Plan included addressing exceedances of objectives for registered pesticides, completion of source evaluations for pesticides and toxicity, development of management practice implementation goals, and monitoring required for toxicity and pesticide management plans and TMDLs.

Implementation completed specifically for registered pesticides and toxicity included review and evaluation of pesticide application data, identification of potential sources, and determination of likely agricultural sources. These evaluations were documented in Source Evaluation Reports for each water body and management plan element. For registered pesticides and identified causes of toxicity, surveys of Coalition members operating on high priority parcels were conducted to determine the degree of implementation of relevant management practices. These survey results have been used to establish goals for additional management practice implementation needed to address exceedances of Basin Plan water quality objectives and *ILRP* trigger limits.

LANDOWNER OUTREACH EFFORTS

The Coalition and its subwatersheds, working with the Coalition for Urban/Rural Environmental Stewardship (CURES), stand committed to working with the Water Board and its staff to implement the *Management Practices Process* and the Coalition's approved Management Plan to address water quality problems identified in the Sacramento Valley. The primary strategic approach taken by the Coalition is to notify and educate the subwatershed landowners, farm operators, and/or wetland managers about the cause(s) of toxicity and/or exceedance(s) of water quality standards. Notifications are focused on (but not limited to) growers who operate directly adjacent to or within close proximity to the waterway. The broader outreach program, which includes both grower meetings and the notifications distributed through direct mailings, encourages the adoption of BMPs and modification of the uses of specific farm and wetland inputs to prevent movement of constituents of concern into Sacramento Valley surface waters.

Targeted Outreach Efforts

The Coalition's targeted outreach approach is to focus on the growers with fields directly adjacent to or near the actual waterway of concern. To identify those landowners operating in high priority lands, the Coalition identifies the assessor parcels and subsequently the owners of agricultural operations nearest the water bodies of interest. From the list of assessor parcel numbers, the Coalition identifies its members and mails to them an advisory notice along with information on how to address the specific exceedances using BMPs. This same approach has been used to conduct management practice surveys in areas targeted by the Management Plan.

General Outreach Efforts

Highlights of outreach efforts conducted by the Coalition and its partners for specific subwatersheds during the monitoring period are summarized in an Excel table for each watershed in **Appendix F**. Available outreach materials are also included as attachments in **Appendix F**.

Conclusions and Recommendations

The Coalition submits this *2013 Annual Monitoring Report* (AMR) as required under the Water Board's Irrigated Lands Regulatory Program (*ILRP*). The AMR provides a detailed description of our monitoring results as part of our ongoing efforts to characterize irrigated agricultural and wetlands related water quality in the Sacramento River Basin.

To summarize, the results from the *ILRP* monitoring in 2013 continue to indicate that with few exceptions, there are no major water quality problems with agricultural and managed wetlands discharges in the Sacramento River Basin.

This AMR characterizes potential water quality impacts of agricultural drainage from a broad geographic area in the Sacramento Valley from October 2012 through September 2013. To date, a total of 91 Coalition storm and irrigation season events have been completed, with additional events collected by coordinating programs and for follow-up evaluations. For the period of record in this AMR (October 2012 through September 2013), samples were collected for 10 scheduled monthly events and 2 wet weather ("storm") events.

Pesticides were infrequently detected (~1.1% of pesticide results for 2013), and, when detected, rarely exceeded applicable objectives. Three registered pesticides (chlorpyrifos, dimethoate, and malathion) exceeded applicable water quality objectives or *ILRP* trigger limits in a total of five Coalition monitoring samples (including one field duplicate). In addition, two breakdown products of the legacy pesticide DDT exceeded applicable water quality objectives in a total of six samples from two sites.

Many of the pesticides specifically required to be monitored in the past by the *ILRP* have rarely been detected in Coalition water samples, including glyphosate, paraquat, and all of the pyrethroid pesticides. Glyphosate, one of the most widely used agricultural pesticides, has been detected in only seven samples to date and has never approached concentrations likely to cause toxicity to sensitive test species[16]. Over 98.5% of all pesticide analyses performed to date for the Coalition have been below detection. Coalition monitoring of pesticides for the *ILRP* for 2013 was conducted based on management plan requirements, and the reported pesticide use and relative toxicity risks for these pesticides in the subwatersheds. Similarly, the Coalition has conducted more focused monitoring of the *ILRP* required trace elements (arsenic, cadmium, lead, molybdenum, nickel, selenium, and zinc) informed by the Coalition's past monitoring results, which have demonstrated that most of these metals rarely approach or exceed objectives and are not likely to cause adverse impacts to aquatic life or human health in waters receiving agricultural runoff in the Coalition watershed. This more focused strategy for monitoring pesticides and trace metals was implemented in 2010 in accordance with the Coalition's 2009 MRP (Order No. R5-2009-0875, CVRWQCB 2009).

The majority of exceedances of adopted numeric objectives continue to consist of conductivity, dissolved oxygen, and *E. coli*. Agricultural runoff and irrigation return flows may contribute to exceedances of these objectives, but these parameters are largely controlled or significantly affected by natural processes and sources that are not controllable by agricultural management practices.

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[16] Monitoring of glyphosate was discontinued in 2010 on this basis, with Regional Water Board approval.

The Coalition has implemented the required elements of the *ILRP* since 2004. The Coalition developed a Watershed Evaluation Report (WER) that set the priorities for development and implementation of the initial Monitoring and Reporting Program Plan (MRPP). The Coalition successfully developed the MRPP, QAPP, and Management Plan as required by the *ILRP,* and these documents have been approved by the Water Board. Subsequent revisions requested by the Water Board and the Coalition have been incorporated into the Coalition's program and implemented through the Coalition's ongoing *ILRP* monitoring efforts. The Coalition also continues to adapt and improve elements of the monitoring program based on the knowledge gained through *ILRP* monitoring efforts.

The Coalition has implemented the approved monitoring program in coordination with its subwatershed partners, has initiated follow-up activities required to address observed exceedances, and continues to implement the approved Management Plan. Throughout this process, the Coalition has kept an open line of communication with the Water Board and has made every effort to fulfill the requirements of the *ILRP* in a cost-effective, scientifically defensible, and management-focused manner. This AMR is documentation of the success and continued progress of the Coalition in achieving these objectives.

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Appendices

The following appendices are available in electronic form on the CD provided.

Appendix A: Field Log Copies

Appendix B: Lab Reports and Chains-of-Custody

Appendix C: Tabulated Monitoring Results

Appendix D: Exceedance Reports

Appendix E: Site-Specific Drainage Maps

Appendix F: SVWQC Outreach Materials