SVWQC

March 1, 2012

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

RE: 2011 Annual Monitoring Report

Dear Ms. Creedon:

Attached is the Sacramento Valley Water Quality Coalition's (SVWQC) 2011 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 2011 monitoring have been approved by the Central Valley Regional Water Quality Control Board (Regional Board).

The AMR summarizes the sampling results and analysis, interpretation of the data, as well as documenting 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 2011 AMR, please contact me or Bruce Houdesheldt.

Sincerely,

David J. Guy
President
Northern California Water Association

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

MARCH 2012

SACRAMENTO VALLEY
WATER QUALITY COALITION

Monitoring and Reporting Program Plan

Annual Monitoring Report 2011

Prepared by:

LARRY WALKER ASSOCIATES

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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 Plan (MRPP) to meet 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). The scope of the MRPP and the sampling and analytical methods used in the Coalition and subwatershed 2011 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 MRPP 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 2011 monitoring effort 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. The Coalition is also coordinating with the California Rice Commission (CRC) under the December 2004 Coalition-CRC Memorandum of Understanding.

The parameters monitored by the Coalition to achieve these objectives are as specified in the *ILRP* and in subsequent amendments to the *ILRP* requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005). The following environmental monitoring elements are included in the Coalition's MRPP:

- 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 the 2011 Coalition monitoring effort are listed in **Table 2**.

A total of 24 regular sampling sites were monitored by the Coalition and coordinating subwatershed monitoring programs during 2011 (**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 the Coalition's 2011 monitoring are summarized in **Table 4**. This *Annual Monitoring Report 2011* (AMR) includes results for October 2010 through September 2011.

Sample collection and analysis has been performed by the following agencies and subcontractors. Pacific EcoRisk (Fairfield, California) conducts sampling and performs toxicity analyses for all sites except for the following:

- Kleinfelder (Sacramento, California) conducts sampling and perform toxicity analyses for the sites coordinated with the California Rice Commission (CRC);
- The Northeastern California Water Association conducts sampling for the Pit River subwatershed site;
- Napa County Resource Conservation District staff conducts sampling for the two Napa County sites in the Lake-Napa subwatershed (not sampled for 2011 Coalition Monitoring).
- Caltest Analytical Laboratory (Napa, California), Basic Lab (Redding, California), and Sierra Environmental Monitoring (Reno, Nevada) conduct all conventional and microbiological analyses; and
- CRG Marine Laboratories (Torrance, California), APPL (Fresno, California), and Physis Environmental Laboratories (Anaheim, California) conduct pesticide analyses.

MANAGEMENT PRACTICES AND ACTIONS TAKEN

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.

The Coalition submitted an annual Management Plan Progress Report (MPPR) to the Regional Water Board in April 2011 documenting the status and progress toward Management Plan requirements. Activities conducted in 2010-2011 to implement the Coalition's Management Plan included addressing exceedances of objectives for registered pesticides, completion of source evaluations for pesticides and toxicity, surveys for pathogen identification source evaluations, and monitoring required for toxicity and pesticide management plans and TMDLs.

Implementation completed specifically for registered pesticides 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 will be 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, working with the Coalition for Urban/Rural Environmental Stewardship (CURES), stand committed to working with the Regional 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.

CONCLUSIONS AND RECOMMENDATIONS

The Coalition submits this *2011 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 2011 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 2010 through September 2011. To date, a total of 67 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 2010 through September 2011), samples were collected for 10 scheduled monthly events and 2 storm events.

Pesticides were infrequently detected (~2.3% of 2011 pesticide results), and when detected, rarely exceeded applicable objectives. Three registered pesticides (chlorpyrifos, diazinon, malathion) exceeded applicable water quality objectives or *ILRP* trigger limits in a total of ten Coalition monitoring samples in 2011 (including 2 field duplicates).

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 Coalition samples to date, and has never approached concentrations likely to cause toxicity to sensitive test species. Over 98.6% of all pesticide analyses performed to date for the Coalition have been below detection. Based on these results, Coalition monitoring of pesticides for the *ILRP* for 2011 was conducted based on recent pesticide use and the relative toxicity risks for these pesticides in the subwatersheds. Similarly, the Coalition conducted more focused monitoring of most trace elements (arsenic, cadmium, lead, molybdenum, nickel, selenium, and zinc) based on the Coalition's past monitoring results, which have demonstrated that these metals typically do not 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[1]).

The majority of exceedances of adopted numeric objectives continue to consist of conductivity 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 continues to participate in the *ILRP* Technical Issues Committee (TIC) workgroups to develop procedures and guidelines for *ILRP* monitoring and evaluation of exceedances. The Coalition has been an active participant in the Water Board's stakeholder process to develop a Long-Term *ILRP*, and will coordinate with the Water Board in developing the Coalition WDR.

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 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 is continuing implementation of 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 and scientifically defensible manner. This annual monitoring report is documentation of the success and continued progress of the Coalition in achieving these objectives.

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[1] 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 Plan (MRPP). 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	7; 38
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	38
11. Electronic data submitted in a SWAMP comparable format	Submitted quarterly; Appendix C	CD
12. Sampling and analytical methods used	Sampling and Analytical Methods	14
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

ILRP Annual Report Requirement	Report Section Headings	Page
16. Summary of Quality Assurance Evaluation results (as identified in Attachment C for Precision, Accuracy and Completeness)	Monitoring Results	23
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	49; 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	72
21. Status update on preparation and implementation of all Management Plans and other special projects	Management Practices and Actions Taken	72
22. Conclusions and recommendations	Conclusions and Recommendations	74

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 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 MRPP 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 MRPP 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 to achieve these objectives are as specified in the *ILRP* and in subsequent amendments to the *ILRP* requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875). The following environmental monitoring elements are included in the Coalition's MRPP:

- Water column and sediment toxicity
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- Pesticides in water and sediment
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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, 2011

Analyte	Quantitation Limit	Reporting Unit
Physical Parameters		
Flow	NA	CFS (Ft^3/Sec)
pH	0.1 [(a)]	$-\log[H^+]$
Conductivity	0.1 [(a)]	μmhos/cm
Dissolved Oxygen	0.1 [(a)]	mg/L
Temperature	0.1 [(a)]	˚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
Pimephales, 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		
Carbamates	(b)	µg/L
Herbicides	(b)	µg/L
Organochlorine	(b)	µg/L
Organophosphorus	(b)	µg/L
Pyrethroids and chlorpyrifos	(b)	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
Molybdenum	1	µg/L
Selenium	1.0	µg/L
Nutrients		
Total Kjeldahl Nitrogen	0.1	mg/L
Phosphorus, total	0.1	mg/L
Soluble Orthophosphate	0.01	mg/L
Nitrate + Nitrite as N	0.1	mg/L
Ammonia as N	0.1	mg/L

Notes:
(a) Detection and reporting limits are not strictly defined. Value is required reporting precision.
(b) 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 twenty-one county watershed 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 for determinations regarding the presence of a water quality problems using a variety of analytical methods including water column and sediment toxicity testing as well 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) Though recognizably complex, 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 a revised MRPP responsive to the new ILRP MRP (ORDER NO. 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. There were no changes in monitoring objectives, but there were several modifications to monitoring strategy in the MRP. These included the following significant revisions in monitoring approach:

- Monitoring at sites in drainages representative of larger regions based on shared agricultural and geographic characteristics
- A three-year cycle of one year of Assessment monitoring for the broad suite of ILRP analytes and two years of Core monitoring of a reduced set of analytes.
- Customization of monitoring schedules and the analytes monitored based on the characteristics of individual subwatersheds.

Monitoring sites for 2011 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 14 of the representative monitoring sites and at 6 additional sites.

SAMPLING SITE LOCATIONS AND LAND USES

The water and sediment sites monitored by the Coalition in 2011 are listed in **Table 3**. All sites monitored in 2011 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, 2011

Subwatershed	Site Name	Latitude	Longitude	Implementing Agency	Site ID (Fig. 1)
ButteYubaSutter	Butte Slough at Pass Rd	39.1873	-121.90847	SVWQC	BTTSL
ButteYubaSutter	Gilsizer Slough at George Washington Rd	39.009	-121.6716	SVWQC	GILSL
ButteYubaSutter	Lower Honcut Creek at Hwy 70	39.30915	-121.59542	SVWQC	LHNCT
ButteYubaSutter	Lower Snake R. at Nuestro Rd	39.18531	-121.70358	SVWQC	LSNKR
ButteYubaSutter	Pine Creek at Nord Gianella Rd	39.78114	-121.98771	SVWQC	PNCGR
ButteYubaSutter	Sacramento Slough bridge near Karnak	38.785	-121.6533	SVWQC/CRC	SSKNK
ColusaGlenn	Colusa Basin Drain above KL	38.8121	-121.7741	SVWQC/CRC	COLDR
ColusaGlenn	Freshwater Creek at Gibson Rd	39.17664	-122.18915	SVWQC	FRSHC
ColusaGlenn	Rough and Ready Pumping Plant (RD 108)	38.86209	-121.7927	SVWQC	RARPP
ColusaGlenn	Stony Creek on Hwy 45 near Rd 24	39.71005	-122.004	SVWQC	STYHY
ColusaGlenn	Walker Creek near 99W and CR33	39.62423	-122.19652	SVWQC	WLKCH
Lake	Middle Creek u/s from Highway 20	39.17641	-122.91271	SVWQC	MDLCR
PitRiver	Pit River at Pittville	41.0454	-121.3317	NECWA	PRPIT
PNSSNS	Coon Creek at Brewer Rd	38.93399	-121.45184	SVWQC	CCBRW
PNSSNS	Coon Creek at Striplin Road	38.8661	-121.58	SVWQC	CCSTR
SacramentoAmador	Cosumnes River at Twin Cities Rd	38.29098	-121.38044	SVWQC	CRTWN
SacramentoAmador	Grand Island Drain near Leary Rd	38.2399	-121.5649	SVWQC	GIDLR
ShastaTehama	Anderson Creek at Ash Creek Rd	40.418	-122.2136	SVWQC	ACACR
Solano	Shag Slough at Liberty Island Bridge	38.30677	-121.69337	SVWQC	SSLIB
Solano	Ulatis Creek at Brown Rd[1]	38.307	-121.794	SVWQC	UCBRD
Solano	Z Drain – Dixon RCD[1]	38.45215	-121.6752	SVWQC	ZDDIX
UpperFeatherRiver	Middle Fork Feather River above Grizzly Cr	39.816	-120.426	UFRW	MFFGR
Yolo	Cache Creek at Capay Diversion Dam	38.7137	-122.085	SVWQC	CCCPY
Yolo	Willow Slough Bypass at Pole Line[1]	38.59015	-121.73058	SVWQC	WLSPL

Note:
1. Sediment chemistry monitoring was conducted at UCBRD, WLSPL, and ZDDIX.

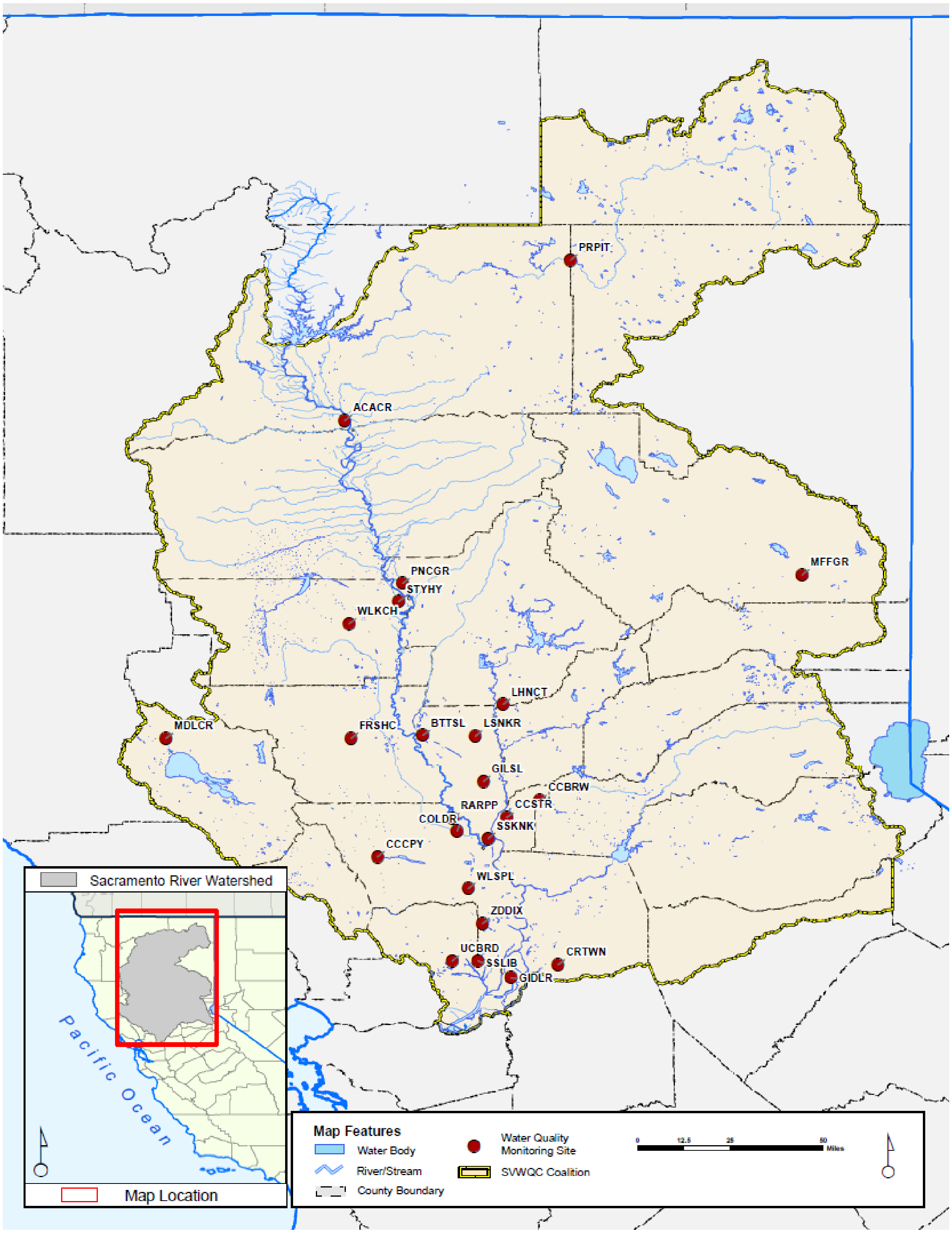

Figure 1. Coalition Monitoring Sites

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, grapes, Lower Honcut receives flows from North Honcut Creek and South Honcut Creek, which extend up into the foothills and include more pasture acreage.

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.

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.

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.

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.

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.

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.

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.

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.

Lake/Napa 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. Due to the ephemeral nature of the creek, sampling at this site is planned to be conducted three times per year: twice during the storm season, and once after commencement of the irrigation season.

Pit River Subwatershed

Pit River at Pittville Bridge (PRPIT)

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

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.

Coon Creek at Striplin Road (CCSTR)

This site captures drainage from the Middle and Lower Coon Creek drainage areas. 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 including 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.

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.

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.

Solano/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.

Shag Slough at Liberty Island Bridge (SSLIB)

Due to the access difficulties, Toe Drain was replaced with Shag Slough in late 2005. 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.

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.

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, and walnuts.

Z Drain (ZDDIX)

The Z-Drain is a major input 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.

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.

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 water trucks.

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 the Coalition's 2011 monitoring are summarized in **Table 4**. The Coalition's monitoring strategy for 2011 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. Coalition 2011 Monitoring Year: Planned Samples, October 2010 – September 2011

Subwatershed and Site	Water Column Events	Sediment Events	Field Measures, Physical, Conventional	Nutrients	Pathogen Indicators	Trace Metals	OP Pesticides	Carbamates, urea pesticides	Chlorothalonil	Diflubenzuron	Dodine	Hexazinone	Metolachlor	Oxyfluorfen	Simazine	Legacy OCs	Ceriodaphnia Toxicity	Pimephales Toxicity	Selenastrum Toxicity	Hyallela Toxicity, Grain Size	Sediment Pyrethroids, Chlorpyrifos, TOC
ButteYubaSutter																					
Butte Slough at Pass Road	4	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	0
Gilsizer Sl. at George Washington Rd	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Honcut Creek at Hwy 70	12	2	12	12	12	7	5	4	0	4	0	1	1	6	3	2	9	9	7	2	0
Lower Snake R. at Nuestro Rd	12	2	12	12	12	7	5	4	0	4	0	1	1	6	3	2	9	9	7	2	0
Pine Creek at Nord Gianella Road	12	2	12	12	12	7	5	4	0	4	0	1	1	6	3	2	9	9	7	2	0
Sacramento Slough bridge near Karnak	10	2	12	10	12	7	5	4	0	4	0	1	1	6	3	2	9	9	7	2	0
ColusaGlenn																					
Colusa Basin Drain above KL	10	2	11	10	11	5	8	5	0	5	0	1	1	8	6	2	8	8	8	2	0
Freshwater Creek at Gibson Rd	10	2	11	10	11	5	8	5	0	5	0	1	1	8	6	2	8	8	8	2	0
Rough and Ready Pumping Plant	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stony Creek on Hwy 45 near Rd 24	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0
Walker Creek near 99W and CR33	10	2	11	10	11	5	8	5	0	5	0	1	1	8	6	2	8	8	8	2	0
Lake																					
Middle Creek u/s from Highway 20	8	2	8	8	8	6	0	0	0	0	3	0	0	6	0	2	3	3	6	2	0
PitRiver																					
Pit River at Pittville	8	2	8	8	7	4	4	1	0	1	0	0	0	0	0	2	4	4	5	2	0
PlacerNevadaSSutterNSacramento																					
Coon Creek at Brewer Road	11	2	11	8	11	4	8	0	0	0	0	0	0	0	0	0	5	5	8	2	0
Coon Creek at Striplin Road	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SacramentoAmador																					
Cosumnes River at Twin Cities Rd	9	2	9	9	12	6	8	4	0	4	0	1	1	3	2	2	7	7	4	2	0
Grand Island Drain near Leary Road	9	2	9	9	12	6	8	4	0	4	0	1	1	3	2	2	7	7	4	2	0

ShastaTehama																					
Anderson Creek at Ash Creek Road	10	2	10	10	12	3	9	0	1	0	0	0	0	6	0	2	9	9	7	2	0
Solano																					
Shag Slough at Liberty Island Bridge	11	2	11	11	11	6	7	2	0	2	0	2	3	5	2	2	7	7	7	2	0
Ulatis Creek at Brown Road	12	2	12	12	12	7	8	3	0	2	0	2	1	7	2	2	8	8	7	2	0
Z-Drain	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Yolo																					
Cache Creek at Capay Diversion Dam	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Willow Slough Bypass at Pole Line	11	2	11	11	11	6	7	3	0	2	0	2	3	5	3	2	7	7	7	2	2
UpperFeatherRiver																					
Middle Fk Feather R. above Grizzly Cr	5	0	5	5	5	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0

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 available for review and approval at each laboratory.

Toxicity Testing and Toxicity Identification Evaluations

Water quality samples were analyzed for toxicity to *Ceriodaphnia dubia*, *Pimephales promelas*, and *Selenastrum capricornutum*. 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* and *Pimephales* 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* and *Pimephales* were conducted as 96-hour static renewal tests, with renewal 48 hours after test initiation. If found to be necessary to control pathogen-related mortality for acute tests with *Pimephales,* test procedures may be modified as described in Geis *et al*. (2003). These modifications consist of using smaller test containers (30 mL), including only two fish per container, and increasing the number of replicates to ten.
- 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* and *Pimephales*) 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 (SVWQC 2010).

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 for Coalition Monitoring and Reporting Program

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)	Azinphos-methyl	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Chlorpyrifos	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Demeton-S	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Diazinon	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Dichlorvos	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Dimethoate	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Disulfoton	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Ethoprop	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Fenchlorphos	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Fenitrothion	Unfiltered	µg/L	0.01	0.1	
EPA 625(m)	Fensulfothion	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Fenthion	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Malathion	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Merphos	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Methamidophos	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Methidathion	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Mevinphos	Unfiltered	µg/L	0.01	0.02	(a)
EPA 625(m)	Naled	Unfiltered	µg/L	0.27	0.5	(a)
EPA 625(m)	Parathion, Methyl	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Parathion, Ethyl	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Phorate	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Phosmet	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Sulprofos	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Tetrachlorvinphos	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Tokuthion	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Trichloronate	Unfiltered	µg/L	0.005	0.01	
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)	Chlordane	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Dacthal	Unfiltered	µg/L	0.008	0.05	

Method	Analyte	Fraction	Units	MDL	QL	Note
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	
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	
EPA 625(m)	Toxaphene	Unfiltered	µg/L	0.01	0.05	
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	Bromacil	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	Chloroxuron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Chlorpropham	Unfiltered	µg/L	0.4	0.8	
EPA 8321	Diuron	Unfiltered	µg/L	0.2	0.4	
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	
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	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 8321	Oxamyl	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Propachlor	Unfiltered	µg/L	1.75	3.5	
EPA 8321	Propham	Unfiltered	µg/L	1.75	3.5	
EPA 8321	Propoxur	Unfiltered	µg/L	0.2	0.4	

Method	Analyte	Fraction	Units	MDL	QL	Note
EPA 8321	Siduron	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Tebuthiuron	Unfiltered	µg/L	0.2	0.4	
Pyrethroid Pesticides						
EPA 625(m)	Bifenthrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Cyfluthrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Cypermethrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Deltamethrin/Tralomethrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Esfenvalerate/Fenvalerate	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Lambda-Cyhalothrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Permethrin	Unfiltered	µg/L	.005	.025	
EPA 625(m)	Tetramethrin	Unfiltered	µg/L	.005	.025	
Other Herbicides						
EPA 549.2	Hexazinone	Unfiltered	µg/L	0.005	0.01	(a)
EPA 625(m)	Metolachlor	Unfiltered	µg/L	0.005	0.01	(a)
EPA 625(m)	Oxyfluorfen	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Simazine	Unfiltered	µg/L	0.005	0.01	
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	
EPA 200.8	Molybdenum	Unfiltered	µg/L	0.01	0.1	
EPA 200.8	Selenium	Unfiltered	µg/L	0.5	1	
Nutrients						
EPA 351.3; EPA 351.2	Total Kjeldahl Nitrogen	Unfiltered	mg/L	0.07	0.1	
EPA 353.2	Nitrate + Nitrite as N	Unfiltered	mg/L	0.02	0.05	
EPA 350.1; EPA 350.2	Ammonia as N	Unfiltered	mg/L	0.02	0.1	
EPA 365.2; SM4500-P E	Soluble Orthophosphate	Filtered	mg/L	0.01	0.05	
EPA 365.2; SM4500-P E	Phosphorus, Total	Unfiltered	mg/L	0.02	0.05	

(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)	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)	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)	Lambda-Cyhalothrin	Total	ng/g d.w.	0.1	1
EPA 8270C(m)	Permethrin	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 2011 (October 2010 through September 2011).

SUMMARY OF SAMPLE EVENTS CONDUCTED

This report presents monitoring results from twelve Coalition sampling events (Events 056-067), as well as data for events conducted by coordinating Subwatershed monitoring programs between October 2010 and September 2011. Samples collected for all of these events are listed in **Table 7**.

The Coalition and Subwatershed monitoring events were conducted throughout the year. Event monitoring analyses included water chemistry and toxicity. During 2011 monitoring, pesticides were monitored during months when higher use is typical. Sediment toxicity testing and chemistry analyses were also conducted by the Coalition at 17 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 2010 through September 2011 events, as well as associated site photographs, are provided in **Appendix A**.

Table 7. Sampling for the 2011 Coalition Monitoring Year

		Sample Count		56	57	58	59	60	61	62	63	64	65	66	67
Subwatershed (Agency)	**Site ID**	**Planned**	**Collected**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
ButteYubaSutter (SVWQC)	BTTSL	4	4	-	-	-	W	W	W	W	-	-	-	-	-
	GILSL	3	3	-	-	-	-	W	W	-	W	-	-	-	-
	LHNCT	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
	LSNKR	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
	PNCGR	12	11	D	W	W	-	W	W	W S	W	W	W	W S	W
	SSKNK	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
ColusaGlenn (SVWQC)	COLDR	11	11	W	W	W	W	W	W	W S	W	W	W	W S	-
	FRSHC	11	11	W	W	W	W	W	W	W S	W	W	W	W S	-
	RARPP	3	3	-	-	-	-	W	W	-	W	-	-	-	-
	STYHY	4	4	-	-	-	-	W	W	S	-	-	-	S	-
	WLKCH	11	11	W	W	W	W	W	W	W S	W	W	W	W S	-
Lake (SVWQC)	MDLCR	8	8	-	-	W	W	W	W	W S	W	W	-	W S	-
PitRiver (*NECWA*)	PRPIT	8	8	W	W	-	-	-	W	W S	W	W	W	W S	-
PNSSNS (SVWQC)	CCBRW	11	11	W	W	W	-	W	W	W S	W	W	W	W S	W
	CCSTR	2	2	-	-	-	-	-	-	W	W	-	-	-	-
SacramentoAmador (SVWQC)	CRTWN	12	11	D	W	W	W	W	W	W S	W	W	W	W S	W
	GIDLR	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
ShastaTehama (SVWQC)	ACACR	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
Solano (SVWQC)	SSLIB	11	11	W	W	W	W	W	W	W S	W	W	W	W S	-
	UCBRD	12	12	W	W	W	W	W	W	W S	W	W	W	W S	W
	ZDDIX	3	3	-	-	-	-	-	-	S	-	S	-	S	-
Yolo (SVWQC)	CCCPY	4	4	-	-	-	-	-	-	-	W	W	W	W	-
	WLSPL	11	11	W	W S	W S	W	W	W	W S	W	W	W	W S	-
UpperFeatherRiver (*UFRW*)	MFFGR	5	5	-	-	-	-	-	-	-	W	W	W	W	W
	Totals	**206**	**204**												

Notes:
W = Water sample collected
S = Sediment chemistry sample collected
D = Site was dry; no samples collected.
"--" = no samples planned.
PCWG = Putah Creek Watershed Group
NECWA = Northeastern California Watershed Association
UFRW = Upper Feather River Watershed Group
SVWQC = Sacramento Valley Water Quality Coalition
PNSSNS = PlacerNevadaSSutterNSacramento

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 2010 through September 2011 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 (SVWQC 2010). 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.

Results of Field and Laboratory QA/QC Analyses

Quality Assurance/Quality Control (QA/QC) data are summarized in **Table 8** through **Table 15** 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. Monitoring results for all programs discussed are tabulated in **Appendix C**.

Hold Times

Results were evaluated for compliance with required preparation and analytical hold times. All analyses met the target data quality objectives for hold times.

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 data quality objectives:

- 5 of 69 hardness results had MDLs and QLs greater than the project DQO due to dilution required to analyze the samples. The elevated analytical QLs for hardness were adequate to assess exceedances of associated water quality objectives for trace metals.
- 26 of 180 total Nitrate+Nitrite as N results had MDLs and QLs greater than the project DQO due to the laboratory not meeting the project DQO. Assessment of compliance was not affected for any results.

- 4 of 53 organophosphate pesticide sediment results had QLs greater than the project DQO due to dilution required to analyze the samples.
- 37 of 88 pyrethroid pesticide in sediment results had QLs greater than the project DQO due to dilution required to analyze the samples.
- 15 of 258 trace metal results had QLs greater than the project DQO due to dilution required to analyze the samples.
- 110 of 208 turbidity results had MDLs greater than the project DQO due to dilution required to analyze the 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:

- Carbamate pesticides and other herbicides were detected above the QL in two field blank analyses. This resulted in two environmental results being qualified due to potential contamination. The qualification did not affect assessment of any exceedances.
- Organophosphate pesticides were detected above the QL in two field blank analyses. One environmental result required qualification. Assessment of exceedances was not affected.
- Total Kjeldahl nitrogen was detected above the QL in one field blank analysis. No environmental results required qualification.
- Total organic carbon was detected above the QL in two field blank analyses. Two environmental samples were qualified. Assessment of exceedances was not affected.
- Turbidity was detected above the QL in four field blank analyses. Two environmental samples were qualified. Assessment of exceedances was not affected.

Field Duplicates

Field Duplicate samples were collected and analyzed for all parameters (**Table 9**). 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 hardness as $CaCO_3$ test. One environmental result was qualified as estimated on this basis. The qualification did not affect assessment of any exceedances.
- Field duplicate RPD results exceeded the DQO for three orthophosphate analyses. Three environmental results were qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.
- Field duplicate RPD results exceeded the DQO for one total Kjeldahl nitrogen (TKN) test. One environmental result was qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.

- Field duplicate RPD results exceeded the DQO for one total organic carbon test. One environmental result was qualified as estimated on this basis. The qualification did not affect assessment of any exceedances.

Method Blanks

Method Blanks were analyzed for TSS, TOC, hardness, turbidity, trace metals, nutrients, *E. coli*, herbicides, and pesticides (**Table 10**). 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:

- Method blank results exceeded the DQO for one total ammonia analysis. Three environmental results were qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.
- Method blank results exceeded the DQO for one total Kjeldahl nitrogen test. Three environmental results were qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.

Laboratory Control Spikes and Surrogates

Laboratory Control Spike (LCS) recoveries were analyzed for TSS, TOC, hardness, turbidity, trace metals, nutrients, and pesticides (**Table 11**). Surrogate recoveries were analyzed for organophosphorus, organochlorine, carbamate, and triazine pesticides (**Table 12**). The data quality objective for Laboratory Control Spikes (LCS) is 80-120% recovery of the analyte of interest for most analytes. The data quality objectives for Laboratory Control Sample recoveries and surrogate 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 five LCS recovery analyses for carbamates and other herbicides were outside the acceptable recovery DQO. A total of 32 analytical result was qualified as low-biased as a result of low recoveries. No analytical results were qualified as high biased as a result of high recoveries.
- The results of five LCS recovery analyses for organophosphate pesticides by EPA 625 were outside the acceptable recovery DQO. A total of three analytical results were qualified as low-biased as a result of low recoveries. No analytical results were qualified as high biased as a result of high recoveries.
- The results of eight LCS recovery analyses for pyrethroid pesticides in sediment by EPA 8270C were outside the acceptable recovery DQO. A total of five analytical results were qualified as low-biased as a result of low recoveries. One analytical result was qualified as high-biased as a result of high recoveries.
- The results of eight surrogate recovery analyses for organophosphorus, organochlorine, carbamate, and triazine pesticides by EPA 625 were outside the acceptable recovery

DQO. No analytical results were qualified as low-biased as a result of low recoveries. Three analytical results were qualified as high-biased as a result of high recoveries.

Laboratory Duplicates

Laboratory Duplicates were analyzed for TOC, TSS, turbidity, and pesticides (**Table 13**). The data quality objective for laboratory duplicates is a Relative Percent difference (RPD) not exceeding 25%. With the exceptions discussed below, all field replicates met this data quality objective:

- Laboratory duplicate results exceeded the DQO for two carbamate pesticide and other herbicide tests. Two environmental results were qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.
- Laboratory duplicate results exceeded the DQO for one organophosphate pesticide test. One environmental result was qualified as estimated on this basis. The qualification did not affect assessment of any exceedances.

Matrix Spikes and Matrix Spike Duplicates

Matrix Spikes and Matrix Spike Duplicates were analyzed for trace metals, nutrients, and pesticides (**Table 14**). T 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 data quality objectives:

- Matrix Spike recoveries for four carbamate pesticide and other herbicides were outside their respective DQOs. Two results were high-biased and one required qualification. Two associated results required qualification as low-biased.
- Matrix Spike recoveries for two Nitrate+Nitrite as N analyses by EPA 351.3 were outside the DQO. Two associated environmental results required qualification as high-biased. Assessment of exceedances was not affected.
- Matrix Spike recoveries for one organochlorine pesticide analysis was outside the DQO. The result was high-biased and required qualification.
- Matrix Spike recoveries for 25 organophosphate pesticide analyses were outside the DQO. Fourteen results were high-biased and none required qualification. Eleven results required qualification as low-biased.
- Matrix Spike recoveries for 13 pyrethroid pesticide analyses were outside the DQO. Three environmental results associated with high recoveries were below detection, and therefore did not require qualification. Ten associated environmental results required qualification as low-biased.
- Matrix Spike recoveries for five trace metal analyses were outside the DQO. Two environmental results associated with high recoveries were below detection, and

therefore did not require qualification. Three recovery results were low-biased, but no environmental data required qualification.

Matrix Spike RPDs

Matrix Spike and Matrix Spike Duplicate Recoveries and their associated Relative Percent Differences (RPDs) were analyzed for trace metals, 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 data quality objectives:

- Matrix spike duplicate results exceeded the DQO for three carbamate pesticide and other herbicides RPD results. One environmental result was qualified as estimated on this basis. The qualification did not affect assessment of any exceedances.
- Matrix spike duplicate results exceeded the DQO for 31organophosphate pesticide RPD results. Thirty-one results were qualified as estimated on this basis. The qualifications did not affect assessment of any exceedances.
- Matrix spike duplicate results exceeded the DQO for eight pyrethroid pesticide RPD results. One environmental result was qualified as estimated on this basis. The qualification did not affect assessment of any exceedances.

Summary of Precision and Accuracy

Based on the QA/QC data for the 2011 Coalition monitoring discussed above, the precision and accuracy of the majority of monitoring results met the DQOs adopted for them by 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, and few results required qualification. Of the 125 total qualified data, 41 results were qualified as *estimated* due to high variability in lab or field replicate analyses, 71 results were qualified as *high-biased* or *low-biased* due to analyte recoveries outside of DQOs, and 13 results were potentially affected by contamination and qualified as an *upper limit* of its true concentration. With the exception of Matrix Spike RPD results, which had a success rate of 93.9%, all other QC sample types showed success rates in excess of 95%. Of the results assigned a qualification of *upper limit*, none were detected below the QL, and none of the data qualified as *upper limit* showed an exceedance of a water quality standard. Of the 7,210 environmental analytical results generated from October 2010 through September 2011, 7,085 results required no qualification, resulting in 98% of samples 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**, 194 of the 196 initial water column and sediment toxicity sample events planned by the Coalition and coordinating programs were conducted, for an overall sample event success rate of 99%. Planned sample collection at two locations did not occur because the monitoring sites were dry. Planned sampling that was not completed successfully is summarized below:

- Samples for one event planned for Cosumnes River (CRTWN) was not collected because the sampling site was dry.
- Samples for one event planned for Pine Creek (PNCGR) was 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:

- One of 14 bottles (collected in December 2010 for Event 58) to be analyzed for carbamate pesticides was received broken at APPL. There was sufficient additional sample remaining from QA samples to complete the scheduled environmental analyses.
- One of 57 bottles (collected in January 2011 for Event 59) to be analyzed for carbamates and other pesticides was received broken at APPL. 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) and 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:

- Five of the 18 samples collected by PER for toxicity analysis in March 2011 (Event 61) were received by PER at 8.4˚C, which was slightly above the recommended maximum temperature (6˚C). Toxicity analyses were performed according to the original sampling plan and the results were qualified (BY).

- The sample collected by NECWA (PRPIT) in May 2011 (Event 63) were received by PER at 10˚C, which was above the recommended maximum temperature (6˚C). Toxicity analysis was performed according to the original sampling plan and the results were qualified (BY).
- Samples collected by the California Rice Commission sampling contractor at COLDR and SSKNK, in June 2011 (Event 64) were received by PER above the recommended maximum temperature (6˚C). The COLDR and SSKNK samples were received at 13.9˚C and 13.3˚C, respectively. Review of shipping and handling procedures and conditions suggested that the samples never cooled to 6˚C from their original ambient temp of >26˚C. Toxicity analysis was performed according to the original sampling plan and the results were qualified (BY).
- Samples collected at COLDR and SSKNK, in July 2011 (Event 65) were received by PER above the recommended maximum temperature (6˚C). The COLDR and SSKNK samples were received at 10.2˚C and 9.4˚C, respectively. Samples from NECWA (PRPIT) were also received by PER at 8.5˚C, which was above the recommended maximum temperature (6˚C). Toxicity analyses for all three sites were performed according to the original sampling plan and the results were qualified (BY).
- Eight of the 16 samples collected by PER for toxicity analysis in August 2011 (Event 66) were received by PER at 8.9˚C, which was above the recommended maximum temperature (6˚C). Evaluation of the sample and receipt data indicated that the samples received above the target temperature were characterized by higher ambient collection temperatures and shorter times to sample receipt and log-in. Toxicity analysis was still 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 37 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 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 350.1 / SM20-4500-NH3 C	Ammonia, Total as N	< PQL	10	10	100%
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	< PQL	124	122	98%
SM20-9223	*E. coli*	< PQL	14	14	100%
SM20-2340 C	Hardness	< PQL	2	2	100%
EPA 353.2	Nitrate+Nitrite, as N	< PQL	13	13	100%
EPA 625 / 8081A	Organochlorine Pesticides	< PQL	91	91	100%
EPA 625 / 8141A	Organophosphate Pesticides	< PQL	124	122	98%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	< PQL	14	14	100%
EPA 8270C	Pyrethroid Pesticides in Sediment	< PQL	13	13	100%
SM20-9221 B/E	Total Coliforms	< PQL	1	1	100%
EPA 351.2 / SM4500-NH3 C	Total Kjeldahl Nitrogen	< PQL	10	9	90%
SM20-5310 B/ SM5310C	Total Organic Carbon	< PQL	13	11	85%
SM20-2540D	Total Suspended Solids	< PQL	17	17	100%
EPA 200.8	Trace Metals	< PQL	14	14	100%
EPA 180.1 / SM2130B	Turbidity	< PQL	15	11	73%
Totals			**475**	**464**	**97.7%**

Table 9. Summary of Field Duplicate Quality Control Sample Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 350.1 / SM20-4500-NH3 C	Ammonia, Total as N	RPD ≤25%	9	9	100%
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	RPD ≤25%	123	123	100%
SM20-9223	*E. coli*	RPD ≤25%	13	13	100%
SM20-2340 C	Hardness	RPD ≤25%	5	4	80%
EPA 353.2	Nitrate+Nitrite, as N	RPD ≤25%	13	13	100%
EPA 625 / 8081A	Organochlorine Pesticides	RPD ≤25%	91	91	100%
EPA 625 / 8141A	Organophosphate Pesticides	RPD ≤25%	135	135	100%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	RPD ≤25%	23	20	87%
EPA 8270C	Pyrethroid Pesticides in Sediment	RPD ≤25%	221	221	100%
SM20-9221 B/E	Total Coliforms	RPD ≤25%	1	1	100%
EPA 351.2 / SM4500-NH3 C	Total Kjeldahl Nitrogen	RPD ≤25%	9	8	89%
SM20-5310 B/ SM5310C	Total Organic Carbon	RPD ≤25%	14	13	93%
SM20-2540D	Total Suspended Solids	RPD ≤25%	13	13	100%
EPA 600/R-99-064M EPA 821/R-02-013 EPA 821/R-02-012	Toxicity	RPD ≤25%	26	26	100%
EPA 200.8	Trace Metals	RPD ≤25%	23	23	100%
EPA 180.1 / SM2130B	Turbidity	RPD ≤25%	13	13	100%
Totals			**511**	**505**	**98.8%**

Table 10. Summary of Method Blank Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 350.1 / SM20-4500-NH3 C	Ammonia, Total as N	< MDL	39	38	97%
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	< MDL	196	196	100%
SM20-9223	*E. coli*	< MDL	32	32	100%
SM20-2340 C	Hardness	< MDL	23	23	100%
EPA 353.2	Nitrate+Nitrite, as N	< MDL	41	41	100%
EPA 625 / 8081A	Organochlorine Pesticides	< MDL	207	207	100%
EPA 625 / 8141A	Organophosphate Pesticides	< MDL	287	287	100%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	< MDL	82	82	100%
EPA 8270C	Pyrethroid Pesticides in Sediment	< MDL	73	73	100%
SM20-2540C	Total Dissolved Solids	< MDL	2	2	100%
EPA 351.2 / SM4500-NH3 C	Total Kjeldahl Nitrogen		48	47	98%
SM20-5310 B/ SM5310C	Total Organic Carbon	< MDL	58	58	100%
SM20-2540D	Total Suspended Solids	< MDL	46	46	100%
EPA 200.8	Trace Metals	< MDL	80	80	100%
EPA 180.1 / SM2130B	Turbidity	< MDL	40	40	100%
Totals			**1254**	**1252**	**99.8%**

Table 11. Summary of Lab Control Spike Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 350.1 / SM20-4500-NH3 C	Ammonia, Total as N	90 - 110%	38	38	100%
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	[1]	244	239	98%
SM20-2340 C	Hardness	80 - 120%	23	23	100%
EPA 353.2	Nitrate+Nitrite, as N	90 - 110%	42	42	100%
EPA 625 / 8081A	Organochlorine Pesticides	[1]	384	384	100%
EPA 625 / 8141A	Organophosphate Pesticides	[1]	486	481	99%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	90 - 110%	80	80	100%
EPA 8270C	Pyrethroid Pesticides in Sediment	[1]	97	89	92%
SM20-2540C	Total Dissolved Solids	80 - 120%	2	2	100%
EPA 351.2 / SM4500-NH3 C	Total Kjeldahl Nitrogen	90 - 110%	47	47	100%
SM20-5310 B/ SM5310C	Total Organic Carbon	80 - 120%	58	58	100%
SM20-2540D	Total Suspended Solids	80 - 120%	43	43	100%
EPA 200.8	Trace Metals	85 - 115%	115	115	100%
EPA 180.1 / SM2130B	Turbidity	90 - 110%	39	39	100%
Totals			**1698**	**1680**	**98.9%**

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 12. Summary of Surrogate Recovery Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 625	Organophosphorus, Organochlorine, Carbamate and Triazine Pesticides	[1]	574	566	98.6%
Totals			**574**	**566**	**98.6%**

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 13. Summary of Lab Duplicate Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	RPD ≤25%	17	15	88%
EPA 353.2	Nitrate+Nitrite, as N	RPD ≤25%	1	1	100%
EPA 625 / 8081A	Organochlorine Pesticides	RPD ≤25%	60	60	100%
EPA 625 / 8141A	Organophosphate Pesticides	RPD ≤25%	152	151	99%
EPA 365.2 / SM20-4500-P E	Surrogates	RPD ≤25%	12	12	100%
SM20-2540C	Total Dissolved Solids	RPD ≤25%	16	16	100%
EPA 160.1 / SM2540C	Total Organic Carbon	RPD ≤25%	2	2	100%
SM20-2540D	Total Suspended Solids	RPD ≤25%	16	16	100%
EPA 600/R-99-064M EPA 821/R-02-013 EPA 821/R-02-012	Toxicity	RPD ≤25%	11	11	100%
EPA 180.1 / SM2130B	Turbidity	RPD ≤25%	21	21	100%
Totals			**281**	**278**	**98.9%**

Table 14. Summary of Matrix Spike Recovery Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Analyses	Number Passing	% Success
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	[1]	326	322	99%
EPA 353.2	Nitrate+Nitrite, as N	90 - 110%	7	5	71%
EPA 625 / 8081A	Organochlorine Pesticides	[1]	172	171	99%
EPA 625 / 8141A	Organophosphate Pesticides	[1]	360	335	93%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	90 - 110%	42	42	100%
EPA 8270C	Pyrethroid Pesticides in Sediment	[1]	108	95	88%
EPA 160.1 / SM2540C	Total Organic Carbon	80 - 120%	32	32	100%
EPA 200.8	Trace Metals	85 - 115%	76	71	93%
Totals			**1123**	**1073**	**95.5%**

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 15. Summary of Matrix Spike Duplicate Precision Results for 2011 Coalition Monitoring

Method	Analyte	DQO	Number of Pairs Analyzed	Number Passing	% Success
EPA 625/8321A/8081A	Carbamate Pesticides and other Herbicides	RPD ≤25%	153	151	99%
EPA 353.2	Nitrate+Nitrite, as N	RPD ≤25%	3	3	100%
EPA 625 / 8081A	Organochlorine Pesticides	RPD ≤25%	86	86	100%
EPA 625 / 8141A	Organophosphate Pesticides	RPD ≤25%	180	149	83%
EPA 365.2 / SM20-4500-P E	Orthophosphate/Phosphorus, as P	RPD ≤25%	21	21	100%
EPA 8270C	Pyrethroid Pesticides in Sediment	RPD ≤25%	54	54	100%
EPA 160.1 / SM2540C	Total Organic Carbon	RPD ≤25%	16	16	100%
EPA 200.8	Trace Metals	RPD ≤25%	38	38	100%
EPA 625 / 8141A	Triazine Pesticides	RPD ≤25%	10	9	90%
Totals			**561**	**527**	**93.9%**

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 2011 Coalition Monitoring Year). Sample collection for the October 2010 – March 2011 Coalition Storm Season was characterized by above-average precipitation during the months of October, November, December, February, and March, as well as below-average precipitation during the month of January[2]. Sample collection for the April 2011 – September 2011 Coalition Irrigation Season was characterized by predominantly dry weather, with the exception of May and June, and mean temperatures were generally cooler than historical averages.

The 2011 Water Year (October – September) was classified as a "Very Wet" year by the Department of Water Resources and was the second year in a row to have above average precipitation and runoff for the Sacramento Valley. The 2011 irrigation season was delayed in some valley regions due to above average precipitation in March, as well as significant precipitation events that occurred in May and June. Regional precipitation patterns for October 2010 – September 2011 are illustrated in **Figure 2-a** through **Figure 2-d**. Storm flows through the watershed exhibited typical wet season variability during the storm season (**Figure 3-a** through **Figure 3-e**), and samples were successfully collected to characterize a wide range of hydrological conditions.

Based on climate data available for the Sacramento Executive Airport weather station, there was slightly more than average rainfall during the April – September 2011 irrigation season (**Table 16**). No precipitation occurred in July or August, and only a trace amount occurred in September. Precipitation during the months of January, February, and April was below normal. There were significant rainfall events in May and June, and the temperatures were also below historical averages from April through August, all of which reduced or delayed the need for irrigation of some crops. The maximum temperature exceeded 90 degrees Fahrenheit on six days in October, two days in May, eight days in June, 15 days in July, 22 days in August, and 20 days in September. The average maximum temperatures at the Sacramento Executive Airport were 64.5, 61.8, 69.2, 74.7, 74.4, and 74.5 degrees Fahrenheit, respectively.

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

Table 16. Summary of Climate Data[3] at Sacramento Executive Airport, October 2010 – September 2011

Month	Departure from Normal Mean Temperature	Days with Maximum Temperature ≥ 90°F	Precipitation Total (Inches)
October 2010	0.1	6	1.43
November 2010	-0.9	0	2.39
December 2010	4.1	0	5.55
January 2011	-0.1	0	1.68
February 2011	-3.0	0	3.39
March 2011	-1.2	0	6.95
April 2011	-0.8	0	0.06
May 2011	-3.7	2	1.02
June 2011	-2.3	8	1.50
July 2011	-0.5	15	0
August 2011	-0.2	22	0
September 2011	3.1	20	0.01

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

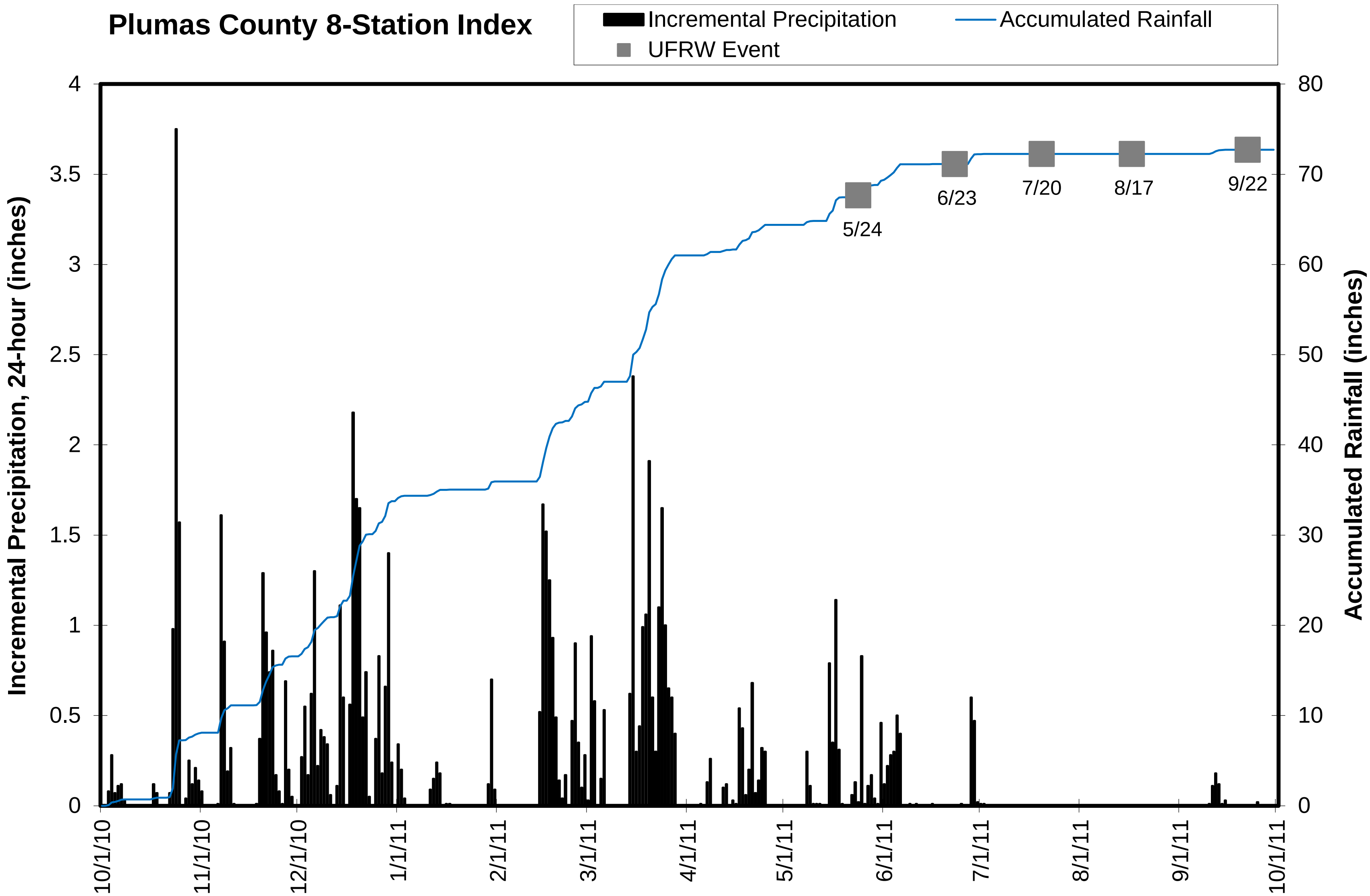

Figure 2-a. Precipitation during 2011 Coalition Monitoring: Plumas County

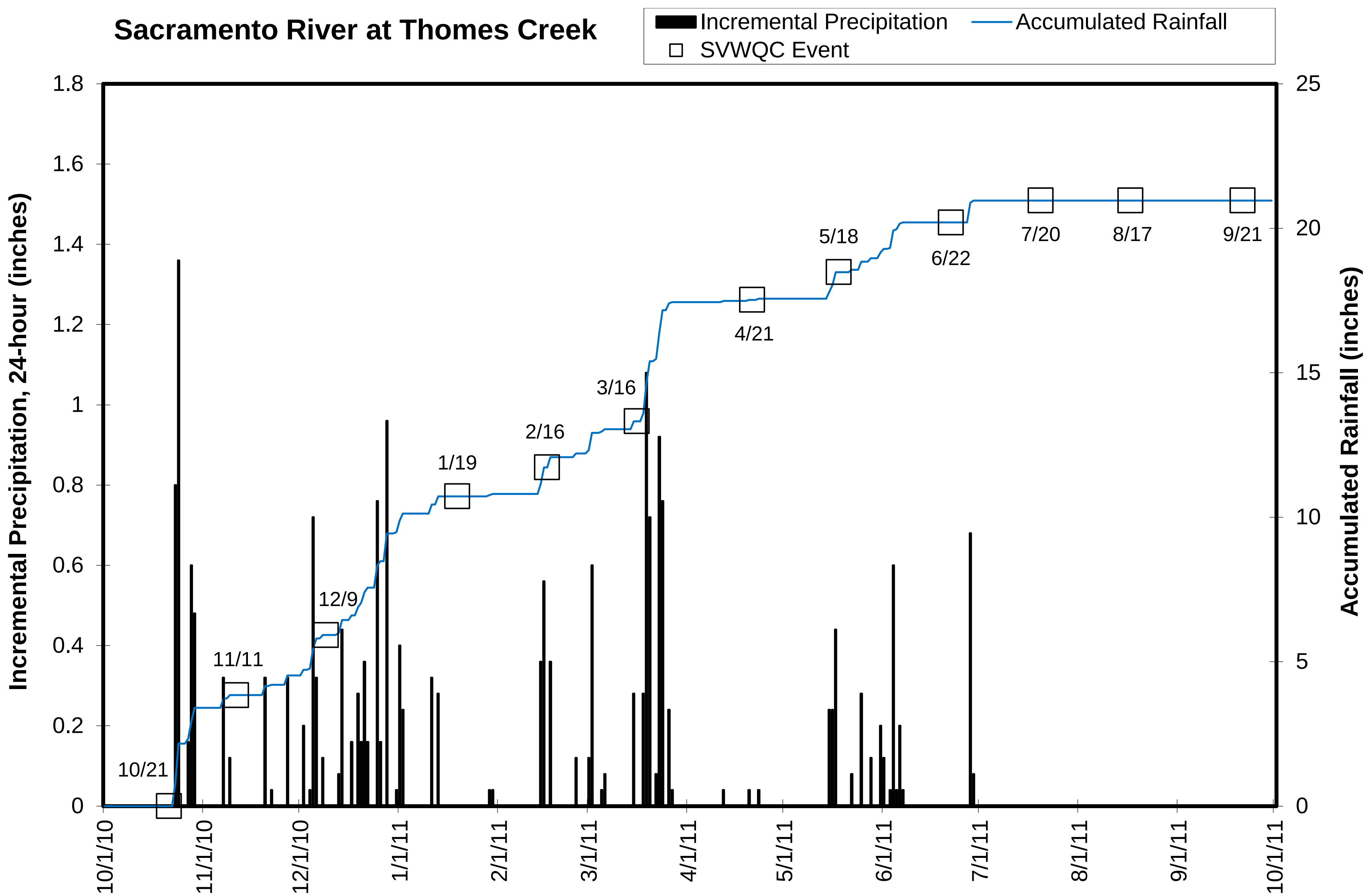

Figure 2-b. Precipitation during 2011 Coalition Monitoring: Upper Sacramento Valley

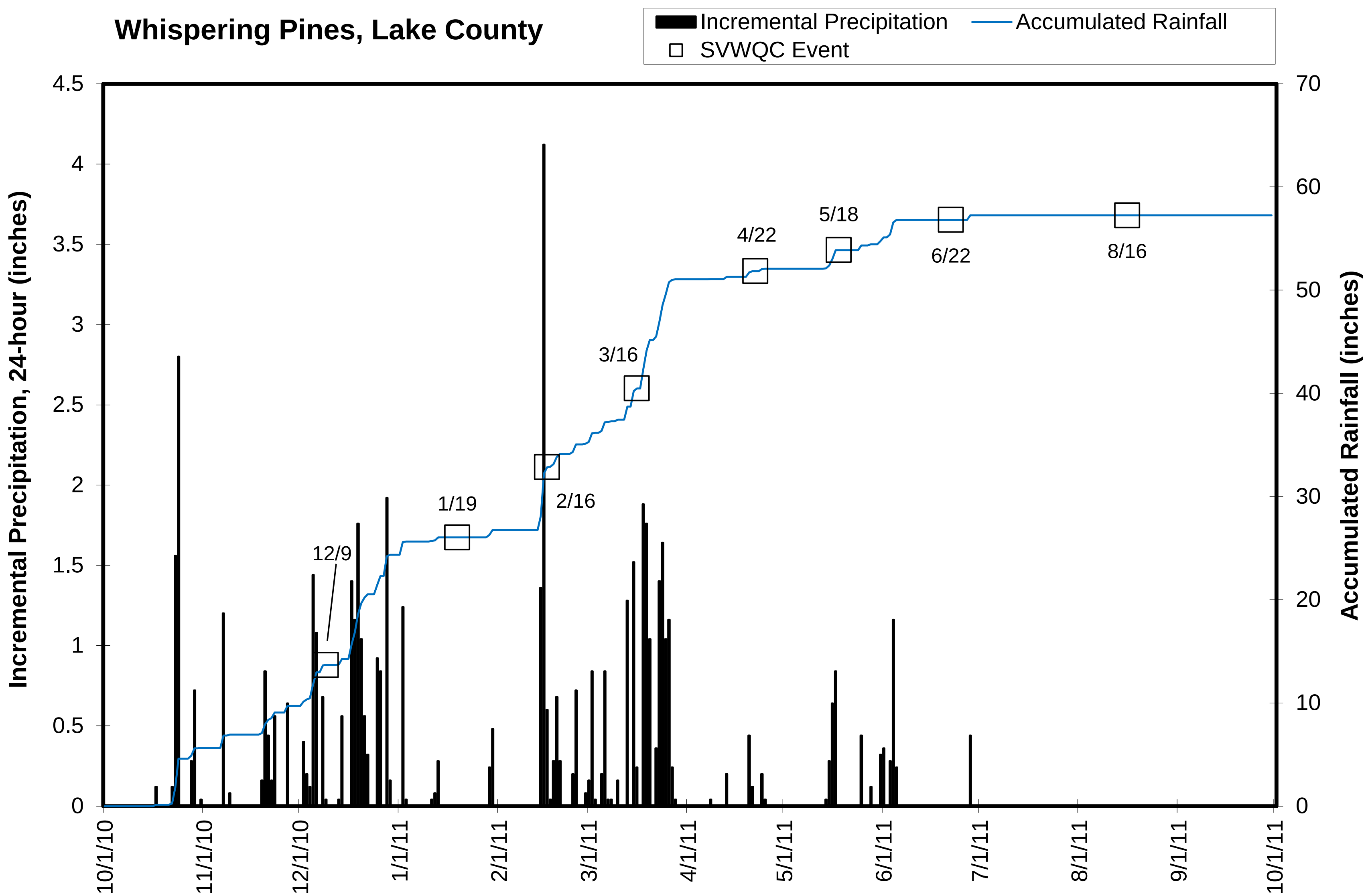

Figure 2-c. Precipitation during 2011 Coalition Monitoring: Lake County

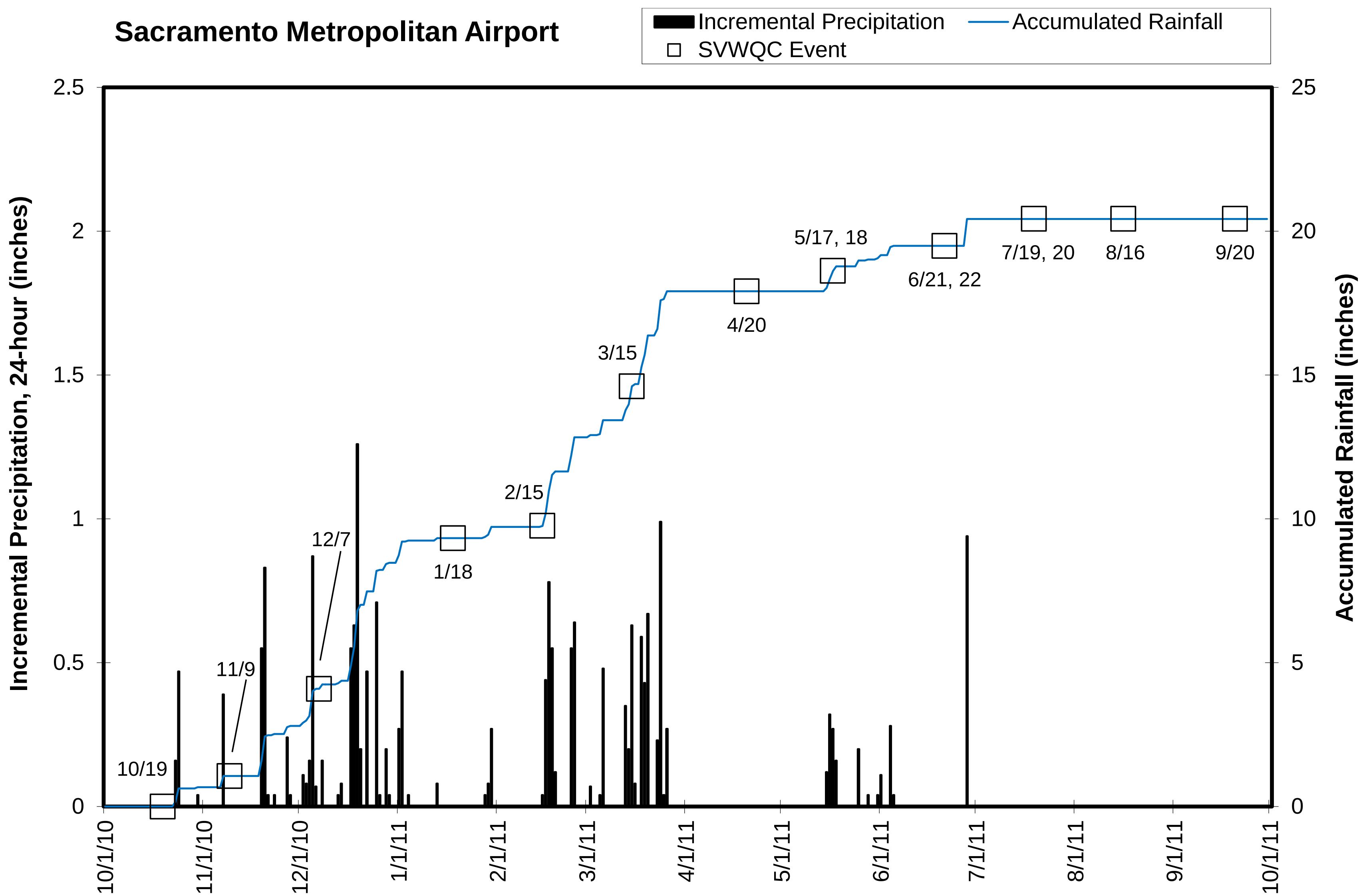

Figure 2-d. Precipitation during 2011 Coalition Monitoring: Lower Sacramento Valley

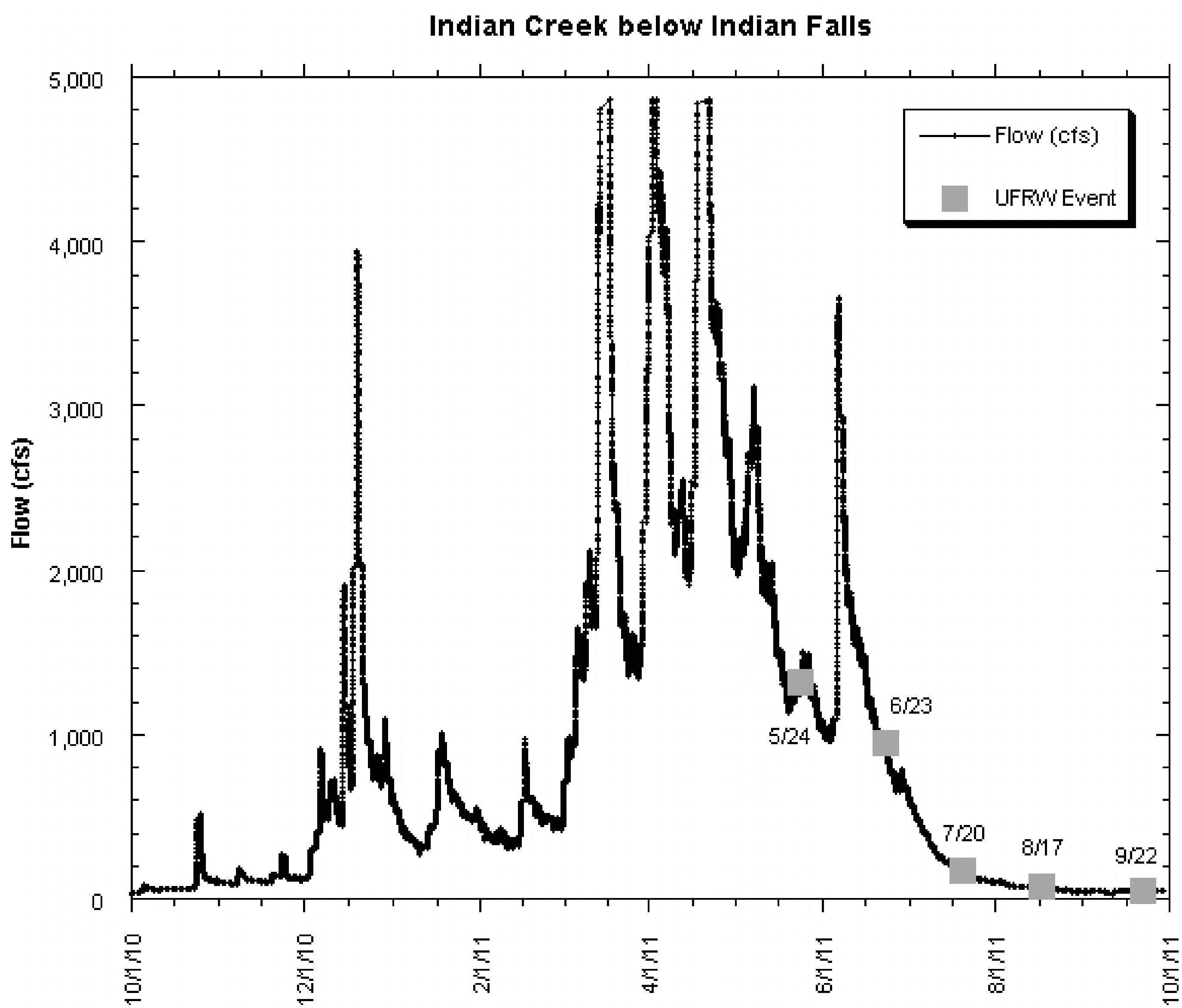

Figure 3-a. Flows during 2011 Coalition Monitoring: Plumas County

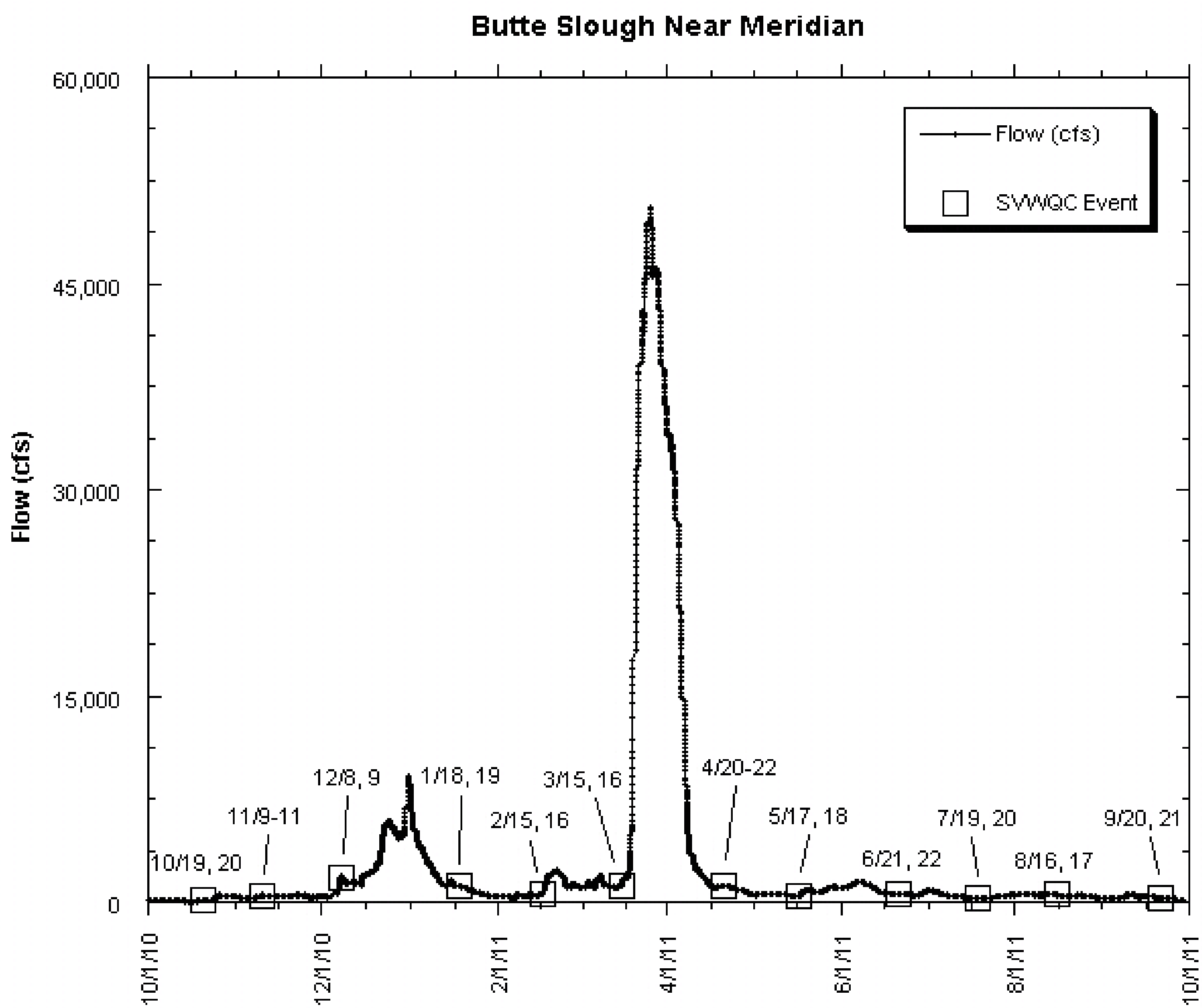

Figure 3-b. Flows during 2011 Coalition Monitoring: East Sacramento Valley

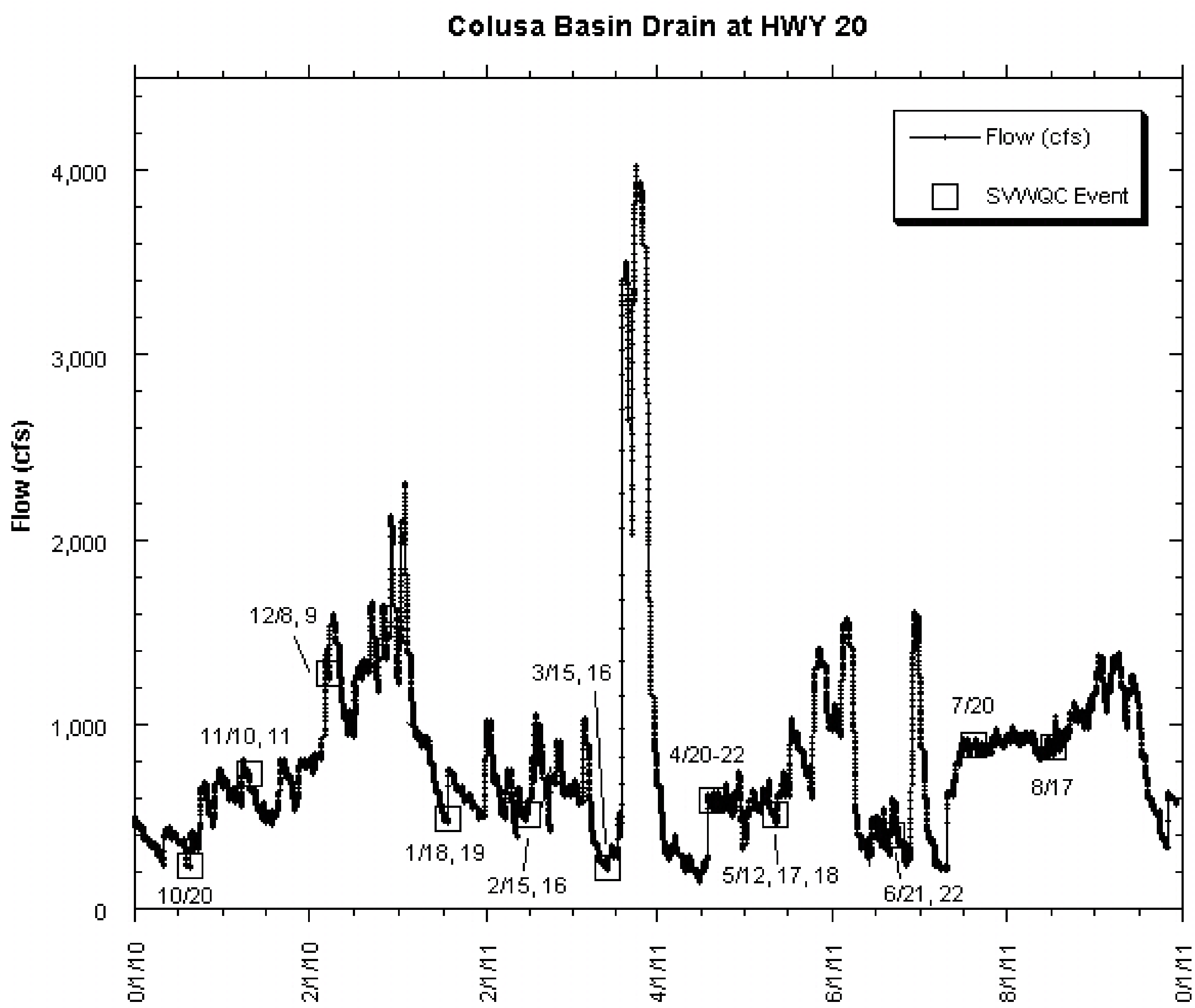

Figure 3-c. Flows during 2011 Coalition Monitoring: West Sacramento Valley

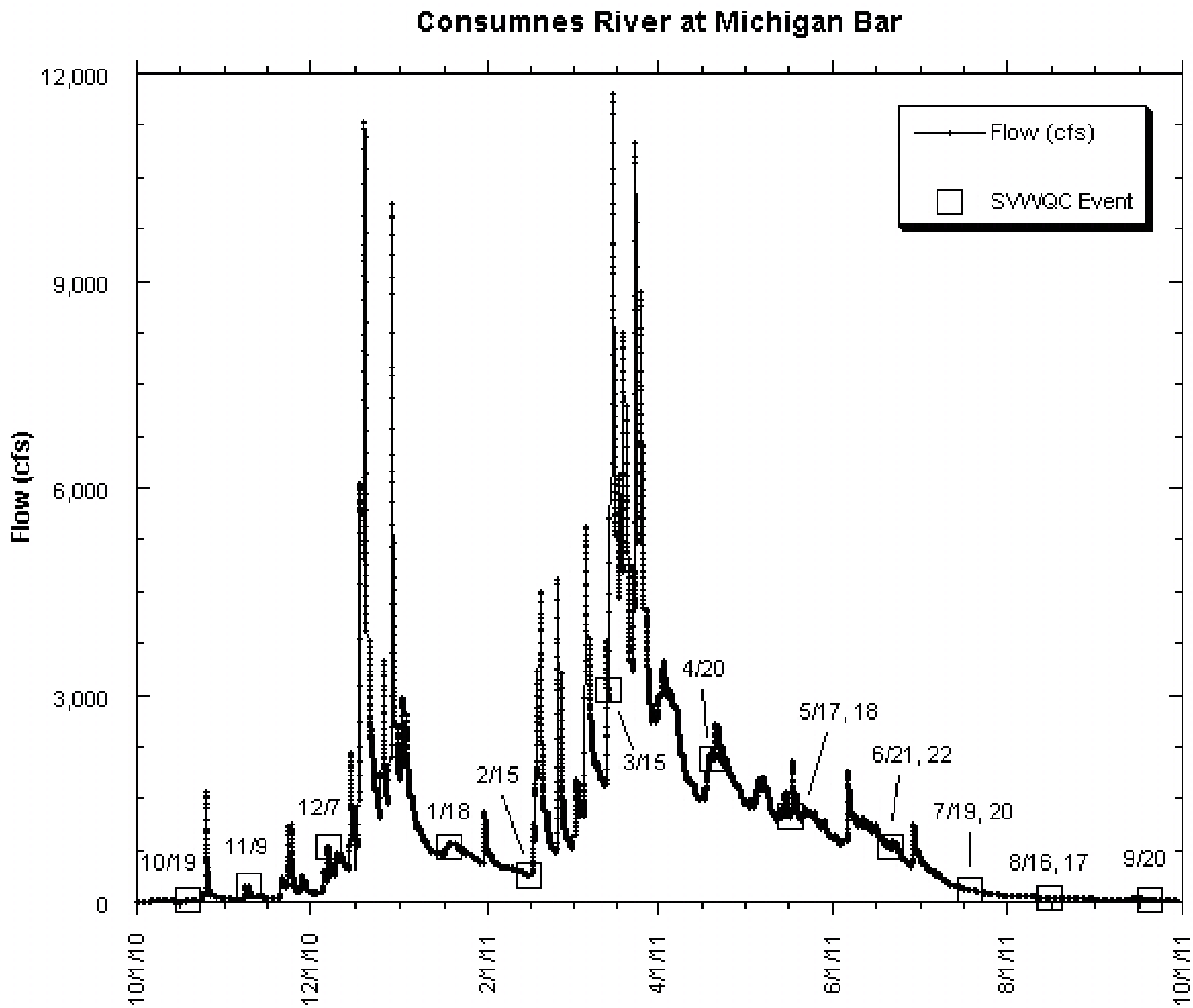

Figure 3-d. Flows during 2011 Coalition Monitoring: Lower Sacramento Valley

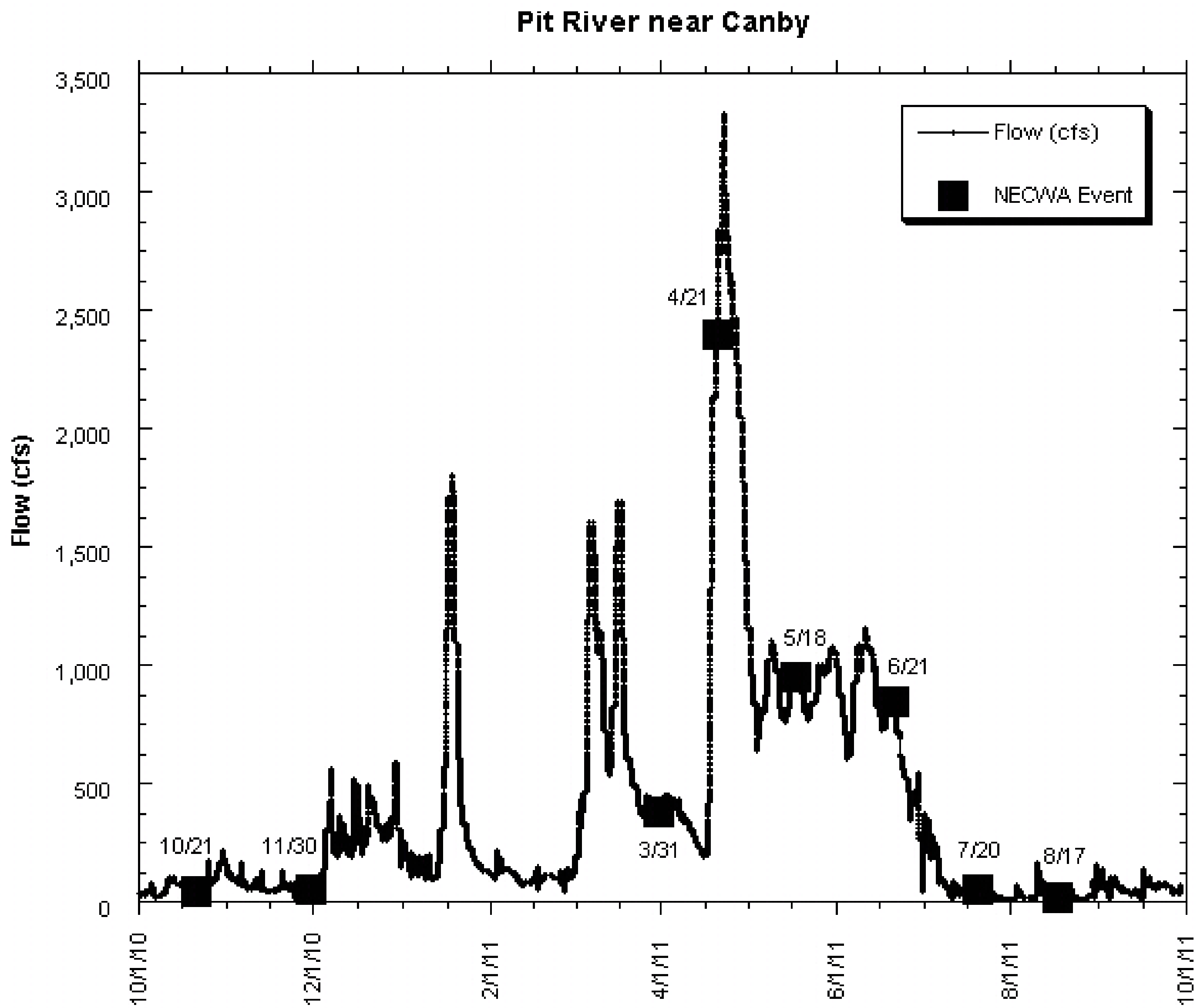

Figure 3-e. Flows during 2011 Coalition Monitoring: Pit River near Canby

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 25**). Based on these evaluations, the program data quality objectives of completeness, representativeness, precision, and accuracy of monitoring data have largely 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 15**.

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 17** and **Table 18**. Monitored analytes without relevant water quality objectives or trigger limits are listed in **Table 19**.

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 17. Adopted Basin Plan and California Toxics Rule Objectives for Analytes Monitored for 2011 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	µg/L	Basin Plan
Methoxychlor	30	µg/L	CA 1˚ MCL
Molybdenum	15	µg/L	Basin Plan
Nickel, dissolved	hardness dependent[(3)]	µg/L	CTR
Nitrate, as N	10	mg/L	CA 1˚ MCL
Oxamyl	50	µg/L	CA 1˚ MCL
Parathion, Methyl	0.13	µg/L	Basin Plan
pH	6.5-8.5	-log[H+]	Basin Plan
Selenium, total	5	µg/L	CTR
Simazine	4	µg/L	CA 1˚ MCL
Temperature	narrative	µg/L	Basin Plan
Toxicity, Algae (*Selenastrum*) Cell Density	narrative	µg/L	Basin Plan
Toxicity, Fathead Minnow (*Pimephales*) Survival	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.

Table 18. Unadopted Water Quality Limits Used to Interpret Narrative Water Quality Objectives for Analytes Monitored for 2011 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
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 19. Analytes Monitored for 2011 Coalition Monitoring without Applicable Adopted or Unadopted Limits

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

Toxicity and Pesticide Results

A summary of the toxicity and pesticide results from 2011 Coalition monitoring is provided in this section.

Toxicity Exceedances in Coalition Monitoring

There were 411 individual toxicity results analyzed in water column and sediment samples collected from 19 different sites during 2011 Coalition Monitoring. Analyses were conducted for *Selenastrum capricornutum, Pimephales promelas, Ceriodaphnia dubia, and Hyalella azteca.* Within these categories, there were 11 toxicity exceedances. The observations of toxicity to *Ceriodaphnia*, *Pimephales, and 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 the Coalition 2011 monitoring year were reported to the Water Board by the Coalition in "Exceedance Reports" as required by the *ILRP* and the Coalition's MRPP. The Exceedance Reports detailing these results are provided in **Appendix D**.

There were 375 individual toxicity results analyzed in water column samples in the 2011 Coalition monitoring, and of these samples, seven had observed toxicity. Significant toxicity to *Ceriodaphnia dubia* was observed in six samples at six different sites. Statistically significant toxicity was also observed in one sample at one site for *Pimephales promelas*. There was no significant toxicity to *Selenastrum capricornutum.* Samples exhibiting statistically significant toxicity are summarized in **Table 20**.

Table 20. Toxicity Exceedances in 2011 Coalition Monitoring

Site ID	Water Body	Sample Date	Analyte	% of Control Survival
STYHY	Stony Creek	2/16/2011	*Ceriodaphnia dubia* Survival	0%
ACACR	Anderson Creek	3/16/2011	*Pimephales promelas* Survival	90%
PRPIT	Pit River	5/18/2011	*Ceriodaphnia dubia* Survival	75%
WLSPL	Willow Slough	7/19/2011	*Ceriodaphnia dubia* Survival	0%
PNCGR	Pine Creek	7/20/2011	*Ceriodaphnia dubia* Survival	0%
CCCPY	Cache Creek	8/16/2011	*Ceriodaphnia dubia* Survival	5%
LSNKR	Lower Snake River	8/16/2011	*Ceriodaphnia dubia* Survival	10%

There were a total of 36 sediment toxicity samples (including two duplicate samples) in the 2011 Coalition monitoring. Four of these samples exhibited statistically significant toxicity to *Hyalella azteca*. The significant toxicity to *Hyalella Azteca* was observed at one site (Grand Island Drain) in April and in August at three sites (Ulatis Creek, Willow Slough, Grand Island Drain). Survival was ≥90% in both Grand Island samples. Samples exhibiting statistically significant sediment toxicity are summarized in **Table 21.**

Table 21. Toxicity Exceedances in Sediment in 2011 Coalition Monitoring

Site ID	Water Body	Sample Date	Analyte	% of Control Survival
GIDLR	Grand Island Drain	4/20/2011	*Hyalella azteca* Survival	90%
UCBRD	Ulatis Creek	8/16/2011	*Hyalella azteca* Survival	54.4%
WLSPL	Willow Slough	8/16/2011	*Hyalella azteca* Survival	45.6%
GIDLR	Grand Island Drain	8/17/2011	*Hyalella azteca* Survival	92.4%

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

Event 60, February 2011 – Stony Creek on Hwy 45 near Rd 24, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 100% compared to the control. The toxicity observed in the sample (>50% reduction compared to control) triggered initiation of TIE procedures and a serial dilution test using *Ceriodaphnia*. TIEs were initiated on the day following observance of >50% mortality for Ceriodaphnia tests. Toxicity was not persistent in the original sample, and the TIE was therefore inconclusive. This pattern is consistent with a rapidly degrading source of toxicity, indicating that the toxicity would probably not be persistent under ambient conditions. No pesticide analyses were conducted for this sample, but the rapid degradation of the toxicity signal appears to rule out commonly applied organophosphate pesticides (which are not expected to degrade that quickly under controlled storage conditions). An aliquot of the toxic sample was tested for copper (commonly applied in the drainage during this season) and was determined not to have toxic concentrations of copper (1.1 μg/L, compared to the hardness-based 4-day average objective of 10 μg/L for a hardness of 115 mg/L as CaCO3).

Data provided by the Glenn County Agriculture Department indicate that bifenthrin was applied aerially to 389 acres and by ground to 366 acres of almonds in the drainage, 19 days prior to the February 16 sample date. Esfenvalerate was applied to 69 acres of prunes (all ground applications), with the last application occurring 11 days before the sample date. Methidathion (an organophosphate pesticide) was applied to 36 acres of prunes 20 days prior to the February 16 sample date. Other pesticides applications included copper (811 acres), six different fungicides (615 acres), a variety of herbicides (645 acres) and petroleum oil dormant spray (865 acres). Based on toxicity to invertebrates and application amounts and timing, most of these applications represent a relatively low risk to be transported in toxic amount to the sampling location. The applications of bifenthrin and esfenvalerate have the greatest potential for causing the observed toxicity to *Ceriodaphnia*.

Event 61, March 2011 – Anderson Creek at Ash Creek Road, Pimephales toxicity

In a toxicity test conducted with *Pimephales*, the Coalition observed a reduction in survival of 10% compared to the control. The observed toxicity in the sample (<50% reduction compared to control) did not trigger initiation of TIE procedures, serial dilution tests, or evaluation of pesticide applications. The sample was tested for organophosphate pesticides, and none were detected. The sample was also tested for copper (commonly applied in the drainage during this season) and was determined to have concentrations of copper that *may* have contributed to mortality (1.6 μg/L, compared to the hardness-based 4-day average objective of 2.8 μg/L for a hardness of 26 mg/L as CaCO3). However, the total organic carbon (TOC) concentration was also elevated in the sample (44 mg/L) and would likely have eliminated any toxicity from dissolved copper. Pesticide application data were not requested or evaluated.

Event 62, April 2011 – Grand Island Drain, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed a reduction in survival of 10% compared to the control. The low level of toxicity observed in the sample (<20% reduction compared to control) did not trigger any follow-up evaluations or analyses.

Event 63, May 2011 – Pit River at Pittville, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 25% compared to the control. The toxicity observed in the sample (<50% reduction compared to control) did not trigger initiation of TIE procedures or serial dilution tests. The sample was tested for organophosphate pesticides, and none were detected.

Due to administrative changes in the Modoc County Agriculture Department, pesticide application data for the month preceding the toxicity exceedance were not yet available for review at the time this report was prepared.

Event 65, July 2011 – Willow Slough at Pole Line, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 100% compared to the control. The toxicity observed in the sample (>50% reduction compared to control) triggered initiation of TIE procedures and a serial dilution test using *Ceriodaphnia*. TIEs were initiated on the day following observance of >50% mortality for Ceriodaphnia tests. Toxicity was not persistent in the original sample (100% survival), and the TIE was therefore inconclusive. This pattern is consistent with a rapidly degrading source of toxicity, indicating that the toxicity would probably not be persistent under ambient conditions. Analyses for organophosphate and pyrethroid pesticides and the herbicide oxyfluorfen were conducted for this sample. Chlorpyrifos (0.0007 µg/L) and oxyfluorfen (0.026 µg/L) were detected well below concentrations expected to cause toxicity. No pyrethroid pesticides were detected.

Data provided by the Yolo County Agriculture Department indicate that 8092 acres were treated with insecticides and miticides in the month prior to the July 19 sample date. These applications included applications of organophosphates and other acetylcholinesterase inhibitors (chlorpyrifos, dimethoate, methomyl), and pyrethroid pesticides (bifenthrin, esfenvalerate, lambda-cyhalothrin, tau-fluvalinate). Many of these insecticides were applied by aerial methods (3242 acres), although only ~120 acres were treated aerially within 7 days of the sample date. Other pesticides applications in the drainage included copper (188 acres), 14 different fungicides (5318 acres), a variety of herbicides (9724 acres) and petroleum oil dormant spray (9724 acres). Based on toxicity to invertebrates and application amounts and timing, most of these applications represent a relatively low risk to be transported in toxic amount to the sampling location. Although the applications of organophosphate and pyrethroid pesticides have a high potential for causing the observed toxicity to *Ceriodaphnia*, these were undetected or below toxic concentrations in the sample.

Event 65, July 2011 – Pine Creek at Nord Gianella Road, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 100% compared to the control. The toxicity observed in the sample (>50% reduction compared to control) triggered initiation of TIE procedures and a serial dilution test using *Ceriodaphnia*. TIEs were initiated on the day following observance of >50% mortality for Ceriodaphnia tests. Toxicity was not persistent in the original sample (100% survival), and the TIE was therefore inconclusive. This pattern is consistent with a rapidly degrading source of toxicity, chlorpyrifos (which is not expected to rapidly degrade at controlled sample storage conditions) was detected at a toxic concentration in the sample. Analyses for organophosphate and pyrethroid pesticides and the herbicide oxyfluorfen were conducted for this sample: Chlorpyrifos (0.25 µg/L) was detected above the water quality objective and the concentration expected to cause toxicity, and was therefore determined to be the likely cause of the toxicity. Oxyfluorfen (0.026 µg/L) was also detected, but well below concentrations expected to cause toxicity. No pyrethroid pesticides were detected.

Data provided by the Butte County Agriculture Department indicate that chlorpyrifos was applied to approximately 2075 acres of walnuts and 40 acres of almonds in the Pine Creek drainage in the month prior to the July 20 *Ceriodaphnia* toxicity exceedance.

Event 66, August 2011 – Cache Creek at Capay Diversion Dam, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 95% compared to the control. This was the result of a re-test, due to unacceptable control survival in the initial test. The toxicity observed in the sample (>50% reduction compared to control) triggered initiation of TIE procedures using *Ceriodaphnia*. TIEs were initiated on the day following observance of >50% mortality for Ceriodaphnia tests. Toxicity was not persistent in the original sample (100% survival compared to control), and the TIE was therefore inconclusive. This pattern is consistent with a rapidly degrading source of toxicity, indicating that the toxicity would probably not be persistent under ambient conditions. Analysis for organophosphate pesticides was conducted for this sample and none were detected.

Data provided by the Yolo County Agriculture Department indicate that there were no insecticides applications upstream from the sampling site in July 2011. Pesticide application data for August 2011 were not yet available for review at the time this report was prepared due to changes in the pesticide application reporting management system and will be evaluated when they become available.

Event 66, August 2011 – Lower Snake R. at Nuestro Rd, Ceriodaphnia toxicity

In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 90% compared to the control. This was the result of a re-test, due to unacceptable control survival in the initial test. The toxicity observed in the sample (>50% reduction compared to control) triggered initiation of TIE procedures using *Ceriodaphnia*. TIEs were initiated on the day following observance of >50% mortality for *Ceriodaphnia* tests. Toxicity was not persistent in the original sample (95% survival compared to control), and the TIE was therefore inconclusive. This pattern is consistent with a rapidly degrading source of toxicity, indicating that the toxicity would probably not be persistent under ambient conditions. Analysis for organophosphate pesticides was conducted for this sample and none were detected. The sample was also tested for copper and was determined not to have toxic concentrations of dissolved copper (1.0 µg/L, compared to the hardness-based 4-day average objective of 9.7 µg/L for a hardness of 110 mg/L as CaCO3).

Data provided by the Butte and Sutter County Agriculture Departments indicate that 2258 acres were treated with insecticides in the month prior to the August 16 sample date. These applications were dominated by pyrethroid pesticides (bifenthrin, esfenvalerate, lambda-cyhalothrin, permethrin; 1731 total acres), but also included chlorpyrifos (87 acres) and chlorantraniliprole (148 acres). Crops treated with insecticides included peaches, rice, walnut, and almond. Based on treated acreage and relative toxicity, the pyrethroid pesticides were the most likely to have contributed to the toxicity observed in the sample.

Event 66, August 2011 – Grand Island Drain, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed a reduction in survival of 7.6% compared to the control. The low level of toxicity observed in the sample (<20% reduction compared to control) did not trigger any follow-up evaluations or analyses.

Event 66, August 2011 – Ulatis Creek, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed a reduction in survival of 46% compared to the control. The toxicity observed in the sample (≥20% reduction compared to control) triggered follow-up sediment analyses for pyrethroid pesticides and chlorpyrifos. Lambda-cyhalothrin was detected in the sample at a normalized concentration of 0.033 µg/g organic carbon, equivalent to less than 0.1 Toxic Units. No other pesticides were detected in the sample and it was concluded that these pesticides were not the cause of the observed toxicity.

Data provided by the Solano County Agriculture Department indicate that substantial acreage was treated with pyrethroid insecticides and chlorpyrifos in the month prior to the August 16 sample date. However, pesticide application data from the new pesticide permit data management system included numerous duplicate records and total acreages could not be calculated for specific pesticides and crops at this time. Pyrethroid pesticides used included , as well as a number of lower risk pesticides unlikely to cause sediment toxicity.

Event 66, August 2011 – Willow Slough, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed a reduction in survival of 54% compared to the control. The toxicity observed in the sample (≥20% reduction compared to control) triggered follow-up sediment analyses for pyrethroid pesticides and chlorpyrifos. Bifenthrin was detected in the sample at a normalized concentration of 0.094 µg/g organic carbon, equivalent to approximately 0.18 Toxic Units. No other pesticides were detected in the sample and it was concluded that bifenthrin may have contributed to the observed toxicity but was not the principal cause.

Data provided by the Yolo County Agriculture Department indicate that substantial acreage was treated with pyrethroid insecticides and chlorpyrifos in the 2 months prior to the August 16 sample date. However, pesticide application data for August 2011 were not yet available for review at the time this report was prepared due to changes in the pesticide application reporting management system and will be evaluated when they become available. Based on the data available for June and July, applied pyrethroid pesticides included bifenthrin, esfenvalerate, fenpropathrin, lambda-cyhalothrin, and beta-cyfluthrin (2430 acres). Chlorpyrifos was applied to 238 acres. Abamectin was applied to ~1690 acres in the watershed and may have contributed to sediment toxicity. Abamectin is an insecticide with a predicted short field half-life, a low solubility, and a tendency to bind to organic particulates. The limited toxicity data for abamectin suggests that it may toxic to sediment dwelling organisms at low concentrations comparable to that of pyrethroids (*Chironimus* 28-day NOEC 3.3 µg/g of sediment as dry weight; IUPAC database). Crops with the largest total acreage treated included corn, tomatoes, sunflowers, and walnuts. Applications were made by air and by ground in approximately equal proportion.

Pesticides Detected in Coalition Monitoring

There were 4,256 individual pesticide results analyzed in 149 water column samples collected from 22 different sites during 2011 Coalition Monitoring. Analyses were conducted for organophosphates, carbamates, organochlorines, triazines, pyrethroids, and other herbicides. Within these categories, 18 different pesticides were detected in 81 of the 166 separate samples (including field duplicates) collected for Coalition monitoring. Approximately 51% of samples had no detected pesticides and more than 97.7% of all pesticide results were below detection.

There were also 109 individual pesticide results analyzed in seven sediment samples collected from three different sites during 2011 Coalition Monitoring. Analyses were conducted for organophosphate and pyrethroid pesticides. Within these categories, five different pesticides were detected in 13 separate samples (out of 109 samples) collected for Coalition monitoring. More than 88% of the results were below detection. Six of seven samples contained detected pyrethroid pesticides.

It should be noted that detected pesticides are not equivalent to exceedances. Three registered pesticides (chlorpyrifos, diazinon, malathion) exceeded applicable water quality objectives or *Trigger Limits* in a total of ten Coalition monitoring samples (including 2 field duplicates). Legacy organochlorines (HCH-alpha, toxaphene) were detected in three water column samples and in all three cases also exceeded applicable (CTR) water quality objectives.

Discussion of Pesticides Detected in Water Column in Coalition Monitoring

All detected pesticide concentrations in water column samples for 2011 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 2011)*. A discussion of these detections and exceedances follow below.

- The insecticide bifenthrin was detected in one sample from the Pine Creek site. The concentration in this sample (0.0003 µg/L) did not exceed or approach concentrations predicted to cause toxicity to sensitive freshwater invertebrates (0.11 µg/L *Daphnia mag* 2-naday EC50, IUPAC database). This sample was toxic to *Ceriodaphnia*, and also had a detected chlorpyrifos concentration that accounted for the toxicity.
- The insecticide carbaryl was detected in one sample from the Grand Island Drain site. It did not exceed the IRP trigger limit (2.53 µg/L) or approach concentrations predicted to cause toxicity to sensitive invertebrates (2.8 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database). There was no toxicity to *Ceriodaphnia* in this sample.

- The insecticide chlorpyrifos was detected in 21 samples (two field duplicates) from 12 different sites. Chlorpyrifos exceeded the Basin Plan Amendment objective (0.015 µg/L) in eight of these samples (one field duplicate) from three sites (Coon Creek at Brewer Road, Coon Creek at Striplin Road, Pine Creek, and Ulatis Creek).
    - Chlorpyrifos was applied to approximately 1500 acres of walnuts in the Coon Creek drainage in the month prior to the August 2011 exceedance at Brewer Road. No chlorpyrifos applications were reported in the month prior to the May 2011 exceedance at Striplin Road.
    - Chlorpyrifos was applied to approximately 2075 acres of walnuts and 40 acres of almonds in the Pine Creek drainage in the month prior to the initial July 20 exceedance. Chlorpyrifos was also applied to additional walnut and prune acreage before the subsequent two exceedances observed at this site in August and September 2011.
    - Chlorpyrifos was applied to approximately 28 acres of walnuts in the Ulatis Creek drainage in the month prior to the May 17, 2011 exceedance. Chlorpyrifos was applied to 2050 acres of alfalfa, 131 acres of walnuts, and 17 acres of almonds in the Ulatis Creek drainage in the month prior to the September 20, 2011 exceedance.
- The herbicide dacthal (DCPA) was detected in one sample from the Ulatis Creek site. The concentration in this sample (0.012 µg/L) did not exceed or approach concentrations predicted to cause toxicity to sensitive invertebrates (>40000 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database).
- The insecticide diazinon was detected in nine samples from six different sites; one of these samples was a field duplicate. Two of these detections exceeded the Basin Plan chronic objective (0.1 µg/L) at the Grand Island Drain and Gilsizer Slough sites. The exceedance and Grand Island Drain was a field duplicate and the result of the environmental sample did not exceed the objective. There was a single application of diazinon to approximately 138 acres of pears 4 days prior to the October 19, 2011 exceedance at Grand Island Drain. Diazinon was applied to approximately 191 acres of peaches and 63 acres of prunes in the month prior to the February 16, 2011 exceedance at Gilsizer Slough.
- The insecticide disulfoton was detected in one sample from the Sacramento Slough site. The concentration in this sample (0.009 µg/L) did not exceed or approach concentrations predicted to cause toxicity to sensitive invertebrates (0.4–0.9 µg/L *Daphnia magna* 1-day EC50, USEPA ECOTOX database).
- The herbicide diuron was detected in seven samples from three different sites (Lower Snake River, Ulatis Creek, Walker Creek), including two field duplicates. None of these detections exceeded concentrations predicted to cause toxicity to algae (2.4 µg/L *Selenastrum* 4-day EC50, USEPA ECOTOX database) or were associated with *Selenastrum* toxicity.
- The insecticide endosulfan I was detected in one sample from the Anderson Creek site. Endosulfan is a legacy OC pesticide that is no longer registered for use in California.

- The insecticide fensulfothion was detected in one sample from the Pit River site. There is insufficient toxicity data available to definitively assess potential toxicity to sensitive invertebrates, but reported toxicity endpoints for all species in USEPA's ECOTOX database were greater than 1 µg/L and the single detected concentration was orders of magnitude lower than 1 µg/L (0.0036 µg/L). There was no toxicity to *Ceriodaphnia* in the associated sample.
- The insecticide HCH-alpha was detected in one sample from the Anderson Creek site, and it exceeded the CTR objective of 0.24 µg/L. HCH-alpha is a legacy OC pesticide that is no longer registered for use in California.
- The herbicide hexazinone was detected in six samples from three different sites. None of the samples exceeded or approached concentrations predicted to cause toxicity to algae (6.8 µg/L *Selenastrum* 5-day EC50, USEPA ECOTOX database). There was no toxicity to *Selenastrum* in the associated samples.
- Malathion was detected in one sample at Colusa Basin Drain. Detection of malathion is an exceedance of the Basin Plan prohibition. There were two applications of malathion to approximately 98 acres of alfalfa in the month prior to the August 17, 2011 exceedance at Colusa Basin Drain. The detected concentration (0.03 µg/L) is below concentrations expected to cause toxicity to sensitive invertebrates (0.5 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database), and there was no significant toxicity in the associated test with *Ceriodaphnia*.
- The insecticide methomyl was detected in one sample from the Colusa Basin Drain site. The concentration in this sample (0.05 µg/L) did not exceed or approach concentrations predicted to cause toxicity to sensitive invertebrates (4.7–31 µg/L *Daphnia magna* 2-day EC50, USEPA ECOTOX database). There was no toxicity to *Ceriodaphnia* in the associated sample.
- The herbicide metolachlor was detected in 16 samples from five different sites (Colusa Basin Drain, Freshwater Creek, Shag Slough, Ulatis Creek, Willow Creek); one of these samples was a field duplicate. One detected result (28.5 µg/L, Ulatis Creek, 3/15/2011) exceeded the concentration predicted to cause toxicity to green algae (8 µg/L *Selenastrum* 5-day EC50, USEPA ECOTOX data base), but there was no toxicity to *Selenastrum* in the associated toxicity test of the same sample.
- The herbicide oryzalin was detected in four samples from two sites (Ulatis Creek, Walker Creek), including one field duplicate. None of the samples exceeded or approached concentrations predicted to cause toxicity to algae (42 µg/L *Selenastrum* 5-day EC50, USEPA ECOTOX database), and no samples were toxic to *Selenastrum*.
- The pesticide oxyfluorfen was detected in 10 samples from five different sites (Colusa Basin Drain, Freshwater Creek, Pine Creek, Walker Creek, Willow Slough), including one field duplicate. Three results exceeded the concentration predicted to cause toxicity to green algae (0.08 µg/L *Selenastrum* 3-day EC50, USEPA ECOTOX database), but there was no toxicity to *Selenastrum* in the associated toxicity tests of these samples.
- The herbicide simazine was detected in 11 samples from seven sites (Colusa Basin Drain, Lower Honcut Creek, Lower Snake River, Pine Creek, Sacramento Slough, Shag Slough,

Walker Creek), including one field duplicate. None of the samples exceeded or approached concentrations predicted to cause toxicity to algae (100 µg/L *Selenastrum* 4-day EC50, USEPA ECOTOX database). There was no toxicity to *Selenastrum* in the associated samples.

- The insecticide toxaphene was detected in two samples from two sites (Middle Fork of the Feather River, Pit River). Both of the samples exceeded the CTR objective of 0.0002 µg/L. Toxaphene is a bioaccumulative legacy organochlorine pesticide. It is no longer registered for use in California, and there have been no reported uses in the SVWQC watershed in the last 10 years, including uses for cattle, irrigated agriculture, or non-agricultural uses.

Table 22. Pesticides Detected in 2011 Coalition Monitoring

Site ID	Date Sampled	Analyte		Result[1] (µg/L)	Trigger Limit[2]	Basis for Limit[3]
PNCGR	7/20/2011	Bifenthrin	DNQ	0.0003		
GIDLR	4/20/2011	Carbaryl	=	2.3	2.53	BP
GIDLR	4/20/2011	Chlorpyrifos	=	0.0027	0.015	BPA
CCSTR	4/21/2011	Chlorpyrifos	=	0.0142	0.015	BPA
CCSTR	**5/17/2011**	**Chlorpyrifos**	**=**	**0.0213**	**0.015**	**BPA**
UCBRD	**5/17/2011**	**Chlorpyrifos**	**=**	**0.0368**	**0.015**	**BPA**
WLSPL	5/17/2011	Chlorpyrifos	=	0.0082	0.015	BPA
WLSPL	7/19/2011	Chlorpyrifos	DNQ	0.000748	0.015	BPA
PNCGR	**7/20/2011**	**Chlorpyrifos**	**=**	**0.248**	**0.015**	**BPA**
PNCGR[5]	**7/20/2011**	**Chlorpyrifos**	**=**	**0.119**	**0.015**	**BPA**
WLKCH	7/20/2011	Chlorpyrifos	=	0.005	0.015	BPA
WLKCH[5]	7/20/2011	Chlorpyrifos	=	0.006	0.015	BPA
ACACR	8/17/2011	Chlorpyrifos	=	0.0138	0.015	BPA
CCBRW	**8/17/2011**	**Chlorpyrifos**	**=**	**0.017**	**0.015**	**BPA**
COLDR	8/17/2011	Chlorpyrifos	=	0.0032	0.015	BPA
PNCGR	**8/17/2011**	**Chlorpyrifos**	**=**	**0.0825**	**0.015**	**BPA**
GIDLR	9/20/2011	Chlorpyrifos	DNQ	0.0017	0.015	BPA
SSKNK	9/20/2011	Chlorpyrifos	=	0.0022	0.015	BPA
UCBRD	**9/20/2011**	**Chlorpyrifos**	**=**	**0.0162**	**0.015**	**BPA**
ACACR	9/21/2011	Chlorpyrifos	=	0.003	0.015	BPA
LHNCT	9/21/2011	Chlorpyrifos	=	0.0061	0.015	BPA
LSNKR	9/21/2011	Chlorpyrifos	=	0.0037	0.015	BPA
PNCGR	**9/21/2011**	**Chlorpyrifos**	**=**	**0.0885**	**0.015**	**BPA**
UCBRD	2/15/2011	Dacthal	DNQ	0.012	NA	
GIDLR	10/19/2010	Diazinon	=	0.0859	0.1	(BP chronic)
GIDLR[5]	**10/19/2010**	**Diazinon**	**=**	**0.102**	**0.1**	**(BP chronic)**
LHNCT	1/18/2011	Diazinon	DNQ	0.1	0.1	(BP chronic)
LSNKR	1/18/2011	Diazinon	=	0.024	0.1	(BP chronic)
SSLIB	2/15/2011	Diazinon	=	0.0062	0.1	(BP chronic)

Site ID	Date Sampled	Analyte	Result[1] (µg/L)		Trigger Limit[2]	Basis for Limit[3]
UCBRD	2/15/2011	Diazinon	=	0.0125	0.1	(BP chronic)
GILSL	**2/16/2011**	**Diazinon**	**=**	**0.1352**	**0.1**	**(BP chronic)**
GILSL	3/16/2011	Diazinon	=	0.0195	0.1	(BP chronic)
GIDLR	5/17/2011	Diazinon	=	0.0185	0.1	(BP chronic)
SSKNK	8/17/2011	Disulfoton	=	0.0087	0.05	BP
UCBRD	12/7/2010	Diuron	=	1.2	2	Narrative
UCBRD[5]	12/7/2010	Diuron	=	0.92	2	Narrative
LSNKR	3/16/2011	Diuron	=	0.52	2	Narrative
WLKCH	3/16/2011	Diuron	=	0.55	2	Narrative
WLKCH	4/21/2011	Diuron	DNQ	0.24	2	Narrative
WLKCH	5/18/2011	Diuron	DNQ	0.2	2	Narrative
WLKCH[5]	5/18/2011	Diuron	DNQ	0.2	2	Narrative
ACACR	2/16/2011	Endosulfan I	=	0.011	0.056	CTR
PRPIT	4/21/2011	Fensulfothion	=	0.0036	NA	
ACACR	**2/16/2011**	**HCH, alpha**	**=**	**0.24**	**0.0039**	**CTR**
SSLIB	1/18/2011	Hexazinone	DNQ	0.15	NA	
UCBRD	1/18/2011	Hexazinone	DNQ	0.3	NA	
WLSPL	1/18/2011	Hexazinone	DNQ	0.44	NA	
SSLIB	2/15/2011	Hexazinone	=	0.1284	NA	
UCBRD	2/15/2011	Hexazinone	=	0.0569	NA	
WLSPL	2/15/2011	Hexazinone	=	0.338	NA	
COLDR	**8/17/2011**	**Malathion**	**=**	**0.0312**	**ND[4]**	**BP**
COLDR	5/12/2011	Methomyl	DNQ	0.05	0.52	BP
FRSHC	3/15/2011	Metolachlor	DNQ	0.0099	NA	
SSLIB	3/15/2011	Metolachlor	=	0.159	NA	
UCBRD	3/15/2011	Metolachlor	=	28.5	NA	
WLSPL	3/15/2011	Metolachlor	=	0.0319	NA	
COLDR	4/20/2011	Metolachlor	=	0.2979	NA	
FRSHC	4/20/2011	Metolachlor	=	0.755	NA	
SSLIB	4/20/2011	Metolachlor	=	0.0788	NA	
WLSPL	4/20/2011	Metolachlor	=	0.2634	NA	
SSLIB	5/17/2011	Metolachlor	=	0.1635	NA	
UCBRD	5/17/2011	Metolachlor	=	0.5951	NA	
WLSPL	5/17/2011	Metolachlor	=	0.3891	NA	
FRSHC	5/18/2011	Metolachlor	=	0.1031	NA	
FRSHC[5]	5/18/2011	Metolachlor	=	0.094	NA	
WLKCH	5/18/2011	Metolachlor	=	0.0173	NA	
UCBRD	6/21/2011	Metolachlor	=	0.0375	NA	
WLSPL	6/21/2011	Metolachlor	=	0.2224	NA	
UCBRD	12/7/2010	Oryzalin	=	1	NA	
UCBRD[5]	12/7/2010	Oryzalin	=	0.81	NA	
UCBRD	2/15/2011	Oryzalin	=	1.5	NA	

Site ID	Date Sampled	Analyte	Result[1] (µg/L)		Trigger Limit[2]	Basis for Limit[3]
WLKCH	3/16/2011	Oryzalin	=	0.6	NA	
FRSHC	1/19/2011	Oxyfluorfen	DNQ	0.37	NA	
WLKCH	4/21/2011	Oxyfluorfen	=	0.0867	NA	
COLDR	5/12/2011	Oxyfluorfen	=	0.7671	NA	
FRSHC	6/21/2011	Oxyfluorfen	=	0.0527	NA	
FRSHC[5]	6/21/2011	Oxyfluorfen	=	0.0628	NA	
WLSPL	6/21/2011	Oxyfluorfen	=	0.0254	NA	
WLSPL	7/19/2011	Oxyfluorfen	=	0.0264	NA	
FRSHC	7/20/2011	Oxyfluorfen	=	0.0229	NA	
PNCGR	7/20/2011	Oxyfluorfen	=	0.0662	NA	
FRSHC	8/17/2011	Oxyfluorfen	DNQ	0.0082	NA	
SSLIB	2/15/2011	Simazine	DNQ	0.0062	4	CA 1° MCL
PNCGR	2/16/2011	Simazine	DNQ	0.23	4	CA 1° MCL
WLKCH	2/16/2011	Simazine	DNQ	0.32	4	CA 1° MCL
COLDR	3/15/2011	Simazine	=	0.0289	4	CA 1° MCL
SSKNK	3/15/2011	Simazine	=	0.0405	4	CA 1° MCL
SSKNK[5]	3/15/2011	Simazine	=	0.0323	4	CA 1° MCL
LHNCT	3/16/2011	Simazine	=	0.0281	4	CA 1° MCL
LSNKR	3/16/2011	Simazine	=	0.0663	4	CA 1° MCL
WLKCH	3/16/2011	Simazine	=	0.151	4	CA 1° MCL
WLKCH	5/18/2011	Simazine	=	0.0162	4	CA 1° MCL
WLKCH	6/22/2011	Simazine	=	0.038	4	CA 1° MCL
PRPIT	**8/17/2011**	**Toxaphene**	**DNQ**	**0.011**	**0.0002**	**CTR**
MFFGR	**8/18/2011**	**Toxaphene**	**DNQ**	**0.02**	**0.0002**	**CTR**

BOLD = Exceedance

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).
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;
CTR = California Toxics Rule; Narrative = unadopted limits used to interpret Basin Plan narrative objectives by the Central Valley Regional Board.
4. 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.
5. This environmental sample was a follow-up analysis for *Ceriodaphnia* toxicity.

Pesticides Detected in Sediment in Coalition Monitoring

All detected pesticide concentrations for sediment chemistry analyses are included in **Table 23**.

- Bifenthrin was detected in four sediment samples from two sites (Willow Slough, Z-Drain). Bifenthrin may have contributed to the toxicity observed in the August 2011 Willow Slough sediment sample, but did not appear to be the principal cause of toxicity. Bifenthrin concentrations detected in the Z-drain samples did not appear to have been elevated sufficiently to cause or contribute significantly to sediment toxicity.

- Chlorpyrifos was detected in one sediment sample from one site (Z-Drain), but was unlikely to have caused or contributed significantly to sediment toxicity based on detected concentrations and known toxicity thresholds for *Hyalella*.
- Esfenvalerate/Fenvalerate was detected in three sediment samples from one site (Z-Drain), but was unlikely to have contributed significantly to sediment toxicity in these samples based on detected concentrations and known toxicity thresholds for *Hyalella* (these samples were not tested for toxicity).
- L-Cyhalothrin was detected in four sediment samples from two sites (Ulatis Creek, Z-Drain). It was sufficiently elevated to contribute to or cause significant toxicity in the April, June, and August Z-drain samples based on detected concentrations and known toxicity thresholds for *Hyalella* (these samples were not tested for toxicity).
- Permethrin was detected in one sediment sample from one site (Z-Drain), but was unlikely to have contributed significantly to sediment toxicity based on detected concentrations and known toxicity thresholds for *Hyalella* (these samples were not tested for toxicity).

Table 23. Pesticides Detected in Sediment in 2011 Coalition Monitoring

Site ID	Date Sampled	Analyte	Result[1] (ng/g dw)	
WLSPL	12/7/2010	Bifenthrin	=	0.39
ZDDIX	4/20/2011	Bifenthrin	DNQ	0.14
ZDDIX	6/21/2011	Bifenthrin	DNQ	0.26
WLSPL	8/16/2011	Bifenthrin	DNQ	0.49
ZDDIX	4/20/2011	Chlorpyrifos	=	0.54
ZDDIX	4/20/2011	Esfenvalerate/Fenvalerate	=	0.52
ZDDIX	6/21/2011	Esfenvalerate/Fenvalerate	=	0.4
ZDDIX	8/16/2011	Esfenvalerate/Fenvalerate	=	1.9
ZDDIX	4/20/2011	L-Cyhalothrin	=	1.9
ZDDIX	6/21/2011	L-Cyhalothrin	=	5.8
UCBRD	8/16/2011	L-Cyhalothrin	DNQ	0.32
ZDDIX	8/16/2011	L-Cyhalothrin	=	2.4
ZDDIX	6/21/2011	Permethrin	DNQ	0.23

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, total dissolved solids, and trace metals during 2011 Coalition Monitoring (**Table 24**).

Conductivity

Conductivity was monitored in 201 samples from 24 Coalition sites. Conductivity exceeded the California recommended 2˚ MCL (900 µS/cm) for drinking water in 21 samples and the unadopted UN Agricultural Goal (700 µS/cm) in a total of 44 samples collected from 10 different sites. Nine of the exceedances were observed at Ulatis Creek (UCBRD), and nine were observed at Willow Slough (WLSPL).

In addition, one out of the five conductivity samples taken from the Middle Fork Feather River (MFFGR) in 2011 exceeded the 90th percentile site-specific water quality objective value in the Basin Plan (150 µS/cm). The 90^{th} percentile of all samples collected from the Middle Fork Feather River for the ILRP since 2005 (205 µS/cm) also exceeded this site-specific objective.

Dissolved Oxygen

During 2011 Coalition Monitoring, dissolved oxygen was measured in 201 samples from 24 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 one sample from one site (Ulatis Creek) and below the Basin Plan lower limit of 7.0 mg/L for waterbodies with a COLD designated beneficial use in an additional six samples from four sites (Colusa Basin Drain, Coon Creek, Cosumnes River, and Middle Fork Feather River).

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. These exceedances occurred during the months of May, June, August, and October, and it was determined that the conditions contributing to low dissolved oxygen were typical for irrigation season at these sites.

E. coli *Bacteria*

E. coli bacteria were monitored in 193 samples from 17 sites, including 13 field duplicate samples. *E. coli* results exceeded the single sample maximum objective (235 MPN/100mL) in 64 samples from 12 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 sometimes very large numbers) of birds and other wildlife. These avian and wildlife resources are expected to be significant sources of *E. coli* and other bacteria in agricultural runoff and irrigation return flows. Other sources include, but are not limited to cattle, horses, septic systems, treated wastewater, and urban runoff.

Nutrients

Nutrients monitored during 2011 Coalition Monitoring included nitrate + nitrite as N, total Kjeldahl nitrogen (TKN), ammonia, total phosphorus, and dissolved orthophosphate. Nutrients were monitored in 189 samples at 17 different Coalition sites, including 22 field duplicate samples. Nitrate as N results exceeded the Basin Plan objective (10 mg/L) in two samples from one site (Ulatis Creek). Ammonia concentrations were typically below quantitation limits and did not exceed the temperature- and pH-dependent national water quality criterion for this parameter in any sample. There are no applicable water quality objectives (adopted or unadopted) for TKN, total phosphorus, or orthophosphate.

pH

During 2011 Coalition Monitoring, pH was measured in 201 samples from 24 Coalition sites. pH exceeded the Basin Plan maximum of 8.5 Standard Units (-log[H+]) in two Coalition samples collected from two different sites (Cache Creek and Z-Drain).

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.

Both of pH exceedances occurred in April and July during the irrigation season. 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. The elevated pH values may be within a normal naturally elevated range of ambient pH for these sites (7.2 - 9.1 in Cache Creek; 7.12 – 9.4 in Z-Drain).

Trace Metals

Trace metals monitored during 2011 Coalition monitoring included both unfiltered metals (total arsenic, boron, copper, lead, molybdenum, and selenium) and unfiltered metals (dissolved copper and lead). Total trace metals were monitored in 104 samples (including 8 field duplicates), and dissolved trace metals were monitored in 66 samples (including two field duplicates) at 17 different Coalition sites.

Arsenic

Arsenic was monitored in 25 samples (including four field duplicates) from six different Coalition sites. Five samples for Grand Island Drain (including two field duplicates) 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 sampling site, if arsenic-based preservatives were used. One final, but somewhat unlikely source is an arsenic-based additive that may still be used for chicken feed (http://water.usgs.gov/owq/AFO/proceedings/afo/pdf/Wershaw.pdf), and which can potentially make its way through the chicken and into agriculture fields and runoff if the poultry litter is used on the field.

Boron

Boron was monitored in 14 samples (including two field duplicates) from four different Coalition sites. Six samples (including one field duplicate) at two sites (Shag Slough, Willow Slough) exceeded the Trigger Limit (700 µg/L, based on Ayers and Westcott). Boron is a naturally-occurring mineral that is not applied by agriculture, but 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.

Copper

Dissolved copper was monitored in 66 samples (including two field duplicates) from 16 different Coalition sites. One sample for the Cosumnes River exceeded the CTR hardness-based objective for dissolved copper (2.65 µg/L) in March of 2011. Copper is widely used by agriculture as a fungicide, but it also occurs naturally in soils and is commonly used for maintenance of septic systems. The heaviest agricultural use in the Lower Cosumnes River drainage typically occurs March through May, with grapes and walnuts accounting for >80% of the use.

Lead

Dissolved lead was monitored in two samples from Pit River, and it exceeded the CTR hardness-based objective (0.9 µg/L) in one sample. Total lead was monitored in three samples from two different Coalition sites. One sample, at Pit River, exceeded the Basin Plan objective (15 µg/L).

The cause of these lead exceedances was not determined. No other trace metals exceeded objectives in the PRPIT sample, and there are no known agricultural sources of lead. Potential non-agricultural sources include lead shotgun pellets and illegally discarded batteries.

Selenium

Total selenium was monitored in 14 (two field duplicates) samples from four different Coalition sites. One sample, at Willow Slough, exceeded the CTR objective (5 µg/L). Selenium is a naturally-occurring mineral that is not applied by agriculture, but 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 supplying irrigation water in the Willow Slough drainage.

Table 24. Other Physical, Chemical, and Microbiological Parameters Observed to Exceed Numeric Objectives in 2011 Coalition Monitoring

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgt Plan(3)
GIDLR	2/15/2011	Arsenic	µg/L	16	10	BP	NO
GIDLR	3/15/2011	Arsenic	µg/L	15	10	BP	NO
GIDLR	6/21/2011	Arsenic	µg/L	14	10	BP	NO
GIDLR(7)	2/15/2011	Arsenic	µg/L	16	10	BP	NO
GIDLR(7)	3/15/2011	Arsenic	µg/L	15	10	BP	NO
SSLIB	4/20/2011	Boron	µg/L	840	700	Narrative	NO
WLSPL	1/18/2011	Boron	µg/L	2300	700	Narrative	NO
WLSPL	2/15/2011	Boron	µg/L	2410	700	Narrative	NO
WLSPL	3/15/2011	Boron	µg/L	1870	700	Narrative	NO
WLSPL	4/20/2011	Boron	µg/L	2230	700	Narrative	NO
WLSPL(7)	4/20/2011	Boron	µg/L	2260	700	Narrative	NO
CCSTR	4/20/2011	Conductivity	µS/cm	783	900, 700(4)	Narrative	YES
COLDR	1/18/2011	Conductivity	µS/cm	734	900, 700(4)	Narrative	YES
COLDR	2/15/2011	Conductivity	µS/cm	942	900, 700(4)	Narrative	YES
COLDR	3/15/2011	Conductivity	µS/cm	998	900, 700(4)	Narrative	YES
COLDR	6/14/2011	Conductivity	µS/cm	737	900, 700(4)	Narrative	YES
FRSHC	10/20/2010	Conductivity	µS/cm	892	900, 700(4)	Narrative	YES
FRSHC	11/10/2010	Conductivity	µS/cm	883	900, 700(4)	Narrative	YES
FRSHC	12/8/2010	Conductivity	µS/cm	838	900, 700(4)	Narrative	YES
FRSHC	1/19/2011	Conductivity	µS/cm	890	900, 700(4)	Narrative	YES
FRSHC	2/15/2011	Conductivity	µS/cm	826	900, 700(4)	Narrative	YES
FRSHC	3/15/2011	Conductivity	µS/cm	932	900, 700(4)	Narrative	YES
FRSHC	4/20/2011	Conductivity	µS/cm	933	900, 700(4)	Narrative	YES
GIDLR	12/7/2010	Conductivity	µS/cm	735	900, 700(4)	Narrative	YES
GIDLR	1/18/2011	Conductivity	µS/cm	1117	900, 700(4)	Narrative	YES
GIDLR	2/15/2011	Conductivity	µS/cm	815	900, 700(4)	Narrative	YES
GIDLR	3/15/2011	Conductivity	µS/cm	1059	900, 700(4)	Narrative	YES
GIDLR	4/20/2011	Conductivity	µS/cm	836	900, 700(4)	Narrative	YES
MFFGR	5/24/2011	Conductivity	µS/cm	181.6(5)	900, 700(4)	Narrative	NO
RARPP	2/15/2011	Conductivity	µS/cm	937	900, 700(4)	Narrative	YES
RARPP	3/15/2011	Conductivity	µS/cm	1320	900, 700(4)	Narrative	YES
SSLIB	1/18/2011	Conductivity	µS/cm	713	900, 700(4)	Narrative	NO
SSLIB	2/15/2011	Conductivity	µS/cm	776	900, 700(4)	Narrative	NO
SSLIB	3/15/2011	Conductivity	µS/cm	737	900, 700(4)	Narrative	NO
UCBRD	10/19/2010	Conductivity	µS/cm	1173	900, 700(4)	Narrative	YES
UCBRD	11/9/2010	Conductivity	µS/cm	1114	900, 700(4)	Narrative	YES
UCBRD	12/7/2010	Conductivity	µS/cm	782	900, 700(4)	Narrative	YES
UCBRD	1/18/2011	Conductivity	µS/cm	1216	900, 700(4)	Narrative	YES
UCBRD	3/15/2011	Conductivity	µS/cm	707	900, 700(4)	Narrative	YES

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit[1]	Basis for Limit[2]	Mgt Plan[3]
UCBRD	4/20/2011	Conductivity	µS/cm	896	900, 700[4]	Narrative	YES
UCBRD	5/17/2011	Conductivity	µS/cm	777	900, 700[4]	Narrative	YES
UCBRD	6/21/2011	Conductivity	µS/cm	1012	900, 700[4]	Narrative	YES
UCBRD	8/16/2011	Conductivity	µS/cm	866	900, 700[4]	Narrative	YES
WLSPL	10/19/2010	Conductivity	µS/cm	1505	900, 700[4]	Narrative	YES
WLSPL	11/9/2010	Conductivity	µS/cm	1067	900, 700[4]	Narrative	YES
WLSPL	12/7/2010	Conductivity	µS/cm	1126	900, 700[4]	Narrative	YES
WLSPL	1/18/2011	Conductivity	µS/cm	1188	900, 700[4]	Narrative	YES
WLSPL	2/15/2011	Conductivity	µS/cm	1190	900, 700[4]	Narrative	YES
WLSPL	3/15/2011	Conductivity	µS/cm	941	900, 700[4]	Narrative	YES
WLSPL	4/20/2011	Conductivity	µS/cm	1167	900, 700[4]	Narrative	YES
WLSPL	6/21/2011	Conductivity	µS/cm	838	900, 700[4]	Narrative	YES
WLSPL	8/16/2011	Conductivity	µS/cm	866	900, 700[4]	Narrative	YES
ZDDIX	4/20/2011	Conductivity	µS/cm	1163	900, 700[4]	Narrative	YES
ZDDIX	6/21/2011	Conductivity	µS/cm	970	900, 700[4]	Narrative	YES
ZDDIX	8/16/2011	Conductivity	µS/cm	787	900, 700[4]	Narrative	YES
CRTWN	3/15/2011	Copper, Dissolved	µg/L	3.3	2.65	CTR	NO
CCBRW	6/21/2011	Dissolved Oxygen	mg/L	6.55	7 (COLD), 5 (WARM)	BP	YES
COLDR	5/12/2011	Dissolved Oxygen	mg/L	6.08	7 (COLD), 5 (WARM)	BP	YES
COLDR	6/14/2011	Dissolved Oxygen	mg/L	4.75	7 (COLD), 5 (WARM)	BP	YES
COLDR	8/17/2011	Dissolved Oxygen	mg/L	5.96	7 (COLD), 5 (WARM)	BP	YES
COLDR[7]	8/17/2011	Dissolved Oxygen	mg/L	5.85	7 (COLD), 5 (WARM)	BP	YES
CRTWN	8/17/2011	Dissolved Oxygen	mg/L	6.6	7 (COLD), 5 (WARM)	BP	YES
MFFGR	8/17/2011	Dissolved Oxygen	mg/L	6.55	7 (COLD), 5 (WARM)	BP	YES
UCBRD	10/19/2010	Dissolved Oxygen	mg/L	3.13	7 (COLD), 5 (WARM)	BP	YES
ACACR	10/21/2010	E. coli	MPN/100mL	770	235	BPA	YES
ACACR	2/16/2011	E. coli	MPN/100mL	1100	235	BPA	YES
ACACR	3/16/2011	E. coli	MPN/100mL	>2400	235	BPA	YES
ACACR	4/21/2011	E. coli	MPN/100mL	770	235	BPA	YES
ACACR	5/18/2011	E. coli	MPN/100mL	490	235	BPA	YES
ACACR	6/22/2011	E. coli	MPN/100mL	370	235	BPA	YES
ACACR	7/20/2011	E. coli	MPN/100mL	610	235	BPA	YES
ACACR	8/17/2011	E. coli	MPN/100mL	>2400	235	BPA	YES
ACACR	9/21/2011	E. coli	MPN/100mL	770	235	BPA	YES
ACACR[7]	7/20/2011	E. coli	MPN/100mL	460	235	BPA	YES

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgt Plan(3)
CCBRW	11/9/2010	E. coli	MPN/100mL	650	235	BPA	YES
CCBRW	12/8/2010	E. coli	MPN/100mL	440	235	BPA	YES
CCBRW	3/15/2011	*E. coli*	MPN/100mL	1200	235	BPA	YES
CRTWN	11/9/2010	*E. coli*	MPN/100mL	1300	235	BPA	YES
CRTWN	12/7/2010	*E. coli*	MPN/100mL	2000	235	BPA	YES
CRTWN	3/15/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
CRTWN	8/17/2011	*E. coli*	MPN/100mL	1300	235	BPA	YES
FRSHC	11/10/2010	*E. coli*	MPN/100mL	290	235	BPA	YES
FRSHC	12/8/2010	*E. coli*	MPN/100mL	330	235	BPA	YES
FRSHC	1/19/2011	*E. coli*	MPN/100mL	260	235	BPA	YES
FRSHC	6/21/2011	*E. coli*	MPN/100mL	870	235	BPA	YES
FRSHC(7)	1/19/2011	*E. coli*	MPN/100mL	460	235	BPA	YES
GIDLR	11/9/2010	*E. coli*	MPN/100mL	610	235	BPA	YES
GIDLR	12/7/2010	*E. coli*	MPN/100mL	520	235	BPA	YES
GIDLR	1/18/2011	*E. coli*	MPN/100mL	240	235	BPA	YES
GIDLR	5/17/2011	*E. coli*	MPN/100mL	290	235	BPA	YES
LHNCT	10/20/2010	*E. coli*	MPN/100mL	440	235	BPA	YES
LHNCT	11/10/2010	*E. coli*	MPN/100mL	410	235	BPA	YES
LHNCT	12/8/2010	*E. coli*	MPN/100mL	460	235	BPA	YES
LHNCT	2/16/2011	*E. coli*	MPN/100mL	2000	235	BPA	YES
LHNCT	3/16/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
LSNKR	10/20/2010	*E. coli*	MPN/100mL	580	235	BPA	YES
LSNKR	2/16/2011	*E. coli*	MPN/100mL	1200	235	BPA	YES
LSNKR	3/16/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
LSNKR	6/21/2011	*E. coli*	MPN/100mL	370	235	BPA	YES
LSNKR	8/16/2011	*E. coli*	MPN/100mL	690	235	BPA	YES
LSNKR	9/21/2011	*E. coli*	MPN/100mL	280	235	BPA	YES
LSNKR(7)	6/21/2011	*E. coli*	MPN/100mL	340	235	BPA	YES
PNCGR	12/9/2010	*E. coli*	MPN/100mL	390	235	BPA	YES
PNCGR	2/16/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
PNCGR	3/16/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
PNCGR	5/18/2011	*E. coli*	MPN/100mL	1100	235	BPA	YES
PNCGR	8/17/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
PNCGR	9/21/2011	*E. coli*	MPN/100mL	2400	235	BPA	YES
SSLIB	11/9/2010	*E. coli*	MPN/100mL	410	235	BPA	YES
SSLIB	6/21/2011	*E. coli*	MPN/100mL	460	235	BPA	YES
UCBRD	10/19/2010	*E. coli*	MPN/100mL	460	235	BPA	YES
UCBRD	11/9/2010	*E. coli*	MPN/100mL	250	235	BPA	YES
UCBRD	12/7/2010	*E. coli*	MPN/100mL	920	235	BPA	YES
UCBRD	2/15/2011	*E. coli*	MPN/100mL	440	235	BPA	YES
UCBRD	3/15/2011	*E. coli*	MPN/100mL	2400	235	BPA	YES
UCBRD	5/17/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit[1]	Basis for Limit[2]	Mgt Plan[3]
UCBRD	6/21/2011	*E. coli*	MPN/100mL	2000	235	BPA	YES
UCBRD	8/16/2011	*E. coli*	MPN/100mL	820	235	BPA	YES
UCBRD[7]	12/7/2010	*E. coli*	MPN/100mL	1100	235	BPA	YES
UCBRD[7]	3/15/2011	*E. coli*	MPN/100mL	1400	235	BPA	YES
UCBRD[7]	8/16/2011	*E. coli*	MPN/100mL	1200	235	BPA	YES
WLKCH	12/9/2010	*E. coli*	MPN/100mL	260	235	BPA	YES
WLKCH	3/16/2011	*E. coli*	MPN/100mL	870	235	BPA	YES
WLKCH	4/21/2011	*E. coli*	MPN/100mL	>2400	235	BPA	YES
WLKCH	5/18/2011	*E. coli*	MPN/100mL	2400	235	BPA	YES
WLKCH	6/22/2011	*E. coli*	MPN/100mL	460	235	BPA	YES
WLKCH	7/20/2011	*E. coli*	MPN/100mL	2000	235	BPA	YES
WLSPL	10/19/2010	*E. coli*	MPN/100mL	>2400	235	BPA	YES
PRPIT	4/21/2011	Lead, Dissolved	µg/L	1.3	0.9	CTR	NO
PRPIT	4/21/2011	Lead, Total	µg/L	43	15	BP	NO
UCBRD	1/18/2011	Nitrate+Nitrite, as N	mg/L	11	10[6]	CA 1˚ MCL	YES
UCBRD[7]	1/18/2011	Nitrate+Nitrite, as N	mg/L	12	10[6]	CA 1˚ MCL	YES
CCCPY	7/20/2011	pH	-log[H+]	8.64	6.5-8.5	BP	NO
ZDDIX	4/20/2011	pH	-log[H+]	8.64	6.5-8.5	BP	YES
WLSPL	2/15/2011	Selenium, Total	µg/L	7.8	5	CTR	YES

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. Site-specific Basin Plan objective (150 µS/cm as a 90th percentile) for the Middle Fork Feather River
6. California 1˚ MCL (10 mg/L as N) for drinking water.
7. 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 Regional Water Board in April 2011. The MPPR that documents the status and progress toward Management Plan requirements for 2011 will be provided to the Water Board at the end of March 2012. Activities conducted in 2011 to implement the Coalition's Management Plan included addressing exceedances of objectives for registered pesticides, completion of source evaluations for pesticides and toxicity, surveys for pathogen identification source evaluations, 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 Regional 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 in **Appendix F**.

Conclusions and Recommendations

The Coalition submits this *2011 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 2011 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 2010 through September 2011. To date, a total of 67 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 2010 through September 2011), samples were collected for 10 scheduled monthly events and 2 storm events.

Pesticides were infrequently detected (~2.3% of 2011 pesticide results), and when detected, rarely exceeded applicable objectives. Three registered pesticides (chlorpyrifos, diazinon, malathion) exceeded applicable water quality objectives or *ILRP* trigger limits in a total of ten Coalition monitoring samples in 2011 (including 2 field duplicates).

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 Coalition samples to date, and has never approached concentrations likely to cause toxicity to sensitive test species. Over 98.6% of all pesticide analyses performed to date for the Coalition have been below detection. Based on these results, Coalition monitoring of pesticides for the *ILRP* for 2011 was conducted based on recent pesticide use and the relative toxicity risks for these pesticides in the subwatersheds. Similarly, the Coalition conducted more focused monitoring of most trace elements (arsenic, cadmium, lead, molybdenum, nickel, selenium, and zinc) based on the Coalition's past monitoring results, which have demonstrated that these metals typically do not 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[4]).

The majority of exceedances of adopted numeric objectives continue to consist of conductivity 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 continues to participate in the *ILRP* Technical Issues Committee (TIC) workgroups to develop procedures and guidelines for *ILRP* monitoring and evaluation of exceedances. The

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[4] 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.

Coalition also continues to be an active participant in the Water Board's stakeholder process to develop a Long-Term *ILRP*.

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 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 is continuing implementation of 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 and scientifically defensible manner. This annual monitoring report 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