SEPTEMBER 2019

SACRAMENTO VALLEY WATER QUALITY COALITION

Monitoring and Reporting Program

Annual Monitoring Report 2018:

October 2017 – September 2018

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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 (MRP) to meet the requirements of the *Waste Discharge Requirements General Order for Growers within the Sacramento River Watershed that are Members of a Third-Party Group* (*R5-2014-0030*) (WDR).[1] The scope of the MRP and the sampling and analytical methods used in 2018 Coalition Monitoring have been approved by the Central Valley Regional Water Quality Control Board (Regional Water Board).

In accordance with the WDR requirements, the Coalition is achieving these objectives by implementing a MRP that evaluates samples for the presence of statistically significant toxicity and exceedances of applicable numeric water quality objectives and Irrigated Lands Regulatory Program (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 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 (i.e., those where Management Plans have been triggered) 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 limited human and fiscal resources.

The 2018 Coalition Monitoring was conducted in coordination with the Northeastern California Water Association (Pit River Subwatershed), the Placer-Nevada-South Sutter-North Sacramento Watershed Group, the Goose Lake Watershed Group, and the Upper Feather River Watershed Group. Additional monitoring in the Upper Feather River and Pit River subwatersheds was conducted in coordination with California's Surface Water Ambient Monitoring Program (SWAMP) beginning in 2012.

The parameters monitored in 2018 by the Coalition to achieve these objectives are as specified in the current WDR and MRP (*Order No. R5-2014-0030*):

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

[1] Prior to adoption of the WDR, the Coalition was subject to a Conditional Waiver of Waste Discharge Requirements for the Irrigated Lands Regulatory Program (ILRP) and subsequent amendments to the ILRP requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875).

- Nitrogen and phosphorus compounds in water

The current WDR and MRP also requires testing for 303(d)-listed constituents identified in water bodies downstream from Coalition sites and discharged within the watershed, if irrigated agriculture has been identified as a contributing source within the Sacramento River Watershed and such monitoring has been requested by the Regional Water Board's Executive Officer.

Note that not all parameters are monitored at every site for every monitoring event. Specific individual parameters measured for 2018 Coalition Monitoring are listed in **Table 2**.

A total of 25 sampling sites was monitored by the Coalition and coordinating subwatershed monitoring programs during 2018 (**Table 3**). A map of these sites is presented in **Figure 1**.

As required by the MRP, Coalition monitoring events include storm season monitoring and irrigation season monitoring. The sites and numbers of samples scheduled for collection for 2018 Coalition Monitoring are summarized in **Table 4**.

This *2018 Annual Monitoring Report* (AMR) includes results for October 2017 through September 2018.

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

- Pacific EcoRisk (Fairfield, California) performs toxicity analyses and conducts sampling for all sites, with the specific exceptions noted below:
  - Placer County Resource Conservation District conducted sampling for the Placer-Nevada-South Sutter-North Sacramento Subwatershed;
- Caltest Analytical Laboratory (Napa, California) conducted all conventional and microbiological analyses.
- Agriculture & Priority Pollutant Laboratories, Inc. (APPL) (Clovis, California) conducted pesticide analyses.
- North Coast Laboratories (Arcata, CA) conducted pesticide analyses.
- PHYSIS Environmental Lab (Anaheim, CA) conducted pesticide analyses.
- Basic Laboratory (Redding) conducted conventional and microbiological analyses for samples collected in the Pit River, Upper Feather River, and Goose Lake subwatersheds.

TREND ANALYSIS

The Coalition's 2018 Monitoring Plan Update[2] was approved by Regional Water Board staff as meeting the requirements of the WDR, MPR, and Pesticides Evaluation Protocol. The WDR provides no additional guidance or criteria for making a determination that there are

[2] On August 1 of each year, the Coalition is required to submit to the Regional Water Board an updated monitoring plan for the upcoming monitoring year (October through September). This annual monitoring plan is called the Monitoring Plan Update, and for 2018 it was developed to follow the requirements of the 2014 WDR and MRP and the Regional Water Board's 2016 Pesticides Evaluation Protocol.

“deficiencies in monitoring” or that additional locations or events are needed, and none were identified as a result of the trend analysis conducted for this report.

In summary, the results of trend analyses conducted for this AMR did not indicate a need for any additional locations, events, or parameters. The adoption of the Pesticides Evaluation Protocol has already expanded the number of parameters that the Coalition analyzes. We continue to recommend that the trend analysis evaluation be performed no more than once per assessment year, with the next evaluation occurring in the 2022 monitoring year. By that monitoring year, two to three years of additional assessment monitoring will have been conducted under the Pesticides Evaluation Protocol, which will increase the amount of data evaluated and the robustness of the analysis.

MANAGEMENT PRACTICES AND ACTIONS TAKEN

Response to Exceedances

To address specific water quality exceedances, the Coalition and its partners developed a Management Plan in 2009, subsequently approved by the Regional 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. The 2009 Management Plan was reorganized into the Comprehensive Surface Water Quality Management Plan (CSQMP) in 2015. The CSQMP was last updated in September 2016 and approved by the Central Valley Regional Water Quality Control Board (Regional Water Board) in November 2016. Implementation of the approved 2016 CSQMP is the primary mechanism for addressing exceedances observed in the Coalition’s surface water monitoring.

Management Plan Status Update

The Management Plan Progress Report (MPPR), documenting the status and progress toward meeting individual Management Plan element requirements for 2018, is provided to the Regional Water Board with this Annual Monitoring Report. Activities conducted in 2018 to implement the Coalition’s CSQMP included addressing exceedances of objectives for registered pesticides, development of a new Management Plan, evaluation of existing Management Plan elements that could be deemed complete, and monitoring required for toxicity and pesticide Management Plans and Total Maximum Daily Loads (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. Prior to 2015, surveys of Coalition members operating on high priority parcels were conducted to determine the degree of implementation of relevant management practices related to individual Management Plan elements for registered pesticides and identified causes of toxicity. Beginning in 2015, these surveys were replaced with data compiled from Coalition Member Farm Evaluations. Farm Evaluation data 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.

CONCLUSIONS AND RECOMMENDATIONS

The Coalition submits this *2018 Annual Monitoring Report* as required under the Regional Water Board's Irrigated Lands Regulatory Program. The AMR provides a detailed description of the Coalition's monitoring results as part of its ongoing efforts to characterize irrigated agricultural and wetlands related water quality in the Sacramento River Basin.

To summarize, the results from the Coalition's monitoring conducted in 2018 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 2017 through September 2018. To date, a total of 151 Coalition storm and irrigation season events have been completed since the beginning of Coalition monitoring in January 2005, with additional events collected by coordinating programs and for follow-up evaluations. For the period of record considered in this AMR (October 2017 through September 2018), samples were collected for ten scheduled monthly events and 2 wet weather ("storm") events.

Pesticides were infrequently detected (~5% of all pesticide results collected in 2018 were for detected concentrations), and, when detected, rarely exceeded applicable objectives. Only two registered pesticides, chlorpyrifos (one sample) and diazinon (two samples), exceeded applicable water quality objectives or ILRP Trigger Limits during the current monitoring year.

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 and paraquat. Over 98.5% of all pesticide analyses performed to date for the Coalition have been below detection. Coalition monitoring of pesticides for the ILRP for 2018 was conducted based on the 2016 Pesticides Evaluation Protocol (PEP) and active Management Plan element requirements. The Regional Water Board's PEP requires the Coalition to monitor specific registered pesticides based on (1) their rate of application in a given drainage (lbs. applied per drainage) and (2) a pesticide-specific relative risk (the ratio of the amount of chemical applied to a reference value with a specific averaging period). The Coalition also conducted monitoring of the ILRP-required trace elements (arsenic, boron, copper, and zinc) informed by the Coalition's past monitoring results, which have demonstrated that most of these metals rarely approach or exceed objectives and are not likely to cause adverse impacts to aquatic life or human health in waters receiving agricultural runoff in the Sacramento River Watershed. This strategy for monitoring trace metals was implemented in 2010 in accordance with the Coalition's 2009 MRP (*Order No. R5-2009-0875*, CVRWQCB 2009), and this same strategy is consistent with the requirements of the current WDR and MRP (*Order No. R5-2014-0030*).

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

The Coalition has implemented the requirements 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 all were approved by the Regional Water Board. Subsequent revisions requested by the Regional Water Board and the Coalition were 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 itsmonitoring program based on the knowledge gained through itsmonitoring efforts.

The 2018 monitoring program, as specified in the 2018 Monitoring Plan Update, was developed to be consistent with the requirements of the WDR and MRP (*Order No. R5-2014-0030*) and 2016 PEP, and was approved by the Regional Water Board for this purpose with the understanding that it would serve as an "Assessment" monitoring period for the Coalition. 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 continued to implement the approved 2016 CSQMP. Throughout this process, the Coalition has kept an open line of communication with the Regional Water Board and has made every effort to fulfill the requirements of the ILRP in a cost-effective, scientifically defensible, and management-focused manner. This AMR is documentation of the success and continued progress of the Coalition in achieving these objectives.

Introduction

The primary purpose of this report is to document the monitoring efforts and results of the Sacramento Valley Water Quality Coalition (Coalition) Monitoring and Reporting Program (MRP). This Annual Monitoring Report (AMR) for 2018 also serves to document the Coalition's progress toward fulfilling the requirements of its *Waste Discharge Requirements General Order for Growers within the Sacramento River Watershed that are Members of a Third-Party Group* (*R5-2014-0030-R1*) (WDR).[3]

The AMR includes the following elements noted in **Table 1**, as specified in the WDR's MRP:

Table 1. MRP Annual Monitoring Report Requirements[4]

MRP Section	AMR Requirement	Report Section Headings	Page
V.C.1	Signed Transmittal Letter	NA	-
V.C.2	Title page	Title page	-
V.C.3	Table of Contents	Table of Contents	*i*
V.C.4	Executive Summary	Executive Summary	*vi*
V.C.5	Description of the Coalition Group geographical area	Description of the Watershed	4
V.C.6	Monitoring objectives and design	Monitoring Objectives	5
V.C.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	8; 30
V.C.8	Location map(s) of sampling sites, crops and land uses	Appendix E: Drainage Maps	CD
V.A.1;[1] V.C.9; V.C.11	An Excel workbook containing an export of all data records uploaded and/or entered into the CEDEN-comparable database (surface water data). The workbook shall contain, at a minimum, those items detailed in the most recent version of the third-party's approved QAPP Guidelines; Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible; Electronic data submittal.	Appendix C: Tabulated Monitoring Results	CD

[3] Prior to adoption of the WDR, the Coalition was subject to a Conditional Waiver of Waste Discharge Requirements for the Irrigated Lands Regulatory Program (ILRP) and subsequent amendments to the ILRP requirements (WQO-2004-0003, SWRCB 2004, R5-2005-0833, R5-2008-0005, R5-2009-0875).

[4] Monitoring and Reporting Program (Attachment B to R5-2014-0030), Section V.C.

MRP Section	AMR Requirement	Report Section Headings	Page
V.C.10	Discussion of data relative to water quality objectives/Trigger Limits and water quality management plan milestones/Basin Plan Amendment Workplan (BPAW) updates, if applicable	Assessment of Water Quality Objectives	46
V.C.12	Sampling and analytical methods used	Sampling and Analytical Methods	21
V.A.5;[1] V.A.7.c.; V.C.13	Electronic copies of all applicable laboratory analytical reports on a CD; Chain of custody (COCs) and sample receipt documentation; Associated laboratory and field quality control samples results	Appendix B: Lab Reports and Chains of Custody	CD
V.C.14	Summary of Quality Assurance Evaluation results (as identified in the most recent version of the Coalition's QAPP for Precision, Accuracy and Completeness)	Quality Assurance	45
V.A.3-4;[1] V.C.15	Electronic copies of all field sheets; Electronic copies of photos obtained from all surface water monitoring sites, clearly labeled with the CEDEN comparable station code and date; Specification of the method(s) used to obtain estimated flow at each surface water monitoring site during each monitoring event	Appendix A: Field Log Copies	CD
V.C.16	Summary of exceedances of water quality objectives/Trigger Limits occurring during the reporting period and surface water-related pesticide use information	Assessment of Water Quality Objectives; Appendix D: Exceedance Reports	46; CD
V.C.17	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; Appendix F: SVWQC Outreach Materials	75
V.C.18	Evaluation of monitoring data to identify temporal and spatial trends and patterns	Trend Analysis; Appendix G: Trend Analysis Results	65
V.C.19	Summary of Nitrogen Management Plan information submitted to the Coalition	---[2]	NA

MRP Section	AMR Requirement	Report Section Headings	Page
V.C.20	Summary of Management Practice information collected as part of Farm Evaluations	---[3]	77
V.C.21	Summary of Mitigation Monitoring	---[4]	NA
V.C.22	Summary of education and outreach activities	Management Practices and Actions Taken; Appendix F: SVWQC Outreach Materials	75
V.C.23	Reduced Monitoring/Management Plan Verification Option Reports	Appendix H: Reduced Monitoring Reports	NA
V.C.24	Conclusions and recommendations	Conclusions and Recommendations	63

1. Quarterly Submittals of Monitoring Results (WDR Provision V.A.) are re-submitted with the AMR.
2. The 2018 Nitrogen Management Plan (NMP) Summary Report will be submitted to the ILRP by 30 November 2019.
3. A Farm Evaluation (FE) is not required to be submitted for the 2018 monitoring year.
4. This item is not applicable because no mitigation monitoring was conducted in 2018.

With the exceptions noted in **Table 1,** all report elements required by the WDR 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 watershed above Lake Oroville. The Sacramento Valley drainages include the Colusa, Cache Creek, and Yolo Bypass watersheds on the west side of the valley, and the Feather, Yuba, and American River watersheds on the east side of the valley. The Coalition also monitors in the Cosumnes River watershed, which is not part of the Sacramento River Watershed.

Beginning at its northern terminus near the city of Redding, 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 species and steelhead trout; and the cities and rural communities that make up this region. This natural and working landscape between the crests of the Sierra Nevada and the Coast Range includes the following:

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

Monitoring Objectives

The Coalition's monitoring program conforms to the goals of the Nonpoint Source (NPS) Program and achieves the following objectives as a condition of the WDR's MRP:

1. Track, monitor, assess and report program activities;
2. Ensure consistent and accurate reporting of monitoring activities;
3. Target NPS Program activities at the watershed level;
4. Coordinate with public and private partners; and
5. Track implementation of management practices to improve water quality and protect existing beneficial uses.

In accordance with WDR requirements, the Coalition is achieving these objectives by implementing a MRP that evaluates water and sediment 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 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 (i.e., those where Management Plans have been triggered) 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 limited human and fiscal resources.

The parameters monitored in 2018 by the Coalition to achieve these objectives are as specified in the current WDR and MRP (*Order No. R5-2014-0030*):

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

The proposed frequency and schedule for water quality sample collection used to assess the presence and concentration of the above-listed parameters in Coalition receiving waters are submitted to the Regional Water Board each year on August 1 in the form of the Coalition's Monitoring Plan Update. The WDR does not explicitly state the individual constituents that require monitoring each year, but allows for the Coalition to make that determination based on guidance provided in the WDR and MRP and the amounts and times of pesticide applications in representative and integration drainages using California Department of Pesticide Regulation (CDPR) pesticide use reporting (PUR) data.

Additional guidance for the monitoring of pesticides was established in November 2016 with the Regional Water Board's requirement that all Central Valley agricultural water quality coalitions begin using a protocol for prioritizing and selecting pesticides for surface water monitoring (ILRP Pesticides Evaluation Protocol or PEP). The PEP was developed by a Pesticide Evaluation Advisory Workgroup and outlines the required steps that Coalition's must use to process PUR data when developing annual monitoring plans. The PEP process requires the Coalition to monitor specific registered pesticides based on (1) their rate of application in a given drainage (lbs. applied per drainage) and (2) a pesticide-specific relative risk (the ratio of the amount of chemical applied to a reference value with a specific averaging period). As a result, not all pesticides are monitored at each site for every monitoring event, and instead Coalition pesticide monitoring reflects the frequency and intensity of pesticide use within an individual drainage.

The current WDR and MRP also require testing for 303(d)-listed constituents identified in water bodies downstream from Coalition sites and discharged within the watershed, if irrigated agriculture has been identified as a contributing source within the Sacramento River Watershed and such monitoring has been requested by the Regional Water Board's Executive Officer.

Note that not all parameters were monitored at every site for every monitoring event. Specific individual parameters measured for 2018 Coalition Monitoring are listed in **Table 2**.

Table 2. Constituents Monitored for the 2018 Monitoring Year

Analyte	Quantitation Limit[(a)]	Reporting Unit
Physical Parameters		
Flow	NA	CFS (Ft^3/Sec)
pH	0.1 [(b)]	-log[H^+]
Specific Conductivity	0.1 [(b)]	µS/cm
Dissolved Oxygen	0.1 [(b)]	mg/L
Temperature	0.1 [(b)]	˚C
Hardness, total as $CaCO_3$	10	mg/L
Turbidity	1.0	NTU
Total Suspended Solids	3.0	mg/L
Dissolved Organic Carbon	0.5	mg/L
Total Organic Carbon	0.5	mg/L
Grain size (in sediment)	1	% fraction
Pathogen Indicators		
E. coli bacteria	2	MPN/100 mL
Water Column Toxicity		
Ceriodaphnia, 96-h acute	NA	% Survival
Selenastrum, 96-h short-term chronic	NA	% of Survival
Sediment Toxicity		
Hyalella, 10-day short-term chronic	NA	% Survival
Pesticides		
Benzophenyls	(c)	µg/L
Carbamates	(c)	µg/L

Analyte	Quantitation Limit[a]	Reporting Unit
Fungicide	(c)	µg/L
Herbicides	(c)	µg/L
Insecticides	(c)	µg/L
Organochlorine	(c)	µg/L
Organophosphorus	(c)	µg/L
Pyrethroids	(c)	µg/L
Triazines	(c)	µg/L
Trace Elements		
Arsenic	0.5	µg/L
Boron	10	µg/L
Copper	0.5	µg/L
Zinc	1	µg/L
Nutrients		
Ammonia as N	0.1	mg/L
Nitrate + Nitrite as N	0.1	mg/L
Orthophosphate as P	0.1	mg/L
Phosphorus, total	0.1	mg/L

Notes:

a. The Quantitation Limit (QL) represents the concentration of an analyte that can be routinely measured in the sampled matrix within the stated limits and confidence in both identification and quantitation.
b. Detection and reporting limits are not strictly defined. Value is required reporting precision.
c. Limits are different for individual pesticides.

Sampling Site Descriptions

To successfully implement the monitoring and reporting program requirements contained in the ILRP adopted by the Regional Water Board in June 2003, the Coalition worked directly with landowners in the 21 counties within the Sacramento River Watershed to identify and develop ten (now 13) 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 watersheds based upon the following fundamental assumptions regarding management of non-point source discharges to surface water bodies: 1) Landscape scale sampling at the bottom of drainage areas allows determination of the presence of water quality problems using a variety of analytical methods, including water column and sediment toxicity testing, water chemistry analyses, and bioassessment; 2) Strategic source investigations utilizing Geographic Information Systems can be used to identify upstream parcels with attributes that may be related to the analytical results, including crops, pesticide applications, and soil type; and 3) Management practice effectiveness can best be assessed by subwatershed 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 are used to complement Coalition efforts on the watershed scale by providing crop-specific information that supports management practice recommendations.

The Coalition uses a "representative monitoring" approach to achieve the goals of the 2014 MRP:

- Representative monitoring is conducted at sites in drainages representative of larger regions based on shared agricultural and geographic characteristics;
- Representative monitoring includes a cycle of two years of "Assessment" Monitoring for the broader suite of ILRP analytes, followed by two years of sampling needed for Management Plan implementation (referred to as "Core" Monitoring or "Non-Assessment" Monitoring); and
- Monitoring schedules and the analytes monitored are customized based on the characteristics of individual subwatersheds and Management Plans.

Monitoring sites visited in 2018 were all previously monitored and included 15 representative sites, three integration sites, and seven special project sites were monitoring requirements were triggered by Management Plans.

SAMPLING SITE LOCATIONS AND LAND USES

The water and sediment sites monitored by the Coalition in 2018 are listed in **Table 3**. All sites monitored in 2018 were approved by the Regional Water Board as MRP 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 provided in **Appendix E**.

Table 3. Monitoring Sites for 2018 Coalition Monitoring

Subwatershed	Site Name	Latitude	Longitude	Agency	Site ID & Category (Fig. 1)	
Butte Yuba Sutter	Gilsizer Slough at George Washington Rd	39.009	-121.6716	SVWQC	GILSL	MP
Butte Yuba Sutter	Lower Honcut Creek at Hwy 70	39.30915	-121.59542	SVWQC	LHNCT	REP
Butte Yuba Sutter	Lower Snake R. at Nuestro Rd	39.18531	-121.70358	SVWQC	LSNKR	REP
Butte Yuba Sutter	Pine Creek at Highway 32	39.75338	-121.97124	SVWQC	PNCHY	REP
Butte Yuba Sutter	Sacramento Slough bridge near Karnak	38.785	-121.6533	SVWQC	SSKNK	INT
Colusa Glenn	Colusa Basin Drain above KL	38.8121	-121.7741	SVWQC	COLDR	INT
Colusa Glenn	Freshwater Creek at Gibson Rd	39.17664	-122.18915	SVWQC	FRSHC	REP
Colusa Glenn	Lurline Creek at 99W	39.21215	-122.18331	SVWQC	LRLNC	MP
Colusa Glenn	Rough & Ready Pumping Plant (RD 108)	38.86209	-121.7927	SVWQC	RARPP	MP
Colusa Glenn	Walker Creek near 99W and CR33	39.62423	-122.19652	SVWQC	WLKCH	REP
El Dorado	Coon Hollow Creek	38.75335	-120.72404	SVWQC	COONH	MP
Goose Lake	Lower Lassen Creek	41.89103	-120.35594	SVWQC	LOWLC	REP
Lake	McGaugh Slough at Finley Road East	39.00417	-122.86233	SVWQC	MGSLU	MP
Lake	Middle Creek u/s from Highway 20	39.17641	-122.91271	SVWQC	MDLCR	REP
Pit River	Fall River at Fall River Ranch Bridge	41.0351	-121.4864	NECWA	FRRRB	MP
Pit River	Pit River at Canby Bridge	41.4017	-120.931	NECWA	PRCAN	MP
Pit River	Pit River at Pittville Bridge	41.0454	-121.3317	NECWA	PRPIT	REP
PNSSNS	Coon Creek at Brewer Road	38.93399	-121.45184	PNSSNS	CCBRW	REP
Sacramento Amador	Cosumnes River at Twin Cities Rd	38.29098	-121.38044	SVWQC	CRTWN	REP
Sacramento Amador	Grand Island Drain near Leary Road	38.2399	-121.5649	SVWQC	GIDLR	REP
Shasta Tehama	Anderson Creek at Ash Creek Road	40.418	-122.2136	SVWQC	ACACR	REP
Solano	Shag Slough at Liberty Island Bridge	38.30677	-121.69337	SVWQC	SSLIB	REP
Solano	Ulatis Creek at Brown Road	38.307	-121.794	SVWQC	UCBRD	REP
Upper Feather River	Middle Fk Feather River above Grizzly Cr	39.816	-120.426	UFRW	MFFGR	REP
Yolo	Willow Slough Bypass at Pole Line	38.59015	-121.73058	SVWQC	WLSPL	REP

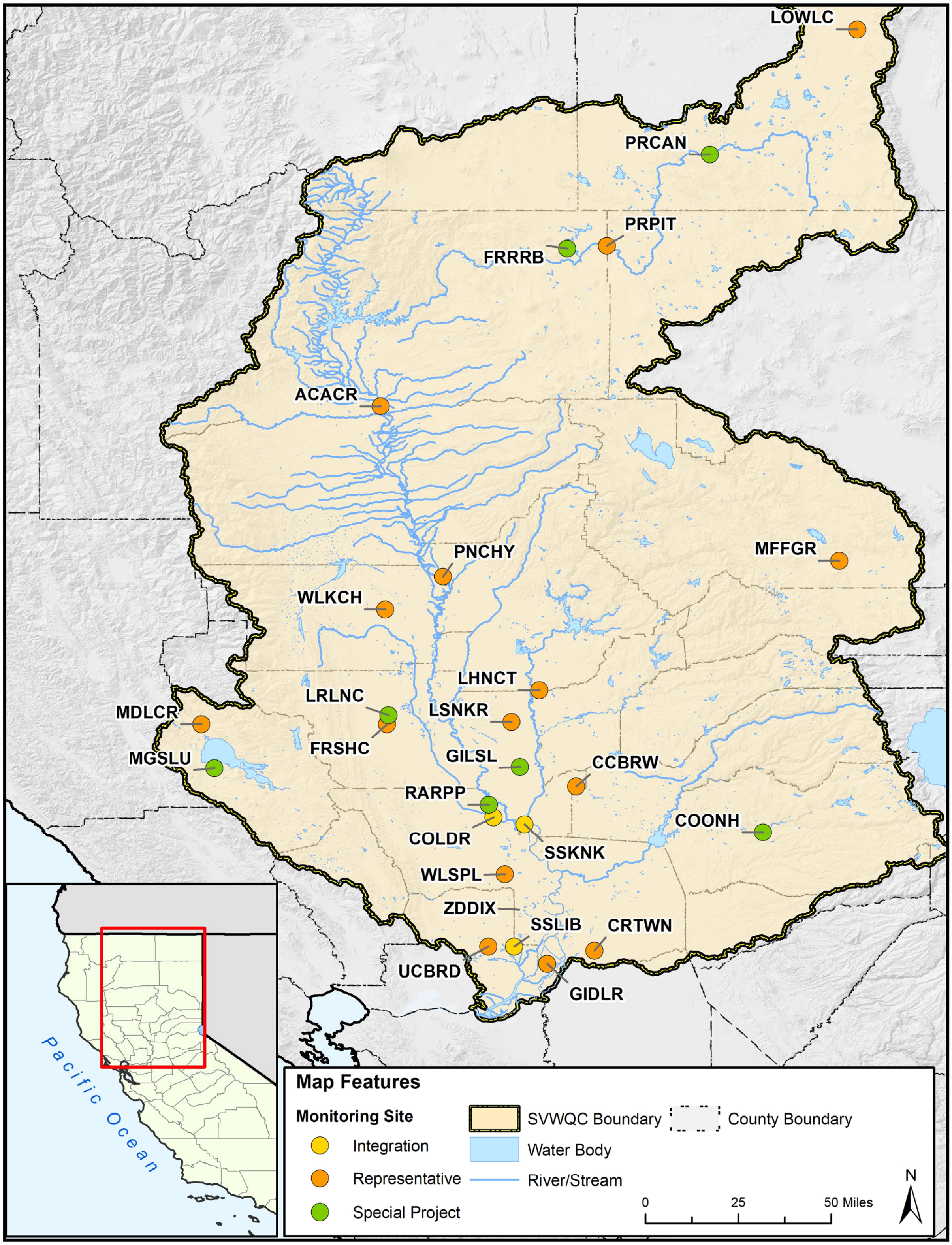

Figure 1. 2018 Coalition Monitoring Sites

SITE DESCRIPTIONS

Butte-Yuba-Sutter Subwatershed

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 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. This is a Management Plan site for this subwatershed.

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 grown in the area and typically has flows allowing sampling through irrigation season. The sampling site is located approximately 3.5 miles from its confluence with the Feather River. Dominant crops in this drainage include rice, walnuts, prunes, pasture, citrus, olive, and grapes. Lower Honcut Creek receives flows from North Honcut Creek and South Honcut Creek, which extend up into the foothills and include more pasture acreage. This is a representative site for this subwatershed.

Lower Snake River at Nuestro Road (LSNKR)

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

Pine Creek at Highway 32 (PNCHY)

The watershed sampled upstream from the Pine Creek monitoring site represents approximately 28,000 acres of varied farmland, riparian habitat, and farmsteads. The predominant crops in this area are walnuts, almonds, prunes, wheat, oats, barley, beans, squash, cucumbers, alfalfa, pasture, and safflower. This is a representative site for this subwatershed.

Sacramento Slough Bridge near Karnak (SSKNK)

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

Colusa Glenn Subwatershed

Colusa Basin Drain above Knights Landing (COLDR)

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

Freshwater Creek at Gibson Road (FRSHC)

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

Lurline Creek at 99W (LRLNC)

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

Rough and Ready Pumping plant, RD 108 (RARPP)

The Rough & Ready Pumping Plant (owned and operated by Reclamation District 108) aggregates runoff and return flows for the Sycamore Slough drainage. The pumps lift the water into the Sacramento River. This drainage area contains large amounts of tomatoes, safflower, wheat, melons, corn, and pasture. This is a Management Plan site for this subwatershed.

Walker Creek near 99W and CR33 (WLKCH)

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

El Dorado Subwatershed

The El Dorado subwatershed is currently operating under the submitted and approved *Reduced Monitoring/Management Practices Verification Option*.

Coon Hollow Creek (COONH)

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

Goose Lake Subwatershed

Lower Lassen Creek (LOWLC)

The land use pattern in the Lassen Creek drainage is similar to the Goose Lake Basin as a whole. Lassen Creek originates in predominately publicly owned lands that are managed primarily for dispersed recreation and livestock grazing. Lassen Creek flows out of the Warner Mountains towards Goose Lake, and land uses along this waterbody focus on dry-land alfalfa, native meadow hay production, and irrigated pasture for livestock. This is a representative site for this subwatershed.

Lake Subwatershed

The Lake subwatershed is currently operating under the submitted and approved *Reduced Monitoring/Management Practices Verification Option*.

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 U.S. Forest Service controlling the majority of the land. Irrigated agriculture constitutes of approximately 1,100 acres farmed by members 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 from the town of Upper Lake, and captures approximately 60% of irrigated agricultural operations within this drainage. This is a representative site for this subwatershed.

McGaugh Slough at Finley Road East (MGSLU)

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

Napa Subwatershed

The Napa subwatershed is currently operating under the submitted and approved *Reduced Monitoring/Management Practices Verification Option*.

No water quality samples were collected by the Coalition in this subwatershed during the 2018 monitoring year.

Pit River Subwatershed

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

Fall River at Fall River Ranch Bridge (FRRRB)

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

Pit River at Pittville Bridge (PRPIT)

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

Pit River at Canby (PRCAN)

This site captures drainage from the Alturas and Canby drainage areas, as well as drainage from the North and South Fork of Pit River and Hot Springs Valley. Land uses are primarily pasture and grain and hay crops. The irrigated acreage is approximately 50,000 acres. This is a Management Plan site for this subwatershed.

Placer-Nevada-South Sutter-North Sacramento Subwatershed

Monitoring in this subwatershed was conducted in coordination with the Placer-Nevada-South Sutter-North Sacramento (PNSSNS) 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, pasture, grains, and Sudan grass, with a high percentage of rice acreage. Irrigated acres (excluding rice) is approximately 13,000. This is a representative site for this subwatershed.

Sacramento/Amador Subwatershed

Cosumnes River at Twin Cities Road (CRTWN)

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

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 irrigated acres drains to the monitoring site. This is a representative site for this subwatershed.

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 flows into the Sacramento River. Crops are predominantly pasture, followed by walnuts and alfalfa/hay, and smaller amounts of other field and orchard crops. Total irrigated land is 8,989 acres. This is a representative site for this subwatershed.

Solano Subwatershed

Shag Slough at Liberty Island Bridge (SSLIB)

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

Ulatis Creek at Brown Road (UCBRD)

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

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 focused on characterizing drainage from three valleys with considerable agricultural acreage. Monitoring in this subwatershed was conducted in coordination with the Upper Feather River Watershed Group (UFRWG) and the California's Surface Water Ambient Monitoring Program (SWAMP).

Middle Fork Feather River Above Grizzly Creek (MFFRG)

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

Yolo Subwatershed

Willow Slough Bypass at Pole Line Road (WLSPL)

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

Sampling and Analytical Methods

The objective of data collection for this monitoring program is to produce data that represent, as closely as possible, *in situ* conditions of agricultural discharges and water bodies in the Sacramento 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 Regional Water Board.

Surface water samples were collected for analysis of the constituents listed in **Table 2** as specified in the Coalition's 2018 Monitoring Plan Update. 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 collected as 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 2018 Coalition monitoring are summarized in **Table 4**. The Coalition's monitoring strategy for 2018 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*); this approach was maintained for the current WDR and MRP (*Order No. R5-2014-0030*). The elements that are key to achieving the Coalition's goals and satisfying the intent of the requirements of the *R5-2014-0030* 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 was detailed in the Coalition's 2009 Monitoring and Reporting Program Plan, as required by *Order No. R5-2008-0005*, and the monitoring plan is updated annually in August, as required by *Order No. R5-2014-0030*.

Table 4. 2018 Coalition Monitoring Year: Planned Samples, October 2017 – September 2018

SiteID	Water Column Sample Events	Sediment Sample Events	Field Measured Group	TOC, TSS, Turbidity, E. coli	Dissolved Organic Carbon	Nutrients Group	Arsenic (total)	Boron	Copper and Hardness	Legacy OCLs	2,4-D acids & salts	ACETAMIPRID	ATRAZINE	BIFENTHRIN	CARBARYL	Chloropicrin	CHLOROTHALONIL	CHLORPYRIFOS	CLOTHIANIDIN	CYFLUTHRIN	CYPERMETHRIN	CYPRODINIL	DELTAMETHRIN	DIAZINON	DIMETHOATE	DIURON	DODINE	ESFENVALERATE	ETHALFLURALIN	FENPROPATHRIN	Glyphosate	IMIDACLOPRID	LAMBDA-CYHALOTHRIN	LINURON	MALATHION	METHIDATHION	METHIOCARB	METHOMYL	METRIBUZIN	OXYFLUORFEN	PARAQUAT DICHLORIDE	PENDIMETHALIN	PERMETHRIN	PHORATE	PROMETRYN	PROPICONAZOLE	PYRACLOSTROBIN	PYRIDABEN	SIMAZINE	TAU-FLUVALINATE	TRIFLURALIN	Algae - Selenastrum	Water Flea - Ceriodaphnia	Hyalella azteca
Butte Yuba Sutter																																																						
SSKNK	4	2	4	4	3	4			2		2	2		2	2	2				2	2		1					2	2		1	2	2					2	1	2	2	1	2		1		2		1		2	4	4	2
LHNCT	10	2	10	10	8	10			3		1			3		3		3		3	2	1				1	2	3		1		2	2							3	3	1	3				1		1			8	8	2
PNCHY	11	2	11	11	7	11			5		4	2		4	1	1		8		3	1	1				3	2	5	3		2	4	3					1			3	1	2				3				3	10	10	2
LSNKR	11	2	11	11	7	11	4		3		5	4		3	3	2		4		3	3	2		2		3	2	3	3		2	5	2					2		4	3	1	2			1	3	1	3		3	9	11	2
GILSL	4		4							2								4						4																														
Colusa Glenn																																																						
FRSHC	11	2	11	11	8	11			4			1		3	1					3	3	1			3		2	3	2	1	2	4	4					2		2	5	1	2			1	3				3	11	9	2
COLDR	4	2	4	4	3	4			2		1	1		2	1			1		1	3	1		1	2		1	2	2	1	2	3	3		1			1	1	2	3	2	2				2				2	4	3	2
RARPP										2																																												
WLKCH	11	2	11	11	8	11			2		3	2	1	3	2	4		3		2	3	2		1	2	3	2	4	3	4	3	3	4		1			1		3	2	1	2	1		2	4	1			4	11	9	2
El Dorado																																																					
COONH	2		2							2																																												
Goose Lake																																																						
LOWLC	3		3	3		3																																																
Lake																																																					
MDLCR	4		4			4																																																
MGSLU	4		4			4																																																
NECWA																																																					
PRPIT	5		5	5	4	5			3		3			1	4	1				3					1			3					2		3	1																4	5	
FRRRB	4		4																																																			
PRCAN	4		4																																																			
PNSSNS																																																					
CCBRW	9	2	9	9	8	9			3		1	1		3		2	1	2		3	3		1					5	2				5							2	4	1	4								2	6	8	2
Sacramento Amador																																																					
CRTWN	10	2	10	10	8	10			2		1		1	3	1		2	2	2	3	4	1			3			3		3		2	3		2		1	1			3	1	2				3	2	3	2	3	9	10	2
GIDLR	12	2	12	12	8	12	6		2	2			2	3	1			2	1	3	2	1		3	2	4		2		2		2	2					1			3	2	1				2		2		2	9	10	2
Shasta Tehama																																																					
ACACR	10	2	10	10	8	10			3		4	2		4	3	3	2	3	1	3	2	1		1	1	1	2	3	2	2	3		4		2						3	1	2				3	2	2			9	9	2
Solano																																																					
UCBRD	12	2	12	12	8	12			2		3		1			2		4						4					1		2		3	1			1	2		5	2		4				1					10	10	2
SSLIB	4	2	4	4	3	4			2		2		1	2	1	2	2		1	2	1	1						2	2	1		2	2								2	2	2				2		1		1	4	4	2
UFRW																																																					

SiteID	Water Column Sample Events	Sediment Sample Events	Field Measured Group	TOC, TSS, Turbidity, E. coli	Dissolved Organic Carbon	Nutrients Group	Arsenic (total)	Boron	Copper and Hardness	Legacy OCLs	2,4-D acids & salts	ACETAMIPRID	ATRAZINE	BIFENTHRIN	CARBARYL	Chloropicrin	CHLOROTHALONIL	CHLORPYRIFOS	CLOTHIANIDIN	CYFLUTHRIN	CYPERMETHRIN	CYPRODINIL	DELTAMETHRIN	DIAZINON	DIMETHOATE	DIURON	DODINE	ESFENVALERATE	ETHALFLURALIN	FENPROPATHRIN	Glyphosate	IMIDACLOPRID	LAMBDA-CYHALOTHRIN	LINURON	MALATHION	METHIDATHION	METHIOCARB	METHOMYL	METRIBUZIN	OXYFLUORFEN	PARAQUAT DICHLORIDE	PENDIMETHALIN	PERMETHRIN	PHORATE	PROMETRYN	PROPICONAZOLE	PYRACLOSTROBIN	PYRIDABEN	SIMAZINE	TAU-FLUVALINATE	TRIFLURALIN	Algae - Selenastrum	Water Flea - Ceriodaphnia	Hyalella azteca
MFFGR	6		6	6		6																																																
Yolo																																																						
WLSPL	11	2	11	11	8	11		4	2		3	2	1	3	2	2			1	2	2					1		1	2			4	3		2			5	2	3	3	1	2				3	1	1		3	10	9	2

Note:
(1) Sediment grain size is analyzed along with sediment toxicity. Samples for pyrethroids, chlorpyrifos, diazinon, and TOC in sediment are analyzed if sample is found to be toxic.

ANALYTICAL METHODS

Water chemistry samples were analyzed for filtered and unfiltered fractions of samples depending on analyte. 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 or USEPA methods or approved modifications to these methods, and all procedures for analyses are documented in the QAPP or are available for review and approval at each laboratory.

Toxicity Testing and Toxicity Identification Evaluations

Water quality samples were analyzed for toxicity to *Ceriodaphnia dubia* and *Selenastrum capricornutum* for 2018 Monitoring. Sediment samples were analyzed for toxicity to *Hyalella azteca*. Toxicity tests were conducted using standard USEPA methods for these species.

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

For all initial toxicity screening 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 test, then 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 two aquatic toxicity tests exhibits a statistically significant reduction in survival (*Ceriodaphnia*) or cell density (*Selenastrum*) of greater than or equal to 50% compared to the control, then 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 are conducted. TIE methods generally adhere to the documented USEPA procedures referenced in the QAPP. TIE procedures are initiated as soon as possible after toxicity is observed to reduce the potential for loss of toxicity due to extended sample storage. Procedures for initiating and conducting TIEs are documented in the QAPP.

Detection and Quantitation Limits

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

Project Quantitation Limits

Laboratories generally establish QLs that are reported with the analytical results—these may be called *reporting limits*, *detection limits*, *reporting detection limits*, or several other terms used 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-flagged”, which is a USEPA data qualifier indicating that the reported value is estimated).

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

Method	Analyte	Fraction	Units	MDL	QL	Note
Physical and Conventional Parameters						
EPA 130.2	Hardness, total as $CaCO_3$	Unfiltered	mg/L	3	5	
EPA 180.1; SM2130B	Turbidity	Unfiltered	NTU	0.1	1.0	
SM20-2540 C	Total Dissolved Solids (TDS)	Particulate	mg/L	4	10	(a)
EPA 160.2; SM2540D	Total Suspended Solids (TSS)	Particulate	mg/L	2	3	
EPA 9060; SM5310B; SM5310C	Organic Carbon, Total (TOC)	Unfiltered	mg/L	0.1	0.5	
Pathogen Indicators						
SM 9223 B	*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)	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)	Malathion	Unfiltered	µg/L	0.005	0.01	
EPA 625(m)	Methidathion	Unfiltered	µg/L	0.01	0.02	
EPA 625(m)	Naled	Unfiltered	µg/L	0.2	0.5	(a)
EPA 625(m)	Phorate	Unfiltered	µg/L	0.01	0.02	
Organochlorine Pesticides						
EPA 625(m)	4,4'-DDT (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	4,4'-DDE (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	4,4'-DDD (o,p' and p,p')	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Aldrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Chlordane	Unfiltered	µg/L	0.001	0.005	
EPA 8081A	Chlorothalonil	Unfiltered	µg/L	0.1	0.2	(a)
EPA 625(m)	Dacthal	Unfiltered	µg/L	0.008	0.05	
EPA 625(m)	Dicofol	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Dieldrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan I	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan II	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endosulfan sulfate	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin Aldehyde	Unfiltered	µg/L	0.001	0.005	
EPA 625(m)	Endrin Ketone	Unfiltered	µg/L	0.001	0.005	
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)	Methoxychlor	Unfiltered	µg/L	0.001	0.005	
Carbamate and Urea Pesticides						
EPA 8321	Carbaryl	Unfiltered	µg/L	0.05	0.07	

Method	Analyte	Fraction	Units	MDL	QL	Note
EPA 8321	Methiocarb	Unfiltered	µg/L	0.2	0.4	
EPA 8321	Methomyl	Unfiltered	µg/L	0.05	0.07	
Pyrethroid Pesticides						
GCMS-NCI	Allethrin	Unfiltered	µg/L	0.0001	0.0015	
GCMS-NCI	Bifenthrin	Unfiltered	µg/L	0.0001	0.0015	
GCMS-NCI	Cyfluthrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Cypermethrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Deltamethrin/Tralomethrin	Unfiltered	µg/L	0.0002	0.003	
GCMS-NCI	Esfenvalerate/Fenvalerate	Unfiltered	µg/L	0.0002	0.003	
GCMS-NCI	Fenpropathrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Fluvalinate	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Lambda-Cyhalothrin	Unfiltered	µg/L	0.0002	0.0015	
GCMS-NCI	Permethrin	Unfiltered	µg/L	0.002	0.015	
GCMS-NCI	Tetramethrin	Unfiltered	µg/L	0.0002	0.0015	
Triazine						
EPA 8141A	Atrazine	Unfiltered	µg/L	0.1	0.5	
EPA 8141A	Hexazinone	Unfiltered	µg/L	0.1	0.5	(a)
EPA 633M	Metribuzin	Unfiltered	µg/L	0.32	1	
EPA 8141A	Prometryn	Unfiltered	µg/L	0.05	0.1	
EPA 625(m)	Simazine	Unfiltered	µg/L	0.005	0.01	
Other Herbicides						
EPA 8081A	Dacthal	Unfiltered	µg/L	0.008	0.05	
EPA 615	2,4-Dichlorophenoxyacetic Acid	Unfiltered	µg/L	0.45	1	
EPA 8321	Diuron	Unfiltered	µg/L	0.2	0.4	
NCL ME 321	Ethalfluralin	Unfiltered	µg/L	0.0038	0.01	
NCL ME 340	Flumioxazin	Unfiltered	µg/L	0.017	0.02	
EPA 547M	Glyphosate	Unfiltered	µg/L	1.7	5	
EPA 8321	Linuron	Unfiltered	µg/L	0.2	0.4	
EPA 625	Metolachlor	Unfiltered	µg/L	0.26	0.5	(a)
EPA 8321	Oryzalin	Unfiltered	µg/L	0.2	0.4	
EPA 8081A	Oxyfluorfen	Unfiltered	µg/L	0.008	0.05	
EPA 549.2M	Paraquat	Unfiltered	µg/L	0.19	0.4	
EPA 8141AM	Pendimethalin	Unfiltered	µg/L	0.53	1	
EPA 8141A	Trifluralin	Unfiltered	µg/L	0.036	0.05	
Fungicide						
EPA 8260BM	Chloropicrin	Unfiltered	µg/L	7.4	10	
NCL ME 340	Cyprodinil	Unfiltered	µg/L	0.0031	0.02	
EPA 625	Dodine	Unfiltered	µg/L	0.01	0.025	
EPA 630	Mancozeb (Ziram)	Unfiltered	µg/L	1	5	
NCL ME 340/ NCL ME 342	Propiconazole	Unfiltered	µg/L	0.0069	0.02	(a)

Method	Analyte	Fraction	Units	MDL	QL	Note
NCL ME 340/ NCL ME 342	Pyraclostrobin	Unfiltered	µg/L	0.0034	0.02	(a)
Insecticide						
EPA 625	Acetamiprid	Unfiltered	µg/L	0.01	0.02	
EPA 625	Clothianidin	Unfiltered	µg/L	0.01	0.02	
EPA 625	Imidacloprid	Unfiltered	µg/L	0.002	0.004	
EPA 625	Pyridaben	Unfiltered	µg/L	0.01	0.05	
Benzophenyls						
EPA 8321	Diflubenzuron	Unfiltered	µg/L	0.2	0.4	
Trace Elements						
EPA 200.8	Arsenic	Filtered, Unfiltered	µg/L	0.08	0.5	
EPA 200.8	Boron	Filtered, Unfiltered	µg/L	0.04	0.1	
EPA 200.8	Copper	Filtered, Unfiltered	µg/L	0.2	0.5	
EPA 200.8	Zinc	Filtered, Unfiltered	µg/L	0.7	1	
Nutrients						
EPA 350.1; 350.2	Ammonia, Total as N	Unfiltered	mg/L	0.02	0.1	
EPA 353.2	Nitrate + Nitrite as N	Unfiltered	mg/L	0.02	0.05	
EPA 365.2; SM4500-P E	Orthophosphate, as P	Unfiltered	mg/L	0.01	0.05	
EPA 365.2; SM4500-P E	Phosphorus, Total	Unfiltered	mg/L	0.02	0.05	

Note:

a. No QL target has been established for this analyte.

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

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

Monitoring Results

The following sections summarize the monitoring conducted by the Coalition and its subwatershed partners in 2018 (October 2017 through September 2018).

SUMMARY OF SAMPLE EVENTS CONDUCTED

This report presents monitoring results from 12 Coalition sampling events (Events 140-151), as well as data for events conducted by coordinating subwatershed monitoring programs and other agencies between October 2017 and September 2018. Samples collected for all of these events are listed in **Table 7**.

The Department of Water Resources conducted monitoring at FRRRB, PRPIT, and PRCAN in November 2017 and February 2018

The Coalition and subwatershed monitoring events were conducted throughout the year. Analyses included water chemistry and toxicity, with pesticides monitored during months when higher use is typical. Sediment toxicity testing and/or chemistry analyses were also conducted by the Coalition as part of the assessment. The sites and parameters for all events were monitored in accordance with the Coalition's current MRP and QAPP.

The field logs for all Coalition and subwatershed samples collected for the October 2017 through September 2018 events, as well as associated site photographs, are provided in **Appendix A**.

Completeness

The objectives for completeness are intended to apply to the monitoring program as a whole. As summarized in **Table 7**, 160 of the 177 initial water column and toxicity sample events planned by the Coalition and coordinating programs were conducted, for an overall sample event success rate of approximately 90%. Planned sample collection at four Coalition locations did not occur because the monitoring sites were dry or inaccessible. Planned sampling that differed from the 2018 Monitoring Plan Update is summarized below:

- Samples for one event in February at Pit River at Pittville (PRPIT) were not collected. Missed analytes were collected in March. DWR collected samples in February.
- Samples for two events at Middle Fork Feather River above Grizzly Creek (MFFGR) were not collected, but make up events were performed in August and September.
- DWR did not conduct all of the planned monitoring events at MFFGR, PRPIT, Fall River Bridge (FRRRB), and Pit River at Canby Road (PRCAN), due to a suspension of funding.

Table 7. Sampling for the 2018 Coalition Monitoring Year

		Sample Count		140	141	142	143	144	145	146	147	148	149	150	151
Subwatershed (Agency)	**Site ID**	**Planned**	**Collected**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
Butte-Yuba-Sutter (SVWQC)	GILSL	4	4	-	-	-	W	W	-	-	W	-	-	-	W
	LHNCT	11	11	-	W	W	W	W	W	W,S	W	W	W	W,S	W
	LSNKR	11	11	-	W	W	W	W	W	W,S	W	W	W	W,S	W
	PNCHY	12	12	W	W	W	W	W	W	W,S	W	W	W	W,S	W
	SSKNK	4	4	-	W	-	-	-	W	-	W,S	-	-	W,S	-
Colusa Glenn (SVWQC)	COLDR	4	4	-	W	-	-	-	W	-	W,S	-	-	W,S	-
	FRSHC	11	11	-	W	W	W	W	W	W,S	W	W	W	W,S	W
	LRLNC	1	1	-	-	-	-	-	-	W	-	-	-	-	-
	RARPP	1	1	-	-	-	-	-	-	W	-	-	-	-	-
	WLKCH	12	7	W	D	D	D	D	D	D	W	W	W	W,S	W
Goose Lake	LOWLC	4	4	-	-	-	-	-	-	W	W	W	W	-	-
Lake (SVWQC)	MDLCR	4	3	-	W	-	-	W	-	W	-	-	-	D	-
	MGSLU	4	1	-	D	-	-	W	-	D	-	-	-	D	-
Napa (SVWQC)	COONH	2	2	-						W				W	
Pit River (NECWA)	FRRRB	4	2	-	DWR	-	-	DWR	-	-	[4]	-	-	[4]	-
	PRCAN	4	2	-	DWR	-	-	DWR	-	-	[4]	-	-	[4]	-
	PRPIT	8	8	-	DWR	-	-	DWR,NS[1]	W	W	W	W	W	W	-
PNSSNS	CCBRW	10	10	-		W	W	W	W	W,[3]	W,S	W	W	W,S	W
Sac/Amador (SVWQC)	CRTWN	10	9			W	W	W	W	W,S	W	W	W	D	W
	GIDLR	12	12	W	W	W	W	W	W	W,S	W	W	W	W,S	W
Shasta/Tehama (SVWQC)	ACACR	12	12	W	W	W	W	W	W	W,S	W	W	W	W,S	W
Solano (SVWQC)	UCBRD	11	11	-	W	W	W	W	W	W,S	W	W	W	W,S	W
	SSLIB	4	4	-	W	-	-	-	W	-	W,S	-	-	W,S	-

Subwatershed (Agency)	Site ID	Sample Count Planned	Collected	140 OCT	141 NOV	142 DEC	143 JAN	144 FEB	145 MAR	146 APR	147 MAY	148 JUN	149 JUL	150 AUG	151 SEP
Yolo (SVWQC)	WLSPL	11	11	-	W	W	W	W	W	W,S	W	W	W	W,S	W
Upper Feather River (UFRW)	MFFGR	6	3	-	[4]	-	-	[4]	-	W	[4], NS[1]	NS[1]	-	[4], W[2]	W[2]
	Totals	**177**	**160**												

Notes:
NECWA = Northeastern California Watershed Association
PNSSNS = Placer-Nevada-South Sutter-North Sacramento
SVWQC = Sacramento Valley Water Quality Coalition
UFRW = Upper Feather River Watershed Group
DWR = Monitoring Completed by the Department of Water Resources

W = Water sample collected
S = Sediment sample collected
D = Site was dry; no samples collected.
NS = Planned, but not sampled
"-" = no samples planned

[1] = Event not performed due to error in event preparation
[2] = Event was not originally included in Monitoring Plan, but scheduled as a makeup for earlier missed events
[3] = Sediment sample did not have enough fines to be analyzed. Resampled in May.
[4] = DWR monitoring suspended due to lack of funding.

SUMMARY OF SAMPLING CONDITIONS

Samples were collected throughout the year for the Coalition (see **Table 2**, Sampling for the 2018 Coalition Monitoring Year). The October 1, 2017 through September 30, 2018, monitoring year was characterized by above-average precipitation during the months of November, January, March, and April, and below-average precipitation during all other months. The water year was classified as "Below Normal" for the Sacramento Valley by the California Department of Water Resources, with an estimated 71% of average total runoff (based on 1966-2015 mean).[5,6] At the end of the 2018 water year, statewide precipitation was 73% of average.[7]

The Coalition's two sample collection periods include the wet season monitoring period from November 2017 to March 2018, and the irrigation season monitoring period from April 2018 through September 2018. October 2017 is classified as belonging to the irrigation season, but is attributed to the previous year's period. The wet season monitoring period had below-average precipitation in December and February with above-average amounts in the remaining months. The irrigation season had above-average precipitation in April and below-average in all other months.

Regional precipitation patterns for October 2017 through September 2018 are illustrated in **Figure 2-a** through **Figure 2-f**. Compared to the prior water year, less frequent precipitation events of varying sizes occurred throughout the year from October to June, resulting in relatively lower flows (**Figure 3-a** through **Figure 3-f**). Water samples were collected during high- and low-flow hydrologic conditions.

Based on climate data available from the Sacramento Executive Airport weather station, rainfall during the April – September 2018 irrigation season was greater than average during April and less than average from May through September (**Table 17**). No precipitation occurred from June through September. Precipitation was above normal in November, January, March, and April, and below normal in the remaining eight months. The maximum temperature exceeded 90° on 2 days in May, 14 days in June, 28 days in July, 16 days in August, and 15 days in September.

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[5] http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST and http://cdec.water.ca.gov/cgi-progs/previous/WSI

[6] Sacramento River Region unimpaired runoff, for water year 2018, was about 12.4 million acre-feet (MAF), approximately 71% of average. During water year 2017, the observed Sacramento River Region unimpaired runoff was about 38.0 MAF, or 213% of average.

[7] California Department of Water Resources 2018 WY Precipitation Summary available at: http://cdec.water.ca.gov/reportapp/javareports?name=PRECIPSUM.201809

Table 8. Summary of Climate Data[8] at Sacramento Executive Airport, October 2017 – September 2018

Month	Departure from Normal Mean Temperature	Days with Maximum Temperature ≥ 90°F	Precipitation Total (Inches)	Departure from Normal Precipitation
October 2017	0.1	0	0.15	-0.80
November 2017	1.5	0	2.13	0.05
December 2017	0.9	0	0.14	-3.11
January 2018	3.7	0	5.20	1.56
February 2018	-0.7	0	0.60	-2.87
March 2018	-1.4	0	5.14	2.39
April 2018	0.0	0	2.00	0.85
May 2018	0.0	2	0.60	-0.08
June 2018	1.3	14	0.00	-0.21
July 2018	2.6	28	0.00	0.00
August 2018	-0.9	16	0.00	-0.05
September 2018	-0.2	15	0.00	-0.29

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

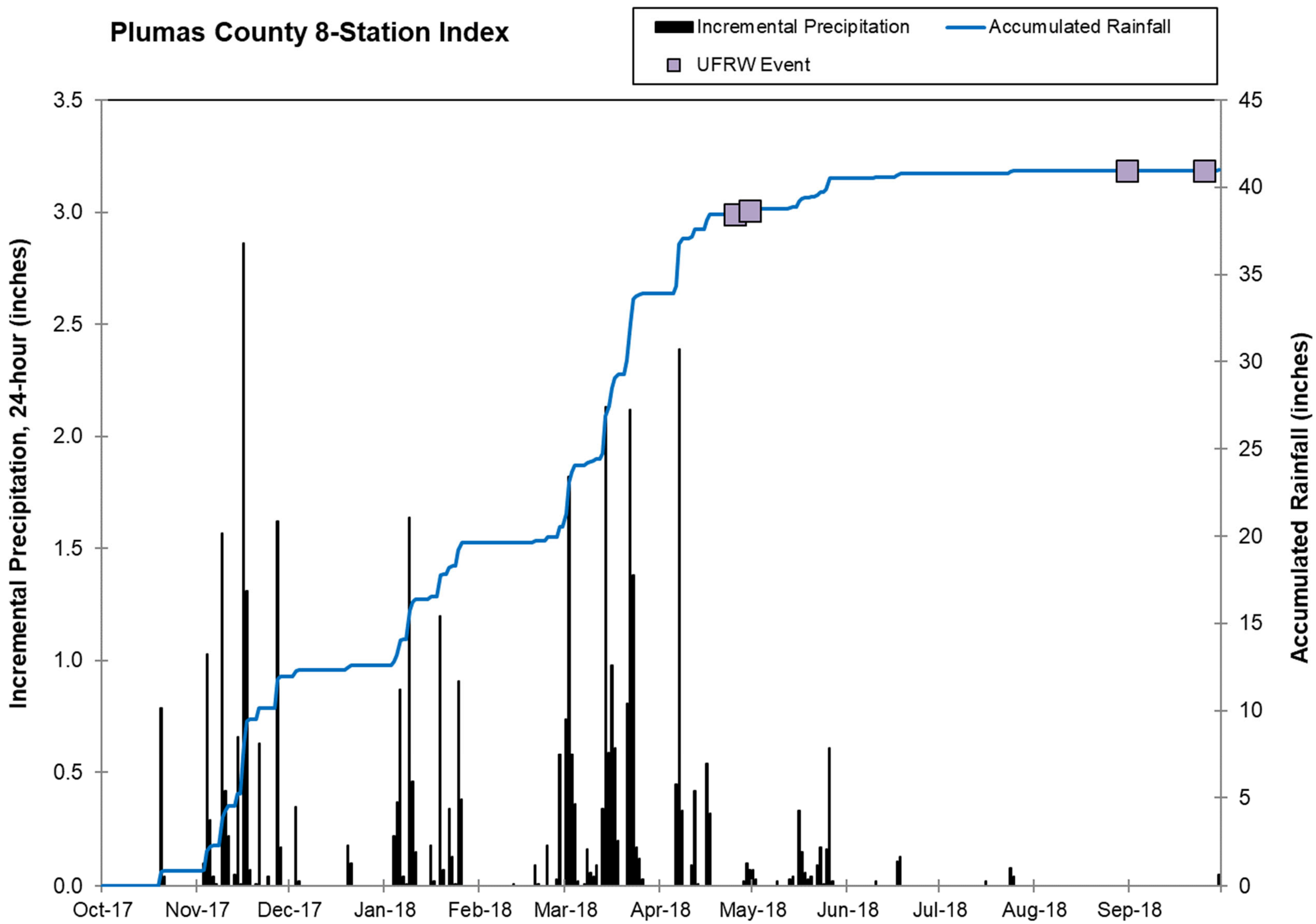

Figure 2-a. Precipitation during 2018 Coalition Monitoring: Plumas County

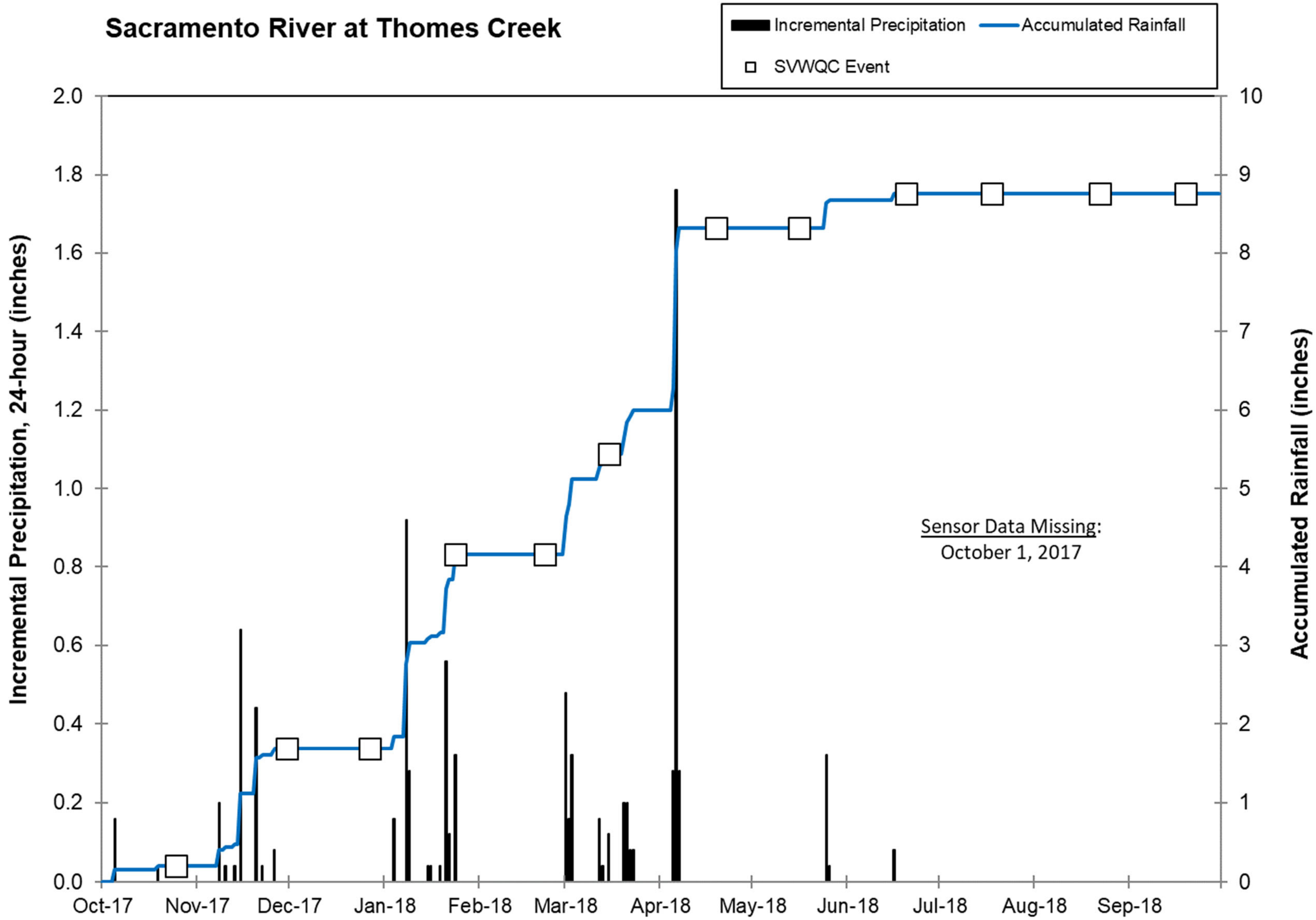

Figure 2-b. Precipitation during 2018 Coalition Monitoring: Upper Sacramento Valley

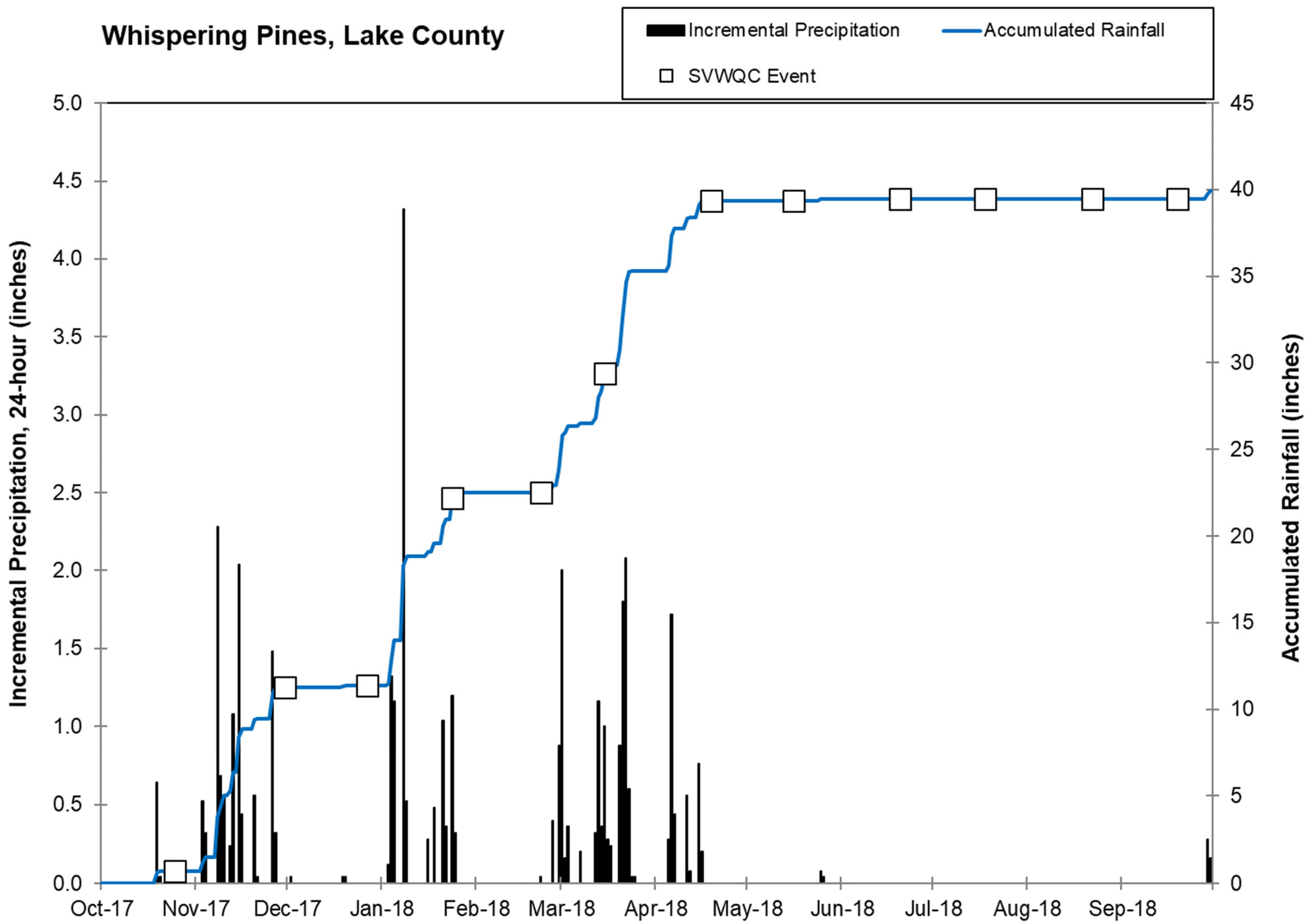

Figure 2-c. Precipitation during 2018 Coalition Monitoring: Lake County

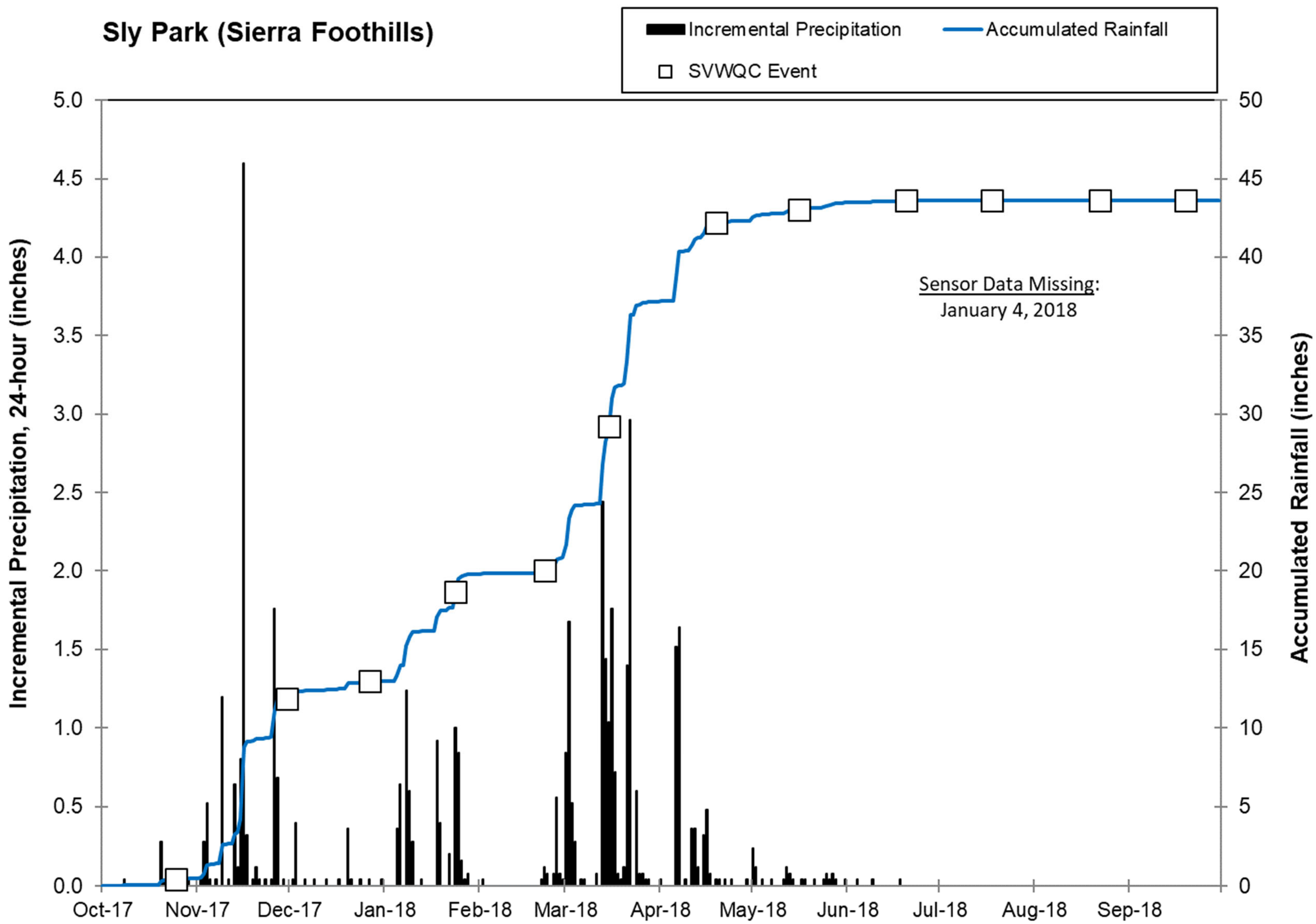

Figure 2-d. Precipitation during 2018 Coalition Monitoring: Sierra Foothills

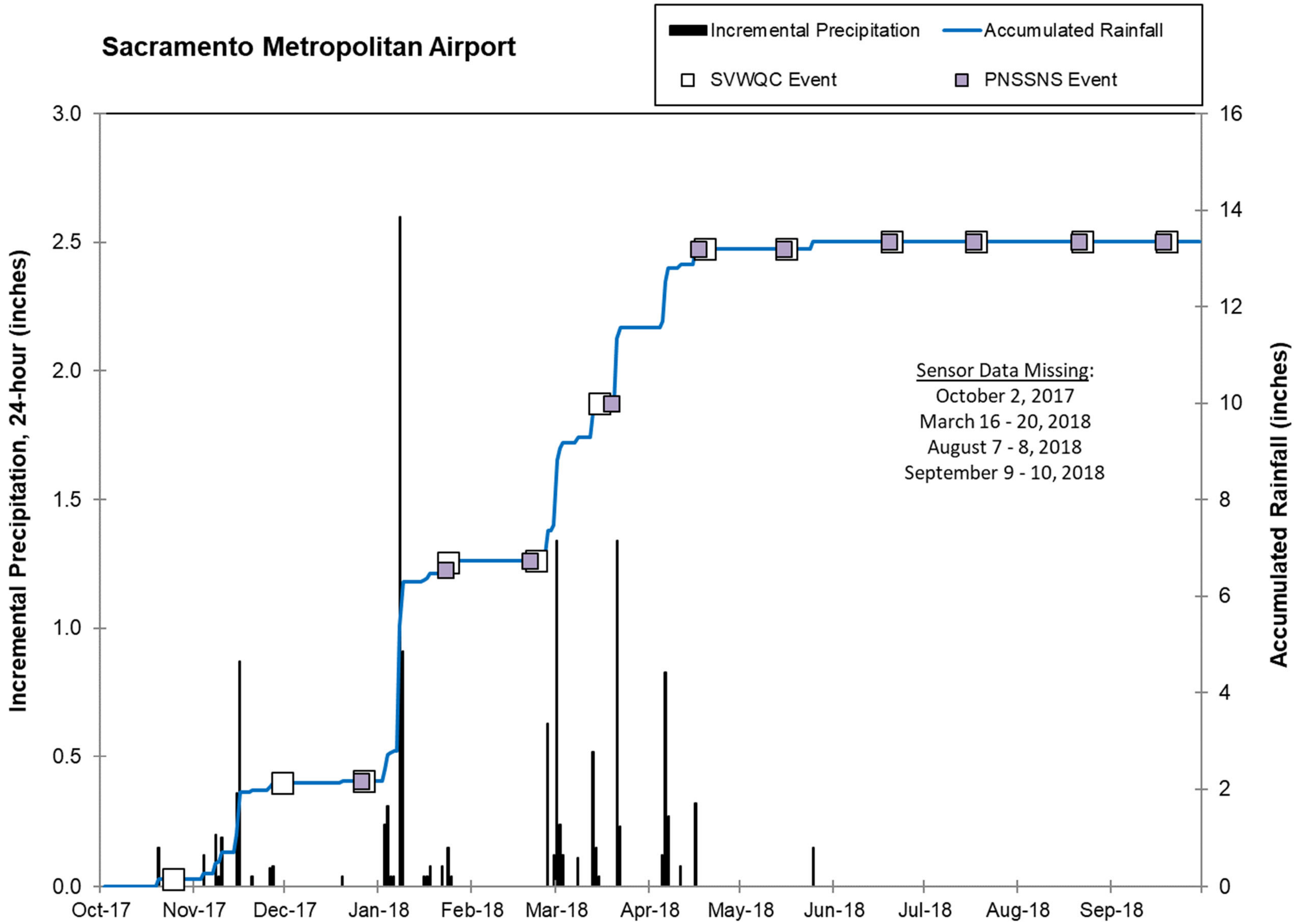

Figure 2-e. Precipitation during 2018 Coalition Monitoring: Lower Sacramento Valley

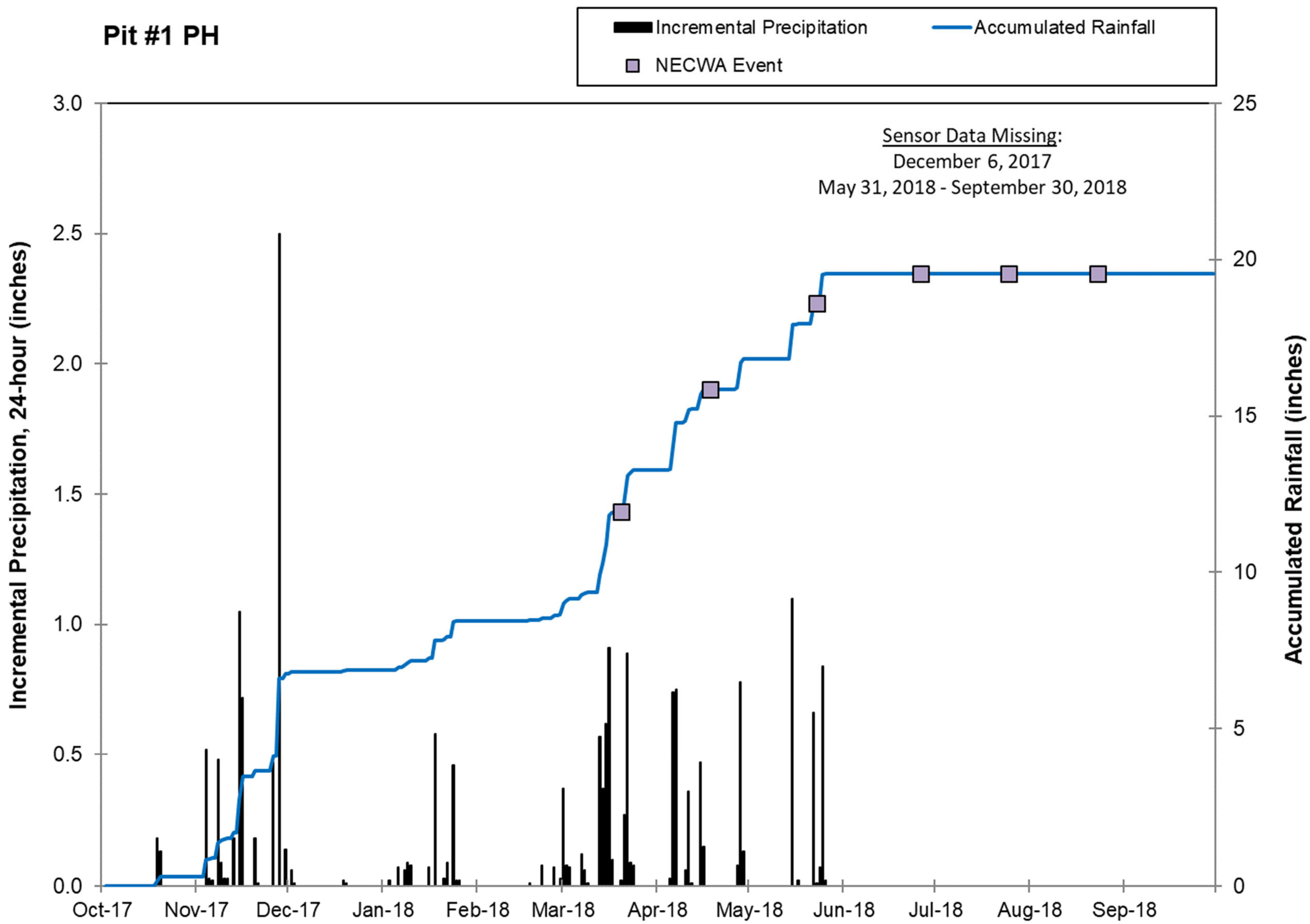

Figure 2-f. Precipitation during 2018 Coalition Monitoring: Pit River

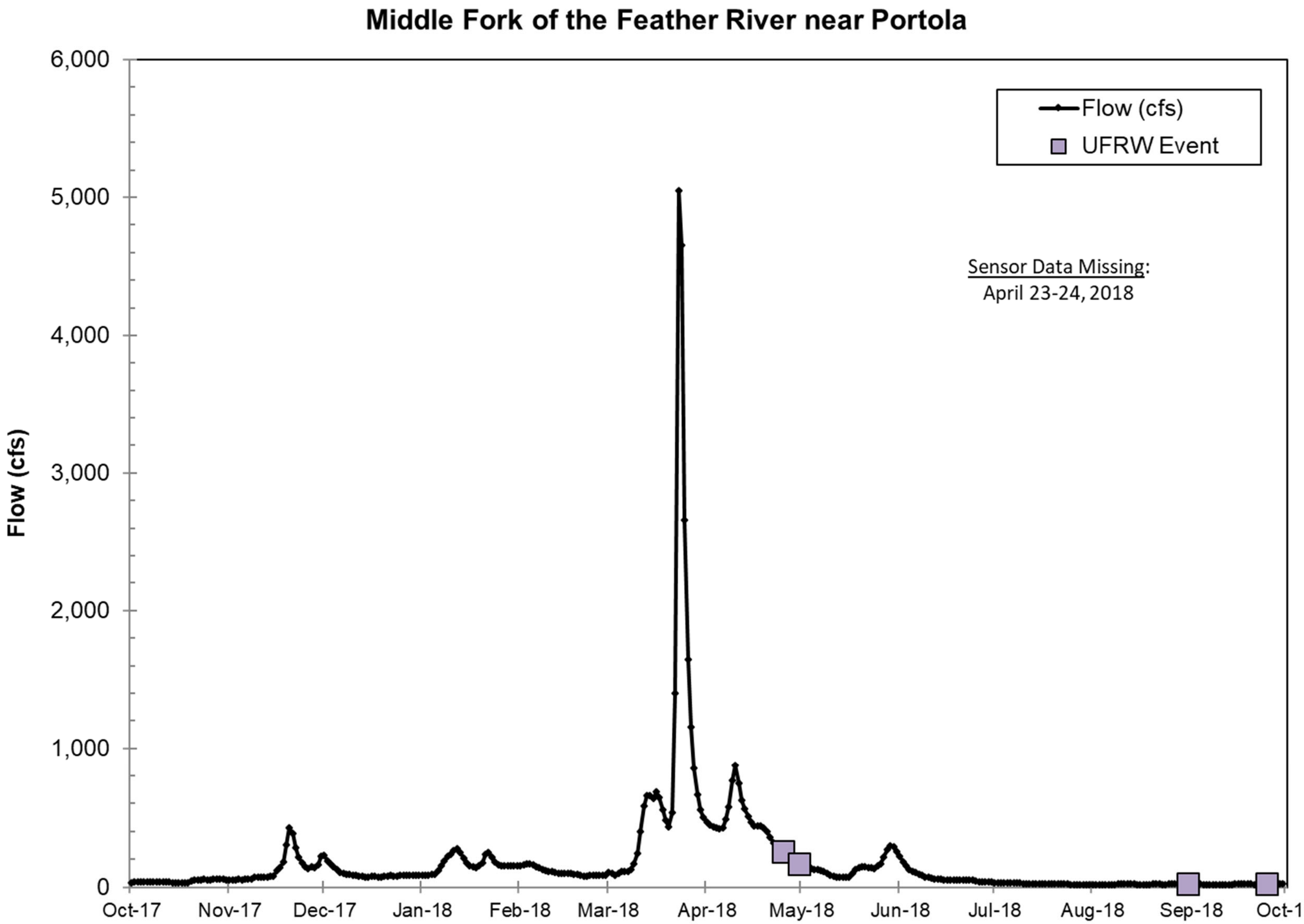

Figure 3-a. Flows during 2018 Coalition Monitoring: Plumas County

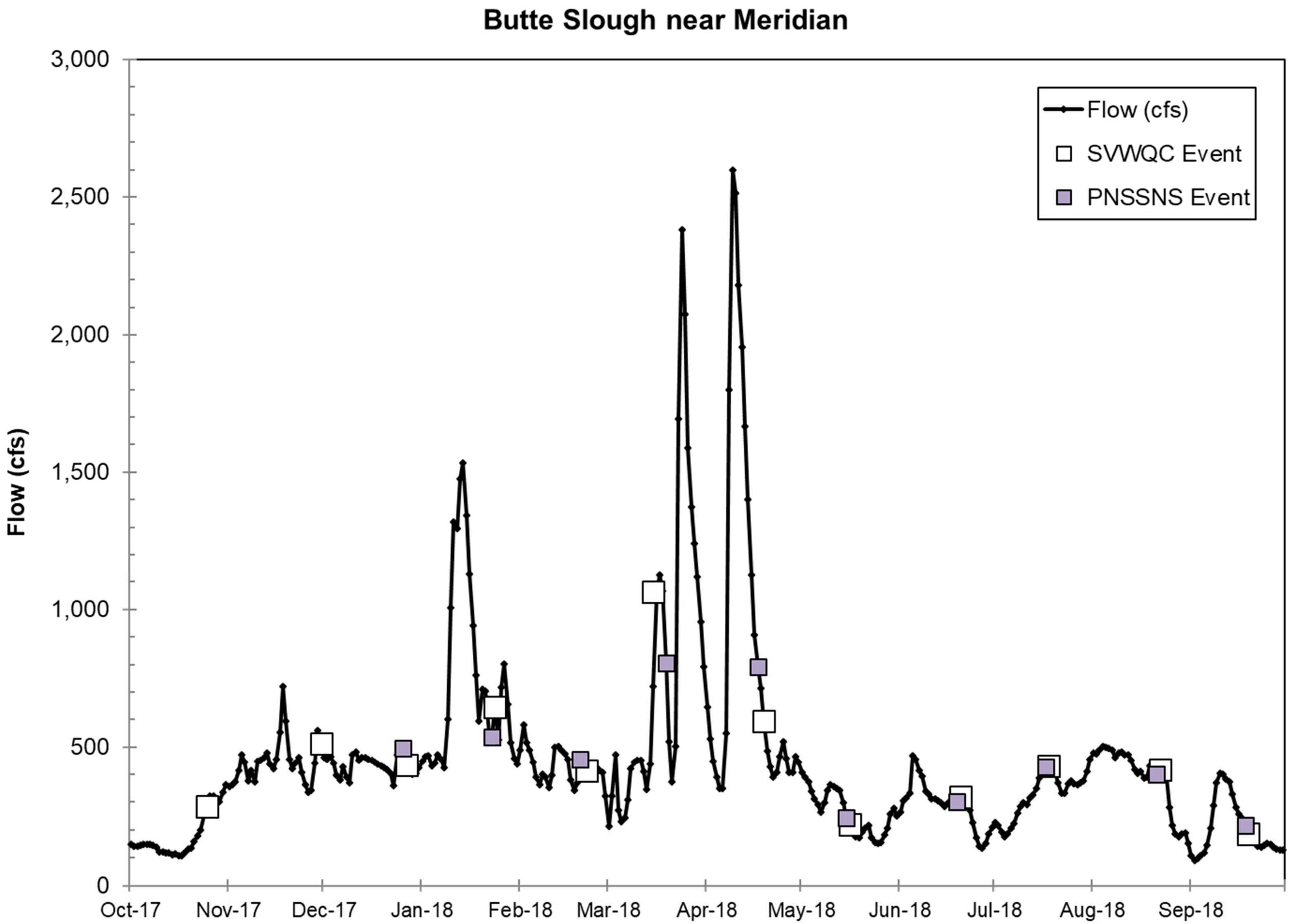

Figure 3-b. Flows during 2018 Coalition Monitoring: East Sacramento Valley

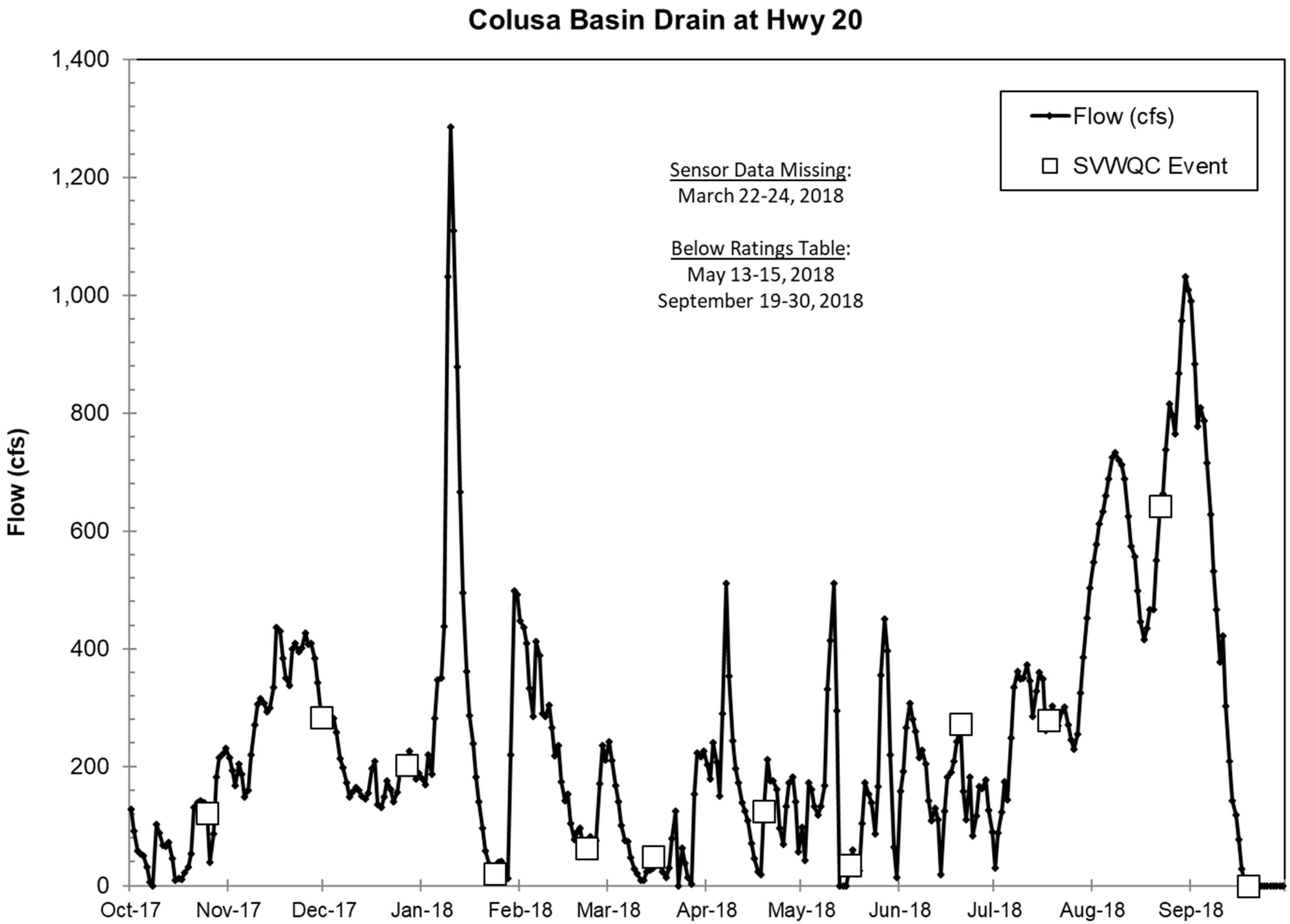

Figure 3-c. Flows during 2018 Coalition Monitoring: West Sacramento Valley

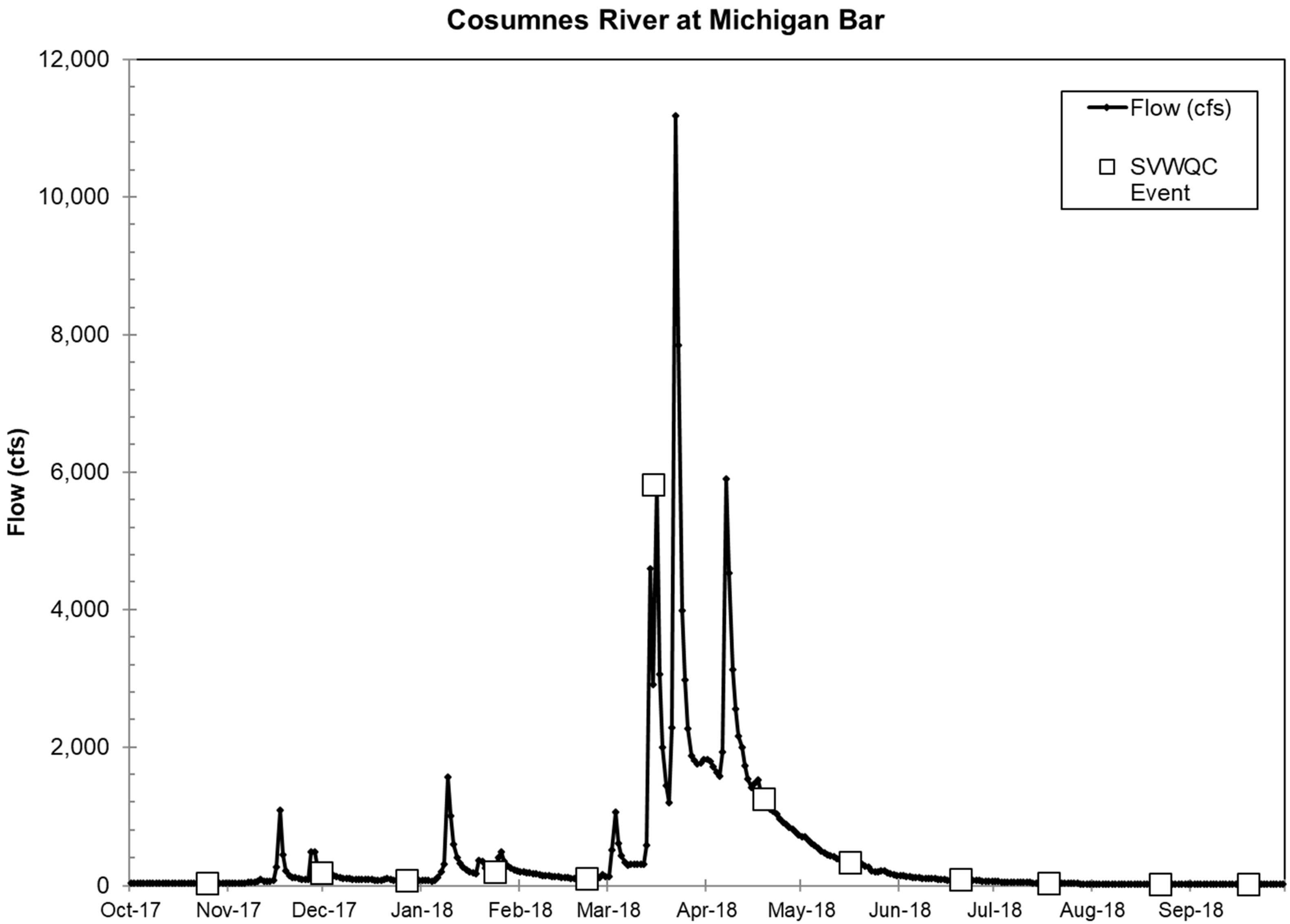

Figure 3-d. Flows during 2018 Coalition Monitoring: Lower Sacramento Valley

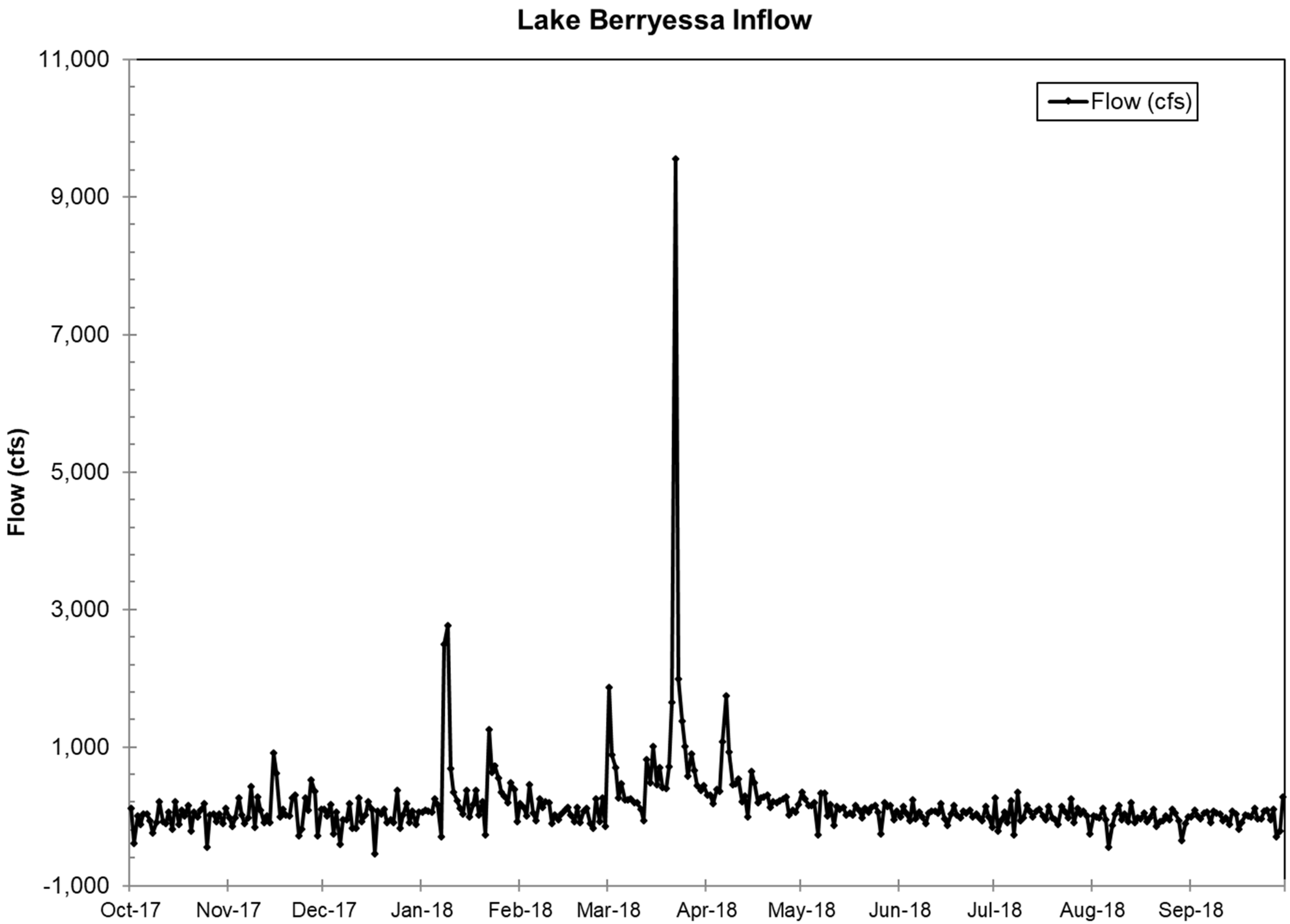

Figure 3-e. Flows during 2018 Coalition Monitoring: Lake Berryessa (Reservoir Inflow)

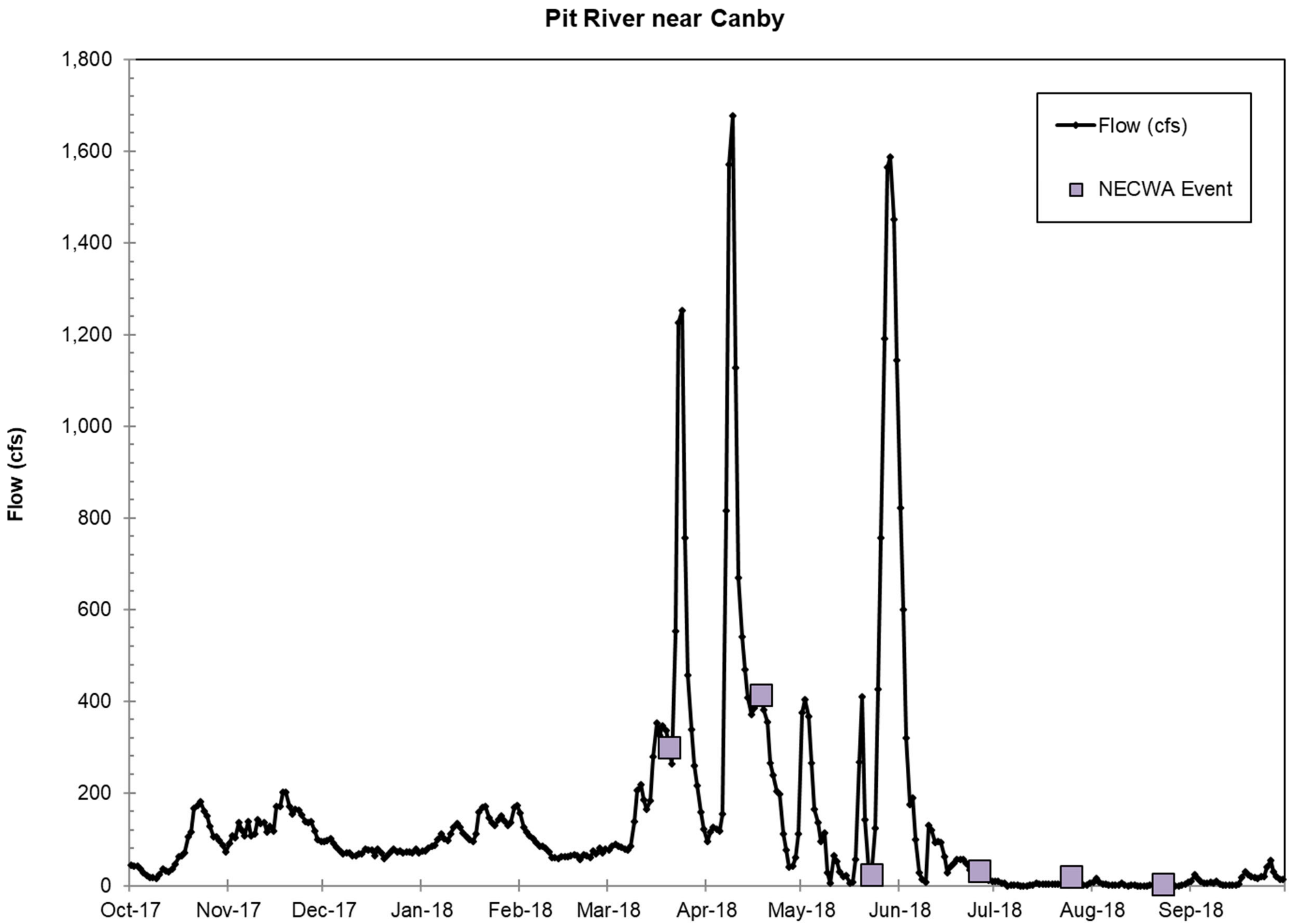

Figure 3-f. Flows during 2018 Coalition Monitoring: Pit River near Canby

SAMPLE HANDLING AND 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 2017 through September 2018 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. Field and laboratory documentation for samples collected by DWR and RMP are maintained by each entity and are not included in **Appendix B**.

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 this report. 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 a future event to ensure program completeness objectives are met. Sample containers that were received broken are summarized below:

- Sample shipments for October 2017 through September 2018 monitoring were all received with no broken or damaged bottles.

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

- Sample shipments for October 2017 through September 2018 monitoring were all received at temperatures below 6˚C.

QUALITY ASSURANCE RESULTS

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

Results of Field and Laboratory QA/QC Analyses

Quality Assurance/Quality Control (QA/QC) data are summarized in **Table 9**. 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.

Table 9. Summary of QA/QC Results for 2018 Monitoring Year

Field Blank	Field Duplicate	Method or Lab Blank	Lab Control Spike	Lab Control Spike Duplicate	Matrix Spike	Matrix Spike Duplicate	Lab Duplicate	Surrogate Recovery
97.2%	95.9%	99.8%	93.4%	97.7%	92.2%	98.5%	100.0%	98.2%

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 Coalition's quarterly data submittals to ILRP. Monitoring results collected and verified by DWR and the DRMP are also included in **Appendix C**.

Assessment of 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, 2018), 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 2018) and the International Union of Pure and Applied Chemistry Pesticide Properties Database (IUPAC PPDB; online database updated regularly).

Water quality objectives and other relevant water quality thresholds discussed in this section are summarized in **Table 10** and **Table 11**. Monitored analytes without relevant water quality objectives or *ILRP* Trigger Limits are listed in **Table 12**.

The data evaluated for exceedances as described in this document include all Coalition collected results, as well as the compiled results from the subwatershed monitoring programs presented in this report where relevant water quality objectives exist. The results of these evaluations are discussed below.

Table 10. Adopted Basin Plan and California Toxics Rule Objectives for Analytes Monitored for 2018 Coalition Monitoring

Analyte	Most Stringent Objective[1]	Units	Objective Source[2]
Aldrin	0.00013	µg/L	CTR
Ammonia, Total as N	narrative	mg/L	Basin Plan
Arsenic, total	50	µg/L	CA 1˚ MCL
Atrazine	1	µg/L	CA 1˚ MCL
Cadmium, dissolved	Hardness-dependent[3]	µg/L	CTR
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
Endosulfan sulfate	110	µg/L	CTR
Endrin	0.036	µg/L	CTR
Endrin aldehyde	0.76	µg/L	CTR
Glyphosate	700	µg/L	CA 1˚ MCL
HCH	0.0039	µg/L	CTR
Heptachlor	0.00021	µg/L	CTR
Heptachlor epoxide	0.0001	µg/L	CTR
Lead, dissolved	Hardness-dependent[3]	µg/L	CTR
Malathion	0.1[4]	µg/L	Basin Plan
Methoxychlor	30	µg/L	CA 1˚ MCL
Nitrate, as N	10	mg/L	CA 1˚ MCL
pH	6.5-8.5	-log[H+]	Basin Plan
Selenium, total	5.0	µg/L	CTR
Temperature	narrative	µg/L	Basin Plan
Toxicity, Algae (*Hyalella*) Survival	narrative	µg/L	Basin Plan
Toxicity, Algae (*Selenastrum*) Cell Density	narrative	µg/L	Basin Plan
Toxicity, Water Flea (*Ceriodaphnia*) Survival	narrative	µg/L	Basin Plan

Analyte	Most Stringent Objective(1)	Units	Objective Source(2)
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 1º MCLs* are California's Maximum Contaminant Levels for treated drinking water; *CTR* = California Toxics Rule criteria.
3. Objective varies with the hardness of the water.
4. These values are Basin Plan performance goals. The Basin Plan states: "…discharge is prohibited unless the discharger is following a management practice approved by the Board." This has been interpreted as an ILRP Trigger Limit of ND (Not Detected).

Table 11. Unadopted Water Quality Limits Used to Interpret Narrative Water Quality Objectives for Analytes Monitored for 2018 Coalition Monitoring

Analyte	Unadopted Limit(1)	Units	Limit Source
Boron, total	700	µg/L	Ayers and Westcott 1988
Specific Conductivity	700	µS/cm	Ayers and Westcott 1988
Specific Conductivity	900	µS/cm	CA Recommended 2˚ MCL
E. coli (1)	235	MPN/100mL	Basin Plan Amendment
Total Dissolved Solids	500	mg/L	CA Recommended 2˚ MCL
Total Dissolved Solids	450	mg/L	Ayers and Westcott 1988
Azinphos methyl	0.01	µg/L	USEPA NAWQC(2)
Carbaryl	2.53	µg/L	USEPA NAWQC
Dichlorvos	0.085	µg/L	Cal/EPA Cancer Potency Factor
Dimethoate	1	µg/L	CDPH Notification Level(3)
Diuron	2	µg/L	USEPA Health Advisory
Linuron	1.4	µg/L	USEPA IRIS Reference Dose
Methidathion	0.7	µg/L	USEPA IRIS Reference Dose
Methiocarb	0.5	µg/L	USFW Acute Toxicity
Methomyl	0.52	µg/L	USEPA NAWQC
Paraquat	3.2	µg/L	USEPA IRIS Reference Dose
Phorate	0.7	µg/L	NAS Health Advisory
Trifluralin	5	µg/L	USEPA IRIS Cancer Risk Level
Zinc	1000	µg/L	CA Recommended 2˚ MCL

Note:

1. Adopted by the Regional Water Board but not approved by the 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 12. Analytes Monitored for 2018 Coalition Monitoring without Applicable Adopted or Unadopted Limits

Analytes		
% Solids	Flumioxazin	Phosphorus as P, Total
Acetamiprid	Hardness as CaCO3	Prometryn
Chloropicrin	Hexazinone	Propiconazole
Chlorothalonil	Mancozeb (Ziram)	Pyraclostrobin
Clothianidin	Metolachlor	Pyrethroid Pesticides[1]
Cyprodinil	Metribuzin	Pyridaben
Dichlorophenoxyacetic Acid, 2,4-	Naled	Total Organic Carbon
Diflubenzuron	Orthophosphate, as P	Total Suspended Solids
Discharge (flow)	Oryzalin	
Dodine	Oxyfluorfen	
Ethalfluralin	Pendimethalin	

1. Pyrethroid pesticides considered in the 2017 Central Valley Pyrethroid Pesticides Total Maximum Daily Load and Basin Plan Amendment (Amendment) include the following: Bifenthrin, Cyfluthrin, Cypermethrin, Esfenvalerate, Lambda-Cyhalothrin, and Permethrin (The Amendment was adopted by the Central Valley Water Board on June 8, 2017, approved by the State Water Resources Control Board on July 10, 2018, and approved by the Office of Administrative Law on February 19, 2019).

TOXICITY AND PESTICIDE RESULTS

A summary of the toxicity and pesticide results from 2018 Coalition monitoring is provided in this section.

Toxicity Exceedances in Coalition Monitoring

There were 269 individual toxicity results (including 27 field duplicates) analyzed in water column and sediment samples collected from 15 different sites during 2018 Coalition monitoring. Analyses were conducted for *Selenastrum capricornutum, Ceriodaphnia dubia,* and *Hyalella azteca*. Statistically significant toxicity was not observed in any of the individual toxicity results analyzed by Pacific EcoRisk (PER) in water column samples. Three sediment samples (including one field duplicate) exhibited statistically significant toxicity to *Hyalella azteca*. Significant toxicity to *Hyalella azteca* was observed at two sites (Ulatis Creek and Lower Snake River) in April 2018 and one site (Pine Creek) in August 2018. All three of the samples exhibited toxicity that exceeded the 20% effect threshold recommended by SWAMP to evaluate toxicity in sediment[9]. Samples exhibiting statistically significant sediment toxicity are summarized in **Table 13**.

Table 13. Toxicity Exceedances in Sediment in 2018 Coalition Monitoring

Site ID	Water Body	Sample Date	Analyte	% of Control
UCBRD	Ulatis Creek at Brown Road	4/17/2018	*Hyalella azteca* survival	73.4
LSNKR	Lower Snake River at Nuestro Road	4/18/2018	*Hyalella azteca* survival	71.8
PNCHY [1]	Pine Creek at Highway 32	8/22/2018	*Hyalella azteca* survival	79.2

1. Field duplicate sample.

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

Event 146, April 2018 – Ulatis Creek at Brown Road, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed survival of 73.4% compared to the control used for the Ulatis Creek sample. The toxicity observed in the sample (≥20% reduction compared to the control) triggered follow-up sediment analyses for pyrethroid and organophosphate (chlorpyrifos) pesticides. Six pesticides were detected in the sample: bifenthrin (4.4 ng/g dry weight (dw)); cyfluthrin (0.38 ng/g dw); cypermethrin (0.23 ng/g dw); esfenvalerate (0.51 ng/g dw); lambda-cyhalothrin (2.0 ng/g dw); and permethrin (0.49 ng/g dw). A total of 0.459 toxic units (TU) of agricultural use pyrethroids were estimated to likely have contributed to the toxicity observed at the UCBRD monitoring site, with bifenthrin and lambda-cyhalothrin concentrations contributing approximately 59% and 31%, respectively, to the

9 Regional Water Board approval letter for completion of the Cosumnes River Hyalella toxicity Management Plan (January 22, 2015).

estimated TU. The TU was estimated based on published LC50 values for pyrethroids and chlorpyrifos in sediment[10], normalized for organic carbon concentrations. A TU of 1 or greater suggests that the pesticide concentrations detected in the sediment sample are sufficient to cause toxicity to *Hyalella*.

Event 146, April 2018 – Lower Snake River at Nuestro Road, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed survival of 71.8% compared to the control used for the Lower Snake River sample. The toxicity observed in the sample (≥20% reduction compared to the control) triggered follow-up sediment analyses for pyrethroid and organophosphate (chlorpyrifos) pesticides. Two pesticides were detected in the sample: chlorpyrifos (0.17 ng/g dw); and cypermethrin (0.10 ng/g dw). A total of 0.111 toxic units (TU) of agricultural use pyrethroids and chlorpyrifos were estimated to likely have contributed to the toxicity observed at the LSNKR monitoring site, with chlorpyrifos and cypermethrin concentrations contributing approximately 18% and 82%, respectively, to the estimated TU. Although it should be noted that the two pesticides only contributed to approximately 10% of a TU and therefore, one or more other unmeasured compounds in the sediment were responsible for the majority of the observed toxicity to *Hyalella*.

Event 150, August 2018 – Pine Creek at Highway 32, Hyalella toxicity

In a sediment toxicity test conducted with *Hyalella*, the Coalition observed survival of 79.2% in a field duplicate sample compared to the control used for the Pine Creek sample. The toxicity observed in the sample (≥20% reduction compared to the control) triggered follow-up sediment analyses for pyrethroid and organophosphate (chlorpyrifos) pesticides. One pesticide was detected in the sample: bifenthrin (3.9 ng/g dw). A total of 0.395 toxic units (TU) of agricultural use pyrethroid was estimated to likely be responsible for the toxicity observed at the PNCHY monitoring site, with bifenthrin concentrations contributing 100% to the estimated TU. The target environmental sample collected at PNCHY was found not to be toxic to *Hyalella*.

Pesticides Detected in Coalition Monitoring

There were 2,253 individual pesticide results (including 337 field duplicates) analyzed in 204 water column samples collected from 20 different sites, including both Representative and Management Plan or Special Study sites during 2018 Coalition monitoring. Analyses were conducted for organophosphates, carbamates, organochlorines, benzophenyls, insecticides, fungicides, pyrethroids, triazines, pyrethroids, and a variety of herbicides. Within these monitored categories, 24 different pesticides were detected (128 total detected results, including 11 field duplicates) in 75 separate samples collected for Coalition monitoring. Approximately 63.2% of samples collected in the 2018 monitoring year had no detected pesticides, and greater than 95% of all pesticide results were below detection.

It should be noted that detections of pesticides are not equivalent to exceedances (with the exceptions of carbofuran, malathion, and methyl parathion which have prohibitions of discharge

[10] Weston, D.P., Jackson, C.J., 2009. Use of engineered enzymes to identify organo-phosphate and pyrethroid-related toxicity in toxicity identification evaluations. *Environ Sci Technol* 43, 5514-5520.

in the Basin Plan). Only two registered pesticides, chlorpyrifos (one sample) and diazinon (two samples) exceeded applicable water quality objectives or ILRP Trigger Limits.

All pesticides detected in water column samples for 2018 Coalition monitoring are listed in **Table 14**. Pesticides were compared to relevant numeric and narrative water quality objectives, and to toxicity threshold concentrations published in USEPA's *ECOTOX* Database (USEPA 2018) and International Union of Pure and Applied Chemistry Pesticide Properties Database (IUPAC PPDB; online database updated regularly). A discussion of these detections and exceedances follows below.

- The insecticide allethrin was detected in one sample collected at Pine Creek. There is currently no ILRP Trigger Limit or adopted water quality objective for allethrin.
- The insecticide and acaricide bifenthrin was detected in 36 samples (and three field duplicates) at 10 sites, including 10 detections at Willow Slough Bypass and six detections at Grand Island Drain. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for bifenthrin.
- The insecticide chlorpyrifos was detected in one sample collected at Gilsizer Slough, which exceeded the chronic Basin Plan limit of 0.015 µg/L.
    - On August 22, 2018, chlorpyrifos was detected at 0.023 µg/L in Gilsizer Slough, which exceeded the chronic Basin Plan limit. There were 32 reported applications of chlorpyrifos in the month prior to the exceedance. Chlorpyrifos was applied to approximately 108 acres of alfalfa, 255 acres of almonds, and 1,334 acres of walnuts in the Gilsizer Slough drainage during that time. All of the alfalfa applications were made aerially, and 100 acres of the walnut applications were also made by air. During the event, the field crews noted that water was present, but there was no measurable flow. In the preceding weeks before the event, there had been no recorded precipitation. Toxicity tests were not performed during this event.
- The insecticide clothianidin was detected in one sample collected at Grand Island Drain. There is currently no ILRP Trigger Limit or adopted water quality objective for clothianidin.
- The insecticide cyfluthrin was detected in two samples, including one sample collected at Ulatis Creek and one sample collected at Willow Slough Bypass. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for cyfluthrin.
- The insecticide and acaricide cypermethrin was detected in one sample collected at Ulatis Creek. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for cypermethrin.
- The insecticide deltamethrin/tralomethrin was detected in one sample collected at Ulatis Creek. There is currently no ILRP Trigger Limit or adopted water quality objective for deltamethrin/tralomethrin.

- The insecticide and acaricide diazinon was detected in two samples, including one sample collected at Grand Island Drain and one sample collected at Gilsizer Slough. Both samples exceeded the chronic Basin Plan limit of 0.10 µg/L.
    - On October 25, 2017, diazinon was detected at 0.15 µg/L at Grand Island Drain, which exceeded the chronic Basin Plan limit. There were 27 reported applications of diazinon in the month prior to the exceedance. Diazinon was applied to approximately 1,120 acres of pears in the Grand Island drainage during that time. All of the applications were made on the ground. During the event, the field crews noted that water was present, but there was no measurable flow. There had been about 0.15 inches of precipitation during the week preceding the event, but there had been no precipitation for the 48 hours prior to sample collection. A *Selenastrum capricornutum* toxicity test was also performed on the sample, but the sample was not found to be toxic.
    - On January 1, 2018, diazinon was detected at 0.15 µg/L at Gilsizer Slough, which exceeded the chronic Basin Plan limit. There were 15 reported applications of diazinon in the month prior to the exceedance. Diazinon was applied to approximately 357 acres of peaches in the Gilsizer Slough drainage during that time. All of the applications were made on the ground. During the event, the field crews noted that water was present, but there was no measurable flow. There had been about 0.41 inches of precipitation during the week preceding the event, with about 0.25 inches of rain falling in the 48 hours before the sample was collected. Toxicity tests were not performed during this event.
- The herbicide 2,4-dichlorophenoxyacetic Acid was detected in seven samples collected at five sites, including three samples collected at Ulatis Creek. There is currently no ILRP Trigger Limit or adopted water quality objective for 2,4-dichlorophenoxyacetic acid.
- The herbicide diuron was detected in three samples collected at two sites, once at Ulatis Creek and twice at Lower Snake River, but did not exceed the USEPA Health Advisory limit of 2 µg/L.
- The insecticide esfenvalerate/fenvalerate was detected in seven samples collected at three sites, including three samples collected at Pine Creek, two samples collected at Lower Snake River, and two samples collected at Lower Honcut Creek. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for esfenvalerate/fenvalerate.
- The herbicide ethalfluralin was detected in one sample collected at Freshwater Creek and one field duplicate collected at Lower Snake River. There is currently no ILRP Trigger Limit or adopted water quality objective for ethalfluralin.
- The insecticide fenpropathrin was detected in two samples at Grand Island Drain. There is currently no ILRP Trigger Limit or adopted water quality objective for fenpropathrin.
- The herbicide glyphosate was detected in one sample at Lower Snake River, which did not exceed the California Maximum Contaminant Level of 700 µg/L.

- The insecticide imidacloprid was detected in nine samples (and one field duplicate) collected at eight sites, including two samples collected at Colusa Basin Drain and Grand Island Drain. The field duplicate sample was collected at Willow Slough Bypass. There is currently no ILRP Trigger Limit or adopted water quality objective for imidacloprid.
- The insecticide and acaricide lambda-cyhalothrin was detected in 19 samples (and one field duplicate) collected at 11 sites, including three samples and one field duplicate sample collected at Ulatis Creek. Three samples collected at Lower Snake River also showed lambda-cyhalothrin detections. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for lambda-cyhalothrin.
- The fungicide mancozeb (Ziram) was detected in one sample collected at Lower Honcut Creek. There is currently no ILRP Trigger Limit or adopted water quality objective for mancozeb (Ziram).
- The herbicide metolachlor was detected in two samples (and one field duplicate), including one sample and one field duplicate collected at Pine Creek and one sample collected at Grand Island Drain. There is currently no ILRP Trigger Limit or adopted water quality objective for metolachlor.
- The herbicide metribuzin was detected in two samples collected at Willow Slough Bypass and Sacramento Slough. There is currently no ILRP Trigger Limit or adopted water quality objective for metribuzin.
- The herbicide oxyfluorfen was detected in nine samples (and one field duplicate), including four samples collected at Willow Slough Bypass and one sample and one field duplicate collected at Pine Creek. There is currently no *ILRP* Trigger Limit or adopted water quality objective for oxyfluorfen.
- The insecticide and acaricide permethrin was detected in one sample collected at Pit River. At the time of sample collection, there was no ILRP Trigger Limit or adopted water quality objective for permethrin.
- The fungicide propiconazole was detected in one sample collected at Lower Snake River. There is currently no ILRP Trigger Limit or adopted water quality objective for propiconazole.
- The herbicide and algicide simazine was detected in five samples (and two field duplicates), including three samples and one field duplicate collected at Grand Island Drain and two samples and one field duplicate collected at Lower Snake River. None of the detected samples or field duplicates exceeded the California Maximum Contaminant Level of 4 µg/L.
- The insecticide tetramethrin was detected in two samples collected at Grand Island Drain and Ulatis Creek. There is currently no ILRP Trigger Limit or adopted water quality objective for tetramethrin.

Table 14. Pesticides Detected in 2018 Coalition Monitoring

Site	Date	Analyte	Result[1] (ug/L)		Trigger Limit[2]	Basis for Limit[3]
UCBRD	5/15/2018	Allethrin	DNQ	0.0006		
WLSPL	1/23/2018	Bifenthrin	DNQ	0.0004		
LSNKR	1/24/2018	Bifenthrin	DNQ	0.0002		
GIDLR	2/20/2018	Bifenthrin	DNQ	0.0002		
UCBRD	2/20/2018	Bifenthrin	DNQ	0.0002		
WLSPL	2/20/2018	Bifenthrin	DNQ	0.0002		
COLDR	3/14/2018	Bifenthrin	DNQ	0.0002		
GIDLR	3/14/2018	Bifenthrin	=	0.0024		
SSKNK	3/14/2018	Bifenthrin	DNQ	0.0002		
UCBRD	3/14/2018	Bifenthrin	=	0.0007		
UCBRD	3/14/2018	Bifenthrin[4]	=	0.0008		
WLSPL	3/14/2018	Bifenthrin	DNQ	0.0002		
ACACR	3/15/2018	Bifenthrin	DNQ	0.0002		
FRSHC	3/15/2018	Bifenthrin	DNQ	0.0001		
LSNKR	3/15/2018	Bifenthrin	DNQ	0.0003		
GIDLR	4/17/2018	Bifenthrin	=	0.0014		
WLSPL	4/17/2018	Bifenthrin	DNQ	0.0002		
WLSPL	4/17/2018	Bifenthrin[4]	DNQ	0.0003		
GIDLR	5/15/2018	Bifenthrin	=	0.0012		
WLSPL	5/15/2018	Bifenthrin	=	0.0006		
COLDR	5/16/2018	Bifenthrin	DNQ	0.0002		
PNCHY	5/16/2018	Bifenthrin	=	0.0015		
SSKNK	5/16/2018	Bifenthrin	DNQ	0.0002		
WLSPL	6/19/2018	Bifenthrin	=	0.0005		
ACACR	6/20/2018	Bifenthrin	DNQ	0.0004		
PNCHY	6/20/2018	Bifenthrin	=	0.0008		
WLSPL	7/17/2018	Bifenthrin	=	0.0008		
PNCHY	7/18/2018	Bifenthrin	=	0.002		
GIDLR	8/21/2018	Bifenthrin[4]	DNQ	0.0002		
WLSPL	8/21/2018	Bifenthrin	=	0.0006		
FRSHC	8/22/2018	Bifenthrin	DNQ	0.0003		
LSNKR	8/22/2018	Bifenthrin	=	0.0007		
PNCHY	8/22/2018	Bifenthrin	DNQ	0.0004		
FRSHC	9/18/2018	Bifenthrin	=	0.0027		
GIDLR	9/18/2018	Bifenthrin	DNQ	0.0003		
UCBRD	9/18/2018	Bifenthrin	=	0.0005		
WLSPL	9/18/2018	Bifenthrin	=	0.0019		
LHNCT	9/19/2018	Bifenthrin	DNQ	0.0003		
LSNKR	9/19/2018	Bifenthrin	DNQ	0.0002		

Site	Date	Analyte		Result[1] (ug/L)	Trigger Limit[2]	Basis for Limit[3]
PNCHY	9/19/2018	Bifenthrin	=	0.0005		
GILSL	**8/22/2018**	**Chlorpyrifos**	**=**	**0.023**	**0.015**	**BP (chronic)**
GIDLR	5/15/2018	Clothianidin	DNQ	0.0113		
UCBRD	5/15/2018	Cyfluthrin	=	0.0012		
WLSPL	5/15/2018	Cyfluthrin	DNQ	0.0003		
UCBRD	5/15/2018	Cypermethrin	DNQ	0.0004		
UCBRD	3/14/2018	Deltamethrin/Tralomethrin	DNQ	0.0006		
GIDLR	**10/25/2017**	**Diazinon**	**=**	**0.15**	**0.1**	**BP (chronic)**
GILSL	**1/23/2018**	**Diazinon**	**=**	**0.15**	**0.1**	**BP (chronic)**
UCBRD	2/20/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.62		
LSNKR	3/15/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.51		
UCBRD	6/19/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.82		
LSNKR	6/20/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.6		
WLKCH	6/20/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.5		
UCBRD	7/17/2018	Dichlorophenoxyacetic Acid, 2,4-	=	1.5		
PRPIT	7/25/2018	Dichlorophenoxyacetic Acid, 2,4-	DNQ	0.61		
LSNKR	2/21/2018	Diuron	DNQ	0.2	2	USEPA Health Advisory
UCBRD	3/14/2018	Diuron	=	0.41	2	USEPA Health Advisory
LSNKR	3/15/2018	Diuron	DNQ	0.37	2	USEPA Health Advisory
LHNCT	1/24/2018	Esfenvalerate/Fenvalerate	DNQ	0.0004		
LSNKR	1/24/2018	Esfenvalerate/Fenvalerate	DNQ	0.0007		
LSNKR	3/15/2018	Esfenvalerate/Fenvalerate	DNQ	0.0003		
PNCHY	5/16/2018	Esfenvalerate/Fenvalerate	=	0.0016		
LHNCT	6/20/2018	Esfenvalerate/Fenvalerate	DNQ	0.0003		
PNCHY	6/20/2018	Esfenvalerate/Fenvalerate	DNQ	0.0002		
PNCHY	7/18/2018	Esfenvalerate/Fenvalerate	DNQ	0.0005		
FRSHC	4/18/2018	Ethalfluralin[4]	DNQ	0.0039		
LSNKR	4/18/2018	Ethalfluralin	DNQ	0.0045		
GIDLR	3/14/2018	Fenpropathrin	=	0.0006		
GIDLR	5/15/2018	Fenpropathrin	DNQ	0.0003		
LSNKR	7/18/2018	Glyphosate	DNQ	2.6	700	1˚ MCL
COLDR	3/14/2018	Imidacloprid	=	0.0047		
LSNKR	4/18/2018	Imidacloprid	=	0.0149		
CRTWN	5/15/2018	Imidacloprid	=	0.007		
FRSHC	5/15/2018	Imidacloprid	=	0.0197		
GIDLR	5/15/2018	Imidacloprid	=	0.0188		

Site	Date	Analyte	Result[1] (ug/L)		Trigger Limit[2]	Basis for Limit[3]
SSLIB	5/15/2018	Imidacloprid	=	0.0084		
UCBRD	5/15/2018	Imidacloprid	=	0.0438		
COLDR	5/16/2018	Imidacloprid	=	0.0157		
GIDLR	6/19/2018	Imidacloprid	=	0.108		
WLSPL	7/17/2018	Imidacloprid[4]	=	0.0292		
LSNKR	1/24/2018	Lambda-Cyhalothrin	DNQ	0.0002		
COLDR	3/14/2018	Lambda-Cyhalothrin	DNQ	0.0002		
GIDLR	3/14/2018	Lambda-Cyhalothrin	=	0.0018		
SSKNK	3/14/2018	Lambda-Cyhalothrin	=	0.0013		
SSLIB	3/14/2018	Lambda-Cyhalothrin	=	0.0009		
UCBRD	3/14/2018	Lambda-Cyhalothrin	DNQ	0.0002		
UCBRD	3/14/2018	Lambda-Cyhalothrin[4]	DNQ	0.0003		
ACACR	3/15/2018	Lambda-Cyhalothrin	DNQ	0.0003		
LSNKR	3/15/2018	Lambda-Cyhalothrin	DNQ	0.0003		
FRSHC	5/15/2018	Lambda-Cyhalothrin	=	0.027		
COLDR	5/16/2018	Lambda-Cyhalothrin	DNQ	0.0002		
LSNKR	5/16/2018	Lambda-Cyhalothrin	=	0.0007		
PNCHY	5/16/2018	Lambda-Cyhalothrin	DNQ	0.0004		
SSKNK	5/16/2018	Lambda-Cyhalothrin	DNQ	0.0004		
FRSHC	6/19/2018	Lambda-Cyhalothrin	DNQ	0.0002		
LHNCT	6/20/2018	Lambda-Cyhalothrin	=	0.0006		
WLSPL	7/17/2018	Lambda-Cyhalothrin	=	0.0006		
PNCHY	7/18/2018	Lambda-Cyhalothrin	=	0.0005		
UCBRD	8/21/2018	Lambda-Cyhalothrin	=	0.0055		
UCBRD	9/18/2018	Lambda-Cyhalothrin	DNQ	0.0002		
LHNCT	5/16/2018	Mancozeb (Ziram)	DNQ	1.3		
GIDLR	10/25/2017	Metolachlor	=	1.5		
PNCHY	10/25/2017	Metolachlor	=	1.3		
PNCHY	10/25/2017	Metolachlor[4]	=	1.4		
SSKNK	3/14/2018	Metribuzin	DNQ	0.34		
WLSPL	3/14/2018	Metribuzin	DNQ	0.34		
WLSPL	11/28/2017	Oxyfluorfen	=	0.41		
FRSHC	1/23/2018	Oxyfluorfen	DNQ	0.0091		
WLSPL	1/23/2018	Oxyfluorfen	DNQ	0.035		
LSNKR	1/24/2018	Oxyfluorfen	DNQ	0.0086		
PNCHY	1/24/2018	Oxyfluorfen	DNQ	0.01		
PNCHY	1/24/2018	Oxyfluorfen[4]	DNQ	0.008		
WLSPL	2/20/2018	Oxyfluorfen	=	0.1		
ACACR	2/21/2018	Oxyfluorfen	DNQ	0.015		
SSKNK	3/14/2018	Oxyfluorfen	DNQ	0.015		
WLSPL	4/17/2018	Oxyfluorfen	DNQ	0.0092		

Site	Date	Analyte	Result[(1)] (ug/L)		Trigger Limit[(2)]	Basis for Limit[(3)]
PRPIT	7/25/2018	Permethrin	DNQ	0.0021		
LSNKR	3/15/2018	Propiconazole	=	0.02		
GIDLR	12/26/2017	Simazine	DNQ	0.18	4	1˚ MCL
GIDLR	1/23/2018	Simazine	DNQ	0.22	4	1˚ MCL
GIDLR	2/20/2018	Simazine[4]	=	0.85	4	1˚ MCL
GIDLR	2/20/2018	Simazine	=	0.86	4	1˚ MCL
LSNKR	2/21/2018	Simazine	=	0.91	4	1˚ MCL
LSNKR	3/15/2018	Simazine	=	0.55	4	1˚ MCL
LSNKR	3/15/2018	Simazine[4]	=	0.52	4	1˚ MCL
GIDLR	3/14/2018	Tetramethrin	=	0.023		
UCBRD	5/15/2018	Tetramethrin	=	0.0052		

BOLD = Exceedance

1. "DNQ" (Detected Not Quantified) indicates that the detected value was less than the quantitation or reporting limit (QL).
2. Water Quality Objective or Narrative Interpretation Limits for ILRP. "NA" if no ILRP limit established.
3. Water Quality Objective Basis: BP = Central Valley Basin Plan; BPA = Basin Plan Amendment; Cal/EPA = Cal/EPA Cancer Potency Factor; CDPH Notification Level = Notification levels (formerly called "action levels") are published by the California Department of Public Health (CDPH) for chemicals for which there is no drinking water MCL; CTR = California Toxics Rule; Narrative = unadopted limits used to interpret Basin Plan narrative objectives by the Central Valley Water Board; USEPA Health Advisory = Drinking water health advisory.
4. Sample was collected as a field duplicate.

OTHER COALITION-MONITORED WATER QUALITY PARAMETERS

Exceedances of adopted Basin Plan objectives, CTR criteria, or ILRP Trigger Limits were observed for specific conductivity, dissolved oxygen, *E. coli*, pH, and trace metals during 2018 Coalition Monitoring (see **Table 15**).

Specific Conductivity

Specific conductivity was monitored in 156 samples from 25 Coalition sites. Specific conductivity exceeded the unadopted UN Agricultural Goal (700 µS/cm) in a total of 23 samples and also exceeded the California recommended 2˚ MCL (900 µS/cm) for drinking water in 17 of the 25 samples. There were also two exceedances of the SSO 90th percentile limit (150 µS/cm) at the MFFGR site. Exceedances were observed at 9 of the 25 monitored sites. UCBRD had nine exceedances, WLSPL had six exceedances, and GILDR had three exceedances, while CRTWN, FRSHC, RARPP, SSLIB, and TCHWY each had one exceedance.

Dissolved Oxygen

During 2018 Coalition monitoring, dissolved oxygen was measured in 156 samples at 25 Coalition sites. A total of 11 samples exceeded the COLD Basin Plan limit with measured dissolved oxygen concentrations below 7.0 mg/L for waterbodies with a COLD designated beneficial use.

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 in-stream algae and also to trap organic particulates that contribute to in-stream oxygen consumption.

E. coli Bacteria

E. coli bacteria were analyzed in 134 environmental samples and 12 field duplicates from 18 Coalition sites. *E. coli* results exceeded the single sample maximum objective (235 MPN/100mL) in 44 samples (including four field duplicates) from 12 different Coalition monitoring locations.

The Basin Plan objectives are intended to protect contact recreational uses where ingestion of water is probable (e.g., swimming). Agricultural lands commonly support a large variety (and very large numbers seasonally) of birds and other wildlife. These avian and wildlife resources are known to be significant sources of *E. coli* and other bacteria in agricultural runoff and irrigation return flows. Other potential sources of *E. coli* include, but are not limited to, cattle, horses, septic systems, treated wastewater, and urban runoff.

pH

During 2018 Coalition monitoring, pH was measured in 156 samples from 25 Coalition sites. pH exceeded the Basin Plan maximum of 8.5 standard pH units (-log[H+]) in 13 samples collected from seven sites (including five exceedances at GILSL) and fell below the Basin Plan minimum of 6.5 pH units ((-log[H+]) in seven samples from three sites (including four exceedances at LOWLC),.

The Basin Plan limit for pH is intended to be assessed based on "…*an appropriate averaging period that will support beneficial uses*" (CVRWQCB 2018). This parameter typically exhibits significant natural diurnal variation over 24 hours in natural waters, with daily fluctuations controlled principally by photosynthesis, rates 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.

The reason for these pH exceedances was not immediately obvious nor 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 and temperatures sufficient to stimulate algal growth.

Trace Metals

Trace metals monitored during 2018 Coalition Monitoring included both unfiltered metals (total arsenic, boron, copper, and zinc) and filtered metals (dissolved copper and dissolved zinc).

Total trace metals were monitored in 55 environmental samples and 17 field duplicate samples from 16 Coalition sites, and dissolved metals were monitored in 40 environmental samples and seven field duplicate samples from 15 Coalition sites.

Arsenic

Ten total arsenic environmental samples and nine field duplicate samples were collected from two Coalition sites. Five environmental samples and five field duplicate samples from the monitoring site Grand Island Drain near Leary Road (GIDLR) and two environmental samples from Lower Snake River at Nuestro Road (LSNKR) exceeded the California 1˚ MCL of 10 µg/L.

There are both legacy and a few current sources of arsenic in the Sacramento River Watershed. There is very little remaining agricultural use of arsenic-based pesticide products (based on a review of DPR's PUR data), and arsenic has only a few potentially significant sources: (1) natural background from arsenic in the soils, (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 Grand Island Drain sampling site, if arsenic-based preservatives were used in the wood. A final, but somewhat unlikely source is an arsenic-based additive that may still be used for chicken feed[11] and which can potentially make its way through the chicken and into agricultural fields and runoff if the poultry litter is used on the field.

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

Boron

Five total boron environmental samples and four field duplicate samples were collected from two Coalition sites. All nine total boron samples exceeded the ILRP Trigger Limit (700 µg/L, based on Ayers and Westcott), with eight exceedances at WLSPL and one exceedance at TCHWY.

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

Table 15. Other Physical, Chemical, and Microbiological Parameters Observed to Exceed Numeric Objectives in 2018 Coalition Monitoring

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgmt Plan(3)
GIDLR	10/25/2017	Arsenic	µg/L	18	10	1˚ MCL (5)	Active
GIDLR	10/25/2017	Arsenic	µg/L	19	10	1˚ MCL (5)	Active
GIDLR	12/26/2017	Arsenic	µg/L	16	10	1˚ MCL (5)	Active
GIDLR	12/26/2017	Arsenic	µg/L	15	10	1˚ MCL (5)	Active
GIDLR	2/20/2018	Arsenic	µg/L	15	10	1˚ MCL (5)	Active
GIDLR	2/20/2018	Arsenic	µg/L	15	10	1˚ MCL (5)	Active
LSNKR	2/21/2018	Arsenic	µg/L	11	10	1˚ MCL (5)	Active
LSNKR	3/15/2018	Arsenic	µg/L	11	10	1˚ MCL (5)	Active
GIDLR	4/17/2018	Arsenic	µg/L	14	10	1˚ MCL (5)	Active
GIDLR	4/17/2018	Arsenic	µg/L	14	10	1˚ MCL (5)	Active
GIDLR	6/19/2018	Arsenic	µg/L	16	10	1˚ MCL (5)	Active
GIDLR	6/19/2018	Arsenic	µg/L	16	10	1˚ MCL (5)	Active
WLSPL	1/23/2018	Boron	µg/L	2500	700	Narrative	Active
WLSPL	1/23/2018	Boron	µg/L	2500	700	Narrative	Active
TCHWY	2/20/2018	Boron	µg/L	1000	700	Narrative	Active
WLSPL	2/20/2018	Boron	µg/L	3200	700	Narrative	Active
WLSPL	2/20/2018	Boron	µg/L	3300	700	Narrative	Active
WLSPL	3/14/2018	Boron	µg/L	3100	700	Narrative	Active
WLSPL	3/14/2018	Boron	µg/L	3000	700	Narrative	Active
WLSPL	4/17/2018	Boron	µg/L	1700	700	Narrative	Active
WLSPL	4/17/2018	Boron	µg/L	1700	700	Narrative	Active
GILSL	8/22/2018	Chlorpyrifos	µg/L	0.023	0.015	BP [Chronic]	Active
GIDLR	10/25/2017	Diazinon	µg/L	0.15	0.1	BP [Chronic]	No
GILSL	1/23/2018	Diazinon	µg/L	0.15	0.1	BP [Chronic]	No
PNCHY	10/25/2017	Dissolved Oxygen	mg/L	6.2	7	BP [SSO COLD]	Active
MGSLU	2/22/2018	Dissolved Oxygen	mg/L	4.7	7	BP [SSO COLD]	Active
WLSPL	5/15/2018	Dissolved Oxygen	mg/L	6.74	7	BP [SSO COLD]	Active
ACACR	6/20/2018	Dissolved Oxygen	mg/L	6.36	7	BP [SSO COLD]	Active
ACACR	7/18/2018	Dissolved Oxygen	mg/L	6.4	7	BP [SSO COLD]	Active
LOWLC	7/31/2018	Dissolved Oxygen	mg/L	5.9	7	BP [SSO COLD]	Active
COLDR	8/21/2018	Dissolved Oxygen	mg/L	4.08	7	BP [SSO COLD]	Active
WLSPL	8/21/2018	Dissolved Oxygen	mg/L	5.4	7	BP [SSO COLD]	Active
PNCHY	8/22/2018	Dissolved Oxygen	mg/L	6.7	7	BP [SSO COLD]	Active
MFFGR	8/31/2018	Dissolved Oxygen	mg/L	6.95	7	BP [SSO COLD]	Active
PNCHY	9/19/2018	Dissolved Oxygen	mg/L	5.9	7	BP [SSO COLD]	Active
ACACR	10/25/2017	E. coli	MPN/100mL	517.2	235	BP	Suspended
GIDLR	10/25/2017	E. coli	MPN/100mL	272.3	235	BP	Suspended
GIDLR	11/28/2017	E. coli	MPN/100mL	488.4	235	BP	Suspended

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgmt Plan(3)
UCBRD	11/28/2017	E. coli	MPN/100mL	1986.3	235	BP	Suspended
WLSPL	11/28/2017	E. coli	MPN/100mL	816.4	235	BP	Suspended
LHNCT	11/29/2017	E. coli	MPN/100mL	325.5	235	BP	Suspended
ACACR	11/30/2017	E. coli	MPN/100mL	410.6	235	BP	Suspended
ACACR	11/30/2017	E. coli	MPN/100mL	344.8	235	BP	Suspended
FRSHC	11/30/2017	E. coli	MPN/100mL	379.4	235	BP	Suspended
WLSPL	12/26/2017	E. coli	MPN/100mL	2419.6	235	BP	Suspended
FRSHC	12/27/2017	E. coli	MPN/100mL	325.5	235	BP	Suspended
CCBRW	1/23/2018	E. coli	MPN/100mL	456.9	235	BP	Suspended
UCBRD	1/23/2018	E. coli	MPN/100mL	1413.6	235	BP	Suspended
ACACR	1/24/2018	E. coli	MPN/100mL	344.8	235	BP	Suspended
FRSHC	2/21/2018	E. coli	MPN/100mL	547.5	235	BP	Suspended
CRTWN	3/14/2018	E. coli	MPN/100mL	770.1	235	BP	Suspended
GIDLR	3/14/2018	E. coli	MPN/100mL	547.5	235	BP	Suspended
GIDLR	3/14/2018	E. coli	MPN/100mL	517.2	235	BP	Suspended
UCBRD	3/14/2018	E. coli	MPN/100mL	1203.3	235	BP	Suspended
ACACR	3/15/2018	E. coli	MPN/100mL	613.1	235	BP	Suspended
LHNCT	3/15/2018	E. coli	MPN/100mL	2419.6	235	BP	Suspended
LSNKR	3/15/2018	E. coli	MPN/100mL	1732.9	235	BP	Suspended
PNCHY	3/15/2018	E. coli	MPN/100mL	1732.9	235	BP	Suspended
WLSPL	4/17/2018	E. coli	MPN/100mL	275.5	235	BP	Suspended
FRSHC	4/18/2018	E. coli	MPN/100mL	261.3	235	BP	Suspended
LHNCT	4/18/2018	E. coli	MPN/100mL	290.9	235	BP	Suspended
ACACR	4/19/2018	E. coli	MPN/100mL	325.5	235	BP	Suspended
UCBRD	5/15/2018	E. coli	MPN/100mL	2419.6	235	BP	Suspended
ACACR	5/16/2018	E. coli	MPN/100mL	365.4	235	BP	Suspended
WLKCH	5/16/2018	E. coli	MPN/100mL	1986.3	235	BP	Suspended
FRSHC	6/19/2018	E. coli	MPN/100mL	435.2	235	BP	Suspended
UCBRD	6/19/2018	E. coli	MPN/100mL	248.9	235	BP	Suspended
ACACR	6/20/2018	E. coli	MPN/100mL	275.5	235	BP	Suspended
FRSHC	7/17/2018	E. coli	MPN/100mL	410.6	235	BP	Suspended
ACACR	7/18/2018	E. coli	MPN/100mL	613.1	235	BP	Suspended
WLKCH	7/18/2018	E. coli	MPN/100mL	1299.7	235	BP	Suspended
LOWLC	7/31/2018	E. coli	MPN/100mL	770	235	BP	Suspended
WLSPL	8/21/2018	E. coli	MPN/100mL	2419.6	235	BP	Suspended
WLSPL	8/21/2018	E. coli	MPN/100mL	2419.6	235	BP	Suspended
ACACR	8/22/2018	E. coli	MPN/100mL	290.9	235	BP	Suspended
FRSHC	8/22/2018	E. coli	MPN/100mL	517.2	235	BP	Suspended
WLSPL	9/18/2018	E. coli	MPN/100mL	435.2	235	BP	Suspended
ACACR	9/19/2018	E. coli	MPN/100mL	328.2	235	BP	Suspended

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgmt Plan(3)
ACACR	9/19/2018	E. coli	MPN/100mL	648.8	235	BP	Suspended
LSNKR	12/26/2017	pH	-log[H+]	9.11	6.5-8.5	BP	Active
WLSPL	12/26/2017	pH	-log[H+]	9.69	6.5-8.5	BP	Active
CRTWN	1/23/2018	pH	-log[H+]	6.45	6.5-8.5	BP	Active
FRSHC	1/23/2018	pH	-log[H+]	10.6	6.5-8.5	BP	Active
GILSL	1/23/2018	pH	-log[H+]	9.88	6.5-8.5	BP	Active
UCBRD	1/23/2018	pH	-log[H+]	9.22	6.5-8.5	BP	Active
WLSPL	1/23/2018	pH	-log[H+]	9.24	6.5-8.5	BP	Active
GILSL	2/20/2018	pH	-log[H+]	9.1	6.5-8.5	BP	Active
RARPP	4/17/2018	pH	-log[H+]	8.83	6.5-8.5	BP	Active
PRPIT	4/18/2018	pH	-log[H+]	6.45	6.5-8.5	BP	Active
LOWLC	4/26/2018	pH	-log[H+]	5.9	6.5-8.5	BP	Active
GILSL	5/15/2018	pH	-log[H+]	8.85	6.5-8.5	BP	Active
LOWLC	5/30/2018	pH	-log[H+]	5.97	6.5-8.5	BP	Active
LOWLC	6/28/2018	pH	-log[H+]	5.65	6.5-8.5	BP	Active
GILSL	7/17/2018	pH	-log[H+]	8.8	6.5-8.5	BP	Active
LOWLC	7/31/2018	pH	-log[H+]	6.12	6.5-8.5	BP	Active
PRPIT	8/23/2018	pH	-log[H+]	6.38	6.5-8.5	BP	Active
MFFGR	8/31/2018	pH	-log[H+]	9.5	6.5-8.5	BP	Complete[6]
GILSL	9/18/2018	pH	-log[H+]	9.2	6.5-8.5	BP	Active
MFFGR	9/25/2018	pH	-log[H+]	9.38	6.5-8.5	BP	Complete[6]
UCBRD	11/28/2017	Specific Conductivity	µS/cm	926	700, 900 (4)	Narrative	Active
WLSPL	11/28/2017	Specific Conductivity	µS/cm	1434	700, 900 (4)	Narrative	Active
UCBRD	12/26/2017	Specific Conductivity	µS/cm	1050	700, 900 (4)	Narrative	Active
WLSPL	12/26/2017	Specific Conductivity	µS/cm	1489	700, 900 (4)	Narrative	Active
FRSHC	1/23/2018	Specific Conductivity	µS/cm	738	700, 900 (4)	Narrative	Active
GIDLR	1/23/2018	Specific Conductivity	µS/cm	908	700, 900 (4)	Narrative	Active
UCBRD	1/23/2018	Specific Conductivity	µS/cm	903	700, 900 (4)	Narrative	Active
WLSPL	1/23/2018	Specific Conductivity	µS/cm	1363	700, 900 (4)	Narrative	Active
TCHWY	2/20/2018	Specific Conductivity	µS/cm	910	700, 900 (4)	Narrative	Active
UCBRD	2/20/2018	Specific Conductivity	µS/cm	1055	700, 900 (4)	Narrative	Active
WLSPL	2/20/2018	Specific Conductivity	µS/cm	1505	700, 900 (4)	Narrative	Active
COLDR	3/14/2018	Specific Conductivity	µS/cm	937	700, 900 (4)	Narrative	Active
GIDLR	3/14/2018	Specific Conductivity	µS/cm	795	700, 900 (4)	Narrative	Active
WLSPL	3/14/2018	Specific Conductivity	µS/cm	1530	700, 900 (4)	Narrative	Active
GIDLR	4/17/2018	Specific Conductivity	µS/cm	800	700, 900 (4)	Narrative	Active
RARPP	4/17/2018	Specific Conductivity	µS/cm	973	700, 900 (4)	Narrative	Active
UCBRD	4/17/2018	Specific Conductivity	µS/cm	840	700, 900 (4)	Narrative	Active
WLSPL	4/17/2018	Specific Conductivity	µS/cm	708	700, 900 (4)	Narrative	Active
UCBRD	5/15/2018	Specific Conductivity	µS/cm	939	700, 900 (4)	Narrative	Active

Site ID	Sample Date	Analyte	Units	Result	Trigger Limit(1)	Basis for Limit(2)	Mgmt Plan(3)
UCBRD	6/19/2018	Specific Conductivity	µS/cm	1134	700, 900 (4)	Narrative	Active
UCBRD	7/17/2018	Specific Conductivity	µS/cm	1198	700, 900 (4)	Narrative	Active
SSLIB	8/21/2018	Specific Conductivity	µS/cm	759	700, 900 (4)	Narrative	Active
MFFGR	8/31/2018	Specific Conductivity	µS/cm	195.8	150, 700, 900 (4)	Narrative	Active
UCBRD	9/18/2018	Specific Conductivity	µS/cm	958	700, 900 (4)	Narrative	Active
MFFGR	9/25/2018	Specific Conductivity	µS/cm	191.6	150, 700, 900 (4)	Narrative	Active

Notes:

1. Water Quality Objective or Narrative Interpretation Limits for ILRP.
2. Water Quality Objective Basis: BP = Central Valley Basin Plan; BPA = Basin Plan Amendment; CTR = California Toxics Rule; Narrative = unadopted limits used to interpret Basin Plan narrative objectives by the Central Valley Water Board.
3. Indicates whether sites and parameter are currently being addressed by an ongoing Management Plan, study, or TMDL.
4. Specific conductivity exceeded the unadopted United Nations Agricultural Goal (700 µS/cm), the California recommend 2º MCL (900 µS/cm) for drinking water, and/or the Site-Specific Objective 90th percentile limit (150 µS/cm).
5. CA 1º MCLs are California's Maximum Contaminant Levels for treated drinking water.
6. The cause of the observed pH exceedance at MFFGR is driven by dissolved organic carbon inputs from a natural wetland system located upstream of the monitoring site, as concluded by a 2010 Special Study to which the Regional Water Board concurred in May 2011. No new Management Plan should be triggered by this exceedance.

Trend Analysis

As part of the evaluation of monitoring results, the WDR requires the Coalition to conduct trend analyses to…

"… identify potential trends[12] and patterns in surface and groundwater quality that may be associated with waste discharge from irrigated lands. As part of this evaluation, the third-party must analyze all readily available monitoring data that meet program quality assurance requirements to determine deficiencies in monitoring for discharges from irrigated agricultural lands and whether additional sampling locations or sampling events are needed or if additional constituents should be monitored. If deficiencies are identified, the third-party must propose a schedule for additional monitoring or source studies. … The third-party should incorporate pesticide use information, as needed, to assist in its data evaluation."

To address this requirement, a trend analysis was conducted as described below.

The data analyzed in the trend analysis met one or more of the following criteria:

- Data collected from representative and integration monitoring sites in 2018
- Data for parameters monitored during the 2018 monitoring year, including all pesticides with ≥5% detection[13], based on the combined data for all representative sites
    - 2,4-Dichlorophenoxyacetic Acid
    - Bifenthrin
    - Clothianidin
    - Diazinon
    - Diuron
    - Esfenvalerate
    - Imidacloprid
    - Lambda-Cyaholthrin
    - Metolachlor
    - Metribuzin
    - Oxyfluorfen
    - Propiconazole
    - Simazine

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12 "All results (regardless of whether exceedances are observed) must be included to determine whether there are trends in degradation that may threaten applicable beneficial uses."

13 Pesticides with lower than 5% detection rates were considered to have insufficient detected data to reliably identify trends.

- Pesticides included in the 2017 trend analysis due to historically high detection rates that did not make the ≥5% detection evaluation noted above
    - Chlorpyrifos
- Data from all Coalition ILRP sample events from 2005 through September 2018

The methods used to analyze and evaluate the data were as follows:

- Data were initially evaluated using Spearman's non-parametric test for trend (concentrations vs. sample date). A table of the initial Spearman's test results are provided in **Appendix G**.
    - Data below detection were coded as "0" for initial non-parametric Spearman's evaluation
    - Data were analyzed separately for each site for all parameters
    - Pesticide results were also analyzed for all sites combined to evaluate broader regional trends
    - The threshold for statistical significance was set at $p<0.05$
- Significant preliminary results ($p<0.05$) were screened for potential water quality degradation impacts
    - Increasing trends in pesticides, metals, nutrients, pathogen indicators
    - Increasing trends in pH, conductivity, temperature
    - Decreasing trends in dissolved oxygen
    - Decreasing trends in toxicity survival or growth results
    - The subset of the initial Spearman's test results with potential water quality degradation impacts are provided in **Appendix G**.
- Parameters with potential water quality degradation trend indicators were plotted (concentration vs. date) for further evaluation (plots are provided in **Appendix G**.)
    - Data below detection were plotted at the detection limit
    - Plots were reviewed for potential detection limit artifacts, and replotted without high detection limit non-detect data for a few parameters
    - Reviewed for potential outliers
    - Linear, log-linear, or robust trend lines were plotted to illustrate trends (the selected method was based on visual inspection and best professional judgment)
    - Plots were evaluated for other (non-trend) patterns

A determination of the significance of a potential water quality degradation trend was based on the likelihood of a continuing trend and the likelihood of adverse impacts on beneficial uses. Evaluations of beneficial use impacts were based on a continued increasing probability of exceedances of trigger limits. These determinations are provided in **Appendix G**, and significant findings are discussed below.

Pesticide use data were evaluated during the process of developing the 2018 Monitoring Plan Update, as required by the WDR, MRP, and PEP, and no additional evaluations of pesticide use data were conducted for this AMR.. The results of the PEP analysis conducted in summer 2017 were incorporated into the 2018 Monitoring Plan Update that was approved by the Regional Water Board.

DISCUSSION OF RESULTS

The Coalition's 2018 Monitoring Plan Update was approved by Regional Water Board staff as meeting the requirements of the WDR, MRP, and PEP. The WDR provides no additional guidance or criteria for making a determination if there are "deficiencies in monitoring" or if additional locations or events need to be included in an annual monitoring schedule, and no deficiencies were identified as a result of the trend analysis conducted for this report.

Summary of initial Spearman's test results

- 516 site-parameter combinations were evaluated
- 325 results were not significant ($p \geq 0.05$)
- 91 results were not significant due to insufficient detected data
- 80 results were initially determined to have potentially significant trends ($p < 0.05$)
    - 53 significant results were identified for trends with no potential negative impacts (i.e., they indicated potentially improving water quality)
    - 27 initially significant results were identified as suggesting potential water quality degradation with potential negative impacts on beneficial uses and were further evaluated
- Of the 27 significant results suggesting potential water quality degradation, five results were dismissed on the basis of insufficient data, or insufficient detected results to establish a trend, or were found not to represent actual trends after additional evaluation of the plots.
- 22 results (~5% of the beginning number of evaluations) were determined to have significant increasing or decreasing trends suggesting potential water quality degradation (see **Table 16** and were evaluated further.

Table 16. Significant Trends Further Evaluated for Potential Water Quality Degradation

Category	Analyte	Site Name
Physical	Conductivity	Anderson Creek at Ash Creek Road
		Colusa Basin Drain above KL
		Pit River at Pittville
		Sacramento Slough bridge near Karnak
		Ulatis Creek at Brown Road
		Willow Slough Bypass at Pole Line
	Dissolved Oxygen	Middle Creek u/s from Highway 20
		Coon Creek at Brewer Road
	pH	Anderson Creek at Ash Creek Road
		Colusa Basin Drain above KL
		Lower Snake R. at Nuestro Rd
		Pine Creek at Highway 32
		Willow Slough Bypass at Pole Line
	Total Organic Carbon	Walker Creek near 99W and CR33
Nutrients	Ammonia, Total as N	Cosumnes River at Twin Cities Rd
		Sacramento Slough near Karnak
	Orthophosphate, as P	Ulatis Creek at Brown Road
Pesticides	Simazine	Grand Island Drain
Trace Metals	Arsenic	Lower Snake River at Nuestro Road
	Boron	Willow Slough Bypass at Pole LIne
Toxicity	Selenastrum growth	Anderson Creek at Ash Creek Road

Most of the significant trends indicating potential water quality degradation (17 of 25 trends) were for physical parameters (conductivity, dissolved oxygen, pH, temperature, total organic carbon). Higher conductivity and pH measurements, and lower dissolved oxygen concentrations generally corresponded to recent critical, dry, and below normal water years with generally lower in-stream flows and elevated temperatures. These patterns reflect shorter term climatic variations that are not controllable by agricultural practices, and do not indicate trends of long-term water quality degradation due to agricultural discharges. This pattern can be expected to continue in the near-term based on predicted future drought conditions, and increased agricultural water use conservation. The longer term resolution of this potential trend is adequately monitored by the current monitoring regime of approximately monthly sampling. Plots illustrating these relationships are included in **Appendix G**.

Four cases of significant increasing trends in nutrient concentrations were observed:

Total ammonia as nitrogen (N) exhibited a significant increasing trend in samples from Cosumnes River at Twin Cities Road (**Figure 4-a**). The trend appeared to be due primarily to elevated concentrations observed in the 2011 monitoring year. These concentrations decreased through the 2014 monitoring year, approaching the baseline concentrations observed previously, and did not appear to indicate a continuing long-term trend. There were no exceedances of the water quality trigger and the analysis did not suggest a need for additional monitoring events or locations.

Total ammonia as N exhibited a significant increasing trend in samples from Sacramento Slough Bridge near Karnak (**Figure 4-b**). The trend appeared to be due primarily to elevated concentrations observed in the 2014 monitoring year and once in 2018. There were no exceedances of the water quality trigger and the analysis did not suggest a need for additional monitoring events or locations.

Dissolved orthophosphate concentrations were elevated above the site average in Ulatis Creek at Brown Road samples collected in 2014 and 2018 (**Figure 4-d**). There is no specific trigger limit or water quality objective associated with orthophosphate, and the observed concentrations and short-term trends did not suggest a need for additional monitoring events or locations. Tracking this potential trend is adequately addressed with ongoing approved ILRP assessment monitoring.

A significant increasing trend was observed in simazine samples from the Grand Island Drain monitoring site (**Figure 4-e**). The increasing trend was due to three detections during the 2018 monitoring year. These detections were all well below the primary MCL of 4 µg/L and the site has never had a prior simazine exceedance. Tracking this potential trend is adequately addressed with ongoing approved ILRP assessment monitoring.

Two cases of significant increasing trends in trace metals concentrations were observed:

Arsenic concentrations show an increasing trend at the Lower Snake River monitoring site (**Figure 4-f**). Lower Snake River currently has a management plan for arsenic. There are only a few current sources of arsenic and in general, elevated arsenic concentrations are attributed to natural background sources in the soil and legacy applications from ag and non-ag. Tracking this potential trend is adequately addressed with ongoing approved ILRP assessment monitoring.

Boron concentrations shown an increasing trend at the Willow Slough monitoring site (**Figure 4-g**). Willow Slough currently has a management plan for boron and it has been shown to be naturally elevated in the groundwater and major tributaries supplying irrigation water in the Willow Slough drainage.

A significant decreasing trend in *Selenastrum* growth was observed for Anderson Creek (**Figure 4-e**) in the Shasta-Tehama subwatershed. However, there were no exceedances and none of the samples for this site exhibited any toxicity or reduction in *Selenastrum* growth below lab controls for the tests. No trend was observed between the 2014 and 2018 assessment monitoring years, and the trend appeared to be driven primarily by elevated growth in samples collected in 2006. No degradation or additional sampling needs were indicated, and there were no other significant decreasing trends in other toxicity results.

In summary, the results of trend analyses conducted for this AMR did not indicate a need for the monitoring of any additional locations, events, or parameters. The Regional Water Board's requirement to follow the Pesticides Evaluation Protocol has already expanded the number of parameters that the Coalition analyzes as a means to analyze all pesticides with significant use and/or risk to beneficial uses. We continue to recommend that the trend analysis evaluation is performed no more than once per assessment year, with the next evaluation occurring in the 2022 monitoring year. By that monitoring year, two to three years of additional assessment monitoring will have been conducted under the Pesticides Evaluation Protocol, which will increase the amount of data evaluated and the robustness of the analysis.

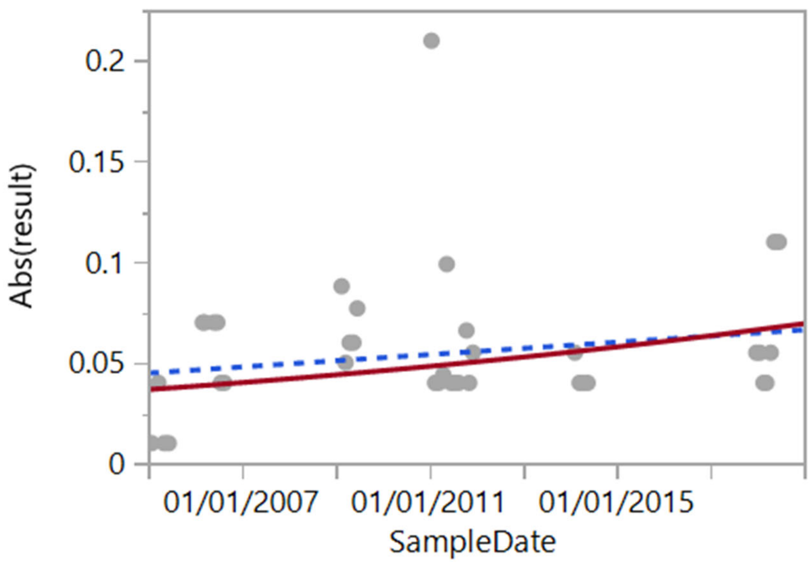

Figure 4-a. Ammonia, Total as N, Cosumnes River at Twin Cities Road

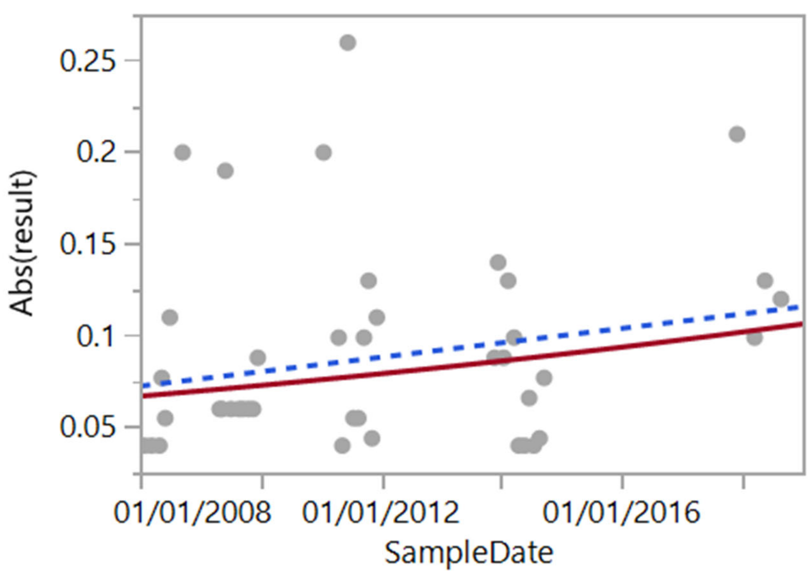

Figure 4-b. Ammonia, Total as N, Sacramento Slough Bridge near Karnak

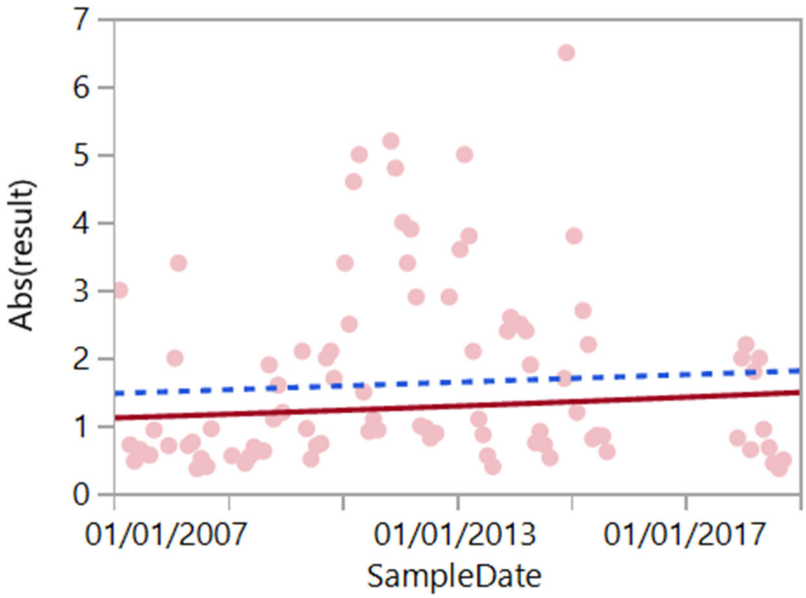

Figure 4-c. Nitrate + Nitrite as N, Freshwater Creek at Gibson Road

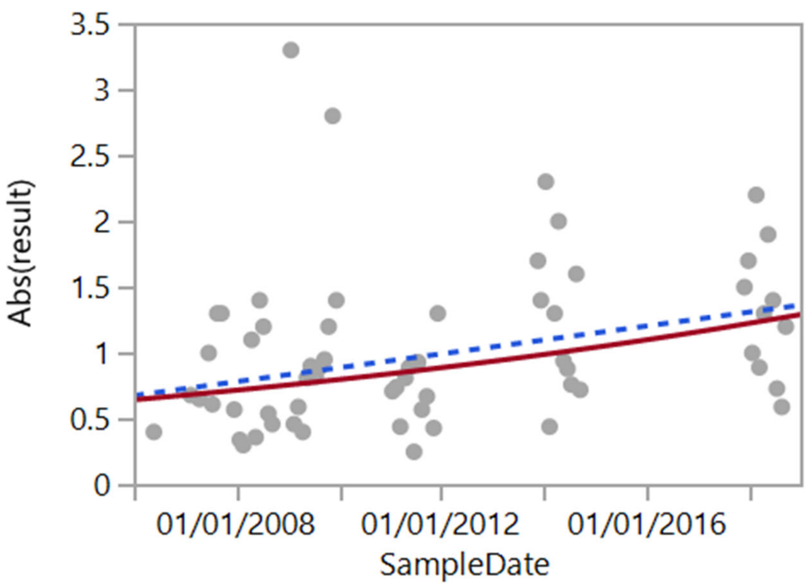

Figure 4-d. Orthophosphate as P, Ulatis Creek at Brown Road

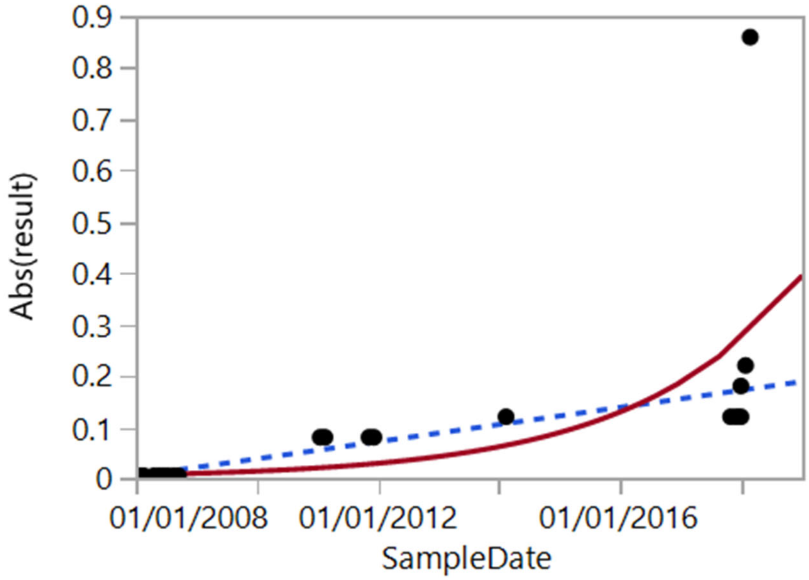

Figure 4-e. Simazine, Grand Island Drain near Leary Road

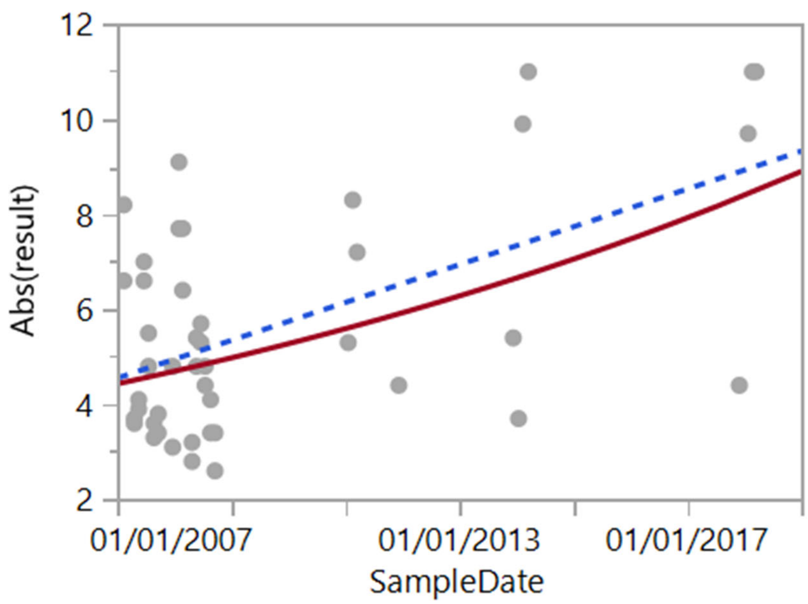

Figure 4-e. Arsenic, Lower Snake River at Nuestro Road

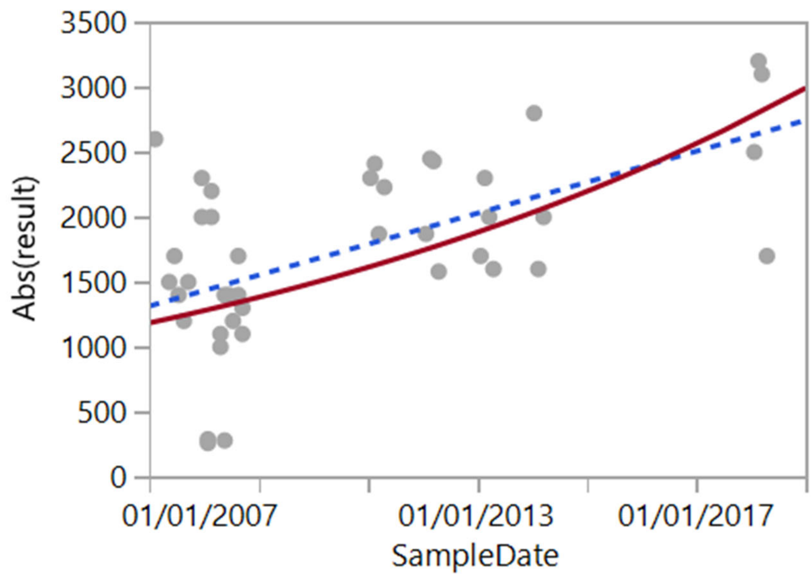

Figure 4-e. Boron, Willow Slough Bypass at Pole Line

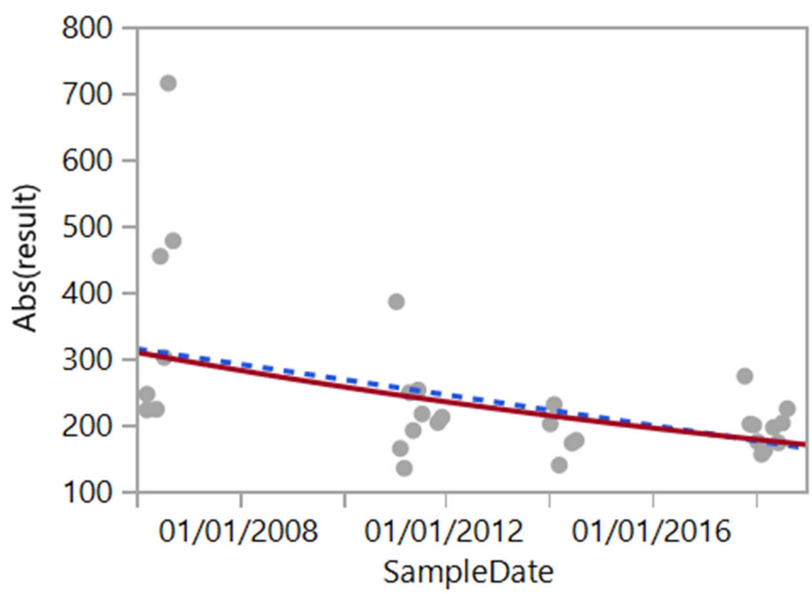

Figure 4-e. Selenastrum Toxicity, Anderson Creek

Management Practices and Actions Taken

RESPONSE TO EXCEEDANCES

To address specific water quality exceedances, the Coalition and its partners initially developed a Management Plan in 2009, subsequently approved by the Regional 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. The 2009 Management Plan was reorganized into the Comprehensive Surface Water Quality Management Plan (CSQMP) in 2015. The CSQMP was last updated in September 2016 and approved by the Regional Water Board in November 2016. Implementation of the CSQMP[14] is the primary mechanism for addressing exceedances observed in the Coalition's surface water monitoring.

Management Plan Status Update

The Management Plan Progress Report (MPPR), documenting the status and progress toward meeting individual Management Plan element requirements for 2018, is provided to the Regional Water Board with this AMR. Activities conducted in 2018 to implement the Coalition's CSQMP included addressing exceedances of objectives for registered pesticides, development of a new Management Plan, evaluation of existing Management Plan elements that could be deemed complete, 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. Prior to 2015, surveys of Coalition members operating on high priority parcels were conducted to determine the degree of implementation of relevant management practices related to individual Management Plan elements for registered pesticides and identified causes of toxicity. Beginning in 2015, these surveys were replaced with data compiled from Coalition Member Farm Evaluations. Farm Evaluation data 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 CSQMP 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 a receiving water. The broader outreach program, which includes both grower meetings and notifications distributed through direct mailings, encourages the adoption

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[14] *SVWQC Comprehensive Surface Water Quality Management Plan. Prepared for the Sacramento Valley Water Quality Coalition (SVWQC) by Larry Walker Associates, Davis, California. November 2016.*

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 where statistically significant toxicity and/or exceedances of applicable numeric water quality objectives and ILRP Trigger Limits have been observed. 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, a subwatershed identifies its members and mails to them an advisory notice along with information on how to address a specific exceedance using BMPs. This same approach was also used to conduct management practice surveys in areas targeted by individual Management Plan elements.

General Outreach Efforts

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

Summary of Farm Evaluation Data

Starting in 2014, the WDR required that the Coalition to collect and aggregate summarized information from Farm Evaluations. In 2018, the Regional Water Board revised the reporting schedule and the Coalition was not required to conduct a Farm Evaluation for the 2018 crop year. Farm Evaluations will now be submitted on a five-year cycle beginning with the 2020 Crop Yer.

Conclusions and Recommendations

The Coalition submits this 2018 Annual Monitoring Report (AMR) as required under the Regional Water Board's Irrigated Lands Regulatory Program (ILRP). The AMR provides a detailed description of the Coalition's monitoring results as part of its ongoing efforts to characterize irrigated agricultural and wetlands related water quality in the Sacramento River Basin.

To summarize, the results from the Coalition monitoring conducted in 2018 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 2017 through September 2018. To date, a total of 151 Coalition storm and irrigation season events have been completed since the beginning of Coalition monitoring in January 2005, with additional events collected by coordinating programs and for follow-up evaluations. For the period of record considered in this AMR (October 2017 through September 2018), samples were collected for ten scheduled monthly events and 2 wet weather ("storm") events.

Pesticides were infrequently detected (~5% of all pesticide results for 2018 were detected), and, when detected, rarely exceeded applicable water quality objectives. Only two registered pesticides, chlorpyrifos (one sample) and diazinon (two samples), exceeded applicable water quality objectives or ILRP Trigger Limits during the current monitoring year.

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 andparaquat. Over 98.5% of all pesticide analyses performed to date for the Coalition have been below detection. Coalition monitoring of pesticides for the ILRP for 2018 was conducted based on the 2016 Pesticides Evaluation Protocol (PEP) and active Management Plan element requirements. The Regional Water Board's PEP requires the Coalition to monitor specific registered pesticides based on (1) their rate of application in a given drainage (lbs. applied per drainage) and (2) a pesticide-specific relative risk (the ratio of the amount of chemical applied to a reference value with a specific averaging period). The Coalition also conducted monitoring of the ILRP-required trace elements (arsenic, boron, copper, and zinc) informed by the Coalition's past monitoring results, which have demonstrated that most of these metals rarely approach or exceed objectives and are not likely to cause adverse impacts to aquatic life or human health in waters receiving agricultural runoff in the Sacramento River Watershed. This strategy for monitoring trace metals was implemented in 2010 in accordance with the Coalition's 2009 MRP (*Order No. R5-2009-0875*, CVRWQCB 2009), and this same strategy is consistent with the requirements of the current WDR and MRP (*Order No. R5-2014-0030*).

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

The Coalition has implemented the requirements 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 all were approved by the Regional Water Board. Subsequent revisions requested by the Regional Water Board and the Coalition were 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 its monitoring program based on the knowledge gained through its monitoring efforts.

The 2018 monitoring program. As specified in the 2018 Monitoring Plan Update, was developed to be consistent with the requirements of the WDR and MRP (*Order No. R5-2014-0030*) and 2016 PEP, and was approved by the Regional Water Board for this purpose with the understanding that it would serve as an "Assessment" monitoring period for the Coalition. 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 continued to implement the approved 2016 CSQMP. Throughout this process, the Coalition has kept an open line of communication with the Regional Water Board and has made every effort to fulfill the requirements of the ILRP in a cost-effective, scientifically defensible, and management-focused manner. This AMR is documentation of the success and continued progress of the Coalition in achieving these objectives.

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Appendices

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

Appendix A: Field Log Copies

Appendix B: Lab Reports and Chains-of-Custody

Appendix C: Tabulated Monitoring Results

Appendix D: Exceedance Reports

Appendix E: Site-Specific Drainage Maps

Appendix F: SVWQC Outreach Materials

Appendix G: Trend Analysis Results

Appendix H: Reduced Monitoring Verification Reports