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SACRAMENTO VALLEY WATER QUALITY COALITION

Monitoring and Reporting Program Annual Monitoring Report 2022:

October 2021 – September 2022

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SACRAMENTO VALLEY WATER QUALITY COALITION
SVWQC

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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* (*R5-2014-0030-11, most recently amended by Order No. R5-2021-0053*) (WDR).[1] The scope of the MRP and the sampling and analytical methods used in the Coalition's 2022 Monitoring Year (October 2021 – September 2022) were approved by the Central Valley Regional Water Quality Control Board (Central Valley 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 products that contain constituents of concern. Additionally, the Coalition is evaluating the degree of implementation of current management practices in priority drainages and represented drainages (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 from agricultural lands that are having an impact on water quality. This iterative approach allows for the most effective use of limited human and fiscal resources.

Surface water quality and sediment sampling for the Coalition's 2022 Monitoring Year was conducted in coordination with the following subwatershed monitoring programs: Northeastern California Water Association (NECWA), Placer-Nevada-South Sutter-North Sacramento (PNSSNS), and Lake County. The parameters monitored in 2022 by the Coalition to achieve these objectives are as specified in the current WDR and MRP (*Order No. R5-2014-0030-11*):

- 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

[1] The WDR was initially adopted in 2014 (R5-2014-0030) but was later revised to its current version in October 2021. 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).

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 Central Valley Water Board's Executive Officer.

Note that not all parameters are monitored at every site for every monitoring event. Specific individual parameters measured by the Coalition during the 2022 Monitoring Year are listed in **Table 2**. A total of 18 sites were monitored by the Coalition and coordinating subwatershed monitoring programs during 2022 Monitoring Year (**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 collected during 2022 Coalition Monitoring are summarized in **Table 4**. This *2022 Annual Monitoring Report* (AMR) includes water quality monitoring results for October 2021 through September 2022.

Sample collection and analysis during the 2022 Monitoring Year were performed by the following agencies and subcontractors.

- Pacific EcoRisk (Fairfield, California) performed toxicity testing and conducted sampling for all sites, with specific exceptions noted below:
  - Placer County Resource Conservation District conducted sampling on behalf of the PNSSNS Watershed Group for the PNSSNS subwatershed site;
  - Vestra Environmental conducted sampling on behalf of NECWA for the Pit River subwatershed site; and
  - Clear Lake Environmental Research Center Lab (CLERCL) conducted sampling on behalf of the Lake Subwatershed Group for the monitoring sites within the Lake subwatershed.
- Caltest Analytical Laboratory (Napa, California) conducted conventional, nutrient, microbiological, and pyrethroid pesticide 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.
- CLERCL (Lakeport, CA) conducted bacteria analyses for the Lake and Napa subwatershed sites.

TREND ANALYSIS

The Coalition's 2022 Monitoring Plan Update[2] was approved by Central Valley Water Board staff as meeting the requirements of the WDR, MPR, and Pesticides Evaluation Protocol. The WDR provides no additional guidance or criteria for determining "deficiencies in monitoring" or

[2] On August 1 of each year, the Coalition is required to submit to the Central Valley 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 2022 it was developed to follow the requirements of the 2014 WDR and MRP, the Central Valley Water Board's 2016 Pesticides Evaluation Protocol, and the Pyrethroid Pesticide BPA.

that additional monitoring locations or events are needed, and none were identified from the trend analysis conducted for this report. The results of the trend analyses conducted for this AMR did not indicate a need for monitoring any additional locations, events, or parameters during a future monitoring year. The adoption of the Pesticides Evaluation Protocol has already expanded the number of parameters that the Coalition analyzes. We recommend that the modified trend analysis no longer be performed during non-assessment years and that the full trend analysis approach be performed following the completion of the single assessment year[3]. The 2023 and 2024 Monitoring Years are both designated as core years (i.e., non-assessment), so the next trend analysis will be performed following the completion of the 2025 Monitoring Year and included in the AMR to be submitted on May 1, 2026.

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 Central Valley 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 Water Board in November 2016. Site-specific Management Plans are included as addenda to the CSQMP as they are developed by the Coalition and approved by the Central Valley Water Board. 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 Coalition's Management Plan Progress Report (MPPR), a document that describes the status and progress toward meeting individual Management Plan element requirements for 2022, is provided to the Central Valley Water Board with this Annual Monitoring Report. Activities conducted in 2022 to implement the Coalition's CSQMP included addressing exceedances of objectives for registered pesticides, toxicity, and nutrients, in addition to conducting monitoring required for existing 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

[3] The Sacramento Valley Water Quality Coalition was approved by the Central Valley Water Board for a 3-year cycle of Assessment-Core-Core monitoring on 14 February 2022. The revised monitoring schedule began with the 2022 Assessment Year (October 2021- September 2022) followed by core monitoring during the 2023 Monitoring Year (October 2022 – September 2023) and 2024 Monitoring Year (October 2023 – September 2024).

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, which are currently collected on a five-year cycle with the most recent survey conducted for the 2020 crop year. During the period 2017 through 2019, select Coalition Subwatersheds conducted Focused Outreach Surveys with growers who operated within the area covered by an active Management Plan for a registered pesticide and/or toxicity and who applied the registered pesticide identified in the Management Plan. The use of Focused Outreach Surveys ended when the Coalition was required to complete Management Plan Implementation Reports (MPIR) beginning with the 2020 crop year. The MPIR is used to report management practices implemented by Coalition members to comply with requirements under a Surface Water Quality Management Plan. The Coalition's Focused Outreach and MPIR survey 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 *2022 Annual Monitoring Report* as required under the Central Valley 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 water quality impacts from irrigated agricultural and wetland operations in the Sacramento River Basin.

To summarize, the results from the Coalition's monitoring conducted during the 2022 Monitoring Year continue to indicate that with few exceptions, there are no major water quality problems resulting from agricultural or managed wetland 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 2021 through September 2022. To date, a total of 197 Coalition storm and irrigation season monitoring 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 2021 through September 2022), samples were collected for ten scheduled monthly events and two wet weather ("storm") events.

Pesticides were infrequently detected (only ~5.4% of all pesticide results generated during the 2022 Monitoring Year were above detection limits), and when detected, rarely exceeded applicable objectives. Historically, few of the pesticides specifically required to be monitored by the ILRP have been detected in Coalition water samples. Over 98.0% of all pesticide analyses performed to date (from 2005 to present) for the Coalition have been below detection. Coalition monitoring of pesticides for the ILRP during the 2022 Monitoring Year was conducted based on the 2016 Pesticides Evaluation Protocol (PEP) and active Management Plan element requirements. The Central Valley Water Board's PEP requires the Coalition to monitor specific registered pesticides based on (1) their rate of application in a given drainage (lb. applied per drainage) and (2) a pesticide-specific relative risk (the ratio of the amount of chemical applied to a reference value for the protection of aquatic life or human health, with a specific averaging period). The Coalition also continued its monitoring of the ILRP-required trace element, copper, and monitoring has consistently demonstrated that copper and other trace 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. The Coalition's strategy for monitoring trace metals was implemented in 2010 in accordance with its 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. R5-2014-0030-11*).

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.

In summary, the Coalition has implemented the requirements of the ILRP since 2004. The Coalition developed a Watershed Evaluation Report (WER) that set the priorities for the development and implementation of the initial Monitoring and Reporting Program Plan (MRPP). It successfully developed the MRPP, Quality Assurance Project Plan (QAPP), and Management Plan as required by the ILRP, and all were approved by the Central Valley Water Board. Subsequent revisions requested by the Central Valley Water Board and the Coalition have been incorporated into the Coalition's program and implemented through its ongoing monitoring efforts.

The Coalition's 2022 monitoring program, as specified in the 2022 Monitoring Plan Update, was developed to be consistent with the requirements of the WDR and MRP (*Order No. R5-2014-0030-11*) and 2016 PEP, and was approved by the Central Valley Water Board with the understanding that the 2022 Monitoring Year 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 continues to implement the approved 2016 CSQMP and approved individual Management Plan elements. Throughout this process, the Coalition has kept an open line of communication with the Central Valley 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 the 2022 Monitoring Year 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* (*R5-2014-0030-11*) (WDR).[4]

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

Table 1. MRP Annual Monitoring Report Requirements[5]

MRP Section	AMR Requirement	Report Section Headings	Page
V.F.1	Signed Transmittal Letter	NA	-
V.F.2	Title page	Title page	-
V.F.3	Table of Contents	Table of Contents	i
V.F.4	Executive Summary	Executive Summary	vii
V.F.5	Description of the Coalition Group geographical area	Description of the Watershed	4
V.F.6	Monitoring objectives and design	Monitoring Objectives	5
V.F.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; 27
V.F.8	Location map(s) of sampling sites, crops and land uses	Appendix E: Drainage Maps	CD
V.B.1;[1] V.F.9; V.F.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

[4] 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).

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

MRP Section	AMR Requirement	Report Section Headings	Page
V.F.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	44
V.F.12	Sampling and analytical methods used	Sampling and Analytical Methods	17
V.B.5;[1] V.B.7.c.; V.F.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.F.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	43
V.B.3-4;[1] V.F.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.F.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	44; CD
V.F.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	67; CD
V.F.18	Evaluation of monitoring data to identify temporal and spatial trends and patterns	Trend Analysis; Appendix G: Trend Analysis Results	59; CD
V.F.19	Summary of Nitrogen Management Plan information submitted to the Coalition	---[2]	NA
V.F.20	Summary of Management Practice information collected as part of Farm Evaluations	Summary of Farm Evaluation Data	NA

MRP Section	AMR Requirement	Report Section Headings	Page
V.F.21	Summary of comparison of township Groundwater Protection Targets and actual value achieved for each township	---[3]	NA
V.F.22	Summary of Mitigation Monitoring	---[4]	NA
V.F.23	Summary of education and outreach activities	Management Practices and Actions Taken; Appendix F: SVWQC Outreach Materials	67; CD
V.F.24	Reduced Monitoring/Management Plan Verification Option Reports	---	NA
V.F.25	Conclusions and recommendations	Conclusions and Recommendations	70

1. Quarterly Submittals of monitoring results for the 2022 Monitoring Year (WDR Provision V.B.) are re-submitted with the AMR.
2. The 2022 Nitrogen Management Plan (NMP) Summary Report will be submitted to the ILRP by 30 November 2023.
3. This item is not applicable to this surface water monitoring report.
4. This item is not applicable because no mitigation monitoring was conducted in 2022.

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 performs monitoring 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 areas from 5,000 feet in elevation to near sea level.

The Sacramento River Basin is a unique mosaic of farmlands, refuges, and wetlands managed for waterfowl habitat; spawning grounds for numerous salmon species and steelhead trout; and the cities and rural communities across the 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. 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 of these exceedances and to inform potential users of the products that contain constituents of concern. Additionally, the Coalition is evaluating the degree of implementation of current management practices in priority drainages and represented drainages (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 from agricultural lands 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 during the 2022 Monitoring Year by the Coalition to achieve these objectives are as specified in the current WDR and MRP (*Order No. R5-2014-0030-11*):

- 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 Central Valley Water Board each year on August 1 in the form of the Coalition's Monitoring Plan Update (MPU). 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 time periods of pesticide applications in representative and integration site 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 Central Valley 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 (lb 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 Central Valley Water Board's Executive Officer.

Specific individual parameters measured for 2022 Coalition Monitoring are listed in **Table 2**. Note that not all parameters were monitored at every site for every monitoring event.

Table 2. Constituents Monitored for the 2022 Monitoring Year

Analyte	Quantitation Limit[1]	Reporting Unit
Physical Parameters		
Flow	NA	CFS (Ft^3/Sec)
pH	0.01[(2)]	-log[H^+]
Specific Conductivity	1[(2)]	μS/cm
Dissolved Oxygen	0.01[(2)]	mg/L
Temperature	0.1[(2)]	˚C
Hardness, total as $CaCO_3$	5	mg/L
Turbidity	0.055	NTU
Total Suspended Solids	3.0	mg/L
Dissolved Organic Carbon	0.5	mg/L
Total Organic Carbon	0.5	mg/L
Grain size (sediment)	0.01	% fraction
Solids (sediment)	0.1	% fraction
Pathogen Indicators		
E. coli bacteria	1	MPN/100 mL
Water Column Toxicity		

Analyte	Quantitation Limit[1]	Reporting Unit
Ceriodaphnia dubia, 96-h acute	NA	% Survival
Hyalella azteca, 96-h acute	NA	% Survival
Selenastrum capricornutum, 96-h short-term chronic	NA	% Survival
Sediment Toxicity		
Hyalella, 10-day short-term chronic	NA	% Survival
Pesticides		
Carbamates	(3)	µg/L
Fungicide	(3)	µg/L
Herbicides	(3)	µg/L
Insecticides	(3)	µg/L
Neonictinoid	(3)	µg/L
Organochlorine	(3)	µg/L
Organophosphorus	(3)	µg/L
Pyrethroids	(3)	ng/L
Triazines	(3)	µg/L
Trace Elements		
Arsenic	0.5	µg/L
Boron	10	µg/L
Copper	0.5	µg/L
Nutrients		
Ammonia as N	0.1	mg/L
Nitrate + Nitrite as N	0.05	mg/L
Orthophosphate as P	0.01	mg/L
Phosphorus, total	0.01	mg/L
Total Kjeldahl Nitrogen	0.2	mg/L
Total Nitrogen	0.2	mg/L

1. 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.
2. Detection and reporting limits are not strictly defined. Value is required reporting precision.
3. 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 Central Valley 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 12[6]) subwatershed groups. Representatives from each subwatershed group utilized agronomic and hydrologic data generated by the Coalition to prioritize watershed areas for initial evaluation of 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 subwatershed 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 one year 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 during the 2022 Monitoring Year were all previously monitored and included 13 representative sites, three integration sites, and two special project sites where monitoring requirements were triggered by active Management Plans or TMDLs.

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[6] The AMR no longer reports Coalition monitoring data for the Goose Lake Subwatershed. On 13 August 2021, the Central Valley Water Board approved for exemption from the Irrigated Lands Regulatory Program 7,000 irrigated acres of pasture and hay operations in the Goose Lake area.

SAMPLING SITE LOCATIONS AND LAND USES

The water and sediment sites monitored by the Coalition during the 2022 Monitoring Year are listed in **Table 3**. All sites monitored were approved by the Central Valley Water Board as MRP compliance sites. A watershed-wide map of Coalition 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 2022 Coalition Monitoring

Subwatershed	Site Name	Latitude	Longitude	Agency	Site ID & Category (see Fig. 1)	
Butte Yuba Sutter	Gilsizer Slough at George Washington Road	39.009	-121.6716	SVWQC	GILSL	SP
Butte Yuba Sutter	Lower Honcut Creek at Highway 70	39.30915	-121.59542	SVWQC	LHNCT	REP
Butte Yuba Sutter	Lower Snake River at Nuestro Road	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 Knight’s Landing	38.8121	-121.7741	SVWQC	COLDR	INT
Colusa Glenn	Freshwater Creek at Gibson Road	39.17664	-122.18915	SVWQC	FRSHCs	REP
Colusa Glenn	Walker Creek near 99W and CR33	39.62423	-122.19652	SVWQC	WLKCH	REP
Lake	McGaugh Slough at Finley Road East	39.00417	-122.86233	SVWQC	MGSLU	SP
Lake	Middle Creek upstream from Highway 20	39.17641	-122.91271	SVWQC	MDLCR	REP
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 Road	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	Ulatis Creek at Brown Road	38.307	-121.794	SVWQC	UCBRD	REP
Solano[1]	Shag Slough at Liberty Island Bridge	38.30677	-121.69337	SVWQC	SSLIB	INT
Yolo	Willow Slough Bypass at Pole Line Road	38.59015	-121.73058	SVWQC	WLSPL	REP

1. Shag Slough at Liberty Island Bridge drainage includes areas in both the Solano and Yolo Subwatersheds.

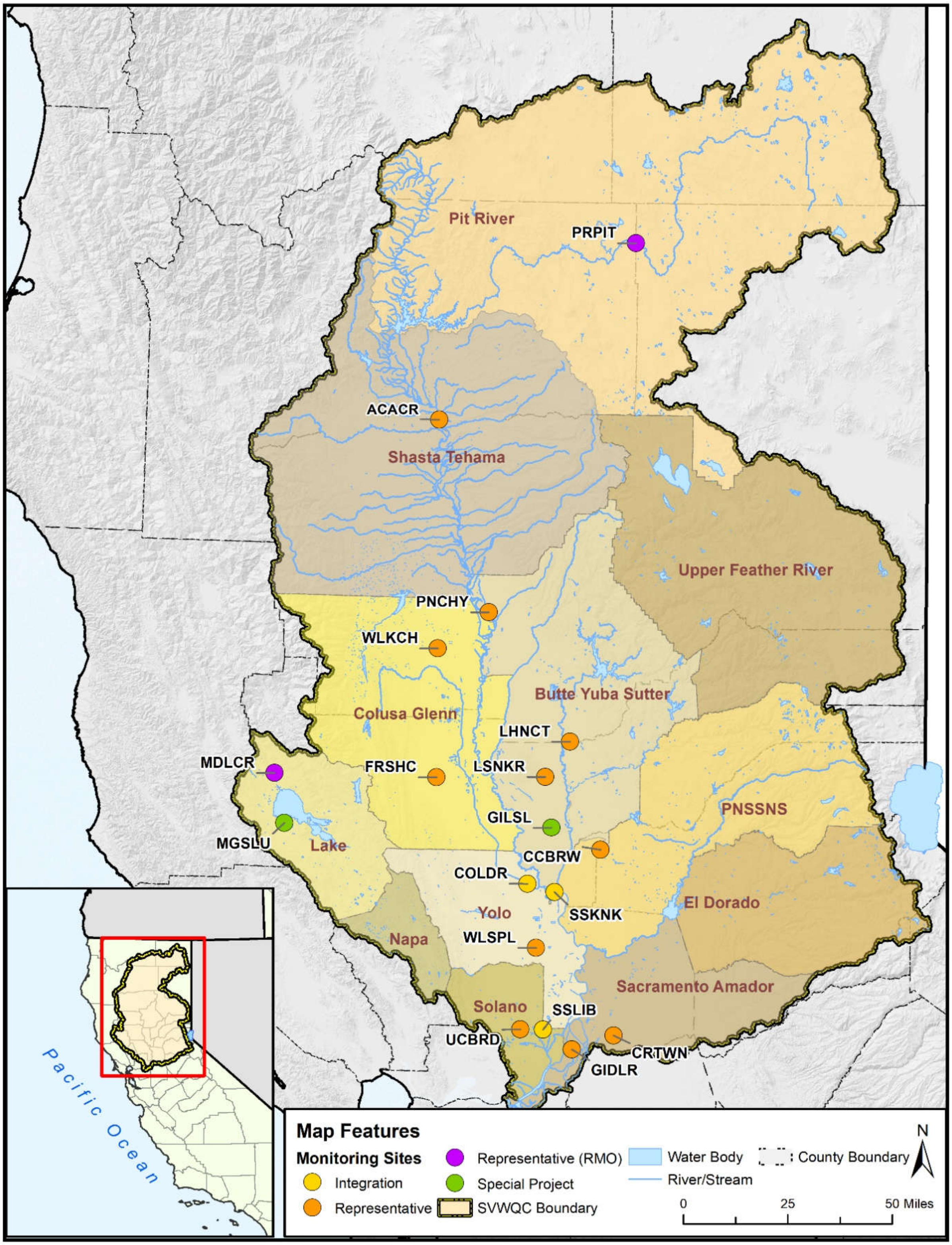

Figure 1. 2022 Coalition Monitoring Sites

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 drained Yuba City and the area south of town. Principal crops grown in this area include prunes, walnuts, peaches, and almonds. This special project site currently 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. This is an integration site for this subwatershed.

Colusa Glenn Subwatershed

Colusa Basin Drain above Knight's 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. 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.

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 an approved *Reduced Monitoring/Management Practices Verification Option*. There was no required monitoring within the El Dorado subwatershed during the 2022 Monitoring Year.

Lake Subwatershed

The Lake subwatershed is currently operating under an approved *Reduced Monitoring/Management Practices Verification Option*. Assessment monitoring was not required in the Lake subwatershed because they are operating under the *Reduced Monitoring/Management Practices Verification Option*, but the Lake Subwatershed Group conducted monitoring for the Clear Lake Nutrient TMDL.

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 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 special project site for this subwatershed.

Napa Subwatershed

The Napa subwatershed is currently operating under an approved *Reduced Monitoring/Management Practices Verification Option*. Monitoring in this subwatershed was conducted in coordination with the Napa Subwatershed Group. There was no required monitoring within the El Dorado subwatershed during the 2022 Monitoring Year.

Pit River Subwatershed

The Pit River subwatershed is currently operating under an approved *Reduced Monitoring/Management Practices Verification Option*. Monitoring in this subwatershed was conducted in coordination with the Northeastern California Watershed Association (NECWA).

Pit River at Pittville Bridge (PRPIT)

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

Placer-Nevada-South Sutter-North Sacramento Subwatershed

Monitoring in this subwatershed was conducted in coordination with the PNSSNS Subwatershed Group.

Coon Creek at Brewer Road (CCBRW)

This site captures drainage from the Middle Coon Creek drainage area 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 6 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 acreage (excluding rice) is approximately 13,000 acres. This is a representative site for this subwatershed.

Sacramento/Amador Subwatershed

Cosumnes River at Twin Cities Road (CRTWN)

This site characterizes flows from the eastern portion of the subwatershed 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 Sacramento River. Approximately 8,000 irrigated acres drain 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, which includes areas in both the Solano and Yolo Subwatersheds. 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 an integration 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 representative site is currently a Management Plan site for this subwatershed.

Upper Feather River Watershed

The Upper Feather River subwatershed is currently operating under an approved *Reduced Monitoring/Management Practices Verification Option*. Monitoring in this subwatershed was conducted in coordination with the UFRW Group. There was no required monitoring within the Upper Feather River subwatershed during the 2022 Monitoring Year.

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 represents, as closely as possible, *in situ* conditions of agricultural discharges to water bodies in the Sacramento Valley. This objective is 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 is 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; amended 2017) and approved by the Central Valley Water Board. Additionally, the Coalition submits an electronic QAPP (eQAPP) to the Central Valley Water Board on a quarterly basis with its quarterly data submittal. The eQAPP alerts Central Valley Water Board staff to the Coalition's event-based analysis of constituents and their associated analytical methods, along with occasional changes to a laboratory's analytical recovery limits for certain parameters.

Surface water samples were collected for analysis of the constituents listed in **Table 2** as specified in the Coalition's 2022 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 and eQAPP; any deviations from these methods were noted.

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 the risk of sample contamination. Samples were collected at approximately mid-stream and mid-depth at approximately the location of greatest flow (where feasible). Sample collection methods are dependent on sampling site and event characteristics.

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 wadable, 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 visited and number of samples collected for 2022 Coalition Monitoring are summarized in **Table 4**. The Coalition's monitoring strategy for the 2022 Monitoring Year 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. R5-2014-0030-11*). The elements that are key to achieving the Coalition's goals and satisfying the intent of the requirements of the 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. R5-2014-0030-11*.

Table 4. 2022 Coalition Monitoring Year: Planned Samples, October 2021 – September 2022

						Core Parameters							Metals		Pesticides in Water																								Toxicity				
Subwatershed	Representative	SiteID	SITE CATEGORY: REP=Representative INT=Integrative SP=Special Project	Water Column Sample Events	Sediment Sample Events	Field Measured Group	Dissolved Organic Carbon	Total Organic Carbon	Total Suspended Solids	Turbidity	E. coli	Nutrients Group	COPPER (dissolved, total + hardness)	ZINC (dissolved, total + hardness)	2,4-D acids & salts	Atrazine	Carbaryl	Chloropicrin	Chlorothalonil	Chlorpyrifos	Clothianidin	Diazinon	Dichlorvos (DDVP)	Dimethoate	Diuron	Ethalfluralin	Fenpropathrin	Imidacloprid	Malathion	Methomyl	Oryzalin	Oxyfluorfen	Propiconazole	Pyridaben	Simazine	Tebuconazole	Thiamethoxam	TMDL Pyrethroids	Algae - Selenastrum	Water Flea - Ceriodaphnia	Hyalella azteca (water)	Hyalella azteca (sediment) [1]	Grain Size [2]
ButteYubaSutter	Sacramento Slough	SSKNK	INT	3	2	3	3	3	3	3	3	3	2				1					2	1	1				2	1									3		3	1	2	2
ButteYubaSutter	Lower Honcut Creek	LHNCT	REP	8	2	8	5	8	8	8	8	8	3					2				3	1					3										5		8		2	2
ButteYubaSutter	Pine Creek	PNCHY	REP	9	2	9	5	9	9	9	9	9	2					1			1				1							3	1		1	1		5	6	6		2	2
ButteYubaSutter	Lower Snake River	LSNKR	REP	9	2	9	5	9	9	9	9	9	3						1						1			4	1									5	1	8		2	2
ButteYubaSutter	Wadsworth	BTTSL	SP																																								
ButteYubaSutter	Wadsworth	GILSL	SP	4		4														4		4																					
ButteYubaSutter	Lower Snake River	WADCN	SP																																								
ColusaGlenn	Freshwater Creek	FRSHC	REP	8	2	8	4	8	8	8	8	8	3				2				2	1						4				1						4	1	7		2	2
ColusaGlenn	Freshwater Creek	LRLNC	SP																																								
ColusaGlenn	Freshwater Creek	SCCMR	SP																																								
ColusaGlenn	Colusa Drain	COLDR	INT	4	2	4	3	4	4	4	4	4	2				1				2				2			3				1						2	1	3		2	2
ColusaGlenn	Lower Colusa Drain	RARPP	SP																																								
ColusaGlenn	Walker Creek	WLKCH	REP	10		10	4	10	10	10	10	10	4	1		2	1		1										4		2	3	1					4					
ColusaGlenn	Willow Creek	LGNCR	SP																																								
ColusaGlenn	Willow Creek	STYHY	SP																																								
ElDorado	Coloma El Dorado	NRTCN	REP																																								
ElDorado	Coloma El Dorado	COONH	SP																																								
GooseLake	Goose Lake	LOWLC	REP																																								
Lake	Upper Lake	MDLCR	REP	4		4						4																													1		
Lake	Upper Lake	MGSLU	REP	4		4						4																															
Napa	Pope Creek	PCULB	REP																																								
Napa	Pope Creek	CCULB	SP																																								
NECWA	Big Lake	PRPIT	REP	1		1																																			1		
NECWA	Big Lake	FRRRB	SP																																								
NECWA	Big Lake	PRCAN	SP																																								
PNSSNS	Middle Coon Creek	CCBRW	REP	9	2	9	4	9	9	9	9	9	3					2				1						3	2									4		6		2	2
PNSSNS	Middle Coon Creek	CCSTR	SP																																								
SacramentoAmador	Lower Cosumnes	CRTWN	REP	9	2	9	4	9	9	9	9	9	2											1	3	1		3	1			3					2	4	4	6	1	2	2
SacramentoAmador	Lower Cosumnes	DCGLT	SP																																								
SacramentoAmador	Lower Cosumnes	LAGAM	SP																																								
SacramentoAmador	Sacramento Delta	GIDLR	REP	11	2	11	5	11	11	11	11	11	2				2		3		2	1		4		2	1	3	2			3					1	5	5	8		2	2
ShastaTehama	Anderson Creek	ACACR	REP	8	2	8	3	8	8	8	8	8	2															2	1			2						3	2	5	1	2	2
ShastaTehama	Anderson Creek	BRCWB	SP																																								
ShastaTehama	Anderson Creek	COYTR	SP																																								
Solano	Cache Slough	UCBRD	REP	11	2	11	8	11	11	11	11	11	2		1			1			3			1				4				3						9	5	8		2	2
Solano	Shag Slough	SSLIB	INT	4	2	4	2	4	4	4	4	4	2									1						3	1	1		2		2			1	2	2	4		2	2
Solano	South Yolo Bypass	ZDDIX	SP																																								
UpperFeatherRiver	Middle Fork Feather River	MFFGR	REP																																								
UpperFeatherRiver	Middle Fork Feather River	INDAB	SP																																								
UpperFeatherRiver	Middle Fork Feather River	SPGRN	SP																																								
Yolo	Willow Slough	WLSPL	REP	9	2	9	4	9	9	9	9	9	3		1						1											3						4	3	4		2	2
Yolo	Willow Slough	CCCPY	SP																																								
Yolo	Willow Slough	TCHWY	SP																																								
			Totals	*125*	*26*	*125*	*59*	*112*	*112*	*112*	*112*	*120*	*35*	*1*	*2*	*2*	*7*	*6*	*5*	*4*	*11*	*13*	*2*	*7*	*7*	*3*	*1*	*34*	*13*	*1*	*2*	*24*	*2*	*2*	*1*	*1*	*4*	*59*	*30*	*76*	*5*	*26*	*26*

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

ANALYTICAL METHODS

Water chemistry samples were analyzed as either filtered or unfiltered fractions of samples, depending on the 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 meet acceptable precision and recovery requirements, 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. All procedures for analyses are documented in the QAPP or are available for review at each laboratory.

Toxicity Testing and Toxicity Identification Evaluations

Water quality samples were analyzed for toxicity to *Ceriodaphnia dubia*, *Selenastrum capricornutum,* and *Hyalella azteca* during the 2022 Monitoring Year. 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* (EPA-821-R-02-012; USEPA 2002a). Toxicity tests with *Ceriodaphnia* were conducted as 96-hour static renewal tests, with renewal 48 hours after test initiation.
- Determination of chronic 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* (EPA-821-R-02-013; USEPA 2002b). Toxicity tests with *Selenastrum* were conducted as a 96-hour static non-renewal test.
- Determination of acute toxicity to *Hyalella azteca* was performed as described in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition* (EPA-821-R-02-012; USEPA, 2002a), with modifications for the Hyalella test based on the Southern California Coastal Water Research Project (SCCWRP) *Stormwater Monitoring Coalition: Toxicity Testing Laboratory Guidance Document* (December 2016).

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 at 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 observed toxicity.

Procedures in the Coalition's QAPP state that if any measurement endpoint from any of the *Ceriodaphnia* or *Selenastrum* 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 rapidly decreases 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.

The Coalition's WDR allows for initiation of a TIE for *Hyalella* when a greater than or equal to 50% reduction in organism survival is observed, but a sediment TIE is not required to be conducted.

Detection and Quantitation Limits

The Method Detection Limit (MDL) is the minimum analyte concentration that can be measured and reported with 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 for both identification and quantitation purposes. For this program, QLs were established based on the verifiable levels and general measurement capabilities demonstrated by labs for each analytical 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 most cases.

Project Quantitation Limits

Laboratories generally establish QLs that are reported with the analytical results — these numeric values may be called *reporting limits*, *detection limits*, *reporting detection limits*, or several other terms used by different laboratories. In the quarterly eQAPP, these limits are referred to as reporting limits (RL). The MDLs and RLs are listed in **Table 5** and **Table 6**. Wherever possible, project QLs are lower than proposed or existing relevant numeric water quality objectives or toxicity thresholds, as required by the ILRP.

All analytical results between the MDL and RL are reported as numeric values and qualified as estimated (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 Reporting Limit (RL) Data Quality Objectives for Analyses of Surface Water during the 2022 Monitoring Year

Method	Analyte	Fraction	Units	MDL	RL
Physical and Conventional Parameters					
SM 20-2340 C	Hardness, total as $CaCO_3$	Unfiltered	mg/L	1.7	5
SM 2130 B	Turbidity	Unfiltered	NTU	0.2	0.5
SM 2540 D	Total Suspended Solids (TSS)	Particulate	mg/L	1	3
SM 5310 B; SM 5310 C	Organic Carbon, Total (TOC)	Unfiltered	mg/L	0.3	0.5
SM 5310 B; SM 5310 C	Organic Carbon, Dissolved (DOC)	Unfiltered	mg/L	0.3	0.5
Pathogen Indicators					
SM 9223 B; SM 9223B-04	*E. Coli* bacteria	NA	MPN/100mL	1	1
Organophosphorus Pesticides					
EPA 8141A	Chlorpyrifos	Unfiltered	µg/L	0.0026	0.015
EPA 8141A	Diazinon	Unfiltered	µg/L	0.004	0.02
EPA 8141A	Malathion	Unfiltered	µg/L	0.03	0.1
EPA 8141A	Phorate	Unfiltered	µg/L	0.072	0.1
Organochlorine Pesticides					
EPA 8081A	Chlorothalonil	Unfiltered	µg/L	0.03	0.1
Carbamate and Urea Pesticides					
EPA 8321A	Carbaryl	Unfiltered	µg/L	0.05	0.1
EPA 8321A	Methomyl	Unfiltered	µg/L	0.05	0.1
Pyrethroid Pesticides					
EPA 625.1	Allethrin	Unfiltered	µg/L	0.0001	0.0005
EPA 625.1	Bifenthrin	Unfiltered	µg/L	0.0001	0.0005
EPA 625.1	Cyfluthrin	Unfiltered	µg/L	0.0002	0.0005
EPA 625.1	Cypermethrin	Unfiltered	µg/L	0.0002	0.0005
EPA 625.1	Deltamethrin/Tralomethrin	Unfiltered	µg/L	0.0002	0.001
EPA 625.1	Esfenvalerate/Fenvalerate	Unfiltered	µg/L	0.0002	0.001
EPA 625.1	Fenpropathrin	Unfiltered	µg/L	0.0002	0.0005
EPA 625.1	Lambda-Cyhalothrin	Unfiltered	µg/L	0.0002	0.0005
EPA 625.1	Permethrin	Unfiltered	µg/L	0.002	0.005
EPA 625.1	Tau-Fluvalinate	Unfiltered	µg/L	0.0002	0.0005
EPA 625.1	Tetramethrin	Unfiltered	µg/L	0.0002	0.0005
Insecticides					
EPA 625.1_MRM	Imidacloprid	Unfiltered	µg/L	0.002	0.004
EPA 625.1	Pyridaben	Unfiltered	µg/L	0.01	0.05

Method	Analyte	Fraction	Units	MDL	RL
Other Herbicides					
EPA 615	2,4-Dichlorophenoxyacetic Acid	Unfiltered	µg/L	0.43	1
EPA 8321A	Diuron	Unfiltered	µg/L	0.2	0.4
EPA 8081A	Oxyfluorfen	Unfiltered	µg/L	0.008	0.05
EPA 549.2M; EPA 549.2	Paraquat	Unfiltered	µg/L	0.15	0.4
EPA 8141AM	Pendimethalin	Unfiltered	µg/L	0.53	1
EPA 8141A	Trifluralin	Unfiltered	µg/L	0.036	0.05
Triazines					
EPA 8141A	Atrazine	Unfiltered	µg/L	0.1	0.5
EPA 8141A	Simazine	Unfiltered	µg/L	0.08	0.5
Fungicides					
EPA 8260BM	Chloropicrin	Unfiltered	µg/L	7.4	10
NCL ME 340	Cyprodinil	Unfiltered	µg/L	0.0031	0.02
NCL ME 340	Propiconazole	Unfiltered	µg/L	0.0069	0.02
NCL ME 340	Pyraclostrobin	Unfiltered	µg/L	0.0034	0.02
EPA 525.3	Tebuconazole	Unfiltered	µg/L	0.071	0.2
Trace Elements					
EPA 200.8	Arsenic	Filtered, Unfiltered	µg/L	0.06	0.5
EPA 200.8	Boron	Filtered, Unfiltered	µg/L	2	10
EPA 200.8	Copper	Filtered, Unfiltered	µg/L	0.15	0.5
Nutrients					
EPA 350.1; SM 20-4500-NH3 C	Ammonia, Total as N	Unfiltered	mg/L	0.04	0.1
EPA 353.2	Nitrate + Nitrite as N	Unfiltered	mg/L	0.04	0.05
SM 4500-P E; SM 4500-P E (filt)	Orthophosphate, as P	Unfiltered	mg/L	0.004	0.01
SM 4500-P E; SM 4500-P B/F	Phosphorus, Total	Unfiltered	mg/L	0.007	0.01
EPA 351.2	Total Kjeldahl Nitrogen	Unfiltered	mg/L	0.09	0.2
Calculated	Total Nitrogen	Unfiltered	mg/L	0.09	0.2

Table 6. Laboratory Method Detection Limit (MDL) and Reporting Limit (RL) Data Quality Objectives for Analyses of Sediments during the 2022 Monitoring Year

Method	Analyte	Fraction	Units	MDL	RL
Physical and Conventional Parameters					
SM 2560 D	Grain Size	Total	NA	NA	NA
EPA 160.3; SM20-2540 G	Solids	Total	%	NA	0.1
EPA 9060	Organic Carbon, Total (TOC)	Total	mg/kg dry wt.	200	500
Pyrethroids					
EPA 8270C(m)	Allethrin	Total	ng/g dry wt.	0.2	1
EPA 8270C(m)	Bifenthrin	Total	ng/g dry wt.	0.4	1
EPA 8270C(m)	Cyfluthrin	Total	ng/g dry wt.	0.5	1
EPA 8270C(m)	Cypermethrin	Total	ng/g dry wt.	0.4	1
EPA 8270C(m)	Deltamethrin/ Tralomethrin	Total	ng/g dry wt.	0.5	1
EPA 8270C(m)	Esfenvalerate/ Fenvalerate	Total	ng/g dry wt.	0.6	1
EPA 8270C(m)	Fenpropathrin	Total	ng/g dry wt.	0.3	1
EPA 8270C(m)	Lambda-Cyhalothrin	Total	ng/g dry wt.	0.3	1
EPA 8270C(m)	Permethrin	Total	ng/g dry wt.	0.5	1
EPA 8270C(m)	Tau-Fluvalinate	Total	ng/g dry wt.	0.2	1
EPA 8270C(m)	Tetramethrin	Total	ng/g dry wt.	0.3	1
Toxicity					
EPA 600/R-99-064M	*Hyalella azteca*, 10-day short-term chronic	NA	% Survival	NA	NA

Monitoring Results

The following sections summarize the monitoring conducted by the Coalition and its subwatershed partners during the 2022 Monitoring Year (October 2021 through September 2022).

SUMMARY OF SAMPLE EVENTS CONDUCTED

This report presents monitoring results from 12 Coalition sampling events (Events 186-197), as well as data for events conducted by coordinating subwatershed monitoring programs and other agencies between October 2021 and September 2022. Samples collected for all of these events are listed in **Table 7**.

The Coalition and subwatershed monitoring events were conducted throughout the year. Analyses included water chemistry and toxicity, with pesticides monitored during months when higher use is typical. Sediment toxicity testing and/or chemistry analyses were also conducted by the Coalition 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 2021 through September 2022 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**, 95 of the 124 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 77%. Executed sampling that differed from the 2022 Monitoring Plan Update is summarized below:

- Many receiving waters in the Sacramento Valley were dry for parts of the 2022 Monitoring Year. Samples at GILSL (two events), WLKCH (eight events), MDLCR (one event), MGSLU (four events), CRTWN (four events), ACACR (seven events), and WLSPL (two events) were not collected for the specified number of events due to sites being dry or non-contiguous.
- Water quality samples were not collected at the WLSPL site for one event due to unsafe sampling conditions.
- Sediment samples were not able to be collected at the LSNKR site for one event due to unsafe access conditions.

Table 7. Sampling for the 2022 Coalition Monitoring Year

		Sample Count		186	187	188	189	190	191	192	193	194	195	196	197
Subwatershed (Agency)	Site Id	Planned	Collected	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Butte-Yuba-Sutter (SVWQC)	GILSL	4	2				W				W		D	D	
	LHNCT	8	8			W	W	W		W,S	W	W	W	W,S	
	LSNKR	8	8				W		W	W,S	W	W	W	W,NS[1]	W
	PNCHY	9	9		W	W			W	W,S	W	W	W	W,S	W
	SSKNK	3	3						W		W,S			W,S	
Colusa Glenn (SVWQC)	COLDR	4	4	W					W		W,S			W,S	
	FRSHC	8	8				W	W	W	W,S	W	W	W	W,S	
	WLKCH	10	2	W	NS[2]	W		D	D	D	D	D	D	D	
Lake (SVWQC)	MDLCR	4	3		W				W		W			D	
	MGSLU	4	0		D				D		D			D	
Pit River (NECWA)	PRPIT	1	1						W						
PNSSNS (PNSSNS)	CCBRW	9	9				W	W	W	W,S	W	W	W	W,S	W
Sac/Amador (SVWQC)	CRTWN	9	5				W	W	W	W,S	W	D	D	D	D
	GIDLR	11	11	W	W	W		W	W	W,S	W	W	W	W,S	W
Shasta/Tehama (SVWQC)	ACACR	8	1			W			D	D	D	D	D	D	D
Solano (SVWQC)	UCBRD	11	11	W	W	W		W	W	W,S	W	W	W	W,S	W
	SSLIB[3]	4	4	W					W		W,S			W,S	
Yolo (SVWQC)	WLSPL	9	6		W	NS[4]		W	W	W,S	W	W	NS[2]	NS[2]	
	Totals	124	95												

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

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

1. Sediment sample not collected due to inaccessible monitoring site
2. Not sampled due to water body consisting of non-contiguous pools
3. SSLIB includes areas in both the Solano and Yolo Subwatersheds
4. Not sampled due to unsafe conditions/site inaccessibility

SUMMARY OF SAMPLING CONDITIONS

Samples were collected throughout the year for the Coalition (see **Table 2**, Sampling for the 2022 Coalition Monitoring Year). The Coalition's two sample collection periods include the wet season monitoring period from November 2021 through March 2022 and the irrigation season monitoring period from April 2022 through September 2022. Additionally, October 2021 is part of the 2022 monitoring year, but is classified as belonging to the previous year's irrigation season. Combining the wet season and irrigation seasons of the Coalition's 2022 Monitoring Year corresponds to the same period as the 2022 Water Year (October 2021 to September 2022).

Based on climate data available from the Sacramento Executive Airport weather station, rainfall during the 2022 Water Year was at or below average (relative to normal precipitation calculated between 1970 to 2020) in November of 2021 and from January through September of 2022 (**Table 8**). Notably, total precipitation in January and February of 2022 was lower than the long-term average for these months by over three inches. In contrast, October and December of 2021 were significantly wetter than the historical average (**Table 8**). Over the course of the wet season (October through March), total precipitation was highly variable, with values exceeding 6.5 inches in October and December, dropping below 1 inch in November, January and February, and increasing slightly to 2 inches in March. Precipitation was ~1.5 inches in April, after which point conditions became exceptionally dry, with values totaling approximately one inch of rain across the Coalition's remaining irrigation season. Average monthly temperatures were at or below long-term monthly average values (1970 to 2020) from October through December 2021. Temperatures then increased slightly above monthly long-term values for most months of the remaining Water Year (January to September; **Table 8**). Temperatures were notably high relative to historic averages in March, June, August and September of 2022 (**Table 8**). Maximum temperatures exceeded 90°F for 2 days in October, 8 days in May, 19 days in June, 22 days in July, 26 days in August, and 15 days in September.

The 2022 Water Year was classified as "Critical" for the Sacramento Valley by the California Department of Water Resources, with an estimated 57% of historic average runoff compared to previous water year indices.[7] Sacramento River Region unimpaired runoff for the 2022 Water Year was about 10.8 million acre-feet (MAF), or approximately 61% of average.

Incremental and accumulated precipitation data were compiled from DWR's California Data Exchange Center (CDEC[8]), and regional precipitation patterns for October 2021 through September 2022, as they relate to Coalition monitoring events, are illustrated in **Figure 2-a** through **Figure 2-f**. Incremental flow data were also compiled from CDEC, and data are reported relative to Coalition monitoring events in **Figures 3-a** through **3-g**. Flow rates increased relatively consistently across all monitoring sites during intervals of elevated precipitation, with peak flow intervals in October, December, and January (**Figures 3-a** through **3-g,** except for **3-f**). Lower amplitude flow intervals also occurred in February and March in the

[7] https://cdec.water.ca.gov/reportapp/javareports?name=WSI
[8] https://cdec.water.ca.gov/dynamicapp/wsSensorData

eastern Sacramento Valley (Feather River at Boyd's Landing gauge; **Figure 3-a**), and in April in Lake County (Middle Creek near Upper Lake gauge) and in the southern Sacramento Valley (Cosumnes River at Michigan Bar gauge) (**Figure 3-c; d**). Flow rates were highly variable throughout the 2022 Monitoring Year. Negative flows were recorded at the Shag Slough site (**Figure 3-f**), due to tidal influence in the Delta. Certain flow data from CDEC had reported values assigned as "BRT", which indicates "below reporting threshold" in the database. These values were assigned a value of zero for the purposes of plotting for **Figures 3-a to 3-g**. Missing data are reported in Figures 2-a through **2-f** and **3-a** through 3-g when sensor data provided by CDEC lacked a value for individual daily, hourly, or 15-minute datapoints. Dates listed for missing data in **Figures 3-a** through **3-g** indicate missing 15-minute measurements on the listed date; however, this does not necessarily indicate missing data for the full 24-hour period.

Table 8. Summary of Climate Data[9] at Sacramento Executive Airport, October 2021 – September 2022

Month	Monthly Mean Temp. (°F)	Departure from Normal Mean Temp. (°F, 1970-2020)	Days with Max. Temp. ≥ 90°F	Precip. Total (Inches)	Departure from Normal Precip. (1970-2020)
Oct. 2021	62.1	-2.3	2	6.71	5.80
Nov. 2021	54.0	0.5	0	0.68	-1.41
Dec. 2021	45.6	-0.9	0	6.98	3.98
Jan. 2022	48.1	1.3	0	0.05	-3.54
Feb. 2022	51.2	0.1	0	T[1]	-3.27
Mar. 2022	57.5	2.7	0	1.38	-1.35
Apr. 2022	60.3	1.2	0	0.64	-0.53
May 2022	67.4	1.5	8	0.01	-0.56
June 2022	75.5	3.5	19	0.09	-0.09
July 2022	76.4	0.7	22	T[1]	-0.03
Aug. 2022	78.2	3.2	26	0.00	-0.05
Sept. 2022	76.4	4.4	15	0.28	0.03

1. "T" indicates trace precipitation, wherein minimal amounts of precipitation wet the rain gauge but the total precipitation is below the detection limit.

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

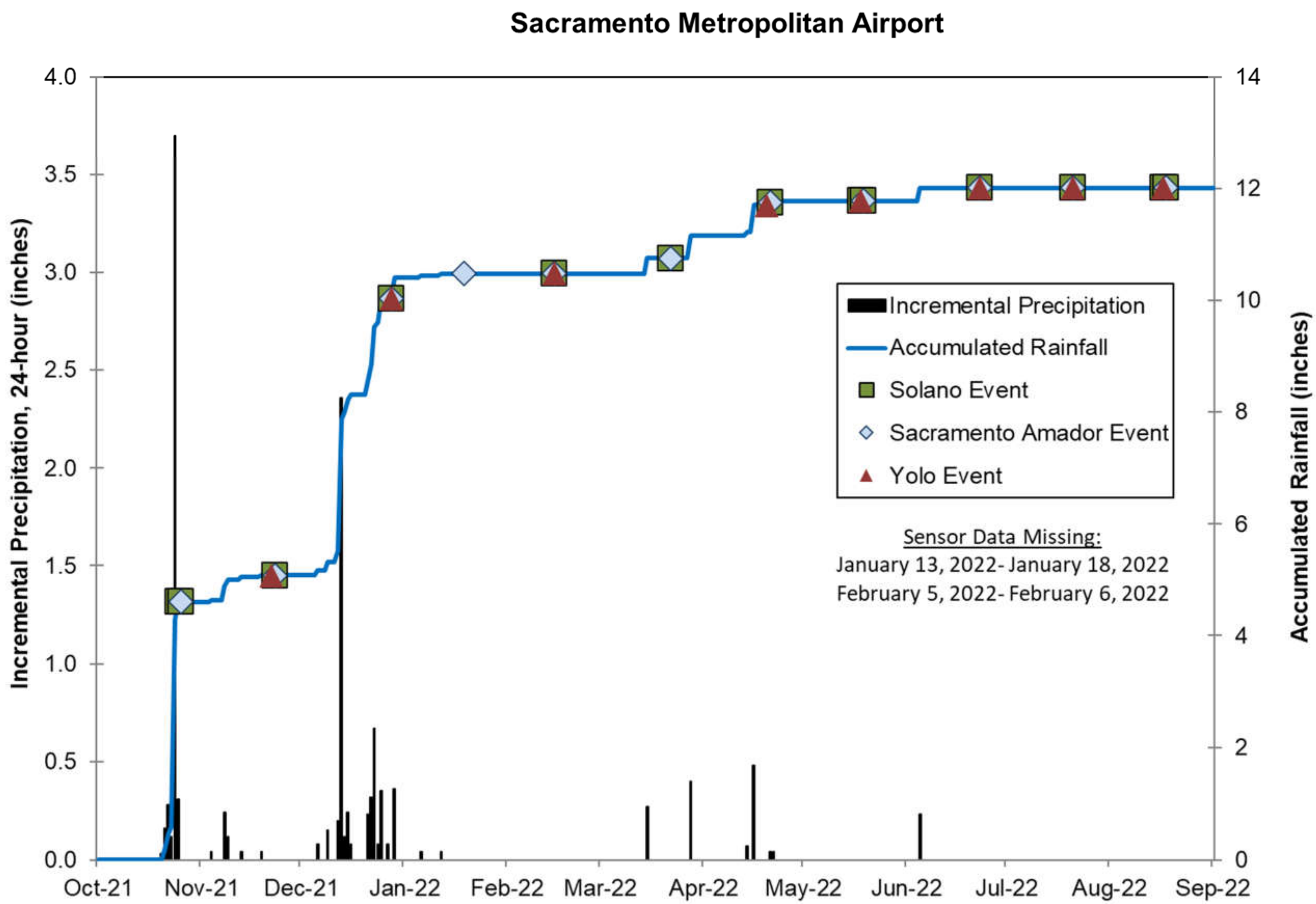

Figure 2-a. Precipitation during 2022 Coalition Monitoring: Southern Sacramento Valley

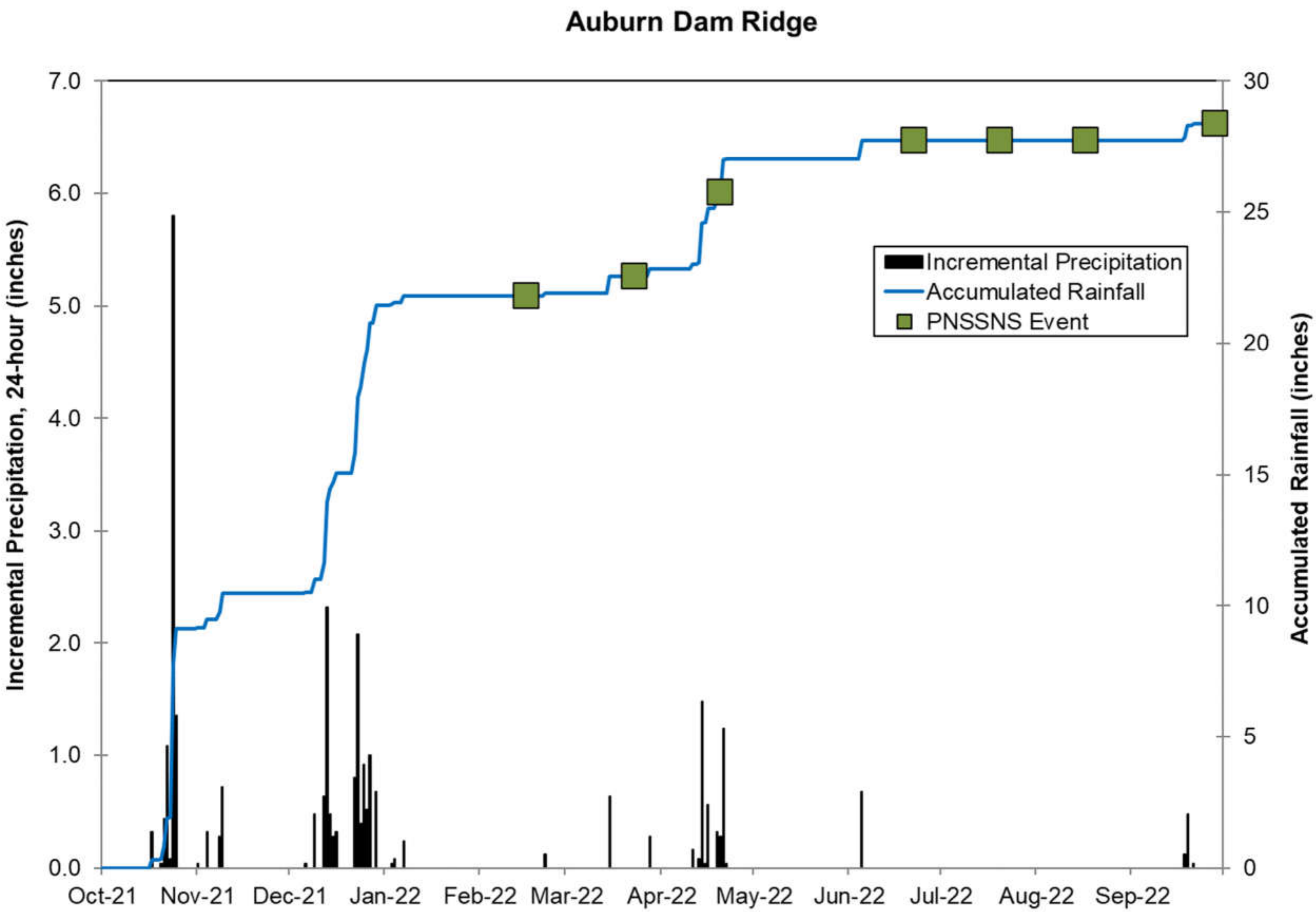

Figure 2-b. Precipitation during 2022 Coalition Monitoring: Sierra Foothills

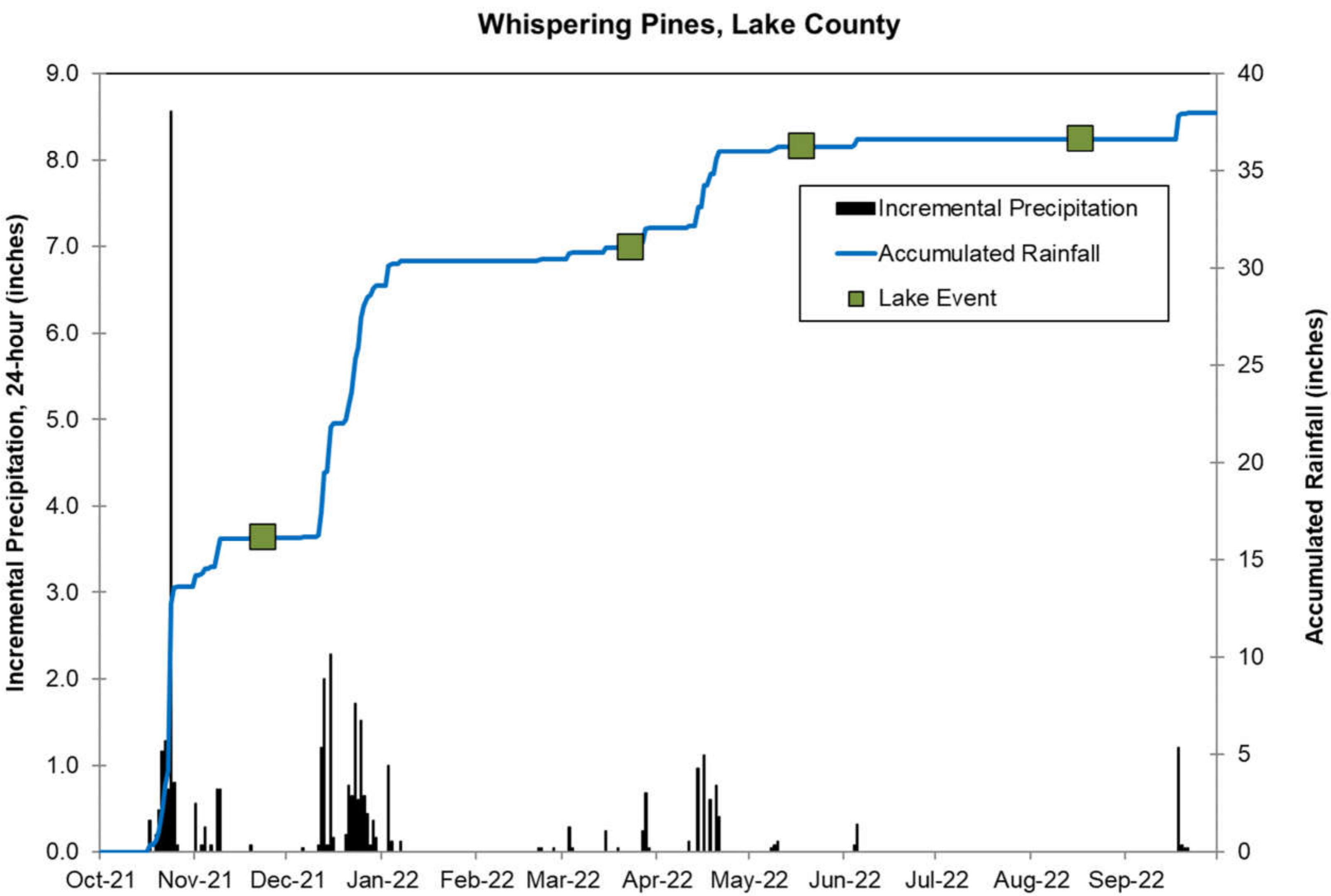

Figure 2-c. Precipitation during 2022 Coalition Monitoring: Lake County

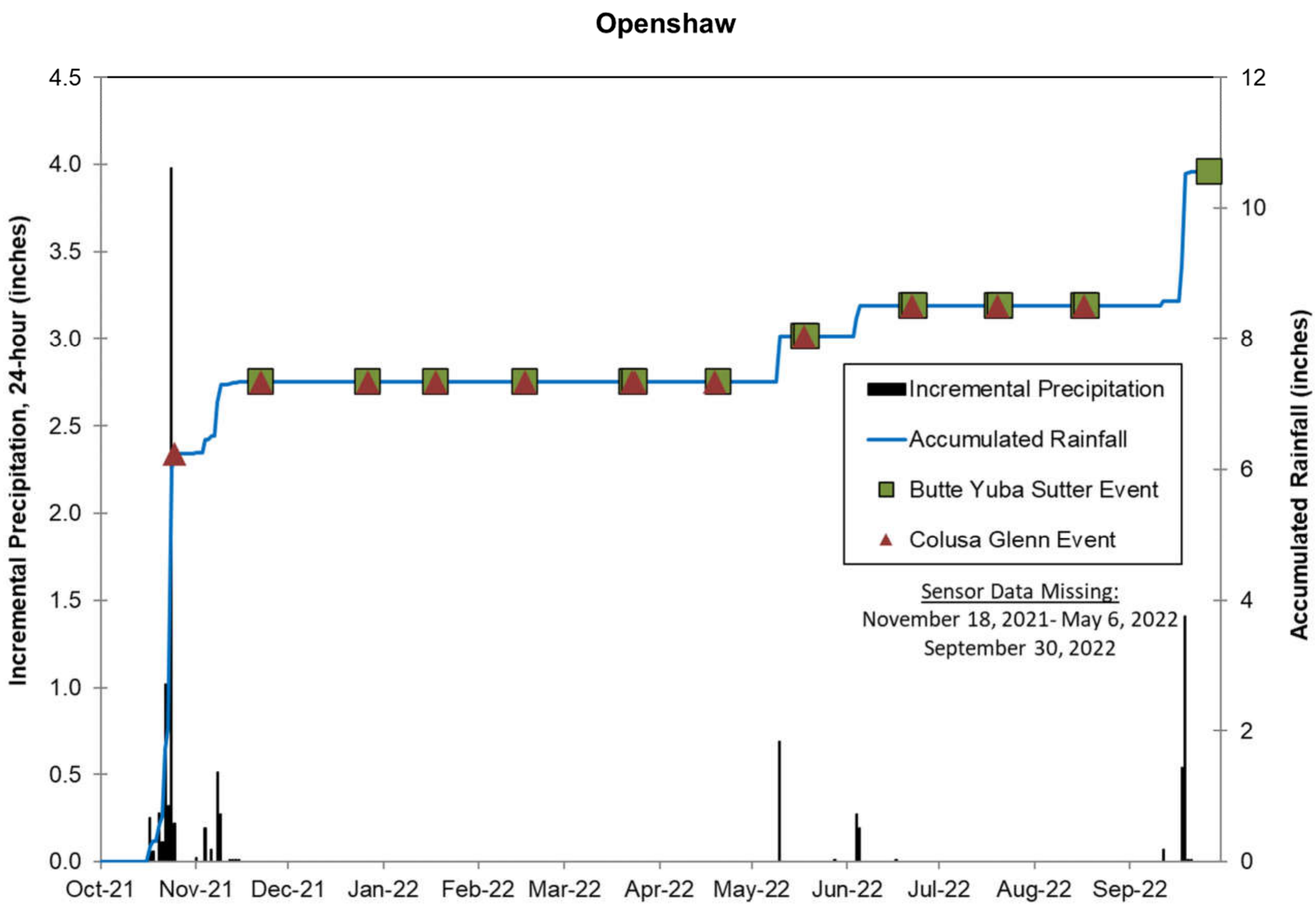

Figure 2-d. Precipitation during 2022 Coalition Monitoring: Central Sacramento Valley

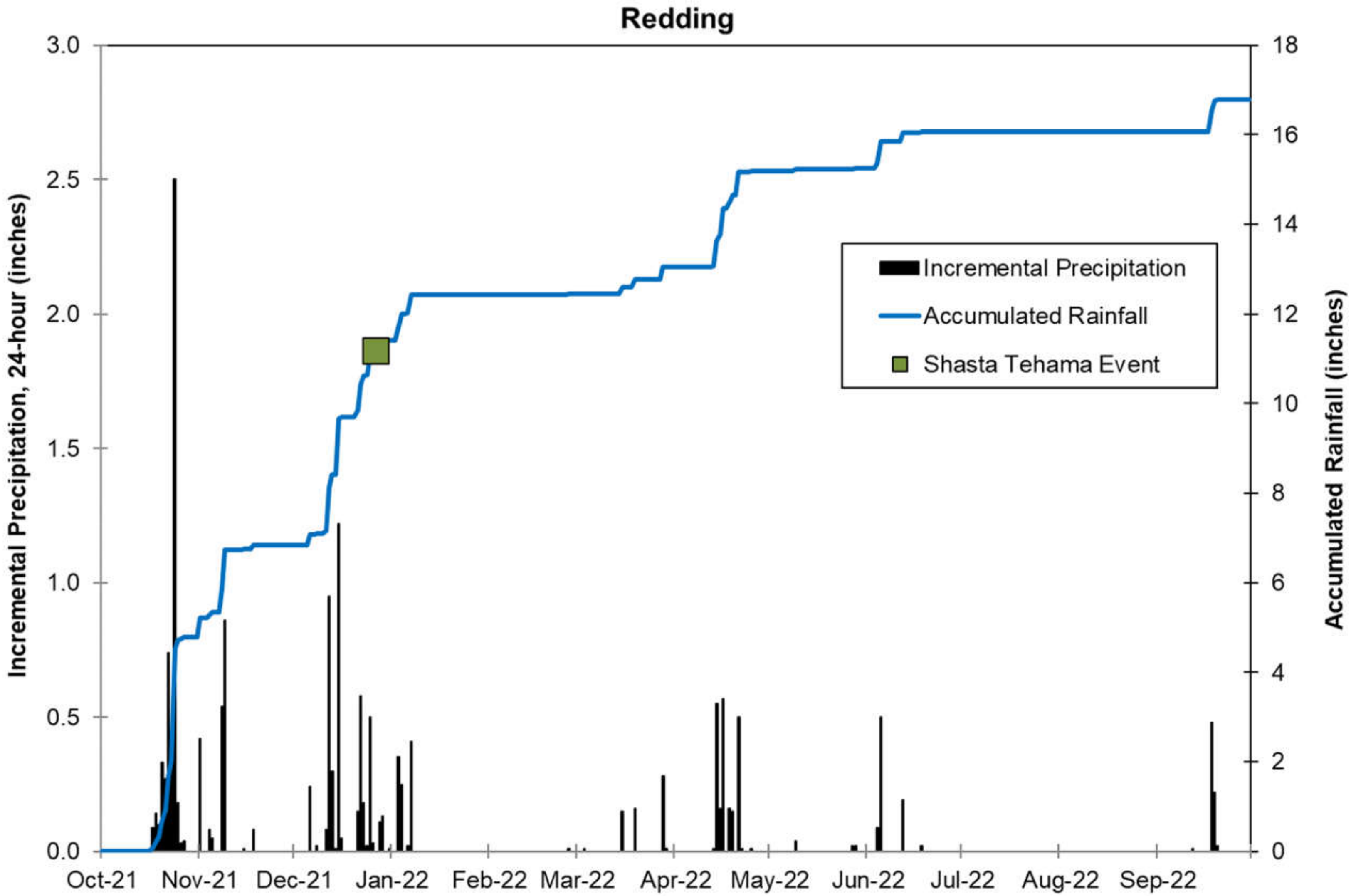

Figure 2-e. Precipitation during 2022 Coalition Monitoring: Northern Sacramento Valley

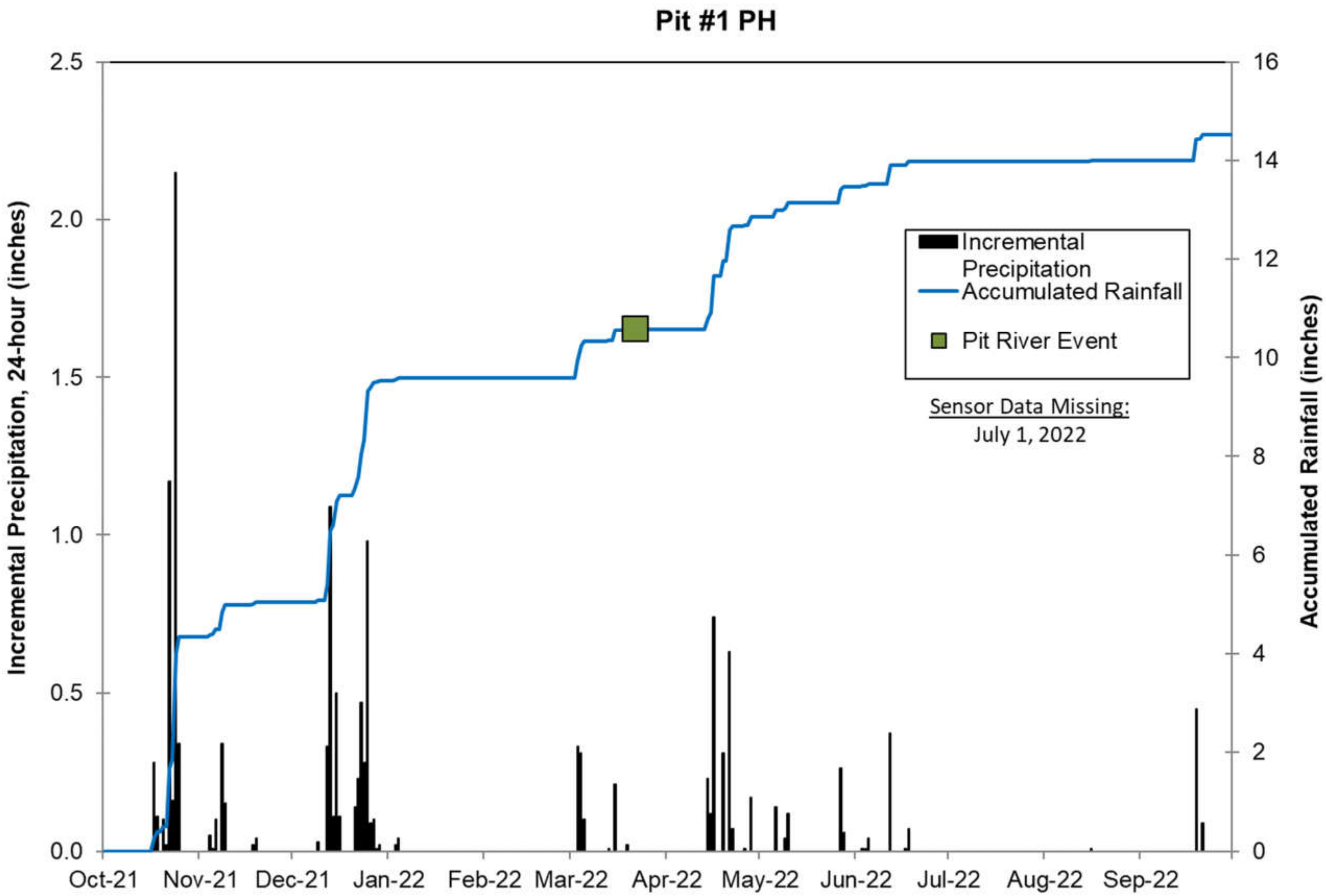

Figure 2-f. Precipitation during 2022 Coalition Monitoring: Pit River

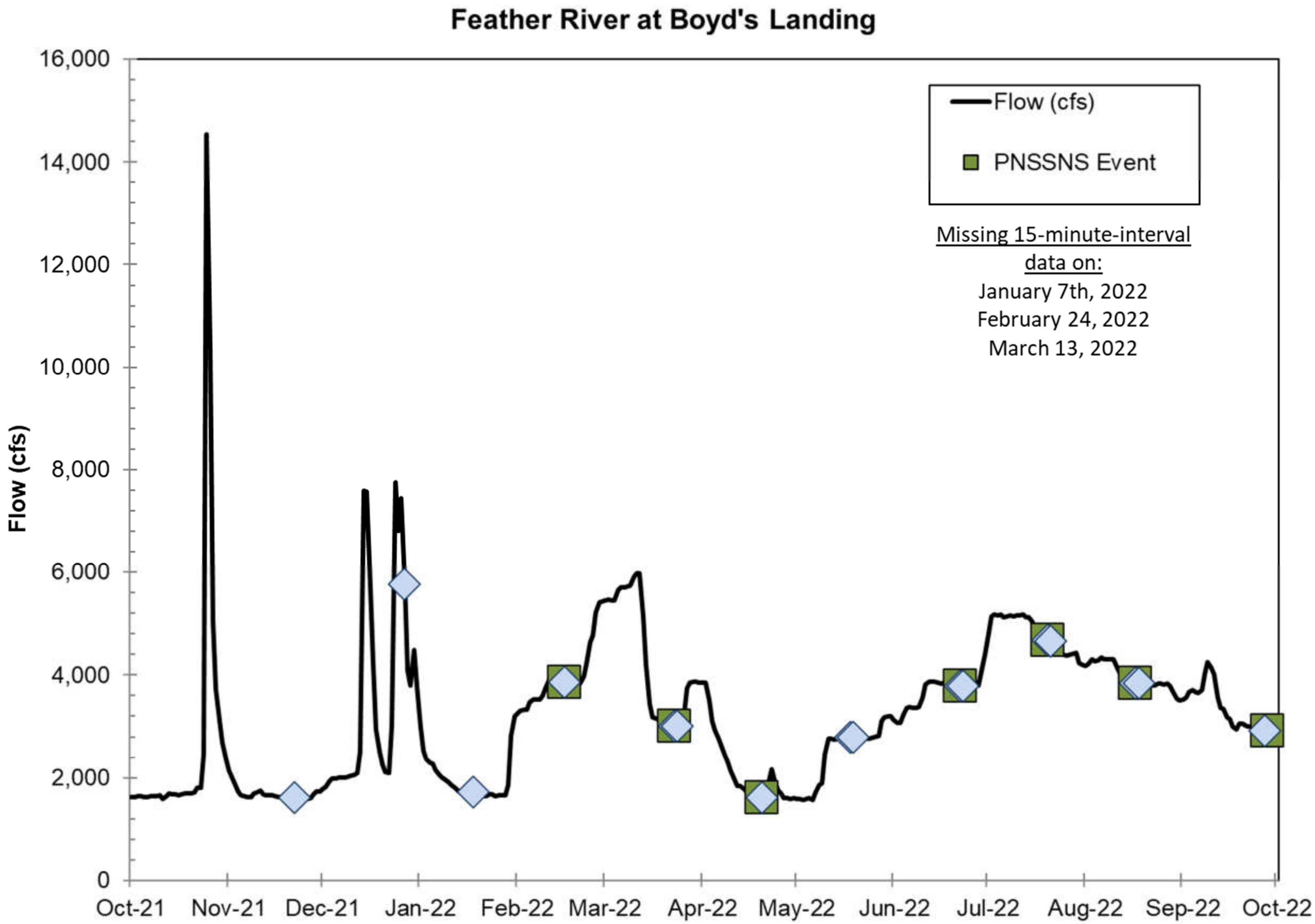

Figure 3-a. Flows during 2022 Coalition Monitoring: Eastern Sacramento Valley

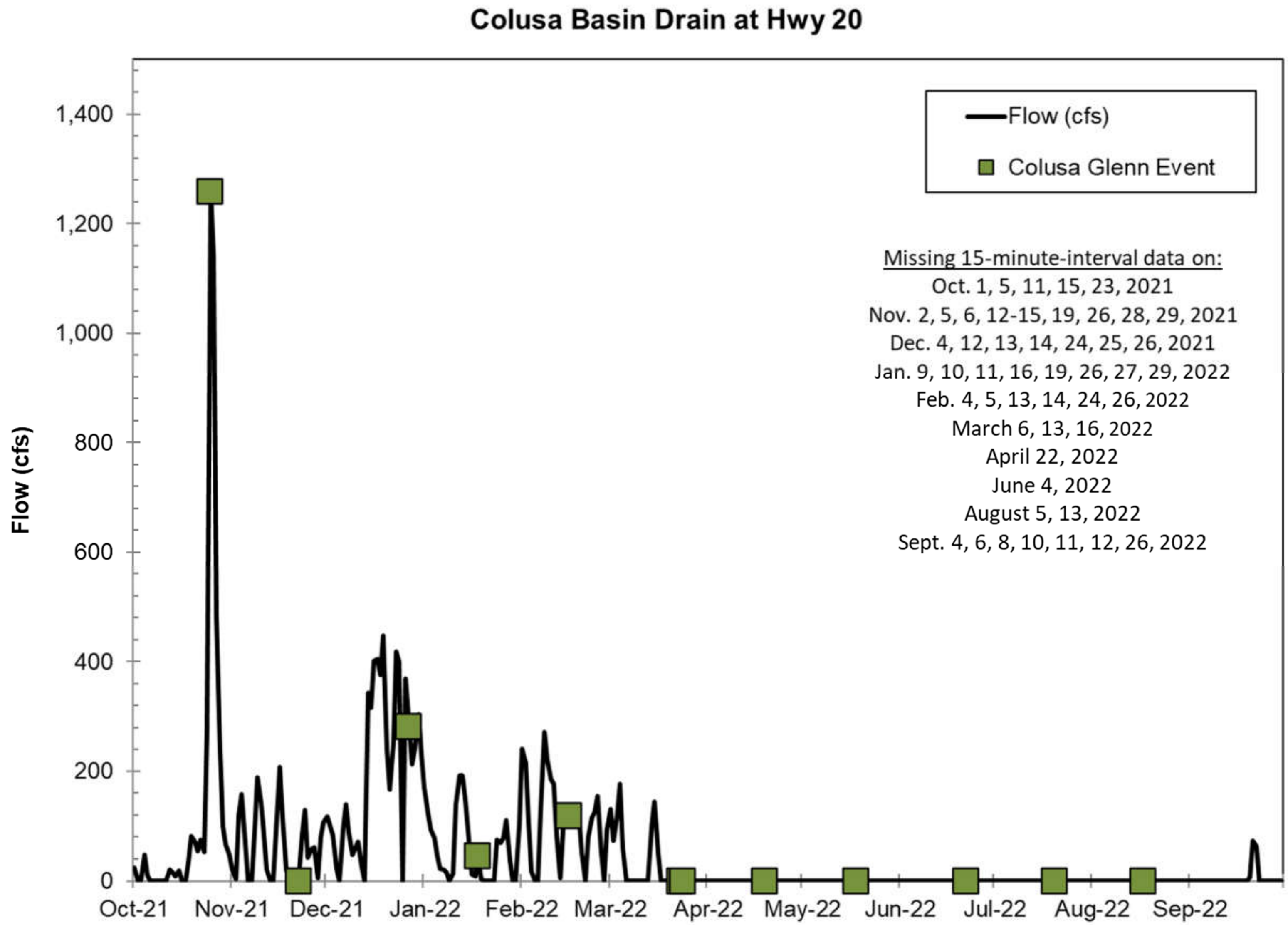

Figure 3-b. Flows during 2022 Coalition Monitoring: Western Sacramento Valley.

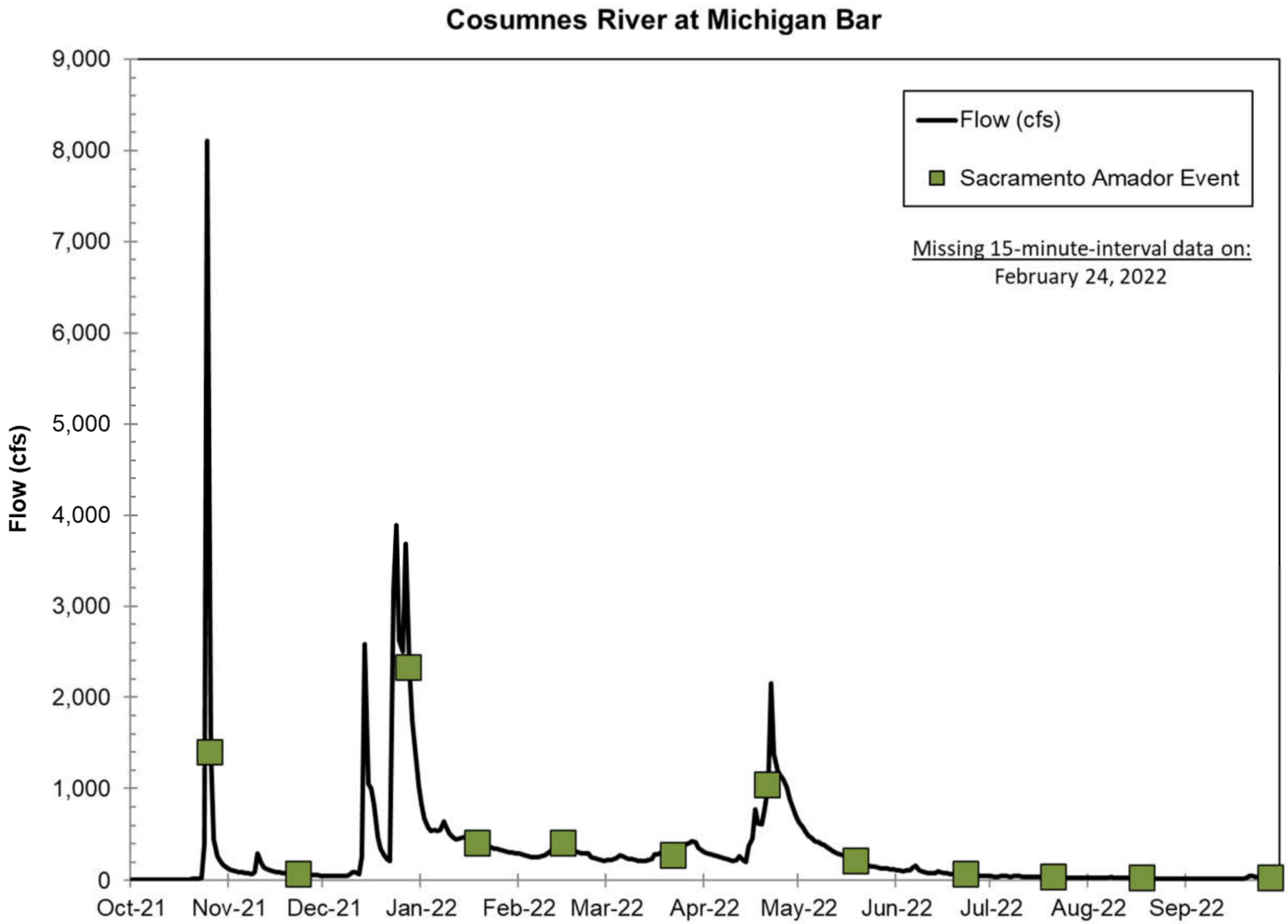

Figure 3-c. Flows during 2022 Coalition Monitoring: Southern Sacramento Valley

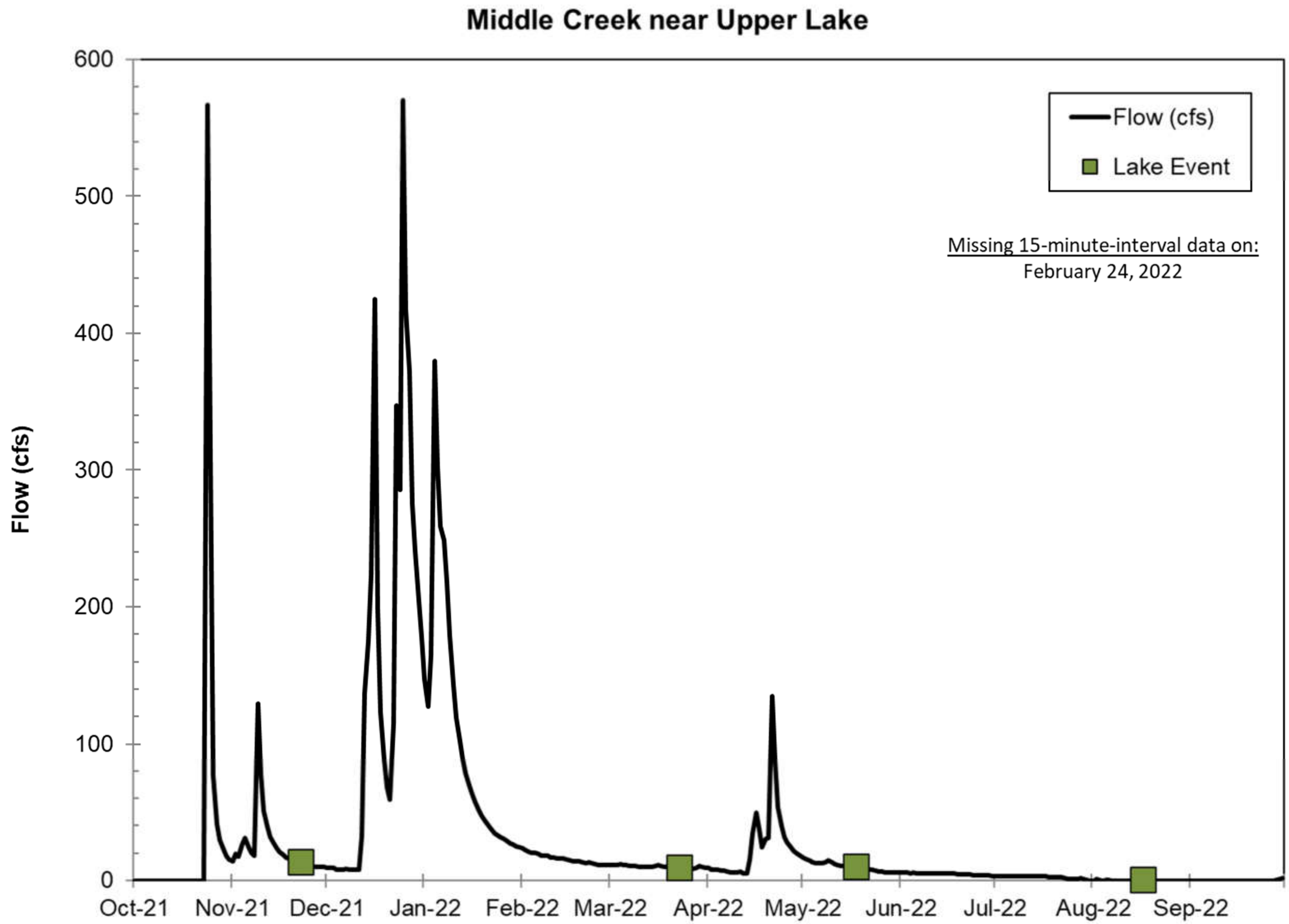

Figure 3-d. Flows during 2022 Coalition Monitoring: Lake County

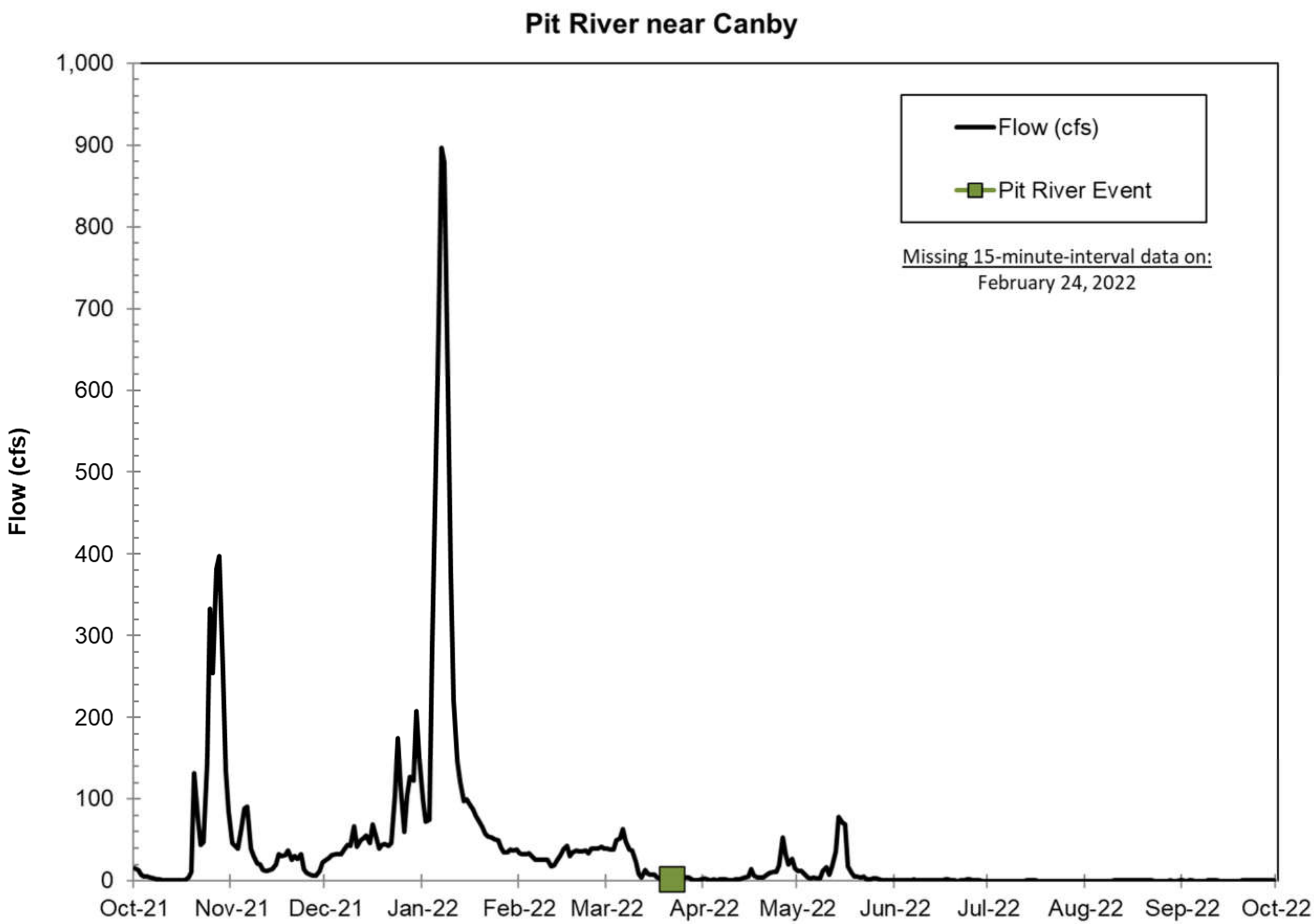

Figure 3-e. Flows during 2022 Coalition Monitoring: Pit River

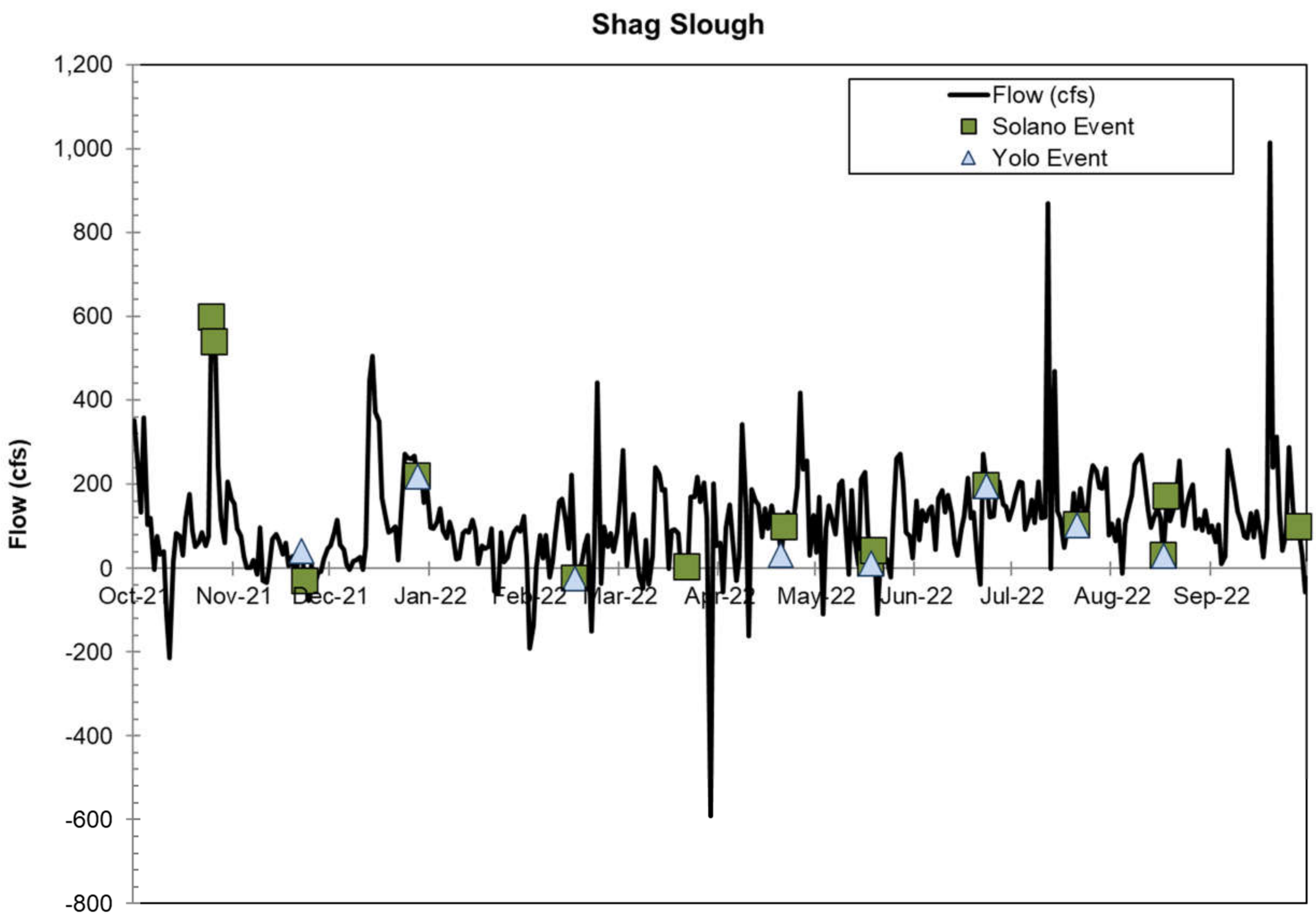

Figure 3-f. Flows during 2022 Coalition Monitoring: Shag Slough

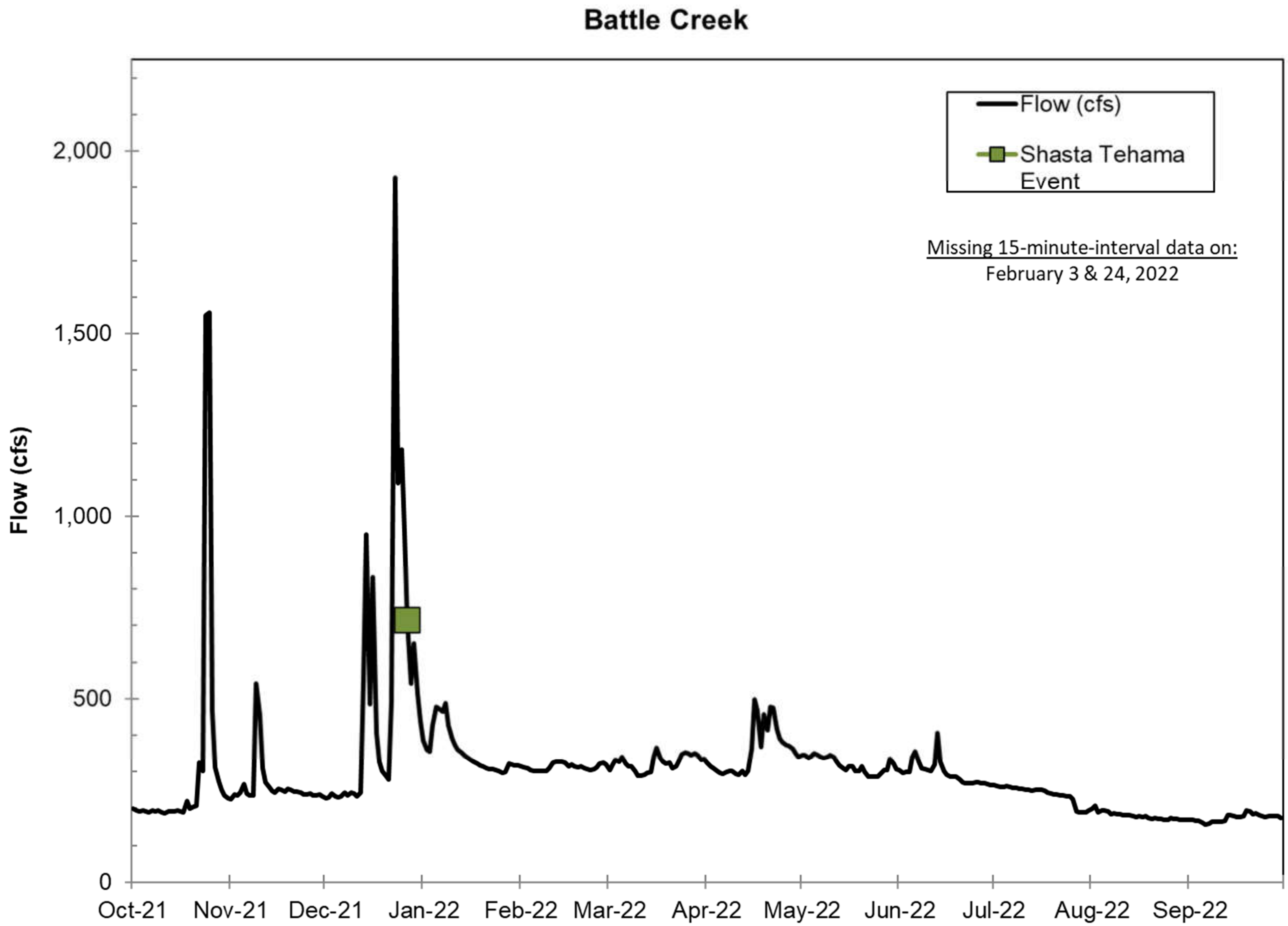

Figure 3-g. Flows during 2022 Coalition Monitoring: Battle Creek

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 2021 through September 2022 are included with the associated 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.

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 the 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, then 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 2021 through September 2022 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., using 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 determine the cause of the elevated temperatures.

- Sample shipments for October 2021 through September 2022 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 described 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, made by either the analyzing laboratory or the Coalition, are presented with the tabulated monitoring data.

Table 9. Summary of QA/QC Results for 2022 Monitoring Year

Field Blank	Field Duplicate	Method or Lab Blank	Lab Control Spike	Lab Control Spike Duplicate	Matrix Spike	Matrix Spike Duplicate	Lab Dup.	Surrogate Recovery
91%	94%	99%	99%	98%	95%	97%	100%	98%

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 environmental and QA/QC data are provided in **Appendix C**. These data were previously submitted as part of the Coalition's quarterly data submittals to the ILRP.

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 or numeric water quality objectives in the Central Valley Basin Plan (CVRWQCB, 2019), subsequent adopted Basin Plan 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 sediment 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 the USEPA's Office of Pesticide Programs (OPP) Ecotoxicity Database (USEPA Ecotox; online database updated regularly) 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 2022 Coalition Monitoring

Analyte	Most Stringent Objective[1]	Units	Objective Source[2]
Ammonia, Total as N	narrative	mg/L	Basin Plan
Atrazine	1	µg/L	1˚ MCL
Chlorpyrifos	0.015	µg/L	Basin Plan
Copper, dissolved	Hardness-dependent[3]	µg/L	CTR
Diazinon	0.10	µg/L	Basin Plan
Dissolved Oxygen	5 [SSO WARM], 7[SSO COLD]	mg/L	Basin Plan
Malathion	0.1[4]	µg/L	Basin Plan
Nitrate, as N[5]	10	mg/L	CA 1˚ MCL
pH	6.5-8.5	-log[H+]	Basin Plan
Pyrethroid Pesticides[6]	1 CGU	----	Basin Plan
Temperature	narrative	°C	Basin Plan
Toxicity, Algae (*Hyalella*) Survival	narrative	% Survival	Basin Plan
Toxicity, Algae (*Selenastrum*) Cell Density	narrative	% Growth	Basin Plan
Toxicity, Water Flea (*Ceriodaphnia*) Survival	narrative	% Survival	Basin Plan
Turbidity	narrative	NTU	Basin Plan

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).
5. Coalition analyzes for Nitrate + Nitrite, as N for comparison to Nitrate, as N water quality objectives.
6. Pyrethroid pesticides considered in the 2017 Central Valley Pyrethroid Pesticides Total Maximum Daily Load and Basin Plan Amendment (Pyrethroid Pesticide BPA) include the following: bifenthrin, cyfluthrin, cypermethrin, esfenvalerate, lambda-cyhalothrin, and permethrin. The ILRP Trigger Limit for the additive concentration of these six pyrethroid pesticides was compared to Coalition water quality results beginning in April 2019.

Table 11. Unadopted Water Quality Limits Used to Interpret Narrative Water Quality Objectives for Analytes Monitored for 2022 Coalition Monitoring

Analyte	Unadopted Limit[1]	Units	Limit Source
Specific Conductivity	700	µS/cm	Ayers and Westcott 1988
E. coli (1)	235	MPN/100mL	Basin Plan Amendment
Carbaryl	2.53	µg/L	USEPA NAWQC
Dichlorvos	0.085	µg/L	Cal/EPA Cancer Potency Factor
Dimethoate	1.0	µg/L	CDPH Notification Level
Diuron	2	µg/L	USEPA Health Advisory
Methomyl	0.52	µg/L	USEPA NAWQC
Paraquat	3.2	µg/L	USEPA IRIS Reference Dose
Simazine	4	µg/L	1˚ MCL

1. Adopted by the Central Valley Water Board but not approved by the State Water Resources Control Board.

Table 12. Analytes Monitored for 2022 Coalition Monitoring without Applicable Adopted or Unadopted Limits

Analytes		
% Solids	Dissolved Organic Carbon	Phosphate as P, Total
Allethrin	Ethalfluralin	Propiconazole
Chloropicrin	Fenpropathrin	Pyridaben
Chlorothalonil	Hardness as CaCO3	Tau-Fluvalinate
Clothianidin	Imidacloprid	Tetramethrin
Deltamethrin	Orthophosphate, as P	Thiamethoxam
Dichlorophenoxyacetic Acid, 2,4-	Oryzalin	Total Organic Carbon
Discharge (flow)	Oxyfluorfen	Total Suspended Solids

PESTICIDE AND TOXICITY RESULTS

A summary of the toxicity and pesticide results from 2022 Coalition monitoring is provided in this section.

Pesticides Detected in Coalition Monitoring

There were 846 individual pesticide results (including 182 field duplicates) generated from 15 sites during 2022 Coalition monitoring. Analyses were conducted for organophosphates, carbamates, organochlorines, insecticides, fungicides, triazines, pyrethroids, and a variety of herbicides. Within these monitored pesticide categories, 13 different pesticides were detected above the MDL out of a total of 77 detected results (including 12 field duplicates). Overall, greater than 91% of all pesticide results were below detection for the 2022 Monitoring Year. 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 as per the Basin Plan).

All pesticides detected in water column samples during 2022 Coalition monitoring are listed in **Table 13**. Pesticides measured in the water column were compared to relevant numeric and narrative water quality objectives and a detailed discussion of all pesticide exceedances observed during 2022 Coalition monitoring is provided in the next section.

Table 13. Pesticides Detected in the Water Column during 2022 Coalition Monitoring

Site	Date	Analyte	Unit	Result[1]	
CCBRW	6/22/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.3
CCBRW	7/20/2022	Imidacloprid	µg/L	DNQ	0.00099
CCBRW	8/17/2022	Imidacloprid	µg/L	DNQ	0.0007
COLDR	10/25/2021	Oxyfluorfen	µg/L	=	0.053
COLDR	10/25/2021	Oxyfluorfen[2]	µg/L	=	0.09
COLDR	3/23/2022	Bifenthrin	ng/L	=	0.6
COLDR	3/23/2022	Bifenthrin[2]	ng/L	=	0.6
COLDR	8/17/2022	Bifenthrin	ng/L	=	0.8
COLDR	8/17/2022	Bifenthrin[2]	ng/L	=	0.6
COLDR	8/17/2022	Imidacloprid	µg/L	DNQ	0.00078
CRTWN	2/15/2022	Oxyfluorfen	µg/L	DNQ	0.125
CRTWN	2/15/2022	Oxyfluorfen[2]	µg/L	=	0.36
FRSHC	2/16/2022	Imidacloprid	µg/L	=	0.0172
FRSHC	6/22/2022	Imidacloprid	µg/L	=	0.00582
FRSHC	**7/20/2022**	**Bifenthrin[3]**	**ng/L**	**=**	**1.1**
FRSHC	8/17/2022	Bifenthrin	ng/L	=	0.7
GIDLR	10/26/2021	Carbaryl	µg/L	=	0.088
GIDLR	2/15/2022	Oxyfluorfen	µg/L	DNQ	0.155
GIDLR	3/22/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.4
GIDLR	4/21/2022	Lambda-Cyhalothrin	ng/L	=	0.8
GIDLR	5/19/2022	Imidacloprid	µg/L	=	0.156
GIDLR	5/19/2022	Thiamethoxam	µg/L	=	0.019
GIDLR	5/19/2022	Thiamethoxam[2]	µg/L	=	0.018
GIDLR	6/23/2022	Imidacloprid	µg/L	=	0.026
GIDLR	6/23/2022	Imidacloprid[2]	µg/L	=	0.0266
GIDLR	7/21/2022	Bifenthrin	ng/L	=	0.9
GIDLR	7/21/2022	Bifenthrin[2]	ng/L	=	0.9

Site	Date	Analyte	Unit	Result[1]	
GIDLR	9/28/2022	Bifenthrin	ng/L	=	0.96
GIDLR	9/28/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.45
LHNCT	**1/18/2022**	**Esfenvalerate/Fenvalerate[3]**	**ng/L**	**=**	**4.9**
LHNCT	**1/18/2022**	**Esfenvalerate/Fenvalerate[2,3]**	**ng/L**	**=**	**5**
LHNCT	**5/19/2022**	**Lambda-Cyhalothrin[3]**	**ng/L**	**=**	**6.2**
LHNCT	6/22/2022	Allethrin	ng/L	DNQ	0.3
LHNCT	6/22/2022	Bifenthrin	ng/L	DNQ	0.4
LHNCT	6/22/2022	Lambda-Cyhalothrin	ng/L	=	0.5
LHNCT	6/22/2022	Tau-Fluvalinate	ng/L	DNQ	0.4
LHNCT	**7/20/2022**	**Bifenthrin[3]**	**ng/L**	**=**	**1**
LHNCT	**7/20/2022**	**Cyfluthrin[3]**	**ng/L**	**=**	**0.6**
LHNCT	8/17/2022	Allethrin	ng/L	DNQ	0.4
LHNCT	8/17/2022	Bifenthrin	ng/L	=	0.7
LHNCT	8/17/2022	Imidacloprid	µg/L	DNQ	0.00081
LSNKR	**1/18/2022**	**Bifenthrin[3]**	**ng/L**	**=**	**0.6**
LSNKR	**1/18/2022**	**Esfenvalerate/Fenvalerate[3]**	**ng/L**	**=**	**1.2**
LSNKR	**5/19/2022**	**Cyfluthrin[3]**	**ng/L**	**=**	**0.7**
LSNKR	**5/19/2022**	**Lambda-Cyhalothrin[3]**	**ng/L**	**=**	**6.8**
LSNKR	6/23/2022	Imidacloprid	µg/L	=	0.0166
LSNKR	6/23/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.3
LSNKR	7/20/2022	Bifenthrin	ng/L	=	0.8
LSNKR	8/18/2022	Imidacloprid	µg/L	DNQ	0.003
LSNKR	9/27/2022	Bifenthrin	ng/L	=	1.3
PNCHY	**6/22/2022**	**Bifenthrin[3]**	**ng/L**	**=**	**1.6**
PNCHY	6/22/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.4
PNCHY	7/20/2022	Bifenthrin	ng/L	=	1
PNCHY	7/20/2022	Esfenvalerate/Fenvalerate	ng/L	DNQ	0.5
PNCHY	7/20/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.4
PNCHY	8/17/2022	Bifenthrin	ng/L	=	3.9
PNCHY	8/17/2022	Esfenvalerate/Fenvalerate	ng/L	DNQ	0.5
PNCHY	8/17/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.4
PNCHY	**9/27/2022**	**Bifenthrin[3]**	**ng/L**	**=**	**5.4**
PNCHY	9/27/2022	Deltamethrin/Tralomethrin	ng/L	=	9.5
PNCHY	**9/27/2022**	**Esfenvalerate/Fenvalerate[3]**	**ng/L**	**=**	**1.6**
PNCHY	9/27/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.3
PNCHY	9/27/2022	Permethrin	ng/L	DNQ	10

Site	Date	Analyte	Unit	Result[1]	
SSKNK	8/18/2022	Imidacloprid	µg/L	DNQ	0.00077
SSLIB	8/18/2022	Imidacloprid	µg/L	DNQ	0.00075
UCBRD	10/26/2021	Bifenthrin	ng/L	=	1.6
UCBRD	10/26/2021	Bifenthrin[2]	ng/L	=	1.6
UCBRD	10/26/2021	Lambda-Cyhalothrin	ng/L	DNQ	0.4
UCBRD	4/21/2022	Bifenthrin[2]	ng/L	DNQ	0.4
UCBRD	7/21/2022	Dichlorophenoxyacetic Acid, 2,4-	µg/L	=	1
UCBRD	7/21/2022	Dichlorophenoxyacetic Acid, 2,4-[2]	µg/L	=	1.2
UCBRD	8/17/2022	Imidacloprid	µg/L	DNQ	0.0029
UCBRD	9/28/2022	Bifenthrin[4]	ng/L	=	0.88
WLKCH	12/27/2021	Oxyfluorfen	µg/L	DNQ	0.11
WLSPL	11/22/2021	Oxyfluorfen	µg/L	DNQ	0.024
WLSPL	2/15/2022	Oxyfluorfen	µg/L	DNQ	0.08
WLSPL	5/18/2022	Lambda-Cyhalothrin	ng/L	DNQ	0.3

BOLD = Exceedance

1. "DNQ" (Detected Not Quantified) indicates that the detected value was less than the quantitation or reporting limit (QL).
2. Sample was collected as a field duplicate.
3. This pyrethroid pesticide contributed to the exceedance of a chronic and/or acute trigger limit included in the Pyrethroid Pesticide BPA. The ILRP Trigger Limit for the additive concentration of six pyrethroid pesticides was compared to Coalition water quality results beginning in April 2019.

Pesticide Exceedances in Coalition Monitoring

Non-pyrethroid pesticides measured in the water column were compared to relevant numeric and narrative water quality objectives. Pyrethroid pesticides were evaluated based on the requirements in the 2017 Pyrethroid Pesticide BPA, which established a conditional prohibition of pyrethroid discharges to Central Valley waterbodies at concentrations above specified aquatic life protection-based concentration triggers (prohibition triggers). The prohibition trigger for pyrethroid pesticides is based on an additive chronic and additive acute concentration goal unit (CGU) of 1 (a unitless value) as required in the Pyrethroid Pesticide BPA. The additive CGU is calculated using the detected concentrations of six pyrethroid pesticides (bifenthrin, cyfluthrin, lambda-cyhalothrin, cypermethrin, esfenvalerate, and permethrin) specified in the Pyrethroid Pesticide BPA and contemporaneous measurements of particulate organic carbon (POC) and dissolved organic carbon (DOC), where POC concentration is derived from total organic carbon (TOC) concentration minus DOC concentration. Pesticide exceedances are listed in **Table 14** and discussed in the sections below.

Table 14. Water Column Pesticide Exceedances during 2022 Coalition Monitoring

Site	Date	Analyte	Unit	Result	Trigger Limit	Basis for Limit
FRSHC	7/20/2022	Pyrethroid Pesticides	CGU chronic	2	1	BPA
LHNCT	1/18/2022	Pyrethroid Pesticides	CGU chronic	2	1	BPA
LHNCT	5/19/2022	Pyrethroid Pesticides	CGU acute, CGU chronic	2, 6	1	BPA
LHNCT	7/20/2022	Pyrethroid Pesticides	CGU chronic	2	1	BPA
LSNKR	1/18/2022	Pyrethroid Pesticides	CGU chronic	2	1	BPA
LSNKR	5/19/2022	Pyrethroid Pesticides	CGU acute, CGU chronic	2, 4	1	BPA
PNCHY	6/22/2022	Pyrethroid Pesticides	CGU chronic	2	1	BPA
PNCHY	9/27/2022	Pyrethroid Pesticides	CGU chronic	3	1	BPA

Description of Pesticide Exceedances

Freshwater Creek

A water column pyrethroid pesticide sample collected at the FRSHC site on July 20, 2022, exceeded the chronic prohibition trigger (chronic CGU = 2). Paired *Hyalella azteca* water column samples were not collected during this event, since Freshwater Creek was not under an approved Pyrethroid Pesticide Management Plan during the 2022 monitoring year. Bifenthrin (1.1 ng/L) was detected above the reporting limit and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that bifenthrin had been ground applied to 1,272 acres of almond and aerially applied to 162 acres of tomato in the six weeks prior to the exceedance. During June and July 2022, non-agricultural applications of bifenthrin in Colusa County comprised 5 applications for structural pest control purposes.

Lower Honcut Creek

Water column samples collected at the LHNCT site on January 18, May 19, and July 20, 2022, exceeded the chronic prohibition trigger for pyrethroid pesticides. All three samples had calculated chronic CGUs equal to 2 and the May sample had a calculated acute CGU equal to 6. The January exceedance was the second exceedance within a three-year period and triggered a Management Plan. Paired water column samples for *Hyalella azteca* toxicity testing were not collected during these events, since Lower Honcut Creek was not under an approved Pyrethroid Pesticide Management Plan during the 2022 monitoring year.

- The January 18, 2022, water sample contained a concentration of esfenvalerate (4.9 ng/L) that was detected above its reporting limit and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that esfenvalerate had been ground applied to 260 acres of prune and 15 acres of peach in the six weeks prior to the exceedance. During

December 2021 and January 2022, non-agricultural esfenvalerate applications (12) in Butte and Yuba Counties primarily were made for structural pest control purposes.

- The May 19, 2022, water sample contained a concentration of lambda-cyhalothrin (6.2 ng/L) that was detected above its reporting limit and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that lambda-cyhalothrin had been aerially applied to 1,606 acres of rice and ground applied to 121 acres of peach and 41 acres of prune in the six weeks prior to the exceedance. During April and May 2022, non-agricultural lambda-cyhalothrin applications (52) in Butte and Yuba Counties primarily were made for structural pest control purposes.
- The July 20, 2022, water sample contained concentrations of bifenthrin (1.0 ng/L) and cyfluthrin (0.6 ng/L) that were both detected above their reporting limits and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that bifenthrin had been ground applied to 34 acres of almond. There were no agricultural applications of cyfluthrin proximate to the monitoring site. During June and July 2022, non-agricultural applications of bifenthrin in Butte and Yuba counties comprised 120 applications and were primarily applied for structural pest control purposes. Cyfluthrin was only used six times in Yuba County for structural pest control.

Lower Snake River

Water column samples collected at the LSNKR site on January 18 and May 19, 2022, exceeded the chronic prohibition trigger. Both samples had calculated chronic CGUs equal to 2 and the May sample had a calculated acute CGU equal to 4. Paired water column samples for *Hyalella azteca* toxicity testing were not collected during these events, since Lower Snake River was not yet under an approved Pyrethroid Pesticide Management Plan during the 2022 monitoring year.

- The January 18, 2022, water sample contained concentrations of bifenthrin (0.6 ng/L) and esfenvalerate (1.2 ng/L) that were both detected above their reporting limits and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that bifenthrin had been ground applied to 20 acres of walnut in the six weeks prior to the exceedance. Esfenvalerate was ground applied to 826 acres of peach, 604 acres of prune, and 167 acres of almond. During December 2021 and January 2022, non-agricultural applications of bifenthrin and esfenvalerate in Sutter County were made for structural pest control purposes. Bifenthrin applications (56) far outnumbered esfenvalerate applications (3).
- The May 19, 2022, water sample contained concentrations of cyfluthrin (0.7 ng/L) and lambda-cyhalothrin (6.8 ng/L) that were both detected above their reporting limits and factored into the exceedance of the prohibition trigger. The remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that lambda-cyhalothrin had been aerially applied to 2,348 acres and ground applied to 92 acres of rice in the six weeks prior to the exceedance. Additionally, the pyrethroid pesticide had been ground applied to 215 acres of peaches in the six weeks prior to the exceedance.

There were no applications of cyfluthrin that were made proximate to the LSNKR site. During April and May 2022, non-agricultural applications of cyfluthrin and lambda-cyhalothrin in Sutter County were made for structural pest control purposes. Lambda-cyhalothrin applications (27) far outnumbered cyfluthrin applications (4).

Pine Creek

Water column samples collected at the PNCHY site on June 22 and September 27, 2022, exceeded the chronic prohibition trigger. The June sample had a calculated chronic CGU equal to 2 and the September sample had a calculated chronic CGU equal to 3. Paired water column samples for *Hyalella azteca* toxicity testing were not collected during these events, since Pine Creek was not yet under an approved Pyrethroid Pesticide Management Plan during the 2022 monitoring year.

- The June 22, 2022, water sample contained a concentration of bifenthrin (1.6 ng/L) that was detected above its reporting limit and factored into the exceedance of the prohibition trigger. Lambda-cyhalothrin was reported as DNQ and the remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that bifenthrin had been ground applied to 227 acres of pistachio in the six weeks prior to the exceedance. During May and June 2022, non-agricultural applications of bifenthrin in Butte County comprised 81 total applications, 77 for structural pest control and 4 for landscape maintenance purposes.
- The September 27, 2022, water sample contained concentrations of bifenthrin (5.4 ng/L) and esfenvalerate (1.6 ng/L) that were both detected above their reporting limits and factored into the exceedance of the prohibition trigger. Lambda-cyhalothrin and permethrin were reported as DNQ and the remaining pyrethroid pesticides were all non-detect. A review of relevant PUR data showed that bifenthrin had been ground applied to 103 acres of walnut in the six weeks prior to the exceedance. There were no reported agricultural applications of esfenvalerate. During August and September 2022, non-agricultural applications of bifenthrin in Butte County comprised 63 total applications, 53 for structural pest control and 10 for landscape maintenance purposes. There were no reported non-agricultural applications of esfenvalerate.

Toxicity Exceedances in Coalition Monitoring

There were 117 individual toxicity results (including 22 field duplicates) for *Selenastrum capricornutum* (41 analyses) and *Ceriodaphnia dubia* (76 analyses) produced from water column samples collected at eight sites during 2022 Coalition monitoring. A single analysis for *Selenastrum capricornutuem* was found to be toxic at the WLSPL site on February 15, 2022. There were also seven water column bioassays (including two field duplicates) for *Hyalella azteca* that were conducted as follow-up monitoring for the Pyrethroid Pesticide BPA. Toxicity was not observed in any of the samples.

There were 24 analyses (including three field duplicates) performed to evaluate sediment toxicity to *Hyalella azteca* across 12 sites during 2022 Coalition monitoring. Nine of these analyses (including one field duplicate) were found to be toxic. These exceedances along with the single water column toxicity exceedance are summarized in **Table 15**.

Table 15. Water Column and Sediment Toxicity Exceedances during 2022 Coalition Monitoring

Site	Date	Analyte	Matrix	% of Control	Follow-up Chemistry (ng/g dw)
WLSPL	2/15/2022	*Selenastrum capricornutum*	Water	80.8	N/A
LHNCT	4/20/2022	*Hyalella azteca*	Sediment	76.5	bifenthrin (0.58 DNQ)
LSNKR	4/20/2022	*Hyalella azteca*	Sediment	22.4	bifenthrin (0.74 DNQ) lambda-cyhalothrin (0.1 DNQ)
FRSHC	4/19/2022	*Hyalella azteca*	Sediment	28.4	ND
CCBRW	4/20/2022	*Hyalella azteca*	Sediment	75.0	bifenthrin (1.2)
WLSPL	4/20/2022	*Hyalella azteca*	Sediment	76.5	bifenthrin (3.7) lambda-cyhalothrin (3.6) permethrin (0.85 DNQ)
UCBRD	4/21/2022	*Hyalella azteca*	Sediment	40.3	bifenthrin (0.32 DNQ) lambda-cyhalothrin (0.11 DNQ)
CRTWN	4/21/2022	*Hyalella azteca*	Sediment	59.7	ND
GIDLR	4/21/2022	*Hyalella azteca*	Sediment	76.5	lambda-cyhalothrin (1.6 DNQ)
UCBRD	4/21/2022	*Hyalella azteca*	Sediment	31.3	bifenthrin (0.32 DNQ)

OTHER COALITION-MONITORED WATER QUALITY PARAMETERS

Exceedances of adopted Basin Plan objectives, California Toxic Rule (CTR) criteria, or ILRP Trigger Limits were observed for specific conductivity, dissolved oxygen, *E. coli*, pH, ammonia as N, and trace metals during 2022 Coalition monitoring (see **Table 16**).

Specific Conductivity

Specific conductivity was monitored in 95 samples from 17 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˚ Maximum Contaminant Limit (MCL) (900 µS/cm) for drinking water in 13 of the 23 exceedances. Exceedances were observed at five sites.

Dissolved Oxygen

During 2022 Coalition monitoring, dissolved oxygen was measured in 91 samples at 17 Coalition sites. A total of two 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. No samples exceeded the WARM Basin Plan limit with measured dissolved oxygen concentrations below 5.0 mg/L for waterbodies with a WARM designated beneficial use.

Dissolved oxygen exceedances are generally 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 in oxygen production by in-stream algae and macrophytes and trap organic materials that increase in-stream oxygen consumption (especially, during nighttime respiration).

E. coli Bacteria

E. coli bacteria were analyzed in 101 environmental samples, including 12 field duplicates, from 14 Coalition sites. *E. coli* results exceeded the single sample maximum objective (235 MPN/100mL) in 30 environmental samples, including three field duplicates, from 11 Coalition monitoring locations.

The Basin Plan's indicator bacteria 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 2022 Coalition monitoring, pH was measured in 95 samples from 17 Coalition sites. pH exceeded the Basin Plan maximum of 8.5 standard pH units (-log[H+]) in one sample.

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 minerals that contribute to water hardness, 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 likely were due primarily to in-stream algal and/or vascular plant respiration, caused in part by low flows or ponded and stagnant conditions, and temperatures sufficient to stimulate plant and algal growth.

Copper

Copper, both filtered (dissolved) and unfiltered (total), was monitored during 2022 Coalition monitoring at 13 sites. Total copper was analyzed in 36 environmental samples, including six field duplicates, while dissolved copper was analyzed in 31 environmental samples, including one field duplicate. There was a single dissolved copper concentration of 10 µg/L at the WLKCH site that exceeded the hardness based CTR freshwater aquatic life-calculated criteria of 8.65 µg/L.

Ammonia, as N

Ammonia as nitrogen (as N) was analyzed in 101 environmental samples, including 12 field duplicates, at 14 Coalition sites. One ammonia exceedance occurred at the LSNKR site, where a measured concentration of 0.24 mg/L as N exceeded the pH- and temperature-dependent 2013 USEPA NRWQC-CCC criterion of 0.21 mg/L as N.

Nitrate + Nitrite, as N

Nitrate + Nitrite (as N) was analyzed in 101 environmental samples, including 12 field duplicates, at 14 Coalition sites. Three nitrate + nitrite concentrations (including one field duplicate) at the GIDLR site exceeded the Title 22 1˚ MCL of 10 mg/L as N.

Table 16. Other Physical, Chemical, and Microbiological Parameters Observed to Exceed Numeric Objectives in 2022 Coalition Monitoring

Site ID	Date	Analyte	Unit	Result		Trigger Limit[1]	Basis for Limit[2]	Management Plan[3]
LSNKR	3/23/2022	Ammonia, Total as N	mg/L	=	0.24	0.21	2013 NRWQC-CCC	No
WLKCH	10/25/2021	Copper	µg/L	=	10	8.65	CTR FW AQ Chronic	No
PNCHY	11/22/2021	Dissolved Oxygen	mg/L	=	6.6	7	BP [SSO COLD]	Active
WLSPL	5/18/2022	Dissolved Oxygen	mg/L	=	6.46	7	BP [SSO COLD]	Active
COLDR	10/25/2021	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
SSLIB	10/25/2021	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
WLKCH	10/25/2021	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
GIDLR	10/26/2021	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
UCBRD	10/26/2021	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
GIDLR	11/23/2021	E. coli	MPN/100mL	=	248.9	235	BP	Suspended
LHNCT	12/27/2021	E. coli	MPN/100mL	=	325.5	235	BP	Suspended
GIDLR	12/28/2021	E. coli	MPN/100mL	=	275.5	235	BP	Suspended
UCBRD	12/28/2021	E. coli	MPN/100mL	=	387.3	235	BP	Suspended
UCBRD	3/22/2022	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
WLSPL	3/23/2022	E. coli	MPN/100mL	=	325.5	235	BP	Suspended
CCBRW	4/20/2022	E. coli	MPN/100mL	=	488.4	235	BP	Suspended
GIDLR	4/21/2022	E. coli	MPN/100mL	=	816.4	235	BP	Suspended
UCBRD	4/21/2022	E. coli	MPN/100mL	=	574.8	235	BP	Suspended
FRSHC	5/18/2022	E. coli	MPN/100mL	=	770.1	235	BP	Suspended
UCBRD	5/18/2022	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
WLSPL	5/18/2022	E. coli	MPN/100mL	=	235.9	235	BP	Suspended
GIDLR	5/19/2022	E. coli	MPN/100mL	=	313	235	BP	Suspended

Site ID	Date	Analyte	Unit	Result		Trigger Limit[1]	Basis for Limit[2]	Management Plan[3]
SSKNK	5/19/2022	E. coli	MPN/100mL	=	770.1	235	BP	Suspended
FRSHC	7/20/2022	E. coli	MPN/100mL	=	613.1	235	BP	Suspended
GIDLR	7/21/2022	E. coli	MPN/100mL	=	435.2	235	BP	Suspended
UCBRD	7/21/2022	E. coli	MPN/100mL	=	816.4	235	BP	Suspended
UCBRD	8/17/2022	E. coli	MPN/100mL	=	1299.7	235	BP	Suspended
GIDLR	8/18/2022	E. coli	MPN/100mL	=	325.5	235	BP	Suspended
PNCHY	9/27/2022	E. coli	MPN/100mL	>	2419.6	235	BP	Suspended
GIDLR	9/28/2022	E. coli	MPN/100mL	=	524.7	235	BP	Suspended
UCBRD	9/28/2022	E. coli	MPN/100mL	=	816.4	235	BP	Suspended
GIDLR	10/26/2021	E. coli[5]	MPN/100mL	>	2419.6	235	BP	Suspended
UCBRD	4/21/2022	E. coli[5]	MPN/100mL	=	727	235	BP	Suspended
UCBRD	9/28/2022	E. coli[5]	MPN/100mL	=	980.4	235	BP	Suspended
GIDLR	10/26/2021	Nitrate + Nitrite, as N	mg/L	=	18	10	1˚ MCL	Triggered
GIDLR	12/28/2021	Nitrate + Nitrite, as N	mg/L	=	20	10	1˚ MCL	Triggered
GIDLR	10/26/2021	Nitrate + Nitrite, as N[5]	mg/L	=	18	10	1˚ MCL	Triggered
LSNKR	3/23/2022	pH	-log[H+]	=	8.6	6.5-8.5	BP	Active
GIDLR	10/26/2021	Specific Conductivity	µS/cm	=	751	700, 900[(4)]	Narrative	Active
WLSPL	11/22/2021	Specific Conductivity	µS/cm	=	1073	700, 900[(4)]	Narrative	Active
GIDLR	11/23/2021	Specific Conductivity	µS/cm	=	970	700, 900[(4)]	Narrative	Active
UCBRD	11/23/2021	Specific Conductivity	µS/cm	=	1074	700, 900[(4)]	Narrative	Active
GIDLR	12/28/2021	Specific Conductivity	µS/cm	=	1482	700, 900[(4)]	Narrative	Active
FRSHC	1/18/2022	Specific Conductivity	µS/cm	=	763	700, 900[(4)]	Narrative	Active
UCBRD	2/15/2022	Specific Conductivity	µS/cm	=	1054	700, 900[(4)]	Narrative	Active
WLSPL	2/15/2022	Specific Conductivity	µS/cm	=	1540	700, 900[(4)]	Narrative	Active

Site ID	Date	Analyte	Unit	Result		Trigger Limit[1]	Basis for Limit[2]	Management Plan[3]
FRSHC	2/16/2022	Specific Conductivity	µS/cm	=	791	700, 900[(4)]	Narrative	Active
COLDR	3/23/2022	Specific Conductivity	µS/cm	=	728	700, 900[(4)]	Narrative	Active
WLSPL	3/23/2022	Specific Conductivity	µS/cm	=	1021	700, 900[(4)]	Narrative	Active
WLSPL	4/20/2022	Specific Conductivity	µS/cm	=	1251	700, 900[(4)]	Narrative	Active
UCBRD	4/21/2022	Specific Conductivity	µS/cm	=	857	700, 900[(4)]	Narrative	Active
COLDR	5/18/2022	Specific Conductivity	µS/cm	=	930	700, 900[(4)]	Narrative	Active
UCBRD	5/18/2022	Specific Conductivity	µS/cm	=	797	700, 900[(4)]	Narrative	Active
WLSPL	5/18/2022	Specific Conductivity	µS/cm	=	1108	700, 900[(4)]	Narrative	Active
UCBRD	6/23/2022	Specific Conductivity	µS/cm	=	1116	700, 900[(4)]	Narrative	Active
WLSPL	6/23/2022	Specific Conductivity	µS/cm	=	1256	700, 900[(4)]	Narrative	Active
FRSHC	7/20/2022	Specific Conductivity	µS/cm	=	785	700, 900[(4)]	Narrative	Active
UCBRD	7/21/2022	Specific Conductivity	µS/cm	=	887	700, 900[(4)]	Narrative	Active
COLDR	8/17/2022	Specific Conductivity	µS/cm	=	1590	700, 900[(4)]	Narrative	Active
UCBRD	8/17/2022	Specific Conductivity	µS/cm	=	757	700, 900[(4)]	Narrative	Active
UCBRD	9/28/2022	Specific Conductivity	µS/cm	=	875	700, 900[(4)]	Narrative	Active

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 parameters 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. Sample was collected as a field duplicate.

Trend Analysis

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

"… identify potential trends[10] 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 trend analysis analyzes data from all Coalition ILRP water quality sampling events from 2005 through September 2022 at both representative and integration monitoring sites. The analytes that are included in the analysis are the following:

- Were measured in samples collected at representative and integration monitoring sites in 2022.
- All field measurements, conventional, nutrient, bacteriological and trace metal analyses.
  - Dissolved Oxygen
  - pH
  - Specific Conductivity
  - Temperature
  - Hardness as CaCO3
  - Total Organic Carbon
  - Dissolved Organic Carbon
  - Total Suspended Solids
  - Turbidity
  - Ammonia, Total as N
  - Nitrate+Nitrite, as N
  - Orthophosphate, as P
  - Phosphorus as P, Total
  - *Escherichia coli*
  - Copper, Total and Dissolved fractions

[10] "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."

- Pesticides that were analyzed during the 2022 monitoring year and had a detection rate ≥5% [11], based on the combined data for all representative and integration sites.
    - Bifenthrin
    - Carbaryl
    - Dichlorophenoxyacetic Acid, 2,4-
    - Esfenvalerate/Fenvalerate
    - Imidacloprid
    - Lambda-Cyhalothrin
    - Oxyfluorfen
    - Thiamethoxam
- Toxicity analyses that were performed during the 2022 monitoring year as required by the WDR in an Assessment year.
    - *Ceriodaphnia dubia* in water column
    - *Selenastrum capricornutum* in water column
    - *Hyalella azteca* in sediment

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 was coded as the minimum detection limit of all data available per site per parameter for initial non-parametric Spearman's evaluation.
    - Data were analyzed separately for each site for all parameters.
    - 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.

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

- Plots were reviewed for potential detection limit artifacts, and, if necessary, replotted without high detection limit non-detect data for a few parameters.
- Reviewed for potential outliers.
- Linear, log-linear, or robust linear regression were conducted (data below detection was coded as the minimum detection limits), and the 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 2022 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 2021 were incorporated into the 2022 Monitoring Plan Update that was approved by the Regional Water Board.

Summary of Initial Spearman's Test Results

- 495 site-parameter combinations were evaluated.
- 329 results were not significant ($p \geq 0.05$).
- 70 results were not significant due to insufficient detected data.
- 96 results were initially determined to have potentially significant trends ($p<0.05$).
    - 50 significant results were identified for trends with no potential negative impacts (i.e., they indicated potentially improving water quality).
    - 46 initially significant results were identified as suggesting potential water quality degradation with potential negative impacts on beneficial uses and were further evaluated.
- Of the 46 significant results suggesting potential water quality degradation, eleven 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. Plots illustrating these relationships are included in **Appendix G**.
- 25 results (~5% of the beginning number of evaluations) were determined to have significant increasing or decreasing trends suggesting potential water quality degradation (see **Table 17**) and were evaluated further.

Table 17. Significant Trends Further Evaluated for Potential Water Quality Degradation

Category	Analyte	Site Name
Physical	Dissolved Organic Carbon	Willow Slough Bypass at Pole Line
	Dissolved Oxygen	Lower Snake River at Nuestro Rd
		Sacramento Slough near Karnak
		Ulatis Creek at Brown Road
		Willow Slough Bypass at Pole Line
	pH	Pope Creek upstream of Lake Berryessa
	Temperature	Pope Creek upstream of Lake Berryessa
	Total Organic Carbon	Colusa Basin Drain above Knight's Landing
		Pine Creek at Highway 32
		Willow Slough Bypass at Pole Line
	Total Suspended Solids	Grand Island Drain near Leary Road
	Turbidity	Grand Island Drain near Leary Road
Nutrients	Ammonia	Colusa Basin Drain above Knight's Landing
		Coon Creek at Brewer Road
		Lower Snake River at Nuestro Road
		Sacramento Slough near Karnak
		Ulatis Creek at Brown Road
		Willow Slough Bypass at Pole Line Road
	Dissolved Orthophosphate	Ulatis Creek at Brown Road
	Phosphorus	Pine Creek at Highway 32
		Ulatis Creek at Brown Road
Pesticides	Bifenthrin	Lower Honcut Creek at Highway 70
		Lower Snake River at Nuestro Road
	Lambda-Cyhalothrin	Coon Creek at Brewer Road
Toxicity	*Hyalella* Survival	Walker Creek near 99W and CR33

Most of the significant trends indicating potential water quality degradation (12 of 25 trends) were for physical parameters (dissolved oxygen, pH, temperature, total organic carbon, dissolved organic carbon, turbidity, total suspended solids). Patterns in these physical parameters 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 during assessment years.

Nine of the significant increasing trends that were evaluated further were associated with nutrients (ammonia, dissolved orthophosphate, phosphorus). Dissolved orthophosphate exhibited a significant increasing trend in samples from Ulatis Creek and phosphorus exhibited a significant increasing trend in samples from Pine Creek and Ulatis Creek. There is no specific trigger limit or water quality objective associated with either of these constituents, and the observed concentrations and short-term trends did not suggest a need for additional monitoring events or locations. Ammonia had significantly increasing trends at six sites (Colusa Basin Drain, Coon Creek, Lower Snake River, Sacramento Slough, Ulatis Creek, and Willow Slough). With the exception of Willow Slough, the trends did not exhibit elevated concentrations that would represent a longer-term trend of degradation. The significantly increasing ammonia trend at Willow Slough (**Figure 4**) is due to elevated spring-time concentrations that have excceded the 2013 NRWQC-CCC trigger and triggered a Management Plan for ammonia. The Coalition is currently investigating the source of the eleveated ammonia concentrations.

There are three sites that had significantly increasing trends for pyrethroid pesticides. Lower Honcut Creek (**Figure 4-b**) and Lower Snake River (**Figure 4-c**) both had significantly increasing trends for bifenthrin and Coon Creek (**Figure 4-d**) had a significantly increasing trend for lambda-cyhalothrin. Both Lower Honcut Creek and Lower Snake River are operating undering Management Plan for pyrethroid pesticides and will be conducting sufficient monitoring to track this trend. The increasing trend for Coon Creek is due to three detected concentrations of lambda-cyhalothrin, with one of the detections being high enough to contribute to an exceedance. Monitoring for lambda-cyhalothrin during assessment years will be sufficient for tracking this trend.

A significant decreasing trend in *Hyalella* survival was observed for Walker Creek (**Figure 4-e**). The trend appeared to be primarily due to a single exceedance in 2019. Due to the drought in recent years, Walker Creek has often been dry during the months when sediment sampling occurs. Monitoring during future asssessment years will confirm whether this trend has a potential for degradation.

In summary, the results of the trend analyses conducted for this AMR did not indicate a need for monitoring any additional locations, events, or parameters during a future monitoring year. The adoption of the Pesticides Evaluation Protocol has already expanded the number of parameters that the Coalition analyzes. We recommend that the modified trend analysis no longer be performed during non-assessment years and that the full trend analysis approach be performed following the completion of a single assessment year[12]. The 2023 and 2024 Monitoring Years are both designated as core years (i.e., non-assessment), so the next trend analysis is recommended to be performed following the completion of the 2025 Monitoring Year and included in the AMR to be submitted on May 1, 2026.

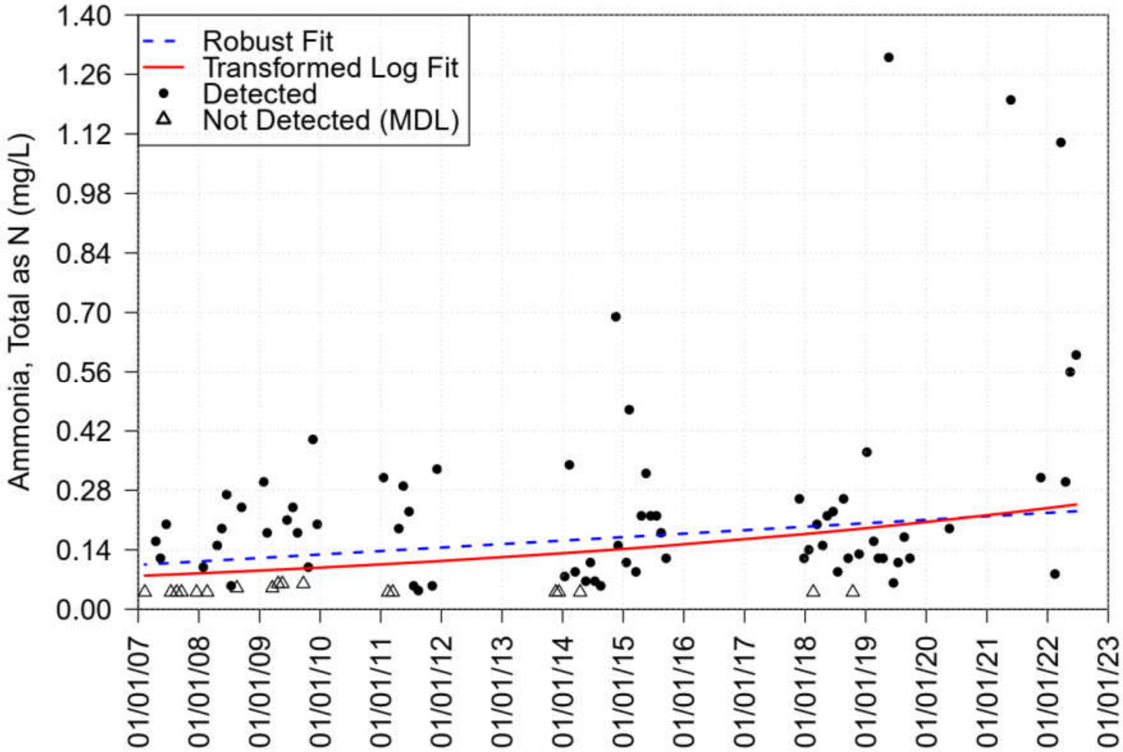

Figure 4-a. Ammonia, Total as N, Willow Slough at Pole Line Road

[12] The Sacramento Valley Water Quality Coalition was approved by the Central Valley Water Board for a 3-year cycle of Assessment-Core-Core monitoring on 14 February 2022. The revised monitoring schedule began with the 2022 Assessment Year (October 2021- September 2022) followed by core monitoring during the 2023 Monitoring Year (October 2022 – September 2023) and 2024 Monitoring Year (October 2023 – September 2024).

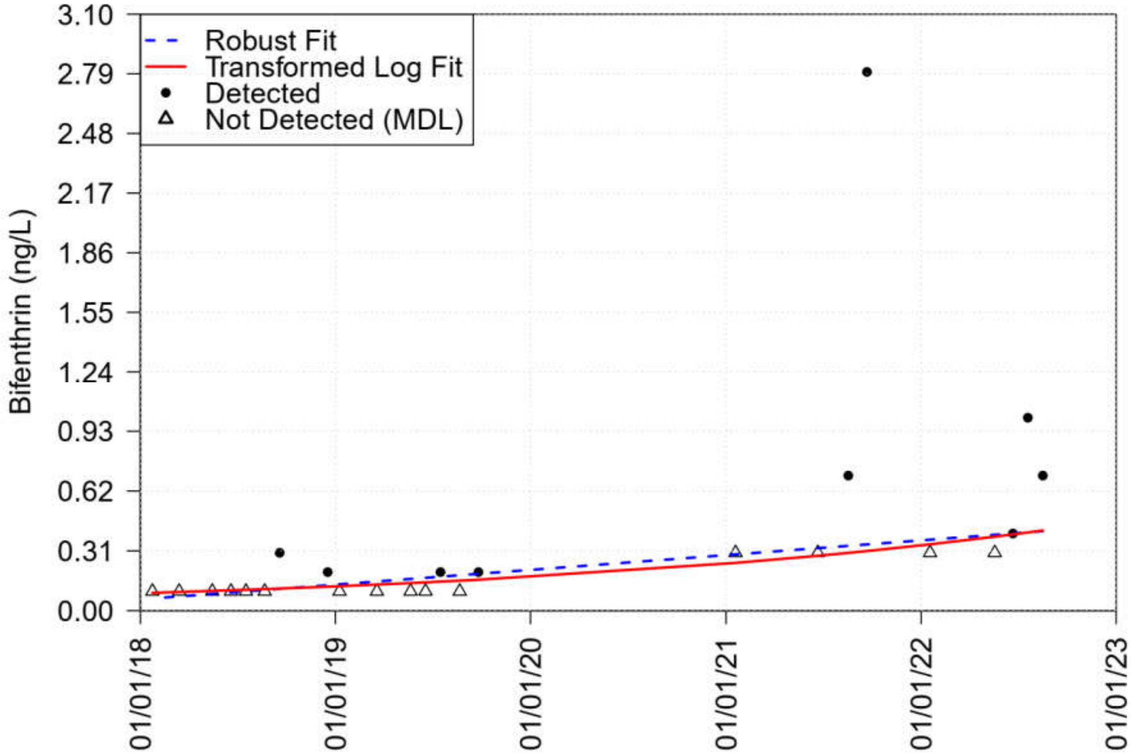

Figure 4-b. Bifenthrin, Lower Honcut Creek at Highway 70

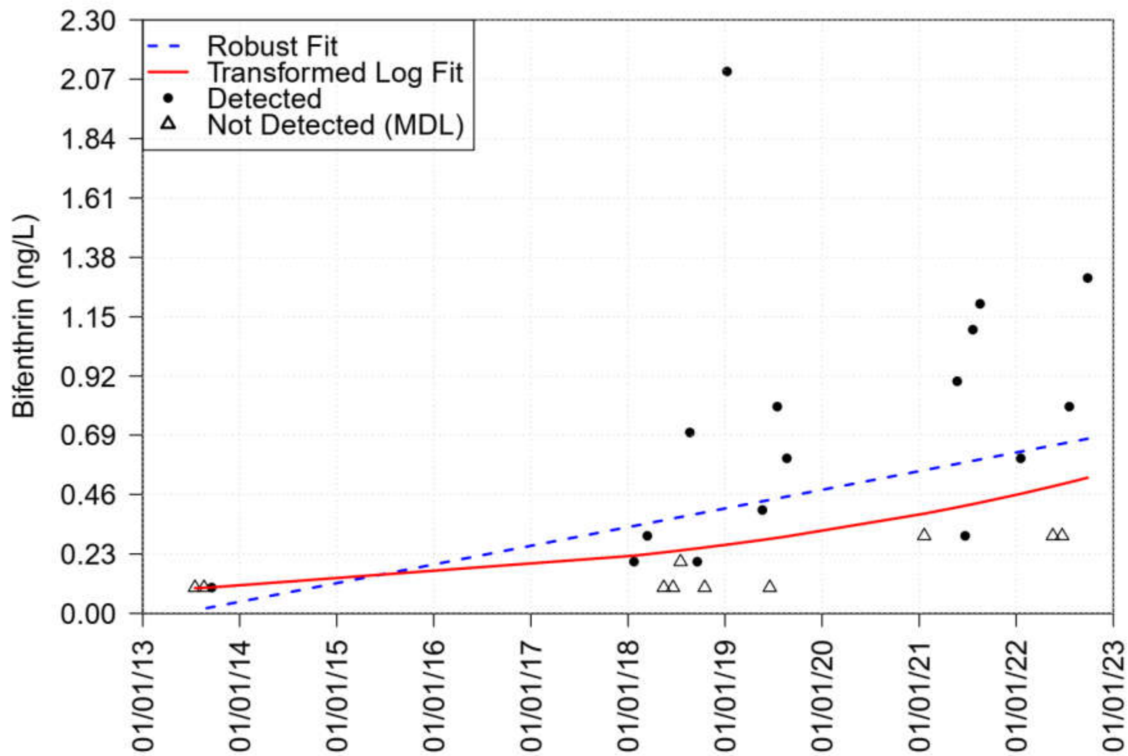

Figure 4-c. Bifenthrin, Lower Snake River at Nuestro Road

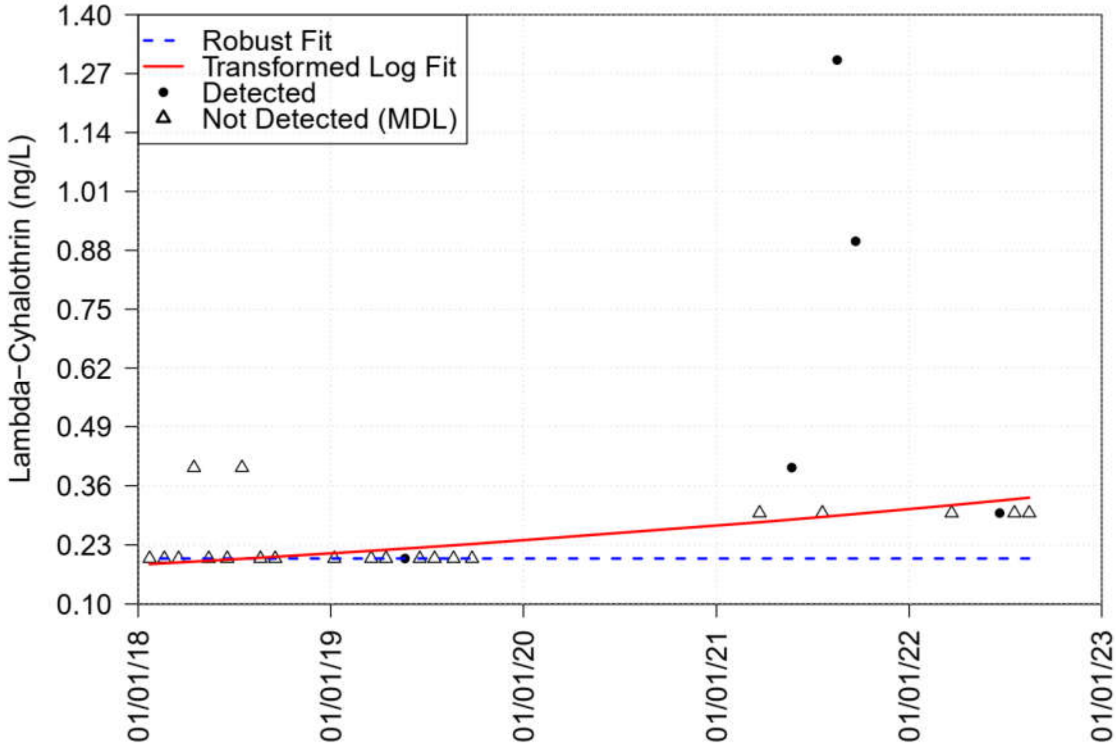

Figure 4-d. Lambda-Cyhalothrin, Coon Creek at Brewer Road

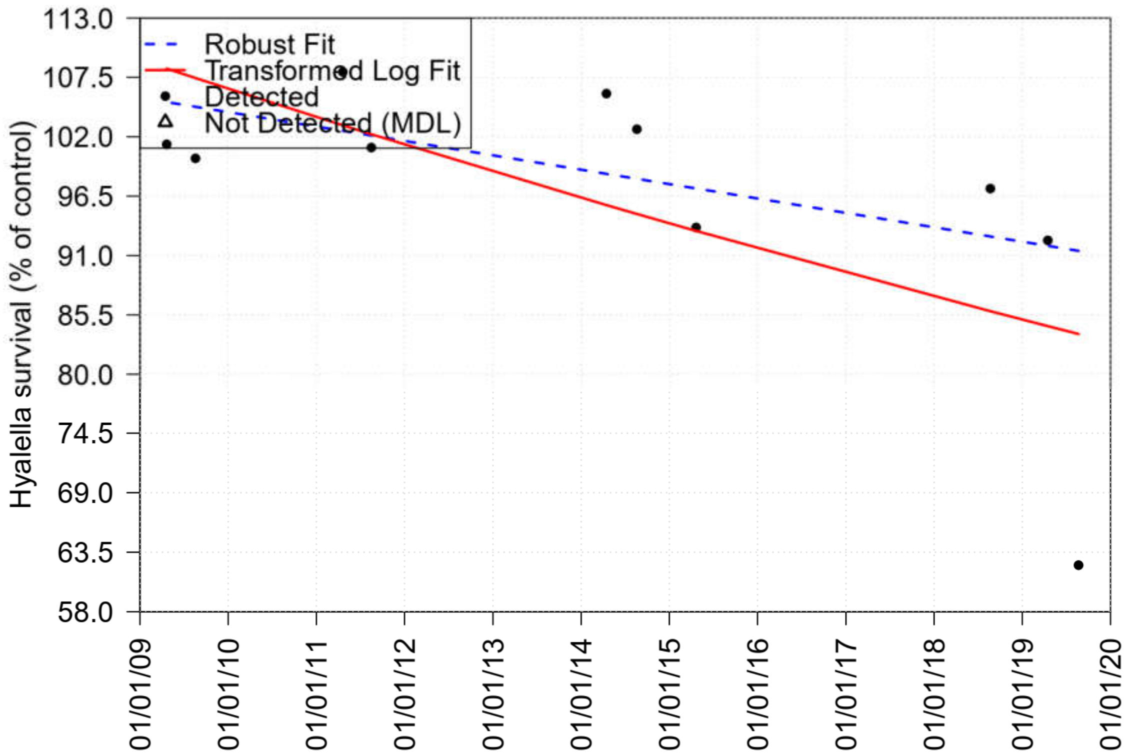

Figure 4-e. *Hyalella azteca*, Walker Creek near 99w and CR33

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 Central Valley 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 Water Board in November 2016. Site-specific Management Plans are included as addenda to the CSQMP as they are developed by the Coalition and approved by the Central Valley Water Board. Implementation of the CSQMP[13] 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 2022, is provided to the Central Valley Water Board with this AMR. Activities conducted in 2022 to implement the Coalition's CSQMP included addressing exceedances of objectives for registered pesticides, toxicity, and nutrients, in addition to conducting monitoring required for existing 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, which are currently collected on a five-year cycle with the most recent survey conducted for the 2020 crop year. During the period 2017 through 2019, select Coalition Subwatersheds conducted Focused Outreach Surveys with growers who operate within the area covered by an active Management Plan for a registered pesticide and/or toxicity and who applied the registered pesticide identified in the Management Plan. The use of Focused Outreach Surveys ended when the Coalition was required to complete Management Plan Implementation Reports (MPIR) beginning with the 2020 crop year. The MPIR is used to report management practices implemented by Coalition members to comply with requirements under a Surface Water Quality Management Plan. The Coalition's Focused Outreach and MPIR survey data have been

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

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 Central Valley 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 objectives. 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 of best management practices (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, ILRP Trigger Limits, and/or pyrethroid pesticide prohibition triggers have been observed at a frequency sufficient to trigger a Management Plan. 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 provides them an advisory notice along with information on how to address a specific exceedance using BMPs. A similar approach was also used to conduct management practice surveys in areas subject to individual Management Plan elements. However, all growers in a drainage with a Management Plan, as well as those drainages represented by a drainage with a Management Plan, are required to receive targeted outreach and submit management practices information (via MPIR surveys) if they apply the pesticide that is the subject of a Management Plan.

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 collect and aggregate summarized information from Farm Evaluations. In 2018, the Central Valley Water Board revised the reporting schedule, and the Coalition will now collect, aggregate, and summarize Farm Evaluations on a five-year cycle beginning with the 2020 Crop Year. The Coalition submitted the 2020 Crop Year data to the Central Valley Water Board at the end of 2021. The next Farm Evaluation will be for the 2025 Crop Year and will be submitted by November 30, 2026.

Conclusions and Recommendations

The Coalition submits this *2022 Annual Monitoring Report* as required under the Central Valley 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 water quality impacts from irrigated agricultural and wetlands operations in the Sacramento River Basin.

To summarize, the results from the Coalition's monitoring conducted during the 2022 Monitoring Year continue to indicate that with few exceptions, there are no major water quality problems as a result of discharges from agricultural lands and managed wetlands 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 2021 through September 2022. To date, a total of 197 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 2021 through September 2022), samples were collected for 10 scheduled monthly events and two wet weather ("storm") events.

Pesticides were infrequently detected (~5.8% of all pesticide results generated during the 2022 Monitoring Year were detected concentrations), and when detected, rarely exceeded applicable water quality objectives.

Many of the pesticides specifically required to be monitored in the past by the ILRP have rarely been detected in Coalition water samples. Over 98.0% of all pesticide analyses performed to date (from 2005 to present) for the Coalition have been below detection. Coalition monitoring of pesticides during the 2022 Monitoring Year was conducted based on the 2016 Pesticides Evaluation Protocol (PEP) and active Management Plan element requirements. The Central Valley Water Board's PEP requires the Coalition to monitor specific registered pesticides based on (1) their rate of application in a given drainage (lb. applied per drainage) and (2) a pesticide-specific relative risk (the ratio of the amount of chemical applied to a reference value for the protection of aquatic life or human health, 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. R5-2014-0030-11*).

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 Central Valley Water Board. Subsequent revisions requested by the Central Valley 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 ongoing monitoring efforts.

The Coalition's 2022 monitoring program, as specified in the 2022 Monitoring Plan Update, was developed to be consistent with the requirements of the WDR and MRP (*Order No. R5-2014-0030-11*) and 2016 PEP, and was approved by the Central Valley Water Board for this purpose with the understanding that 2022 Monitoring Year would serve as a "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 and approved individual Management Plan elements. Throughout this process, the Coalition has kept an open line of communication with the Central Valley 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