Kaweah Basin Water Quality Association

Comprehensive Surface Water Quality Management Plan

Tulare County, California

April 24, 2023

Prepared for:

KAWEAH BASIN WATER QUALITY ASSOCIATION

Prepared by:

EST. 1968 PROVOST & PRITCHARD CONSULTING GROUP

An Employee Owned Company

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List of Acronyms

AID........ Alta Irrigation District

AMR........ Annual Monitoring Report

ASR........ Annual Status Report

CEDEN........ California Environmental Data Exchange Network

COC........ Constituent of Concern

CSQMP........ Comprehensive Surface Water Quality Management Plan

CVRWQCB........ Central Valley Water Quality Control Board

DPR........ Department of Pesticide Regulation

DWR........ Department of Water Resources

EO........ Executive Officer

General Order........ Tulare Lake Basin General Order

ILRP........ Irrigated Lands Regulatory Program

INMP........ Irrigation and Nitrogen Management Plan

LID........ Lindmore Irrigation District

LISD........ Lindsay-Strathmore Irrigation District

KBWQA........ Kaweah Basin Water Quality Association

KCWD........ Kings County Water District

KDWCD........ Kaweah Delta Water Conservation District

KSJRA........ Kaweah & St. Johns River Association

MPEP........ Management Practice Evaluation Program

MPIR........ Management Practice Implementation Report

NOA........ Notice of Applicability

NOAA........ National Oceanic and Atmospheric Administration

PEP........ Pesticide Evaluation Protocol

PUR........ Pesticide Use Report

SCID........ Stone Corral Irrigation District

SPM........ Suspended Particulate Matter

SQMP .... Surface Water Quality Management Plan

SSJVWQC...South San Joaquin Valley Water Quality Coalition

SWMP.. Surface Water Monitoring Plan

TID.. Tulare Irrigation District

TDS... Total Dissolved Solids

USEPA.. US Environmental Protection Agency

WQTL ....Water Quality Trigger Limit

WY .... Water Year

WDR.. Waste Discharge Requirements

1 Introduction

This Comprehensive Surface Water Quality Management Plan (**CSQMP**) has been prepared on behalf of the Kaweah Basin Water Quality Association (**KBWQA** or **Coalition**) in compliance with the Waste Discharge Requirements (**WDRs**) Order R5-2013-0120-09 (**General Order)**, which requires waterbodies with constituents that have had more than one exceedance within a three-year period to be addressed in a Surface Water Quality Management Plan (**SQMP**). A comprehensive SQMP was selected due to the similarities with irrigated agriculture cultural practices and management practices within the KBWQA. The purpose of this CSQMP is to provide an approach that the KBWQA, its grower members, and the Central Valley Regional Water Quality Control Board (**CVRWQCB**) staff may use as a guide for examining and, if necessary, addressing exceedances of water quality limits through surface water monitoring of constituents in exceedance more than once in a three-year period at each monitoring site. Additionally, this CSQMP includes management plan implementation schedules and timelines for reporting to the CVRWQCB on the progress and efficiency of this CSQMP.

The submittal of the SQMP was delayed due to the ongoing development of the Surface Water Monitoring Plan (**SWMP**). The KBWQA initially submitted a SWMP on August 6, 2014. Staff comments were received on December 29, 2014 from the CVRWQCB. A revision of the SWMP was submitted to the CVRWQCB on March 2, 2015 (**Revision 1**) and subsequent comments were received from the CVRWQCB on January 7, 2019. An Update (**Update 2019**) was submitted on July 2, 2019, with comments from the CVRWQCB being received on July 15, 2020. A further revision (**Revision 2**) of the SWMP was submitted to the CVRWQCB on May 28, 2021 to address CVRWQCB staff comments. Comments were received from the CVRWQCB on April 29, 2022. Another revision of the SWMP (**Revision 3**) was submitted on December 22, 2022. A recent update (**Updated Revision 3**) was submitted on March 24, 2023. Approval of the SWMP was received on April 13, 2023.

1.1 Purpose

The KBWQA has elected to complete a CSQMP to address multiple constituents that have triggered a management plan from various sites. The purpose of this CSQMP is to provide an approach that the KBWQA, its growers, and the CVRWQCB staff may use as a guide for examining and, if necessary, addressing the exceedances of water quality limits through surface water monitoring. Additionally, this CSQMP identifies surface water locations and constituents of concern that have had more than one exceedance in a three-year period ranging from the 2014 water year **(WY)** (October 1, 2013 to September 30, 2014) to the 2022 WY (October 1, 2021 to September 30, 2022). A WY is a 12-month period that is commonly used to measure total precipitation during that period. An Annual Status Report (**ASR**) that discusses progress and changes will be submitted yearly in the Coalition's Annual Monitoring Report (**AMR**) on August 31st. These updates will include the status of grower outreach effectiveness, pesticide usage data collection, and additional water quality data.

As a result of more than one exceedance of the constituents of concern (**COC**) outlined in Table 1 beyond their respective water quality trigger limit (**WQTL**), an SQMP is necessary for the following sites:

Kaweah River (**SP-1**)
St. Johns River (**SP-2**)
Elk Bayou (**SP-5**)
Goshen Ditch (**SP-6**)
Cameron Creek (**CC-1**)
Foothill Ditch (**FD**)
Lewis Creek (**LC-1**)
Yokhol Creek (**YOK**)
Stone Corral (**SP-3**)

Several of the exceedances that triggered management plans were exceedances of the same constituent at multiple sites. Constituents in this CSQMP have been categorized and require significant steps to appropriately address. Some of the constituents of concern are categorized as a valley-wide issue and require no action by the KBWQA at this time. Fecal Coliform and E. coli, which likely come from surrounding livestock areas and natural wildlife, will be subject to direction provided by the Executive Officer (**EO**). Total Dissolved Solids (**TDS**) and Specific Conductivity (**SC**) will be subject to specific salinity plans still in development through the Central Valley Salinity Alternative for Long-Term Sustainability (**CV-SALTS**).

If exceedances of other monitored constituents on any of the approved waterbodies within the KBWQA boundary trigger the need for a management plan, they will be addressed through addendums to this CSQMP, which will be submitted to the CVRWQB for approval. Upon submittal of multiple addendums, an updated CSQMP will be submitted to the CVRWQB for approval.

Outlined in Section 3 is a management plan strategy and schedule for the completion of this management plan.

1.2 Background

The KBWQA covers the Kaweah River watershed in northern Tulare County, which is a geographic area of approximately 1 million total acres in the Tulare Lake Basin of California. This coverage area includes various public and private entities that manage surface water for agricultural interests within the basin. The KBWQA was formed in 2013 as a California non-profit mutual benefit corporation as the successor organization of the Kaweah and St. Johns Rivers Association (**KSJRA**). The KSJRA represented the Kaweah sub-watershed portion of the former Southern San Joaquin Valley Water Quality Coalition (**SSJVWQC**), until the valley-wide Coalition dissolved. The KBWQA received its Notice of Applicability (**NOA**) to be a Third-Party Coalition on February 7, 2014.

1.2.1 KBWQA Area

The KBWQA is primarily located in Tulare County. The eastern boundary is bounded by the Sierra Nevada Mountains that contain the watershed of the Kaweah River. The northern boundary roughly follows the Kaweah Delta Water Conservation District (**KDWCD**) northern border but has been extended further north to include Stone Corral Irrigation District (**SCID**) and portions of Cottonwood Creek. The western boundary generally follows the Kings County Water District (**KCWD**) and Tulare Irrigation District (**TID**) borders. The southern boundary generally follows the KDWCD southern border, but approximately follows the Avenue 212 alignment as it heads towards the foothills. The KBWQA Coalition boundary area includes the Kaweah River watershed from the Sierra Nevada Mountains to the valley floor in northern Tulare County within the Tulare Lake Basin. The Tulare Lake Basin is a closed-basin, separated from the Sacramento-San Joaquin Bay-Delta system. Both primary and secondary boundaries of the Coalition reside within the estimate boundary of the Tulare Lake Basin (Figure 1). The KBWQA is comprised of the valley floor area as its Primary Area with much of the irrigated agricultural activity, while the foothill and mountain regions considered as the Supplemental Area due to significantly limited irrigated agricultural activity. In total, the KBWQA encompasses approximately 958,000 total acres. With roughly 356,000 acres that make up the Primary Area and 602,000 acres that make up the Supplemental Area. Roughly 156,057 acres are associated with irrigated agriculture and are regulated under the with the Irrigated Lands Regulatory Program (**ILRP**) as of the end of September 2022.

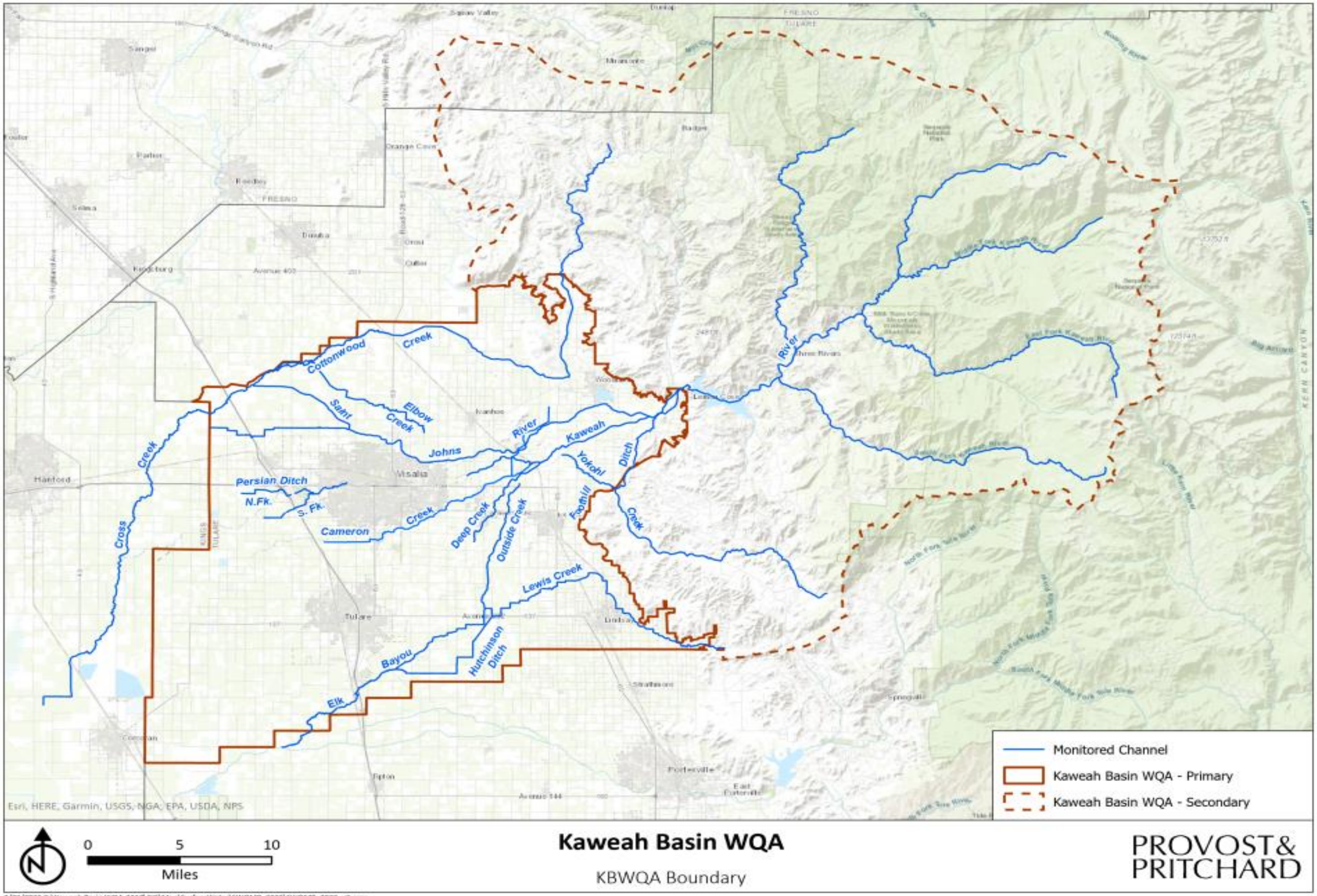

Figure 1 KBWQA Primary and Secondary Areas

1.2.2 Districts and Companies

Several public districts and private water companies are located within the KBWQA boundary. A list of the districts and companies can be found in Table 1. Apart from Lindmore Irrigation District (**LID**), Lindsay-Strathmore Irrigation District (**LSID**), and Alta Irrigation District (**AID**), all listed districts and companies are fully encompassed in the KBWQA's boundary. LID and LSID extend outside the southeast edge of the KBWQA boundary into the Tule Sub-Watershed. AID extends outside the north KBWQA boundary into the Kings River Sub-Watershed.

Table 1 Irrigation Districts and Ditch Companies within the KBWQA

Districts and Companies within the KBWQA		
Alta Irrigation District	Bliss Ditch Company	Modoc Ditch Company
Exeter Irrigation District	Consolidated Peoples Ditch Company	Oakes Ditch Company
Ivanhoe Irrigation District	Elk Bayou Ditch Company	Persian-Watson Ditch Company
Lewis Creek Irrigation District	Evans Ditch Company	St. Johns Ditch Company
Lindmore Irrigation District	Fleming Ditch Company	Sweeney Ditch Area

2 Physical Setting and Constituents of Concern

2.1 Climate and Hydrology

Semi-arid desert regions receive 10-20 inches of annual rainfall, while desert regions receive less than 10 inches of annual rainfall. Based on historical statistics for the City of Visalia, historic average rainfall in the KBWQA is 10.26 inches. Considering the historic average rainfall that the KBWQA area receives each year, the Coalition area is considered a semi-arid desert. Nearly 80 percent of the rainfall typically occurs between November and March when most crops are not actively irrigated. Rainfall in summer months, when irrigation is at its highest, is typically negligible. Storm intensities are generally insufficient to produce overland runoff, except from impervious surfaces such as roads and parking lots typical of urban infrastructure. On the valley floor between 1969 and 2021, average monthly rainfall during the wettest month of the year was only 1.94 inches, or an average of just over 0.06 inches per day. During the 2021 WY, the wettest month was only 1.82 inches, making the daily average 0.05 inches per day[1]. While rainfall intensities can vary, rainfall on the valley floor is typically absorbed by cropland or other pervious surfaces.

Temperatures in the KBWQA can be classified as hot summer months with mild to cool winter months. Irrigation is at its peak during the summer months when temperatures can easily surpass 100 °F during the day and crop evapotranspiration is at its highest. Winter months are generally mild, but temperatures can drop below freezing during nighttime, which can become problematic for citrus growers.

[1] https://cdec.water.ca.gov/dynamicapp/QueryWY?Stations=VSL&SensorNums=2&End=2022-02-01&span=7+years

2.2 Watershed Descriptions

Table 2 KBWQA Surface Water Monitoring Site GPS Coordinates and Surface Water Ambient Monitoring Program (SWAMP) Codes

KBWQA Monitoring Sites				
Monitoring Site	**Latitude**	**Longitude**	**SWAMP Site Code**	**Monitoring Schedule**
Kaweah River (SP-1)	36.33821	119.22050	558KRWSP1	Representative
St. Johns River (SP-2)	36.35357	119.28043	558SJRSP2	Representative
Elbow Creek (ELB)	36.40260	119.32300	TBD	Core/ Assessment
Goshen Ditch (SP-6)	36.37075	119.42887	558GSDSP6	Representative
Cameron Creek (CC-1)	36.31693	119.22460	558CAMCC1	Core/ Assessment
Cottonwood Creek	36.42735	119.15615	TBD	Representative
Lewis Creek (LC-1)	36.23905	119.13651	558LEWCLC	Core/ Assessment
Outside Creek (OUT)	36.25427	119.20378	TBD	Core/ Assessment
Yokohl Creek (YOK)	36.34635	119.11643	558CRKYOK	Representative
Stone Corral (SP-3)	36.45729	119.22331	558SCDSP3	Special Project
Foothill Ditch (FD)	36.32474	119.07916	558FDSPFD	Special Project
Elk Bayou (SP-5)	36.15286	119.31748	558ELKSP5	Special Project

2.2.1 Kaweah River

The Kaweah River originates at the convergence of Marble Fork and Middle Fork Kaweah River on the western slopes of Sierra Nevada in Sequoia National Park. Most of the waters observed at the Kaweah River are fed primarily by snowmelt from winter snowpack in the Sierra mountains. At the base of the mountains toward the San Joaquin Valley, Kaweah River feeds into Kaweah Lake before the Terminus Dam. Past the dam the Kaweah River flows through the San Joaquin Valley and is used primarily for irrigated agriculture. Dam flows are typically observed during summer months when there are releases at Terminus Dam that is managed by the Kaweah Delta Water Conservation District. The primary soil type along the Kaweah River ranges between fine sandy and sandy loam. Most of the land use the Kaweah River passes through consists largely of agriculture.

2.2.2 St. Johns River

The St. Johns River is a distributary of the Kaweah River just over three miles past Terminus Dam. Most of the St. Johns River flows through the San Joaquin Valley and to the north of the City of Visalia. Like the Kaweah River, St. Johns River receives water from Lake Kaweah but is mostly used for irrigated agriculture in Tulare County, which is also the primary land use St. Johns passes through. Soil types along the St. Johns River are found to be mostly sand.

2.2.3 Elbow Creek

Elbow Creek is a 303d listed waterbody for Chlorpyrifos, which is currently proposed for sampling In Revision 3 of the SWMP. Matthews Ditch comes off the St. Johns River and becomes Elbow Creek further downstream. Flow observed at Elbow Creek is often seen following long periods of intense rain.

2.2.4 Goshen Ditch

Goshen Ditch is located northwest of the City of Visalia. Goshen Ditch comes off the St. Johns River. During wet years and following storm events, Goshen Ditch will see a full channel. The amount of water released at Terminus dam and diverted by the Tulare Irrigation District will determine how much water Goshen Ditch will receive. Waters in Goshen Ditch are primarily used for irrigated agriculture.

2.2.5 Cameron Creek

Historically Cameron Creek was a branch of Deep Creek. However, with the addition of the canal system to support the agriculture industry, many natural streams and their origins have fluctuated. Cameron Creek now branches off the Tulare Irrigation Canal that originates at the St. Johns River. As stated above, the St. Johns River breaks from the Kaweah River at the bottom of the foothills below Terminus Dam. Just east of Highway 99, Cameron Creek transitions from a natural stream to a highly engineered canal system to the west of Highway 99. In addition, land use also significantly converts to agricultural operations to include areas of heavy dairy operations. Part of Cameron Creek is south of the City of Visalia and can observe some influences from municipal areas. Soil types along Cameron Creek can consist of a range between fine and coarse loam.

2.2.6 Cottonwood Creek

Cottonwood Creek originates in the foothills of the Sierras just north of Ash Spring Mountain. Cottonwood Creek extends into Tulare County until it merges with Cross Creek. The stretch of Cottonwood Creek surrounding the sampling site is considered a stream order 4 and is a stream level 6. The mean annual flow volume is roughly 30 cfs. Cottonwood Creek typically sees flows following intense rainstorms with velocities beginning to pick further downstream. It’s rare to see water in Cottonwood Creek from dam releases.

2.2.7 Lewis Creek

Lewis Creek originates at the foothills of the Sierra's and passes northeast of the City of Lindsey as it flows through the Valley floor. The Lewis Creek watershed is roughly 50 sq miles with much of the reach located in the foothills. Within the KBWQA boundary, land use is primarily used for cultivation of crop types that consist primarily of grapes, oranges, fruits trees, and some pasture. Soils found along Lewis Creek are mostly clayey and sandy loam.

2.2.8 Outside Creek

Outside Creek is a tributary of the Kaweah River that comes off Kaweah Lake as described previously. The stretch is roughly 14.5 miles. East of the City of Tulare, Outside Creek and Inside Creek meet and form Elk Bayou. The short stretch of stream south of the identified sampling site can flow up to 20 cfs annually. Soil type is mostly sandy.

2.2.9 Yokhol Creek

Yokhol Creek originates in Yokhol Valley at the Foothills of the Sierras and runs for about 5 miles through agricultural and domestic land uses. Most of the water that passes through Yokhol Creek is due to rain events. During a wet year, Yokhol Creek can flow at approximately 20 cfs.

2.2.10 Stone Corral

The small section of Stone Corral in the northern part of the Coalition is managed and owned by the Stone Corral Irrigation District. Stone Corral was constructed to as part of the irrigation districts storm water control project. This site is directly upstream of Cottonwood Creek which originates in the foothills. Most of the land use along stone corral consist primarily of citrus agriculture. Soil types include clay and silt content in loamy soils.

2.2.11 Foothill Ditch

This site monitors discharge that flows into Yokohl Creek. Foothill Ditch is located on the eastern edge of the Coalition boundary at the foothills of the Sierras. Foothill ditch is a privately owned ditch that was constructed to convey flows into Yokhol Creek. Land use adjacent to Foothill Ditch are primarily citrus crops. Soil types found along most of the Foothill Ditch area include sandy loam and clayey soils.

2.2.12 Elk Bayou

Elk Bayou is located south of the City of Tulare just east of Highway 99. Inside Creek and Outside Creek converge to a low laying area where they make up Elk Bayou. Elk Bayou flows for approximately 11 miles before entering the Tule River. Most of the land use identified surrounding Elk Bayou within the KBWQA boundary is comprised mostly of nut trees, almonds, and field crops. However, the dominant land use surrounding Elk Bayou has been observed to be mostly dairies. Soils found along Elk Bayou consist primarily of clay and sandy loam.

2.3 Land Use

Irrigated agriculture is one of the largest land uses in the KBWQA, with an agricultural production value roughly over $8 billion in 2021 in Tulare County. The top crops in Tulare County vary from tree and vines to row crops, including grapes, almonds, citrus, pistachios, hay, alfalfa and many others. Management practices in use largely depend on the land use or crop on a particular site. Agriculture in the KBWQA is very diverse and accounts for one of the largest land uses in the KBWQA area. Other uses in the KBWQA area include dairies, pasture lands, urban lands and natural lands. Within the KBWQA crop varieties can be generalized into majority crop mixes. Citrus along the foothills transitions to fruit and nut trees dominating the flatter regions east of the cities of Visalia and Tulare, and then transitioning to field crops (generally associated with dairies) to the west and southwest regions of the KBWQA boundary.

Table 3 2021 Top 10 Tulare County Commodities

2021 Rank	Commodity	2021 Value	2020 Rank
1	Milk	$1,943,043,000	1
2	Oranges-Navel, Valencia	$1,224,885,000	2
3	Grapes	$683,601,000	4
4	Cattle & Calves	$633,600,000	3
5	Pistachio Nuts	$560,120,000	5
6	Tangerines	$431,520,000	6
7	Almonds- Meats & Hulls	$355,710,000	7
8	Lemons	$347,130,000	8
9	Peach cling and freestone	$196,863,000	10
10	Corn-Grain, Silage	$181,792,000	9
	Top 10 Total:	**$6,558,264,000**	

Source: Tulare County Annual Crop Report 2021

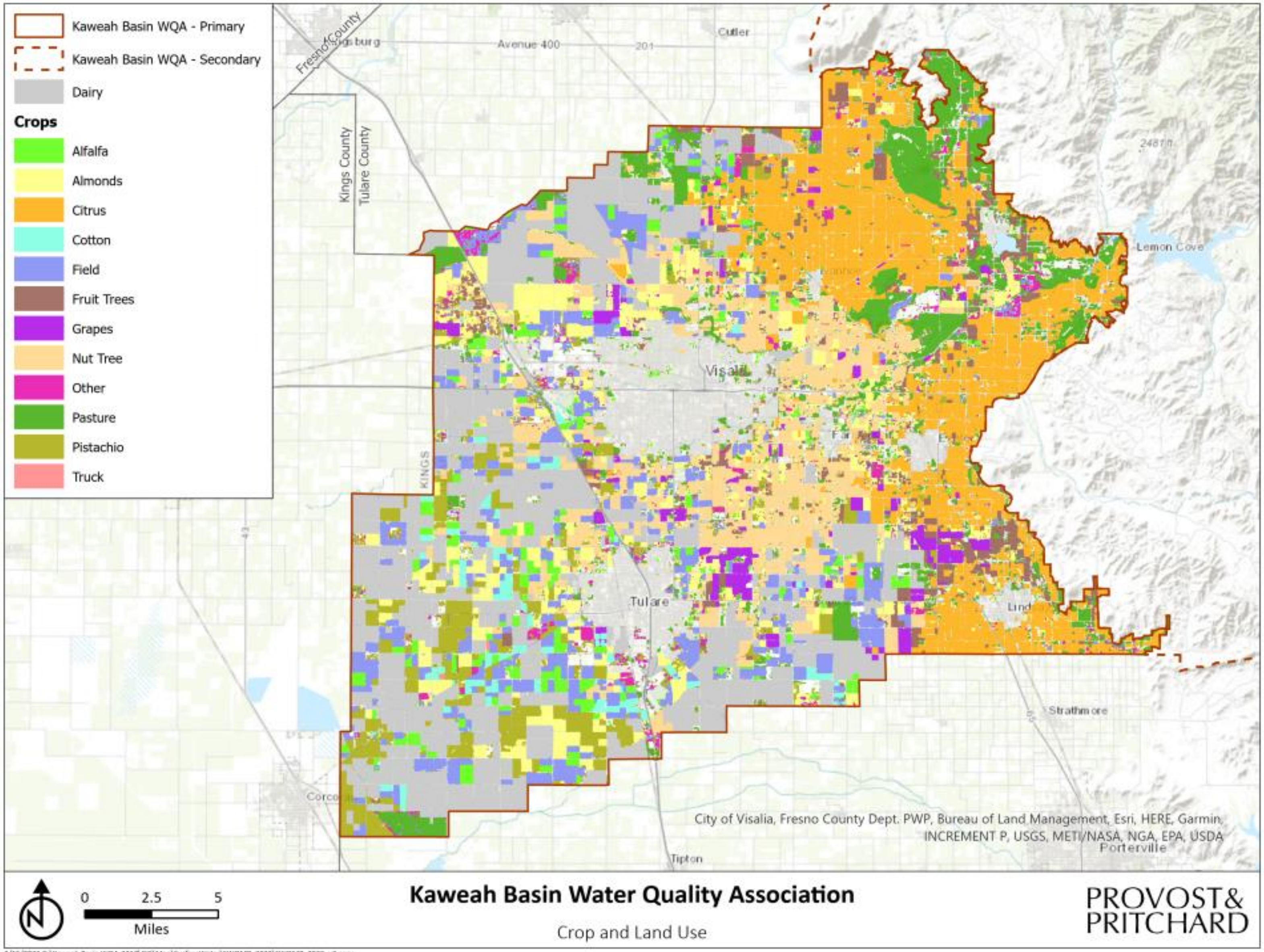

Figure 2 Crop types within the KBWQA

2.4 Beneficial Uses

The Second Edition of the Tulare Lake Basin Plan (2004) (**Basin Plan**) was reviewed for identified surface water beneficial uses in the KBWQA. The KBWQA's Supplemental Area includes the Kaweah River watershed in the mountainous regions of the Sierra Nevada Mountains, and all beneficial uses (MUN through FRSH) are listed.

Table 4 conveys Beneficial Uses in the Tulare Lake Basin Plan (2004) depicts Table II-1 from the Basin Plan. The KBWQA understands that the quality and beneficial uses of all surface water bodies within the Coalition boundaries must be protected. However, since the primary focus of the General Order is in regard to impacts from irrigated agriculture, the beneficial uses below Lake Kaweah will be the focus of the surface water monitoring effort since almost all agriculture operations in the KBWQA occur in the Primary Area on the valley floor. The beneficial uses below Lake Kaweah have been identified as:

- MUN Municipal
- AGR Agriculture Supply
- IND Industrial Service Supply
- PRO Industrial Process Supply
- REC-1 Water Contact Recreation
- REC-2 Non- Contact Water Recreation
- WARM Water Ecosystems
- WILD Wildlife Habitat
- GWR Groundwater Recharge

The waters of the Kaweah Basin are primarily used for AGR, REC-1, REC-2, WARM, WILD, and GWR. Several agencies use surface water for groundwater recharge. Habitat and ecosystem benefits (WARM, WILD) are also realized during wetter years when water flows. Finally, REC-1 and REC-2 activities occur incidentally because of surface flows.

No direct users of the MUN beneficial use have been identified for surface waters within the KBWQA. Mining occurs in the foothills on the eastern edge of the Primary Area upstream of most agricultural operations that can potentially be classified for the IND beneficial use. No PRO uses have been identified in the Primary Area.

Table 4 Beneficial Uses in the Tulare Lake Basin Plan

TABLE II-1

TULARE LAKE BASIN

SURFACE WATER BENEFICIAL USES

Stream	MUN	AGR	IND	PRO	POW	REC-1	REC-2	WARM	COLD	WILD	RARE	SPWN	GWR	FRSH
552, 551 Kings River														
North Fork, Upper					•	•	•	•	•	•	•	•		•
Main Fork, Above Kirch Flat	•					•	•	•	•	•	•	•		•
Kirch Flat to Pine Flat Dam (Pine Flat Reservoir)					•	•	•	•	•	•				•
Pine Flat Dam to Friant-Kern	•	•			•	•	•	•	•	•		•	•	•
Friant Kern to Peoples Weir	•	•		•		•	•	•		•			•	
Peoples Weir to Stinson Weir on North Fork and to Empire Weir No. 2 on South Fork		•				•	•	•		•			•	
553, 558 Kaweah River														
Above Lake Kaweah	•				•	•	•	•	•	•	•	•		•
Lake Kaweah					•	•	•	•		•				•
Below Lake Kaweah	•	•	•	•		•	•	•		•			•	
555, 558 Tule River														
Above Lake Success	•	•			•	•	•	•	•	•	•	•		•
Lake Success		•			•	•	•	•		•				•
Below Lake Success	•	•	•	•		•	•	•		•			•	
554, 557 Kern River														
Above Lake Isabella	•				•	•	•	•	•	•	•	•		•
Lake Isabella					•	•	•	•	•	•				•
Lake Isabella to KR-1‡					•	•	•	•	•	•	•			
Below KR-1‡	•	•	•	•	•	•	•	•		•	•		•	
555, 558 Poso Creek		•				•	•	•	•	•			•	•
552 Mill Creek, Source to Kings River	•					•	•	•		•			•	•
552, 553, 554, 555 Other East Side Streams	•	•				•	•	•	•	•			•	
556, 559 West Side Streams		•	•	•		•	•	•		•	•		•	
551, 557, 558 Valley Floor Waters		•	•	•		•	•	•		•	•		•	

‡ KR-1: Southern California Edison Kern River Powerhouse No. 1.

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2.5 Summary of Existing Data Sources

There are various data sources available to KBWQA regarding water quality and agricultural practices. For surface water quality, there is limited historical data for each site within the KBWQA boundary. The KBWQA visits each site every month as required by the General Order; however, it is rare that a site is sampled during each visit due to many sites being dry. The KBWQA closely monitors storm events and dam releases that would yield a sample. As such, the Coalition collects surface water quality data at monitoring sites when conditions are appropriate.

Additionally, the Coalition has and continues to collect grower data via ILRP Farm, a database where grower members can enter management practice information and complete various documents like Farm Evaluations, Management Practice Implementation Reports, Irrigation and Nitrogen Management Practices Summary Reports, Outreach Surveys. The data helps the Coalition evaluate basin-wide management practices.

In addition to this data, public data available for Coalition reference include the California Environmental Data Exchange Network (**CEDEN**), Pesticide Use Reports (**PUR**) provided by the Department of Pesticides (**DPR**) and the County Agriculture Commissioner, National Oceanic and Atmospheric Administration (**NOAA**) monthly precipitation data, and Department of Water Resources (**DWR**) and US Army Corps of Engineers flow data.

2.6 Inventory of Existing Management Practices

KBWQA growers have and continue to utilize multiple conservation practices to protect water quality for years. The KBWQA reports member and Coalition activities to the CVRWQCB via submission of an AMR. The AMR summarizes management practices as reported by enrolled growers as required by the Irrigation and Nitrogen Management Plan (**INMP**) Summary Report summarized in Table 5 and Farm Evaluation. The most recently reported Farm Evaluation was collected during 2020 WY AMR. Upon approval of this management plan, INMP Summary Report and Farm Evaluation data will be used to establish a baseline inventory of existing management practices, which is described further detail in Section 3.3.

A total of 139,099 field acres of single cropped fields accounts for 96% of the total irrigated acreage enrolled on reported parcels. Much of the water flowing through the Kaweah watershed are a result of water deliveries released at Terminus Dam at the foothills of the Sierras toward the eastern edge of the Coalition boundary. The system is managed by multiple districts and private water companies.

Table 5 KBWQA 2021 Irrigation & Nitrogen Management Practices

Irrigation & Nitrogen Management Practices		
Nitrogen Efficiency Practices	**Irrigation Practices**	**Irrigation Efficiency Practices**
Split fertilizer applications	Flood	Water application scheduled to need
Irrigation water N testing	Micro-Spray	Laser Leveling
Soil Testing	Furrow	Use of ET in scheduling irrigation
Tissue/Petiole Testing	Drip	Use of moisture probe
Fertigation	Border Strip	Aerial imaging
Foliar N Application	Sprinkler	
Cover Crops		
Variable rate applications using GPS		
Dendrometers		

2.7 Summary of Exceedances

Table 6 includes a summary of overall actionable constituents of concern that have exceeded trigger limits resulting in the requirement to develop a management plan. Additionally, the table totals the number of times a constituent has exceeded trigger limits throughout the Coalition and the number of constituents that have triggered a management plan per site. Exceedances occurred between 2016 and January 2023 of the 2023 WY. Constituents include dissolved oxygen, pH, metals, pesticides, toxicity to algae, and E. coli. Appendix A outlines by site and year the constituent that exceeded a WQTL and when that trigger occurred.

Table 6 Monitoring Sites and Corresponding Constituents that have Triggered a Management Plan

Monitoring Site	Dissolved Copper	Total Zinc	Molybdenum	Diuron	Simazine	Chlorpyrifos	Toxicity to Algae	Toxicity to Monnow	E. coli	pH	Total per Site
Kaweah River (SP-1)		X					X		X		3
St. Johns River (SP-2)							X		X		2
Stone Corral (SP-3)	X			X	X	X	X		X	X	7
Elk Bayou (SP-5)							X		X	X	3
Goshen Ditch (SP-6)							X		X		2
Cameron Creek (CC-1)		X					X		X		3
Foothill Ditch (FD)	X						X	X	X		4
Lewis Creek (LC-1)							X		X		2
Yokhol Creek (YOK)			X						X		2
Management Plans per Constituent	2	2	1	1	1	1	8	1	9	2	**28**

2.8 Water Quality Trigger Limits

Water Quality Trigger Limits are outlined in the Water Quality Control Plan for the Basin Plan set forth by the CVRWQCB. Table 7 outlines all parameters of the KBWQA monitors. By September 30, 2022 the end of the 2021 WY, there were 28 outstanding management plans triggered. Exceedances identified that trigger an additional management plan, following the submittal of this comprehensive management plan, will be addressed through the ASR.

Table 7 Parameters Monitored for all Assessment Sites

Constituent	Matrix	Analyzing Lab	units	WQTL	RL	MDL	Analytical Method
Field Measurements							
Flow	Fresh Water	Field Measure	cfs	NA	1	NA	-
pH	Fresh Water	Field Measure		<6.5; >8.3	0.1	NA	EPA 150.1
Electrical Conductivity (EC)	Fresh Water	Field Measure	µmhos/cm	700	50	NA	EPA 120.1
Dissolve Oxygen (DO)	Fresh Water	Field Measure	mg/L	5	0.1	NA	SM 4500-O
Temperature	Fresh Water	Field Measure	°C	NA	0.1	NA	SM 2550
Physical Parameters							
Turbidity	Fresh Water	MTA	NTU	Variable	0.05	0.02	SM 2130B
Total Dissolved Solids (TDS)	Fresh Water	MTA	mg/L	450	10	4	SM 2540 D

Constituent	Matrix	Analyzing Lab	units	WQTL	RL	MDL	Analytical Method
Total Suspended Solids (TSS)	Fresh Water	MTA	mg/L	NA	10	NA	SM 2540 C
Hardness (as $CaCO_3$)	Fresh Water	MTA	mg/L	NA	2.5	1	EPA 200.7
Total Organic Carbon (TOC)	Fresh Water	MTA	mg/L	NA	0.5	0.13	SM 5310 C
Pathogens							
E. Coli	Fresh Water	MTA	MPN/100 mL	235	1	1	SM 9223 B
Fecal Coliform	Fresh Water	MTA	MPN/100 mL	400	1	1	SM 9221 E
Nutrients							
Total Kjeldahl Nitrogen (TKN)	Fresh Water	MTA	mg/L	NA	0.5	0.27	EPA 351.2
Nitrate-N	Fresh Water	MTA	mg/L	10	0.1	0.01	EPA 300.0
Nitrite-N	Fresh Water	MTA	mg/L	10	0.1	0.01	EPA 300.0
Ammonia	Fresh Water	MTA	mg/L	1.5	0.1	0.05	SM 4500-NH3 G
Unionized Ammonia (calculated value)	Fresh Water	MTA	mg/L	1.5	0.1	0.05	SM 4500-NH3 G
Orthophosphate	Fresh Water	MTA	mg/L	NA	0.1	0.01	SM 4500 P E
Phosphorus	Fresh Water	MTA	mg/L	NA	0.1	0.01	SM 4500 P E
Metals							
Arsenic (Total)	Fresh Water	MTA	µg/L	10	1	0.09	EPA 200.8
Boron (Total)	Fresh Water	MTA	µg/L	700	50	5	EPA 200.8
Cadmium (Total and Dissolved)	Fresh Water	MTA	µg/L	5	0.1	0.02	EPA 200.8
Copper (Total and Dissolved)	Fresh Water	MTA	µg/L	Variable	1	0.1	EPA 200.8
Lead (Total and Dissolved)	Fresh Water	MTA	µg/L	Variable	0.2	0.1	EPA 200.8
Molybdenum (Total)	Fresh Water	MTA	µg/L	10	1	0.05	EPA 200.8
Nickel (Total and Dissolved)	Fresh Water	MTA	µg/L	100	1	0.2	EPA 200.8
Selenium (Total)	Fresh Water	MTA	µg/L	5	1	0.1	EPA 200.8
Zinc (Total and Dissolved)	Fresh Water	MTA	µg/L	Variable	1	0.1	EPA 200.8
Water Column Toxicity							
Ceriodaphnia dubia (water flea)	Fresh Water	ABC	48h % survival	50%	NA	NA	EPA 821-RO2-012
Pimephales promelas (fathead minnow)	Fresh Water	ABC	48h % survival	50%	NA	NA	EPA 821-RO2-012
Selenastrum capricomutum (green algae)	Fresh Water	ABC	96h % survival	50%	NA	NA	EPA 821-RO2-013
Sediment Toxicity							
Hyalella azteca	Sediment	ABC	10d % survival	80%	NA	NA	EPA 600-R99-064

Constituent	Matrix	Analyzing Lab	units	WQTL	RL	MDL	Analytical Method
Sediment & Pesticide (Pyrethroids) Parameters							
Bifenthrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	110	0.3	0.1	EPA 8081
Carbaryl	Fresh Water	APPL	µg/L	2.53	0.07	0.05	EPA 8321A
Chlorpyrifos	Fresh Water; Sediment	ABC	µg/L; µg/kg	NA	0.3	0.1	EPA 8241
Clothianidin	Fresh Water	EMA	µg/L	NA	1.0	NA	LC-MS/MS
Cyfluthrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	NA	0.3	0.1	EPA 8081
Cypermethrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	70	0.3	0.1	EPA 8081
Deltamethrin	Fresh Water/ Sediment	ABC	µg/L; µg/kg	NA	0.3	0.1	EPA 8081
Dimethoate	Fresh Water	MTA	µg/L	Variable	0.05	0.02	EPA 625
Diuron	Fresh Water	APPL	µg/L	2	0.1	0.02	EPA 632
Esfenvalerate/Fenvalerate	Fresh Water; Sediment	ABC	µg/L; µg/kg	NA	0.3	0.1	EPA 8081
Fenpropathrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	180	0.3	0.05	EPA 8081
Flumioxazin	Fresh Water	APPL	µg/L	NA	1.0	1.0	EPA 8321A
Imidacloprid	Fresh Water	APPL	µg/L	NA	0.4	0.2	EPA 8321
Isoxaben	Fresh Water	MTA	µg/L	35	NA	NA	NA
Lamda Cyhalothrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	NA	0.3	0.05	EPA 8081
Malathion	Fresh Water	MTA	µg/L	Variable	0.02	0.05	EPA 625
Oxyfluorfen	Fresh Water	APPL	µg/L	20	0.05	0.008	EPA 8081A
Paraquat dichloride	Fresh Water	MTA	µg/L	3.2	0.5	0.12	EPA 549
Pendimethalin	Fresh Water	APPL	µg/L	280	0.05	0.05	EPA 8141
Permethrin	Fresh Water; Sediment	ABC	µg/L; µg/kg	Variable	0.3	0.1	EPA 8081
Piperonyl butoxide (PBO)	Fresh Water; Sediment	ABC	µg/L; µg/kg	NA	0.3	0.1	EPA 8081
Pyrethrins	Fresh Water	MTA	µg/ L	NA	NA	NA	NA
Pyridaben	Fresh Water	EMA	µg/ L	NA	0.25	NA	EPA 8081A
Simazine	Fresh Water	MTA	µg/L	4.0	0.5	0.16	EPA 507
Total Organic Carbon (TOC)	Sediment	ABC	mg/kg	NA	200	100	EPA 9060
Grain size	Sediment	ABC	%	NA	NA	NA	SM 2560 D

2.9 Constituents of Concern

Many sites within the KBWQA obtain waters from several different sources. The main sources include dam releases and storm events. Additional sources may include agriculture discharge from field runoff. Dam releases typically occur during the summer months and have the potential to provide enough flow for sampling events at several sites. During wet water years, many additional sites will observe ample flow in response to storm events.

To the knowledge of the Coalition, no irrigation tailwater is allowed in any of the water bodies within the Coalition. Additionally, the KBWQA will contact the growers in question to inform them of water quality discrepancies, ensure they are aware of proper management practices, and advise the growers of ways to improve current practices. If the discharger fails to respond or comply, water districts will be notified for further action.

2.9.1 Pesticides

Pesticides are chemical agents used to prevent or kill pests that threaten agricultural commodities, structures, and health of human and livestock. These chemicals include herbicides, insecticides, fungicides, rodenticides, larvicides, nematicides, and molluscicides. Some pesticides are biodegradable and readily breakdown in the environment while others persist. Regardless of breakdown, many pesticides and their metabolites pose risk to humans as well as to non-target aquatic and terrestrial organisms. Within recent decades, additional research into pesticide breakdown and toxicity have resulted in many compounds being terminated or restricted in their use and/or production. However, these pesticides may linger within the environment from historical applications as legacy pesticides depending on their half-life.

The fate and transport of pesticides is dependent on their tendency to partition between deposited and suspended solids, water, air, and biota. Typically, this tendency is described by the organic carbon normalized sediment-water partitioning coefficient (**K_{oc}**). Interpretation of retention of pesticides to soil helps to evaluate their potential transport within an environment setting and thus potential to contaminate groundwater and surface water resources and impact human and ecological health.

Each year, the Coalition submits an updated Pesticide Evaluation Protocol (**PEP**) to amend pesticides that need to be monitored. These pesticides can vary each year to reflect management practices growers adopt over time. Between 2015 WY and 2018 WY, exceedances triggered management plans for diuron, simazine, and chlorpyrifos at SP-3.

2.9.1.1 *Diuron*

Diuron is a substituted urea herbicide and algaecide often used to control annual and perennial broadleaf and grassy weeds in protection of agricultural crops as well as non-agricultural rights-of-way, irrigation or drainage ditches, and recreational or residential areas[2]. It is moderate to high in toxicity to aquatic organisms and highly toxic to plants, depending upon application concentration and location. Diuron can be applied in granular and liquid form and is typically sprayed onto soil. In March 2022, the U.S. Environmental Protection Agency (**USEPA**) proposed to terminate the use of current tolerances of

[2] Giacomazzi and Cochet, 2004. Environmental impact of diuron transformation: a review. *Chemosphere*, 56 (11): 1021-1032. https://doi.org/10.1016/j.chemosphere.2004.04.061

conventional diuron on food and feed crops, commercial fish farming, and on non-agricultural sites in effort to mitigate human health exposure and ecological risks[3]. Although its use has been restricted, it is still registered for agricultural use, and regardless of application source, diuron presence may remain in the environment for months to years following application due to the persistence of its degradation products[2]. Given its moderate K_{OC} value, diuron favorably binds to soil, especially in soil with high levels of organic matter.

2.9.1.2 *Simazine*

Simazine is a triazine herbicide used to control various types of weeds, grasses, and woody plants[4]. This herbicide product is used on agricultural crops (primarily citrus and corn) and non-agricultural sites, including residential and recreational areas, nurseries, greenhouses, and ornamentals. Studies have indicated that simazine is carcinogenic and toxic under chronic exposure as well as highly toxic to aquatic life[5]. When applied, simazine is typically sprayed directly on soil, particularly within orchards during the winter[6]. As a persistent pesticide, its metabolites can remain in the environment between 1 and 4 months after application. Simazine does not readily absorb soil particles. As such, it is susceptible to leaching in soils which poses a risk to groundwater resources[5].

2.9.1.3 *Chlorpyrifos*

Chlorpyrifos is an organophosphate pesticide primarily used as an insecticide that has a half-life of 29 to 74 days[7]. Effective February 2022, the USEPA revoked all tolerances for chlorpyrifos' applied to food though it may still be used as an insecticide for agricultural and non-agricultural purposes, typically in winter when trees are dormant[8]. As an insoluble compound, chlorpyrifos is typically applied as a capsule or mixed with an oily liquid prior to application. As a non-polar compound, chlorpyrifos tends to bind to soil and shows limited transport via runoff, erosion, and limited mobility in soil[7], which reduces its potential to contaminate groundwater. Further, chlorpyrifos is mobile in the atmosphere due to its volatility, which means it can be found in air, rain, snow, and other atmospheric environmental media. As such, it may enter water through atmospheric deposition[9].

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[3] USEPA, 2022. Diuron Proposed Interim Registration Review Decision Case Number 0046. Docket Number EPA-HQ-OPP-2015-0077. https://www.regulations.gov/document/EPA-HQ-OPP-2015-0077-0065

[4] USEPA, 2019. Simazine Proposed Interim Registration Review Decision Case Number 0070. Docket Number EPA-HQ-OPP-2013-0251. https://www.regulations.gov/document/EPA-HQ-OPP-2023-0251-0174.

[5] USEPA, 2014. Technical Factsheet on: SIMAZINE. *National Service Center for Environmental Publications (NSCEP).* https://nepis.epa.gov/Exe/ZyPDF.cgi/P1011OOA.PDF?Dockey=P1011OOA.PDF

[6] Coats, G.E., Taylor, J.M., Kelly, S.T., 2008. Chapter 19 - Benefits of Triazine Herbicides in Turf, Editor(s): Homer M. LeBaron, Janis E. McFarland, Orvin C. Burnside, The Triazine Herbicides, *Elsevier*, Pages 235-242, ISBN 9780444511676, https://doi.org/10.1016/B978-044451167-6.50022-2.

[7] Racke K.D., 1993. Environmental fate of chlorpyrifos. Reviews of Environmental Contamination and Toxicology; 131:1-150. doi: 10.1007/978-1-4612-4362-5_1.

[8] USEPA, 2022. Chlorpyrifos. USEPA. https://www.epa.gov/ingredients-used-pesticide-products/chlorpyrifos.

[9] Mackay D, Giesy J. P., Solomon K. R., 2014. Fate in the environment and long-range atmospheric transport of the organophosphorus insecticide, chlorpyrifos and its oxon. Reviews of Environmental Contamination and Toxicology; 231:35-76. doi: 10.1007/978-3-319-03865-0_3.

2.9.2 Toxicity

Toxicity describes the amount and extent to which a substance is poisonous to an organism. Many chemicals, including pesticides, are known to be toxic to humans, terrestrial organisms, and aquatic organisms. Toxicity is organism-dependent and varies for different chemical compounds. For some organisms, exposure to certain chemical contaminants in low concentrations is not harmful. At higher concentrations, these same chemicals may begin to negatively impact organism health. Higher concentration exposures can be classified as both acute and/or chronic. Chronic exposure can occur if the toxin bioaccumulates (i.e., binds to lipids and becomes concentrated within organs). When this happens, the accumulated toxin increases in concentration within an organism over time, resulting in toxicity to that organism or those that consume it. Sources of toxins include pesticides, agricultural fertilizers, petroleum, industrial equipment and processes, and bacteria. Toxic chemicals can enter waterways during point and non-point source discharge events from a variety of sources depending upon the chemical.

As required by the General Order, the Coalition analyzes for toxicity to the water flea (*Ceriodaphnia* dubia), the flathead minnow (*Pimephales promelas*), and green algae (*Selenastrum capricornutum*) at all monitoring sites. Toxicity tests determine the bioavailability of contaminants, test the aggregate effect of contaminates at a site, and evaluate toxicity for contaminates whose toxicity may not be well known[10]. Triggers for algal toxicity can be found between 9 monitoring sites since the 2014 WY Sites that have triggered a management plan for algal toxicity include SP-1, SP-2, SP-3, SP-5, SP-6, CC-1, FD, and LC-1.

As an indicator of water toxicity, green algal growth (*S. capricornutum*) is tested. Reduced algal growth following exposure to sample water indicates the presence of a toxin or contaminant at the sample location. It is likely these toxins include herbicides, phosphite or phosphoric acid[11], and other chemicals or metals with phytotoxicity. Phytotoxicity includes any adverse effects to plant growth and development caused by chemical substances. These chemicals may derive from a variety of sources depending upon the contaminant. In the Kaweah Basin common constituents that are toxic to algae include, copper (copper sulfate as an algaecide) and diuron (an herbicide and algaecide). Both of which have outstanding management plans. Additional investigations are required to confirm if copper or diuron impact toxicity which will be developed further in the Source ID Review. It is necessary to first identify the chemical causing the toxicity to properly assess the source, fate, and transport of the toxin.

2.9.3 Metals

Metals derive from both natural and anthropogenic sources. Many metals in the environment are essential for biogeochemical processes. At trace levels, metals are necessary for ecosystem health. However, at higher levels, metals contaminate the environment and cause toxicity issues. Metal contamination derives from a variety of sources, including geochemical cycling (e.g., geologic material, weathering, volcanos), agricultural fertilizers, fungicides, paints, vehicles, industrial equipment, and other industrial processes.

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[10] USEPA, 1994. Using Toxicity Tests in Ecological Risk Assessment. Office of Solid Waste and Emergency Response: ECO Update; 2(1):1-12. Publication 9345.0-05I

[11] Gómez-Merino & Trejo-Téllez, 2015. Biostimulant activity of phosphite in horticulture. Scientia Horticulturae; 196:82-90. doi: 10.1016/j.scienta.2015.09.035.

Typically, metals are transported in the particulate phase (i.e., suspended solids in waterways or aerosols in the atmosphere). Metals favorably adsorb to soil particles and primarily exist in the solid phase. Metals often accumulate in suspended particulate matter (**SPM**) in river and estuary sediments. As such, anthropogenic addition of metals to waterways may not be reflected in the dissolved metal concentrations, but rather, may be reflected in the surficial sediment and SPM metal concentrations. The tendency of metals to exist within a water column is described by the soil-water partition coefficient for inorganic constituents, K_D, which describes a metal's tendency to adsorb to soil particles. Although metals tend to bind to soil, speciation of metals and environmental conditions may alter metal adsorption potential. This means that the tendency for dissolved metals to exist within a water column is influenced by parameters such as pH, hardness, and conductivity; although, hardness determines the metal exceedance trigger limits. Further, metal adsorption to terrestrial soil depends upon its oxidative state within the environment meaning it may not adsorb to soil and may be leached within the soil profile. As such, multiple factors should be considered when identifying potential sources of metal contamination.

To evaluate the potential transport of metals, the KBWQA analyzes Total Arsenic, Boron, Molybdenum, and Selenium, as well as Total and Dissolved Cadmium, Copper, Lead, Nickel, and Zinc for this CSQMP. Management plans were triggered for Dissolved Copper at SP-3 and FD in December 2016, Total Zinc at CC-1 in April 2019, and Total Molybdenum at YOK in April 2017.

2.9.3.1 *Copper*

Copper is often applied to agricultural fields as either an algaecide or fungicide[12] or as an amendment to correct copper deficiencies in soils[13]. It is commonly applied as copper sulfate dissolved in water and sprayed directly onto fields or on the foliage of young crops. Copper oxide may also be sprayed onto dormant almonds or stone fruit trees during the winter. Copper sulfate is also used to maintain agricultural ditches as an algaecide. Non-agricultural related sources of copper may come from anthropogenic origin like road surfaces, industrial maintenance, and improperly closed mining operations in the Sierra Nevada Mountains. Speciation of copper, soil pH, and oxidation-reduction potential control copper bioavailability and adsorption to soil and SPM[14, 15]. While hardness determines the trigger limits for metals, consideration of soil and water column conditions (e.g., pH, conductivity, hardness, and chemistry) should be considered when evaluating the source of dissolved copper exceedances observed within the KBWQA.

[12] USEPA, 2008. Copper Fact Sheet. *National Service Center for Environmental Publications (NSCEP).* https://nepis.epa.gov/Exe/ZyPDF.cgi/P1001BJR.PDF?Dockey=P1001BJR.PDF

[13] Williams, E.R., Unpublished. The benefit of foliar applied copper fertilizer on romaine lettuce grown in low copper soils of the coastal Santa Maria, California. *California Polytechnic State University, San Luis Obispo.* https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1076&context=theses

[14] Rader et al. 2019. The Fate of Copper Added to Surface Water: Field, Laboratory, and Modeling Studies. Environmental Toxicology and Chemistry; 38(7):1386-1399. doi:10.1002/etc.4440.

[15] Sharma et al., 2009. Transport and Fate of Copper in Soils. Journal of Civil and Environmental Engineering; 3:145-150. doi:10.12974/2311-8741.2013.01.01.1.

2.9.3.2 *Zinc*

Zinc is an essential micronutrient for plant growth. Zinc deficiencies often exist in agricultural soils during the cooler season, when excess phosphate fertilizer is present, or in certain soil textures. Zinc is often applied to trees during the winter or spring seasons as either a liquid or in a granular form. Other sources of zinc include urban runoff, industrial or municipal wastewater, and sewage sludge. Similar to other trace metals, the species of zinc present in the environment depends on various factors such as pH, organic matter, conductivity, and temperature. A study found that zinc oxide, which is toxic to aquatic organisms, more readily aggregates under saline and warm temperatures[8]. Under more acidic temperatures, zinc in soil can dissolve and migrate to groundwater[16]. Most zinc present in waterways is sourced from erosion of soil containing zinc. Both current and historical zinc usage will be considered in evaluating sources of total zinc exceedances and identifying sources of zinc rich soil within the KBWQA.

2.9.3.3 *Molybdenum*

Molybdenum is a micronutrient for crops as well. Often, molybdenum fertilizer is applied granularly to soil or is sprayed onto soil or foliage when molybdenum deficiencies occur – typically during the summer or the early fall season. This metal is a known contaminant to groundwater and surface waterways as it adsorbs to solids under acidic conditions[17]. In alkaline soil, molybdenum bioavailability and desorption tendency can increase. Like other metals, additional conditions (e.g., pH, conductivity, organic matter) will be considered when tracing the source of molybdenum within the KBWQA.

2.9.4 E. coli

Escherichia coli (*E. coli*) is a coliform bacterium commonly found in human and animal feces. Coliform bacteria are a natural part of the environment; however, when present in the environment, these bacteria may persist and proliferate when oxygen is available. Elevated quantities of coliforms can negatively impact human health. *E. coli* can enter surface water via animal waste (e.g., manure, animal fecal matter) or human waste (e.g., leaking septic or sewage systems). In agricultural settings, manure that was not completely composted may act as a source of *E. coli*, as can animal droppings present from migratory or local birds or animals. Livestock ranches may also contribute *E. coli* to waterways during storm events as their animals' waste may runoff and enter surface waterways or leach to groundwater.

Management plans were triggered for *E. coli* at all samplings sites: SP-1, SP-2, SP-3, SP-5, SP-6, CC-1, FD, LC-1, and YOK.

In California's Central Valley, *E. coli* in waterways has been a valley-wide issue and a concern in a number of waterways outside the KBWQA. It is difficult to specify one source of the bacteria given the wide variety of agricultural, livestock, and urban sources that could contaminate these waterways.

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[16] Noulas et al., 2018. Zinc in soils, water and food crops. Journal of Trace Elements in Medicine and Biology; 49:252-260. doi:10.1016/j.jtemb.2018.02.009.

[17] Xu et al., 2013. A Review of Molybdenum Adsorption in Soils/Bed Sediments: Speciation, Mechanism, and Model Applications. Soil and Sediment Contamination: An International Journal; 22(8):912-929. doi:10.1080/15320383.2013.770438.

2.9.5 Field Parameters

In addition to analyzing samples for chemical constituents, some water quality parameters are measured *in situ* in the field. The Field Parameters monitored at each site include estimated flow, conductivity, temperature, pH, and dissolved oxygen (DO). Individually, these parameters provide an additional layer of insight to water quality conditions that chemical constituents alone do not provide.

- **Flow Measurements:** Flow measurements can be used to estimate the number of contaminants moving through the system during a given timeframe and can indicate when additional upstream inputs are present. Additionally, the presence flow indicates whether a quality sample can be obtained.
- **Temperature:** Certain aquatic organisms require distinct temperatures. Many species are found to be sensitive to extreme shifts in temperature. Temperature also influences chemical kinetics and gas solubility within the water column.
- **Conductivity:** Extremely high conductivity can reduce the activity of chemical compounds or may indicate input of a pollutant, reduced freshwater inputs, or increased evaporation.
- **pH:** pH can impact solubility and biological availability (speciation) of nutrients and trace metals in the water column. The chemical species present in a water column can influence toxicity of contaminants to aquatic organisms. Additionally, some aquatic organisms thrive in a narrow range of pH values.
- **Dissolved Oxygen:** Dissolved oxygen reflects a balance between aeration, photosynthesis, and respiration. In most aquatic environments, DO varies throughout the day. However, some biological processes may drastically draw down DO, making the environment uninhabitable for other organisms.

In most aquatic environments, diurnal and seasonal variation in water quality parameters can occur. Diurnal variability of water quality parameters occurs due to changes in solar radiation or biological processes over the course of a day. Seasonal variability can indicate changes in atmospheric temperature, solar radiation, biological activity, and upstream water inputs that change throughout the year. Collectively, these parameters characterize ambient water quality and provide data that can help evaluate ecosystem and biogeochemical processes.

Anomalous field parameter values may be caused by a variety of sources which could be evaluated individually. Of the five parameters measured, previous monitoring results at SP-3 and SP-5 triggered management plans for pH.

Exceedances in pH may derive from point and non-point source contributions of chemical contaminants, temporal variability, and biological activity. Fluctuations in pH naturally occur due to diurnal variability from microbial respiration and photosynthesis. These changes may be compounded if additional chemical constituents are added upstream. These can include cleaning agents used in industrial cleaning, food processing, and agricultural soil amendments. To identify specific sources of pH variability, a variety of sources should be considered based on whether the exceedance was basic or acidic. This parameter may also influence the desorption of certain contaminants from particulate matter within the water column, contributing to toxicity or increased concentrations of other contaminants. While pH may directly affect aquatic organisms, its secondary effects like speciation threaten these organisms as well.

2.9.6 Nutrients

Nutrients are molecules essential for organism energy, growth, and reproduction. Nutrients come from both natural cycling (e.g., weathering, nitrogen cycling) as well as anthropogenic inputs (e.g., agricultural fertilizer, dairy manure). In the environment, macronutrients (e.g., nitrate, nitrite, ammonium, phosphate) and micronutrients (e.g., trace metals) are present in soil and waterways. At normal levels, these nutrients allow ecosystems to grow and thrive. In excess, nutrients can cause detrimental growth that disrupts natural ecosystem cycles. For example, eutrophication (i.e., when excess nutrients are present within a waterway) leads to rapid and expansive growth of algae in surface waters. The decomposition of these algae results in higher respiration rates within the water column, which draws down dissolved oxygen and creates uninhabitable conditions for some aquatic organisms. At times, algal blooms can also become toxic, which leads to a bioaccumulation of neurotoxins in humans and larger aquatic organisms. Finally, some nutrients in soil readily leach to groundwater (e.g., nitrate). Contaminated drinking water wells threaten human health, especially in babies and children.

In the 2022 WY quarterly monitoring report data indicate no monitoring sites triggered a management plan. If any sites exceed the trigger limits for new constituents in the future, an addendum will be added to this management plan to address nutrient exceedances.

3 Management Plan Strategy & Integration Measures

3.1 Description of Approach

The KBWQA has developed this Comprehensive SQMP approach to address each constituent of concern efficiently and effectively. Each constituent has been categorized based on recent research, the ability to properly identify probable sources, and the Coalition's ability to address the issues that have been caused by irrigated agriculture. These categories include a Source Identification Review, 10-Year Compliance, and Valley Wide Issue.

The Coalition intends to utilize the following main objectives and approach to successfully implement this CSQMP:

1. Identifying potential sources causing exceedances of identified constituents in the management plan region via a Source Identification Review.
2. Grower outreach and education meetings to disseminate information to members in the management plan region.
3. Continued monitoring of associated waterbodies.
4. Review implementation of grower management practices.
5. Evaluation of effectiveness of implementation of improved/adjusted management practices.

3.1.1 Management Plan Strategy

1. First, the Coalition plans to collectively determine potential sources of each constituent and appoint each to the proper compliance category.

- Data for those that have been categorized as a Source Identification Review will be analyzed.
- Data to be analyzed include management practices utilized and reported by growers before and at the time of an exceedance, to determine where a constituent may have originated.
- However, identifying a single source may be difficult for many constituents. So, a 10-Year Compliance category will allow the Coalition to observe trends in monitoring data and compare water quality based on variations of management practices.
- Finally, the Valley Wide Issues category includes constituents that have triggered management plans Valley wide. Progress for compliance will stem from a collaborative effort between Coalitions and the CVRWQCB.

2. To determine potential sources of chemicals causing exceedances, the Coalition intends the following.
    - Review surface water quality data, PUR data, and grower management practice data to identify applications of potential constituents.
    - Data review will begin with observing practices utilized by parcels adjacent to each waterway, upstream of sampling sites where management plans have been triggered. The buffer of parcels adjacent to each waterbody will be adjusted upon findings.
    - Figures 4 through 11 showcase the parcels adjacent to each waterway included in this plan that will be used for an initial review.

3. Following the Source Identification Review and management practice evaluation:
    - The KBWQA, plans to notify growers adjacent to associated waterbodies and those who have been identified as potential contributors.
    - Depending upon the constituent compliance category, outreach will commence to a broad group of growers or to individual growers adjacent to waterbodies.
    - Education and outreach efforts will communicate best management practices for constituents that have triggered management plans in their area and will include a follow-up survey to document implementation of management practices.

4. The KBWQA plans to continue regular monitoring at each site as required.
    - Monitoring is to detect if the quality of waters are being maintained.
    - The Coalition will continue to notify the Waterboard as exceedances are identified.
5. Following a review of grower outreach survey and water quality:
    - The KBWQA will evaluate whether water quality has improved with respect to the associated constituent.
    - If results indicate that water quality has not yet improved, the Coalition will enter a second iteration of the management practice implementation strategy outlined in Figure 3.
    - The second iteration will continue to investigate potential sources, management practices, and/or outreach such that the approach is more narrow or specific in addressing the constituents.

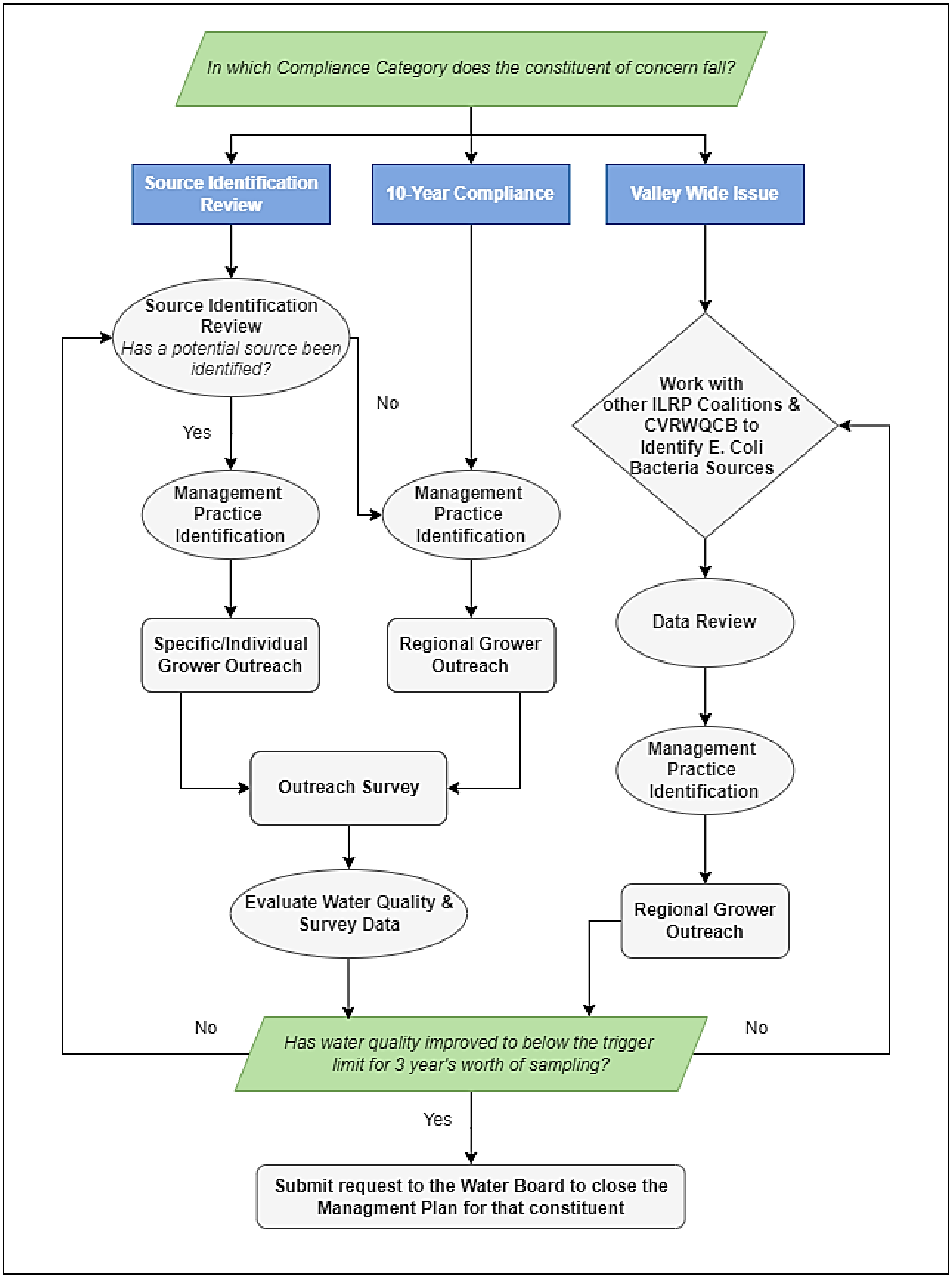


Figure 3 Management Plan Strategy according to compliance category

3.2 Constituents of Concern

There are nine constituents that have triggered management plans, as discussed above, the KBWQA has categorized each shown in Table 8. By categorizing constituents that have triggered management plans, the Coalition will be able to address and prioritize each based on the ability to narrow down a source, observe trends, and collaborate with other Coalitions and the CVRWQCB.

Table 8 Compliance categories and the corresponding constituent

Compliance Category	Constituent
Source ID	Dissolved Copper
	Total Zinc
	Molybdenum
	Diuron
	Simazine
	Chlorpyrifos
10 Year Compliance	Toxicity to Algae
	pH
Valley Wide Issue	E coli

3.2.1 Compliance Category: Source Identification Review

Constituents included in the Source Identification Review consist of metals and pesticides that have triggered management plans. Source identification review consists of an extensive data review and periodical research on potential direct and indirect sources of each constituent included in this category.

Pesticides included in Table 7, include diuron, simazine, and chlorpyrifos, which have triggered management plans at the Stone Corral sampling site which is independently managed by Stone Corral Irrigation District (**SCID**). Changes to the SCID's management of Cottonwood Creek and Stone Corral introduce challenges in obtaining a quality sample. The Coalition plans to continue working with the SCID on proposed management changes. Historic pesticide application data will be reviewed as part of the Source ID review. Additionally, Outreach will be conducted to all growers adjacent to the waterbody and to those who have been identified as a possible source following a review of pesticide data.

Metals, including dissolved copper, total zinc, and molybdenum have also triggered management plans at various sites. Historic application data will be reviewed to determine whether growers have applied chemicals containing highlighted constituents in the past. Additionally, research will commence on naturally occurring elements in the area, other anthropogenic activities, etc., to ensure that sources are properly observed. As stated above, outreach will commence to convey findings and the best management practices that will maintain water quality within appropriate limits.

3.2.2 Compliance Category: 10-Year Compliance

The 10-Year Compliance category includes toxicity to algae (*S. capricornutum*) and pH, both of which are constituents that may derive from either agricultural and/or non-agricultural sources. As part of this management plan, these constituents are proposed to be addressed within 10 years. Toxicity to algae and pH may derive from a variety of sources, and an initial broad or regional grower outreach will commence to communicate exceedances to all members in the Coalition. A trend analysis for toxicity to algae will be included in management plan updates to track water quality results since the first exceedance that triggered the management plan.

Combined with documentation of management practice implementation and three years of monitoring without exceedances can demonstrate that growers have implemented effective practices that eliminated water quality impairment if they are a contributing source. The Coalition will use the survey results, surface water quality data, and other management practice data to identify individual growers or smaller regions that may benefit from additional outreach. Finally, Communication with the Regional Board on outside sources contributing to elevated levels of algal toxicity will continue through ongoing monitoring and submittal of quarterly reports.

3.2.3 Compliance Category: Valley Wide Issues

Constituents that fall under Valley Wide Issues include E. coli. This category includes constituents for which larger efforts are in place to manage or mitigate water quality degradation. The Coalition will proceed in reviewing data and land uses surrounding each site where a management plan has been triggered in addition to outreach to growers to encourage the use of best management practice. Table 7 indicates a review conducted to communicate how widespread the issue of E coli is throughout the Central Valley which points to a larger issue at the regional level rather than the Coalition level. Many ILRP Coalitions received a letter from the Regional Board's Executive Officer on February 17, 2012, requesting that the Coalitions collaboratively develop an approach for understanding fecal indicator bacteria sources to regional waterbodies. To the knowledge of the KBWQA, no programs or additional efforts have convened since the issuance of the letter. The KBWQA will participate in the efforts made by the Regional Board or other collective Coalition efforts to reduce the impact of its growers and the associated levels of E coli in surface waters.

3.3 Management Practice Identification, Implementation, and Review

To determine potential sources of chemicals causing exceedances, the Coalition intends to review and use various data sources (e.g., grower data, PUR data) to identify applications upstream of the sampling site. A summary of existing data is included in section 2.5. Additional data will be evaluated to identify management practices of lands adjacent to streams that may have contributed to the degradation of the water quality. Data review will begin with all parcels immediately adjacent to the waterbody where a management plan has been triggered as depicted in Figure 4 – Figure 11. Following initial review and dependent on findings, the data review may expand the radius of reviewed parcels adjacent to the waterbody. Additionally, water quality data will be reviewed to determine the sources of toxicity, that many have stemmed from other exceedances that have occurred within a selected time period as the algal toxicity exceedance.

Growers adjacent to associated waterbodies and those who have been identified as a potential contributor will be notified of exceedances and the ongoing management plan effort. As part of the outreach effort, growers will be encouraged to utilize best management practices to support maintaining water quality within acceptable limits. Potential contributors will be determined based on management practice data that may indicate a contribution to the degradation of the waterbody. The KBWQA wants to highlight that many exceedances have occurred historically and since the first trigger, have ceased to be an ongoing issue. Therefore, to ensure that irrigated agriculture is no longer the issue, historic management practices will be compared to current practices to properly identify whether irrigated agriculture may have been the problem and whether an adjustment to practices was the solution.

During annual outreach and education events, the need for management practice implementation to prevent constituents from entering the waterway will be emphasized to all growers. Management practice surveys will be sent to identified growers following outreach events to document implementation of management practices. Monitoring will commence at all sampling sites as required by the General Order. Additional outreach will commence to individual growers identified if water quality improvements.

With the ASR submitted on August 31 each year, data will be evaluated and reported with respect to each management plan objective to inform and evaluate the effectiveness of each step. Data will include Coalition member management practices, surface water quality monitoring data, outreach survey data, and other publicly available environmental data.

The Coalition will reevaluate and reiterate management practices and implementation upon any lack of water quality improvement following outreach and education

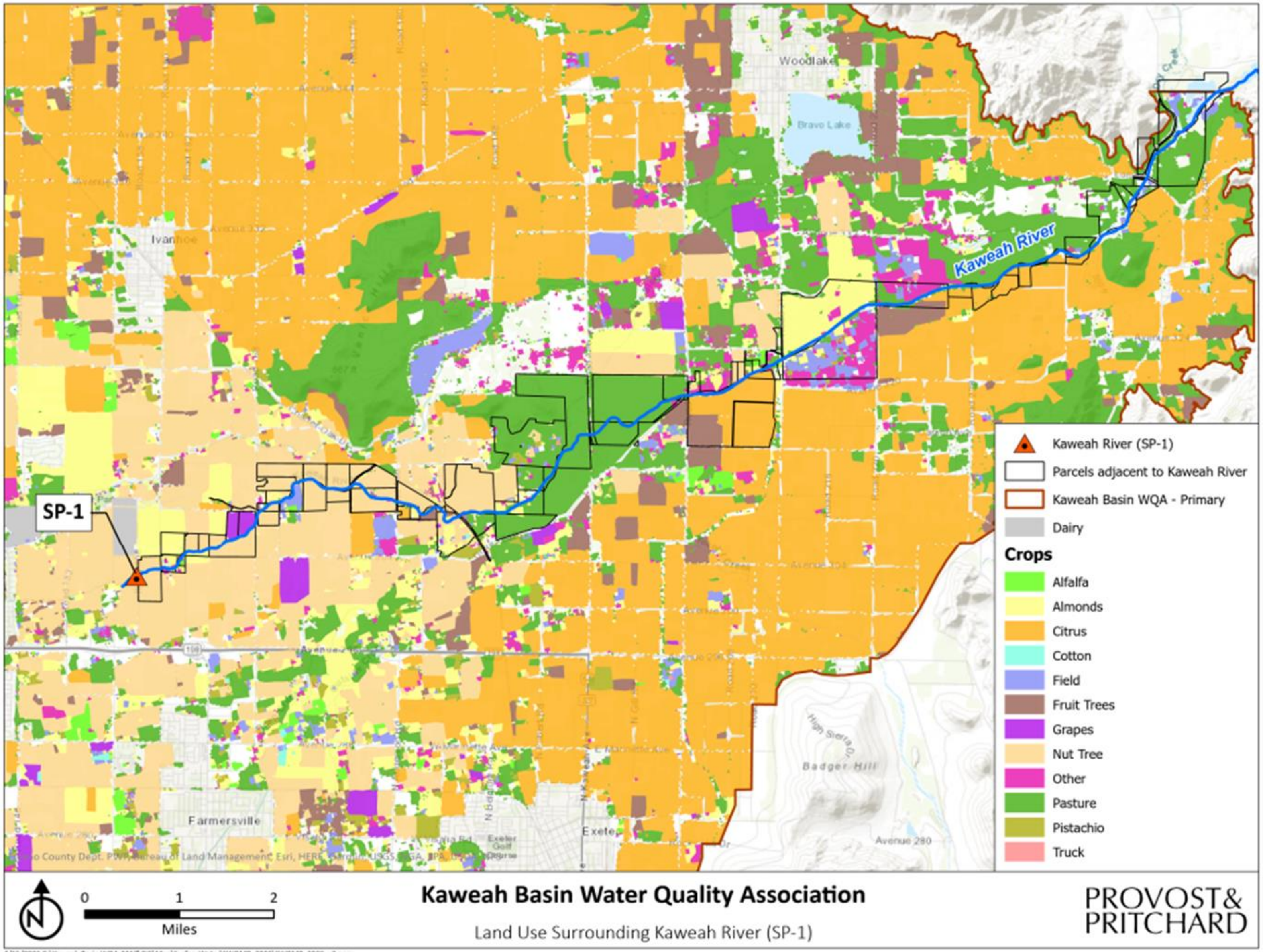


Figure 4 KBWQA Land Use Surrounding Kaweah River (SP-1)

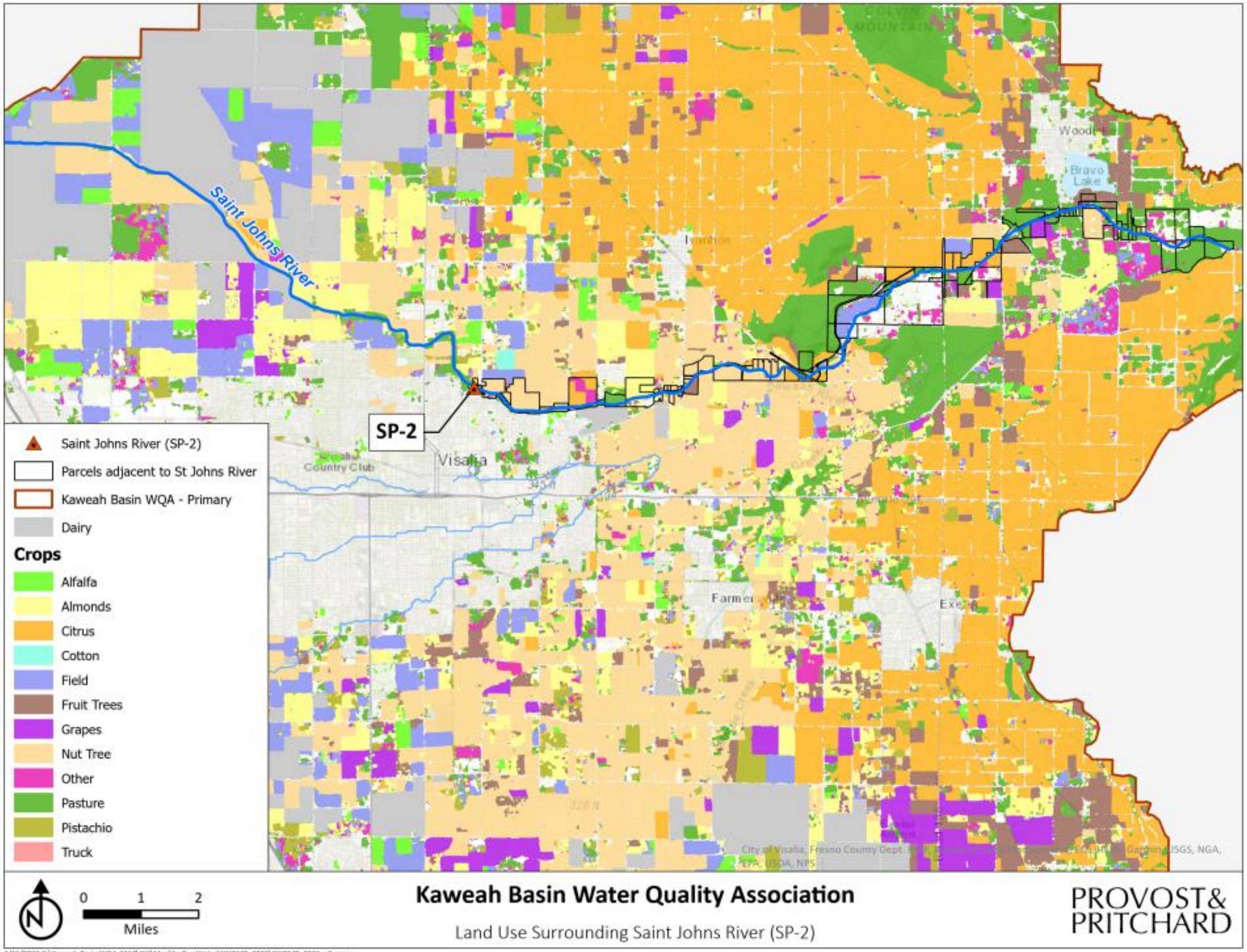


Figure 5 KBWQA Land Use Surrounding Saint Johns River (SP-2)

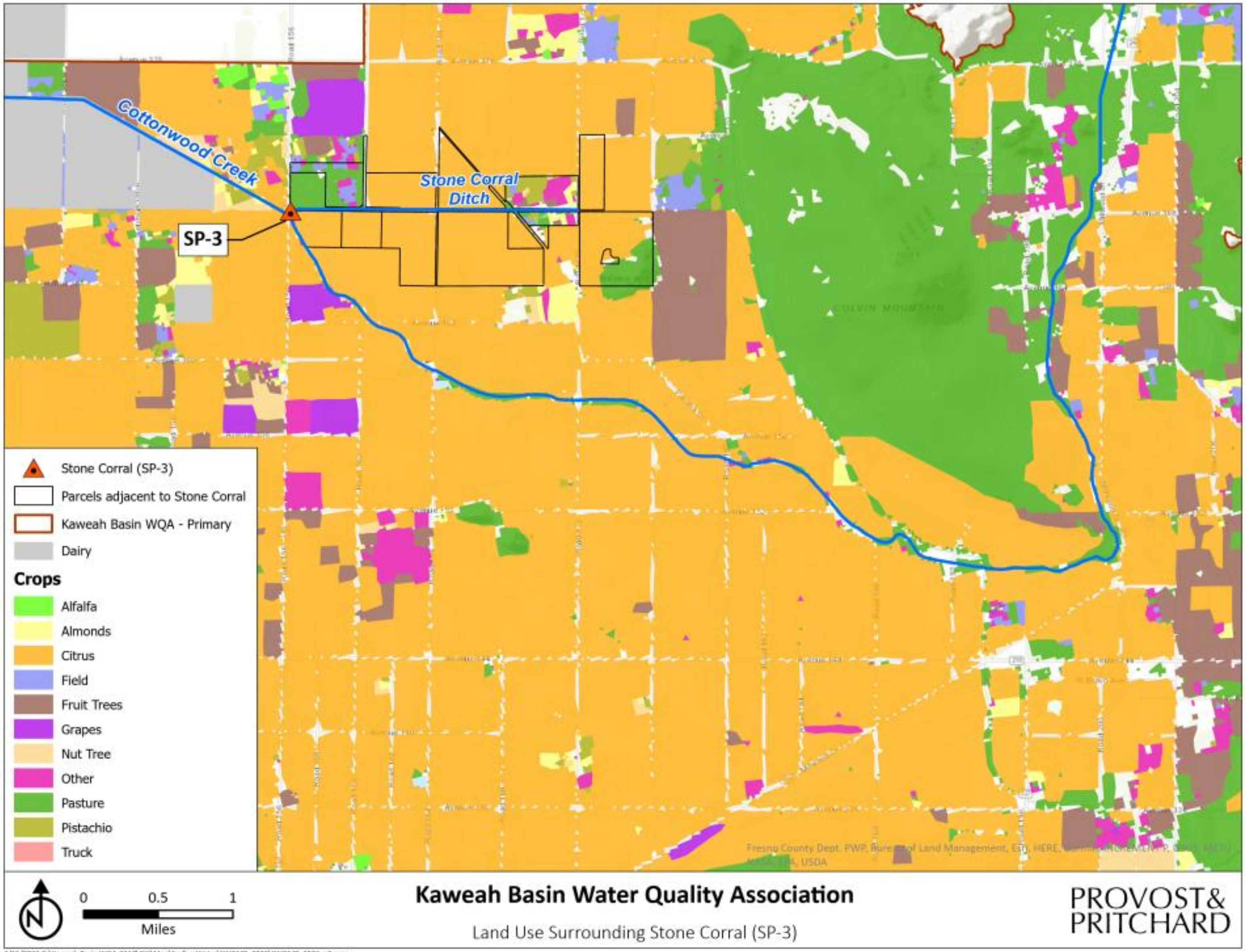


Figure 6 KBWQA Land Use Surrounding Stone Corral (SP-3)

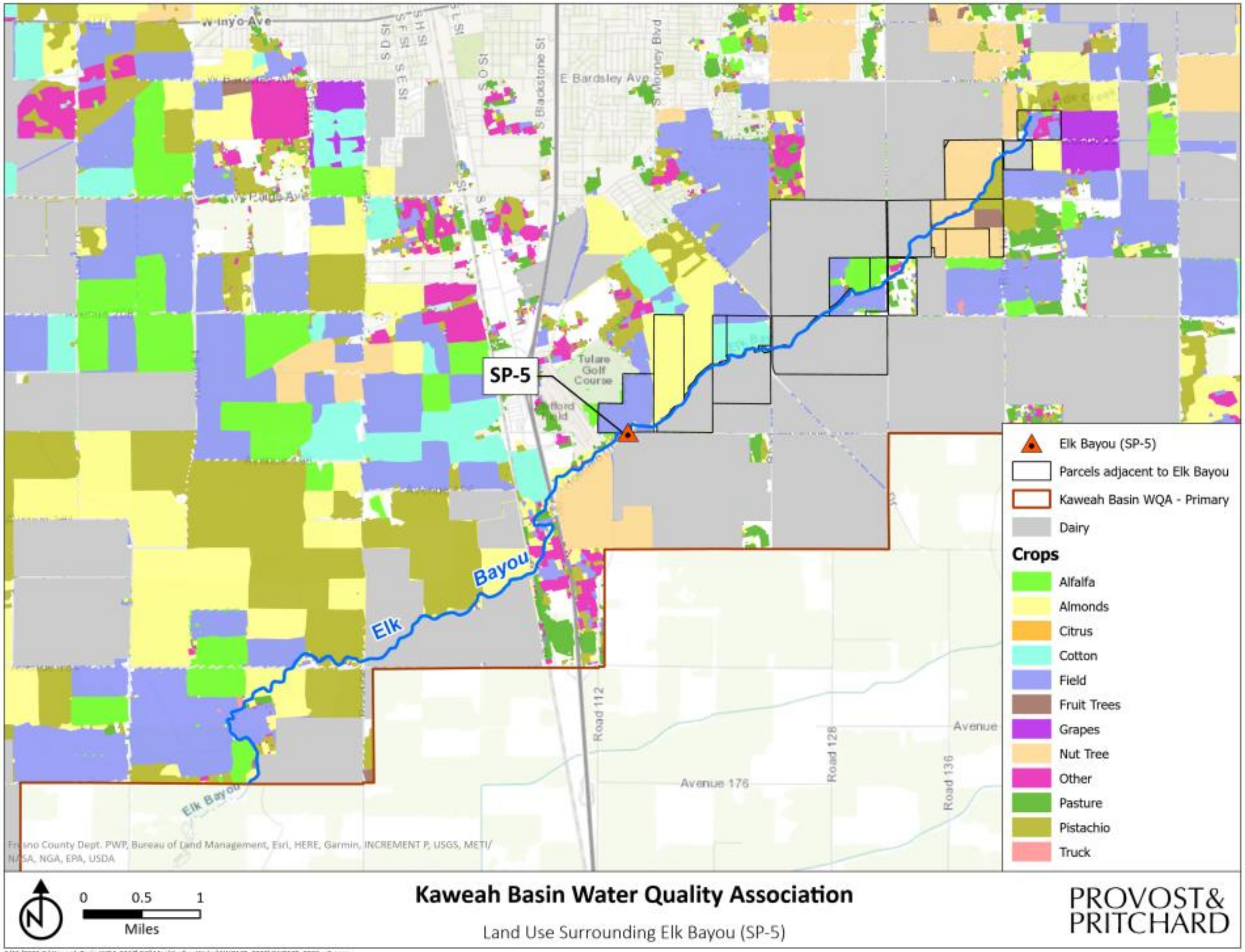


Figure 7 KBWQA Land Use Surrounding Elk Bayou (SP-5)

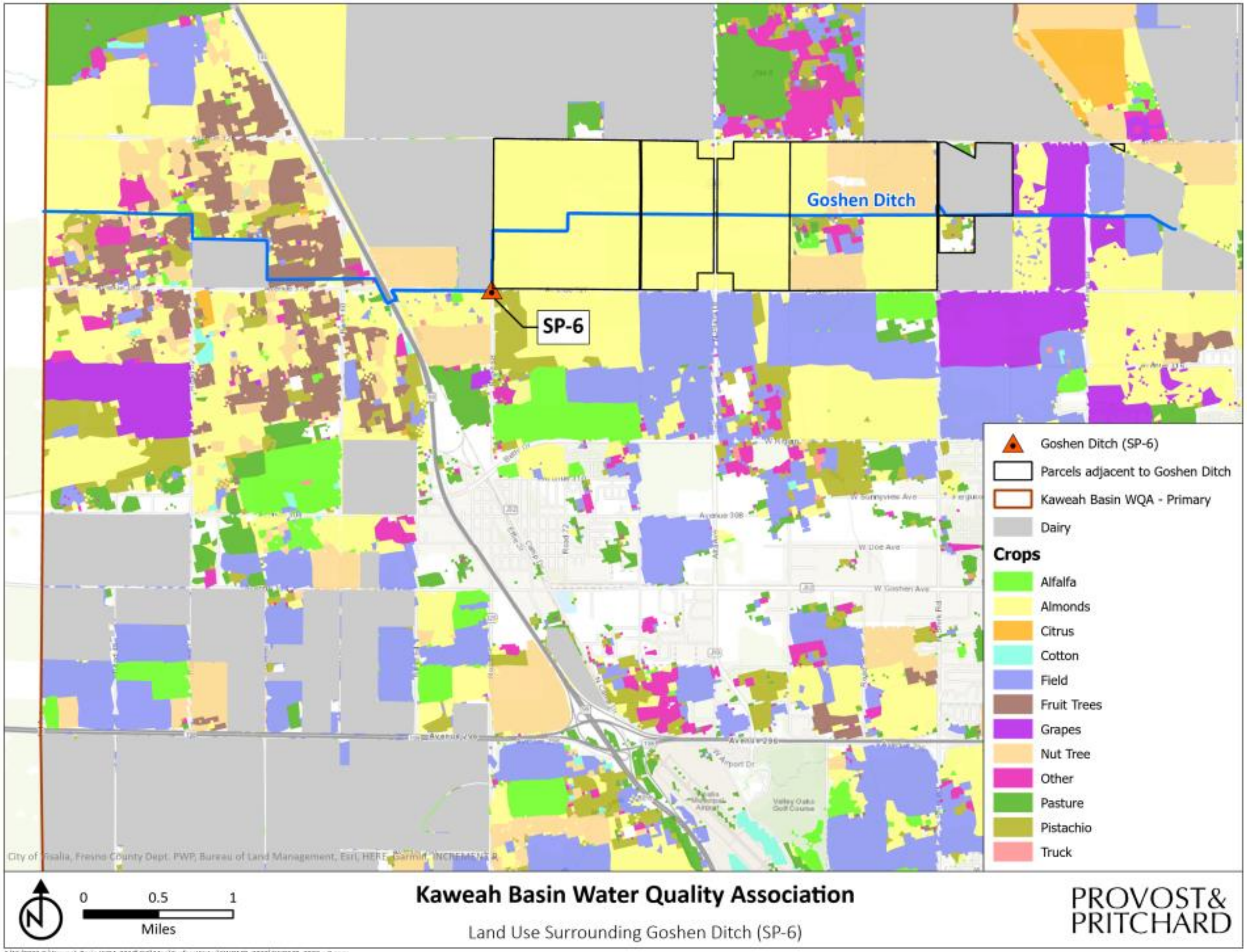


Figure 8 KBWQA Land Use Surrounding Goshen Ditch (SP-6)

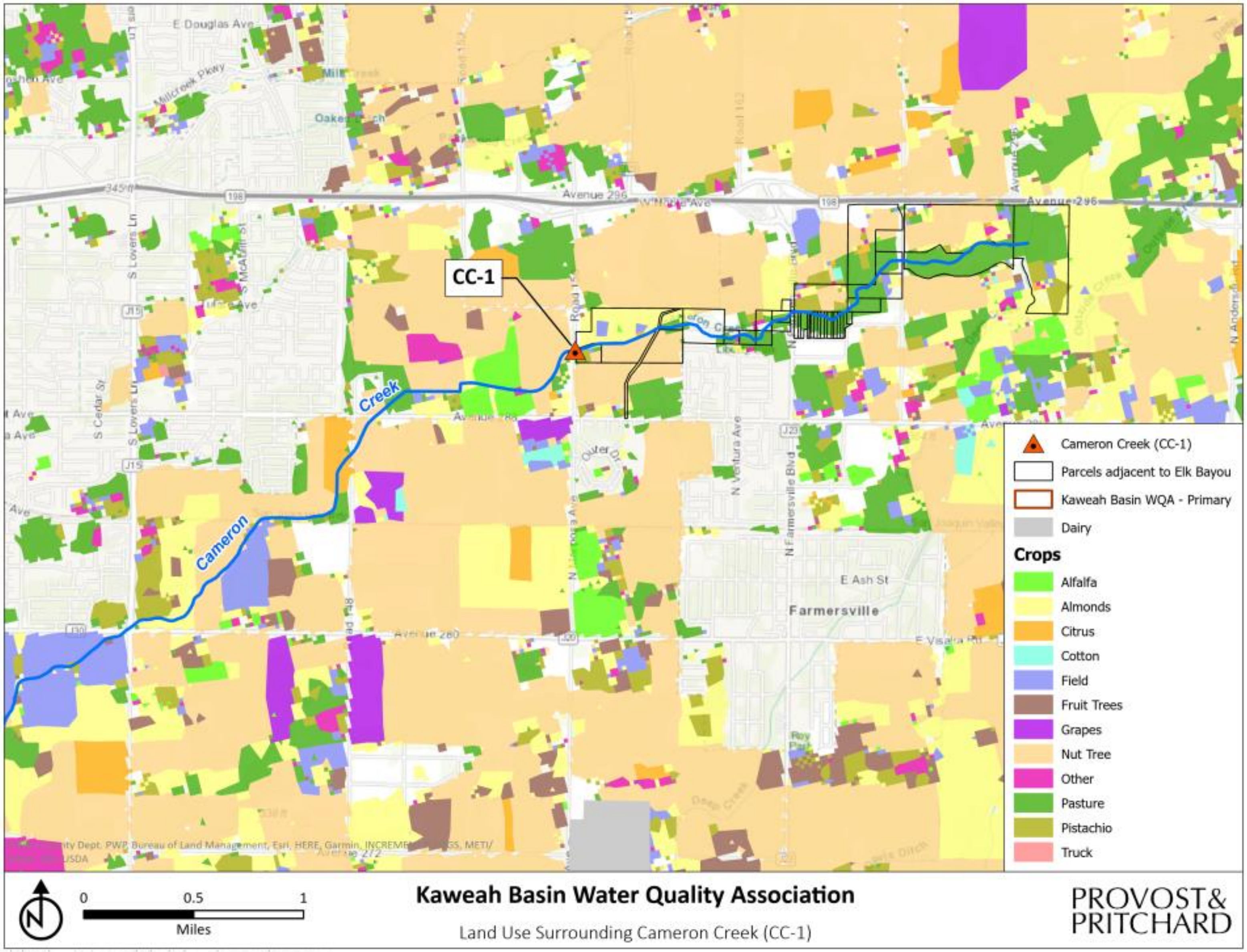


Figure 9 KBWQA Land Use Surrounding Cameron Creek (CC-1)

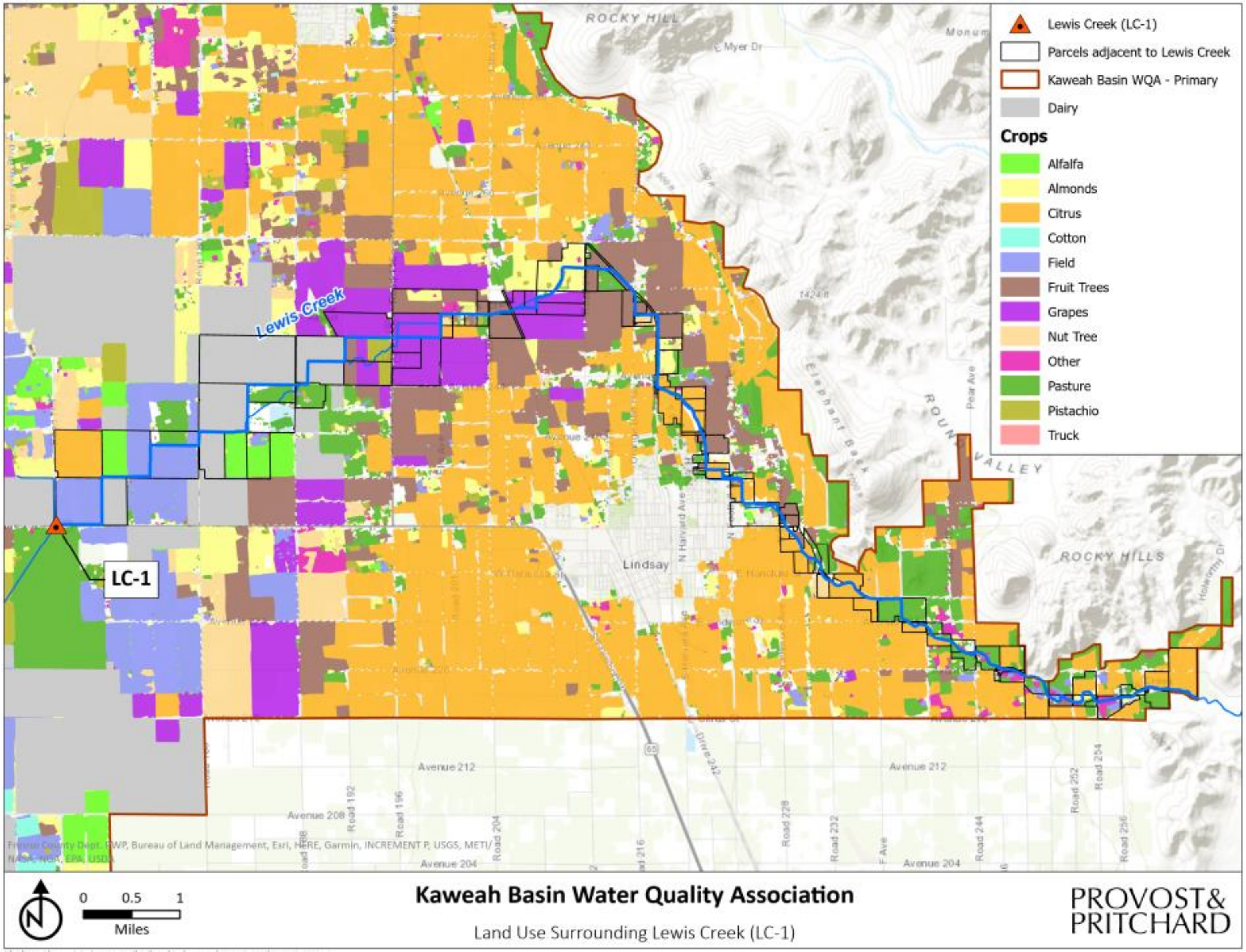


Figure 10 KBWQA Land Use Surrounding Lewis Creek (LC-1)

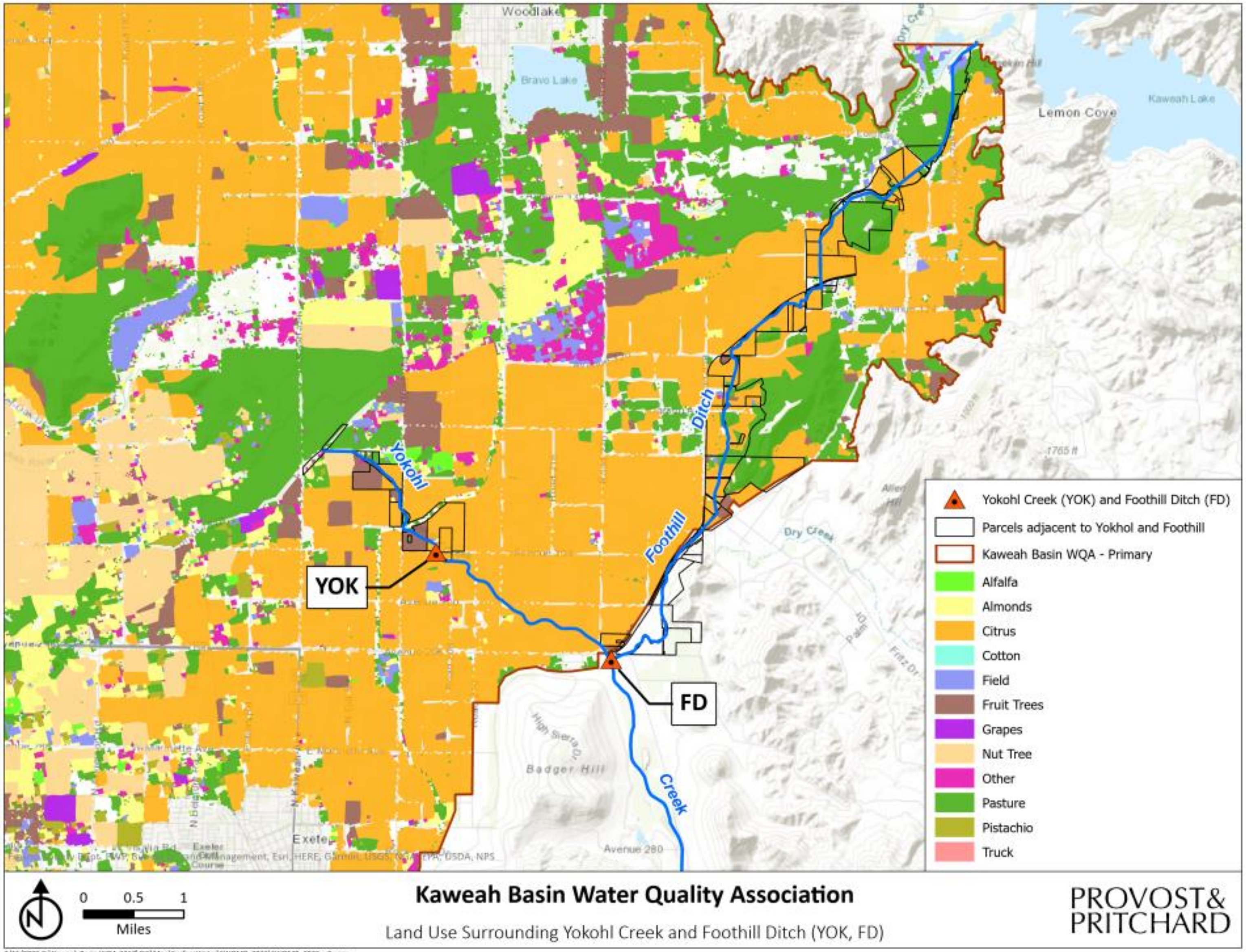


Figure 11 KBWQA Land Use Surrounding Yokohl Creek (YOK) and Foothill Ditch (FD)

3.3.1 Implementation Schedule & Prioritization

The implementation schedule outlined in Table 9 will commence upon EO approval of this CSQMP. This schedule is a rough guide for the Coalition and its growers to use. Upon approval, an initial review of management practice data will take place for each compliance category. This initial review will support the Coalition in identifying potential agricultural impacts that could be the source of an exceeded constituent. Additionally, this data review will determine trends in management practices since the first management plan triggered for most constituents. Drought patterns will be analyzed as water quality data that Coalition obtains is dependent on variations in drought and whether any dam releases or precipitation occurred for the Coalition to obtain a quality sample. The amount of water in the system will also affect the concentration of many constituents that have triggered management plans. Data review findings will be reported to the CVRWQCB in the ASR submitted annually on August 31. Additionally, outreach will commence to growers upon EO approval. General outreach is meant to notify growers of the exceedances that have occurred and to encourage proper management practices to minimize their individual impact.

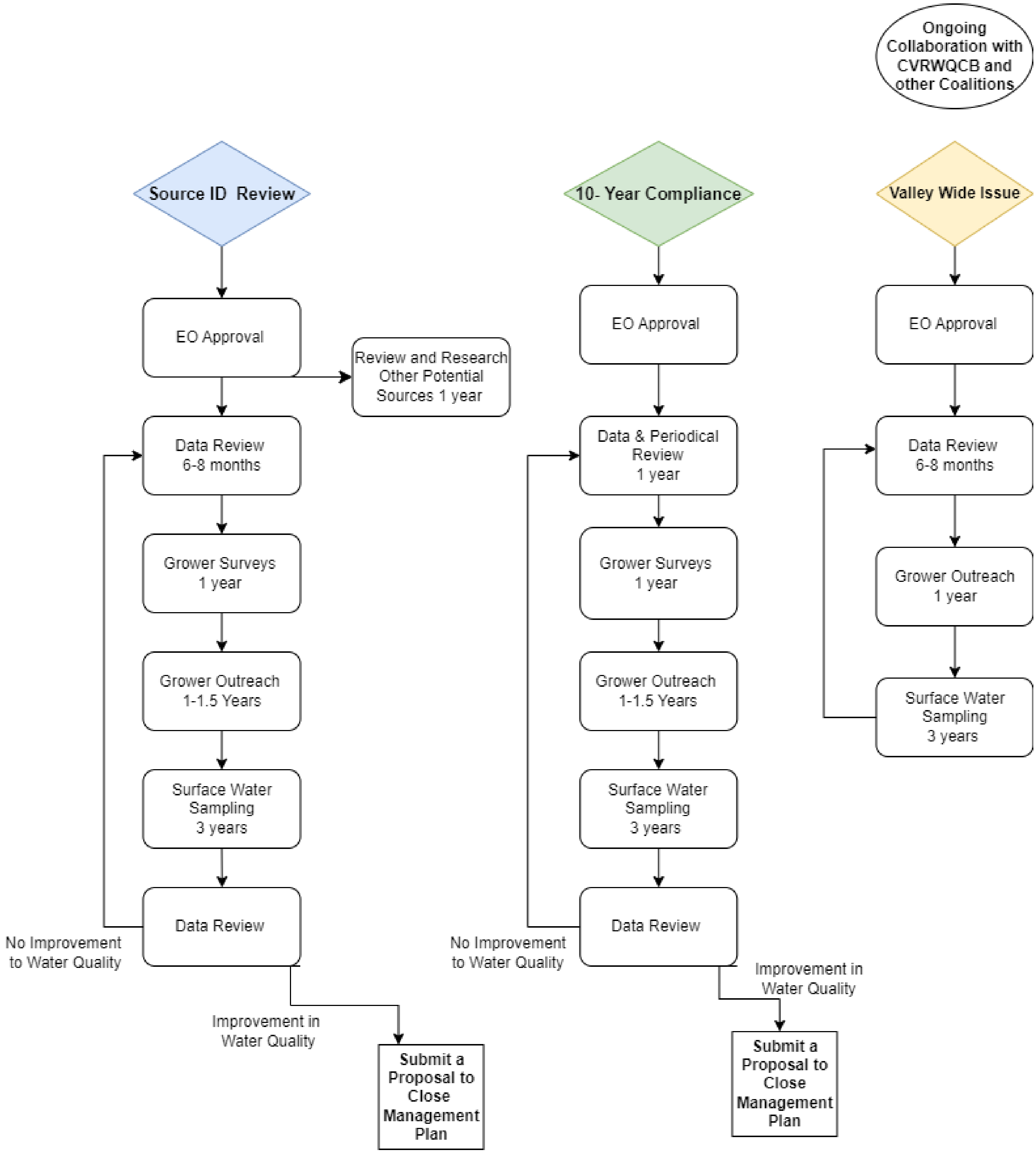
Each compliance category will go through various reviews based on findings and goals. Data Reviews will also analyze dependable data and other research to understand potential nonagricultural sources that may contribute to exceedances within the KBWQA area.

Several rounds of data review and outreach will help the KBWQA determine where sources may originate and determine whether irrigated agriculture is a contributing source.

The Valley Wide Issue compliance category will also go through a series of data reviews and trend analysis, however, the KBWQA will work closely with other Coalitions and look to the CVRWQCB on guidance and additional programs to support the constituent’s causing exceedances throughout the Central Valley.

Implementation strategy and schedule also will depend on prioritization the KBWQA set for each constituent which relies heavily on the potential for irrigated agriculture to be the source and risk the parameter poses to human and aquatic health.

Table 9 Tentative 2023 Management Plan Implementation Schedule



3.4 Objective Criteria and Performance Measures

The KBWQA has set performance measures outlined in Table 10 to achieve the main objectives and approach of this management plan as stated in Section 3.1. The action associated with each objective should yield the intended result which will be considered adequate if it meets the performance measure.

Monitoring will continue monthly as required and outlined in the SWMP with data submitted to the regional board quarterly. The KBWQA does not propose additional monitoring for the CSQMP at this time. Additional monitoring will be considered following data review and outreach efforts. Monitoring specifics can be reviewed in Section 4. As monitoring data is analyzed, emphasis on addressing the constituents will be evaluated. Achievement of performance measures of the management plan implementation are:

- Determined based on Coalition follow-through on overall and individual grower outreach and potential Source Identification Review.
- Confirmed if there is an improvement in water quality following the implementation of management practices.

One of the main ways to evaluate the effectiveness of grower outreach and management practice implementation is by observing the overall water quality improvements through ongoing monitoring and grower response to outreach and surveys. An evaluation of implementation effectiveness will be included in the ASR.

Table 10 Management Plan Objective Criteria and Performance Measures

Management Plan Objective Criteria & Performance Measures			
Objective	**Action**	**Result**	**Performance Measure**
Identifying potential sources causing exceedances of constituents in the management plan region	*Conduct a Source ID Review and/or review data*	If a non-irrigated agricultural source is found: Communicate to Regional Board for further action.	*Determination of a possible source*
		If an irrigated agricultural source is found: Identify proper management and prepare to conduct outreach.	
Grower Outreach and Education meeting to disseminate information to members in the management plan region.	*Hold periodic meetings*	If irrigated agricultural source was identified, outreach will commence to corresponding members to improve management practices	*Grower survey responses, adjustments in grower management practices*
		Ensure growers are aware of water quality issues and encourage improved management practices	*Number of survey responses, grower turnout and participation*
Continued Monitoring of Associated Waterbodies	*Continue monitoring surface water sites*	Sample and analyze water samples for required parameters and constituents	*Generate monthly sampling data, according to regular sampling requirements*
Review Implementation of Management Practices	*Maintain inventory of management practices prior and following grower outreach.*	Ensure inventory of management practices prior to and following grower outreach is up-to-date	*Document grower outreach survey results, management practice information, and follow-up efforts*
		Follow up with relevant growers to gather outreach survey results	
Evaluation of Effectiveness	*Evaluate water quality monitoring data and management practice implementation data*	Compare water quality monitoring data before and after grower outreach	*Determination of if management practice implementation improved water quality*
		Consider water quality improvements with respect to management practice implementation results	

3.5 Source ID Review

Findings of the initial Source ID data review will determine how the Coalition intends to proceed. Grower outreach will commence initially to inform growers of their potential contribution to the degradation to the corresponding waterbody to ensure awareness and encourage improved management practices. The KBWQA intends to conduct a thorough data review to determine potential points or areas of discharge based on management practices. If an individual grower has been identified to be a potential contributor, further action will be taken between the Coalition and grower member to communicate them of their potential contribution and how an improvement to practices support water quality goals and efforts outlined by the CVRWQCB. However, if sources are identified as non-agricultural or outside of the scope of the ILRP, then related documentation and a thorough study shall be conducted. Additionally, continued monitoring of sampling sites will determine the progress of water quality. As mentioned previously, water districts will be informed of grower noncompliance for enforcement action.

3.6 Roles and Responsibilities

Key individuals involved with this CSQMP, and their roles are described below. An organizational chart is also provided in Figure 12.

KBWQA Board: The KBWQA Board determines and approves policies and action items. The Board meets monthly to provide oversight on financial matters and are informed on current projects that meet regulatory requirements. The Board will work with the Program Manager and Consultant throughout this management plan process.

Donald Ikemiya: Mr. Ikemiya is the Executive Director for the KBWQA. His primary roles consist of daily operations and oversight of Consultant contracts and work items, while working closely with the Consultant and KBWQA members within the Management Plan Area to ensure all requirements of this CSQMP are completed.

Merisa Casaus: Ms. Casaus is a technical consultant and part of the surface water monitoring program. She was responsible for developing this CSQMP in collaboration with others and is involved with all aspects of the surface water quality program for the KBWQA. Additionally, Ms. Casaus will provide insight for most components of the CSQMP including technical analysis, water quality sampling, and data management and evaluation.

Jacquie Chisholm: Ms. Chisholm is a technical consultant and assisting in the development of this CSQMP in collaboration with others. Ms. Chisholm will provide insight for components of the CSQMP including technical analysis, data management, and evaluation.

Moore-Twining & Associates (MTA): MTA is the contracted laboratory of the KBWQA to perform water quality analysis. MTA is responsible for ensuring lab analysis proceeds as required and sub-contracts out to other laboratories for additional analysis far beyond their capabilities.

KBWQA Members: The KBWQA Members in the Management Plan Area will also be involved and play key roles in the success of this CSQMP. These members will be asked to provide information and input during the development of this CSQMP and will also be required to implement management practices, as appropriate, while the CSQMP is in effect.

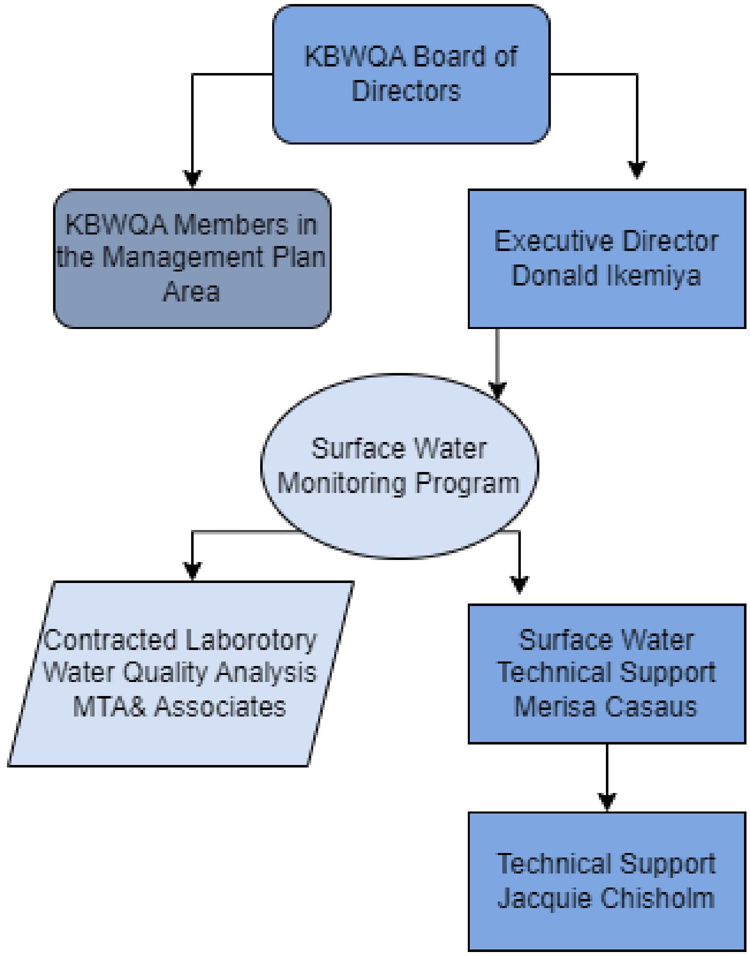


Figure 12 Key Individuals Involved in this CSQMP

4 Monitoring Methods

4.1 Monitoring Design and Schedules

The continuation of the KBWQA's ongoing monitoring will allow the Coalition to recognize whether improved management practices influence water quality. The Coalition currently monitors sites according to the SWMP Revision 2 depicted in Figure 13. As previously discussed, Revision 3 of the Surface Water Monitoring Plan was submitted to the CVRWQCB on December 22, 2022, with an update submitted on March 24, 2023. Upon approval, the KBWQA will begin implementing the sampling schedule outlined in Revision 3 of the SWMP as depicted in Figure 14. The KBWQA will closely observe results of constituents that have triggered management plans. Additional monitoring will be determined as needed following the steps outlined in this CSQMP, but no additional monitoring is proposed at this time. Adjustments to monitoring schedules for the implementation of this management plan will be discussed in the ASR. Data from sampling events will continue to be submitted in quarterly data reports and the AMR.

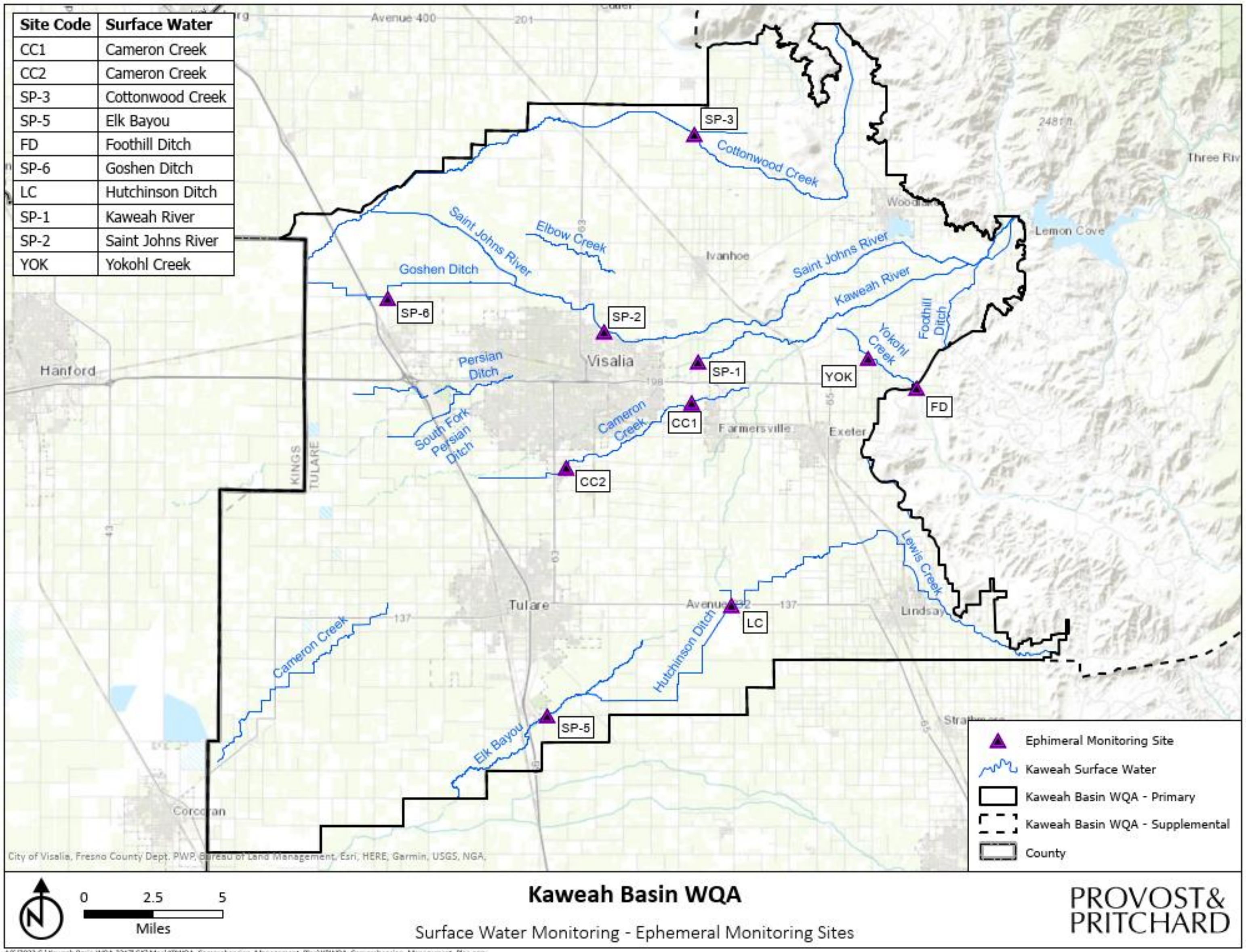


Figure 13 Ephemeral Monitoring Sites Outlined in Revision 2 of the SWMP

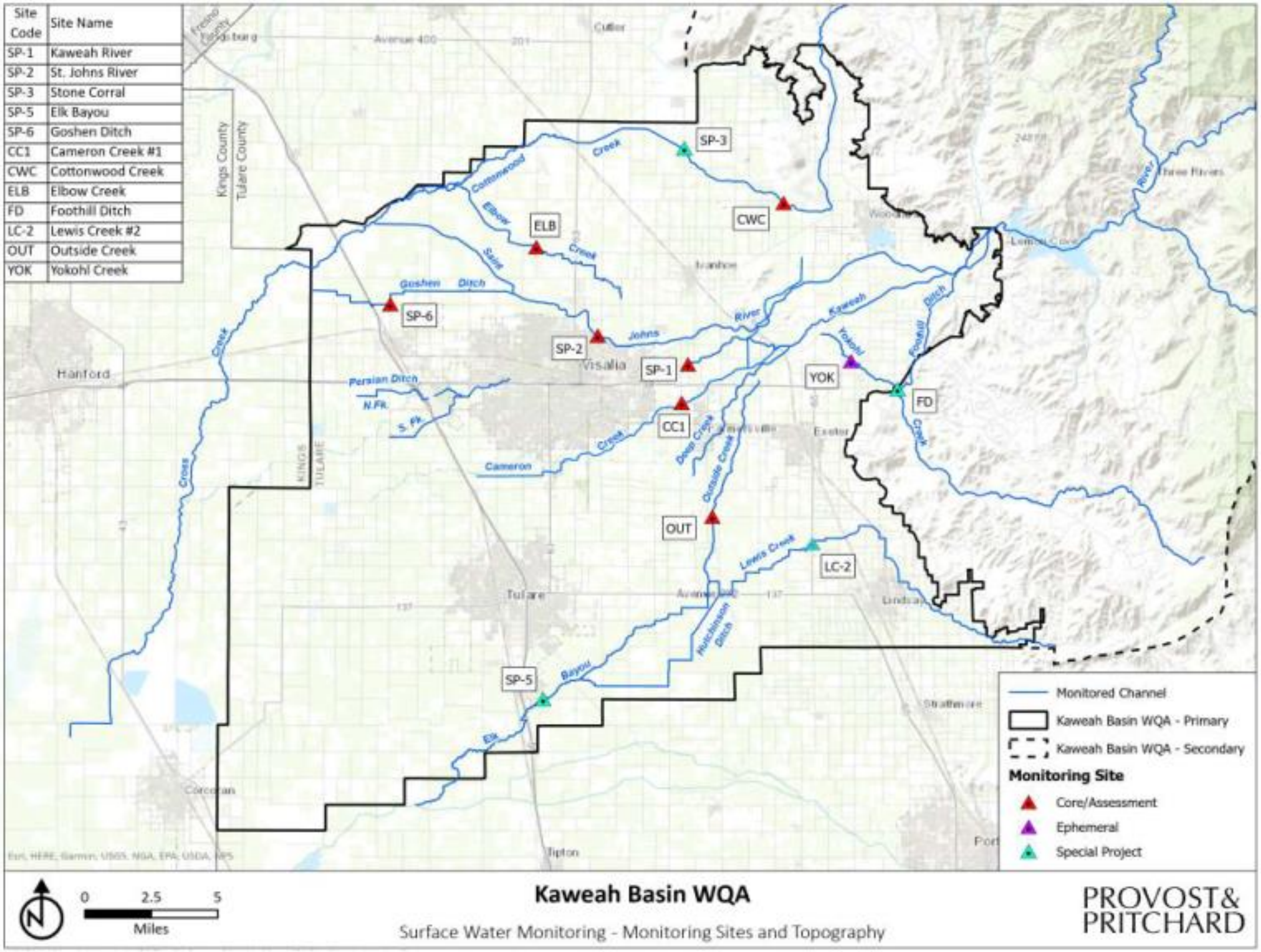


Figure 14 Monitoring Outline in Revision 3 of the SWMP

4.2 Monitoring Schedules

For the Coalitions current monitoring schedule, reference the approved current SWMP being utilized. The KBWQA received the approval for Revision 3 SWMP on April 13, 2023. Implementation is set to begin for the 2024 WY.

5 Data Evaluation

5.1 Methods for Evaluation of Effectiveness

Several different data types will be used to evaluate the effectiveness of implemented management practices. Data incorporated in the CSQMP includes:

1. Surface water monitoring data.
2. Existing management practices used by KBWQA members (e.g., Farm Evaluation, Management Practice Implementation Report (**MPIR**) Survey, Management Practice Evaluation Program (**MPEP**).
3. Adjusted/Additional management practices implemented by KBWQA members following outreach (e.g., Outreach Surveys).
4. Recommended actions based on findings of the Source ID Review, this CSQMP, and participation in continued monitoring and outreach.
5. Land use and corresponding nutrient, amendment, and/or pesticide application data.
6. Local weather conditions (e.g., precipitation, flow).

Management plans are only as effective as their ability to evaluate both the data collected and the associated actions. The data components gathered as part of this CSQMP will need to be properly evaluated to evaluate progress toward the goal of protecting surface water quality. Tools the KBWQA will use to evaluate the data collected will primarily be through the use of spreadsheets. Spreadsheets will be the primary source of data evaluation. Other programs used to compute/ compile statical analysis include databases, custom programs, and GIS which will evaluate the following:

- Concentration trends for the constituents of concern (% change).
- Tracking frequency of exceedances.
- Tracking weather patterns and local conditions during sample events.
- Data trending to correlate data to local conditions.

The data will be presented in a tabular and graphical form for annual progress reporting. The required actions of KBWQA members involve completion of Outreach Surveys and ongoing communication with the KBWQA.

5.2 Quantifying Effectiveness

The KBWQA will quantify the effectiveness of the management plan based on the amount of data compiled and processed for the CSQMP.

Trends are to be evaluated based on available management practice data (e.g., INMP Summary Report, Farm Evaluation, MPIR, and MPEP) and compared to trends of management practice implementation data (e.g., Outreach Surveys). One metric that could indicate effectiveness of the CSQMP, is positive trends in management practice implementation data compared to surface water quality improvement.

The KBWQA proposes to continue to educate and reach out to its growers to emphasize the importance of protecting water quality and the associated management practices. Trends in practices are observed through INMP Summary Report and Farm Evaluation data and will continue to be tracked to determine trends in management practices and opportunities for improvement. The MPEP will provide additional information on management practices that are protective of water quality, potentially improve farm efficiency, and may reduce input costs for growers.

6 Reporting and Review

6.1 Reporting

Several reports are submitted throughout the year as required by the General Order. Table 11 outlines the surface water related reports due to be submitted each year with their respective due dates.

Table 11 Reports Submitted each year the Waterboard and Respective Due Dates

Report	Date Submitted
Annual Monitoring Report (AMR)	August 31st
Surface Water Monitoring Quarterly Reports	March 1st, June 1st, September 1st, December 1st
CSQMP Annual Status Report	August 31st

6.1.1 Annual Reporting

Following the approval of this CSQMP, the KBWQA will provide an annual management plan status report summarizing the progress made in the previous reporting periods and a plan for the upcoming year until the CSQMP is closed. These updates will include:

- Additional Monitoring.
- Additional Exceedances/Management Plan Triggers.
- Source ID reviews/findings.
- Grower Outreach and Education and Progress.

The reporting period is proposed to be the Water Year (October 1st - September 30th). The Status Report will be submitted with the Annual Monitoring Report and will contain the 13 mandatory components listed in Appendix MRP-1 of Attachment B of the General Order.

Management plan updates will provide monitoring updates, management practice implementation and effectiveness, outreach and education to growers, Source Identification Review progress, and overall progress. Additionally, updates will include monitoring results from sites that have triggered management plans, outreach efforts and responses, inventory to management practices, updates to proposed management plan goals, updates to Source Identification findings, and modifications/continuation of the Management Plan.

6.1.2 Quarterly Reporting

Surface water monitoring data and progress reporting will continue to be submitted quarterly coinciding with the submittals required for the Monitoring and Reporting Program of the General Order. These submittals will include any surface water monitoring data specific to this CSQMP. Quarterly surface water monitoring data submittal dates are listed in Table 12.

Table 12 Reporting Periods and Due Dates for Quarterly Reports

Reporting Period	Due Date
January 1st through March 31st	June 1st
April 1st through June 30th	September 1st
July 1st through September 30th	December 1st
October 1st through December 31st	March 1st of the following calendar year

6.2 Periodic Review

Per guidelines provided in Appendix MRP-1 of Attachment B of the General Order, at least once every five years, the CVRWQCB will review available data and determine whether an approved management plan is resulting in water quality improvements. Evaluation of the sufficiency of a management plan will be based on review of the data and meetings with the third-party and other interested parties. A determination will be made by the EO on the progress if the management plan. The KBWQA understands the provisions of the periodic review and will strive to progress as quickly as feasible when working through management plans. If a periodic review is not provided by the CVRWQCB, the KBWQA will assume that its current actions are sufficient and continue implementing this CSQMP as normal.

6.3 Pathways of Completion

The goal of the KBWQA is to work with its members to continue to utilize management practices that are protective of water quality and to close this CSQMP in a timely manner according to the requirements of the General Order. Successful completion will ultimately be determined by the EO, but the KBWQA has proposed some actions based on the findings of the Source ID studies. The progress towards completion of this CSQMP will be updated in the Annual Management Plan Status Reports. The Coalition will submit a proposal to close a management plan when:

1. Irrigated Agriculture has been identified to not be a source,
2. Management Practices resolve the water quality problem,
3. Irrigated agriculture is a potential source, but compliance with water quality objectives is not achievable by reasonable and economically feasible agricultural management practices, or
4. No conclusion can be reached regarding the probable sources of exceedances, and reasonable efforts to identify the sources have been exhausted.

7 References

Coats, G.E., Taylor, J.M., Kelly, S.T., 2008. Chapter 19 - Benefits of Triazine Herbicides in Turf, Editor(s): Homer M. LeBaron, Janis E. McFarland, Orvin C. Burnside, The Triazine Herbicides, *Elsevier*, Pages 235-242, ISBN 9780444511676, https://doi.org/10.1016/B978-044451167-6.50022-2.

Giacomazzi and Cochet, 2004. Environmental impact of diuron transformation: a review. *Chemosphere*, 56 (11): 1021-1032. https://doi.org/10.1016/j.chemosphere.2004.04.061

Gómez-Merino & Trejo-Téllez, 2015. Biostimulant activity of phosphite in horticulture. Scientia Horticulturae; 196:82-90. doi: 10.1016/j.scienta.2015.09.035.

Mackay D, Giesy J. P., Solomon K. R., 2014. Fate in the environment and long-range atmospheric transport of the organophosphorus insecticide, chlorpyrifos and its oxon. Reviews of Environmental Contamination and Toxicology; 231:35-76. doi: 10.1007/978-3-319-03865-0_3.

Noulas et al., 2018. Zinc in soils, water and food crops. Journal of Trace Elements in Medicine and Biology; 49:252-260. doi:10.1016/j.jtemb.2018.02.009.

Racke K.D., 1993. Environmental fate of chlorpyrifos. Reviews of Environmental Contamination and Toxicology; 131:1-150. doi: 10.1007/978-1-4612-4362-5_1.

Rader et al. 2019. The Fate of Copper Added to Surface Water: Field, Laboratory, and Modeling Studies. Environmental Toxicology and Chemistry; 38(7):1386-1399. doi:10.1002/etc.4440.

Sharma et al., 2009. Transport and Fate of Copper in Soils. Journal of Civil and Environmental Engineering; 3:145-150. doi:10.12974/2311-8741.2013.01.01.1.

USEPA, 1994. Using Toxicity Tests in Ecological Risk Assessment. Office of Solid Waste and Emergency Response: ECO Update; 2(1):1-12. Publication 9345.0-05I

USEPA, 2008. Copper Fact Sheet. *National Service Center for Environmental Publications (NSCEP).* https://nepis.epa.gov/Exe/ZyPDF.cgi/P1001BJR.PDF?Dockey=P1001BJR.PDF

USEPA, 2014. Technical Factsheet on: SIMAZINE. *National Service Center for Environmental Publications (NSCEP).* https://nepis.epa.gov/Exe/ZyPDF.cgi/P1011OOA.PDF?Dockey=P1011OOA.PDF

USEPA, 2019. Simazine Proposed Interim Registration Review Decision Case Number 0070. Docket Number EPA-HQ-OPP-2013-0251. https://www.regulations.gov/document/EPA-HQ-OPP-2023-0251-0174.

USEPA, 2022. Chlorpyrifos. USEPA. https://www.epa.gov/ingredients-used-pesticide-products/chlorpyrifos.

USEPA, 2022. Diuron Proposed Interim Registration Review Decision Case Number 0046. Docket Number EPA-HQ-OPP-2015-0077. https://www.regulations.gov/document/EPA-HQ-OPP-2015-0077-0065

Williams, E.R., Unpublished. The benefit of foliar applied copper fertilizer on romaine lettuce grown in low copper soils of the coastal Santa Maria, California. *California Polytechnic State University, San Luis Obispo*. https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1076&context=theses

Xu et al., 2013. A Review of Molybdenum Adsorption in Soils/Bed Sediments: Speciation, Mechanism, and Model Applications. Soil and Sediment Contamination: An International Journal; 22(8):912-929. doi:10.1080/15320383.2013.770438.

Appendix A:
Management Plan Tracking

Comprehensive Surface Water Quality Management Plan- Kaweah Basin Water Quality Association