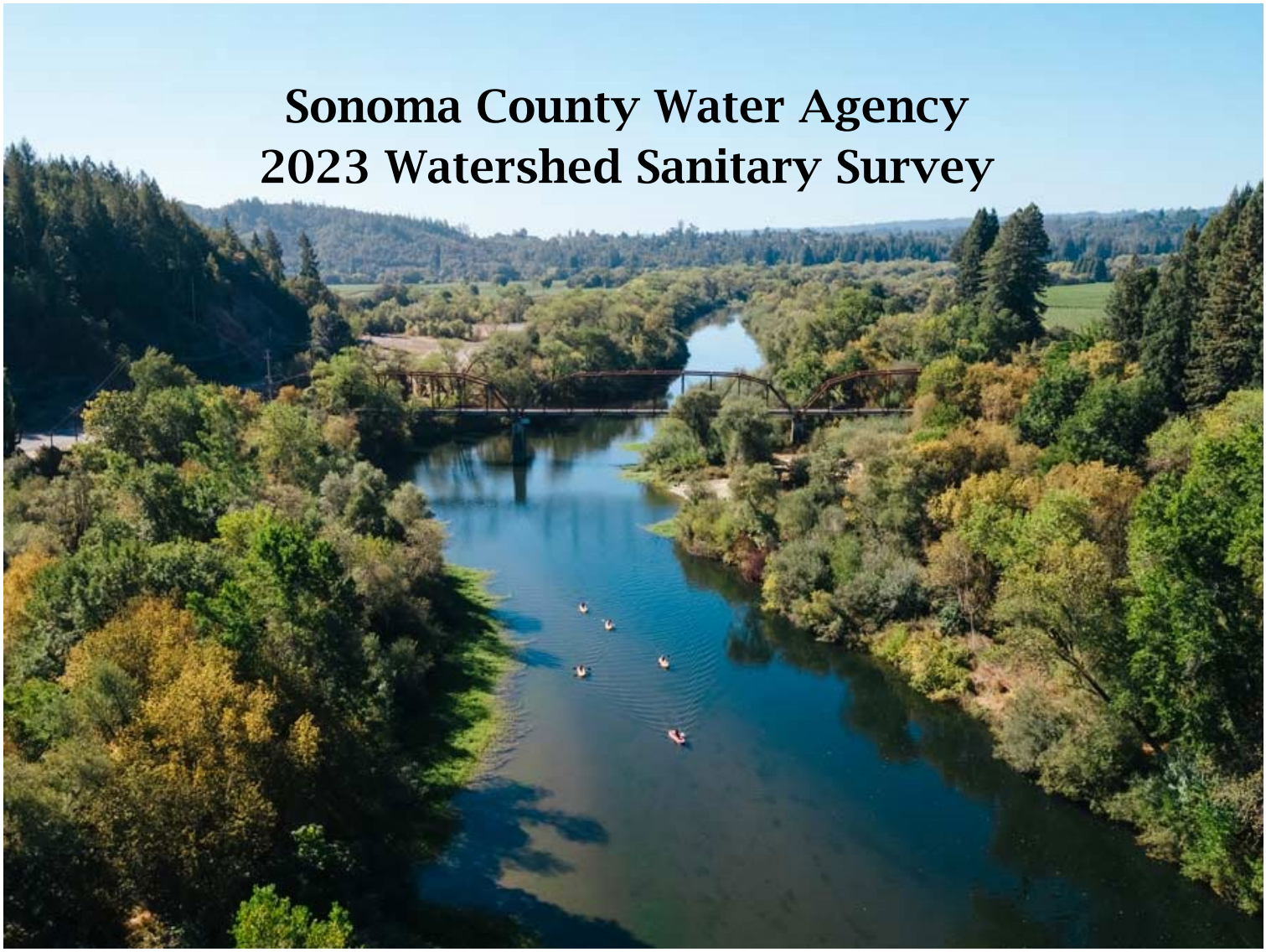
Sonoma County Water Agency
2023 Watershed Sanitary Survey



December 2023

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Sonoma County Water Agency Watershed Sanitary Survey
Fourth Update
FINAL REPORT
December 2023

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LIST OF ABBREVIATIONS

APMP – Advanced Protection Management Plan
ARM Plan- Aggregate Resource Management Plan

BAT – Best Available Technology
BCT – Best Conventional Technology
BMP – Best Management Practice
BOD – Biological Oxygen Demand

CALPIP- California Pesticide Information Portal
cfs – cubic feet per second
CIWQS – California Integrated Water Quality System
CUPA – Certified Unified Program Agency

DDW – Division of Drinking Water
DBP – disinfection by-product
DOC – dissolved organic carbon

E. coli – *Escherichia coli*

gpd – gallons per day
gpm – gallons per minute
GWUDI – groundwater under the direct influence of surface water

HA – Health Advisory
HAA5 – haloacetic acids

IESWTR – Interim Enhanced Surface Water Treatment Rule

LT1ESWTR – Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR – Long Term 2 Enhanced Surface Water Treatment Rule
LSCE – Luhdorff and Scalmanini Consulting Engineers
LUST – leaking underground storage tank

MCL – maximum contaminant level
µg/L - micrograms per liter
mgd – million gallons per day
mg/L – milligrams per liter
MPN/100 mL – most probable number per 100 milliliters
MS4 – Municipal Separate Storm Sewer Systems
MSL – mean sea level
MRTS – Meridian Range Township Section
MTBE – methyl tertiary-butyl ether

North Coast Regional Water Quality Control Board – Regional Board

NPDES – National Pollution Discharge Elimination System

OAL – Office of Administrative Law
OEHHA – Office of Environmental Health Hazard Assessment
OES – California Office of Emergency Services
OWTS – Onsite Wastewater Treatment System

PCSs – Potential Contaminating Sources
PG&E – Pacific Gas and Electric
PRMD – Permit Resource Management Department
PWRPA – Power and Water Resources Pooling Authority

RAA – running annual average
Regional Board – North Coast Regional Water Quality Control Board
RIMS – Response Information Management System
RV – Recreational Vehicle

Sonoma County Water Agency – Water Agency
SEMS – Standardized Emergency Management System
SMARTS – Storm Water Multiple Application and Report Tracking System
SOC – synthetic organic compound
SSO – Sanitary Sewer Overflow
SWPPP – Storm Water Pollution Prevention Plan
SWRCB – State Water Resources Control Board
SWTR – Surface Water Treatment Rule

TMDL – Total Maximum Daily Load
TOC – total organic carbon
TTHM – total trihalomethanes

ug/L – micrograms per liter
URO – urban runoff
USEPA – US Environmental Protection Agency
USGS – US Geological Survey
UV – Ultraviolet light
UVSD – Ukiah Valley Sanitation District
VOC – volatile organic compound

WDR – Waste Discharge Requirement
WWTP – Wastewater Treatment Plant

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INTRODUCTION

Drinking water utilities that use surface water or groundwater under the influence of surface water are required to conduct a watershed sanitary survey for that source, under the California Surface Water Treatment Rule (SWTR). This survey must be updated every five years. This Fourth Update for the Sonoma County Water Agency (Water Agency) watershed sanitary survey covers the period January 1, 2018 through December 31, 2022.

OBJECTIVES OF THE UPDATE

A watershed sanitary survey focuses on the first barrier to contamination of the drinking water supply, namely source water protection. Evaluating source water quality and watershed contaminant sources provides key information to aid in understanding how to maintain and possibly improve the first barrier.

This Fourth Update is intended to accomplish the following objectives:

- Fulfillment of the California SWTR requirements mandates that a watershed sanitary survey be completed every five years by utilities that use surface water or groundwater under the influence of surface water. Any significant changes within the last five years that affect source water quality are to be identified in each update. In addition, it is required to comment on the appropriate level of treatment for pathogens, specifically for *Giardia*, viruses, and *Cryptosporidium*.

- Review and evaluation of selected constituents of interest to identify potential water quality issues at Radial Collector Well 5. Assess the ability of Radial Collector Well 5 to meet standards based on current regulatory framework.

- Review and evaluation of selected potential contaminating activities to identify impacts on source water quality.

- Identification of appropriate watershed management actions to protect and possibly improve source water quality. Development of recommendations for watershed management actions that are economically feasible and within the authority of the Water Agency to implement is critical.

KEY FINDINGS AND CONCLUSIONS

The key findings and conclusions for this report are organized as they pertain to water quality and watershed contaminant sources. Highlights of these findings and conclusions are presented below.

Water Quality

Very few contaminants were detected in Radial Collector Well 5. All of the inorganic contaminants regulated with a primary maximum contaminant level (MCL) were not detected. No synthetic or volatile organics were detected in the five years of annual monitoring.

There were a few detectable inorganic chemicals with secondary MCLs; specifically color, total dissolved solids, specific conductance, chloride and sulfate. However, the detected levels are low, much lower than their respective recommended secondary MCLs.

The Sonoma County Department of Health Services and the North Coast Regional Water Quality Control Board monitored for cyanotoxins in the Russian River over the reporting period. Unfortunately, monitoring for dissolved cyanotoxins in water was terminated in 2019, with a recent focus on monitoring the presence of cyanotoxins in algal mats instead. Based on the cyanotoxin data collected in the Russian River through 2019, the following conclusions were made relative to river water quality:

- All cyanotoxins (microcystin, anatoxin-a, cylindrospermopsin, saxitoxin, nodularin) were infrequently detected at all monitoring locations; overall, microcystin had the most number of detections.

- Cyanotoxins showed presence at monitoring locations from as far as Hopland to the SYAR Ponds, indicating either transport of cyanotoxins from upstream to downstream, or growth in multiple locations. For example, cylindrospermopsin was detected at Hopland, Cloverdale and SYAR Ponds on June 25, 2019. Anatoxin was detected at Cloverdale and SYAR Ponds on September 11, 2019. Microcystin was detected at Cloverdale River Park, Del Rio Woods Beach, and Camp Rose Beach on August 13, 2018.

- For the data presented in **Section 3**, there were no detections above the acute and short-term notification levels, except for the short-term NL for microcystin. Also, there were no detections above the U.S. Environmental Protection Agency (USEPA) health advisories except for the 0.3 µg/L for microcystin for children less than six years old.

Based on a review of the water quality data and an evaluation of the contaminant sources in the watershed, the key constituents identified for further evaluation in this watershed sanitary survey are turbidity, microbiological constituents, and disinfection byproducts. Key findings for the constituents of interest are presented below.

Turbidity

- Turbidity levels in the Russian River at the diversion location are quite variable, ranging from less than 2.0 to over 400 NTU. The highest levels are typically found during the wet season when Radial Collector Well 5 is not being used as a water supply source.
- Turbidity levels in Radial Collector Well 5 are very low with peak values of 2.0 NTU and annual averages of 0.028 to 0.044 NTU.
- If Radial Collector Well 5 is not under the direct influence of surface water and is operating, DDW requires that Radial Collector Well 5 be taken out of service if turbidity exceeds 5.0 NTU at any time. If the well produces water with a turbidity level greater than 0.2 NTU for more than four hours, additional actions must be taken.
- These data indicate that riverbank filtration is effectively removing the high particulate levels seen in the Russian River.

Microbiological Constituents

- The Russian River has relatively high levels of coliforms, associated when watershed runoff is high due to precipitation. Therefore, the highest levels of *E. coli* generally occur when Collector 5 is not operating, as the Water Agency does not operate Collector 5 when it is under the direct influence of surface water (when the flow in the Russian River at Hacienda Bridge reaches 5,000 cubic feet per second (cfs) and until the flow drops below 2,000 cfs).
- Total coliforms and *E. coli* were analyzed in samples collected from Radial Collector Well 5 prior to disinfection, when it was operating. Total coliforms were found two times at 1.0 and 3.1 most probably number per 100 milliliter (MPN/100 mL). *E. coli* was never detected.
- The Radial Collector Well 5 data show that riverbank filtration is very effective in removing microorganisms from the water, producing high quality groundwater for the Water Agency's system.

Disinfection By-Products and Precursors

- Collector 5 has relatively low levels of organic carbon, the main precursor that reacts with chlorine to form disinfection byproducts in the distribution system.
- Total trihalomethanes (TTHM) and haloacetic acids (HAA)5 concentrations in the storage tanks of the Water Agency's distribution system are consistently below the MCLs of 80 µg/L and 60 µg/L.

Watershed Contaminant Sources

There are numerous types of potential contaminating sources (PCSs) in the study watershed. Nine PCSs were selected for evaluation in this report based on constituents

of interest and predominance in the watershed. Timber harvesting and landfills were evaluated but eliminated from the report as they are not located in the study watershed.

Each PCS was given a vulnerability assessment ranking as shown in **Table ES-1** based on having a direct or indirect impact to the Russian River, proximity, number of occurrences, and possible impact to Radial Collector 5 water quality. Selected findings for each of the nine PCSs are provided below.

Table ES-1. Vulnerability Assessment Ranking for each PCS in Study Area

Contaminant Source	Vulnerability
Spills	High
Wineries	Low
Agriculture	Low/Medium
Mines	Low/Medium
Urban Runoff	Low
Wastewater	Medium
Recreation	Low
Leaking Underground Storage Tanks	Low
Fires	Medium/High

Spills

From 2018 to 2022, there were 24 spills involving a variety of contaminants such as sewage, diesel fuel, gasoline, oil, non-hazardous geothermal condensate, and winery waste. All of the spills impacted water. Out of the 24 spills, seven spills were sewage-related, 11 spills involved either diesel fuel, gasoline, or food oil, three spills involved the CALPINE Corp., two are unknown, and one was winery-related. Notably, three incidents involved boating incidents at Lake Sonoma; one spill and two submerged boats.

The largest sewage spill occurred on October 30, 2018 in the City of Healdsburg when a pipe failed, resulting in 42,967 gallons of raw sewage spilled. The second largest spill of 20,400 gallons of raw sewage occurred on February 26, 2019 in the City of Healdsburg due to storm surge.

The largest non-sewage spill occurred on November 26, 2018 when 500 gallons of Ultra Seal and water entered a storm drain at the City of Cloverdale Fire Department. The second largest non-sewage spill occurred on March 9, 2021 when 325 gallons of steam condensate was released into a creek due to a pump leak.

Although no spills occurred in close proximity to Radial Collector Well 5 from 2018 to 2022, the potential for a hazardous materials spill or sanitary sewer overflow to impact source water quality in the future is high because there are a number of potential sources in the watershed. A large volume sewage spill or petroleum spill in the vicinity of Radial Collector Well 5 could impact water quality.

Wineries

There are 51 regulated wineries in Sonoma County and 14 regulated wineries in Mendocino County within the study watershed, as queried from the California Integrated Water Quality System (CIWQS) database. In comparison to the 2018 Update, there were 54 regulated wineries in Sonoma County, so there has not been a significant change.
This assessment indicates the vulnerability for source water quality impacts due to wineries is low. As wineries treat and reuse their process wastewater on-site, there is no impact to the Russian River from the processing of grapes into wine. Unauthorized discharges could potentially impact water quality in the vicinity of the discharge but would be unlikely to affect the water quality of Radial Collector Well 5.

Mines

Within the study watershed, there are currently no active instream mining sites. The Russian River Vested Bars site, which was active in the 2018 Update, is now inactive and is in the process of being reclaimed. The instream gravel bars are typically reclaimed for wildlife habitat through natural processes. According to the Sonoma County Permit and Resource Management Department (PRMD), mining operations along the main stem of the river are unlikely to resume operations in the near term or perhaps ever (Communication, Robert Pennington, August 2023, Sonoma Co. PRMD).

There are two former terrace pit sites upstream of Wohler Bridge: the Hanson pits and the SYAR pits. These are terrace pits that are outside the active channel, but within the floodplain of the Russian River. A use permit for reclamation of the Hanson Pits was submitted in August 2023. Reclamation would involve filling the ponds and removing internal levees, roads and mining infrastructure. The floodplain would also be reconfigured to reestablish the natural floodplain topography and function. The future reclamation of the Hanson Pits could impact water quality in the Russian River, but studies have been completed that conclude the Wohler wells are too far downstream of the site to be impacted.

Agriculture

A significant portion of the land use in the study watershed is permitted as agriculture. As shown in **Attachment D**, the three crop types with the highest percent coverage are grapes for wine (vineyard) at 52 percent, then pasture land at 14 percent, and grapes (mixed with other use) at 11 percent.

Information on pesticide and herbicide use was obtained from the California Pesticide Information Portal (CALPIP) database. Data within this database is organized by meridian range township section (MRTS) which is approximately 1 X 1 mile. As shown in **Figure 4-2**, MRTS from Healdsburg to Radial Collector 5 along the Russian River were queried for pesticide usage in 2021. Sulfur had the highest lbs. applied for all 11

MRTS from Healdsburg to Radial Collector 5. After sulfur, mineral oil is generally the next most commonly used chemical, and glyphosate as the third highest ranked. (An exception would be the 4,881.2 lbs. of 1,3-dichloropropene applied to M08N09W03.)

This assessment indicates the vulnerability for source water quality impacts due to agriculture is low/medium. There are currently no remaining dairies in the study watershed. Due to the proximity of the wine grape crops to the Russian River, there may be an impact to water quality from the use of pesticides/herbicides and erosion. However, there were no pesticides/herbicides detected at Radial Collector Well 5. Turbidities are also low at Radial Collector Well 5. Therefore, there is no evidence from the monitoring conducted at Radial Collector Well 5 that croplands and vineyards are impacting water quality.

Recreation

There are a number of recreational uses in the study watershed such as boating, camping, picnicking, hiking, fishing, mountain biking, and equestrian trails. Source water quality may be impacted from body contact recreation such as swimming, waterskiing, and use of personal watercraft. According to Sonoma County Regional Parks, the primary swimming areas are Veteran's Memorial Beach in Healdsburg, Riverfront Regional Park, Camp Rose and Del Rio Woods Beach. However, swimming can be at many points along the river during warm weather. Recreational uses at Lake Sonoma include boating, swimming, fishing, camping, hiking, biking, and horseback riding trails.

As described in **Section 3**, the median *E. coli* level in the Russian River at the diversion location is 23.8 MPN/100mL, which is similar to the median *E. coli* levels during the summer season at the Veteran's Memorial Beach in Healdsburg, Riverfront Regional Park, Camp Rose and Del Rio Woods Beach. Therefore, recreation does not appear to impact the microbial quality of source water at the diversion location and at Radial Collector Well 5. This assessment indicates the vulnerability for source water quality impacts due to recreation is low.

Urban Runoff

This assessment indicates the vulnerability for source water quality impacts due to urban runoff is low. Over eighty percent of the land use is comprised of open space and agricultural uses. Additionally, the cities of Healdsburg, Cloverdale and Ukiah have storm water management plans and best management practices in place to reduce pollutants from entering into the storm drain system. Storm water monitoring conducted in 2019 for one selected outfall for each of the cities did not show elevated levels of metals or nutrients. *E. coli*, total coliforms and *Enterococci* were present in elevated concentrations in the storm water runoff, as expected. Overall, urban runoff is a low risk PCS.

The State Water Resources Control Board's (SWRCB) Stormwater Multiple Application and Report Tracking System (SMARTS) database was also queried, and within the study watershed, there were 131 industrial facilities which are covered under the SWRCB General Industrial Activities Storm Water Permit. This is a notable increase from the 2018 Update, which had 73 industrial facilities. These industries must complete a storm water pollution plan, and are subject to inspection by the Regional Board, although very few inspections have been completed annually over the reporting period.

Wastewater

The three wastewater treatment plants (WWTPs) in the study watershed which are permitted to discharge to the Russian River are the City of Ukiah's WWTP, the City of Cloverdale's WWTP, and the City of Healdsburg's WWTP. Specific information about flow rates, treatment processes, and effluent discharge locations are discussed in **Section 4**. If the effluent is tertiary treated, it may be discharged directly to the Russian River from October 1st to May 14th only, and must be limited to one percent of the flow in the Russian River. Discharge of secondary treated wastewater is never allowed to the Russian River.

The City of Ukiah has expanded their recycled water system to reduce discharge to the Russian River. The City of Cloverdale is not planning to install advanced treatment facilities or a recycled distribution system, instead are allowed to use their percolation ponds and have disconnected their outfall to the Russian River. The City of Healdsburg has expanded their recycled water system, and has recently come into compliance with the seasonal discharge prohibition.

The Sonoma County PRMD estimates that there are 45,000 septic systems in all of Sonoma County. The Regional Board has developed a pathogen TMDL and action plan for the Russian River. Once it is approved by the SWRCB in 2024, the action plan will address recreation, storm water, and septic systems within the study area.

The City of Cloverdale and the City of Healdsburg WWTPs appear to be in compliance with their effluent limitations. As the WWTPs expand recycling the tertiary treated effluent instead of discharging to the Russian River, the impact from WWTPs will decrease in the future. However, there are a large number of septic systems in the study watershed which will continue to age and possibly fail. As some septic systems are located in close proximity to the Russian River, wastewater is considered a medium risk PCS.

Leaking Underground Storage Tanks

There are no leaking underground storage tanks within the 2500 foot protection zone for Radial Collector Well 5. The four open leaking underground storage tank (LUST) sites in Healdsburg are much farther away from Radial Collector Well 5, and have been

determined to have no impact on the Russian River. Therefore, the vulnerability for source water quality impacts due to current LUST sites is low.

Fires

There were three fires which occurred within the study watershed since 2017. Specific information on acreage burned, dates and locations are discussed in **Section 4**.

As a result of the wildfires, the Water Agency conducted baseline and post-storm monitoring at 15 locations. The Franz Creek monitoring location was within the burn area for the 2019 Kincade fire. Samples collected by the Water Agency were analyzed for nutrients, salinity, physical, organic carbon, and metals. Metals were not analyzed in any of the post-fire samples for Franz Creek. The highest dissolved organic carbon (DOC) peak in the pre-fire period was 6.1 mg/L, and the highest DOC peak in the post-fire period was 8.6 mg/L, indicating a 41 percent increase. The highest nitrate peak in the pre-fire period was 1.26 mg/L, and the highest nitrate peak in the post-fire period was 1.58 mg/L, indicating a 25 percent increase. There were no notable increases in ammonia, alkalinity and specific conductance in comparing pre and post fire samples.

For the 2020 Walbridge fire, the Water Agency collected one pre- and two post-fire samples from multiple tributaries (Porter Creek, Pena Creek, and Warm Springs) within the burned area. Similar to the monitoring discussed above, samples collected by the Water Agency were analyzed for nutrients, salinity, physical, organic carbon, and metals. In summary for the three sites monitored, percent increases from pre to post monitoring were:

- 228% to 502% increase for DOC
- 135% to 359% increase for TOC
- 12% to 1206% increase for iron
- 18% to 2175% increase for nitrate
- 17% to 424% increase for phosphorus

The post-fire monitoring conducted by the Water Agency after the Kincade and Walbridge fires did show an post-fire impact with higher concentrations of DOC and nitrate in the tributaries within the burn area. Additionally, increases in iron and phosphorus were seen in tributaries within the burn area of the Walbridge fire. These increases may have been higher with higher monthly precipitation totals (similar to February 2019). As these tributaries flow to the Russian River, there is a direct impact to the Russian River. However it is difficult to precisely quantify the impact due to the distance from the burned area to Collector 5, as dilution occurs within the river. This assessment indicates the vulnerability for source water quality impacts due to fires is medium/high.

RECOMMENDATIONS

A number of recommendations were developed for this Fourth Update. Please refer to **Section 5** for further information on the recommendations.

INTRODUCTION

This report presents the findings of the Fourth Update to the Sonoma County Water Agency's (Water Agency) Watershed Sanitary Survey. This study covers the period January 1, 2018 through December 31, 2022. The Third Update was completed in December 2018, the Second Update was completed in November 2013, the First Update was completed in March 2007, and the initial Watershed Sanitary Survey was completed in 2001 in accordance with the California Surface Water Treatment Rule (SWTR).

For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the report.

OBJECTIVES OF THE UPDATE

A watershed sanitary survey focuses on the first barrier to contamination of the drinking water supply, namely source water protection. Evaluating source water quality and watershed contaminant sources provides key information to aid in understanding how to maintain and possibly improve the first barrier.

This Fourth Update is intended to accomplish the following objectives:

- Fulfillment of the California SWTR and the Interim Enhanced Surface Water Treatment Rule (IESWTR) require that surface water agencies or groundwater under the influence of surface water agencies conduct a watershed sanitary survey of the source watershed once every five years. Any significant changes within the last five years that affect source water quality are to be identified in each update. In addition, it is required to comment on the appropriate level of treatment for pathogens, specifically for *Giardia*, viruses, and *Cryptosporidium*.

- Review and evaluation of selected constituents of interest to identify potential water quality issues at Radial Collector Well 5. Assess the ability of Radial Collector Well 5 to meet standards based on current regulatory framework.

- Review and evaluation of selected potential contaminating activities to identify impacts on source water quality. Determine whether it may be useful to conduct additional monitoring to further assess contaminant levels in the source water or contaminants from a particular watershed source.

- Identification of appropriate watershed management actions to protect and possibly improve source water quality. Development of recommendations for watershed management actions that are economically feasible and within the authority of the Water Agency to implement is critical.

CONSTITUENTS AND POTENTIAL CONTAMINATING ACTIVITIES COVERED IN THE FOURTH UPDATE

Several water quality constituents were selected for evaluation as part of the Fourth Update. **Table 1-1** presents a summary of the water quality constituents selected and the reason for selection.

Table 1-1
Water Quality Constituents Selected for Evaluation as Part of the Fourth Update

Constituent	Reason for Inclusion in Fourth Update
Turbidity	Turbidity is a measurement of suspended solids in water. Division of Drinking Water (DDW) requires routine monitoring of turbidity in Radial Collector Well 5 to demonstrate the integrity of the Riverbank Filtration system.
Total Coliform	Levels in source water need to be evaluated to determine appropriate level of treatment for *Giardia* and viruses under the SWTR (if Radial Collector Well 5 were used during the periods when it is under the direct influence of surface water).
E. coli	*E. coli* is specific for fecal contamination.
Total Organic Carbon	Total organic carbon (TOC) is a surrogate measure of disinfection by-products (DBP) precursor material in water.
Total Trihalomethanes	Total Trihalomethanes (TTHMs) are disinfection by-products formed in disinfected treated water. Treated water levels are regulated by the Stage 2 D/DBP Rule.
Haloacetic Acids	Haloacetic acids (HAA5) are disinfection by-products formed in disinfected treated water. Treated water levels are regulated by the Stage 2 D/DBP Rule.

Nine potential contaminating activities were selected for review as part of the Fourth Update: spills, wineries, mines, agriculture, recreation, urban runoff, wastewater, leaking underground storage tanks, and fires. Each of these activities can contribute at least one of the constituents identified in **Table 1-1** to the source water. These activities were selected based on their presence in the study watershed, and were identified by the Water Agency as key contaminating activities.

DESCRIPTION OF HOW THE FOURTH UPDATE WAS CONDUCTED

The project team consisted of a Technical Committee comprised of representatives from the Water Agency and the consultant team of Palencia Consulting Engineers. The Technical Committee participated in developing the scope of work and reviewed identification and development of key findings and recommendations.

Water quality data for Radial Collector Well 5 and the Russian River at the diversion point was obtained from the Water Agency. The consultant team collected information on contaminant sources in the watershed through literature reviews, Internet searches, and discussions with various agencies' staff. References and agency contact information is provided in **Appendix A**.

REPORT ORGANIZATION

Section 1 – Introduction

This section describes the objectives of the Fourth Update, lists the main constituents and potentially contaminating activities covered, describes how the Fourth Update was conducted, and includes a description of the basic report organization.

Section 2- The Watershed and Supply Systems

This section is largely descriptive and provides: (1) a brief overview of the physical, hydrologic, and land use characteristics of the study watershed, (2) a description of the existing water supply system, and (3) watershed maps delineating the study watershed and outlining land use in the watershed. For more detailed descriptive information on watershed characteristics, the reader is referred to the 2001 and 2007 Watershed Sanitary Surveys.

Section 3 – Water Quality Review

This section provides a review of the constituents of interest, including an explanation for their selection and a summary of the data obtained for the period of study for each constituent.

Section 4 – Watershed Contaminant Sources Review

This section describes pertinent characteristics of each of the nine potential contaminating activities that were reviewed as part of this Fourth Update. If applicable, each potential contaminating activity will include a discussion on background and occurrence, seasonal patterns, water quality issues and data review, regulation and management, and source water protection activities.

Section 5 – Recommendations

This section consists of a list of recommendations for future source water protection efforts.

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SECTION 2 – WATERSHED AND WATER SUPPLY SYSTEMS

WATERSHED DESCRIPTION

This section provides an overall description of the study watershed and summarizes physical, hydrologic, and land use characteristics. This section also provides a description of the Sonoma County Water Agency (Water Agency) water supply system.

The entire Russian River watershed occupies much of both Mendocino and Sonoma counties, and is roughly 1,485 square miles, from the top of the watershed just north of Lake Mendocino to the terminus of the Russian River at the Pacific Ocean.

This report will focus on Radial Collector Well 5, as it is under the influence of surface water under certain Russian River flow conditions. Thus, any watershed lands draining to the Russian River downstream of Radial Collector Well 5 are not included in this survey. The study watershed for this report is shown in **Attachment A**, and includes the cities of Ukiah, Cloverdale, Geyserville, and Healdsburg. Similar to the previous watershed sanitary reports prepared in 2007, 2013, and 2018 the survey will primarily focus on the Russian River watershed from the City of Cloverdale to the Water Agency's intakes at the Wohler/Mirabel site.

Major tributaries in the study area are Dry Creek, Big Sulphur Creek and Maacama Creek. Mark West Creek, and the Laguna De Santa Rosa are downstream of Radial Collector Well 5 and are not included in the study watershed. This is beneficial as these subwatersheds have urbanized areas and agriculture which does not impact the source water quality at Radial Collector Well 5.

Dry Creek Subwatershed

Elevations in this subwatershed range from 100 feet mean sea level (MSL) in the lower valley area near Healdsburg, to approximately 4,000 MSL in the upland areas surrounding Red Mountain. While the headwaters are steep and rugged, the southern half of the subwatershed opens up to the wide alluvial plain of Dry Creek.

Vegetation consists mostly of oak woodland with areas of Douglas fir forest, mainly on north facing slopes, and with patches of chaparral, coast redwood, nonnative grassland, vineyard and cropland. Land use is primarily rural (57 percent), agricultural, mainly vineyards and orchards (20 percent) and recreational (12 percent).

Big Sulphur Creek Subwatershed

This subwatershed is bound to the east by the Mayacamas Mountain Range and to the west by the Alexander Valley. Elevations in the watershed range from 4,000 feet MSL along the border between Sonoma and Lake Counties, to approximately 400 MSL at the confluence of Big Sulphur Creek and the Russian River.

The Big Sulphur Creek subbasin is characterized by steep rugged terrain. Vegetation consists of chaparral, oak woodland, and some areas of mixed oak and pine forests at

higher elevations and north slopes. Land use is 97 percent rural, and three percent agricultural.

Maacama Creek Subwatershed

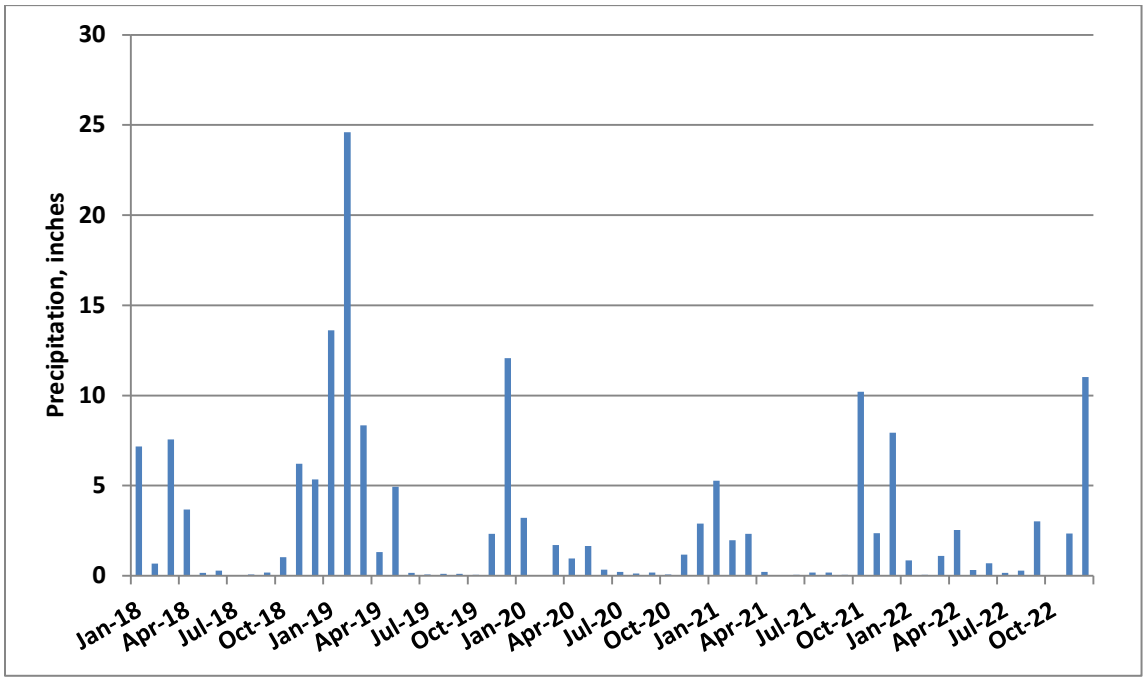
This subwatershed is located in east-central Sonoma County. Vegetation is predominantly brush land and oak woodland intermixed with open Douglas fir and pine forests at higher elevations and north facing slopes. Land use is primarily rural residential (44 percent) and agricultural (46 percent) in the vicinity of Knights Valley.

Climate and Precipitation

Average annual precipitation ranges from roughly 20 inches in the southeastern portion of Sonoma County to 30 to 40 inches in central and northern valley areas. Annual precipitation generally increases with elevation.

Figure 2-1 shows monthly precipitation totals from the U.S. Army Core of Engineers rain gage at the Warm Springs Dam at Lake Sonoma from January 2018 to December 2022. The average annual rainfall over this five year period was 33.2 inches. **Table 2-1** shows annual rainfall totals from 2018 to 2022; the wettest year was 2019 with 67.8 inches of rain.

Figure 2-1
Monthly Rainfall Totals at Warm Springs Dam, 2018-2022



Note: Data obtained from CDEC, station WRS

Table 2-1
Annual Rainfall Totals at U.S. Army Core of Engineers Rain Gauge at Warm Springs Dam, Lake Sonoma
2018-2022

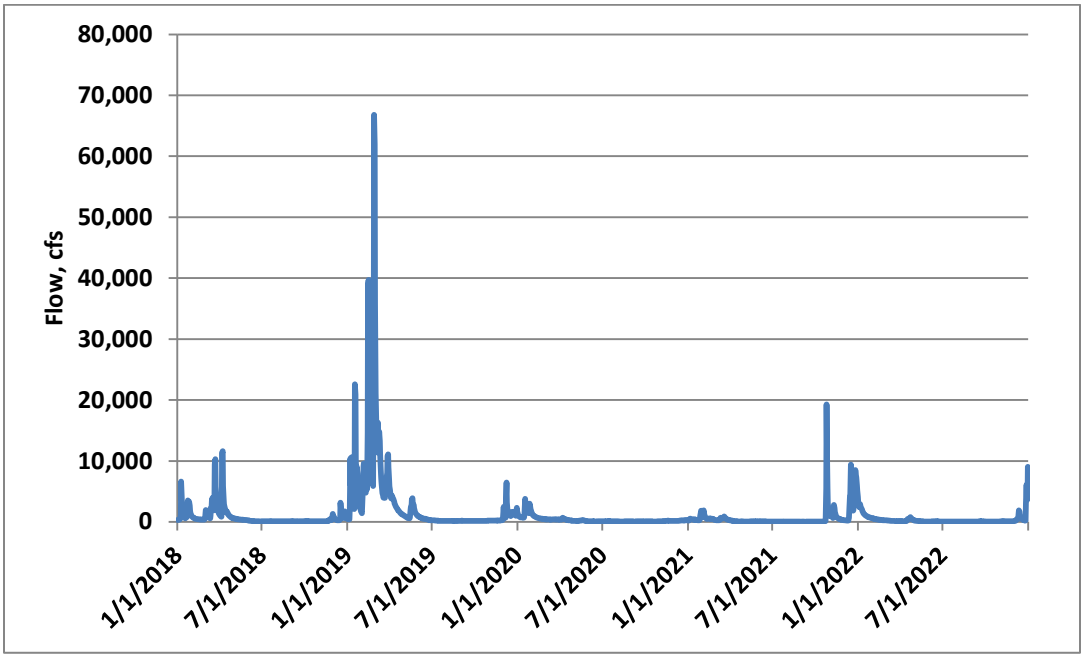
Year	Rainfall, inches
2018	32.4
2019	67.8
2020	12.6
2021	30.8
2022	22.4

Flow

The United States Geologic Survey (USGS) maintains a number of stream flow gages on the Russian River. As shown in **Figure 2-2**, the highest daily mean flow on the Russian River at Hacienda Bridge over the reporting period was 66,800 cubic feet per second (cfs) on February 27, 2019.

Floods in the Russian River watershed are generally of short duration, lasting three to four days. They normally develop within 24 to 48 hours after the beginning of a large flood-producing storm event, and recede within two to three days or less of the end of the storm. Typically, flows in the smaller tributaries to the Russian River rise so rapidly that flooding occurs within four to six hours of a storm event. Coyote Valley Dam and Warm Springs Dam provide flood protection from overflow of the Russian River during the winter and spring months.

Figure 2-2. Russian River Flow at Hacienda Bridge



Land Use

The majority of the land use in the Sonoma County portion of the study watershed is predominantly agricultural related, with 58.2 percent dry farmland and 23.3 percent irrigated farmland. **Table 2-2** provides percentages for the various land use categories, and **Attachment B** shows land use in the study watershed.

Table 2-2
Land Use in the Russian River Study Watershed

Land Use	Percentage of Watershed
Commercial	0.1
Dry Farm	57.8
Government	7.7
Industrial	2.4
Institutional	0.3
Irrigated Farm	23.8
Miscellaneous	2.2
Recreational	0.1
Residential	5.3

Changes Since 2012

Google Earth photos along the river corridor from Healdsburg to Radial Collector Well 5 were reviewed from 2012 to 2018 to 2023. Overall, there appears to be very little change along the river corridor. As shown in **Attachment C**, photos #1, #2 and #3 shows the Mirabel/Wohler area in 2012, 2018, and 2023 respectively. Photos #3, #4, and #5 shows from Mirabel/Wohler area to the Healdsburg WWTP, in 2012, 2018 and 2023, respectively. Photos #5, #6 and #7 show the Healdsburg area in 2012, 2018 and 2023, respectively. There is a new housing development on the west side of Windsor, along Windsor River Road as shown on Photo #6.

Population

The major cities in the watershed are Healdsburg, Cloverdale, Geyserville, and Ukiah. The United States Census Bureau reported the following populations in 2020: 11,340 for Healdsburg, 8,998 for Cloverdale, 865 for Geyserville, and 16,607 for Ukiah.

WATER SUPPLY SYSTEM

Background

The Water Agency was created as a special district in 1949 by the California Legislature to provide flood protection and water supply services. Legislation enacted in 1995 added the treatment and disposal of wastewater to the Water Agency's responsibilities. The Water Agency also provides recycled water services.

The Water Agency manages and maintains a water transmission system that provides naturally filtered Russian River water to nine cities and special districts that in turn deliver drinking water to more than 600,000 residents in portions of Sonoma and Marin counties.

- City of Cotati
- Marin Municipal Water District
- North Marin Water District
- City of Petaluma
- City of Rohnert Park
- City of Santa Rosa
- City of Sonoma
- Valley of the Moon Water District
- Town of Windsor

Three major reservoir projects provide water supply for the Russian River watershed: Pacific Gas & Electric Company's (PG&E) Lake Pillsbury on the Eel River, Lake Mendocino on the East Fork of the Russian River, and Lake Sonoma on Dry Creek. Lake Mendocino and Lake Sonoma provide water for municipal and industrial uses, in addition to maintaining the minimum stream flows required by Water Agency water rights permits. These minimum stream flows provide recreation and fish habitat/passage for salmon and steelhead. The Russian River receives some water year-round from the Eel River through the Potter Valley Project. Streamflows are augmented by releases from Lake Mendocino and Lake Sonoma.

Scott Dam and Lake Pillsbury:

Scott Dam is a concrete gravity dam on the Eel River that captures a drainage area of 298 square miles and forms PG&E's Lake Pillsbury. Lake Pillsbury has a storage capacity of 86,388 acre-feet. Since 1923, the lake stored water for diversion to the Potter Valley Project through a tunnel constructed through a mountain ridge.

Coyote Valley Dam and Lake Mendocino:

Located on the East Fork of the Russian River, Coyote Valley Dam is a rolled earth embankment that forms Lake Mendocino. Lake Mendocino is a U.S. Army Corps of Engineers project that began storing water in 1959. It captures a drainage area of about 105 square miles, and provides a total storage capacity of 118,000 acre-feet with a water supply pool of 70,000 acre-feet.

Coyote Valley Dam/Lake Mendocino is a multi-purpose reservoir that serves as a flood control, water supply and recreational facility. The Water Agency is the local cost-sharing partner for Coyote Valley Dam and determines the amount of water to be released when the lake level is in the water supply pool. The US Army Corps of Engineers manages flood control releases.

Warm Springs Dam and Lake Sonoma:

Located about 14 miles northwest of Healdsburg, Warm Springs Dam is a rolled earth embankment dam that forms Lake Sonoma. The Water Agency generates electricity at Warm Springs Dam and sells the power to the Power and Water Resources Pooling Authority (PWRPA), a joint powers authority that coordinates power supplies for its members. The Water Agency is member of the PWRPA and receives credit for providing and utilizing the power it generates at Warm Springs Dam. Located at the confluence of Warm Springs Creek and Dry Creek, this lake began storing water in 1984 and has a total storage capacity of 381,000 acre-feet with a water supply pool of 212,000 acre-feet.

Warm Springs Dam/Lake Sonoma is a multi-purpose reservoir that serves as a flood control, water supply and recreational facility. The Water Agency is the local cost-sharing partner for Warm Springs Dam and determines the amount of water to be released when the lake level is in the water supply pool. The US Army Corps of Engineers manages flood control releases.

Potable Water Production

Water produced by the Water Agency originates from the following water supply facilities: six Radial Collector wells along the Russian River; seven production wells along the Russian River; and three production wells along the Cotati Aqueduct in the Santa Rosa Plain. There are three Radial Collector Wells at Wohler (1, 2, and 6) and three Radial Collector Wells at Mirabel (3, 4, and 5). The seven production wells are at Mirabel between Radial Collector Well 5 and Radial Collector Well 2.

Radial Collector Wells 1 and 2 were constructed in the late 1950's and Radial Collector Wells 3, 4 and 5 were constructed between 1975 and 1985. Construction of Radial Collector Well 6 was completed in the spring of 2006 and is located several thousand feet upstream of the Wohler Bridge.

The Water Agency has an inflatable dam that is put up across the Russian River during the spring/summer. The inflatable dam creates a backwater that raises the upstream water level, and allows river water to be pumped into infiltration ponds where it filters into the ground. The dam and the infiltration ponds also help to recharge the alluvial aquifer so that the Water Agency can meet peak demand for water in the summer. The dam is typically lowered in the late autumn or early winter after water demands have decreased and Russian River discharge is increasing.

The State Water Resources Control Board Division of Drinking Water (DDW) currently classifies Radial Collector Well 5 as being under the direct influence of surface water when 1) the flow in the Russian River at Hacienda Bridge reaches 5,000 cfs and 2) until the flow at the Hacienda Bridge drops below 2,000 cfs. During periods that the Russian River flows meet these criteria, Radial Collector Well 5 must be operated under the

Surface Water Treatment Rule (SWTR). Over the reporting period from 2018 to 2022, Radial Collector Well 5 was not operated under the SWTR. The Water Agency as common practice and policy, does not operate Radial Collector Well 5 under conditions that would require operation under the SWTR.

By locating the wells adjacent to the Russian River, the Water Agency is able to take advantage of the natural filtration process of the riverbed to treat the river water before it is distributed into the drinking water supply. When not operating under the SWTR, extracted groundwater is disinfected with chlorine for 4-log virus inactivation disinfection and pH adjustment to prevent pipe corrosion.

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This section provides an overall review of the Russian River water quality data available within the focus area of this study. Primarily, this includes all of the source (raw) water data collected by the Water Agency at the diversion location and at Collector 5. In addition to those data sets, there were two ambient water quality monitoring programs/studies with relevant water quality data during the study period. Work conducted by the North Coast Regional Water Quality Control Board (Regional Board) and the Sonoma County Department of Health Services will be discussed separately from the data collected by the Water Agency as shown in **Table 3-1**. The frequency of data collection varies by constituent and monitoring program.

This section provides a review of the constituents of interest, including an explanation for their selection and a summary of the data obtained for the reporting period, which is 2018 through 2022.

For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

Table 3-1
Summary of Outside Water Quality Data Sources

Agency	Data Collected	Sampling Location	Period of Record
Sonoma County Dept. of Health Services	Cyanotoxins	Cloverdale River Park, Del Rio Woods Beach, Camp Rose Beach, Healdsburg Memorial Beach	Summer 2018, Summer 2020
North Coast Regional Water Quality Control Board	Cyanotoxins	Hopland gauge, Cloverdale near Airport, SYAR Ponds	August 2016 – September 2019

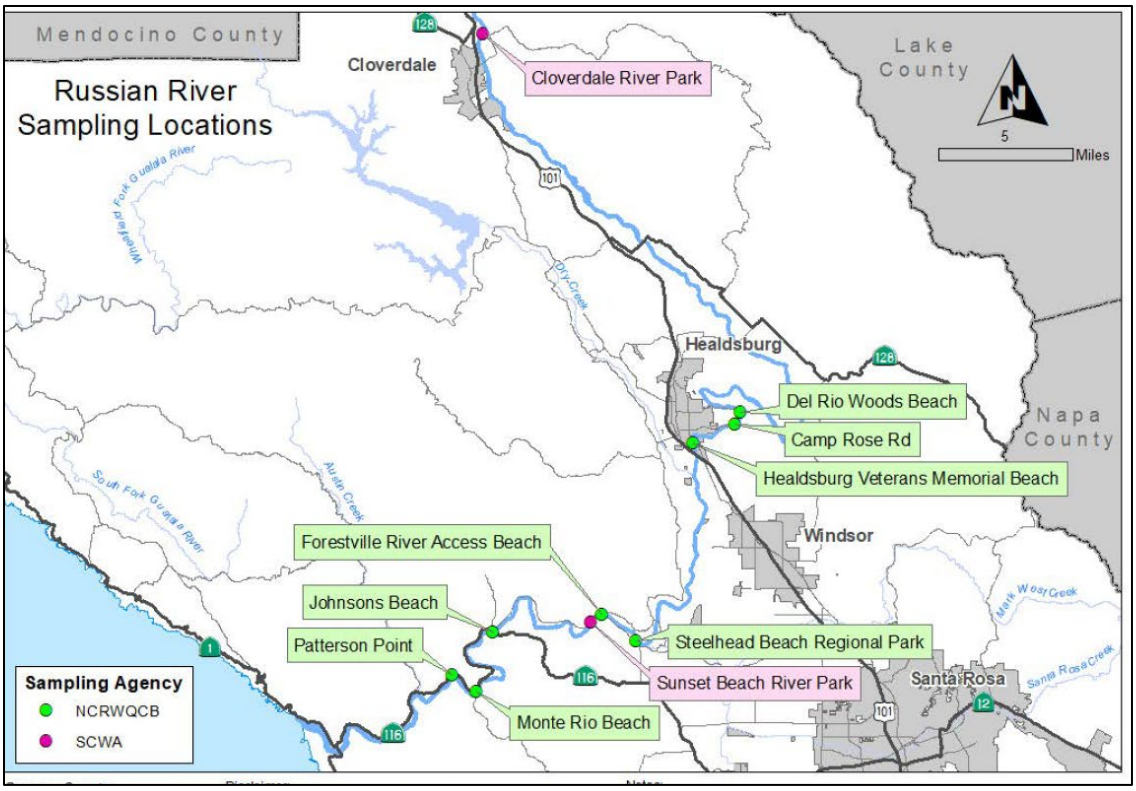
AMBIENT MONITORING PROGRAM DESCRIPTIONS

CYANOTOXINS

Sonoma County Department of Health Services works collaboratively with the Regional Board to conduct cyanotoxin monitoring at ten public beaches. After Memorial Day, water temperature, flow and visual monitoring is conducted. Once conditions are favorable for cyanobacteria growth, samples are collected for cyanotoxins, specifically, *Anatoxin-a*, *Cylindrospermopsin*, and *Microcystin*. Over the reporting period, samples were collected in 2018 and 2020. Samples were not collected in 2019 due to major flooding in the Russian River. Sonoma County Department of Health Services indicated that for 2021 and 2022, the County's cyanotoxin posting signage would be based on

North Coast Regional Water Quality Control Board's monitoring. **Figure 3-1** shows the monitoring locations for the Sonoma County Department of Health Services.

Figure 3-1. Beach Monitoring Locations for Cyanotoxins



Source: Sonoma County Department of Health Services

Currently, no federally enforceable limits exist for microcystin, cylindrospermopsin, or any other cyanotoxins. In June 2015, United States Environmental Protection Agency (USEPA) issued drinking water Health Advisories (HA) for two cyanotoxins – microcystin and cylindrospermopsin. It was determined that insufficient data was available to develop a health advisory for anatoxin-a. Health advisories are non-regulatory values that serve as informal technical guidance to assist federal, state and local officials, and managers of public or community water systems to protect public health from contaminants.

The HA values represent concentrations in drinking water below which adverse non-carcinogenic effects are not expected to result from the ingestion of drinking water for a ten-day exposure. The health advisory values are:

- 0.3 µg/L for microcystin and 0.7 µg/L for cylindrospermopsin for bottle-fed infants and children less than six years old
- 1.6 µg/L for microcystin and 3.0 µg/L for cylindrospermopsin for children six years old and up and adults.

On May 3, 2021, the Office of Environmental Health Hazard Assessment (OEHHA) submitted short-term (up to one month or three months) notification level recommendations to the State Water Resources Control Board Division of Drinking Water (DDW) for microcystins, cylindrospermopsin, anatoxin-a and saxitoxin. On June 15, 2022, OEHHA submitted acute (one day) notification level recommendations for microcystins, cylindrospermopsin, anatoxin-a, and saxitoxin. These are summarized in **Table 3-2** and are currently being evaluated by DDW.

Table 3-2. Recommended Acute and Short-term Notification levels for Cyanotoxins

	Acute NL (1 day)	Short-term NL
Anatoxin-a	8 ug/L	4 ug/L (up to 1 month)
Cylindrospermopsin	3 ug/L	0.3 ug/L (up to 3 months)
Microcystin	3 ug/L	0.03 ug/L (up to 3 months)
Saxitoxin	0.5 ug/L	NA

As shown in **Table 3-3**, there have been no detections of cylindrospermopsin and microcystin above their respective USEPA 10-day health advisories in 2018 and 2020 for the locations in the table. Additionally, there have been no detections above the acute and short-term notification levels except for the short-term NL for microcystin. However it is important to note that this applies to a three month exposure.

Table 3-3. Cyanotoxin Detection at Selected Locations in Study Watershed, Sonoma County Dept. of Health Services Monitoring, 2018 and 2020

	Anatoxin-A		***Cylindrospermopsin***		***Microcystin***	
	No health advisory		0.7 µg/L for children and 3.0 µg/L for adults		0.3 µg/L for children and 1.6 µg/L for adults	
	2018	**2020**	**2018**	**2020**	**2018**	**2020**
Cloverdale River Park	One detection at 0.15 µg/L				Two detections at 0.17 and 0.14 µg/L	
Del Rio Woods Beach					One detection at 0.19 µg/L	
Camp Rose Beach	One detection at 0.13 µg/L				Two detections at 0.14 and 0.19 µg/L	One detect at 0.141 µg/L
Healdsburg Memorial Beach	One detection at 0.13 µg/L			One detection at 0.069 µg/L		

The Regional Board also monitors for cyanotoxins. However their primary focus is to protect recreators and their pets. They have determined that the highest risk for recreators is through ingestion of algal mat material, and not through ingestion of dissolved cyanotoxins in river water. Therefore in September 2019 they terminated monitoring for dissolved cyanotoxins in water. Beginning in 2020, monitoring efforts have been primarily focused on visual assessments of the river and the analysis of algal mat material when deemed necessary. Since monitoring of cyanotoxins in algal mats is not applicable to drinking water, this report will only summarize the cyanotoxin data collected in water through 2019.

Tables 3-4 through **3-6** show cyanotoxin monitoring data at the Hopland USGS gauge, Cloverdale (near airport), and the SYAR Ponds, respectively. Detected cyanotoxins are shaded in red. **Figure 3-2** shows the monitoring locations.

Figure 3-2. Cyanotoxin Monitoring Locations, North Coast Regional Water Quality Control Board

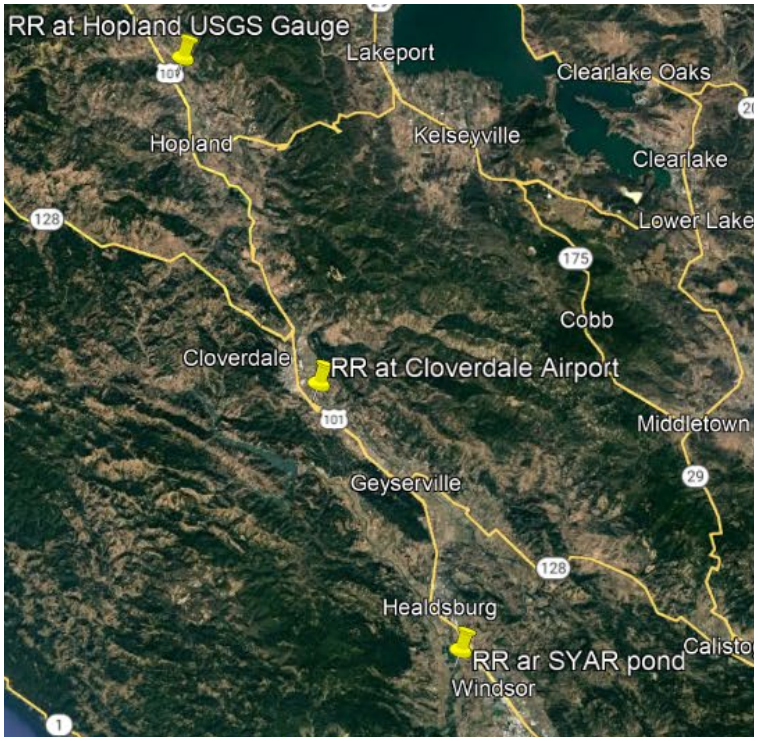


Table 3-4. Cyanotoxin Detection at Hopland, North Coast Regional Water Quality Control Board Monitoring, 2016 to 2019

Date	Anatoxin	Cylindrospermopsin	Saxitoxins	Nodularins	Microcystins (ELISA)	Microcystins (LCMS summed)
6/28/2016	ND	ND	ND	ND		ND
7/13/2016	ND	ND	ND	ND		ND
8/2/2016	ND	ND	ND	ND		ND
8/18/2016	ND	ND	ND	ND		0.83
8/31/2016	ND	ND	ND	ND		0.13
9/15/2016	ND	ND	ND	ND	0.05	0.14
9/30/2016	0.15	ND	ND	ND	0.20	ND
5/24/2017	ND				ND	
6/15/2017	ND	ND	ND		ND	
6/27/2017	ND	ND	ND		ND	
7/12/2017	ND	ND	ND		ND	
8/3/2017	ND	ND	ND		ND	
8/17/2017	ND	ND	ND		ND	
8/30/2017	ND	ND	ND		ND	
9/14/2017	ND	ND	ND		ND	
9/26/2017	ND	ND	ND		ND	
6/12/2018	ND	ND	ND	ND	0.19	0.12
6/25/2018	ND	ND	ND	ND	ND	ND
7/19/2018	ND	ND	ND	ND	ND	ND
8/2/2018	ND	ND	ND	ND	ND	ND
8/15/2018	ND	ND	ND	ND	ND	ND
9/13/2018	ND	ND	ND	ND	ND	ND
9/25/2018	ND	ND	ND		ND	
6/25/2019	ND	0.07		ND	ND	
6/27/2019	ND	ND	ND		ND	
7/30/2019	ND	ND			ND	
9/4/2019	ND	ND	ND		ND	

Table 3-5. Cyanotoxin Detection at Cloverdale Near Airport, North Coast Regional Water Quality Control Board Monitoring, 2016 to 2019

Date	Anatoxin	Cylindrospermopsin	Saxitoxin	Nodularin	Microcystins (ELISA)	Microcystins (LCMS summed)
8/2/2016	ND	ND	ND	ND		ND
8/18/2016	ND	ND	ND	ND		0.81
8/31/2016	ND	ND	ND	ND		0.23
9/15/2016	ND	ND	ND	ND		0.32
10/2/2016	ND	ND	ND	ND		ND
10/3/2016	ND		ND		0.20	
5/24/2017	ND				ND	
6/15/2017	ND	ND	ND		ND	
6/27/2017	ND	ND	ND		ND	
7/18/2017	ND	ND	ND		ND	
8/3/2017	ND	ND	ND		ND	
8/17/2017	ND	ND	ND		ND	
8/30/2017	ND	ND	ND		ND	
9/14/2017	ND	ND	ND		ND	
9/27/2017	ND	ND	ND		ND	
6/25/2018	ND	ND	ND	ND	ND	ND
7/17/2018	ND	ND	ND	0.22	ND	ND
7/31/2018	ND	ND	ND	ND	ND	ND
8/2/2018	ND	ND	ND	ND	ND	ND
9/13/2018	ND	ND	ND	ND	ND	ND
9/19/2018	ND	ND	ND	ND	ND	ND
9/25/2018	ND	ND	ND		ND	
6/25/2019	ND	0.10		ND	ND	
6/27/2019	ND	ND	ND		ND	
7/9/2019	ND	ND	ND	ND	ND	
7/24/2019	ND	ND	ND	ND	ND	
7/30/2019	ND	ND			ND	
9/4/2019	ND	ND	ND		ND	
9/11/2019	1.75					
10/5/2019	ND	ND	ND		ND	
10/11/2019	ND	ND	ND		ND	

Table 3-6. Cyanotoxin Detection at SYAR Ponds, North Coast Regional Water Quality Control Board Monitoring, 2017 to 2019

Date	Anatoxin	Cylindrospermopsin	Saxitoxin	Nodularin	Microcystins (ELISA)	Microcystins (LCMS summed)
5/25/2017	ND				ND	
6/15/2017	ND	ND	ND		ND	
6/28/2017	ND	ND	ND		ND	
7/18/2017	ND	ND	ND		ND	
8/3/2017	ND	ND	ND		ND	
8/15/2017	ND	ND	ND		ND	
8/30/2017	ND	ND	ND		ND	
6/27/2018	ND	ND			ND	ND
7/17/2018	ND	ND	ND	ND	ND	ND
8/2/2018	ND	ND	ND	ND	ND	ND
9/13/2018	ND	ND	ND	ND	ND	ND
9/19/2018	ND	ND	ND	ND	ND	ND
9/25/2018	ND	ND	ND		ND	
6/25/2019	ND	0.09		ND	ND	
6/27/2019	ND	ND	ND		ND	
7/9/2019	ND	ND	ND	ND	ND	
7/11/2019	ND	ND	ND		ND	
7/30/2019	ND	ND			ND	
9/11/2019	1.79					

Summary

All cyanotoxins were infrequently detected at all locations; overall, microcystin had the most number of detections.

Cyanotoxins showed presence at monitoring locations from Hopland to the SYAR Ponds, indicating either transport of cyanotoxins from upstream to downstream, or growth in multiple locations. For example, cylindrospermopsin was detected at Hopland, Cloverdale and SYAR Ponds on June 25, 2019. Anatoxin was detected at Cloverdale and SYAR Ponds on September 11, 2019. Microcystin was detected at Cloverdale River Park, Del Rio Woods Beach, and Camp Rose Beach on August 13, 2018.

For the data presented herein, there were no detections above the acute and short-term notification levels, except for the short-term NL for microcystin. Also, there were no detections above the health advisories except for the 0.3 µg/L for microcystin for children less than six years old.

OVERALL WATER QUALITY REVIEW

This section provides an evaluation of the Russian River and Radial Collector Well 5 water quality data collected between 2018 and 2022. The Russian River data collected at the diversion location are representative of the source water quality prior to riverbank filtration. The Radial Collector Well 5 data are representative of the quality of water entering Sonoma County Water Agency's (Water Agency) distribution system. The hydrology of the Russian River during the study period is presented first, followed by a discussion of the annual water quality data collected from Radial Collector Well 5. This section then provides a review of the constituents of interest, including an explanation for their selection and a summary of the data obtained during the study period.

HYDROLOGY

Radial Collector Well 5, located on the north bank of the Russian River near Mirabel, has been determined by the DDW to be groundwater under the direct influence of surface water (GWUDI) under certain flow conditions on the Russian River. Radial Collector Well 5 was constructed in 1982 by Ranney Method Western Corporation. The well consists of a 13-foot inside diameter (16-foot outside diameter) steel reinforced concrete caisson that is 99 feet from the floor of the pump house to the floor of the caisson. The well configuration consists of ten 10-inch diameter carbon steel laterals that range in length from 70 to 175 feet with a total of approximately 1,304 lineal feet of screen. The laterals are equipped with 10-inch diameter valves and extend into the aquifer from approximately 42 inches above the caisson floor. The well is equipped with two vertical turbine pumps with 1,250 horsepower motors.

Radial Collector Well 5 and the other collector wells in the Water Agency's water supply system were initially classified as GWUDI by DDW. The Water Agency performed a comprehensive water quality monitoring program in 1992 and 1993 that showed that only Radial Collector Well 5 was actually under the direct influence of surface water when the flow in the Russian River at Hacienda Bridge reaches 5,000 cubic feet per second (cfs) and until the flow drops below 2,000 cfs. Once the flows decrease below 2,000 cfs, the Water Agency may operate Collector 5 not under the influence of surface water until the Russian River flow again increases above 5,000 cfs. **Figure 3-3** presents the flow data for the river at the Hacienda Bridge. This figure shows that there are many periods of time in the wet season when the river flows exceed the conditions that cause Radial Collector Well 5 to be under the influence of surface water. The Water Agency has not used Radial Collector Well 5 when it is under the direct influence of surface water during the study period, per standard operating procedures.

Figure 3-4 shows a detailed breakdown of the operational status of Collector 5 and the flows at the Hacienda Bridge. Blue shaded boxes show the time periods when Collector 5 was in operation, and the red and pink boxes show when Collector 5 was not in operation. There a few time periods when the flows had decreased to below 2,000 cfs and are increasing, in this scenario, Collector 5 is allowed to operate not under the

influence of surface water until the flows reach 5,000 cfs, as shown in yellow shaded boxes.

Figure 3-3. Russian River Flow at Hacienda Bridge, 2018 to 2022

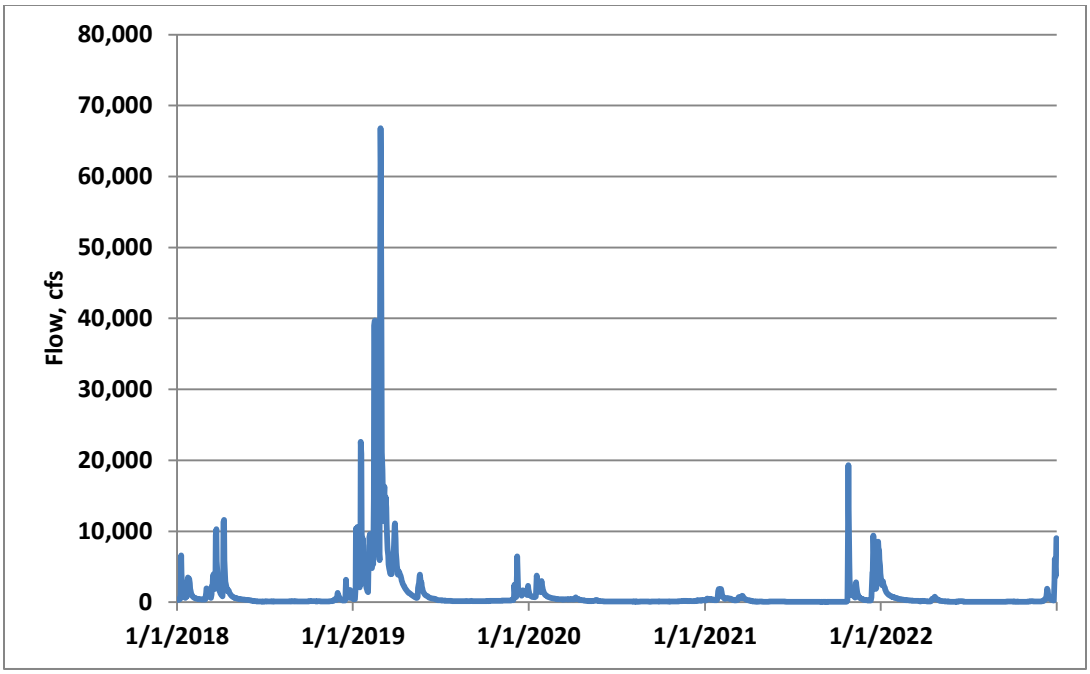


Figure 3-4. Operational Status for Radial Collector Well 5, 2018 to 2022

Year	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
2018		o/s			o/s							
2019												
2020	o/s	o/s	o/s								o/s	
2021												
2022	o/s	o/s						o/s	o/s	o/s		

	Flows below 2,000 cfs and operating		
o/s	Flows below 2,000 cfs and not operating		Flows above 2,000 cfs but below 5,000 and operating
	Flows above 5,000 cfs and not operating	o/s	Flows above 2,000 cfs but below 5,000 and not operating

The Water Agency collects annual samples from Radial Collector Well 5 for organic and inorganic contaminants regulated in drinking water supplies. **Table 3-7** compares the Radial Collector Well 5 data to primary maximum contaminant levels (MCLs) and **Table 3-8** compares the data to secondary MCLs.

No synthetic or volatile organics were detected in the five years of annual monitoring (2018-2022). There were no detectable levels of inorganic chemicals with primary MCLs. There were a few detectable inorganic chemicals with secondary MCLs; specifically color, total dissolved solids, specific conductance, chloride and sulfate.

However, the detected levels are low, much lower than their respective recommended secondary MCLs.

Table 3-7. Comparison of Radial Collector Well 5 Monitoring Data (2018 to 2022) To Primary Maximum Contaminant Levels

Constituent	Primary MCL	Number of Samples	Median Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, µg/L	1000	5	<50	<50
Antimony, µg/L	6	5	<6	<6
Arsenic, µg/L	10	5	<2	<2
Asbestos, MFL	7MFL	5	<0.2	<0.2
Barium, µg/L	1000	5	<100	<100
Beryllium, µg/L	4	5	<1	<1
Cadmium, µg/L	5	5	<1	<1
Chromium, µg/L	50	5	<10	<10
Chromium 6, µg/L	no MCL	5	<1*	<1
Copper				
Cyanide, mg/L	0.15	5	<0.003	<0.003
Fluoride, mg/L	2	5	<0.1	0<0.1
Lead				
Mercury, µg/L	2	5	<0.2	<0.2
Nickel, µg/L	100	5	<10	<10
Nitrate, mg/L	10	5	<0.4	<0.2
Nitrate + Nitrite, mg/L	10	5	<0.4	<0.4
Nitrite, mg/L	1	5	<0.2	<0.2
Perchlorate, µg/L	6	5	<4	<4
Selenium, µg/L	50	5	<5	<5
Thallium, µg/L	2	5	<1	<1
Radioactivity				
Gross Alpha Particle, pCi/L	15	4	0.06**	0.121**
Organic Chemicals[a]				

[a]No organic chemicals were detected.
*Detection limit for Hexavalent Chromium was <0.50 in 2018
** Sampled in 2014

Table 3-8. Comparison of Radial Collector Well 5 Monitoring Data (2018 to 2022) To Secondary Maximum Contaminant Levels

Constituent	Secondary MCL	Number of Samples	Median Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, µg/L	200	5	<50	<50
Color, units	15	5	3	4
Copper, mg/L	1000	5	<50	<50
MBAS, mg/L	0.5	5	<0.05	<0.05
Iron, mg/L	0.3	5	<0.1	<0.1
Manganese, µg/L	50	5	<20	<20
MTBE, mg/L	0.005	5	<0.003	<0.003
Odor, units	3	5	<1	<1
Silver, mg/L	0.1	5	<0.010	<0.010
Thiobencarb, mg/L	0.001	5	<0.001	<0.001
Turbidity[a], NTU	5	5		2
Zinc, µg/L	5000	5	<50	<50
TDS, mg/L	500-1,500	5	140	160
Specific Conductance, µS/cm	900-2,200	5	230	290
Chloride, mg/L	250-600	5	5.2	6.8
Sulfate, mg/L	250-600	5	12	16

[a] See Table 3-9 for turbidity data.

SELECTED CONSTITUENT REVIEW

Based on a review of the water quality data and an evaluation of the contaminant sources in the study watershed, the key constituents identified for further evaluation in this sanitary survey are turbidity, microbiological constituents, and disinfection byproducts. Furthermore, these key constituents are also regulated by DDW.

Turbidity

General Characteristics and Background

High turbidity levels in surface water sources, such as the Russian River, are typically the result of erosion and sediment transport during high flow events. High flow events on the Russian River can occur as a result of storm events and releases from upstream reservoirs. High turbidity in source water can mask the presence of microorganisms and interfere with disinfection. Turbidity is typically used to evaluate the efficiency of the

treatment process in removing particles, including microorganisms, and also to comply with regulatory requirements.

DDW requires routine monitoring of turbidity in the collector wells to demonstrate the integrity of the natural filtration system. Although Radial Collector Well 5 has been determined to be GWUDI when river flows are high, it is not typically operated during those conditions so this evaluation focuses on a review of the turbidity data to determine if it meets the DDW requirements during the times it is operated.

Evaluation

Turbidity has been selected for evaluation not only because it is a regulated constituent, but also because it is commonly used as an indicator of general water quality and the effectiveness of riverbank filtration. Weekly grab samples at the diversion location are shown in **Figure 3-5,** indicating variability in turbidity levels in the river. **Figure 3-5** also shows monthly precipitation from the rain gauge at Warm Springs Dam at Lake Sonoma. Generally, turbidity peaks are associated with precipitation, due to transport of sediment from the watershed.

Turbidity is also monitored continuously at Radial Collector Well 5 when it is being used as a water supply well with SCADA polling data approximately every 2.5 minutes. **Table 3-8** presents the range and annual average turbidity values for Radial Collector Well 5 for 2018 through 2022. The Water Agency calculates the annual average as the mean of the monthly average values, weighted by hours of pumping each month. This table shows that turbidity levels are exceedingly low. The maximum turbidity level recorded is 2.0 NTU and the annual average ranges from 0.0028 to 0.044 NTU. The Radial Collector Well 5 turbidity monitoring is designed to monitor the exceedingly low levels that are found most of the time so the instrument is not able to record values that exceed 2.0 NTU.

The current operating permit for the Water Agency, dated February 5, 2020 states that if any radial collector well produces water with a turbidity level greater than 0.2 NTU for more than four hours, the following actions must be taken in order for the well to remain in service:

a. Verify that the radial collector well is producing water with a turbidity level less than 1.0 NTU
b. Determine why the problem is occurring and correct it within 48 hours
c. If the problem cannot be corrected within 48 hours: then 1) perform daily coliform and particle count sampling, 2) collect one microscopic particulate analysis, and 3) inform the State Board within 24 hours of beginning daily coliform sampling

As indicated in **Table 3-9**, the maximum turbidity in Radial Collector Well 5 was 2.0 NTU. When this occurred, the turbidity would have decreased to 0.2 NTU or below within four hours, or the Water Agency would have completed the investigative actions

as required by the operating permit. However, in most cases, a 2.0 NTU reading at Collector 5 is related to start-up of the well. Sonoma Water Operations would monitor the turbidity closely, and would shut off Collector 5 if it did not decrease to below 1.0 NTU within 30 minutes.

Figure 3-5. Weekly Turbidity Data in the Russian River at the Diversion Location, 2018 to 2022

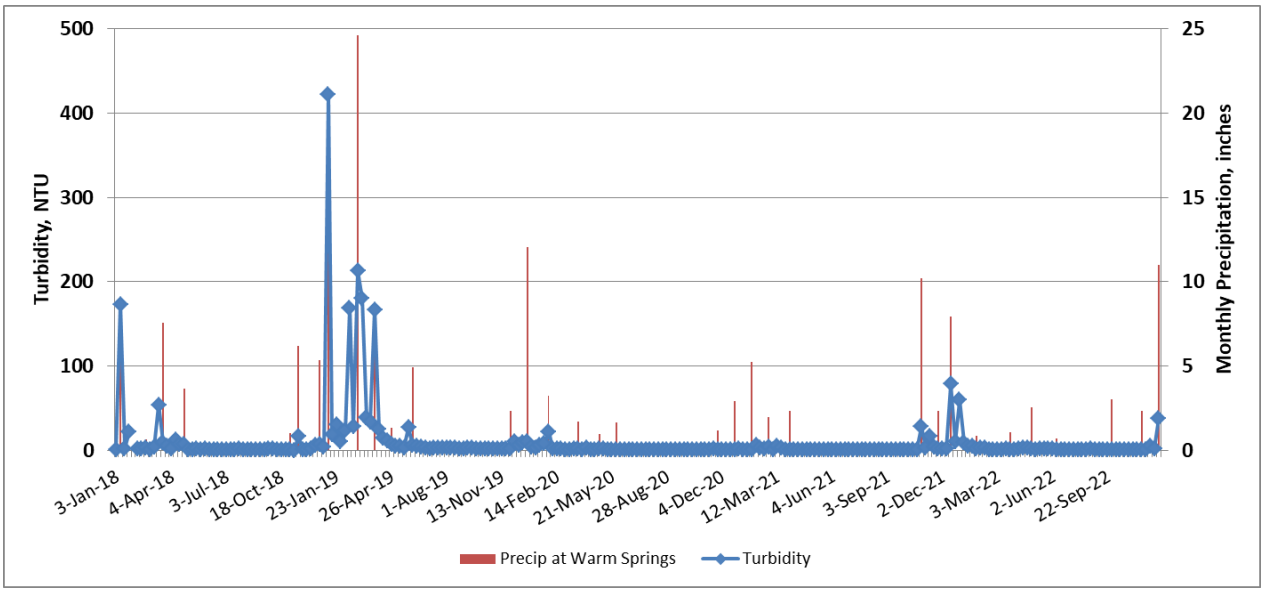


Table 3-9. Radial Collector Well 5 Turbidity Data

Year	Range	Average
2018	0.026 – 2.0	0.033
2019	0.039 – 2.0	0.044
2020	0.025 – 2.0	0.039
2021	0.018 – 2.0	0.028
2022	0.023 – 2.0	0.031

Summary

- Turbidity levels in the Russian River at the diversion location are quite variable, ranging from less than 2.0 to over 400 NTU. The highest levels are typically found during the wet season when Radial Collector Well 5 is not being used as a water supply source.

- Turbidity levels in Radial Collector Well 5 are very low with peak values of 2.0 NTU and annual averages of 0.028 to 0.044 NTU.
- If Radial Collector Well 5 is not under the influence of surface water and is operating, DDW requires that Radial Collector Well 5 be taken out of service if turbidity exceeds 5.0 NTU at any time. If the well produces water with a turbidity level greater than 0.2 NTU for more than four hours, additional actions must be taken.
- These data indicate that riverbank filtration is effectively removing the high particulate levels seen in the Russian River.

Microbiological Constituents

General Characteristics and Background

The major microbiological constituents of concern include total coliform, fecal coliform, *Escherichia coli (E. coli)*, *Giardia lamblia*, and *Cryptosporidium parvum*. Potential sources of bacteria and protozoans in the watershed include wastewater discharges, spills from wastewater treatment plants, leaking septic tanks and sewers, urban runoff, dairies, recreational usage, and wild animals. Generally speaking, pathogenic organisms carried by mammalian species may be infectious to humans although this depends on the species of microorganism. Pathogens infecting other types of animals, such as birds and reptiles, are usually not infectious to humans; however, some types of animals, such as birds, may be vectors for human pathogens. Each of these constituents was identified for further evaluation because they are currently regulated.

Total and fecal coliform and *E. coli* have been used to indicate the potential presence of pathogenic microorganisms in source waters. Although coliform levels have not been shown to correlate well with pathogenic microorganisms, they continue to be used as indicators due to the lack of affordable analytical methods for detecting pathogens. The USEPA has determined that the most practical surrogate for protozoans at this time is *E. coli*. Coliform levels in water in the distribution system are currently regulated through the Total Coliform Rule, to ensure the effectiveness of the disinfection process throughout the distribution system.

Giardia lamblia is a species of the protozoa genus *Giardia* that infects humans and can cause the gastrointestinal disease giardiasis. *Giardia* is found in the environment as a cyst from the feces of humans and animals; both wild and domestic animals may be hosts. Sources close to water bodies have the most potential to introduce viable cysts to the source water. Cysts may be destroyed naturally in the environment by desiccation and/or heat. The cysts are effectively inactivated using chlorine disinfection.

Giardia lamblia is currently regulated by the Surface Water Treatment Rule (SWTR) and the Interim Enhanced Surface Water Treatment Rule (IESWTR). A GWUDI source must provide 3-log reduction of *Giardia* through physical removal and chemical inactivation. The USEPA provided guidance with the SWTR that indicated additional reduction would be appropriate if measured *Giardia* levels in the source water were

greater than 0.01 cysts per liter. However, in the 1980's there was no practical means to measure *Giardia*, therefore DDW prepared guidance under the SWTR that indicated that 3-log reduction would likely be appropriate when monthly median levels of total coliform in the raw water were less than 1,000 most probable number per 100 milliliter (MPN/100 ml). In recent years DDW has allowed for the substitution of fecal coliform or *E. coli* levels in raw water since they are more specific indicators. The DDW has set the guidance level for increased treatment at raw water monthly fecal or *E. coli* median levels greater than 200 MPN/100 mL, based on the historic ratio of five total coliform to one fecal coliform. These requirements would apply to Radial Collector Well 5 if the Water Agency intended to use it during the periods of time that it is currently deemed to be a GWUDI source.

Cryptosporidium parvum is a species of the protozoa genus *Cryptosporidium* that infects humans and can cause the gastrointestinal disease cryptosporidiosis. *Cryptosporidium* is found in the environment as an oocyst. Like *Giardia*, *Cryptosporidium* oocysts may be destroyed naturally in the environment by desiccation and/or heat. Once in the source water, however, viable oocysts are very resistant to traditional chemical inactivation using chlorine. Stronger disinfectants such as ozone or ultraviolet (UV) light are required to inactivate these pathogens.

Cryptosporidium is currently regulated through the IESWTR and the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), which require 2-log reduction, and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) which potentially requires additional log action based on source water monitoring results for *Cryptosporidium*. Under the IESWTR and LT1ESWTR well-operated treatment plants are granted a 2-log removal credit for *Cryptosporidium* if they meet all treated water turbidity standards. The LT2ESWTR further regulates *Cryptosporidium* and requires additional action (treatment or protection) if the source water quality is determined to be impaired based on *Cryptosporidium* monitoring of the source. These requirements would apply to Radial Collector Well 5 if the Water Agency intended to use it during the periods of time that it is currently deemed to be a GWUDI source.

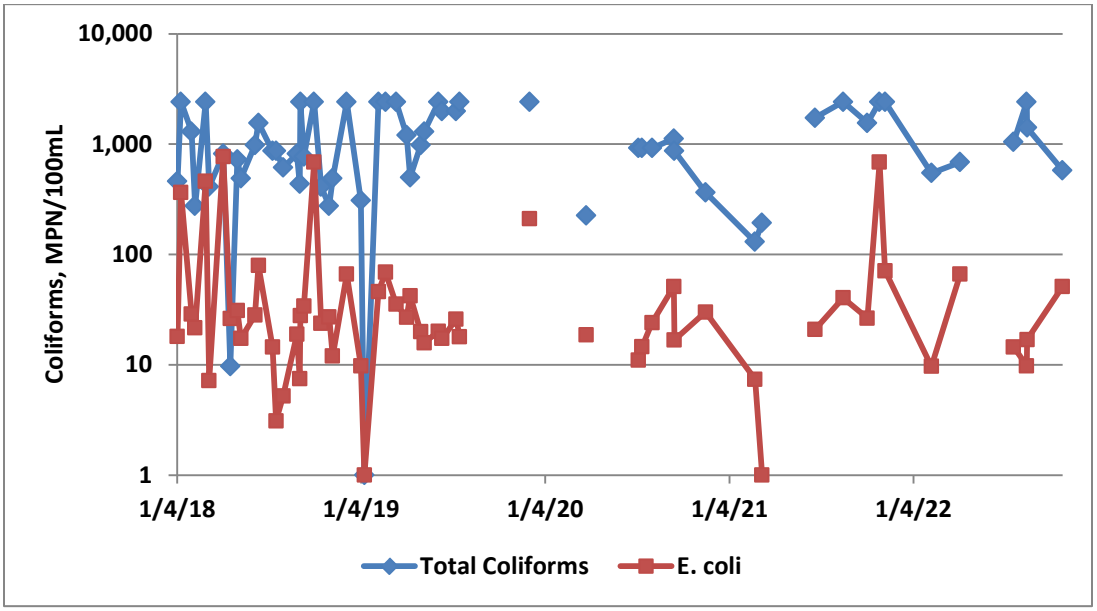
Evaluation

Total coliform and *E. coli* were analyzed approximately monthly from the Russian River at the diversion location. All samples from the river were positive for both organisms, as shown in **Figure 3-6**. Total coliform levels ranged from <1 to >2,419 MPN/100 mL, with a median of 920.8 MPN/100mL. *E. coli* levels ranged from <1 to 770.1 MPN/100 mL, with a median of 23.8 MPN/100mL. Over the reporting period from 2018 to 2022, there were five months where the *E. coli* monthly median at the diversion location exceeded the DDW guidance of 200 MPN/100 mL that could potentially trigger additional *Giardia* removal or inactivation if the Water Agency were to use Radial Collector Well 5 during the periods when it is deemed to be a GWUDI source. However, there were two months (October 2018 and December 2019) out of the five months when Radial Collector 5 was operating. In other words, although there were five months when the *E. coli* monthly median was above the 200 MPN/100mL trigger level, there was no need

for additional treatment in three out the five months as Collector 5 was not in operation, with the exception of October 2018 and December 2019.

Total coliforms and *E. coli* were also analyzed in samples collected from Radial Collector Well 5 prior to disinfection, when it was operating. Total coliforms were found detectable two times, at 1.0 and 3.1 MPN/100 ml. *E. coli* was never detected.

Figure 3-6. Total Coliform and *E. coli* Levels in the Russian River, 2018 to 2022



The water from the collector wells is disinfected prior to entering the distribution system. Total coliform samples are collected throughout the distribution system, generally with over 520 samples collected each year in the study period. Between 2018 and 2022, there was one positive sample in 2018, two positive samples in 2019, and one positive sample in 2021. The MCL is less than two positive samples per month.

Summary

- The Russian River has relatively high levels of coliforms, associated when watershed runoff is high due to precipitation. Therefore, the highest levels of *E. coli* generally occur when Collector 5 is not operating, as the Water Agency does not operate Collector 5 when it is under the direct influence of surface water (when the flow in the Russian River at Hacienda Bridge reaches 5,000 cubic feet per second cfs and until the flow drops below 2,000 cfs).
- Total coliforms and *E. coli* were analyzed in samples collected from Radial Collector Well 5 prior to disinfection, when it was operating. Total coliforms were found two times at 1.0 and 3.1 MPN/100 ml. *E. coli* was never detected.
- The Radial Collector Well 5 data show that riverbank filtration is very effective in removing microorganisms from the water, producing high quality groundwater for the Water Agency's system.

Disinfection Byproducts and Precursors

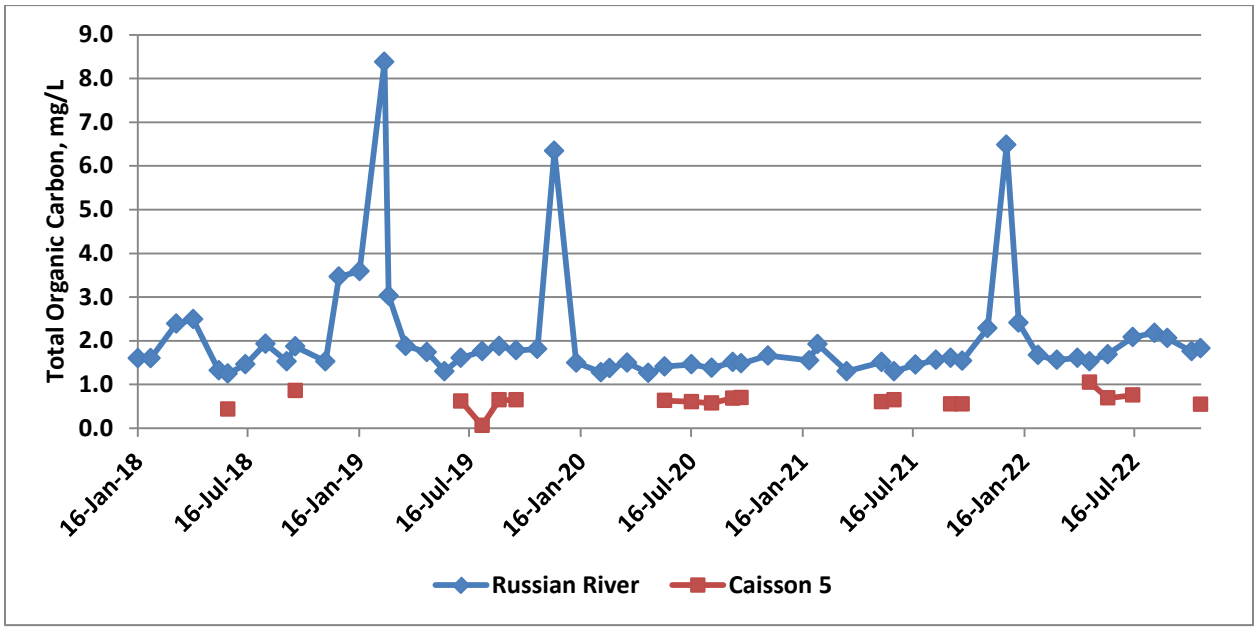
General Characteristics and Background

Disinfection By-Products (DBPs) are formed when disinfectants added to water react with organic carbon and bromide. The most common DBPs are total trihalomethanes (TTHM), which are suspected carcinogens. Other DBPs, including haloacetic acids (HAA5), are suspected mutagens and teratogens. Potential sources of organic carbon are plant matter, animal matter, and soil, which can be contributed by general watershed runoff, urban runoff, agricultural runoff, recreation, grazing, and wastewater sources. TTHMs and HAA5 are regulated by Stage 2 Disinfectants/Disinfection Byproduct Rules. The MCL for TTHM is 80 µg/L and the MCL for HAA5 is 60 µg/L.

Evaluation

The Water Agency collects total organic carbon (TOC) samples on a monthly basis from the diversion location, and occasionally at Collector 5. **Figure 3-7** presents TOC in the Russian River and at Collector 5. TOC in the river ranged from 1.3 to 8.4 mg/L, with an average of 2.0 mg/L. TOC in Collector 5 was much lower, ranging from 0.1 to 1.1 mg/L, with an average of 0.6 mg/L.

Figure 3-7. Total Organic Carbon Concentrations in the Russian River and Collector 5, 2018 to 2022



The Water Agency monitors the individual trihalomethanes and haloacetic acids in samples from the tanks in the water distribution system. TTHM and HAA5 are calculated from the individual species to determine compliance with the MCLs. Since water from Radial Collector Well 5 is mingled with water from other wells in the distribution system, the data for all of the storage tanks have been aggregated and are

presented in **Table 3-10**. This table shows that the maximum TTHM concentration detected in a single sample between 2018 and 2022 was 24.1 µg/L in 2019. This is well below the MCL of 80 µg/L. The maximum HAA5 concentration detected in a single sample was 23.6 µg/L in 2022. This is well below the MCL of 60 µg/L.

Table 3-10. Disinfection Byproduct Concentrations in the Storage Tanks, µg/L

	THM Range	THM Average	HAA5 Range	HAA5 Average
2018	4.7 – 21.1	12.3	1.55 – 14.19	7.37
2019	6.9 – 24.1	14.9	3.08 – 13.33	9.06
2020	5.2 – 18.6	10.5	1.44 – 11.62	6.15
2021	3.2 – 21.3	10.4	0 – 18.88	8.27
2022	4.8 – 22.9	12.2	1.1 – 23.64	8.44

Summary

- Collector 5 has relatively low levels of organic carbon, the main precursor that reacts with chlorine to form disinfection byproducts in the distribution system.
- TTHM and HAA5 concentrations in the storage tanks of the Water Agency's distribution system are consistently below the MCLs of 80 µg/L and 60 µg/L.

This section contains an evaluation of the nine potential contaminant sources (PCS) selected for review for the current Update: (1) source water spills, (2) wineries, (3) mines, (4) agriculture, (5) recreation, (6) urban runoff, (7) wastewater, (8) leaking underground storage tanks, and (9) fires. These PCSs were selected based on their presence in the study watershed and their potential to impact Russian River water quality. Timber harvesting and landfills were evaluated but eliminated from the report as they are not located in the study watershed

SPILLS

Background

A hazardous material spill or leak into a surface water body could occur as the result of a vehicular traffic accident, pipeline leak or spill, wastewater treatment plant spill, or other incident. In the event of a leak or spill, timely notification is critical to ensure that the plant operators are provided with sufficient time and information to best respond to potential treatment concerns.

Spills of raw or partially treated wastewater occur from collection systems and from wastewater treatment plants. A sanitary sewer overflow (SSO) is any overflow, spill, release, discharge, or diversion of untreated or partially treated wastewater from a sanitary sewer system. Major causes of SSOs include grease, root and debris blockages; sewer line flood damage; manhole structure failures; vandalism; pump station mechanical failures; power outages; excessive storm or groundwater inflow/infiltration; improper construction; lack of proper operation and maintenance; insufficient capacity; and contractor-caused damage. Spills of raw or partially treated wastewater occur due to equipment malfunctions or operator errors at wastewater treatment plants. Spills also occur during storm events when storm water infiltrates a wastewater collection system and the capacity of the wastewater treatment plant or collection system is exceeded.

Seasonal Patterns

There are no seasonal patterns as to when spills may occur due to the various causes of spills and SSOs. However, SSOs may occur more frequently during the wet season, when stormwater can infiltrate a wastewater collection system.

Related Constituents

The most common spills are related to oil and petroleum products or sewage. Therefore, typical constituents of concern range from volatile organic compounds (VOCs) and hydrocarbons to microbial constituents (i.e. viruses, pathogens, *Giardia, Cryptosporidium*). However, hazardous materials emergencies can involve a virtually infinite number of chemicals or chemical combinations.

Occurrence in Watershed

The main transportation routes through the watershed are California State Highway Routes 128, 175, 253, 20 and Interstate Highway 101. Information on spills was obtained from two sources: 1) the Office of Emergency Services (OES) Response Information Management System (RIMS) archived database, and 2) the State Water Resources Control Board's (SWRCB) California Integrated Water Quality System (CIWQS) database on SSOs. Information obtained from OES and from CIWQS provided additional information regarding whether or not the spill impacted surface water.

As shown in **Tables 4-1 and 4-2,** and in **Attachment A**, from 2018 to 2022 there were 24 spills involving a variety of contaminants such as sewage, diesel fuel, gasoline, oil, non-hazardous geothermal condensate, and winery waste. All of the spills impacted water. Out of the 24 spills, seven spills were sewage-related, 11 spills involved either diesel fuel, gasoline, or food oil, three spills involved the CALPINE Corp., two are unknown, and one was winery-related. Notably, three incidents involved boating incidents at Lake Sonoma; one spill and two submerged boats.

The three largest sewage spills were:

- 42,967 gallons of raw sewage spilled on October 30, 2018 in the City of Healdsburg due to pipe failure
- 20,400 gallons of raw sewage spilled on February 26, 2019 in the City of Healdsburg due to storm surge
- 10,000 gallons of partially treated sewage spilled on March 1, 2019 in the City of Healdsburg due to storm surge.

The three largest non-sewage spills were:

- 500 gallons (Ultra Seal mixed with water) released on November 26, 2018 into a storm drain at the City of Cloverdale Fire Dept. when fire sprinkler system was on
- 325 gallons of steam condensate released into creek on March 9, 2021 due to condensate pump leak at CalPine Corp
- 125 gallons of gasoline released into Lake Sonoma on September 18, 2018 from submerged boat.

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Table 4-1. Summary of Spills in OES Database Occurring in Study Area of Russian River Watershed, 2018-2022

Incident Date	Agency	Substance	Quantity	Impacted Waterway	Location	City
2/10/18	Cal Fish and Wildlife	Gasoline	1-2 gallons	Lake Sonoma	Lake Sonoma Marina	Unincorporated Sonoma County
2/22/18	Calpine Corp	Water - Drilling Liquid Type	2 gallons	Squaw Creek	Lakeview Rd at Sawmill Flat Rd, 38.815 N 122.77 W	Unincorporated Sonoma County
3/20/18	Army Corps of Engineers	Oil - Vessel Fluid Type	Unknown	Lake Sonoma	3333 Skaggs Springs Rd, Dry Creek Dam	Geyserville
4/25/18	Verisk 3E	Stain	1 gallons	Storm Drain	350 N. Orchard Ave	Ukiah
8/31/18	Ukiah CHP	Diesel fuel	50 gallons	Unknown Creek	HWY 128 Mendocino C, MM49.23	Unincorporated Mendocino County
9/11/18	CA DFW	Gasoline	125 gallons	Lake Sonoma	Lake Sonoma Resort area Marina	Healdsburg
10/19/18	Calpine	Geothermal condensate	100 gallons	Squaw Creek	Release occurred in Sonoma County	Unincorporated Sonoma County
11/26/18	Cloverdale Fire Dept.	Ultra Seal PC505-66/Water	500 gallons	Storm Drain	1184 S Cloverdale Blvd	Cloverdale
1/26/19	City of Ukiah	Unknown Material	Unknown	Storm Drain - Gibson Creek	390 East Gobbi St.	Ukiah
5/21/19	Flower Winery	Wine run off	40 barrels	Storm Drain	4035 West Side Road	Healdsburg
3/9/21	Calpine Corporation	Condensate, steam	325 gallons	Intermittent creek	Lat: 38° 48’ 46.92” N / Long: 122° 45’ 28.72” W	Unincorporated Sonoma County
3/20/21	Mendocino County Fire	Gasoline	35 gallons	Dry Creek Bed	Hwy 101 MM: 2.74 South of Comminsky Station Rd	Hopland
6/15/21	CHP Mendocino	Diesel	Unknown	Russian River	HWY 101, Mendocino County, Mile Marker 5	Hopland
6/17/21	Raleys	Food Oil	150 gallons	Storm Drain	1315 N State St.	Ukiah
9/15/21	Healdsburg FD	White Liquid, foul smelling	Unknown	Storm Drain	138 W North St, Welding Shop	Healdsburg

Incident Date	Agency	Substance	Quantity	Impacted Waterway	Location	City
6/18/22	CHP Golden Gate	Fuel	42 gallons	Storm Drain	Southbound 101 Dry Creek Off Ramp	Healdsburg
11/20/22	Empire Hazardous Incident Team	Diesel	40 gallons	Mc Nabb Creek	Highway 101 MP 15.955	Hopland

Table 4-2. SSOs in State Water Resources Control Board Database, 2018-2022

Spill Date	Spill Location	Spill Volume	Spill Recovered	Spill Cause
8/15/2018	843 Cindee Dr Ukiah, CA	62	56	Debris-Rags
10/30/18	1147 Healdsburg Ave Healdsburg, CA	42,967	0	Pipe Structural Problem/Failure
2/26/19	1080 Magnolia Dr. Healdsburg, CA	20,400	0	Flow Exceeded Capacity (Separate CS Only)
3/1/19	340 Foreman Lane, Healdsburg CA	10,000		Storm Surge
7/2/19	700 Benjamin Way Healdsburg, CA	576	0	Root Intrusion
2/22/21	631 Alta Vista Dr Healdsburg, CA	719	0	Debris-Wipes/Non-Dispersables
4/3/21	139 Kennedy Lane Healdsburg, CA	184	0	Grease Deposition (FOG)

Related Water Quality Issues and Data Review

Although there was various petroleum products spilled in the study watershed, there were no VOCs or synthetic organic compounds (SOCs) detected at Radial Collector Well 5 over the reporting period.

Collector 5 was operating during the largest sewage spill which occurred in the City of Healdsburg on October 30, 2018. *E. coli* sampled at the Russian River at the diversion location was 27.2 MPN/100mL on November 1, 2018, two days after the spill. Collector 5 was not in operation during the timing of the other two large sewer spills which occurred on February 26 and March 1, 2019.

Regulation and Management

When a hazardous materials spill or leak of a reportable quantity occurs, notification to an emergency response agency is required by state and federal law. A sewage spill is required to be reported if 1,000 gallons or more are released. An oil or petroleum product spill is required to be reported if 42 gallons or more are released. Any other hazardous materials spill is required to be reported if there is a reasonable belief that the release poses a significant present or potential hazard to human health and safety, property, or the environment. When a hazardous materials spill or leak occurs, it is the owner's or operator's responsibility to notify the local designated emergency response agency, which is called the Certified Unified Program Agency (CUPA), as well as the OES. The local CUPA is the Sonoma County Fire and Emergency Services Department. Depending on the type of spill and where it occurred, other agencies such as the U.S. Forest Service, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the North Coast Regional Water Quality Control Board (Regional Board) may be involved. An incident report would then be sent to OES.

California Emergency Management Agency

OES developed the RIMS as part of the development of the State's Standardized Emergency Management System (SEMS). The purpose of RIMS is to provide a single point for tracking the status and progress of hazardous materials spills statewide. Only registered users can input data into RIMS, but anyone can access the website to review current or archived OES cases.

The archived cases, including those from 1993 through 2022, can be accessed at: https://www.caloes.ca.gov/office-of-the-director/operations/response-operations/fire-rescue/hazardous-materials/spill-release-reporting/

State Water Resources Control Boards

To provide a consistent, statewide regulatory approach to address sanitary sewer spills, the SWRCB adopted Statewide General Waste Discharge Requirements for Sanitary

Sewer Systems, Water Quality Order No. 2022-0103-DWQ (Sanitary Sewer Systems General Order) on December 6, 2022. The Sanitary Sewer Systems General Order requires public agencies that own or operate sanitary sewer systems to develop and implement sewer system management plans and report all sanitary sewer spills to the SWRCB's online California Integrated Water Quality System (CIWQS) Sanitary Sewer System Database. The General Order became effective June 5, 2023.

Recommended Source Water Protection Activities

The City of Healdsburg developed a Sewer System Spill Response Plan in March 2009, which was later updated in 2014 and in 2020. Sonoma County Water Agency Operations (707-523-1070) is on the outside agency contact list to be notified of any spills.

The Sonoma County Water Agency (Water Agency) indicated that although notification for upstream sewage spills has occurred in the past, no spill notification was given during the reporting period. Once notified of a spill, the Water Agency considers time, volume and substance to consider potential impact on water supply. The Water Agency indicated that if a spill is significant, surface diversion may be secured until the spill passes.

It is recommended that the Water Agency contact the City of Healdsburg to remind them that the Water Agency would like to be notified of all sewage spills.

Vulnerability Assessment - High

Although no spills occurred in close proximity to Radial Collector Well 5 from 2018 to 2022, the potential for a hazardous materials spill or sanitary sewer overflow to impact source water quality in the future is high because there are a number of potential sources in the watershed. A large volume sewage spill or petroleum spill in the vicinity of Radial Collector Well 5 could impact water quality.

WINERIES

Background

Winery wastewater comes primarily from grape-crush, barrel-cleaning, and bottling operations. Some wineries send their process wastewater to a septic system, while others send their process wastewater to wastewater ponds. Larger wineries have on-site treatment systems. Generally, treated winery wastewater from on-site ponds or treatment systems is used as irrigation water to designated vineyards, pastures, or landscape irrigation areas through spray or drip irrigation. Treated process wastewater is never allowed to discharge to the Russian River.

If a winery sends their process wastewater to a septic system, then domestic wastewater must be sent to a separate septic system. A combined septic system receiving both process wastewater and domestic wastewater is not allowed. However, a combined leach field is allowed.

Seasonal Patterns

Although the harvest for wine grapes is usually August through early November, the type of grapes and weather can alter the harvest period. Other aspects of the operations such as blending, racking, and bottling occur other times of the year. Since each winery is different, there are no easily identifiable seasonal patterns associated with winery operations.

Related Constituents

Winery wastewater generally does not contain pesticides, chemicals, or fecal matter. One of the key concerns with winery wastewater is natural sugar in the grapes which dissolves easily in the water and is measured as Biochemical Oxygen Demand (BOD).

According to Regional Board staff, water quality downstream of wineries could be impacted if the facility over-irrigates with water from the process wastewater ponds. Other concerns with wineries are storm water runoff, sediment discharges due to erosion, and pesticide use.

It is important to note that wine grapes are typically irrigated using drip irrigation. Due to the nature of drip irrigation, drip irrigated lands do not generate runoff during the growing season when most fertilizers and pesticides are applied. Therefore, irrigation related pesticide or fertilizer transport is highly unlikely to occur.

Occurrence in Watershed

In order to enumerate the number of wineries within the study watershed, the Regional Board recommended using the CIWQS public reports. (Using the Interactive Regulated Facilities Report, one would select "WDR" for Program, and then "Winery" for Facility Type.) This type of query will provide a list of wineries and will indicate which order they are regulated under. Currently, there are four general orders (R1-2002-0012, R1-2022-0031, R1-2021-0001 and R1-2016-0002) and a winery might also be regulated under an individual order.

R1-2002-0012 is the General Waste Discharge Requirements for Discharges of Winery Waste to Land, R1-2016-0002 is the General Waste Discharge Requirements for Discharges of Wine, Beverage, and Food Processor Waste to Land, R1-2021-0001 is the Conditional Waiver for WDRs for Discharges of Wine, Beverage, and Food Processor Waste and applies to smaller wineries that produce less than 1,500 gallons per day of process wastewater, and R1-2022-0031 is a General Waiver order for low threat discharges.

With the new statewide winery WDR Order (Order WQ 2021-0002), it is the intent of the SWRCB that all eligible wineries be enrolled under the SWRCB statewide winery WDR order. Since the North Coast Regional Board (Region 1), has had wineries in Region 1 under various orders since 2002, Region 1 plans to prioritize enrollments under the SWRCB winery WDR Order with first priority being the enrollment of winery discharges currently not authorized via an Order. The second priority is to transition wineries enrolled under the old 2002-0012 winery WDR to the SWRCB winery WDR Order. The third priority is transitioning wineries under the low threat Waiver Order 2022-0031 to the SWRCB winery WDR Order. The fourth and fifth priority is transitioning wineries enrolled under R1-2021-0001 and R1-2016-0002.

Based on the information from CIWQS, there are 51 regulated wineries in Sonoma County and 14 regulated wineries in Mendocino County. Of the 51 regulated wineries in Sonoma County, 32 are regulated under a General Order and 19 are regulated under an Individual Order as shown in **Tables 4-3** and **Table-4-4**, respectively. Of the 14 regulated wineries in Mendocino County, 11 are regulated under a General Order and 3 are regulated under an Individual Order as shown in Tables **4-5** and **Table 4-6**, respectively. In comparison to the 2018 Update, there were 54 regulated wineries in Sonoma County, so there has not been a significant change.

It should be noted that there may be additional unpermitted winery facilities within the study watershed.

Table 4-3. Wineries in Sonoma County Regulated by a General Order

Facility Name	Facility Address	Latitude	Longitude
Guadagni Winery	2050 Yoakim Bridge Road, Healdsburg	38.70111	-122.95885
Montemaggiore Winery	2355 Dry Creek Road, Healdsburg	38.645	-122.9048
Gary Farrell Winery	10701 Westside Road, Healdsburg	38.50776	-122.89761
Flowers Winery (Formerly VML Russian River Winery)	4035 Westside Road, Healdsburg	38.56386	-122.8732
Matrix Winery (formerly Rabbit Ridge Winery)	3291 Westside Rd, Healdsburg	38.57461	-122.87714
Medlock Ames Winery	13414 Chalk Hill Road, Healdsburg	38.60658	-122.75512
Seghesio Wineries, Inc.	14730 Grove Street, Healdsburg	38.61856	-122.87473
Talty Vineyards	7127 Dry Creek Road, Healdsburg	38.6981	-122.95789
Windsor Oaks Winery	10810 Hillview Road, Windsor	38.5714	-122.81366
Coyote Crest Vineyards	5314 Tre Monte, Healdsburg	38.62313	-122.75393
Francis Coppola Winery - Winery Waste	300 Via Archimedes, Geyserville	38.6799	-122.88802
Virginia Dare Winery	22281 Chianti Road, Geyserville	38.71545	-122.92275
E&J Gallo Winery of Sonoma - Winery Waste	3387 Dry Creek Road, Healdsburg	38.66031	-122.91446
Clos Du Bois Winery	19410 Geyserville Road, Geyserville	38.68472	-122.87646
Prevail Winery	2450 Highway 128, Geyserville	38.71149	-122.85826
Silver Oak Cellars - Highway 128 Alexander Valley	7300 Highway 128, Healdsburg	38.67222	-122.80554
Aperture Cellars - Winery	12295 Old Redwood Highway, Healdsburg	38.58319	-122.84711
Arista Winery	7015 Westside Road, Healdsburg	38.52393	-122.86993
Blue Rock Vineyard	24511 Rich Ranch Road, Cloverdale	38.73631	-122.96207
Field Stone Winery & Vineyard	10075 Highway 128, Healdsburg	38.63885	-122.77572
Fritz Winery	24691 Dutcher Creek Road, Cloverdale	38.73692	-122.98804
J. Pedroncelli Winery	1220 Canyon Road, Geyserville	38.70499	-122.93708
Orsi Family Vineyards Winery	2306 Magnolia Drive, Healdsburg	38.60431	-122.87259
Moshin Vineyards Winery	10295 Westside Rd, Healdsburg	38.50228	-122.89706
Ridge Vineyards Inc. - Lytton Springs Winery	650 Lytton Springs Road, Healdsburg	38.65933	-122.88594
Robert Young Estate Winery	4960 Red Wine Road, Geyserville	38.69251	-122.82631
Shepherd's Oak Estates	21800 River Road, Geyserville, CA	38.60378	-122.78179
Sloan Family Winery	994 Limerick Lane, Healdsburg	38.58708	-122.83155
Hales Winery - Winery Waste	4304 Dry Creek Road, Healdsburg	38.66509	-122.931958
Windacre West LLC dba Merriam Winery	11650 Los Amigos Road, Healdsburg	38.57903	-122.8356
Hafner Vineyard	4280 Pine Flat Road, Healdsburg	38.68099	-122.80359
Saini Winery	2500 Dry Creek Road, Healdsburg	38.64704	-122.90798

Table 4-4. Wineries in Sonoma County Regulated by an Individual Order

Facility Name	Facility Address	Latitude	Longitude
Domaine St. George Winery	1141 Grant Avenue, Healdsburg	38.60103	-122.84129
Asti Winery	26150 Asti Road, Cloverdale	38.76209	-122.97256
Ferrari-Carano Winery	8761 Dry Creek Road, Geyserville	38.71103	-122.97716
Foppiano Wine Company, Inc.	12707 Old Redwood Highway, Healdsburg	38.58972	-122.85088
Geopfrich Family Winery	7564 West Dry Creek Road, Healdsburg	38.68705	-122.95617
Vinwood Cellars, Inc.	18700 Geyserville Road, Geyserville	38.67339	-122.87669
Stonestreet Winery	7111 Highway 128, Healdsburg	38.66256	-122.81711
Michel-Schlumberger Winery	4155 Wine Creek Road, Healdsburg	38.65745	-122.94862
Rodney Strong Vineyards	11455 Old Redwood Highway, Healdsburg	38.57289	-122.84484
Landmark Vineyards	9150 Los Amigos Road, Healdsburg	38.57904	-122.83566
Michael David Winery (formerly Silver Oak Cellars)	24625 Chianti, Geyserville	38.74132	-122.95562
Preston Winery	9205 West Dry Creek Road, Healdsburg	38.70149	-122.97212
Stemmler Winery	3805 Lambert Bridge Road, Healdsburg	38.65373	-122.92567
Verite Winery LLC	4611 Thomas, Healdsburg	38.61424	-122.76899
De Lorimier Winery	2001 Highway 128, Geyserville	38.70844	-122.87865
Mazzocco Vineyards Inc.	1400 Lytton Springs Road, Healdsburg	38.65573	-122.89762
Pezzi King Vineyards	3225 West Dry Creek Rd., Healdsburg	38.64034	-122.92584
Wilson Winery	1960 Dry Creek Road, Healdsburg	38.6393	-122.90068

Table 4-5. Wineries in Mendocino County Regulated by a General Order

Facility Name	Facility Address	Latitude	Longitude
Dunnewood Vineyards	2399 North State Street, Ukiah	39.18057	-123.20834
Lolonis Winery	1905 Road D Road, Redwood Valley	39.26889	-123.18975
Fetzer Vineyards Hopland	12901 Old River Road, Hopland	38.99007	-123.10095
Jaxon Keys Winery & Distillery	10400 South Highway 101, Hopland	39.01322	-123.1283
Ray's Station Winery	13300 Buckman Drive, Hopland	38.9763	-123.0473
Waterfowl Winery	14100 Mountain House Road, Hopland	38.96136	-123.12034
Yokayo Wine Company	301 West Lake Mendocino Drive, Ukiah	39.1927	-123.21476
Frey Vineyards	11700 West Road, Redwood Valley	39.30894	-123.22222
Ampere Winery	25475 Cloverdale Peak Road, Cloverdale	38.85459	-122.96574
Potter Valley Wine Works	10320 Main Street, Potter Valley	39.32235	-123.10659
Saracina Vineyards	11684 U.S Highway 101, Hopland	38.99687	-123.12112

Table 4-6. Wineries in Mendocino County Regulated by an Individual Order

Facility Name	Facility Address	Latitude	Longitude
Brutocao Vineyards	1400 Highway 175, Hopland	38.9775	-123.08895
Mendocino Wine Company (Formerly Parducci Winery)	501 Parducci Road, Ukiah	39.19981	-123.21246
Redwood Valley Cellars	7051 North State Street, Redwood Valley	39.2463	-123.2074

Related Water Quality Issues and Data Review

There are no direct discharges of process wastewater from wineries. Wineries can potentially impact Russian River water quality due to accidental spills of process wastewater and due to runoff of pesticides and sediment from vineyards (covered in the Agriculture – Crops section).

Regulation and Management

The SWRCB adopted General Winery Permit (WQ 2021-0002) in 2021, which replaced the North Coast Regional Board's 2016-0002 order for Discharges of Wine, Beverage, and Food Processor Waste. The 2021-0002 Order is tiered based on gallons of winery process water produced annually as shown below. Requirements, fees, monitoring and reporting are connected to each tier.

Tier	Facility process water flow (gal/year)
Exempt	<10,000 gal/year
Tier 1	10,000 – 30,000
Tier 2	30,001 – 300,000
Tier 3	301,000 – 1,000,000
Tier 4	1,000,001 – 15,000,000

The North Coast Regional Board still has a conditional waiver for small wineries producing less than 1,500 gallons/day of process wastewater, which is currently R1-2021-0001, which replaced R1-2016-0003.

A query using the SWRCB's CIWQS database was conducted to check for violations for all 54 wineries in Sonoma County. The only violation occurred at the Hartford Winery in Forestville when 133,000 gallons of process wastewater was released from a pond due to capacity on February 9, 2017.

Recommended Source Water Protection Activities

No source water protection activities are recommended at this time.

Vulnerability Assessment - Low

As wineries treat and reuse their process wastewater on-site, there is no impact to the Russian River from the processing of grapes into wine. Unauthorized discharges could potentially impact water quality in the vicinity of the discharge but would be unlikely to affect the water quality of Radial Collector Well 5.

MINES

Background

There are three types of mines occurring in either Sonoma or Mendocino County: instream mining, terrace mining, and quarry mining. In-stream mining occurs within the banks of the watercourse, but never occurs in water. Usually in-stream extraction occurs from the gravel bars that have accumulated after winter storms. Terrace mining does not occur in the water channel itself, but just outside of the watercourse. A quarry is usually extraction from a hillside, and generally more removed from water.

Seasonal Patterns

The instream mining season is generally limited from June 1st to November 1st. Quarries may operate year-round but operations are generally low during the winter season, as quarries serve the construction industry, which slows during the winter.

Related Constituents

The main impact to water quality is sediment. A quarry is similar to a construction site, except that the time span for a quarry may be twenty to forty years.

Typical water quality concerns due to instream mining include discharge of loose decomposed rock and soil stockpiles, increase of fine sediment loads in the Russian River, soil discharge from disturbed slopes, and fuel and chemical discharges from vehicles, and storage and maintenance areas. Loose or unstable soil after skimming slopes can contribute silt and suspended solids to stormwater and to the river at higher flows.

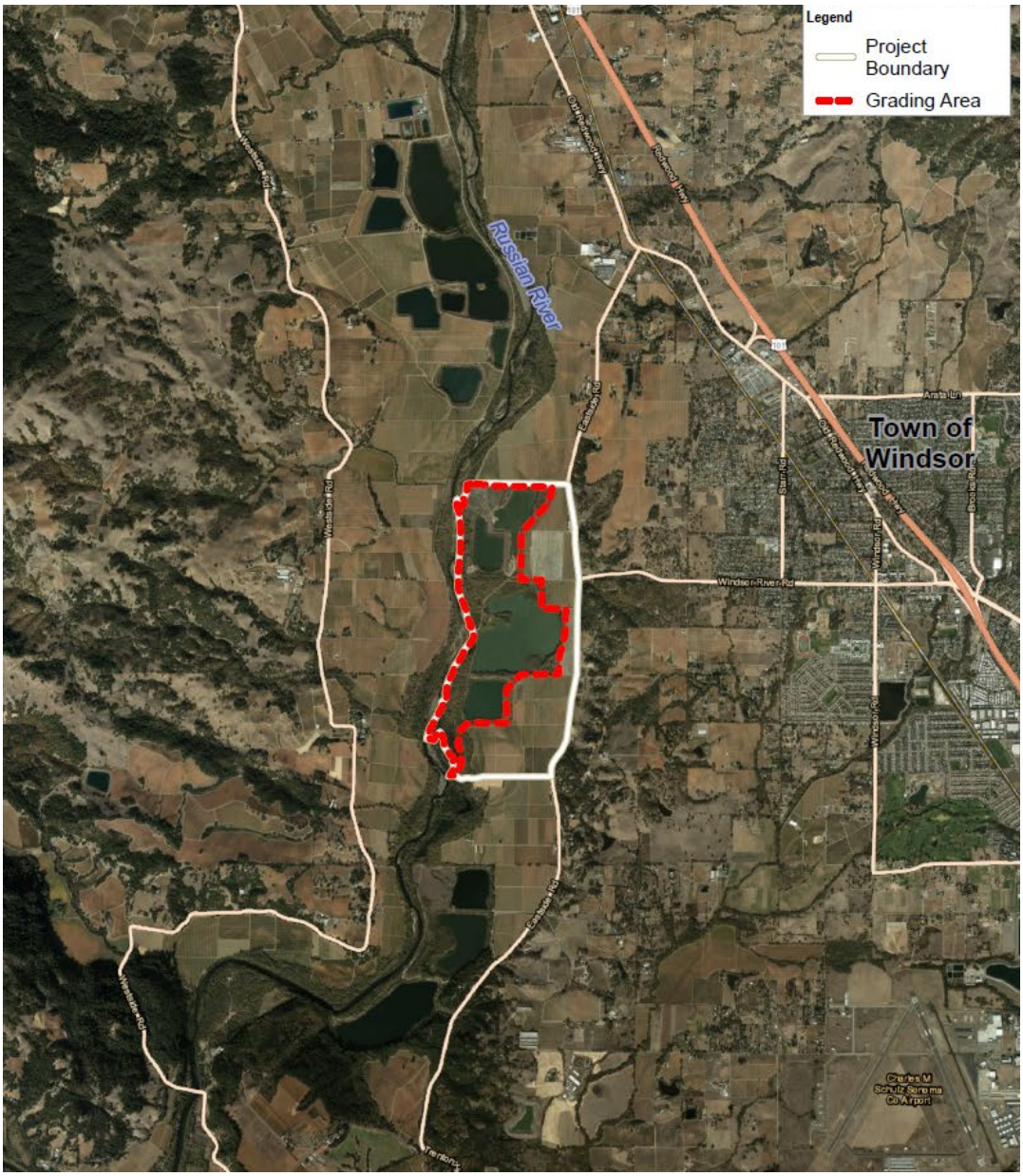
Occurrence in Watershed

For the purpose of this report, the number of active mines within the study watershed will be discussed. Abandoned mines are not included and will not be discussed.

Within the study watershed, there are currently no active instream mining sites. The Russian River Vested Bars site, which was active in the 2018 Update, is now inactive and is in the process of being reclaimed. The instream gravel bars are typically reclaimed for wildlife habitat through natural processes. According to the Sonoma County Permit and Resource Management Department, mining operations along the main stem of the river are unlikely to resume operations in the near term or perhaps ever (Personal Communication, Robert Pennington, August 2023, Sonoma County PRMD).

There are two former terrace pit sites upstream of Wohler Bridge: the Hanson pits and the SYAR pits. These are terrace pits that are outside the active channel, but within the floodplain of the Russian River. **Figure 4-1** shows the Hanson Pits. A use permit for reclamation of the Hanson Pits was submitted in August 2023. Reclamation would involve filling the ponds and removing internal levees, roads and mining infrastructure. The floodplain would also be reconfigured to reestablish the natural floodplain topography and function.

Figure 4-1. Hanson Pits Restoration Project



According to the Sonoma County PRMD, it will take two years to approve the use permit for the Hanson Pits, which includes the required CEQA environmental

documentation. Therefore, the earliest start date for reclamation work is 2026. As part of this project, a "Hanson Ponds Groundwater Study" was prepared by Luhdorff and Scalmanini Consulting Engineers (LSCE) in 2022. This study evaluated the potential to impact water quality in the Russian River due to earthwork associated with filling the ponds. Filling the ponds creates a potential gradient for lateral sub-surface flow towards the Russian River during backfilling operations. Another report prepared for this project was the 2021 GHD report on Russian River Floodplain Restoration Project 30% Basis of Design Report, which stated that "the abandoned gravel ponds also create biogeochemical processes that convert naturally occurring mercury into highly toxic and bioavailable methylmercury, and accumulate phosphorous and other detrimental nutrients." Additionally, "organochlorine pesticides and PCBs were not detected in Russian River benthic sediment or bank soils. However, these constituents of concern were detected above laboratory reporting limits in the Hanson Ponds."

The Water Agency's Wohler Collection Wells are located approximately 2.5 to 3.0 river miles downstream of Vimark Pond. According to the 2021 GHD report above, "the potential increases in concentrations of methyl mercury, turbidity, and temperature related to filling of the Hanson Ponds can be expected to be significantly reduced along this river pathway due to dilution from additional surface water and groundwater inflows to the river downstream of Vimark Pond along with potential seepage out of the river system prior to reaching the Wohler Collection wells. In addition, a constituent such as turbidity would undergo further filtration/reduction in levels even if it reached 2.5 to 3 miles downstream and were induced to flow into the riverbed sediments to the Wohler Collection Wells."

The study also comparatively assessed potential impacts to the Russian River using two different construction scenarios: one construction season and three construction seasons. The LSCE study concluded that a phased approach to construction would result in reduced potential increases to methyl mercury, temperature, and other water quality constituents of concern and turbidity mobilization, when compared to single season construction (LSCE 2022). Phasing construction would allow for a gradual blend through sub-surface lateral flow between the ponds and the Russian River. Currently, the phased approach to construction is the plan for reclamation of the Hanson Pits.

A revised reclamation plan for the SYAR Pits was also recently submitted but major revisions are expected due to concerns from the National Marine Fisheries Service about predatory fish

Within Mendocino County, there are three active sites and two sites which are being reclaimed as shown in **Table 4-7** and in **Attachment A.** These sites were confirmed by the Mendocino County Planning and Building Services. According to Mendocino County Planning and Building Services, the mines located in the Russian River watershed in Mendocino County are primarily quarries and terrace mines.

Table 4-7. Active Mines in Mendocino County as of September 2023

Mine Name	Primary Commodity	Mine Owner	Lead Agency	Status	Type of Mining
Blue Ridge Rock Products	Stone	Mccutchan	Mendocino County	Active	Quarry
FioRito Quarry (formally Pieta Quarry)	Sand and Gravel	Northern Aggregates	Mendocino County	Reclaimed	Quarry
Ford Gravel Co	Sand and Gravel	Granite Construction Co.	Mendocino County	Reclaimed	Streambed or Gravel Bar Skimming, Open Pit
Harris Quarry	Sand and Gravel	Northern Aggregates	Mendocino County	Active	Open Pit
Redwood Valley Gravel Products	Sand and Gravel	Redwood Valley Gravel Products	Mendocino County	Active	Streambed or Gravel Bar Skimming, Pitting

Related Water Quality Issues and Data Review

Mines in the study watershed can potentially increase sediment loading to the Russian River, although there have been no specific studies that document the contribution from mines. There are currently no active instream mining sites in Sonoma County upstream of Radial Collector Well 5 to impact water quality.

As described earlier, water quality impacts from abandoned pits could potentially include turbidity, metals, methylmercury, phosphorous, organochlorine pesticides and PCBs.

Regulation and Management

Mining activities are regulated in Sonoma County by the County's Aggregate Resource Management Plan (ARM Plan) and at the State level by the Surface Mining and Reclamation Act.

The ARM Plan establishes specific adaptive management policies and methods that identify where mining can occur, and how the mining areas would be measured to ensure no long term degradation occurs. The ARM Plan relies on a "redline" method, which requires the establishment of baseline elevations below which mining cannot occur. Mining in subsequent years can only occur where there has been sufficient recharge above the baseline elevations. Annual monitoring of the Russian River has shown that the ARM Plan has been very effective at limiting mining to a sustainable yield and minimizing the potential for down cutting of the riverbed.

The Sonoma County Mining and Reclamation Ordinance list criteria that need to be met for surface and instream mining operations. Among the criteria are:

- Incorporation of best management practices to minimize storm water ponding, alterations to the natural drainage system, and siltation of adjacent or downstream watercourses.
- Protection of water quality by meeting all applicable water quality standards of the Regional Board and any other agency with authority for water discharges.
- Prevention of erosion and sedimentation by incorporating approved erosion control and stream bank protection measures. An erosion and sediment control plan must be prepared.

As required by the Surface Mining and Reclamation Act, both Sonoma and Mendocino Counties conduct annual inspection of mines. Primarily they are inspecting for erosion control.

Recommended Source Water Protection Activities

The Water Agency may wish to keep track of surface and groundwater monitoring during construction phase of the Hanson Pits Reclamation Project.

Vulnerability Assessment – Low/Medium

There are currently no active instream mining sites in Sonoma County upstream of Radial Collector Well 5. The future reclamation of the Hanson Pits could impact water quality in the Russian River, but studies have been completed that conclude the Wohler wells are too far downstream of the site to be impacted.

AGRICULTURE

Background

There are a variety of agricultural-related activities within the watershed, including dairies, crops, and nurseries. The majority of the dairies in Sonoma County are located in the Laguna de Santa Rosa subwatershed of the Russian River.

Seasonal Patterns

Agricultural operations are most likely to impact source water quality during and after storms because runoff can carry manure, sediment, and pesticide residuals into surface waters.

Related Constituents

Agricultural lands such as row crops, orchards, nurseries, and irrigated pasture have the potential to contribute to water quality problems through the over application of fertilizers and pesticides, erosion, pollutants in tailwater return flows, and removal of riparian vegetation.

It is important to note that wine grapes are irrigated using drip irrigation. Due to the nature of drip irrigation, drip irrigated lands do not generate runoff during the growing season when most fertilizers and pesticides are applied. The main concern is from overland flow during storm events which could transport pesticide and sediment contaminated runoff.

Occurrence in Watershed

Dairies

As stated in the 2018 Update, there is one dairy, Bucher Farms, in the study watershed. Bucher Farms was located at 5285 Westside Road in Healdsburg. In 2022, the dairy initiated shut down of their operation, and the dairy is now closed.

Crops and Pesticide/Herbicide Use

Attachment D shows the various crop types within the study watershed. This information was obtained by the Sonoma County Agricultural Commissioner. It should be noted that the field boundaries shown are the permitted boundaries by crop, not actual planted. As shown in **Attachment D**, the three crop types with the highest percent coverage are grapes for wine (vineyard) at 52 percent, then pasture land at 14 percent, and grapes (mixed with other use) at 11 percent.

Information on pesticide and herbicide use was obtained from the California Pesticide Information Portal (CALPIP) database. Data within this database is organized by

meridian range township section (MRTS) which is approximately 1 X 1 mile. As shown in **Figure 4-2**, MRTS from Healdsburg to Radial Collector 5 along the Russian River were queried for pesticide usage in 2021. The top 5 chemicals for each of the eleven MRTS from Healdsburg to Radial Collector 5 are summarized in **Table 4-8.** As a side note, wine grapes are the primary crop grown on all 12 MRTS according to the CALPIP database.

Figure 4-2 MRTS with Chemical Use for Crops in proximity to Collector 5

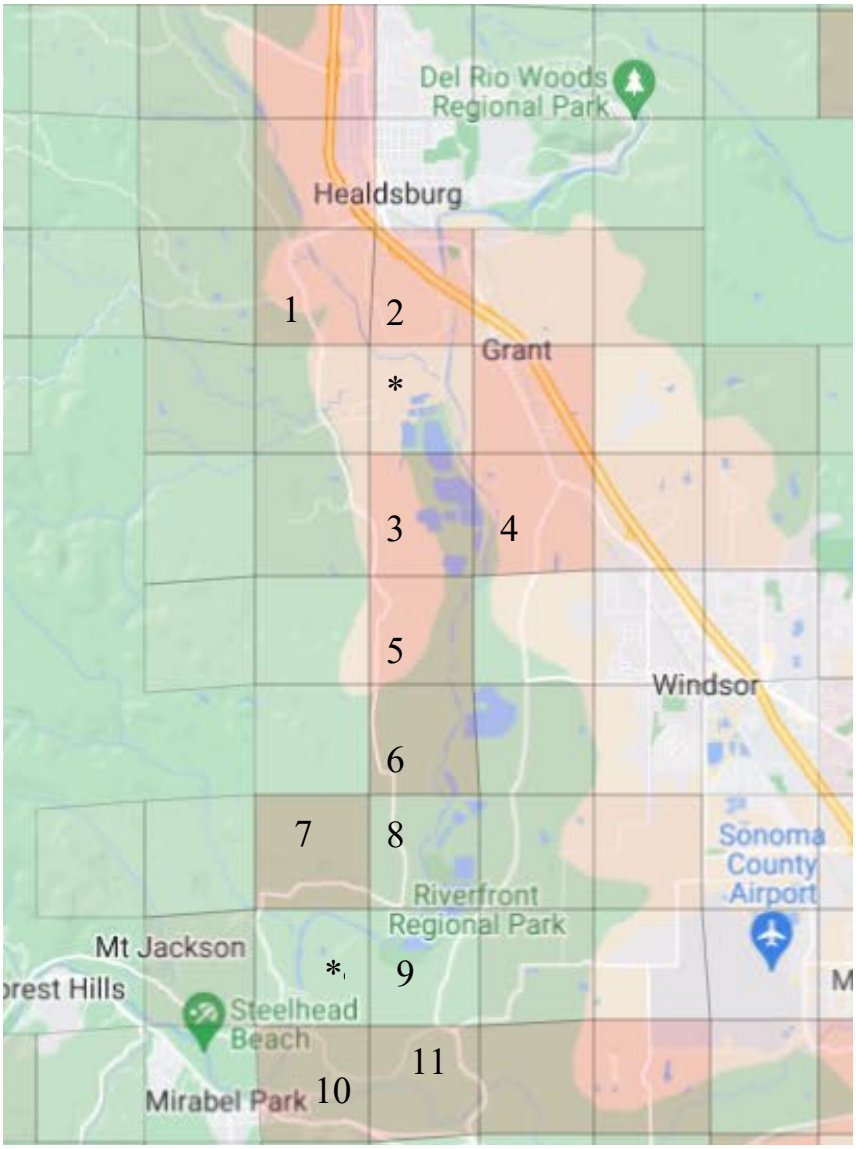


Table 4-8. Summary of Top 5 Chemicals used for selected MRTS, 2021

Township	# on Map	Highest Ranked Chemical	Lbs./applied	#2 highest Ranked chemical	Lbs./applied	#3 highest Ranked chemical	Lbs./applied	#4 highest Ranked chemical	Lbs./applied	#5 highest Ranked chemical	Lbs./applied
M09N09W29	1	Sulfur	1,382.3	Mineral Oil	146.5	Glyphosate	116.3	Fenhexamid	38	Copper Oxide	37.3
M09N09W28	2	Sulfur	3,260.9	Mineral Oil	1,631.5	Glyphosate	308.8	Oxyfluorfen	54.8	Fenhexamid	45.5
M08N09W04	3	Sulfur	22,952.0	Glyphosate	356.2	Cyprodinil	116	Copper Oxychloride	86.6	Copper Hydroxide	78.1
M08N09W03	4	Sulfur	20,279.3	1,3-dichloropropene	4,881.2	Glyphosate	622.6	Mineral Oil	374.3	Metrafenone	208.6
M08N09W09	5	Sulfur	4,318.0	Mineral Oil	359.5	Glyphosate	231.6	Pendimethalin	127.8	Copper Oxide	124.6
M08N09W16	6	Sulfur	10,257.1	Mineral Oil	882.8	Glyphosate	320.6	Cyprodinil	80.9	Glufosinate	67
M08N09W20	7	Sulfur	6,186.2	Glyphosate	574.8	Mineral Oil	285.1	Pendimethalin	87.9	Glufosinate	63
M08N09W21	8	Sulfur	1,774.5	Kaolin	1,006.9	Mineral Oil	325.1	Caprylic Acid	306.6	Glufosinate	64.2
M08N09W29		insignificant chemical usage									
M08N09W28	9	Sulfur	1,592.9	Glufosinate	41.5	Imidacloprid	31.7	Cyprodinil	31.2	Pendimethalin	28.2
M08N09W32	10	Sulfur	11,151.1	Mineral Oil	1,118.9	Kaolin	600.6	Glyphosate	419.2	Metrafenone	104.9
M08N09W33	11	Sulfur	3,856.8	Mineral Oil	2,223.2	Glyphosate	196.6	Copper Oxide	125.4	Glufosinate	123.4

As shown in **Table 4-8**, sulfur has the highest lbs. applied for all 11 MRTS from Healdsburg to Radial Collector 5. After sulfur, mineral oil is generally the next most commonly used chemical, and glyphosate as the third highest ranked. An exception would be the 4,881.2 lbs. of 1,3-dichloropropene applied to M08N09W03.

Based on the chemicals in **Table 4-8**, primary drinking water MCLs exist for only for glyphosate, 1,3-dichloropropene and copper. Sulfur is used as a fungicide used to combat powdery mildew. Sulfur is oxidized by bacteria and becomes sulfate. 1-3-dichloropropene is used as a soil fumigant and has a primary MCL of 0.0005 mg/L and a public health goal of 0.0002 mg/L. Glyphosate is an herbicide used to control weeds and has a primary MCL of 0.7 mg/L and a public health goal of 0.9 mg/L. Copper oxide and copper hydroxide are also used as a fungicide to combat downy mildew. Copper is regulated in the distribution system under the Lead and Copper Rule. Yearly chemical monitoring of Radial Collector 5 from 2018 to 2022 did not show any detectable levels of glyphosate, 1,3-dichloropropene and copper.

Related Water Quality Issues and Data Review

No VOCs or SOCs (including 1,3-dichloropropene and glyphosate) were detected at Collector 5 over the reporting period. Sulfur is the frequently used in large quantities on wine grapes; however, there are no current water quality concerns with sulfate.

Regulation and Management

In June 2023, the Regional Board issued a proposed General Order for Waste Discharge Requirements for Commercial Vineyards. A discharger may enroll individually or through a third-party group. Specific monitoring and reporting requirements vary by enrollment. The basic elements of the order will require: 1) surface water quality monitoring for sediment and 20 pesticides, 2) groundwater monitoring for nitrate and pesticides, 3) Irrigation and Nitrogen Management Plan, 4) Implementation of agricultural road storm-proofing, and 5) Farm Evaluation. The public hearing to adopt this order will occur in summer 2024.

Recommended Source Water Protection Activities

There are no recommended source water protection activities at this time.

Vulnerability Assessment – Low/Medium

A significant portion of the land use in the study watershed is permitted as agriculture, and the majority of the crops are wine grapes. Due to the proximity of the wine grape crops to the Russian River, there may be an impact to water quality from the use of pesticides/herbicides and erosion. However, there were no pesticides/herbicides detected at Radial Collector Well 5. Turbidities are also low at Radial Collector Well 5.

RECREATION

Background

There are a number of recreational uses in the study watershed such as boating, camping, picnicking, hiking, fishing, mountain biking, and equestrian trails. Source water quality may be impacted from body contact recreation such as swimming, waterskiing, and use of personal watercraft.

Seasonal Patterns

All of the recreational uses occur year-round, although body contact recreation occurs primarily from Memorial Day to Labor Day weekend.

Related Constituents

Body contact recreation in general has long been known to be a source of pathogen contamination, resulting partly from personal sanitary conduct and partly from a natural shedding process. Pathogens shed by recreationalists include bacteria, viruses, and protozoa. Moreover, because their origin is human, microorganisms shed by recreationalists are transmittable to other humans.

Occurrence in Watershed

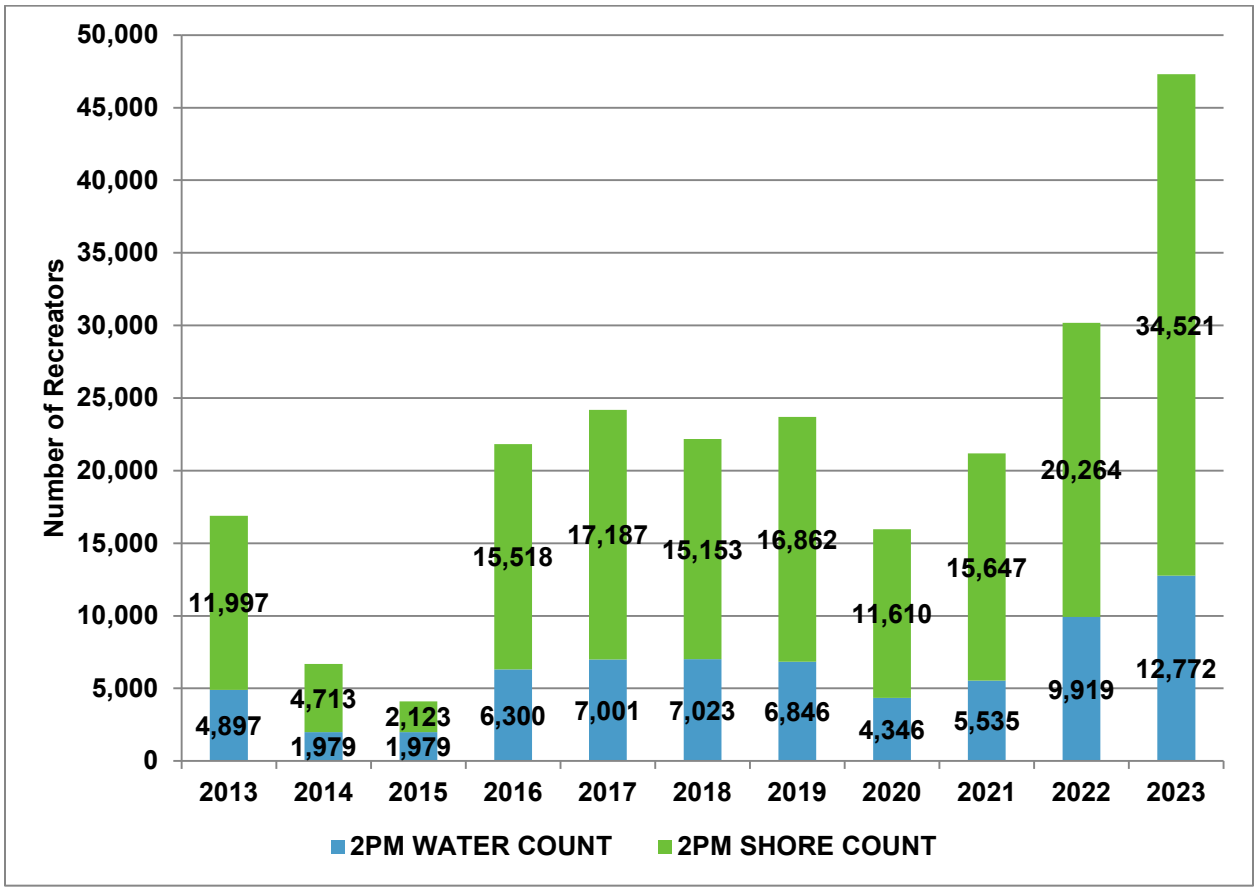
Russian River

According to Sonoma County Regional Parks, the primary swimming areas are Veteran's Memorial Beach in Healdsburg, Riverfront Regional Park, Camp Rose and Del Rio Woods Beach. However, swimming can be at many points along the river during warm weather.

The Sonoma County Regional Parks counts the number of persons in the water and on shore at Veterans Memorial Beach on weekends at 2pm from Memorial Day to Labor Day. As shown in **Figure 4-3**, the water count over the 2023 summer season was 12,772 persons and the shore count was 34,521 persons. The majority of recreators were present during the month of July. According to Sonoma County Regional Parks, the number of recreators was low in 2014 and 2015 due to low level in the river.

Boat launches for small craft are available at Wohler Bridge from October 1 through May 15th and also at Cloverdale River Park. Kayaking tours are also conducted from Alexander Valley to Healdsburg, and from Memorial Beach to Wohler Bridge.

Figure 4-3. Number of Shore and In-Water Recreators at Veteran's Memorial Beach in Healdsburg, 2013-2023



Sonoma County Regional Parks is currently developing a Master Plan for the Veteran's Memorial Beach and the planning process has been community based. The draft Master Plan should be finished by spring 2024 (email communication, Mark Cleveland, Sonoma County Regional Parks, August 29, 2023). The project goals are to:

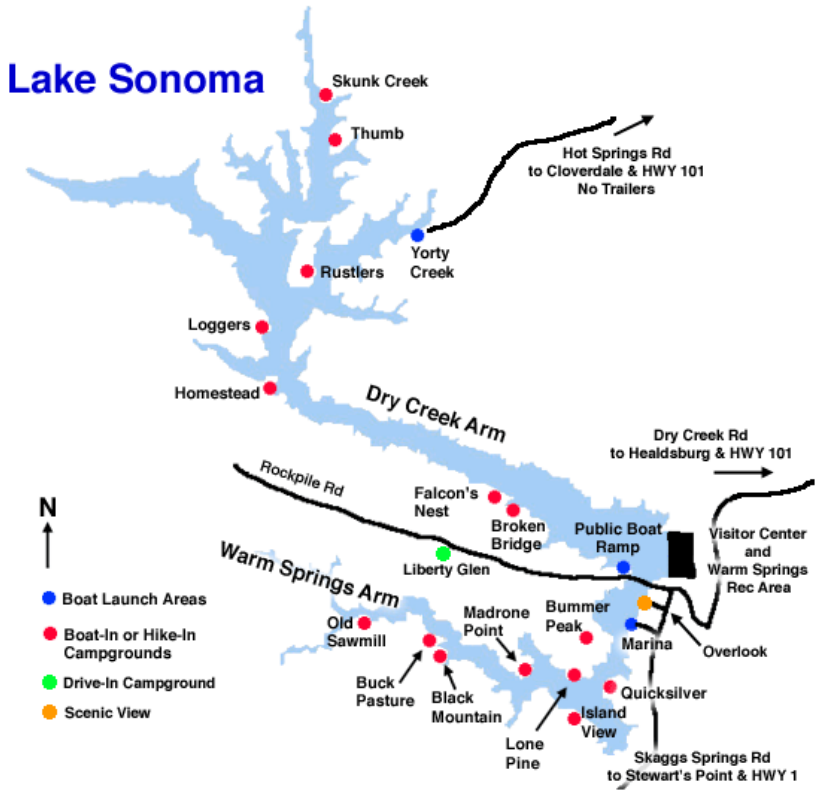
- Unite the beach area and upland area to provide complimentary uses.
- Explore expanded uses, amenities, and revenue generating facilities.
- Anticipate population center, demographic and adjacent land use changes.
- Improve bike, pedestrian and transit routes to the park.
- Explore land based trails and Russian River water trail connections.
- Provide destination playground and other family-centered amenities.
- Address current septic and potable water system regulations.
- Improve access to the river, including lunch and take out opportunities
- Provide group picnic and event areas away from the road.

Lake Sonoma

Recreational uses at Lake Sonoma include boating, swimming, fishing, camping, hiking, biking, and horseback riding trails. Lake Sonoma has 106 primitive campsites and two group-use campsites which are all only accessible by boat or hiking trail. The primitive campsites have chemical vault toilets but no potable water. All of the campsites located in the Dry Creek Arm are boat-in only sites. Campsites located in the Warm Springs Arm are either boat-in or hike-in. The only drive-in campground is Liberty Glen campground, located on a ridge above the Warm Springs Arm of the lake as shown in **Figure 4-4.** The Liberty Glen campground has 96 campsites for recreational vehicles (RV)'s and tent campers. There are restrooms, showers, potable water but no RV hookups.

The Lake Sonoma Marina has a boat ramp, full service marina, approximately 250 boat slips, boat rentals and a store. There are pumpout facilities and gasoline at the marina. Several areas on the lake are designated for waterskiing and some areas are no wake. The designated swim beach is at Yorty Creek on the north side of Lake Sonoma. Swimming also occurs near the Public Boat Ramp. The Army Core of Engineers does not count the number of swimmers or boaters in Lake Sonoma.

Figure 4-4. Recreational Sites at Lake Sonoma



Related Water Quality Issues and Data Review

The Sonoma County Department of Health Services, in cooperation with the North Coast Regional Water Quality Control Board and the Sonoma County Water Agency, monitors bacterial levels in the water at beaches on the Russian River. Sampling is conducted regularly between Memorial Day and Labor Day. *E. coli* data for Cloverdale River Park Beach, Camp Rose Beach, and Healdsburg's Veterans Memorial Beach from 2018 to 2022 is shown in **Figure 4-5** and **Table 4-9**. **Figure 4-5** shows that *E. coli* levels at the Cloverdale River Park are slightly higher compared to Camp Rose and Healdsburg Veterans' Memorial Beach, which is reflected in a higher median of 31 MPN/100mL at Cloverdale River Park.

Figure 4-5. *E. coli* Beach Monitoring Data from 2018 to 2022

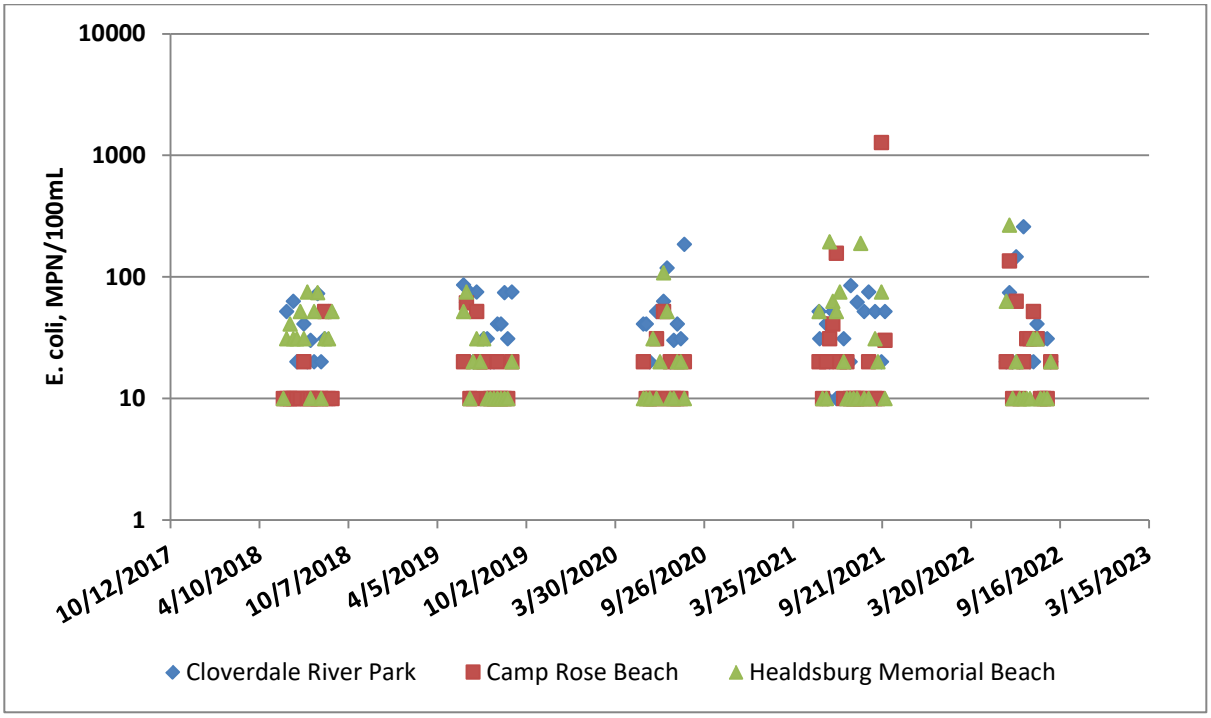


Table 4-9. *E. coli* Beach Monitoring Data from 2018 to 2022, MPN/100mL

Monitoring Location	Range	Median
Cloverdale Beach Park	<10 - 259	31
Camp Rose Beach	<10 – 1,274	10
Healdsburg Memorial Beach	< 10 - 266	20

As described in **Section 3**, the median *E. coli* level in the Russian River at the diversion location is 23.8 MPN/100mL, which is close to the median *E. coli* levels as shown in **Table 4-9**. Therefore, recreation does not appear to negatively impact the source water quality at the locations in **Table 4-9**, compared to the natural fluctuation

of the *E. coli* levels seen at the diversion location. Additionally, *E. coli* was never detected at Collector 5.

Regulation and Management

The US Army Core of Engineers manages recreation at Lake Sonoma, with the exception of the Lake Sonoma Marina which is operated by a private concessionaire.

Recommended Source Water Protection Activities

No recommended source water protection activities at this time.

Vulnerability Assessment - Low

This assessment indicates the vulnerability for source water quality impacts due to recreation is low. As stated above, *E. coli* levels in the summer season at the diversion location are low.

URBAN RUNOFF

Background

Urban runoff (URO) is a concern in the study area as there are urbanized areas in the watershed, particularly the cities of Ukiah, Cloverdale and Healdsburg.

Seasonal Patterns

URO occurs on a year-round basis and includes wet and dry weather discharges. Wet weather runoff results from seasonal storms. Wet weather runoff is of relatively short duration and can have highly variable pollutant concentrations. Because of the high degree of imperviousness, urban areas typically generate higher per acre volumes of runoff than undeveloped or agricultural lands. Dry weather runoff results from activities such as lawn irrigation and car washing.

Related Constituents

Data on urban runoff discharges indicate that the runoff is turbid, a source of total organic carbon (TOC), a source of bacteria, a source of nutrients, and a source of other constituents such as pesticides and organic compounds. Generally, the impact is greater during the wet season, immediately following a first-flush event.

Occurrence in Watershed

Municipalities are required to obtain Municipal Separate Storm Sewer Systems (MS4s) Permits which regulate storm water discharges. MS4 permits are issued by Regional Water Quality Control Boards and are usually issued to a group of co-permittees encompassing an entire metropolitan area. Sonoma County has two major watersheds, one regulated by the North Coast Regional Water Quality Control Board, and one by the San Francisco Bay Regional Water Quality Control Board.

For the study watershed, there is one Phase I MS4 permit, Order R1-2015-0030. This permit regulates the discharge of pollutants from the City of Santa Rosa, portions of unincorporated County of Sonoma, Sonoma County Water Agency, the City of Cotati, the City of Cloverdale, the City of Healdsburg, the City of Rohnert Park, the City of Sebastopol, the City of Ukiah and the Town of Windsor. However, the only MS4 areas within the study watershed are the City of Healdsburg, the City of Cloverdale, and portions of unincorporated County of Sonoma and Sonoma County Water Agency.

The MS4 permit requires the discharger to develop and implement a Storm Water Management Program with the goal of reducing the discharge of pollutants to the maximum extent practicable.

Over half of the urban area for the City of Healdsburg falls within the drainage area of Foss Creek. Foss Creek empties into a channel known as West Slough, which then runs south approximately 7,000 feet to its confluence with Dry Creek. The City of Healdsburg operates two off-stream hydraulic detention basins. Water from Foss Creek enters each of the detention basins after the water level in the creek overtops a weir, controlling the peak flows that have historically caused flooding in the City's downtown area. With minor exceptions, all other areas of the City drain directly to the Russian River. Most of the commercial and industrial areas are clustered along the west and southern portions of the City.

The SWRCB's Stormwater Multiple Application and Report Tracking System (SMARTS) database was also queried, and within the study watershed, there were 131 industrial facilities which are covered under the SWRCB General Industrial Activities Storm Water Permit as shown in **Table 4-10.** This is a notable increase from the 2018 Update, which had 73 industrial facilities. **Table 4-10** also includes the date a facility was inspected by the Regional Board from January 2020 to the present. Although this time period does not match the 5-year study period for this Update, it gives an indication of the percent of facilities inspected. Out of the 131 facilities, 10 inspections were completed from January 2020 to present, which is less than four facilities per year.

The SMARTS database has also added information on violations and enforcement actions since January 2020. Overall, the nature of violations is primarily paperwork related, for example, a facility did not recertify itself for storm water permit coverage by the required deadline. The most notable violations were:

- In January 2020, a 100,000 gallon wine storage tank at Klein Foods in Healdsburg had a catastrophic failure and rapidly released 97,000 gallons of wine.
- In April 2023, Vintage Wine Estates had an unauthorized discharge of treated process wastewater using a water truck.

Table 4-10. Industries Covered under State Water Resources Control Board General Industrial Activities Storm Water Permit

Facility Name	Facility Address	City	Date Inspected
All Coast Forest Prod	250 Asti Rd	Cloverdale	
Asti Remanufacturing Plant	26800 Asti Road	Cloverdale	
Asti Winery	26150 Asti Road	Cloverdale	
Bear Republic Brewing Company Inc.	110 Sandholm Lane	Cloverdale	
BobDog LLC	31955 Pine Mountain Road	Cloverdale	
Classic Inc. Classic Mill & Cabinet	590 Santana Dr	Cloverdale	1/24/2022
DESIGNS PLUS	60 INDUSTRIAL DR	Cloverdale	
Fritz Winery	24691 Dutcher Creek Rd	Cloverdale	
Gerdes Auto Wreckers	1000 Gerdes Ln	Cloverdale	3/28/2022
Journeyman Meat Company LLC	597 Santana Drive	Cloverdale	
Mathy Winery LLC	25510 River Road	Cloverdale	
MGM Brakes	1184 CLOVERDALE	Cloverdale	
Nu Forest Products Inc	280 Asti Road	Cloverdale	
Phillips Farm LLC dba MDWS	24625 Chianti Road	Cloverdale	
Plank Coffee Roasting	817 N Cloverdale Blvd	Cloverdale	
Redwood Empire	31401 Mccray Rd	Cloverdale	
Reuser Inc.	370 Santana Dr	Cloverdale	
Sonoma Forest Products	27420 Asti Road	Cloverdale	
Tuell and Reynolds	228 s east street	Cloverdale	
deLorimier Winery	2001 Highway 128	Geyserville	
Dutcher Crossing Winery	8533 Dry Creek Road	Geyserville	
E & J Gallo Winery Clos du Bois	19410 Geyserville Ave	Geyserville	
Foley Sonoma Winery	5110 Hwy 128	Geyserville	
Francis Coppola Winery	300 Via Archimedes	Geyserville	
Frick Winery	23072 Walling Road	Geyserville	
J Pedroncelli Winery	1220 Canyon Rd	Geyserville	
Kendall Jackson Vinwood Cellar	18700 Geyserville Ave	Geyserville	
Marietta Cellars	PO Box 800	Geyserville	
PreVail Winery	2450 HWY 128	Geyserville	
Rack & Riddle Custom Wine Services	4001 Highway 128	Geyserville	
Robert Young Estate Winery	4960 Red Winery Road	Geyserville	
Trentadue Winery	19170 Geyserville Ave	Geyserville	
Trione Vineyards Winery	19550 Geyserville Avenue	Geyserville	

Facility Name	Facility Address	City	Date Inspected
Virginia Dare Winery	22281 Chiant Rd	Geyserville	
A Rafanelli Winery & Vineyards LP	4685 west dry creek road	Healdsburg	
Acorn Alegria Winery	P O Box 2061	Healdsburg	
Armida Winery	2201 Westside Road	Healdsburg	
AVV Winery Co Llc	8644 Hwy 128	Healdsburg	
Chalk Hill Winery	10300 Chalk Hill Rd	Healdsburg	
Copain Winery	7800 Eastside Road	Healdsburg	
Dry Creek Vineyard	3770 Lambert Bridge Rd	Healdsburg	
F Teldeschi Winery	3555 Dry Creek Rd	Healdsburg	
Ferrari Carano Winery	8761 Dry Creek Rd	Healdsburg	
Gallo of Sonoma	3387 Dry Creek Rd	Healdsburg	
General Dynamics OTS	511 Grove St	Healdsburg	
General Dynamics OTS	190 Foss Creek Circle	Healdsburg	
Grapewagon Corp	851 Magnolia Drive	Healdsburg	
Hafner Vineyard	4280 Pine Flat Rd	Healdsburg	
Hanna Winery Inc.	9280 Highway 128	Healdsburg	
Healdsburg Municipal Airport	1580 Lytton Springs Rd	Healdsburg	
Healdsburg Transfer Station	166 Alexander Valley Rd	Healdsburg	
Healdsburg Unified School District Transportation Yard	13557 Healdsburg Ave	Healdsburg	
Huneeus Wines LLC	4035 Westside Road	Healdsburg	
Hutchinson Wines Inc.	4791 Dry Creek Road	Healdsburg	
J Vineyards and Winery	11447 Old Redwood Highway	Healdsburg	
Klein Food In	11455 Old Redwood Hwy	Healdsburg	1/23/2020 and 5/17/2022
Kokomo Winery	4791 Dry Creek Road	Healdsburg	
L Foppiano Wine Co	12707 Old Redwood Highway	Healdsburg	
Lake Sonoma Resort Area Inc.	100 Marina Drive	Healdsburg	
Lambert Bridge Winery Inc.	4085 W Dry Creek Rd	Healdsburg	
Lancaster Estate Winery	15001 Chalk Hill Road	Healdsburg	
Limerick Lane Cellars	1023 Limerick Lane	Healdsburg	
Lytton Springs Winery	650 Lytton Springs Rd	Healdsburg	
Matrix Winery	3291 Westside Rd	Healdsburg	
Mazzocco Winery	1400 Lytton Springs Road	Healdsburg	
Michel Vineyards	4155 Wine Creek Road	Healdsburg	
Opperman Son Inc.	280 Kinley Dr	Healdsburg	3/28/2022
Optima Winery	101 Grant Avenue	Healdsburg	
Orsi Family Vineyards LLC	2306 Magnolia Drive	Healdsburg	
Passalacqua Winery	3805 Lambert Bridge Road	Healdsburg	
Peterson Winery	4791 Dry Creek Rd	Healdsburg	4/30/2021

Facility Name	Facility Address	City	Date Inspected
Pezzi King Vineyards	3225 West Dry Creek Rd	Healdsburg	
PJK Winery LLC	4900 W Dry Creek Rd	Healdsburg	
Preston Vineyards	9206 W Dry Creek Rd	Healdsburg	
Rack Riddle Custom Wine Services	499 Moore Lane	Healdsburg	
Ramey Wine Cellars	25 Healdsburg Avenue	Healdsburg	8/23/2021
Rochioli Winery	6192 Westside Rd	Healdsburg	
Roth Estate Winery	10309 Chalk Hill Road	Healdsburg	
Santa Rosa Lead Products LLC	33 South University Street	Healdsburg	
Seghesio Family Vineyards	Grove St	Healdsburg	
Silver Oak Wine Cellars	7300 Highway 128	Healdsburg	
SIMI WINERY	16275 HEALDSBURG AVE	Healdsburg	
Simoncini Vineyards	2303 West Dry Creek Road	Healdsburg	
Sloan Family Winery	996 Limerick Lane	Healdsburg	
Stonestreet Winery	7111 Highway 128	Healdsburg	
Stuhlmuller Vineyards Lp	4951 West Soda Rock Lane	Healdsburg	
Syar Industries Inc. Healdsburg Quarry	13666 Healdsburg Ave	Healdsburg	
Trinite Estate	10603 Chalk Hill Road	Healdsburg	
UNTI WINE COMPANY LLC	4202 DRY CREEK RD	Healdsburg	
Verite Winery LLC	4611 Thomas Rd	Healdsburg	
Veterans United Hauling and Junk Removal LLC	107 Bailhache Ave	Healdsburg	
Vinegrove	1830 Jameson Rd	Healdsburg	
Westec Tank Equipment	1402 Grove St	Healdsburg	6/23/2021
Wilbur Ellis Company LLC Healdsburg	160 Grant Ave	Healdsburg	
Williams Selyem LLC	7227 Westside Rd	Healdsburg	
Williams Selyem LLC	6575 Westside Rd	Healdsburg	
Wilson Winery	1960 Dry Creek Rd	Healdsburg	
Blue Ridge Quarry	24951 Geysers Road	Hopland	
Fetzer Vineyards Hopland	12901 Old River Road	Hopland	
Heritance Vintners LLC	11684 South Highway 101	Hopland	
Jaxon Keys Winery	PO Box 487	Hopland	
Tali Pak	81 Hwy 175	Hopland	
Vintage Wine Estates	13300 Buckman Drive	Hopland	2/3/2020 and 5/5/2023
Waterfowl Winery	14100 Mountain House Rd	Hopland	
Elemental Elixirs LLC	633 E School Way	Redwood Valley	
Paramount Sign Contractors Inc.	2701 Road I	Redwood Valley	

Facility Name	Facility Address	City	Date Inspected
Redwood Valley Cellars	7051 N State St	Redwood Valley	
C&S Waste Solutions Inc.	3515 Taylor Drive	Ukiah	
City of Ukiah	300 Plant Road	Ukiah	
Conrad Forest Products Ukiah	650 Kunzler Ranch Rd	Ukiah	
Daniel Steel & Machine Inc.	160 Brush St	Ukiah	5/11/2022
DenBeste Landscape Supplies Inc.	4200 N State St	Ukiah	
Gobbi Street Facility	751 E Gobbi Street	Ukiah	
Husch Vineyards	2401 Old River Road	Ukiah	
Maverick Enterprises Inc.	650 Ford Road	Ukiah	
McNab Ridge Winery	2350 McNab Ranch Road	Ukiah	
Mendicino Transit Auth	241 Plant Rd	Ukiah	
MFP Ukiah Sawmill	850 Kunzler Ranch Rd	Ukiah	
Nor Cal Recycled Rock Agg	900 Talmage Rd	Ukiah	
NORTH STATE PROPERTIES LLC	1801 NORTH STATE STREET	Ukiah	
North State Street Facility	4201 N State St	Ukiah	
Pacific Recycling Solutions	3201 TAYLOR DR	Ukiah	
Pink Sands	4101 Cox Schrader rd	Ukiah	
Redwood Coast Fuels Lube Bulk Plant	3471 N State St	Ukiah	7/26/2022
Reyes Coca Cola Bottling LLC	650 Babcock Lane	Ukiah	
RW Murray Inc. A to Z Construction	4300 North State Street	Ukiah	
Solid Wastes Systems Inc.	3151 Taylor Dr	Ukiah	
Ukiah City Municipal Airport	1403 S State St	Ukiah	
Ukiah Unified School District	710 Maple Ave	Ukiah	
UPS Ukiah CAUKI	291 Cherry Street	Ukiah	
York Ranch Landfill	Pomo Rd	Ukiah	

Related Water Quality Issues and Data Review

As required by the North Coast Region Water Quality Control Board Order No. R1-2015-0030, the Cities of Healdsburg, Cloverdale, and Ukiah are each required to monitor/sample one storm event at one outfall during the five-year storm water permit term which ended on January 5, 2021. A qualifying rain event is defined as a 70 percent chance of 0.25 inches of rain, occurring during work hours Monday through Friday.

One of the goals of the study is to provide an initial baseline of water quality data for each of the cities. The sample location data from this baseline event can then be

compared with data collected in the future from the same location. Please refer to the Upper Russian River Discharge Characterization Special Study, dated July 2019 for specific information on the monitoring sites, as well as the rainfall and precipitation data. A time and flow weighted field composite was collected from each of the sampling locations. Due to weather conditions during storm events of the 2018 - 2019 season, the three cities were sampled on three different dates.

Table 4-11 shows the monitoring results for each of the cities. As these results represent one-time baseline sampling event, few conclusions were provided in the report except that the concentrations of total coliform, *E. coli* and Enterococci indicate unhealthy biological quality, for recreational contact. It is expected that high concentrations of coliform would be present in storm water runoff. Samples collected for heavy metals and nutrients do not appear to be at levels of concern or exceeding primary or secondary MCLs in drinking water.

Table 4-11. Storm Water Monitoring at Selected Outfalls, Upper Russian River Cities

Constituent	Ukiah 2/1/2019	Cloverdale 2/25/2019	Healdsburg 2/13/2019
Total Coliform, MPN/100mL	>2419.6	>2419.6	>2419.6
E. coli, MPN/100mL	365.4	1986.3	1986.3
Enterococci, MPN/100mL	310	>2419.6	>2419.6
TSS, mg/L	9.4	38	93
Ammonia as N, mg/L	<20	<20	<20
Total Nitrogen, mg/L	3.4	1.6	3.4
Nitrate+Nitrite as N, mg/L	2.3	1.6	3.4
TKN, mg/L	1.1	<1.0	<1.0
Total Phosphorus, mg/L	0.14	0.13	0.18
Total Hardness, mg/L	133	28	43
Total Copper, µg/L	7.1	<6.0	10
Total Lead, µg/L	<5.0	<5.0	<5.0
Total Zinc, µg/L	<50	<50	<50
Calcium, mg/L	25	5.5	6.4
Magnesium, mg/L	17	3.5	6.7

Regulation and Management

State Water Resources Control Board

The Clean Water Act requires the SWRCB and the Regional Boards to regulate the discharge of stormwater from a number of sources. For Phase I, these sources included large (populations greater than 250,000) and medium (population from 100,000 to 250,000) sized municipalities, most industrial sites, and construction activities of one acre or more.

For Phase II, the SWRCB adopted a General Permit for the discharge of stormwater from small MS4s to provide permit coverage for smaller municipalities and non-traditional MS4s, such as military bases, public campuses, and prison and hospital complexes. The Small MS4 Permit regulates storm water discharges from municipalities that serve populations of less than 100,000 persons.

Stormwater discharges are regulated on a statewide and regional basis. The SWRCB issued two General Permits (General Industrial Activities Storm Water Permit and the General Construction Activity Storm Water Permit) to address most of the industrial facilities and construction sites within California. The North Coast Regional Board has also adopted individual stormwater permits for some facilities within their region. The Regional Boards administer the State's General Permits and the Regional Board's individual permits.

As mentioned earlier, the SWRCB has issued two general permits. Dischargers whose projects disturb more than one acre of soil or whose projects disturb less than one acre, but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation.

The Statewide General Permit for Storm Water Discharges Associated with Industrial Activities, Order 2014-0057-DWQ (Industrial General Permit or IGP) implements the federally required storm water regulations in California for storm water associated with industrial activities discharging to waters of the United States. The Industrial General Permit is a NPDES permit that regulates discharges associated with 10 broad categories of industrial activities. The Industrial General Permit requires the implementation of management measures that will achieve the performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT). The Industrial General Permit also requires the development of a Storm Water Pollution Prevention Plan (SWPPP) and a monitoring plan. Through the SWPPP, sources of pollutants are identified, and the means to manage the sources to reduce stormwater pollution are described. The General Industrial Permit requires that an annual report be submitted each July 1.

Source Water Protection Activities

City of Healdsburg

The City of Healdsburg is required to have a storm water management plan which details the City's proposed actions for each of the six required plan components on: public education and outreach, public involvement/participation, illicit discharge detection and elimination, construction activities, post-construction storm water management, and good housekeeping for municipal operations.

Some specific activities conducted by the City of Healdsburg related to storm water management are street sweeping at least once a week, annual employee training on storm water quality, and inspection of restaurants, automotive service facilities, and gasoline stations. City staff also does not apply herbicides during the rainy season, and do not allow irrigation runoff from fertilized turf areas. The Water Agency's Flood Control and Stream Maintenance program has easements to maintain hydraulic capacity and promote riparian habitat health for approximately 100 miles of modified and natural stream channels and 75 miles of engineered flood channels. Usually, ten miles of stream are maintained every summer. Sediment and garbage is removed, as well as planting trees and bank stabilization projects.

Sonoma County Water Agency

As required by the North Coast Region Water Quality Control Board Order No. R1-2015-0030, the Water Agency was required to develop a Hydromodification Control Plan. The Water Agency conducted a hydromodification special study over the 2020 to 2021 time period. The purpose of the study was to determine if low-impact development BMPs were effective in controlling hydromodification. The drainage area selected for the study was a subwatershed of Mark West Creek. Unfortunately, the flows predicted by the model were much lower than actual flows, so the model could not be properly calibrated. It was concluded that the drainage area chosen was not ideal due to the complicated underground culvert network that made the flow data hard to model. The Water Agency has another area (near Todd Road) for a hydromodification study if the North Regional Control Board would like this to be conducted for the next permit term.

As required by the North Coast Region Water Quality Control Board Order No. R1-2015-0030, the Water Agency was also required to conduct a best management practices (BMPs) assessment report on lawn care and lawn watering conservation. The study was intended to evaluate the implementation of outdoor water conservation BMPs resulting in a reduction of water use. The study assessed BMPs implemented between 2010 and 2019. It was found that all participating agencies in the partnership demonstrated an overall water use reduction. Reduction in outdoor water use has a direct correlation with reduction in over-irrigation which reduces pollution in runoff.

Recommended Source Water Protection Activities

There are no recommended source water protection activities at this time.

Vulnerability Assessment - Low

Approximately eight percent of the study watershed is classified under urban land uses, while the majority of the land use is comprised of open space and agricultural uses. Additionally, the cities of Healdsburg, Cloverdale and Ukiah have storm water management plans and best management practices in place to reduce pollutants from entering into the storm drain system. Storm water monitoring conducted in 2019 for one selected outfall for each of the cities did not show elevated levels of metals or nutrients. *E. coli*, total coliforms and *Enterococci* were present in elevated concentrations in the storm water runoff, as expected. Overall, urban runoff is a low risk PCS.

WASTEWATER

Background

Various types of wastewater facilities, such as wastewater treatment plants, wastewater ponds, and septic systems will be discussed in this section.

Wastewater is known to contain pathogenic microorganisms. Wastewater treatment plants remove and/or inactivate some, though not all, of these organisms through various treatment processes. Secondary treatment of domestic sewage is expected to remove 75 to 99 percent of enteric viruses (National Research Council, 1998), 85 to 99 percent of heterotrophic bacteria, and 92 percent of *Giardia* cysts (Chauret, 1999).

Seasonal Patterns

The three wastewater treatment plants (WWTPs) in the study watershed which are permitted to discharge to the Russian River are the City of Ukiah's WWTP, the City of Cloverdale's WWTP, and the City of Healdsburg's WWTP. Although the WWTPs are operated year-round, discharge of tertiary treated wastewater to the Russian River is not allowed from May 15th to September 30th of every year. From October 1 to May 14th, discharge is limited to one percent of the flow in the Russian River. Discharge of secondary treated wastewater is never allowed to the Russian River. These sites are also shown in the Potential Sources of Contamination Map, **Attachment A.**

Related Constituents

Wastewater is a blend of sewage, washwater from showers, kitchens, etc., and any effluent from industrial facilities within the sewer collection system. Potential contaminants of concern in wastewater include microbial pathogens (such as bacteria, viruses, and protozoa), TOC, nutrients, VOCs, and SOCs. Septic tank effluent typically contains high concentrations of TDS, chlorides, phosphates, nitrates, bacteria, and viruses.

Occurrence in Watershed

Wastewater Treatment Plants which discharge to Russian River

City of Ukiah

The City of Ukiah WWTP is located at 300 Plant Road in Ukiah, California. The facility produces disinfected secondary effluent for discharge to three percolation ponds and disinfected, dechlorinated tertiary treated effluent for direct discharge to the Russian River. The City of Ukiah discharges to the percolation ponds year-round, but is allowed to discharge tertiary treated effluent to the Russian River during the wet season from October 1 to May 14th. The facility treats wastewater from the City of

Ukiah and the Ukiah Valley Sanitation District (UVSD), serving a population of approximately 21,059. The flow is comprised of 72 percent residential and 28 percent commercial/business. Leachate from the City of Ukiah's municipal landfill is discharged to the WWTP.

The facility is designed to provide secondary treatment for an average daily dry weather flow of 3.01 million gallons per day (MGD) and the peak daily wet weather flow of 24.5 MGD. The treatment system consists of an influent wet well, bar screens, aerated grit removal, primary clarifiers, trickling filters, aerated solids contact tank, secondary clarifiers, and a chlorine contactor. It also has a peak wet weather flow of 7.0 MGD of advanced treated wastewater. The advanced treatment system consists of primary sedimentation, trickling filters, secondary sedimentation, coagulation, multi-media filtration, chlorination, and dechlorination.

Over the reporting period, the City of Ukiah has expanded their recycled water system to reduce discharge to the Russian River. Recycled water is used for landscape irrigation, agricultural irrigation, and frost protection

City of Cloverdale

The City of Cloverdale WWTP is located at 700 Asti Road in Cloverdale, California. The facility discharges disinfected, secondary wastewater via seven percolation/evaporation ponds, with a combined capacity of 35 million gallons, located on the west bank of the Russian River. Although the facility is permitted to discharge to the Russian River, the discharge must be tertiary treated. Currently, the facility does not have advanced wastewater treatment and is therefore prohibited to discharge to the Russian River. However, the facility has sufficient percolation capacity for disposal of its treated wastewater year-round. Wastewater is received from approximately 3,000 connections, primarily residential, serving a population of approximately 8,800 people and commercial/industrial dischargers.

The North Coast Regional Water Quality Control Board inspected the facility on March 4, 2022. Regional Board staff found that the facility was in proper operating order and well maintained. Regional Board staff noted in the inspection report that all controls that allowed the facility to discharge to the Russian River had been physically disabled. Also, the former outfall to the Russian River is now disconnected.

The facility is designed to provide secondary treatment for an average dry weather flow of 1.0 MGD and a peak daily wet weather flow of 8.25 MGD. The current treatment system is a series of three ponds; Pond No. 1 is a 2.8 million gallon primary aeration pond equipped with a Parkson Biolac extended aeration system, Pond No. 2 is a secondary aeration pond equipped with six aerators, and Pond No. 3 is a settling/polishing pond which allows the suspended solids to settle at the bottom of the pond. The treated wastewater is chlorinated prior to disposal to one of seven percolation ponds.

City of Healdsburg

The City of Healdsburg Water Reclamation Facility is located at 340 Foreman Lane in Healdsburg, California. The facility discharges tertiary wastewater to Basalt Pond, which is physically connected to the Russian River. As stated earlier, tertiary-treated discharge to the Russian River and the Basalt Pond are prohibited from May 15th to September 30th. This is referred to as the seasonal discharge prohibition. During the period from October 1 through May 14, discharges of treated wastewater to the Basalt Pond shall not exceed one percent of the flow of the Russian River, as measured by the sum of flows at United States Geological Survey (USGS) gauge No. 11-4640.00 in the Russian River near Healdsburg and at USGS Gauge No. 11-4653.50 in Dry Creek near its mouth.

The facility provides sewerage service to a population of approximately 11,800 which is approximately 90 percent residential and 10 percent combined commercial, industrial, and municipal flows. The City of Healdsburg upgraded its treatment plant from a pond-based secondary treatment process to a tertiary facility which went on-line in April 2008. Although the upgrade resulted in compliance with most requirements, the facility has until September 30, 2024 under Cease and Desist Order R1-2022-0018 to comply with the seasonal discharge prohibition from May 15th to September 30th.

Over the years, the City of Healdsburg has requested multiple extensions to achieve compliance with the seasonal discharge prohibition, citing that additional time was needed to construct recycled water storage tanks, transmission pipelines and to secure additional recycled water users. In a letter dated February 8, 2021, the facility requested an extension to September 30, 2024 to allow time to secure additional recycled water users and to gain experience managing their recycled water system to comply with the seasonal discharge prohibition.

In February 2019, flooding resulted in a significant breach of the levee between Basalt Pond and the Russian River, resulting in a direct surface water connection between them. Corrective actions related to the levee breach are currently under development by SYAR Industries under the conditions of their Mine Reclamation Plan issued by the County of Sonoma.

The facility is designed to provide tertiary treatment for an average dry weather flow of 1.4 MGD and a peak daily wet weather flow of 4.0 MGD. The current treatment system consists of influent screening, grit removal, extended aeration with biological nutrient removal, microfiltration through hollow membrane fibers (membrane bioreactor), and ultraviolet (UV) light disinfection. The facility has two recycled water storage ponds, 25 million gallon and 15 million gallon capacities with synthetic liners to provide storage for the disinfected tertiary treated recycled water and deliver it to authorized recycled water users.

Wastewater Treatment Plants which discharge to Land

Table 4-12 lists the municipal facilities which hold Waste Discharge Requirements (WDRs) for wastewater disposal within the study watershed, and **Table 4-13** lists the private facilities which hold WDRs for wastewater disposal within the study watershed

Table 4-12. Waste Discharge Requirements Permits in the Study Watershed for Wastewater, Municipal Facilities

	Permit No.	Capacity (gpd)	Treatment Type/Disposal
Calpella County Water District	R1-2019-0010	80,000 (monthly average dry flow)	Aerated pond treatment, disinfection and percolation disposal
Hopland Public Utility District	R1-2008-0003	90,000 (average daily dry flow)	Aerated pond treatment, disinfection and percolation disposal
Geyserville Sanitation Zone	R1-2019-0013	92,000 (average dry weather flow)	Aerated pond treatment, disinfection and percolation disposal
US Army Core of Engineers Lake Sonoma Lake System	89-040	22,400	Septic Tank and Leachfield

Table 4-13. Waste Discharge Requirements Permits in the Study Watershed for Wastewater, Private Facilities

Facility Name	Permit No.	Capacity (gpd)	Treatment Type/Disposal
El Gallo Winery (Healdsburg)	R1-2012-0099	3,060	Conventional septic tank/leachfield system
Jordan Vineyard (Healdsburg)	R1-2008-0078	140,000	Aerobic pretreatment and mound disposal
Consolidated Tribal Health Project	97-010-DWQ	1,495	Septic Tank/Leachfield
Silver Oaks Cellars	2014-0153-DWQ	4,025	
Lytton Springs Rehab Facility (owned by Lytton Band of Pomo Indians)	97-10-DWQ	15,000	Aerated pond, disinfection, spray irrigation

Septic Systems

The Sonoma County Permit and Resource Management Department estimates that there are 45,000 residential septic systems in all of Sonoma County. Within the study watershed, septic systems exist in residential areas outside of the sanitation zones covered by the wastewater treatment plants discussed above.

Related Water Quality Issues and Data Review

Failing or poorly sited septic systems, leaking sewer lines, and wastewater discharges are potential sources of fecal indicator bacteria and human pathogens in the Russian River watershed. As discussed in the 2013 and 2018 Updates, the Regional Board developed a pathogen Total Maximum Daily Load (TMDL) for the Russian River. A number of water quality studies were undertaken, such as DNA tracing to identify sources of fecal waste throughout the watershed. The study found that human and grazer waste are entering the Russian River at locations throughout the middle and lower portions of the watershed. Specifically, the highest matches of human waste were found in Guerneville and the highest matches of grazer waste were found in the Laguna de Santa Rosa watershed. DNA matches for bird fecal waste was evenly distributed throughout the watershed.

The Regional Board also evaluated fecal indicator data based on different land cover types and during both wet and dry periods. It was found that *E. coli* was most strongly associated with unsewered developed areas and shrubland during both wet and dry seasons.

Regulation and Management

Wastewater Treatment Plants

Each of the wastewater treatment plants discussed above has Waste Discharge Requirements which contain effluent limitations for the treated discharge. The following paragraphs will discuss effluent limitations and any violations of those limitations for each WWTP.

The Ukiah WWTP was issued a new NPDES permit No. CA0022888 (Order No. R1-2018-0035) in September 2018. The Ukiah WWTP must meet separate effluent limitations for discharge to the Russian River, to the percolation ponds, and to the recycled water system. Effluent limitations as specified for discharge to the Russian River include limitations for BOD5, total suspended solids, pH, cyanide, chlorodibromomethane, copper, dichlorobromomethane, chlorine, nitrate as N, total coliform and ammonia. Effluent limitations for discharge to the evaporation/percolation ponds and to the recycled water system are only for BOD5, total suspended solids, total coliform and pH. Over the reporting period, The Regional Board has taken a number of enforcement actions against the City of Ukiah over the

reporting period. In regards to water quality, one Administrative Civil Liability (ACL) Complaint was filed.

From January 2017 to December 2021, the WWTP had 83 violations for exceeding effluent limits for ammonia, nitrate, total coliform, residual chlorine, dichlorobromomethane, BOD, copper, and cyanide. In November 2022, ACL Complaint No. R1-2022-0042 assessed a $75,000 penalty. The City of Ukiah has proposed to replace its belt filter press with a screw press to enhance biosolids dewatering, reduce maintenance time, and improve effluent quality at the Ukiah City WWTP. Replacing the belt filter press should reduce ammonia, nitrate, organics and solids in flows returned to the plant headworks.

The Cloverdale WWTP was issued a new NPDES permit No. CA0022977 (Order No. R1-2018-0034) in September 2018. As required in the previous Order R1-2012-0048, the Cloverdale WWTP must meet effluent limitations for discharge to the Russian River which include limitations for BOD5, total suspended solids, pH, total coliforms, total residual chlorine, total copper, total ammonia, chlorodibromomethane, and dichlorobromomethane. There are also limitations set for discharge to the evaporation/percolation ponds. However, these limitations are less stringent and are only for BOD5, total suspended solids, pH and total coliform.

There were two violations involving total coliform in the effluent in December 2020. Total coliform in the effluent was 350 MPN/100mL and 1,600 MPN/100mL on December 2 and December 9, respectively. The limit for total coliform is 240 MPN/100mL maximum.

The Healdsburg WWTP was issued a new NPDES permit No. CA0025135 (Order No. R1-2022-0017) in October 2022. The Healdsburg WWTP must meet separate effluent limitations for discharge to the Basalt Pond and for discharge to the Recycled Water Storage ponds. The effluent limitations are the same for the two discharge locations, with limitations on biochemical oxygen demand, total suspended solids, pH and total coliforms. The median concentration for total coliform shall not exceed 2.2 MPN/100mL for a seven day period, or exceed 23 MPN/100ml for a 30 day period, and never exceed 240 MPN/100mL. There have been no violations noted over the reporting period.

The use of recycled water from the WWTP is covered under State Water Resources Control Board Order No. WQ 2014-0090-DWQ, General Waste Discharge Requirements for Recycled Water Use.

As shown in **Table 4-14**, there were some violations associated with wastewater treatment plants which discharge to land.

Table 4-14. Violations for Wastewater Treatment Plants which Discharge to Land

Facility	Violation
Geyersville Sanitation Zone WWTP	Effluent was only partially treated before being discharged to percolation pond due to storm event in February 2019.
Calpella County Water District	Exceeded effluent total coliform monthly median of 23 MPN/100mL and maximum daily of 230 MPN/100mL in 2021
Hopland Public Utility District	Effluent was only partially treated before being discharged to percolation pond in 2022. Violated effluent limitations for biological oxygen demand, total coliform and total suspended solids in 2020 and 2021.
Lytton Springs Rehab Facility	Exceeded 900,000 gallon irrigation limit by discharging 1,076,210 gallons in August 2019.

Residential Septic Systems

Currently, the County inspects non-standard septic systems on a regular basis, and inspects standard systems on a complaint basis.

The SWRCB developed a draft State Policy for Water Quality Control for Siting, Design, Operation, and Management of Onsite Wastewater Treatment Systems (OWTS) which was released in September 2022. The administrative record for the OWTS Policy was approved by the Office of Administrative Law (OAL) on September 26, 2023.

The County of Sonoma updated County regulations for septic systems in the OWTS Manual which was approved by the Sonoma County Board of Supervisors in August 2019.

Source Water Protection Activities

The Regional Board adopted an Action Plan for the Pathogen TMDL in December 2021. The Action Plan will not be in effect until it is approved by the SWRCB and the State Office of Administrative Law, which is expected in early 2024. Some of the proposed changes to occur are:

1) Individual Onsite Wastewater Treatment Systems – If located within an Advanced Protection Management Program (APMP), the tank and leachfield will need to be inspected every five years by a qualified professional. Owners of OWTS will need to submit information to the Regional Board such as system age, repair history and pumping records. The Regional Board may then notify the owner of corrective action needed.

2) Large Onsite Wastewater Treatment Systems – Owners and operators of OWTS with flow over 10,000 gallons per day shall submit a Report of Waste Discharge to the Regional Board.
3) Wastewater holding ponds that discharge to surface water – Effluent limitations for *E. coli* will be added to existing NPDES permits.

4) Recreation – Sonoma County, Sonoma County CDC and Regional Board shall work with local entities to install sanitary facilities along the river for recreational users.

5) Storm Water – Phase 1 enrollees shall implement a Pathogen Reduction Plan.

Recommended Source Water Protection Activities

Due to the number of proposed activities listed in the Action Plan for the Pathogen TMDL, Water Agency staff should consider tracking this effort closely.

Vulnerability Assessment - Medium

The City of Cloverdale WWTP and the City of Healdsburg WWTP appear to be in general compliance with their effluent limitations. All WWTPs are currently in compliance with the seasonal discharge prohibition. However, there are a large number of septic systems in the study watershed which will continue to age and possibly fail. As some septic systems are located in close proximity to the Russian River, wastewater is considered a medium risk PCS.

LEAKING UNDERGROUND STORAGE TANKS

Background

A leaking underground storage tank (LUST) is an underground storage tank that has leaked hazardous substances into the soil or groundwater. Underground storage tanks leak for a variety of reasons such as faulty installation, negligence, or inadequate operation and maintenance. Additionally, some tanks are made of steel, which can corrode over time. Although leakage from underground storage tanks primarily affects groundwater, there is potential for surface water contamination if the contaminated groundwater is hydrogeologically connected to surface water. Once surface water is contaminated, contaminants will be diluted based on fate and transport factors; including the tank site's proximity to the drinking water intake, the magnitude of the spill, and method of transport (surface or groundwater flow).

Seasonal Patterns

There are no seasonal patterns as to when an underground storage tank may leak into the environment.

Related Constituents

Contaminants of concern from LUSTs likely include hydrocarbons from gasoline and other petroleum-based products. Methyl tertiary butyl ether (MTBE) is now less of a concern since it was banned in California fuel supplies in January 2004.

Occurrence in Watershed

The SWRCB maintains a database of leaking underground storage tanks called GEOTRACKER which can be queried by location. As the concern with LUSTs decreases with distance, only LUST sites from the City of Healdsburg downstream to Radial Collector Well 5 were enumerated. **Table 4-15** lists the four open sites where leaking underground storage tanks were documented as of September 2023. These sites are also shown in the Potential Sources of Contamination Map, **Attachment A.**

As **Table 4-15** shows, each site is in various stages of assessment or remediation. Of the four sites, one site (McConnell Chevrolet) is a new site and is currently being assessed to identify a suitable remediation method.

Table 4-15. Leaking Underground Storage Tanks in Study Watershed from City of Healdsburg to Radial Collector Well 5, as of September 2023

GEOTRACKER ID	SITE NAME	CLEANUP STATUS	ADDRESS	CITY
T0609700124	VINTAGE II STATION	OPEN – REMEDIATION HALTED SINCE 2015. OWNER APPLYING FOR UST ORPHAN CLEANUP FUND TO CONTINUE REMEDIATION.	1281 HEALDSBURG AVENUE	HEALDSBURG
T0609700161	TEXACO	OPEN – REMEDIATION COMPLETE IN DECEMBER 2020, REMEDIATION EQUIPMENT APPROVED TO BE REMOVED AND REMEDIATION WELLS FOR DESTRUCTION	186 DRY CREEK ROAD	HEALDSBURG
T0609700466	CASH OIL COMPANY	OPEN – REMEDIATION WITH HVDPE (High Vacuum Dual-Phase Extraction)	1496 HEALDSBURG AVENUE	HEALDSBURG
T0000019777	McCONNELL CHEVROLET	OPEN – SITE ASSESSMENT	1395 HEALDSBURG AVENUE	HEALDSBURG

Source: Geotracker Database

Related Water Quality Issues and Data Review

Sonoma County indicated that there are no LUST sites currently impacting the Russian River. It should be noted that although remediation has halted at the Vintage II Station site, the petroleum release for this site is limited to the soil and shallow groundwater. The affected groundwater is not currently being used as a source of drinking water. Additionally, the Regional Board stated that the Vintage II Station site is still required to continue remediation even if they do not secure UST Orphan Cleanup funding (Personal Communication, Francois Bush, Regional Board Region 1, August 2024).

Regulation and Management

The Regional Board has jurisdiction over gasoline releases in the City of Healdsburg and the City of Santa Rosa, as well as all other non-gasoline releases. Sonoma County has jurisdiction for all gasoline releases within Sonoma County except for the City of Healdsburg and the City of Santa Rosa.

Recommended Source Water Protection Activities

No source water protection activities are recommended at this time.

Vulnerability Assessment - Low

There are no leaking underground storage tanks within the 2500 foot protection zone for Radial Collector Well 5. The four open LUST sites in Healdsburg are farther away from Radial Collector Well 5, and have been determined to have no impact on the Russian River. Therefore, this assessment indicates the vulnerability for source water quality impacts due to current LUST sites is low.

FIRES

Background

The aftermath of a wildfire or prescribed burn can alter source water quality. In general, the load of dissolved substances to streams will increase following a wildfire due to increased runoff. Increased runoff can occur following a fire because the formation of a hydrophobic organic layer in the soil increases the water repellency of soils (DeBano, 2000). A 2004 USGS study concluded that measurable effects of fires on runoff water quality are most likely to occur if the fire was severe enough to burn large amounts of organic matter, if windy conditions were present during the fire, if heavy rain occurred following the fire, and if the fire occurred in a watershed with steep slopes and soils with little cation-exchange capacity (USGS, 2004).

Seasonal Patterns

Wildfire season in Sonoma County spans the months after the last spring rains until the first fall or winter rains occur. The months of August, September, and October have the greatest potential for wildland fires as vegetation dries out, humidity levels fall, and off shore winds blow.

Related Constituents

The magnitude of the effects of fire on water quality is dependent on how fire characteristics (frequency, intensity, duration, and spatial extent of burning) interact with watershed characteristics (weather, slope, soil type, geology, land use, timing of regrowth of vegetation, and burn history). This interaction is complex and highly variable so that even fires in the same watershed can burn with different characteristics and produce variable effects on water quality. Typically, stormwater runoff from burned forested areas contains high concentrations of phosphorus, nitrogen, dissolved organic carbon (DOC), sediment, and metals such as mercury, lead, and arsenic.

Occurrence in Watershed

There were three fires which occurred within the study watershed since 2017. **Table 4-16** contains information on dates and acreage burned. In addition, **Attachment A** shows the burn perimeter areas.

Table 4-16. Summary of Fire Information Over Reporting period

Fire	Date	Acreage Burned
River	2018	48,920
Kincade	10/23/2019 to 11/6/2019	77,758
Walbridge	8/27/2020 to 10/1/2020	55,209

Source: CALFIRE

Related Water Quality Issues and Data Review

After a fire has occurred, the natural vegetation on hillsides is denuded. Additionally, a fire can cause the soils to become hydrophobic. Therefore, increased erosion of soils and associated discharge is expected to occur during the first rains immediately following a fire due to water repellent soils and reduced surface cover.

As a result of the wildfires which occurred in October 2017, the Water Agency conducted baseline and post-storm monitoring at 15 locations as shown in **Figure 4-6.** A discussion of the 2017 wildfires impact to the Mirabel location was included in the 2018 Update. The following is a discussion of the impacts of the 2019 Kincade and 2020 Walbridge wildfires.

As shown in **Figure 4-7**, the Franz Creek and Maacama Creek monitoring locations are both within the burn area for the 2019 Kincade fire. The Franz Creek site was selected to evaluate the impact of the Kincade fire as Franz Creek had four samples (November 2017, January 2018, March 2018, April 2018) to characterize baseline pre-fire conditions, whereas the Maacama Creek had only one baseline sample collected in October 2017. The Kincade fire occurred from 10/23/2019 to 11/6/2019.

Samples collected by the Water Agency were analyzed for nutrients, salinity, physical, organic carbon, and metals. Metals were not analyzed in any of the post-fire samples. **Figures 4-7** and **Figure 4-8** show monitoring results for dissolved organic carbon (DOC) and nitrate as N, allowing for a comparison between pre- and post-fire time periods. Monthly precipitation totals (measured at Franz Creek) were also included for informational purposes. Although peaks for both DOC and nitrate occur with precipitation in both the pre- and post-fire time periods, the peaks are higher in the post-fire time period. For example, the highest DOC peak in the pre-fire period was 6.1 mg/L, and the highest DOC peak in the post-fire period was 8.6 mg/L, indicating a 41 percent increase. The highest nitrate peak in the pre-fire period was 1.26 mg/L, and the highest nitrate peak in the post-fire period was 1.58 mg/L, indicating a 25 percent increase. It is also interesting to note that peaks continued to occur in the third winter after the fire occurred. There were no notable increases in ammonia, alkalinity and specific conductance in comparing pre and post fire samples.

Additionally, the highest monthly precipitation occurred in February 2019, which was in the pre-fire time period. It could be postulated that higher peaks of DOC and nitrate may have occurred if the monthly precipitation in February 2019 occurred in the post-fire period.

Figure 4-6. Post-fire Monitoring Surface Water Quality Locations

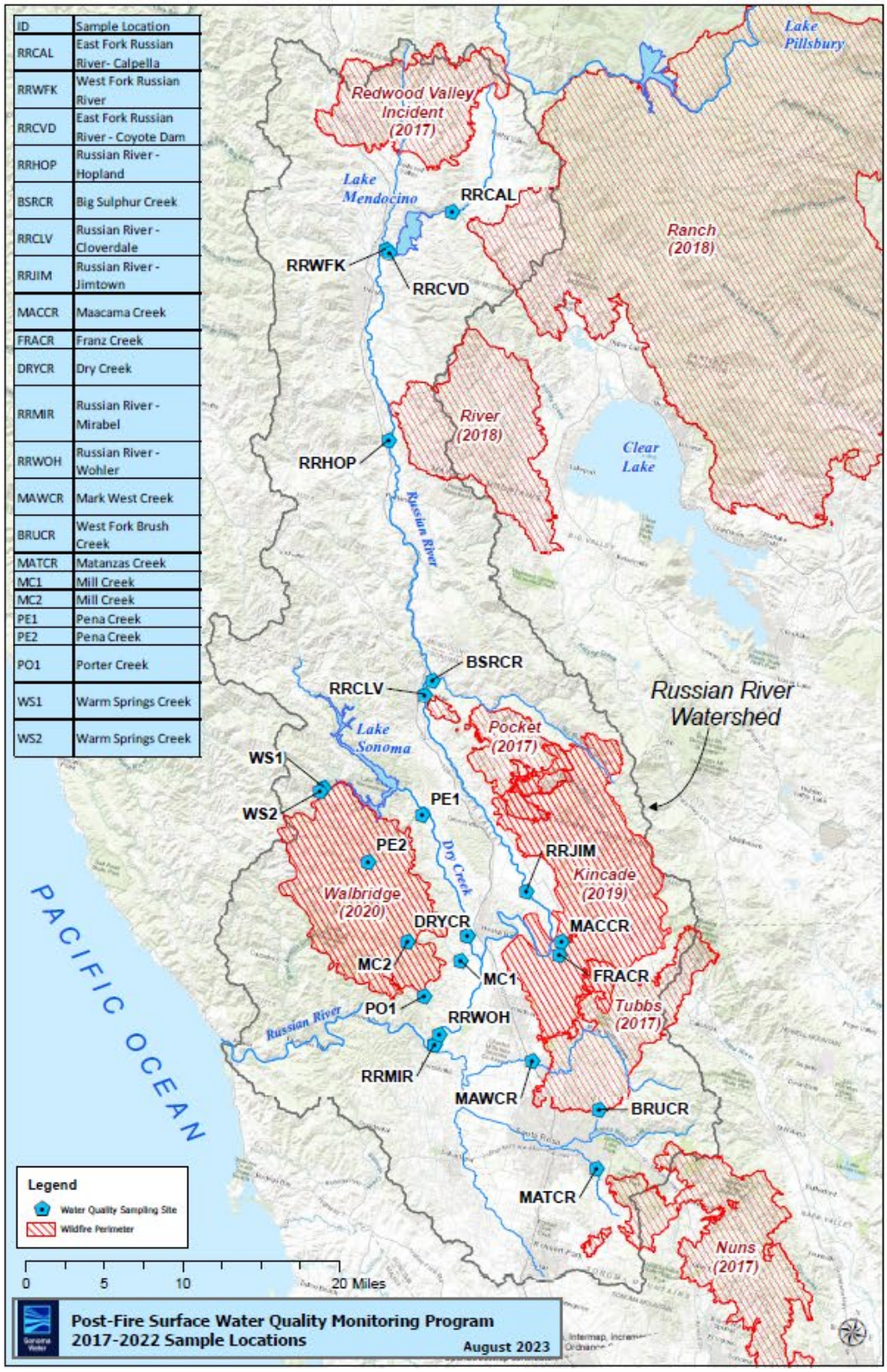


Figure 4-7. Dissolved Organic Carbon at Franz Creek (FRACR) before and after the Kincade Fire

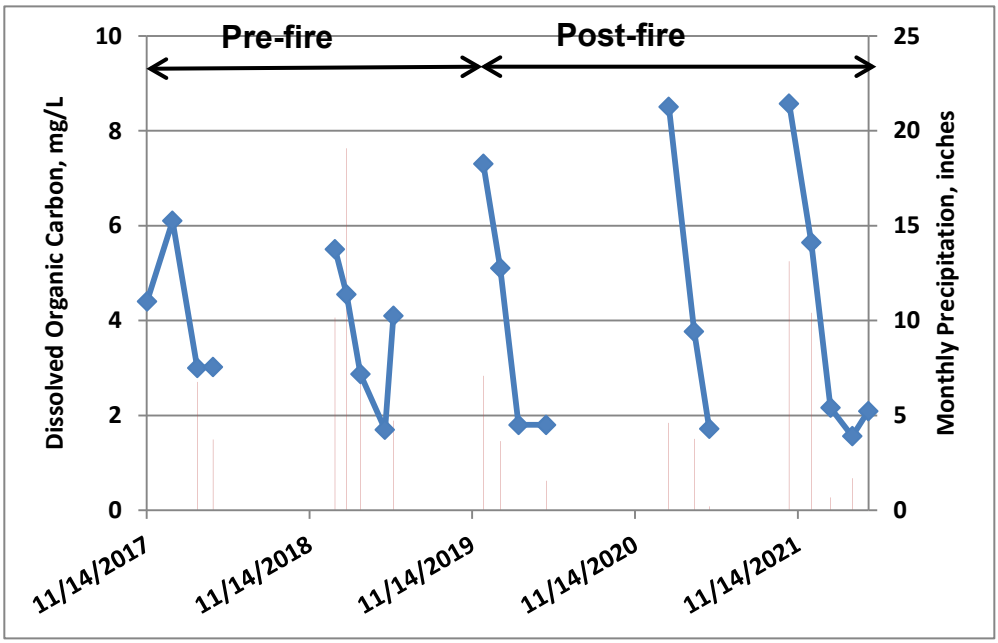
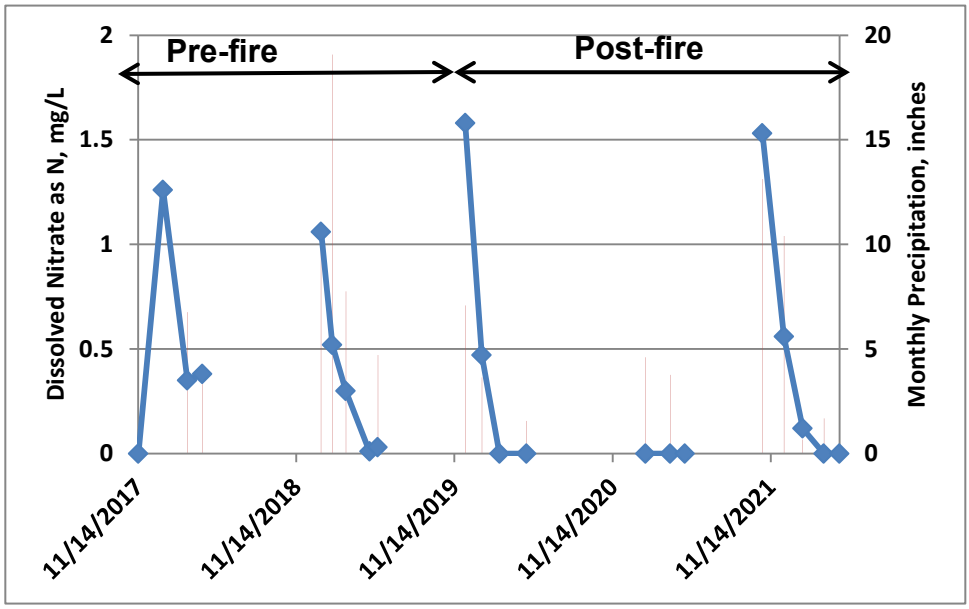


Figure 4-8. Nitrate as N at Franz Creek (FRACR) before and after the Kincade Fire



For the 2020 Walbridge fire, the Water Agency collected one pre- and two post-fire samples from multiple tributaries (Porter Creek, Pena Creek, and Warm Springs)

within the burned area. Similar to the monitoring discussed above, samples collected by the Water Agency were analyzed for nutrients, salinity, physical, organic carbon, and metals. **Tables 4-17 through 4-19** show pre and post-fire monitoring results for Porter Creek, Pena Creek, and Warm Springs, respectively.

Table 4-17. Pre- and Post-fire monitoring results at Porter Creek after the Walbridge Fire

Sampling Date	DOC, mg/L	TOC, mg/L	Iron, mg/L	Nitrate as N, mg/L	Total Phosphorus, mg/L	Sulfate, mg/L
Baseline 10/5/2020	1.16	1.62	<0.05	<0.04	0.076	7.7
Post-fire 12/17/2020	5.13	6.09	0.13	0.047	0.05	21
Post-fire 1/27/2021	6.98	7.43			0.089	
Percent Increase	502%	359%	160%	18%	17%	173%

Table 4-18. Pre- and Post-fire monitoring results at Pena Creek after the Walbridge Fire

Sampling Date	DOC, mg/L	TOC, mg/L	Iron, mg/L	Nitrate as N, mg/L	Total Phosphorus, mg/L	Sulfate, mg/L
Baseline 10/5/2020	1.4	1.79	<0.05	<0.04	0.042	18
Post-fire 12/17/2020	1.92	2.1	0.056	0.062	0.052	28
Post-fire 1/27/2021	6.41	6.9		0.91	0.22	
Percent Increase	358%	285%	12%	2175%	424%	56%

Table 4-19. Pre- and Post-fire monitoring results at Warm Springs Creek after the Walbridge Fire

Sampling Date	DOC, mg/L	TOC, mg/L	Iron, mg/L	Nitrate as N, mg/L	Total Phosphorus , mg/L	Sulfate, mg/L
Baseline 10/5/2020	1.2	1.89	0.072	<0.04	0.042	17
Post-fire 12/17/2020	4.96	6.82	0.94	0.046	0.09	25
Post-fire 1/27/2021	3.94	4.44		0.37	0.085	
Percent Increase	228%	135%	1206 %	825%	102%	47%

As shown in the tables, monitored tributaries within the Walbridge fire burn area showed an increase from the baseline. In summary for the three sites monitored, percent increases from pre to post monitoring were:

- 228% to 502% increase for DOC
- 135% to 359% increase for TOC
- 12% to 1206% increase for iron
- 18% to 2175% increase for nitrate
- 17% to 424% increase for phosphorus

Similar to the Kincade fire, DOC and nitrate increased in tributaries within the burn area after the Walbridge fire. For the Walbridge fire, iron and phosphorus also increased in tributaries within the burn area. Overall, nitrate and organic carbon increased in post-fire flows for the Walbridge and Kincade fires.

Regulation and Management

CALFIRE is the lead agency responsible for fighting wildland fires. The Sonoma County Fire and Emergency Services Department provides fire protection, rescue, emergency medical, and arson investigation services for the unincorporated portions of the county that are not included in an independent fire protection district or city fire department.

The use of approved long-term retardants in wildland fire suppression is standard in fire management and planning. The retardants are most often delivered in fixed or rotor- wing aircraft. Current qualified products and approved uses are listed on the U.S. Forest Service Wildland Fire Chemical Systems website (http://www.fs.fed.us/rm/fire). According to the U.S. Forest Service, the fire retardant

commonly used is Phos-Check. The use of fire retardants can impact water quality if chemicals are accidentally dropped into a water body, or if heavy rains occur before the product has had time to naturally degrade.

The National Interagency Fire Center has developed *Interagency Standards for Fire and Fire Aviation Operations* which are annually revised. The *Interagency Standards for Fire and Fire Aviation Operations* states, references, or supplements policy for the U.S. Bureau of Land Management, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the National Park Service. Regarding the use of fire retardants, the Aerial Application Guidelines are to "avoid aerial or ground application of retardant or foam within 300 feet of waterways." (http://www.fire.blm.gov/Standards/redbook.htm)

Recommended Source Water Protection Activities

After the wildfires of October 2017 the Water Agency participated in numerous efforts to protect watersheds and water supply from potential adverse impacts from the wildfires such as:

• Monitoring water quality in and around burn areas in collaboration with the Regional Water Quality Control Board, United States Geological Survey, and other regional partners from November 2017 to April 2022;
• Installing wattles, sandbags, and other erosion control techniques to minimize the amount of sediment, debris, and potential pollutants entering waterways;
• Removing debris and excess vegetation from flood control;
• Installation of gages to measure stream flows and precipitation to improve regional storm monitoring, and installation of an X-band radar unit to provide enhanced localized weather forecasting.

No additional source water protection activities are recommended at this time.

Vulnerability Assessment - Medium/High

The post-fire monitoring conducted by the Water Agency after the Kincade and Walbridge fires did show an post-fire impact with higher concentrations of DOC and nitrate in the tributaries within the burn area. Additionally, increases in iron and phosphorus were seen in tributaries within the burn area of the Walbridge fire. These increases may have been higher with higher monthly precipitation totals (similar to February 2019). As these tributaries flow to the Russian River, there is a direct impact to the Russian River. However it is difficult to precisely quantify the impact due to the distance from the burned area to Collector 5, as dilution occurs within the river. This assessment indicates the vulnerability for source water quality impacts due to fires is medium/high.

SECTION 5 – RECOMMENDATIONS

This section consists of a discussion of key findings, update on recommendations from the 2018 watershed sanitary survey and a list of current recommendations.

UPDATE ON 2018 RECOMMENDATIONS

The 2018 Update recommended three actions that Sonoma County Water Agency (Water Agency) should consider to protect source water quality. These recommendations and the Water Agency's response are discussed in **Table 5-1.**

Table 5-1. Recommendations from 2018 Watershed Sanitary Survey

Recommendation	Summary of Action Taken
1) Contact the City of Healdsburg and the City of Cloverdale to remind them that the Water Agency would like to be notified of all major sewage spills.	Both cities were contacted by telephone.
2) Keep track of cyanotoxin monitoring being conducted by the Regional Board and Sonoma County Department of Health Services.	Cyanotoxin monitoring data is compiled and evaluated in this report.
3) Due to the number of proposed activities listed in the Action Plan for the draft Pathogen TMDL, Water Agency staff should continue tracking this effort closely.	Activities listed in the Pathogen TMDL Action Plan have been limited as the Plan has not yet been approved by the State Water Resources Control Board, although approval is expected in early 2024.

RECOMMENDATIONS

Table 5-2 presents the recommendations developed for the 2023 Update. Development of recommendations for watershed management actions that are economically feasible and within the authority of the Water Agency is critical. Recommendations will be implemented as resources are available.

Table 5-2
Recommendations for 2023 Watershed Sanitary Survey

1) Contact the City of Healdsburg, the City of Cloverdale and the City of Ukiah to remind them that the Water Agency would like to be notified of all major sewage spills.	There were three large sewage spills in the City of Healdsburg over the reporting period and the Water Agency was not notified, although the Water Agency expressed to be notified.
2) Due to the number of proposed activities listed in the Action Plan for the Pathogen TMDL, Water Agency staff should continue tracking this effort closely. For example, the Cities of Ukiah, Cloverdale and Healdsburg have to develop a Pathogen Reduction Plan.	These activities are related to source water protection of the Russian River.
3) Consider/Continue monitoring for metals, nutrients, TSS, TOC/DOC for at least two winters for post-fire monitoring.	At some locations, baseline water quality monitoring was completed for metals, but did not continue during the post-fire monitoring.
4) Monitor source water closely during the construction phase for Hanson Pits Reclamation Project. This could occur as early as 2025, most likely 2026. **https://share.sonoma-county.org/link/_ZYKWOBAPgc/**	Construction for this project is planned to be completed in phases to minimize water quality impacts. However, it would be beneficial to track the project during construction.

APPENDIX A
BIBLIOGRAPHY AND LIST OF CONTACTS

APPENDIX A - BIBLIOGRAPHY AND LIST OF CONTACTS

Michael Harrigan, Storm Water Program Manager, City of Healdsburg, mharrigan@healdsburg.gov

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Rachel Prat, North Coast Regional Water Quality Control Board, Rachel.Prat@waterboards.ca.gov, Wineries

Charles Reed, North Coast Regional Water Quality Control Board, Charles.reed@waterboards.ca.gov, Pathogen TMDL

Francois Bush, North Coast Regional Water Quality Control Board, Francois.Bush@waterboards.ca.gov, Leaking Underground Storage Tanks

Robert Pennington, Sonoma County Permit and Resource Management Department, Robert.Pennington@sonoma-county.org, Mines

Greg Desmond, Sonoma County Regional Parks, Lifeguard and Recreation Coordinator, greg.desmond@sonoma-county.org (707) 565- 3080 office

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Order No, R1-2018-0034 NPDES No. CA0022977 WDID No. 1B84032OSON Waste Discharge Requirements for the City of Cloverdale Wastewater Treatment Plant Sonoma County

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Leaking Underground Storage Tanks

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Attachment A
Potential Sources of Contamination Map

Attachment A - Potential Sources of Contamination

Location Map

Legend

- Wastewater Treatment Plants
- Underground Storage Tanks (Leaking)
- Hazardous Spills
- Sanitary Sewer Overflows
- Wastewater Discharge To Land
- Mines (Office of Reclamation)
- Wineries - Sonoma
- Wineries - Mendocino
- Fire History - 2017 to 2022
- Dry Creek
- Russian River
- Sub Watershed Selection
- 2,500' Buffer on Collector 5

REDWOOD VALLEY (2017)

RANCH (2018)

RIVER (2018)

POCKET (2017)

WALBRIDGE (2020)

KINCADE (2019)

TUBBS (2017)

Van Arsdale Reservoir

Lake Pillsbury

Lake Mendocino

Coyote Valley Dam

Lake Sonoma

Warm Springs Dam

Mendocino County

Sonoma County

Lake County

Napa County

Healdsburg Area Insert

2,500' Buffer on Collector 5

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This map document and associated data are distributed for informational purposes only "AS-IS" at the published scale and provided without warranty of any kind expressed or implied. The positional accuracy of the data is approximate and not intended to represent survey map accuracy. The Sonoma County Water Agency assumes no responsibility arising from use of this information.

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Sonoma Water

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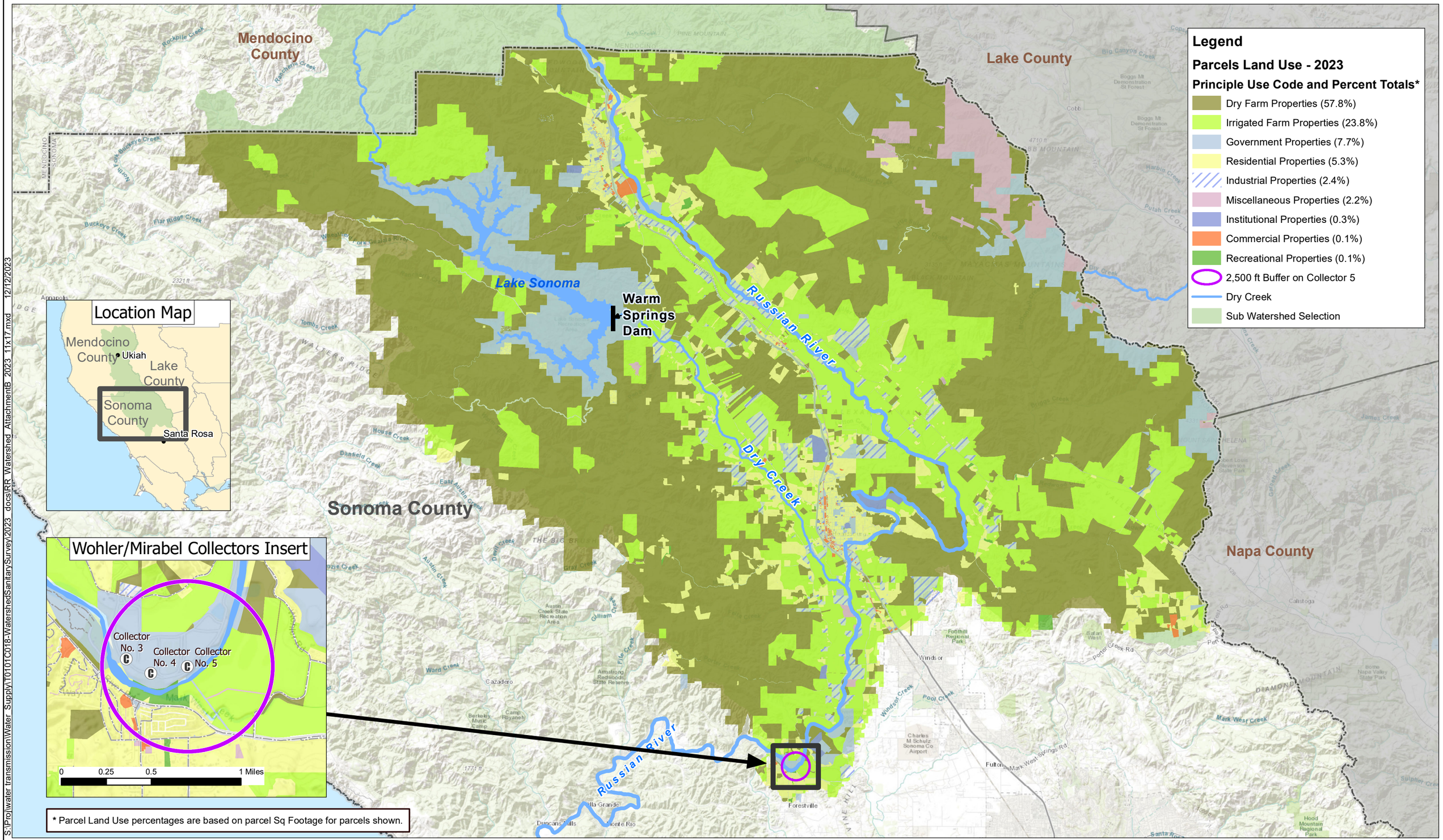
Attachment B
Land Use by Parcel Map



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Attachment B - Land Use by Parcel

DISCLAIMER

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0 2.5 5 10 Miles

Sonoma Water

Attachment C
Aerial Photos

ATTACHMENT C AERIAL PHOTOS

Photo #1. Mirabel/Wolher Area 2012

Photo #2. Mirabel/Wolher Area 2018

Photo #3. Mirabel/Wolher Area 2023

Photo #4. Mirabel to Healdsburg WWTP 2012

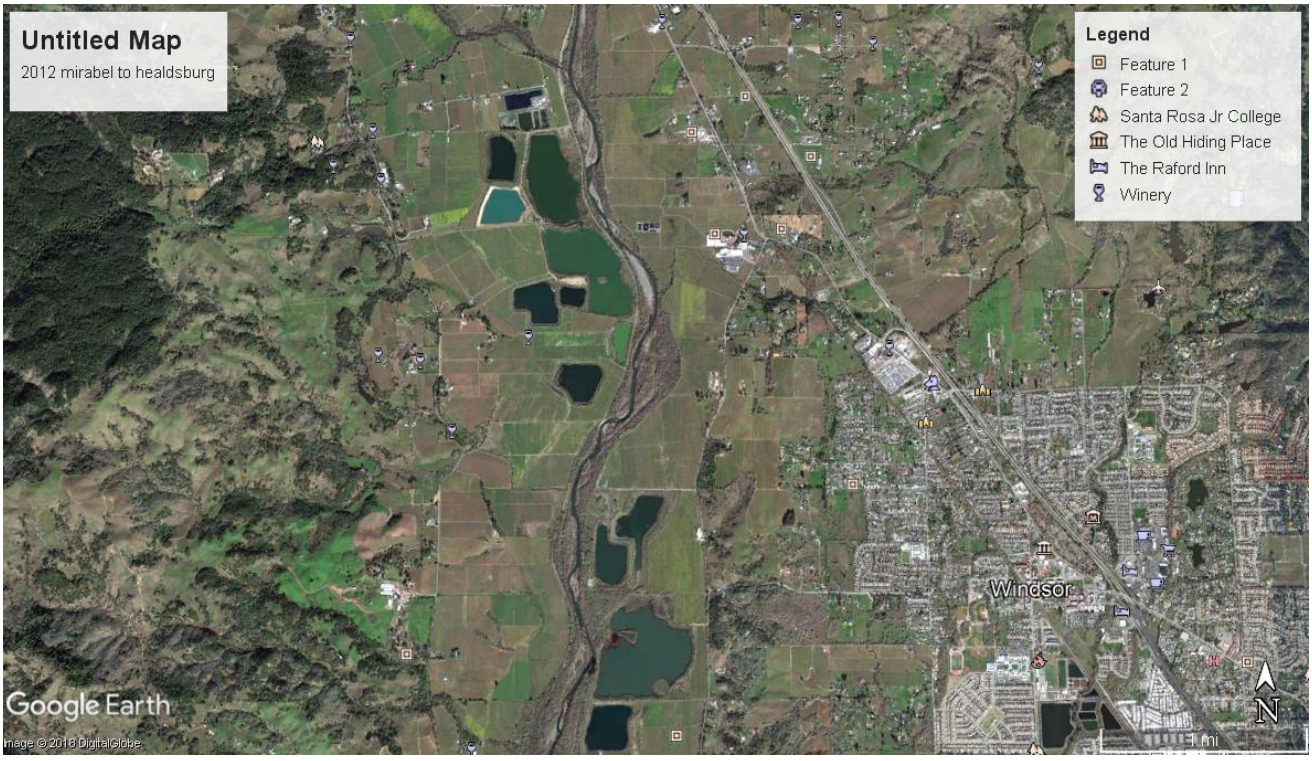


Photo #5. Mirabel to Healdsburg WWTP 2018

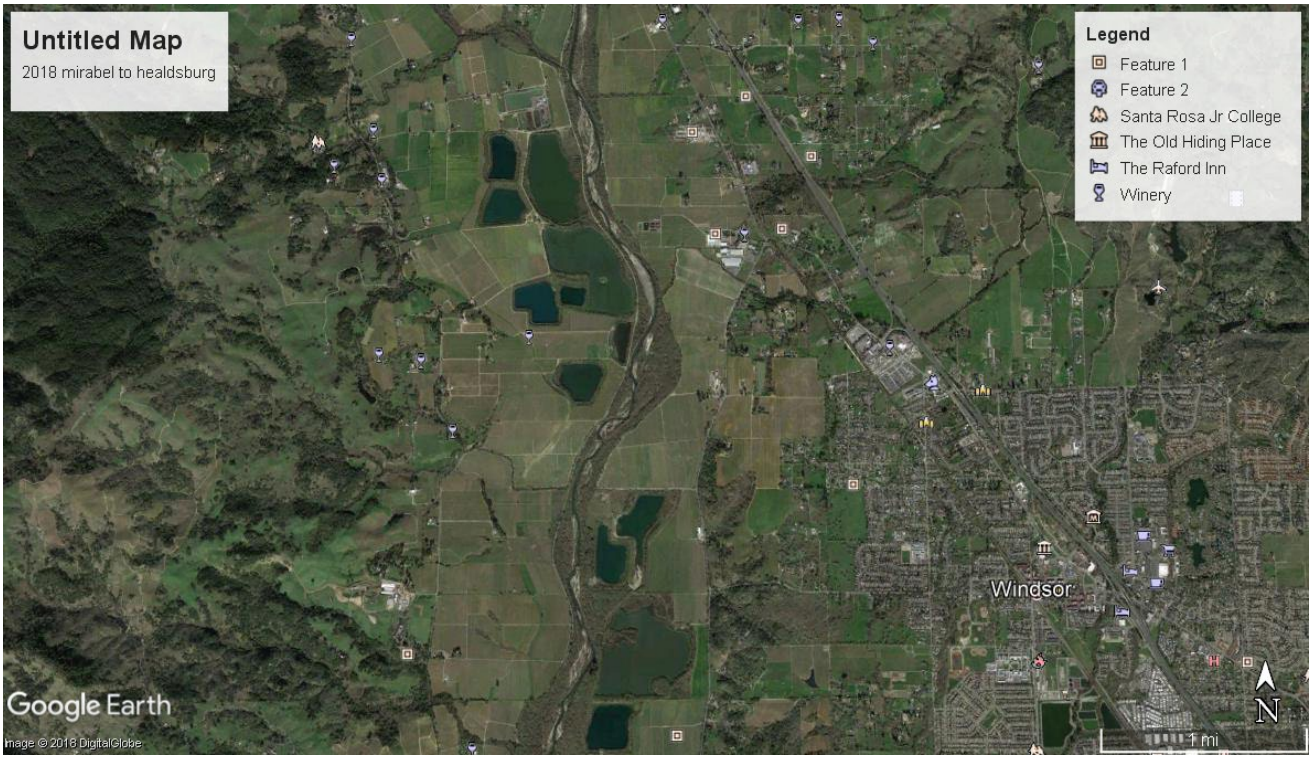


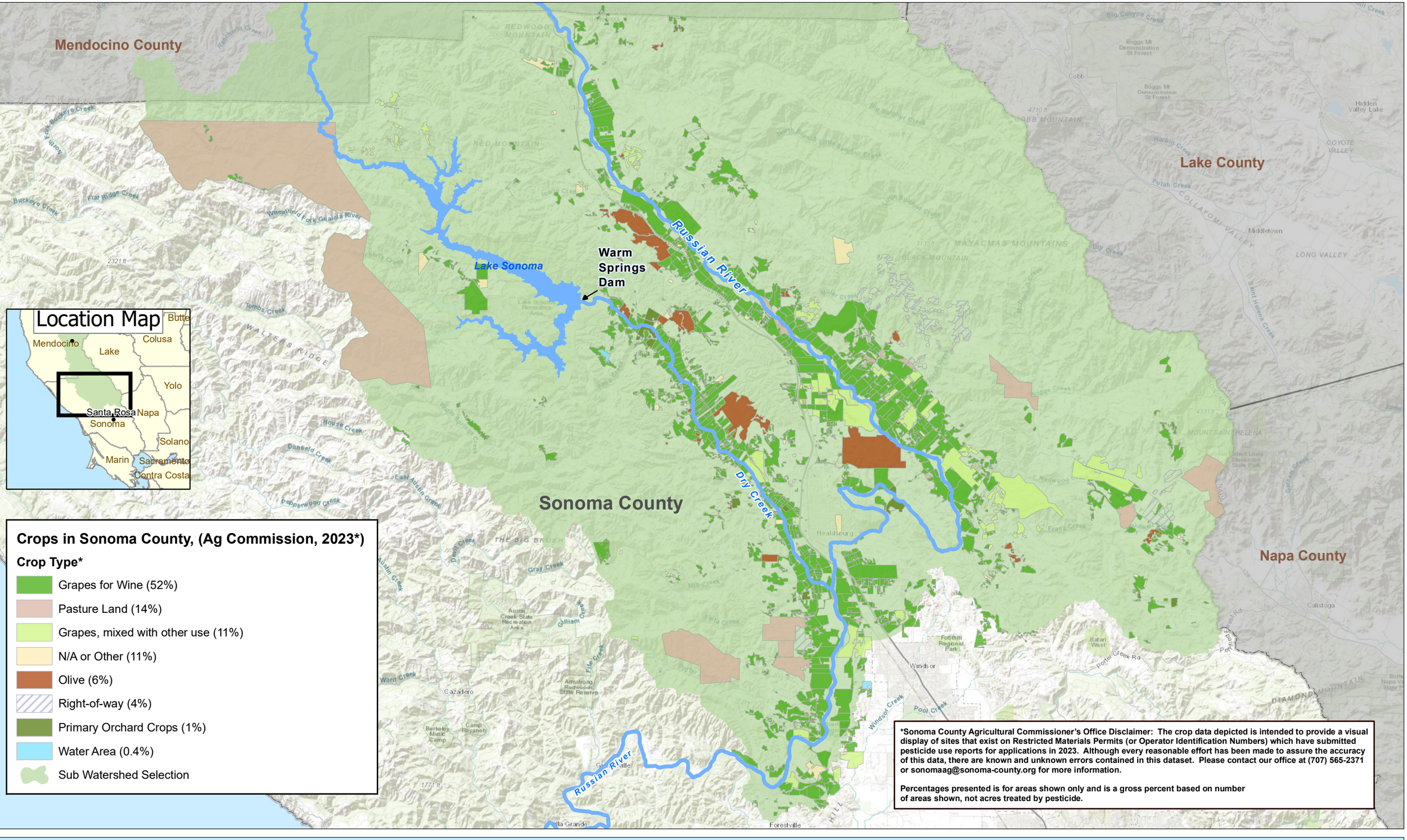
Photo #6. Mirabel to Healdsburg WWTP 2023

Photo #7. Healdsburg Area 2012

Photo #8. Healdsburg Area 2018

Photo #9 Healdsburg Area 2023

Attachment D
Orchards and Field Crops Map



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Attachment D - Orchards and Field Crops

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0 1.25 2.5 5 Miles

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