

River Monitoring Plan for the Yuba River Watershed



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List of Acronyms

- SYRCL – South Yuba River Citizens League
- QAPP – Quality Assurance Project Plan
- SWRCB – State Water Resources Control Board
- CEDEN – California Environmental Data Exchange Network
- CWA – Clean Water Act
- PAMP – Principal Area of Mine Pollution
- TOMS – Topographically Occurring Mine Symbols
- FERC – Federal Energy Regulatory Commission
- YCWA – Yuba County Water Agency
- PG&E – Pacific Gas & Electric
- NID – Nevada Irrigation District
- CDFW – California Department of Fish and Wildlife
- BMI – Benthic Macroinvertebrates
- CNDDDB – California Natural Diversity Database

Introduction

The South Yuba River Citizens League’s (SYRCL) River Monitoring Plan addresses the most current, pressing water quality needs in the Yuba River watershed. Since 2000, SYRCL’s water quality monitoring efforts have been guided by current and historic impacts. SYRCL has developed and completed annual monitoring goals and is guided by a multi-year plan that assures continuity, direction, and program longevity. The goal of SYRCL’s River Monitoring Plan (hereinafter “the Plan”) is to document and justify the need for water quality protection and remediation efforts through targeted data collection efforts. It accomplishes this by posing, and answering, a series of questions using scientifically defensible data collection methods. The monitoring plan is built upon a framework that:

- emphasizes specific water quality concerns
- investigates the questions being examined
- determines the data that will be collected and how it will be used
- establishes SYRCL’s implementation priorities

This plan builds on over 20 years of water quality and citizen science data collection efforts and is guided by SYRCL’s members and volunteers, scientists, and the Yuba/Bear Monitoring Technical Advisory Committee. It incorporates watershed-wide strategies and accomplishments, providing a foundation for SYRCL’s ongoing water quality monitoring efforts. Our future efforts to monitor water quality will be guided by this multi-year plan and will allow SYRCL and its partners to address the most pressing issues in the Yuba watershed, through both community and scientifically driven studies.

A Citizen Science Framework

Over the last 20 years, SYRCL’s River Monitoring Program has inspired nearly 400 volunteers to join our team to monitor water quality across the watershed. Most volunteers complete a two-day training and visit sites once a month, for nine months of the year. Volunteers who do not secure a site often accompany SYRCL science staff to work on special projects, sampling during storm events, assessing meadow restoration and floodplain success, or providing office and data entry support. Each season our volunteers log over a thousand hours and hundreds of miles in support of providing accurate and high-quality data. Volunteers carry a pack full of scientific equipment allowing them to sample the water for temperature, pH, conductivity, turbidity, and dissolved oxygen. These samples tell us about the health of our watershed and the suitability of our streams to support aquatic life and provide safe environments for recreation.

Monitoring Program Highlights

- Began in 2000
- Over 1,400 volunteer hours per year
- Volunteer time has contributed over \$35,000 of in-kind support
- 40+ monitoring sites per year

Plan Overview

Water quality monitoring and the data it produces provides the scientific basis for management and action in the Yuba River watershed. The data produces a defensible rationale for funding requests that are translated into partnerships and projects aimed at safeguarding and restoring the Yuba River watershed. Our River Monitoring Program increases our capacity by over 40 volunteers a month and allows SYRCL to directly address our mission – to unite the community to protect and restore the Yuba River watershed. Samples collected in the field are analyzed for water quality parameters and the data is reviewed and quality controlled by SYRCL through the [Quality Assurance Project Plan \(QAPP\)](#), approved by the State Water Resources Control Board (SWRCB). The data is online at RiverDB.org and submitted to the [California Environmental Data Exchange Network \(CEDEN\)](#) as a resource for many government and non-profit entities involved with stewardship of our aquatic resources.

SYRCL’s Plan articulates very specific concerns, questions to investigate, anticipated outcomes, methods to follow during investigation and exploration of constraints or challenges. These are discussed in detail in the Plan and cover specific investigation areas:

1. Long-Term Monitoring Stations
2. Mine Land Streams
3. Dam-affected Reaches
4. Restoration Success Monitoring
5. Development Impacts in the upper South Yuba River Watershed
6. Bacterial Contamination of Recreational Waters
7. Nutrient and Chemical Runoff
8. Invasive and Sensitive Species

This monitoring Plan will be implemented in phases, as funding becomes available through grants, collaborations, and SYRCL’s fundraising efforts. The River Monitoring Plan underscores SYRCL’s commitment to monitor baseline conditions across the watershed and address specific questions about water quality resulting from past data analysis and/or citizen concerns. SYRCL will also continue its work with important stakeholders such as local government, non-profit organizations, state and federal agencies, and universities to respond to concerns about water quality throughout the Yuba River watershed.

Plan Implementation

To date, SYRCL has conducted water quality investigations at over 150 sites within the Yuba River watershed (Figure 1).

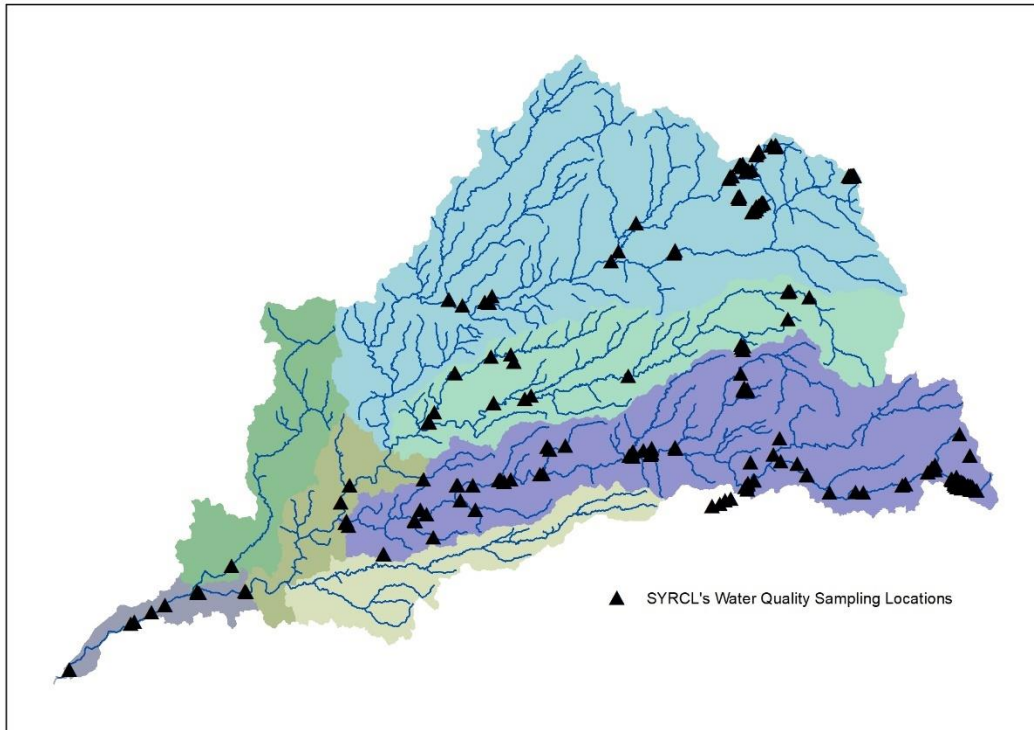


Figure 1. All of SYRCL's water quality monitoring locations since 2000.

SYRCL has successfully raised funds for or completed the following efforts:

1. Long-term Monitoring

- RL Bushway Master's Thesis (2014)
- Continuous temperature monitoring at 25 locations (2007-present)
- Stream Surveys (2000s)

2. Mine Land Streams

- Spring and Shady creeks/ San Juan Ridge Mine: sediment and mercury loading study and foothill yellow legged frog surveys (2013-2018)
- Scotchman Creek/Alpha and Omega Diggins: sediment and mercury loading study (2015-2018)
- Malakoff Diggings: work collaboratively with The Sierra Fund on Humbug Creek and Malakoff Diggings (2014)
- Relief Hill: work with the Tahoe National Forest to monitor water quality before and after remediation efforts (2016-present)
- Tippe Canoe and Grizzly Creek: baseline mercury and sediment data (2018-2019)

3. Dam-affected Reaches

- Continuous temperature monitoring above and below key dam locations (2007-present)
- Dam Relicensing: The Yuba-Bear Drum-Spaulding and Yuba River Development Projects (*ongoing*)

4. Restoration Success Monitoring (water quality)

- Loney and Upper Loney Stream Flow and Water Quality (2014-present)
- Van Norden Meadow Stream Flow, Water Quality, Benthic Macroinvertebrates (BMI), and Periphyton studies (2012-present)
- Hallwood: mercury monitoring before and after restoration (2019-present)
- Long Bar: mercury monitoring before and after restoration (2020-present)
- Relief Hill Mine Remediation Monitoring (*see also Mine Land Streams*) (2016-present)

5. Development Impacts in the Upper South Yuba River Watershed

- Upper Castle Creek Salinity Study (2019-present)
- I-80 Salinity Study (2016-present)
- Algae monitoring (2000s)

6. Bacterial Contamination of Recreational Waters

- State of California Safe to Swim E. coli Study (2008-2014)
- Annual E. coli monitoring at major swimming holes (2015-present)

7. Nutrient and Chemical Run-off

- *Growing Green for the Yuba* workshops and webinars (2014-present)
- Addition of nitrate and phosphate sampling to River Monitoring Program (2015-present)

8. Invasive and Sensitive Species

- Aquatic Invasive Species Vulnerability Assessment and Prevention Plan for Tahoe National Forest Reservoirs (2017-2020)
- Identification and monitoring of invasive species populations (2013-present)

Areas of Investigation

1. Long-term Monitoring Stations

Concern

Baseline water quality conditions in the Yuba River watershed may change over time, from season to season, and from location to location. Understanding these differences is important in order to work effectively as stewards and advocates of a healthy watershed.

Questions

1. Is water quality changing at historically healthy or stable sites?
2. What are the baseline conditions for conventional water quality parameters that could be useful in assessing water quality impacts?
3. Have all factors impacting the water quality or habitat of the Yuba River watershed been identified?

Expected Outcomes

Long-term data analysis, review, and sharing facilitates investigation of many questions, including those stated above. The process will shed light on other areas of investigation and enable discovery of unidentified issues. Identification of water quality trends or issues may result in new investigations or new actions to advocate for the protection of aquatic conditions in the watershed.

Data will be shared, expanding its use, value and impact. Since 2000, SYRCL has provided access to long-term datasets to academic and regulatory institutions to promote trend analysis and to supplement ongoing research efforts in the watershed. Data is made publicly available through RiverDB, SYRCL's online data portal, at presentations at conferences, in project reports, and through direct submittals to regulatory institutions.

Site Selection and Map

Long-term monitoring stations are distributed across the five major sub-basins of the watershed and include sites considered to be the most pristine and sites with long-term datasets (Figure 2). Analysis by Rebecca Bushway and Dr. Carrie Monohan assisted SYRCL in determining which sites should be classified as sentinel or long-term monitoring stations and sites that should be prioritized for remediation actions. Long-term monitoring stations will be located in upper and lower sections of the North, Middle, and South Yuba mainstems and on tributaries in an effort to cover a broad range of elevations and conditions throughout the watershed.

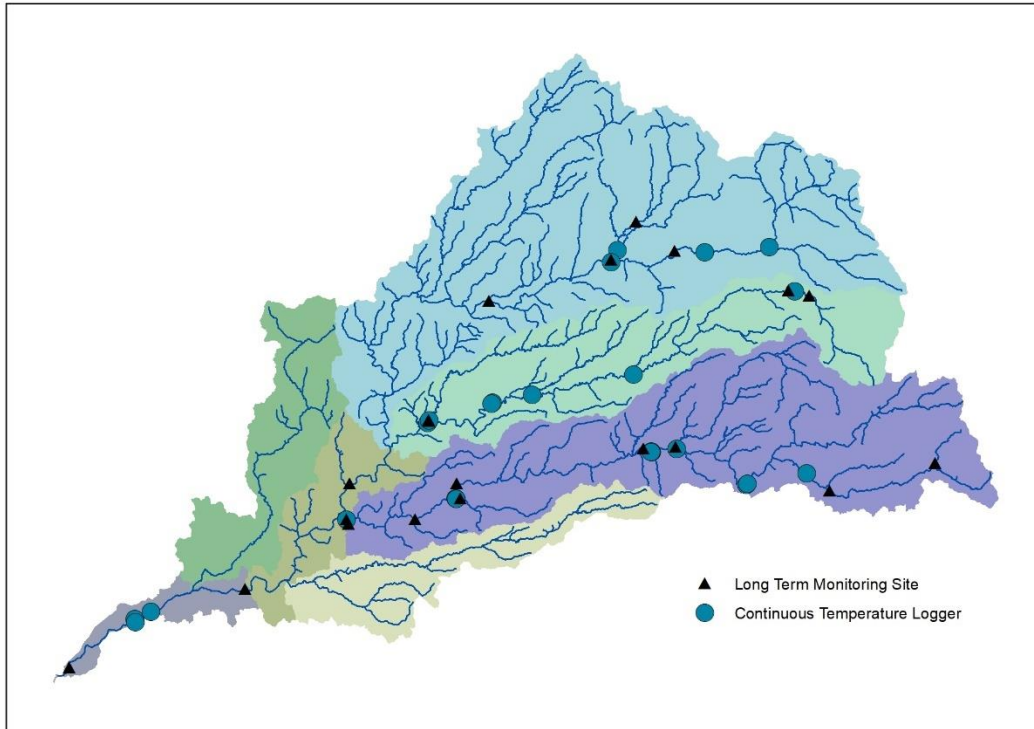


Figure 2. Long Term Monitoring Stations in the Yuba River watershed.

Methods

Long-term monitoring consists of monthly testing for conventional water quality parameters (temperature, conductivity, pH, dissolved oxygen, and turbidity) between March and November. Since 2007, continuous temperature monitoring equipment is installed annually at up to 25 locations across the watershed. Additionally, sites are evaluated for the presence of species on the sensitive and invasive species lists.

Priorities, Constraints and Phased Implementation

Based on past monitoring activities of this type and expected competition for resources with other areas of investigation, the number of sentinel sites should not exceed 20. Some sites will be snowbound during the winter months, especially from November through March. If there is a need for more detailed monitoring (due to land use change or an unidentified concern), long term monitoring sites may also be included in one or more of the areas of concern outlined in this plan.

2. Mine Land Streams

Concern

Abandoned mine lands are sources of contamination that degrade water quality and habitat in the Yuba River watershed. The Yuba River watershed contains hundreds of abandoned mines that conspicuously impact numerous streams. Mine-impacted streams are waterways that receive discharge or runoff from abandoned mine features, such as tunnels or shafts; or from mine-impacted landscapes, such as areas without topsoil; or from erosion of mine waste or tailings piles.

Questions

1. Are mine-impacted streams transporting contaminants? (e.g. mercury, copper, nickel)
2. Is stream habitat degraded from elevated sediment transported from mine impacted landscapes?
3. Are there elevated concentrations of metals in the soil or deposited sediments that are contributing to degraded water quality?

Expected Outcomes

Within the Clean Water Act (CWA), section 303(d) requires states, territories, and authorized tribes to develop, and update every two years, impaired or threatened waters subject to pollution. Our data is used to identify streams that exceed California water quality standards for mercury and other constituents. SYRCL will submit data to CEDEN for inclusion in the state's biennial assessment of available data and revision of 303(d) listed water bodies. Water quality information on mine-impacted streams will be used to promote remediation plans through coordination with landowners or regulatory authorities (e.g. Central Valley Region Water Quality Control Board). Resulting data will also be used to prioritize abandoned mine lands for site-specific remediation actions. The appropriate remediation techniques for abandoned mines, such as erosion control, revegetation, sediment retention and/or hot spot removal, will be evaluated using water quality and soil sampling data.

Site Selection and Map

A comprehensive list of mine-impacted streams was identified by overlaying publicly available GIS layers (e.g PAMP (Principal Area of Mine Pollution) and TOMS (Topographically Occurring Mine Symbols)). By identifying a comprehensive list of potentially impacted water bodies, mine impacted streams can be prioritized for targeted investigation (Figure 3).

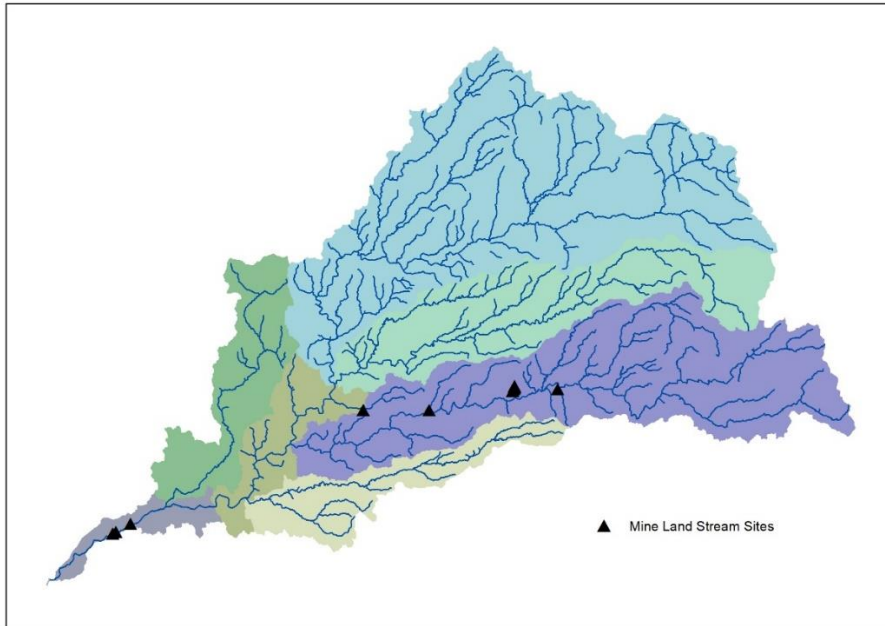


Figure 3. Priority mine impacted streams in the Yuba River watershed.

Methods

Mine impacted streams require baseline monitoring and monitoring during storms when sediment and metals are mobilized. Storm-event monitoring and flow measurements will be used to quantify the concentration and load of contaminants coming from mine impacted areas to inform remediation techniques. Water samples need to be analyzed for total and dissolved metals to determine how metals are being transported and in what form. In addition, collecting soil samples of potential hot spots is an effective way to identify source areas of contamination. Foothill yellow-legged frog surveys can be used to evaluate the condition of a sensitive aquatic species. BMI sampling of reaches above and below mine impacted reaches can be used to determine the impact of the mine lands on aquatic habitat.

Priorities, Constraints and Phased Implementation

Based on known conspicuous impacts, the following mine-land impacted streams have been prioritized for monitoring: Humbug Creek, Spring Creek, Shady Creek, and Scotchman Creek. A phased approach will be implemented to determine if discharge is contaminated with elevated levels of metals.

If the presence of elevated metals in discharge is identified, a more comprehensive approach will follow; this will involve collection of samples during multiple storm events and continuous monitoring of stage and discharge to calculate loads. Samples should be sent to a trace metals lab for mercury analysis, where the detection limits are lower than the regulatory criteria of 50 ng/L. This means that a 48-hour hold time must not be exceeded and that samples are typically sent overnight on ice following collection. Trace metal sampling is constrained by the cost of laboratory testing (approximately \$100 per sample, plus shipping) and more comprehensive monitoring including additional costs of equipment and staffing.

3. Dam-affected Reaches

Concern

Dams and diversions in the Yuba River watershed impair water quality and habitat conditions in downstream reaches through changes in the timing and amount of streamflow. In addition, dams impair the passage of sediment, organic material and aquatic organisms.

Questions

1. Are flows in compliance with terms of licenses from the Federal Energy Regulatory Commission (FERC) or SWRCB?
2. Do water temperatures fall within acceptable thresholds and are high temperatures mitigated by increased releases?
3. Are levels of dissolved oxygen and pH above or below accepted thresholds?
4. Are foothill yellow legged frog populations present in all life stages?
5. Does algal biomass impair the health of the aquatic ecosystem?
6. Do invertebrate communities indicate healthy stream conditions?
7. Are native fish species present and at expected abundances, and responding as expected to enhanced flows?

Expected Outcomes

SYRCL will use monitoring data and information collected and reported by FERC licensees to hold them (Yuba County Water Agency (YCWA), Pacific Gas & Electric (PG&E) and Nevada Irrigation District (NID)) accountable to license terms designed to provide environmental and recreational benefits. Data will be shared with regulatory agencies such as FERC, the US Forest Service, the California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service, and the SWRCB in conjunction with FERC relicensing and required monitoring.

Site Selection and Map

Collection and use of data will result in productive consultation meetings between licensees and regulators. Data could be used, as needed, to advocate for additional monitoring or enhancement measures. In the case of non-FERC dams, such as Englebright, and private dams not associated with hydropower, data will be used to evaluate impacts of the dams and advocate for improving stream and habitat conditions (Figure 4).

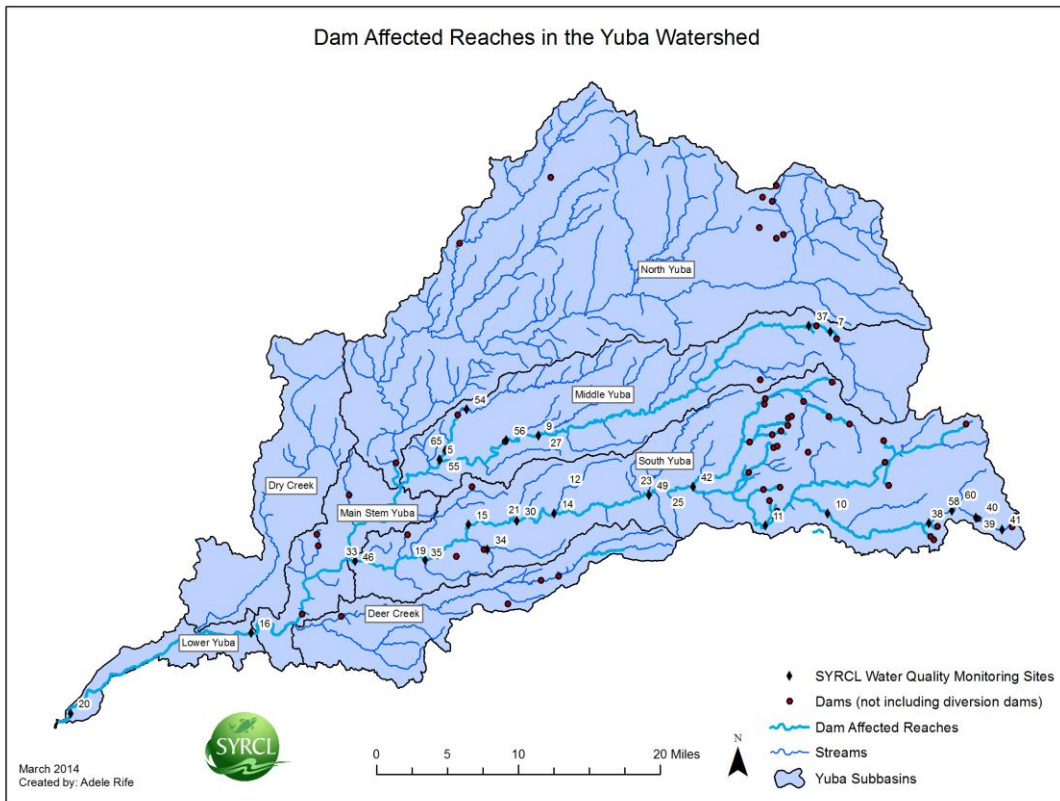


Figure 4. Dam affected reaches in the Yuba River watershed.

Methods

SYRCL will monitor flow data reported from licensees (available online) and review reports and filings associated with each FERC license. Data collection consists of annual deployment of data-logging temperature sensors (May to October), water quality monitoring, bioassessment (algae and BMIs), and sensitive and invasive species surveys. Some monitoring stations will be selected for diurnal surveys of temperature, pH and dissolved oxygen. SYRCL’s field work will augment or fill gaps in monitoring conducted by licensees, and where needed, be used to advocate for additional monitoring by licensees.

Priorities, Constraints, and Phased Implementation

Immediate priorities for monitoring dam-affected reaches include documenting temperature and algal conditions. For the reaches downstream of the dams owned by NID, YCWA, and PG&E, the monitoring associated with the pending new licenses has not yet begun. For other parameters, such as BMI surveys, a baseline has been established for some reaches, but future monitoring by SYRCL is needed to evaluate change. SYRCL will advocate for the licensee or regulatory agencies to conduct the necessary monitoring and for SYRCL to obtain copies of the resulting data.

4. Restoration Success Monitoring

Concern

As restoration or remediation projects are implemented, it is critical to document whether or not the project has met its stated goals. Many river, stream, or wetland restoration projects set water quality goals, such as improved water temperatures, improved flow, decreased turbidity, etc. SYRCL is committed to quantifying these outcomes so that we can continue to learn from restoration projects as they are implemented.

Questions

Are restoration or remediation actions meeting water quality goals?

Expected Outcomes

The expected outcomes of restoration success monitoring will be the adoption of an adaptive management framework for restoration or remediation projects where SYRCL is involved. If the data we collect shows a different outcome than expected, we will work to understand why and then adjust our projects in order to better achieve our restoration or remediation goal.

Site Selection and Map

Currently, SYRCL collects water quality data in support of restoration projects across the watershed, from our headwater meadows, our forest health projects, all the way down to our lower Yuba restoration projects. Site selection is dependent on where restoration projects are occurring and what questions are being asked at specific sites.

Methods

Methods for assessing whether or not a project is meeting its restoration goals in terms of water quality can range from installation and monitoring of stream gages and groundwater wells, collecting turbidity and TSS data, to collecting samples to be analyzed for heavy metals, such as mercury. The method employed at any restoration site will be selected based on site conditions and project specific questions.

Priorities, Constraints, and Phased Implementation

Priorities and constraints for this question are based on site specific project conditions and whether or not monitoring funding is available for the restoration or remediation project.

5. Development Impacts in the Upper South Yuba River Watershed

Concern

The upper South Yuba River is a sensitive high-elevation environment with multiple sources of potential impacts on water quality and habitat. Potential sources for these impacts include Interstate 80, ski resorts, the transcontinental railroad, the trans-Sierra Nevada Fuel Pipeline, small impoundments, and discharge from septic systems and the local wastewater treatment facility. Any impacts or alterations to the headwaters region have the potential to impact the entire South Yuba River, and yet the upper Yuba River is not receiving adequate protection.

Questions

1. Do water quality impairments in the upper South Yuba River warrant listing under Section 303(d) of the CWA?
2. Does water chemistry (chloride, pH, dissolved oxygen, etc.) reflect impairment from identified sources?
3. Does algal biomass and community structure reflect impairment?
4. Does invertebrate community structure indicate impairment?
5. What is the fish assemblage (native and non-native)?

Expected Outcomes

Data collected will be used to document impairment of water quality or habitat conditions and will be submitted to the CDFW and the SWRCB. Findings will also be shared with local stakeholders such as the Donner Summit Public Utilities District, ski area owners, and homeowners' associations for the purpose of identifying actions for protection, restoration or mitigation in the upper South Yuba River.

Site Selection and Map

SYRCL has established monitoring locations in the upper South Yuba River and its tributaries (Figure 5). Mainstem sites are located above and below Van Norden Meadow, above and below the wastewater discharge location, and distributed down the South Yuba River along I-80. The tributaries, Upper and Lower Castle Creek, are of comparative size and elevation and will be analyzed as paired watersheds to investigate impacts from I-80 and other developments on Upper Castle Creek.

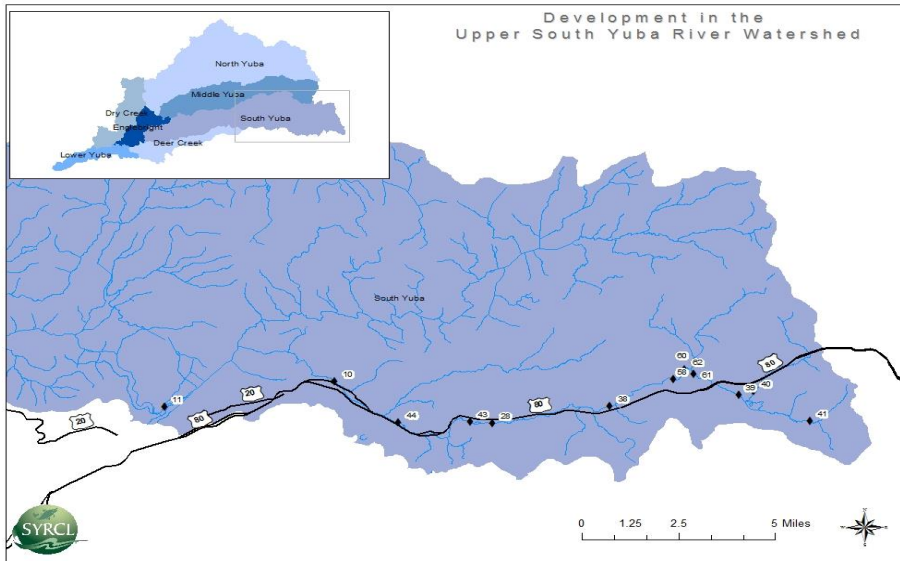


Figure 5. Map of SYRCL's River Monitoring sites in the upper South Yuba River watershed.

Methods

A variety of methods will be employed to quantify impacts from development in the upper South Yuba River including: algae monitoring, benthic macroinvertebrate sampling, sodium chloride sampling for baseline and spring run-off events, testing for other road-related pollutants, fish surveys, and discharge and temperature sampling. These methods will be phased based on the specific impact being addressed (e.g. sodium chloride will be sampled to address concerns about salt application to I-80 during the winter months) and will supplement SYRCL's monthly monitoring program which tests for water temperature, pH, dissolved oxygen, conductivity, and turbidity.

Priorities, Constraints, and Phased Implementation

The priority for the upper South Yuba will be acquisition and submittal of data to be used by the SWRCB for determining whether or not the upper South Yuba River should be added to the CWA 303(d) list of polluted water bodies. Target data that could potentially lead to a determination by the SWRCB include temperature, pH, dissolved oxygen, chloride and other chemicals. Monitoring will include documenting water quality impacts related to winter road maintenance and "first flush" events. Data to be reviewed and submitted will include that collected by the Donner Summit PUD as part of regulations associated with their wastewater treatment facility. Listing under the CWA by the SWRCB would bring additional resources to this investigation. Regardless, SYRCL will analyze data to inform subsequent phases. A characterization of habitat conditions will be informed by water quality surveys and bioassessment. A thorough survey of sensitive and invasive species is also a priority. Subsequent phases of the investigation are expected to involve responsible entities and local stakeholders to address questions necessary to develop remediation or habitat restoration actions. Some specific areas of investigation will be delayed due to constraints related to capacity, funding and competing priorities.

6. Bacterial Contamination of Recreational Waters

Concern

Is the Yuba safe to swim and play in?

Questions

1. Are waters contaminated with bacteria beyond state and federal standards?
2. What are the health risks to people in contact with the water?
3. What do the types of bacteria infer about pollution sources?

Expected Outcomes

The results of bacterial sampling will be used to communicate to the public that popular locations for swimming are being tested for bacteria. SYRCL will alert the public and authorities in the event that potential health risks are detected. If results indicate contamination, SYRCL will advocate for more testing, more intense investigation, public notices as appropriate, and remediation of the pollution source with the Regional Water Quality Control Board, the California Department of Health Safety, and Nevada County (Departments of Public Health and Environmental Health). A special page at RiverDB.org will provide an overview of this investigation and results.

Site Selection and Map

The following locations have been previously tested and will remain on a list of sites for this investigation: South Yuba at Bridgeport, South Yuba at Purdon Crossing, South Yuba at Edwards Crossing, South Yuba at 49 Bridge, and the Oregon Creek Swimming hole (Figure 6). Additional sites may be added to either address concerns for additional swimming locations in the watershed or test for bacterial contamination sources.

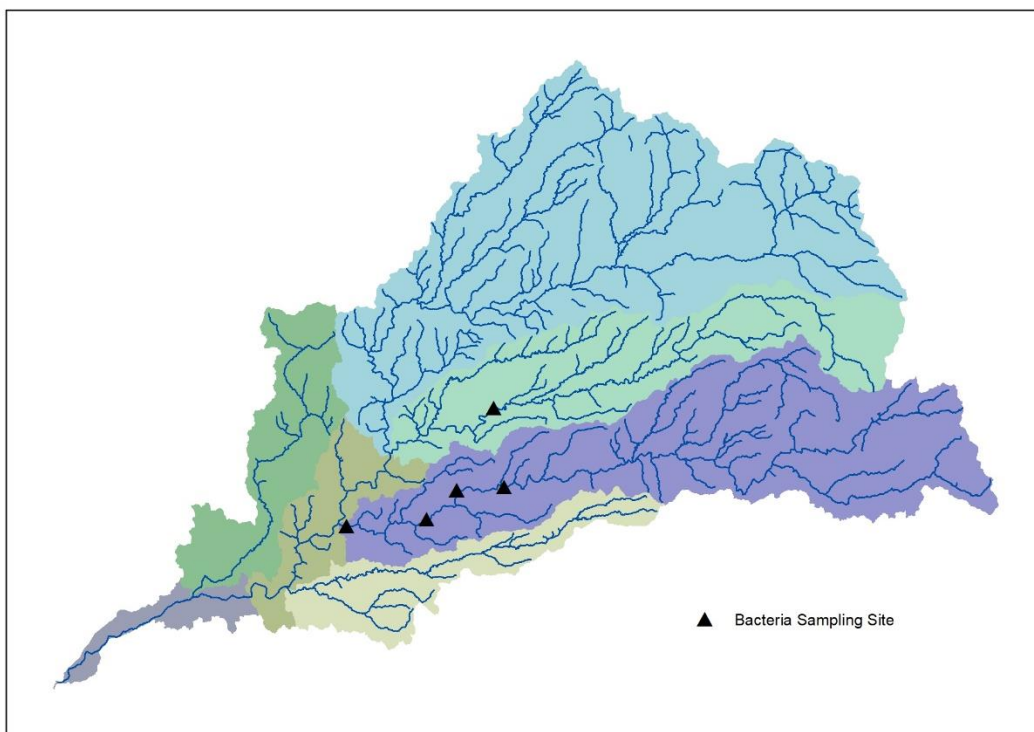


Figure 6. Monthly during the summer season *E. coli* sampling locations collected by SYRCL.

Methods

Basic testing for bacterial contamination consists of lab assays for Total Coliform and *E. coli*. Water samples for Total Coliform and *E. coli* are taken in the field using sterile containers that are kept on ice for a maximum hold time of 8 hours. Testing can be done by two local laboratories for approximately \$30 per sample. Previously, these lab analyses were conducted by the SWRCB’s “Safe to Swim” program at no cost but is now conducted by SYRCL. The “Safe to Swim” program typically conducts monthly sampling in the summer months; however, first flush data is needed to understand seasonal bacterial inputs.

Priorities, Constraints, and Phased Implementation

SYRCL will continue to sample Total Coliform and *E. coli* at five popular swimming holes within the South and Middle Yuba River watersheds. If there are additional issues or sites that need to be addressed, such as the 2019 Yellow Plume Event, SYRCL will test for bacteria using available laboratory resources. We are aware that a certified laboratory would be required for regulatory or legal application of results. Funding sources would need to be identified to support extensive bacteria testing.

7. Nutrient and Chemical Run-off

Concern

Nutrient and chemical inputs from a variety of anthropogenic sources may be contributing to water quality issues, including algal blooms, low oxygen levels, and toxicity.

Questions

1. What is the level and distribution of nutrient and/or chemical loading to the main forks of the Yuba River?
2. What are the sources of nutrient and/or chemical pollution and opportunities for abatement?
3. What is the relationship between nutrient and/or chemical inputs and algal blooms or other water quality impairments?

Expected Outcomes

The desired outcomes of this area of investigation are to determine the source, frequency, and distribution of nutrient and chemical concerns in our watershed and to use that information to support direct actions by SYRCL to protect the river from nutrient and chemical sources that degrade water quality. If nutrients and chemicals are found to be persistent, data will be shared with the SWRCB for the purposes of determining 303(d) listing under the CWA.

Site Selection and Map

Streams along roadways, areas of high urban density or agricultural lands will be targeted in this area of investigation. Nitrates are sampled at a subset of monthly River Monitoring locations.

Methods

Water samples will be taken directly upstream and downstream from a potential source to determine whether inputs from that source are directly affecting nutrient or chemical loading. Nutrient or chemical samples will be tested in a certified laboratory whenever data may be used in a regulatory or legal context. Algal biomass may be monitored at certain sites to correlate with nutrients in conjunction with characterizing nutrient levels in various sections of river. SYRCL piloted an algal bioassessment method in 2008 focused on developing a repeatable method of surveying algal cover using volunteers.

Priorities, Constraints, and Phased Implementation

Priorities for nutrient and chemical analysis are streams that are directly downstream of roadways, agricultural, or urbanized environments where other water quality concerns are documented. Specifically, unregulated agriculture, like large illegal cannabis grows, or the stretch of I-80 that runs along the upper South Yuba River, may be significant contributors of chemical and nutrient runoff. Because of the expense related to this type of sampling, any sampling that directly targets nutrient or chemical concerns will be implemented as funding becomes available. This additional monitoring will be accomplished through grant-writing or fundraising campaigns. Algal bioassessment could occur at 1-3 sites, annually, with limited resources if deemed valuable for long-term monitoring.

8. Invasive and Sensitive Species

Concern

The spread of invasive species and the decline of sensitive species in the Yuba River watershed are occurring with rates and patterns that are not known, and without an understanding of these changing conditions we will not be able to effectively protect and restore watershed health.

Questions

1. Where are invasive species increasing or declining in aquatic and riparian communities in the Yuba River watershed?
2. Is the increase in invasive species or the decline in sensitive species related to watershed management or other water quality concerns?

Expected Outcomes

By documenting the distribution and spread of invasive species in the watershed, we will be able to prioritize areas for management actions such as weed removal, road closures and advisories. By documenting the occurrence of sensitive species in the watershed, we will be able to improve management actions to protect and restore habitat for those species, as well as increase awareness of sensitive resources in the watershed. Sensitive species data will be shared with the CDFW - California Natural Diversity Database (CNDDDB) (<https://wildlife.ca.gov/Data/CNDDDB>).

Site Selection and Map

Invasive and sensitive species will be monitored at each long-term monitoring station and as an addendum to all river monitoring actions. A map of these locations is not currently available. Additional sites may be selected based on the presence of algal blooms, didymo or rock snot (*Didymosphenia geminate*), foothill yellow-legged frog (*Rana boylei*), Sierra Nevada yellow-legged frog (*Rana sierra*), California red-legged frog (*Rana draytonii*), Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi*), spring run chinook salmon (*Oncorhynchus tshawytscha*), willow flycatcher (*Empidonax traillii*), Sierra Nevada mountain beaver (*Aplodontia rufa californica*), western pond turtle (*Emys marmorata*), and osprey (*Pandion haliaetus*).

Methods

Invasive and sensitive species will be documented by visual observations, and relative cover or abundance will be recorded. If a sensitive species is identified, a GPS position will be recorded and CNDDDB documentation will be filled out. Species identified at river monitoring sites will be associated with the GPS position of that site. Volunteers and staff will be trained in identification of species.

Priorities, Constraints, and Phased Implementation.

Additional training and field surveys will occur as capacity for the program increases with newly obtained grant funds for project specific surveys.

Conclusion and Acknowledgements

SYRCL's water quality monitoring program uses the best available science to understand and quantify water quality issues that arise or are known within the watershed. This program has created broad and rich datasets that have allowed SYRCL to communicate with local governments, local, state, and federal agencies, universities, and other non-profits about the health of the Yuba River and to advocate for and implement projects that improve watershed health. The program was born from a love of the river and an immense amount of community support. Today it is fueled by that same passion for the river through trained citizen scientists who dedicate their time and expertise to help us better understand the river and the entire watershed.

SYRCL would like to thank its members, volunteers and the entire community for sustaining this program and for continuing to support these important data collection efforts with their time, insights, and unrivaled love for the Yuba River watershed.