



**CALAVERAS RIVER
BASELINE WATER QUALITY MONITORING PROGRAM**

FINAL REPORT

Prepared for

**Calaveras County Water District
and
Stockton East Water District**

Submitted by

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Authors Note:

Scope of the Phase II Calaveras River Watershed Monitoring Study

This study includes the results of monitoring that occurred from May 2003 to May 2004 at 56 sites throughout the watershed during the dry and wet seasons. The sites and parameters selected for this study are based on the findings and recommendations from Phase I of the Calaveras River Watershed Plan (CRWMP).

The Phase I Calaveras River Watershed Plan (CRWMP) included outreach to stakeholders to identify potential issues or concerns within the watershed. Physical habitat data for stream sampling stations were included because of the importance of physical habitat integrity to water quality and stream ecosystem function. There are several other existing monitoring programs being carried out in the watershed; 1) Calaveras River Fish Screen Facilities Feasibility Study (CCWD and SEWD); 2) Lower Calaveras River Chinook Salmon and Steelhead Life History Limiting Factor Analysis (Fisheries Foundation of California, Stillwater Science and FWS); and 3) Calaveras River Anadromous Fish Protection Project (DWR). Additionally, a Pit Tag Study is under review. SEWD and CCWD are currently working to develop a Habitat Conservation Plan with NOAA Fisheries for the Calaveras River. It is envisioned that once these on-going studies are complete, they will be incorporated into the Calaveras River Watershed Management Plan. These programs are evaluating the fisheries and habitat issues within the watershed to a much greater extent than the scope for this project allowed.

The original scope of this study included a longer and more intensive sampling regime. Funding limitations caused several aspects of the study to be significantly reduced including: the number of stations, frequency of sampling ($n = 1 - 4$), and the number of parameters. Thus, the project became a screening-level study upon which additional monitoring data could be added to provide the temporal depth necessary for a full study and the data could be statistically validated. These results still provide important background information relative to the concerns expressed by stakeholders during Phase I of the CRWMP. For conservative parameters, such as metals, the limited number of samples can provide a reasonable estimate of the risk of the presence or absence of contamination. The results of this study suggest that the magnitude of concern by stakeholders related to metals is not supported. The presence of non-conservative pollutants in a limited number of samples suggests the need for additional monitoring.

The results of this study will allow the Districts to optimize the monitoring network design and focus on those areas where further sampling is suggested and to eliminate those sites where conservative elements were not detected. The physical habitat data can provide important insights into water quality parameters such as dissolved oxygen, turbidity, temperature, and bacterial contamination. While limited from its original scope, this study retains valuable information for resource managers, those charged with the preservation of water quality within the Calaveras River watershed, and a complement to on-going studies and monitoring programs.

ACRONYMS

BMP – Best Management Practice
BOD – Biochemical Oxygen Demand
BTEX – Benzene, Toluene, Ethylbenzene, and Xylene
CCC – Criterion Continuous Concentration
CCWD – Calaveras County Water District
CDFG – California Department of Fish and Game
CRWMP – Calaveras River Watershed Management Plan
CSBP – California Stream Bioassessment Protocol
CTR – California Toxics Rule
DO – Dissolved Oxygen
HSI – Habitat Suitability Index
LUST – Leaky Underground Storage Tanks
MIB – Methylisoborneol
MTBE – Methyl Tertiary-Butyl Ether
OHV – Off-Highway Vehicle
PCB – Polychlorinated Biphenyl
SEWD – Stockton East Water District
SWRCB – State Water Resources Control Board
THM - Trihalomethane
TKN – Total Kjeldahl Nitrogen
TMDL – Total Maximum Daily Load
TPPH - Total Purgeable Petroleum Hydrocarbons
VOC – Volatile Organic Compound
WMA – Watershed Management Area
WWTP – Wastewater Treatment Plant

NOTE:

To convert from °C to °F: °F = 1.8(°C) + 32

EXECUTIVE SUMMARY

INTRODUCTION AND OVERVIEW

This study follows the completion of Phase I of the Calaveras River Watershed Management Plan. Phase I compiled existing information regarding watershed characteristics and conditions, created stakeholder forums, and collected stakeholder input on issues and opportunities within the watershed. Among the recommendations of Phase I was to conduct a watershed-monitoring program in Phase II to evaluate issues, concerns, and opportunities within the watershed. This study is based on the Baseline Watershed Monitoring Plan and QAPP that was reviewed and approved by stakeholders, Calaveras County Water District, and Stockton East Water District.

The purpose of this document is to present and discuss the findings obtained from the Phase II Water Quality Monitoring Program, to provide recommendations that can be used by CCWD and SEWD to either maintain or improve the condition of the watershed, and to discuss the “Next-Steps.”

This document provides the following:

- An overview of the Watershed Management Program;
- A description of the Calaveras River Watershed, including its primary water and habitat quality issues and how they affect watershed health;
- An assessment of water and habitat quality within the watershed, and a discussion of whether water quality objectives and beneficial uses of the watershed are being met;
- An assessment of potential sources of water quality impacts at major discharge points (e.g., urban and storm water runoff, agriculture, recreation, mining, leaking in-ground septic, and other land uses); and
- Next steps – where do we go from here?

MONITORING RESULTS

The primary concern of both CCWD and SEWD is drinking water quality. Data collected in this limited survey indicate that drinking water quality in the Calaveras River Watershed is acceptable, with the exception of fecal coliform bacteria, which was found in concentrations throughout the watershed that could potentially exceed Basin Plan objectives for water contact recreation and lead to human health concerns. An additional concern of the water districts is whether the water quality in the Calaveras River Watershed is fully supportive of its designated beneficial uses. As mentioned previously, water quality parameters were compared to the Basin Plan Water Quality Objectives and the CTR to assess whether there is the potential for impairment to the designated beneficial uses of the watershed, including aquatic life. This comparison indicated that there is the potential for water quality to be less than optimal with respect to fecal coliform bacteria levels, nutrient concentrations and subsequent eutrophication, dissolved oxygen and surface water temperature. This potential for impairment increased as the waterbody moved from upstream to downstream in the watershed. It is expected that water temperatures will increase and dissolved oxygen levels will decrease as the water flows from the upper watershed down to the valley floor. However, this natural phenomenon might potentially be exacerbated by the absence of an adequate and healthy riparian zone in the watershed. All other parameters were within acceptable limits, with the possible exception of dissolved mercury, which could be explained by artifactual contamination.

Physical habitat assessments were conducted at 36 sampling stations. Six of these stations scored in the optimal range, 18 were suboptimal, and 12 were marginal. A station was not evaluated if the stream channel was dry. These results suggest that habitat conditions within much of the watershed are suitable or capable of sustaining either a cold and / or warmwater fishery. Physical habitat integrity was compromised at several locations throughout portions of the lower, middle, and upper watershed.

The combined effect of high water column temperatures, low flows, and nutrients created optimal conditions for the formation of nuisance levels of floating algal mats and attached algae, which contributed to low levels of dissolved oxygen during the early morning hours.

The influence of development, grazing, and other agricultural practices on the riparian zone, stream bank stability, and stream channel structure was observed throughout the watershed. Minimal or absent riparian vegetation reduced shading and canopy cover, which exacerbated the normal higher surface water temperatures inherent to valley floor conditions and contributes to low flow conditions. Stream bank instability leads to increased rates of sedimentation, which reduces channel structure and depth.

The relatively high Habitat Suitability Index (HSI) scores at several stations suggest that there remains a significant amount of fisheries habitat in the watershed. Six stations received HSI scores greater than 139 (out of 170). Phase II did not include a habitat connectivity assessment to determine whether stations with high HSI scores are isolated or provide a continuous refuge capable of supporting fish populations. Habitat

connectivity is an important component to supporting a sustainable fisheries population, which would be supportive of the designated beneficial uses of the watershed.

CONCLUSIONS AND NEXT STEPS

The Calaveras River Watershed Management Plan (CRWMP) is a continuous adaptive management process. This Phase II report represents the completion of the first iteration of the monitoring and data collection component of the program. The monitoring objectives of Phase II were established through a public stakeholder process where public and agency concerns within the Calaveras River Watershed were identified. This Phase II Monitoring Study was designed to address those concerns. The information in this report provides the necessary feedback to the adaptive management process to develop management actions that will restore and maintain watershed health within the Calaveras River basin.

The purpose of this section is to provide to CRWMP stakeholders the project team conclusions and next steps for future watershed-wide efforts. The best outcome would be for stakeholders to consider at upcoming public forums these and other recommendations for activities that can be undertaken to achieve CRWMP objectives. Public forums are an essential element of the CRWMP for two reasons:

1. The success of CRWMP recommendations will require significant voluntary acceptance and participation of watershed residents and agencies to implement Best Management Practices associated with development, grazing, domestic wastewater disposal (septic tanks), and agricultural practices.
2. There are several other studies and stewardship activities underway within the Calaveras River Watershed that through interaction in a public forum would result in mutual benefit to the CRWMP and these other stewardship efforts.

The monitoring results indicate that there is no evidence to suggest that many of the concerns identified by stakeholders pose serious threats to public health and safety, and that many of the indicators of watershed health are positive. Due to the reduced nature of the study additional monitoring and study is recommended before management actions are developed. Overall, water quality appears to improve as one moves from the lower to upper watershed, with low dissolved oxygen, elevated fecal coliform bacteria, and eutrophication related impacts being the primary concerns throughout the watershed. This assessment is based on a small dataset, with no more than four samples having been collected at any location and, as such, nothing definitive can be stated without additional study. All other parameters were within acceptable limits.

Conclusions and Recommendations:

Dissolved Heavy Metals: Calaveras County and the Sierra foothills have a legacy of mining and mining related activities that have often resulted in environmental impacts that persist long after the activities have ceased. During Phase I meetings, stakeholders

raised concerns regarding the potential for leachate from old tailings to deliver toxic concentrations of dissolved metals to Calaveras River Watershed streams. However Phase II monitoring results suggest there is little evidence of dissolved heavy metals in stream water columns sampled by the project team.

Concentrations of heavy metals in the watershed were compared to applicable water quality criteria (California Toxics Rule Criterion Continuous Concentration – CCC and the Region 5 Basin Plan) and determined to be within acceptable limits. The CCC is based on a long-term exposure (4 day average) and is designed to be protective of aquatic life. The only exceptions were found in Lower Indian Creek, which had elevated concentrations of barium (145 ug/l vs. Basin Plan criterion = 100 ug/l), iron (932 ug/l vs. Basin Plan criterion = 300 ug/l), and manganese (627 ug/l vs. Basin Plan criterion = 50 ug/l). Lower Indian Creek is an intermittent creek and was dry at all subsequent sampling events so we were unable to confirm whether or not these metals are consistently elevated there or whether these values represent a “one-time” event.

Dissolved heavy metals do not appear to negatively impact beneficial uses within any of the Calaveras River Watershed management areas.

Next Steps: The extensive number of tailings piles within the watershed could become a potential source of dissolved metals contamination. Any large mass-wasting event or other disruption of stabilized tailings piles could serve as a possible source of leachate containing high levels of dissolved metals. Future monitoring programs should include sampling to detect any changes in dissolved metal concentrations.

The Phase II study did encounter a possible exception with dissolved mercury concentrations. The California Toxics Rule (CTR) has a criterion of 50 ng/l (0.050 ug/l) for dissolved mercury. This criterion was exceeded in approximately 30% of all samples that were analyzed for dissolved mercury, with the range being 0.06 – 0.7 ug/l. The potential seriousness of these elevated values and the relatively high risk for atmospheric mercury to artifactually contaminate the samples, prompted Tetra Tech to collect a set of samples using ultra-clean technique and a laboratory (Frontier Geosciences, Seattle, WA) that can quantify mercury concentrations as low as 1 ng/l, or 1 part-per trillion. The results from the ultra-clean procedures showed that, indeed, actual mercury samples were much lower (up to an order of magnitude) than originally observed and indicated that mercury was most likely not causing impairment. However due to the acute toxicity of methyl-mercury and its associated tailings from mining related activities, future watershed monitoring samples should continue to include ultra-clean mercury sampling techniques.

Physical Habitat Related Water Quality Impacts: There are currently four on-going investigations on the Calaveras River that are addressing fisheries-related issues. These in-depth studies are envisioned as forming the bases for addressing habitat issues in the CRWMP. The monitoring completed in this study will complement these on-going studies.

Eighty percent of the sampling sites included in the Phase II monitoring program have HSI scores that demonstrate compromised physical habitat integrity. In many cases the conditions are severe enough to have a potentially negative influence on the designated beneficial uses of the watershed as described in the Basin Plan (e.g., fisheries and related water quality parameters). In many cases the combined impact of low dissolved oxygen, high water column temperatures, and low flows contributed to the formation of nuisance levels of floating algal mats and attached algae. These conditions existed at many locations despite low to normal levels of nutrients (phosphorus and nitrogen). The influence of development, grazing, and other agricultural practices on the riparian zone, stream bank stability, and stream channel structure frequently reduced HSI scores throughout the watershed. The elimination of riparian vegetation reduces shading and canopy cover, which increases water temperature and contributes to low flow conditions. Stream bank instability leads to increased rates of sedimentation, which reduces channel structure and depth.

General water quality parameters in the watershed indicate that the surface waters were generally neutral to slightly basic in pH and water temperatures were warmer in the lower watershed, with the range being 16 – 27°C (60.8 – 80.6 °F) and middle watershed, with the range being 10 – 27°C (50 – 80.6 °F), and cooler in the upper watershed, with the range being 8 – 24°C (46.4 – 75.2 °F). Dissolved oxygen levels were impacted at 47% (n = 16) of the sites. Warm and coldwater fisheries are two of the beneficial uses for surface waterbodies in the Calaveras River Watershed (Region 5 Basin Plan). As such, dissolved oxygen concentrations below 5 and 7 mg/l are considered to cause impairment to warm and coldwater fisheries, respectively. Using the more conservative value of 7 mg/l, 47% of the sites visited during the period bracketed by May 2003 and May 2004 had dissolved oxygen levels that were below the 7 mg/l limit. This trend tended to become more prevalent as one moved from the upper watershed to the middle and lower areas of the watershed, with the percentage of low DO values being 21%, 47%, and 78%, respectively. While this is not entirely unexpected for a waterbody as it enters the valley floor, where ambient air temperatures are significantly greater than those found in the higher elevations of the watershed, reduced habitat structure (e.g., riparian zone) might potentially exacerbate the already warm temperatures. Low levels of DO were observed regardless of the season and that the observed values were not representative of the full range of dissolved oxygen at a particular site over a 24-hour oxygen cycle.

Concentrations of nitrogen (nitrate, nitrite, ammonia, total Kjeldahl) and phosphorus (ortho-phosphate) were generally low, with the majority of the analytes being non detectable. Detectable values were generally low and, of those detectable values, 40% were for nitrate (range: 0.05 – 2.2 mg/l); 1% were for nitrite (0.2 mg/l); 11% were for total Kjeldahl nitrogen (range: 1.1 – 6.5 mg/l); 0% were for ammonia; and 1% were for ortho-phosphate (0.14 mg/l). Further investigation is warranted.

Next Steps: Currently, CCWD, SEWD, and other agencies are undertaking detailed habitat studies, which will be used to develop management strategies for the Calaveras River. Voluntary adoption of Best Management Practices through continued interaction with local landowners and producers is a viable option. Resource Conservation Districts

have discovered that grazing and agricultural resource management objectives do not have to exclude or contradict fishery or water quality objectives. The single largest improvement to watershed health in the Calaveras River Watershed would be the adoption of voluntary protocols designed to preserve and restore these valuable habitat components.

Development is proceeding at an increasing pace throughout the watershed. In many cases developments are encroaching upon flood plain and riparian zones of streams. This not only has the potential to affect the stream through a reduced riparian zone and limited access to the flood plain, but might also place property owners at risk to damages from flooding. The CCWD should work with local city and county planning agencies to evaluate the potential for development and adoption of stream setback standards for inclusion in general plans and development ordinances.

Fecal Bacteria: Coliform levels were elevated throughout the watershed, with 32% and 16% of all sites sampled having fecal coliform concentrations that were greater than Basin Plan objectives of 200 and 400 CFU/100 ml. Concentrations were slightly higher in the middle watershed areas than in either the lower or upper areas. The prevalence of grazing activities and their proximity to streams and creeks in the middle watershed when compared to either the upper or lower watershed reaches could be the source of this impact. These results warrant further study.

The Region 5 Basin Plan states that,

“...Waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/ml.”

Neither the number nor the frequency of samples collected during this study meet the requirements for the Basin Plan criterion for fecal coliform. However, the large percentage of elevated values does cause concern that the potential for bacterial impairment of surface waters in the watershed exists.

Next Steps: Human waste has the potential to carry human pathogens; therefore, the relative risk of contamination of fecal coliform from human sources is much higher than the associated risks of contamination from cattle or other mammals. The Phase II monitoring did not identify the source of the fecal coliform contamination.

Additional study should include recently developed analytical methods that allow for source identification of fecal coliform to determine whether it originates from human, livestock, or wildlife sources.

Improved fecal coliform and pathogen source identification sampling techniques should be applied to a limited number of sites where there are potential sources and the exposure risk is greatest. This would support a more focused program of septic tank mitigation.