

Stevens Creek Reservoir Temperature, Turbidity, and
Dissolved Oxygen Study
2020-2021



Valley Water

Clean Water • Healthy Environment • Flood Protection

Environmental Planning

Unit 247

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Background

Since 2015, Valley Water has operated a hypolimnetic oxygenation system (HOS) in Stevens Creek Reservoir during thermal stratification (April – October) to prevent anoxic outlet discharge and improve downstream water quality. The HOS is also part of a pilot study to reduce methylmercury production and bioaccumulation in the reservoir. Though HOS has increased dissolved oxygen (DO) concentrations in outlet discharge from Stevens Creek Reservoir, there is evidence that it may increase turbidity and temperature in the outlet discharge. Though preliminary data suggests that HOS may have an effect on downstream temperature and turbidity, further investigation is required to more definitively assess these effects in comparison to background variation due to reservoir inflow and operations.

Study Goal

This study will assess the effects of HOS on dissolved oxygen (DO), temperature, and turbidity of Stevens Creek Reservoir outlet discharge.

Study questions include:

1. How do the effects of HOS compare to the effects of the reservoir water retention on temperature, DO, and turbidity between the inflow and outlet?
 - a. Does HOS operation increase turbidity and/or temperature in outlet discharge?
2. How do turbidity, temperature, and DO change between the inlet and outlet?
3. How do dissolved oxygen, temperature, and turbidity levels compare at the reservoir outlet and 60 meters downstream of the outlet prior to, during, and after hypolimnetic oxygenation system operation?

Methods

We will deploy YSI EXO2 multiparameter water quality sondes for one year and one month of continuous (15-minute interval) monitoring at the Stevens Creek Reservoir inlet, outlet, and 60 m downstream of the outlet. (Figure 1). Though there are multiple small inflows to Stevens Creek Reservoir, the Stevens Creek inlet provides the most water. Parameters collected during continuous monitoring will include dissolved oxygen (mg/L and % saturation), temperature (C°), turbidity (NTU). Additional parameters will be collected to help assess changes in turbidity and

oxygen including chlorophyll and phycocyanin (turbidity and increases in biomass), and redox potential (indicator of the extent of oxygenation).

Site 1: Stevens Creek upstream of the reservoir at ALERT stream flow gage #5045.

Site 2: Stevens Creek Reservoir drop structure outlet works.

Site 3: Stevens Creek approximately 60 meters downstream of the outlet works.

Deployment

Sondes will be deployed in the creek at Sites 1 and 3 inside protective metal cages that are weight-anchored and attached to wired cables to prevent location movement and or theft during deployment. At Site 2, the sonde will be submerged above the outlet drop structure inside a protective metal cage, weight-anchored, and attached with a wire cable to the adjacent metal fencing to prevent movement and or theft during deployment.

Calibration and Maintenance

During periods of data collection, EXO2 sondes will be removed once per month and taken back to Valley Water facilities for calibration and cleaning. These maintenance activities will cause brief periods of disruption in the dataset lasting up to one day but will prevent sensor drift, biofouling, and data inaccuracy.

High Flows

To prevent instrument damage or loss, sondes will be removed when intense winter storm events are forecasted during the data collection period. Sondes will not be removed or redeployed by staff during intense storm events due to safety reasons.

Data Storage

During each battery check or calibration, data will be downloaded from the sonde to the handheld device and transferred to excel spreadsheets on Valley Water servers for short-term storage. After spreadsheet data undergoes QA/QC, data will be uploaded to the Valley Water EM-IMS database for long-term storage.

QA/QC

EXO2 sondes are equipped with SmartQC mechanisms that assesses individual sensor performance relative to factory-defined performance parameters. SmartQC alerts users when the individual sensor may be starting to drift from factory-defined limits or may require

adjustments or part replacement. SmartQC will be used each calibration period before re-deployment to ensure all sensors are providing reliable, consistent, and replicable data. Additionally, the EXO2 sondes have internal thermistors for quality assurance related to temperature correction.

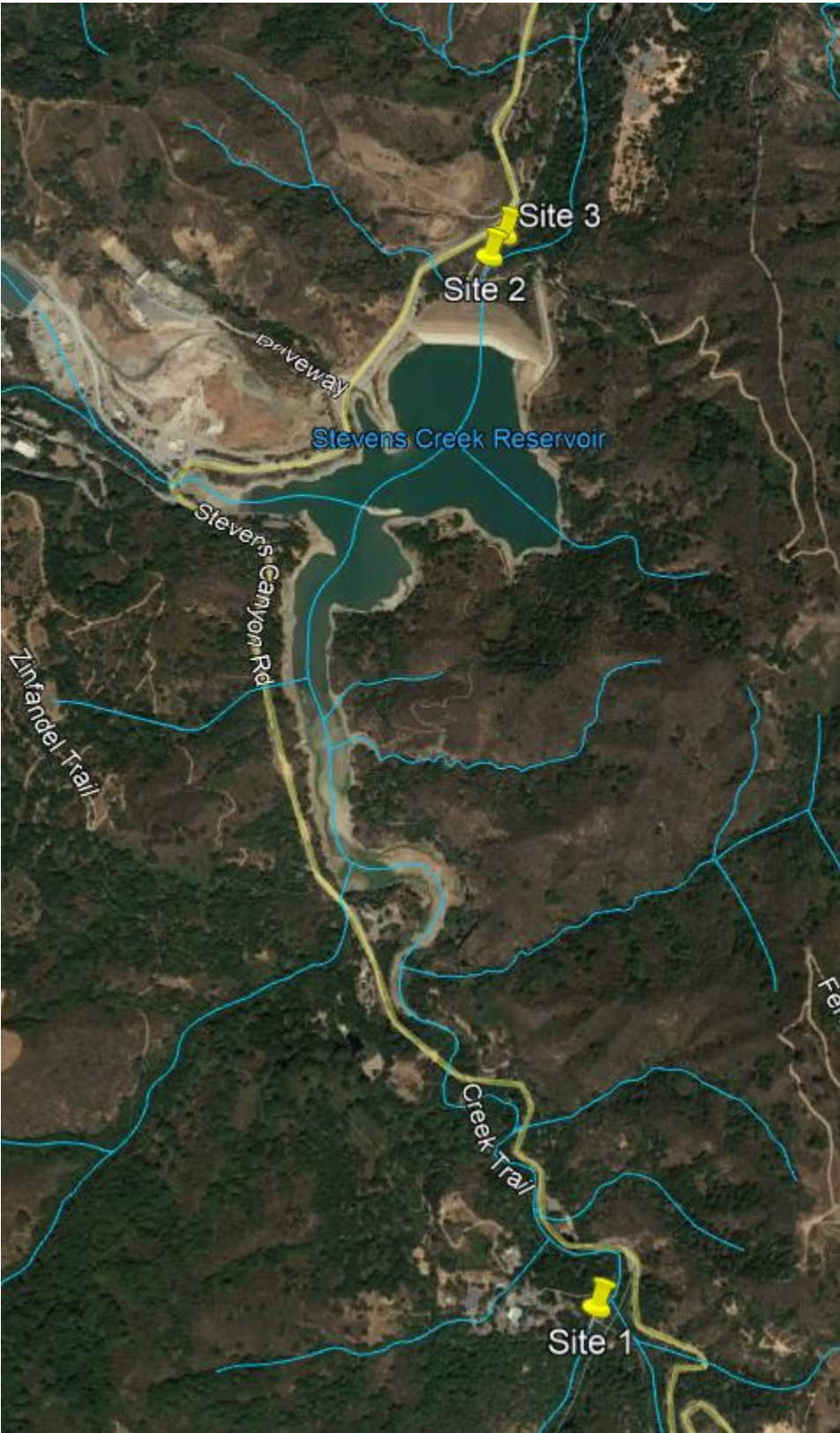
In addition to using EXO2 SmartQC, all collected data will undergo manual QA/QC checks by the Assistant and Associate Water Resource Specialists for unrealistic results and flagged as necessary.

Schedule

To obtain data that represents the range of hydrological and operational conditions in Stevens Creek Reservoir (inflow and outflow conditions, HOS operation status), sondes will be deployed for one year and one month from June 4, 2020 to July 1, 2021. A detailed schedule including hypolimnetic oxygenation system status is described below.

Date	Activity
6/4/2020	Begin Sonde Data Collection
6/24/2020	Begin HOS Operation
October 2020	End HOS Operation
May 2021	Begin HOS Operation
July 2021	End Sonde Data Collection

Figure 1: Sonde Deployment Locations



Data Analysis:

To answer study question 1, we will compare temperature and turbidity data collected at the reservoir outlet (site 2) prior to and during HOS operation using analysis of variance. We will control for the effects of reservoir stage and outflow release to isolate the effects of the HOS.

To answer study question 2, we will compare temperature, turbidity, and DO data collected at the reservoir inflow (site 1) to temperature, turbidity, and DO data collected at the reservoir outlet (site 2) prior to, during, and after HOS operation using analysis of variance.

To answer study question 3, we will compare temperature, turbidity, and DO data collected at the reservoir outlet (site 2) to temperature, turbidity, and DO data collected 100 meters downstream of the outlet (site 3) prior to, during, and after HOS operation using analysis of variance. We will control for the effects of outflow release and stream flow to isolate the effects of the HOS.

Maintaining Social Distancing: To comply with Santa Clara County health directives during the COVID-19 pandemic, Valley Water staff will maintain appropriate social distancing during this project. To achieve social distancing, staff will follow guidance described in Appendix 1.

Roles and Responsibilities:

The Associate Water Resource Specialist(s) will provide project management and review the monitoring plan and data analysis.

The Assistant Water Resource Specialist II will schedule and direct sonde deployment, calibration, maintenance, and retrieval and conduct the data analysis.

The Intern will support the Assistant Water Resource Specialist II with project tasks.

Collaboration

The Environmental Planning Unit collaborated with the following units for notification or requests for information in preparation for this study:

Unit Name	Unit Number
Hydraulics, Hydrology & Geomorphology	296
Environmental Mitigation & Monitoring	244

Raw Water Operations	455
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Budget

The majority of this project will be completed under fiscal year 21 funds.

Category	Budget
Labor*	\$35,200
Materials	\$20,054
Total	\$55,254

**Assuming Avg. Burdened Rate of \$80/hr*

Labor

Fiscal Year	Labor	Total Hours
2020	Intern	16
	Assistant WRS II	25
	Associate WRS	10
	Hours	51
2021	Intern	144
	Assistant WRS II	175
	Associate WRS	70
	Hours	389
Labor Hours		440

Materials

Fiscal Year	Material	Cost
2021	Calibration Solution	\$3,407
	Sonde equipment	\$16,647
	Cost	\$20,054

Valley Water May 7, 2020

CORONAVIRUS (COVID-19)

Social Distancing Protocols and Employee Protective Measures for Valley Water Field Staff



These safety protocols are intended to provide field staff guidance to comply with Valley Water's Employee Communications Directives, Social Distancing Protocols, & Employee Protective Measures, and Public Health Orders during the pandemic. These protocols do not include, and are not a substitute for, specific job-related safety requirements that may require specialized skills, knowledge, abilities and training. These protective measures are solely for the prevention of contracting or transmitting COVID-19 while working in the field.

During this rapidly changing situation, as Public Health Orders are changed or lifted, Valley Water will amend and/or provide additional information and protocols for the phasing in of Valley Water operations. It should be expected that social distancing, cleaning and disinfecting practices and personal protective equipment recommendations will continue for some time after the shelter in place order is lifted.

Apart from reviewing the information noted in this document, staff should stay informed of the latest employee safety recommendations by regularly checking the [Coronavirus Resource Information](#) for the latest updates.

Effective April 24th 2020, and continuing until further notice, Valley Water issued a notice directing any persons entering a Valley Water facility, to wear a protective face covering. This was implemented as a precautionary measure that is in line with recommendations from the Centers of Disease Control (CDC) and the Santa Clara County Public Health Department

Outdoor workers are highly encouraged to wear a mask at all times while in public, and if you are working within 6 feet of others, a face covering is required. There are times during physical exertion activities that make it a lot more difficult to breathe when you're wearing a face covering, and unless there is a Cal/OSHA mandate for respiratory protection for those activities, employees do not need to wear those face coverings that are inhibiting their breathing as long as social distancing is maintained. If you are driving alone in a vehicle, no protective face covering is required. Currently, the following Bay Area cities/counties are requiring the use of a protective face covering by all persons while in public:

- Fremont
- Alameda County
- San Francisco County
- Pleasant Hill
- Contra Costa County
- San Mateo County
- Milpitas
- Marin County
- Sonoma County
- Cupertino
- San Francisco County

Please take note of these cities and counties, and comply with local public health orders by wearing a protective face covering when working in these areas.

* A **protective face covering** is a cloth, bandana, or other type of material that covers an employee's mouth and nose. In contrast, a mask is usually defined as either a filtering face piece respirator, such as an N95, or a specialized medical-grade surgical mask

Field Safety Protocols

Stay 6 feet apart

- Do not come to work or enter Valley Water facilities if you have any signs or symptoms of illness.
- Wear a protective face covering when entering a Valley Water facility. Staff may comply with this directive by using personal protective face coverings or masks rather than the protective face coverings furnished by Valley Water.
- Unless working in an enclosed room alone and with the door closed, eating or drinking, or otherwise exempt, a protective face covering is required to be worn inside all Valley Water facilities.
- If medical concerns or health issues interfere with wearing a face covering, notify your Unit Manager immediately and initiate an interactive process with Valley Water's Reasonable Accommodation coordinator.
- Continually observe your work distances in relation to other staff, maintaining a 6-foot distance at all times, if possible.
- Follow proper sneezing and coughing etiquette: sneeze or cough into a cloth or tissue, or, if not available, into one's elbow; and do not shake hands or engage in any unnecessary physical contact.
- Wash your hands frequently for at least 20 seconds with soap and water, if available. Hand sanitizer can be used, if soap and water are not available. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Avoid touching your face and common surfaces with bare hands.
- Avoid traveling to jobsites with more than one person per vehicle. If traveling in separate vehicles is not possible, follow PPE recommendations for breaking the 6-foot social distance.
- Motor pool vehicles are being cleaned and disinfected on a regular basis. Employees who reserve vehicles on an extended basis, or are assigned vehicles, are required to self-clean/wipe down high touch surfaces of their assigned vehicles.
- Conduct regular tailgate discussions/briefings to review social distancing protocols and other related coronavirus precautions. Coronavirus-related Employee Communications are published frequently based on CDC and County Health guidance.
- Ensure you regularly clean and maintain reusable face coverings and additional PPE issued. Do not loan or share PPE items.
- Do not share phones, utensils, food items, or other similar items.
- Maintain social distancing or wear a face covering and/or mask while operating a boom lift, scissor lift, or other similar types of equipment where workers may be required to share a standing/working platform.
- Ensure that all tools and equipment are wiped with disinfectant when transferred to another employee; and, that equipment common touch areas are disinfected upon change of operator (such as water cooler push buttons, equipment controls, etc.). If surfaces are dirty, they should be cleaned using a detergent with soap and water prior to disinfection. The Winfield Warehouse carries approved disinfection solutions for cleaning equipment.
- Used masks, disposable PPE, paper towels, and other similar wastes can be thrown in the regular trash. If signs and symptoms of illness, consider sealing in a plastic bag before discarding. Thoroughly wash hands with soap and water after discarding.
- If jobsites are equipped with portable handwashing facilities and/or jobsite toilets, arrange for them to be cleaned and disinfected at least daily.
- Prohibit gatherings of any size, even during meal and rest breaks. Gatherings of any kind must be reserved for essential meetings only.

NOTE: If 6 feet of physical distance cannot be maintained when working frequently near others, i.e., more than transient interactions, then the use of Personal Protective Equipment is needed.

- Goggles, face shield, or (safety glasses with side shields when others are also wearing face coverings).
- Face coverings should be worn at all times and are required when working frequently within 6 feet.
- Rubber gloves – Nitrile, latex, etc., are recommended, not required, if working frequently, and in close proximity to others (closer than 6 feet).

Coronavirus Signs & Symptoms

Coughing

Fever

Shortness of breath, difficulty breathing

Early symptoms may include chills, body aches, sore throat, or headache

If you develop a fever and symptoms of respiratory illness, DO NOT COME TO WORK and call your healthcare provider immediately.

Cleaning & Disinfecting

PPE Requirements:

- Wear disposable gloves and safety glasses with side shields for all tasks in the cleaning/disinfection process.
- Additional PPE might be required, such as chemical goggles, based on the cleaning/disinfectant products being used and whether there is a risk of splash. Follow the instructions on the label and SDS to ensure safe and effective use of the product.

Cleaning:

- Remember to put on appropriate PPE before cleaning and/or disinfecting.
- Cleaning with soap and water reduces the number of germs, dirt and impurities on the surface. Disinfecting kills germs on surfaces.
- Practice routine cleaning of frequently touched surfaces.
- High-touch surfaces in common areas should be cleaned and disinfected frequently.

Vehicles:

At a minimum, clean and disinfect commonly touched surfaces in the vehicle at the beginning and end of each shift. Doors and windows should remain open when cleaning the vehicle.

- Remember to put on appropriate PPE before cleaning and/or disinfecting.
- For hard non-porous surfaces within the interior of the vehicle such as hard seats, arm rests, door handles, seat belt buckles, light and air controls, doors and windows, and grab handles, clean with detergent or soap and water if the surfaces are visibly dirty, prior to disinfectant application.

Hygiene Requirements:

- Wash your hands often with soap and water for a minimum of 20 seconds.
- Always wash immediately after removing gloves and after physical contact with anyone.
- Hand sanitizer can be used, if soap and water are not available and hands are not visibly dirty. Use alcohol-based hand sanitizer that contains at least 60% alcohol. However, if hands are visibly dirty, always wash hands with soap and water.

Disinfecting:

- The Winfield Warehouse carries a variety of approved disinfection solutions.
- Follow the instructions on the label and SDS to ensure safe and effective use of the product.
- Many products recommend:
 - Keeping surface wet for a period of time (see product label).
 - Making sure you have good ventilation during use of the product.

Please contact [Jesse Ruiz](#) at X3209 with any questions regarding these protocols.