

**Water Quality Analysis of Lake Gregory,
Crestline, California**

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Executive Summary

Water quality is always a concern for both human and ecosystem health. With the increase in human population and related development, there is a growing need to protect water resources including rivers, lakes and streams. Lake Gregory, located in the San Bernardino Mountains, is no different. In the past, there have been California agency reports that have linked water contaminants, such as mercury and pesticides, promoting health and fish consumption advisories (Murphy 2016). Although Lake Gregory website states that the water is frequently tested to ensure safety, there is no publicly available. This project has tested several water quality parameters for over a year. The results will be compared to water quality standards. The data will also test for correlations between the water quality and precipitation data.

Project Objectives

Lake Gregory is a man-made lake located in the San Bernardino Mountains in Crestline, California. Lake Gregory and its dam were completed in 1938. The reservoir has a storage capacity of 2,340 acre ft and has a surface area of 94 acres (San Bernardino County Regional Parks 2010). The lake is used recreationally for fishing, swimming, and community events. During the summer, residents and tourists flock to the lake to use the floating water park and slide as well as to rent boats and kayaks. In

addition to the lake, the Lake Gregory Regional Park includes trails, a dog park, and picnic areas.

Lake Gregory is at the center of commercial and residential development. The water that feeds into the lake comes from two main locations: the west end of the lake and the south end. In addition to the streams, water flows across roads and through the ground during times of high precipitation. As a result, contamination from the landscape possibly associated with septic tanks, gutters, and pet waste is a concern.

Because so many people including children are in contact with the water, the water quality is a concern. Stormwater is untreated water that has come from roads, gutters, construction sites, and yards. It frequently carries chemicals and bacteria into larger bodies of water and can lead to beach closure along the coast. People exposed to stormwater are much more likely to contract illnesses with symptoms that include earaches, rashes, fever, and diarrhea (EPA 2019). In addition to being a safety issue, water quality needs to be monitored so ensure the health of the surrounding riparian and wetland habitat. Many species require specific environments that can be easily disrupted by pollution. For example, trout typically require 6.0 mg/L dissolved oxygen in the water to survive. Other water quality parameters such as extreme pH values and high nutrients can greatly impact an aquatic ecosystem.

The Lake Gregory website (www.lakegregoryrecreation.com) states that they test the water quality monthly during the fall and winter and weekly when the swim beach is open. The website also boasts the the lake has the “cleanest water on the mountain”

but does not provide any further information. Attempts to find out more about what is being tested and the results of the water quality assessment have not been successful.

As a result of the high stakes and minimal water quality information, we set out to test the water quality of Lake Gregory. We planned to test several water quality parameters biweekly or more frequently depending on precipitation for a minimum of one year. We tested for the following: dissolved oxygen, nitrate, ammonium, pH, temperature, turbidity, conductivity, total coliform and *E. coli*.

Being involved in this project has allowed me to gain real-life experience in a field that I am passionate about. I was able to learn about water quality analysis methods, hydrology, and water quality regulations. I would be able to apply these tools in a number of careers including with the USDA. Many of the USDA agencies such as the National Resource Conservation Service and the Forest Service do research that involves water quality.

Project Approach

There were four testing sites (labeled LG1-LG4) within the lake which are shown in **Figure 1**. LG1 was located at the west side of the lake where the floating water park is set up during the summer. LG2 was the outlet of the lake located at the southeast side of the lake, while LG3 was the inlet located south of LG2. LG4 was across the lake at the north end near the dam.

The parameters discussed in the previous section were chosen because of the health and environmental implications they pose. Dissolved oxygen is required to

support fish and other aquatic species much like we depend on the oxygen in the air. Nitrate and ammonium were tested for because these nutrients can be an indication of pollution and excess nitrogen leads to the eutrophication of water bodies. pH levels that are too extreme (lower than 6.5 or higher than 8.5) can kill off aquatic life. High turbidity (cloudiness) levels are less aesthetic and also impact ecosystem health. Conductivity is related to the total dissolved solids in the water which can be harmful to species if present in excess. The total fecal coliform and *E. coli* are tested for because high levels increase the likelihood of people becoming sick when they come in contact with the water.

Analysis for all four sites was done biweekly during drier periods but increased to weekly or more frequently during precipitation events. In addition to testing the water quality, data was also compared to precipitation records for that region.

Project Outcomes

Data was collected from April 2018 to May 20019. Site LG 3 frequently went dry in between precipitation events, so there are periods of missing data. Occasionally, issues with the analysis probes also caused a loss in data collection. Besides these caveats, data was collected consistently through the year for all the parameters. **Figure 2** shows the dissolved oxygen for all the sites. The dissolved oxygen was always over 5 mg/L; for the Lohanton region, the recommendation for dissolved oxygen is greater than 4 mg/L. **Figure 3** shows the *E. coli* levels. There is no *E. coli* standard for MPN (most probably number), but the EPA recommends that recreational water bodies have less

than 410 colony-forming units/100 ml. There were many times during sampling that the *E. coli* numbers were excessive and likely hazardous to human health. **Figure 4** shows the nitrate measured at the sites through the year. As little as 10 mg/L can be harmful to aquatic life; there were many times in which nitrate exceeded 10 mg/L, especially during times of heavy precipitation (Oram 2014). Figures for the other parameters tested are not shown in this report.

Conclusions

Our water quality analysis has shown that typically, water quality is safe in Lake Gregory. There are times that people should not be able to recreate in the lake due to high levels of *E. coli*. Because these high levels seemed to coincide with precipitation events, most people who swim in the lake are not at risk because they tend to use the lake in warm, sunny weather.

Water quality testing will continue for Lake Gregory. Besides collecting more data, there will be analysis of the data to compare between site locations. Additionally, data will also be compared to precipitation data. This will allow us to confirm that precipitation causes a decline in the water quality due to stormwater flowing in. Eventually, maps of the potential sources of contamination around the lake will be made. Many homes in Crestline are still on septic systems that may be the cause of excessive nutrients and bacteria levels that have been frequently recorded in the lake. It is difficult to identify which homes are on septic because of the lack of records. It may

be possible to determine the location of septic tanks by figuring out which homes are connected to the sewer system and eliminating those.

Appendix

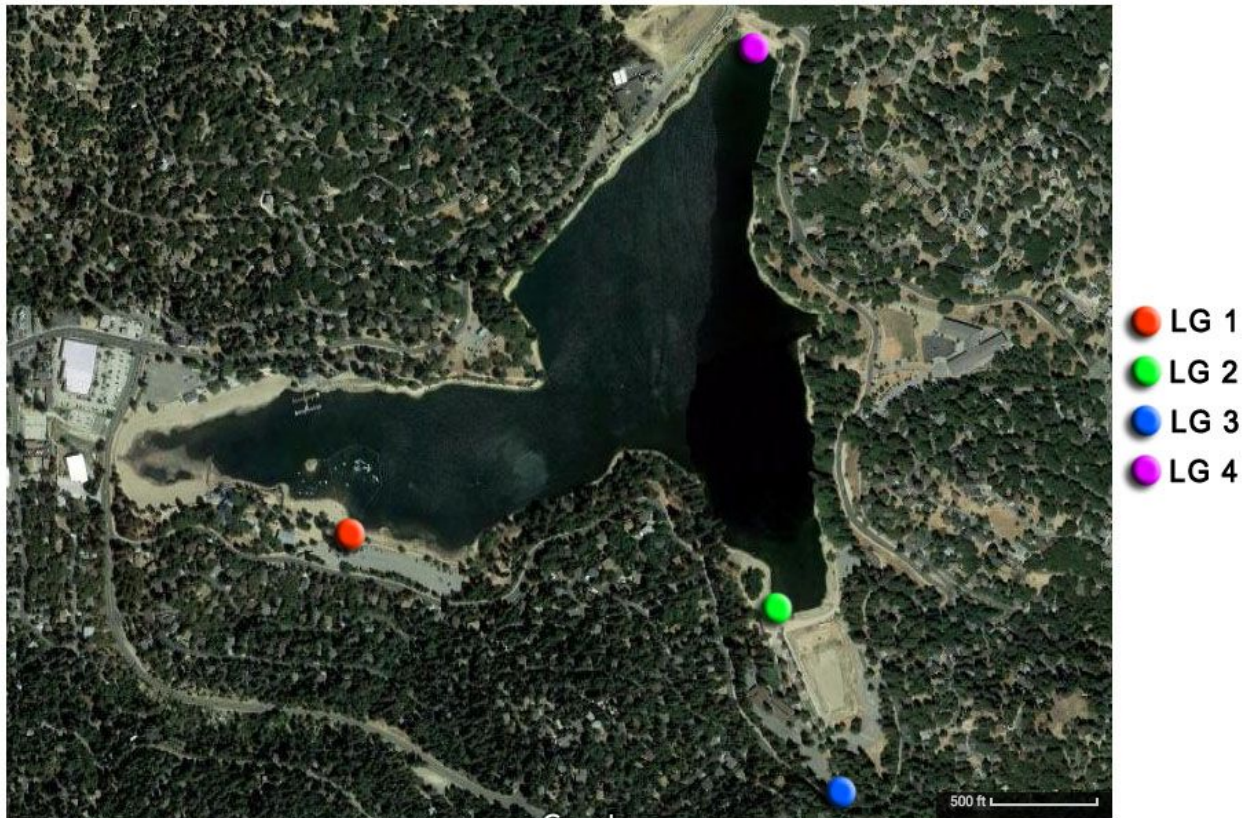


Figure 1. Map of the sampling site locations at Lake Gregory.

Dissolved Oxygen (mg/L)

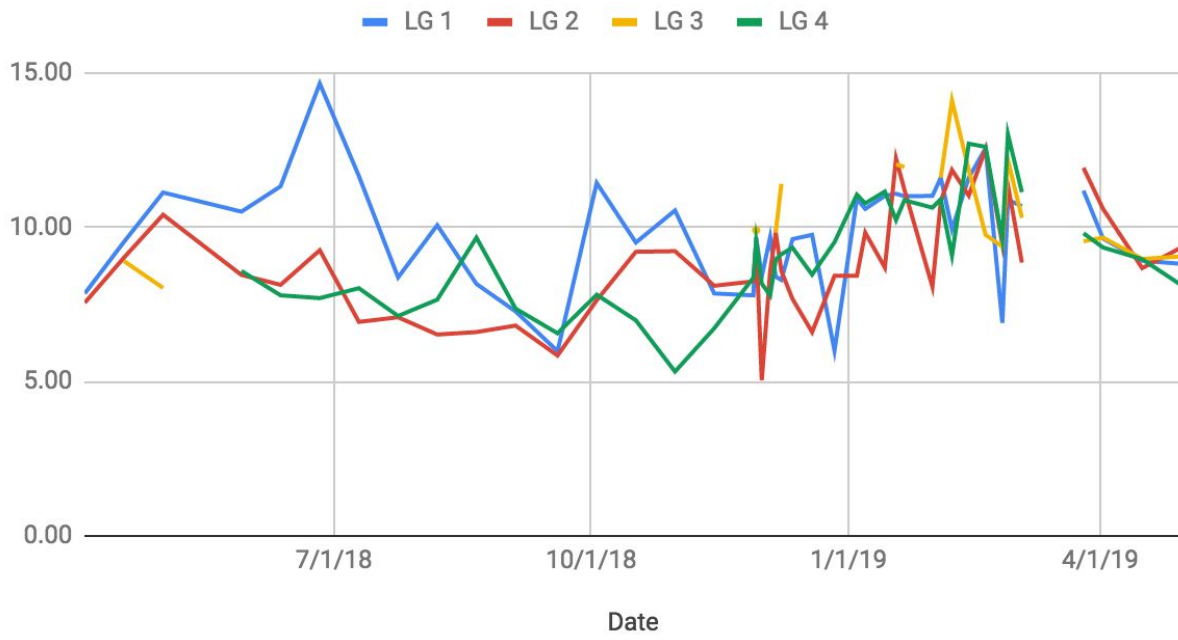


Figure 2. Dissolved oxygen at all sampling sites.

E. coli (MPN)

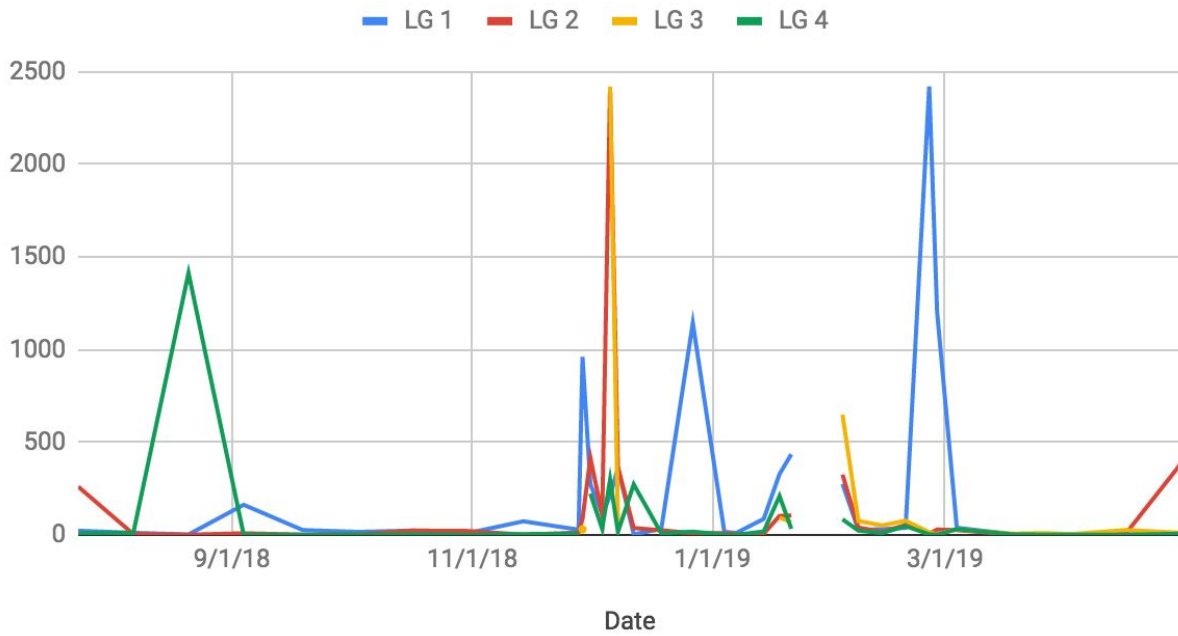


Figure 3. E. coli levels at all sampling sites.

Nitrate (mg/L)

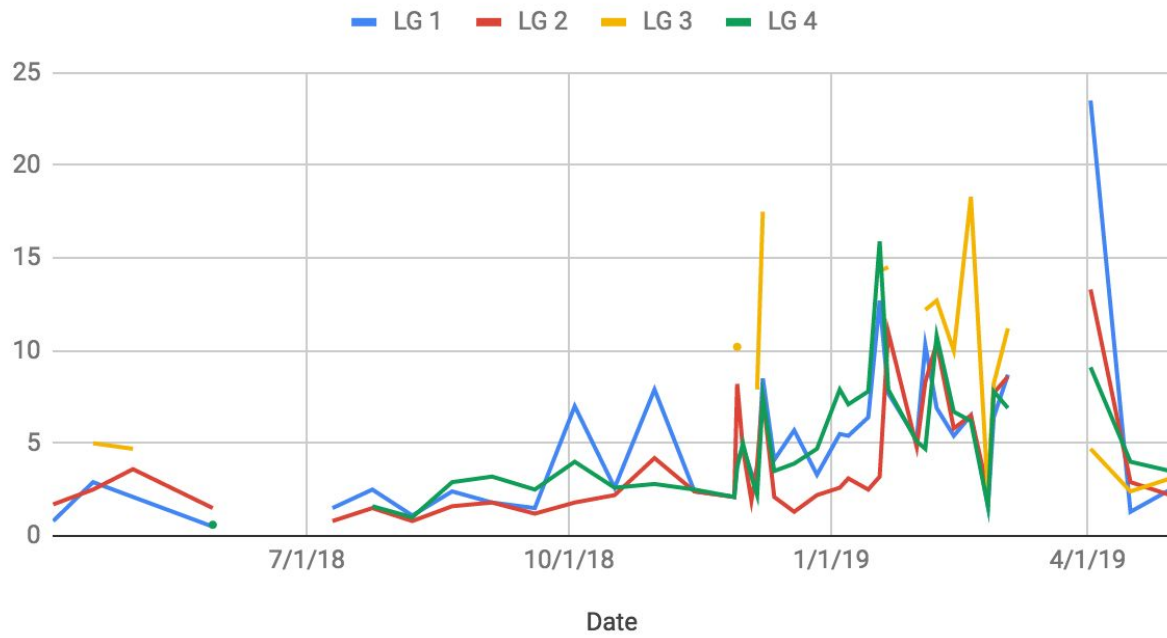


Figure 4. Nitrate levels at all sampling sites.

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