



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Joy H. Ruppert	Project Number 38139
Project Title Cottonwood Creek Contamination: Investigating Water Quality of Moonlight Beach Effluent	
Abstract Objectives/Goals Approximately 20% of the Encinitas city runoff empties into Cottonwood Creek and is discharged at Moonlight State Beach. I have seen many young children and families playing in the effluent, but the water often looks murky and discolored. I wondered if this really was a safe place to play. The city built an Urban Runoff Dry Weather Flow UVC Treatment Facility to treat the water from Cottonwood Creek, but the facility is 240 meters from the effluent outlet. I believed the effluent water might not meet state standards for primary contact. I also hypothesized that plants growing in the concrete channel carrying water from the UVC treatment facility to the ocean might reduce nutrient levels of nitrates and phosphates in the creek water. Methods/Materials I performed 182 tests on 24 different water samples taken from the Moonlight Beach effluent. I collected water samples over a three-month period at distances ranging from 1 to 11 meters from the effluent. I performed 120 water quality tests. I used kits from LaMotte and Hach to document the pH, nitrates, phosphates, nitrite, ammonia, copper, iron, chromium, and dissolved oxygen. For 12 water samples, I inoculated 50 plates using Coliscan Easygel media to identify coliforms, including E.coli, and noncoliforms. I also performed 12 separate dissolved oxygen tests at the site to support my results. Results According to my results, the Moonlight Beach effluent failed to meet state standards for primary contact water. Water samples consistently contained excessive levels of coliform bacteria. 100% of my 50 plates were either TNTC, or for dilutions, ranged from 25,000 CFU/100mL to 150,000 CFU/100mL for coliform bacteria. The samples also revealed nitrates and phosphates far above recommended levels. Nitrates ranged from 60 to 100 ppm, which were 60 to 100 times the recommended level of 1ppm. Phosphates ranged from 12 to 14 ppm, which were 120 to 140 times the 0.1 ppm suggested limit for phosphates. The plants in the concrete channel seemed to have little impact on nutrient levels in the water. Available dissolved oxygen levels were consistently low in my samples. Conclusions/Discussion The UVC Treatment Facility appears unable to reduce the number of bacteria in the water probably due to the distance between the facility and the effluent. High levels of nitrates and phosphates in the effluent also put the beach at risk for harmful algal blooms (HABs).	
Summary Statement I tested the water of the Cottonwood Creek effluent at Moonlight Beach to determine water quality, including bacteria and nutrient samples.	
Help Received My parents transported me to Moonlight Beach. My science teacher supplied equipment, testing supplies, and supervised me for safety in the lab. I collected all the water samples myself as well as performed all of the water quality tests.	