CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36576

Project Title

E. coli Contamination in Shingle Mill Creek

Abstract

Objectives/Goals

Shingle Mill Creek is a non-point source of fecal coliform pollution into the San Lorenzo River. Last year, we determined that the coliform originates from an upstream location, where the density of houses is highest. This year, we investigated the source of fecal contamination in Shingle Mill Creek. We hypothesize that the coliform is most likely coming from faulty septic systems, as coliform bacteria can easily leach through the relatively sandy soil present along Shingle Mill Creek. We collect water samples bimonthly from 5 sites along the creek. Lab tests include membrane filtration and filter incubation on medium specific for E. coli. To further pinpoint the contamination source, we monitored creek nitrate levels, which can indicate malfunctioning septic systems. We are collecting rainfall data; high rainfall events should correlate with septic system failure. This year, we continue to find increased E. coli contamination upstream, along with increased nitrate levels. As El Niño begins, we hypothesize that fecal coliform concentrations and nitrate levels will increase.

Methods/Materials

Whirlpak bags, receiver flasks, pipettes, 0.45 µm membrane filters, funnels, M Coli blue media, absorbent pads, petri dishes, autoclave, Vernier nitrate probe and standards, LabPro, Abraxis Caffeine Analysis Test Kit. Collect water sample with Whirlpak bag; filter water sample (5 mL) from each location; test nitrate concentration with LabPro, nitrate probe, standards, and water samples; Caffeine analysis run at Santa Cruz County Wastewater Treatment Plant.

Results

Using StatPlus, we determined an R squared value of 0.1561, showing no significant relationship between E. coli and precipitation. Caffeine testing revealed that the water in Shingle Mill Creek on March 3rd, 2016 contained less than 0.175 ppb caffeine, which is not significant.

Conclusions/Discussion

We are unable to make a definite conclusion concerning the effect of precipitation on E. coli levels, although data suggest that higher precipitation in 48 hours before sampling may cause higher concentrations of E. coli. Our caffeine analysis data suggest that the source of contamination is not human. Even so, we did not determine coliform contamination in this same sample, therefore we are unsure if this water sample was simply low in coliform contamination. We experienced little rainfall before this sampling, which could have affected coliform levels.

Summary Statement

Precipitation causes an initial increase in E. coli contamination, followed by a decrease likely because of increased water flow in the creek, effectively lowering the concentration.

Help Received

We received guidance from Steve Peters, from the Santa Cruz County Water District, and Sam Blakesley, from the Surfrider Foundation. We received further help from Dave Bernick, a professor at UCSC, and Jennie Munster, a lab technician at the SC County Wastewater Treatment Plant.

Preliminary