CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)

Rebecca J. Kim

Project Number

S0711

Project Title

Beach Pollution in Southern California II: Time and Space Variation of Fecal Indicator Bacteria Concentration

Abstract

Objectives/Goals

To identify where the pollutants are coming from and what the major time and space patterns of beach pollution are in Orange County. I set up three hypotheses, 1) Surface water runoff would be the primary source of pollutant loading to the coastal ocean due to non-point sources, 2) Dominant time variation patterns of beach pollution were highly correlated with rainfall and lunar cycle, and 3) Dominant space variation patterns of beach pollution were mainly affected by direction of coastal current.

Methods/Materials

I plotted three fecal indicator bacteria (FIB) concentrations (TC, FC, and ENT) in the surf zone to understand the relationship between water quality and storm event. The results can verify Hypothesis No. 1. Then, I plotted and compared FIB concentrations against Santa Ana river discharge records to verify Hypothesis No. 2. Finally, I plotted and compared the FIB concentrations at each monitoring stations to understand the impact of coastal current direction to the beach pollution and to verify Hypothesis No. 3.

Results

The concentration of FIB was frequently elevated during and after rain events when storm water was discharging from the river. FIB concentrations exhibit positive correlation with stream discharge records implying that land-based sources of fecal pollution to beach water. Along with the seasonal pattern of high FIB concentrations during rainy season, FIB concentrations show two-week period pattern of spring-neap cycle. My results indicate that FIB contaminations events were occur during the spring period with 13.17 days period while reported spring-neap cycle period is 13-15 days. Increased level of all three FIB were observed in the surf zone north of the Santa Ana River than south of it. Overall trend shows that North stations (Huntington Beach) recorded higher concentrations of FIB concentration than South stations (Newport Beach).

Conclusions/Discussion

The conclusions are 1) long-term data (12 months) analysis confirmed that urban source of beach pollution and two-week lunar cycle, 2) storm water discharge is the main source of pollutant loading to the coastal ocean. Higher levels of beach pollution were recorded around rainfall events, 3) dominant time variation patterns of beach pollutions are seasonal rainfall events and two-week periodicity of lunar cycle, and 4) dominant space variation patterns of beach pollutions are controlled by direction of local coastal current.

Summary Statement

My project is to identify where the pollutants are coming from and what the major time and space patterns of beach pollution are in Orange County.

Help Received

Father helped me to develop methods and derive conclusions.