Name(s)

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Project Number

S0819

Project Title

Investigation of Beach Pollution in Southern California

Abstract

Objectives/Goals

To find out where the pollution is coming from, how the environmental factors such as wind and lunar cycle contribute to the spread of beach pollution, and what the major time and space patterns of beach pollution in Orange County are.

Methods/Materials

Field grab sample collection was conducted at 3 study sites, total 16 times, 13 samples during dry season and 3 samples during wet season. The samples were analyzed for the total coliform (TC), escherichia coli (EC), and enterococci bacteria (ENT). To verify my study with 16 field samples, year-long public data were used. In order to investigate a year round water quality of study area, daily surf zone monitoring data for fecal indicator bacteria by Orange County Sanitation District were used. Daily wave and wind directions recorded by lifeguards in the City of Newport Beach were used. Daily water flow data into ocean from Santa Ana river outlet were used.

Results

Laboratory test data show that the storm events generate high concentration of fecal indicator bacteria from the Santa Ana River outlet compare to other sampling locations for all 3 fecal indicator bacteria measured. The data show that TC appears to be transported by wave driven force to the beaches. Also, the data show that TC, EC and ENT concentration is relatively high at each full moon and the lunar cycle could affect on the variability of fecal indicator bacteria concentration.

Conclusions/Discussion

Conclusions of my study are 1) Storm water runoff would be the primary source of pollutant loading to the urban ocean mostly due to non-point loading exposed to surface water runoff. Higher levels of beach pollution were recorded around rainfall events. 2) Fecal indicator bacteria will be transported by wave and wind driven forces to the beaches. Dominant space variation patterns of beach pollutions are controlled by direction of local coastal current, 3) Fecal indicator bacteria levels are elevated and affected by two-week lunar cycle due to stronger gravity forces between Earth and Moon at the beginning of cycle. The stronger gravity forces creates higher tide which cause resuspension of ocean bottom sediments thus elevated levels of microbial contamination has been found at the beginning of each lunar cycle. Dominant time variation patterns of beach pollutions are seasonal rainfall events and two-week lunar cycle.

Summary Statement

Storm water runoff is the primary source of beach pollution and fecal indicator bacteria are transported by wave and wind driven forces (space variation) and affected by rainfall and two-week lunar cycle (time variation).

Help Received