



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title
The Determination of Bacterial and Pollutant Flows in Coastal Estuaries of Southern California

Abstract

Objectives/Goals
There are two main objectives of this experiment: to create a mathematical model showing the relationship between turbidity, dissolved oxygen, pH, and the levels of indicator bacteria for fecal contamination and to assess the impact of the Ballona Wetlands on coastal water quality.

Methods/Materials
In the field samples were tested for temperature, salinity, dissolved oxygen, and pH levels using the YSI 600R Sonde Electronic Probe. Further testing was done in the laboratory using the HACH2100N Turbidimeter for turbidity levels and the IDEXX Quantitray 2000 System with the MPN method for levels of indicator bacteria for fecal contamination (total Coliform, Eschericia coli, and Enterococci).

Results
Results indicated that bacterial levels were higher with increased turbidity and dissolved oxygen in a neutral pH. 70 percent of the time total Coliform levels were higher during the flood tide than during the ebb tide. The state law maximums were breached 60 percent of the time for total Coliform levels and 70 percent of the time for Enterococci levels. A mathematical model was created for bacterial contaminant determination: $[EB] = Ke^{(7-pH)}([dO][T])^2$. The correlation constants were K (total Coliform) = 2.00×10^1 , K (E. Coli) = 1.06×10^{-1} , and K (Enterococci) = 8.79×10^{-3} .

Conclusions/Discussion
Coastal pollution and beach water quality are a result of the interaction of a myriad of human and naturally occurring factors. This study clearly demonstrates that there is contamination in the Ballona Wetlands, which is carried into the ocean by tidal flows. The two possible explanations for this are primary contamination from wildlife in the Ballona Wetlands or secondary contamination from human sources from the Ballona Watershed area. This study also shows that sophisticated mathematical models can be constructed to greatly simplify the current testing procedures and be more cost effective. These types of models are critical from an economic point of view and for beach safety considerations.

Summary Statement
The purpose of this project is to understand the role of the Ballona Wetlands on coastal water quality and to construct a mathematical model for bacterial contaminant determination.

Help Received
Used equipment at Loyola Marymount University under the supervision of Dr. John Dorsey