



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

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Project Title
Beach Changes During a Period of Low Waves and High Tides

Abstract

Objectives/Goals
Locally, Goleta Beach erosion has become a problem so we chose this area for study and Mesa Lane beach is physically different from Goleta.

Methods/Materials
Materials: 2, 5 ft wooden rods, measuring tape, data sheets
Method: Emery 1961
1. Establish an East, Central and West station with reference points at each beach on three dates.
2. At low tide, start rod 1 at reference point. Place rod 2 at significantly different elevation. Measure distance between rod 1 and 2. Find elevation by aligning their eye at rod 1 with the top of rod 2 and the horizon, record the distance from the top of rod 1 at the point which is intersected by this line of sight. Move rod 1 to the seaward side of rod 2 at a different vertical elevation. Continue until rod is fully submerged.

Results
During our research period neither beaches experienced a high wave energy event. No significant sand volume changes occurred at the East or West stations at Mesa Lane beach. Erosion occurred at Mesa Lane's central station. At Goleta beach Central and East stations at sand was deposited, then eroded, and then returned.

Conclusions/Discussion
At the Mesa Lane East and West stations, lack of wave events created no change in the profiles. The erosion at Mesa Lane's central station may be related to the large tide fluctuation immediately prior to the profile measuring. The erosion was possibly due to the lack of sand build up in front of the cliff. During the highest tide of the year there was a 9ft difference in the tide, small waves reflected off the cliff, creating more erosion. The sand build up at the other stations prevented the waves from reaching the cliff. The accretion and erosion during our research period at Goleta beach central and Goleta beach east station is due to the sand being carried onto the beach by the small waves. During periods of low tide/wave events, beaches build up with larger volumes of sand. Erosion occurred after the highest tide of the year bringing the profiles back to a physical state similar to their original. Since the seawall can increase erosion, we believe that Goleta beach should not choose to add one to protect the park, but should instead replenish sand deposits from another source or let the ocean run its course.
Contrary to our hypothesis, we found that high-energy waves were not necessary for significant erosion of the beaches. The low energy waves were able to erode the beaches during high tides.

Summary Statement
We used the Emery Method to measure beach profiles in order to determine the affects of wave energy and tides on erosion and deposition.

Help Received
Mentor, Dr. Imperato, helped develop project design and assisted in first experiment trial.