



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

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Project Title The Effect of Soil Particle Type, Saturation Level, and Slope Angle on Slope Stability and Landslides	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of the research was to determine how different types of soil particles, along with varying levels of saturation and slope angles, affect slope stability and the occurrence of landslides. In this case, sand, gravel and garden soil were tested to see which best prevented a landslide that was caused by an earthquake or heavy rainfall. The hypothesis was that in the dry experiment, the gravel would be worst because of the looseness and heaviness of the pebbles and sand would be best because of the small fine particles. In the experiment with water, the hypothesis was that the same result would remain as soil liquefaction occurred.</p> <p>Methods/Materials The materials which were used include sand, gravel, garden soil, measuring cups, two flat blocks, a homemade clinometer, cardboard, water, a watering can and small roots/trees. Specifically 4L of each type of soil was required. A model was set up in order to resemble the shape and characteristics of a hillside slope. To test the effects of an earthquake, each soil was placed one by one on the model and the slope angle was increased. The angle at which the landslide occurred was measured. In order to test the effects of heavy rainfall, the same soils were applied again and water was added to the model from a fixed position until a landslide occurred. The amount of water used was measured. The procedure was repeated for a total of 3 trials for each soil type and each part of the experiment.</p> <p>Results In dry conditions with increasing slope angles, sand was found to be most effective, withstanding the greatest slope angle, and was followed by the garden soil and finally gravel. With a constant angle and increasing levels of saturation, the gravel was best at preventing a landslide and withstood the greatest amount of water, and was followed by sand and lastly garden soil.</p> <p>Conclusions/Discussion Through the data, it was learned that in dry areas with a moving hillside as in earthquakes, sand would be best in keeping a hillside stable and safe from landslides. But under conditions of heavy rainfall, gravel would work best as an additive to maintain slope stability. In making the appropriate decisions to help prevent a landslide, the soil particles size, structure and composition which affect the contact forces, as well as the gravitational pull must be taken into consideration as they greatly affect the final outcome.</p>	
Summary Statement Various soil types are tested on a mock hillside to determine which best withstands the occurrence of a landslide when the slope angle and water levels increase.	
Help Received	