# CALIFORNIA STATE SCIENCE FAIR
## 2007 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**S0717**

**Project Title**
# The Effect of Particle Size and Gradation on the Erodibility of Soil

**Abstract**

**Objectives/Goals**
The objective of the experiment was to investigate the effect of particle size and gradation on the erodibility of soil.

**Methods/Materials**
The experiment called for approximately 4 kg of each soil type (well-graded sand; silt; clay; poorly-graded sand), 3 rectangular soil sample pans, 1 water-flow apparatus, 12 circular soil runoff collection pans, 1 electronic precision scale, 1 lead weight, and 1 large oven.

An apparatus was built to create consistent soil sample position, slope, and water flow. Three samples of each soil type were massed, then tested for erodibility using the apparatus. When water flowed onto the soil, eroded matter was transported and accumulated in a collection pan. After the three initial soil types were tested, a fourth soil type, poorly-graded sand, was tested for additional comparison. After the erodibility testing, the pans of eroded matter were placed in an oven for ten hours. When the eroded matter was dried, each pan was massed to determine the amount of soil that had been eroded.

**Results**
Soil behavior during the erodsion tests differed greatly among the samples, as did the mass of eroded soil. Silt was the least erodible, with an average eroded mass of 51.20 g. Clay was the second-least erodible, suggested by an average eroded mass of 75.32 g. Well-graded sand was the most erodible, with an average eroded mass of 218.12 g. The fourth type of soil, poorly-graded sand, had an average eroded mass of 131.12 g. Average deviations less than 10% for silt and both types of sand suggest precise results, while clay's average deviation of 25% indicated lower precision.

**Conclusions/Discussion**
As hypothesized, it was concluded that particle size and gradation do play a role in soil erodibility. The hypothesis regarding the erodibility of the soils with respect to each other, however, was not supported. The outcome of this experiment, as well as the research conducted throughout the project, indicated the complexity of relationships between a wide range of soil physical properties and soil behavior. More refined testing to explore the effect of specific properties or variables on soil behavior would require greater experimental detail than achieved in this project.

**Summary Statement**
This project examines the role of various soil properties in determining soil erodibility.

**Help Received**
Geomatrix Consultants lent various testing materials for the experiment. Mr. Loc Tran and Mr. Tim Keuscher of Geomatrix helped with gradation tests and offered ideas for creating a consistent, valid experimental design. Mr. Mike Nakaue reviewed the report and provided overall guidance for the project.