



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Jasper Huang	Project Number S1010
Project Title Manipulating Coarseness and Moisture to Enhance CO₂ Sequestration by Basalt Sand and Red Harvester Ants as Biotic Agents	
Abstract Objectives/Goals The objective is to determine if the rate of carbon sequestration by basalt sand with red harvester ants as biotic agents can be enhanced by varying sand coarseness and moisture in the sand. I hypothesized that a higher moisture content and finer coarseness will enhance the rate of carbon sequestration. Methods/Materials 2 levels of sand coarseness and 3 levels of moisture content were tested, for a total of 6 combinations. 6 containers were set up, one combination for each container. The following were held constant for each experimental container: type of basalt (obtained from the basalt formation Table Mountain in Colorado), quantity of basalt, species of ants (<i>Pogonomyrmex barbatus</i>), quantity of ants (20 per container), and ant food. Controls were set up similarly: 6 were same as experimental group except without ants, 1 with ants only. In each container, carbon dioxide gas sensors connected to LabQuests (data-collection devices) recorded the levels of carbon dioxide (in parts per million) 30 times an hour for 5 days. Results Increasing water content increased the rate of CO ₂ absorption while coarseness had no significant correlation with the rate in the given 5 day period. Both coarse and fine basalt containers with the maximum amounts of water had the greatest average rates at 0.37% and 0.35% decrease per hour respectively. Additionally, all controls for the soil had increasing or stationary CO ₂ levels while all experimental groups showed decreasing CO ₂ levels, confirming the ants' ability to enhance CO ₂ absorption by basalt. The ants control had a nearly constant slope, showing that ants by themselves produce a negligible amount of CO ₂ . Conclusions/Discussion In conclusion, my hypothesis was partially supported. Higher moisture contents enhanced carbon sequestration rates while coarseness had no correlation with it. The simple combination of red harvester ants, basalt sand, and water may be the most natural way in mitigating CO ₂ levels.	
Summary Statement This project tests the effect of soil coarseness and soil moisture content on the rate of CO ₂ sequestration by basalt sand with red harvester ants as biotic agents.	
Help Received Dr. Ronald Dorn answered some questions I asked him; Dr. Stephen Wilson of the U.S. Geological Survey supplied basalt sand	