CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Risha R. Bera

Project Number
S0601

Project Title
20-Year Study of Air Quality at University of California (UC) Campuses

Abstract

Objectives/Goals
To evaluate the University of California (UC) school campuses as to ambient air quantity standards set by the Environmental Protection Agency (EPA). The study period took place during class sessions from 1980 to 2000.

Methods/Materials
Ambient monitoring stations nearest to the ten UC campuses were identified. Data templates were then originated from these monitoring stations. The resulting tables measured the ambient concentrations per day during the school session. A formula was inserted to identify the days in the year exceeding the federal standard.

Results
UCR had the highest count in Particulate Matter and Ozone (1-hr.) concentrations of the 1999-2000 school year. All sites met the federal standards for 8-hr. carbon monoxide quantities. Environments surrounding UCD, UCI, UCM, and UCR exceeded the ozone 8-hr. federal standards. The general trend of improvement in air quality should lead to adequate concentrations for the 2000-2001 school year.

Conclusions/Discussion
The universities that were in an unhealthy environment are more prone to cause faculty and students to be susceptible to asthma and other breathing problems. Universities in sites that currently exceed may want to consider implementing pollutant reduction measures (carpooling, rapid transit, etc). By 2006, the air quality at all the universities should meet the EPA standards.

Summary Statement
This project evaluated the University of California campuses of whether they maintained a healthy environment in attainment with the U.S. federal air quality standards.

Help Received
California Air Quality Management District provided 20 years' information; Semi-finalist of Southern California Junior Science and Humanities Symposium.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jessie Y. Chew

Project Number
S0602

Project Title
Growth Structures in Bivalves from Pleistocene Coastal Reefs: Las Animas, Baja California, Sur

Abstract

Objectives/Goals
The goal of this project is to measure and compare the growth rates of Pleistocene bivalves of the Las Animas region with those of modern-day bivalves of the same species. The information I collect in this project will further help me hypothesize the environment and climate of the Baja Coast during the Pleistocene Epoch.

Methods/Materials
Information was collected with the help of selected Pleistocene and modern-day bivalves (with the modern shells on loan from the Natural History Museum of Los Angeles), an x-ray machine and x-rays to reveal growth lines of the bivalves at three and five minute exposure times (all of which was handled by my professor), the finished x-ray negatives of the bivalves, prints of the negatives for my use, a light microscope to calculate the growth lines and Microsoft Excel to store data.

Results
I was unable to compare my Pleistocene bivalves with the modern-day bivalves because the x-rays of the modern-day bivalves failed to show growth lines on the negatives. One reason for this was the fact that since the bivalve shells were fairly new, the pearly nacreous layer within the shell was still intact, making x-ray penetration more difficult. Due to the insufficient amount of time and money, I was not able to expose the modern-day shells for longer periods of time and instead had to rely on outside information to find the modern-day growth rates of Baja bivalves.

Conclusions/Discussion
Outside research shows that most modern bivalves of the Baja region grow at a rate of 1-1.6 cm/ year while the average yearly growth for the Las Animas bivalves was 2.07 cm/year. With this information, I can now conclude that the climate of Las Animas in the Pleistocene Epoch was once warmer and more favorable to the bivalves native to that area, for the average growth rate of the Pleistocene bivalves was 25% higher than the growth of modern species today. Even as the same species of bivalves continue to thrive on the southern tip of Baja, the climate today allows for little energy for extra growth beyond the minimum.

Summary Statement
Growth rate comparison of Pleistocene and modern-day bivalves of the Las Animas region in Baja California

Help Received
Performed research at the University Of Southern California Department Of Geology under the guidance of Professor Donn S. Gorsline

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Anika Danh; Amber Jennings

Project Number
S0603

Project Title
Nitrates in Ground Water: A Silent Threat

Abstract

Objectives/Goals
The objective is to determine whether nitrate contamination in ground water is more prevalent in an agricultural area versus a rural residential area.

Methods/Materials
A comparison scenario was created in order to align the experiment with the objective. A total of twenty-five residential and agricultural test sites were determined using the following guidelines established in order to ensure the integrity of the experiment. Each residential test site was defined by its ratio of one house for every two and a half acres that was not presently surrounded or inclusive of any active agricultural operation within a one mile radius. Conversely, the agricultural test sites were defined by the establishment of an active agricultural operation such as those relating to botany or livestock. All water purifiers or softeners were removed for the samples collected from within residential dwellings.

Results
All of the ground water samples were determined to contain at least one hundred percent of the nonenforceable Environmental Protection Agency's Maximum Contaminant Level guideline of ten parts per million for nitrates. An increase in nitrate levels was noted in two of the rural residential test sites. Since these sites were labeled using a linear pattern of east to west, it is likely that there is an outside variable such as unreported fertilizer usage or a poorly placed septic tank. These results illustrate the objective which was to analyze ground water for the presence of nitrates.

Conclusions/Discussion
The latter results are of significance since all of the ground water analyzed is used in human consumption. Currently, private residential wells are not governed by any county, state, or federal guideline insofar as testing for water contamination is concerned. Nitrates are of human interest due to their ability to cause Metheglobinemia or "Blue Baby Syndrome" in infants under the age of six months. Also, the effects of long term exposure to high levels nitrates in adults is largely unknown. However, nitrates are thought to be responsible for hemorrhaging of the spleen, diuresis, and cancer.

Summary Statement
Our project analyzed ground water for the presence of nitrates.

Help Received
This experiment would not have been possible without the assistance of families who generously allowed us access to their well water.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Katie A. Dolence

Project Number
S0604

Project Title
A Study of Marine Surface Currents Using IR Thermography

Abstract

Objectives/Goals
To measure the magnitude of marine surface currents using infrared themography.

Methods/Materials
I utilized my connected pool and spa, and rented two infrared cameras. The first camera was a PD 300 Radiometric Super-Cooled Thermal Infrared that provided the ability to measure the temperature from the IR Image stored in the digital image. The second was a PalmIR Pro 400 DX Infrared Camera that provided the ability to record video documentation of the thermal plume. To run the experiment I first blocked the connection between my pool and spa using bricks; I then heated the spa and removed a brick to create a connection. I observed and recorded the event with both infrared cameras. With the PalmIR Pro 400 DX I recorded the data to video tape. With the PD 300 Radiometric camera I took digital radiometric photographs every 5 seconds.

Conclusions/Discussion
When two still bodies of water at different temperatures are connected, a current is spontaneously generated. Mechanical and digital conventional thermometers were insufficient in accuracy and method to measure the phenomenon. By examining the currents using IR Video and Thermography I discovered- Thermal surface currents appear to pulse. By examining the changes in surface temperatures as recorded by the radiometric camera at intervals corresponding to the video pulse phenomenon, I was able to zero in on and document the event When the gradient reaches approximately 1.5°C, the density difference provides enough gradient to induce a new surge in flow. This appears as a pulse of hot water. Infrared is reflected just as visible light is. There is no lag in the commencement of the thermal current flow upon removing the barrier. This contrasts with earlier observations using the dye technique where the current needed to get to a more substantial flow to carry the dye out. A temperature gradient of 1.5° C or above significantly speeds thermal current flow. Much larger gradients appeared to be required using the drop dye technique used in previous experiments by the author. Good design is necessary but measurement is everything. The use of the thermal video camera permitted visualizing a pulse phenomenon in the evolution of the thermal surface current and the radiometric camera permitted direct temperature measurement to .1 degree C. Well worth my ($200) personal investment in renting the thermal imaging equipment for my science fair project.

Summary Statement
The measurement of marine surface currents using IR thermographic cameras.

Help Received
Mother edited report. Brother helped with cameras.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Alan D. Foreman

Project Number
S0605

Project Title
Are Our Waters Clean? A Study of the Concentrations of the Pollutants Cadmium, Uranium, and Phosphate in Newport Estuary

Abstract

Objectives/Goals
The objective was to determine the concentrations of the pollutants Uranium, Cadmium, and Phosphate, and whether they stemmed from a point or non-point source within the Newport Estuary.

Methods/Materials
Using "clean" procedures, samples were taken in 15 locations in Newport Estuary, and each location was recorded using a Global Positioning System. Ocean water taken at a location off of Dana Point was used as a control for the experiment. Unwanted particles and organic matter were removed through filtration. The concentrations of the heavy metals Uranium and Cadmium were measured using an Argon Plasma Mass Spectrometer, and were calculated using the "Isotope Dilution" method. The concentration of phosphates was calculated using the molybdenum titre method. Salinity was calculated by measuring each sample's electrical resistance. For each sample, the concentration of each pollutant was plotted against the salinity of the sample.

Results
As salinity increased, the concentration of both Uranium and Cadmium increased conservatively as well. The concentration of phosphates decreased as salinity increased, but it significantly increased at the common entry of several runoff streams, before returning to its conservative decrease.

Conclusions/Discussion
This data suggests that in fact there are fewer pollutants coming into the estuary from the San Diego Creek than are coming in from the lower bay and that they mix conservatively. Thus there was no point source for either heavy metal. The concentration of phosphates suggested a point source located at the common entry of several runoff streams into the estuary, well downstream of San Diego Creek.

Summary Statement
My project determined that there was no point source for Cadmium or Uranium in the Newport Estuary, but I was able to identify a point source for Phosphate.

Help Received
Jeff Mendez, a post-doc at Caltech, helped me to filter and analyze the samples. My father helped me understand a large portion of the math needed to complete the project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Casey E. Gorish

Project Number
S0606

Project Title
Dust Is in the Air

Abstract

Objectives/Goals
The purpose of this project is to find if the amount of haze coming from Owens Valley has been reduced from 1997 due to Los Angeles Department of Water and Power's dust mitigation procedures.

Methods/Materials
A sun photometer is assembled from an LED, operational amplifier, a breadboard, and two batteries. The photometer is then calibrated to find the Extraterrestrial Constant (ET). A dark reading and a sunlight reading must be taken at each measurement. The following conditions must be recorded at each measurement to calculate the Aerosol Optical Thickness (AOT): sun angle, time, pressure, wind speed, and direction. The AOT can then be calculated by the following formula: (ln ET - ln signal - (0.10599 x M) x (P/1013.25))/M. The AOT shows how much sunlight is being transmitted throught the atmosphere.

Results
Five months of data was collected over three years, 1997, 2002, and 2003. Each set of data was plotted and compared on a graph. Calibrations were performed to find the ET.

Conclusions/Discussion
When the graphs of the AOT points are compared, the AOT values were lower in 2003 and 2002 than in 1997. This shows that the sunlight transmission levels are higher than in 1997. This is compelling evidence that the LADWP's Owens Lake Dust Mitigation is working to lower the amount of air pollution coming from Owens Lake.

Summary Statement
This project measures the amount of dust coming from Owens Lake, and found that the LADWP's measures to lower air pollution have worked.

Help Received
Mr. Glenn Harris gave me research links and information, Father helped in general with several things (transportation, help building the photometer, etc.)

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
John M. Greenfield

Project Number
S0607

Project Title
Moving Towards a New Model for the Formation of Sedimentary Features

Abstract

Objectives/Goals
Can sedimentary features be formed from a process differing from the normally accepted depositional processes?

Methods/Materials
- Build a sedimentary tank that simulates a confined depositional basin.
- Tank is firmly mounted to larger wooden base using bolts and glue.
- Attach and firmly secure vibration mechanism to larger wooden base.
- Mix different types of soils (3 used) with water into a slurry.
- Pour slurry into tank.
- Vibrate tank assembly for various periods of time.
- Observe sedimentary features formed.
- Photograph sedimentary features.
- Catalogue features and compare with features noted in geology textbooks.
- Compare formation processes with generally accepted depositional models.

Results
Sedimentary features formed by seismic vibrations include:
Parallel Continuous - Semi-Parallel Continuous - Prograding -
Mounded (Hummocky) - Vugular - Channels

Conclusions/Discussion
My hypothesis that sedimentary features can be formed by a process differing from accepted depositional processes was correct. In every test, one or more sedimentary features commonly thought to be formed by accepted depositional processes were formed by vibration of the homogeneous slurry. One surprise was noted. Parallel and semi-parallel continuous bedding planes were formed immediately after the sediment slurry was poured into the tank. Commonly, these bedding planes are thought to be formed by slow or rapid lateral transport of sediments that lose velocity and are differentially deposited. Generally, these layers are thought to take a large amount of time to form, yet these layers were formed instantaneously from a homogeneous slurry. These initial bedding plane formations were then altered by the vibrations into other various sedimentary features found in the tests.

Summary Statement
Can sedimentary features be formed through processes that differ from commonly accepted depositional processes?

Help Received
Used my father's woodshop to construct the tank assembly.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Amanda M. LeQuire

Project Number
S0608

Project Title
Under Pressure

Abstract

Objectives/Goals
The objective of my project was to find out whether or not the atmospheric pressure is higher or lower at a higher altitude.

Methods/Materials
Materials: one barometer, two balloons, one tape measurer, an airplane, and a pen and paper to record data.
Procedure:
1. Blow up two balloons and set the barometer and altimeter to the correct pressure readings.
2. Measure and record the widths of the two balloons. Record the ground level pressure from the barometer, before take-off. (These measurements serve as the controls.)
3. For every one thousand feet (or 304.8 meters) above ground level the plane reaches, record the circumference of both balloons and the pressure reading from the barometer.

Results
In the first test, the pressure dropped 126 millibars. The pink balloon expanded a total of 3.81 centimeters and the purple balloon expanded 4.445 centimeters. In the second test the pressure dropped 119 millibars. The pink balloon expanded 3.175 centimeters, and the purple balloon expanded a total of 3.81 centimeters. These results show that the pressure was lower at the higher altitude in both tests.

Conclusions/Discussion
My hypothesis, which was that the pressure would be lower at higher altitudes, was correct. Both the balloons and the barometer showed that the pressure dropped steadily as the airplane flew higher.

Summary Statement
My project was about whether the atmospheric pressure was higher or lower at different altitudes, from 1000 to 9000 feet above sea level (304.8- 2743.2 meters).

Help Received
Father flew the plane.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

William L. Little, Jr.

Project Number

S0609

Project Title

And a Cloud Is Born! The Effects of Atmospheric Conditions on Cloud Type

Abstract

Objectives/Goals

The objective is to investigate the effects of upper-air weather conditions, such as temperature, dewpoint temperature, relative humidity, and barometric pressure, on cloud type and stage.

Methods/Materials

Manual observations of cloud type were taken over Monterey, CA every day for a total of 28 recordings, and observations over Oakland, CA were taken by means of a cloud classification chart from the Internet for a total of 25 readings. Skew-T/Log-P diagrams from the Internet were used to probe the upper-air weather conditions over Monterey and text data was utilized to view the conditions over Oakland. The values of three distinct tropospheric layers were used from the data: 900 mb, 500 mb, and 300 mb.

Results

Every type of cloud was viewed except for cumulus clouds. The clouds viewed with consistent high air pressure were cirrus and cirrostratus, and those with low pressure were were cirrocumulus and stratocumulus. Stratus and stratocumulus were the wettest 900 mb cloud types, although all clouds were seen with a wet humidity reading at their formation level. Stratus and stratocumulus had 900 mb dewpoint readings of 4 and 5 degrees C, respectively, while many of the other types had a reading below 0 degrees C. Stratus and stratocumulus both had an average 900 mb temperature below that of any other type.

Conclusions/Discussion

Due to the diverse nature of clouds, an enormous variety of patterns were found between cloud type and upper-air conditions. Most of the conclusions agreed with the hypothesis, but many were unexpected. For example, stratocumulus was found with low barometric pressure, low temperature, high relative humidity, and warm dewpoint temperatures. These are many of the elements of atmospheric instability, which would explain why stratocumulus clouds are associated with developing stormy weather. This project brings up many areas of further research, including the need for an updated, more precise cloud classification system. This study also helps us expand our knowledge of how clouds foreshadow stormy or fair weather and displays the complexity and variety the atmosphere constantly offers to forecasters.

Summary Statement

This project explores what effects upper-air atmospheric conditions have on cloud type and stage.

Help Received

Dr. Phil Durkee helped by offering possible accessable data options available for this project online and by briefly reviewing some results.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Brigitta E. Miyamoto

Project Number
S0610

Project Title
Reef to the Rescue: Which Artificial Surfing Reef Counteracts Beach Erosion Best?

Abstract

Objectives/Goals
The objective of this experiment was to determine which characteristics of an artificial surfing reef prevent beach erosion best.

Methods/Materials
A wave chamber constructed out of Plexiglas was filled with sand and water. A manual wave-generating crank was positioned at one end, and a sloped sandy beach at the other. Ten clay models of artificial surfing reefs, based on reefs in existence, under construction, or planned, were placed in the chamber and tested for their ability to protect the beach from erosion. After 10 minutes of wave generation with each model, erosion was measured by averaging 4 beach sand inflection measurements. Beach erosion data for each reef was compared to the control situation in the absence of any reef, and to data obtained with other reefs.

Results
The results suggest that the best reef design for erosion control features a shallow-sloped, concave surface towards incoming waves. The shallow slope presents a large surface area to effectively dissipate waves, and the curved concave surface additionally rotates the waves. A reef's profile facing shore was found to be less important. Erosion also decreases if the reef is placed at an angle to the shore, further dampening waves by rotating them. Optimal erosion control is achieved by a reef that dampens waves by both dissipating and rotating them.

Conclusions/Discussion
The relatively recent technology of man-made offshore reefs was first used to condition waves to improve surfing, and was later found to have the desirable secondary effect of decreasing beach erosion. The logic behind using artificial surfing reefs to counteract beach erosion stems from the fact that the bathymetry, or underwater topography, is altered by the introduction of a reef; the wave's shape and energy, and the amount of sand it transports to and fro, are altered as the bottom of the wave passes over the reef. A dampened wave transports less sand to and especially away from the beach, and erosion is checked. This experiment investigated the effect of reef design on beach erosion, and showed that artificial reefs with geometries that both dissipate and rotate waves perfom best in combating erosion. The results support the idea for an increased awareness of this novel engineering approach for erosion control.

Summary Statement
My project involves the use of a wave chamber to investigate how the geometry of an artificial surfing reef affects beach erosion, and gives us an idea of a real-life application, especially the protection of the California coastline.

Help Received
My dad helped me design and build the wave chamber. A friend built the paddle out of spare parts.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nolan H. Reis

Project Number
S0611

Project Title
Is the Wind Predictable?

Abstract

Objectives/Goals

The intent of this project is to find out if the wind is predictable within a day. And if so, with this information, can a sailor optimize his route around a racecourse.
Research shows that the wind has some level of predictability within a day. If true, then for a sailboat race, the racer could go out an hour or so prior to the race and collect trend data. Then, during the race, the sailor would use this data to predict upcoming wind direction shifts.

Methods/Materials

The first step in my experiment is to collect highly accurate wind data and then to analyze this wind data for trends. Unfortunately, a conventional wind vane will not work because it has friction, inertia, and it is not very sensitive to small wind direction shift. The technique that will be used to calculate the direction of the wind is to construct an apparatus containing a cross-axis of ultrasonic transmitters and receivers. Sonic pulses will then be sent along each axis. The magnitude of the wind's effect on each pulse's transit time will be logged to determine the speed and direction of the wind (through the use of trigonometry). For example, if the wind is behind an ultrasonic transmitter, the pulse will get to its receiver faster than if there were no wind. Tests were done to verify that there is linear relationship to the sonic pulse transit time. The data were then collected at the Port of Redwood City, and compared to a USGS weather station there. The wind direction and speed were sampled every 20 seconds and store to a memory device.

Results

For the majority of my data, there was a clear periodic nature to the wind. It is sinusoidal in structure and has a typical period of 15 to 50 minutes. Furthermore, when it occurs, it continues throughout the afternoon in that pattern.

Conclusions/Discussion

This data shows that the wind is (within a day) often predictable. Using this data, my device can look at the trends and tell him when to tack to sail a shorter course. This shorter course could save as much as 15%, or a 120 second advantage.
My next step is to make this apparatus into a device that can go on top of a mast or on a sailor`s head so that it can be used in an actual sailboat race.

Summary Statement

The intent of this project is to find out if the wind is predictable within a day.

Help Received

Dad helped organization, floating point software, and display board; Mom gave up ski weekends; Brother for costructing model; girlfriend for staying home all those Saturday nights

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Allison G. Suarez

Project Number
S0612

Project Title
Solving the Mystery of the Penn Mine Wetland

Abstract

Objectives/Goals
The goal of this project was to find out what caused the low pH (as low as 3.4) in the Penn Mine wetland during and after the rainy season in 2002. I also wanted to find out why the wetland removed dissolved iron during the rainy season when almost all other dissolved metals actually increased. This project is a follow-up to my science project in 2002. I studied metals removal by the Penn Mine wetland at the former Penn Mine site, which was restored to a natural condition in 1999. Seepages that contain high levels of metals still flow at the site.

Methods/Materials
I conducted a simple experiment to determine the change in pH that occurs when dissolved iron changes state to insoluble iron. Samples were taken at a seepage, wetland inlet and wetland outlet. I continued the monthly samples at the wetland inlet and wetland outlet for the following analytes: pH, turbidity, and dissolved iron. I also added a total iron sample to the monthly samples. I used a Hydrolab multi-probe unit and Hach Turbidimeter for my experiment and field readings. Iron samples were analyzed at the East Bay Municipal Utility District (EBMUD) Lab in Oakland.

Results
The experiment data for the wetland inlet showed what happens in the wetland when dissolved iron changes state to insoluble iron. The pH dropped from 5.4 on day one to 3.6 on day four. Turbidity increased from 162 NTU 316 NTU on day eight (the last day of the experiment). The pH remained at 3.6. Total dissolved solids decreased during the experiment. The dissolved iron in the sample was 37,000 ug/l on day one. It dropped to 832 ug/l on day eight.

Conclusions/Discussion
Dissolved iron increases at the Penn Mine site during the rainy season. The limestone drains, which were designed to increase the pH of acid mine drainage at the site are less effective during this time. The flow of water slows down in the wetland (detention time during January and February was approximately 1.5 days). The pH in the wetland drops when dissolved iron changes to insoluble iron. The insoluble iron is retained in the wetland.

Summary Statement
This project solved the pH mystery in the Penn Mine wetland.

Help Received
My advisors Laura Lazzelle, EBMUD and Lorraine Angel, Calaveras High School helped me define the problem, hypothesis, and procedure. I used field equipment from EBMUD. Eileen Fanelli, Penn Mine Restoration Project Manager provided the resources necessary to do the study such as sample analysis at

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Veha Vaene

Project Number
S0613

Project Title
Down to Earth

Abstract

Objectives/Goals
The purpose of the project is twofold: (1) to determine the affect of object size on crater and ray size and (2) to determine the affect of the altitude an object is dropped on crater and ray size. Marbles are used to simulate meteors from space hitting the Earth.

Methods/Materials
The materials used in the project include marbles, soil, balconey, meter stick, and ladder. Marbles of different sizez were dropped from different altitudes. The crater sizes and ray sizes were measured using the meter stick.

Results
Small marbles tended to leave smaller craters. Larger marbles left larger craters. As the height of the drops increased, the craters increased.

Conclusions/Discussion
The greater the size of the object hitting the soil, the greater the size of the crater. Similarly, the higher the altitude of the drop, the larger the crater.

Summary Statement
The project simulates meteors hitting the Earth creating craters and rays.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Laura E. Van Alstine

Project Number
S0614

Project Title
Health... in a Handful of Dust?

Abstract

Objectives/Goals
To prove whether or not rock dusts rapidly add a great deal of nutrients to soils, as opposed to chemical fertilizers.

Methods/Materials
Firts, four soils from four areas were collected: one from the student's backyard, one from the vicinity of the Conejo Valley, one from the vicinity of Buenaventura State Park, and one from store-bought potting soil. Each soil's pH and levels of nutrients (nitrogen, phosphorous, and potassium) were determined with the use of an Accugrow SOil Test Strips kit. Each of the four soils were divided into four containers. Then, the two types of granite rock dusts were added to the first two containers. These steps were repeated for each soil sample from each different area. After a period of one day, each soil from each different container was tested for its pH level, as well as for its nutrient levels. After a period of two days, the previous step was repeated and changes in soil nutrient levels as well as changes in the level of pH were observed.

Results
Overall, the rock dusts did not have a large impact on the nutrient levels or the pH of the soil. The fertilizers, however, had a large impact on the nutrient levels, but not on the pH's different types of soil.

Conclusions/Discussion
Rock dusts do not rapidly add nutrients to soils, while chemical fertilizers do. Rock dusts also do not rapidly affect the pH's of soils. Further, fertilizers do not significantly affect the pH's of soils.

Summary Statement
Rock dusts do not add a great deal of nutrients very quickly to soils, while chemical fertilizers do.

Help Received
Mother drove to different areas to gather soils samples and helped to find materials for the project. The Vulcan Mining rock quarry in Saticoy, California supplied the two types of granite rock dusts.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Angeline R. Wolski

Project Number
S0615

Project Title
Burning Questions: The Effect of Fires on Soil Infiltration Rates

Abstract

Objectives/Goals
The objective of my project was to determine if wild fires, such as grass and redwood forest fires, affect soil infiltration rates. I think that water will take longest to infiltrate on the forest fire plot because of the heavy ash produced. Grass fire plots will have faster infiltrating times than the forest fire plots, but the control plots will have the fastest. As the ash wears away over time and vegetation regrows, the infiltration rates will increase.

Methods/Materials
Two types of fires, grass and forest, were tested for their effects on infiltration rates. Fires were tested in two situations; a real fire in Redwood National Park, and a synthetic fire (one I created under controlled conditions.) Nine plots were constructed in each environment: three forest fire plots, three grass fire plots, and three control plots. I used a double ring infiltrometer to measure infiltration rates. I also tested for water repellency on all plots and measured rainfall during the experiment.

Results
The forest fire plots showed the largest decrease in infiltration rates. Grass fire infiltration rates were also much slower than the control, but faster than the forest fire plots. Infiltration increased once ash was worn way and vegetation began to grow back. Rainfall decreased infiltration on grass fire and control plots, but increased infiltration on forest fire plots. However, after the rainy season, burned plots still exhibited lower infiltration rates than the control. Variability was greatest on forest fire plots. None of the plots exhibited water repellency.

Conclusions/Discussion
My conclusion is that wild fires decrease the soil infiltration rates. The greater intensity of the fire, the slower the infiltration rate. The infiltration rates of fire plots will be slower than the control until vegetation regrows. In my experiment, slow infiltration rates persisted for at least five months. This may lead to higher levels of run-off, flooding, and erosion after a fire.

Summary Statement
The purpose of my experiment was to determine if forest and grass fires affect soil infiltration rates.

Help Received
Mother helped drive to Redwood National Park; Used infiltrometer from US Geological Survey.