CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Rameen M. Aryanpur

Project Number

J0601

Project Title

Natural Disasters

Abstract

Objectives/Goals

I wanted to find out how moisture and soil type affects landslides and mudslides

Methods/Materials

In this experiment I used: 1 complete apparatus with filter, 5 gallons of silt, 5 gallons of sand, 5 gallons of dirt, 5 gallons of gravel, a measuring cup, an oven, a set of hands, a hose, 2 baking dishes. Methods: For this experiment, I placed 12 cups of the substance on a moving board inside the apparatus and shaped it into a 10 degree angle to simulate a hill. Next, I gradually moved the board up to 10 degrees, 20 degrees, 30 degrees, 40 degrees, 45 degrees, 50 degrees, and then 60 degrees. When 4 cups of the substance fell into the measuring cup, I considered that a landslide or mudslide. I did this experiment when when the substances were dry, when 3 cups of water had been added to the substance, and when 8 cups of water had been added to the substance. I also did the tests 5 times with each substance under each condition.

Results

The average angle at which substances slid under dry conditions: Silt: 34 degrees. Sand: 30 degrees. Dirt: 30 degrees. Gravel: 32 degrees

The average angle at which substances slid under wet conditions: Silt: 30 degrees. Sand: 34 degrees. Dirt: 37 degrees. gravel: 30 degrees.

The average angle at which substances slid under very wet conditions: Silt: 12 degrees. Sand: 24 degrees. dirt: 18 degrees. Gravel: 20 degrees.

Conclusions/Discussion

My predictions for dry conditions were that gravel would be the sturdiest, then dirt, silt, and then sand. But it turned out that silt was the sturdiest, followed by gravel, and then dirt and sand were tied.

I thought that under the wet conditions, the order would be the same as under wet conditions. But dirt was really the most stable, in second was sand, and then tied for last were gravel and silt.

Under the very wet conditions, my predictions were that the most stable substance would again be gravel, then sand, followed by dirt and then sand. The results showed that sand was the most stable, then gravel, dirt, and finally silt.

These results weren't really true to my hypothesis, although some of the predictions were.

This experiment helps people understand soil stability and the importance of it while making a road. It also tells what soil is the best to use when making a road.

Summary Statement

Testing how soil type and moisture affect landslides and mudslides.

Help Received

Dad helped build apparatus. Talked with Storm Damage Coordinator at Cal Trans(Dale Couly) about money used to clean up landslides and mudslides.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Thallia R. Bird

Project Number

J0602

Project Title

Pollution Diffusion

Abstract

Objectives/Goals

My project shows how the type of permeable rock or the size of pore space affects the distance pollution diffuses in a model aquifer. I think the diffusion of pollution in a model aquifer will be increased by increased pore space.

Methods/Materials

Using three different types of permeable rock (gravel, sand, and potting soil), I made three model aquifers. I polluted each model aquifer with food coloring. I measured the spread of the pollution (in millimeters) in all three model aquifers. I repeated the experiment three times to establish validity.

Results

Contrary to my hypothesis the pollution in the potting soil spread more than the sand. The pollution spread the most in the gravel.

Conclusions/Discussion

My hypothesis was partially incorrect. As I predicted the pollution spread the most in the gravel. However, the pollution spread more in the potting soil than in the sand. Still, the size of pore space directly correlates with the diffusion of pollution. Sand has very uniform particles. Soil has smaller particles than sand, but as I discovered it also has some bigger particles. These bigger particles probably are the reason the pollution spread farther in the potting soil than in the sand.

Summary Statement

My project shows how the type of permeable rock or the size of pore space affects the distance pollution diffuses in a model aquifer.

Help Received

Mother helped with title. Neighbor lent computer.

Name(s)

Caschjen L. Davis

Project Number

J0603

Project Title

The Prediction of Geyser Eruptions

Abstract

Objectives/Goals

Will a size and heat controlled geyser erupt on a consistant schedule allowing for mulitple advanced eruption predictions.

Methods/Materials

7 gal trashcan, 3ft braided plastic tubing, 20ft copper tubing, 2 coffee cans, charcoal/lighter fluid, welding mat'l, heat radar gun, water, stop watch and a lighter.

To build the geyser a 1/2" hole was drilled into the trashcan about 2" from the bottom and another 12" above. A copper 4" tube was welded in place in both locations sealing it completely. The braided plastic tubes were then attached snuggly over each 4" copper tube and clamped in place. Remaining 19ft of copper tubing was coiled tightly/vertically inside the stacked coffee cans with each end clamped tightly to other ends of plastic tubing.

Charcoal and lighter fluid is placed in the middle of the copper coils and lit. Using a heat radar gun the core temperature of the coal is taken. Once the coal temperature reaches 450 degrees 5 gals of water is poured into the trashcan. The stopwatch is started and each eruption is timed.

The pressure of the water level in the trashcan causes water to flow over and up through the 1/2" copper tubing. As the charcoal heats the copper tubing it applies pressure to the water causing it to erupt. Steam escapes first followed by the fluid eruption. Due to the eruption the water evacuates the copper tubing. The water pressure in the trashcan pushes water back up into the copper tubing starting the process over.

Results

My geyser erupted around 2 mins 39 sec apart. By controlling the core heat, water temp/amount, the tubing diameter and continuous flow of the tubing the geyser erupted on a regular schedule unlike Old Faithful which you can only predict one eruption in advance. I was able to predict 10 eruptions in advance with-in a 5 second variable.

Conclusions/Discussion

Having a controlled environment enabled me to make advanced, accurate predictions. If the water filled caverns of Old Faithful were exactly the same dimension throughout and coiled around the molten rock so it was evenly heated I conclude that we could predict several eruptions in advance. Unfortunately today we are only able to predict one eruption at a time. Think of the possibilities of a harnessed timely eruption.

Summary Statement

Predicting the eruption of a controlled environmental geyser vs. the natural geysers.

Help Received

My father welded and built the geyser. My mom typed up my notes/report and helped me with my display board.

Name(s)

Regina M. Dettmer

Project Number

J0604

Project Title

The Saturation and Flow of Rainfall through the Soil of the Owl Canyon Watershed

Abstract

Objectives/Goals

To calculate how much water Owl Canyon soil could hold, and compare this with how much water it does hold once saturated with autumn and winter rains. Also to observe increases and decreases in canyon water flow after periods of rainfall.

Methods/Materials

I calculaterd the approximate amount of rain needed to saturate canyon soil and begin flow by multiplying the average soil depth by the ratio of saturation water volume to soil volume. I determined the average top soil depth by driving a rod into the soil in many places in the canyon. I determined the saturation ratio by pouring measured amounts of water through soil core samples and collecting the drainage. I measured rainfall and canyon water flow.

Results

I calculated that it would take 11.25 cm of rainfall to saturate the soil. I observed that it actually took 13 cm.

My flow observations show that within a day after a rain, flow reaches its peak(as great as 23.6 liters/sec). It then decreases by 1 to 2 liters/sec each day, until it drops to 2 liters/sec. After that it decreases by only .3liters/sec each day.

Conclusions/Discussion

I was able to predict within 10% how much water the Owl Canyon soil can hold.

I was able to compare flows with periods of rainfall, and observe trends.

Summary Statement

The measurements and observations of soil saturation and water flow in a watershed

Help Received

Father suggested topic, accompanied me to the canyon, and gave editing suggestions.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Jennie E. Elliott

Project Number

J0605

Project Title

Into Thin Air: The Effect of Elevation on Temperature

Abstract

Objectives/Goals

This project's objective is to determine if temperatures change randomly or if there is a specific pattern of change, and also to determine if the elevation of a certain place is a key factor in a change in temperature.

Methods/Materials

This project involved placing eight thermometers at different altitudes, beginning at 1,000 feet above sea level to 8,000 feet, in similar topographical areas. I checked the thermometers in three different seasons -- summer, autumn, and winter -- during the same time of day, and recorded the temperature and weather conditions. The materials used for this experiment were: thermometers, altimeter, and a vehicle.

Results

I discovered that temperature mostly decreases as elevation increases, but that these temperature changes are random rather than occurring with any set pattern. At three of the selected elevations, however, a temperature inversion always occurred. It was significantly warmer at these specific sites than at elevations that were lower. This is due to a consistently rising current of cool air that lost its buoyancy when reaching a pocket of warmer, less dense air that was trapped at these elevations due to the prevailing breezes caused by the river canyon.

Conclusions/Discussion

There are several factors for variations in local temperature. Air pressure decreases as elevation increases. Air density decreases as air is heated. In a process called adiabatic cooling, when an air parcel is moved to a lower pressure level (higher elevation), it expands (lower density) and the temperature decreases. Weather systems that bring higher (warm, compressed air) or lower (cold) air pressure also affect the air's density and, therefore, temperature. These results supported my hypothesis that temperature decreases as elevation increases, but these findings also conclude that although the general population is aware that snow falls at higher elevations (mountains), while in the lowlands that precipitation is in the form of rain, it is important to know that there are many factors involved in temperature both locally (air pressure, air density, weather systems, and elevation) and globally (latitude, seasons, and the greeenhouse effect).

Summary Statement

The study of weather and temperature patterns at varying elevations.

Help Received

My parents provided my transportation so I could check my eight thermometers.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Nicholas E. Forsburg

Project Number

J0606

Project Title

Holding Their Own, Soil Texture and Water Capacity

Abstract

Objectives/Goals

My project was to test the soil water holding capacity of three soil types. After meeting with a soil conservationist and learning how to read soil maps I selected three distinct locations to sample. I sampled in a pasture for loam soil, a redwood forest for clay soil and the banks of the Mad River for a silty loam soil.

Methods/Materials

At each sample site after clearing the organic material (O horizon)I dug a 30-60 cm hole and filled 4 tin sample cans. Each can had a lid and each sample was placed in a lableled plastic bag and stored in a cool dry place. Soils were weighed, baked in an oven at 110 degrees C (230 degrees F) for 6 hours, then weighed again to determine the weight loss from the water evaporation. The formula used to derive the various percentage of water holding capacity was as follows:the ratio of wet soil weight with can minus dry soil weight with can divided by the dry soil weight without the can multiplied by 100.

Results

The loam soil had the highest percentage of water holding capacity followed by the silt and then the clay.

Conclusions/Discussion

The result for the clay soil was not as I predicted. Environmental factors may have contributed to the difference in results. The sample hole dug for the clay soil was made up of organic material in the O horizon. This organic material may not have allowed rainwater to access lower horizons in the soil. Also nearby redwood trees may have been actively transporting the available water through their roots.

Summary Statement

Estimates of water holding capacity , which is the amount of water a soil can store, vary depending on soil texture.

Help Received

I met with Mr. Mark Meissner and Mr. Ricardo Velarde who are Soil Conservationist with the Natural Resource Conservation Service, US Dept. of Agriculture.

Name(s)

Carter E. Greenbaum

Project Number

J0608

Project Title

Predicting Coastal Bluff Erosion

Abstract

Objectives/Goals

Objective: The objective is to predict where coastal bluff top erosion will occur.

Methods/Materials

Materials and method: (3 boxes, dirt, rocks and three water sources.) three different dioramas of bluffs were constructed. Each having different forms of bedrock, vertical, diagonal and horizontal. Each had six rocks and the same amount of dirt. Water dripped on these dioramas for 24 hours at 10 drops a minute.

Results

Results: The height of the diagonal diorama was 5.7-cm. For trial one, 2.3 cm depth and 4.5 cm. For the horizontal diorama, height: 2.5 cm, Depth: 1 cm, Width 3.3 cm. For the vertical diorama, height: 5 cm, depth: 4.3 cm, width 5.5 cm.

Conclusions/Discussion

Conclusion: The horizontal diorama had the least amount of erosion

Summary Statement

My project is about predicing where Erosion will occur (on which bed rock more than other.)

Help Received

Mother corrected grammar. Sister helped gather materials. Dad helped think of project idea.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
James Henrard; Kevin Medeiros

Project Number
J0609

Project Title
Hollister's Impact on the San Benito River

Abstract

Objectives/Goals
What impact does the City of Hollister have on the quality of the water flowing in the San Benito River? We answered this question by investigating the quality of water in the river by examining its chemical and physical characteristics. We tested 4 different locations: upstream, downstream, in Hollister, and just before Hollister. We hypothesis that the San Benito River will become contaminated as it flows downstream and passes the town of Hollister. We think this will happen because Hollister is a large town and trash and toxic runoff will pollute the river.

Methods/Materials
We tested each site using the Hach Stream Survey Kit. We tested the river for Ammonia Nitrogen, Phosphates, Nitrates, Dissolved Oxygen, pH, and water temperature. Our Hach Kit is supplied with a thermometer and pH tester. We conducted the other tests using kit instructions, test tubes, color comparator, and different reagents and chemicals provided for each test. Test results were then averaged, graphed, and recorded.

Results
Temperature: The temperature at all sites stays about the same (12*C - 14*C) except at the site within Hollister which averaged 21.5*C.
Average pH: The highest pH reading was in the middle of Hollister at 8.63 and the lowest reading was downstream at 7.75.
Dissolved Oxygen: The DO was highest in Hollister at 49.5 mg/L and lowest downstream at 30.8 mg/L.
Ammonia Nitrogen: The readings for all sites were below 0.1 mg/L. But, the Hollister site had the darkest color green.
Nitrate-Nitrogen: Downstream was highest at .053 mg/L and Hollister was 2nd at .016 mg/L.
Phosphate: Before Hollister and in Hollister had the highest numbers at .165 mg/L and .12 mg/L.

Conclusions/Discussion
We concluded that the chemical tests from our sites show the river water to be healthy with the execption of the Hollister site. Healthy streams have a temperature lower then 20*C and pH range of 6.5 to 8.5. The Hollister site had higher levels. The physical characteristics showed man-made pollution increased as the river flowed downstream. It reached disturbing amounts at the site in Hollister. We learned that even though man has adverse effects on the water, subsurface flows cleaned out some of the harmful toxins.

Summary Statement
Analyzing the chemical and physical impact of Hollister on the San Benito River

Help Received
Father helped with water testing procedures; San Benito Co. Water District Engineer discussed water flow characteristics

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Gregory M. Hirsch

Project Number

J0610

Project Title

The Effect of Soil Absorbency on Erosion

Abstract

Objectives/Goals

The purpose of this experiment is to show how the different saturation rates of soil samples effect erosion. I will test this by showing which of four soil samples can retain the most water and then in the second part of the experiment show which soil has the least erosion.I will measure the volume of water that the soil samples allow to pass through. I believe that the soil that retains the most moisture will have the least permeability and will erode the least.I believe that the soil with sand will have the most absorbency.

Methods/Materials

Fill four globes with equal amounts of different soil samples:soil with gravel, clay, loam and soil with sand.Globes have cloth on the bottom. Pour 8 oz. of water into each globe, measure how much water each can hold before run-off.Repeat.Fill four waterproof wooden troughs that have fine mesh screen attached to one end,with equal amounts of the four soil samples.Beakers are at the end of each trough.Pour 8 oz. of water into each trough. Note which has the most erosion and run-off. Measure the run-off. Repeat.

Results

In the first test I showed how much water a soil sample can hold before becoming saturated. The soil with gravel held 7 oz. in both trials. The soil with gravel averaged 6.5 oz.,clay soil averaged 5.75 oz.,and loam held the least at 3.5oz. Next, when I measured the permeability of the soil samples: soil with gravel had the least run-off, followed by soil with sand, loam and the clay soil.

Conclusions/Discussion

The absorbency of the soil does make a difference in erosion. Since soils contain particles of different sizes, the space between the particles determines how much water a soil sample can hold.The more water retained, the less run-off. I thought the sandy soil would hold the most water, but it was the soil with gravel that held the most and had the least run-off.

Summary Statement

To show how the different saturation rates of soil samples effect erosion and that the soil that holds the most moisture will have the least erosion.

Help Received

My mother showed me how to do graphs on the computer.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Lauren D. Ivey

Project Number

J0611

Project Title

Slow The Flow: Controlling Erosion on Dirt Roads

Abstract

Objectives/Goals

The objective of this experiment was to determine the most effective water bar to use on dirt roads. A water bar is an alteration of the road terrain to divert water flow in order to minimize erosion.

Methods/Materials

A model road (4'Length x 2'Width x 3"Depth) was built from wood and filled with red earth (the soil most common to this local area). A 45-degree mound water bar was formed on the model. Droplets of water, comparable to a moderate rainfall, were lightly sprayed on the model. This process was repeated with a 30-degree mound water bar, a 45-degree rolling dip water bar, and a 30-degree rolling dip water bar. The experiment was done on a surface with no water bar as well to compare the difference when no water bar of any kind is formed. Three more trials were done following the same process.

Results

The 30-degree angle more effectively controlled erosion than the 45-degree angle, using either the mound or the rolling dip style water bar. When the data from the 30-degree angle trials were averaged, the rolling dip had slightly better results. The data from the 45-degree angle indicated it was not as effective as the 30-degree angle; however, the rolling dip was more effective than the mound. The trials involving the surface with no water bar had more than double the erosion as the least effective water bar.

Conclusions/Discussion

Using the data from this study, I conclude that the rolling dip and mound water bars are equally effective in minimizing erosion on dirt roads at a 30-degree angle. Based on the information collected from interviews with two experts, I recommend a rolling dip style water bar because mounds are quickly flattened by vehicle traffic.

Summary Statement

This project compares four kinds of water bars in order to determine which is most effective in minimizing erosion on dirt roads.

Help Received

Mother edited (except logbook); father supervised building of model

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Melissa S. Izbicki

Project Number
J0612

Project Title
Water Retention Is a Function of Soil Type

Abstract

Objectives/Goals
My project was to determine which soil retains the most water. My independent variable was the water retained by the soil under the pull of gravity (field capacity) My dependent variable was soil type. I believe sand and gravel will retain the least water because they have large pore spaces. When I researched water retention in soil physics I found that the larger the air spaces the more rapidly the water will drain.

Methods/Materials
I collected seven soil samples from various locations. Bulk density and porosity were calculated from the volume of the container and the soil weight according to the following equations:

Bulk density = weight of soil/volume of container
Porosity = 1 - (bulk density / mineral grain density)

Volumetric water content was calculated by dividing the water retained by the soil by the volume of soil. Gravimetric water content was calculated by dividing the weight of the water retained by the dry weight of the soil.

Results
For the seven soils measured the average bulk density of three replicates ranged from 0.26 to 1.50 g/cm3. The soils with the highest values were coarse and medium gravel. The soils with smaller particles had lower bulk density. The average porosity ranged from 0.43 to 0.73. The highest values were soils of smaller particles (garden soil, topsoik, and subsoil). The lowest porosity were gravel and sand. The average volumetric water content at field capacity ranged from 0.07 to 0.56. The highest values were potting soil, sand, and subsoil. The lowest were topsoil, coarse and medium gravel. The average gravimetric water content ranged from 0.07 to 0.62. The highest values were garden soil, subsoil, and potting soil. The lowest were gravel and topsoil.

Conclusions/Discussion
I learned that different soil types retain water differently. My hypothesis was correct that gravel and sand would retain the least water. I was surprised to learn that the finer grain soils (garden soil, topsoil, subsoil and potting soil) had more air space than the coarser grain soils. Water was retained in these small air spaces that I could not see. Water retention is an important property of soils that affects plant growth and suitability for building sites.

Summary Statement
Water retention is a function of soil type and an important property of soils that affects plant growth and suitability for building sites.

Help Received
father helped collect soil and conduct experiment. US Geological Survey provided balance, graduated cylinders, mother took pictures

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Emma C. Kelsey

Project Number

J0613

Project Title

Seasonal Changes in Little River Estuary

Abstract

Objectives/Goals

My objective was to find out how the salinity, water temperature and water level changed in Little River estuary from summer to winter, and to look for long-term changes in the river channel.

Methods/Materials

I used a salinity meter and sounding line to measure water characteristics at three sites in the downstream 1.2 miles of the Little River estuary. Every month I paddled a canoe out to my measuring sites and recorded my data. I used a hand held Global Positioning Satellite system (GPS) to make a cross section of my deepest site and to map the current path of the river channel.

Results

I found that in August through October there was a salt water layer at the bottom of the estuary. With higher precipitation and stream flow in November and December, the water temperature dropped, the water level dropped, and the salt water disappeared. In January I observed salt water in the estuary again. When I compared the current path of the river channel to the mid-1960s channel, I found that the current path goes 80 to 100 m farther west, into the dunes, while the older channel had stayed next to the cliff.

Conclusions/Discussion

The changes I measured from summer to winter were related to changes at the mouth of the estuary. There was a berm blocking the mouth in August through October. In November the berm broke, the water level dropped, and all of the salt water washed out of the estuary. In January, large waves moving up the estuary started bringing salt water back in again. In the 1960s the highway bridge over the river was supported on pillars, but between then and now the bridge has been widened and the space between the pillars has been filled in by cement walls. The river was able to flow around the pillars, but when the cement walls were put in they directed the river out into the dunes where the channel tends to be shallow and smooth rather than deep and rocky like it is next to the cliff. This change is not good for salmon habitat in Little River estuary because salmon like deep pools.

Summary Statement

Seasonal changes in salinity, water temperature, and water level in Little River estuary reflect changes in shape of the berm at the mouth of the estuary and changes in discharge of the river.

Help Received

I would like to thank Mrs. Skiles for support and advice, Mitch Farro and Tom Weseloh for information on estuaries and fish, Eileen Hemphill-Haley for loaning me her salinity meter, and my parents for taking me out to Littl

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Timothy M. Kiefer

Project Number

J0614

Project Title

The Engineering Properties of Soil

Abstract

Objectives/Goals

The main reanon I'm doing my science project on the engineering properties of soil is to show what soils are good for building on and why it is an important step in construction.

Methods/Materials

I had different types of soils (gravel, humus, and sand) and put washers (weights) on top of small cylinder shaped samples of soil and saw which types was sturdier.

Results

The results were just as I predicted. Gravel won because of its interlocking capabilities and held nineteen of twenty washers where as sand only held the base to hold the washers. The humus, which had some organic material inside it, held eight of twenty washers.

Conclusions/Discussion

I found out that testing the quality of soils is very important, if engineers didn't do this step, probably most buildings willsink into the ground or fall apart.

Summary Statement

My project is about the engineering properties of soil or the amount of weight different soils can hold.

Help Received

Dad supplied books for research and corrected errors in report.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Natalie C. Kraft

Project Number

J0615

Project Title

Which Factor Has the Greatest Effect on the Rate of Water Evaporation?

Abstract

Objectives/Goals

The objective is to see what factor has the greatest effect on the rate of evaporation of water. Factors tested were surface area, wind speed, air temperature and water temperature.

Methods/Materials

Experiment #1 (Surface Area):
Four different diameter plastic beakers were filled with 100 mL of water at the same temperature. They were placed right next to each other on the counter. Let sit for 63 hours and 20 minutes.
Experiment #2 (Air Temperature):
Three identical glass beakers were filled with 100 mL of water at the same temperature. One was placed under a heat lamp, one in the refrigerator and one on the counter at room temperature. Let sit for 60 hours and 30 minutes.
Experiment #3 (Wind Speed):
Four identical glass beakers were filled with 100 mL of water at the same temperature. One was placed in a cabinet for 24 hours. The other three (one at a time)were put in front of a fan at the same distance on low speed, medium speed and high speed. Each for 24 hours.
Experiment #4 (Water Temperature):
Three identical glass beakers were filled with 100 mL of water. One was placed on a hot plate, one under a heat lamp and one in an ice bath. Evaporation was measured 24 hours after temperatures stabilized.

Results

The hot water had the most evaporation of all the samples. The cold air had the least evaporation of all the samples.

Conclusions/Discussion

My conclusion is that the four factors I tested can have a significant impact on the rate of evaporation of water. This information could be helpful in the location of reservoirs to improve water conservation.

Summary Statement

My project is about which of these factors: surface area, air temperature, wind speed or water temperature has the most effect on the rate of evaporation of water.

Help Received

My father helped me to do the experiment by buying the equipment I needed and reminding me when it was time to check the experiment. My grandfather let me use his weather instrument to measure the wind speed of the fan and my mother helped me with MS PowerPoint problems.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

DeeAnn J. Kroeker

Project Number

J0616

Project Title

Gypsum's Effect on Soil Drainage

Abstract

Objectives/Goals

The objective of my project was to find out how much gypsum would help my dad's soil drain water better.

Methods/Materials

I used three liter bottles with the bottoms cut off and cloth fastened at the necks of the bottles. The samples contained; ten cups soil and one cup gypsum (10:1), ten cups soil and two cups gypsum (10:2) and five cups soil and five cups gypsum (5:5). I poured one cup of water in the bottles each day and let drain for 24 hours. I repeated this process for five days, each day recording the water amount that had drained.

Results

My results concluded that the 10:1 mixture (soil and gypsum) drained the most water.

Conclusions/Discussion

My research indicated that too much gypsum could actually have the opposite effect on drainage. This was what happened with the sample that had the most gypsum in it.

Summary Statement

My project is about using gypsum as a soil ammendment for water drainage, determining how much of it is needed for the maximum benefit.

Help Received

My dad helped me get my supplies and find research materials.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Blake D. Krongaard

Project Number

J0617

Project Title

How Does Pressure Affect the Size and Speed of a Tornado?

Abstract

Objectives/Goals

The objective of this project was to prove or disprove my hypothesis that as the pressure decreases within the core of a tornado, the size and speed increase.

Methods/Materials

Materials:

3 18 in. plywood disks, 2 18 in. Plexiglass disks, 1 speed controller with potentiometer, 1 radial blower fan, 1 4 x 8 ft. sheet of fiberglass, 1 ultrasonic mist generator, 3 toggle switches, 1 light bulb base with 7W bulb, 1 tube silicone caulk, 2 aluminum strips, 4 ft. PVC pipe, 8 ft. 1 x 2 wood stock, 2 cans black satin spray paint, 8 rivets, 24 wood screws, 1 terminal block, 10# 16 guage wire, 4 wheels, 1 metric ruler, 1 stopwatch.

Methodology:

A. Construct a tornado generator to simulate the two primary atmospheric components of a tornado (updraft/wind shear, swirling winds).
B. Test the tornado generator.
C. Operate the tornado generator at various power settings and measure width of tornado at top and bottom.
D. Use stopwatch to time the rotational speed of tornado at top and bottom.
E. Calculate the rotational speed based on time and distance calculated from C and D above.
F. Run two trials. The first using ten power settings (increased vacuum) in increments of 10% (10% to 100%). The second using 10 power increments of about 3% over a range 20% to 50% of power.
G. Record data and graph results.

Results

As the percentage of power was increased, the pressure was decreased at the core of the tornado. And as the pressure decreased in the core, the size and speed at the top and the bottom of the tornado increased.

Conclusions/Discussion

The lower the internal pressure of a tornado, the larger and faster it will become. Therefore, colliding weather fronts capable of producing greater internal updrafts and areas of extreme low pressure will produce tornadoes that are larger, faster and cause more damage. I also was able to conclude that if meteorologists could accurately detect these updrafts and areas of low pressure, they could save lives by providing advance warning to those who would be in its path.

Summary Statement

My project is about the study of tornados and how they are affected by atmospheric pressure.

Help Received

My father helped me build the tornado gnerator, type report and construrct the final display.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Karina B. Mudd

Project Number
J0618

Project Title
Testing Variables that May Affect Geysers

Abstract

Objectives/Goals
To find out what variables might affect the eruption cycles of geysers.

Methods/Materials
In this project, different variables were tested in a simulation geyser, to see how they affect the geyser#s eruption process. The geyser was made from a 1 liter flask and a funnel, connected by clear, plastic tubing. When the structure was filled with water, and heated to a high temperature by a hot plate, an eruption cycle began, similar to a real geyser#s. The variables were;
- length and diameter of the tubing, which simulates the underground passageways of a geyser
- the presence of salt, which is plentiful in geysers
- the presence of chicken parts, which simulates when a wild animal falls into a geyser

Results
In summery:
The larger the volume of the structure, the longer it took to heat the water to the point of eruption and the larger the eruption. The various added substances also had different affects on the behavior of the geyser.

Conclusions/Discussion
The larger the volume of the structure, (i.e. the longer and wider the tubing,) the longer it took to heat up the water, and the eruption intervals were made longer. The chicken parts had a significant affect on the behavior of the eruptions, and the salt also created some changes. All of the tested variables had some type of affect on the geyser#s eruption cycle, which suggests that geysers are very sensitive natural features.

Summary Statement
Testing variables that may affect a geyser's eruption cycle

Help Received
Used band saw and lathe in Dad's shop (under supervision)

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Scott S. Nelson

Project Number

J0619

Project Title

Bust the Dust

Abstract

Objectives/Goals

My project goal was to determine if the sediments under the Salton Sea are more or less likely be blown into the air than surrounding soils. My question, If the Salton Sea recedes, will wind blow more of the exposed particulates into the air, compared to other soils?

Methods/Materials

Nine different soil types as well as a sediment sample from the Salton Sea are gathered. These samples are subjected to wind speeds of 10 mph, 20 mph, 30 mph, 40 mph, 50 mph, and 60 mph. Each soil test is replicated three times for a total of 180 trials. The beginning weight of the sample, minus the ending weight of the sample after one minute of wind speed, gave me a number by which to compare all soil types and sediment samples. An electronic scale was used for weighing the materials. A Kestrel 3000 wind meter measured wind speed.

Results

Two soils were less susceptible to getting blown away, and the other 7 were more susceptible to being blown away. The most susceptible 4 soil types were Sb, Gca, Gda, It. The least susceptible were Cdc, Nab, and the Salton Sea Sediment sample. The numeric results were the same as the visual results.

Conclusions/Discussion

The sediments from under the water were not as erodible as most of the other soil samples from the Coachella Valley. Based on my results, I could not conclude that exposed land by a receding Salton Sea would have a greater impact on airborne particulate matter than surrounding soils.

However, this experiment and my research has led to many other questions that could be addressed about a declining shoreline and its impacts on Coachella Valley air quality.

Summary Statement

With water use in Southern California on the increase, inflows into the Salton Sea are reduced due to better water utilization, according to my experiment, exposed soil will have no greater effect on air quality than the surrounding soils.

Help Received

My father helped me with the computer formatting, and my mother helped me design the board presentation.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Elise M. Rico

Project Number
J0620

Project Title

The Effects of Soil Types and Soil Compaction on the Percolation Rate of Toxic Chemicals

Abstract

Objectives/Goals
Determine an average percolation rate of toxic chemicals on different soil types and compacted soil types.

Methods/Materials
Using 5 soil types (farming/agriculture, playground/sandbox, canal/clay, potting/mulch, landscape/med.), weigh 10 oz. of ea., pour in PVC pipe, then pour in 1 oz. lighter fluid. Allow to percolate for 15 sec., push out w/smaller pipe, light from top, measure how far flame is burning w/ruler. Record data, repear 10 times w/ea. soil. Repeat above procedure, only this time compact soil in pipe before pouring in lighter fluid.

Results
My results showed that non-compacted soils had a higher percolation rate than compacted soils. Non-compacted potting/mulch had the lowest average percolation rate with a 4.45 in. average. Non-compacted agri/farming soil had the highest rate with a 5.55 in. average. Compacted potting/mulch had the lowest rate with a 3.80 in. average. Compacted landscape/med. soil had the highest rate with a 4.80 in. average.

Conclusions/Discussion
I learned that potting/mulch soil had the lowest toxic percolation rate in both compacted & non-compacted soils. Most of the toxic fluid was absorbed on the top layer of the soil. We should all educate ourselves on the harmful effects toxic chemicals can cause humans, animals and our environment. We should find alternatives to using harmful chemicals. If we all do our part, we can save our environment for our future.

Summary Statement
Investigate the percolation rate of toxic chemicals on various soil types.

Help Received
Dad helped with board, Mom helped type, teacher/lab tech. helped research, comp. tech. helped with graphs.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Todd K. Sakamoto

Project Number

J0621

Project Title

Determining Which Soils Best Stabilize Buildings During an Earthquake

Abstract

Objectives/Goals

My objective was to see what potting soil mixture would have the greatest amount of fish weights standing up after five seconds, ten seconds, and fifteen seconds. My hypothesis was that the potting soil with landscape stone would work work best for all of the intervals.

Methods/Materials

I used fou intervals to see what would work ther best. They were potting soil plus pumice, pottring plus walk-on mulch, potting soil plus landscape stone, and potting soil by itself. Then I simulated an earthquake by using a massager to shake a storage box. I used fish weights in place of buildings.

Results

Potting by itself would best for five seconds and ten seconds.The walk-[on mulch plus potting soil was the worst for the five and ten second intervals. The lqndscape stone worked best for the fifteen second interval.

Conclusions/Discussion

The results did not support my hypothesis for the five and ten second intervals. It did support my hypothesis for the fifteen second interval. My project us a better understanding of what we could use as base soils to stop the damage of earthquakes.

Summary Statement

In my project I wanted to see what soil mixture would hold the most buildings.

Help Received

Mother helped put boarsd together

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Michelle K. Schafer

Project Number

J0622

Project Title

What's Hot? What's Not?

Abstract

Objectives/Goals

My project was to find out if temperature is affected by solar radiation. I predicted that on days with less solar radiation, the outdoor temperature would be cooler than on days with more solar radiation. Because solar radiation is the energy radiated in the form of waves or particles from the sun, it would make sense that the more radiation, the higher the temperature.

Methods/Materials

I collected three months worth of data from our school#s weather station. The data included solar radiation and temperature measurements from the same year (2001) and season (autumn). At first, I only collected data from one time every day, but then I realized that I needed complete daily data to get solid results. I printed out 13 strip charts from the weather station illustrating the correlation between solar radiation and temperature.

Results

After analyzing all of my data, I found that the overall pattern between temperature and solar radiation supported my hypothesis. When there were higher temperatures and less solar radiation, I found that it was due to the precipitation of a storm. There were only a few times when the solar radiation was noticeably higher than the temperatures.

Conclusions/Discussion

If I were to continue this project, I would make it into a yearly project involving all four seasons. I could then see if there was a correlation between seasonal temperatures and radiation measurements. My results supported my hypothesis, proving that temperature is affected by solar radiation.

Summary Statement

I collected weather data and analyzed it to see if temperature was affected by solar radiation.

Help Received

My science teacher, Diana Skiles, showed me how to get the data from the weather station. She also helped me print out the strip charts for use on my backboard.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Li N. Schmidt

Project Number

J0623

Project Title

Can We Dew It?

Abstract

Objectives/Goals

Can I collect enough water from the atmosphere, in the form of dew, to supply my daily drinking needs?

Methods/Materials

The materials I will need for my experiment are, a stopwatch, containers filled with cold water (soda cans), an electric scale, a thermometer, and an instrument to measure the humidity. My procedure was first to set a container on a scale. Then, I measured the temperature of the water and poured the water into the container. Then I watched the clock and the scale to see how much the scale was gaining each minute. Knowing the amount of dew formation over time will allow me to figure out how many containers I will need to collect enough drinking water for one day.

Results

: I recorded my data for two different days. During the first experiment, the temperature was 66 Fahrenheit (F) and the relative humidity (a measure of the amount of moisture in the air) was 44%. During the second experiment, the temperature was 64 F and the relative humidity was 48%. For both experiments, the water in the can was 38 F. The amount of water collected on the moist day was nearly twice as much than the water collected on the dry day (0.27gm vs. 0.16gm).

Conclusions/Discussion

The water forms on the can in both experiments because the moist air next to the can cools and eventually forms water. The second experiment collected more water because there was more moisture in the air. Since I drink five cups a day, I would need 60 cans to collect my drinking water for one day. This is if I could keep the cans cold and collect the water every 20 minutes. You can see that you could easily collect enough water, even here in California, to meet a person#s daily drinking needs. If it is used on a larger scale, I think my experiment could help solve California#s water problem without polluting the environment.

Summary Statement

My project was to see if I could collect enough water from atmosphere, in the form of dew, to help solve California's drinking water shortage.

Help Received

I made my measurements on an electric scale at the Naval Post Graduate School; My Dad taught me how to plot the data using Microsoft Excel; My Dad bought my science board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Bryan M. Strege

Project Number
J0624

Project Title
Polluted Percolation: How Pollutants Affect Our Soil and Water

Abstract

Objectives/Goals
My objective is to determine how over the counter pollutants, if not disposed of properly, effect the percolation of water or liquid through the soil--ultimately effecting the water table.

Methods/Materials
The pollutants I tested were, automatic transmisssion fluid, brake fluid, power-steering fluid, paint thinner, motor oil, gasoline and anti-freeze. All of these products are commonly used everyday in our society. My soil and water table environments consisted of two cups of gravel, which I poured into the bottom of each strainer. Next I placee four cups of soil on top of the gravel. Each strainer was suspended by metal dowels over water collection bowls. I poured four cups of water into my constant, then in all my other units I poured one cup of pollutant and three cups of water. I carefully poured the pollutants and water into the soil, patiently let it drain, and measured the amount of water and pollutant that percolated through the soil.

Results
By conducting four percolation tests for the seven different pollutants I mentioned above, the one that hindered the water percolation the most was gasoline. The pollutants that came in second were, Automatic Transmission Fluid, Motor Oil and Paint Thinner. These pollutants are made up of chemicals that endanger human life and the water that percolated through the soil carried these chemicals through the soil staining the water and causing odorous water.

Conclusions/Discussion
After measuring the amount of water and pollutants that percolated through the soil, and then comparing the amounts--the data proves that pollutants hinder the amount of water that percolates through the soil endangering the level of groundwater and in addition pollutes it with chemicals that endanger human life. The hydrologic water cycle is greatly effected also as the level of groundwater needs to be protected for proper evaporation and condensation back to earth.

Summary Statement
To test over the counter pollutants, if disposed of improperly into the soil, how they effect the percolation of water through the soil damaging our level of groundwater and contaminating it.

Help Received
My parents funded my experiments, thanks to them.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Alexander J. Velarde

Project Number

J0625

Project Title

Impact Craters: The Effects of Different Angles of Impact

Abstract

Objectives/Goals

An impact crater is formed when a meteoroid strikes the surface of a planet, moon, or other land mass in space. In my research and experiment, I tried to find out how the angle of a meteoroid impact changes the appearance of an impact crater.

Methods/Materials

In my experiment, I filled a pan with cornmeal and powdered tempera. I then rolled a marble (the impactor) down a ramp situated at 20, 45, and 90 degrees. I then observed and measured the craters and recorded the measurement of crater size and depth. I repeated this process fifteen (15) times for each angle. In addition, I calculated the energy available for crater formation by using the formula F=MA (Force = Mass x Acceleration) where acceleration is the result of gravity (32ft/sec squared) and for the slopes, the sine of the angle.

Results

The results I came up with are the following: A higher angle of impact caused a smaller crater; a lower impact angle caused a larger crater. If the angle is lower, the crater will be shallower and if the angle is steeper, the crater will be deeper.

Conclusions/Discussion

With a steeper angle of impact, the marble will gain speed and have more velocity. This will result in a larger crater. This, however, does not apply to a vertical drop. In the event of a vertical drop, the surface material has nowhere to go, which in turn causes the initial crater to be smaller and deeper.

Summary Statement

In my project, I looked at the effects of different angles of impact on how craters are formed.

Help Received

Mother helped with typing and graphs. Father helped with typing.