CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Zoie S. Andre

Project Number
J1101

Project Title
Soil Organic Carbon: Salt or Fresh?

Abstract

Objectives/Goals
The objective is to determine whether salt or freshwater marshes store the most soil carbon on the wetlands of northern Humboldt Bay. I predicted that the salt water marshes store (sequester) the greatest amount of soil organic carbon because of the anaerobic environment caused by saltwater tides.

Methods/Materials
Randomly select six sample locations, three freshwater and three saltwater. Next the samples were extracted using a soil probe. The samples were then weighed before and after being heated in a muffle furnace to determine percent weight loss on ignition (LOI).

Results
The freshwater marshes store 2.03% soil organic carbon and the saltwater marshes store 1.76% soil organic carbon.

Conclusions/Discussion
Unlike my hypothesis, the freshwater marshes store slightly more soil carbon than the saltwater marshes in my study area at Humboldt Bay. In conclusion, although freshwater marshes store slightly more soil organic carbon, protecting and restoring saltwater marshes may be more important for helping reduce climate change impacts because they do not release methane (CH4), a powerful greenhouse gas, where freshwater marshes do.

Summary Statement
I measured soil organic carbon content in salt and freshwater marshes.

Help Received
Equpment from father (Mark Andre) and supervision in lab and lab equipment from Rachel Hernandez

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Nigella M. Baur

Project Number

J1102

Project Title

Can the Number of Birds Be a Predictor of Coliform Levels in the Arcata Marsh?

Abstract

Objectives/Goals

The world famous Arcata Marsh and Wildlife Sanctuary is an important part of Arcata#s Wastewater Treatment Plant and is temporary refuge to over 270 species birds year round. To protect the visiting public, the water is chlorinated before going into the marshes. But when the water leaves the marsh it is contaminated with coliform and needs to be rechlorinated. It has been theorized that the birds are the cause of the contamination, but no one has actually investigated if the number of birds using the marsh affects coliform levels. The purpose of this experiment was to see if the number of birds observed in the marsh effects or could be used as a predictor of the level of coliform leaving the marsh. My hypothesis was that there would be a higher coliform concentration when there were more birds in the marsh.

Methods/Materials

I counted birds at each of the three marshes that make up the Arcata Marsh and Wildlife Sanctuary and collected water samples at the outlet of each marsh at three different times. To try to get a variation in the number of birds I performed the experiment on different days and at different tide levels (in the adjacent Humboldt Bay). At home I used the multiple-tube method to find the most probable number (MPN) of coliform concentrations in each of the samples. The test tubes filled with lactose broth and pipets required for the test were supplied by the Humboldt State University biology department laboratory. Then I compared the bird counts to the coliform concentration found in each sample.

Results

The results of this experiment showed a great deal of variability in the coliform levels leaving each of the marshes. The bird counts for each marsh as well as the total for all the marshes had no significant relationship to the correlating coliform concentrations. This proved my hypothesis false.

Conclusions/Discussion

In conclusion, a visitor to the Arcata Marsh cannot claim that the absence of birds means that the water is more safe (or less contaminated) then if they were seeing a lot of birds. It also means that the birds may not necessarily be the cause of the need to rechlorinate the water that leaves the marshes before it enters the Humboldt Bay.

Summary Statement

The purpose of this experiment was to find out if the number of birds observed in the Arcata Marsh and Wildlife Sanctuary (at Arcata's wastewater treatment plant) could be used as a predictor of the level of coliform leaving the marsh.

Help Received

Andrea Yip, Microbiology Lab Supervisor at HSU set up the broth filled test tubes and loaned me the pipets from the biology lab. Dr. Robert Gearheart met me at his office at the marsh and helped me brainstrom ideas for an interesting subject to research. My dad drove me around and carried my stuff.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Quentin C. Bertrand

Project Number

J1103

Project Title

Quantitative Determination of Particulate Matter Emissions from Air Freshener Aerosols

Abstract

Objectives/Goals

Indoor pollution can be ten times more severe than outdoor pollution and aerosols may be an important part of particulate matter pollution. Air freshener aerosols are omnipresent in most households. The purpose of this project was to link increased indoor air pollution to the extensive use of air freshener aerosols and to quantify the amount of particulate matter induced by air freshener sprays.

Methods/Materials

I purchased six different air freshener sprays. To determine their chemical composition I researched their Material Safety Data Sheet and their list of ingredients. The instrument used to detect the particles was a Particle Counter, which I borrowed. This instrument uses the principle of light scattering to count and discriminate the particles by their size. Fine particles are smaller than 2.5 micrometers (PM2.5) while coarse particles are between 2.5 and 10 micrometers (PM10-2.5). Control experiment were conducted to determine the amount of PM naturally present in the room. Each aerosol was sprayed for a calculated number of seconds and the data were recorded. Each experiment was repeated three times, for a total of 18 trials and 36 tests.

Results

All samples increased the level of PM2.5 and PM10-2.5 by at least a factor of two and up to 32 times the original (control) particulate levels. The level of fine particles was always higher than coarse particles. Four of the six sprays emitted so many particles that the instrument was saturated and was not able to record the data peaks. Clorox 4-in-One and Febreze were the lowest particulate emitters tested.

Conclusions/Discussion

All of the sprays emitted particulates at levels that saturated the instrument except Febreze. Glade had the highest recorded fine particulate peak levels at 9,164 particles per second compared to the control peak levels at 350 fine particles per second. These results confirmed that air freshener sprays used in a confined environment contribute significantly to particulate matter pollution. For high particulate matter emitting aerosols, the sensor was quickly saturated. A second generation of particle counter is actually in development, which may have a wider range of detection.

Summary Statement

The purpose of this project was to link increased indoor air pollution to the use of air freshener aerosols.

Help Received

I borrowed the particle counter from the University of California San Diego

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Austin D. Birch

Project Number
J1104

Project Title
An Ocean of Plastic

Abstract

Objectives/Goals
In September our class went on a weeklong trip to Catalina to learn about the ocean. When I returned home, I took my own plankton sample, and I found microplastic. A goal of this project was to see what the ratio of plastic to plankton was in a sample of ocean water. Another goal was to see how much microplastic was in a sample from the ocean at a lagoon effluent versus the ocean north of the effluent. I believed that overall there would be more plankton than plastic in each sample.

Methods/Materials
I first studied eight preliminary samples and created a plastic control so I could recognize the plastic pieces. I then obtained multiple samples on three different days. The materials that I used were a 153 micron plankton net, water bottles, a computer, a microscope, and petri dishes for viewing. I obtained samples at low tide and high tide for both locations. The counting and documentation for the sample contents took many hours.

Results
After examining more than 100 Petri dishes of sample water, I found the plastic count to be at least three times the number of plankton in the all of the samples. The highest ratio of plastic to plankton was at the effluent at 28:1 and the lowest ratio was 3:1. For this project I used a microscope that could take photographs and video with 40x and 100x lenses.

Conclusions/Discussion
In one Petri dish of ocean water there were at least 45 pieces of plastic, and it contained just 5ml of water. I was surprised by how much plastic was in my samples and how some of the phytoplankton were able to form colonies on the plastic (which eventually sinks the plastic). The findings in this project made me aware of much plastic might be present at our local beaches.

Summary Statement
The goal of my project was to document microplastic in ocean water samples from a lagoon effluent and along the beach at high and low tide.

Help Received
My Dad who drove me to the Carlsbad State Beach; My science teacher, Mrs. Hunker for her help and support.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Vincent A. Chen

Project Number

J1105

Project Title

The Use of Thamnocephalus to Analyze Water Qaulity of the Santa Ana River

Abstract

Objectives/Goals

The objective was to evaluate water quality of the Santa Ana River with a "live biomarker" crustacean species (Thamnocephalus platyurus)to determine areas of pollution. Null Hypothesis: Mean values of water quality of the "control" water samples would be no different than that of the water samples taken from the Santa Ana River.

Methods/Materials

Thamnocephalus cysts were hatched at 30 degrees C for 30-32 hours, before being exposed to "control" or "test" water samples for 2 hours, and then fed red-colored micro-beads for 30 min. After termination with fixative, total number animals were counted as well as the number which had consumed red beads. Feeding inhibition was calculated and used to evaluate the pollution of the Santa Ana River samples vs. control water samples (Arrowhead Spring Water).

Results

The use of Thamnocephalus as a viable organism to evaluate water quality was established. Significant differences in water quality were found in different water samples taken from the main body of the Santa Ana River and its tributaries.

Conclusions/Discussion

Data did not support the Null Hypothesis, which was rejected. The Alternative Hypothesis was accepted: There are some areas of the Santa Ana River which are more polluted than other regions and from the control water samples. Results are discussed in terms of their predictive capacity. Results are significant because obtaining data regarding the water quality of the Santa Ana River will permit a prediction of where to focus efforts to control storm water runoff, which is the primary source of pollution of the Santa Ana River watershed.

Summary Statement

Thamnocephalus platyurus was used to detect polluted areas of the Santa Ana River.

Help Received

Guidance was received from my science teacher, Yucaipa Valley Water District, Riverside Flood Control and Water Conservation District, Department of Public Works, San Bernardino County, EPA, Riverside Waterkeeper, and my grandfather.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Hannah M. Crousore

Project Number

J1106

Project Title

Investigating Lichen Recovery in the Burned Coastal Sage Scrub Community

Abstract

Objectives/Goals

I chose to study the effects of the May 2014 fires on the lichen of the Coastal Sage Scrub Community in Northern San Diego County. Lichens are sensitive to air quality. I wanted to find out if there was a specific species of lichen that resurfaced most quickly after a fire, as well as which lichen species had survived the fire, if any. I also wanted to see if there was a difference in the population of lichen in relation to proximity to the burned area. The fires personally affected me, and it was a great concern of mine to determine which lichen species remained.

Methods/Materials

Each time I encountered lichen, I filled out a lichen log form which I created documenting the air temperature and humidity measurements, weather of that day, soil pH, lumens, and moisture levels, the distance to the nearest roadway or highway, the distance to the burned area, the width, color, and texture of the lichen thallus, the surface on which the lichen was encountered, and the common and scientific name of the lichen that I found.

Results

At the first burned area, I found two sample of crustose lichen, one sample of foliose lichen, and one uncategorized sample of lichen. At the second location, I found six samples of crustose, five samples of foliose, and one uncategorized sample of lichen. At the third trail, I found twelve samples of crustose and three samples of foliose. At the final location, a restricted burned area to which I got access, I encountered five samples of crustose lichen and one uncategorized sample of lichen. 94.6% of the lichen that I documented were found on tree bark, and only 5.4% of lichen were found on the ground. 67.6% of the lichens that I encountered were crustose, 24.3% of the lichens were foliose, 0% of the lichen were fruticose, and 8.1% of the lichens observed were uncategorized. As a control, I had observed two of these regions for lichen before the fire.

Conclusions/Discussion

Comparing this year to my control studies of the same areas, twelve species of lichen could no longer be found and five species reappeared. The most common lichen now were Common Greenshield (Flavoparmelia caperata), Fluffy Dust Lichen (Lepraria lobificans), and Common Goldspeck Lichen (Candelariella vitellina).

Summary Statement

My project studied the effects of the May 2014 Southern California fires on lichen of the Coastal Sage Scrub Community.

Help Received

Access to burned areas was granted by the City of Carlsbad.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Logan A. Dalton

Project Number

J1107

Project Title

Examining Potential Well Water Contamination and Implications for Mitigation

Abstract

Objectives/Goals

The objective of this experiment was to discover the source of well water contamination on the Dalton Farm in Idaho. Samples were taken from the Surface Canal, the Test Well in question, and a Control Well located at the same depth as the Test Well, but a half kilometer further from the Surface Canal. My goal was to help the farm owners solve this problem informed by my findings.

Methods/Materials

A LaMotte Urban Water Testing Kit, and its procedures were used to test for; Bacteria, Dissolved Oxygen, Hardness, Iron, Nitrate, Phosphate, pH, and Temperature. I also used safety goggles, timer, chlorine bleach, and waste container

Results

Correlations were found in Bacteria and Dissolved Oxygen. Coliform Bacteria presented in the Test Well and the Surface Canal water but not the Control Well. The Test Well had a Dissolved Oxygen value between the Control Well and the Surface Canal indicating transport of oxygenated surface water into the test well. These tests were performed three times, results did not vary. The remaining parameters were inconclusive.

Conclusions/Discussion

The Coliform Bacteria and dissolved oxygen correlations support my hypothesis. Volcanic geology could facilitate the contamination, serving as a transport to the annulus below the sealant. Recommendations are to inject more sealant into the annulus or relocate the well further from the Surface Canal.

Summary Statement

This project aims to establish the source of water contamination in the Test Well to help the owners remedy this problem.

Help Received

My father helped supervise the water tests;drove me to the water locations;and took photos of me. My mother helped me type my report.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Morrgin K.A. Fedinick-Emmons

Project Number

J1108

Project Title

The Golden State Flaming Flora

Abstract

Objectives/Goals

The objective is to determine whether California Native Plants are more or less fire-resistive when dead or alive.

Methods/Materials

A propane torch was used to burn 7 species of plants in a controlled lab environment. There were 21 samples of each plant, live and dead. Each specimen was burned until self extinguished or 2:00 minutes passed. Plant masses were obtained pre- and post- burn. Fire-resistance was determined by percentage of mass lost and burn time.

Results

The plant specimens with the greatest fire-resistance were the live sample of the Deer Fern and the dead sample of the Western Coltsfoot. Overall, the live plants group were most fire-resistive based on average mass loss of 1.002 grams. The dead plants group was less fire-resistive based on average mass loss of 1.479 grams.

Conclusions/Discussion

Based on experimental results, one can conclude that California Native Plants tested were more fire-resistive when live. A homeowner's removal of dead vegetation could potentially lower the risk of property damage in the event of a wildfire.

Summary Statement

This project explored the fire-resistance of live and dead California Native Plants.

Help Received

Used lab equipment at Humboldt State University under the supervision of Dr. Jeffery Kane; Principal allowed clipping of plants from aboretum; Fire Batallion Chief helped me better understand topic; Family friend helped edit/give suggestions;

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Edwin Gao; Leonardo Zepeda

Project Number
J1109

Project Title
The Effects of Ocean Acidification on Clamshells

Abstract

Objectives/Goals
Our goal in this project is to inform and bring this problem about ocean acidification to the public to try and educate people to try and stop this issue before it becomes a greater threat to everyone.

Methods/Materials
Our materials important materials for this project were2 Clam shells ,4.5 cm of acidified seawater,4.5 cm of fresh water,1PH strip. Our methods to investigate our experiment were (1.) Get materials. See materials list. (2.) Start experiment by putting one clam into a tank with tap water and another into a tank with acidic seawater. (3.) Take pictures over the course of 20 days.(4.) After 20 days we take out the clams from their tanks and we take some final pictures. Record our results. (5.) Write down if our hypothesis was correct or not.

Results
Our experiment has shown that the clams shell in the acidic water has been damaged. Pieces of the shell has chipped and or left great cracks in the shell of the clam. The clam in tap water has shown no signs of damage. The results has shown us how ocean acidification can break down the structure of the clam shell.

Conclusions/Discussion
In conclusion our project has shown us that our hypothesis was correct and that the clam in the seawater did chip and crack due to the ocean acidification. We have realized that if the public does not do anything to stop this problem this issue will become to strong causing a lack in sea life and a great distortion in the food web. We hope that the public will try to change how much carbon dioxide they use.

Summary Statement
How ocean acidification in the monterey bay affect clamshells

Help Received
Joseph Appiot

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Mihir Gupta

Project Number
J1110

Project Title
Light: A Form of Pollution?

Abstract

Objectives/Goals
The objective of my project was to determine if there is a correlation between light pollution levels and population. I also wanted to compare the different levels of light pollution between areas in Southern California to Mumbai, India. According to the National Library of Medicine, greater amounts of Light At Night(LAN) increases breast cancer rate by 30-50%. It was hypothesized that the light pollution in India will be a minimum of 35% greater than in San Diego. In San Diego, it is hypothesized that the sky brightness will be >36.0 millicandelas per square meter per second. In Mumbai, it is hypothesized that it will be >48.6 millicandelas per square meter per second.

Methods/Materials
1. DSLR Camera; 2. Photometer; 3. MaxIm Pro DL V6; 4. Laptop or Desktop.

I used a Nikon D7000, with a lens that was set at a constant of F3.5. The ISO was also constant at 500. There were many exposures taken, and it took about 25-40 minutes at each location to take the photos.

Results
The results were in three units. They were: relative brightness, millicandelas per square meter per second, and how many times darker than a natural dark sky. The sky at Mumbai was the brightest,and the sky at Palomar Observatory was the darkest. The brightest location in the US was Eastings Park, located in San Diego County. The location at Mumbai was 1172x brighter than a natural dark sky, compared to Palomar Observatory, which was 2.57x brighter than a natural dark sky. The experimenter went to 25 locations total to take photos in RAW mode.

Conclusions/Discussion
These findings show that the light pollution levels are related to population. If all light fixtuers are shielded, the light will not travel upward and pollute the sky. This is a cost effective solution to the problem, and it may decrease cancer rates in those areas. Another way to minimize the effect of light pollution is to use low-pressure sodium lights, which impact light pollution levels the least. These types of lights are already in use in Southern California, specifically for the benefit of the astronomers at Palomar Observatory. Many nocturnal animals would be able to hunt at night, if the sky is not as bright as it is now. Sea turtles would be safer, and birds would be able to migrate at night. It can be concluded that the light pollution levels in an area are directly related to the human population, and that the night sky is getting brighter over time.

Summary Statement
My project is about light pollution, and I wanted to determine whether a correlation between the population of an area's population and its light pollution levels existed.

Help Received
Mr. Dan McKenna helped with determining experimental procedure and loaned a photometer; Ms. Elaine Gillum helped proofread my written work; Mr.Anil Gupta helped drive me around to take photos

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Abigail M. Hooper

Project Number
J1111

Project Title
Lead Should Be Dead

Abstract

Objectives/Goals
The purpose of this experiment was to prove the soccer fields I practice on don#t have harmful levels of lead (Pb) in the soil.

Methods/Materials
Materials included: Soccer fields, soil samples, Pb test kit, containers, timer, scoopers, and labels.
Method: Collect soil samples from three soccer fields. Test each sample multiple times by 1) filling test tubes half way with dry soil, 2) mixing ~ 1 table spoon of reagent (testing chemical solution) and shake for 30 seconds, 3) dip a test strip in the mixed soil/reagent for 5 seconds, 4) secure test strip for the minutes needed to see if there is Pb, 5) swish test strip in 4 ounces of tap water for 5 seconds, 6) match the color on the test strip with the color on test kit label to determine the amount of Pb. With the test strip colors (9 tests) seeming to be the same from my point of view, conveying high levels of Pb contamination, I was concerned and had the samples further tested by a professional lab.

Results
I originally performed 7 tests on 2 different soccer fields using a web-based test kit and the results were either inaccurate (I couldn't tell a difference in colors on the test strips) or had significant Pb contamination (higher than 400 ppm which the test strip was conveying, with 300 ppm being my acceptable reference point based on a study by the University of Massachusetts). Being concerned, I added a third soccer field to the sample-set and decided to try a professional lab for Pb concentration. The results from the lab were accurate and indicated each soccer field had safe Pb levels of 23 ppm, 29 ppm and 45 ppm.

Conclusions/Discussion
My hypothesis of low Pb levels in the three soccer fields I practice on was correct; measuring 23 ppm, 29 ppm and 45 ppm. I defined below 300 ppm of Pb in soil being an acceptable concentration level based on a study done by the University of Massachusetts. This makes sense because two major contaminants have been banned or properly managed; lead paint (1978) and leaded gasoline (1995). The original test kit I used from the web did not work in my opinion. The color variation between test strips was not visible enough to drawn a proper conclusion. A professional lab produced results with a high level of accuracy.

Summary Statement
Confirming the soccer fields I practice on do not have harmful levels of lead (Pb) in the soil.

Help Received
Parent provided: transportation, helped with computer forms (application), printed pictures and purchasing the web-based test kit

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Samuel B. Kahn

Project Number

J1112

Project Title

New Growth in Coastal Sage Scrub Habitat: Comparing Burned vs. Unburned Areas

Abstract

Objectives/Goals

My project was to determine if more or fewer seedlings would grow in Coastal Sage Scrub habitat that had burned, versus areas that did not burn, and also to see if different species would grow. I plan to do my project for several years at Mission Trails Regional Park in San Diego, CA.

Methods/Materials

I used transects (lines on the ground) and quadrats (sampling areas) to investigate seedling growth in a burned and an unburned area. My transect line was 8 meters long, and each quadrat was 1 meter by 1 meter in size. I put them at the same place each time along the transect line. I went to take data once a month. I counted the number of seedlings (some seedlings were so numerous I had to estimate them), estimated the percent cover, and tried to determine the species of the seedlings in each quadrat. I also planted native seeds of my own in burned and unburned soil, to determine if there was a difference in germination.

Results

Four months after the fire there were only 71 seedlings in the burned transect, and about 950 in the unburned. Eight months after the fire, the number of seedlings in the unburned area went down to around 600, while the burned area had 112. The percent cover of new growth in the unburned area was also higher than the burned early on, though it was almost equal between the two 8 months after the fire because the plants in the burn were bigger. I was able to identify some but not all of the plants, and I saw differences between the two areas. In the burned area I saw non-natives like Black Mustard and Indian Sweetclover that were not in the unburned transect. I saw some natives in the burn area too, like Sun Cups, Artemisia, and Laurel Sumac. The unburned area had natives like Buckwheat, Artemisia, and Yarrow. The results of seed planting in different soils were inconclusive, as too few seeds germinated. I plan to do another study in the near future with a more diverse selection of seeds.

Conclusions/Discussion

My study is important for learning how Coast Sage Scrub recovers from fire, which is useful since it is an endangered habitat. My results show that fire can affect the number and type of seedlings that grow in this habitat following a burn. There were more seedlings overall in the unburned area, and fewer non-natives like Black Mustard and Indian Sweetclover. I plan to continue this study so I can see how the types of plants that grow in the different areas change over time.

Summary Statement

My project investigated seedling growth in Coastal Sage Scrub following a fire, which I did by comparing burned and unburned areas.

Help Received

Ranger Chris Axtmann gave me access and helped me set up my study, my mom drove me, helped me to take data and photographs, and to make my graphs, Ranger Heidi Gutknect, Bruce Hanson, and Kyle Ince helped with seedling identification, and S&S seeds gave seeds for a new seed planting study.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Esha B. Kashyap

Project Number

J1113

Project Title

To Drink or Not to Drink: A Comparison of Arsenic Levels and Water Quality in Europe and the United States

Abstract

Objectives/Goals

The objective of this experiment was to compare the waters of Europe and United States to the World Health Organization standardized guidelines, and to determine which one is superior in quality and hence safer for consumption. The experiment will involve the testing of the waters of both areas for arsenic, bromine, free chlorine, total chlorine, pH, alkalinity, total hardness, nitrates and nitrites. The hypothesis was that the arsenic level in the United States water would be 3 times that of Europe. It was also predicted that the pH, nitrate and nitrite levels in Europe would be 30% closer to the lower bound of the WHO guidelines than the United States.

Methods/Materials

The Lovibond Arsenic Testing Kit, LaMotte Insta-Test 5 way and Nitrite and Nitrate test strips, collection bottles, timer, camera, tape, gloves, and data recording sheets were used to carry out the experiment. Three water sources were picked in each of the five European and two American cities and three samples were tested within each source. Photos were taken of the test strips after testing to document the color change and the results were logged in the data recording sheets.

Results

A total of 360 trials/ tests were conducted. Majority of the drinking water sources tested in the US and in Europe had similar chemical level profiles which were within the WHO guidelines. The tap water both regions tested negative for arsenic and had all the other parameters within the recommended ranges. The average arsenic level in Europe was 0.0051 mg/L while that in US was 0.0005 mg/L. However, the non-drinking sources, such as seas, oceans, lakes and rivers, contained higher levels of nitrates, nitrites, bromine, free and total chlorine.

Conclusions/Discussion

This experiment demonstrated that pH, nitrate, nitrite, free chlorine, total chlorine and bromine levels in the European waters were closer to the WHO guidelines than the United States#. The average arsenic level in Europe was found to be ten times higher than that of US. This led to the conclusion that although the water quality of Europe is better than that of the United States with regards to the WHO guidelines, the United States has less arsenic in its water than Europe.

Summary Statement

This project is a comparison of the average arsenic levels and water quality in the United States and Europe as compared to the World Health Organization Guidelines

Help Received

My mother guided in finding a mentor, in ordering supplies and in collection/testing of samples; My father planned the trip; My mentor, Ms. Patsy Schreiber answered any questions I had regarding my project

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Yoonji A. Kwon

Project Number

J1114

Project Title

How Particulate Matter Concentrations Vary by Location and by Combustion

Abstract

Objectives/Goals

The objectives of my project were to determine if particulate matter (PM) concentrations were affected by indoors and outdoors locations and by different cooking methods.

Methods/Materials

PM2.5, ultrafine particles (UFP), black carbon (BC), and PAHs (polycyclic aromatic hydrocarbons) were measured using real-time monitors, which used inertial collection and particle counters. PM was measured in a backyard, in a lab and in a house, and near combustion: burning candles, boiling water, deep frying food, BBQs, and use of Panini grills, ovens, and electric grills. The times of distinctive changes of surrounding conditions during combustion were recorded.

Results

In January, the concentration of PM2.5 in a backyard was higher than PM2.5 concentration indoors and in Fresno Central Monitoring Station outdoors. In November, the concentration of PM2.5 outdoors was still higher than the PM2.5 concentration indoors but not higher than the PM2.5 measured in Fresno Central Monitoring Station. In January and November, PM concentrations measured outdoors increased at noon and in the evening.

PM2.5, BC, and PAHs increased the most in charcoal BBQ. Concentrations of all components of PM increased more for Panini grill than electric grill. Boiling water and use of ovens affected the components of PM the least. PM2.5 increased the most in charcoal BBQ, Panini grill, and electric grill. UFP increased the most in Panini grill, electric grill, and charcoal BBQ. BC increased the most in charcoal BBQ, Panini grill, and electric grill. PAHs increased the most in charcoal BBQ, deep frying food, and burning candles.

Conclusions/Discussion

PM concentrations are higher outdoors than indoors. During the higher PM days, the PM measurements varied more depending on location outdoors. Times of more traffic caused higher PM concentrations from motor vehicles.

The highest concentrations of PM2.5, BC, and PAHs were observed during outdoor BBQ because of incomplete combustion of charcoal. PM2.5, UFP, and BC concentrations increased more for grilling than deep frying, burning candles, boiling water, and using ovens because grilling can char or burn food. Unlike BC, UFP, and PM2.5, PAHs increased more in deep frying and burning candles than in grilling because of incomplete combustion of carbon-containing fuels, such as oil, fat, and wax.

Summary Statement

My project tests how the concentrations of different components of particulate matter, such as PM2.5, UFP, BC, and PAHs, are affected when we stay indoors, outdoors, or near combustion, such as cooking, using real-time aerosol monitors.

Help Received

My father is an expert in environmental science and operated the real-time aerosol monitors, which were from California State University, Fresno, and also helped construct the graphs.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Erin K. Lamphear

Project Number

J1115

Project Title

Factors Affecting Aquatic Macroinvertebrate Diversity in Northern California Coastal Streams

Abstract

Objectives/Goals

The objective of this study was to determine which abiotic factors affect macroinvertebrate diversity within local streams.

Methods/Materials

Six study sites in five coastal streams were selected for variability among water quality and habitat variables and were sampled for macroinvertebrates and abiotic variables. Conductivity, water temperature, pH, canopy closure, dissolved oxygen, substrate size, maximum depth, maximum width, and catchment area were measured and recorded. At each study site, three macroinvertebrate samples were collected. Macroinvertebrates were separated by taxa, quantified, photographed, recorded, and returned to the stream.

Results

The number of macroinvertebrate taxa and abundance in each group were analyzed and two diversity indices, Species Richness (SR) and Simpson#s Index of Diversity (SID), were calculated for each site. Five abiotic factors were found to have moderate to high correlation with SR and/or SID. These factors, listed by R-squared value, from low to high, include maximum water depth ($r^2 = 0.48$, SR; $r^2 = 0.46$, SID), pH ($r^2 = 0.57$), substrate size D16 ($r^2 = 0.63$), canopy closure ($r^2 = 0.69$), and catchment area ($r^2 = 0.78$).

Conclusions/Discussion

Previous studies on limiting factors for macroinvertebrates indicate that one or more water quality or habitat variables will affect species diversity. A moderate, positive correlation was evident between SR and pH; this may be a consequence of higher acidity mobilizing heavy metals which are selectively toxic to macroinvertebrates. A moderate correlation was present between SID and the 16th percentile of substrate size (D16).

A moderate to strong, positive relationship was apparent between SID and canopy closure. The range of canopy closure values measured in this study, 52%-79%, was in the middle range of those found in local riparian ecosystems. Perhaps increasing canopy closure to a certain level is beneficial, but once reached, it is likely that periphyton growth would decline limiting macroinvertebrate diversity.

This study demonstrated various abiotic factors have moderate to strong effects on macroinvertebrate diversity. Moderate to high macroinvertebrate diversity promotes healthy and productive stream ecosystems which in turn provide food for hungry salmonids. Healthy salmonid populations supply high quality food and benefits local economies through the sport fishing industry.

Summary Statement

In this study, I collected, analyzed, and determined what abiotic factors affect aquatic macroinvertebrate diversity in northern California coastal streams.

Help Received

My dad mentored me during this project, and Green Diamond Resource Company provided equipment and acces to study sites.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Lillian I. Lerner

Project Number
J1116

Project Title
Lead: Soiling the Fun

Abstract

Objectives/Goals
For this year's science fair, I am investigating the dangerous levels of lead in soil in and around children's play areas. I chose this question because this topic greatly interests me, and many children get lead poisoning every year and I wonder if their playgrounds are a cause of it. My research shows that lead poisoning is most common in children because they explore the world by putting things in their mouths. More the 4% of the children in the US have lead poisoning right now. My hypothesis is, if playground soil is tested, then it will test positive for lead.

Methods/Materials
I began my experiment by picking five parks and collecting their soil samples. Then, I used the Carolina Biological Lead Test Kit to test my samples. The independent variable in my experiment is the lead in the soil I am testing. My dependent variable in my experiment is the danger caused by this.

Results
The major results I found in my study are that all five parks I tested exceed 400ppm, which is above/equal to the maximum government standard. These parks could be a danger to children because I tested that they have 400ppm of lead or more. So, I wrote a letter to the Ventura County Health Department letting them know of my findings. They responded by saying they will have professional testing done on my five locations.

Conclusions/Discussion
The major conclusions I have drawn are that all five parks I tested exceed that government maximum of lead in children's play areas. I proved my hypothesis because I predicted that playground soil would test positive for lead, and it did. One change I would make if I were to do this project again would be that I would send my lead samples to lab in addition to using the at-home lead testing kit that I used. My project is important to the real world because lead poisoning can cause death in children and this information could potentially save their lives.

Summary Statement
My project is about testing the soil at local playgrounds to see if they exceed the lead safety limit because high levels can cause lead poisoning in children.

Help Received
My mom helped time testing segments and drove me to locations.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Eric J. Longo

Project Number
J1117

Project Title
The Effects of Acid Rain on Sunflower Growth

Abstract

Objectives/Goals
The objective was to determine how acid rain affects sunflower growth, and how each pH level affects the plants differently.

Methods/Materials
Five different solutions of pH were poured into each pot with five separate beakers. The seeds were then watered and observed once a day for around thirty days. At around day thirty, the plants were then watered with the acid solutions directly on their leaves and stems with a strainer.

Results
The plants watered with a lower pH were affected more than the plants watered with a higher pH. The plants were affected below the ground on its roots which made the sunflowers less stable. The leaves became spotted and the stem could not stand up straight, which made the sunflowers less stable and weak.

Conclusions/Discussion
The acid burned and harmed the leaves, stems and roots. The lower pH levels had more acid than the higher pH levels, so the sunflowers were affected more.

Summary Statement
This project was used to show the affects of air pollution and acid rain on plants.

Help Received
My mother purchased the supplies and materials used in the project and my father helped supervise the pouring of the acid on the plants for safety reasons.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Chloe C. Mauceri

Project Number
J1118

Project Title
In Search of BPA

Abstract

Objectives/Goals
My objective for this project was to determine what objects/liquids are safe and which ones are dangerous. I play volleyball, and after playing all day at the beach, my water bottles always taste odd, and I was curious to see if that taste was leaching plastic. My curiosity for receipts came shortly after, because I learned that receipts would be a possible test subject, and since I touch receipts almost everyday, I thought it would be a valuable test. The toilet paper, I was curious after hearing a rumor and I wanted to know if something no-one would expect to be dangerous, actually was. My goal for this project was to be able to warn others what is and what isn't safe.

Methods/Materials
For my project, I used a receipt, a plastic water bottle with a recycling code 1, a plastic container with a recycling code 5, a spectrometer, a cuvette, a beaker, regular tap water, experimental vodka, and lastly, Trader Joe's toilet paper

Results
The amount of BPA is more consequential on solid objects rather than liquids stored in water bottles. After first testing the liquids in the water bottles, I found that the BPA level is non effective, and barely traceable. The solids I tested, toilet paper, and a receipt, had higher absorption levels. Although, this is not true for all liquids, just the liquids in water bottles. The vodka I tested also had traces of BPA.

Conclusions/Discussion
The water bottle I tested did not contain any traceable amount of BPA, but a very common household item did. That item was a receipt! After continuous research of why receipts are dangerous and what reacts with them when combined to become a bigger contamination. I discovered that when hand sanitizer and a receipt mix, the absorption level increases by 85 times. I was curios about what caused this reaction and found that it was the alcohol. So, I tested straight-up vodka and found traces of BPA. I also looked for BPA in recycled toilet paper after learning that recycling toilet paper was partially made out of receipt, and I wanted to kno if some of the traces moved onto the toilet paper.

Summary Statement
I tested various household items to find out if any of them contained the dangerous plastic chemical BPA.

Help Received
My mentor James Rogers helped me understand the material, and also helped me gain access to the UCSB Science Lab. My mom helped me with indesign and photoshop. She taught me how to work the programs.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Faith A. Miller

Project Number
J1119

Project Title
How Do Natural Disasters Affect Plant Growth?

Abstract

Objectives/Goals
My project is to see how natural disasters such as drought, flood, and temperature change affect plant growth. This project was to see which tested disasters were most damaging, and easiest to solve. Also it was to see if it payed to ignore natural disasters' impact on plants My goals were how natural disasters helped plants in any way, and to find how plants adapt to great changes.

Methods/Materials
I used radishes, vitamin soil, tap water, and lamps. I grew all sprouts to the same size first. For drought I watered each row with less water than the row before it. For flood I submerged each row one day more than the row before it. For temperature change I grew plants in hot, cold, and room temperature, then I will move them to different temperatures.

Results
Flood was most damaging compared to temperature change and drought. Best to least out of temperature change was room, hot, then cold. For drought, the plants with more water grew bigger and for flood, the plants with less time underwater grew bigger.

Conclusions/Discussion
My hypothesis was incorrect because data proved that flood was more damaging rather than drought. I think flood was more damaging because while the plants were underwater, their natural routine paused. I believe that cold temperature slowed growing, hot temperature sped up growing, and room temperature steadied growing. What could've changed hot temperature's outcome was the change of the sunlight variable because of the use of lamps for heat. For drought the decrease of water was a decrease in necessities, causing the plant to grow, but not flourish like it would with water.

Summary Statement
How drought, flood, and temperature change affect plants and which is more damaging.

Help Received
Dad helped water and measure plants; Science teacher, Mrs. Englund corrected my research.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Luke M. Pusateri

Project Number

J1120

Project Title

Cardiff Lagoon Effluent: Is the Water Safe?

Abstract

Objectives/Goals

Heavy metal contaminants and coliforms may sometimes pose threats to humans at our local beaches. I wanted to find out if these contaminants might be present in the lagoon outlet at Cardiff Beach at levels that might impact water quality. I thought that relatively small amounts of heavy metals would be in the Cardiff effluent, but that the water might be contaminated with bacteria.

Methods/Materials

The equipment I used to conduct this experiment including a dipper, La Motte TesTabs, Hach test strips, sterile water bottles, thermometers, an incubator, and 43 plates of Coliscan Easygel. I tested eight water samples from four sites on two different days by collecting the water from the effluent using a dipper. After I arrived at the school lab, I tested for nutrients, heavy metals and coliforms.

Results

In total I tested 80 water samples with LaMotte TesTabs and Hach test strips. I found that the water was surprisingly low in nitrates (0 ppm) and fairly low in phosphates (1 ppm). I tested a positive control nitrate sample to be sure my test tablets were working. Copper, chromium and iron were all at 0 ppm. The bacterial results, for my 40 sample plates, many of the plates contained coliforms too numerous to count, and a total of 45% of the plates exceeded the state standard for contact water quality due to excessive coliforms, E. coli or both.

Conclusions/Discussion

I concluded that the water at Cardiff effluent was not safe for swimming since so many plates exceeded California standards for safe water contact. The Cardiff effluent should probably have advisory signs posted to warn people who use the beach for recreational purposes. A recommendation I would make would be to test a larger sample size to confirm my results. Water quality evaluation is very important for deeming whether bodies of water are safe for recreation.

Summary Statement

My project tested for bacterial contaminants, metal contaminants, and other water quality indicators at a local lagoon effluent beach contact area.

Help Received

My teacher supervised me while testing.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Samiha Reza

Project Number
J1121

Project Title
Arsenic and Water Quality in Bangladesh and America

Abstract

Objectives/Goals
The objective of this project was to test and compare a number of sources in both America and Bangladesh for arsenic and various parameters like pH, total dissolved solids, oxidation reduction potential, and turbidity.

Methods/Materials
Water quality testing was done with multiple probes and strips for the various parameters and arsenic was tested with an arsenic kit. All of the water samples were collected from various locations that were near populated locations. Graphs were made for each parameter where arsenic was measured in micrograms, pH was measured in units, total dissolved solids was measured in parts per million, oxidation reduction potential was measured in millivolts and turbidity was measured with units. All comparisons were with either data found, World Health Organization (WHO) acceptable rates, and previous research.

Results
The average arsenic concentration in Bangladesh water sources was 22.4 micrograms while the average arsenic concentration in American water sources was 0.23 micrograms. For pH, Bangladesh did have a slightly more basic average than America, fitting the hypothesis exactly by o.3 units more basic. The average total dissolved solids (TDS) results were 242.6 ppm greater and oxidation potential reduction (ORP) results were 61.6 mV greater in America than they were in Bangladesh. Turbidity was greater in Bangladesh by a range average of twelve.

Conclusions/Discussion
The arsenic levels in Bangladesh are much greater than the levels in America due to the massive arsenic groundwater outbreak but the water in America has greater ORP and TDS. This is possibly because of the constant treatment water in America is surrounded by and easier access to substances near sources. Turbidity is greater in Bangladesh mostly because the water sources are used constantly for irrigation, bathing and cleaning.

Summary Statement
This project's purpose was to compare arsenic and water quality from water sources within Bangladesh and America.

Help Received
The assistance received during this experiment included Mrs. Gillum, Dr. Fakir Yunus and Ershad Bin Ahmed. Mrs. Gillum and Dr. Yunus helped with formatting and Mr. Ahmed helped with researching, finding equipment, and on-field testing.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Tommy G. Robinson

Project Number
J1122

Project Title
Bacterial Material: Bacterial Accumulation in Rivers and Creeks

Abstract

Objectives/Goals
I was trying to find out if there is more bacteria upstream or downstream and if it is safe to swim in the water.

Methods/Materials
To conduct my experiment, I built an apparatus with two mason jars and a .45 pore size membrane filter. To build the apparatus you bend the filter over the edge of the jar then screw on the cap over the filter with the water inside it, put the other jar on top, and flip the apparatus to start it. I ran 18 different apparatuses at once there being 3 locations on each of the three rivers and two samples at each location. So I collected samples and simultaneously ran them through the apparatus then plated them and counted the amount of colonies.

Results
There was more bacteria downstream than upstream but the downstream location to the middle location sometimes had varied results such as being much higher downstream or being the middle was a very close result or even a bit more bacteria.

Conclusions/Discussion
The conclusions I made were that there is more bacteria downstream because of the accumulation that may be coming from agriculture and livestock areas which on all waterways were very close to the water at the downstream locations. It was safe to swim in the water at all my sample locations but if there were to be a big rain that would cause lots of runoff and could make the water unsafe to swim in.

Summary Statement
In this project I compared if there was more bacteria upstream or downstream and if it was ssafe to swim in the water.

Help Received
I recieved help from Arcata High teacher Mrs.Conndit by letting me use the incubator and autoclave, also my sister delivered the petri dishes to the high school to be incubated.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sukhmandeep K. Sidhu

Project Number
J1123

Project Title
The Effects of Acid Rain on the Germination Rate of Raphanus sativus (Radish Seeds)

Abstract

Objectives/Goals
The purpose of my science project was to investigate how acid rain affects the growth of plants. I wanted to know about how acid rain kills plants, and how we can prevent it from happening. I know acid rain has killed many plants and animals in our environment, but I wanted to know how badly has our environment been effected by acid rain. So I decided to use radish seeds, or known as Raphanus Stativus, to test my curiosity. My hypothesis stated that the acid rain will affect he germination rate of the radish seeds by slowing their growing rate.

Methods/Materials
1.) Mixed one molar of sulfuric acid (H_2SO_4) with 500mL of tap water (H_2O) .
2.) Using a pH meter create pH levels 6.0, 5.0, and 4.0 which will the dependent variable because I want to see the different effects of each solution. However, the water with the pH level of 7.0 (H_2O) will be the control variable because that consists of minimal acid.
3.) Dispense 15mL of the solution in each of the 6 test pots for each solution that already have 2 cups of soil and 6 toothpicks designating where each seeds is placed. This will be the independent variable because they need to be given the same amount of solution.
4.) Dispense the solution three times for every three days.
5.) Next, 12 days dispense only 15mL of pure water (H_2O) because there could be different levels of acid rain every time it rains.

Results
The pH level of 4.0 had killed some of the plants within the first 2 weeks of measuring and left with the average of 2.4 cm growing rate. The level 5.0 had only killed 1 of the plants and average growing rate of these plants was 2.9 cm. The pH level of 6.0 had all of the plants grow and sprout at a 3.3 cm. The level of 7.0 had all of the plants looking green and healthy with a average of 3.7 cm.

Conclusions/Discussion
After completing my experiment, I learned the importance of reducing how much pollution we let into the environment. The pollution we allow into the air by factories, cars, and any other object that runs on other fossil fuels can determine how much acid rain is created and ruins our food and plants. My hypothesis was correct and my experiment showed how acid rain can easily kill plants.

Summary Statement
This project is an experiment to show how acid rain affects the plants in our environment.

Help Received
The 8th grade science teacher, Mr. Jones, helped make the acid solutions.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Eva Weller; Cheyenne Wilson

Project Number

J1124

Project Title

Low Levels of Creek Pollution in an Environmentally Friendly Town

Abstract

Objectives/Goals

Our city tries to protect its watersheds and Humboldt Bay from pollution. We tested whether water pollution in creeks increased as it moved through the city of Arcata.

Methods/Materials

We tested for pollution at 4 creeks including 2 that ran directly through town. On each creek we sampled an upstream, downstream, and mid-stream site. We tested for dissolved oxygen, pH, nitrites and phosphates during each survey of each site. We tested both creeks that ran through town on 3 separate days.

Results

We found no evidence that pollution increased as the creeks progressed downstream. Dissolved oxygen and pH both increased and decreased from upstream to downstream. We measured no nitrite pollution and only found phosphate pollution at one site on one day.

Conclusions/Discussion

We found our hypothesis was wrong: pollution did not increase as creeks moved through town. But we were glad to know we lived somewhere that has little creek pollution.

Summary Statement

We found that water pollution did not increase as creeks flowed through our town.

Help Received

Dad drove us to sites and helped make graphs.