CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Chantel Alarcon; Kellie Crisman; Alana Richert

Project Number

J1201

Project Title

Testing Local Water Sources for Contaminants

Abstract

Objectives/Goals

The objective of this project is to test water samples from a well, a spring, and city pumped water to determine which results had the most contaminants. We are testing each sample for lead, pesticides, bacteria, copper, iron, nitrites, nitrates, pH, hardness, alkalinity, and total chlorine. The result that stood out most was that city pumped water and well water both tested positive for lead. Another interesting result was that spring water tested for 1.3 ppm of copper, which is the limit of the safe zone for human consumption. In conclusion, this project taught us about local water pollution and that it is important to test our drinking water.

Methods/Materials

For materials, we used 3 water testing kits, a timer, water samples, and water tight containers. We collected water samples then tested each water based on the instructions in the test kits.

Results

The well water and the city pumped water tested positive for lead. iron, nitrites, nitrates and chlorine all tested at 0 ppm. For spring water copper tested at 1.3 ppm, which is the limit of the safe zone. Spring water had much less hardness and alkalinity the the other two sources. pH tested at 9 for all three for the samples.

Conclusions/Discussion

Our results supported our hypothesis that well water would have the most contaminants out of the three sources of water. The purpose was to test local water so the community gains awareness the water they are consuming. Further testing would be needed to determine the impact of the contaminants in these sources.

Summary Statement

The objective of this project is to test water samples from a well, a spring, and city pumped water to determine which results had the most contaminants.

Help Received

My science teacher, Ms. Mayne, provided the materials, a printer, and a board.

Name(s)
Noah M. Cain

Project Number
J1202

Project Title
Particulate Matter Spatial Analysis in Micro-Environments: Decreasing Childhood Microfine PM Exposure

Abstract

Objectives/Goals
Children are unwillingly and needlessly exposed to excessive amounts of microfine particulate matter (PM). This poses many health hazards, especially for children, the elderly, and those with pulmonary & cardiovascular health concerns by penetrating deep into the respiratory system and can potentially damage the gas-exchange surfaces (alveolar region) of the lung. The goal is to measure and spatially analyze the accumulation/dispersion rate of PM over distance from vehicle sources in a parent pick-up lane or roadway in order to understand PM accumulation and thereby minimize childhood exposure. My hypothesis is that the microfine PM concentrations would decrease exponentially over distance.

Methods/Materials
I generated a 1-meter grid over a satellite image of the area behind the parent pickup line at Krystal School (34.379011, -117.288474) using Google Earth and placed 2 Purple Air PA-II sensors each day for three weeks. I wrote a shell script to upload data to my google drive and then calculated the average of all of the data per sensor per location. I generated graphs and analyzed the data.

Results
The data trend shows that the smaller the particle, the greater decrease (linear, not exponential) in the concentration of PM. Microfine PM (0.3 microns)decreased 88.04% while fine PM (2.5 microns) decreased 79.23% and course PM (PM10) decreased just 14.86% over 15 meters from source. Conversely, larger particles trend less decrease over distance.
The data indicates that the smaller particles accumulate through chemical bonds (I found PM bonded with H2O molecules last year due to their weak electron bond) over distance and time. Kids should be moved back at least 5 meters from PM sources to minimize microfine PM exposure.

Conclusions/Discussion
I found that the larger the size of the particles, the less of a decrease there was in the concentration of PM over distance and time from sources, but not an exponential decrease as predicted in my hypothesis. This is due to the smaller PM accumulating through homogeneous nucleation, condensation, and then coagulation/agglomeration forming larger particles.

The results show that children should be moved at least five meters back from cars/PM sources to minimize their exposure to microfine PM and decrease the health risks.

Summary Statement
This project measured microfine, fine, and coarse particulate matter accumulation trends over distance from sources in order to create a risk assessment for children displayed in a spatial analysis of a microenvironment.

Help Received
I purchased the sensors and ran the experiments by myself, but Dr. Vaselios Papapostalou at the Southern California AQMD provided a resource to select sensors.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Cole Fowler; Carson Galletti

Project Number
J1203

Project Title
Up In Flames

Abstract

Objectives/Goals
The objective of this study is to determine what tree's and bushes are the safest to plant near your home in case of a wildfire.

Methods/Materials
We tested ten different plant cuttings, one metal cookie sheet, one torch, one bucket of water, fire safe glove and a stopwatch.

Results
The thicker waxier leaves took longer to ignite the evergreens such as pines and redwoods ignite much quicker.

Conclusions/Discussion
Our results were proven to be correct during each trial the cuttings ignited within a few seconds of each other and the thicker waxier leaves took longer to ignite. We feel to make our experiment more accurate we could test our hypothesis in Summer months to see if the hot dry weather makes a big difference in out results.

Summary Statement
Our project results have proven that there are many types of flammable bushes and trees in people landscaping. This knowledge should help people choose the correct type of plant or bush for their property.

Help Received
Ukiah Valley Fire Caption John Corippo, Cal Fire Air Tactical Supervisor Chief Ray Taglio, Whispering Winds Nursery Ukiah Ca. and www.readyforwildfire.org

Name(s)
Samantha C. Gaiera

Project Number
J1204

Project Title
Ocean Acidification Simulation Investigating Copepod Survivorship

Abstract

Objectives/Goals
The objective of this study was to determine how ocean acidification affects copepod survivorship.

Methods/Materials
Copepod culture, microscope, digital pH meter, CO2 tank, regulator, mason jars. Monitored copepod survivorship with a microscope after controlled exposure to CO2 gas. pH was monitored with a digital pH meter.

Results
20 copepods were put into the ocean acidification model for 24 hours to test the effects of acidity change on mortality. Trials were repeated four times to validate results. It was found that as acidity levels decrease, copepod survivorship decreases as well. Survivorship in the control samples was 100% compared to a mean of 63% survivorship in the test samples.

Conclusions/Discussion
The major findings were that there was an increase in copepod mortality as pH decreased between the control, level 1 and level 2. Copepods in level 2 (more CO2) consistently showed higher mortality rates than level 1(less CO2). The implications of this work show that as human-created carbon emissions increase, ocean acidification will increase and negatively impact copepod populations.

Summary Statement
I created a model simulating ocean acidification to test its effects on copepod mortality confirming the hypothesis that as pH decreases, copepod survivorship also decreases.

Help Received
I received my copepods and information on how to raise them from the HSU telonicher marine lab.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Fiel Angelo L. Gamad

Project Number
J1205

Project Title
Comparison of Air Quality in Different Clovis Schools Based on the Level of Particulate Air Pollutants

Abstract

Objectives/Goals
There are two objectives: First objective is to find out which school has the highest level of pollution based on the number of particulate air pollutants and analyze data by proximity to possible air pollutant sources. Second objective is to determine which school area, hallway, parking lot, or field, has the highest level of particulate air pollutant.

Methods/Materials
Materials: white cardboard, black permanent marker, magnifying lens, strings, Vaseline, ruler, calculator. Methods: 1. Four Clovis West schools were randomly selected. Geographical description, such as proximity to busy roads, industrial facilities, commercial establishments, construction sites were noted for each school. 2) School areas namely, parking lot, field and hallways served as collection sites. 3) 5x5 inches white cardboards were used as sample collection cards. 4) Vaseline was applied to each card before hanging it at approximately 4-5 ft high. 5) Replaced with new cards after 24 hours. 6) Particles stuck on the collection grid were counted using magnifying lens. 7) Process repeated for 10 days. 8) Tabulated and analyzed data.

Results
Results showed significant difference in the level of air pollution in four schools. School nearest to industrial establishments, commercial areas and busy roads, had the highest daily average particulate air pollutants (405). School near construction site had the second highest air particulates (392). Two schools mainly surrounded by residential areas, had the least air particulates (361) and (308) respectively. Results also showed striking difference in air particulates for each collection area. Parking areas had the highest total number of air particulates (529), followed by hallways (495) and the least polluted was the field (442).

Conclusions/Discussion
This project showed that although these schools are located in the same school district, there is a remarkable difference in the air quality of each school based on the level of air particulate pollutants. The level of air particulates is directly related to the proximity of schools to major sources of particulate pollutants. There was also a remarkable difference in the air quality among different collection areas, the parking being the most polluted compared to the hallways and fields. These results were concerning to students realizing that they were being exposed to air particulate pollution which can cause potential health problems.

Summary Statement
This project demonstrated significant difference in the air quality among different Clovis schools, indicating direct association with proximity to major sources of air pollution.

Help Received
Parents drove me to the Clovis schools for sample collections. Parents also purchased materials and helped in developing photos.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Olivia M. Hansen

Project Number
J1206

Project Title
Urban Runoff: Is 72 Hours Enough?

Abstract

Objectives/Goals
The Department of Environmental Health recommends waiting 72 hours before entering the water at our local beaches after a significant storm event. The purpose of my project was to perform water quality tests on the Cottonwood Creek outlet at Moonlight Beach (a storm drain water runoff area) to discover the impact of urban runoff to this waterway both 24 hours and 72 hours after a heavy rainfall and to confirm if 72 hours is an adequate amount of time for the water quality to return to safe levels. My hypothesis states that although this runoff is UV treated before entering the ocean, I believe there will be a decrease in water quality, including a large increase in bacteria levels immediately following significant rainfall.

Methods/Materials
I collected two water samples from the Cottonwood Creek outlet during a dry period without any rainfall. I tested the following water quality indicators - temperature, pH, salinity, turbidity, nitrates, phosphate and dissolved oxygen. I also tested for total bacteria and fecal bacteria (E.coli) using Coliscan Easygel. Within 24 hours following 1.88 inches of measured rainfall, I collected two water samples from the same location and repeated the same tests. Then I collected two more water samples 72 hours after the rain stopped and repeated all the same tests.

Results
My results showed that urban runoff immediately following a large storm has a negative impact on water quality in this area. Phosphate and turbidity levels increased. Dissolved oxygen decreased. E.coli levels showed a 225% to 400% increase from levels before the rainfall. Nitrate levels did not increase as expected however. 72 hours after the rainfall stopped, the water quality levels returned close to their original values. One interesting result I observed was that E.coli levels do not necessarily return to an EPA acceptable level after 72 hours.

Conclusions/Discussion
Urban runoff after storm events causes water quality issues at the Cottonwood Creek outlet at Moonlight Beach, particularly during the first 24 hours. Although most water quality indicators return to initial levels after 72 hours, E.coli levels that exceed EPA standards are still present in the water that enters our oceans.

Summary Statement
At the Cottonwood Creek outlet at Moonlight Beach, the urban runoff created after a significant amount of rain has a negative impact on water quality and creates an unsafe level of E.coli bacteria to enter the ocean even after the 72 hour r

Help Received
My parents purchased the materials and helped me safely collect the water samples. They provided guidance on how to avoid contact with the bacteria. The Coliscan Easygel kits were purchased from Micrology Labs. They also provided information on sample handling and safe disposal of the bacteria.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Anika V. Koop

Project Number
J1207

Project Title
How Many Microorganisms Are in Various Bodies of Water?

Abstract

Objectives/Goals
The objective in this study was to figure out how many microorganisms are in the water around us, and which body of water has the most different microorganisms.

Methods/Materials
Microscope, 6 Containers, Glass Slides and coverslips, 6 Droppers, and water from various sources.

Results
Water from various sources were analyzed using a microscope to determine which water source contained the most different microorganisms. The amount of microorganisms found in the American River were found to contain 29% more than the next highest body of water.

Conclusions/Discussion
The study compared the quantities of microorganisms and it was discovered that the body of water with the most variety was the American River. This study was relevant because it discovered that the three bodies of water with the highest amount of microorganisms were flowing water. Also, the lake water had a similar count as the drinking water that was examined.

Summary Statement
By measuring the amount of microorganisms in multiple bodies of water, I found that there is significant variation in the amount of microorganisms.

Help Received
My science teacher provided me with the materials to analyze the water. However I performed the analysis myself.

Name(s)
Charles O. Luke

Project Number
J1208

Project Title
Respiratory Impacts of Ultrafine Particulate in Preschools and Daycare Centers throughout Los Angeles County

Abstract

Objectives/Goals
The objective of this study is to determine the correlation between distance from preschools to major highways and levels of ultrafine particulate matter in the surrounding air. Do these levels correlate to asthma rates in the tested communities. Asthma rates are high in Los Angeles, and air particulate is linked to reactive airway disorders with young children most vulnerable. Locations of preschools and daycare centers are often unregulated in the city, and low cost of land incentives the placement of these centers near highways. The study sought to determine if young children attending these preschools are inhaling high levels of ultrafine particulate matter at risk for developing asthma.

Methods/Materials
A TSI P-trak Ultrafine Particulate Scanner 8525 was employed to measure ultrafine particulate matter less than 2.5 micrometers in diameter, per cm3 of air at 40 different preschools and daycare centers. This data was combined with rates gathered from area hospitals indicating specific numbers of emergency room visits for the targeted population of children. Analyzable charts were then constructed.

Results
Elevated levels of ultrafine particulate were found throughout Los Angeles, however levels were particularly elevated near major roads and highways, often well over the EPA standards for healthy air. Outcome suggests proximity to highways will increase air particulate levels dramatically. Asthma cases were determined to be prevalent throughout Los Angeles, but concentrated heavily in at risk communities where highways are clustered.

Conclusions/Discussion
The results, though inconsistent due to the prevalence of particulate and major roadways throughout the city, nevertheless suggests that asthma is linked to particulate levels. The data from this study leads one to the conclusion that reactive airway disorders are triggered or caused by elevated particulate levels and diesel exhaust. Other studies back up these conclusions. It is therefore likely that a preschooler's chance of developing asthma is significantly increased by attending a preschool near a highway.

Summary Statement
By testing ultrafine air particulate in the air surrounding preschools and daycare centers, I determined that high levels of particulate correlate with proximity to highways and elevated asthma rates.

Help Received
I used the P-Trak monitor and tested the air by myself, though my mother drove me to the locations around Los Angeles. I consulted with an industrial hygienist prio to commencing work in order to determine the feasiblilty of my study. I also consulted with the experts at Field Environmental in order to

Name(s)
Anneli Macdonald; Mathilde Macdonald

Project Number
J1209

Project Title
Secret of the Rings: Does 15N in Spruce Cores Tell of Salmon-Borne Nutrients Brought from Sea to Tree?

Abstract

Objectives/Goals
We wanted to find out if levels of the nitrogen isotope 15N in Sitka spruce cores correlate with populations of past salmon runs in Freshwater Creek.

Methods/Materials
Corer, HSU Mettler Toledo balance, dryer, coffee grinder, tincapsules, U.C. Davis Stable Isotope Facility (SIF) mass spectrometer, Freshwater Creek weir counts. Obtained core samples from a Sitka spruce within 25 meters of Freshwater Creek salmon spawning area and used tree ring marks to identify wood from each of the last four decades. Prepared wood samples for each decade and sent them to SIF to be analyzed for 15N. Obtained salmon run population data from the Freshwater Creek weir for each decade and received delta 15N measures from the SIF. Calculated a correlation coefficient to see if 15N levels correlated with density of salmon runs. As a control, performed the same analysis with a Sitka spruce 200 meters from Freshwater Creek.

Results
There is a strong correlation, with correlation coefficient of 0.69, between 15N levels by decade in the spruce close to the creek and the salmon run data for each decade. There was almost no correlation between 15N levels in the spruce far away from the creek and the past salmon runs. (0.006 was the result of the correlation coefficient)

Conclusions/Discussion
Our results supported but did not prove our hypothesis. If we had repeated this experiment with multiple trees and at different salmon spawning creeks, our hypothesis would have been better supported. Nevertheless, the data we gathered supports the idea that, if careful to avoid confounding factors, 15N levels in spruce cores could assist ecologists to discover trends in the numbers of salmon in a creek or river. This information could help ecologists restore or maintain a waterway and its surrounding ecosystem to its healthiest (optimal) state.

Summary Statement
We measured levels of nitrogen isotope 15N in cores from a creekside Sitka spruce and showed that these levels had strong correlation with measured changes in populations of salmon runs in the creek over the past 40 years.

Help Received
Used lab equipment at Humboldt State University under the supervision of Dr. Ward.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Talisa A. Martinez

Project Number
J1210

Project Title
Keep It Clean! Testing Water Quality through Daphnia magna Survival Rate

Abstract

Objectives/Goals
The purpose of my project is to test the survival rate of Daphnia magna in specific waters that came from the Imperial Valley county in California. Specifically, by using the survival rate of Daphnia magna, the quality of the collected water can be determined and shown to the public eye in hopes of promoting for the reduction of pollution in the Imperial County.

Methods/Materials
Each trial of the experiment featured 6 946-milliliter jars (without lid) filled with 800 milliliters of a collected water (Salton Sea, the New River, Alamo Canal, All-American Canal, tap water, and bottled water) and 12 Daphnia magna, all of which were inserted into a jar with a pipette. The amount of Daphnia magna was recorded in each jar every 24 hours for 7 days.

Results
Many notable observations were observed in the trials: the appearance of Daphnia magna changed, the jar containing a sample of tap water plunged in Daphnia magna survival rate, and the survival rate of Daphnia magna was best in the jar containing tap water.

Conclusions/Discussion
The trials showed a direct correlation between polluted waters and survival rate of Daphnia magna. As the survival rate of Daphnia magna was recorded when placed in collected waters from the Imperial County, California, it was concluded that one will see that the bigger the decrease in survival rate relates to a more toxic water.

Summary Statement
I showcased that many bodies of waters in Imperial County were toxic on earth by using the survival rate of Daphnia magna to exemplify the deterimental effects it could have on life.

Help Received
I design and conducted the experiment myself. My advisor, Ms. Lindsay Claverie aided me in the process of gathering materials.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Christina J. Moon

Project Number
J1211

Project Title
Sordid Sediment

Abstract

Objectives/Goals
My objective was to determine the effect of sediment on water quality in lakes and the marine organisms that inhabit it.

Methods/Materials
Sediment was collected from three local lakes. 50 grams of sediment from each lake was mixed with 300 milliliters of spring water in a container (each labeled with the lake name) to simulate rainwater run-off (independent variable). A sediment free container with 300 milliliters of spring water was also prepared (control). Fifteen adult Daphnia magna were transferred into each of the four containers (dependent variable). Over the course of 48 hours, the number of Daphnia magna in each container was counted every 8 hours and the heart rate per minute of the Daphnia magna was counted with a microscope every 16 hours. This was to keep track of the viability of Daphnia magna. For more reliable results, a second test was replicated. The water temperature and pH levels of the eight containers were also recorded every 8 hours.

Results
My results showed that the sediment-infused water had a lower reproduction rate compared to the control in both tests. Test A: 387% (control), 200%, 247%, 327%. Test B: 407% (control), 227%, 267%, 334%. The heart rate of the Daphnia magna in the sediment-infused water was much faster than the control in both tests. Test A: 178 (control), 209, 204, 199. Test B: 178 (control), 211, 206, 197. The water temperature and pH levels were almost within the same range among the eight containers throughout the 48 hours.

Conclusions/Discussion
The run-off sediment from man-made structures around the lakes was the cause of water pollution and vitality of marine organisms. The degree of pollution depended on the number/size of man-made structures, proving my hypothesis to be correct. The data showed that there were correlations between the reproduction rate and the heart rate. When the heart rate increased, the reproduction rate lowered. That means if a larger number/size of man-made structures are present, the higher the pollution would be in the lake.

Summary Statement
Lakes were polluted by run off sediment from man-made structures, and the degree of pollution depended on the toxicity level of the sediment.

Help Received
My professional contact, Dr. Kevin Raskoff answered my questions about collecting sediment and supplied a microscope and a pH tester. My dad drove me to the different lakes and bought the materials.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Will A. Myatt

Project Number
J1212

Project Title
The Impact of Fertilizer on Water Quality

Abstract

Objectives/Goals
The objective of my experiment was to test how different types of fertilizers affect water quality and aquatic microorganisms.

Methods/Materials
To conduct this experiment, I filled 7 cups with pond water and 1 cup with distilled water, and put different fertilizers in each cup. The fertilizers were Lawn Fertilizer, Lawn Starter, and Compost. Each day, I would test the pH, Total Dissolved Solids (TDS), Electric Conductivity (EC), and Temperature of each cup and record my results.

Results
After experimentation, the most relevant data was the slope of the pH graph, and my results were: a 0.97% decline for Lawn Fertilizer, a 0.31% decline for Lawn Starter, a 0.17% decline for Compost, a 0.47% decline for the No Fertilizer, and a 0.74% decline for Distilled.

Conclusions/Discussion
My experimentation shows that the Lawn Fertilizer caused the fastest decline in pH, and the Compost caused the slowest decline. This data proves the hypothesis that Compost is the best fertilizer for the water ecosystem, and that the Lawn Fertilizer is the worst for the water ecosystem.

Summary Statement
I proved that the lawn fertilizer with the most nitrogen had the most harmful effect on the water ecosystem, and the compost had the most beneficial effect.

Help Received
I conducted the experiment by myself. Mrs. Bertram, a retired science teacher, let me borrow equipment and gave me guidance. Mrs. Wangnoo let me use her classroom for my experiment and checked my math. Soil Born Farms let me use their compost. Chrissi Brewer let me interview her for research.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Makayla A. Plasse

Project Number
J1213

Project Title
Effects of Light Pollution on Astrophotography

Abstract

Objectives/Goals
My goal was to find out if light pollution effected astrophotography. I wanted to be able to provide picture evidence of light pollution. I focused on the star Rigel in the constellation of Orion. I wanted four different photographs of Rigel in different light pollution levels.

Methods/Materials
In my research I found a light pollution map where I chose my four different locations (White Water, Palm Springs, Ontario, and Long Beach). To keep variables as consistent as possible I traveled to each location in one night to take pictures of Rigel. I used a Nikon D3200 camera and a 180140 mm lens. I repeated this a total of three times over the course of three months. I could only take pictures on one night of each month because the moon will interfere with the brightness of the star.

Results
My data showed a clear connection between the level of light pollution and the apparent brightness of the star. The more light pollution the dimmer the star appeared. I fulfilled my goal, in that I was able to obtain picture clear picture evidence of the brightness of Rigel.

Conclusions/Discussion
While doing this experiment I found that light pollution is an issue that must have dramatic effect more than just astrophotography. Starting this project I didn't expect to see such clear results. The images of White Water were so much brighter than those in Long Beach. I can't imagine how much worse light pollution will get in the coming years if regulations aren't made. During my research I came across articles saying light pollution can effect animals and even humans. I would love to take this experiment a step further and find a way to quantify just how much organisms are effected by light pollution.

Summary Statement
The level of light pollution in the sky effects the brightness of the star in your photograph.

Help Received
My father helped me carry out my science fair project. He drove me to each location so I could take photographs of the star Rigel.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Firas A. Qureshi

Project Number
J1214

Project Title
A Geotechnical Investigation of Infused Soil Characteristics

Abstract

Objectives/Goals
The 2017 California Wildfire Season was the most destructive on record. Over 9,054 fires burned 1,381,405 acres. I wanted to learn if wildfires affect soil fertility by studying the soil's characteristics such as the Potassium, Phosphorus, Nitrogen, and pH Levels of the soil as well as the vertical stem growth of the radish plant planted in the soil. My hypothesis stated if soil was affected by wildfire, then that soil would be more fertile compared to soil not affected by wildfire. Based on the nitrogen cycle, wildfire burn leads to increased release of nitrogen levels in the soil, augmenting the soil's fertility.

Methods/Materials
In my investigation, I planted four radish seeds in eight trials of wildfire soil and eight trials of topsoil in a natural environment. I planted radish seeds because of the short germination period. I watered each pot of seeds with 30 mL of water every three days starting on the day of planting and did this for three weeks. At the end of each week, I measured and recorded the plant's vertical stem growth. I also tested and recorded the Nitrogen, Phosphorus, Potassium, and pH Levels of both the topsoil and wildfire-affected soil.

Results
The pH levels in wildfire soil were closer to neutral compared to topsoil across the trials. The nitrogen levels in the topsoil were on average deficient compared to the wildfire soil which was sufficient or in surplus. The radish seeds in the wildfire-affected soil erupted within the first week and grew to be on average 3.5 times higher in vertical stem growth. The potassium and phosphorus levels in the wildfire-affected soil were sufficient compared to the levels of topsoil across three weeks.

Conclusions/Discussion
Overall, the data supported my hypothesis. The radish seeds in the wildfire-affected soil germinated quicker and grew much more than the plants in the topsoil. This could be due to the fact that there weren't enough nutrients in the topsoil for the radish plants to grow naturally. There was a direct correlation between the Nitrogen, Phosphorus, Potassium, and pH Levels in both the topsoil and wildfire-affected soil. The study supports that new life can be supported by wildfire effectively.

Summary Statement
By comparing radish seed germination, growth, and chemical characteristics between wildfire-affected soil and topsoil, I studied how soil fertility affects the post-wildfire environment.

Help Received
I would like to acknowledge my mother for helping me buy my materials

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Shreya A. Rajappa

Project Number
J1215

Project Title
Going Up in Flames: Soil Bacteria

Abstract

Objectives/Goals
I wanted to identify the soil type with the highest bacterial biodiversity (number of different bacterial colonies) and to see how fires affect bacterial biodiversity. My project could change how people think about wildfires and the soil type they use in agriculture. The question was: How do different soil types from burned areas affect soil bacterial biodiversity? The hypothesis was: If the soil is unburned clay, then it will have a higher bacterial biodiversity than unburned silt or sand. If the soil is burned, then it will have a lower bacterial biodiversity than unburned soil.

Methods/Materials
I identified the soil type through field observation tests and through an online Soil Web Browser that has mapped out the soil types across California. I measured the dependent variable (bacterial biodiversity) through diluting the soil with distilled water, spreading it on agar petri dishes, incubating the plates in a reptile terrarium, and counting the different colonies.

Results
The results were that unburned clay's average was 6.8 different colonies, compared to the average bacterial biodiversity of unburned silt (4.6 colonies) and of unburned sand (4.4 colonies). Burned clay's average was 4.2 colonies and the averages for burned silt and for burned sand were 4 colonies. Going back to the objective, clay was the soil type with the highest bacterial biodiversity, and fires decrease bacterial biodiversity.

Conclusions/Discussion
The hypothesis should be accepted because unburned clay with 6.8 different colonies had a higher bacterial biodiversity than unburned silt and sand and because the burned soils had a lower bacterial biodiversity than the unburned soils for each type. My project expands our knowledge by showing that fires seem to make all soils have the same qualities since they all had a similar bacterial biodiversity after being burned and bacterial biodiversity depends on the qualities of the soil. My project is important because intense fires occur often in California, and we need to see how these fires affect the foundation for life.

Summary Statement
I wanted to identify the type of soil with the greatest number of different bacterial colonies and to see how wildfires affect soil bacterial biodiversity.

Help Received
I interviewed Dr. Joshua Schimel from UCSB and Mr. Bill Palmisano, who wrote an article about soil and its bacteria. Both interviewees provided background information on soil bacteria and fires and described their own findings from experiments. However, I designed, built, and performed the experiments myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Joy H. Ruppert

Project Number

J1216

Project Title

Cottonwood Creek Contamination: Investigating Water Quality of Moonlight Beach Effluent

Abstract

Objectives/Goals

Approximately 20% of the Encinitas city runoff empties into Cottonwood Creek and is discharged at Moonlight State Beach. I have seen many young children and families playing in the effluent, but the water often looks murky and discolored. I wondered if this really was a safe place to play. The city built an Urban Runoff Dry Weather Flow UVC Treatment Facility to treat the water from Cottonwood Creek, but the facility is 240 meters from the effluent outlet. I believed the effluent water might not meet state standards for primary contact. I also hypothesized that plants growing in the concrete channel carrying water from the UVC treatment facility to the ocean might reduce nutrient levels of nitrates and phosphates in the creek water.

Methods/Materials

I performed 182 tests on 24 different water samples taken from the Moonlight Beach effluent. I collected water samples over a three-month period at distances ranging from 1 to 11 meters from the effluent. I performed 120 water quality tests. I used kits from LaMotte and Hach to document the pH, nitrates, phosphates, nitrite, ammonia, copper, iron, chromium, and dissolved oxygen. For 12 water samples, I inoculated 50 plates using Coliscan Easygel media to identify coliforms, including E.coli, and noncoliforms. I also performed 12 separate dissolved oxygen tests at the site to support my results.

Results

According to my results, the Moonlight Beach effluent failed to meet state standards for primary contact water. Water samples consistently contained excessive levels of coliform bacteria. 100% of my 50 plates were either TNTC, or for dilutions, ranged from 25,000 CFU/100mL to 150,000 CFU/100mL for coliform bacteria. The samples also revealed nitrates and phosphates far above recommended levels. Nitrates ranged from 60 to 100 ppm, which were 60 to 100 times the recommended level of 1ppm. Phosphates ranged from 12 to 14 ppm, which were 120 to 140 times the 0.1 ppm suggested limit for phosphates. The plants in the concrete channel seemed to have little impact on nutrient levels in the water. Available dissolved oxygen levels were consistently low in my samples.

Conclusions/Discussion

The UVC Treatment Facility appears unable to reduce the number of bacteria in the water probably due to the distance between the facility and the effluent. High levels of nitrates and phosphates in the effluent also put the beach at risk for harmful algal blooms (HABs).

Summary Statement

I tested the water of the Cottonwood Creek effluent at Moonlignt Beach to determine water quality, including bacteria and nutrient samples.

Help Received

My parents transported me to Moonlight Beach. My science teacher supplied equipment, testing supplies, and supervised me for safety in the lab. I collected all the water samples myself as well as performed all of the water quality tests.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Collin M. Schneider

Project Number
J1217

Project Title
Documenting the Impacts of the Carlsbad Desalination Plant on Agua Hedionda Lagoon

Abstract

Objectives/Goals
The Carlsbad desalination plant began operating in December of 2015. I wondered if the desalination process might have impacts on the water quality at the Agua Hedionda Lagoon. I decided to test the water at four locations in the lagoon and also test the ocean water quality north and south of the brine discharge. I believed that the salinity and levels of nitrates and nitrites in the water might exceed recommended levels.

Methods/Materials
I evaluated 198 water quality values from 18 water samples collected from six different locations in the vicinity of the Agua Hedionda Lagoon during multiple site visits. I used test kits from LaMotte and Hach. I also used Coliscan Easygel media and inoculated a total of 50 plates to test for coliform bacteria, including E. coli, non-coliform bacteria, and mold.

Results
Salinity levels were the highest at Hubbs Research center and the east junction, the hydrometer showing salinity of 38 ppt while the two ocean tests yielded only 34 and 36 ppt; however, the salinity could be even higher at greater depth due to the halocline of the lagoon. The levels of phosphates averaged 1.5 ppm, which is 15 times the state recommended limit. Nitrates, a strong indicator of brine discharge, were found in most locations to be at 2-3 times above the state standard of 1 ppm. The highest levels were found north of the discharge, at the mouth of the lagoon and the east junction. The total nitrates averaged 2.3 ppm, and all results were within 0.5 ppm of each other. Levels of dissolved oxygen averaged 2.6 ppm, an amount 2.4 ppm below state standards. The highest levels of ammonia were found north of the discharge and east of the PCH, averaging 0.15 and 0.2 ppm, which was 0.5 to 1.0 ppm above the recommended level. I found levels of coliform bacteria to be highest at the points north and south of the discharge. Levels of E. coli were found highest east of the PCH where my tests revealed levels of E. coli too numerous to count.

Conclusions/Discussion
Salinity levels, nitrates, phosphates, and dissolved oxygen tests showed results that could be harmful to the marine ecosystem. I believe that many of my findings were due to brine discharge and also to possible non-point-source pollution from nearby agricultural areas. I recommend that salinity levels and the water quality in the lagoon and the ocean in the vicinity of the brine discharge be monitored closely.

Summary Statement
I examined the effects of the Carlsbad Desalination Plant on water quality at the Agua Hedionda Lagoon.

Help Received
Thanks to my mother for driving me to the lagoon to collect my samples, and to my science teacher Mrs. Hunker supervising my safety in the lab and providing me with test kits and materials. I conducted and analyzed all of my tests myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Audrey C. Sherf

Project Number
J1218

Project Title
Effect of Pesticides on Decomposition

Abstract

Objectives/Goals
The objective of this experiment is to observe the effects of pesticides on the decomposition of leaves in soil.

Methods/Materials
For this experiment, I filled 12 jars with soil from an organic garden. Half of the jars had pesticides added to them. The other half just had water added. One leaf was placed into each jar. Every week (for 12 weeks) I weighed the leaves to see if they decomposed or lost mass.

Results
After 12 weeks, the leaves in the control jars lost 3.5g overall. The leaves in the pesticide jars lost 4.3g overall. The average amount of mass lost for the leaves in the control jars was 0.5g. The average mass lost for the leaves in the pesticide jars was 0.7g. The leaves in the pesticide jars lost more mass overall.

Conclusions/Discussion
The leaves in the pesticide jars lost more mass than the leaves in the control jars. It was observed that the pesticides did not seem to kill sow bugs. In fact, the sow bugs multiplied. Sow bugs skeletonize leaves. The pesticide jars had more sow bugs than the control jars. I believe that the sow bugs had a direct effect on the decomposition of the leaves.

Summary Statement
I observed the effect of pesticides on the decomposition of leaves in soil.

Help Received
I designed and conducted this experiment by myself. My mother reviewed my results and assisted with photography.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Boldizsar T. Szabo

Project Number
J1219

Project Title
Plants that Change Climate Change

Abstract

Objectives/Goals
The purpose of this project was to investigate the claim that different plants absorb CO2 at different rates. My hypothesis was that the claim is true and that plants do absorb CO2 with different efficiencies because they have different leaf sizes, leaf pigments, and sensitivities to light.

Methods/Materials
I chose 3 different plants for independent variables: a Zonal Geranium, a Senecio Vitalis, and a spider plant. For each experiment, I placed a CO2 meter, which also served as a thermometer and hygrometer, in a 2.5 gallon airtight jar. I put one of the plants inside the jar and sealed it for 24 hours. I noted initial and final humidity, temperature, and CO2 levels inside the jar. I shined a light on the plant from 7:00 a.m. to 7:00 p.m. I cleared the jar between experiments. I tested only soil and the air in the jar as negative controls. The testing was done 3 times per condition.

Results
Averaged over the triplicates, the CO2 levels in experiments with only air in the jar dropped by 99.7 parts per million (PPM) from the beginning of the experiment to the end. In the experiments with soil but no plant, they rose by 1515.0 PPM. During the spider plant experiments, CO2 levels rose by 4375.3 PPM. The CO2 levels in the Senecio Vitalis experiments rose by 6810.3 PPM and in the experiments with the Zonal Geranium, they rose by 7285.0 PPM. These very different CO2 levels show that the different plants absorb different amounts of CO2.

Conclusions/Discussion
The claim that different plants absorb CO2 at different rates is true, because each plant absorbed a different amount of CO2. It suggests that some plants are better than others for fighting climate change. A good follow-up experiment could be testing which characteristics are responsible for the different rates of CO2 absorption.

Summary Statement
I showed that different plant species absorb CO2 at different rates.

Help Received
My parents turned on and off the UV lamp when I was not there to do it myself. My teacher helped me organise my project and better understand the scientific method.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Caroline G. Worman

Project Number
J1220

Project Title
Analyzing Escondido Creek Water Quality

Abstract

Objectives/Goals
My goals were to analyze the water quality of Escondido Creek at different sites to identify the effects of the seven-mile flood control channel versus the natural environment. I hypothesized that the concrete channel has an adverse effect the water quality. I believed that the creek water quality would be poorest at the channel effluent in Escondido. I also hypothesized that as the creek water ran through the natural environment, the water might be filtered and cleaner than at the concrete channel.

Methods/Materials
I obtained water quality testing kits and materials from La Motte and Hach chemical companies. I conducted 130 water chemical tests and 42 water bacterial tests, using 10 different water samples acquired over three months. I tested for pH, alkalinity, ammonia, hardness, nitrate, nitrite, phosphate, chlorine, turbidity, dissolved oxygen, biochemical oxygen demand, coliform colonies, non-coliform colonies, E. Coli and mold. I also recorded environmental observations I saw around the test sites.

Results
I found that the seven mile flood control channel was harmful to the water quality, and the natural environment was able to filter some of the damage done by the channel. About 10 miles downstream from the channel, water quality improved, but was still below state standards. Along the entire creek the dissolved oxygen levels were low, suggesting the creek could not support a diverse ecosystem. Bacterial tests showed many plates contained TNTC coliform colonies per 100 mL. As a whole, the creek chemical and bacterial levels do not meet the state standards for water quality.

Conclusions/Discussion
The flood control channel that encloses the Escondido Creek seems to have an adverse effect on water quality. Returning the creek bed to its natural environment is likely to improve the quality of the water of the Escondido Creek. Plans to fix the problem of the concrete channel are already in progress and must be balanced with the need to control flooding.

Summary Statement
The purpose of this project was to test the water quality of Escondido Creek and assess the effects of the seven mile flood control channel.

Help Received
My parents provided transportation to each of the sites as well as to my school lab. My science teacher, Mrs. Hunker, provided me with equipment and test materials and also supervised me while testing. I performed all water quality tests and obtained all samples independently.