CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Yabby Abejie; Bailee Kitchen

Project Number

J1201

Project Title

Removing Heavy Metals with an Affordable Home Filter: A Second Year Study

Abstract

Objectives/Goals

All over the world, heavy metal water contamination is a prominent problem; from the water crisis in Flint, Michigan to the wasteland runoff and unorthodox dumping contaminants leaching into Mumbai, India#s Mithi River. Heavy metals exposure can cause severe diseases and even fatality, making it a paramount problem globally. Here In the Central Valley, the drought causing wells to run dry could lead to higher concentration of heavy metals in groundwater. The purpose of this project is to design and build an affordable layered gravity water filter and test water samples for arsenic, copper, lead, and mercury from private wells in Fresno County.

Methods/Materials

We built our filter from a cloth coffee filter, ion exchange resin (cation and anion), activated carbon pellets, ion exchange/coconut carbon mixture, kinetic degradation fluxion, tourmaline bio-ceramic balls, and additional fibers. After the filter was built, we collected four raw samples from four wells and 250 mL of each raw sample was sent to a NELAP certified laboratory for heavy metal analysis. Then we filtered the sample from each well with our filter and 250 mL of each filtrate was sent to the same lab for analysis. The concentration of heavy metals in the raw and filtered samples were compared.

Results

Copper was the highest concentration detected in all of the samples. The concentrations of copper before filtration in Sample One, Two, Three, and Four were 9.7, 54, 5.2, and 17 ug/L, respectively. After filtration, the concentration of copper was undetectable in the first three samples and 16 ug/L in the fourth sample. Arsenic was the second highest concentration detected. It was only detected in the unfiltered Sample Three with a concentration of 4.7 ug/L and after filtration it was undetectable. Lead was only detected in Sample Two with a concentration of 5.7 ug/L and after filtration it was undetectable. Mercury was not detected in any of the samples.

Conclusions/Discussion

After comparing the filtered results to the raw results, we concluded that our filter is effective in removing the heavy metals arsenic, lead, and copper. The copper from the last sample was not completely removed, most likely because copper of different isotopes were present in the water.

Summary Statement

This project focuses on filtration of arsenic, copper, lead, and mercury from groundwater in Fresno County with our layered gravity filter.

Help Received

The well owners collected the water samples based on lab instruction. BSK Labs tested the water free of charge. Our parents transported us to and from the lab, and our coach provided us technical support. The ion exchange resins, the resin/carbon mixture, and fiber was provided by San Joaquin Chemicals.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Noe T. Arredondo-George

Project Number

J1202

Project Title

Invasion of the Microplastics!

Abstract

Objectives/Goals

test environment waters to see if plastic microfibers are in waterways and water sources. hypothesis: there are microplastics in waterways leading to Monterey Bay.

Methods/Materials

13 gallon jugs
1 glass measuring cup
1 clear plastic sheet with printed grid
1 plastic funnel (1.1 cm diameter spout)
1 microscope (Leica# MZ6 dissecting microscope w/light, 6.3-40x magnification)
1 microscope eyepiece camera (AmScope# Microscope Eyepiece Camera 50 mA USB 2.0 DC 5v)
13 plates
13 coffee filters (basket style, approx. 6 micron filter)
1 permanent marker
2 gallons of Arrowhead# Distilled Water
13 Ziploc# Pint Containers (used as filter covers for storage)
1 measuring collection bottle (Nalgene# 13 oz)
1 roll of painter#s tape
1 rubber band

Collect samples with measuring cup, fill one gallon jug
Record time and location on jug

Wash out funnel with distilled water, clean grid with painter#s tape if necessary
Filter water samples
Analyze water samples under microscope with plastic grid on top of the filter
Scan filter square-by-square at 30-40x magnification, counting numbers of fibers
Record results

Results

Microfibers found in every water sample, including those from beaches, rivers and creeks, residential water and water treatment plant effluent.

Summary Statement

successfully located microfiber plastic pollution by analyzing &comparing samples from local waterways, treatment plant, clothes washer, tap water, and ocean water.

Help Received

thank staff at Santa Cruz Water Treatment Plant, Pacific Collegiate School, and my parents, Gabriela Arredondo and Bill George

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Ian J.N. Bachant

Project Number
J1203

Project Title
How Will a Change in Mineral Content in Soil Affect the Amount of Water Retained by the Soil?

Abstract

Objectives/Goals
The effect of two clay minerals, montmorillonite and kaolinite, on water retention in soil was investigated, along with how salt and pH changes these properties. Kaolinite is a 1:1 clay whose layers are held together strongly by hydrogen bonds and does not disperse in water, and montmorillonite is a 2:1 clay whose layers are held together loosely by cation interactions and readily disperses in water. The objective was to see how these clay properties affect water drainage, which can influence water retention for plants, soil surfaces for nutrients, and groundwater replenishment.

Methods/Materials
The approach I used was to set up columns where sand was mixed with different amounts of kaolinite or montmorillonite. The columns were made by drilling holes into the bottom of 50 ml plastic conical tubes and sticking tubing into the holes. Powdered kaolinite and montmorillonite were donated by Dr. Robert Graham, a scientist at UCR.

Results
I observed that without clay water runs through sand quickly. For both kaolinite and montmorillonite, as the clay concentration increased, water flow through the column decreased. However, montmorillonite retained water to a greater extent than an equivalent amount of kaolinite. With respect to the effect of salt, I found that adding NaCl made water flow through montmorillonite soil more quickly than water lacking salt. In comparison, adding salt did not have as big of an effect on infiltration through kaolinite soil. Finally, I observed that basic water (pH 10) took longer to move through the column compared to acidic (pH 4) or neutral pH water.

Conclusions/Discussion
The ability of montmorillionite to retain water better than kaolinite is probably due to clay structure. As a 2:1 clay, montomorillionite readily disperses as fine particles that block water movement. In contrast, kaolinite is a 1:1 clay and does not swell as much and so is less effective. Also, because montmorillionite layers are held together by cations, the presence of salt in solution might offset the ability of water to disperse montmorillionite, explaining why more rapid drainage was observed at higher salt concentrations. I do not understand the effect of the pH, but I would like to explore how pH affects soils. With greater amounts of greenhouse gases in our atmosphere, the pH of rain will begin to change, so if we explore this effect now, we will be better prepared to deal with this.

Summary Statement
By examining different concentrations of swelling and non-swelling clays in soil, I was able to show that a swelling clay was more effective at slowing water infiltration in soil, and this effect was altered by salinity and pH fluctuations.

Help Received
Dr. Robert Graham at the Univ. of California, Riverside answered questions I had about clay and soil, and donated the powdered forms of the clay minerals I used. My mom and dad helped me with ideas, running the columns, taught me about preparing graphs in Excel, and helped with putting my poster together.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Sarah C. Bruno

Project Number
J1204

Project Title
How Water Quality Changes along an Open Water System

Abstract

Objectives/Goals
The experiment determined how water quality changes along an open water system that supplies drinking water (prior to treatment). Samples were obtained at different locations along the water system and were evaluated for changes in bacteriological content, pH and hardness.

Methods/Materials
Alkalinity - Determine amount of Sulfuric Acid necessary to add to water sample to reach a pH of 4.5. Calculate total alkalinity using formula.
Hardness - Prepare water sample and determine the amount of titration with EDTA needed to satisfy test. Use formula to determine hardness.
Bacteriological- 1. Inoculate the Lauryl Tryptose Broth media with water using 5 tubes with 10 mLs and 5 tubes with 1 mL; 2. Incubate test and culture tubes for 24 hours; 3. Check to see if gas has formed in the culture tubes. If gas has formed, move to Step 4. If not, record data and dispose of the test tubes; 4. Use a sterilized inoculation loop to transfer the culture into three different media (BGB - total, EC - fecal, and EC MUG - E. coli); 5. Move the EC and EC MUG to the fecal bath, and move the BGB tubes to the incubator; 6. Check the tubes in 24 hours. If the EC and EC MUG test tubes don't prove positive for bacteria in the coliform family, record the data and dispose of the test tubes. If the BGB tubes don't prove positive, incubate for another 24 hours; 7. If gas is observed in the culture tubes, repeat Steps 4-6; 8. If gas is still observed, repeat Steps 4-6. This is the last day, so if the test tubes don't prove positive, record your data and dispose of the test tubes; 9. Use the Most Probable Number chart to find the number of bacteria colonies in the water samples.

Results
I discovered from my data that it is hard to find an easy answer to which location has the best water quality. The results for water hardness were the most clear as it doubled as the water traveled downstream. As for the bacteriological content, the total coliform bacteria reached more than 15 times Lyon's total bacterial value at Old Oak Ranch, before reducing to about 3 times at San Diego Reservoir. However, the majority of fecal and E. coli bacteria was found at the 5.5 mile mark. The alkalinity stayed consistent in all four tests.

Conclusions/Discussion
Water quality along an open water system varied with distance, except hardness and alkalinity. Further testing could reveal if UV exposure or other factors influenced the bacterial content.

Summary Statement
After testing water at different locations along an open water system, the data show that quality does not worsen with distance, but varies.

Help Received
Tests performed at Aqua Lab under supervision. I also received assistance from my parents to reach sampling locations and proofreading.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Noah M. Cain

Project Number
J1205

Project Title
Kids Still at Risk: Particulate Matter and Flammable Gas Exposed

Abstract

Objectives/Goals
My objective was to determine if there was a positive or negative correlation between relative humidity and particulate matter (PM-10) and flammable/combustible gasses.

Methods/Materials
I built a sensor to measure PM-10, combustible/flammable gasses, and humidity/temperature and conducted my experiment at my school's parent pick-up lane. I built an Arduino microcontroller-based sensor with a Shinyei PM-10 particle sensor, MQ-2 gas sensor, a DHT11 humidity/temperature sensor, and assembled the components on a breadboard in a repurposed Dell computer power supply with fan. I wrote the code, and modified some of the code from a previous version I built, to control the sensors and monitored the serial output on a laptop computer. I copied the data points (over 2000) into a google sheet for analysis and graphing.

Results
My results showed that when there is more humidity, there is less PM₁₀ and more combustible gas. When there is less humidity, there is more PM₁₀ and less combustible gas.

The average level of PM₁₀ at 52% humidity was 0.792.
The average level of PM₁₀ at 33% humidity was 1.076.
That is an increase of 136%.
The average level of combustible gas at 52% humidity was 247.178.
The average level of combustible gas at 33% humidity was 185.852.
That is a decrease of 75%.

Conclusions/Discussion
My hypothesis was partially correct because although PM-10 decreased with higher humidity levels, the amount of flammable gasses increased. When the humidity level decreased, the PM-10 levels increased, while the combustible gas levels decreased.

My hypothesis was that both flammable gasses and PM-10 would decrease on a humid day.

This suggests that on dry days, children at Krystal School of Science, Math, and Technology are exposed to higher levels of PM-10 than they are on days with higher humidity.

Summary Statement
I measured an inverse correlation between PM-10 levels and relative humidity, but combustible/flammable gas levels were not affected by humidity.

Help Received
My parents funded the purchase of my materials and drove me to various locations for testing. I selected my project, materials, designed and built my prototype and final sensor, wrote and tested the microcontroller/Arduino code, and conducted the experiment myself.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Emilio S. Chavez

Project Number
J1206

Project Title
Does Blue Lakes Have Safe Levels of E. coli?

Abstract

Objectives/Goals
The objective of this experiment was to see if dangerous levels of E. coli are currently in Blue Lakes, a lake that is located in Lake County, California.

Methods/Materials
Materials: Colilert Reagent, autoclave, incubator, comparator, 100 ml sterile bottles, Quanti-trays, Quanti-tray sealer, 6 watt UV light (Alpha Labs tools used)
-GPS application (iphone), iPhone camera, electric boat (rental).
Lake water samples were collected and tested from five different areas with three trials at each location. Each 100 mL water sample was evaluated for Total Coliform and E. coli using Colilert Reagent.

Results
The five sample sites, with three trials gave varying results for Total Coliform and E. coli. The samples taken by the Le Trianon Resort (A1, A2, A3) gave the highest values of E. coli. While the samples taken from Blue Lakes that had no resort or homes in close proximity (C1, C2, C3) gave the highest Total Coliform counts.

Conclusions/Discussion
The results of my experiment showed that the highest levels of E. coli were from the samples that were taken by the Le Trianon Resort. The highest Total Coliform results were from samples taken at the southwest side of Blue Lakes. The Total Coliform levels were much higher than the levels by the Le Trianon Resort, so there may be other types of bacteria at the southwest side of Blue Lakes that need tested. The high amount of E. coli by the Le Trianon Resort site was not a surprise due to its high amount of tourists and how close some of their buildings are to the shore. I did not find dangerous levels of E. coli.

Summary Statement
I tested water samples from Blue Lakes for E. Coli and Total Coliform in order to show that there is a low health risk for E. Coli to the general public when using the lake for recreation.

Help Received
Alpha Labs allowed me to use their lab space. Zee Hopper-Alpha Labs told me how to run the tests, then I did them for my own experiment, she answered questions about testing. My mother took pictures/wrote my gps coordinates down while I sampled water. My grandmother drove the boat.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Elisabeth J. Eichinger

Project Number
J1207

Project Title
Firescape

Abstract

Objectives/Goals
The objective of this project is to measure the ignition times (in seconds) of drought resistant plants when they come in contact with an open flame.

Methods/Materials
12 samples of drought resistant plants, stopwatch, consistent open flame (gas barbecue): Samples were held at a consistent distance over an open flame and ignition times were measured in seconds. Three trials were conducted for each sample.

Results
Ignition times ranged from an average of 2.3 seconds to 20.7 seconds. Mexican Sage was the least fire resistant sample and Bougainvillea was the most fire resistant sample.

Conclusions/Discussion
The California Department of Water Resources (CDWR) recommends planting drought resistant landscapes. The California Department of Forestry and Fire Protection recommends planting fire resistant landscapes. This project determines which plants meet both of these recommendations. Drought resistant plants with slow ignition times include Bougainvillea, Jerusalem Sage, and Spurge. Drought resistant plants with fast ignition times include Mexican Sage, Verbena, and Mexican Marigold.

Summary Statement
My project determined which drought resistant plants are also fire resistant.

Help Received
I designed and implemented the experiment by myself.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Daniel Feng

Project Number
J1208

Project Title
Are Southern Californian Waters in Danger of Algae Blooms?

Abstract

Objectives/Goals
Algae blooms are becoming increasingly common worldwide and are environmentally and financially damaging. In this project, I wanted to find if Southern Californian waters are in imminent danger of an algae bloom. In particular, I asked, "Can the presence of small amounts of fertilizer set off an algae bloom?" and "How does the amount of fertilizer affect the growth of algae blooms?"

Methods/Materials
I tested 3 local water sources in Orange County. To measure and observe algae growth from these sources, I used Miracle Gro fertilizer, glass vials, a spectrophotometer, a 96-well plate, a microscope, a micropipettor, and cover slides. I divided the water from my sources into many samples and changed the amount of added Miracle Gro fertilizer and the water source (independent variables) to see how they affected algae growth, measured by light absorbance with a wavelength of 750 nm (dependent variable). I had five trials for each sample type, and over three 1-month periods, I took more than 650 measurements.

Results
I found that it is possible to obtain algae blooms in all 3 of my Southern Californian water sources using very small amounts added fertilizer. The amount of fertilizer in those samples had a fertilizer-to-sample ratio of 1:2000. All of the water sources contained different types of algae as well. I also found that too much fertilizer can stunt algae growth, showing that there is an optimal amount of fertilizer for algae growth.

Conclusions/Discussion
Very small amounts of fertilizer can cause an algae bloom easily in every water source tested. Southern California is, therefore, in danger of algae blooms. My experiment shows that people should be very wary of fertilizer runoff into their water sources because small fertilizer amounts lead to very noticeable results. These results are important to everyone because water is a precious resource and is used by everybody in many ways.

Summary Statement
I found that Southern California is in danger of algae blooms because a very small amount of fertilizer runoff can result in algae blooms in many water sources.

Help Received
I designed and carried out the experiments myself. Graduate student Medea Neek (UC Irvine) taught me how to use lab equipment and helped me set spectrophotometer conditions. Dr. Huber (Algae Research Supply) gave me helpful information over the phone about algae and sold me algae materials.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Anneli Macdonald; Mathilde Macdonald

Project Number

J1209

Project Title

Jammin' Freshwater: The Influence of Log Jams on Macroinvertebrates in Freshwater Creek

Abstract

Objectives/Goals

We wanted to find whether log jams affect the number of macroinvertebrates in Freshwater creek.

Methods/Materials

Stopwatch, 170 cm kick-net. Counted macroinvertebrates at 2 natural log jams and 2 human intervention areas with cleared log jams in Freshwater Creek on 3 different days.

Results

In the combined results of our 3 trials there were 50 macroinvertebrates in log jam areas and 27 macroinvertebrates in human intervention areas. For this comparison the P value of a Student's t-test was 0.21, suggesting this difference could have been the result of chance.

Conclusions/Discussion

Our results supported, but did not prove, our hypothesis. It may be that making more measurements or making measurements in more areas would allow us to prove our hypothesis true or false. Additionally, the presence or absence of log jams may affect macroinvertebrates in an entire stream and not just in the immediate log jam area. We learned that macroinvertebrates are an important part of the food chain and thus stream health.

Summary Statement

The presence of natural log jams positively influences the quantity of macroinvertebrates in Freshwater Creek.

Help Received

Scientific advice from our teacher, Diana Skiles. Background research guidance from hydrologist Mark Morris, Ph.D., and ecologist Arthur Morris, Ph.D.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Umair Mahmood

Project Number
J1210

Project Title
Flammability Properties of Native and Non-Native Landscape Plants

Abstract

Objectives/Goals
In May of 2014 in San Diego County, eight to fourteen fires were burning at the same time. One fire was less than two miles away from my home.The purpose of this project, was to see which outdoor plants might be least likely to ignite. Which plants should be planted around the perimeter of a house that might help prevent a wildfire from spreading? Based on my research, I believed that planting the right type of plants might help protect houses from wildfire or prevent a wildfire from spreading.

Methods/Materials
I tested three samples each of ten plants, five native and five non-native. I used a blowtorch to stimulate wildfire and I used my grill for a fire safe location. I used a GoPro to take videos. I set up the grill and wore goggles and welder's gloves. I placed the plant into the tongs. I tested the time to burn, char, disintegrate, and the time until the end of the experiment.

Results
According to my results, 50% of the plants I tested were unsuitable for protecting against wildfire, and I rated these plants as "C". 40% of the plants I tested seemed suitable to protect against wildfire and earned an "A" rating. Of the plants I tested, I rated 10% as "B" on my rating scale, indicating that they may be moderately protective. The plants that received a "C" rating were Laurel Sumac (Native), Ornamental Strawberry (Native), Rose (Non-Native), Toyon (Native), and French Lavender (Non-Native). The plant that earned a "B" rating was Chamise Sage (Native). The plants I gave an "A" rating were Aloe (Non-Native), Stonecrop (Native), Dragonfruit (Non-Native), and Jade (Non-Native). I noticed that all the succulents had acted like a barrier against the fire and did not ignite even with extended time.

Conclusions/Discussion
Every species of succulents I tested held up extremely well throughout prolonged testing. The succulents acted like a barrier against the fire and completely deflected it. The succulents seemed to be "sweating" and released much water that dripped from the bottom. I think all the succulents fared better because in their tissue they have a high moisture content and I saw that when the moisture was coming out of the succulent. These succulents could help save homes, schools, office buildings, libraries, the possibilities are endless, as long as you plant these plants you may have a higher chance of not losing your home to a wildfire.

Summary Statement
The purpose of this project is to see which plants might be least likely to ignite and would protect a home from wildfire and prevent the fire from spreading.

Help Received
I did everything myself except I had adult supervision while doing the flame induced experiments.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Rodrigo Marquez, Jr.

Project Number
J1211

Project Title
Analyzing Water Quality from Various Central Valley Sources

Abstract

Objectives/Goals
The objective of this study is to indicate if various Central Valley sources contain a safe level of nitrate and phosphate.

Methods/Materials
Water monitoring kit, 3 different water sources from Central Valley. Tested different waters for levels of nitrate and phosphate.

Results
Tested 3 different water sources for nitrate and phosphate. Repeated test for all other waters. All the waters had safe levels of nitrate and phosphate which were 5ppm and 3ppm.

Conclusions/Discussion
Repeated trials for all different water sources revealed that all had safe levels of nitrate and phosphate. It is concluded that all the diffenet Central Valley were safe.

Summary Statement
I indicated that different Central Valley water sources contain a safe level of nitrate and phosphate.

Help Received
I recieved a test kit from my school science teacher. I recieved help in understanding how each test worked.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Lu C. Patterson

Project Number
J1212

Project Title
Are Nitrate and Nitrite Levels Reduced in the Natural vs. Concretized Sections of the Los Angeles River?

Abstract

Objectives/Goals
The objective of this study is to determine if there is a difference in nitrate and nitrite pollution levels in the natural bottom versus concretized sections of the Los Angeles River.

Methods/Materials
I used collection vials, Los Angeles river water samples, and chemical test strips. I collected, measured and compared nitrate and nitrite concentrations in two water samples taken weekly from the natural bottom and concretized sections of the river.

Results
My results indicate that the Burbank concretized section of the LA River has about 12 mg / L more nitrates that the natural bottomed portion of the river. However, nitrite concentrations were greater by 0.15mg/L in the natural bottom Glendale Narrows section.

Conclusions/Discussion
My results indicate that while returning the Los Angeles river to a permeable natural bottom might reduce nitrate pollution, the increased vegetation and wildlife in the restored river ecosystem may increase nitrite levels.

Summary Statement
I determined that there is a difference in average nitrate and nitrite pollution levels in the natural versus concretized sections of the Los Angeles River.

Help Received
I designed, collected, tested, and averaged the water samples by myself.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Emily T. Shi

Project Number
J1213

Project Title
Microscopic Study of Torrey Pine Needles for Moisture Condensation

Abstract

Objectives/Goals

The Torrey Pine tree is well known for its ability to efficiently condense moisture and water itself to survive under drought conditions. However, the mechanism of Torrey pine tree collecting moisture from fog is not well understood.

We want to learn how Torrey pine tree achieves this function by having what unique surface and structure properties. These learning can be used to guide moisture collection equipment design in practical.

This study is focused on learning its surface structure and properties in microscopic level. Interactions between Torrey pine needle, liquid water drop and water vapor are studied under digital microscope. Jeffrey Pine needles are reference.

Methods/Materials

Equipment: Portable microscope with PC, Cold vapor generator, Multi-meter, Eye dropper.

Material: Fresh Torrey pine tree bunch, Fresh Jeffery pine Tree bunch.

Results

The contact angles for the three sides of Torrey Pine needles were under 90° so they were all hydrophilic.

The rough surface contact angles were 34.2±8.2 degree which indicates very strong hydrophilic properties. The smooth surface has a relatively higher contact angle (49.4±10.7 degree) which still indicates hydrophilic properties.

Upon observation, small droplets of water formed on the rough sides and then quickly spread out to the smooth side due to its hydrophilic properties. Larger droplets were observed on the smooth side. As the mass of the droplet increased, they flowed towards the tip of the needles. This freed up the space in the smooth surface and more droplets were formed that soon flowed away.

A single Torrey Pine needle had 2.5 times more surface area than a Jeffrey Pine needle. A bunch had four times more surface area.

The electric resistance of Torrey Pine needles is lower than the Jeffrey Pine needles.

Conclusions/Discussion

For both Torrey Pine and Jeffrey Pine needles, the rough and the smooth surfaces were hydrophilic.

The two rough surfaces in Torrey Pine trees were much more hydrophilic than the smooth surface. They were more efficient in collecting the moisture.

For practical moisture condensation equipment design, the surface shall be as large as possible, and

Summary Statement

Study Torrey pine tree needles moisture condensation function to provide design guidelines, leading to free water resource for dry areas

Help Received

Dr. Mellisa Gingrich at The Cambridge school

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Corey D. Telfer

Project Number
J1214

Project Title
Investigating Water Quality at Cardiff Beach

Abstract

Objectives/Goals
I have noticed the difference in the water quality of the San Elijo Lagoon effluent which feeds into the ocean. I hypothesized that nutrients such as phosphates, and nitrates, and bacteria from the San Elijo lagoon effluent will flow directly into the ocean water designated for swimming and surfing which can affect the water quality and may cause algal blooms in the vicinity.

Methods/Materials
For my experiment, I went to Cardiff Beach to take water samples for testing of the chemicals and bacteria. I then went to the science lab at my school, and I tested for phosphates, nitrates, nitrites, ammonia, and pH. I also tested for bacteria levels and plated my water samples into Coliscan Easygel. I inoculated 25 plates with my six different water samples. I included plates containing 0.1 dilution in each sample, and a sterile sample containing only distilled water and the media. 24 hours later, I returned to the
lab to read the plates for bacteria and mold colonies. I recorded my results into a field log and on my lab pages.

Results
No ammonia or nitrites were found in any of the water samples I tested. The phosphate measurements were an average of 5 ppm, 50 times greater than the recommended 0.1 ppm. Nitrates were an average of 2.6 ppm, 30% greater than the recommended 2 ppm. The highest concentration of nitrates was found in the lagoon effluent at 3 ppm. The greatest measure of coliform colonies was too numerous to count with colonies all around the plates. E. coli colonies were a maximum of 250 colony forming units per 100 ml. Noncoliform colonies were at most 600 colony forming units per 100 ml. Only three plates contained traces of mold colonies. The bacteria levels were all within the recommended safe ranges with the exception of excessive coliforms found in the effluent water samples. Ocean water samples from the surfing area all contained acceptably low levels of bacteria.

Conclusions/Discussion
In my project, I discovered high levels of phosphates, nitrates, and bacteria in the San Elijo Lagoon effluent and at Cardiff State Beach water. These may contribute to harmful impacts on the ecosystem. Phosphates were the greatest offenders and were at levels of 50 times the recommended ppm for San Diego ocean water. Nitrates exceeded the recommended quantity by 30%. These nutrients may cause algal
blooms in the ocean and lead to eutrophication in the lagoon.

Summary Statement
In my project, I tested the impacts of certain chemicals and bacteria flowing out of the San Elijo Lagoon on the water quality of the ocean water.

Help Received
Throughout my project, I required minimal assistance. Throughout my testing, my science teacher, Mrs. Roxanne Hunker supervised my testing in order to test safely and accurately. I also received help from my mother who measured my distance from the shoreline when taking samples of the ocean water.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Andrea N. Zarazua

Project Number
J1215

Project Title
Light Pollution in the Americas and Its Possible Contributors

Abstract

Objectives/Goals
The objective of this study is to measure the amount of light pollution at different locations within North and Central America and identify the main contributors of the light pollution detected.

Methods/Materials
NIKON Camera, Tripod, ImageJ. Photographs were taken at locations and processed through ImageJ, an image processing program

Results
Once the images were analyzed it was observed that the amount of light pollution detected varied throughout the locations. Difference in population seemed to be the most likely reason for the variation of light pollution measures but a direct correlation was not found between the two.

Conclusions/Discussion
The population of a city or general area is a major contributor to the amount of light pollution the city or area produces, but it is not the only contributor. The layout of the city, monuments in the surrounding area, the lifestyle of the population, and how wealthy a city is affect the amount of light that location produces.

Summary Statement
I measured the amount of light pollution in different locations in North and Central America, proving not only population, but many other factors contribute to light pollution.

Help Received
I took all photographs and collected date with no help and only used the program ImageJ to process the images.