CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Aamna J. Abbasi

Project Number
J1201

Project Title
Biodegradation of a Sugarcane-based Disposable Plate and a Tree-based Disposable Plate in a Landfill

Abstract

Objectives/Goals

When placed in a landfill, I hypothesize that a sugarcane-based paper plate will biodegrade faster than the traditional tree-based paper plate. Eco-Products has made statements on their website about their products being 100% compostable. I understand that a product that is compostable may act differently in a landfill because the conditions are very different, but I do think that being 100% compostable would help the product biodegrade faster.

Methods/Materials

My basic design was to try and build a bunch of landfill cells, and make them as close to a real landfill as possible. I tried my best to have all the major layers of a landfill; drainage, geotextile membrane, leachate collections system, and of course trash. Trash in landfills can never be the same. I was afraid that if I had different trash in each landfill, the biodegradation could be because of the differences in the trash, and not because of the plate samples. So I weighed all the different kinds of trash that I put in my landfills.

I set the landfills up in December of 2008, and placed half a weighed Eco-Products sugarcane-based plate and half a Dixie tree-based plate side by side in a single landfill. Whole plates would not fit. At the end of January, February, March and April 2009, I removed the samples and weighed them again and made some calculations to figure out how much degraded.

Calculations
1. The percentage left of each plate at the end of each month is calculated:
Divide the wieght of the biodegraded plate by the weight of the original plate
Calculate percentage by multiplyng it by 100

Results

The Eco-Products sugarcane-based plates do biodegrade faster than the tree-based plates. The Eco-Products plates are marketed as 100% compostable in 45 days# they did not entirely biodegrade in my landfills, but they did biodegrade much faster than the Dixie plates.

Conclusions/Discussion

Any kind of disposable plate will take up space in a landfill; however, a sugarcane-based plate, uses the leftovers from the sugar making process and will biodegrade faster than a tree-based plate. A single Eco-Products plate is only about 1 penny and a half more than a Dixie plate# a small price to pay to save trees and use a product that will biodegrade faster.

Summary Statement

A comparison of the biodegradation of a tree-based disposable plate and a sugarcane-based disposable plate in a landfill environment.

Help Received

Mother helped with typing and setting up the landfill, and also registering my project for the County and State Fairs.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
J. Alejandra Alvarez

Project Number
J1202

Project Title
Fishing for Chlorine and Bacteria

Abstract

Objectives/Goals
The purpose of this project was to see how much bacteria and chlorine was in the water after and before Willit's water treatment plant. The procedure consists on two experiments that involve collecting 3 water samples before and 3 water samples after the water treatment plant in each test. I collected the water samples from 3 locations before the water treatment . The locations are just before the water treatment plant (water intake to plant), 1 mile before the water treatment plant, and 1 1/2 miles before the water treatment plant. Then I collected water from 3 more locations after the water treatment plant;just after treatment plant, 2 1/2 mile after the water treatment plant, and 3 miles after the water treatment plant. I repeated it for the second test, then, I did the same thing for the second experiment. NOTE: The distance from the water treatment plant to the different locations I took the water samples from (before and after) are not accurate, they are estimated.

Methods/Materials
I used a chlorine test kit to test each of the samples for the level of chlorine. I used Petri dishes with agar to grow bacteria of each sample. For the first experiment, I set my Petri dishes in an incubator at 37 degrees Celsius at 9:00 am on Saturday, Feb. 28th. I adjusted the temperature to 50 degrees Celsius on Sunday, and reset it to 37 degrees Celsius on Monday at 10:30 am. The incubator stayed at that temperature until Wednesday at 9:30 pm, when I took the Petri dishes out. Then I measured the bacteria by the area it had covered on the Petri dishes. For the second experiment, I set my Petri dishes in an incubator at 39 degrees Celsius at 10:00 pm Friday, April 10th. The incubator stayed at the same temperature for the rest of the five days. I took the Petri dishes out on Wednesday at 10:00 pm. Then I measured the bacteria by the area it had covered on the Petri dishes.

Results
The results of my procedure half supported my hypothesis. There was more bacteria before the water treatment plant than the water that came after the water treatment plant. But there was no chlorine in any samples from experiment one and experiment two.

Conclusions/Discussion
I learned that inside pools can cause asthma. It's not just the chlorine that is bad for you, it is the mixture of chlorine and organics, like urine and sweat, that you breath in an inside place with no fresh air.

Summary Statement
I wanted to find out how much chlorine and bacteria the water had before and after the water treatment plant.

Help Received
Mother help mount board;teacher guided through steps;water treatment plant of willits with water samples and answered questions

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Elizabeth M. Dambra

Project Number
J1203

Project Title
Storm Drains: Safe Water Ways or Pollution High Ways?

Abstract

Objectives/Goals
The objective was to analyze the amount of pollution carried through the Storm Drains to our Ocean at both Rat Beach and Torrance Beach. Test sites were inside the Storm Drain, at the mouth of the Storm Drain and 15 Meters into the Ocean. The sites were tested before rain, 2 days after rain and 6 days after rain to see the affect of rain on the levels of pollution.

Methods/Materials
Materials needed to complete my project included: three urban water testing kits;test tubes,Coliform Bacteria tablets,Chlorine TesTabs, Copper TesTabs,Dissolved Oxygen TesTabs,Iron TesTabs,Nitrate TesTabs,pH TesTabs, and Phosphate TesTabs and a color detection chart. I also needed: a camera,safety materials and a map of our city storm drains. Samples were taken at 2 sites, three different times at three different locations on each site and tested for 8 elements. After each test, results were charted and pictures were taken.

Results
Storm drains have a great affect on the pollution in our oceans before and after rain fall. Before a rain fall, inside the storm drain was the most polluted, two days after rain the ocean was most polluted and six days after rain everything went back to it's original pollutant state before rain. One surprise result was the high amount of Iron found at Rat beach 6 days after the Rain. It is possible that an underground spring may be draining into the Storm Drain however further testing is needed. Overall, Rat Beach was the most contaminated site.

Conclusions/Discussion
Storm Drain Pollution is a significant factor in our shoreline and ocean contamination. The water at the mouth of the drain, and in the ocean were more polluted after the rain fall, suggesting that the water running from the storm drain into the ocean brings pollutants into the ocean. Six days after rainfall appears to be the safest time to reenter the ocean water, the ocean is back to its original balance of pollutants (safe to swim in however not save to swallow). The overall hypothesis was wrong, it was thought that every thing would be more polluted after rain; yet, only the ocean was, the storm drain was cleaner.

Summary Statement
How does the pollution in local Los Angeles Storm Drains affect the amount of pollution in the ocean before and after rain, at various points around each specific storm drain?

Help Received
My mom drove me to each location for water samples; Teacher helped organize data.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Madison M. Dutra

Project Number
J1204

Project Title
Save the Wetlands: Effects of Drought on Pond Water Quality

Abstract

Objectives/Goals
California has lost more wetland habitat than any other state in the Nation. Due to this wetland loss, artificial reservoirs and farm ponds have become important replacements for lost habitat. Evans Pond is a local farm pond established over 100 years ago from runoff. Last year, I tested the water quality in Evans Pond and found the dissolved oxygen was too low. To promote better water quality at Evans Pond, five aerators were installed by the city in early June. The goal of my project was to continue to monitor water quality in Evans Pond and record the effects of the aerators. Another goal was to continue to document the migratory ducks and other animals residing at the pond.

Methods/Materials
I performed 303 tests using 25 different water samples obtained over six months. I tested water samples for pH, alkalinity, ammonia, hardness, nitrate, nitrite, phosphate, chlorine, chloride, turbidity, dissolved oxygen, biochemical oxygen demand, total coliform, and E. coli. I recorded wildlife observations each time I visited the pond.

Results
This year, Evans Pond did not receive imported water over the summer which it usually does. As the months passed, the water level dropped and the pond shrank. By the beginning of September the pond temperature was high, the pH was 9.5, and the ammonia was at an unhealthful value. An algal bloom occurred. On September 5th, 2008 a devastating fish die-off took place. This was followed by yet another die-off on September 20th, 2008. On that day, the available dissolved oxygen was 0 ppm. Despite the five aerators, the results of my biochemical oxygen demand tests showed the bacteria consumed all of the available oxygen in the water sample. In December, the pond received water that was paid for and added by the city. This improved water quality. The migratory ducks returned, but I still see few fish and few turtles.

Conclusions/Discussion
I recommend that the city establish a permanent plan to allocate water on a regular basis. The water the pond received this year was appreciated, but unfortunately five months too late. Unless a plan is established to provide Evans Pond with water at set intervals, the pond will again be at risk and more die-offs will occur. I am concerned that if no plan is set in place to provide water, the city may simply decide not to spend the money, and all the animals that reside in Evans Pond will be in danger again.

Summary Statement
The goal of my project was to monitor the effects of recently installed aerators in a local pond, but I ended up recording the effects of a devastating drought on pond water quality.

Help Received
Thanks to my parents for driving me to Evans Pond. Thanks to my science teacher for providing me with scientific guidance. Thanks to Eileen Rodriguez, Parks and Recreations for supporting Evans Pond and obtaining water in December.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Matt A. Friedman

Project Number
J1205

Project Title
Bioremediation Impacts on Water Quality: Effects on Urban Runoff

Abstract

Objectives/Goals
Over the summer, while at a park near a beach, I noticed a sign that intrigued me. The park contained a small riparian habitat and the sign mentioned a process called "bioremediation". The purpose of my project was to determine if there were significant differences in water quality before and after a creek flowed through a dedicated bioremediation riparian habitat. I hypothesized that, due to the process of bioremediation, the levels of phosphate, ammonia, nitrite, nitrate, and metals would be lower at the downstream test location of Cottonwood Creek Park than at the outflow at the upstream testing location.

Methods/Materials
I tested in two locations: where the stream enters the park (upstream) and where the creek flows out of the riparian habitat (downstream). I tested for ammonia, pH, nitrates, nitrites, chloride, chlorine, phosphates, iron, copper, chromium, lead and turbidity. I performed 518 tests.

Results
On average, ammonia, phosphates, and iron levels were all significantly lower in the downstream test site than the upstream site. Ammonia, when present, was reduced, on average, by 0.23ppm. Phosphate was reduced on average by 6.1ppm. In the upstream testing location, iron was sometimes in excess of the iron level normally allowed in recreational waters. Bioremediation, however, lowered iron to 2.8ppm which is within the acceptable range.

Conclusions/Discussion
The improvements observed in the water quality are especially important since the creek flows almost immediately from the park into the oceans. The reductions in nutrients might help prevent algal blooms. The riparian habitat in Cottonwood Creek Park appeared to have a significant, positive impact on water quality. In addition to being aesthetically pleasing, the riparian habitat provided a valuable environmental benefit: helping to remove excessive nutrients as well as harmful metals. I recommend further study of the effectiveness of bioremediation by riparian habitats as well as more widespread use of these habitats.

Summary Statement
The purpose of my project was to determine if there were significant differences in water quality before and after a creek flowed through a dedicated bioremediation riparian habitat.

Help Received
Thanks to my parents who drove me to my test sites. Thanks to my science teacher who provided me with testing supplies and equipment. Thanks to Schmidt Design Group, a small architectural firm, for providing me with a map of the park I tested.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Cristina M. Gago

Project Number
J1206

Project Title
Does Environmental pH Affect the Growth of Nannochloropsis? Or Vice Versa?

Abstract

Objectives/Goals

Scientists predict that much of the carbon dioxide in Earth's atmosphere will be absorbed by the world's oceans. As this carbon dioxide interacts with seawater, it forms carbonic acid, driving down the pH of the seawater.

The two questions addressed in this project are:

1. How does an aquatic environment's pH affect the growth of the Nannochloropsis?
2. How does Nannochloropsis growth affect an aquatic environment's pH?

Methods/Materials

Nannochloropsis (a type of marine alga) was cultured in duplicate for two experiments. In one experiment the algae were grown under identical conditions (light, temperature, nutrients), but were exposed to different pH levels. Growth and pH were monitored. In the other experiment the algae were grown under identical conditions, except that specific volumes of dilute hydrochloric acid were added several times during the incubation period to help maintain the different pH levels. The growth was monitored using spectrophotometry, and pH was monitored using a pH meter and pH test strips. Nannochloropsis was cultured in filtered seawater enriched with f/2 nutrient solution, and exposed to a cool white fluorescent lamp.

Results

Fig. 1 shows that the drop in pH due to the addition of dilute hydrochloric acid was reversed after less than three days. After six days the culture's pH increased by at least 2 pH units. Fig. 2 shows that the pH of the other set of cultures decreased with the addition of dilute hydrochloric acid. These pH levels also increased over time. Fig. 3 shows that if the acid is only added once, the growth of the algae over 7 days was highest for the culture that was exposed to the most acid. Fig. 4 shows that if acid is added throughout the culture period, the growth of the algae exposed to the highest levels of acid was reduced.

Conclusions/Discussion

A continuous low pH level appears to decrease the growth of Nannochloropsis, while a brief exposure to a low pH level appears to increase the growth. The Nannochloropsis increased the environmental pH over time. Since Nannochloropsis is capable of raising the pH of seawater, growth of this algae in the world's oceans may allow for a correction of the acidification of these oceans due to anthropogenic carbon.

Summary Statement

Nannochloropsis can raise the pH of seawater that has been acidified, but this acidification can affect the growth of the algae.

Help Received

Suggestions for culturing Nannochloropsis were provided by aquarists at Cabrillo Marine Aquarium, San Pedro, CA. Use of a pH meter was provided by Glendale College. Use of a spectrophotometer and glassware were provided by Pasadena City College.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alexandria Gallizioli; Sean Wieser

Project Number
J1207

Project Title
Is Copper the Cause? Investigating Copper in the Santa Cruz Mountain Drinking Water

Abstract

Objectives/Goals
Part 1: To determine how much copper is in the wells and tap water in the Santa Cruz Mountain homes and research factors and treatment systems that affect it. Part 2: Analyze hair for copper levels as an indicator of its possible effect on health.
Hypotheses:
*If water stands in copper pipes for 6+ hours or is acidic, then the tap water will have higher levels of copper than the water source.
*If the water is flushed for 1 minute or treated with reverse osmosis, carbon filtration, or deionization, then there will be less copper than in the tap water.
*If the copper levels are high in ingested water, then there will be high levels of copper in the hair analysis.

Methods/Materials
We tested well/spring water and tap water from 50 houses in the Santa Cruz Mountains for copper, pH, alkalinity, total dissolve solids, and temperature and had owners complete a water system survey. 2 different faucets unused for 6 hours inside the house were tested and then flushed for 1 minute and retested. Samples from reverse osmosis, deionization, and/or carbon filtration systems were also tested. 3 hair samples were analyzed for copper.

Results
None of the wells or springs contained copper but we found 84% of untreated tap water in the Santa Cruz Mountain homes were above the Ca EPA health goal and 56% were above US EPA action level. 100% of the houses with acidic water also had the maximum amount of copper measurable in their tap water. If you flush the pipes for 1 minute, copper levels are significantly reduced. Reverse osmosis and carbon filtration (refrigerators) are very effective in removing copper. Sean's hair analysis showed high levels of copper and his tap water had high levels. Alexandria's hair sample had ideal levels and she has copper free tap water.

Conclusions/Discussion
Using a t-test we determined that our results were statistically significant. The government should reevaluate whether copper piping should be used. We recommend residents flush faucets 60 seconds before using, use filtered refrigerator water, reverse osmosis with deionization if needed, and add a neutralizing system if the water is acidic. For future research, we would like to test more houses, do more hair analyses, and for part 3, compare copper levels in tap water to the resident's health histories.

Summary Statement
We tested wells and tap water and found that 84% of the tap water had copper levels higher than the CA EPA goal due copper pipes, that excess ingested copper shows up in tissue samples, and that copper can be effectively removed from water.

Help Received
Our mothers drove us to most of the houses tested and to get materials. We used ideas from Sean's brother's science fair board to organize our board. My mother gave advice on getting this abstract to fit the form.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Katarina M. Guzman

Project Number
J1208

Project Title
Corn to the Rescue

Abstract

Objectives/Goals
To see if Polylactic acid (PLA) biodegradable cups, knives, spoons and forks can be composted in a home compost pile. If this is possible America could reduce both it's oil dependance and landfill waste.

Methods/Materials
I used equal sized Polylactic acid biodegradable "plastic" dinnerware and petroleum based "plastic" dinnerware to compare the biodegration rate over a 90 day interval. The compost used was ground ficus tree, which was added every 10 days to a 90 gallon rotating composter. The daily outside temperature was documented along with the temperature of the compost pile by inserting a large thermometer. A camera helped document the stages of biodegration and a scale was used to weigh the cups on day 1 and on day 90.

Results
I was very pleased with my results. Although my Polylactic acid PLA cups did not fully biodegrade, they did show significant signs of biodegration and lost 12.8% of their weight on average, while the petroleum based plastic cups showed no signs of biodegration.

Conclusions/Discussion
I now know that PLA cups will biodegrade in a home compost pile within a reasonable time. In comparison, petroleum based cups take 700 years to start biodegration. I believe PLA products are the future, because they are just as durable as plastic, reduces our dependency on oil and can return to the earth naturally.

Summary Statement
Biodegradable PLA cups can save our landfills one cup at a time.

Help Received
Mom: typing Dad: chopping ficus tree Science lab: weighing of cups

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sandra Karon

Project Number
J1209

Project Title
The Disappearing Night: Does Night Urban Light Pollution Cause More Skyglow than Natural Moonlight?

Abstract

Objectives/Goals
The project objective was to determine if the nighttime urban light pollution causes more skyglow than natural moonlight.

Methods/Materials
Two different digital cameras were used to measure the ambient light at zenith by collecting multiple data series within a densely inhabited area in Huntington Beach, CA and an uninhabited area outside of Barstow, CA. Care was taken to shield the instruments from direct light sources and to assure comparable measurement conditions. The average pixel luminosity values of all digital photographs were extracted using the Photoshop software and the resulting data was statistically analyzed and compared for the two locations.

Results
The measurements provide evidence that the urban skyglow is on average 294% brighter than moon skyglow.

Conclusions/Discussion
This experiment, somewhat surprisingly, concluded that even though the moon is a relatively strong light source, capable of creating shadows, the multitude of individual city light sources adds up to a much brighter (but diffused) night-time skyglow. The results presented are conclusive and convincing based on collected data, but they do not accurately state the absolute amount of skyglow. In relative terms however, the cityglow is almost three times stronger than moonglow, and thus may have a stronger than commonly realized impact on the urban human environment. It also indicates an area of potentially huge energy consumption savings.

Summary Statement
This project is about measuring and comparing the amount of light in the artificial skyglow created by an urban area and the natural skyglow of the moon.

Help Received
My father drove with me to observation locations and helped organize data; uncle (physics professor) advised on the methodology and suggested subjects to include in the research report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Lilly Keating-Mayfield; Esther Razo

Project Number
J1210

Project Title
The Water Runs Through It

Abstract

Objectives/Goals
What is the oxygen,NO3(nitrate) and NO2(nitrite) levels in Gibson,Orr,McClure,Mill and Hensley creeks,and the health of the water relative to these levels.
We hypothesized that Hensley Creek would have the highest oxygen level,because of a recently built fish ladder there.(the fish would die with out sufficient oxygen)

Methods/Materials
Materials:GLOVES,STERILIZED BOTTLES,NO2 and NO3 TEST STRIPS,LOG BOOK,WRITING UTENSILS ,OXYGEN READER and CAMERA.
We collected the water samples(properly),used the OR (oxygen reader) within 15 minutes (to assure an accurate reading),used the test strips for nitrates and nitrites, then compared the color to the chart on the test strip container.

Results
All the creeks tested clear of nitrite and nitrate pollution.
All the creeks had healthy oxygen levels.

Conclusions/Discussion
We observed a lot of trash accumulating in the area of all five creeks,so we were surprised that there was no sign of Nitrates or Nitrites in any of the creeks.
We were also surprised that the creeks had healthy Oxygen levels considering we are in the middle of a drought.

Summary Statement
The health of our local creeks.

Help Received
Used lab equipment at Alpha Analytical Laboratories under the supervision of Zee and Bruce.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jacqueline Lopez

Project Number
J1211

Project Title
Do Enclosed Beaches Have Higher Levels of E. coli and Enterococci When Compared to Open Beaches?

Abstract

Objectives/Goals
The goal of my project was to determine if the levels of Fecal Indicator Bacteria such as E.Coli and Enterococci were higher at enclosed beaches when compared to the levels of E.Coli and Enterococci at open beaches. I tested the sand at two enclosed beaches (Cabrillo Beach and Marina del Rey Mother#s Beach) and two open beaches (Sunset beach an Huntington Beach) along the Southern California coast. My hypothesis is that because enclosed beaches lack wave activity, the amount of E.Coli and Enterococci in these beaches will be much less that the amounts of E.Coli and Enterococci found at open beaches.

Methods/Materials
I collected triplicate samples at each of the four beaches. Each of the triplicates was 1 cm surface sand that was at an approximate 3-4 feet away from the intertidal zone. In addition, 3.5 ml. of ocean water was collected from each of the beaches. The samples were then tested for Enterococci and E.Coli. The bacteria that was removed from the sand and into the ocean water was incubated for 20-24 hours. There were four different tests done, two for E.Coli and two for Enterococci. All of the beaches were tested in all of the different tests. The results compared open to enclosed beaches.

Results
The levels of E.Coli and Enterococci at enclosed beaches were higher than the levels the FIB in open beaches. All the sets of test (E.Coli and Enterococci) showed that the amount of E.Coli and Enterococci at enclosed beaches were far more in number when compared to the open beaches. In the majority of the tests, the open beaches showed no E.Coli and Enterococci. The only open beach that had any E.Coli or Enterococci was Beach 3 (Sunset Beach), in E.Coli sample B, with 1.94 per every gram of sand. The average amount of bacteria in the sand in E.Coli Sample B was of 194.665 E.Coli in 1 gram of sand, so the 1.94 is at a difference of 191.725.

Conclusions/Discussion
In the end, the results supported my hypothesis. Fecal Indicator Bacteria in the sand, such as E.Coli and Enterococci were higher at enclosed beaches, in comparison to the FIB in open beaches. Research that I obtained has showed that sand can act as an #incubator# where FIB can live longer and flourish, sand that was disturbed less by wave activity can hold higher levels of E.Coli and Enterococci.

Summary Statement
The purpose of my project was to determine if enclosed beaches have higher levels of E.Coli and Enterococci when compared to open beaches.

Help Received
My mom took me to all the beaches to collect the sand. Anand Patel, graduate student at USC#s Fuhrman Lab provided the supplies to collect and test the sand, along with guidance for one days worth of lab usage to test my samples. My science teacher Mr. Quintrell provided the scientific guidance.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sabrina M. Lui

Project Number
J1212

Project Title
Palo Alto Baylands Water Analysis

Abstract

Objectives/Goals
This project#s general purpose is to make those who are ignorant on our failing environment aware of it so that we can take action. I evaluated the safety of a local animal preserve and determined the causes of its perils.

Methods/Materials
In order to attain this information, I measured the water quality at different times (after rain, during holidays, etc.) and different locations (a richly populated duck pond, the effluent from a neighboring water treatment plant, etc.) I ordered a test kit online, which measured pH, ammonia, nitrate, and dissolved oxygen by color-reactant chemical tablets. I then began to measure on 10/4/08 in three different locations: a duck pond, a marsh, and the nearby Regional Water Quality Control Plant#s (RWQCP) effluent, which pumps into the Baylands. I collected 108 samples over five months, ending on 3/11/09. Additionally, I researched all the parameters thoroughly in order to interpret results.

Results
The most crucial findings of my project were that the pH of the Baylands becomes dangerously alkaline (about 9-10) during rain, because the treatment effluent accidentally turns severely diluted, and that nitrate and ammonia, two hazardous chemicals which provoke illnesses and fatality in fish, increased approximately 90% in the duck pond during the Christmas-New Year season and in the middles of autumn and spring. This, I found (after consulting the RWQCP lab chemists), was because of an increased amount of people feeding ducks at this time. Ammonia and nitrate entered the pond by way of left-over human food decaying and excreted feed.

Conclusions/Discussion
As the most significant points I found in my research, people feeding the ducks should not be condoned, and the treatment plant, with whom I will work further, should take more precautions when pumping effluent into the Baylands. We can take the first step to a friendlier environment by not putting human food into natural aquatic habitats. As a follow-up, I plan to work (hopefully with the Palo Alto Pollution Prevention) on signs and other community outreach tools to notify duck-pond visitors of the dangers of feeding ducks.

Summary Statement
This project's purpose is to evaluate the safety of the Palo Alto Baylands Preserve for animals and determine the causes of its perils.

Help Received
Mother drove me to collection sites; measured samples from Regional Water Quality Control Plant's effluent (which a lab chemist collected for me).

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Teresa H. Netro

Project Number
J1213

Project Title
Cleaner and Greener

Abstract

Objectives/Goals
As a child I spent many Saturday mornings washing the car with my dad. I had no idea that what I was doing was wrong, and impacting the environment in such a strong way. I watched as the suds reached the storm drain but could never really comprehend the toll it was taking on our sea life. But now I understand and would like to help shed some light on the effect of car pollutants on Santa Cruz County shores, and marina. The main point of this project was to reasearch the different ways to cut down on pollution and water usage while washing your car.

Methods/Materials
For this project I used four soaps with different washing methods. The car was split up into six different sections, and was washed with the corespondng method of wash and soap. From the wash I was looking for the most conserving wash, and the one to give the best quality. Under consideration for finding the most conservational wash is that even after washing your car the pollution from the towels you wash will after being treated at the waste water treatment plant will still be 15% toxic and released into the bay. To figure out the washing quality I first judged the wash's quality by eye, then took a 3"x3" square, and by taking a dry, a water, and a vinegar swab and take down the results.

Results
My results showed that a new kind of wash, waterless car wash, was tied for the best quality with the traditional wash. This was amazing because while being tied for the best wash it also used no water and the only pollution it gave was from washing the towels.

Conclusions/Discussion
The results of this project do not support my hypothesis. I thought that the environmentally friendly car soap with the modified wash would be the best for the environment while giving the best wash. The true winner of this test was the waterless car soap, which was the least pollutant, saved the most water, and gave the best quality wash. This was truly an unexpected outcome. I believe that in the future this new brand of car wash will be very popular, and eventually be the most demanded soap for washing cars.

Summary Statement
My project is about car soap's effect on marine life.

Help Received
Mother helped with project ideas

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Maxwell J. Pierro

Project Number

J1214

Project Title

Pesticide Contamination: Investigating Water Quality in Imperial County vs. San Diego County

Abstract

Objectives/Goals

I have read that frog populations were in trouble due to contamination in water from a herbicide called Atrazine. I also read that high phosphate levels intensified the problem when Atrazine was present. The goal of this project was to see if any rivers, creeks, or lagoons I tested had Atrazine or Simazine present and if the water samples I obtained met water quality standards. My hypothesis was that the New River and Alamo River's water samples I obtained from Imperial County might test positively for Atrazine or Simazine. I also believed the water samples might not meet water quality standards, and the two rivers in El Centro would be higher in phosphates and lower in oxygen than a creek and lagoo in North County San Diego.

Methods/Materials

For my experiment, I performed 154 tests on 14 different water samples. I was interested in evaluating potential farm runoff contamination indicators. I tested pH levels, ammonia, nitrate, nitrite, dissolved oxygen, biochemical oxygen demand, and performed tests for detecting the herbicides Atrazine and Simazine. I used materials made by LaMotte, Hach, and Pesticide Test Co.

Results

None of my water samples tested positive for Atrazine and Simazine, but my results revealed high levels phosphate in all samples tested. The Alamo River, and New River in El Centro, contained the highest levels of phosphates at 12-15 ppm. The Alamo River, New River, and Escondido Creek water samples were low in available dissolved oxygen with values ranging from 2 ppm all the way down to 0 ppm.

Conclusions/Discussion

It is clear that for some bodies of waters the methods of preserving water quality need to be improved. I would like to continue to test multiple local creeks in San Diego County. I would also like to test more Imperial County water sites in different months to see if herbicides appear in the water during other times of the year.

Summary Statement

The purpose of this project was to evaluate water samples in San Diego County and Imperial County, to look for evidence of farm runoff pollution and herbicide contamination.

Help Received

Thanks to my mother who drove me many miles to perform my testing. Thanks to my science teacher who provided scientific kit materials.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alec R. Rodriguez

Project Number
J1215

Project Title
Radon Emissions from Granite in Homes

Abstract

Objectives/Goals
Inside my home in Boston, we tested for the presence of Radon gas. I learned that this invisible, dangerous gas could eventually cause cancer to its inhabitants. This hazardous gas is produced as a byproduct of decaying uranium in the bedrock below the surface and may also be found in small amounts in many homes. Radon is linked to 12% of all lung cancer deaths, 20,000 deaths in the United States annually. I wondered if the countertops in our homes might actually be emitting enough radon to be harmful to our health. The purpose of this project was to measure the amount of radon gas that was emitted from a variety of granite samples. My hypothesis was that the radon emitted from the granite samples would measure below the EPA suggested maximum of 4 picocuries per liter of air (pCi/L).

Methods/Materials
More than 1000 hours of testing with over 60 different readings from 13 granite samples were performed. The 13 varieties of granite samples were tested first with a Ludlum model 3 Geiger counter with a model 44-7 probe to measure the levels of alpha and beta radiation along with the gamma rays. The samples were subsequently measured for radon emissions with a Safety Siren Pro Series 3 device.

Results
The mean, median, mode, and range for the results from the Geiger counter were: approximately 2.5, 2.3, 2.8 & 2.8 respectively (millirem per hour, ionizing radiation). The mean, median, mode, and range for the results with the radon gas detector were: approximately 4.1, 2.4, 2.4 & 14.9 respectively. The mean, median, mode, and range for the results with air flow allowing the radon to dissipate were: approximately 1.6, 2.2, 1.1 & 3.0.

Conclusions/Discussion
Of the 13 samples three results were beyond the EPA recommended allowable levels, but these results occurred during 48 hour tests in which the emissions were concentrated. With air flow around the granite sample during another 48 hour test, none exceeded the EPA recommended level. The granite samples were relatively small compared to the amount of granite used in homes. When a granite sample was tested over a period of time there was a variance in the readings of radon emissions. The spike of 30.4 pci/L, from one of the granite samples, indicates that different levels of radon are emitted over time. This shows that radon levels may be inconsistent and that the level of radon may have a considerable high or low depending on uranium content within the granite.

Summary Statement
The purpose of this project was to measure the amount of radon gas that was emitted from a variety of granite samples.

Help Received
Nick Chim at UCI lent the Geiger counter, Debbie Rodriguez provided the granites, support from Roxanne Hunker

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Avneesh K. Sharma

Project Number
J1216

Project Title
Do Wetlands Effectively Remove Nitrates from San Diego Creek Water Before Discharging into the Ocean?

Abstract

Objectives/Goals
Develop a scientific and practical model that can be used anywhere in the world to effectively reduce nitrates and nutrients from polluted river water before discharge into the ocean.

Methods/Materials
Materials:
47 milliliter sample bottles, thermometers, 20-micron filters, test sample storage bottles, deionized water, graduated pipettes, distilled water, gloves.
Method:
Collect seven (7) 47mL water samples from the wetlands ponds at the Inlet from the Creek to the Ponds, at the 5 treatment Ponds, and at the Outlet from Ponds back into the Creek.
Take ambient air and water temperatures on day of test.
Filter each water sample through a 20-micron filter.
Perform Ion Chromatography Testing to determine nitrate concentration levels.
Perform Spectrofluorometer Testing to determine dissolved organic material concentrations.
Perform Spectrophotometer Testing to determine dissolved organic material concentrations in the invisible part of the light spectrum.
Analyze data collected and see if it supports the hypothesis.

Results
Results from 5 independent tests show that the nitrate levels were reduced in each case. 4 out of 5 tests show nitrate reductions of 72% to 78%. One test showed nitrate reductions of 18%.
The dissolved organic matter concentrations were reduced or remained unchanged in 4 out of 5 tests.

Conclusions/Discussion
The Wetlands can be used as a good model to naturally reduce the high nutrient nitrate levels in river water before environmentally safe discharge into the ocean.
The bacteria growth in the 5 treatment ponds naturally reduced the nitrate levels of San Diego Creek water by 72% to 78%. And this was accomplished without increase in the concentration of dissolved organic matter (DOM). This is very significant. This gives society a scientific and practical model to naturally treat river water and prevent the extinction of sensitive marine in our oceans.

Summary Statement
This project is about determining the effectiveness of the Wetlands to remove or reduce nitrates from urban river water before discharging it into the ocean.

Help Received
Dr. Bill Cooper, UCI, provided guidance/permission to use UCI test lab/equipment. Testing supervised by post-doc scholars, Drs. Michael Gonzior and Joon Seeon, and post-grad student, Matt Zwartjes. Mom and dad drove me, whenever needed, to Wetland sites and UCI to collect/test samples.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Rohan Sharma

Project Number
J1217

Project Title
The Dilemma: Too Little or Too Much? Nitrogen and Algal Blooms

Abstract

Objectives/Goals
My hypothesis was that the contamination of the oceans with nitrates derived from fertilizers has led to massive algal blooms.Subsequent algal decomposition contributes to areas of decreased oxygen(<2ppm)in the oceans called Dead Zones,jeopardizing marine life.

Methods/Materials
Incremental concentrations of sodium nitrate solution in water were prepared by dissolving an increasing number of sodium nitrate tablets in
1000 mL water. Uniform length (7.5 cm) of Chara vulgaris algae specimen with 29 branchlets each was incubated, in 300 mL of this sodium nitrate solution at 2ppm, 4ppm, 6ppm, 8ppm, 10ppm, 12ppm and 14ppm in open lid containers, at 18 degrees Celsius and diurnal variation light conditions for 21 days. A control specimen was incubated in water without sodium nitrate(0 ppm). Using a low-power magnifying lens, new algal branchlets and dead branchlets were counted every week. Then a specimen of 5 grams of Chara vulgaris was incubated in closed-lid glass container containing water. The dissolved oxygen concentration was measured at 48-hour intervals for 35 days.

Results
There was an incremental growth of algal branchlets in the containers with 2 to 12 ppm concentration of sodium nitrate solution. At the highest concentration of sodium nitrate (14 ppm), there was a decline in the number of new branchlets and an increase in the number of dead branchlets. In the closed lid experiment, as the algae decomposed, the dissolved oxygen concentration in water decreased progressively with time.

Conclusions/Discussion
My conclusion is that the Nitrates make algae flourish like the vegetation on land. The death of these massive algal blooms causes oxygen deprivation of the ocean water contributing to areas of decreased oxygen in the oceans (Dead Zones). Fertilizers are a two edged sword. Nitrogen from our farmlands and lawns finds its way to the estuaries and oceans contributing to algal blooms and jeopardizing marine life.

Summary Statement
Nitrogen derived from fertilizers is finding its way to our oceans,contaminating them and leading to algal blooms that contribute to increasing Dead Zones around the world.

Help Received
Mother helped get the supplies and dispose of the chemicals.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Darian M. Spencer

Project Number
J1218

Project Title
Ember Traps: Can Vegetation Reduce Fire Risks to Homes?

Abstract

Objectives/Goals
My experiment was designed to test whether vegetation reduces the number of embers hitting or entering a house during wildfire. My experiment tested two hypotheses: Do trees and shrubs near a house affect the number of embers that land around and inside the house, and what arrangement of plants is best to keep houses safe?

Methods/Materials
I simulated blowing embers by pouring a measured amount of sawdust in front of a fan toward a cardboard house with holes for windows. I placed trees and shrubs made from sticks and Spanish moss between the fan and house in different numbers and arrangements. After each trial, I counted the simulated embers landing inside the house and within 1 cm of the front and back of the house. I also used a camcorder to record how the embers behaved in the wind. The materials used were a cardboard house, scale-model trees, a box fan, a 5-foot long foam board, bedding sawdust, and a 1/3 cup measure.

Results
More embers landed in or near the house if there was no vegetation. Trees seemed more effective than shrubs in reducing embers, and in general, the number of embers reaching the house declined as I added more vegetation. Some arrangements worked better than others. For example, evenly spaced trees simulating an orchard were very effective, as were random arrangements of trees or shrubs. Some embers were trapped in the vegetation, but many of them actually fell to the ground in dead air spaces between the trees and shrubs.

Conclusions/Discussion
I conclude that placing fire-resistant vegetation around your house, with a 15 to 30 foot fire-break, will reduce the number of embers entering your house. Good arrangements include random placements of trees and shrubs, random placement of trees only, or orderly arrangement as in an orchard. Based on my research of the literature, I think it is important that the trees and shrubs are types that do not catch fire easily, such as irrigated fruit trees or oak trees.

Summary Statement
Trees and shrubs can reduce the number of embers hitting or entering a house during wildfire.

Help Received
My father gave me ideas and contacts with fire experts and literature; my neighbor Brian lent me the fan.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Nathan T. Stein

Project Number
J1219

Project Title
Is the Sand at Our Beaches Contaminated?

Abstract

Objectives/Goals
I like to surf and spend time at the beach. I've noticed that after rain, ocean water may become polluted due to runoff. Lifeguards sometimes close beaches due to high bacteria counts in the water, but in my research I found few studies on beach sand quality. I wondered, if the sand on our beaches might be contaminated in areas with high mammal use, such as "dog" beaches or seal use areas?

Methods/Materials
I tested dry (upper beach) and wet (lower beach) sand samples from several beaches. All the sand samples were collected in sterile bottles. I added 30 ml of sterile water for every 100 g of test sand. Bottles were inverted multiple times to mix the sand and water, then placed on a shaker table for approximately 20 minutes. Next, I poured water from the sand samples into Coliscan Easygel using sterile, serological pipettes. I also plated dilutions. I incubated the test samples, I performed two separate trials.

Results
Unexpectedly, sand from two ordinary beaches and a "dog beach" revealed low levels of bacteria. La Jolla Cove area sand had very high levels of bacteria. The La Jolla site was just south of a large seal population. The sand samples were loaded with Coliforms and E. Coli. Another local beach, Moonlight, for reasons unknown, had sand that was like the La Jolla site. I repeated the test for "Dog Beach" and Moonlight Beach. Again, "Dog Beach" sand samples grew very few bacterial colonies. Moonlight Beach upper sand samples grew thousands of E. Coli colonies.

Conclusions/Discussion
Perhaps the difference in contamination was due in part to the fact that the water does not reach the upper parts of Moonlight Beach often enough to cleanse the sand while water covers the sand at Dog Beach twice daily during every high tide. This was an interesting project with surprising results, and I had fun performing the experiment.

Summary Statement
The goal of this project was to test for sand bacterial contamination at five local beaches; two of the beaches were associated with high mammal use by dogs or seals.

Help Received
Thanks to my mother who drove me to the beaches to collect samples. Thanks to my science teacher who helped supply the lab equipment.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Erendiz Tarakci

Project Number
J1220

Project Title
Is There Plastic in Your Water?

Abstract

Objectives/Goals
My project was to determine whether or not it is dangerous to leave plastic water bottles out in the sun since substances in the plastic are known to be found in breast cancer patients and they harm the organs. I believe that if you leave plastic water bottles known to harmful substances in the sun, then some of the harmful substances will leak into the water.

Methods/Materials
One glass water bottle, as a control, two BPA-free nalgene water bottles, three Arrowhead water bottles, and three Rubbermaid, code seven plastic, Tupperware containers were used in this experiment. All of the bottles and containers were left in the sun inside a car for ten days and all of their pH#s were tested before and after being placed in the car. Samples of water from all of the bottles and containers were weighed, placed in an oven to evaporate the water, and weighed a gin to see the weight difference and the visible residue. Algae was also placed in the water since BPA, a known carcinogen in plastic, kills algae.

Results
There was no major change in pH from any of the bottles or containers. However, there was residue the color of BPA in the tin pans the water was evaporated from. The Tupperware had the most of this residue, while it was almost indistinguishable in the tin pans from the other bottles.

Conclusions/Discussion
My conclusion is that there is a strong possibility that code 7 plastics with BPA will leak BPA into the water when they are heated.

Summary Statement
Does BPA leach into the water in a plastic container when the plastic container is heated?

Help Received
Mother helped use lab equipment; mother preformed tests while I was in school; I interviewed a Professor

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Seren S. Villwock

Project Number
J1221

Project Title
What's in the Water?

Abstract

Objectives/Goals
The water in Wolf Creek looks fresh and clear, but how clean is it really? This experiment tested the cleanliness of the creek and surrounding areas to find out if contaminants like arsenic were coming from the nearby mine tailings dump and polluting the water. My hypothesis is that the levels of arsenic will be above the drinking water standard for arsenic, which is 10 parts per billion (ppb).

Methods/Materials
To find the answer, I collected water samples from ponds and creeks around the tailings dump and then tested the samples using an ICP-MS (Inductively Coupled Plasma Mass Spectrometer) at UC Davis college campus.

Results
I found ou that the arsenic levels were lower directly in the tailings dump, 0.965 ppb. The creek samples had higher levels of arsenic, 5.101 ppb. These are all below the drinking water standard.

Conclusions/Discussion
From these data, I concluded that the arsenic in the creek must have come from a source other than the tailings dump, and that my hypothesis was incorrect. Other elements, such as vanadium, lithium, aluminum, iron, and rubidium, followed a similar pattern to arsenic, with higher levels in the creek than the samples taken directly from the tailings dump. This supported my conclusion that some arsenic and other elements came from another source upstream.

Summary Statement
The purpose of this project is to see if the mine tailings near Wolf Creek are contaminating the ground water near the tailngs dump with arsenic and/or other elements.

Help Received
Dad taught me how to collect samples effectively, Joel Comisso ran the ICP-MS with me to test the samples at UC Davis, and science teacher Mr. Kyle gave me a format for organizing the display.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Hannah J. Washburn

Project Number

J1222

Project Title

Does Adding Polymers to Soil Prolong the Toxicity of Pesticide? Year 2 Study

Abstract

Objectives/Goals

The purpose of my science project is to determine if adding PAM (polyacrylamide) to topsoil will prolong the toxicity of pesticide. A second year study was needed to remove the possibility of cricket age being a factor in cricket death. I solved this problem by using special order healthy 5/8" crickets (approximately 3.5 weeks old). Also, my year 1 study did not have a control group which I added in my year 2 study.

Methods/Materials

To test my hypothesis I filled 30 plastic storage containers with 2 cups of untreated topsoil. Group A is containers 1-10, group B is 11-20, and group C is 21-30. Groups A and B then recieved 1 full spray of pesticide to each container. Group A also recieved 3/4 tsp. of PAM to each container. Group C was free of PAM and pesticide. I labeled and punched 10 holes in the lids of each container for air circulation. Then I added cricket food and 1 cricket to each container. I checked the containers 2 times a day for 51 days. If a cricket died I charted it in my data book and on the container lid then replaced the dead cricket with a live one.

Results

My results for test group A showed that adding PAM did not significantly prolong the toxicity of pesticide. It took an average of 6.5 days for the 10 test containers to kill 92 crickets in a 51 day test period. Results for Group B are similar to Group A. Group B took an average of 6.9 days to kill 87 crickets in a 51 day test period. Group C appeared to provide an environment that allowed the crickets to live close to a normal life span. On average it took the 10 test containers 13.3 days to kill 30 crickets in a 51 day testing period.

Conclusions/Discussion

After completing my science project I found my hypothesis was incorrect. My hypothesis stated that I believed adding PAM to topsoil would prolong the toxicity of pesticide. After studying the data I discovered that test group A and test group B had results so similar I could not claim a correct hypothesis. Also , when comparing the results of my year 2 study with those of my year 1 study I discovered significant differences in results. This leads me to believe that still even more testing is needed to acurately determine if adding PAM to soil prolongs the toxicity of pesticide.

Summary Statement

This project is about determing if adding PAM to farmland for water conservation and to prevent soil erosion is also prolonging the toxicity of pesticide.

Help Received

Dr. James Ayars, Agricultural Engineer USDA-ARS helped with guidance and research; Dan S. Munk M.S. U.C. Davis Coop Extension helped with guidance and research; Carl Gong helped with graphs; and my mom helped to type some of my written work and photograph the experiment.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alex Zivkovic

Project Number
J1223

Project Title
The Effects of the Tide on Plate Counts and Chemical Balance in Ocean Water

Abstract

Objectives/Goals
The question that my project hoped to answer was if tide type or the height of the tide had any effect on bacterial and chemical levels in ocean water. I tested different tide cycles, spring tide or neap tide, as well as different tide heights, low or high.

Methods/Materials
To test my project, I required 58 petri dishes as well as 57 zippered bags. To ensure that all samples were taken from the same depth, I used a measuring stick. This experiment required the use of iron, phosphate, and nitrate/nitrite water testing strips. I used tape to seal the petri dishes, and stickers to label them. Samples were collected from three different locations on Crystal Cove State Beach. For each tide type, spring or neap, there were two trials. On the days that the most extreme spring and neap tides fell, I collected three samples from each location twice a day: once during high tide, and once during low tide. Roughly 1.5 mL of each sample was then spread evenly over a nutrient agar petri dish. I would then seal each petri dish and label it with a sticker. All of the petri dishes were grown for one week, and bacterial growth was monitored daily. To test each of the chemical levels, I used water testing strips. Chemical levels were counted in parts per million, while the bacterial level of each petri dish was determined by the number of colonies that were grown during that one week period.

Results
After obtaining the final bacterial counts, the results were averaged to determine which tide type had the highest bacterial levels. These results showed that high tide during spring tide had the highest levels, with low tide during spring tide following it with the second highest amount. After that was low tide during neap tide, and lastly was high tide during neap tide. I then averaged the different tide types to determine if high or low tide had higher bacterial levels. High tide had 94.959 bacteria on average, while low tide had 64.139 bacterial on average per petri dish.

Conclusions/Discussion
The results I obtained agreed with my hypothesis in certain aspects. Bacterial levels were ranked from highest to lowest in the same order as I predicted, however low tide during neap tide had higher bacterial levels than high tide during neap tide. However, phosphate and iron levels had no correlation, and only appeared in some of the locations, while nitrate and nitrite were not at all present in any of the trials.

Summary Statement
My project summarizes the effects of tide on ocean water through bacterial counts and chemical analysis.

Help Received
My parents paid for the supplies that I ordered and drove me to the beach whenever necessary for my project.