CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Kaitlyn A. Arst

Project Number
J1001

Project Title
Citrus Peel Extracts and the Reduction of Styrofoam Pollution

Abstract

Objectives/Goals
The purpose of this experiment was to find an eco-friendly solution to the Styrofoam pollution problem. This was done by applying citrus extracts from oranges, lemons, and grapefruits onto several six-inch Styrofoam plates to see if the Styrofoam would disintegrate.

Methods/Materials
Oil, juices and a homemade solution were extracted from grapefruit, oranges and lemons. These 3 different types of solutions were then spread onto Styrofoam plates. The Styrofoam plates were buried into containers filled with sand to see if it would deteriorate in landfills.

Results
The results showed the hand squeezed orange, lemon and grapefruit oil peels all worked to deteriorate the Styrofoam plate. The homemade solution and juices did not deteriorate the Styrofoam. The Styrofoam, with the orange oil peel extract, deteriorated the most. It had a 1-cm hole by day four. The lemon oil peel extract was the second best. On day four, the largest hole was 0.01 cm. The grapefruit oil peel extracts was the least effective. The largest hole measured 0.0001 cm by day four.

Conclusions/Discussion
My conclusion is that hand squeezed orange peel oil disintegrate the Styrofoam plate the best. My hypothesis that hand squeezed lemon peel oil would work the best has to be rejected. It was not as strong as the orange peel oil. All the citrus fruit oil peels I tested were able to disintegrate Styrofoam. Only the oil from the peels, not the juice from the inside of the fruit or homemade solution was able to dissolve the Styrofoam. Next time, I would like to test different variety of citrus fruits to see if they are able to help Styrofoam deteriorate.

Summary Statement
The purpose of this experiment was to find an eco-friendly solution to the Styrofoam pollution problem.

Help Received
My mom made sure I safely performed my experiment and took some of the photos.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ahsan A. Bari

Project Number
J1002

Project Title
Bioremediation, A Solution To Pollution: Bioremediation of Petroleum Oil Lubricant Spills by Adding Inert Nutrients

Abstract

Objectives/Goals
My objective is to find if the Bioremediation (Natural Attenuation) of Petroleum Oil Lubricant (POL) Contaminated Soils can be enhanced by adding Inert Nutrients like Agricultural Fertilizer. I believe that the remediation process can be enhanced, that can result in saving time and money.

Methods/Materials
In order to measure the rate of bioremediation scientifically, four cells (2#x4#x1#) were built. A plastic liner in three cells was placed to keep contamination from POL contaminated soil entering to the ground water. First cell- inert soil as control, second cell- POL contaminated soil treated through natural attenuation, third cell-POL contaminated soil treated by adding moisture and aeration by tilling and the fourth cell # POL contaminated soil treated by adding moisture, aeration by tilling and added agricultural fertilizer (Urea- $CO(NH_2)_2$). Water was sprinkled (to keep soil moist) and the dirt was tilled to add aeration (oxygen) weekly. The three cells were physically examined for color, smell, moisture once a week. The contamination levels of total petroleum hydrocarbon (TPH) were measured by using Hanby Soil Test Kit. The first, control cell, TPH measurements were taken only to ensure the dirt is clean and inert.

Results
Cell One - The control cell had no change. Cell Two- soil treated through Natural attenuation- TPH decreased from2550 ppm -1125 ppm in 15 weeks. Cell Three- treatment by adding moisture and aeration through tilling- TPH decreased from 2550 ppm-570 ppm in 15 weeks and Cell Four- treatment with moisture, aeration and added nutrients, agricultural fertilizer (Urea) # TPH decreased from 2550 ppm -275 ppm in 15 week.

Conclusions/Discussion
By adding agricultural fertilizer, the bioremediation levels were enhanced significantly. The treatment level was increased to 94% by adding agricultural fertilizer compared to 37 % decreased by natural attenuation. Water and tilling only achieved 81% treatment in the same 15 weeks. My conclusion is that 50% of cost and time can be saved by adding nutrients. I plan to add on to this project by comparing different nutrients to check if the treatment can be further enhanced to utilize this process at the commercial levels to treat major spills. Also I would like to study if any naturally occurring nutrients (nonhazardous and biodegradable) can be added in-situ, onshore or off shore that will enhance the bioremediation and not harm the ecosystem.

Summary Statement
Enhance the Bioremediation of POL Contaminated Soil by adding Inert Nutrients like Agricultural Fertilizer (Urea).

Help Received
My father and sister helped me during the construction of cells and data collection. Professional staff from Environmental Division, DPW at Fort Irwin, CA provided technical and equipment assistance.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Lee R. Begin

Project Number
J1003

Project Title
Which Method of Composting Works Best? Home Vermiculture System or Commercial Compost Activator?

Abstract

Objectives/Goals
The objective of my project was to determine if red wiggler worms (Eisenia foetida) would compost food and paper waste into humus faster than commercially available compost activators.

Methods/Materials
Three containers were prepared with a 5-inch bedding of food scraps, shredded cardboard, newspaper, soil, and sprayed with water. After letting the containers sit for a week, one bin received 1000 red worms, another was given the commercial compost maker, and the third bin received nothing. Each week, measurements were taken of internal temperature and height of bedding. The method used to determine the success or failure was the height of bedding with respect to the amount of humus produced.

Results
The bedding in the red worm bin decreased to 2 inches after four weeks compared to 2.5 inches and 3.25 inches after 5 weeks in the other bins. The temperature in the red worm bin stayed at 105 degrees, whereas the temperature in the other bins fluctuated between 100 and 105 degrees.

Conclusions/Discussion
My conclusion is that red wiggler worms are better at composting food and paper scraps better and faster than a commercial compost activator. The worm compost had the strongest negative correlation between height of bedding and time. The higher, more consistent temperature shows a larger amount of biological activity in the worm bin, than in the commercial compost maker.

Summary Statement
My project is about comparing two difference methods of composting household waste: a home vermiculture system (using red wiggler worms) or commercially available compost activators.

Help Received
I received help from my parents. They bought the plastic containers and worms. My mom offered suggestions on the design of the board. I received guidance from the owner of Gardener's Supply store; he helped chose the compost maker.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Adam R. Clark

Project Number
J1004

Project Title
The Effect of Magnetism on Mineral Deposition

Abstract

Objectives/Goals
In this project, The Effect of Magnetism on Mineral Deposition, it was hoped that a family-friendly, environmentally conscientious alternative form of water treatment would be found. It was hypothesized that magnetic water treatment would produce fewer water spots than other, more traditional forms of treating water. Additionally, it was hypothesized that environmentally-destructive chemicals are not necessary to rid surfaces of water spots.

Methods/Materials
In this study, 10.4 gallons of water was used. Magnets and a water filter were used to produce magnetically treated water and filtered water, respectively. A third portion of water totaling 2.6 gallons was softened water, and the remaining amount was used in the tap water segment. The water ran onto a small sheet of glass, divided into four sections by strips of caulking. The water was contained in milk jugs until it was time for testing, when the water was placed into 16.9 fl. oz. water bottles. The bottles were supported by a frame of 2x4s which were screwed together. To pour the water into the bottles, a funnel was used, and to collect data, a pen was used to write in a notebook the results of that day and/or the total of the counting period. This period consisted of four tests, and there were five periods in this test.

Results
After this study was complete, it was determined that magnetic water treatment is the best when it comes to producing the fewest water spots because it only produced 205, and traditional filtering was the worst since it produced 1810. Softened water was third with 730, and tap water was second, with a total of 304 spots.

Conclusions/Discussion
Magnetically treated water produces fewer water spots than conventional methods. However, it should be noted that magnetism only affects the mineral molecules, so any potential toxins might still remain. Softening and filtering do reduce foreign contaminants, but they are less aesthetically appealing than magnetic water treatment. Tap water is somewhat pleasing, but no alterations are made at all, so the risk of poisoning is higher. Also, softening may be harmful to people who are restricted to low sodium diets. It is also harmful to the environment in the long run. Traditional water softeners may also be harmful to sceptic systems, as they may disrupt the chemical balance needed to effectively treat and break down waste.

Summary Statement
My project is about the effect of using magnetism as an alternative method to treating water to reduce the amount of hard water deposits on glass.

Help Received
Father helped me build the apparatus; mother helped me center the project on the board

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Mary Travis H. Doepner

Project Number

J1005

Project Title

Findings from the Field: A Study of Pervious Materials in LID Project at Riv. Co. Flood Control/H2O Conservation Dist.

Abstract

Objectives/Goals

The purpose is to find the infiltration rates of 3 pervious substances (asphalt, concrete, pavers)at Riverside Co. Flood Control & Water Conservation District as part of their low impact development experimental design for reducing surface water runoff. I also want to determine if oil inhibits water flow through these pervious materials by studying infiltration rates of H(2)O with soybean oil (nontoxic proxy for motor oil) to find if using porous materials in areas subject to traffic is advisable.

Methods/Materials

Make infiltration ring using a 9in. diameter section of air conditioning duct with plumber's putty & mark measurements. Test H(2)O infiltration in 4 locations for each pervious substance. Repeat testing with H(2)O only on 2 additional days at one location per material for control. Complete additional infiltration testing of H(2)O/oil at the other three locations per material. Repeat on two additional days. Calculate results using Akers's formula(2010).

Results

When comparing infiltration rates of H(2)0 & H(2)0/oil, I found that on average while the porous concrete is the quickest, the porous pavers were the slowest. Porous asphalt had the most consistent times and rates from location to location. All of the H(2)0 infiltration rates were faster than the H(2)0/oil infiltration rates. Only the infiltration rates of porous asphalt decreased in meters per hour. The infiltration rates of both porous concrete & porous pavers increased in meters per hour (though times were inconsistent); the porous concrete having the greatest increase.

Conclusions/Discussion

Porous asphalt was the sole material whose infiltration rates became slower over the course of the experiment. The infiltration rates for porous concrete & porous pavers grew faster over time. Possibly the introduction of H(2)O/oil contributed to a capillary effect because the H(2)O created pathways down to the next strait by dislodging dirt and small rocks. These unexpected results are useful because porous asphalt would be the most likely material for paving parking lots and roads due to cost and stability. Finding that porous asphalt rates decreased over time indicates that oil is being absorbed by the asphalt which may eventually cause runoff. With respect to environmental water conservation and flood control, this research provides useful insights for those interested in applying LID techniques designed to reduce surface H(2)O runoff.

Summary Statement

The purpose of this investigation was to compare the water infiltration rates of the three porous substances (asphalt, concrete, pavers) used at the Riverside Co. Flood Control and Water Conservation District as part of their LID experiment

Help Received

Robert Cullen allowed this research to take place at the RCFC&WCD and provided background information. Julianna Gonzalez provided tour/interview. Mother and sister helped carry and pour water. Father helped with research.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Brandon B. Dutcher

Project Number
J1006

Project Title
Bananas to Biofuel: Meeting the Energy Needs of Africa

Abstract

Objectives/Goals
My main objective was to determine if banana briquettes are a viable fuel source for firewood in places that have a lot of banana peels, but little firewood (Africa is the prime example). A related objective is to determine whether the briquettes burn better than wood or not. Another secondary goal is to determine which ratio of banana peel to sawdust burns the best.

Methods/Materials
I used around 20 lbs of banana peels, and approximately 5 lbs of sawdust. I then ground up the banana peels and mixed them with sawdust in varying proportions (100% banana 0% sawdust to 70% banana 30% sawdust in 10% increments) then pressed them in a briquette press and dried them out in an oven for about 15 hours. After that, I burned the briquettes under a pot of water for 10 minute increments, all the while recording the temperature of said pot of water with a probe connected to my computer.

Results
After 10 minutes of burning, the pot of water reached a normalized temperature of: 27 degrees for 100%banana; 48 for 90%banana; 50 for 80%banana; 52 for 70%banana; 52 for poplar; 63 for red oak; and 44 for white pine.

Conclusions/Discussion
I have determined that the optimal briquette is that of 70% banana and 30% sawdust, and said briquette burns better than white pine, the same as poplar, but less efficiently than red oak. Also I determined that these briquettes can definitely be used as a fuel source in Africa.

Summary Statement
My project is testing the plausibility of taking banana peels and turning them into solid biofuel for use in places like Africa.

Help Received
Father helped design briquette press and burn briquettes; Mother helped put project board together.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Robert J. Fernandez

Project Number
J1007

Project Title
What Makes the Best Artificial Reef?

Abstract

Objectives/Goals

Throughout my research on coral reefs, I discovered that there are many factors that are threatening their existence. Some examples are, over fishing, coral bleaching, human impact and climate shifts. I also learned how artificial reefs are one way we can help increase coral population in our oceans.

My project compares three different materials; aluminum, concrete and rubber. The goal is to determine which one would make the best artificial reef.

My hypothesis is that concrete will be best due to it's porous texture.

Methods/Materials

First I set up a 20 gallon salt water tank. I then placed in its center, a live rock containing 40 specimens of aptasia (related to coral in both phylum and species). I then placed beside it a base rock that does not contain any aptasia, for use as a control. I then placed four specimens of each material equally spaced throughout the tank. I recorded daily water conditions, aptasia growth on all materials, including control rock.

Results

My experiment proved that concrete is the best material for use in artificial reefs compared to rubber and aluminum. More aptasia grew on concrete than the others.

Conclusions/Discussion

I feel that my experiment is of great environmental importance, during my research, I contacted Dr.Milton Love, proffesor at UCSB and a leading authority on the "rigs to reefs" program in which oil companies turn old oil rigs into artificial reefs. I feel this is a great way to turn what would be waste material into a natural resource.

Summary Statement

Comparing best materials for use in artificial reefs

Help Received

Mother helped with board. Milton Love research assistance, Angela Dang (engineer) research assistance

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Connor J. Golden

Project Number
J1008

Project Title
Carbon Sequestration in Farming: Can an 80 Acre Farm be Carbon Neutral?

Abstract

Objectives/Goals
The objective was to see if an 80 acre farm could be farmed carbon neutral.

Methods/Materials
Building on last year's Science Fair Project "Is There an Optimal Cover Crop Density for Carbon Sequestration in Vineyards?", an experiment was designed to verify the carbon content of what I believed would be the major carbon absorption element; the cover crops and grassland. Fifty samples of cover crop and grassland growth were measured, harvested, dehydrated and weighed. The average carbon content was calculated using the average sample weights in three representative areas of: 1) newly tilled and planted cover crop, 2) untilled/unplanted cover crop regrowth and 3) open perennial grassland. Sample grapevines and trees were also harvested, dehydrated and weighed. Because it is impractical and wouldn't be right to cut multiple samples of trees and vines, I devised an experiment to measure the average trunk dimensions and dig up a single representative sample of a diseased vine and small tree to dehydrate and weigh. A calculation was then performed to account for all carbon absorbing elements within the fenced 80 acres. The results were tabulated to estimate the total annual carbon sequestration in metric tonnes per acre. An estimate of annual carbon emissions was prepared using actual data of electricity, gas and fuel consumption and animal/people load on the farm. These variables were plugged into a web-based greenhouse gas auditing tool, CPLAN, available from cplan.org using the standards and equations agreed at the Intergovernmental Panel on Climate Change (IPCC) in 2006. For the larger trees and forested areas I used the US Department of Agriculture Carbon Calculation Tool (CCT).

Results
The results showed that 49.8 metric tons of carbon were produced on the farm last year with the single greatest emitter, the Bio-Diesel used to power pumps, vehicles and tractors (14.9 tonnes). During the same period, the farm sequestered over 139.8 tonnes with over half (69 tonnes) of the carbon absorption coming from cover crops and grasslands within the 80 acres.

Conclusions/Discussion
The hypothesis is verified: this 80 acre bio-diverse farm can be farmed carbon neutral and, in fact, sequesters almost 3 times as much carbon as it emits.

Summary Statement
An experiment was performed to determine whether or not an 80 acre farm could be farmed carbon neutral.

Help Received
My advisor Mr. Paul Zellman gave me lots of feedback. Jerry Yates helped me dig up and weigh and the grapevine and tree samples. My mother helped me take samples. My father helped me put the data into a spreadsheet.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Carlos Heredia; Jesus Maldonado

Project Number

J1009

Project Title

Efficacy of Different Materials on Oil Filtration, Water Absorption, and Cleansing of Water for Drain Guards

Abstract

Objectives/Goals

The objective was to determine whether drain guards can filter oil from storm water run-off and prevent it from going into the ocean. Our objective was also to determine which material is most effective as a filler for a drain guard in order to absorb used motor oil, cleanse storm water and allow it to flow freely.

Methods/Materials

The study was conducted by first making a mixture of 10 ml. of used motor oil and 150 ml. of water. Then a funnel was filled with 1 of the 7 materials in the experiment. The materials tested were: saw dust, mulch, carpet padding, cotton, lint, moss and sponge. Each time the oil/water mixture was poured through the funnel and flow time was recorded, as was water absorption and water clarity.

Results

Drain guards can filter used motor oil from run-off. The most efficient filler material was moss because it had the best water clarity rating, it didn't absorb any water and it allowed the 150 ml. of water to pass through at a good rate of 33 seconds.

Conclusions/Discussion

Home-made drain guards can effectively filter run-off before it enters our oceans. Drain guards filled with moss can be placed at storm drains to filter out harmful pollutants such as used motor oil to help protect marine life and the marine environment.

Summary Statement

Our project is about determining whether drain guards can effectively filter out used motor oil from run-off and figuring out which material is the most effective as a filler for a drain guard.

Help Received

Mr. Quien provided us with some of the materials we needed; Mrs. Lopez took pictures of us, helped us figure out how to create charts and let us borrow her scrapbooking materials; Mr. Heredia took us to the store to buy materials and gave us used motor oil;

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Nicholas K. Ida

Project Number
J1010

Project Title
Enhancing Light Transmission through Solar Bottle Bulb in Homes without Electricity

Abstract

Objectives/Goals
What is the optimal design for the most effective solar bottle bulb to be used in homes without electricity?

Methods/Materials
1. Construct lightproof box w/ 4 light sensors. 2. Establish control w/ indoor constant light. 3. Test light transmission of following variables: bottle size,shape,color, cap color, angle of bottle placement, existence or absence of reflective paint/foil reflector cones, solutions in the bottle (MgSO4, Salt Water, Mineral Oil, No solution). 4. Take 4 luminance readings for each variable. 5. Repeat the same trials using outdoor natural sunlight. 6. Compare current solar bottle vs improved model vs skylights. 8. Compare results to identify optimal design to improve light transmission.
Materials:Light meters, plastic bottles & caps, mineral oil, bleach, water, MgSo4, NaCl, reflective paint, foil, Xenon light source, duct tape, glue gun, 60 watt lightbulb,boards, nails, tape measure, plumbers putty, protective eyewear

Results
Testing 8 independent variables that may affect light transmission and conducting 212 indoor and 148 outdoors (total 360) trials showed that a 2 liter, clear, cylinder shaped bottle with white opaque cap, filled with tap water, no reflective paint band and no reflector cone transmitted 52% more light (1694 Lux) than current solar bottle bulb. A 60-watt light bulb produced 2862 Lux. When the solar water bottle was replaced with a skylight made of plastic pane from soda bottle over the same opening, the light transmission was 1077 Lux. A larger opening (same size as current roof panel) covered with double plastic pane yielded most light transmission at 4285 Lux.

Conclusions/Discussion
Results from 360 trials of 8 independent variables showed that increasing bottle size, using water & white cap increased light transmission. Use of reflectors & reflective paint blocked light transmission. None of the solar bottles produced light levels that were even close to the light of a 60-watt light bulb. Depending on the size, a skylight can produce as much or more light as the solar bottle bulb and can be better than 60-watt light bulb. The skylight can be constructed in 1/72 of time it takes to make a solar bottle. The method of creating a larger opening in the roof of the houses and covering it with plastic pane made of soda bottles may be a more cost-effective & efficient alternative that should be explored to illuminate homes without electricity.

Summary Statement
Improving the design of solar bottle bulb for use in homes without electricity.

Help Received
Dad helped construct lightbox & record results;mom helped with display

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Mitchell G. Klein

Project Number
J1011

Project Title
Biodegradable Plastics: Our Environmental Solution?

Abstract

Objectives/Goals
The US produces eighty-two million football fields of trash every year. Over 90% of this trash ends up in oceans and landfills, and 80% of this is plastic. Society needs a true, biodegradable plastic to replace petroleum-based plastic. The goal of this project was to create two homemade, biodegradable plastics and compare them to a homemade petroleum-based plastic control.

Methods/Materials
I created homemade plastics from gelatin, glycerin and water, milk and vinegar, and Styrofoam treated with acetone. They were molded into strips 10 cm x 2 cm x 0.3 cm and disks 0.3 cm thick x 6 cm in diameter and tested for breaking strength, shatter resistance and biodegradability. To test break resistance, the strips were clamped to a workbench and the other end stressed with weight until they broke. This was done four times for the gelatin-plastic, three times for the polystyrene, and twice for the milk-plastic. For the shatter test, two disks of each plastic were placed on concrete and a brick was dropped from increasing heights, starting at 5 cm, until the disks shattered. For biodegradability, four grams of each plastic was placed in a loaf pan filled with moist garden soil at 150 degrees. The weight of the plastic was measured hourly for three hours.

Results
In the breaking strength test, the gelatin-based plastic was 10x stronger than the polystyrene control. The polystyrene did slightly better than the gelatin and significantly better than the milk-plastic in the shatter test. The gelatin-based plastic degraded completely; the milk-plastic slowly; and the polystyrene not at all.

Conclusions/Discussion
The gelatin plastic appeared to perform as well, if not better than, the polystyrene. This may be due to its flexibility, which allowed it to bend before breaking. The milk plastic was a poor performer overall. The gelatin did seem to get harder as time went on, and further testing is needed to determine the ideal mixture of gelatin/glycerin and time to dry before testing. Also, though adding low-heat to the degradation was used to aid the microbial breakdown of the organic plastic, it may have added a component of thermal degradation that wasn't accounted for. Next time I will give myself more time and use both low heat and outside soil. The bottom line is that these results show that it is possible to create a degradable plastic that is strong enough to compete with petroleum-based plastic.

Summary Statement
The experiment investigated whether it was possible to create a biodegradable plastic that can effectively compete with a petroleum-based plastic such as polystyrene.

Help Received
My mom purchased the materials needed to make the plastics as well as the display board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Pablo E. Martinez

Project Number
J1012

Project Title
Is Tap Water Better than Graywater?

Abstract

Objectives/Goals
I became interested in this experiment when I noticed how much tap water I waste from the shower and sink on a daily basis. I wondered how to find harmless ways to conserve water that has already been used one time. I wanted to research Graywater, which is wastewater from bathtubs, showers and laundry machines. I then arrived at a hypothesis. If tap water and graywater are used to water the same kind outdoor plants for five weeks, then the plants watered with tap water will grow more quickly than the plants watered with graywater because tap water has less contaminates than graywater.

Methods/Materials
My project is to test graywater on outside plants of the same species and under the same daily weather conditions. I will use tap water on half the plants and graywater on the other half for over 5 weeks. I plan to use graywater from the shower that has a mix of tap water and soapy water from shampoo and bath soap. I will make sure that the graywater is consistent by using the same type of shampoo and bath soap and take the same water measurement samples each time. My experimental procedure of watering the labeled plants with 2 cups of gray and/or tap water each week, measuring plant growth, monitoring plant health, keeping track of the variables that included tracking weather temperature and type of day, making sure the plants were not damaged by animals, and keeping a weekly photo record.

Results
My results showed that my hypothesis was incorrect because even though graywater and tap water sustained life throughout the 5 weeks, the graywater plants maintained growth and grew. Graywater Plant 1 started at 13 inches and ended at 13 inches. Graywater Plant 2 started at 12.5 inches and ended at 12.75 inches. Tap Water Plant 1 started at 12.5 inches and ended at 12 inches. Tap Water Plant 2 started at 13.25 and ended at 12.75 inches.

Conclusions/Discussion
My results disagree with my original hypothesis. Graywater plants grew more quickly than the tap water plants and the soapy water contaminates did not create a problem related to growth or visible health. Future projects could focus on the safety of graywater irrigation systems for home gardens and crops and how they can sustain our water supply. Can jobs be created for plumbers, engineers, and gardeners? I think my experiment can help give graywater a chance to people that doubt its use and lead to possibilities for other studies.

Summary Statement
To determine if tap water usage is better than graywater to sustain outside plant growth.

Help Received
My Mother helped with cutting the velcro. My Dad helped me with buying the plants.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Zahra B. Masood

Project Number
J1013

Project Title
The Effectiveness of Bioremediation with Different and Varying Concentrations of Nutrients

Abstract

Objectives/Goals
The purpose of this project is to investigate the effect of different essential nutrients and their concentrations on the rate of bioremediation.

Methods/Materials
Obtain 4 different types of garden fertilizer (each with a different N-P-K concentration (18-18-18, 16-16-21, 30-10-10 and 15-30-15)), Zinc and non-iodized table salt. Use five different amounts of each fertilizer (1, 2, 4, 6 and 8 grams) in 200ml sea water with 20ml of oil. Leave each sample for 1 week after which the remaining oil should be measured (Experiment 1). Repeat the process using the fertilizer which resulted in greatest amount of bioremediation and five different concentrations of Zinc (0.05, 0.10, 0.15, 0.20 and 0.25 grams) (Experiment 2). As a last step, the fertilizer and Zinc sample which resulted in most bioremediation was used with five different amounts of non-iodized table salt (0.2, 0.4, 0.6, 0.8, 1.0 grams)(Experiment3).

Results
In experiment 1, 8 grams of fertilizer sample 4 (N-P-K=15-30-15) showed the most oil reduction (21.17%). In experiment 2, 8 grams of fertilizer sample 4, and 0.15 grams of Zinc showed the greatest oil reduction (24.83%). In experiment 3, 8 grams of fertilizer 4, 0.15 grams of Zinc, and 0.4 grams of Sodium Chloride showed the highest amount of oil reduction (25.67%).

Conclusions/Discussion
The rate of bioremediation varied when using different nutrients in varying concentrations. Bioremediation is a natural process whereby the bacterial communities within the sea water metabolize the oil through enzymes into water and carbon dioxide. This process transforms hazardous compounds into harmless products and it is less expensive than other oil spill cleanup technologies.

Summary Statement
My project is about investigating various nutrients with varying concentrations, and I observed the rate of bioremediation.

Help Received
My father supervised me while I did the project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Will McConnell; James Valencia

Project Number
J1014

Project Title
Can Gray Water Be Recycled to Water Plants?

Abstract

Objectives/Goals
Our experiment determined whether common household gray water could be recycled to water plants without negatively affecting their growth. This could have the potential to reduce the amount of fresh water used around the world and lessen the strain on sewage treatment facilities.

Methods/Materials
In our experiment, we divided fifteen of the same type of plants into five different groups each watered with a different concentration of grey water. The groups were either watered with 100% grey water, 50% grey water and 50% tap water, 25% grey water and 75% tap water, 75% grey water and 25% tap water, or pure tap water (which was the control). We hypothesized that the health of the plants being watered with the 75% gray water and 25% tap water will not be significantly reduced. Every other day, we watered each plant with a designated amount of its allocated compound/liquid. We left them indoors in an area where they each received an equal amount of sunlight. We observed the plants every day, and every four days took pictures and measurements of the average height of the stalks, and the tallest stalk. We also compared pH levels, turbidity levels, and dissolved oxygen levels in the gray water

Results
The results have shown that the plants watered with the 50% - 50% liquid grew the most in average height at 12.7 cm. The plants watered with 75% grey water and 25% tap water grew the least at 8.5 cm in average height. All other plants grew more than the control plants which grew 9.8 cm in average growth. The results also showed that all of the plants watered with any amount of grey water had a higher average tallest stalk than the plants watered with tap water.

Conclusions/Discussion
We have concluded that grey water can be used to water plants without any adverse effect on its growth.

Summary Statement
The purpose of our project was to determine if grey water can be used to water plants without any negative affect to the growth of the plants.

Help Received
Mr. Lyle Hatridge provided us with equipment to determine ph levels, dissolved oxygen levels, and turbidity level of the waters.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jenna R. Murphy

Project Number
J1016

Project Title
Determining the Cost Efficiency and Water Conservation of Various Irrigation Methods

Abstract

Objectives/Goals
My objective was to determine which irrigation method would conserve the most water and is the most cost efficient.

Methods/Materials
I used four different kinds of irrigation methods to grow oats for my experiment: sub-surface tray, sub-surface drip, sprinkler (traditional), and surface drip. A separate container was used for each method. I germinated oat seeds and planted ten in each of the four containers. I used a moisture sensor to know when to water. Using the particular irrigation method for each container, I added one liter of water only if the moisture sensor registered a 4 or below. At the end of ten weeks I added up the amount of water used and compared each system. From my research I know what each of the irrigation methods costs per acre for materials, labor, and water.

Results
I found that the sub-surface tray conserved the most water, and the sprinkler system used the most amount of water. The sub-surface tray conserved ten more liters than the sprinkler system. The traditional drip and sub-surface drip averaged 12 liters. The sprinkler system was the most cost efficient and the sub-surface tray system costs the most. The sub-surface tray cost $82,298.00 per acre just to start up. The traditional irrigation system only cost $466.00 per acre. The sub-surface drip cost $1,000.00 and the surface drip cost $800.00 to start up.

Conclusions/Discussion
I observed the roots on the sub-surface tray plants were as much as four times as long as the other three trays. I believe this is because the roots had to grow down to the water making the plants healthier. Through this experiment I furthered my knowledge of irrigation systems. I learned that even though there are better systems for conserving water, it wouldn#t be feasible for growing crops. I learned that the sub-surface drip irrigation, though not the least expensive system, conserved more water than the traditional sprinkler and the surface drip systems and gave a higher yield than the traditional sprinkler and the surface drip systems.

Summary Statement
We need to get as much benefit from each liter of water we remove from the earth as we can, while finding the most cost efficient system for those countries that have limited financial resources.

Help Received
My parents helped me measure the plants and my mother helped me glue my reports to my board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ankita Nair

Project Number
J1017

Project Title
H(2)O: Making Every Drop Count

Abstract

Objectives/Goals
The objective of this experiment was to find an effective covering method that would significantly reduce water evaporation in aqueducts. It was hoped by the experimenter, that the data could be used to help decrease water loss in aqueducts that are used commercially.

Methods/Materials
Three different types of aqueducts were built as one meter long, concrete models and then put into testing. the three aqueduct designs used in this experiment were the semicircular, narrow and deep trapezoidal, and wide and shallow trapezoidal aqueducts. The models were built to have different capacities of 6,12.5,and 20 liters each. Three different covering methods were then tested on the aqueducts. The covers tested were a plastic sheet, plastic balls, and a Canadian powder known as Water Savr. A control group (aqueducts without covers) was also used to help compare the water loss of the three covers. Each cover underwent a series of 24 hour trials. The starting and ending water amounts were recorded along with the temperature and then used to generate evaporation rates.

Results
It was discovered that the plastic balls conserved the most amount of water. The plastic balls lost 5.00%-14.50% of the water but saved at least 85% of it. The powder Water Savr saved more than 75% water, but had an 24 hour evaporation rate of 9.00%-25.00%. 8.25%-20.00% of the water was evaporated everyday with the plastic sheet, but more than 80% of the water was saved. The control group had the highest amount of water loss losing 23.33%-51.50% of the water. The control group had an average water loss rate of over 30% in all the aqueducts.

Conclusions/Discussion
Overall, the plastic balls turned out to be the most effective cover to use on aqueducts. The plastic balls helped save over 85% of of the water and loss less than 15%. Water Savr ended up being the least effective cover loosing 38% more water than the plastic balls. The plastic sheet helped save over 80% of the water, but wasn't as effective as the plastic balls. The control trials proved that a significant amount of evaporation does occur and that more than 1/2 or 50% of the water can evaporate at one time.

Summary Statement
This experiment was trying to find a more effective way to reduce water evaporation in aqueducts.

Help Received
Dad helped buy the supplies, edit my writing, and build the aqueduct models; Mom helped edit and plan out my experimentation; my teachers, Mrs. Schumacher and Mrs Gillum guided me and gave me advice; officials from the Bureau of Reclamation and the San Diego Water Authority also advised me

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Rajiv K. Nelakanti

Project Number

J1018

Project Title

The Effect of Acidity on Phytoremediation of Copper Using Brassica juncea (Indian Mustard) Plants

Abstract

Objectives/Goals

It is important to remove metal contaminants such as copper from soil. Environment scientists are promoting phytoremediation of soil due to its low cost and environmental friendliness. The scientific purpose of this project is to understand if acidity affects phytoremediation of copper in soil by Brassica juncea plants.

I hypothesize that Brassica juncea seeds germinate in copper sulfate concentrations up to 10 ppm; anything higher would be too toxic for germination. I also hypothesize that pH 6.0 plants take up the most percentage of copper from soil.

Methods/Materials

In Part 1 of my experiment, I tested different concentrations of copper sulfate that the mustards could tolerate during germination. I used 0, 5, 10, and 50 ppm of copper sulfate solutions, including the acidity variable at pH 6.0, pH 6.5, and pH 7.0. In Part 2 of my experiment, I watered Brassica juncea plants with 10 ppm concentration of copper sulfate, while adding HCl acidity (pH 6.0 to pH 7.0) to the mixtures. For my control group I watered distilled water with HCl acidity (pH 6.0 to pH 7.0). I watered the same amount of solutions and kept the plants in the same general area. The plants were grown for 13 days. At the end of the experiment, both soil and plants were tested for copper accumulation using the Copper CHEMets Kit. The relative growth, and the amount of copper accumulated in the plant tissue was studied to understand the effect of acidity on the phytoremediation of copper.

Results

From Part I results, all the seeds germinated normally except for the 50 ppm copper sulfate concentration. pH levels did not affect the germination results much. But, the higher the copper concentration, the worse the seeds germinated. From Part II results, the higher the pH, the more the mustard plants accumulated copper. The pH 6.0 plants' mass accumulated 0.5 ppm copper whereas the pH 7.0 plants' mass took up 0.15 ppm.

Conclusions/Discussion

The results of my experiment show that Brassica juncea plants are better at phytoremediation of copper in acidic soils, which is a new finding. This may help speed up cleaning efforts for copper contaminated areas, like old copper mining facilities.

Summary Statement

The Brassica juncea plants accumulated more copper in more acidic soils and the seeds germinated best at 10 ppm of copper sulfate and lower.

Help Received

My father and my science teacher, Ms. Heinke, helped me in preparing the copper solutions. Also, my father supervised the project. My mother helped with the making of the project board. Finally, my brother proofread my project write-up.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Cameron D. Newman

Project Number
J1019

Project Title
Biodegradability of Single-Use Plastic

Abstract

Objectives/Goals
The purpose of this project was to test the biodegradability of various single use plastic bags and utensils, as well as paper bags, in various environmental conditions over the course of 8 months. I tested these products in open air, a compost bin, salt water, and fresh water. I also tested several #compostable# plastic bag products and #compostable# plastic utensil products to see if they composted or biodegraded in all the above environments.
The pollution and damage to the environment and wildlife caused by disposable plastic is a major concern. The destruction of wildlife and the horrendous conditions in the Pacific Gyre are only the obvious effects of plastic. We will not know how many entire species are being extinguished and the ultimate effect on the food chain on up to humans for years to come. We must find alternatives to single-use plastic.

Methods/Materials
I tested these products in open air, a compost bin, salt water, and fresh water. I also tested several #compostable# plastic bag products and #compostable# plastic utensil products to see if they composted or biodegraded in all the above environments.

Results
My 8-month project demonstrated that only #Glad compostable# bags performed as advertised. The Glad bag composted in 6 weeks in perfect conditions in my compost bin. However, it did not biodegrade in any other conditions. The #BioBag# compostable did not compost or biodegrade in any conditions. Taterware and Ingeo #compostable# utensils likewise did not compost in even the best of compost conditions. The Safeway and Walmart single-use bags stayed in #like new# condition in almost all environments. However, the Walmart bag did begin to weaken in the salt water at 7 months. The regular plastic utensils were in perfect condition after 8 months in all environments.

Conclusions/Discussion
My conclusion is that none of these products are safe for the environment. Although the Glad bag did decompose, it did so only in perfect composting conditions in a compost bin. It will not compost in any other conditions, such as a landfill, open air, salt water, or fresh water.
We must stop using single use plastic, and recycle where possible until the technology is invented to convert plastic into fuel or some other harmless product.

Summary Statement
The purpose of this project was to test the biodegradability of various single use plastic bags and utensils, as well as paper bags, in various environmental conditions over the course of 8 months.

Help Received
Mother held products for photographing, and helped finish the crochet bag made from recycled plastic on display.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Aneyah D. Parks

Project Number
J1020

Project Title
Solar-Powered Water Desalinator

Abstract

Objectives/Goals
My project was about desalination to remove the salt from water to make it drinkable. The current methods of desalination are very expensive, and are not safe to the environment and to humans. In my project, not only is the desalination using ready, available materials, but cheap ones too. My goal is to find the material that desalinates water best in this solar-powered water desalinator.

Methods/Materials
I mostly use a one-gallon and 16 oz. water bottle in the desalinator. I put the saltwater in the one-gallon bottle, and when it evaporates, it collects at the low point and drips down into a small container where it then flows out of the one-gallon bottle into the bottom half of the 16 oz. bottle through a straw. I then measure the salinity (in ppt) of the collected condensate.

Results
My data shows that aluminum foil was the material that reduced the salinity of the saltwater best, with an average salinity reduction of 32.6 ppt. Plastic cling wrap was the second best, with an average of 31 ppt. Level four plastic was the third best, with an average of 30.8 ppt. Biodegradable was paper was the worst with an average salinity reduction of 0 ppt.

Conclusions/Discussion
The data tables and graphs displayed on my board support my hypothesis that the aluminum foil desalinator would have the highest salinity reduction average. As shown in the graphs and tables on my board, aluminum foil had an average salinity reduction of 32.6 ppt, plastic cling wrap of 31 ppt, level four plastic of 30 ppt, and biodegradable wax paper of 0 ppt.

Summary Statement
My project is about water desalination.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Titus M. Patton

Project Number
J1021

Project Title
Poop Power

Abstract

Objectives/Goals
Determine if a homemade digester can produce a gas from common pet waste, and if that gas would burn as methane.

Methods/Materials
Three homemade digesters were made from a one gallon bucket and two five gallon buckets; then connected with tubing and sealed with silicone.
The gas production was measured by the displacement of the buckets, and a bunsen burner was used to try to burn the gas.

Results
The digester filled with goat waste produced the most gas and longest burns. While the digester filled with cat waste produced the lowest amount of gas and did not burn.

Conclusions/Discussion
I concluded that it is possible to produce methane, but the temperature and the type of waste used effects the production of gas. I found goat waste contained a lot more biomass, making it ideal to produce methane.

Summary Statement
If goat, dog, and cat waste are put in separate homemade digesters, then they will produce a measurable and burnable gas.

Help Received
Father and grandfather helped with the supervision and used power tools to make the homemade digesters. Nathan Whittington, Sanger High School Science teacher, advised and provided Bunsen burner.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Matthew R. Quinn

Project Number
J1022

Project Title
Chosen for Erosion

Abstract

Objectives/Goals
To determine how the addition of different materials help control the erosion of sand caused by water.

Methods/Materials
Materials:
300 cm segment of metal rain gutter.
2 ladders and bricks to create a slope.
40kg playground sand.
Water
2 graduated cylinders.
Funnel.
Gravel and small rocks.
Stopwatch.

1. Assemble 300cm long, 7 cm wide rain gutter with higher end 70 cm above lower end.
2. Place a funnel at lower end to catch drainage into a graduated cylinder
3. Spread 1000ml sand evenly across the bottom of the gutter
4. Pour 600 ml water over 2 minutes into top of gutter and collect water/sand for one hour
5. Ten trials were done with each of four variables of erosion: dry sand/wet sand/gravel over dry sand/rocks over dry sand.

Results
Sand was eroded in all trials: gravel best prevented erosion, letting an average of 15ml of sand erode. Rocks were next most effective, allowing on average 54ml of sand erosion. With dry sand alone an average of 253ml of sand eroded, and with wet sand 443ml of sand eroded.

Conclusions/Discussion
My hypothesis was incorrect; the largest rocks did not keep the greatest amount of sand from being eroded. Instead, gravel held back the most sand, but both gravel and rocks reduced erosion by quite a bit. The wet sand eroded a lot more than the dry sand. My conclusion is that physical barriers (gravel and rocks) helped reduce the amount of erosion, and wet sand had a lot more erosion, suggesting that drainage is also a key factor in erosion control. Next time I would add man-made objects to the gutter, and run repeated tests over the same set-up, and investigate different flows of water.

Summary Statement
How the addition of different objects effects the erosion of sand by water.

Help Received
Father purchased materials and helped construct my design

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Tatiana N. Scalisi

Project Number
J1023

Project Title
pH Level of Soil: Down and Dirty with Worms

Abstract

Objectives/Goals
The objective of this experiment was to find out, how does changing the diet of kitchen compost given to Red wiggler earthworms, affect the pH level of a higher acidity or alkaline/base level, or a lower acidity or alkaline/base level of the soil they enrich? The prediction was that the diets of vegetables and fruit will bring the pH level down to a more alkaline/ base level between 7&14, but the diets of eggshells, meats, and breads will bring the pH level to a higher rate of acidity, the numbers between 7&0. This is because vegetables and fruits have a lower rate of acidity while meats, eggshells, and breads have a much higher acidity rate.

Methods/Materials
The method used for this experiment was changing the food types. There were five different types of left over kitchen scraps. These foods included breads, eggshells, fruit/fruit peels, vegetables, and meats. Each different food was placed into a separate pot with the earthworms in. When all the foods were first placed in the pots the pH level was first measured. Every 2-4 days the worms were checked on and fed more food or water if needed. This continued after the time period was over which were 3 & a half- 4 weeks, after the time period was over the pH level was measured again.

Results
: The pot that had meat, egg shells, and bread in had a much lower acidity rate than predicted, the averages of bread being 6.96 as the last measurement, as well as the last measurement of the meat pH average being 8.0. Although, the pots with the vegetables and fruit in had a rate of pH that was higher in alkaline level, and lower in acidity level. The pot with vegetables last average being 8.84, and the fruit penetrated soil last average being 8.2.

Conclusions/Discussion
: It has come to a conclusion that the organic foods, (fruit & vegetables), are ones the worms eat more, and they penetrate a lower level of acidity in the pH. However, the meats also had a much lower level of acidity pH, but the worms didn#t eat a lot of it. The egg shells and breads had a lower level of acidity than expected, but the worms seem to be quite active with these foods. The final results were much more different than expected.

Summary Statement
How does changing the diet of kitchen compost given to earthworms change the pH level of the soil they enrich?

Help Received
Mother took photos

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Attie Sit; Echo Sit

Project Number
J1024

Project Title
Catching the Greenhouse Culprit at Home: Building a Safe and Effective Filter to Capture Carbon Dioxide at Home

Abstract

Objectives/Goals
The purpose of this project is to build an environmental friendly carbon dioxide filter that is safe and economical for home use, as well as to determine its efficacy with different carbon dioxide absorbent materials.

Methods/Materials
By adjusting carbon dioxide level in an airtight container to 1,000 ppm, the rate of carbon dioxide absorption of equal molar of calcium oxide (CaO), magnesium oxide (MgO), and zinc oxide (ZnO) were determined and compared via a carbon dioxide monitor and a timer. The next experiments were conducted with and without the filter machine running so as to determine the efficacy of the filter machine to improve the rate of carbon dioxide absorption (efficiency) of the absorbent materials.

Results
From experiment 1a & 1b, ZnO was eliminated as an absorbent material for our carbon dioxide filter (too slow) and the Molar Equivalency Ratio of 1.56 was found for MgO. From experiment 2a, 2b, & 2c, the average efficacy percentages (20 min interval) of the filter machine were 343% for 1 mole of CaO, 436% for 1.5 mole of MgO, and 727% for 2 mole of MgO. From Graph 2d & 2e, by using 1.65 mole of MgO, the carbon dioxide absorption curve approximate well with that of 1 mole of CaO.

Conclusions/Discussion
The main conclusions from this project are that MgO can be used as a carbon dioxide absorbent material and that the filter machine is efficacious in increasing the rate of carbon dioxide absorption of the absorbents. Despite the rate of carbon dioxide absorption of MgO is slower than that of CaO when comparing on an equal molar basis, it is more suitable for everyday use at home or school due to its safety and higher carbon dioxide absorption capacity. In fact, when increase the amount of MgO to (or beyond) its Molar Equivalency Ratio, its rate of carbon dioxide absorption can match (and exceed) that of CaO. Our filter is environmental friendly because the by-product, magnesium carbonate, can be reusable and recyclable by converting back to magnesium oxide, as well as there are many other uses, such as in fire proofing and extinguishing materials and medicines.

Summary Statement
This project is to build an environmental friendly carbon dioxide filter that is suitable for everyday use at home or school.

Help Received
Teacher taught us the skills in building devices; Father helped us with the safety and accuracy of all experiments; Mother helped purchase the necessary materials. We'd like to thank Mrs. Anderson and Mr. Oliver for their support.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Anthony A. Stenzel

Project Number
J1025

Project Title
The Biochemical Oxygen Demand Dilemma: What Can We Do to Get More DO (Dissolved Oxygen)?

Abstract

Objectives/Goals
Would the installation of a bio-remediation water treatment system increase the levels of dissolved oxygen enough to withstand the biochemical oxygen demand of the sudden algal blooms at the Madrona Marsh sump?

Methods/Materials
For 10 months prior to installation of the bio-remediation water treatment system, I took bi-weekly measurements of the sumps water chemistry. I have continued to follow the sampling protocol and plan to continue for another 10 months. This included measuring the Dissolved Oxygen, Temperature, Phosphates (PO4) and pH. For measuring Dissolved Oxygen, I used the Winkler Method in which a water sample is "fixed" by adding a series of reagents that form an acid compound that is then titrated with a neutralizing compound that results in a color change. The point of the color change coincides with the DO concentration in the sample.

Results
The dissolved oxygen levels did increase dramatically once the treatment system became active.

Conclusions/Discussion
Conclusion: Bio-remediation water treatment systems are an effective means of increasing dissolved oxygen levels at Madrona Marsh sump.

Discussion: The idea to do this project came to me through my work on the Environmental Science Merit Badge and the Soil and Water Conservation Boy Scout Merit Badge. Through the course of studies required by the merit badges, I learned that the environmental conditions are just as important to sustaining life as is the food these animals need. I also have learned that humans can have a big negative impact on the delicate balance of the many abiotic factors that exist in an ecosystem. Madrona Marsh is located within an urban setting and the water quality there is especially sensitive to nonpoint source pollution in the runoff from local lawns, gardens and gutters. The sudden surge of phosphates is a challenge to the delicate balance of life as it leads to algal blooms that in turn can crash the ecosystem's balance. Because the runoff is as unpredictable as the weather, the Marsh needs a way to increase the oxygen levels above normal in the system such that the ecosystem could endure the sudden increase of biochemical oxygen demand from an algal bloom.

Summary Statement
To test whether the use of a bio-remediation unit can raise the dissolved oxygen levels high enough to sustain an aquatic ecosystem through an algal bloom and the resulting spike in the biochemical oxygen demand.

Help Received
I used the laboratory equipment at the Madrona Marsh, but I did all sampling, testing and recording involved in the project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Mauricio Wulfovich

Project Number
J1026

Project Title
Powerless Desalination

Abstract

Objectives/Goals
Every year more than 3.5 million people die from unsafe drinking water, yet many of these people live right next to an ocean. The objective of my project is to try to create a portable parabolic desalination system. Based on my research, I think a parabola#s focal point can raise water to sufficient temperature to desalinate it at a rate of half a liter per hour.

Methods/Materials
Build a parabolic reflector with a sheet of highly reflective stainless steel and build a base with PVC. Erect a copper tube at the focal point with a system to collect all the steam that would be evaporated, and a tie a rope in such a way so the parabola can be tilted according to the position of the sun in the sky. Later, create ocean water by adding 35 grams of sodium chloride (salt) to a liter of water to use as input. Set the dripper rate and return every 15 minutes to measure the temperature and tilt the parabola to achieve maximum efficiency. Collect the residual and the desalinated water to test the salinity levels and total dissolved solids.

Results
After running the experiment five times and collecting more than 40 samples of water, it was seen that a parabolic reflector can heat up the focal point to almost twice the temperature of the outside weather in less than 15 minutes. The water produced has 80% less salt than before and 78% less dissolved solids. While this project did not follow the second part of hypothesis it achieved a great feat by providing true portable solar powered desalination.

Conclusions/Discussion
Referring back to my hypothesis, it is easy to see that while I had the right research and ideas, a small parabolic reflector can still not generate enough heat to evaporate half a liter of water per hour. Overall, however, we are finally one step closer to helping people in natural disasters near home all the way to people in third world countries be able to survive.

Summary Statement
The purpose of my project is to create a portable system using a parabola#s focal point to raise water to sufficient temperature to desalinate it.

Help Received
Father helped me with power tools; Mrs. Armour helped me organize my data and taught me how to use the lab equipment; Mrs. Rines taught me a lot about the science behind my project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Daniel Besson

Project Number
J1099

Project Title
Bio Survival: Creating a Self Sustaining Ecological System in a Sealed Container

Abstract

Objectives/Goals
The objective of my project is to see whether two living things can survive in a sealed container, and if so for how long. I hypothesized that they could survive for at least a week.

Methods/Materials
To test my hypothesis I created two bio domes. I put gravel, sand, ane soil inside of a 5 gallon bottle. In the first I put two blue grape hyacinth plants, and two packs of wheat grass seeds. In the second I put a strawberry plant and 1 1/2 packs of wheat grass seeds. Then I put in the crickets, the first had 5, and the second had 12. I had also added some other items to the second, like a thermometer and a measuring stick to see if they had any effect on the animals. After I placed both of them in a well lit area and took down observations.

Results
In my first bio dome all of the animals had died in the first six days, but the plants continued for at least a week after. The animals in the second bio dome stayed alive for the same time. I noticed that in the second dome they began to died in a four day period when the tempurature had significantly raised. So my belief that the tempurature would affect the animals was correct. As in the first, the plants continued to grow even after the animals.

Conclusions/Discussion
After testing my hypothesis I can say that under these circumstances two living things can survive in a sealed container, but only for a maximum of six days. I do think, however, that they could have lived longer if I had found the correct balance between both the quantity of animals, plants and water.

Summary Statement
Finding out if two living organisms can survive in a sealed container and for how long.

Help Received
My mother and father helped purchase the materials I needed for my project.