



## Project ID: 701

### JR - Earth and Environmental Sciences

Patrick Kozak

#### *Are The Homeless Encampments Along Rose Creek Polluting It's Water?*

This project examined whether the presence of homeless encampments along Rose Creek waterways may be a source of increased pollution. It is hypothesized that the homeless encampments along Rose Creek were contributing to its bacterial pollution, specifically Coliform bacteria and E. coli. To conduct this experiment, four different sites along Rose Creek were tested for ten days. Sites 3 and 4 were the first two test sites located right next to homeless encampments in urban districts. The sites 1 and 2, were located upstream of sites 3 and 4, in more remote areas where there are no homeless encampments nearby. Water samples were collected from each site and then plated on specific bacterial growth plates for Coliforms and E. coli. The bacterial plates were allowed to culture for twenty-four hours to observe possible bacterial growth. The results showed that the hypothesis was supported/ not supported in that there were more Coliforms in sites close to homeless encampments than sites in more remote areas where no homeless camps were found. However, there was a trend of more E. coli by the homeless encampments but we couldn't prove it statistically using the Student T test. This data leads to the belief that the homeless encampments are increasing Coliform counts in Rose Creek leading to further pollution in its watershed. Knowing this information is important for keeping our waterways pollution free. It also raises the issue of the need for proper housing and resources for the homeless in our community.



## Project ID: 702

### JR - Earth and Environmental Sciences

Alexander Allport

#### *Corn Husks Get More Done*

In my experiment, Corn Husks Get More Done, my hypothesis was that the tea bags filled with husks would absorb more oil than water. I learned that people had cleaned up oil spills using hair and I thought I could try a similar absorbent material, corn husks. During my research, I discovered that corn husks had similar properties to hair. I thought that the corn husks would absorb oil while repelling water, making them an effective choice to clean up oil spills in the ocean. First, I dried and shredded the corn husks, put a fixed amount into tea bags, then dipped them in olive oil for three minutes. I made sure that the tea bags were drained for one minute to prove what was retained was from the corn husks themselves. I did the same for water, as a control. The tea bags filled with corn husks clearly absorbed more oil than water, proving my hypothesis true. The corn husks absorbed xx of oil on average and only xx of water. In conclusion, the results proved successful with the corn husks absorbing 204% of their own body weight in oil. I suggest that government agencies such as NOAA could attempt to clean up oil spills using corn husks. This economically available resource in most countries could help third-world countries fight oil spills.



## Project ID: 703

### JR - Earth and Environmental Sciences

McKayla Matkov

#### *The Effect of Particle Size on the Rate of Erosion through Wave Action*

The purpose of this experiment was to find a solution to coastal erosion. Many factors contribute to erosion, some of which can be a huge threat to human civilization, animal habitats, and ecosystems that surround beaches. This project is a result of how particle size affects the rate of erosion. Each trial is conducted with 10 waves 5 seconds apart. I used a glass wave tank when conducting these experiments and had 10 trials per substrate, with three substrates.

After conducting this experiment the following results were gathered. Substrate 1 was 0.82 millimeters and the change in height of the slope was 2.31 centimeters. Substrate 2 was 3.39 and the change in height of the slope was 1.68. Substrate 3 was 7.42 and the change in height of the slope was 0.31. It became clear that substrate 3 would be best to consider in a real-life situation. When comparing the two graphs you can see that larger the grain size the less erosion. Therefore substrate 3 (the large gravel) had the least amount of erosion that occurred. My hypothesis was correct resulting in the finer the substrate the higher the rate of erosion would be.

In conclusion my project was overall successful and proved my hypothesis. It demonstrated how coastal erosion affects our beaches, while providing data to help resolve this threat.



## Project ID: 704

### JR - Earth and Environmental Sciences

Aaron Cooper

#### *The Effect of the Moon and Sun's Gravitational Force on Volcanic Eruptions*

Since the moon's gravity affects the ocean by causing the tides and magma is liquid too, I wondered if the moon's gravity also affected when volcanic eruptions start. The moon's gravity is strongest when there is a new moon or a full moon because the moon and the sun's gravitational forces work together. Volcanoes erupt because of tectonic forces, but I was wondering if the moon's gravitational pull added just enough force so that the volcano couldn't hold it anymore and it went boom!

Procedure: I downloaded a bunch of volcanic eruptions from the Smithsonian Global Volcanism Program's website and entered the start dates of the eruptions into a website to find moon phases and percent full out on that date. I combined the data into a chart of my own and then counted how many volcanoes started to erupt during new and full moons. Finally, I organized the data into graphs and analyzed them.

Result: In the end, I found that 89/300 volcanic eruptions happened when the moon was 0-5% full (New Moon) or when the moon was 95-100% full (Full Moon). That means that 29.67% of the volcanoes erupted within 5% of a new or full moon which is when the gravitational pull on Earth is greatest.

Conclusion: If the gravitational pull of the moon didn't affect when volcanoes erupt about 10% of volcanic eruptions would start within 5% of a new or full moon, but because about 30% of the volcanic eruptions began with a moon within 5% of a new or full moon, I safely concluded that the gravitational pull from the moon does affect when a volcanic eruption start.



## Project ID: 705

### JR - Earth and Environmental Sciences

Sammy Weyer

#### *The Effects of Primary and Secondary Colors on the Temperature of Water*

The purpose of this experiment is to determine how primary and secondary colors affect the temperature of water. It is hypothesized that dark-colored fiberglass containers heat up more than light-colored fiberglass containers. To begin the project, 8 fiberglass containers were spray painted (Red, Orange, Yellow, Green, Blue, Purple, Black, White) and filled with water. Every container's water temperature was 62°F; this was the control throughout the experiment. Over a 30-day period, the water temperature of different colored fiberglass containers was measured daily. The water temperatures for the first 10 days were measured at 3:30 pm - 4:00 pm. For the next 10 days, the water temperatures were measured at 1:30 pm. For the final 10 days, the order of the fiberglass container was rearranged and the water temperatures were all measured. After the tests were run, the results showed that the hypothesis was supported and dark colors will heat more than light colors.

The water temperature on average in order from warmest to coolest was: Purple, Black, Red, Blue, Green, White, Orange, Yellow. The average water temperature on sunny days in order from warmest to coolest was the same order as just listed above. This order changed on cloudy/rainy days because there was less sun and the warmer containers' water had time to cool down. The order from warmest to coolest was: Purple, Black, Red, White, Green Blue, Orange, Yellow. In conclusion, dark primary and secondary colors heat more than light primary and secondary colors.



## Project ID: 706

### JR - Earth and Environmental Sciences

Mia Stevens

#### *The Sunshine Tax*

This project examined the effect additives might have in controlling the evaporation of water in swimming pools. It is hypothesized that commercial evaporation prevention chemicals (Solar Blanket) are more effective at preventing water evaporation when compared to the additives of vinegar, alcohol, chlorine alone, and water with no additive. Trials of ten tests of each liquid solution were performed for a total of fifty tests. The procedure involved placing all samples, including vinegar plus water with chlorine, alcohol plus water with chlorine, Solar Blanket plus water with chlorine, the control sample (untreated water) and water with chlorine, in the same physical environment and observing and measuring liquid amounts after four days. Liquids were measured in 300 mL beakers and each sample weighed with a kitchen scale to ensure accuracy. Samples started with 250 mL of water, adding 25 mL of each additive and 25 mL of chlorine, for a total of 300 mL of liquid in each beaker. Results indicated that the hypothesis was supported by the data collected, the Solar Blanket product was most effective at preventing evaporation. The explanation for this result comes down to the molecular level - the Solar Blanket molecules are more compact with stronger hydrogen bonds, making water less likely to evaporate. This is proven because water molecules are stronger than alcohol molecules. Additionally, vinegar also has compact molecules with strong bonds and was second best at preventing evaporation. The commercial water evaporation chemicals, Solar Blanket product proved to be the best for use in preventing loss of water in swimming pools.



## Project ID: 707

### JR - Earth and Environmental Sciences

Bernardo Marce

#### *What is the Best Way to Dispose of Biodegradable Products? A Year 3 Study*

This is a continuation of my previous experiments, where the results were inconclusive but have produced sufficient data that I can conclude my project after three years. The question I wanted to answer was, "What is the best method to decompose biodegradable products in a controlled environment." I realized that I had recreated most of the environments we use to dispose of trash and decided to make the water container in a controlled environment. I thought that the water container would have an effective decomposition record, the paper products would decompose first in compost containers, and straws would decompose first in trash containers. I added the months from the previous experiments to the months accumulated in this experiment bringing the total to twenty six months. I created charts based on this data and used them to discover that the water container was effective with some products. The paper products are not likely to decompose in the compost containers, and all straws are likely to decompose in trash containers. I believed I discovered the best environment to dispose of biodegradable products; Closed Plastic Compost container. I also discovered that the Plastic closed containers were the best of all. Together they have 5 already decomposed products and a few more at an advanced decomposition rate. What is interesting is the decomposition rate increased significantly as soon as the plastic containers began breaking apart. The worst scenario to dispose of was the landfills, I hoped they would be more effective because we use them daily, but in the 15 months I have studied them not one product has reached a rate of over fifty-one percent. The products that had the best decomposition rate in almost all containers was the paper plate and the ones that had by far the worst rates were both the Wecare and Ecoshell spoons.



## Project ID: 708

### JR - Earth and Environmental Sciences

Tyler Rowe

Joaquin Revilla-Harker

#### *The Effects of Different Waters on the Growth of Grass*

Water has been used for watering grass and plants for a long time, but is very bad for the environment. Greywater, which is relatively clean waste water, is not always used because many people think that it could have a difference on the growth of their plants compared to regular water.

Problem/Question: Does the type of water affect the growth of grass?

Hypothesis: The hypothesis that we are trying to prove with this experiment is that if we use different types of water to grow the grass, then the waters will all be able to grow the grass.

Procedure: First, pour the soil and grass seeds into biodegradable soil liners and lightly stir until the seeds are in the soil. Next, water and label all eight trays (two for each water) so that we know which trays to water. Then, record the temperature of the day at the time of doing it and repeat this process everyday for 7 weeks.

Results: All of the waters were suitable for growth, but the tap and filtered grew the most. The average of tap water was 6.65. The average of filtered water was 5.24. The average of dish water was 5.02. The average of car wash water was 4.53. The dish and car wash water were also suitable for growth and were not far off of the filtered water and tap water.



## Project ID: 709

### JR - Earth and Environmental Sciences

Mila Wroblewski

#### *Effect on Coral after Sand Disturbances*

Having coral in sandy places is not necessarily the most ideal spot for a piece of coral. When coral is on sandy beaches the sand gets pushed against the coral by the waves and either grinds against the coral and breaks it down into smaller pieces or breaks off a piece of the coral. This is one of the many reasons the coral reefs are dying. Sand disturbances.

Procedure: Step 1: Get all the materials for the tank. Step 2: Set up proper habitat for coral. Step 3: Place coral in with the first cup of sand. Step 4: Add  $\frac{1}{4}$  cup of sand every 5 days. Step 5: Every day measure its health. Step 6: Record data in the spreadsheet.

Results: In this experiment, I tested the durability of coral after sand disturbances. When the sand was added into the tank the coral did surprisingly very well. The coral started at 1.5oz, 1.1 inches, and a reddish color. As I added sand into the tank, every five days, the coral kept growing and maintaining its health pretty well. Although there were a few downfalls the coral ended at 1.53oz, 1.19 inches, and a reddish color with yellow tips. The average weight of the coral was 1.58115oz, the average height of the coral was 1.23 inches, and the average color was red with white tips. (a little unhealthy).



## **Project ID: 710**

### **JR - Earth and Environmental Sciences**

Aamina Mohammad

#### *Plastic Sorting Using Machine Learning*

The Plastic Sorter Robot, or the PSR, is designed to aid in ocean cleanup efforts but can be used on land, as well. The PSR sorts more types of plastics than what normally is being recycled and in a more efficient and economical way. Machine learning algorithms are used to recognize different pictures of plastics. I have used teachable machine tensorflow, a machine-learning algorithm to train the model to recognize different categories of plastics. The algorithm utilizes images from seven categories of commonly mismanaged plastics such as straws, bags and food containers. The program ended up with 90% of success. With the neural network trained, the program is able to recognize and sort plastics even when the items are in various conditions.



## Project ID: 711

### JR - Earth and Environmental Sciences

Omar Musse

#### *Which Aquatic Plant Absorbs Oil the Best?*

The purpose of this project is to investigate the ability of different aquatic plants to absorb different types of oil. This project aligns with the fields of environmental science and ecology, as it explores the use of plants as a tool for mitigating oil pollution and the potential consequences for aquatic life. It is hypothesized that the water lilies will be the most effective at absorbing all the different types of oil.

Five graduated cylinders were obtained and labeled consecutively as "1" (water), "2" (gasoline), "3" (engine oil), "4" (corn oil), and "5" (kerosene). Then, 45 mL of water was added to each of the 5 cylinders. The control cylinder marked "1" was filled with 50 mL of water. Next, a 7" Elodea plant was placed in each of the 5 cylinders. The plants were then fully submerged in water. Five mL of gasoline, engine oil, corn oil, and kerosene were added to the cylinders according to their markings, with the exception of cylinder "1", which did not receive any oil. The measuring cylinders were placed in a location where they could receive adequate sunlight. For up to 7 days, the level of oil on the surface of the water was observed daily to determine if the level of oil had reduced or remained the same. This process was repeated for all other aquatic plants, and the measurements were recorded after each of the 7 days.

The results of the experiment showed that the Elodea plant was the most effective in absorbing the different types of oil out of all the tested aquatic plants, followed by the Pygmy Water Lilies. These findings indicate that Elodea and Pygmy Water Lilies have potential as effective natural tools for mitigating oil pollution in aquatic environments. However, it is important to note that further research is needed to determine the long-term impact of using these plants on the surrounding aquatic life and ecosystem. Overall, the experiment provides valuable insight into the use of aquatic plants as a means of mitigating oil pollution and highlights the importance of continued study in this field.



## Project ID: 712

### JR - Earth and Environmental Sciences

Yandel Salmeron

*Which Type of Produce will be Disposed the Most: Fruit or Vegetables?*

The purpose of this experiment was to identify what should be provided more during 7th-grade lunch to create less waste. The experimental question was “During 7th-grade lunch, which type of product is disposed of the most; fruits or vegetables?” The hypothesis was that fruits are going to be disposed of the most because the packaging makes the liquid spill which makes eating the fruit messy. To conduct this experiment, fruits and vegetables were collected from the trash cans during 7th grade lunch. Then, the fruits were separated from the vegetables, placed in different buckets, weighed, and the data was recorded. The result of the experiment showed that 7th graders disposed of fruits more than vegetables. The hypothesis was supported because fruits were disposed of more than vegetables.



## Project ID: 713

### JR - Earth and Environmental Sciences

Afrika Tapia

*Are San Diego Freshwater Habitats pH Healthy for Bluegill Fish to Inhabit?*

The purpose of this experiment was to discover if ten lakes and ponds of San Diego have a healthy pH level for Bluegill fish to inhabit. The experimental question was "Are the pH levels of San Diego lakes and ponds healthy for Bluegill fish to inhabit?" The hypothesis was, If the pH levels of San Diego freshwater habitats are tested, the pH levels will range from 7 to 8 due to the chemicals, and pollutants in the water that have gathered due to runoff. To conduct this experiment, ten San Diego freshwater habitat (5 lakes and 5 ponds) samples were collected. Then 5 trials to measure the pH level were conducted for each freshwater habitat, and according to the results it was determined if the habitats had an adequate pH level for Bluegill fish. The result of the experiment showed that all ten freshwater habitats had an adequate pH level for Bluegill fish to inhabit. The hypothesis was supported because the pH levels in the experiment ranged from 7 to 8.



## Project ID: 714

### JR - Earth and Environmental Sciences

Haadi Naveed

#### *Will Chelation Help the Plants from Heavy Metal Toxicity*

The effects of lead contamination on plant growth and the ability of EDTA and cilantro powder to mitigate these effects were studied. Mustard greens, Reddish , and Poppy Seeds. seeds were grown in soil alone or soil contaminated with lead, EDTA, and cilantro powder. The growth of the plants was monitored and measured daily for 15 days, and the average height was calculated for each group of plants. The results showed that lead had a negative impact on plant growth, while cilantro powder was effective in mitigating these effects. The use of EDTA was not as effective in reducing the impact of lead. These findings suggest that cilantro powder may have potential as a natural alternative to chemical chelating agents in reducing the impact of lead in contaminated soil.



## Project ID: 715

### JR - Earth and Environmental Sciences

Sebastian Ayesta Hollstein

Tim Huschke

#### *The Effects of Different Conditions on Solar Panel Output Efficiency*

Solar panels are a clean energy source that is increasing in popularity to combat human-generated climate change. Solar panels use the sun to create electrical energy, and certain conditions decrease the amount of light reaching the ground. What are the effects of clouds, shade, smog, and fog, on solar panel output? Our hypothesis is that clouds and shade will decrease output by 10-20%, while fog and smog by 20-30%.

Procedures: Four trials were conducted with three solar cells and a digital multimeter. In each trial, we measured solar cell output in a control condition of direct sunlight and compared it to an experimental condition. First, we compared output under direct sun to output under a moving cloud. Second, we simulated fog using steam in a plastic bag and compared the steamed bag to a dry bag. Third, we compared a day with a PM 2.5 level of 55 to a day with a PM 2.5 level of 41 at the same time. Lastly, we compared the output of direct sunlight to the output under a sun umbrella.

Results: The largest decrease in output from all the conditions is shade, followed by clouds, then fog, and finally, smog. The average decrease of solar panel output compared to the control

Shade = 6.37 Vdc, control = 7.37 Vdc = 13.57% decrease, Clouds = 6.56 Vdc, control = 7.35 Vdc = 10.75% decrease, Fog = 7.01 Vdc, control = 7.24 Vdc = 3.18% decrease, Smog = 7.24 Vdc, control = 7.33 Vdc = 1.23% decrease

Conclusion: In the hypothesis, it was predicted that clouds and shade would decrease the output of the solar panels by 10%-20%, while it was expected that smog and fog would decrease the output of the solar panels by 20%-30%. This hypothesis was partially correct, because our estimate about clouds and shade was correct. In our trial, they both decreased the output of the solar panels by 10%-20%. The estimate about smog and fog was incorrect, it was predicted that they would decrease the output by 20%-30%, but in our experiment they only decreased the output by 0%-10%. Although this has been demonstrated in other places, in our trials we were unable to show "cloud lensing" (that clouds, and fog can increase solar cell output). Perhaps this is because that requires very specific conditions which did not occur during our testing period. Based on the results, shade decreased the output of the solar panels the most. The order of the highest decrease to the lowest decrease of solar panel output compared to the control is as follows: smog (1.23%) → fog (3.18%) → clouds (10.75%) → shade (13.57%) → control. After reviewing the results, we concluded locating solar panels in a sunny location away from coastal fog and heavy smog, though some smog and fog okay, is a way to make solar panels produce electricity at increased outputs.



## Project ID: 716

### JR - Earth and Environmental Sciences

Nythalia Trevino

#### *Can a Homemade Water Filter Remove Harmful Substances from San Diego's River?*

The purpose of this experiment was to obtain information and data on what harmful substances a homemade water filter can remove. The experimental question was, "Can a homemade water filter remove harmful substances from San Diego's river?" The hypothesis was if the homemade water filter can remove harmful substances then it will remove Carbonate, Fluoride, Iron, Chlorine, and QUAT because the charcoal in the water filter will remove the substances. To conduct this experiment, a water filter needed to be built, after the filter was constructed, a trip to San Diego's river was required to test the water. Once the filter is done and water is collected, use the SJ wave water testing kit to test the water and collect the data results then filter the water and collect the data again. The result of the experiment showed that the homemade water filter can remove the harmful substances that were listed. The hypothesis was supported because the data showed that the water filter was able to remove different amounts of different substances.