



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Phillip A. Benedetti	Project Number J0901
Project Title South San Francisco's Air Pollution	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals What areas of South San Francisco have the most air pollution (particulate matter), how does it effect the residents, and how does this air quality compare to the rest of our state?</p> <p>Methods/Materials Ten index cards with petroleum jelly on six inch high wooden platforms were placed at various locations around South San Francisco for two forty-eight hour time periods. Each index card collected particles from the air which was analyzed, taking into account location and weather conditions. The data was recorded and analyzed. Specifically, they were compared in regards to benefits, detriments, and amounts.</p> <p>Results The residential areas had the least amount of air pollution while the industrial sections had the most. South San Francisco's particulate matter is good compared to the rest of California. It was composed primarily of dirt vs. pollutants like tar or sulfur. The amount of particulate matter in the air appeared to be much less than other parts of California (L.A. in particular).</p> <p>Conclusions/Discussion In conclusion, our air is affected by weather, people, and industry, all of which can contribute to air pollution. Particulate matter has a very negative effect on our society. It can only be controlled by using less fossil fuels and being self aware of the particulate matter in our areas. People have to be careful of the harmful substances they put into our air and realize the negative effects that particulate matter has on all of us.</p>	
Summary Statement South San Francisco's Air Pollution records and analyzes the effects of air pollution, particularly particulate matter, on the air quality of our city and state.	
Help Received I received help from my father, who drove me to the various locations, and my mother who videotaped my presentation.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Sabrina P. Brett	Project Number J0902
Project Title How Do We Affect Water Quality?	
Abstract Objectives/Goals My hypothesis was: if it rains, the polluted runoff will affect the quality of the water in an area where the storm drain empties into the ocean. Methods/Materials The materials I used are pH activity strips, a conductivity meter, a transparency tube, and a digital thermometer. I also used a cup, gloves, and a datasheet to keep track of my results. I monitored at Asilomar, Still Water Cove, and Pacific Grove Park storm drains every 3-4 days. Results Based on my results, the water quality was more affected by changes in local population than by rainstorms. The transparency reading, in particular dropped dramatically after the AT&T Golf Tournament in Pebble Beach, which was evident in Still Water Cove's stormdrain. At the Pacific Grove storm drain the transparency level decreased, most likely because of the rainstorm which took place about 24 hours before I monitored. Throughout the test period the conductivity level remained at an average of 2.00 and the pH level averaged 7.0 or neutral. Conclusions/Discussion The variations in results by location indicated that the negative qualities of urban runoff were directly related to specific local conditions. It showed me that it is possible to control the damaging affects on the environment through our actions and awareness as well as maintenance and improvements to the sewer systems.	
Summary Statement My project examined, through a series of measurements, the effect of urban runoff on marine ecology.	
Help Received Bridget Hoover of the Monterey Bay National Marine Sanctuary supplied me with the necessary materials and equipment.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Ariana Ceballos	Project Number J0903
Project Title Water Water Everywhere: Which One Is the Most Contaminated Out There?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Which water source is the most contaminated? Different sources of water were tested to determine which was the most contaminated.</p> <p>Methods/Materials To obtain results, several steps were taken. To find the bacteria, samples of each source were spread over agar and bacteria was allowed to grow. In determining the levels of ammonia, ammonia dry tablets were mixed in the water and the change in color determined its concentration. Algae colonies in the water were observed under a microscope. Finally to determine the pH, pH paper established whether the water was an acid, neutral, or a base.</p> <p>Results It was found that no one source was free of pollution. The average results were taken from each test and calculations were made to see which source was the most contaminated in each test. For the bacteria test, ocean water had the most grown colonies, 2,426. In the ammonia test, river water had the most ammonia with 4.0 ppm (parts per million). In the pH test, rain water was an acid having an average pH of 5 and river water was a base with an average pH of 8. Finally, in the algae microscopic test, rain water was the only water source to show traces of algae existing in the water.</p> <p>Conclusions/Discussion From this project, no one water source was found to be free from contamination. Bottled water had more bacteria than expected. Lake and Ocean water, however, had the basic outcomes that were expected. Rain water had traces of algae that were not expected to occur. River water had the most shocking results in having ammonia of 4.0 ppm. Tap water was not predicted to have as much ammonia as it had as well. Therefore, further testing must be conducted to have one final answer. If no attention is called, the water sources will continue to increase in contamination.</p>	
Summary Statement Different water sources were collected and tested to determine which was the most contaminated.	
Help Received Mother helped grow agar.	



CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

Name(s) Nathan S. Dusaban	Project Number J0904
Project Title Wind Energy on Sand Dune Formation: The Effect of Desertification on Human and Plant Life	
Objectives/Goals I intended to investigate the effect of wind on dune formation. I also wanted to figure out the harmful effects of desertification, or the gradual covering over of an area by sand, on human and plant life and the remedies people of the world can do to not contribute to this process.	
Abstract Methods/Materials 20 liters of sand, Large Aquarium Tank (measuring 760 mm width, 460 mm height and 310 mm length), Hair Blower with high power and diffuser, Cross-Section Layout bond paper, Metric Ruler, Stopwatch, 3 tropical plants, 4 rock simulated styrofoam shapes (measuring 45x45x100) My Methodology started by pouring the sand in the tank. Then using the metric ruler, I measured the measurements of height, length, width, and length of slope and recorded it in my logbook. Next, I drew my overhead and side view contour drawings of the outline appearance of the sand before the wind has affected the sand. Then I blew the sand, horizontally, for three minutes, using the stopwatch. Then I measured the various measurements of change and drew contour drawings of after wind has affected the sand. I repeated this five more times, totaling in six trials total for this test (sand alone test). For my second test (sand with vegetation), I put the plants in the sand and in the third test (sand with the rock simulations) I put the 4 rock simulations in the sand. I repeated each test group five more times totaling in six trials for each test group.	
Results I observed that after wind affected the sand, the measurements were clearly differentiated in each test group. I also observed that after the wind affected the sand for the second and third test group, there appeared to be a blowout, or a gap, around each object. Lastly, based on my observations of excess sand remaining on the leaves of the plants in the second test, I inferred that vegetation and the environment are affected by the process of dune formation.	
Conclusions/Discussion Based on my research on dune formation, a dune is formed when wind blows sand up against a rock or bush. I conclude that desertification has many harmful affects on the environment, societies and cultures such as loss of animal and plant species and severe population reductions. Although we cannot stop this natural process completely, remedies for reducing contributions to desertification include; planting of windbreaks, reforestation of denuded areas, and dams to control erosion.	
Summary Statement My project is in regard to the effect of wind energy on the formation of sand dunes as well as how desertification affects human and plant life.	
Help Received Mother helped acquire materials, father helped me set up the necessary apparatus, sister helped take pictures of me performing experiment, teacher guided me throughout the year.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Dorsey R. Ek	Project Number J0905
Project Title What Is the Best Way to Eradicate the Water Primrose?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal in this project is to find the most effective way to kill the Water Primrose without harming the environment. I hope to help many lakes around the world that have been infected with this invasive plant. The elimination of the Water Primrose will benefit the natural ecology and wildlife of our lakes. It will also invite the use of recreational use such as fishing.</p> <p>Methods/Materials The methods I used in this project were; I set up 4 squares labeled A, B, C, and D. Square A was my control and in square B I cut off all the stems above the water level. In square C I cut off all the stems above the water level and covered it with a black plastic bag. In square D I covered the plant with a black plastic bag. I took both the water and the air temperature. I counted all the stems above the water level. In squares B and C I measured the stems that came up past the water level. Last I measured the water depth.</p> <p>Results My results were; square B worked the best at reducing the growth of the Water Primrose. None of the methods I used eradicated the Water Primrose but after revising my data and looking at many graphs I concluded that square B did the best. Square C nearly did as good of a job as square B but it wasn't close enough.</p> <p>Conclusions/Discussion My conclusion is that square B worked the best but it might have had something to do with the weather. I did this project in winter and the Water Primrose does not like cold or moving water. If I were going to redo this project I would do it in summer when the Water Primrose is very mature. This information that I have discovered will be given to Mission Trails Regional Park to help in their research of this invasive plant.</p>	
Summary Statement My project is about trying to eradicate the Water Primrose and to restore our lakes to their natural condition.	
Help Received Ranger Barrett gave me permission to do the project at Mission Trails Regional Park. My mother also drove me to the lake for 7 weeks in order for me to do this project.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Dana A. Feeny	Project Number J0906
Project Title CO at SFO	
Abstract Objectives/Goals The goal is to determine the carbon monoxide levels at different locations in the San Francisco airport to see if levels exceed OSHA or EPA's recommended limits. Methods/Materials A Senco Model One digital carbon monoxide tester is modified and used to test the carbon monoxide level at six different locations over a 28 minute time period. All samples were taken at a height of five feet. Results The CO level did not exceed OSHA's limits at any of the six locations. Two areas, outside the baggage claim and at the exit booth, exceeded EPA's and UK's guidelines for an extended period. The range of CO measurements did not vary much at any location except outside the baggage claim area. The carbon monoxide level was consistant at heights from 0 to 12 feet. Conclusions/Discussion EPA, OSHA and UK National Air Quality Strategy guidelines for CO exposure are not consistant. Since two locations at the San Francisco airport exceeded EPA and UK standards, the areas should be retested over an eight-hour period to more accurately determine the exposure. Pregnant female workers should not work in these areas. The health histories of policemen and other workers in these areas should be studied to determine if CO has affted their health or that of their babies.	
Summary Statement The levels of carbon monoxide were measured at the San Francisco airport to determine if they were dangerous to the health of workers.	
Help Received Stan Yamaichi from the Bay Area Air Quality Management District advised to test air pollution by monitoring CO, Mother drove to airport	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Andrea N. Gaines	Project Number J0908
Project Title Plover Preferences: Is Beach Grooming Driving Snowy Plovers to Extinction?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The Western Snowy Plover is a threatened species that lives on beaches. Many human activities are thought to harm plovers, but none has been tested experimentally. I tested the hypothesis that beach grooming to remove seaweed and debris eliminates suitable habitats for Snowy Plovers. I hypothesized that key plover habitats will be depressions in the sand and piles of kelp. The process of grooming beaches smoothes sand and rakes away kelp, which should be harmful to snowy plovers.</p> <p>Methods/Materials My experiments and observations were done at the Coal Oil Point Reserve, in Goleta, CA. I observed plovers at different times of day and recorded their habitat choices. For the experiment, I set up five replicate experimental areas. Each area had 4 treatments (control, kelp removal, smoothed sand, combined smoothed sand & kelp removal) that I used to examine two separate effects of beach grooming -- smoothing the sand and removing kelp. The treatments were randomly assigned to 2m x 2m squares. I monitored the number of plovers in each treatment square on six different dates in March.</p> <p>Results My results supported some of my predictions but not all of them. The birds overwhelmingly preferred rough sand treatments over groomed treatments. 99% of the plovers I observed in my experimental area were located in rough sand treatments. Only 1% of the birds were observed in groomed treatments. This experimental finding was supported by my field habitat observations, where the birds were most commonly found in sand depressions. The most surprising finding was that kelp did not seem to play a big role in where plovers occurred in my experiments. Some of my field observations suggest kelp may be more important than my experiments suggest.</p> <p>Conclusions/Discussion Grooming beaches eliminates suitable habitat for the western snowy plover. Now there is not only anecdotal evidence for this claim but experimental evidence as well. I believe these experimental results could be useful in managing beaches. Further verification of my findings could help in banning beach grooming on snowy plover beaches. Protecting beaches from grooming could potentially play an important role in the recovery of snowy plovers. Stopping beach grooming on beaches where plovers used to occur may help reestablish populations on these beaches.</p>	
Summary Statement My experiments test whether beach grooming is harming the snowy plover, a threatened bird species.	
Help Received My mother and father helped me clear kelp and smooth sand in my experiments. Dr. Cris Sandoval gave me access to the snowy plover populations in the Coal Oil Point Nature Reserve. Drs. Sandoval & Kevin Lafferty taught me many things about snowy plover biology, which helped me design my experiments.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Alia D. Ghoneum	Project Number J0909
Project Title Effect of Stress on the Immune System of Earthworms (<i>Lumbricus terrestris</i>)	
Abstract Objectives/Goals The objective of this study addresses the problem of how the immune system responds to stress induced by a sustained temperature decrease. The earthworm <i>Lumbricus terrestris</i> was selected as the model. Methods/Materials The methods used included examining two group of earthworms (50 per group) under two temperatures. The control group was kept at 21C, while the stress group was kept at 1C. As an indicator of the immune response, the number of coelomocytes (the immune cells of the earthworm) were counted at different intervals: 1 day, 1 week, 2 weeks, and 1 month. Earthworm releases coelomocytes after exposre to 5% alcohol. The coelomocytes were counted using a light microscope and hemocytometer. Results The significant finding of this study was that earthworms respond to lower temperature by decreasing the number of coelomocytes. After two weeks the stressed earthworms showed a 22% decline in the number of coelomocytes in comparison to the control group. This decrease continued up through one month; the stressed worms had an average of 0.27×10^6 coelomocytes. The controls had 2.73×10^6 , reflecting a 91% decrease. Conclusions/Discussion The earthworms subjected to a prolonged temperature stressor suffered a measurable decline in the number of coelomocytes and within a one month period were found to have an insufficient number of coelomocytes to support a normal earthworm's immune system. In conclusion, this observation may have a practical application for humans, which is that long term applied stress may significantly affect the immune system. Subsequently, the human body may become vulnerable to infection or cancer.	
Summary Statement Stress supresses the immune system by decreasing the number of coelomocytes (immune cells) of earthworms.	
Help Received Dr. E. Cooper at UCLA advise during experiment, Mother helped with panel, Father supplied scientific equipment	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Alyssa F. Giacalone	Project Number J0910
Project Title Cover Crops	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Even under the best conditions, with the most fertile soil, growing food crops in the same location, season after season, will deplete the soil of nutrients causing lower yields and eventual crop failure. When a cover crop is planted and maintained properly, the soil quality in that area should naturally increase. The improved soil should enhance the growth of the plants and increase the flower and fruit production without fertilizers or chemicals.</p> <p>Methods/Materials Three garden areas were chosen that had the same sun exposure. Each area was tested for ph value, nitrogen, potassium and phosphorus content with a commercial soil testing kit. Bed A was treated with fertilizer before planting with the cover crop. Bed B was planted with the cover crop and Bed C, the control area was left alone. Each area received the same amount of water. When the cover crop began to bloom after approximately ninety days, it was chopped into the soil as a green manure. Nitrogen deposits were visible on the roots of the crops in both Beds A and B. After waiting two weeks for the cover crop to breakdown the soil was tested again for ph value, nitrogen, potassium and phosphorus content. This was repeated again one week later. All results were then compared.</p> <p>Results My results showed that Bed B had the most improved soil quality with a lowered ph, higher nitrogen and potassium content and a constant phosphorus level. Bed A which was treated with fertilizer before planting the cover crop showed higher ph, higher potassium, reduced nitrogen and reduced phosphorus content. Surprisingly, the control bed, Bed C showed changes in the ph and nitrogen levels which went up and then returned to their original levels; potassium and phosphorus level remained the same.</p> <p>Conclusions/Discussion With this experiment, cover crops have shown the ability to improve the soil quality. This would enhance and increase the development of flowers and fruit production while continuing to maintain garden soil at it's highest level of productivity.</p>	
Summary Statement Garden soil can be improved to the highest quality for planting food crops with the use of cover crops as a green manure.	
Help Received My mom helped with maintaining the plants, and performing the experiments.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Etta L. Grover-Silva	Project Number J0911
Project Title Does Rainfall Affect the Amount of Coliform in Janes Creek?	
Abstract Objectives/Goals My objective was to learn if rain effected the amount of coliform bacteria in Janes Creek. Methods/Materials Water samples were taken from three different sites along Janes Creek before rainfall. Samples were put through Presumptive and Confirmed Tests to determine the Most Probable Number of coliform per 100 ml of water (MPN/100 ml) and to identify the type of coliform. These steps were repeated after it rained one inch in 48 hours. Results There was a huge increase in coliform after it rained. Before rain, Site 1 had an MPN/100 ml of 240, Site 2 had an MPN of about 240. Site 3 hand an MPN of 23. After rain, Site 1 had and MPN of more than 4,400 and the bacteria was all E. coli. Site 2 had an MPN of more than 2,400 and less than 11,000. Site 3 had an MPN of more than 2400 and less than 11,000. The bacteria in the medium from Site 3 produces less gas and less cloudiness than Site 3, leading me to think Site 2 had more coliform than Site 3. Conclusions/Discussion The location and surrounding geography of each site were the main factors in the amount of increase and type of coliform present. Site 1 had a cow pasture right next to it leading to the large increase in E. coli from fecal contamination. Site 2 was not located next to any cow pastures so all the run-off that ran into the stream only contained sediment leading to the increase in E. aerogenes. Site 3 was also not located near any cow pastures and is below a logging area leading to a lot of sediment in the creek and a large increase in E. aerogenes. If I were to do this experiment again I would order or make my own media to have more tubes and plates so I could repeat my experiment.	
Summary Statement I studied the Effect of Rainfall on the Amount of Coliform Bacteria in Janes Creek.	
Help Received Used lab equipment at Humboldt State University under the supervision of Dr. Patricia Siering.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Amanda B. Haney	Project Number J0912
Project Title Acid Rain: Friend or Foe?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my Science Fair experiment was to find out which level of acidity, 3, 4, 5 or 6, was most harmful to plant growth. I hypothesized that my controlled group, with a neutral pH level of 7, would grow the tallest and have the most leaves, because there was no acid to affect the growth.</p> <p>Methods/Materials To test my hypothesis I planted 20 seeds in 5 groups of 4, with the seeds and soil as my control. Each group was watered with a different pH level of water. The groups were labeled: group 3, 4, 5, 6 and 7 (group 3 was watered with water a pH level of 3, group 4 was watered with water a pH level of 4, etc.). Each plant was watered with 59.15ml (1/4 cup) of water. The plants were watered as needed, and I measured them every 4-8 days.</p> <p>Results My results revealed that my hypothesis was incorrect. Although my controlled group had the most leaves, it did not grow the tallest. The most acidic plant, watered with a pH level of 3, grew the tallest, but did not have the most leaves.</p> <p>Conclusions/Discussion In conclusion my results did not support my hypothesis; however, I believe that if I continued this project for a longer period of time (such as a year) I would see results supporting my hypothesis. I believe this additional time would be needed to ensure that the acidity level in the soil is equal to the acidity level in my pH solution.</p>	
Summary Statement The purpose of my Science Fair experiment was to find out which level of acidity, 3, 4, 5 or 6, was most harmful to plant growth.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) William B. Hinds	Project Number J0913
Project Title To Waste or Not to Waste: Does Adding Biosolids Affect the Biodiversity of Silage Cornfield Soils?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My purpose is to test three different soils to see which one contains the highest level of biodiversity. I will be testing soils from fields that contain animal fertilizer, bio-solid fertilizer and no fertilizer at all.</p> <p>Methods/Materials I collected soil samples from a ranch in Western Kern County. I placed 10ml of soil in a graduated cylinder with 90ml of sterile distilled water and shook it vigorously for one minute. Then, I placed 10 ml of the solution into another cylinder with 90ml of sterile distilled water and shook it vigorously again. I repeated this dilution one more time. With a sterilized inoculating loop, I transferred one drop from the last solution onto culture dishes. I let the cultures grow at room temperature. Bacteria and fungi started growing within 24 hours. Counts were made after 48 hours.</p> <p>Results The non-fertilized soil produced the highest level of biodiversity with a total of 595 colonies per 24 petri dishes. The biosolid-fertilized soil produced a total of 258 colonies per 24 petri dishes and the animal fertilized soil produced a total of 303 colonies per 24 petri dishes.</p> <p>Conclusions/Discussion After 72 petri dishes, biodiversity tests and pH level readings, I have come to the conclusion that my hypothesis is partly correct due to the fact that the bio-solids did affect the biodiversity, not by nutrient amount, but by pH level. The bio-solid soil had less biodiversity than both the non-fertilized soil and the animal fertilized soil. The pH level is higher in both bio- and animal fertilized soil. The pH level was lower in the non-fertilized soil, resulting in a higher level of biodiversity. Other factors, such as tith and soil structure, could affect the results of this project. It appears that pH limits biodiversity, but further testing is required to gather more conclusive data.</p>	
Summary Statement Adding bio-solids to soil does affect the biodiversity of the soil.	
Help Received My science teacher, Mr. Duerr, helped with the design of the experiment. My mother helped with the typing. Mr. Mike Car, of the Ag Extension Office, helped with the testing of the soil pH levels.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Kathryn C. Hund	Project Number J0914
Project Title The Effect of Slope Aspect on Environmental Conditions and Vegetation (Slope Aspect Study)	
Abstract Objectives/Goals My objective is to determine if environmental conditions and vegetation on north and south facing slopes will be different due to the differences in the amount of solar radiation they receive. I believe there will be significant differences between north and south facing slopes. Methods/Materials I tested my hypothesis on a ridge in Idyllwild, California. I chose a location where the soils and steepness of slope were similar for both aspects. I stratified the sample on the ridge, establishing six sampling locations in pairs of three. Each pair was at the same elevation, with one station on the north facing slope and one on the south facing slope. Measurements of air, water and soil temperature, relative humidity, and wind speed were taken. I identified and recorded the vegetation composition and frequency around each station. The data for both aspects was compared and analyzed. Results I found significant differences between north and south facing slopes for air, water and soil temperatures and wind speed. Relative humidity was nearly the same for both aspects. I found a significant difference in vegetation composition between north and south facing slopes. There were more and taller trees on north facing slopes and more shrubs on south facing slopes. Some plant species were only found on north facing slopes while others were only found on south facing slopes. Conclusions/Discussion Slope aspect affects local climate and vegetation. This has important implications for home design and location, agriculture and fire management.	
Summary Statement My project is about the effects of different slope aspects on environmental conditions and vegetation.	
Help Received My father helped me with the experimental design and data analysis. My father and mother helped me assemble the poster board.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Courtney E. Jones	Project Number J0915
Project Title There Is More in Our H(2)O than Just H and O!	
Abstract	
Objectives/Goals My objective was to learn if proximity to sources of inland runoff affects ocean water quality by testing and comparing the pH, ammonia, dissolved oxygen, and nitrogen levels.	
Methods/Materials I selected six test sites in Carpinteria, CA and collected samples over a period of thirty days of ocean water and the tributaries. Then I measured the temperature and pH, ammonia (NH ₃), dissolved oxygen, and nitrogen levels in each sample using LaMotte test tablets.	
Results In testing the waters of Carpinteria, there were many variables. These variables did not measurably affect the test results. Water temperature differed, but there was no pattern between test results and temperature. Rain experienced during the testing period did not affect results; the rainfall was less than 1/2 inch. Carpinteria Salt Marsh had the most extreme range of data for each test. Although Carpinteria Creek and Carpinteria Lagoon seemed like they would have similar results, they had different results. There was little correlation between the tributaries and the bodies of water into which they flowed. Carpinteria Salt Marsh and Holly Street Beach also seemed like they would have similar results; they had little correlation. In answer to my question: Does proximity to sources of inland runoff affect the pH, ammonia, dissolved oxygen, and nitrogen contents of nearby bodies of water, my tests indicate the answer is there is little correlation in times of low flow in those tributaries.	
Conclusions/Discussion In times of low flow, inland runoff does not measurably affect ocean water quality. I predict with a lot of runoff, the water chemistry will be affected. This is demonstrated by the relationship between Carpinteria Creek and the Lagoon. When there is little flow in the creek, they had different chemical compositions. Carpinteria Salt Marsh and Holly Street Beach also support my opinion. Different results were observed in these two areas because the Salt Marsh does not flow out near Holly Street Beach. This might be because the ocean is a large body of water and any tributary that flows into it is so small, it does not make a difference.	
Summary Statement My project involved testing the creeks and oceans around Carpinteria, CA, for ammonia, nitrogen, dissolved oxygen, and pH in an effort to discover any types of pollution.	
Help Received Dad helped a little bit with board graphics, Mom and Dad drove me around to test sites.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) John A. Kaufman	Project Number J0916
Project Title Variation of Microorganism Population in Lakes	
Abstract Objectives/Goals The purpose of my experiment was to determine whether the population of microorganisms in lakes varies depending on how close the lakes are to urbanized areas. Methods/Materials For this experiment I collected water from three lakes. One lake was urban, was suburban, and the third was rural. From each lake I collected one sample from five different locations. I then took the samples home and examined them under a microscope, recording and identifying what I saw. Materials list: 1 broomstick, 1 bungee cord, 5 12 oz. water bottles, 1 microscope, 20 microscope slides, 20 cover slips, 1 glass pipette, and 1 bound notebook. Results From looking at the different samples I can tell that there isn't very much microscopic life in these lakes that I could see. Most of what I saw was just clumps of debris. I didn't see many flagellates or ciliates, and no rotifers or amoebas. Conclusions/Discussion I wasn't able to draw firm conclusions from my results, since I didn't see very much in any of the lakes. I can think of a few reasons why this happened. One of these reasons is that the days I sampled the lakes were in December after recent heavy rain storms, which could have washed some microorganisms out and brought other sediments in. Another factor is that there wasn't as much sunlight at that time of year, which probably negatively affected algae growth, and therefore would have caused a lack of food for all the organisms that eat the algae, and so on. From this project I can tell that winter is not a good time of year to do an experiment like this, since the microorganism population is lower than in the rest of the year.	
Summary Statement I was trying to find out how the population of microorganisms in lakes varies depending on how close the lakes are to cities.	
Help Received My dad drove me to the three lakes and provided the microscope and other materials from his work. My mom drove me to the art supply store to get the board and paper for my project, and advised me on putting it together.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Kieran M. Kelly	Project Number J0917
Project Title Survivorship of Valley Oaks: Type I, II, or III?	
Abstract Objectives/Goals My objectives were to determine what type of survivorship curves valley oak populations had and if the age structure differed between developed and undeveloped locations in Fresno and Tulare counties. My hypothesis was that oak populations in natural conditions should have Type III survivorship curves. Methods/Materials At 10 sites (5 developed, 5 undeveloped) in the San Joaquin Valley, I measured the circumference (at 1.3 meters from the base) of as many trees as I could locate within one hour and recorded the measurements in my notebook. I marked the location of every tree with a GPS (global positioning system) unit. I entered the measurements into an Excel spread sheet and used the formula $\text{Diameter} = \text{Circumference}/\pi$ to calculate the diameter at breast height (DBH). The trees with the largest DBH are the oldest in a population. I created a frequency table with 17 different size classes (10 centimeters/class). I could then describe a survivorship curve for each population and for the two different situations (developed and undeveloped). Results The combined data for the undeveloped parks produced a Type III survivorship curve but the combined data for the developed parks had no distinct survivorship curve. However, some of the developed parks had good representation of all size classes and some of the undeveloped parks did not. Conclusions/Discussion My results indicate that my hypothesis was largely correct for undeveloped parks, with good numbers of all age classes, and higher numbers the younger age classes. My research seems to indicate that oak populations in natural conditions are generally in good condition (Type III). Developed parks need to have more trees in the younger age classes to replace the older trees as they die out.	
Summary Statement My project set out to determine the age structure of valley oak populations in developed and undeveloped parks in Tulare and Fresno counties.	
Help Received My family helped me to get to field sites, my father showed me how to use Excel for my analysis, my mother helped me with my board, and a number of people helped me get access to field sites.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Matthew Y. Kennedy	Project Number J0918
Project Title Dicyphus hesperus	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to examine whether <i>Dicyphus hesperus</i> (a fairly new bug being studied and used as a beneficial) produces damage to tomato plants and their fruit while feeding on the plants for water and laying of their eggs in the plants' tissues.</p> <p>Methods/Materials Tomato plants were put into cages made from netting and PVC piping. <i>Dicyphus hesperus</i> were released in varying amounts (25, 50, 200, 500, 1000) into the cages. The first trial was run without an additional food source being provided to the <i>Dicyphus</i>. The second trial was run using <i>Ephestia</i> eggs, spider mites, and whiteflies as a food source. The third trial used only <i>Ephestia</i> eggs for a food source. Observations were made to note any damage to the tomato plants' leaves, stems, fruit and general health. Replicating trials are being run.</p> <p>Results Varying degrees of yellow spotting on leaves, damage to leaf edges, and minimal spotting on the plants' stems was noted. Amount of damage was directly related to the number of <i>Dicyphus hesperus</i> released into the cage. No damage was noted in the cages with 25 & 50 <i>Dicyphus</i>. General health of all plants remained good despite spotting and damage to leaf edges. Fruit on the plants were healthy and unblemished and remained that way as they ripened on the plants. The <i>Dicyphus hesperus</i> populations all died off at around the two week mark.</p> <p>Conclusions/Discussion I conclude that while the <i>Dicyphus hesperus</i> did produce some yellow spotting and leaf edge damage, the damage was not sufficient to affect the tomato plants' overall general health. The tomatoes grown from these plants were healthy and unblemished. This would seem to indicate that any damage to the plants' leaves or stems does not affect crop production or quality. Further study is warranted.</p>	
Summary Statement My project examined whether <i>Dicyphus hesperus</i> damaged tomato plants and its fruit by using the plants as a water source and for its egg laying.	
Help Received Ms. Bobby Orr of Syngenta provided me with <i>Dicyphus hesperus</i> and <i>Ephestia</i> eggs as well as lab/nursery space in which to run my experiments. Sasaki Nursery provided me with my tomato plants.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) George C. Konugres	Project Number J0919
Project Title Which Lettuce is Clean, Cleaner, Cleanest II	
Abstract Objectives/Goals I predict that lettuce grown hydroponically using recycled soapy water will grow taller, greener, and have fewer surface bacteria; than lettuce grown hydroponically using either ground or rain water. Methods/Materials 3 American Hydroponics kits, pH test kits, Agar plates, chemical test kits, 6L of each: ground water, rain water, recycled soapy water. Ten lettuce plants were grown hydroponically in each of the three waters. Each water was tested for pH, nitrogen, copper, ammonium, phosphate and iron. After 30 days the plant heights were measured in cm. Each plant was cultured for bacteria. Bacteria growth was measured at 24, 48 and 72 hours. Results Of the hydroponically grown lettuce, the lettuce grown with recycled water had the least amount of surface bacteria, and the lettuce grown with ground water had the most bacteria. When rain water was used, the bacteria count was less than with ground water, but much more than with the recycled water; however, this lettuce grew the tallest. Conclusions/Discussion My hypothesis was correct the lettuce grown hydroponically with recycled water had the least surface bacteria, while still growing to a good height and appearing green and full.	
Summary Statement Which type of water is best for growing lettuce with the least amount of surface bacteria.	
Help Received Parents helped with the ordering and purchasing of some materials for the project	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Monica I. Larano	Project Number J0920
Project Title Pop! Go the Kernels	
Abstract Objectives/Goals The objective is to determine whether popcorn kernels stored in the freezer will yield more popcorn kernels than those stored in room temperature. Methods/Materials Three groups of popcorn kernels were tested. Each group consisted of 10 plastic bags with 200 kernels in each bag. The bags in the first group, the control group, were stored at room temperature in a cupboard. The second group was stored in the refrigerator, and the third was stored in the freezer. After 5 days, a hot air popper was used to pop the kernels. After a popping time of 3 minutes for each batch, the number of kernels that remained unpopped was counted, and the number of popped kernels was determined. The mean, the median and the mode for each group were calculated and graphed. Results Popcorn kernels stored in the freezer yielded fewer popped kernels than those stored in the refrigerator or at room temperature. Popcorn kernels stored at room temperature yielded the most popped kernels. Conclusions/Discussion Popcorn stored in refrigerators or freezers can dry out quickly. Since the moisture in the popcorn causes the kernels to pop, then the drying effect of storage in the refrigerator or freezer results in fewer popped kernels as compared to those stored at room temperature.	
Summary Statement The project is about the effect of freezing popcorn on the number of popped kernels.	
Help Received Father taught me how to use Excel to graph results.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Courtney McTeer; Hannah Wilensky	Project Number J0921
Project Title Where in an Apple Orchard Is the Best Nutrient Uptake?	
Abstract Objectives/Goals Our objective was to answer the question, "Where in an apple orchard is the best nutrient uptake?" Methods/Materials Using a refractometer to measure the Brix (sugar content) of each tree, we took readings from twelve trees at different locations within the apple orchard. For each selected tree, we used a sap extractor to crush a leaf from ten locations around the circumference of the tree. Other materials used: -Damp Cloth -Camera -Distilled Water -Twelve zip-loc bags -Eye Dropper Results The trees on the north section of the orchard, nearest the forest, had the highest Brix. The trees on the south section of orchard had the lowest Brix. Conclusions/Discussion Our hypothesis that the trees on the north section of the orchard would have the lowest reading and the trees on the south section would have the highest, was proved wrong. We developed three theories to explain our results. First, the pine trees were fertilizing the trees in the north with their pine needles and other waste. Second, the farmer has a hap-hazard fertilization process. Lastly, the northern trees are able to drain better than the southern trees, aiding better photosynthesis for the northern trees.	
Summary Statement How to find the best spot to plant an apple tree using a refractometer and sap extractor.	
Help Received Father helped take samples, mother helped construct display, sister helped fill out application.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Anthony J. Neuberger	Project Number J0922
Project Title Will Greenhouse Gas Accumulation Help Feed the World?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Conversion of fuels to energy is known to increase the concentration of carbon dioxide in our atmosphere and this, in turn, can have profound effects on our environment and the quality of our lives. We hypothesized that a small increase in the atmospheric carbon dioxide concentration would increase the temperature within our experimental chambers and result in accelerated germination rates of 3 common vegetables: cucumbers, squash and beans.</p> <p>Methods/Materials To test our hypothesis we planted cucumber, squash and bean seeds into 3.78 liter jars containing planting soil. Using a calibrated instrument, carbon dioxide was added to yield 5%, 20% or 100% carbon dioxide. The control jar contained atmospheric levels of carbon dioxide. Jars were maintained in shade or sunlight for 14 days after which the temperature of the soil was determined, the pH of the water was measured and the seeds were inspected for germination.</p> <p>Results When jars were maintained in sunlight, the addition of carbon dioxide resulted in elevated soil temperature and decreased pH. Seed germination was noted only in jars that did not receive extra carbon dioxide. In contrast, jars that were maintained in the shade did not show a difference in soil temperature or pH. The germination rate was similar in all jars; however, more germination was noted in the control jars and the resulting plants grew faster compared to jars that were supplemented with carbon dioxide.</p> <p>Conclusions/Discussion The results of this study proved that my hypothesis was incorrect. Even increases in the atmospheric carbon dioxide concentration as small as 5% was sufficient to have important negative effects on the environment. As carbon dioxide levels in the atmosphere increase, we expect to see both higher global temperatures and more acidic rain. As I demonstrated in this project, one or both of these changes can result in lower germination rates of food plant seeds and that could lead to less food being produced for the world.</p>	
Summary Statement This project was designed to determine what effect in any, increased atmospheric carbon dioxide levels will have on seed germination and plant growth rates.	
Help Received Mother and father proof read report, father added carbon dioxide to containers	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Richard W. Pinckert	Project Number J0923
Project Title How Will the Levels of Salinity Delineate the Ballona Wetlands and Affect the Halophyte Salicornia virginica?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My problem is "How will the levels of salinity delineate the Ballona Wetlands and affect the halophyte Salicornia virginica?" My purpose for choosing this project is because I have a conjecture that people interfered with the natural wetlands system at Balona Creek and I believe people who live on the earth should maintain the environment, not just for their own interests but for the benefit of all living creatures.</p> <p>Methods/Materials To test salinity levels in the Ballona water samples, I poured the samples into a 500 ml. beaker. I took three samples at each test site. I tested the temperature and the specific gravity using a hydrometer in the three trials. These calculations were used to determine the salinity level from a salinity conversion chart. The analysis of the results were charted and compared. The data is used to confirm or invalidate the hypothesis. Inferences were made to determine if the pickelweed plant was receiving enough salt to sustain it.</p> <p>Results The salinity level in the Ballona wetlands was approximately 38% lower than an effective delineated working tidal wetland so this means the Pickelweed plant isn't receiving the salt necessary to sustain their natural place in the ecosystem.</p> <p>Conclusions/Discussion From observing the results, it is concluded that when the Army Corp of Engineers installed the floodgates they didn't realize that besides saving homes from flood, they kept the seawater from coming into the Ballona Wetlands and kept the area from maintaining an environment that can be delineated as a true tidal marsh. Their idea was to eliminate the continual flooding in the area so it could be used to build industrial and residential buildings. This caused the Ballona Wetlands to be so demolished that it became an unnatural environment for many plants and animals. The floodgates interfere with the free flow of salt water into the estuary and the sewer run-off has polluted the environment ruining its natural marsh delineation. The Ballona wetlads have been drastically influenced by man-made interferences. Without these obstructions the Ballona wetlands could be a healthy place for Pickelweed and other saltwater plants, but at this time, Ballona isn't a natural and safe environment for these plants.</p>	
Summary Statement My project is about the Ballona Wetlands salinity levels, how it affects its delineation as a tidal marsh, and how it affects the Pickelweed in the area.	
Help Received Abby Fox let me into the area of testing at the Ballona wetlands.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Kelcey J. Price	Project Number J0924
Project Title The Effect of an Enriched CO(2) Atmosphere on Oxygen Production	
Abstract Objectives/Goals What are the effects of an enriched carbon dioxide atmosphere on oxygen production from bromeliad plants, or put simply, can we sustain life on Mars? The hypothesis that was tested in this investigation was that in an enclosed atmosphere, high levels of carbon dioxide would produce increased levels of oxygen from a single bromeliad plant. Methods/Materials Eight bromeliads were each tested 7 times for a total of 56 tests. Four of the 8 plants were tested for three 24 hour periods in a normal air atmosphere and four 24 hour time periods in an increased carbon dioxide atmosphere. The other 4 plants were tested in four 24 hour periods in a normal air atmosphere and three 24 hour periods in an increased carbon dioxide atmosphere. I used Vernier sensors hooked up to the computer to measure the oxygen output from the plants, the amount of carbon dioxide in the enclosed atmosphere, and the amount of light hitting the plant. Statistical analysis were then run. Results The results of this experiment showed that there was not a significant amount of change in the oxygen output between the two test groups to prove the hypothesis. Although the hypothesis was not supported, being that the increased amount of carbon dioxide in an atmosphere would increase the amount of oxygen production, the experimental manipulation, blowing exhaled air into the enclosed atmosphere, thus producing more carbon dioxide in the enclosed atmosphere, was supported. Conclusions/Discussion Life on Mars cannot be supported with this type of plant individually. It does not produce enough oxygen to sustain life on the red planet. I originally thought that more tests would support my hypothesis, so I increased the tests from 8(school fair) to 32(county fair) to the final 56(state fair). The initial results didn't change. Some possible changes that could be made to my experiment to better support my hypothesis include using more than one plant in the test bottle at one time, keeping the carbon dioxide level high throughout the whole 24 hour test period, or using a different type of plant.	
Summary Statement What are the effects of an enriched carbon dioxide atmosphere on oxygen production from bromeliad plants, or simply, can we sustain life on Mars?	
Help Received Mrs. Sniffen let me use her classroom for running tests and provided guidance throughout; Dad ran statistical analysis and explained what they meant; Mom helped edit report; PTA purchased sensors and computer program.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Alyssa M. Quaintance	Project Number J0925
Project Title Bubbling Up Your Yard: The Effects of Gray Water on Grass and Flowering Plants	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I am doing this project to find out whether recycled gray water can be safely used for irrigation, or if it is detrimental to the growth of plants. I think that some detergents are so strong that they could inhibit the growth, or possibly kill the plants. Environmentally safe detergents on the market may even be beneficial to the plants. I hope to determine that gray water recycling could be used as a vital part of ecosystem management.</p> <p>Methods/Materials In my experiment I need a roll of sod, flowers, potting soil, five flats, five pots, Detergents, bottles, measuring spoons, a ruler and tap water. I put two inches of potting soil into each flat, cut the sod and put them into each flat. I watered the flowers and grass with detergent/water mixtures.</p> <p>Results I observed the grass height, color, green or yellowing, and root growth. With the flowers I observed the height, width, coloring of the leaves, number of flowers, buds and seed pods, as well as the general health of the plants. After careful observation of the grass, I recorded significant growth of grass blades and root system. The flowers declined in growth in December, but they seemed to recover and increase in size in January. Concentrated amounts of detergent are detrimental to the health of plants.</p> <p>Conclusions/Discussion After completing my experiment, I found that the detergents did not have any adverse affect on the gass and flowers. We can safely use gray water with moderate amounts of detergent to irrigate lawns and flowering plants. We can conserve household water use by recycling gray water through irrigation.</p>	
Summary Statement In my project I tested detergent mixtures on flowering plants and grass to simulate recycled gray water on our environment.	
Help Received Mother helped get materials, helped type report and helped put together my board. Jerry Brown advised me during phone interviews, and sent me the Small Flows magazine. Neighbors provided samples.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Daniel J. Ridgway	Project Number J0926
Project Title Environmental Factors Affecting Transpiration / To Transpire or Not to Transpire: That Is the Question	
Abstract Objectives/Goals The objective of my project was to determine which environmental variable would cause the greatest transpiration in snapdragon plants. Based upon my research, I hypothesized that the plants subjected to "heat and wind" would show the greatest transpiration. Methods/Materials Six different groups, containing three single snapdragon plants in individual containers, were established. Groups were designated: 1) control, 2) heat, 3) water, 4) heat and wind, 5) dark, and 6) Next Step's petroleum coated. Each test group, excluding control, was given 20ml water. Each plant base, excluding control, was wrapped with a plastic baggie and tied off to prevent evaporation of water from the soil. Plants were weighed using a triple beam balance. The weight of each plant was recorded in grams. Each group was then subjected to its designated environmental variable (condition). Every individual plant was weighed every hour for a period of eight hours. Loss of mass through transpiration was recorded. Data was analyzed. Graphs were created representing transpiration of each individual plant and averages of like plants within a variable group. Results Plants subjected to "heat" showed the most transpiration. In addition, the petroleum coated "Next Step" group should have shown little evidence of transpiration, according to my research; however, the "petroleum coated" plants transpired more than the "heat and wind" group, the "dark" group, and the "water" group. Conclusions/Discussion My results did enable me to determine which environmental variable caused the greatest transpiration. My original hypothesis was incorrect. The "heat" group of plants showed greater transpiration than the "heat and wind" group. Surprisingly, the hypothesis for my "Next Step" was also incorrect. According to my research, the "petroleum coated" plants should have shown little evidence of transpiration; however, the "petroleum coated" group transpired more than the "heat and wind" group, the "dark" group, and the "water" group. My findings suggest that gardeners and landscapers should know how the transpiration of plants is affected by various environmental conditions before planting any plant in a garden or landscape setting. Water, a valuable resource in California, could also be better conserved if a transpiration index was developed. Garden and landscaping plants could then be labeled for various geographic areas in California and across our nation.	
Summary Statement Snapdragon plants were subjected to different environmental conditions to determine which variable caused the greatest transpiration; therefore, I could determine if snapdragons were environmentally suited for my back yard garden.	
Help Received Mom typed my project, took pictures, and had film developed. Dad borrowed the triple beam scale from his high school. My project was critiqued by Mrs. Nelson, my teacher, and Mr. Bline, Dean of Students.	



CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

Name(s) Lisa S. Rotenstein	Project Number J0927
Project Title Living Lights from the Sea	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My study is designed to show the relationship between the large amounts of pollution that people dump down the storm drain everyday, and the lifespan and bioluminescence of single-celled algae, namely <i>Pyrocystis fusiformis</i>.</p> <p>Methods/Materials I used twenty-two bags of <i>Pyrocystis fusiformis</i>. I divided twenty of the bags into five groups of four bags each. The two bags left over, which I never opened, were used to measure bioluminescence intensity. To measure the algae's lifespan, I took a 0.1 mL sample from each bag with a pipette and put 1 drop on each well of a counting chamber slide. I then counted the number of algae in each well through a microscope. I repeated this for all bags. To measure bioluminescence I turned off all lights, shook the bags of <i>Pyrocystis</i>, and gave a grade for bioluminescence intensity on a scale of 1-10. The 5 intensity measurements were the unopened control bags and the 10 intensity measurements were a small keychain flashlight. I repeated this for all bags. I added a certain type of pollution into each group, either smoke, antifreeze, fertilizer or oil, and left one group of bags without pollution (control). After adding pollution, I took 6 more days of measurements, for a total of 7 days.</p> <p>Results As a whole, bioluminescence intensity declined. The bioluminescence for all bags followed irregular patterns, having no decided rate for growth or decline. Fertilizer bags were the only ones with no luminescence at the end of the experiment. Dead, empty, and dividing cells became less frequent or did not exist at all, depending on the bag. Cells lost their diamond shape, nuclei became smaller, and there was less material in the cytoplasm as a result of the pollution.</p> <p>Conclusions/Discussion In conclusion, pollution did affect the lifespan and bioluminescence of single-celled algae. The number of cells went up and down at different rates and there was no real pattern of growth or decline. My hypothesis that pollution would affect the bioluminescence of all bags was correct. My hypothesis that the lifespan for oil, antifreeze and smoke bags would decline was correct. My hypothesis that the lifespan for fertilizer bags would grow was not proven. Since these types of dinoflagellates clean up oil-spills, create oxygen, and create algal bloom-tides, there are both positive and negative effects to polluting the waters of the ocean, in effect killing <i>Pyrocystis fusiformis</i> and other dinoflagellates.</p>	
Summary Statement My project is about the effects of pollution on the lifespan and bioluminescence of single-celled algae.	
Help Received Michaela and Sergiu Rotenstein (parents) helped get materials and helped with problems. Howard Kaplan helped me take pictures of algae under a microscope and SunnysideSeaFarms answered questions about algae and providing algae.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Garrett D. Rueda	Project Number J0928
Project Title Is Horse Manure a Possible Energy Source When Compared to Charcoal, Wood, and Buffalo Manure?	
Objectives/Goals There are over 8,000 horses in Ramona, California where I live. Is horse manure a possible energy source? Why hasn't horse manure been used as a fuel source in the past like buffalo chips? I compared the amount of energy(heat) from wood, charcoal, buffalo chips and horse manure to see how horse manure stacked up against these more common fuel sources.Perhaps horse manure could be a possible energy source in a crisis. I wanted to know!	
Abstract Methods/Materials I created and built a fire pit that would act like a calorimeter. Composed of fire bricks it would have the burning fuel in the bottom and a lid of sorts on top in which the can containing water could sit above the heat. At one minute intervals the temperature of the water could be taken with a thermometer and plotted.This was done over several runs with each fuel and averaged. The calories and joules were computed. Calories are computed by taking the amount of water heated in grams, "n" and multiplying by the difference of the maximun temperture obtained minus the beginng temperature, "t". This gives calories obtained and to get joules this figure is multiplied by 4.2.	
Results As expected the charcoal gave the most heat (21,638 joules). Next was the buffalo chips (19,286 joules). Horse manure (12,701 joules) and then wood (10,349 joules) was last. It was very obvious that horse manure could be an energy source. But other factors became apparent during the testing process. The wood, charcoal and buffalo chips were easy to handle and were collect. The horse manure,when dry, crumbles and flakes into tiny pieces. This is why the early settlers on the plains didn't use horse manure- it was very difficult to find and collect!! It also doesn't stack well.	
Conclusions/Discussion Hose manure is another source of energy and therefore heat.It burned very much like other more common fuel like wood and charcoal, and is like buffalo chips in gathering method and cost(free from a kind horse!). It was very interesting to see the differnces in the four fuels and how they burned. But it was clear that horse manure is much more difficult to manage as a fuel because of the way it falls apart when dry.	
Summary Statement Charcoal, wood, buffalo manure and horse manure were burned in a home-made fire pit which acted like a calorimeter to compare heat energy given off.	
Help Received Buffalo chips were gathered at Star B Buffalo Ranch, The Pott Belly Shop provided fire bricks	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Kevin M. Shear	Project Number J0929
Project Title Reptile Road Rage: The Effects of Urbanization on Reptiles and Amphibians	
Objectives/Goals My objectives in this project were to find out whether or not Genesee Avenue, a road in Clairemont San Diego, effects the reptiles and amphibians of Tecolote Canyon.	
Abstract Methods/Materials To begin the study a permit was required from the Tri-City Parks and Recreation Department, City of San Diego California. Fifty 2X2 foot boards were placed in the canyon. They were laid in five linear arrays of ten boards each and placed approximetly 25 feet apart. The coverboards were labeled and placed on both the west and east sides of Genesee Avenue which cuts right through Tecolote canyon. I also used a GPS (Global Positioning Satellite)to record the exact location. Each array started close to the road (board 1 being the closest to the road and board 10 being the furthest from the road). I would go out and look under all fifty boards for reptiles and amphibians. All of my sightings were recorded into a field log and then transferred into an Excel data base.	
Results In my project I found that more reptiles and amphibians were found further away from the road. Boards 1 through 4 are closest to the road and I had more sightings in boards 5 through 10 which are further from the road.	
Conclusions/Discussion At the conclusion of this study I found that Genesee Avenue affects reptile populations in that less reptiles are sighted near the road. This supports my hypothesis, that fragmentation of natural habitats affects reptile and amphibian communities, because most of the sightings were found approximetly 125 feet from the road indicating that the road is a threat and preventing an even spread of reptile communities. This project expands our knowledge about environmental science by showing us that we need to be considerate of our surrounding natural habitats when buliding roads.	
Summary Statement My project is about finding whether or not Genesee Avenue affects reptiles and amphibians.	
Help Received Mother helped edit report; herpatologist, Robert E. Lovich, helped set up project, Excel data and advised me on how to handle reptiles and amphibians.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Michael Sinanian; Alexan I. Yerevanian	Project Number J0930
Project Title How to Prevent the Effects of Acid Rain	
Abstract Objectives/Goals The objective is to find out how acid rain affects a pond environment and to find methods of preventing its harmful effects Methods/Materials A large tank full of natural spring water was left open outside for one month. At the end of the month, 4 half-liter containers, each containing one Elodea plant, were filled with the water from the tank. 2 teaspoons of lemon juice were put into each of the containers to create acid rain like pH. 1 container was left as is, and in the others specific buffers (bases) were added. The containers were left outside. The macroscopic effects on the plant were recorded daily. Samples from each experimental condition were also examined for live and dead microorganisms, under the microscope using the Methylene blue technique. Results After a 10-day study, we found that the hydrated lime is the best material for preventing cell death and wilting of the Elodea caused by acidity. Pure ammonia damaged the plant to a certain degree. Baking Soda was not as effective as the hydrated lime. Conclusions/Discussion From these experiments we can conclude that acidity is a cause of microscopic and macroscopic damage to plants and living organisms in a pond and that this damage can be prevented and controlled. Correcting the pH, however, was not sufficient and buffers offered different levels of protection at equivalent pH correction. From our experiments we can conclude that hydrated lime was the best in preventing microscopic and macroscopic damage to life in the pond.	
Summary Statement What can be done to prevent the damage caused by acid rain in a pond environment?	
Help Received Used lab equipment at school under the supervision of Mr. Kevork Agopian; Mother helped get the materials and put the board together; Father helped in experimental design and analysis; Mr. Raffi Svadjian helped with statistical analysis; Brother gave critical advice	



CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

Name(s) Allison G. Suarez	Project Number J0931
Project Title Metals Removal by Nature's Biofilter	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to determine if the wetland on the Penn Mine site reduces the amount of dissolved metals in the water from the creeks and seepages that flows into Camanche Reservoir from the Penn Mine site.</p> <p>Methods/Materials Water quality data was used from the Penn Mine water quality monitoring program that is performed by EBMUD. In addition, a new sample location was added just below the wetland. This new sample location was used to determine if there was a reduction of metals in the wetland. The wetland was measured for total area and for the most common plants in the wetland. Conditions and changes in the wetland were monitored during the study including: weather, rainfall, and water flow. Water samples were analyzed for the following parameters: dissolved metals, pH, temperature and turbidity.</p> <p>Results The wetland was more effective at reducing dissolved metals during periods of low flows and high detention times. Copper was reduced by 73% in September 2001. The flow was 0.5 gpm and the detention time was 20 days. The January and February 2002 sample data were much different than previous sample data. A seepage (PRSS-3) with very high levels of metals began flowing in January 2002. The only metal that was reduced in the wetland was iron. All other metals increased (except nickel in January) through the wetland. The previous months saw an increase in pH at wetland outlet. However, pH decreased from 5.5 to 4.7 in January; and 5.8 to 4.6 in February.</p> <p>Conclusions/Discussion The wetland was most effective at dissolved metals removal during the months of September, October, and November 2001. The flows through the wetland were low (2 gpm or lower) during sample collection. Flow did not exceed 63 gpm through the wetland during this time. The average flow through the wetland was 8 gpm or less for these three months. The wetland continued to remove dissolved metals in December 2001 except for manganese and nickel with a flow of 32 gpm. The overall removal was not as good as the previous three months. Rain in December increased flows through the wetland, however the high flows occurred later in the month and in January 2002. Loading on the wetland increased with high flows from the rain and most significantly from seepage PRSS-3. The high flows which peaked at 1,706 gpm on January 2, 2002 also dumped sediment in the wetland.</p>	
Summary Statement This project examined dissolved metals reduction in the water flow through the Penn Mine wetland for a period of six months.	
Help Received Mom and Dad drove me to the site. EBMUD provided lab data including my new sample site. Friends helped with plant identification and construction of sample display. Mom and Dad also helped with typing and graphs.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Daniel L. Tibbett	Project Number J0932
Project Title Don't Tread on Me: A Study of the Effects of Off-Road Motorcycles on Mojave Desert Flora	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective is to find if Mojave Desert plants grow in areas used by off-road motorcycles. I think that off-road motorcycle use will damage plant numbers in the Mojave Desert, and with more motorcycle use, the greater will the plant loss.</p> <p>Methods/Materials Method: I made a 3 ft. by 3 ft. grid and divided it into 9, 1 sq. ft. sections. I staked off a 3 ft. by 3 ft. area in the desert (my control) next to an unused motorcycle trail at 4 different sites. I then stretched the string grid over the stakes and counted the number of plants in each grid for 14 weeks, and recorded the numbers in my notebook.</p> <p>Materials: Wooden Stakes, Pencils, Field Notebook, Plant Field Guide, Measuring Tape, String, Epoxy, Hammer, and Camera.</p> <p>Results I found that if a site had only 1 time use, the total plant count didn't change that much. With moderate use, plant re-growth was significantly less. With heavy use, virtually all plant life was destroyed.</p> <p>Conclusions/Discussion My hypothesis was partially correct. The more use of a trail by an off-road motorcycle, the damage to desert flora greater was. But, for one time use, the plant totals were not affected greatly. I believe my study demonstrates that motorcycle riding in desert areas is very harmful to plant life.</p>	
Summary Statement My project is a study to see if Mojave Desert plants grow back in trails made by off-road motorcycle riding.	
Help Received My Mother proof read my report, and helped count plants. My Father (using power saw) cut wood stakes, helped make grid, taught me how to make an Excel spreadsheet and graphs, and helped in counting.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Tara M. Torcaso	Project Number J0933
Project Title What Are the Effects of Pollutants on Aquatic Life?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine what substances pose as the greatest threat to aquatic life in this bioassay test.</p> <p>Methods/Materials For the Acute Test, which lasted for 24 hours, divide beta cups containing seven daphnia and 115 ml of spring water into categories by the volumes of pollutants in each category- (Milk category- 1.15ml, 2.3 ml, 3.45 ml.) (Oil-.575 ml, 1.15 ml, 1.72 ml.)(Glass Cleaner- .575 ml, 1.15 ml, 1.72 ml.)and record the death rate. This test is conducted twice for accuracy. For the Chronic Test, which was a five day exposure of pollutants to daphnia, follow the same steps as the Acute Test except add 13 daphnia and use these volumes of pollutants- (Milk- .575 ml,1.15 ml,1.32 ml.)(Oil- .23 ml,.575 ml,.69 ml.) (Glass Cleaner- .23 ml, .575 ml, .69 ml.) and wait five days. After the five day period, observe under a microscope and record the heart rate per minute, take the PH of the water aqnd conduct 15 times per volume of every pollutant before and after exposure, and record the fatalities.</p> <p>Results Pollution does indeed affect aquatic life tremendously.In the Acute Test, oil and glass cleaner ranged at the highest death rate. In the Chronic Test, oil had the highest death rate and milk and glass cleaner were similar. The Ph changed in both the milk and glass cleaner at the greatest volume of concentration of pollutants and became more acidic. Also, the heart rate increased greatly and because daphnia are transparent and give live birth as well, in high concentration, the young daphnia still growing inside the adult were dead.</p> <p>Conclusions/Discussion The by-products from the biological breakdown of petroleum releases toxins that can greatly affect aquatic life. Car products such as oil and gasoline highly contaminate strom drains that lead to oceans. Cleaning products can cause birth defects, liver damage, and heart difficulties that can terminate an aquatic organism after a long period of time although in some cases it occurs rather quickly. Milk also greatly effects daphnia and probably other forms of marine life for after many days milk decomposes and releases bacteria causing problems. Pollution needs to be prevented from the incredibly toxic substances to the supposedly subtle substance such as milk, for the effects are life threatening.</p>	
Summary Statement It proves how dangerous pollution is and the long-term problems that arise from various volumes of the pollutants.	
Help Received Used grauated cylinders, microscope, and petri dishes from school supplies; Daphnia were provided by Berkshire Biological.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Laura A. Vogelsang	Project Number J0934
Project Title Fire, A Force of Nature: The Effect of Ash Leachate on Soil Components	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to study the chemistry of ash leachate solutions, a by-product of the combustion of wood by forest fires, and its effect on key soil constituents. Hypothesis: Ash leachate (AL) stabilizes clay particles leading to flocculation or aggregation.</p> <p>Methods/Materials Preparation of Ash Leachate (AL) Solution: Ash was collected at actual forest fire sites (Miranda Fire, 2001 and Weaverville Fire, 2001), or produced under controlled burn conditions in a Jotul III Wood Stove, and deionized water mixed with ash (5:1). Determination of Ash Leachate Chemical Composition: Ash leachate solution was analyzed using instrumental analysis. Experimental Model for Determination of AL Effect on Soil Components: A test tube model was developed using 0.5, 1, and 2 grams of kaolin mixed with 40 milliliters of either deionized water, which is the control (CTL), or AL solution and incubated for 0.25, 0.5, 1 and 2 hours. At the end of the incubation period 20 ml of the suspension is removed, transferred to a pre-weighed crucible, oven-dried and weighed.</p> <p>Results The ash leachate composition was defined using standard instrumental analysis. Composition of leachate changes with intensity of burning; grey ash (Jotul III) leached more ions than black (Miranda). Rainfall on ash (Weaverville) removes ions. The ash leachate was used as the test solution mixed with Kaolin suspension vs. the control solution of deionized water demonstrating a profound effect on the 2 gm AL treatment group with dispersion of Kaolin particles up to 19X the amount of suspended Kaolin in the treatment group vs. the control group.</p> <p>Conclusions/Discussion A model to evaluate the effects of ash leachate on a clay suspension was created and evaluated. Ash leachate solutions were prepared. The composition of leachate changes with intensity of burning; grey ash (Jotul III) leached more ions than black (Miranda). Rainfall on ash (Weaverville) removes ions. The measurements demonstrated a profound effect on the 2 gm AL treatment group with dispersion of Kaolin particles up to 19X the amount of suspended Kaolin in the treatment group vs. the control group. This finding does not support the original hypothesis, but rather the ash leachate appears to result in dispersion of kaolin. Ash leachate can have a powerful effect on clay particles, an important component of soils, and may play a role in soil conservation and/or erosion.</p>	
Summary Statement I studied the chemistry of ash leachate and its effect on soil constituents.	
Help Received Father advised on experimental design; CDF Environmental specialists and rangers, provided onsite ash collection support; Tom Benedict, Mad River Hospital Lab, analytical chemistry support; John Berning, Medical Scientist, aided in computer graphics development.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Paul A. Westhart	Project Number J0935
Project Title The Effect of Acid Rain on Oil-Degrading Microbes	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment is to determine if certain oil-degrading microbes are affected by acid rain.</p> <p>Methods/Materials Place 60 mL of distilled water, 20 drops of refined oil, 0.5 g of nutrient fertilizer and a density strip in 7 jars. Inoculate 2 jars with 6 mL of Penicillium, 2 jars with 6 mL of Pseudomonas and 2 jars with 6 mL of Bacterial Blend. The seventh jar is the control jar and contains no microbes. Separate the experimental jars into 2 groups, leaving one group at pH 7.5 and lowering the other group to pH 5 to mimic acid rain. Incubate the jars at 30 degrees Celsius for two weeks. Measure the turbidity of the jars with the density strips and the rate of oil degradation with the oil-degradation scale daily.</p> <p>Results The Bacterial Blend degraded 80% of the oil at pH 7.5 and 50% at pH 5. Pseudomonas degraded 70% of the oil at pH 7.5 and 30% at pH 5. Penicillium degraded 50% of the oil at pH 7.5 and 20% at pH 5. The control jar showed no evidence of oil degradation. The colors of the jars at pH 7.5 were quite turbid compared to the control, indicating microbial population growth and activity. The colors of the jars at pH 5 were slightly darker than the control, indicating less microbial activity and growth than the pH 7.5 jars. The oil was fragmented into tiny droplets in the pH 7.5 jars but not in the pH 5.0 jars.</p> <p>Conclusions/Discussion The data supports my hypothesis that acid rain negatively affects the activity of oil degrading microbes because the microbes become inactive or die due to the acidity of the environment. The results show that bioremediation is an effective method for cleaning oil spills in non-acidic environments.</p>	
Summary Statement My project tests the effect of acid rain on bioremediation.	
Help Received My teacher obtained and supervised my use of the microbes. My dad helped type the report.	



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Carlisle A. Williams	Project Number J0936
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Project Title
How Does Acid Rain Affect the Cell Structure of Spirogyra and Plant Life within Our Ecosystem?

Abstract

Objectives/Goals
My objective was to determine whether water that contains a measurable amount of acid with a pH level below 7 (to simulate acid rain) will negatively affect the cellular structure of Spirogyra and if so, to determine which is more harmful, sulfuric or nitric acid. The sulfuric and nitric acid are administered to simulate acid rain in six fishbowls containing two liters of distilled water and Spirogyra cultures. Two fishbowls will have no acid and neutral pH. Two fishbowls will have 3cc of acid and a 6.0 pH. Two fishbowls will have 12cc of acid and a 3.0 pH.

Methods/Materials
The materias used in the experiment were six Spirogyra algae cultures, six one-gallon (3.79 liter) fishbowls, 12 liters of distilled water, two quarts soil/water mixture (5mg soil and one liter tap water.) Also, six lamps (each with a 40-watt bulb, thermometer, dropper cc-calibrated), a 200x microscope, microscope slides, a pH indicator, and 15cc of 90% water and 10% sulfuric acid (3cc for the second bowl, 12cc for the third bowl), and 15cc of 90% water and 10% nitric acid (3cc for the second bowl, 12cc for the third bowl.) I let the algae cultures grow for ten days. I added the correct amounts of acid to the bowls. I took samples from all bowls 24 hours and 48 hours after the "acid rain" was administered.

Results
After careful observation and processing of the experiment's data, I accepted my hypothesis as correct. My hypothesis is correct because both concentrations of the sulfuic acid rain simulation damaged the Spirogyra cell structure to a greater degree than the nitric acid. Though the nitric acid rain simulation had similar damaging effects to cell structure and color, in both concentrations and pH levels, the sulfuric acid seemed to create greater cell damage and therefore would be considered more harmful to plant life.

Conclusions/Discussion
My results supported my hypothesis and proved that sulfuric acid is more harmful to the cellular structure of Spirogyra than nitric acid. These findings are important because among other things, they show that acid rain negatively affects our ecosystem because it damages the most basic levels of the food chain and thus jeopardizes the higher forms of life. Acid rain also causes changes to the atmosphere, more pollution, and damages trees, which absorb carbon dioxide and produce oxygen.

Summary Statement
How does acid rain affect the cell structure of Spirogyra and plant life within our ecosystem?

Help Received
Father purchased sulfuric and nitric acid from Tri-ess Sciences Inc.



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Jonathan W. Winslow	Project Number J0937
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Project Title
Are Our Coastal Streams Safe?

Abstract

Objectives/Goals
The purpose of my project was to determine whether there are safe levels of total coliform and fecal coliform (E. coli) bacteria in coastal creeks and lagoons of San Mateo County, using State and County standards, and what variables may affect them.

Methods/Materials
Five creeks at San Mateo County and State beaches were tested. Urban and rural locations are the independent variables. Water samples were collected from 2 sites at the five creeks, once per week for 7 weeks. The measured dependent variables are total coliform bacteria, E.coli bacteria, water temperature, and rainfall. Bacterial levels were measured in incubated test plates with specific culture medium, and have a sensitivity of 3-5 minimal probable number of colony forming units per 100 ml (MPN of CFU/100ml. Titrers were determined by dilution series, and MPN tables. Blue wells (galactosidase+) were scored for total coliform bacteria, and UV fluorescent wells (glucoronidase+) indicated E. coli as a measure of fecal coliform. The bacteria levels were graphed for each site per week, and as a function of the dependent variables, and compared to County safe levels.

Results
All 5 creeks had some weeks of unsafe levels of total coliform and/or E.coli. The unsafe levels correlated best with the independent variable of location of the creek: urban areas had more unsafe weekly readings (66% total coliform >10,000 MPN of CFU/100ml and 57% E. coli >400 of all measurements) than creeks in more rural areas (0% total coliform and 14% E.coli). These results supported part of my hypothesis. The results did not support my hypothesis that bacterial levels would correlate with the higher water temperatures and weekly rainfall. amounts.

Conclusions/Discussion
Although one of the urban creeks has been posted as unsafe (San Pedro Creek, Pacifica, CA)the levels in 2 other urban creeks were suprising. Articles suggest San Pedro Creek may be contaminated from leaking sewage collateral lines which connect houses with the main sewer lines. Possible sources for high levels in 2 other major creeks in the Half Moon Bay area have not been identified but may also be from leaking sewage lines or horse stables. Initial heavy rains may have caused a surge increase in bacterial levels but did not correlate later in the study. Cleaning up our creeks is a good idea because they are in State and County beaches which are heavily visited by the public.

Summary Statement
My project determined over a 2 month period whether there are safe levels of total and fecal coliform bacteria in San Mateo County coastal creeks.

Help Received
I had the idea but discussed details of project with my science teacher and parents. My parents drove me to the test creeks every week. I used a heated incubator at my dad's work to grow the bacteria, and a UV light box to measure E.coli. I collected and analyzed all the data. My parent helped me assemble my



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Jeffrey C. Friedman	Project Number J0999
Project Title Can I Breathe?	
Abstract	
Objectives/Goals My objective was to discover how carbon dioxide effects global warming, the greenhouse effect, and the enhanced greenhouse effect by determining which of four gas sources produced the highest concentration of carbon dioxide.	
Methods/Materials The four sources of varied gases included; ambient air, human exhalation, automobile exhaust, and a combination of baking soda and vinegar. I also included wood smoke and exhaust from a hybrid vehicle in my third trial. Gases were collected, and discharged into individual test tubes, which contained a dilute concentration of Bromthymol Blue indicator solution. Each sample was analyzed by titrating with a dilute ammonia solution to measure the concentration of carbon dioxide.	
Results I discovered that the baking soda and vinegar produced almost pure carbon dioxide which isn't a common occurrence in daily life. The auto exhaust from the combustible engine produced ½ as much carbon dioxide but with the volume of cars in the world this is a great amount of carbon dioxide and a main contributor to global warming. The hybrid car produced ½ as much carbon dioxide as the combustible engine vehicle. Human exhalation and wood smoke produced some carbon dioxide. No effects were discovered in ambient air.	
Conclusions/Discussion My conclusion is that global warming is a major problem that can only be slowed down with worldwide participation. I see that hybrid cars could be a significant step towards a solution.	
Summary Statement My project was to explore the relationship between carbon dioxide, enhanced greenhouse effect, and global warming	
Help Received My Dad helped to type my backboard and he collected the samples of automobile exhaust.	