

ESF
in the
High School

Environmental Summit

June 2, 2016

Hosted by

ESF Outreach



A BETTER WORLD THROUGH
ENVIRONMENTAL DISCOVERY

What is *ESF in the High School*?

ESF in the High School is a partnership program between SUNY ESF and High Schools throughout New York State that enables qualified students to:

- Experience college-level course work while still in high school.
- Understand the complex scientific and social perspectives behind the environmental issues that make headlines every day such as the relationship between energy and the environment.
- Learn about and explore diverse interests and career opportunities in environmental science, engineering, management, policy and design - and in related areas such as law, communications, technology and medicine.



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Platform Presentations

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WELCOME AND INTRODUCTION

The Environmental Summit is the culmination of a year's worth of scientific inquiry, skill development, and hard work. Today you will engage in an age-old tradition within the scientific community as you present your work and discuss your results with others who share your passion and interest in your subject. We hope this experience will inspire you to embrace the importance of scientific research and its influence on your day to day experiences and choices. We also hope that you've become active citizen scientists who are concerned with the science behind the headlines as a result of your involvement in an *ESF in the High School* course.

Dr. Richard “Rick” Beal, Assistant Dean for K-12 STEM Education
and Director of ESF in the High School

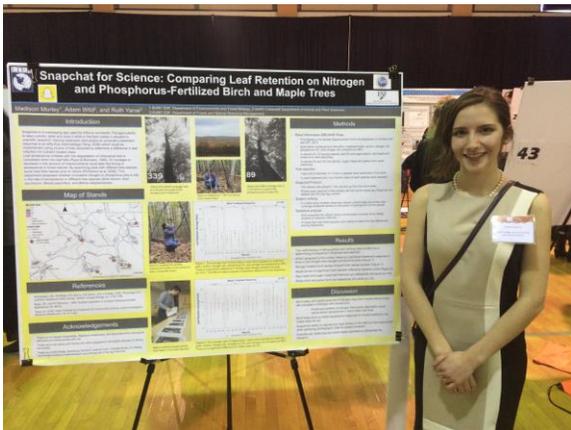
Jake O’Connell, Project Coordinator

Maura Harling Stefl, Administrative Assistant

Schedule for the Environmental Summit

8:00 – 9:00 AM	Registration/Check-in Baker Laboratory Lobby and poster setup in Gateway Center.
9:00 – 11:45 AM	Student Presentations in Baker Laboratory Presentation Rooms.
11:45 – 11:55 AM	Transition to Gateway Center for Keynote Speaker.
11:55 – 12:15 AM	Keynote Address – Gateway Center.
12:15 – 1:15 PM	Lunch and Poster Sessions (Mixer Style) – Gateway Center and Judging of Posters.
1:15 – 1:30 PM	Awards Presentation.

Keynote Speaker: Madison Morley, SUNY College of Environmental Science and Forestry



Madison Morley is sophomore at SUNY ESF majoring in environmental biology. Last year she was in the same seats you are in as a senior at Paul V. Moore High School in Central Square, NY. As a student in Tim Harrison's Global Environment class she did her research project on reintroducing wolves into the Rocky Mountain State Park. After graduating from

high school she participated in the summer research credit offered for ESFHS partner schools here at ESF with the Multiple Element Limitation in Northern Hardwood Ecosystems project. As a result of her work with this forest nutrient cycling project she presented her research at the SUNY Undergraduate Research Symposium this past spring. Madison plans to become a large animal veterinarian and volunteers with the North Country Veterinary Services in Pulaski, NY. Over spring break she assisted with the birth of a calf.

Environmental Summit Presentations

Baker 145				
Time	Topic Category	Student Name(s)	Project Title	School
9:15				
9:30	Sustainable Food Production	SCALISI, R.	BIOMASS OF INDOOR CROP PRODUCTION UNDER DIFFERENT COLORS AND INTENSITIES OF LIGHT	Fabius-Pompey
9:45	Sustainable Food Production	PEREZ, D. and SHARPE, S.	A COMPARISON OF GROWTH RATES OF SUNFLOWER AND LETTUCE UNDER NORMAL AND HYDROPONIC GROWING CONDITIONS	Fabius-Pompey
10:00	Pollution and Remediation	FITZPATRICK, B. TANNER	BIOREMEDIATION: THE SOLUTION TO CANAL POLLUTION	Lafayette
10:15	Pollution and Remediation	Hagan, E.	USING GAS CHROMATOGRAPHY TO ANALYZE PESTICIDES	Rochester Academy Charter School
10:30	Pollution and Remediation	Johnson, D.	CONTAMINATED WATER	East High School
10:45	Biodiversity and Natural History	Chapman, J and K, Reed	WILDERNESS SURVIVAL SKILLS AND URBAN YOUTH EMPOWERMENT	East High School
11:00	Pollution And Remediation	GREEN, J. and J. LAPORT	Environmental Health and Urbanity: The Effects of Community Parameters on the Maintenance of Green Spaces	World of Inquiry
11:15	Pollution and Remediation	BARBER, O. and J. KONECNY	THE EFFECTS OF MYCELIUM ON OCEANIC OIL SPILLS	Union-Endicott
11:30				

Baker 146

Time	Topic Category	Student Name(s)	Project Title	School
9:15	Alternative Energy	ALEXANDER, A.	A DETERMINATION OF SOIL LOSS WHEN GROWING WILLOW BIOMASS IN FABIUS, NY	Fabius-Pompey
9:30	Alternative Energy	POWLESS, N. and J. RAMIE	ELECTRIC BUSES HELPING LAFAYETTE'S ENVIRONMENT	Lafayette
9:45	Alternative Energy	HODGES, D.	HYDROPONICS: THE EFFECT ON PLANT GROWTH WHEN YOU ALTER SUBSTRATES.	Chittenango
10:00	Ecological Economics	MCCONNELL, D. and M. MILLICK	THE STUDY OF EPIGENETICS THROUGH PHENOTYPIC EXPRESSION	Chittenango
10:15	Ecological Economics	POMPEII, M. and A. KASSON	THE ELIMINATION OF STYROFOAM LUNCH TRAYS	Vestal
10:30	Alternative Energy	BARCELONA, G.	ENERGY SOURCES:USEFULNESS IN ROCHESTER	East High School
10:45	Alternative Energy	BRINK, B., A. NIERMEYER, A. SPRAGUE	THE FEASIBILITY IN PRODUCING AND USING BIO-DIESEL	Vestal
11:00	Alternative Energy	BLUM, H. AND E.LONG	BIO-FUELED SCHOOL -THE POSSIBILITIES OF ALTERNATIVE FUELS AND SCHOOL TRANSPORTATION	Lafayette
11:15				
11:30				

Baker 148

Time	Topic Category	Student Name(s)	Project Title	School
9:15	Ecology and Climate Change	WOLF, E. KEOHANE, E.	THE EFFECT OF TEMPERATURE VARIATIONS ON DAY FIVE OF BLACK SEX LINK CHICKENS GENDER.	Central Square: Paul V. Moore HS
9:30	Biodiversity and Natural History	PILCHER, T. and PITTS, M.	CREATING A NATIVE TREE ARBORETUM AT FABIUS-POMPEY SCHOOLS	Fabius-Pompey
9:45	Pollution and Remediation	ROCKWOOD, R, and L. WALDRON	THE ENVIRONMENTAL EFFECTS OF ACID RAIN ON THE INDIGENOUS POPULATIONS OF HYPNUM CUPRESSIFORME	Central Square: Paul V. Moore HS
10:00	Sustainable Food Production	CACACE, J. and EATON, N.	USING MINIMAL ENERGY TO SUSTAINABLY GROW PLANTS YEAR ROUND IN CENTRAL NEW YORK	East Syracuse-Minoa
10:15	Pollution and Remediation	LUKACH M, and D. NOVITSKE	EFFECTS OF HEAVY METALS ON BRINE SHRIMP AND SCUD POPULATIONS USING LD50	Union-Endicott
10:30	Alternative Energy	THOMPSON, M. A, HUSEINBASIC.	ANAEROBIC DIGESTION: USING BIO-SOLIDS TO PRODUCE A RENEWABLE FUEL SOURCE	East Syracuse-Minoa
10:45	Pollution and Remediation	HOHM, I. and E. STEWART and T. BEAULIEU	CONSTRUCTED WETLANDS	East Syracuse-Minoa
11:00	Sustainable Food Production	POLLOCK, ROBBIE; MCDERMOTT, J; GREEN, C; DEXTER, E	THE EFFECT OF RECYCLING IN AN ELEMENTARY SCHOOL	Fulton: G. Ray Bodley High School
11:15				
11:30				

PLATFORM PRESENTATIONS

Alternative Energy

ALEXANDER, A. - *Fabius-Pompey* **A DETERMINATION OF SOIL LOSS WHEN GROWING WILLOW BIOMASS IN FABIUS, NY** Willow is currently an emerging biomass. However, when growing willow, soil erosion is an issue. Willow can be a high efficiency crop to use for biofuel if soil erosion is limited. I chose this topic because as growing willow becomes more popular, it will help to know which soil types would be best to plant it in. I used the USDA's computer program Revised Universal Soil Loss Equation 2 (RUSLE2) to determine which soil is the most desirable to grow willow, in terms of soil erosion. Using the Soil Survey of Onondaga County, NY that was created by the USDA Soil Conservation Service, I was able to find all the soil types that are in the Fabius, NY area. I computed results for these soils. I computed results for growing willow without a cover crop and with winter rye mid-September seeding as the cover crop. With the winter rye, every soil type eroded less than without any cover crop. Without a cover crop, the top ten soil types with the least amount of soil loss ranged from 0.56 t/ac/yr to 6.0 t/ac/yr.. With winter rye mid-September seeding as a cover crop, the top ten soils types with the least amount of soil loss ranged from 0.0089 t/ac/yr to 0.072 t/ac/yr. Ideal values of soil loss are no more than 5.0 t/ac/yr. Without a cover crop, the top ten soils with the least amount of net event runoff were all 4.3 in/yr. With winter rye as a cover crop, the top ten soils with the least amount of net event runoff were all 0.89 in/yr. These results were shared so that researchers could make use of them. Future studies of this include expanding the soil types to all types in New York State.

BARCELONA, G. – *East High School* **ENERGY SOURCES: USEFULNESS IN ROCHESTER** Sources of energy used to power a home can be controversial to discuss. This study examined characteristics of various sources of power and if Rochester should use a combination of these sources or continue using mostly natural gas. Currently, Rochester uses mostly natural gas for power. However, there are better sources of energy, such as solar and wind power. Most of the alternative sources of energy are commonly un-favored sources. If natural gas disappeared from the energy market, then Rochester would most likely have to rely on a combination of nuclear, solar, wind, and hydroelectric power based on availability and economics. This investigation involved researching each type of power, with help from information and resources from Fairport Electric. My research proved that the popularity and low price of natural gas power is preventing RG&E from converting to a combination of power sources. This is important because RG&E would have fewer burdens operating their plant and the air would be cleaner.

BLUM,H, and E.LONG – *Lafayette* **BIO-FUELED SCHOOL -THE POSSIBILITIES OF ALTERNATIVE FUELS AND SCHOOL TRANSPORTATION** Our purpose is to investigate the economic and environmental effects of our school district's transportation department. Our community is located in a rural area with a busing system that covers over 100 miles per day. With this in mind, we believe that it is our duty to provide an alternative fuel option to lessen the environmental impact and counteract the distance traveled. We believe that the current diesel fuel that is being used is not as environmentally friendly as the other options. However, some of the other options would cost the district considerably more money than is spent currently. We investigated the possibilities of using bio-diesel, ethanol, propane and compressed natural gas. By calculating the costs of switching from our current fuels, our findings will show that the fuels do have a considerably higher cost. We found that bio-diesel is the most environmentally and economically friendly. The cost of switching over to bio-diesel would require a converter for the cars that run on gasoline, but not on the buses which account for 2/3 of the fuel budget. Though the cost would be considerably more to start out with, over time it would lessen the environmental impact of our transportation department.

BRINK, B., A. NIERMEYER, and A. SPRAGUE – *Vesta* **THE FEASIBILITY IN PRODUCING AND USING BIO-DIESEL** Conventional diesel creates an exorbitant amount of greenhouse gas emissions that are simply released into the atmosphere. Bio-diesel has been shown to burn cleaner than conventional and therefore, we think it would be more efficient and environmentally sustainable. To investigate this hypothesis we first researched the use of bio-diesel versus the use of conventional diesel. Within this research, we looked into how much is consumed, the

environmental impacts and the predicted future impacts of conventional diesel versus bio-diesel. Each of the production processes was also examined. After our research was concluded, we produced our own bio-diesel in order to gather information on the ease of its production using both waste oil and new vegetable oil. We then took samples of both conventional diesel and of the bio-diesel we produced and, using an alcohol burner within a calorimeter, determined the caloric output of each by heating a small amount of water and measuring the increases in temperature. The results were then compared to determine if either fuel was more efficient.

HODGES, D. – *Chittenango* **Hydroponics: The Effect on Plant Growth when you alter the Substrates.** In this experiment the viability of small scale hydroponic systems was tested with different substrates. Hydroponics is the way in which plants are grown through water being pumped through substrates, then being recycled back through the system again. Aquaponic systems are very similar to hydroponics but with the addition of fish to supply the plants with nutrients in a closed system. In this experiment hydroton and vermiculite, very popular substrates used in these systems, were tested to see which would make a more successful system that could be made at home. The experiment was run for three weeks; it was stopped due to complications which could be found in the results section. The final results concluded that my hypothesis was correct but further testing should be done.

POWLESS, N. and J. RAMIE – *Lafayette* **ELECTRIC BUSES HELPING LAFAYETTE'S ENVIRONMENT** If the school district was to get electric buses, it could impact the local environment in a positive way. These buses could reduce the carbon dioxide gas released into the environment surrounding LaFayette. Although there are downfalls to electric buses, including electric plants producing electricity that also produce harmful fumes, there are many upsides to increasing the use of electric buses. In order to determine this topic as feasible, we determined the average mileage of one of our buses traveling in one day to be about 100 miles a day. We also determined that though the cost would be high getting the buses, and we'd need to get double the amount because the electric buses fit half the amount of people that they seat now, the overall health outcome and money saved in the long run would be high. The price of diesel is higher than the price of electricity, \$4.20 a gallon to \$0.106 per kWh, for powering the buses, meaning it would be cheaper to obtain an energy source to power the buses. The estimated millage that batteries can run, is also about 100 miles which should be enough for the buses because over the course of a day they aren't running the whole time, and when they're not, they can be charging. Having the Lafayette district convert to using electrically powered buses has many positive outcomes for long term prices and health benefits for the children who ride the bus as well as the drivers.

THOMPSON, M. and A. HUSEINBASIC. - *East Syracuse-Minoa* **ANAEROBIC DIGESTION: USING BIO-SOLIDS TO PRODUCE A RENEWABLE FUEL SOURCE** The students at East Syracuse Minoa Central High School conducted a five month research project spanning from the winter to the spring of the 2015-16 school year. Students traveled to the Cleanwater Educational Research Facility (CERF) in the village of Minoa weekly and studied a single phase bio-digester to measure the temperature and Ph of the bio-solids collected from the Village Minoa. Students also recorded the volume of the methane produced by the Digester. Early on in the recording of the Ph and temperature of the bio-solids, there were fluctuations in the feeding times for the Digester in order to find the most suitable environment for bacteria colonies. In the future, the Village of Minoa has the possibility of using bio-solids as a renewable energy source.

Biodiversity and Natural History

CHAPMAN, J and K, REED - *World of Inquiry* **WILDERNESS SURVIVAL SKILLS AND URBAN YOUTH EMPOWERMENT** This project studies the effect of wilderness survival programs on youth empowerment. This paper examines the youth state of teenagers and how they respond to wilderness survival programs. A variety of different programs will offer alternative ways for youth to feel more empowered. Are methods are as follows; first, survey the attitudes and habitats of teenagers in urban areas of Rochester. Second, divide the survey group into two groups; the first subgroup will participate in wilderness survival skills programs, while the second group will be used as the control and will continue with their regular routine. Third, in partnership with Earthworks Institute, a regular schedule of wilderness survival programs will be established over a 6 week time period. Forth, another survey will be conducted 3 weeks into the program. Fifth, a final survey will be conducted after 6 weeks. Finally, we will analyze data and compare results. We expect the results of this research to prove that if teens are encouraged to experience wilderness survival programs, then they will feel more empowered in their own communities.

PILCHER, T. and PITTS, M. - *Fabius-Pompey* **CREATING A NATIVE TREE ARBORETUM AT FABIUS-POMPEY SCHOOLS** We wanted to make an outdoor classroom where children or young adults can see the science they are learning in a conventional classroom in action, in real time. The kids could measure the saplings growth or the width of the trunk over a period of time. They can also see relationships between the trees and the environment, also the relationship between the animals and the trees where the trees are planted. Some suitable species would be, White Pine, Red Maple, Red Oak, Black Oak, Cotton Wood, Black Cherry, American Beech, Basswood, and Silver Maple. So, we took a soil sample where the trees were most likely to be planted we split the sample in half. Separated each component, and weighed them individually (excluding the sod). That way we could find the soil type through the percentage of the components to the overall sample. We also tested pH, N, K, and P. Based on that data we determined trees that were suitable for the soil type and characteristics. Then, we mapped out where the trees could be planted where they were most likely to survive. Next, we looked for nurseries that had the five trees we were looking for. One of our goals is for this to be an ongoing project. In other words, we hope to pass on this project to people looking to take this course next year, that way the arboretum can grow into that ultimate outdoor classroom we envisioned when we started this. Hopefully, every year a student takes interest in it and grows in by five trees and maybe consider a thing that we might not have that'll increase the tree's chance of survival.

Ecological Economics

GREEN, G. and LA PORT J. - *World of Inquiry* **HEALTH AND ENVIRONMENTAL URBANITY** Greenspaces are important to neighborhoods and have been a part of our environment for centuries. As our Green Spaces continue to prosper and live on it's critical that we as a community do our best to protect them, because our green spaces help provide not only better looking quality to our neighborhood but also benefits our health. The healthier our green spaces are, the more the community will have a desirable appeal. Me and my partner, Jarell Green hypothesized that there are various factors that restrict a community's green space.

MCCONNELL, D. and M. MILLICK – *Chittenango* **THE STUDY OF EPIGENETICS THROUGH PHENOTYPIC EXPRESSION** Epigenetics studies the changes in organisms caused by modification in gene expression. An organism's genotypes can be affected by the environment. The purpose of this experiment was to monitor growth patterns of plants with modified genotypes from multiple generations to track the inheritance of various phenotypes. Epigenetics is valuable because it can be applied to analyze gene expression, human diseases, and new treatment options. The study was done in a classroom setting over the course of 8 weeks. Data included the monitoring of plant height, temperature, light intensity, humidity, and physical characteristics of individual plants. Over the course of the study, the seeds were planted and placed under a 24-hour

light source where they were monitored daily. The Boyce-Thompson Institute was contacted at the conclusion of the experiment to evaluate the findings. It was concluded that the experimental types were infertile and, therefore, not able to seed. The offspring generation mostly resembled the mutant-type plants rather than the wild type. The results and conclusions will be discussed at the environmental summit.

POMPEII, M. and A. KASSON – *Vestal* **THE ELIMINATION OF STYROFOAM LUNCH TRAYS** For many years, the Vestal High School has been using Styrofoam lunch trays. We researched the impact that the use of Styrofoam trays has on the health of the environment and the consumers. We determined that the composition and chemicals involved in the production and use of these trays is what causes them to be detrimental. Healthier alternatives include reusable plastic trays and biodegradable/compostable trays. In order to bring this information into the eye of the public, we created a website and presented our findings to the school board, the Parent Teacher Organization, the Vestal faculty, and Chinese exchange students to gain support for our cause. By holding numerous meetings with the superintendent, the public information coordinator, and the food service director, we discussed economic feasibility and logistics for eliminating Styrofoam. In order to gauge the public's opinion, we created a survey on our website and on our district's homepage pertaining to the different options of dealing with the Styrofoam trays. We received a range of data from students, parents, community members, and others. The purpose behind this initiative was to gain the support of the community and school officials in hopes that the district will transition from the use of Styrofoam to a healthier and more sustainable alternative.

Ecological Footprints and Energy Audits

WOLF, E. and KEOHANE, E. - *Central Square: Paul V. Moore HS* **THE EFFECT OF TEMPERATURE VARIATIONS ON DAY FIVE OF BLACK SEX LINK CHICKENS GENDER.** Researchers at Paul V. Moore High School conducted an experiment on six dozen chicken eggs to observe the effect of temperature variations, if they occurred on day five of incubation. The hypothesis stated; if temperature was spiked three degrees Celsius for one hour on day five, then more of the chicks would be female, whereas if temperature was dropped three degrees Celsius, more chicks would be male. To test this hypothesis, researchers set up three incubators. Incubator A was spiked three degrees, Incubator B dropped three degrees Celsius, while the control incubator (C) remained at 37.5 degrees Celsius. The eggs used were classified as black sex link chickens. To keep embryos from sticking to the shell, researchers had to hand turn the eggs three times daily, once at 7:20am, at noon, and again at 3: pm. After the requisite 21 days chicks began to hatch and data collected. On the first trial, only three hatched. The sheer lack of data leads to the results being deemed inconclusive. The low rate of successful hatchlings may have been a result of a culmination of issues that arose during the incubation period. Factors such as non-fertile eggs, school wide power outage, and the inability to rotate eggs over weekends, may have all played a role in the nonperformance of the eggs. It was determined after 72 hours of the expected hatch date, only 9.778% were fertile. As a result, a second experiment was set up to further investigate the hypothesis, which is currently underway. Beyond the initial results, questions of further investigation for research were formed to expand upon gained knowledge.

Ecology and Climate Change

No Submissions

Pollution and Remediation

BARBER, O. and J.KONECNY - *Union-Endicott* **THE EFFECTS OF MYCELIUM ON OCEANIC OIL SPILLS** Our experiment aimed to investigate if mycelium is able to decompose oil in an oceanic setting. Our prediction set the mycelium to be fully capable of decomposing the oil, the cotton setup was predicted most effective. This experiment was also performed to see which material if any is financially practical for bioremediation. After gathering 3 organic fibers: peat moss, coir, and cotton, and we inoculated them with mycelium by planting a slice of mushroom brick into the fibers. Then, once they were inoculated we put the organic fibers in nets then we put wooden dollies on each side of the length of the net and put dollies at the end and zip tied them together to create the base of the raft. Following this, we zip tied empty water bottle on all four sides of the raft. The setup we used was consistent with a design similar to that of a catamaran. This flotation device was designed to keep the mycelium out of the salt water to reduce the chances of mycelium death. It's clearly evident that our experiment has provided relevant, important results that can help in future studies.

FITZPATRICK, and B. TANNER – *Lafayette* **BIOREMEDIATION: THE SOLUTION TO CANAL POLLUTION** This study was performed to find which methods of bioremediation are suitable for use in the vast collections of drainage canals stretching between the Southeastern Florida Coastal Zone (SFCZ) and the Everglades. The series of canals and dikes constructed in between the SFCZ and the Everglades at the beginning of the last century now pose an environmental problem that requires a more effective alternative for purification of built up, polluted sediment. The bioremediation practices of forced aeration, as well as introduction of the pollutant filtering Eastern Oyster, offer cost effective options for decontamination of polluted canal sediment. This study not only found that forced aeration of areas with the greatest concentration of contaminated sediment, but also that it is a much more cost effective alternative to dredging. The alternative that the water filtration capabilities of the Eastern Oyster, *Crassostrea virginica*, would be needed is ruled out in this research, because of its potential to become an invasive species in the area of the study. Although this study puts great importance on mending the wounds of pollution in the canals separating the SFCZ and the Everglades, more attention must be paid to eliminating the causes of pollution within the Everglades, specifically that of mercury poisoning via acid rain.

GREEN, J and J. LAPORT- *World of Inquiry* **Environmental Health and Urbanity: The Effects of Community Parameters on the Maintenance of Green Spaces** Green spaces have always been an essential part of human connection with the environment. However the maintenance of green spaces and the limitations within a given community is believed to have a connection. We believe that if green space maintenance encounters negative limitations and factors, then as the limitations increase, the maintenance of the green spaces will worsen and decrease. We care about this issue because green spaces benefit our health and continue to support ecosystems and improves our communities' environment. In this sense, it is imperative that our local green spaces should be given extreme care and attention. We have went about this issue by designing a plan of action, setting up meetings with associates such as Genesee Land Trust and by conducting interviews with managers of specific trails within local and rural townships. We have collected research and data from various sources listed and from these interviews to come up with specific parameters that could limit green space maintenance.

HAGAN, E - *Rochester Academy Charter School* **USING GAS CHROMATOGRAPHY TO ANALYZE PESTICIDES** The purpose of our experiment was to develop a method that detects pesticides in fruits and vegetables. Developing a method is important so that we can further use the method to find pesticides in fruits and vegetables we eat daily. Our main focus was getting familiar with gas chromatography and how it works to come up with our method. A method was developed for analyzing pesticides in fruits and vegetables.

HOHM, I. and E. STEWART and T. BEAULIEU - *East Syracuse-Minoa* **CONSTRUCTED WETLANDS** Students at East Syracuse Minoa Central High School measured the effectiveness of constructed wetlands on wastewater treatment at the Clearwater Educational Research Facility (CERF) located in Minoa, NY over the course of the 2015-2016 school year. Students tested the pH, temperature, and ammonia content of the water at certain intervals as it progressed through the process. Through sampling, the students concluded that the wetland has a drastic effect on the ammonia content of the water while the temperature and pH remain relatively constant and have no bearing effect on the ammonia content. The students have found a correlation between living autotrophic and heterotrophic bacteria in the wetlands, and the change in ammonia content which ranges from 30 Mg/L at the start of the process to less than .1 Mg/L by the end. These discoveries can have a significant impact on the development and design of future constructed wetlands as well as inform decisions to implement constructed wetlands into new environments in the future.

JOHNSON, D. - *East High School* **CONTAMINATED WATER** The Genesee River has been the center point for the dumping of pollutants. The company Kodak has been dumping its chemical waste in the river for years; almost permanently destroys the ecosystem within and around the river. Many organisms have been killed or pushed out of the ecosystem by these harmful chemicals. The macroinvertebrates are an indicator of water quality and can give away the exact health of the river. The use of this indicator species is very critical to the experiment. As it is how I wanted to approach the problem to make clear the extent of the issue and damage. The samples collected from the Genesee river were also important to seek out which parts of the river are more polluted than others.

LUKACH M, and D. NOVITSKE - *Union-Endicott* **EFFECTS OF HEAVY METALS ON BRINE SHRIMP AND SCUD POPULATIONS USING LD50** Brine shrimp are commonly used for toxicity testing in saline aquatic ecosystems because of their sensitivity to heavy metals and other toxins that runoff into bodies of water. Brine shrimp need a saline water solution to be able to survive so they cannot as accurately be used to test toxicity of freshwater ecosystems. Scuds are a similar organism that dwells in freshwater ecosystems that are sensitive to toxicity levels on water. Scuds may be a viable alternative to testing toxicity for freshwater ecosystems. The experiment was designed to test two different heavy metal ions, copper (II) and lead (II), that could runoff into aquatic ecosystems. In each trial, 5 organisms of the same species were put into small glass containers with 10 mL of solution, keeping the environment constant between species, and the heavy metal ion solution was administered directly to the water. Once the compounds were exposed to the systems, they sat for 24 hours and the numbers of dead organisms were counted. This data was then used to find the lethal dose using the LD50 test procedure. The data obtained from each organism was compared to each other to find if there was enough similarity to sensitivity to the toxins so that they could be used interchangeably in toxicity testing.

ROCKWOOD, R, and L, WALDRON - *Central Square: Paul V. Moore HS* **THE ENVIRONMENTAL EFFECTS OF ACID RAIN ON THE INDIGENOUS POPULATIONS OF HYPNUM CUPRESSIFORME** Hypnum cupressiforme is a common species of moss found in the backyards and dark wet areas of the local forest. As canaries deaths are analogous to unhealthy conditions in mines, so moss health can be used as a warning marker for unhealthy conditions. As such, this seemingly simple plant deserves more investigation.

Sustainable Food Production

CACACE, J. and EATON, N. - *East Syracuse-Minoa* **USING MINIMAL ENERGY TO SUSTAINABLY GROW PLANTS YEAR ROUND IN CENTRAL NEW YORK** Students at the East Syracuse Minoa Central High School conducted research at the Cleanwater Educational Research Facility located in the Village of Minoa, NY, during the 2015-2016 school year. Students studied plant growth in a "brown house," heated throughout the winter from heat generated by an adjacent compost pile. The heat was transferred from the pile to the soil through Pex tubing filled with a fluid. Minimal traditional energy inputs powering only a light fixture and water pump were used for plant growth and heat regulation. Watering was automated by utilizing a containment system that was designed to be gravity fed. Students took weekly temperature profiles of the compost pile, in addition to soil temperature and moisture readings inside the brown house. Temperatures were stable enough for plant growth to stay sustained throughout the coldest winter months. The data received from the plant growth of the strawberries, beans, lettuce, and pepper plants proved that the use of the compost pile as a heat source is feasible in locations with extreme temperature changes. The results relate to the agriculture industry is useful for decreasing food miles by allowing local growing even in urban areas as well as lengthening growing seasons in areas where that is a limiting factor.

PEREZ, D. AND SHARPE, S. - *Fabius-Pompey* **A COMPARISON OF GROWTH RATES OF SUNFLOWER AND LETTUCE UNDER NORMAL AND HYDROPONIC GROWING CONDITIONS** My partner and I both wanted to do a project on a unique way to grow plants (even during harsh weather). Hydroponics are plants or seedlings growing without soil (with adequate minerals and sunlight and water). As partners, we both grew sunflowers seedlings and lettuce seedlings hydroponically and normally (in soil). In the hydroponically growing setup, lettuce and sunflower seedlings were put into pots with pea gravel which were put into holes in a Rubbermaid 10 Gallon Tote where a water pump cycled water to the seedlings. Measurements were taken of the seedlings around the same time each day for 28 days straight to see which method would help the seedlings to grow taller and better in a given period of time. Hydroponics could help solve food problems in the future (due to when food cannot be grown during the winter). Hydroponics helps plants or seedlings to grow all year round. The hydroponics did indeed help the seedlings to grow taller and better. The seedlings that underwent hydroponics grew significantly larger and better than the seedling that grew normally.
Keywords: hydroponics, sunflower, lettuce

POLLOCK, R.; J, MCDERMOTT, C. GREEN, and E. DEXTER - *Fulton: G. Ray Bodley High School* **THE EFFECT OF RECYCLING IN AN ELEMENTARY SCHOOL** Our goal for this project is to spread awareness about the importance of recycling to the elementary school students. We gathered information and statistics about landfill space and recyclable materials, and presented them in a PowerPoint to the 5th and 6th grade students at Granby Elementary. Landfills are full of recyclable materials and this creates multiple environmental problems. This is why we stressed the importance of recycling the younger generations so that they grow up knowing what the right thing to do is. We started a recycling program at the elementary school much like the one at our high school, and we have returned twice weekly to measure the amount of materials and help them with any questions they may have about the recycling process. The amount of materials the school has recycled has increased slightly each week, just as we expected.

SCALISI, R. - *Fabius-Pompey* **BIOMASS OF INDOOR CROP PRODUCTION UNDER DIFFERENT COLORS AND INTENSITIES OF LIGHT** For this experiment I modeled indoor gardening. As a result of experimenting which color light is the most beneficial for indoor crop production of early contender bean plants, high intensity of white light proved to be the most productive. I first experimented with bean seeds growing under red, blue, and white single light bulbs light in separate compartments for about seven weeks with ten pots in each compartment, two seeds per pot. After even the first three weeks, the white light proved to produce the sturdiest, wide-leaf, fruitful plant, while those under the red and blue light were tall, skinny and weak.

Seeing that the white light was clearly the most productive, I conducted a second experiment in which I grew the same type of bean seeds under different intensities of white light: one bulb in one compartment, two bulbs in another compartment, and three bulbs in the third compartment. <<the light bulbs were printed to have 10 Watts, but after measuring the wattage with a power-output meter, each bulb proved to have 9.0 per bulb>> The single-bulb compartment produced a power output of 9.0 Watts, the double-bulb compartment produced 18.0 Watts, and the triple-bulb compartment produced 27.0 Watts. Just by looking at the plants over the seven-week period, I could infer that the three-bulb compartment with the most intense power output had the most rapid growth and provided the most foliage. But to find out which lights were most efficient, I then measured the biomass in each compartment. I did this by rinsing out the soil from the root systems, cooking them so they dry out, and then weighing the total biomass of each compartment on a scale. The single-bulb compartment had a biomass of 2.68g, the double-bulb compartment had a biomass of 5.08g , and the triple-bulb compartment had the greatest biomass of 10.5g. I then calculated which light intensity was most efficient in terms of Watt/gram--the result with the highest numerical value is the one that is most efficient because it will produce the most amount of biomass per Watt. For the single-bulb compartment, $9.0W/2.68g = 3.36W/g$. The double-bulb compartment, $18.0W/5.08g = 3.54W/g$. The triple-bulb compartment, $27.0W/10.5g = 2.57W/g$. From these results I concluded that the efficiency of this crop production experimentation peaked in the compartment with two white light bulbs because it produced the highest amount of biomass per Watt.

POSTERS

Alternative Energy

BROWN, R. and S.GRANT - *Syracuse Academy of Science Charter School* **BURNING WOOD** Our project is about the different types of wood. What types of wood burns the fastest and what types burn the slowest. We thought this was a great testing idea for the people that like to go camping. They will be able to figure out what types of wood they should get so it can be able to last for a while.

CHARETTE, S. - *Fabius-Pompey* **INVESTIGATING THE EFFECT OF COLORED GELS ON SOLAR CELLS POWER OUTPUT** Solar cells don't absorb all the colors of the visible light spectrum or, some are absorbed more than others. I used a single 2 volt solar cell and placed colored films over and measured the voltage of each one. This resulted in showing there are three peaks in voltage – orange, yellow and blue. Since solar cells are made of silicon, they mostly use the red and orange ("The Naked Scientists."). What can we do to make these cells use more colors of the spectrum and not waste potential solar energy? This problem is in an experimenting stage attempting to use multi-layered solar cells. This would allow one layer to absorb one color then another to absorb a different one and so on. The layers would need to be made of different materials that are not silicon. This would make the cost of solar cells go up since silicon is the cheapest material possible. So the question is, what other materials can we use to absorb other colors like silicon absorbs the red and orange light? Also, what can we do to still make solar panels made of these materials be affordable for everyday people?

CONNER, L. - *Syracuse Academy of Science Charter School* **WATER WHEEL EFFICIENCY** This project analyzes the effectiveness of a water wheel based on the ones used before water dams were introduced. I determine the factors that make a water wheel work well and not so well. Then I explain why they were replaced with dams by comparing them.

CROSS, N., R. GYLLENHAMMER and C. STOCKDALE - *Union-Endicott* **COMPARING THE EFFECT OF SUPER PHOSPHORUS CONCENTRATION AND CARBON DIOXIDE CONCENTRATION ON ALGAL GROWTH FOR BIOFUEL USE.** Algae have the potential to be a major fuel source due to its high productivity and its ability to convert pollutants from the environment into sustainable biofuels. By altering the growing conditions of algae and recording the various growth rates of the samples, it is possible to determine the prime growing conditions for algae cultivation for use as biofuel. Our study relies on the use of various nutrients to determine the ideal environment for algal growth. We decided to use two common resources, carbon dioxide and phosphates, to conduct our experiment. We used a total of six 200 mL samples of water with 3 mL algae solution, three with mixed algae and three with spirogyra, and allowed them three weeks to grow under the same conditions (temperature, lighting, water amount, pH, etc). We then added a phosphate supplement to one pair of the samples (one mixed, one spirogyra), used a CO₂ generator to add CO₂ to two of the samples, and left two samples in the previous growing conditions with no additional nutrients as a control. Our prediction was a larger increase in the rate of growth in the phosphate samples rather than the carbon dioxide samples. We also hypothesized that the mixed algae samples would show a greater increase in growth than the spirogyra samples. In the end we discovered which factor had the greatest impact on algal growth rates and which type of algae grew best, paving the way for countless possibilities in the field of biofuel and carbon dioxide remediation.

CUTLER, D - *Syracuse Academy of Science Charter School* **THE CHEAPEST AND MOST EFFICIENT WIND TURBINES** My project mainly focuses in the ability to use our wind resources in order to produce much needed energy. I strongly believe that multiple test runs of numerous man made materials, in a sense, will provide our best options for an efficient wind energy providing model. We have been reducing energy found within such trials that often include the study of physics and mechanisms. With this project, I hope to influence scientists, of energy background, to alter their path towards a more organic style of work.

DANCIL, I. and M. PHONHARATH - *Rochester Academy Charter School* **ARE FOSSIL FUELS AN OVERALL BETTER ENERGY RESOURCE THAN HYDROPOWER** The goal of our project was to compare fossil fuels and hydro power energy. Throughout our research we found positive and negative impacts done to the environment caused by both hydro power and fossil fuels. Overall, our research lead us to the conclusion that hydro power is a better energy source for the environment based on the amount pollution emitted, maintenance and energy returned on investment (E.R.O.I.). This was due to hydro power only polluting when it is constructed and fossil fuels polluting whenever they are burned, and fossil fuel also having a low E.R.O.I. due to it not being produced enough to reach its usage rate.

KEPLINGER, J. - *Fabius-Pompey* **BUILDING A SOLAR CELL PHONE CHARGER** I chose the task of building a solar powered cellphone charger because I wanted to find a cleaner way to charge a cellphone. Most people in the United States have cellphones and if there was a more environmental friendly alternative to charging phones then it would be very helpful because of the controversy over other methods of obtaining energy, and solar power is one of the cleanest forms of energy. Building this took very few parts and only soldering was one of the only skills necessary. After completing assembly of the charger I wanted to test out the ability of the solar energy compared to normal charging methods, to see if it was as efficient time wise as normal methods of charging. The process I chose of doing this was letting my solar-powered charger charge in mid-day sunlight for two hours and then charging my phone with the built up energy gained from the sun. I compared this to charging my phone normally to an outlet for the same amount of time as I let my solar powered charger go for. Although I feel as if I covered this project well, further studies could be done on this project with means of improving cost, efficiency, and size. Cost could be addressed with more improvements the current model I used. Efficiency could change with using different types of chargers and solar panels, and size could be addressed with how it is put together and stored.

RENGIN, B. - *Rochester Academy Charter School* **GEOTHERMAL ENERGY VS. SOLAR ENERGY** In our most recent time, one of the significant problems that we are facing is the end of the energy sources. The nonrenewable energy sources are coming to an end. This is due to the daily burning of fossil fuels and toxic chemicals in our atmosphere. In our research, we have compared the two renewable energy sources, geothermal energy and solar energy, in which one is the most environmentally friendly. Our research have concluded that solar energy is more beneficial compared to geothermal energy in the way of releasing less toxic chemicals.

REDDOCK, S. and L. ROWSER-GROHOL - *Syracuse Academy of Science Charter School* **EFFECTS OF AMOUNT AND WAVELENGTH OF LIGHT ON A SOLAR CELL** We will be testing how much light a solar cell can take in based on the different parts of the color spectrum. Violet is the lowest on the color spectrum, has the most energy but the least wavelength. Red is the highest on the color spectrum, has the least energy and the longest wavelength. There are two parts in this experiment... The first part test how the amount of light affects a solar cell, the second test how the wavelength of light affects a solar cell. In the first test, the independent variable is one piece of black construction paper. The dependent variable would be the object that the solar cell is connected to. In the second test, the independent variables are the colors on the color spectrum. The dependent variable would also be the object that is being controlled by the solar cell.

ROCKWOOD, D. – *Chittenango* **HARVESTING COMBUSTION FREE HEAT FROM COMPOST** One of the major byproducts of modern agriculture is compost. This is organic matter which is purposefully allowed to degrade over time into soil, which is later used as an effective and sustainable fertilizer. One product of this decomposition is heat energy, and for hundreds of years this energy was not used in any application. In the 1970's however, Swiss inventor Jean Pain created a system which allowed for him to harness the heat energy from compost for practical applications. A group of Chittenango students have worked in collaboration with Cazenovia's Grey Rock Farms CSA, To reinvent Jean Pain's original design on a small scale, in order to provide the community with an example of how combustion free heat can be produced in the modern age.

SHERIDAN, Z. - *Fabius-Pompey* **CREATING A BIOGAS DIGESTER FROM COMMON MATERIALS** I chose to try and prove that biogas could be produced out of household materials at a low cost. Americans are too reliant on oil and refined gas so I set out to show that each American could produce their own cheap gas for their own uses. For my biogas digester, I used a 5 gallon water jug, PVC pipe, rubber tubing, dirt, super glue, black paint, water, and manure. I believed these items to be either household items or easily accessible and low-cost materials. After 15 days of anaerobic digestion in the digester, the water and manure mixture (kept at 90 degrees F the whole time) produced a flammable methane gas. The amount of gas produced in this small-scale experiment couldn't sustain an entire household's gas usage but does prove that gas can be produced with these few materials.

TAPE, T and S.ZAHRAN - *Syracuse Academy of Science Charter School* **EFFECTS OF ETHANOL ADDITIONAL TO MINERAL OIL** Renewable energy is extracted from sources that naturally replenish. Nonrenewable energy comes from fossil fuels a limited source such as coal. Biofuel is a form of renewable energy, related to living and recently dead biological matter that can be used as a liquid, solid, or gaseous fuel. Few people realize that oil can be used as fuel for engines with biofuel. The oils offer many benefits including sustainability, regional development, reduction in greenhouse gases and reduction on dependency on mineral diesel, etc. One approach to utilization of mineral oil as fuel is to blend it with ethanol, another agricultural based energy source being investigated for on the farm preparation of fuel. Many researchers have tried to use mineral oils (with or without heating) for diesel engine, but they found that the mineral oils have very high viscosity and low volatility causing poor atomization, slow burning, poor engine performance compared to diesel. In this work, I compared energy of mineral oil with ethanol.

VINCENT, N. - *Ulster BOCES - iLab* **ELECTRIC CAR** I have been working on optimizing solar panel efficacy to charge the batteries in the electric car. We are trying to find the angle at which they capture the most amount of sunlight. I have been working with a group of people on building an electric car which we will race from Dallas Fort Worth, Texas to Minneapolis, Minnesota in the 2016 Winston Solar Car Challenge. The research collected will optimize the solar panel efficacy to charge the batteries in the electric car. The Electric car is a two seater car that runs on four batteries charged by a solar array mounted on a trailer. I hope to learn the angle at which the sunlight is captured most efficiently; this is called the angle of incidence. I hope to use this information to contribute to the race.

Biodiversity and Natural History

BARRETT, D. – *Chittenango* **CONSERVATION OF THE RED PANDA** The Red Panda is a currently vulnerable species in desperate need of support and attention. Their population numbers are declining due to a number of different variables, including poaching and deforestation. In countries like China and Bhutan, two countries the Red Panda is native to, bamboo deforestation is currently a huge and ongoing issue. The purpose of my study was to research and examine the issues surrounding this species's conservation in order to get a better grasp on the problem. Using a number of different sources of information and data, I compiled information on the species and its conservation. I used secondary research as my main form of information gathering. I studied many works surrounding the topic and made inferences based on the information I gathered. Through my research I have found that the destruction of bamboo in countries like China and Bhutan has negatively affected the population of the Red Panda. The Economic and Agricultural growth in these countries is demanding more and more land, leading to more and more deforestation. It really all boils down to human interference for these animals, we are harming our environment more that it can handle. All of the results I have gathered lead me to this same conclusion, either we attempt to slow the rate at which we destroy the environment or we run the risk of losing the Red Panda. There needs to be a heavier focus on conservation for these animals and other animals like them. The conservation focus for the Red Panda is going along well in theory but if you look at the numbers you can tell that it's not enough.

CANTY, C. - *Fabius-Pompey* **A COMMUNITY ACTION PLAN REGARDING EMERALD ASH BORER** This project involved creating a community action plan to show community members how to first identify what are Ash trees if you have any on their property, then how to identify if a tree has been affected by Emerald Ash Borer and then what to do to properly assess the situation and who can help them with their trees if infected. Emerald Ash Borer was first seen in the United States in Michigan year - and has caused much devastation to the Ash tree population there. Emerald Ash Borer has recently entered into New York and I chose to study Emerald Ash Borer because of how devastating it can be. To start I contacted experts at SUNY ESF and then met with them to get information and techniques to help stop it. With the experts i saw samples of Emerald Ash Borers, Trees infested with Emerald Ash Borer and techniques they are using to kill and take action against the Emerald Ash Borer. I then with the help of an expert from ESF, hung triangle prism traps designed to attract and trap Emerald Ash Borers. These traps are designed to attract them and then they are stuck to the side, they can be a survey of amounts in areas.

CHANDLER, C.and D. DEMAND. – *Chittenango* **CHITTENANGO OVATE AMBER SNAIL** Throughout history, the world has experienced millions of species come and go. A species that resides in Chittenango, New York located at the bottom of Chittenango Falls is on the endangered species list. This species is known as the Chittenango Ovate Amber Snail, scientifically known as the *Novisuccinea chittenangoensis*. Our research was geared towards finding the reason behind the constant fluctuation, and sparse number of the Chittenango Ovate Amber Snail population. We believe there is a strong correlation between the weather conditions, predation they face. The weather patterns in New York vary from year to year, so that would also cause the species number to decline. Each experiment that we encountered were structured differently due to advancements in technology and enhanced techniques of locating these snails. Though we experienced many

different kinds of data sets that tried to highlight the population number, it was evident no datasets found a vast amount of snails. Thus, we found that our hypothesis was proven true due to the explanations given by scientists that outlined what causes the Chittenango Ovate Amber Snail population to fluctuate at such a low number.

CHRISTOPHER, K., K. SMITH and R. DELANEY *Chittenango* **STURGEON RESTORATION**
Sturgeon is the general name referring to 26 individual species of fish from the biological family Acipenseridae. The sturgeon is one of the oldest species of bony fish in the world, native to the temperate, subarctic and subtropical areas in Europe, Asia and North America. Their eggs became very valuable in the 1800s, which led to the decimation of their population. The main purpose of research is to see how sturgeons are being stocked in many of our waterways. We wanted to see if the sturgeon's population was growing. Sturgeon populations have continued to grow in Oneida Lake. In 1996, populations were at 500. In 2004, populations grew to 1,200. The sturgeons were starting to make a comeback. For our results, the sturgeons in the Genesee River and in Oneida Lake are growing to well over 1,000 in numbers. Lake Ontario and the St. Lawrence River also show signs of growth and prosperity. We were able to determine that Sturgeon are making a great stride in their revival efforts. To conclude, we saw that sturgeons are becoming more and more relevant in many of our local waterways. The sturgeons are also being more commonly caught in these waterways. Sturgeon are now thriving and growing, resurging where they once had not.

COURTEAUX, K., M. DIBELLA, J. LELAND and S. MCCORMICK - *Onondaga Central School*
"CORNSPIRACY": SUGAR CONSUMPTION TRENDS IN THE UNITED STATES AND THEIR NEGATIVE EFFECTS ON HEALTH How has sugar production and consumption changed in America in the past half century, and what have been the negative health effects of these changes? Our belief is that in the past 50 years, there has been an increase in sugar consumption in the average American diet due to the lower cost of refined sugar production, new types of sugars disguised in food and drink ingredient lists, and advertising. This increase has led to a rise in a variety of medical problems harmful to human health, such as obesity, diabetes, and cancer. There was indeed a rapid increase in sugar consumption in the United States beginning in the mid-20th century, but around the year 2000, the growth stopped. Ever since, sugar consumption in the United States has been on a decline. There are about 61 different names for sugar that can be listed in ingredient lists--sucrose, high-fructose corn syrup, barley malt, dextrose, maltose, rice syrup, etc.--making it very difficult for consumers to truly know what they're choosing to buy and eat. Advertising agencies intentionally target children to be the principal consumers of their high sugar, low nutrient products, and these children often grow into adults with poor eating habits. Many veritable scientists and researchers have found strong connections between excessive sugar consumption and a myriad of health problems.

LOUGHLIN, J. and T. REINHARD - *Fabius-Pompey* **USE OF CAMERA TRAPS TO OBSERVE WILDLIFE IN FABIUS, NY** During the spring of 2016 I have been setting out trail cameras in Central New York to watch deer moving through an area of land and to see what time the deer move and why they move when they do. I am also looking for other animals to see how they interact with the deer. Some other things I am also looking for is antler growth, how many fawns are in the area, and how big they are based on time of year. In my evidence I have found that many places where there are deer there is also other wildlife such as turkeys and coyotes. In many pictures and videos I have seen countless deer. The deer come usually during the early morning and late evening. Coyotes have been moving at late night, and turkeys move at any time of the day. Trail cameras are up to continue further research to see the interaction between deer and other animals. Trail cameras are up to continue further research to see the interaction between deer and other animals. The interaction has been positive, in many pictures; deer come through the area shortly after other animals. Trail cameras were able to capture pictures as proof that deer have interactions with other animals, there are many fawns growing and the pictures in the future will help show the growth of antlers.

SMITH D, and W. MYERS – *Chittenango* **DEFORESTATION IN BRAZIL** The purpose of our project was to find out what Brazil is doing to curb the vast deforestation of their natural rainforest. Brazilian legislation has been passed and supported by countless countries abroad. We used studies that have been carried out by the Brazilian government, taking place over the last 30 years. Using multiple studies and some range from 1988 to 2015, others use data from specifically 2012. Brazil lost 400,000 square kilometers of trees last year (2015), these results were recorded by the National Geographic science department. Only 21% of the land deforested was going to be regenerated. We found that Brazil has enlisted other countries to help fund an organization called REDD+, which has helped to decrease the amount of land deforested. Since 2004, the amount of land deforested has stopped rising and started falling. It has taken a global effort to recognize how essential these dense rainforests are and act on defending them.

Ecological Economics

BUECHNER, L. - *Fabius-Pompey* **A COMMUNITY GARDEN MANAGEMENT PLAN: AVOIDING THE TRAGEDY OF THE COMMONS** This is an action plan project where I will be taking over a garden outside of our school. This project demonstrates the tragedy of the commons. The tragedy of the commons is an economic theory of a situation within a shared-resource system where individual users acting independently according to their own self-interest behave contrary to the common good of all users by depleting that resource. I will be taking over the garden by getting rid of all old and dying plants and revitalizing it with new plants. So far I have planted seeds and recorded their growth and used a timer. I also weeded out the garden and cut a material for the garden to prevent weeds from happening. Then I moved my plants outside, which didn't help because they then died due to frost. Now I will replant the seeds in the garden for a more effective approach since it seems to be getting warmer out.

SHORT, C - *Ulster BOCES - iLab* **PROMOTING HEALTHY EATING HABITS IN YOUNG CHILDREN** Childhood obesity is a problem that has recently been affecting children from ages two to nineteen. In the past year, approximately 17% of children were considered obese ("Childhood Obesity.") Teaching children healthy eating habits at a young age helps children stay healthy and choose healthy choices. Our project was based on how to show children healthy eating habits. We put together a plant kit to help children learn healthy eating habits. The plant kit has soil, seeds, and watering tin to water the plants. In the group, we each planted a certain seed in each cup and monitored how it grew. Plants are something that need to be watched every day. We are giving these kits to various classrooms with our hope to help children get into healthy eating habits in a fun way.

Ecological Footprints and Energy Audits

ALI, P. and H. HUSSEIN.- *Rochester Academy Charter School* **ECOLOGICAL FOOTPRINT ANALYSIS OF ROCHESTER ACADEMY CHARTER HIGH SCHOOL STUDENTS** Ecological footprint measures human consumption of natural resources in comparison to Earth's ecological capacity to regenerate them. This can be done by calculating everything from what we eat, the house we live in, and to the car we drive. Has it ever occur to you how individual's ecological footprint would affect global warming? How does it differ from male to female, and which one holds a greater impact on their community or the environment? A selective group of students from each grade level completed a survey which determines how each grade level impact the environment. We hypothesize that as the grade level increased individuals were aware of their role in the environment and were much more environmental friendly. It is not wrong to have a footprint but it may be wrong base on how big the footprint is.

CRUZ-GOEBEL A. – *East High School* Ecological Footprint and Energy Audits

This paper examines the effects of the off-leash dog walks in Washington Grove and the outcome at which our brochure, survey, and quick interview had. To conduct this research I first had to understand the habits and impacts of off-leash dog walking on forested ecosystems. I received data on the impact of dog on off-leash dog walks on the natural environment from reliable research on the Internet, Google Scholars. I also received data that most of the dog owners would stop walking their dogs through the Grove if the city builds a dog park right next to the Cobbs Hill Reservoir from an online survey that we promoted by making signs to advertise at the entrances of Washington Grove. Following this, I designed an educational brochure on the impacts of off-leash dog walking and short survey to collect data about habits and perceptions of off-leash dog walking. The brochure and survey were distributed to people using the grove over a two day period. I was able to determine I then gathered data from a quick-interview with the dog owners while they were on a walk and found that 65% of dog owners walk their off-leash (not including the dog owners who weren't present at the time and the ones who lied because the activity is illegal) even though despite the fact that it is illegal. Reasons for their behavior ranged from; allowing the dog to enjoy itself freely to off-leash dog walking is better exercise and that they do it so their dog, "can enjoy their time and get a better exercise than being leashed." From the survey, I have found that. In addition, the data indicated that more than half (50%) of dog owners who walked their dog's off-leash were most likely to utilize a future dog park that is near the Grove. This study concludes that, a simple educational campaign could help to insight a change in dog owner habits which, would. His review indicates that about half of the off-leash dog walks decrease negative impacts on the old growth ecosystem, allow flora and fauna to regenerate and help to conserve Washington Grove and the natural environment began to regenerate. With plant life growing on the dog's past trampling and wild life became more present. This paper encourages all dog owners to appropriately walk their dogs in order to keep other life safe and the environment preserved.

NURDAN K. and V. ESMAULHUSNA - *Rochester Academy Charter School* ECOLOGICAL FOOTPRINT IN HIGH SCHOOL VS UNIVERSITY Ecological footprint analysis can be defined as the tool that measures progress towards the goal of sustainable development, converting consumption and waste of a person is the use of food and other resources that absorb its wastes into the environment and the atmosphere. In this study, the ecological footprint of Rochester Academy Charter School (RACS) students will be compared to that of University of Rochester (UofR) Students. We hypothesized that the footprint of UofR students will be lower than that of RACS students, because since UofR students are older and in college, they are more educated and therefore more attentive about this issue when compared to RACS students. 25 students from both RACS and UofR were given the ecological footprint survey to complete. Based on their answers, the website calculated their ecological footprint. The results were then compared. The results confirmed our hypothesis. On average, UofR students had lower ecological footprint than RACS students.

POWLESS, S. – *Lafayette* MAKING STEPS TOWARDS SUSTAINABILITY Sustainability has a key role in making our environment healthy. We have not been following the principles of sustainability and we need to make actions to make sustainability happen. Universities have been making steps towards a more sustainable environment. Across the country they have found ways to help the United States become more sustainable. I am looking at the procedures and actions that universities have taken and how the actions have affected their campus. Also looking at the ways that they have improved their university and if the actions was truly sustainable. I have found that across the United States each university has discovered many ways to be sustainable and have also been incorporating their communities and cities into their procedures as well. Cities also have been giving money to the universities to keep up their sustainable actions. The results are consistent because each university gave a sustainable action that benefited the environment and even their school. Though there is inconsistency in the geographic location, climate, size of school, and budget. Overall they all showed a change towards a more sustainable environment for the students, faculty, and the Earth. If more colleges and universities took part the country and the world could benefit from these. Knowing that even universities can make effective changes means

that we can take steps on a larger scale, learning from what they did and making choices to a more healthy and sustainable country.

YOUNG, A – *Chittenango* **ANTHROPOGENIC EFFECTS ON THE GREAT BARRIER REEF: CROWN OF THORNS STARFISH AND OVERFISHING** It is evident that humans have a tremendous impact on coral reefs. However, we often ignore the effects it has on us. Things like: shoreline buffers, biodiversity, and tourism. Humans are the main source of the Great Barrier Reef (GBR) decline. Many human impacts have proven to have an effect on the reef. The range of anthropogenic effects on the GBR include: climate change, destruction of corals, pollution, nutrient loading/sewage, overfishing, and destructive fishing. My focus is narrowed upon overfishing and the Crown of Thorns Starfish (COTS). Overfishing impacts a variety of aspects of the GBR and disturbs the overall function of the reef. COTS are a result of increased nutrient inputs by humans and wipes out entire coral populations when breakouts occur. Through the use of secondary research, I was able to obtain proper data in support of my hypothesis. As a result, findings concluded that predatory fish are fished the most. This links to the shortage of fish for human consumption and breakdowns of the coral ecosystem as a whole. This has also had an effect of the population of the COTS. Through data, I have been able to pinpoint breakouts and discover that these breakouts are most concentrated along coastal areas. However, it's shown that predicting and anticipating a breakout is very difficult to calculate. Overfishing and the COTS have proven to be anthropogenic effects that have led to the destruction and decline of the GBR.

Ecology and Climate Change

BAYAZIT, Z. and A.KARAKUS - *Rochester Academy Charter School* **THE EFFECT OF GLOBAL WARMING ON HEART DISEASES** Our world is changing in a way that we never thought it would. One of the most important factors that cause this change is known as global warming. Global warming is the continual rise of average temperature on Earth. The important cause of global warming is the emission of greenhouse gases. The Earth's temperature has increased by 0.85°C since the early 20th century. Global warming has a variety of negative effects on health including cardiac health. As global warming takes place the heart rate of a human increase. Heart rate is affected by body position, body size, medication use and finally air temperature. So, as heart rate increases along with temperature the heart diseases become more common. With the help of different experiments such as Effect of Temperature on the Heart Rate, Electrocardiogram and Certain Myocardial Oxidations of the Rat, and with the help of graphs and data we were able to prove our hypothesis.

COXUM, E. and K. DUGAN - *Ulster BOCES - iLab* **ENVIRONMENT FACTORS THAT AFFECTS STUDENTS' ABILITY TO LEARN AT ULSTER BOCES ALTERNATIVE AND NEW PALTZ HIGH SCHOOL** This data is based off of the data that was collected from an AP Chemistry class and multiple classes at the Ulster BOCES Alternative School. The experiment is to see what possible factors affect a student's ability to learn in school. The variety of classes used in this experiment may or may not help narrow down the information and conclusion. However, information that correlates with climate change will be our most concern and our research will be focused on the climate change correlation. We are future educators and we are determined to figure out if a student's ability to concentrate is based off of the content, the teacher, the climate change, etc. and be able to possibly solve the issue before we begin our careers.

MULVIHILL, E – *Chittenango* **THE SUCCESS RATE OF WILD V.S. FARM RAISED FISH IN AN ENVIRONMENT** Over the years fish hatcheries have become well known due to the rising concern for various species disappearing; which continues into the twenty first century. Hatcheries play a vital role in an ecosystem's overall effort to maintain healthy fish populations in waters throughout the country. In fish hatcheries, the fish are used to being fed and cared for; what happens when these fish are released into their natural habitat? Researchers at the Oregon State University crossed wild and first-generation hatchery Steelhead trout, raising them in a hatchery environment.

The sum total of all the messenger RNA molecules expressed from the genes of the Steelhead trout were compared to wild bred fish. Oregon State University reported more than 700 genes are differentially expressed between the offspring of wild-raised fish. These genes were enriched for involvement in wound healing response, immunity, and metabolism. Immune genes may potentially help hatchery fish deal with diseases that may more easily spread in overflow conditions. Fish hatcheries can provide a number of benefits to society, but reliance on fish hatcheries as a substitute for the conservation of wild populations is risky as a long-term conservation strategy. When taking a closer look and investigating into fish hatcheries there are several pros and cons to the fact of mechanical breeding.

SEGUIN, A – *Chittenango* **THE RISE OF TICKBORNE DISEASES** It is obvious that our world's climate is changing with no signs of stopping. Also, it is difficult to go outdoors without becoming the host of a tick. Tick species and the diseases that they carry have increased recently, especially in New York. This research project was conducted to determine if increasing temperatures will have an effect on the number and severity of each disease. After analyzing the amount of tick borne disease in each county of New York, Dutchess County was found to have the highest. The scope of the study is the tick population in Dutchess County. By looking at graphs showing the amount of cases per disease in the past 20 years, the increase of temperature in the past 20 years, and the amount of ticks found in that county in the past 20 years, the amount of data found was enough to aid the results of the study. The amount of cases of Lyme disease, Ehrlichiosis, and Anaplasmosis has all increased along with the annual temperature. The hypothesis was found to be true with the data found in the study. The amounts of tick borne diseases present are high now and will continue to increase.

Pollution and Remediation

CHATMAN-FLAGLER, S. and J. LEE - *World of Inquiry* **USING PHYTOREMEDIATION TO REMOVE LEAD POLLUTANTS FROM SOIL** Plants have often been used to absorb pollutants from the soil. It was discovered that lead is prominent in Rochester's soil, more so in the inner city to be exact. This has caused poisoning in children and young adults who have been exposed to contaminated soil, which can lead to physical and neurological damage. We hypothesize that, to minimize the issue of lead contaminants in soil, lead can be removed efficiently and cost effectively using phytoremediation with the following ornamental plant species cockscombs and brassica. To test this hypothesis, our methodology we will be; to contact an organization that specializes in phytoremediation. Next, we will identify sources to acquire these plant species. After this, we will identify contaminated locations in urban areas. Then we will plant these ornamental species in the locations we have chosen to begin our experiment. Finally, we will monitor plant growth, survival rate, and quantity of lead removed. Resources we may need, but are not limited to are: Different plant species, (most fastest mature rate to accommodate our time schedule) A clear field located in the inner city of Rochester, contaminated with lead, (must check the amount of lead in soil before and after treatment and record data). Background knowledge of how to conduct our experiment, and chosen organization to cooperate with Field personnel skilled in phytoremediation. Planned schedule of when the experiment will be taking place, as well as a timeline for the experiment. After we conduct our research and gather quantitative data, we will compare the state of the soil prior and after the test. We believe that the outcome of this experiment will result in a less polluted space, slight change in soil color, and overall a safer environment (health wise) in the community for children to stay active in. As a result of cleaner green spaces, children are usually physically and mentally healthier to an increase of daily activity, and interaction with the world around them, which may even result in some help from the community effective way. Not only will the experiment benefit the citizens of the community by extracting high concentrations of lead from polluted and contaminated soils, but it will also provide the community with useful green space for gardening, events, and youth play. Helping kids build social skills.

DOWNIE, H., G KATONA, and M. KHAN - *Ulster BOCES - iLab* **THE AEREM SENSOR** There are 5.5 million deaths a year due to air pollution. Air pollution causes more deaths than cigarettes. The most concentrate polluted areas are found in industrialized urban and suburban areas, such as Delhi, India and Beijing, China. We proposed to design an air particulate sensor that will inform people within these heavy polluted areas when pollution reaches a dangerous level. They will have the ability to tell how bad the air is outside of their homes. The design uses a raspberry pi (micro programmable computer), which then connects through the arduino uno (converts digital to analog signal), which then talks to the sensor. The sensor is a Sharp-Microelectronics DN7C3CA006 sensor that uses an LED light to detect air particulate. This prototype is called the Aerem Sensor. The Aerem Sensor will be tested for its capabilities to detect dangerous levels of air particulates. We hope to someday bring this product to production and shine a light on the pollution problem on Earth.

DUGAN,S. and G, LANDERS - *Ulster BOCES- iLab* **REUSING AND REPOSING PHONE CASES IN ULSTER COUNTY** Over a one hundred forty million phone cases will end up in a landfill each year. Our project is focusing on re-purposing and reusing old cell phone cases within the community. Our goal is to collect the used phone cases and redistribute them for reuse and re-purpose. This program will help promote reusable concepts in the community bring to light the concepts of reuse and re-purpose.

IKRAM M. - *World of Inquiry* **LITTERING IN GREEN SPACES** This research project examines the correlation between littering in community green spaces and public perceptions of responsibility to conserve green spaces.. I will test the hypothesis; If city residents are more educated about environmental pollutants, then they would be less likely to pollute (leave trash in green spaces). I will do this by surveying at least 10 people in Cobbs Hill to see their input on littering and if they think it has any effect on Rochester's environment. I'm also working with an organization; The Nature Conservancy, to help me with conducting this research. Purpose of this research is to educate people on the importance of paper waste removal in green spaces and how to avoid the consequence of pollution that would harm our environment, by educating people this would lead to less pollution and would also avoid future issues with pollution.

HILL, Z., LARKIN, J. and STEINMETZ, C. - *Fabius-Pompey* **A COMPARISON OF PH VALUES IN SOIL AND NEARBY WATER SOURCES** I picked a topic that measures the effects of soil on the pH of water in several different locations. I am doing this project with partners who went with me to the same ten locations where I collected soil next to a water source and they collected the water. We put our samples in jars and labeled them with the date and exact location to where we got the samples from. These ten locations are important because now we can test and see how different areas can affect the pH of water based on the soil we abstracted from these ten locations. These ten locations include DeRuyter Lake, Limestone Creek, Fabius Brook, Pratt Falls, Butternut Creek, Tinker Falls, Labrador Pond, Jamesville Reservoir, Cazenovia Lake and Cuyler Pond. After all the samples were collected we brought our data back to the school and used a pH meter to find the pH of each of jars and then compared the water and soil of each one from the same location to see if there was an effect of soil on the pH of water.

LU, M – *East High* **HOW WASHING MACHINES CONTRIBUTE TO WATER POLLUTION** Micro plastics have become a growing threat to our ecosystems. Micro plastics can get into our waterways in a variety of ways. One way is through washing machines. It may not seem like there isn't any form of plastic coming from our clothes but research has shown that our clothing is often made of synthetic products such as polyester and nylon. For this reason, our dirty laundry has become one of the biggest culprits of water pollution because it is part of our everyday routine. If humans continue to use synthetic fibers in clothing, plastic microfibers will be transported from these clothes into our waterways. This research will start by installing a specialized filter on a washer machine in my house in Rochester, NY. The filter will collect plastic microfibers from clothing during an interval of 14 days. I will then quantify the amount of plastic debris produced in

my home and multiply it by the number of households in Rochester NY. This information is important to know because we can begin to find a solution to this problem. In conclusion, this will allow for a general idea of how many synthetic microfibers are released in washing machine effluent and potentially into our waterways.

PERRY, T. – *East High School* **REVITALIZATION OF ABANDONED SPACES** This study examines the perceptions of residence of Rochester New York in relation to abandoned spaces in urban areas. Furthermore we examine how restoring these lots would impact the community of Rochester. 20 random people were given a survey based on five questions on how they felt about both abandoned and revitalized spaces. This was done to answer my hypothesis, which is, “If abandoned lots in urban areas of Rochester are rehabilitated for public use, then the vitality of those urban communities would increase dramatically”. The results to this hypothesis are interesting and they are help to notify what people feel about their everyday neighborhood.

ROSE, K and S. ALVEREZ - *Ulster BOCES-iLab* **CLEAN WATER IN ETHIOPIA** A major problem in Ethiopia is potable water. I want to concentrate on producing a portable water filtration system that can be retro fitted onto a Jerry Can. The area in Ethiopia has dirty contaminated water in their streams. People in rural villages can walk-up upwards of 3 hours one way to get water using a Jerry Can. The distance the people travel to receive the dirty water is far and for it to be filled with bacteria is not safe. I want to focus on innovating the Jerry Can that Ethiopian people use to collect their water in. The goal is to clean the water and provide a mechanism before it gets into the jerry can and cause contamination to the can.

VANGORDEN, B. and A. CERIO – *Chittenango* **THE EFFECTS OF THE GULF AND THE EXXON VALDEZ OIL SPILLS ON MARINE SHOREBIRD POPULATIONS** The Gulf oil spill which took place on April 20th, 2010 was considered to be the largest accidental oil spill in history, spilling 3.19 million bbl of oil. The Exxon Valdez oil spill, in the Prince William Sound of Alaska was reported to have spilled 260,000-750,000 bbl of oil where 1300 miles of shoreline were affected. Due to these spills we believe wildlife; especially shorebirds were greatly affected throughout the surrounding areas. To test our hypothesis, we used secondary research. The tests compared the oiled and unoiled areas, and the effect on the shorebirds population. The results agreed with our hypothesis, showing that the oiled bird populations were much more effected by the spills than the unoiled populations. Our hypothesis was supported by the evidence shown in the secondary research.

Sustainable Food Production

WARSAME – *East High School* **GREEN SPACE** Studies have shown that decreased crime rate can be positively correlated with close proximity to green spaces in a number of cities. Rochester, New York has a significant number of low income neighborhoods with high crime rate. I hypothesize that if these lower income areas in Rochester were to have access to green space, it would be probable that the crime rate in these neighborhoods could also be reduced. This project will compare two locations of similar size green space within in the geographical region of the City of Rochester using geodemographic data-base and crime data from the Rochester Crime Data-Base in an attempt to relate income level to proximity to green space. I believe this research will prove that the presence of green space will be positively correlated with reduction in crime rate. If the presence of green space increases, people will feel safer, healthier, and happier. We would increase the amount of natural habitats and positive interactions amongst community.

NOTES



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