BSISAT Program

LOCATION: ISAT/CS ROOM 136

Presentation Time:	3:00 – 3:40 pm
Presenters:	Drake Cary and Walker Turner
Concentration:	Environment
Capstone Advisor:	Dr. Thomas Benzing
Project No.:	BSISAT-01-14T
Capstone Title:	Case Study of Bergton, Virginia to Develop Water Quality Testing Protocols in Areas Proposed for Hydraulic Fracturing

Capstone Abstract:

Hydraulic fracturing (fracking) has claimed attention because of the industry's destructive habits and alterations to environments, specifically the industry's detrimental effects on water. It was the goal of this project to assess groundwater and surface water qualities in and around Bergton, Virginia, an area overlying the Marcellus Shale shelf. This area has been proposed by the industry for fracking and was used as a case study to develop protocols for water quality testing prior to its development. To establish baseline water quality conditions, a continuous monitoring device accompanied by a grab sampling design was used on the North Fork of the Shenandoah River and its tributaries. The main parameter of interest is specific conductivity. This parameter was determined to be the most effective determinant for fracking disturbances, making conductivity an important parameter to log in a database. For this study, conductivity is a measure of human disturbance to the local streams because fracking fluids have been shown to raise conductivity. In addition to surface water testing, groundwater on nearby residents' land was sampled and tested for hydrocarbons (methane, ethane, and BTEX compounds), surfactants, and chloride. Through a contract with a local laboratory, groundwater samples were processed using a legal chain of custody and EPA-approved laboratory methods to ensure accuracy and defensibility of these data. After performing groundwater sampling and surface water monitoring the results show healthy water conditions in the Bergton community.

BSISAT Program

LOCATION: ISAT/CS ROOM 136

Presentation Time:	3:45 – 4:10pm
Presenter:	Dustyn Michael Reeser
Concentration:	Environment
Capstone Advisor:	Dr. Thomas Benzing
Project No.:	BSISAT-02-14S
Sponsor:	National Museum of the Marine Corps.
Capstone Title:	Performance and Redesign of a Green Roof at the National Museum of the Marine Corps

Capstone Abstract:

The benefits of a green roof include reducing heating and cooling costs and improving the characteristics of storm water runoff. In 2006, the National Museum of the Marine Corps in Triangle, Virginia, installed a green roof covering 39,546 square feet. The museum expressed interest in improving the aesthetics and sustainability of their roof. In order to evaluate its performance, I monitored runoff water and surface temperatures of the green roof. Storm water samples from roof drains contained chloride, phosphate, nitrate, and sulfate. Chloride, phosphate, and nitrate were generally less than one part per million (ppm), whereas, sulfate was present at 3-5 ppm. Using programmable sensors during November 2013 to February 2014, a wide range of surface temperatures were recorded (1-98 degrees Fahrenheit) depending on time of day and sensor location. Based on comparisons to ambient air temperatures, the roof creates a microclimate that must be considered in plant selection and design. I concluded that the existing infrastructure of the green roof is absorbing most of the water runoff and functioning well. However, the existed vegetative layer of the roof needs to be replaced. A new design for the roof is recommended which includes three different sedum plant species planted in plugs every square foot along the roof. The new design will help reduce heating and cooling costs of the building, help reduce water runoff, and add to the aesthetics of the roof.

BSISAT Program

LOCATION: ISAT/CS ROOM 136

Presentation Time:	4:15 – 4:55pm
Presenters:	Michael Weitekamp and Taylor Murray
Concentration:	Applied Biotech and Environment
Capstone Advisor:	Dr. Thomas Benzing
Project No.:	BSISAT-03-14T
Sponsor:	Mr. Tom Benevento, New Community Project of Harrisonburg
Capstone Title:	Design and Testing of a Household Water Treatment System for the New Community Project in Harrisonburg, Virginia

Capstone Abstract:

The purpose of this project is to create an economically and environmentally friendly system to filter rainwater for use in an on-site outdoor kitchen at the Sustainable Living Center operated by New Community Project. The project was sponsored by Tom Benevento, the Sustainable Living Center Coordinator for New Community Project of Harrisonburg, VA.

The system includes an existing cistern collecting roof rainwater, to which plumbing and filtration will be added. Different filtration media were selected based on research, and then tested to determine if they were effective in removing chemical and microbiological contaminants. Recommendations regarding the filter housing and design include the use of 30-gallon food barrels plumbed with PVC valves and pipes. The options for filter media are presented based on cost and an analysis of our data.

BSISAT Program

LOCATION: ISAT/CS ROOM 148

Presentation Time:	9:00 – 9:40am
Presenters:	Lindsay Nguyen and Matthew Hess
Concentration:	Energy
Capstone Advisor:	Dr. Karim Altaii
Project No.:	BSISAT-04-14T
Sponsors:	Dr. Chris Bachmann and, Nyeshu "Shu" Street, Senior Project Engineer, MillerCoors
Capstone Title:	MillerCoors Energy Analysis on CIP Systems

Capstone Abstract:

The beer brewing industry is highly energy intensive and that is why MillerCoors has taken the next step towards sustainability by stating, “we are making significant strides in reducing our energy consumption and carbon footprint.” Therefore, in the spring of 2013, a connection was formed between JMU and the MillerCoors Shenandoah Brewery to examine the potential energy savings.

The purpose of the first project is to investigate the heat and monetary loss of the uninsulated piping inside the brew house. The specific piping examined were the FV/MV Clean-In-Place (FV/MV CIP) and Yeast Mains CIP systems that are responsible for introducing hot fluid into the brewing process to flush the systems as they are prepared for the next brew. The study concluded that the FV/MV CIP and the Yeast Mains CIP systems would save MillerCoors energy and money, however the return on investment was not sufficient to justify the insulation. We are in the process of evaluating the facilities current energy use in order to find potential alternative modes and methods to enhance efficiencies and to potentially reduce undesirable energy losses.

BSISAT Program

LOCATION: ISAT/CS ROOM 148

Presentation Time:	11:20 – 11:40am
Presenter:	Alan Tate
Concentration:	Biotechnology
Capstone Advisor:	Dr. Robert McKown
Project No.:	BSISAT-05-14T
Sponsor:	4-VA Grant
Capstone Title:	Canine Clinical study for Tear Lacritin as a Treatment for Dry Eye

Capstone Abstract:

Lacritin is a human tear protein first characterized as a novel secretion enhancing factor from the human lacrimal gland. Preclinical animal studies have shown that recombinant human lacritin promotes basal tearing in rabbit eyes upon topical application. Recently, antibodies were produced specific for human lacritin, and a clinical assay was developed to detect and quantify lacritin in human tear samples. Lacritin is currently being developed as a new topical therapeutic for the treatment of dry eye; however, a dry eye animal model system is needed to test lacritin prior to human clinical trials. The canine dry eye model is promising in that it is a common naturally occurring disorder with clear clinical parallels to dry eye disease in humans. The purpose of this study is threefold. The first objective was to determine if the assay to detect lacritin in human tears could detect a lacritin like protein in canine tears. Then an effort was made to clone, sequence, and purify the canine lacritin protein. In the final phase of this study, purified canine lacritin will be used for a preclinical study in a healthy canine population to test for stimulation of tear production upon topical application.

A lacritin like protein was detected by antibodies specific to the N-terminus of human lacritin. The canine lacritin gene homolog was amplified from lacrimal tissue and sequenced. The canine lacritin gene was expressed and protein purified to greater than 95% purity. Protein sequence analysis reveals the canine lacritin is 29% identical to human lacritin.

BSISAT Program

LOCATION: ISAT/CS ROOM 148

Presentation Time:	11:45 – 12:10pm
Presenter:	Veronica Vassilev
Concentration:	Biotechnology
Capstone Advisor:	Dr. Robert McKown
Project No.:	BSISAT-43-14S
Capstone Title:	Immunodiagnostic Analysis of Lacritin in Human Breast Milk

Capstone Abstract:

Purpose: Human breast milk and tears share a number of common proteins including lysozyme, lactoferrin, albumin, secretory immunoglobulins, and mucins. Human breast milk has been used as self-medication for conjunctivitis and has been recently reported to improve corneal healing in an animal model system. One study suggested that lacritin may be expressed in normal human breast tissue and breast tumors; however, none was detected by RNA dot-blot or tissue array using samples from elderly individuals. Lacritin is prosecretory, mitogenic and when cleaved, antimicrobial. Topical application promotes sustained basal tearing in rabbits and is protective against INFG and TNF. Here we ask if lacritin can be detected in human breast milk.

Methods: Voluntarily donated breast milk samples were stored at -70º C until processing for analysis. Milk fat was removed by centrifugation and samples were analyzed by Western blot using polyclonal anti-lacritin antibodies specific for N- and C-termini. Blots included recombinant lacritin, human tear samples, and human milk samples. Detection was by chemiluminscence.

Results: N-terminal specific lacritin antibodies produced distinct primary bands between 18 kDa - 20 kDa on the western blots for milk, tears, and recombinant lacritin. C-terminal specific lacritin antibodies produced distinct primary bands between 18 kDa - 20 kDa for tears and recombinant lacritin; however, only a faint band for milk was observed at this mobility while the primary band for milk with the C-terminal antibody was shifted up in molecular weight to approximately 75 kDa on the blot.

Conclusions: Anti-lacritin antibodies that detect recombinant lacritin and human tear lacritin also detect a protein in human milk with similar electrophoretic mobility suggesting that lacritin or lacritin-like proteins are expressed in human breast milk; however, levels may be low since proteomic analyses of human milk have failed to report lacritin.

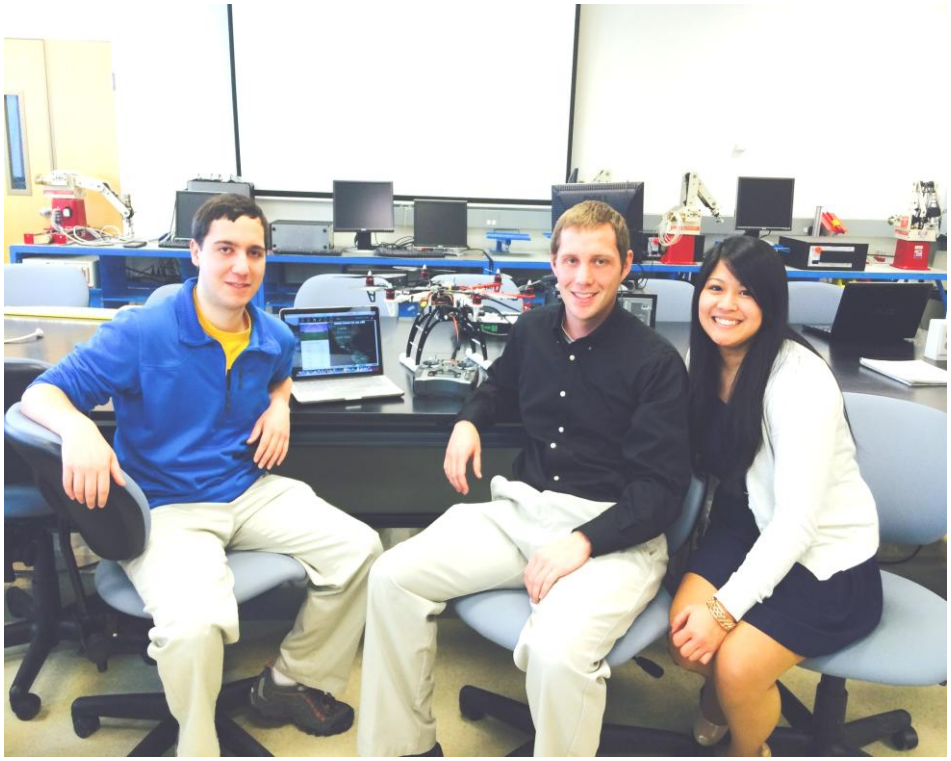
BSISAT Program

LOCATION: ISAT/CS ROOM 150

Presentation Time:	10:10 – 10:50am
Presenters:	Jason Whetzel, Erwin Will, and Manithong Susan Xayavongsa
Concentration:	Engineering and Manufacturing and Information Knowledge Management
Capstone Advisor:	Dr. Geoffrey Egekwu
Project No.:	BSISAT-06-14T
Capstone Title:	Madison's Eye in the Sky v2.0

Capstone Abstract:

The purpose of this project is to obtain an already assembled Unmanned Aerial Vehicle (UAV), further add additional capabilities to it, and deploy the vehicle to become a prototype to be used in an agricultural or forestry setting. It is expected that a UAV would help cut operating costs, provide unique visual angles, ensure safety in environments too dangerous for humans, and create versatility with quick deployment in the field. The goal of the project is to implement the UAV in the applications specified and be able to demonstrate the possibilities of this new technology as a useful tool that facilitates these important human tasks. We have upgraded the previous live feed from earlier version of this project (2013) with a transmitter/receiver device that should be able to gain more distance in terms of broadcast width. In addition to the added capabilities, the project team used the project as a way to define how the UAV will be implemented and utilized in the specified applications, as well as determine any social and political issues that may occur from this new form of monitoring devices.



BSISAT Program

LOCATION: ISAT/CS ROOM 150

Presentation Time:	3:00 – 3:25 pm
Presenter:	Christopher Hogan
Concentration:	Engineering and Manufacturing
Capstone Advisor:	Dr. Abdelrahman Rabie
Project No.:	BSISAT-08-14S
Sponsor:	Mr. Allen Bancroft, Flexicell Inc.
Capstone Title:	Feasibility of Implementing Material Tracking for Flexicell Inc.

Capstone Abstract:

The manufacturing industry has been a part of the US economy for centuries. The US economy has transformed from a mass producer of goods to a producer of highly specialized products. Today, the US relies on technology based advanced products to compete globally. Non-value activities have a large influence on manufacturers, and they account for considerable added cost to products. Manufactures must use every possible option to their advantage to keep up with global competition and to increase profit. Working with Flexicell in Ashland, VA, I developed a methodology based on observations of manufacturing times compared to theoretical manufacturing times for a specific representative part assembly used in many products of Flexicell. The percentage of non-value adding activities was estimated, and the possible savings from a material tracking system was determined.

BSISAT Program

LOCATION: ISAT/CS ROOM 150

Presentation Time:	3:30 – 3:55 pm
Presenters:	Remy Biron
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Christopher Bachmann
Project No.:	BSISAT-39-14S
Capstone Title:	The Design, Construction, and Testing of a Solvent Reclamation Unit for Algae Based Biofuels

Capstone Abstract:

Algae based biodiesel has been shown to have numerous advantages over petroleum based fuels, but the production and commercialization of algae biodiesel is not cost effective using current technology. For algae biodiesel to become cost competitive with petroleum fuels, each production phase must be as energy efficient as possible. Currently, the most energy intensive phase is the harvesting phase in which algae are traditionally dewatered before the lipids are extracted. James Madison University has been conducting research on algae based biodiesel for the past ten years and has recently developed a novel system that does not require harvesting and allows for a solvent extraction of lipids while algae are still in suspension. The output of this process is a solution of the organic solvent Hexane and algal lipids. In previous research, the recovery of these lipids required the evaporation of Hexane, which is neither economically sustainable nor environmentally minded. The goal of this Capstone project was to develop a unit capable of continuously recovering Hexane and that could be integrated into the current extraction system. Working within parameters dictated by the existing system, the software Engineering Equation Solver (EES) was used to model the theoretical heat transfer necessary to continuously evaporate a flow of Hexane/lipids. EES was then used to develop and optimize a heat exchanger capable of meeting those heating needs. A three-dimensional computer model of this heat exchanger was designed and from the model, a scaled down non-working unit was produced using a 3D printer. From this design, a working prototype was constructed and tested to determine the effectiveness of the unit. By implementing this Hexane recovery unit into the existing lipid extraction system, the system is more environmentally safe and cost efficient, thus making the commercial production of algae biodiesel more feasible than before.

BSISAT Program

LOCATION: ISAT/CS ROOM 150

Presentation Time:	4:00 – 4:40 pm
Presenters:	Jaclyn Ayers, Margaret Duarte, Katherine Sasek, and Daniel Silvernail
Concentration:	Information Knowledge Management and Telecommunications
Capstone Advisor:	Dr. Emil Salib
Project No.:	BSISAT-10-14T
Sponsor:	Cyril Thornton
Capstone Title:	TutorScout Webservices

Capstone Abstract:

Tutor Scout is a non-profit start-up organization, launched last year by a JMU Alumnus. It is envisioned to enable students with specific learning needs to have access to a network of highly educated and skilled individuals who are willing to tutor and share their knowledge and expertise with others including students. To facilitate the interactions between the students and tutors, Tutor Scout organization reached out to a number of JMU senior students to develop a number of components for their web application. Our team has been focusing on prototyping a secure web application with a specific focus on developing the components required for interfacing the final TutorScout web application to a number of critical Web Services. The web application prototype, we developed, supports the integration to the following web services (RESTful based) APIs: OAuth 2.0 Google (for Authentication), OAuth 2.0 Facebook (for Authentication), Swift Mailer (for Email Notification), and Pusher (for Real-time Subscriber/Publish Notification). The software development environment used by our team includes: Web Application Development framework known as Laravel and MySQL Database Server. Laravel is a Model-View-Controller (MVC) framework built using php and makes use of Apache as a secure Web Server. In the development of this project, we applied a SCRUM-like (agile) Software Engineering Life Cycle processes and methods, such as, feature sets definition and tracking, documenting user and system requirements for each of the feature set, the development of a test plan and the definition and execution of test cases covering system functionality and integration.

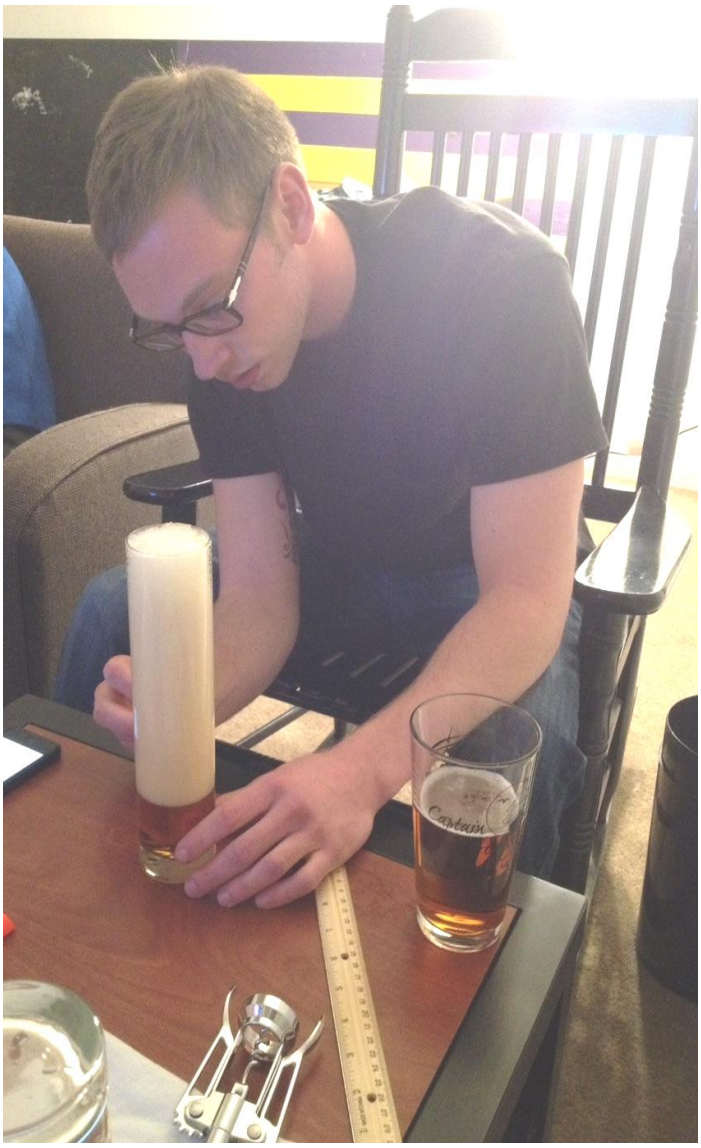
BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	9:00 -9:25 am
Presenter:	Michael Carr
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Nicole Radziwill
Project No.:	BSISAT-28-14S
Capstone Title:	An Analysis of Foam Quality in Starr Hill and Three Brothers Products

Abstract Title:

Factors associated with the objective and perceived quality of beer include foam head stability, quantity of foam, glass adhesion of foam, and strength of foam. The following study was modeled after Hackbarth's "Multivariate Analysis of Beer Foam Stand" manuscript published in the Journal of the Institute of Brewing in 2006. The study uses the method of Constant, focusing on the physics, substance, perception, and measurement of beer foam. This method was used to determine differences between the foam quality of two locally brewed beers by analyzing and comparing the mean lifetime of foam decay (tau). The observed data using the Constant method was then compared to baseline data in Hackbarth's article. Physiochemical measurements of beer foam quality, including hydrophobicity, fluorescence recovery after photo bleaching, surface dilational rheology, and surface viscometric activity were also considered, but were determined to be impractical assessments of foam quality outside of industrial applications.



BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	9:30 – 10:10 am
Presenters:	Ian Loganadan and Kevin Rakaric
Concentration:	Information and Knowledge Management
Capstone Advisor:	Dr. Nicole Radziwill
Project No.:	BSISAT-29-14T
Sponsor:	Angler's Choice Marine
Capstone Title:	Improving Inventory Ordering Strategies to Reduce Holding Costs for Angler's Choice Marine

Abstract Title:

Angler's Choice Marine is a boat dealership specializing in Bass boats. The company currently has no data-driven strategy for ordering new floor models throughout the year, and as a result, they order based on heuristics derived from past personal experience. Management believes that inventory holding costs, particularly during the winter season when sales are diminished, could be excessive and negatively impacting costs and cash flow. The purpose of this project is to explore potential new inventory models for the Ranger product line, which includes the company's most popular items, to determine whether holding costs can be minimized while still satisfying the requirement to have boats available on site during all months. The @RISK package was used to simulate inventory levels and holding costs using historical data from 2009 through 2013, compare multiple models, and propose recommendations to Angler's Choice to help support business decision making in the future.

BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	10:15 – 10:55 am
Presenters:	Tessa Heydinger, Gordon Heil, and, Andrew Lucchesi
Concentration:	Information and Knowledge Management
Capstone Advisor:	Dr. Nicole Radziwill
Project No.:	BSISAT30-14T
Sponsor:	CrossKeys Vineyard
Capstone Title:	Crosskeys Vineyard Business Analysis: Comparison of weather trends to sales

Capstone Abstract:

CrossKeys, a local vineyard in Mt. Crawford, Virginia, sells a variety of wines, hosts events such as weddings and concerts, and recently opened a restaurant. The purpose of this project was to explore sales data between January 1 and December 31, 2013, to assess whether relationships existed between observed weather and sales. Using a Six Sigma DMAIC project methodology, we obtained multiple forms of data including surveys from employees and upper management, customer surveys, and financial data from their point of sales (POS) system. We compared the sales data to weather trends to investigate four research questions. Based on the results from our analyses, we suggested improvements for CrossKeys to enhance their revenue potential.

BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	11:00 – 11:40 am
Presenters:	Bastiana Rodebaugh and Elizabeth Wronko
Concentration:	Engineering and Manufacturing, Environment, and Pre-Veterinary Medicine
Capstone Advisor:	Dr. Nicole Radziwill
Project No.:	BSISAT-31-14T
Sponsor:	Star Hill Brewery
Capstone Title:	Analysis of the Relationship between Beaver Creek Reservoir Water Quality and Starr Hill Brewery Product Quality

Capstone Abstract:

Beer is one of the most popular and highest selling products in the world. Because the primary ingredient in beer is water, the quality of the water used to brew the beer is a significant factor in the overall quality of the final product. Starr Hill, a craft brewery in Crozet, Virginia, draws its water supply from Beaver Creek Reservoir. The purpose of this project was to identify any seasonal patterns in the water quality and product quality parameters, and explore whether the current alkalinity treatment process at Starr Hill is sufficient based on the fluctuations in the chemical content of the water supply. The alkalinity of the water is an important component to the brewing process because it helps control the pH of the mash and wort, which is crucial to the activation of the enzymes in the yeast.

First, we investigated the relationship between precipitation patterns and water quality over a period of one year. Statistical analyses were also performed to determine relationships between various water quality measurements such as pH, conductivity, dissolved oxygen, and water hardness taken at Starr Hill Brewery and the Beaver Creek Reservoir. Finally, these results were applied to exploring research questions related to seasonal patterns and alkalinity treatment. This project will also result in an academic research article which is to be submitted to the Journal of Quality Technology.

BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	3:30 – 3:55pm
Presenter:	Joshua Erney
Concentration:	Information and Knowledge Management and Telecommunications
Capstone Advisor:	Dr. Morgan Benton
Project No.:	BSISAT-32-14S
Sponsor:	Spotter Charts
Capstone Title:	Analysis and Development of Mobile Application for Spotter Charts

Abstract Title:

Spotter Charts, a company that provides the most up-to-date and accurate college football statistics for sportscasters, is looking to have a mobile application built that would make these statistics available to everyone with a mobile device. The mobile application will use Cordova/ PhoneGap, which allows developers to create cross-platform mobile applications using well-known web technologies like HTML, CSS, and JavaScript. The application will receive data from a backend web application programmed with the PHP MVC framework Laravel via a RESTful API. The Laravel application also takes the role of an administrator interface to the information on the database, as well as a hub where clients can request and purchase charts.

BSISAT Program

LOCATION: ISAT/CS ROOM 337

Presentation Time:	4:00 – 4:40 p.m.
Presenters:	Alex Morgan, Anthony Pham, and, Christopher Yantz
Concentration:	Information and Knowledge Management
Capstone Advisor:	Dr. Morgan Benton
Project No.:	BSISAT-33-14T
Sponsor:	Cyril Thornton
Capstone Title:	TutorScout

Capstone Abstract:

The purpose of the TutorScout project was to create a secure web application that utilizes the Apache web server, Laravel 4 PHP framework, Laravel's out of the box Artisan database management service, and the MySQL Open Source Database in order to correctly match tutors and students based on an algorithm developed through research regarding achievement-goal theory and learning style compatibility. The TutorScout web application was developed in an agile, Software Engineering Life Cycle while implementing a model-view-controller (MVC) software architecture. A major problem that we look to solve is creating a platform that offers educational services to individuals who lack the means to afford such amenities. We strive to revolutionize the educational services industry by providing a time-bank system that will outweigh the cost of financial compensation. The key component of our website is leveraging a time-for-time based platform that will allow people with certain qualified skills to offer up their own personal time in return for tutoring in a subject that they struggle with. Another key aspect of this project is developing a matching algorithm for tutors and students based off their learning style, achievement-goal construct, and personal information. In result of our work we have developed a functional web application that allows users to register an account with TutorScout, a working algorithm with literature to justify our approach to matching students with tutors, and a database that is scalable in functionality.

BSISAT Program

LOCATION: ISAT/CS ROOM 346

Presentation Time:	9:00 – 9:25 am
Presenter:	Chelsey Frelke
Concentration:	Environmental and Emergency Management
Capstone Advisor:	Dr. Ronald Raab
Project No.:	BSISAT-11-14S
Sponsor:	Mr. Robbie Symons, Emergency Management Coordinator, Sentara RMH Medical Center
Capstone Title:	Design and Implementation of a Hospital Emergency Response Team at Sentara RMH Medical Center

Capstone Abstract:

Hospitals are critical infrastructures and key resources in society that can be affected by incidents due to natural disasters, mass casualty incidents, or planned attacks. To combat the potential effects of such incidents a Hospital Emergency Response Team (HERT) was developed to increase emergency preparedness, response, and management at Sentara RMH Medical Center (SRMH) with their Emergency Management Coordinator. During planning, organization, training, equipping, exercises, evaluation, and corrective action an all-hazards approach was utilized to allow for flexibility in response plans. The flexibility of an all-hazard approach allows the hospital to prepare for any event and increase their capability of continuing pre-response objectives within the hospital. This objective was met through obtaining a materials inventory and acquisition of needed materials, participation in multiple training drills, review of after action reports completed after training drills, and training of HERT team members. Before implementation of the HERT the hospital completed multiple drills to assess their current preparedness, response, and management.

After each drill an after-action report was written to address areas which excelled and those that could use improvement. The areas of concern were taken into consideration during planning and organization processes of the response team. The Hospital Emergency Response Team currently consists of 55 multi-disciplinary team members. They have received Federal Emergency Management Agency (FEMA) certified training in National Incident Management System (NIMS), Incident Command System (ICS), Hazards Awareness, and Hospital Emergency Response.

BSISAT Program

LOCATION: ISAT/CS ROOM 346

Presentation Time:	9:30 – 9:55 am
Presenters:	Jennifer Raffaele and Brittany McCarthy
Concentration:	Biotechnology
Capstone Advisor:	Dr. Ronald Raab
Project No.:	BSISAT-12-14T
Capstone Title:	Molecular Forensics of Human Blood Isolated from Bed Bugs

Capstone Abstract:

Identifying an individual based on blood or tissue isolated from insects can be used to implicate a suspect in the time and place of a crime. However, human DNA isolated from an insect would have to be stable and intact long enough to be useful in a forensic investigation and unambiguously identifiable to an individual host. Human DNA has been extracted and identified from mosquitoes, crab and body lice, fly larvae, and beetles. Bed bugs (Cimex lectularius) are globally resurgent pests that feed exclusively on vertebrate blood.

Both males and females feed on blood, and juveniles require blood to molt to the next instar. In our field studies, we found population densities of hundreds per square foot in lower-income housing. Because of their obligate blood-feeding behavior and high population densities, bed bugs would be a valuable source of human DNA for forensic analysis. A proof-of-concept paper demonstrated that human DNA can be isolated from bed bugs, although the host genotype and time elapsed since feeding were not noted. Therefore, the goals of our study were (a) to assess the stability of human DNA in bed bugs over time, using validated polymorphic autosomal short tandem repeat (STR) markers commonly employed in forensic investigations and (b) to correlate blood isolated from bed bugs to the genotype of an individual human host. The results of our study showed that human DNA extracted from blood-fed bed bugs can be positively identified for up to 72 hours. Above 96 hours, human DNA was degraded, and was therefore unable to be amplified with the STR markers. Upon comparing DNA isolated from two human volunteers, one of which blood-fed the bed-bug samples, to the DNA isolated from the fed bed bugs, we were able to successfully identify an individual based on their unique STR banding patterns. These procedures will assist in the field of forensic entomology.

BSISAT Program

LOCATION: ISAT/CS ROOM 346

Presentation Time:	10:00 – 10:30am
Presenter:	Nicholas Wright
Concentration:	Biotechnology
Capstone Advisor:	Dr. Ronald Raab
Project No.:	BSISAT-13-14T
Capstone Title:	Cloning, Expressing, Purifying and Characterization of Binding Interactions Between the gyrA and gyrB Subunits from *Mycobacterium tuberculosis*

Capstone Abstract:

The emergence of multi drug resistant and extensive drug resistant *Mycobacterium tuberculosis* is proving to be a serious global health issue. Fluoroquinolone class antibiotics are a second line of treatment for *M. tuberculosis* that inhibits the bacterial protein DNA gyrase. Multiple recent studies have shown the prevalence of fluoroquinolone resistant *M. tuberculosis* strains and have also characterized the resistance mutations that occur in the gyrase genes. The DNA gyrase protein complex is a type II topoisomerase composed of 2 gyrA subunits and 2 gyrB subunits. The purpose of this study is to characterize any binding interactions occurring at the interface between the gyrA and gyrB subunits by changing specific amino acids via site directed mutagensis. So far the gyrA and gyrB subunits have been cloned, expressed, purified and shown to be active with the help of JMU students in the Raab laboratory.

BSISAT Program

LOCATION: ISAT/CS ROOM 346

Presentation Time:	10:45 – 11:25am
Presenters:	Alexander Conner, Jack French, and Scott Stewart
Concentration:	Energy and Environmental Sustainability
Capstone Advisor:	Dr. Tony Chen and Dr. Maria Papadakis
Project No.:	BSISAT-14-14T
Sponsor:	Tom Benevento, New Community Project
Capstone Title:	Energy and Sustainability Options for New Community Project - Harrisonburg, VA

Capstone Abstract:

A New Community Project is a non-profit organization in downtown Harrisonburg that strives to create a sustainable community with environmental impact in mind. They have recently renovated two refugee houses and are interested in implementing solar technologies to meet their energy needs. An energy assessment will be undertaken to determine the total energy needed and how conservation and efficiency can be implemented to minimize energy needs. This Capstone will assist A New Community Project by performing an analysis of implementing solar technologies that allow the houses to be "Net-Zero Carbon" houses. Energy monitoring and analysis will be conducted using the eQUEST® software which will help simulate parameters that maximize efficiency and retain low energy usage. PV designer software will be utilized in order to optimize design constraints of the photovoltaic systems. Finally, recommendations will be drafted and presented to A New Community Project on how they can meet their energy-efficiency goals.

BSISAT Program

LOCATION: ISAT/CS ROOM 346

Presentation Time:	11:30 – 11:55am
Presenter:	Braden Tanner
Concentration:	Environment
Capstone Advisor:	Dr. Tony Chen
Project No.:	BSISAT-15-14S
Capstone Title:	Photovoltaic Roads

Capstone Abstract:

Renewable energy is becoming cheaper and more efficient every year, making it a more practical alternative to fossil fuels for the production of energy. One of the main obstacles to implementing solar photovoltaic (PV) on a large scale is the amount of area that would need to be covered by the panels. Several groups around the world have attempted to solve this problem by designing roads made with solar panels, because roadways already cover a large area of land. Some of these groups have claimed that the long-term cost of PV roads would be comparable to, or even lower than, the cost of traditional asphalt roads. In addition to generating electricity, these roads could have many other applications such as LED-lighted road lines, self-heating systems to melt ice, and sensors to detect things like roadkill, fallen trees, or traffic. This project is intended to evaluate the feasibility of PV roads through data analysis and the creation of a small model PV road to be tested in the field.

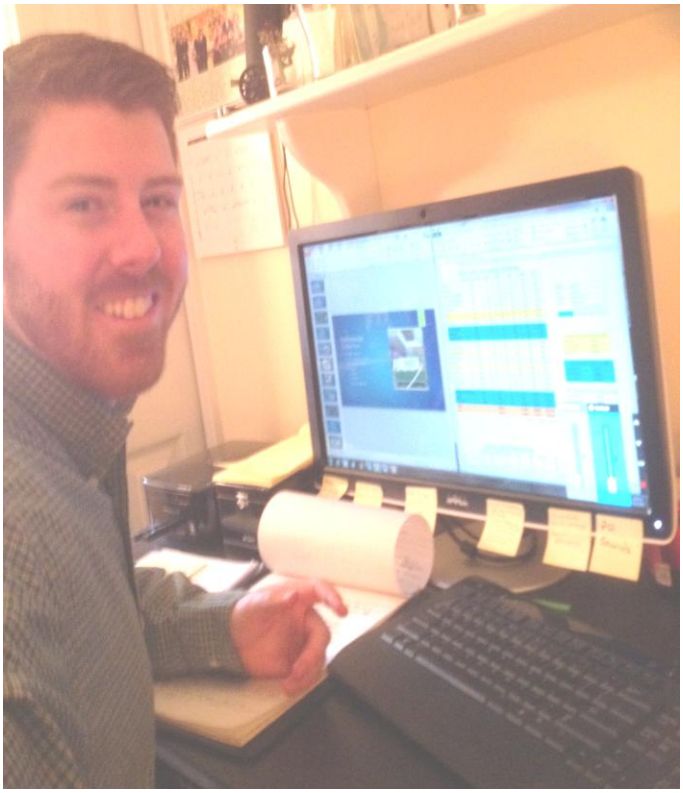
BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	9:00 -9:25 am
Presenter:	Justin Parker
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Christie-Joy Hartman
Project No.:	BSISAT-19-14S
Capstone Title:	Feasibility Analysis of Water Recovery from Campus Fire Pump Testing

Abstract Title:

Building fire pumps supply water to the building sprinkler systems. The National Fire Protection Association's "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems" requires JMU to test building fire pumps on a weekly basis. In the US, the water used during testing is commonly flushed into the outdoor stormwater system. JMU's Facilities Management Department is currently conducting a pilot reclamation effort to capture some of the approximately one million gallons of water being used during campus fire pump testing annually. Data on JMU's fire pump testing was collected in cooperation with JMU Facilities Management, and an analysis was performed to characterize the feasibility of reclaiming the water. A web search was conducted to identify water pump conservation efforts elsewhere. This presentation will review the regulations, capital and maintenance costs, and water savings associated with fire pump water reclamation at JMU.



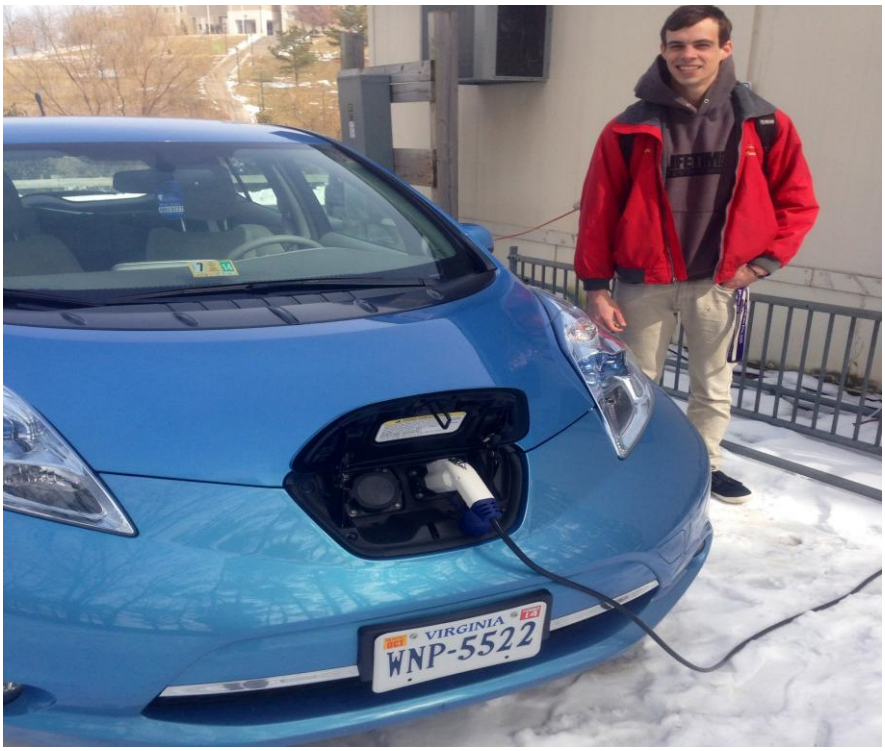
BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	9:30 – 9:55am
Presenter:	Morgan Ziegler
Concentration:	Engineering and Manufacturing, Environment
Capstone Advisor:	Dr. Christie-Joy Hartman and Dr. Maria Papadakis
Project No.:	BSISAT-20-14S
Sponsor:	Virginia Clean Cities
Capstone Title:	Feasibility of Electric Vehicle Charging at JMU

Capstone Abstract:

This presentation discusses the feasibility of electric vehicle charging at JMU. The feasibility criteria studied include technical requirements, infrastructure needs, user preferences, cost considerations, and institutional policies and constraints. The methodology used was qualitative analysis of personal interviews with facilities and sustainability staff members at five universities in Virginia: George Mason University, Old Dominion University, Virginia Tech, University of Virginia, and Bridgewater College. Interview data included logistics, economic, infrastructure, and policy considerations for universities operating these stations. An analysis of the data is present as well as recommendations regarding electric vehicle charging at James Madison University.



BSISAT Program

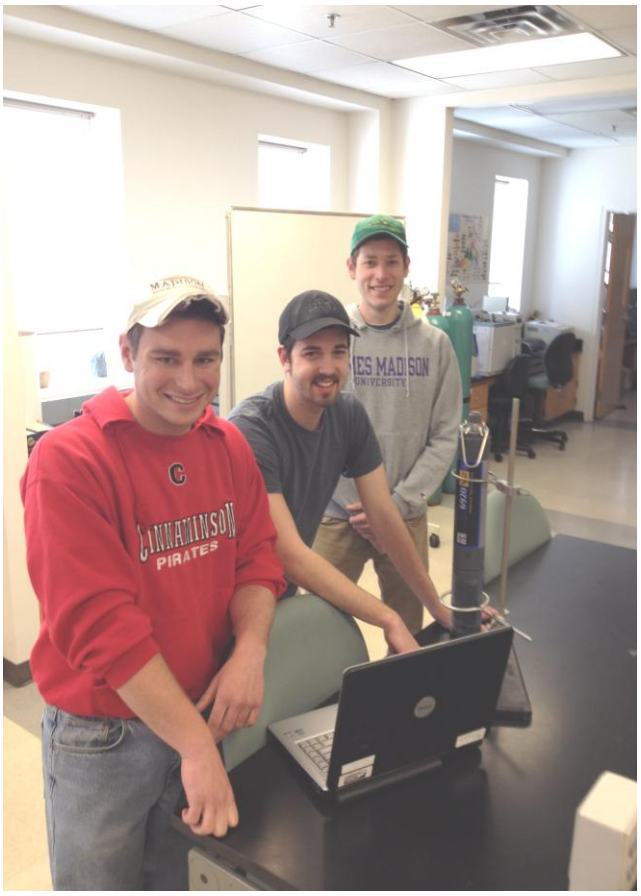
LOCATION: ISAT/CS ROOM 348

Presentation Time:	10:00 – 10:40 am
Presenters:	Dave DiPascale, Jared Johnstone, and, Kevin Weissgold
Concentration:	Applied Biotech and Environment
Capstone Advisor:	Dr. Robert Brent
Project No.:	BSISAT-21-14T
Capstone Title:	Quantifying Water Quality Parameters in Blacks Run and Execution of Fecal Coliform Survey

Capstone Abstract:

Blacks Run is one of many streams on the Clean Water Act's 303 (d) list for impaired waterways due to unacceptable levels of E. coli and sediments.

For this reason, the City of Harrisonburg initiated a stream restoration project in Purcell Park in 2009. The restoration project was aimed at reducing stream bank erosion to decrease the amount of sediment entering the stream and increase the amount of vegetation available for biological uptake of excess nutrients and adverse contaminants. This thesis project is a continuation of the prolonged monitoring of overall stream health for Blacks Run in Harrisonburg, Virginia. Bi-weekly samples were taken at four locations along Blacks Run for 9 months testing the turbidity, dissolved oxygen, temperature, specific conductivity, total phosphorus and total nitrogen, fecal coliforms, and E. coli. A macroinvertebrate survey of the stream was also conducted to determine if stream health has improved.



Surveys of fecal coliforms and E. coli were conducted under dry conditions at low flow and under high flow storm conditions. Based on results found, bacterial impairment, on average, was higher than the maximum of 235 cfu/100 mL for the Commonwealth of Virginia and turbidity, on average, was higher than the commonwealth's standard of 0.3 NTU for turbidity. Blacks Run has been determined to be improving since the restoration project, but is still impaired due to bacterial and sediment loading in the stream.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	10:45 – 11:25 am
Presenters:	Daniel Freeman, Lukas Osmers, and, Dylan Shifflette
Concentration:	Applied Biotech and Environment
Capstone Advisor:	Dr. Robert Brent
Project No.:	BSISAT-22-14T
Sponsor:	United States Geological Survey
Capstone Title:	Treatment of Acid Mine Drainage Using Ozonation

Capstone Abstract:

Acid mine drainage is a major problem in areas that have been subject to mining activities. Discharge of surface water and groundwater from these mining sites typically has a low pH and high metal concentrations, which can have a substantial negative impact on the surrounding environment, as well as human health. For the past several years the United States Geological Survey has granted JMU permission to test their patented ozonation process for the treatment of acid mine drainage. The United States Geological Survey system works by introducing ozone to the acid mine drainage, which enhances the oxidation reduction potential (ORP) of the waste and enables heavy metals in the waste to more easily precipitate. For this study, a pilot-scale flocculation step was added to the system to try and further remove metals such as manganese from simulated acid mine drainage waste. In order to see if the flocculation step was successful, the effectiveness of the treatment system was compared with and without the flocculation step. Other variables manipulated in the tests were the filter size for particle removal and the settling time. The results from this study showed that flocculation consistently removed more manganese from the samples, but the amount of manganese removed was not consistent and varied from run to run, leading to the conclusion that the cost to implement flocculation may not be economically feasible.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	11:30 – 11:55 am
Presenter:	Sean Henke
Concentration:	Environment
Capstone Advisor:	Dr. Robert Brent
Project No.:	BSISAT-23-14S
Sponsor:	Ecosystem Services, LLC, South River Science Team DuPont
Capstone Title:	Use of "In Situ" Adsorptive Structures for Reducing Mercury Contamination Within Aquatic Ecosystems

Capstone Abstract:

This project focuses specifically on mercury contamination within the South River and South Fork of the Shenandoah River. A fish consumption advisory for mercury spans 125 miles of these rivers from Waynesboro, VA to Front Royal, VA. The mercury originated from its use as a catalyst within a textile manufacturing facility in Waynesboro that lasted from 1929 until 1950. In the 1970's, scientists discovered the mercury contamination, and the Virginia Department of Health established fish consumption advisories for the river. Initially, it was believed that the contamination would be naturally reduced within the environment, and DuPont established a 100-year monitoring program to monitor the recovery. However, after decades of monitoring, no recovery was observed and mercury levels in fish remained. As a result, the South River Science Team was formed in 2000 to further investigate the mercury contamination and seek strategies for remediation. Over the summer of 2013, I worked in conjunction with the South River Science Team and Ecosystem Services, LLC. The goal was to investigate the remediation capabilities of biochar on mercury and methylmercury contamination. The project consisted of field and laboratory experiments using "in situ" structures packed with biochar. In the field experiments, these structures were tested for mercury removal. In the laboratory, an artificial stream table was utilized to further investigate the adsorptive capacities and flow effectiveness of different "in situ" structure designs. This was done by using methylene blue powder as a surrogate for organic mercury. Adsorption of the methylene blue dye by the biochar structures could be easily monitored by tracking the concentration of the dye using a spectrometer. Samples were collected over 24 hours and reductions in dye concentration were correlated to the efficiency of the adsorptive structures. This report discusses the results from both the field and laboratory experiments.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	3:00 – 3:25 pm
Presenter:	Daniel Manley
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Amanda Biesecker
Project No.:	BSISAT-24-14S
Capstone Title:	Testing Organic and non-GMO Corn Seed for the Presence of a Horizontal Gene Transfer of the 35S Promoter

Capstone Abstract:

Of the corn grown and produced in the United States, approximately 90% of it has been genetically modified. The purpose of this project is to test organic and non-GMO labeled corn seed for the existence of a horizontal gene transfer of the genetically engineered 35s promoter gene normally found in GM crops. This information will give insight into any possible contamination of GM corn into non-GMO corn and the validity of organically certified corn. Additionally, the accuracy of the test will be determined by the results of a genetically modified controlled sample. There are several steps to set up and organize in order for this project to unfold and take action. This experiment intends to include both locally grown and produced samples, as well as samples from other states. The type of corn seed and their vendors will be determined based on responses to a survey sent out to various Virginia farmers.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	3:30 – 3:55 pm
Presenter:	Brandon Walraven
Concentration:	System Design for Sustainable Development
Capstone Advisor:	Paul Goodall
Project No.:	BSISAT-25-14S
Capstone Title:	Feasibility Study of Novel Aquaponic Systems

Capstone Abstract:

Aquaponics is method a of food production that uses aquaculture to grow produce in a closed loop system that does not require soil. The system is driven by nitrifying bacteria populations that convert the toxic waste outputs from the fish population into biologically available nutrients for the plants, simultaneously growing fish and vegetables. Aquaponic production has multiple ecologic and social benefits including reduced water usage, location flexible food production, nutrient recycling, and the reduced environmental degradation from unsustainable agriculture. Recently new developments in system design and grow media have increased system productivity and reduced space requirements, allowing for small but productive growing systems. These advances have the potential to open up new markets for aquaponic production, specifically in areas with stressed food systems and limited space. To assess the economic viability of aquaponics a business plan was developed to model how urban based aquaponics might be feasible. To compete with the low cost and profit margins of the vast mechanized agriculture and food industry a local perspective is essential and growers must innovate in the value propositions to customers. Specifically for this investigation the concept of live produce sales directly to the customer was explored. This analysis concluded that it is difficult to make a compelling case for aquaponics strictly on the grounds of business due to the lack of economic benefit associated with micro-scale aquaculture. The remainder of the investigation is focused on the potential for social entrepreneurship applications in aquaponics, specifically in improving food security in developing countries and urban areas. To demonstrate the system's potential a small footprint system has been constructed and analyzed for it productivity. Although aquaponics may have potential for increasing food security in an increasingly urbanized world it still has many significant hurdles to overcome.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	4:00 – 4:25 pm
Presenter:	Seth Fields
Concentration:	Energy
Capstone Advisor:	Paul Goodall
Project No.:	BSISAT-26-14S
Capstone Title:	A Plan for Developing a Smart Microgrid Electrical Distribution System at JMU

Capstone Abstract:

Generally speaking, the Smart Grid is a goal that the electric power industry is aspiring to, which is to bring the entire U.S. electrical grid into the 21st century. More specifically, it describes a totally interconnected national electrical grid that utilizes distributed generation, automation, and a bidirectional flow of power and information to accurately meet consumer demand in almost real-time. A key component of the overarching Smart Grid will be smart microgrids. A smart microgrid refers to a small community, like a suburban locality, academic institution, or industrial location, with onsite distributed generation resources that operates in parallel with the utility grid but can also disconnect from it during peak hours or an emergency. The purpose of this project is to provide a pathway that JMU could follow to develop a smart microgrid. Extensive research was conducted on Smart Grid development, Smart Grid technology, and existing smart microgrids. Interviews were conducted with personnel from Facilities Management and Building Automation to learn about current operations at JMU regarding the electrical system and discuss the feasibility of developing a smart microgrid. While a project like this cannot be justified economically with today's technology, it has significant potential for educational gains for JMU students, the Harrisonburg community, and other similar institutions in the U.S. that are considering developing a smart microgrid. It would also contribute to JMU's sustainability initiatives. The Smart Grid is coming and this project describes the initial steps that will prepare JMU to integrate into it and to assist Smart Grid development by contributing to the knowledge pool about the practical implementation and operation of smart microgrids.

BSISAT Program

LOCATION: ISAT/CS ROOM 348

Presentation Time:	4:30-4:55 pm
Presenter:	Joshua Braden
Concentration:	Energy
Capstone Advisor:	Paul Goodall
Project No.:	BSISAT-27-14S
Capstone Title:	Feasibility Analysis for Geothermal Energy in Hawaii

Abstract Title:

As the demand for energy advances and the cost for electricity increases, alternative methods for electricity production are being explored. The state of Hawaii currently endeavors to provide, cheap, clean, and safe electricity for its population of approximately 1.2 million people. On the main island of Hawaii, the average price for electricity is roughly 30 cents per kWh compared to the US average of 10 cents per kWh. This is due to Hawaii's over dependence on petroleum based fuels and its six separate electricity grids. However, the island has a unique and abundant energy source due to its location in the Pacific Ocean in what is known as the "Ring of Fire". The Ring of Fire is the location where a considerable extent of seismic activity creates hot spots that reveal magma closer to the surface of the earth and provide a high potential for geothermal energy extraction. Currently the Hawaii Electric Light Company (HELCO) has issued a Request for Proposals (RFP) for an additional 50 MW of geothermal power generation. A feasibility analysis was developed for a Binary Geothermal Power Plant in southeastern Maui to meet the requirements of the RFP presented by HELCO and the Clean Energy Initiative that permits renewable energy for the state of Hawaii with goal of 40% renewable energy by 2030.

Results of the analysis indicate competent installed capacity estimates, but low economic incentives due to location, difficult terrain, and drilling conditions. It is also likely that approval for a new project will be superseded by any proposals for additions onto the existing geothermal plant.
Nonetheless, additional geothermal power in Hawaii is promising in the near future

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	9:00 -9:25 am
Presenter:	Jackson J. Snarr, II
Concentration:	Energy, Environment
Capstone Advisor:	Dr. Christopher Bachmann
Project No.:	BSISAT-37-14S
Sponsors:	Wes Pence (Wholesome Energy-Nonox Ltd.) Eric Cottel (Nonox Ltd.)
Capstone Title:	Assessment of Emulsified Fuel Technology on Transportation Engine Efficiency and Pollution Reduction

Capstone Abstract:

This study reports the results of a research project assessing the impact of emulsified fuel technology (EFT) on potential energy conservation and pollution reduction in the transportation sector. An EFT that mixed water and bunker and/or diesel fuel was assessed on a marine freight ship (MV Tarago Mark IV RoRo) as well as a tractor trailer (2003 Mack CX600).

Thirty different test procedures yielded more than 15,000 data points for these real world transport applications; preliminary findings suggest that a combined average fuel savings of approximately 1.6%. NOx, SOx, CO, CO2, O2, and particulate matter were also quantified and compared. Additional laboratory studies employing a dynamometer in a controlled environment have been undertaken to validate these on-road and on-water measurements.

These novel water EFT devices provide innovative solutions to pollution and high fuel demands for on road, on-rail, and marine transport systems. The project is being conducted in partnership between Wholesome Energy in Edinburg, VA, NoNox Ltd., (the product patent-holder), and James Madison University. This technology has the potential to be easily reconstructable and deployable for active use in any equipment with an internal combustion engine. Virginia's on land and marine freight industries are likely industrial markets for this technology.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	9:30 – 10:10 am
Presenters:	Kerianne Bertolino and Sarah Gibson
Concentration:	Applied Biotech, Energy, and Information and Knowledge Management
Capstone Advisor:	Dr. Christopher Bachmann
Project No.:	BSISAT-38-14T
Sponsor:	Wholesome Energy and NoNox Ltd.
Capstone Title:	Investigating a Novel System to Extract Algal Oil

Capstone Abstract:

According to the Department of Energy, the use of biodiesel dramatically reduces carbon dioxide emissions by 75% as compared to fossil fuels. The use of algae as a biofuel feedstock has attracted considerable attention because of it's potential to provide abundant, clean, renewable fuel that does not interfere with the global food supply. This is evident in the Department of Energy's National Algal Biofuels Technology Roadmap and recent funding announcements that were awarded in August 2013. Current methods for algae oil reclamation require the algae to be dewatered which is not only time consuming but very energy intensive. Through a public-private partnership between our University, Wholesome Energy, and NoNOx Ltd. of Edinburgh, VA, our team has developed a novel algae-oil harvesting strategy that circumvents the need for this energy-intensive dewatering step. Oil yields were analyzed by the Virginia Institute for Marine Science and confirmed pure, highly saturated hydrocarbons. The goal of this study is to quantify the difference in energy required to harvest algae oil using this novel oil harvesting strategy compared to traditional dewatering methods. Additional experiments are underway to improve the overall efficiency of the process by increasing oil yields and decreasing inputs. Finally, an energy analysis of the experimental setup will be performed to determine if this system is capable of large-scale implementation and financially attractive enough to compete with traditional fossil fuel resources. We believe this system can be replicated and expanded to effectively decrease current reliance on environmentally damaging fossil fuels around the world and provide a clean, renewable alternative that can meet growing energy demands.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	10:15 – 10:40 am
Presenter:	Britton Cocke
Concentration:	Agricultural Biotechnology/Sustainable Environment
Capstone Advisor:	Dr. Christopher Bachmann
Project No.:	BSIAT-40-14S
Sponsor:	NoNox Ltd. Of Edingburg, VA
Capstone Title:	Using Byproducts of a Novel Algae Harvesting System in the Production of Animal Feed and Supplemental Products

Capstone Abstract:

According to the Environmental Protection Agency, motor vehicles account for nearly half of smog forming volatile organic compounds (VOC's), more than half of nitrogen oxides (NOx), 75% of carbon monoxide (CO), and significant amounts of CO2. Additionally, the Statistical Review of World Energy predicts current proven global oil reserves to be depleted in 54 years. Algae-based biofuels have been proposed as a promising alternative to petroleum because of their potential for pollution reduction, large-scale implementation, and long-term, sustainable productivity. A major challenge impeding adoption of algae-based biofuels is the relatively expensive cost compared to conventional petroleum. The purpose of this project is to improve the overall economic viability of a novel algae-oil harvesting system by examining the market potential for the residual biomass derived from the algae-fuel processing steps. This novel algae harvesting system is being developed as part of a public-private partnership between James Madison University and Wholesome Energy, and NoNOx ltd. of Edinburgh, VA. Previous studies demonstrated the successful extraction of algae oil. A significant amount of residual biomass has been observed after oil has been extracted from the algae cultures. Experiments are ongoing to quantify the nutritional value of the residual biomass and assess any potential toxicity concerns that arise from the oil extraction process. By combining a novel fuel-harvesting step with developing algae-based feed production strategies, this project creates a system that can produce a clean, renewable substitute for petroleum while creating a nutritious, valuable animal feed. By incorporating animal feed production into this novel algae-oil extraction system, the economic feasibility is greatly improved. This novel algae-oil/feed production system helps advance changes in critical areas of energy security and environmental sustainability needed for a growing global population.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	10:45 – 11:10 am
Presenter:	Olivia McGuigan
Concentration:	Environment
Capstone Advisors:	Dr. Mary Handley and Dr. Steve Frysinger
Project No.:	41-14S
Capstone Title:	A Comparative Life Cycle Assessment of Cotton vs. Polyester Textiles

Capstone Abstract:

The purpose of this work is to develop a qualitative life cycle assessment of the environmental and occupational health impacts associated with producing cotton versus polyester textiles. These two textiles are the most common fibers used in garment making worldwide. This work compares cotton and polyester in order to reach a conclusion as to which has less environmental impact. Life cycle assessment (LCA) is a tool used to assess the inputs and outputs of a product. This is done in order to determine the environmental impacts associated with the stages, from cradle to grave, in a product's life span, which includes material extraction, material processing, product manufacturing, distribution, product use, and end-of-life disposal. A complete LCA includes four phases: determining a goal and scope, creating a life cycle inventory, assessing the life cycle impacts, and interpreting the data. These analyses can lead to improvements of the product to reduce its environmental impacts.

The boundaries of this LCA are specific to the individual textiles. Cotton is assessed beginning with the agricultural phase. The agricultural spectrum includes all on-farm activities associated with growing and harvesting cotton. The subsequent processing phases include ginning, spinning, weaving, and finishing. Polyester is evaluated starting with the assumption that the raw material (petroleum) has already been extracted.

The assessment continues with polymerization of Polyethylene Terephthalate (PET) to production of the textile. Use and disposal are also evaluated for each fiber. Garment making was eliminated from the scope because it is assumed that there is little difference between the two different textiles in this phase. Overall, this analysis determined that both cotton and polyester have significant health, water, energy, and climate impacts throughout their life cycles.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	11:15 – 11:55 am
Presenters:	Casey Fox, Jonathan Matthews, and, Ryan Sheppard
Concentration:	Energy
Capstone Advisor:	Dr. David Lawrence
Project No.:	BSISAT-43-14T
Capstone Title:	Development of Thin Film Photovoltaic Cells using Sustainable Materials and Processes

Capstone Abstract:

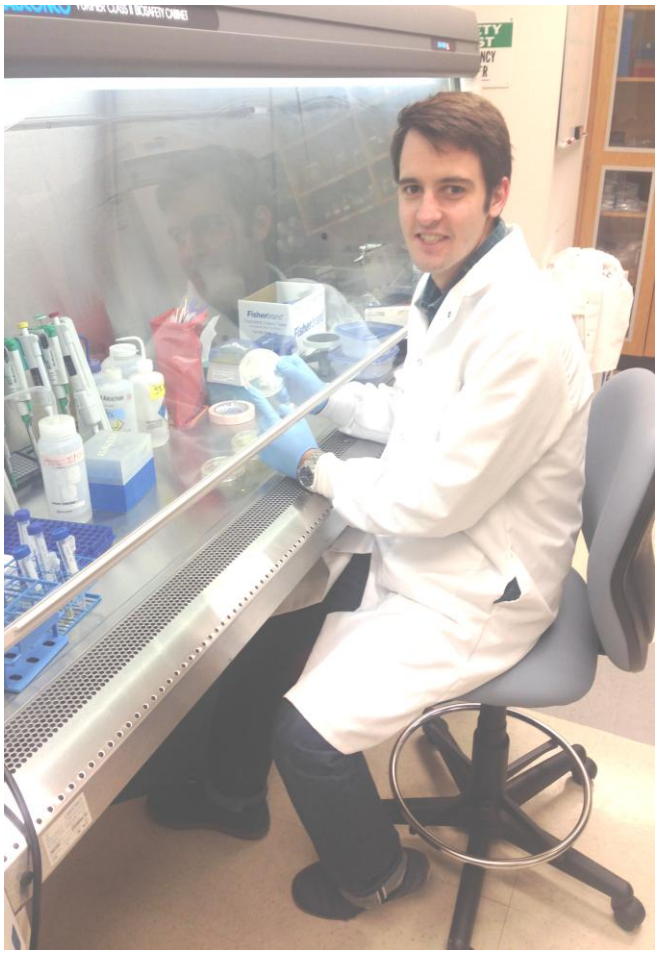
The world is undergoing a transition towards more sustainable energy sources. Solar energy is the most abundant energy source on earth, but converting this resource into electricity has not yet become cost-competitive. As a result, there has been on-going research within the ISAT program relating to developing cost-effective processes and materials for the production of photovoltaic (PV) cells. Our group in particular has continued the efforts of past groups in optimizing each step in the PV cell fabrication process. This year the focus has moved towards one layer in particular, the light absorption layer. Copper zinc tin sulfide (CZTS) is a more abundant and less toxic alternative to traditional materials, which usually are toxic, rare, or require energy intensive processes to produce, contributing to a higher cost. Additionally, we are investigating spray processes, which are significantly less energy intensive and can be scaled to coat larger areas. Currently, we are only using spray techniques for the CZTS absorption layer and the zinc oxide contact layer, but ultimately the spray process will be extended to the other layers as well. We hope that through optimizing the use of more sustainable materials and processes, PV cells will become a more attractive option for electricity generation.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	3:00 – 3:25 pm
Presenter:	Coles Keeter
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Louise Temple and Dr. Robert McKown
Project No.:	BSISAT-34-14S
Capstone Title:	An Investigation of the Anitmicrobial Activity of a Lacritin Derivative Against Various Strains of Cariogenic Streptococcus

Capstone Abstract:



The purpose of this study was to investigate the possible antimicrobial effects of a lacritin derivative (N-65) against various strains of Streptococcus. The formation of dental caries has been primarily linked to the metabolism of glucose and sucrose by *S. mutans*, as well as several other species within this genus, in which the lactic acid byproduct erodes tooth enamel. N-65 is a peptide that results from cleavage of 65 amino acids from the N terminus of lacritin, and has shown antimicrobial effects against the ocular pathogens *Staphylococcus epidermidis* and *Pseudomonas aeruginosa*. The primary experiment performed in this study was a colony forming unit assay (CFU), in which buffered suspensions of these bacteria were treated with either N-65 or phosphate buffered saline as a control.
Colony formation on tryptic soy agar served as the basis for comparison of growth ability after treatment. N-65 showed a 50% decrease in cell viability against *S. sanguinis*. However, the results were generally inconclusive for the other strains of Streptococcus based on variability in colony count after treatment. Further study involving growth media that is more suitable for Streptococcus would allow for a more accurate understanding of the efficacy of this lacritin derivative.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	3:30 – 3:55 pm
Presenter:	Carly Elizabeth Starke
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Louise Temple
Project No.:	BSISAT-35-14S
Capstone Title:	An Approach to *Bordetella avium* as a Universal Poultry Live Vaccine Platform for the Expression of Foreign Antigens

Capstone Abstract:

The Shenandoah Valley of Virginia is a major poultry growing region in the United States, leading to a strong interest in controlling zoonotic pathogens in poultry to prevent economic losses and transmission to humans. *Bordetella avium*, a Gram negative bacterium, is the causative agent of the upper respiratory illness, bordetellosis, in turkeys. An existing bordetellosis vaccine decreases severity of the disease but does not limit infection or spread. A better vaccine for bordetellosis is needed. Our research involves developing B. avium as a universal poultry live vaccine platform that will protect against bordetellosis and serve to express foreign antigens. We hypothesize that B. avium can stably express foreign antigens, such as those from important poultry pathogens as *Campylobacter jejuni, Clostridium perfringens*, and Hemorrhagic enteritis virus, and produce a strong immune response to multiple pathogens following intranasal vaccination. The gene encoding Baa1, an autotransporter involved in host colonization in B. avium but shown to be non-essential, was selected as the location for heterologous genes, to produce an attenuated B. avium strain and express the foreign antigens at the cell surface. The potential vaccine delivery plasmid design consisted of the plasmid pBBR1-MCS, a broad host range plasmid, with the Baa1 autotransporter and the foreign antigen of interest replacing the passenger domain of the autotransporter gene. Antigens from *C. jejuni*, such as a flagellin protein and an amino acid binding protein, that are known to elicit immune responses in poultry have been cloned into the passenger domain of the autotransporter gene to form the plasmid construct in the *E. coli* plasmid pCR2.1. After moving the construct into pBBR1-MCS, the expression will be tested in *B. avium.* Success of these efforts will allow this vaccine platform to be used for the delivery of foreign antigens and response to pathogen threats.

BSISAT Program

LOCATION: ISAT/CS ROOM 350

Presentation Time:	4:00 – 4:25 pm
Presenter:	Nathaniel Tate Burkholder
Concentration:	Applied Biotech
Capstone Advisor:	Dr. Louise Temple, Dr. Stephanie Stockwell, Dr. Nathan Wright
Project No.:	BSISAT-36-14S
Capstone Title:	Structure and function of novel RTX-like proteins BAV1944 and BAV1945 in *Bordetella avium*

Capstone Abstract:

Bordetella avium is a gram-negative bacterial pathogen that colonizes the upper trachea of turkeys and causes bordetellosis. Two large, novel proteins denoted as BAV1944 and BAV1945 are suspected to play a role in *B. avium* virulence. These proteins seem to present a metabolic burden to produce, share slight homology to a variety of virulence factors in other pathogens, and function as secreted proteins through an upstream SecA-dependent type I secretion system (TISS). The bav1944-5 and TISS genes were found to be transcribed at 37°C, implicating their expression and secretion under typical host physiological temperature. The function of a bav1944-5 knock-out derivative of *B. avium* 197N was tested for loss of phenotype using various methods. This mutant exhibited no significant difference in serum resistance, tracheal binding affinity, and apoptotic activity compared to 197N. Further analysis of these proteins revealed likenesses to the family of repeat-in-toxin (RTX) proteins. BAV1944 and BAV1945 appear to be secreted through a TISS and have GD-rich nonapeptide repeats that are signature features of RTX proteins. Protein models of a C-terminal domain of unknown function identified in BAV1945 matched cysteine protease domains (CPDs) found in the *Clostridium difficile* toxin B and the multifunctional autocatalytic repeat-in-toxin (MARTX) toxin in Vibrio cholera. These CPDs act through self-cleavage upon activation with a host cytosolic component, which releases Rho-GTPase glucosylating effector domains that can directly cross-link actin. Activity of purified BAV1945 CPD with eukaryotic extract would support a model of host translocation. Examining the effects of the bav1944-5 mutant on cultured turkey ciliated cells' actin organization may reveal the function of these proteins. BAV1944 and BAV1945 appear to represent a novel class of RTX toxins that could be targeted for vaccine design.

BSISAT Program

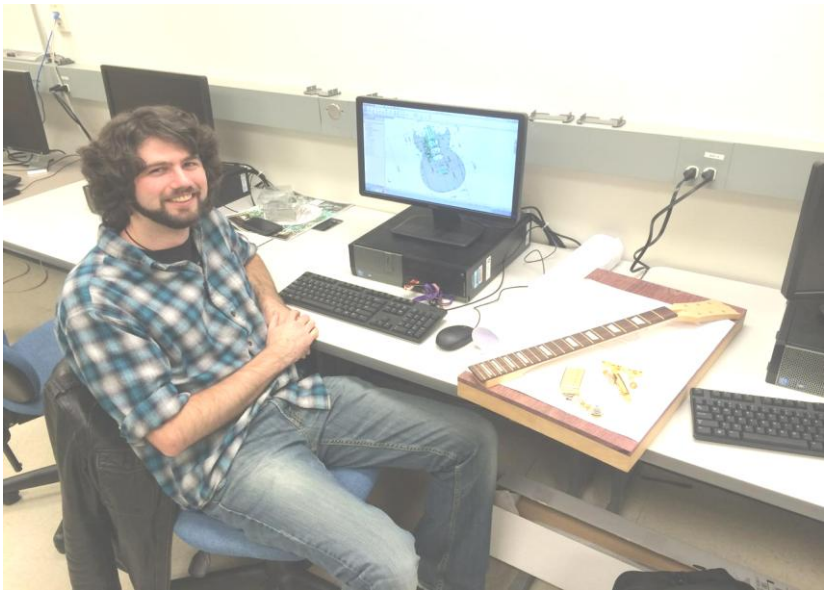
LOCATION: ISAT/CS ROOM 350

Presentation Time:	4:30 – 4:55pm
Presenter:	Alan Sites
Concentration:	Engineering and Manufacturing
Capstone Advisor:	Dr. Geoffrey Egekwu
Project No.:	BSISAT-07-14S
Capstone Title:	Design and Manufacturing of an Electric Guitar Utilizing 3D Print Technologies

Capstone Abstract:

It is difficult for musicians to find an instrument with the desired feel and look (fit-and-form as we say in manufacturing) that meet all of their expectations, therefore players have to settle for certain traits or buy multiple instruments to get everything they want out of their playing. A guitar was developed to encompass several of these key favorable traits and materials in the design for a highly customized musical instrument. *Solidworks*® CAD software was used to design the guitar, while extensive materials and process research was conducted through *CES*® material and process selection software, as well as consulting other luthiers, to develop a working electric guitar.

Top of the line instrument manufacturing is traditionally handcrafted; however, 3D printing is an ever growing trend within the manufacturing field that can easily be integrated into the process. This project explores many of the possibilities 3D printing and traditional manufacturing techniques present in guitar manufacturing



BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	9:00 -9:40 am
Presenters:	William Fleury and Andrew White
Concentration:	Energy
Capstone Advisor:	Dr. Jonathan Miles
Project No.:	BSISAT-44-14T
Capstone Title:	Ridgeline Wind Farm Development Opportunity and Obstacle Analysis

Capstone Abstract:

The purpose of this analysis was to identify the potential opportunities for and obstacles to the development of a ridgeline utility-scale wind power plant in Rockingham County, along the border of West Virginia's Hardy and Pendleton Counties. The proposed site sits along a roughly 8-mile ridge with a maximum elevation of 4,032 feet. Prior to undertaking this analysis, several years of Sonic Detection And Ranging (SoDAR) analysis was conducted, and wind data were collected from meteorological towers distributed throughout the area. These data demonstrate a viable wind resource for a utility-scale wind power plant.

Several obstacles to the potential development of this land area must be overcome. This report focuses on accessing and altering federal Lands, community outreach and consensus, and quantification and classification of the wind resource available. In order to create a better understanding of the topographical features, land ownership, road access, and federal and protected land distribution, and other land classifications, a comprehensive GIS map of the ridgeline and the surrounding area was created. From this map, it was determined which federal lands would be viable areas for additional access road infrastructure, which lands would be problematic to disturb, which existing access routes could be utilized, and which privately owned land parcels would likely be available for development.

BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	9:45 – 10:25 am
Presenters:	Ryan Hoag and David Hryvniak
Concentration:	Energy
Capstone Advisor:	Dr. Jonathan Miles
Project No.:	BSISAT-45-14T
Capstone Title:	U.S. Department of Energy Inaugural Collegiate Wind Competition

Capstone Abstract:

James Madison University was selected to compete in the U.S. Department of Energy's inaugural Collegiate Wind Competition. This competition is the first of its type, and quite different from traditional engineering competitions. It requires interdisciplinary teams to address the economics, political and environmental policies, and social context of wind in addition to the technical aspects of wind turbines. The competition challenges students to three tasks: to design and prototype a small, portable wind turbine capable of charging electronic devices; to develop a comprehensive business plan to market the turbine; and to deliver a market issues presentation on a region-specific topic. In order to complete these tasks, JMU formed a team of faculty and students drawing from a variety of programs and departments, including: Engineering, Integrated Science and Technology, Business, Industrial Design, Political Science, and Communication Studies.

The purpose of this capstone project was to assume Project Manager roles for the competition. This involved a number of tasks, including: team formation, communication and dispersion of materials, formulation of timelines, meeting with faculty and students to discuss pertinent topics, helping to plan an ISAT 480 course geared toward the competition, and others. In some cases, this role also involved aiding in more specific aspects of the project, such as brainstorming and problem solving with the Business Team, 3D-modeling blades for the prototype, or helping to research and develop the Market Issues presentation. This project has been effective at applying the skills acquired through the ISAT program, as it has involved approaching a number of issues with a holistic view and working with members from various disciplines to produce cohesive products that thoroughly address social, cultural, political, economic, environmental, and technical factors.

BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	10:30 – 10:55 am
Presenter:	Blake Richardson
Concentration:	Information and Knowledge Management
Capstone Advisor:	Dr. Anthony Teate
Project No.:	BSISAT-46-14S
Capstone Title:	BikeShare: A Mobile Application to Facilitate On-Campus Transportation using GPS Enabled Bikes

Capstone Abstract:

Transportation from one side of JMU's campus to the other side between classes has been an evolving issue. While the University busses run regularly and gates around the bluestone area of campus have helped, many students still choose to walk or bike across campus. The BikeShare system consists of a website and an Android based mobile application that would allow students to easily locate bikes on campus that are available for use. These bikes can be used to ride anywhere on campus and then locked up for the next person to access. BikeShare uses PhoneGap to access the geolocation properties of phones to track the locations of the bikes. The website was developed using HTML5, JavaScript, utilizing Google Maps API, and PhoneGap to access the Geolocation API.

BSISAT Program

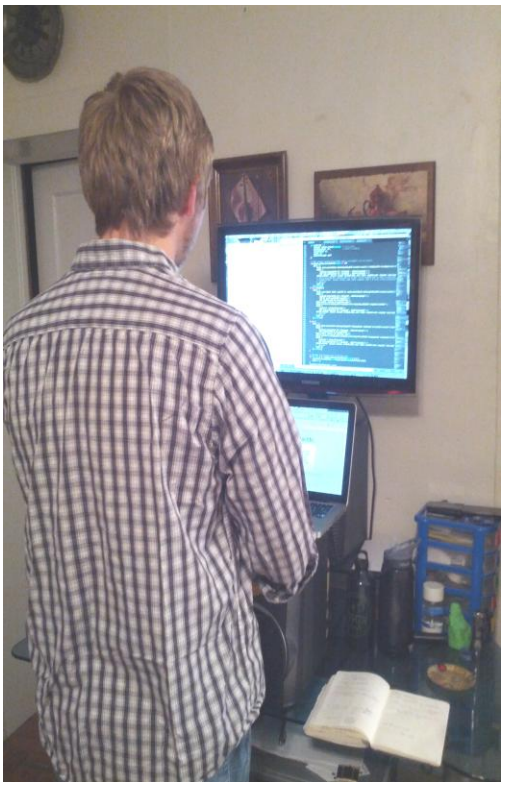
LOCATION: HHS Room 2201

Presentation Time:	11:00 – 11:25 am
Presenter:	Tim Borny
Concentration:	Information and Knowledge Management
Capstone Advisor:	Dr. Anthony Teate
Project No.:	BSISAT-47-14S
Capstone Title:	Creating an application for aggregating and organizing the most valuable content on the web using a graph database and modern web technologies

Capstone Abstract:

The internet is an amazing resource potentially representing the sum of human knowledge. Organizations like google and wikipedia have made it incredibly easy to find and access information on the web, however, they only work if you know exactly what it is you're looking for and their focus is on access to information rather than the transfer of knowledge.

Oaddo was created as a solution to this problem. From the latin words omni (everything) and addo (to inspire, to join, and to give), Oaddo aims to be a universal, open source, community driven site, focused on knowledge acquisition.



At its core, Oaddo is about aggregating the most knowledge dense and valuable content on the web and providing a platform for exploring that content. By using a graph database to store content, relevant terms, and relationships between the two, Oaddo is able to suggest search terms relevant to whatever topic the user is currently exploring, even if at first, they don't know what to be searching for.

Oaddo uses the PaaS Heroku for hosting, node.js for its server, hapi.js on top of node as an API, angular.js for its MV* framework, the graph database neo4j (hosted at grapheneDB) for its persistence data storage, and AWS S3 for persistence file storage. Oaddo also takes advantage of many open source scripts, plugins, and modules for node.js, hapi.js, angular.js, and general web development.

BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	11:30 – 12:10 pm
Presenters:	Shaina Hyman and Lauren Donoghue
Concentration:	Environment
Capstone Advisors:	Dr. Joy Ferenbaugh and Dr. Morgan Benton
Project No.:	BSISAT-48-14T
Capstone Title:	Saving the Sea Turtles: Conservation methods including a mobile application

Capstone Abstract:

The purpose of our project is to aide in sea turtle conservation efforts and to develop and implement a plan in which increases their rate of survival. Sea turtles are enlisted as an endangered species due to predator interaction, climate change, human impact, disease, and habitat loss. Tracking sea turtles has proven to be a necessary process to help determine sources of endangerment, and in determining declining numbers. In order to aid in the tracking process, we have developed an Android/iOS mobile application using a combination of Javascript, CSS, and HTML. This will allow sea turtles to be logged in and tracked. Anyone who downloads the application can access the information available and can submit their own. The application consists of manual entry capabilities, and the ability to access information regarding turtles already existing in the system. A hand held application will provide users with an easy to manage device while collecting data in the field. Information regarding tracked sea turtles was collected from researchers in Malta and plugged into our application to have initial information in the system. With the addition of this application, awareness of Sea Turtle threats and declines can be increased and efforts to rejuvenate populations can be maximized.

BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	3:00 -3:25 pm
Presenter:	Brandon McRory
Concentration:	Energy
Capstone Advisor:	Dr. Maria Papadakis
Project No.:	42-14S
Capstone Title:	Improving the Energy Efficiency of Two Harrisonburg City Homes

Capstone Abstract:

This project involved an energy audit of two private residences in the City of Harrisonburg. The goal was to identify energy improvements and reduce energy costs to improve the quality of life of the clients and help save them money. The families were sponsored for the audit by New Community Project. Standard residential energy audit and data analysis was used; recommendations focused on low cost improvements and opportunities for assistance from the federal Weatherization Assistance Program.

BSISAT Program

LOCATION: HHS Room 2201

Presentation Time:	3:30 – 4:10 pm
Presenters:	Aaron Doherty and Tom Griffin
Concentration:	Energy
Capstone Advisor:	Dr. Maria Papadakis
Project No.:	16-14T
Capstone Title:	CO2 Monitoring of "Stuffy" Dorm Rooms at JMU

Capstone Abstract:

The goal of our project is to analyze the relationship between CO2, temperature, and humidity levels in dorm rooms that are not readily equipped with ventilation. Students living in some residence halls at JMU have reported a "stuffy" feeling within their living space, and often open their windows during the winter heating season. Such a "stuffy" feeling can be a sign of CO2 buildup or uncomfortable heat and humidity. We custom-built 6 devices that contain a mix of CO2, temperature, and humidity sensors and Raspberry Pi single-board computers. These monitoring devices were used to collect data in 25 JMU dorm rooms. The data were used to analyze room conditions at the time occupants opened their windows. Our findings will be used to make energy and ventilation management recommendations to JMU's Office of Residence Life.

Presentation Time:	4:15 – 4:55 pm
Presenter:	Connor Gray and Raguram Sellakkannu
Concentration:	Energy
Capstone Advisor:	Dr. Maria Papadakis
Project No.:	
Sponsor:	Shenandoah Bicycle Company, Mr. Tim Richardson and Mr. Thomas Jenkins
Capstone Title:	Shenandoah Bicycle Company Energy Audit

Capstone Abstract:

This project is centered around an energy audit conducted at Shenandoah Bicycle Company. The detailed energy audit looked into the performance of the major energy systems in the building. Appropriate energy saving measures were determined and analyzed in order to determine potential energy savings. Computer software was used to determine the accuracy of the potential energy savings.

BSISAT Program

LOCATION: HHS Room 3022

Presentation Time:	11:00 – 11:40 am
Presenters:	Ryan Carter and Ryan Lutz
Concentration:	Telecommunications
Capstone Advisor:	Dr. Emil Salib
Project No.:	BSISAT-09-14T
Capstone Title:	Virtualization of HHS 3022 Lab using VMware vSphere Suite

Capstone Abstract:

Virtualization is one of the most effective ways to reduce IT expenses, increase efficiency, and boost productivity. Virtualization is the use of software, to mimic the functionality of hardware. VMware, one of the largest commercial virtualization companies has created the software suite vSphere. vSphere is a server based product that allows a company to consolidate resources and expenses in hardware by creating a virtual platform that allows for the use of multiple operating systems in a single environment. The goal of this project is to create a virtual environment in the Telecommunications Lab that reduces the cost of hardware and administration, while allowing the Telecommunications classes to continue with the current curriculum. We implemented the virtual lab using the vSphere software suite provided by VMware. In order to create the environment with the resources needed, we have obtained two Dell Precision T7600 tower servers, each of which are fitted with dual Xeon E5-2630 CPU's, 256 gigabytes of RAM, and 3 TB's of storage. These two servers have the computing capability to support the needs of the students using the Telecommunications Servers.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1201

Presentation Time:	10:30 – 11:10 am
Presenters:	Megan Laskey and Alex Van Natta
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Jennifer Coffman
Project No.:	GS-01-14T
Sponsor:	New Community Project
Capstone Title:	Peddler's Produce

Capstone Abstract:

According to the USDA, 8,391 people in Harrisonburg, Virginia, reside in food deserts. The Farm Bill defines a food desert as 'an area in the United States with limited access to affordable and nutritious food' (U.S. Congress, 2008). Tom Benevento, the homestead director of Harrisonburg's New Community Project, proposed a solution: Peddler's Produce, a portable farmer's market that will bring sustainable produce into local neighborhoods via bicycle.

Our research focused on how Peddler's Produce could be a viable and sustainable way to provide access to healthy food in food deserts. Our research included three key components: interviews with residents and farmers, surveying of local grocery stores, and the design and pilot run of the project. In order to streamline our analysis, we looked at our data through the lenses of affordability, transportability, access to goods and customers, interest, and need. While our project's accomplishments were a step in the right direction, we did not achieve a system that met our standards for sustainability. Further research is needed on how to improve the participation of those in the food desert and those supporting the portable farmers' market.

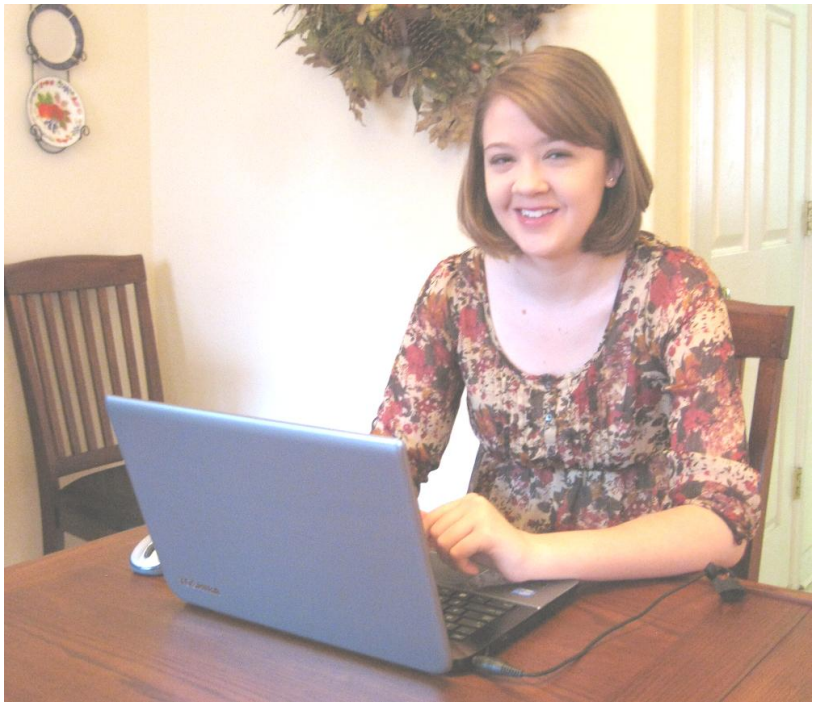
GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1201

Presentation Time:	11:15 – 11:40 am
Presenter:	Leeanne Jackson
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Helmut Kraenzle
Project No.:	GS-02-14S
Capstone Title:	Graphical Calculation of the Fractal Dimension for Applications in Geography

Capstone Abstract:

Natural geographic features have long been difficult to model with traditional Euclidean geometry, due to their complexity and scale-dependent characteristics. The details of a geographic feature that may be examined at a finer scale resemble those of a coarser view of the feature. This characteristic is called "self-similarity", and can be represented using fractal geometry. Fractals differ from traditional Euclidean geometry in that they are defined recursively rather than by direct description of their characteristics. They have been successfully used to represent both natural and man-made features since Benoit Mandelbrot pioneered the development of techniques to analyze these complex forms in 1982. One measure which may be calculated using fractal geometry as a model for geographic features is the fractal dimension, which describes an object's complexity. It can be used to predict patterns in data or to improve existing datasets. The goal of this project was to create an application to graphically calculate the fractal dimension of geographic features, which may be added to the existing set of technological tools used by geographers. The method chosen for this algorithm was to perform a functional box count.This involves overlaying a grid on a feature and counting the number of cells that intersect it. An object-oriented Python program was developed to represent geographic features in a vector format, and to recursively calculate the fractal dimension. The design includes classes representing polygon and linear curve features, as well as the points and line segments of which they are composed. The algorithm for calculating the fractal dimension has been tested for accuracy by assessing its output using fractals with known and documented fractal dimensions. It has then been applied to different geographic features to measure the dimension as a quantitative indicator of various geographic properties.



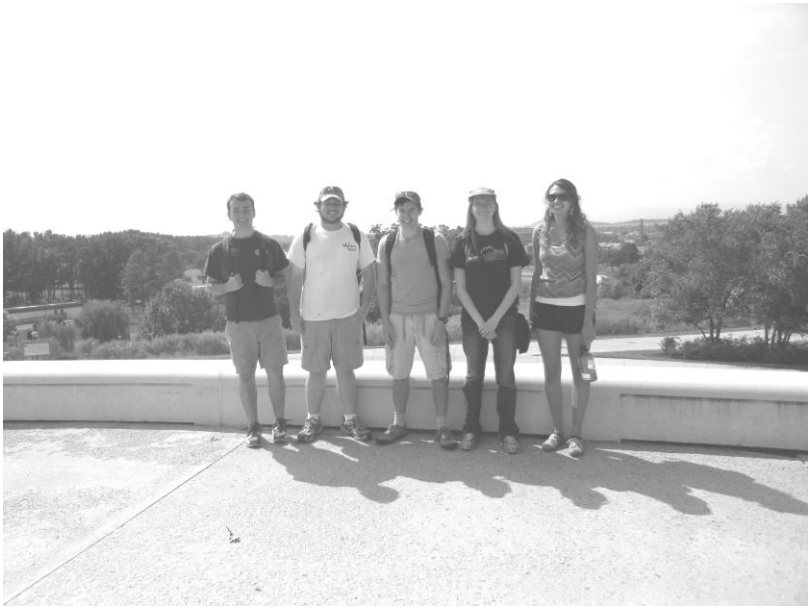
GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	10:00 -10:40 am
Presenters:	Bradley Andrick, Madeline Bryant, Michael Hudson, Matthew Smith, and, Helen White
Concentration:	Applied Geographic Information Science (AGIS) and Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Amy Goodall
Project No.:	GS-03-14T
Sponsor:	Principal Anne Lintner, W.H. Keister Elementary School
Capstone Title:	A Proposal for Modifying the Keister Elementary School Forest

Capstone Abstract:

W. H. Keister Elementary School (KES) in Harrisonburg, VA is located adjacent to a 4.5 acre urban forest patch which is shared by KES and the City of Harrisonburg. The forest serves as an outdoor learning area for the school's classes. During the past few years, thick ground vegetation, anthropogenic litter, and invasive plant species within the forest have concerned the school. We designed this study to investigate the vegetation of the forest, assess human activities within the forest, and to make recommendations about changing the vegetation in order to increase student learning and to reduce concerns about unwanted activities in the forest. We used aerial images to identify forest zones based on vegetation structure. For each forest zone, we collected data on the forest floor vegetation density, tree species diversity and density, and average height of trees. A digital elevation model (DEM) was used to map topography. We used GPS and GIS technologies to map and analyze each forest zone. Based on our analyses of forest structure and a review of literature, we make recommendations for future modification or conservation of each zone, including the removal of thick underbrush and invasive species, conservation of existing native species, and planting of understory native shrubs and flowers. We suggest formation of an additional nature trail that can encourage student learning and recreational use of the forest by the local community.



GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	10:45 – 11:10 am
Presenter:	Kinsey Browning
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Amy Goodall
Project No.:	GS-04-14S
Sponsor:	Ms. Anne Linter, Principal, W. H. Keister Elementary School and, Mr. Mitch Yoder, Teacher , W.H. Keister Elementary School
Capstone Title:	W.H. Keister Elementary Garden: Making Environmental Connections

Capstone Abstract:

Development of Harrisonburg's W.H. Keister Elementary School (KES) Garden was started during Fall 2011. KES Principal Anne Lintner and several faculty from KES worked with the JMU ISAT Department, three JMU Geographic capstone students, and the preschool – 4th grade KES students to create a vegetable and wildflower garden. The design of the garden was developed by the JMU Geographic Science capstone students with the objective to create a learning laboratory where KES students could learn about and explore the growth of vegetables and the life science of insects and birds that visit the garden. In this study, I address the importance and benefits of a school garden for increasing children's connections to natural environments. Through literature review and hands-on experience in the KES garden during late summer and fall 2013, I assessed how the vegetable portion of the KES Garden works as a learning environment and how to improve learning opportunities in the garden. Through investigation of case studies and my own observations, I present methods for increasing student involvement with the garden and make recommendations for further work.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	11:15 – 11:40 am
Presenter:	Janice Garner
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Amy Goodall
Project No.:	GS-05-14S
Sponsor:	Ms. Anne Linter, Principal, W. H. Keister Elementary School
Capstone Title:	Biodiversity and Community Composition of Butterflies in Harrisonburg, Virginia

Capstone Abstract:

Butterflies are known to serve as indicators of environmental conditions; however, geographic data of butterfly species diversity and abundances are limited though many regions of the globe. Additionally, less is known about butterfly communities in urban environments than in rural environments. This project was designed to assess the butterfly community in the city of Harrisonburg, Virginia including species presence and community composition within different habitats. Butterfly surveys were conducted during late summer and early fall 2013 within prairie patches at James Madison University and Harrisonburg City parks, the Keister Elementary School garden, and a forest patch at a Harrisonburg City park. Species composition, diversity, and similarity indexes among sites surveyed were configured. Results of this project suggest that butterflies of urban Harrisonburg are good indicators of habitat and current environmental conditions. The summary of this project provides insight for a longer-term study of butterflies in Harrisonburg.

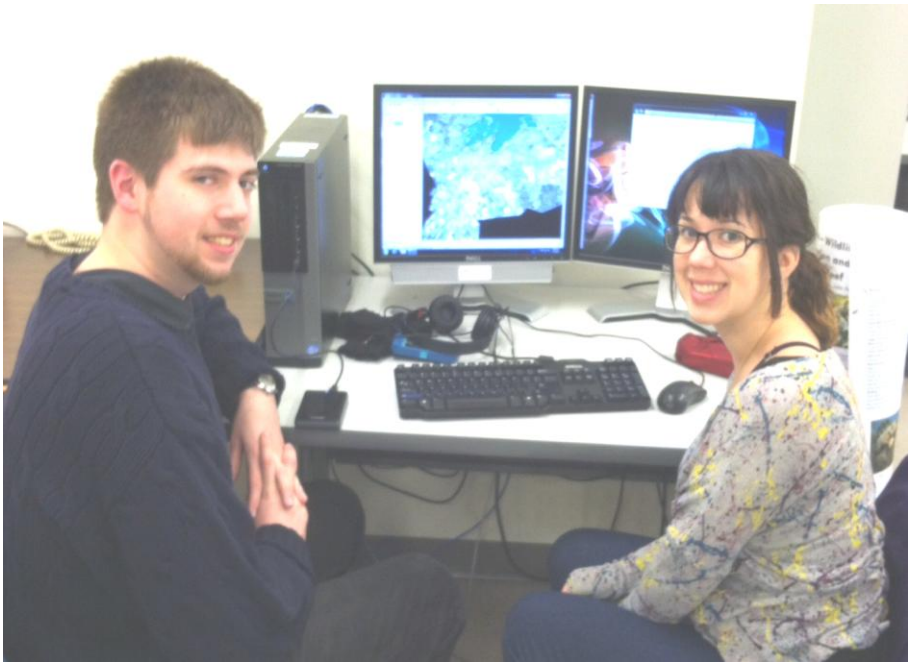
GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	3:00 – 3:40 pm
Presenter:	Peter Fliss and Candace Mercer
Concentration:	Applied Geographic Information Science (AGIS) and Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Zachary Bortolot
Project No.:	GS-06-14T
Capstone Title:	Land Use Classification of Harrisonburg from 1957 to 2012

Capstone Abstract:

Harrisonburg has experienced great land-use change in the last century. Changes in land use can become problematic especially when there is a shift from pervious surfaces to impervious surfaces. This project shows the different types of land use from the 1950s to 2012. A classification of Harrisonburg in the years 1957, 1965, 1974, 1983, 1990s, 2003, 2012 was performed showing agriculture, forest, urban build-up (including areas of construction), and other vegetation (meadows and grass). After various failed attempts of classification due to the lack of multiple spectral bands, a reduced focus was instituted. Urban build-up, like neighborhoods and other man-made landscapes, were digitized, while the other classes were developed using a texture based classification in PCI Geomatica. Actual maps were created in ArcMap showing the areas that have seen the most change from pervious surfaces to impervious surfaces.



GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	3:45 – 4:10 pm
Presenter:	Parker Ward
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Carole Nash
Project No.:	GS-07-14S
Capstone Title:	Backyard Oyster Aquaculture

Capstone Abstract:

The purpose of this research project is to determine the most effective type of oyster cage for waterfront property owners to use when engaging in backyard oyster (Crassostrea virginica) aquaculture in the Chesapeake Bay. The state of the Bay has been degraded in recent decades due to excess influx of nitrogen and phosphorus from runoff that leads to algal blooms and dead zones. An increasingly popular program for homeowners with waterfront property is backyard "oyster gardening," in which oysters are grown off of piers to a certain size, transported to the Chesapeake Bay Foundation, and then relocated to oyster reefs in the Bay. As more people get involved with the small-scale aquaculture, it is hoped that the water quality of the Bay will improve. The primary research question concerns the type of cage that is best suited for backyard gardeners to use when growing oysters on a small scale. The research site, at Christchurch School on the Urbanna Creek, a tributary of the Chesapeake Bay, was selected due to the long-term commitment of students and teachers to oyster gardening. The Creek models the Bay's characteristics in that it has multiple freshwater inputs and flows into a higher salinity river through a narrow mouth. Four cage types, filled with 1,000 oyster seed, were tested including suspended buckets, suspended bags, Taylor floats, and bottom cages at a depth of approximately five feet. The most effective method of backyard aquaculture, the suspended bucket, was determined over a nine-month period by taking into consideration measurements of growth rates, maintenance requirements, and financial investments associated with each of four cage types. The results found in this research will be used to justify a larger scale project in the same location with possible grants from the National Oceanic and Atmospheric Administration (NOAA).

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	4:15 – 4:55 pm
Presenters:	Brad Anderson and Michael Hammerstrom
Concentration:	Applied Geographic Information Science (AGIS) and Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Carole Nash
Project No.:	GS-08-14T
Capstone Title:	Geospatial and Field Assessment of Sea Level Rise, Saxis Island, Virginia

Capstone Abstract:

Sea level rise is widely acknowledged as a consequence of climate change. Glacial melt and thermal expansion of water increases the volume of ocean water across the globe. Geospatial modeling is an important tool for establishing the rate of SLR; in the United States, the Digital Coast Sea Level Rise Viewer, developed by the National Oceanic and Atmospheric Administration, is used by local governments and state agencies to plan for and mitigate coastal inundation and erosion. Our capstone project entails assessing projections of SLR and NOAA's model to understand SLR impact on Saxis Island, located in the Chesapeake Bay in Accomack County, Virginia.Saxis is severely threatened by inundation. At the request of the Virginia Department of Historic Resources, we combined geospatial analysis with field mapping to investigate coastal change, historical and projected SLR, marsh inundation, and the immediate impacts of SLR on Saxis.

Digital Coast was used to identify the areas of Saxis that will be most affected by a 1' and 2' SLR. Geospatial data collected by the Virginia Institute of Marine Science identified current coastal protection techniques and severity of erosion along the shore. Dated archaeological sites were used as landmarks for stable land surfaces of the Holocene, serving as georeference points. Historic maps allowed us to visualize the change in Saxis' coastline over the past 180 years. Overlays of satellite imagery showed the consistency of the shoreline along Saxis for the past century. The combination of these tools resulted in the identification of vulnerable areas: under the 1' to 2' contour; having a high coastal erosion rate; and/or having no protective barrier to withstand erosion. Fieldwork conducted in early March 2014 in the Hunting Creek area demonstrates that the predicted 1' impacts are already evident, leading to a re-examination of the NOAA model.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1202

Presentation Time:	5:00-5:25 pm
Presenter:	Luke Laprad
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Carole Nash
Project No.:	GS-09-14S
Capstone Title:	Using Basic Cartography and Geography to Help Elementary Students Better Understand Their Local Environment Luke Laprad, GEOG 496

Capstone Abstract:

Having two small children, I often wonder, what concepts of space do they understand? How and where do they see themselves in the world? At what age, developmentally, can they begin to distinguish themselves from their surroundings? Are children able to grasp the concept of space? Children develop at different rates, but they reach important milestones in spatial thinking between the ages of 3-5. They develop these skills throughout the rest of their lives. Spatial thinking or reasoning is a huge part of how we, as humans, conduct our daily lives. The purpose of this study is to investigate the 'fit' between elementary education and the development of spatial skills. Background research into the Virginia Standards of Learning for grades K-5, cognitive development, and spatial pedagogies demonstrates that elementary-aged children are more than adept at learning about scale and the environment surrounding them. Spatial learning is facilitated through simple cartographic representations and activities that reinforce a child's identification with place. As a result, I developed a series of map-making exercises geared to the Standards, while incorporating information on spatial thinking development. These exercises, staged for grade level, can be implemented in the classroom with limited effort.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1203

Presentation Time:	3:00 – 3:25pm
Presenter:	Ashley Carpenter
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-10-14S
Capstone Title:	Transition Town Strategies: Research & Application of a Resilient Harrisonburg

Capstone Abstract:

This project focuses on the need for local communities to begin the process of energy and carbon descent plans of action to combat the global and environmental problems our world faces today. Research into the methodology and success of the Transition Town Network, founded by Rob Hopkins, was examined to see if the Transition Town Strategy of connecting the community towards a sustainable future could be applicable to the city of Harrisonburg. Building off Hopkins principle of local resilience, Harrisonburg's current green initiatives were also examined through interviews of key figures and available city data to draw parallels with the Transition Town model as well as neighboring Transition Staunton Augusta. The city of Harrisonburg has many opportunities to strengthen and further its own resilience while building a stronger community and potentially joining the global network of Transition Town initiatives; to build a future in which we want to live in.

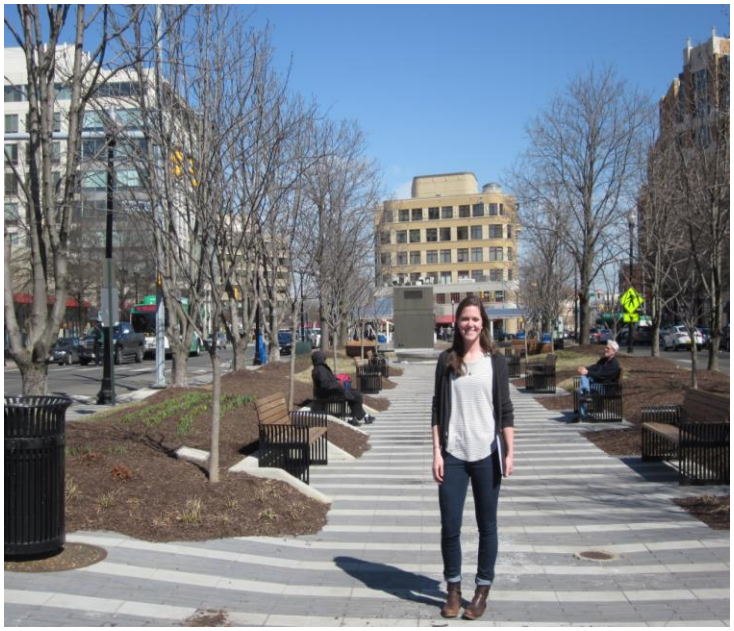
GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1203

Presentation Time:	3:30 – 3:55 pm
Presenter:	Logan Knowles
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-11-14S
Capstone Title:	Holistic Standards of Sustainability Measurement: The Need for Place-Specific Assessment in Mid-Sized Cities

Capstone Abstract:

City regulations were first proposed as tools to alleviate the problems of health, safety, and morality in urban centers in the late nineteenth century. Today's regulations represent the accumulation of decades of rules that have become the delineators and definers of place, irrespective of variation in human culture, landform, and natural systems. In order to create more 'livable' environments, traditional community assessment frameworks must be updated to encompass the multi-dimensional and complex issues present in cities today.



The primary objective of this study is to apply a holistic assessment framework to various Virginian mid-sized cities to determine its effectiveness across different densities, populations, and areas. The framework used in this study, devised by Matthew Carmona and Claudio de Magalhães, encompasses all forms of environment and public space at the community level with attention to both humans and the environment. Individual 'community quality profiles' were created for each of the nine cities by measuring three dimensions of community health, aggregated to create an overview of the cities' overall wellbeing. This presentation will give a comparative overview of community quality profiles versus other conventional standards of measurement; show the results of the individual community quality profiles and its effectiveness across various contexts; and discuss the need for holistic standards of sustainability measurement in today's multifaceted cities. The structure of the community quality profiles proved to be a uniform framework that can be flexible and accommodating when examining place in different local contexts.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1203

Presentation Time:	4:00 – 4:25
Presenter:	Chelsea Henderson
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-12-14S
Capstone Title:	A Study in the History and Changing Landscape of Harrisonburg, Virginia: What Should be Preserved and How to Make it More Sustainable

Capstone Abstract:

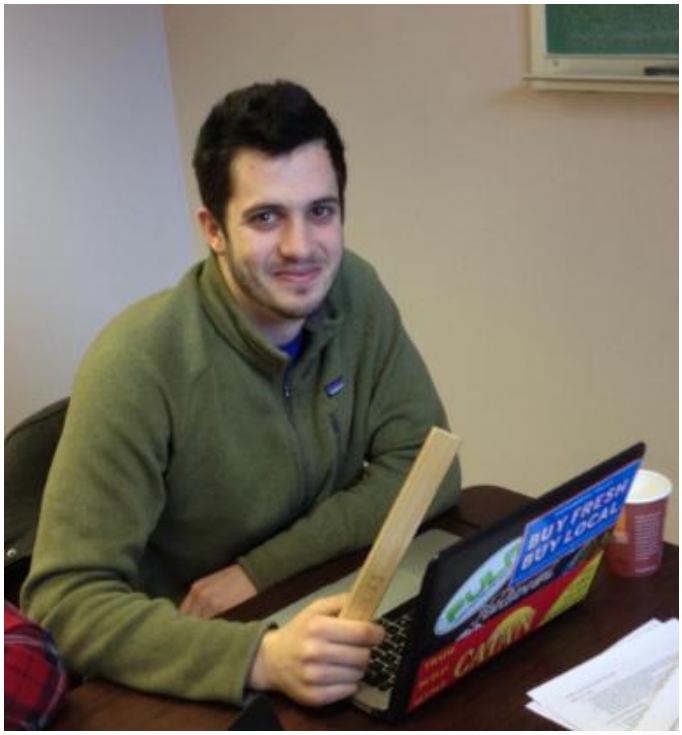
This study attempts to analyze the history of Harrisonburg, particularly Grace Street, in order to determine what is important to preserve and how the landscape has changed overtime and what can be done to make the corridor more sustainable and create a sense of place for the people of Harrisonburg. I reviewed published books, scholarly journals, maps, government documents, and the buildings and street itself to better understand the history of this area and to ascertain what sustainable and green practices would be best fit to make Harrisonburg a greener and more environmentally concerned city. I began my search from the 1890s when Harrisonburg was much smaller and went to present day and looked at maps and palimpsest to see what changes occurred and why. I found that the railroad, Blacks Run stream, and the houses and other buildings on Grace Street are important facets of the street because they represent the human landscape and how human development and culture can create spaces and make them unique. After researching this area thoroughly I concluded that this area needs to preserve Memorial Hall due to its rich history and role it has played in the Harrisonburg community since it serves as a spot for learning, once the high school and now it is used for Education and Geology classes taught at James Madison University. I also recommend that the street add more trees, riparian vegetation, vegetative swales, green infrastructure planning, and create a more pedestrian friendly environment in order to build an appropriate hub-and-corridor network with careful environmental analysis and landscape architecture that will restore lost land cover and ecological function to Grace Street and Harrisonburg as a whole.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION – HHS 1203

Presentation Time:	4:30 – 4:55 pm
Presenter:	Michael Ryan
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-13-14S
Capstone Title:	Assessing a Model For Urban Growth and Development: The Washington Navy Yard

Capstone Abstract:



The project is a case study of the redevelopment of the neighborhood surrounding the Washington, DC Navy Yard. Since the opening of Nationals Park in 2008, the area has undergone an extensive revitalization from the brownfield site that it once was. The project looks at the impact of a stadium as the catalyst for urban revitalization and if this can be used as a model for future sites around the country. In addition to an overall study of the area, three particular areas of interest were looked at in more depth. The first is the implementation and expansion of public transportation infrastructure and building principles.

Second, the changing housing stock and new housing construction was studied to see the impact on changing demographics for residents who have been in the neighborhood long term. Last, the use of public space was examined to see if the neighborhood is able to foster a sense of community. The goal is to see if this model of redevelopment is one that can be implemented in other sites.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

9:00 am – 10:30 am

Presenter:	Dezirae Brown
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Zachary Bortolot
Project No.:	GS-14-14S
Sponsor:	American Transmission Co.
Capstone Title:	Internship Experience: Integrating Transmission Line Data with GIS

Capstone Abstract:

From May 6 – August 23, 2013, I worked as an Asset Drawings & GIS Intern for American Transmission Company (ATC) at its headquarters in Waukesha, Wisconsin. American Transmission Company (ATC) was founded in 2001 as the first multi-state, transmission-only utility in the United States; transmission is their single focus. ATC meets the electric needs of more than five million people in 72 counties within four states: Wisconsin, Michigan, Minnesota, and Illinois. My main project was to help manage and publish the 10-Year Transmission System Assessment map series.

Each year, ATC publishes its 10-year assessment plans and proposals for its transmission system. My deliverables portray proposed, provisional, and asset renewal projects through 2022 for American Transmission Company. This 10-Year Transmission System Assessment serves as a guide to current and future stakeholders, Wisconsin community members, and business partners of how ATC aims to improve reliability, access to the market and renewable energy resources.

This capstone project provided a deeper understanding of how GIS influences the site of the proposed lines, its actual construction, and the revenue it will yield. The map assessments identify and prioritize future projects needed to improve the adequacy and reliability of the electric transmission system of their customers and all electricity users within the region it serves. The objectives of this project were to utilize Geographic Information Science (GIS) to visually display transmission line projects to stakeholders and the public. I developed a geodatabase with layers involving transmission infrastructure, topographic features, and digitized project lines. I chose to conduct this project based on my internship experience because I wanted to see first-hand how GIS can be put to use in the utility world.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

9:00 am – 10:30 am

Presenter:	Andrew Sengstacken
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Thomas Benzing
Project No.:	GS-15-14S
Sponsor:	Trout Unlimited
Capstone Title:	Survey of Springs Flowing to South River and the Creation of a Geographic Information System

Capstone Abstract:

The South River of Augusta County, Virginia, is highly influenced by many large and small springs located along the river. A spring is a natural occurrence of water flow to the surface of the earth. These springs provide the river with a steady supply of water, which stays at a constant temperature annually, cooling the river during the summer months and warming it during the winter. As a result, the South River is able to support trout increasing its popularity with anglers and the potential for ecosystem restoration.
To improve the understanding of the spatial relationships among the springs, the river and its water quality, this project surveyed the locations and characteristics of known springs and created a geographic information system for storing and analyzing them. A Trimble Juno GPS unit was used to determine the locations of springs and convert these points into a spatial data format compatible with ESRI's ArcMap. Flow rate, temperature, and water quality parameters were measured and used to populate the attribute table associated with the spring's layer. This geographic information system will be used by Trout Unlimited and other organizations interested in conserving and restoring the South River.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Alex Paullin
Concentration:	Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Jack Gentile
Project No.:	GS-16-14S
Sponsor:	USDA Forest Service – Mr. Pete Irvine
Capstone Title:	An Evaluation of Campsite Impact: Saint Mary's and Ramsey's Draft Wilderness Virginia 1989-2012

Capstone Abstract:

Eastern Wilderness areas are becoming more popular. As more people seek the solitude and rejuvenating aspects these areas provide, user impacts are becoming more prevalent in areas that are mandated to remain free from signs of human activity. During the summer of 2012, James Madison University joined forces with the United States Forest Service and the George Washington and Jefferson National Forests to document the degree of impact in St. Mary's and Ramsey's Draft Wildernesses in Virginia. User impacts were assessed using two monitoring systems. One developed by The Geography Program at James Madison University, and the other developed by the Forest Service. The two monitoring systems are compared and the results of this comparison and of the fieldwork are presented.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Owen Cyr
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Carole Nash
Project No.:	GS-17-14S
Capstone Title:	Relationship Between Species Distribution of East Campus Hillside Meadow Flora and Selected Environmental Parametrs

Capstone Abstract:

The East Campus Hillside Meadow is an ongoing effort at James Madison University to encourage environmental stewardship through the development of an early successional meadow on campus. The meadow, ca. 7.5 acres, was created in 2012 with 22 forbs and 6 grasses planted across four plots divided by mowed grass strips. The progress of this meadow offers insight into the health of the ecosystem and how future meadows might be informed through the project. In 2013, JMU Geographic Science students undertook a transect survey of the meadow to determine plant distribution (Abdullah, Frigm, and Knight). They found that six species have established themselves as dominant meadow residents, while some species appear as minority elements or not at all. They questioned whether localized environmental variability across the meadow could have an impact on the diversity of meadow plants.

For the present study, several environmental variables, including hydrology, slope, soil series, soil moisture, soil porosity, and soil pH were visualized and overlaid with the plant survey data in ArcMap 10.1 to create a highly contextualized overview of meadow conditions. Map layers were obtained from various Federal agencies and the soil data came from ISAT 302 student testing over two years. In addition, the environmental requirements of each of the six dominant species were researched. Together, these data sets demonstrate that while conditions vary across the meadow, none of the species showed strong correlation with the ideal environmental characteristics; however Brown-Eyed Susan, Heath Aster, and New York Ironweed are suggested as strong candidates for establishing new early successional meadows due to their adaptability to a variety of conditions. It is recommended that a more comprehensive study of this unique early successional meadow environmental type be executed in order to better ascertain what plants can best preserve the vital process of succession.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenters:	Mitchell Freitas, Chase Haugh, and, Kevin Van Deusen
Concentration:	Applied Geographic Information Science (AGIS) and Environmental Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Carole Nash
Project No.:	GS-18-14T
Sponsor:	Shenandoah National Park
Capstone Title:	Mount Vernon Iron Furnace: A Historical and Geographical Investigation of an Industrial Iron Complex

Capstone Abstract:

The Mount Vernon iron furnace, constructed circa 1800 by Samuel Miller was a critical part of the economic growth in the Shenandoah Valley. The furnace, during the Civil War, under the control of Miller's son, John, was used as a safe haven for Union loyalists who refused to fight for the Confederacy. Even with its Union association, the furnace and its surrounding lands served as temporary campgrounds for Gen. Stonewall Jackson's men after the battle after the Battle of Port Republic. Between the soldiers scavenging for resources and the immense need of raw materials for the iron furnace, the surrounding area would have been stripped of its resources. Due to the large number of inhabitants as well as their distinct needs and uses of the land, the purpose of this project is to ascertain the origin and use of the landscape palimpsest's that occur and how they fit into the area's historical importance along with its place in the archaeological record. Using GIS (Geographical Information System) and GPS (Global Positioning System) technologies, this project stems to exemplify the effectiveness of the relationship between the disciplines of archaeology and geography and their ability to aid one another in data collection and analysis.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

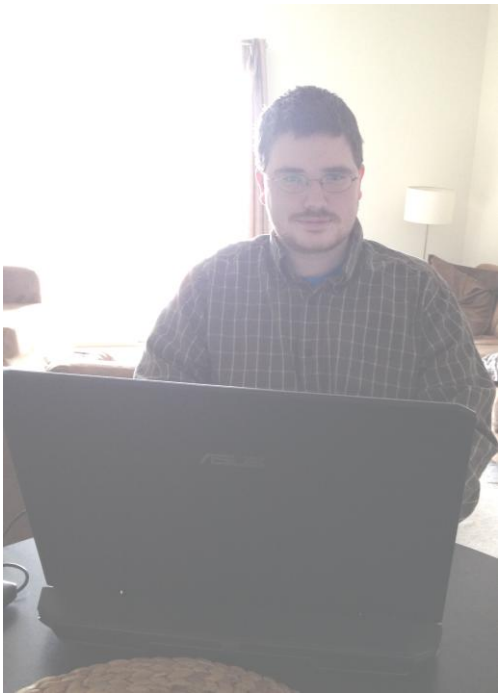
LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Michael (Briar) Wilson
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Maria Papadakis and Dr. James Wilson
Project No.:	GS-19-14S
Capstone Title:	Modeling Invasive Species Spread: Yellow Starthistle in Wallowa-Whitman National Forest, Oregon

Capstone Abstract:

Invasive Science deals with understanding and controlling foreign species introduced to nonnative areas. Invasive species can have drastic effects on ecosystem processes, resulting in negative consequences and ecosystem dismantlement. The significance of determining vulnerable areas to specific invasive flora, as well as determining spread from invaded locations is necessary in order to best allocate resources and maximize the utility of management budgets. The aim of this project is to incorporate the unique spatial advantages of GIS in combating Invasive Species. The project goal is to model the spread of Yellow Starthistle (YST) for the Wallowa-Whitman National Forest region in Oregon and Idaho in order to assist in the detection of infestations for ongoing control and eradication. A literature review delineated multiple sources that promote YST establishment and spread. The project incorporates the use of ArcGIS to create a model that ranks an area's ability to be infested by YST based on the amount of these spread promoting or inhibiting sources that are present. Current infestations of YST and seed transportation vectors were used to model spread throughout the park. Spread was analyzed in 3 year intervals over 21 years. For an area to be considered "invaded" it required a score above a certain threshold. In order to capture the accuracy of the model, the effects of weighting variables differently were tested; furthermore, different thresholds were tested to determine their effects on the model outcome. The weighting of variables and the effects of changing thresholds resulted in moderate changes to the final outcome of the models, therefore suggesting that more research in this area may be needed in order to create an accurate model.



GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Steven Martin
Concentration:	Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Mary Tacy
Project No.:	GS-20-14S
Capstone Title:	A Plan for Providing Adequate Housing in Nan Boukan, Haiti

Capstone Abstract:

The village of Nan Boukan is a community of 30-35 households on the island of La Gonave, Haiti, in which the daily income is less than one U.S. dollar per person per day. The 2010 earthquake followed by the impacts of Hurricane Sandy in 2012 have either destroyed or done great damage to the houses in Nan Boukan. In this research, the goal was to create a plan and determine the cost for providing adequate housing for all inhabitants of the village. The first step was to evaluate the current condition of the housing. This was accomplished through the use of photos taken of each house in the community and direct communication with the families. The second step was to evaluate floor plans developed by various organizations and to apply them, virtually, to the village. This analysis was conducted using the base standards of living as established in the Sphere Project Handbook and by incorporating cost effective ways to make this a reality in Nan Boukan. Among things considered were ability to withstand hurricanes and earthquakes, collection of rainwater, and provision of power for lighting. The final step was to analyze the cost for providing structurally sound, functional and sustainable housing for each household. Future improvements to the housing in the village as presented in the plan created through this research would make Nan Boukan a model community on La Gonave.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	John Parker
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Mary Tacy
Project No.:	GS-21-14S
Capstone Title:	A Healthcare Plan for Nan Boukan, Haiti

Capstone Abstract:

Based on human development indicators, Haiti is one of the least-developed countries in the world. By almost any measure, Haiti is well behind the rest of the world. Healthcare is no exception with Haitians lacking even the most basic of services, services considered to be the minimum standard as outlined by the UN and other organizations. The goal of this project is to create a plan that is feasible and realistic for improving the overall health and wellness of those suffering from extreme poverty. It is focused on the healthcare for a rural village in Haiti, Nan Boukan, located on the Ile de La Gonave. The residents suffer from both high rates of infectious diseases, including malaria, dengue fever, typhoid, and scabies, and chronic conditions, such as high blood pressure, diabetes, undernourishment and malnourishment.

Six steps were involved in the creation of a healthcare plan for Nan Boukan: 1. a review of the literature on healthcare in the developing world; 2. an analysis of data collected on the people of the town; 3. personal communication with the people of Nan Boukan; 4. personal communication with medical professionals in the U.S. and in Haiti; 5. determination of the most needed and most cost-effective measures to improve healthcare; and, 6. estimation of the cost for implementing the plan. Among the areas that the plan addresses are maternal health, causes of common diseases and conditions, infant mortality, and basic personal healthcare (e.g. wound care and what to do when someone is sick). The very extreme poverty factor offers unique challenges to improving basic healthcare that are not present in other areas of the world. We hope that this can be implemented in the village of Nan Boukan sometime in the very near future.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Caitlin Wilson
Concentration:	Applied Geographic Information Science (AGIS) and Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Mary Tacy
Project No.:	GS-22-14S
Capstone Title:	A Plan for Providing Adequate Housing in Nan Boukan, Haiti

Capstone Abstract:

The village of Nan Boukan is a community of 30-35 households on the island of La Gonave, Haiti, in which the daily income is less than one U.S. dollar per person per day. The 2010 earthquake followed by the impacts of Hurricane Sandy in 2012 have either destroyed or done great damage to the houses in Nan Boukan. In this research, the goal was to create a plan and determine the cost for providing adequate housing for all inhabitants of the village. The first step was to evaluate the current condition of the housing. This was accomplished through the use of photos taken of each house in the community and direct communication with the families. The second step was to evaluate floor plans developed by various organizations and to apply them, virtually, to the village. This analysis was conducted using the base standards of living as established in the Sphere Project Handbook and by incorporating cost effective ways to make this a reality in Nan Boukan. Among things considered were ability to withstand hurricanes and earthquakes, collection of rainwater, and provision of power for lighting. The final step was to analyze the cost for providing structurally sound, functional and sustainable housing for each household. Future improvements to the housing in the village as presented in the plan created through this research would make Nan Boukan a model community on La Gonave.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenters:	Ashley Huff and Amanda Rice
Concentration:	Conservation, Sustainability and Development (ECSD)
Capstone Advisor:	Dr. Mary Tacy
Project No.:	GS-23-14T
Capstone Title:	Improving Agricultural Conditions in Nan Boukan, Haiti

Capstone Abstract:

The United Nations (UN) Millennium Development Goals (MDGs), established in 2000, are a set of guidelines to assist the developing world in attaining certain objectives. The goals were meant to help underdeveloped nations improve living conditions by the year 2015. The Haitian village of Nan Boukan, located on the island of La Gonave, has a lot to gain from the achievement of the MDGs.

Of the 8 goals set forth by the UN we chose to focus on eradicating extreme hunger and ensuring environmental sustainability in Nan Boukan. The goal of our project was to formulate a plan to increase agricultural productivity and decrease hunger and malnutrition through improved fertilizer techniques and more efficient production of crops in Nan Boukan. Our methodology consisted of analysis of academic literature and other published sources, interviews with the villagers of Nan Boukan on their gardens, and soil sampling of the gardens themselves. Our study's focus crops were watermelon, coconut, and peanuts which each has important nutritional and economic values. Research was conducted on each plant to determine how they could supplement nutrition either through consumption or through selling them so that other wholesome foods could be purchased.

Analysis of soil from Nan Boukan gardens indicated some serious nutrient deficiencies that would benefit from compost. By examining soil samples we were better able to understand, too, which crops could assist soil fertility. All three crops of interest offer ample amount of inedible organic material, which can be converted into compost. Finally, an assessment of the need for seeds and gardening tools was made. All of this information was compiled in order to formulate a plan to increase agricultural productivity and decrease malnutrition in Nan Boukan.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenters:	Victoria Pugliese and Lauren Privette
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Mary Tacy and Dr. Zachary Bortolot
Project No.:	GS-24-14T
Capstone Title:	Using Geospatial Technologies to Analyze Environment and Human Patterns in Nan Boukan, Haiti

Capstone Abstract:

The town of Nan Boukan on the island of La Gonave, Haiti, is situated on the coast. As a result, people of Nan Boukan face the challenges of damaged homes and altered landscapes from tropical storms. The purpose of this research is to evaluate coastal climate change and impact from a recent storm, Hurricane Sandy, on Nan Boukan (also referred to as Chic Kata). High spatial resolution satellite imagery of the island was purchased from Apollo Mapping, a reseller of DigitalGlobe, and used to evaluate change in the coastline from 2006 to 2011; the latter image was taken one month after Hurricane Sandy. Both images were pan-fused using the software, ArcMap, for clarity and color correction. It was then possible to determine coastal change. Structures in the image were digitized and the census data on the families relegated to the attribute table of their respective structure (i.e. house). The final step was to create a GIS map of the island with suggested boundaries created using a tool in ArcMap. These boundaries illustrate a safe distance from the coast required to prevent future damage to structures from severe weather events. An additional product of this research, one using the 2011 imagery and ArcMap's Story Map application, was an interactive map to display demographic information. These spatial maps are valuable resources for the people of Nan Boukan, future JMU faculty and student projects, and aid organizations traveling to the village.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Martin Revercomb
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-25-14S
Capstone Title:	Predictive Accuracy Assessment of Prominent Hotspot Mapping Techniques: Analyzing Part 1 Crimes of Los Angeles 2010-2012

Capstone Abstract:

The purpose of the capstone is to determine areas within Los Angeles country that are conducive for crime occurrences using three mapping techniques: Standard Deviational Spatial Ellipses, Thematic Mapping of Administrative Units (Los Angeles Law Enforcement Reporting Districts), and Kernel Density Estimation to see which technique offers the most accurate results for predicting the Part 1 crimes' spatial occurrences. The five criminal types that follow have been included for the hotspot analysis: criminal homicide, robbery, rape and both residence and "other structure" burglaries. ArcGIS and CrimeStat III have been utilized for mapping and conducting the spatial analysis. In order to assess the accuracy of each hotspot technique two classes have been established. The Measurement Class serves as the foundation for establishing the hotspots. Each of the five crime types were grouped together from two years of georeferenced crime occurrences spanning 2010 to 2011. The Accuracy Class is only 2012 crimes, the same category as the measurement class, but separated temporally in the following manner: 1 day (1 January 2012), 1 week (1-7 January 2012), 1 month (1-31 January 2012), 4 months (1 January-30 April), 8 months (1 January-31 August), and 12 months (1 January-31 December). Each segment of the Accuracy Class will be applied to each hotspot map series and the accuracy will be gauged by determining 1) Hit Rate: The percentage of new crimes that occur in the "risk areas", 2) Search Efficiency Rate: The measurement of crimes occurring within 1mi2 or 2 mi2 "risk areas", and 3) the Prediction Accuracy Index (PAI) that incorporated the Hit Rate percentage/ Area percentage. In doing so, this capstone hopes to illustrate the most predictive hotspot mapping technique as well as the location, relative size, spread, and concentration of differing crimes across Los Angeles County.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Dylan Sheets
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. Henry Way
Project No.:	GS-26-14S
Capstone Title:	The Effect of Transportation and Industry on the Geography of Richmond, Virginia

Capstone Abstract:

The purpose of this project is to analyze the evolution of transportation networks and industry in Richmond, Virginia and to determine how this evolution has shaped the geography of the city. This project focuses on the time period from the city's founding in 1733 to the mid twentieth century.By examining a number of variables including the canal system, streetcar system, and railroad network it became obvious that the transportation networks played no small role in contributing to the growth and geography of Richmond. It also became evident that industries such as coal mining, flour milling, tobacco processing, and iron milling had a profound impact on the transportation networks of the city, and therefore also contributed to the geography of the city.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

LOCATION: GEOGRAPHIC SCIENCE SUITE – HHS ROOM 3203

TIME: 9:00 am – 10:30 am

Presenter:	Braden Pierson, Ryan Luria and Martin Palacios
Concentration:	Applied Geographic Information Science (AGIS)
Capstone Advisor:	Dr. James Wilson
Project No.:	GS-27-14T
Sponsor:	Abram Kaufman-Facilities Management, James Madison University
Capstone Title:	Virtual JMU: An Interactive Map of James Madison University

Capstone Abstract:

Advancements in geography and information technology have taken a substantial turn over the past few decades. New technologies have allowed geographers to display a variety of information in countless ways, including on the Internet. Through data collection, creation, and the utilization of ArcGIS and ArcGIS Viewer for Flex, a prototype interactive map for James Madison University has been developed. Some of the data and functions on the map include: campus turn-by-turn directions, Google Street View, bus routes and other transit information, parking information, virtual tours of student residences and many other data. Blending creativity and efficiency, these programs have allowed a multitude of data to be displayed online, providing a wide range of viewership options for people interested in James Madison University.

Intelligence Analysis Program

LOCATION – HHS Room 2202

Presentation Time:	8:15 – 8:35 am
Presenter:	Fanuel Haile
Capstone Advisor:	Dr. Jeffrey Tang
Project No.:	BSISAT-49-14S
Capstone Title:	E-bikes/Electric Bikes

Capstone Abstract:

The goal of this project is to expose staff and faculty members to electric bikes or e-bikes and collect qualitative data (surveys that contain personal opinions with users experience with the e-bike) along with quantitative data (e-bike energy use compared to a Toyota Prius) based on their experience. E-bikes are an environmentally-friendly, alternative to driving. E-bikes have an electric motor that provides an electric assist based on users discretion. This electric assist function is what separates e-bikes from regular bikes and allows the user to tackle various terrains by replacing mechanical energy (energy produced by user pedaling to move bike forward) with electrical energy (energy from electric motor which does work for user to move bike forward). This project started with two e-bikes that were distributed to different departments on campus. Then a set of survey questions were designed specifically to target whatever departments were using the bikes in order to obtain the qualitative and quantitative data needed.The information from the survey will allow for an overall assessment of how beneficial or unbeneficial e-bikes are, how much people liked or didn't like e-bikes, and how much energy did the e-bikes require compared to the energy the Prius required for the same distance travelled. This data will provide some insight for JMU administrators who may hopefully then provide more grants into this program and start JMU's own e-bike sharing library.

Intelligence Analysis Program
LOCATION – HHS Room 2202

Presentation Time:	8:40 -9:00am
Presenter:	Thomas Johnston
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-01-14S
Capstone Title:	Threat Analysis: Al-Shabaab

Capstone Abstract:

This project seeks to determine if al-Shabaab poses a credible threat to U.S. national security, and if so, evaluate possible methods the group may use to carry out a future attack on U.S. interest by assessing the group's goals, objectives, and capabilities. The intent of the project is to then determine various methods for which the US could employ in attempt to disrupt the threat posed by al-Shabaab. Al-Shabaab, a Somali Islamist insurgent group which has affiliations with Al-Qaeda, has repeatedly threatened the United States and has demonstrated the capacity to strike beyond Somalia's borders. Al-Shabaab recruitment in the United States has raised concerns regarding not only the involvement of U.S. citizens in terrorism activities overseas, but also possible threats to the United States from those carrying U.S. passports.

Presentation Time:	9:05 – 9:30 am
Presenters:	Theresa DeSantis and Cory Persohn
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-02-14T
Capstone Title:	Mitigating the Threat of Lone Wolf Terrorist Attacks: A Vulnerability Assessment of Three Federal Buildings within Washington, D.C.

Capstone Abstract:

Americans are on edge with the concern of domestic terrorist attacks committed by their own neighbors. In comparison to other countries, the United States is the most frequently targeted country in regards to lone wolf terrorist incidents. The reality that lone wolves are a common occurrence has communities, defense agencies and our nation's leaders alarmed, predominantly concerned with the vulnerability of our nation's capital. This study focuses on the vulnerabilities of three Federal buildings within the Washington, D.C. region to lone wolves' use of various explosive devices: The United States Supreme Court, the Embassy of Afghanistan, and the Pentagon. Our primary concerns are the vulnerabilities of the current standards and regulations that federal buildings have implemented to counter or prevent an explosive attack. The objective is to highlight these areas of vulnerability and provide new, innovative provisions to the interior and exterior infrastructures of Federal buildings. If effective, these strategies used to mitigate attacks are modifiable to buildings throughout the United States to ensure domestic national security.

Intelligence Analysis Program

LOCATION – HHS Room 2202

Presentation Time:	9:35 – 9:55 am
Presenter:	Matthew Care
Capstone Advisors:	Dr. Jeffrey Tang, Dr Timothy Walton, Dr. Geoffrey Egekwu, Dr. Anthony Teate
Project No.:	IA-03-14S
Capstone Title:	The Significance of the Transition of Supervisory Control and Data Acquisition (SCADA) Systems to TCP/IP Platforms

Capstone Abstract:

SCADA system security is a significant United States national security issue based on the systems' vulnerabilities and the cyber threats that seek to exploit them. Within the last fifteen years as SCADA systems have collectively transitioned to Transmission Control Protocol/ Internet Protocol (TCP/IP) networks, analysts and policy-makers have expressed increased concern over the general security and protection of SCADA systems, which are responsible for monitoring and controlling our nation's critical infrastructure. SCADA systems are susceptible based on their ease of entry and their attractiveness as a target. In addition, there a number of cyber threats such as hackers and malware, insiders, terrorist organizations and state actors that are dangerous based on their intent and capabilities. U.S. government engagement with private sector owners and operators of critical infrastructures is essential for mitigating the abundant threats that characterize cyber-terrorism.

Presentation Time:	10:00 – 10:30 am
Presenters:	Danielle Joffee, Emily Morse, and, Emily Somma
Capstone Advisor:	Dr. Stephen Marrin, Dr. Jeffrey Tang. Dr. Morgan Benton, and Dr. Mike Deaton
Project No.:	IA-04-14T
Capstone Title:	Japanese Remilitarization

Capstone Abstract:

Japan's current constitution declares it a pacifist nation. Because of this, the country is limited to a self-defense force and the military support of the United States, which is bound by treaty to defend Japan in the chance of conflict. Japan's current leader, Shinzo Abe, is taking strides to change Japan's constitution so that the country can have the ability to reestablish a military with more capabilities, known as remilitarization. This is escalating a multitude of existing tensions between Japan and China, such as disputes over the Senkaku Islands. Because the United States has responsibility in this conflict, this project identifies the potential impact of remilitarization on Sino-Japanese relations and the implications on the United States as a result.

Intelligence Analysis Program

LOCATION – HHS Room 2202

Presentation Time:	10:35 – 11:00 am
Presenters:	Tracy Fey, Cindy Nguyen
Capstone Advisor:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-05-14T
Capstone Title:	National Health Information Exchange

Capstone Abstract:

A Health Information Exchange (HIE) allows healthcare professionals and patients to appropriately access and securely share a patient's medical information electronically. While many statewide and regional HIEs have come into existence within the last decade, there have yet to be full-scale efforts of a national exchange. The purpose of our project is to conduct a policy analysis on how a national Health Information Exchange could come into existence in the coming years. We focus in particular on the successes of the Statewide Health Information Network for New York (SHIN-NY), which proved quite effective after the disastrous Hurricane Sandy. We also performed a systems analysis, which entails its technical infrastructure, the architecture of the system, and the interoperability involved. Finally, we have applied SHIN-NY as a model of potential nationwide HIE that successfully meets its goals.

Intelligence Analysis Program

LOCATION – HHS Room 1210

Presentation Time:	3:00 – 3:35 pm
Presenters:	Jessica Fischer, Brian O'Neil, Martin Revercomb, and, Melanie Tran
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-06-14T
Capstone Title:	Assessing the Direction and Future Possibilities of Syria's Civil War

Capstone Abstract:

The turmoil in Syria began in March 2011 when what started as peaceful protests were swiftly suppressed with unprecedented levels of violence as the Regime of Bashar al -Assad sought to quell dissent. Within several months, the regime's suppression efforts soon evolved from a counterinsurgency campaign into a civil war as foreign fighters, lured from across the Gulf States and elsewhere joined a growing number of Syrians to topple the Assad Regime. Three years later, the conflict has worsened and represents a humanitarian crisis not seen in the region for decades, with north of 130,000 casualties and between a third or half of Syria's population displaced. At the present, the country is roughly divided between Regime controlled areas in the west and armed opposition controlling the Northern and Eastern broader regions near Turkey and Iraq. The current stalemate poses both short-term and long-term challenges for the United States and regional allies, such as the degree to which the sectarian nature of the conflict coupled with a heightening Islamification may impact United States interests in the Middle East. The conflict's dynamic and convoluted nature present various difficulties in analyzing the direction of the war. To inform our futures oriented analysis this capstone incorporates a systems and causal analysis of the current situation and the major actors within it, vetting them along military, social, economic, political, and in some cases religious dimensions.

Intelligence Analysis Program

LOCATION – HHS Room 1210

Presentation Time:	3:40 -4:15 pm
Presenters:	Joshua Arnold, Alexandra Coulson, Brian Stevens, and, Joseph Young
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-07-14T
Capstone Title:	A Threat Assessment, Futures Analysis, and Opportunities Analysis of North Korea

Capstone Abstract:

Since the Korean War (1950-1953), the Democratic People's Republic of Korea (DPRK) has remained a threat to United States' national security, regional interests and allies. Today this threat seems to have intensified under Kim Jong-un's brinkmanship diplomacy, growing remilitarization of the East Asian nations and the United States' intended strategic pivot to the Asian-Pacific. Various analyses have been implemented to gain a comprehensive perspective from open resources available. A Threat Assessment encompasses an analysis of the DPRK's leadership, military strength, WMD programs, and relationship with nations abroad. A Futures Analysis generates scenarios based on present causal factors. By identifying important signposts and indicators, the scenarios' probability can be monitored going forward. An Opportunities Analysis involves potential U.S. strategies to prevent regional conflict and how relationships with other countries can benefit U.S. interests. Despite North Korea's possession of testable nuclear devices, the DPRK's nuclear program at this point in time will be more of a menace to regional stability than a true threat to the U.S. homeland until their weapon delivery capabilities have expanded. Key findings from the analysis provided can aid strategic decision makers in the Department of State and the U.S. military regarding North Korea's potential evolution over the next decade and what opportunities the U.S. could have both diplomatically and militarily to prevent regional conflict.

Intelligence Analysis Program

LOCATION – HHS Room 1210

Presentation Time:	4:20 -4:50 pm
Presenters:	Aaron Csik, Kevin Bartnick, and, Tyler Larson
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-08-14T
Capstone Title:	Security Concerns Surrounding the 2014 FIFA World Cup

Capstone Abstract:

"We performed a threat and vulnerability analysis on the host cities and venues of the 2014 FIFA World Cup in Brazil. We focused on gang violence, cartel violence, military security measures, police presence, and infrastructure to provide key safety information. From this, we developed future scenarios with key signposts for each, hypothesizing the economic and national security status of post-World Cup Brazil."

Presentation Time:	4:55 – 5:15 pm
Presenter:	Melissa Szymanski
Capstone Advisors:	Dr. Stephen Marrin and Dr. Jeffrey Tang
Project No.:	IA-09-14S
Capstone Title:	Increasing Women Participation in Terrorism: What Does This Mean For the US?

Capstone Abstract:

Since 1985, there has been a rise in the female participation of suicide attacks and a general involvement in terrorist networks. With female-perpetuated terrorism, groups are granted the strategic tactic of surprise when they use female operatives. The motives of women to cooperate with a terrorist network will be explored through the lens of the women themselves in a method called Red Team Analysis. This project specifically looks at the surrounding forces that lead women into Al Qaeda and the Chechen Black Widows. Causal forces from three levels of analysis (individual, group, and organizational) are used to extrapolate trends and produce information on the environment in which membership increases for these groups. The information produced is used to assess the threat faced by the United States from these groups, in addition to the overall use of women operatives as a strategy.