15th ANNUAL SYMPOSIUM ON SUSTAINABILITY AND THE ENVIRONMENT

BRIDGEWATER STATE UNIVERSITY
RONDILEAU CAMPUS CENTER BALLROOM

Saturday, November 19, 2016
9:30 AM - 2:30 PM

SYMPOSIUM PROGRAM

15th ANNUAL SYMPOSIUM ON SUSTAINABILITY AND THE ENVIRONMENT

Saturday, November 19, 2016
Bridgewater State University Rondileau Campus Center Ballroom

The 15th Annual Symposium on Sustainability and the Environment will focus on student research posters (including completed, in progress, and proposed research) in all environmental disciplines from colleges, universities and high schools in the Northeastern U.S. Since its inception in November 2001, the Symposium has averaged 100 attendees and over 50 student poster presentations. This Symposium provides an annual forum for discussion of issues related to environmental research and education specific to the New England region, and has opened doors to collaborations in research and education among the participants.

Our guest speakers are: **Dr. Madeleine Scammell**, Assistant Professor of Environmental Health, Boston University School of Public Health. Dr. Scammell is the PI on several research initiatives that seek to determine the compounded effects of environmental and public health threats with social stressors, and **Roseann Bongiovanni**, Executive Director of GreenRoots. Ms. Bongiovanni has implemented and managed the environmental justice work carried out in Chelsea, formerly through the Green Space Committee and now thru GreenRoots. Her accomplishments include raising $1.5 million dollars to vision, design and create, with the community, Creekside Commons Park; leading an effort to transform an abandoned parcel of land into a beautiful playground and community garden.

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Bridgewater State University Rondileau Campus Center Ballroom

PROGRAM

8:00 – 11:30 AM: Registration and light snacks

9:30 AM: Welcoming Remarks in the Rondileau Campus Center Ballroom:
Dr. Kristen Porter-Utley, Dean of the Bartlett College of Science & Mathematics

9:45 – 10:45 AM: Guest Speakers:

Dr. Madeleine Scammell
Assistant Professor of Environmental Health, Boston University School of Public Health

~and~

Roseann Bongiovanni
Executive Director of GreenRoots

"Environmental Justice Research and Action: Examples from a Community-University Relationship"

11:00 – 12:15 PM – Poster Session I: Boards 1-17, Rondileau Campus Center Ballroom

12:15 – 1:15 PM – Lunch in the Ballroom; take down posters from Session I, set up Session II posters

1:15 – 2:30 PM – Poster Session II: Boards 18-35, Rondileau Campus Center Ballroom

Poster Session I Titles and Abstracts: Boards 1-17
Rondileau Campus Center Ballroom (11:00 AM to 12:15 PM)

Board #1: "Environmental Impact of war", Julien Williams and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

War impacts the environment, natural resources, and fundamentally people. Unfortunately, the environmental impacts of war are not often considered on a holistic level and remain on going even after warring has ended. Evaluating the impact of the outcome of conventional war provides another perspective of assessing the cost of war.

Board #2: "BPA and Plastic", Samantha Conkey and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

Every day the products we consume have an opportunity to impact us both in expected and unexpected ways. The expected outcomes include satisfaction and a quenching of our preferences; however, the unexpected, though tied to our consumption, may yield detrimental impacts. Plastic and other containers routinely used in food products can leech chemicals into the food that we consume, affecting not only human health but also groundwater thereby having more compounded adverse impacts. Understanding what is being consumed is the first step to establishing sustainability based on conscious consumption.

Board #3: "Environmental impact of 24 hour lighting", Matthew Chuckran and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

Many businesses maintain interior lighting 24-hours a day. The benefit and cost of providing the lighting during non-operating hours has not been formally assessed. However, given the significance of conservation in the era of sustainability thinking, there is a need to evaluate the use of lighting over such a long duration and also to determine viable alternatives to present practices.

Board #4: "Environmental Significance of Bees", Garillee Cabral and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

Bees are the major pollinators for North American and world agriculture as a result they have a significant impact in the economy and the ecosystem. Understanding the impact of herbicides and pesticides on both North American honeybees and indigenous bees is an important component to ensuring a healthy ecosystem. Exploration of the present impact of chemical use of bees as well as evaluation of mitigation processes that can be implemented is needed to ensure their survival but also to promoting the chain of life dependent on these insects.

Board #5: "Significance of Common but Differentiated Responsibilities", Britany Mayala and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

The Principle of Common but Differentiated Responsibilities (CBDR) relies on two fundamental conditions. Under the first condition, CBDR targets efficient ways to protect the environment. With the second, the principle provides information on how each country contributes to certain environmental issues and provides guidance on how to lessen harmful emissions into the environment. Given the significant difference in both emission reductions and economic impact resulting from emissions reductions as noted in country specific Intended Nationally Determined Contributions under the Paris Agreement an understanding of CBDR is needed to establish a common ground to enable successful implementation of a global environmental policy.

Board #6: "Thinking Outside the Box", Ryan Brown and Madhavi Venkatesan, ECON 360 – Environmental Economics, Economics Department, Bridgewater State University, Bridgewater, MA 02325

The tradition funeral service often requires the use of a casket, a concrete slab and the use of formaldehyde to preserve the body. A newer way of disposing bodies after death is the by way of cremation. Both processes pose many environmental problems that come with the inevitable fate that we must all one day encounter. There are other ways of post-death-body-disposal that should be considered.

Board #7: "Climate Change and Potential Improvements", Maria Hernandez and Carissa Koski, Sustainability Living and Learning Community, University of Rhode Island, Kingston, RI 02881

Climate change is severely increasing due to numerous evidence of anthropogenic contribution to glacier mass loss.We live in a greenhouse which means the gases in our greenhouse help keep our earth cool but warm enough to maintain life on earth. One major consequence due to climate change is the melting of ice glaciers. These ice glaciers are melting due to the increase of carbon emissions into our atmosphere. The melting of these glaciers result in drastic sea level rise. Human activities that contribute to their melting are as follows: burning fossil fuels, gas from moving vehicles and energy being emitted in the form of heat. As steward of the earth we can change some of our daily habits to improve our climate. One way we can improve the climate change is primarily by reducing greenhouse gas concentrations, while adaptation means changing the way we as a society live in response to the changing climate. Reduction and conservation of oil, gas, and coal, the fossil fuel that are used in transportation, heating and cooling, agriculture, and electricity generation. Changing our own behavior can limit climate change: by switching to energy sources that don't release greenhouse gases, increasing the energy efficiency of our homes and schools, and driving less.

Board #8: "Creating the Sustainability Living and Learning Community at the University of Rhode Island", Chris McCormick and Carissa Koski, Sustainability Living and Learning Community, University of Rhode Island, Kingston, RI 02881

The Sustainability Living and Learning Community (LLC) at the University of Rhode Island is one of the most innovative programs of its kind in higher education. The program consists of ten upperclassmen from diverse majors living together and embarking on an educational journey exploring the world through the lens of sustainability. We aim to educate a network of students about holistic sustainability, so they can go on to become leaders in their communities on these issues. We also aim to create quantifiable change at the University of Rhode Island, making it a more sustainable place by affecting its policies and culture. Our program's key components are a directed study in which students choose a topic related to sustainability, an internship in sustainability, weekly meetings, and experiential learning through field trips and community service. These components culminate to create a program in which students earn credits, learn about sustainability, and effect real change on campus. This program is in its infancy, but it has seen tremendous improvements over the past 2 years. Already, we have seen this program open doors for students including the offering of internships, and priceless mentoring opportunities. This program is ever changing and developing. Through our experiences a model has been created that can be applied to other themed LLCs, as well as other universities. This information will be elaborated on and presented on a poster.

Board #9: "Rhode Island Shell-fisheries and Management Progress", Kathryn Flannery and Carissa Koski, Sustainability Living and Learning Community, University of Rhode Island, Kingston, RI 02881

Rhode Island is the smallest state, the 8th least populated and the last of the 13 colonies to ratify the Constitution. At first, it is very easy to overlook Rhode Island and its economy. The Rhode Island Coastal Resources Management Program was approved by NOAA in 1978 and revisions have been ongoing. This project focuses on the Rhode Island Fisheries and how policy and management plans have affected the industry. Shellfish farms have increased since dramatically since 1998. By 2015 there were 61 individual farms compared to the original 10. And between 2014 and 2015 there was a 20% employment increase in shell-fisheries alone. The overall goal of the Shellfish Management Plan is to create policies and

practices from the input of all stakeholders to restore shellfish populations and enhance the economy of the industry. My goal is to highlight the progress that Rhode Island has made in management and convey the successes and future goals of the project.

Board #9A: "Integration of Sustainability into School Curriculum", Lizmaylin Ramos and Carissa Koski, College of Environmental and Life Sciences, University of Rhode Island, Kingston, RI 02908

The purpose of this project is to understand the phenomenography of sustainability and use that knowledge to propose a solution for advancing sustainable development. The proposed solution in this project is to use education systems as a platform to promote and propel sustainable development. In order to integrate sustainability into school systems, we must understand first, how people experience the environment and then ascribe meaning to it. Secondly, we must understand how instructors view sustainability within the education system as well as their own fields of study. Integrating sustainability within school systems is an ideal platform for sustainable development for several reasons. The first is that students are the most willing to learn and will be the future agents of change. Another reason is that these students will also learn how to integrate sustainability in their professional lives. Research methods for this project are as follows. Research was done on how people ascribe meaning to sustainability and how that affects their behavior. Another method was finding out how sustainability is viewed in academia. Research was done on how the instructors themselves viewed sustainability within their own realms on study as well as classroom. Another aspect of this project analyzed students' receptiveness to instructors' approach on teaching sustainability. The results of this research showed that there is a relationship between the phenomenography of sustainability and human behavior. In terms of sustainability in academia, while there are universities that are pushing for sustainable development, most instructors, especially in higher education, feel as though sustainability belongs only in the realm of environmental sciences. Instructors often make reference to sustainability not as the main component of a lesson, but supplemental information. The first step needed to integrate sustainable development into all disciplines, especially in higher education, is to emphasize the importance of it to future educators, so that there may be a common language and understanding amongst instructors of all disciplines.

Board #10: "Bridgewater-Raynham Regional High School Youth Environmental & Social Society – YESS", Kinsley Alkeins, Caristha Sanjay, Hannah Coffee, Sarah Walton, Jocelyn Leuenberger, Kaliyah Danbreville, Casey Pupek and Jessica Lazarus, Bridgewater-Raynham Regional High School, Bridgewater, MA 02324

The Youth Environmental & Social Society (YESS) is an after school club that meets twice a week to recycle, learn about environmental and social issues of concern and lead activities that support sustainability within our community. Each week YESS recycles paper, cardboard, plastic bottles to reduce school waste and upcycle materials. YESS supports local farms through gardening and volunteering, supports a yearly Green Awareness Day for all 1500 students in the high school building with a different presentation given each period, conducts a yearly recycled fashion show to raise money for environmental causes, engages in oceanographic research and marine debris as well as runs community programs on these topics. In addition, YESS offers learning modules for students that speak to Climate Change, technology, town systems and local agriculture. Our goals include educating the community on sustainable practices through info-graphics such as PSAs, raising awareness of issues concerning poverty, equality and environmental welfare, and forming new friendships through exciting and fun activities in service of others.

Board #11: "The Northern Red-bellied Cooters Headstarting Program", Naomi Buldini and Catherine Etter, Department of Environmental Technology, Cape Cod Community College, West Barnstable, MA 02668

The Northern Red-bellied Cooter (*Pseudemys rubriventris*) is an endangered species of turtle. These turtles are usually found in Maryland, Virginia and North Carolina. However, there is a small population in Massachusetts, mostly in Plymouth County, therefore, sometimes referred to as the Plymouth Red-bellied Turtle. In 1980, the Northern Red-Bellied Cooter was placed on the endangered species list. It is the first fresh water turtle in the United States to be classified as endangered at both state and federal levels. In 1983, the Massasoit National Wildlife Refuge established a program to help conserve the Plymouth Red-bellied Cooter, as well as other wildlife. Since 1984, the Massachusetts Division of Fisheries

and Wildlife and The Natural Heritage and Endangered Species Program, has led the headstarting program for Red-bellied Cooters. In 2006, The National Marine Life Center in Buzzards Bay began a headstarting program too. Headstart means that in the fall the Northern red-bellied Cooter hatchlings are removed from the wild and placed with partnering education and scientific facilities from across the state to accelerate the growth and reduce mortality during the turtles' first year of life. The mortality rate of the Northern red-bellied Cooter is 90% in the first year of life, leaving only 10% alive. "From 1984 to 2016, more than 4,000 headstart turtles have been released at more than 30 sites in southeastern Massachusetts. From 2013 to 2016, MassWildlife and the University of Massachusetts Amherst partnered on a study of the effectiveness of the headstart program, finding that annual survivorship rates appear to exceed 95% in many pond. Research is ongoing to determine the extent and status of the Northern Red-bellied Cooter population in Massachusetts." Volunteers, especially high school and college students, are a crucial element for this program to succeed.

Board #12: "Economic Analysis of Policies to Decrease Dog Waste in Chebacco Woods", Hannah Reimel, Jarron VanCeylon and Kristen Cooper, Department of Business and Economics, Gordon College, Wenham, MA 01984

The Chebacco Woods, consisting of forests, ponds, and wetlands, is an important local habitat, with economic value including ecosystem services, recreational use, and water supply. Unfortunately, the proximity of the woods to human activity poses a danger to these cherished attributes of the Chebacco Woods, namely its biodiversity, recreational uses, and water resources. This project focuses on dog waste as a cost of human activity on the various use of values of the Woods. In light of the market failure associated with people not picking up dog waste, we investigate the comparative merits of a wide array of policies intended to decrease the quantity of uncollected dog waste in the woods and improve environmental quality. We discuss the effectiveness and limitations of current policies related to dog walking, including leash policy, fines for off-leash walking and fines for waste. We also present research on the costs and benefits of alternative policies, we investigate the policies' effects on commercial dog walking activity, non-commercial dog walking activity, water quality and other use values of the Woods, in economic terms.

Board #13: "Water Quality Assessment of Coy Pond", Quincy Dougherty, Sara Lareau, Victoria Arau, Lisa Blais and Otonye Braide, Department of Chemistry, Gordon College, Wenham, MA 01984

Through the service learning initiative funded by the Davis Foundation, we were able to partner with Covenant Christian Academy to test the water quality of Coy Pond using 5 different variables: turbidity, pH, temperature, dissolved oxygen (dO) and electrical conductivity. Data was collected with individual sensors using the Vernier LabQuest 2 interface at 11 different locations along the perimeter and at the center of the pond. Surface measurements were performed in real time and in the lab with collected water samples. Most of the assessed parameters fell within ranges that are characteristic of healthy ponds (10-15 mg/L for dO, less than 200 NTU for turbidity, 4.6–7.0 for pH, 200-500 μS/m for conductivity, and 2-30 ◦C for temperature), however there were some exceptions. Future work in assessing pond health would include sampling at varying depths, increasing the number of samplings, and including additional variables.

Board #14: "Spatial variations in mercury and selenium concentrations in marine fishes of Rhode Island: Risks and benefits to human health", Josh Jacques, Mary Yurkevicius and David Taylor, Department of Marine Biology, Roger Williams University, Bristol, RI 02809

Mercury (Hg) is a prevalent environmental contaminant that poses risk to human health, and exposure occurs mainly by consuming fish. The U.S. Environmental Protection Agency (U.S. EPA) introduced a Hg action level of 0.3 ppm (wet weight) in fish tissue, above which consumption may become a health risk. Selenium (Se), a trace element that mitigates Hg toxicity, is also present in fish, thus increasing their health benefits for human consumers. While some data exist on the Hg and Se concentrations in coastal marine fishes, there is a lack of information on how these concentrations vary across geographic locations. This is important because estuarine and inshore habitats are often subjected to elevated anthropogenic contaminants, as compared to more offshore, oceanic habitats. In this study, total Hg and Se concentrations will be measured in the muscle tissue of five marine fish species collected from the Narragansett Bay (inshore) and Rhode Island/Block Island Sound (offshore), including summer flounder (*Paralichthys dentatus*), scup (*Stenotomus chrysops*),

bluefish (*Pomatomus saltatrix*), black sea bass (*Centropristis striata*), and striped bass (*Morone saxatilis*) (target sample sizes, n = 20 per species per location). Hg and Se data will be analyzed relative to the spatial location of collected fish (inshore versus offshore), as well as fish body size in order to assess bioaccumulation patterns. Intraspecific Health Benefit Values (HBV) will also be calculated to estimate the relative health risk vs. benefit of each fish species for human consumers.

Board #15: "Improving a method for detecting fish exposed to cyanide via thiocyante ion excretion using high performance liquid chromatography (HPLC)", Rebecca J. Metivier, Andrew Rhyne and Nancy Breen, Department of Biology, Marine Biology & Environmental Science, Roger Williams University, Bristol, RI 02809

Cyanide fishing, which involves the use of a solution of sodium cyanide squirted on and around coral reefs to stun and capture reef fish, is a scourge on the marine aquarium trade. It is also destructive to the reefs where it is used and the surrounding environment. Currently, there is no reliable and universally accepted method to detect if a fish has been exposed to cyanide during the capture process. The use of reversed phase HPLC with a C30 column treated with polyethylene glycol and a UV detector operating at 210 nm is most promising for detecting the thiocyanate ion excreted from exposed fish. However, published results using this method have been varied. This study endeavors to repeat and possibly improve this method for SCN- detection in fish caught with cyanide. *Amphiprion ocellaris* (common clownfish) will be exposed to 50 ppb aqueous sodium cyanide and held in 1-L tanks. Water will be collected from the tanks of the exposed fish daily and will be analyzed for SCN-. Previous attempts to detect SCN- in exposed fish in our lab have proven unsuccessful; in this study, the brand of salt used to prepare the aquarium water will be changed to test the effect of salt composition on ion detection. Other aspects of the protocol that will be investigated include mobile composition for the HPLC and sampling time after water change. It is hoped that these studies will lead to a reliable, robust and repeatable method for SCN- detection in fish that have been exposed to cyanide, which in turn can be used as a tool to enforce existing anti-cyanide fishing laws and to prevent the import of fish caught using illegal techniques.

Board #16: "Foraging ecology of blue crabs (*Callinectes sapidus*) and their potential impact on winter flounder (*Pseudopleuronectes americanus*)", Molly Fehon and David Taylor, Department of Marine and Natural Sciences, Roger Williams University, Bristol, Rhode Island 02809

The blue crab, *Callinectes sapidus*, is a temperate species that is expanding its geographic range northward, thus possibly altering benthic community structure in Southern New England waters. This study examined the potential impact of blue crabs on local fauna by analyzing their abundance, size-structure, and diet. Potential crab predation on winter flounder, *Pseudopleuronectes americanus*, was of particular interest due to locally declining populations of this flatfish species. Crabs were collected from the Seekonk River (RI) and Taunton River (MA) from May to August 2012-2016, and subsequently preserved in 95% ethanol. In the laboratory, crabs were measured for carapace width, and prey contents were extracted from stomachs and identified to the lowest practical taxon. Crab abundance exhibited both spatial and temporal variations in the rivers, but overall estimates were consistent with southern Mid-Atlantic populations. Moreover, decomposition of crab length-frequency distributions revealed three distinct cohorts, suggesting that multiple life history stages utilize the riverine habitat. Direct visual analysis of stomach contents indicated that crabs undergo ontogenetic dietary shifts. The main prey of small crabs were crustaceans (e.g., amphipods/isopods, shrimp, and crabs), whereas larger conspecifics preferentially consumed bivalves. There was also evidence of crabs consuming fish, including winter flounder, with rates of predation positively related to predator-prey size ratios. The incidence of crab predation on flounder was minimal, however, and thus crabs may not be an important source of mortality for juvenile flounder. Future research will continue to examine the feeding habits of blue crabs via visual/genetic analysis of stomach contents and measurements of stable nitrogen and carbon isotope signatures in chelae muscle tissue.

Board #17: "Fatty acid profiles of marine fishes from Rhode Island coastal waters ", Mary Yurkevicius, Joshua Jacques, Nancy E. Breen and David L. Taylor, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Marine fish are an excellent source of omega-3 fatty acids, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which provide numerous health benefits to human consumers. Further, the majority of consumed fish are of marine origin, thus underscoring the importance of research focused on this topic. In this study, fatty acids were analyzed in Rhode Island coastal fishes, including summer flounder, *Paralichthys dentatus*; black sea bass, *Centropristis striata*; striped bass, *Morone saxatilis*; scup, *Stenotomus chrysops*; winter flounder, *Pseudopleuronectes americanus*; and bluefish, *Pomatomus saltatrix*. Fatty acid profiles of fish muscle tissue were determined by esterification and gas chromatography. Data were categorized as mono-saturated, saturated, omega-3 and omega-6 fatty acids, and results were expressed as concentrations (mg/100 g wet weight; [FA]) and percent of total fatty acid content (%FA). Future research will examine total mercury and selenium concentrations of each fish species to further evaluate their respective health risks and benefits to human health.

Poster Session II Titles and Abstracts: Boards 18-35
Rondileau Campus Center Ballroom (1:15 to 2:30 PM)

Board #18: "Benefits of Land Conservation and Positive Impacts on Carbon Emissions in our Atmosphere", Nicholas James Caterina and Ronald Maribett, Geography department, Bridgewater State University, Bridgewater, MA 02325

In the recent years we've seen a huge spike in clear cutting of forests, and a massive spike in carbon emissions on our atmosphere. Which has led to the summer of 2016 being the hottest year on record. It will continue to do so every year, unless severe action is taking on all of our parts. What I plan to examine how land conservation/land preservation has only positive impacts on reducing the carbon in our atmosphere. The study is going to examine how National Parks, State Forests, and other protected lands have less of carbon fingerprint than a major American city and show the process of carbon sequestration and how this process is more effective in conservation land than in urbanized areas. As a whole the proposed study will show increasing conservation land has only positives from reducing carbon to increasing our sustainability as a whole. The purpose of this study is to increase land conservation, and show what kind of benefits conservation land can have as whole. The study also serves the purpose to enlighten the general public to make it more well known what important purpose conservation land can serve ecologically to maintain a certain balance in the ecosystem, rather than cutting mass amounts of trees down. My hypothesis is that if we compare and urbanized city or state to conservation land we'll see that the conservation land is much healthier than urbanized area. The study will not only show which land to be healthier, but also show the benefits of increasing conservation land, how the increase of conservation land will reduce emissions, and allow for greater carbon sequestration; thus reducing the carbon count in our atmosphere. By doing this we'll see that conservation land has a great role in reducing carbon emissions in our atmosphere, which leads to greater amounts of carbon sequestration. Which will lead to greater and better crop cultivation of area.

Board #19: "Qualitative Survey of Flame Retardants in Household Items", Kristen Doucette, Sophia Streimer, Shannon Sullivan and Michael Berger, Department of Chemistry and Physics, Simmons College, Boston, MA 02115

For years flame-retardants have been added to many common household items; however there is currently considerable evidence that these chemicals pose significant harmful health impacts. The goal of our project was to examine everyday items to determine what flame retardants could be detected using solvent extractions and GC/MS instrumentation. We analyzed foams, fabrics, bedding, furniture, rugs, electrical cords and other materials. Thus far two flame retardants have been identified, tris(1,3-dichloroisopropyl)phosphate (TDCPP) and triphenyl phosphate in two of the household items: teddy bear stuffing and changing table foam respectively. Other solvent extraction techniques are being evaluated in their ability to extract flame-retardants.

Board #20: "Search for New Biosorbents for Cleaning up Drinking Water", Samantha Rivera, Danielle Francis and Michael Berger, Department of Chemistry, Simmons College, 300 The Fenway, Boston, MA 02115

There are many methods of removal of metal contaminants from drinking water. However, many of these approaches are expensive and unaffordable by many, especially in developing countries. We examined the use of inexpensive, readily available, recycled, or reused materials for effective removal of heavy metals from drinking water. Using atomic absorption and ultraviolet absorption spectrometry, we evaluated several candidate biosorbents for their effectiveness for removal of copper and zinc from water.

Board #21: "Colleges of the Fenway Collaborative Examination of Chemical and Biological Aspects of the Muddy River, Boston, MA", Tala Ferguson and Lisa Lobel, Department of Mathematics and Science, Wheelock College, Boston, MA 02215

Abiotic and biotic parameters within Boston's Muddy River were measured and shared between introductory classes in chemistry and environmental science at two neighboring Institutions in the Colleges of the Fenway. Environmental science students at Wheelock and Simmons Colleges participated in the Charles River Watershed Association's biological monitoring program assessing habitat and water quality using benthic macroinvertebrates (BMIs) as bioindicators. During this project sediment samples were also collected for PAH and metals analysis by a Simmons College chemistry course. Chemical and biological data were collected from two sites within the Muddy River watershed in 2015 and 2016. The Babbling Brook (MRBB) site was surrounded by parkland and was hypothesized to be a "better quality" habitat containing a diverse assemblage of BMIs as compared to the second site (MRRW), which was in a more urban setting downstream from the Babbling Brook. Students assessed the quality of the habitat using the EPA rapid bioassessment protocol. BMIs are classified based on their tolerance of poor or contaminated water and can be classified as sensitive, intermediate or tolerant of poor water quality. Abundance of BMIs in these three classes was used to calculate a water quality index. Metal concentrations in sediments were measured by x-ray fluorescence (XRF) while solvent extracted PAHs were analyzed with gas chromatography/ mass spectrometry. Both PAH and metal concentrations were to threshold effects level (TEL) and probable effect level (PEL) sediment screening guidelines. Combining the data from the two classes can give students from each, new insight into the important interactions between the abiotic factors and resulting biota found within the ecosystem.

Board #22: "Geohealth: A new paradigm for integrating geochemistry, participatory action research, and public health in the built environment", Hannah Oettgen, Ciaran Gallagher, Nisreen Abo-Sido, Kimberly Chia Yan Min, Meredith Wade, Melanie Passaretti, Sarah Smith-Tripp, Nhia Solari , Brianna Love, Gabrielle Jerz, Lucy Wanzer, Sarah H. Koenig, Alexis M. Corcoran and Dan Brabander, Geosciences Department, Wellesley College, Wellesley, MA 02481

Geohealth is an emerging discipline at the boundary between the natural sciences and public health that is focused on refining exposure assessment and risk communication for targeted demographics in the built environment. We are a transdisciplinary research group focused on the fate and transport of pollutants in the urban environment comprised of undergraduate researchers from across the liberal arts. We investigate the biogeochemical mobility of lead and other contaminants to examine community and public health implications. The range of current projects includes remediation of contaminated urban soils by amending with compost, and, in a pilot study, manganese oxides from used alkaline batteries. We also investigate lead and micronutrients in fruit harvested from trees growing in contaminated urban soils, as well as the potential presence of glyphosate in tampons. Our analytical tools vary across projects and include pED-XRF, CHNS, VP-SEM-EDS, and GIS mapping and analysis. We employ participatory action research frameworks based on partnerships with citizen scientists and Greater Boston community organizations including the Food Project and the League of Urban Canners. Our latest collaboration is with the newly funded Paulson Initiative on the Wellesley College campus aimed at understanding the importance of ecology of place. These partnerships inform how we generate research questions that often result in the development of best practices to minimize exposure risk and inform ecologically based management practices. By collaborating both in the lab and with our partners, we design targeted infographics to communicate results with communities impacted by environmental injustices.

Board #23: "The City of Westfield's Effects on the Westfield Rivers Water Quality", Emily Landon, Madison Kaplan, Daniella Lopez, Alice Hawkes, Mackenzie Connors and Michael Vorwerk, Department of Environmental Science, Westfield State University, Westfield, MA 01086

Many urban areas degrade the water quality of surrounding rivers, lakes, and streams. We believe our results will support this trend, leading to lesser water quality downstream of the City of Westfield. Our presentation will illustrate the effects that the City of Westfield has on the Westfield River's water quality. We sampled two separate sites during the month of October: one upstream of the City of Westfield, and one downstream. The water quality parameters that we sampled included: total suspended solids, dissolved oxygen, temperature, turbidity, conductivity, pH, and benthic macroinvertebrates. Preliminary results from dissolved oxygen and turbidity readings show possible downstream water quality degradation. Our poster will display our sampling results and any conclusions we can draw linking the City of Westfield to water quality degradation in the Westfield River.

Board #24: "An Analysis of Knightville Dam's Impacts on the Westfield River's Water Quality, Huntington, MA", Tyler Schofield, Robert Arcese, Jacob Merritt, Nate Nichipor and Michael Vorwerk, Department of Environmental Science, Westfield State University, Westfield, MA 01085

Determining the water quality of a body of water is extremely important in deciding what the water can be used for. A team of five of us set out to determine how the Knightville dam impacts the water quality of the East Branch of the Westfield River in Huntington, MA by sampling upstream and downstream from the dam. Parameters we focused on included the water's: pH, temperature, turbidity, dissolved oxygen, total suspended solids, conductivity, and macroinvertebrates. The sampling was carried-out in the afternoon on three different Wednesdays during the month of October. Using this information, we analyzed the impact of the dam on the water quality of the river. The results we observed so far show that the dam is moderately degrading the water quality of the river."

Board #25: "A Comparison of the Water Quality of Westfield River Tributaries: The Little River, West Branch, and Sanderson Brook", Christopher Burke, Alex Fellmann, Angelina Pietroniro, Will Conklin and Michael Vorwerk, Environmental Science Department, Westfield State University, Westfield MA 01086

Our poster displays the results of our water quality survey of the Little River in Westfield MA, the West Branch of the Westfield River, in Westfield MA, and Sanderson Brook in Chester, MA. Throughout the month of October, we sampled water from each of these locations and measured pH, dissolved oxygen, turbidity, conductivity, and total suspended solids. We also sampled for macroscopic aquatic invertebrates using D-net and kick net techniques. The Little River is well known as a source of drinking water, Sanderson Brook is part of a state forest known as Sanderson Brook Falls that is widely accessed by the public, and the section of the West Branch of the Westfield River where we sampled is accessible from Route 20 and has several small hill towns on it, but it is not state managed like Sanderson Brook. We investigate in our observation of the data how the different uses of these bodies of water affects the water quality of those streams.

Board #26: "The Relationship Between Invasive Species Abundance and the Presence of *Ixodes scapularis*", Alexandra Gaspar, Bailey Vinette and Timothy Parshall, Department of Environmental Science, Westfield State University, Westfield, MA 01085

Due to their rapid reproductive rates, aggressive growing behaviors, and durability, invasive species are becoming the dominant plants in many forested areas. The experimental forest on the campus of Westfield State University is no exception to the invasion, and includes bush honeysuckle (*Lonicera spp.*), privet (*Ligustrum spp.*), and Oriental bittersweet (*Celastrus orbiculatus*). According to recent research, the presence of these invasive species may be causing an increase in tick abundance, specifically the black-legged tick (*Ixodes scapularis*), commonly known as the deer tick. To examine this relationship, we established four transects located in the experimental forest. Two of these transects had low (<5%) invasive plant cover, and the other two had high (>70%) invasive plant cover. We measured differences in tick

abundance using either a flagging or dragging method two times a week over a five-week period (for a total of 10 visits). We found that there was a significantly higher ($p<0.0001$, t-test) abundance of ticks in areas that had higher invasive plant cover (510 ticks/ha) than areas with lower invasive plant cover (90 ticks/ha). These data support our hypothesis that there is a relationship between the presence of invasive plants and the abundance of ticks.

Board #27: "An Assessment of How Different Matrices in Stationary Light Biosand Filters Affect Flow Rate and Pathogen Removal from Contaminated Water", Mikayla Cote, Carl Ramponi and Jennifer Mendell, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

Clean water is a basic human right, and one that is vital to human health and survival. Sadly, many underdeveloped countries, including Cambodia, lack access to a clean drinking water supply. As such, many people, including children, die from microbial-borne gastrointestinal diseases from fecally contaminated water. One way to provide clean drinking is through the installation of a type of point of use water filter, called a biosand filter. Biosand filters are gravitational water filtration systems comprised of layers of gravel and sand. Traditional biosand filters are made of concrete, and while effective, these filters are too heavy to install in the floating villages, on the Tonle Sap Lake, Cambodia. An alternative, lighter, PVC based biosand filter was introduced, but to date have not performed as well as the concrete filters. These issues in performance could be due to the proportions of matrices used or from the sand matrix packing in these filters, slowing the water output or flow rate. To further investigate this, PVC based light biosand filters with a variety of sand and gravel matrices were designed, built and tested using water contaminated with chicken feces (to simulate the fecally-contaminated water sources found in Cambodia) to assess both the efficiency of removing these contaminants and maintenance of the proper flow rate of the filters. The initial filters built according to CAWST specifications demonstrated a rapid decline in flow rate and were deconstructed. New filters were built with a coarser sand matrix, and varying amounts of gravel, which performed better initially, but eventually slowed to a flow rate below the acceptable level. It was hypothesized that sand was leaching into the gravel layer, blocking the outflow, so prototypes are currently being constructed to test this. Future work will involve the building and testing of filters with different types of sand, as well as building suspended filters to simulate the wave action of the homes on the floating villages in order to refine the design so these filters can provide clean water to the families who reside on the Tonle Sap Lake, Cambodia.

Board #28: "Gene Expression Analysis of Carbohydrate Metabolism in *Apis mellifera* when exposed to Artificial Sugars", Michelle Jennette and Jonathan Roling, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

Over the past few years, bee populations have drastically decreased due to an increase in Colony Collapse Disorder (CCD). CCD is when all of the honeybees abandon their hive and queen, with no intention to return. There may be a correlation between the types of food bees are given to CCD. This research concentrates specifically on metabolic genes, as well as carbohydrate metabolism of honeybees. Metabolic genes were selected through literature searches and primers were designed. To determine levels of gene expression between different sugars, bees from 12 hives were exposed for one week to honey, high fructose corn syrup, corn syrup, sugar water, or denatured honey. After the exposure ended, bees were euthanized, RNA was extracted and Complimentary DNA (cDNA) was synthesized. 22 genes were identified, and 11 successfully amplified when tested to the exposure cDNA. These primers include GAPDH, PEPCK, LDHA, LPD1, PGM2, GK1, Aldolase, PFK, PGK, FBP, and endogenous control Actin. Four of these genes have been quantified, including Actin, PFK, GK1 and PEPCK. Analyses for changes in gene expression are currently ongoing.

Board #29: "Nicotinic Acetylcholine Receptor Gene Expression in Bees Exposed to Imidacloprid", Brikena Gjeci and Jonathan Roling, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

The honey bee, *Apis mellifera*, is a highly beneficial insect for crop pollination. Its contribution in agriculture is valued at more than 14 billion dollars per year in the U.S. alone. For several years, however, honey bee populations have been suffering a drastic decline in numbers, a phenomenon that has been termed as Colony Collapse Disorder (CCD). The first report of CCD was in November 2006 and by February 2007, large commercial migratory beekeepers in several states

were reporting substantial losses associated with CCD. These losses varied widely, ranging from 30% to 90% of the bee colonies; in some cases, the colonies were so weakened that they were no longer able to pollinate or produce honey. Evidence suggests that neonicotinoids may play a major role in these occurrences. Neonicotinoids are systemic pesticides, and are thus absorbed by the plant when applied to seeds, soil, or leaves. The pesticide then circulates through the plant's tissue, killing the insects that feed on them. For this reason, they are used against piercing-sucking pests of major crops. These pesticides act as nicotinic acetylcholine receptor (nAChR) agonists, which provide the majority of the excitatory neurotransmission in the insect central nervous system. My research will focus on the specific neonicotinoid imidacloprid, and the effect it has on the gene expression of nAChRs of bees that have been exposed to it. The honey bees that will be used in this experiment were obtained from 12 different hives from a commercial beekeeper and fed a mixture of sugar and imidacloprid for five days. The concentrations of imidacloprid used were 0 µg/L, 0.2 µg/L, 20 µg/L, and 2,000 µg/L. To measure gene expression, I will be using QPCR and analyzing the standard curves produced. Eleven genes have been identified that encode for the subunits of the nAChRs: Amelα1 – Amelα9, Amelβ1 and Amelβ2. Primers for these genes have been ordered and, to perfect my technique, I have been running several standard curves for the Actin gene."

Board #30: "Analysis of Iron and Nitrate Cycling in the Water Column and Riverbed Sediment of the Nemasket River", Ariana Cosenza, Phoebe Kurriss, Nathan Ivanowsky, Leonard Sprague, Cielito D. King and Franco Pala, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

Literature shows that the geochemical cycling of chemicals in natural waters influences phenomena such as eutrophication and harmful algal bloom. Despite the importance of geochemical cycling, few studies have been done on its influence in local rivers and ponds. This work is intended to provide insight on the processes that influence the distribution, or geochemical cycling, of iron and nutrients such as nitrates in the Nemasket River at Oliver Mills Park in Middleborough, MA in a laboratory setting. A plastic tube was used to collect riverbed sediment core at the beginning of spring semester. A sample of river water was also collected in a plastic jug. Both sediment and water sample were brought to the lab where a known concentration of soluble iron and nitrate was added to the water sample. A portion of this iron- and nitrate-containing water was carefully poured into the tube without disturbing the sediment core in order to create a water-sediment interface for our study. The tube was capped and stored at 4°C for seven weeks to slowly transition from oxygen-rich condition (oxic) at the time of sampling to anoxic condition during the course of the study. Such conditions are known to influence the geochemical cycling of iron and nitrate. To follow any changes in concentrations of these chemicals, a small volume of water was sampled from the tube weekly and preserved for analysis at a later date. pH and conductivity measurements were also done once a week. After seven weeks at 4°C, the tube was brought to room temperature to accelerate the process and conclude our studies. The final phase of our project involves testing preserved water samples for changes in concentrations of iron and nitrate using standard EPA methods. These changes will allow us to hypothesize if iron and nitrate come out of solution and become incorporated in the bottom sediment.

Board #31: "Application of green chemistry principles to improve the synthesis of 3-bromooxindole acetic acid from 3-indole acetic acid", Nathan Ivanowsky and Edward J. Brush, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

3-Bromooxindole-3-acetic acid (BOAA) is a keyintermediate in our synthesis of oxindole derivatives designed as mechanism-based inhibitors of therapeutic target enzymes. The traditional synthesis of BOAA from indole-3-acetic acid, N-bromosuccinimide (NBS) and tert-butanol is wasteful with the use and generation of hazardous chemicals, low yields (25%), and poor atom economy (35%) and selectivity. Our approach is to apply green chemistry principles to reduce or eliminate the use and generation of hazardous reagents and byproducts. This is important as chemical products are produced and used around the world, resulting in unintended consequences to human and environmental health. Green chemistry metrics were used to analyze changes to the reaction parameters including: scale, temperature, stirring time, rate and order of adding reagents, inert atmosphere, stoichiometry, solid-state (solvent-free) reactions, and use of catalysts. Our preliminary experiments were conducted on a small scale, making it possible to efficiently run multiple reactions simultaneously. It was determined that an inert, Argon atmosphere was not essential during the reaction. To date, our investigation of solid state reactions using a stoichiometric amount of tert-butanol (usually in excess as solvent) have not resulted in improved reaction efficiency. Reactions run with acid catalysts produced impure products with no

improvement in yield. However, the formation of any product under these conditions is promising, and we believe that a better understanding of the chemical mechanism will provide further insight to improving reaction efficiency. Future work will involve studying the overall BOAA synthesis as two, separate reaction sequences, and investigating the use of Oxone and ammonium bromide to replace the hazardous and wasteful brominating agent, NBS. Further understanding of the reaction will bring us closer to successfully developing a more selective and benign synthesis. This research was supported by a summer 2016 grant from the BSU Adrian Tinsley Program.

Board #32: "Extraction of pesticides in local and imported fruits followed by GCMS analysis", Krista Greeley and Cielito DeRamos King, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

All over the world pesticides are studied to better understand their toxicity and risks that come with ingestion of contaminated produce. Today's society teaches people to think of pesticides as carcinogenic chemicals that are detrimental to our health, when in most cases their amount of detection is below the USDA's detection violation rates. While pesticides may or may not be detrimental to our health at certain exposure levels, it is important to understand the chemistry behind pesticides, especially those found in fruits, and the methods used to extract, separate, and detect them. The goals of this experiment are to (1) learn different ways of extracting pesticides in fruits, and (2) provide a basic understanding of the use of gas chromatography with mass spectrometric (GCMS) detection for the separation and identification of selected pesticides in fruits. Two common methods for extracting pesticides in fruits, liquid-liquid extraction (LLE) and solid phase extraction (SPE), will be used to extract pesticides from selected fruits, both local and imported. The pesticides in the extract will be separated and identified using selective ion monitoring on a GCMS. Standard solutions of selected pesticides will also be analyzed on the GCMS as reference materials for identification of pesticides in the extracts. Finally, the results from local fruits will be compared with imported fruits to see if there is any difference between the types of pesticides used in those produce.

Board #33: "Greener spectrophotometric determination of phosphate", Ryan Lindsay and Meghna Dilip, Department of Chemistry, Worcester State University, Worcester, MA 01606

An antimony-free spectrophotometric method to determine phosphate concentration was investigated for use in an undergraduate lab. The technique utilizes less hazardous chemicals than the standard method, requiring a lower concentration of sulfuric acid (5.5 M to 0.25 M) and replacing the previously required ascorbic acid and ammonium molybdate-antimony potassium tartrate with 2% thiourea and 0.05 M ammonium molybdate. In addition to greener reactants, the new technique is conscientious waste prevention, requiring reduced sample volumes and reduced molar concentrations of reactants. The new method showed a strong linear curve in the 0.1 -10 ppm phosphate range with ($R2 = 0.9908$). Household detergents including Arm and Hammer, Cascade, and Finish were investigated by the standard and new method for phosphate concentration. It was found that Arm and Hammer showed no measurable phosphate concentration whereas Cascade and Finish did show measurable phosphate using both the standard and the new method.

Board #34: "Sustainable Vinyl Ester Resin from Glycerin Waste", Kaweng Choi and Yongwoo Lee, Department of Chemistry, University of Massachusetts Lowell, Lowell, MA 01850

Use of composite materials for construction of DoD weapons platforms will approach 200 million pounds per year. VER is a low-cost resin that can be processed at ambient temperature using vacuum-assisted resin transfer molding (VARTM) into massive carbon-fiber-reinforced composite structures such as ship hulls and transportation vehicles. The objective of this presentation is to demonstrate the feasibility and development of an environmentally safe ""green"" vinyl ester resin (GVER) derived from renewable biomass wastes-glycerin waste. Furthermore, green VER composites could be produced without the use of reactive diluent styrene. Lignin will be obtained from waste wood and pulp production, while glycerin will be obtained from biodiesel production, and/or from waste vegetable oil of the food industry.

Board #35: "Phase Effects on the Nanoparticle Permeation Process", Alexander Steacy, Ryan Hamelin and Steven Fiedler, Department of Biology and Chemistry, Fitchburg State University, Fitchburg, MA 01420

The application of nanoparticles is a subject of interest in current research, for example: as a potential toxin to the human system or a mechanism for targeted drug delivery. It is however difficult to gain an accurate understanding of the effects of these particles without first understanding the free energy profiles of the permeation process. Molecular dynamic simulations provide a means for extrapolating the free energy profile on a sub nano-sized permeant as it passes through model membranes. The resultant free energy profile provides a basis for the biochemists to design experiments to determine the effects caused by the presence of sub nano-sized particles in and around the cellular membrane.