Undergraduate Students Symposium

Tuesday, September 15, 2020 | 4:30 p.m.

EI-STEPS Summer Research Internship Program

Virtual Presentation

Presenters: **Kiera Englehart and Christine Mosley**
Additional Group Members: **Zhihao Guo, Kaya Harper, Joseph Malisov**
Advisors: Professors Morris, Targett, and Whitney
Thinking Outside the (Lunch) Box: Establishing a Food Carbon Footprint for Lehigh

Have you ever thought about the carbon footprint of the foods eaten on Lehigh's campus? In this project, students are creating a food carbon footprint calculator that suits Lehigh Dining's needs to determine which menu items are the most and least carbon intensive. This end goal will allow Lehigh Dining to provide a carbon footprint (red - high, yellow - medium, green - low) for key menu items at dining locations across campus. This will encourage students, faculty, and staff to choose to alter their food choices based on the impact of the menu item. The students have collected and analyzed data from Lehigh Dining, reviewed existing carbon footprint calculators, and examined current practices in the restaurant industry and at colleges/universities. Students worked with different kinds of data including recipe ingredients, ingredient quantities, distance of ingredient sourcing, and food carbon intensities.

Alyssa Gengaro
Advisor: Professor Morris
Agriculture and Climate Change in The Lehigh Valley

All across the Lehigh Valley, farmers are feeling the effects of human induced climate change. Conducting interviews with our region's farmers revealed that some are becoming aware of the immense impact that certain agricultural practices have on the planet's climate, and how that in turn limits the ability to grow healthy and abundant food. To ensure food security for our world's growing population, a more sustainable approach must be taken in the agricultural sector. Most often, farmers focus on taking active steps to increase carbon sequestration in their farming techniques in order promote productive farmland for generations to come.

Brianna Gipson
Advisor: Professor Ramage Macdonald
Monitoring Changes in Air Quality Throughout COVID-19 Lockdown in Pennsylvania

News regarding unprecedented decreases in pollution as a result of Covid-19 shutdown in countries like Italy and China was a shining piece of information in such a gloomy time. Taking these observations one step further, the goal of this project is to track the levels of different atmospheric pollutants over the course of Stay-at-Home orders in different Pennsylvanian counties, comparing them to averages from previous years. Under the guidance of Dr. Joan Ramage Macdonald, I have been able to access satellite data from the AURA-OMI instrument then produce visualization maps from said data, utilizing two different NASA-engineered applications, Giovanni and Panoply.

Vicki Jagdeo and Kendall O'Farrell
Advisor: Professor Ramage Macdonald
RADAR Glacier Zone Analysis of Vatnajökull through 2019

Glaciers are linked with climate as warming temperatures have noticeably shrunk them and consequently cause sea level rise. Vatnajökull is particularly important because it is the biggest ice cap in Iceland, located in the southeast region of the country. It is a temperate ice cap with an approximate area of 7,900km2 and about 30 outlet glaciers. Glaciers typically have a season of ablation and accumulation with progression of melting through ablation. These features are easily observed and analyzed in synthetic aperture radar images (SAR). The objective of this project was to learn how remote sensing, in particular how SAR images can be used to observe patterns in melting and accumulation seasons in glaciers as well differences in surface textures and composition. This was done in order to get a better understanding of how these observations can serve as a baseline for further research on glacial retreat and changes over a prolonged period of time.

Jon Krupnick
Advisor: Professor Booth
Feeding Habits of The Spotted Lanternfly Throughout its Life Stages in a Forest Ecosystem

The spotted lanternfly (Lycorma delicatula), is an invasive species in the Fulgoridae family of insects. Native to eastern China, India, and Vietnam, this species invaded eastern Pennsylvania in 2014. Spotted lanternflies feed on plant sap from a range of species and pose a significant threat to agriculture and native ecological communities. Much research has focused on agricultural impacts; however, little is known about their effects on forested ecosystems. While spotted lanternflies are known to prefer the tree of heaven (Ailanthus altissima), a species from their native range, they have also been observed feeding on at least 70 other species. To anticipate potential impacts of this new invasive species, I conducted a study to collect baseline ecological data assessing the lanternfly's feeding preferences in the forest of South Mountain near Bethlehem, Pennsylvania. Specifically, I assessed 1) whether different life stages of the spotted lanternfly feed on different species and 2) whether their feeding reflected the abundance and availability of plant species in the surrounding forest or genuine species preference. To do this, I conducted repeated surveys of ~75-acres of forest from early July through the end of August 2020 recording the density of spotted lanternflies on trees, vines, and shrubs. Each day I revisited a subset of the affected plants and recorded changes in the number of spotted lanternflies and what life stage they represented. To assess whether the spotted lanternflies were targeting particular plant species at greater rates than their abundance in the surrounding forest, I also recorded the three nearest, non-affected plant species at each of the trees, shrubs, and vines used by the lanternflies. Spotted lanternflies were observed feeding on a total of 186 individual plants representing 21 different species. Results indicate clear feeding preferences, with substantial differences across life stages. Plant species targeted at higher rates than what would be expected given their availability in the forest included grape (Vitis sp.), tree of heaven, black walnut (Juglans nigra), devil's walking stick (Aralia spinosa), and oriental bittersweet (Celastrus orbiculatus). Earlier life stages fed on a broad range of species, but as the lanternfly progressed through its life stages it increasingly focused on tree of heaven, with a small portion of adults feeding on black walnut and grape. Recent research has demonstrated that spotted lanternflies sequester toxins from tree of heaven as a defense against predation. Several targeted plant species on South Mountain, like black walnut, oriental bittersweet, and devil's walking stick also contain toxic chemical compounds, suggesting that spotted lanternfly may be using them in a similar way. Additional research is needed to better understand spotted lanternfly feeding preferences and to determine potential relationships with the chemical content of host plant species.

Adam Patching *with Ethan Kurak 21' research assistant*
Advisor: Professor Pazzaglia
A Knick in Time

I spent my July in Ohiopyle state park working as Ethan Kurak M.S. 21' research assistant under the supervision of Frank Pazzaglia. My purpose was to help Ethan in the completion of his USGS Educational mapping project. To achieve this goal we worked collaboratively with Frank Pazzaglia, Jim Shaulis (PA geological survey), along with numerous Ohiopyle staff. Over three weeks we located and mapped the Carmichaels' formation along the Youghiogheny River. Using Lidar, GIS, GPS, and topography maps a river long profile was constructed and with terrace elevations indicated.

After the fieldwork was done I began my own project investigating the retreat of the Ohiopyle Falls. Using the current knick point retreat data Professor Pazzalgia provided, I was able to move the falls up and downstream, interpreting what the river and the falls may have looked like one million years in the past and the future. By interpreting the interaction between the Youghiogheny river and the underlying geological units I have attempted to locate the past and future location of the falls as well as illustrate what the falls might have, or will look like based on the rocks it is interacting with.

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