

8th Annual Sustainability Symposium

ADAPTING



in uncertain times

April 23 – 24, 2021

PROGRAM WITH ABSTRACTS

sustainabilitysymposium.scholar.bucknell.edu

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The Sustainability Symposium celebrates sustainability and environmental related research, teaching, creative works, practice, and action where faculty, staff, students, and community stakeholders from regional institutions share their completed and ongoing works, network for ongoing or new initiatives, and are inspired by shared keynote activities. This annual meeting showcases work from the natural sciences, physical sciences, social sciences, engineering, management, and humanities exploring emerging themes such as climate change, energy, human rights, food, and resilience.

The Center for Sustainability & the Environment

The Bucknell Center for Sustainability & the Environment creates impactful, interdisciplinary, experiential opportunities for learning and research that address global and environmental challenges. By enabling collaborative scholarship from across the university, we empower students and faculty to explore, learn about, engage with and transform their world.

The Center for Sustainability & the Environment was created as the Bucknell Environmental Center in 2005 with support from about 50 faculty and staff from across the university and from students, who helped to define areas of interest. From the beginning, the center sought to create a university-wide platform capable of supporting collaborative, interdisciplinary scholarship, teaching and outreach, situating Bucknell as a national leader in applied research and teaching on 21st-century environmental and sustainability issues.

Today, the center's three signature programs manage a network of 16 interdisciplinary field stations in Pennsylvania giving students, faculty, and community partners experiential, applied research and learning opportunities that impact our local communities and beyond.

Watershed Sciences & Engineering Program

Bucknell makes the most of our proximity to the majestic Susquehanna River through the Watershed Sciences & Engineering Program. By taking the classroom outdoors, Bucknell connects people to the river and builds upon our existing strengths in science and engineering. Faculty, staff and students partner with local, state and federal organizations on watershed research, stewardship and conservation projects.

Sustainable Technology Program

Bucknell's Sustainable Technology Program works to build on the university's advances in sustainable technology through research, programs and projects. Using the campus as a living-learning laboratory, the program brings a collaborative, hands-on approach to a variety of topics, including climate change, renewable energy and eco-landscaping.

Place Studies Program

Working in collaboration with faculty, students and staff from across the humanities, social sciences and management, the Place Studies Program develops teaching, research and outreach projects. These opportunities allow faculty and students to actively engage with the social, political, historical and cultural dimensions of nature-society relationships and sustainability, related to how we imagine, understand and engage with "place".

Letter from Symposium Co-Chairs

The theme for the 8th Annual Sustainability Symposium, “*Adapting in Uncertain Times*”, is one which has become more urgent since the world shifted to new modes of being, doing, and acting in the midst of the coronavirus pandemic. The quick pivots to working from home, education shifting to online, curbside pick-ups, and rediscovering the possibilities and benefits of being outdoors demonstrate that massive societal change in short order is possible. But the impacts were not felt evenly. Indeed the pandemic has served to highlight existing inequalities, making it impossible to look away; Inequalities in healthcare, worker protections, education, broadband access, nutrition. The differential impact along race and class lines are more prominent in public discourse, with death being an outcome of underlying systemic difference that cannot be ignored.

The continued assault of black and brown people in 2020, such as the murder of George Floyd, rattled this nation as the ramifications of systemic racism persisted during the unprecedented COVID-19 pandemic. Subsequently, the summer of 2020 saw a galvanizing force in nationwide demonstrations in support of *Black Lives Matter* stretching from rural towns to the largest cities in the country. These colossal and epic protests illustrate that large mobilization for justice and change is possible.


Coupled with the protests for racial justice in the U.S., we as a country have experienced a stronger movement for environmental justice. Environmental justice is racial justice for many of the environmental problems within this nation that occur in or adjacent to communities of color. Racial identity is a key sign in the placement of toxic sites and industries in this country. At the same time, communities of color are faced with polluted water and junk food versus having access to nutritious food and clean water (Flint, Michigan). These issues are only to be exacerbated as climate change and its effects (e.g., droughts, flooding, reduced soil fertility, etc.) affect the availability of food and water essential for healthy living and sustainable communities. The woes of 2020 only inflamed the existing environmental injustice in the United States. Yet, these communities of color and accomplices in government agencies, NGOs, and the private sector have also displayed their tenacity and resolve in fighting for environmental justice and racial justice. These groups are a testament to adapting to change for the better.

Before the pandemic, the uncertain times to which humanity needed to adapt centered on climate change. Our first iteration of an 8th Annual Sustainability Symposium was to be held in April 2020, under the theme of “Addressing Climate Change through the Arts, Research, and Community Action” – a very pre-pandemic symposium title. That theme was intended to be a response to both the previous year’s keynote address by Dr. James Hanson and the *Intergovernmental Panel on Climate Change* report telling the world that drastic change was needed by 2030 to reduce greenhouse gas emissions to avoid the worst outcomes of the inevitable coming climate change. Changing coast lines, more frequent and severe storms, droughts disrupting farming systems, disappearing islands – such impacts and more represent uncertainty in a time of climate change and a call on humanity to adapt to a changing world. And according to the IPCC, we need to make drastic changes – quickly. Last year, we had 10 years to pivot. Ten years to drawdown. To drastically change the way we think about being, doing, and acting. To create meaningful policies. To ensure all voices are brought to the table to create an inclusive future where all communities – human and non-human – will thrive. Now, we have 9 years. Despite this short timeline, we now have hope. The coronavirus pandemic has shown us that drastic quick pivots, in a matter of weeks if necessary, are possible.

Addressing sustainability dilemmas, including climate change, requires cross-sector collaborations, inclusion of diverse voices, and participation of those impacted in developing and implementing solutions. COVID-19 has forced the examination of global issues, such as the climate crisis, through a deeper lens of public health. The ongoing struggle for equity and dismantling systemic racism reminds us that social justice is at the core of sustainability. Creating a world that is livable and just for all requires us all.

As we seek to understand how we can adapt in uncertain times, the past pandemic year has shown us that large scale shifts in novel methods of being, doing, and acting is possible. With this year’s symposium, we showcase a range of work in environmental and sustainability studies and action. We celebrate how the arts can create community. How policy can create new frameworks for actions. How faith intersects with action for justice and equity. We’ll hear from speakers talking about their research, experiences, and action from individual scales to a national stage. And through it all, we consider ways that we can work together to adapt in uncertain times.

- Drs. Shaunna Barnhart and Milton Newberry, III
Co-Chairs, 8th Annual Sustainability Symposium



2021 Sustainability Symposium

SCHEDULE

Friday, April 23rd

Welcome Remarks

4:45 - 5:00 pm

Shaunna Barnhart and Milton Newberry III
Sustainability Symposium Co-Chairs

Poster Session

5:00 - 6:00 pm

Oral Session 1: Regulations, Standards, and Values

6:15 - 7:15 pm

Keynote Panel Discussion: “Adapting in Uncertain Times”

7:30 - 8:45 pm

This year’s Keynote Panel brings together activists and civil servants to talk about how the intersections of the climate crisis and the COVID-19 pandemic lay bare social, economic, and racial injustices and can actually create opportunities for thinking about new ways of being, doing, and acting. The keynote panelists are responding to the prompt: “How has the pandemic created opportunities for thinking about new ways of being, doing, and acting in your field or line of work?”

Moderator

Coralynn Davis, *Professor of Women’s & Gender Studies at Bucknell University*

Panel

- Sandy Spieler
Founder and former director of In the Heart of the Beast Puppet and Mask Theatre and the Annual Mayday Parade and Ceremony (1974-2019)
- Allison Acevedo
PA DEP Director of Environmental Justice
- Charles Lee
Senior Policy Advisor for Environmental Justice at the EPA
- Friar Mike Lasky
Chairman of Franciscan Conventual’s Justice, Peace, and Integrity of Creation Ministry and President of Franciscan Action Network

Saturday, April 24th

Plenary Panel: “COVID’s Impact on Sustainable Communities’ Research and Activism”

10:00 - 11:00 am

This plenary panel features two faculty-student research teams from Bucknell University who reflect on the research they’ve done during the pandemic, the challenges and opportunities it has presented, and impacts on traditional mentor-mentee relationships

Moderator

Shaunna Barnhart, *Symposium Co-Chair and Director of Place Studies program within the BCSE*

Panel

- Deborah Sills
Associate Professor of Civil and Environmental Engineering at Bucknell University
- Elizabeth Durden
Associate Professor of Sociology at Bucknell University
- Emily Turner '22
Political Science major, double minor in Sociology and Legal Studies
- Riley Doyle '22
Environmental Engineering major

Oral Session 2: Sustainable Living and Climate Change

11:00 am - 12:00 pm

Oral Session 3: Food Justice and Waste

12:00 - 1:00 pm

Closing Remarks

1:00 – 1:15pm

INVITED SPEAKERS

Allison Acevedo

PA DEP Director of Environmental Justice



Allison operated a consultancy providing guidance on education, program development, policy and strategic planning for non-profit organizations. She has served as Director of Education of United Way of Greater Philadelphia and Southern New Jersey; as a staff advisor to Pennsylvania Representative W. Curtis Thomas and Pennsylvania Senator Allyson Y. Schwartz; and as an attorney with the U.S. Department of Labor. She also co-founded the Philadelphia Black Giving Circle, and is a member of the Southeastern Pennsylvania Early Childhood Coalition.

Allison holds a Bachelor of Arts from Swarthmore College, and a Juris Doctor and Master of Laws in Taxation from Temple University Beasley School of Law.

(Source: [Neil Shader – PA Media](#))

Friar Mike Lasky

Chairman of Franciscan Conventual's Justice, Peace, and Integrity of Creation Ministry & President of Franciscan Action Network



Friar Lasky earned his M.Div. and in 2000 he was ordained to the priesthood. He was a teacher at St. Francis High School in Hamburg, NY in 1997 and from 2000-2005. He spent the next five years as Campus Minister, at Western Connecticut State University, in Danbury, CT. In 2010, he began a two year assignment as Regional Director for the Americas, of [Franciscans International \(FI\)](#), in NY, working at the United Nations (UN) to address human rights injustices that impact on the poor and most vulnerable. After spending time in Spanish Studies, Bogota, Columbia, he served as the Parish Administrator and Campus Minister of [Newman Student Center Parish](#), University of North Carolina at Chapel Hill (NC). Friar Michael was one of the Religious Leaders to sign the [Franciscan Action Network and Muslim Leaders' Joint Statement on Anti-Muslim Rhetoric](#).

Sandy Spieler

Founder and former director of In the Heart of the Beast Puppet and Mask Theatre & the Annual Mayday Parade



Sandy is a sculptor, painter, graphic artist, performer, director, teacher, activist, and perpetual student. Her work includes tiny puppet shows, main stage productions, public art commissions, streetscape designs, residencies/collaborations in communities, schools and universities locally, nationally and internationally. She is passionate about work 'For the Water' and the reparation of our world, and constantly wonders what it means to enact a 'theatre of inter-being'." She holds an MA of Cultural Performance from Bristol University England, studied puppetry arts at Bread and Puppet Theatre, and at NYU. Among many awards are two UNIMA-USA Citations of Excellence and the 2014 "Distinguished Artist of the Year" from the McKnight Foundation.

Charles Lee

Senior Policy Advisor for Environmental Justice at the EPA



Charles Lee is widely recognized as a true pioneer in the arena of environmental justice (EJ). He was the principal author of the landmark report, “Toxic Wastes and Race in the United States,” and helped spearhead the emergence of a national EJ movement and Federal action, including the First National People of Color Environmental Leadership Summit; Executive Order 12898; the U.S. Environmental Protection Agency’s (EPA) Office of Environmental Justice; the National Environmental Justice Advisory Council (NEJAC); and the Federal Interagency Working Group on Environmental Justice.

He has served in multiple capacities, ranging from creating the United Church of Christ’s EJ program to directing EPA’s EJ office. He led efforts to incorporate EJ into EPA’s rulemaking process, develop models for collaborative problem-solving, transform brownfields redevelopment into a community revitalization paradigm, advance approaches to address cumulative risks and impacts, lay a strong science foundation for integrating EJ into decision-making, develop and implement EPA’s EJ strategic plans, and advance EJ at the State level. (Source: [Alliances for Equity](#))

Coralynn V. Davis

Professor of Women’s and Gender Studies and Anthropology at Bucknell University



An award-winner teacher, Coralynn V. Davis holds a PhD (1999) in Anthropology at the University of Michigan, where she also received a Graduate Certificate in Women’s Studies (1994). She has held a Research Associateship at the Five College Women’s Studies Research Center (2005-2006) and at the Harvard Divinity School Women’s Studies in Religion Program (2008-2009). In addition to numerous peer-reviewed articles, her book *Maithil Women’s Tales: Storytelling on the Nepal-India Border*, based on her ethnographic research with communities in Nepal and India, was published by University of Illinois Press in 2014.

Elizabeth Durden

Associate Professor of Sociology at Bucknell University



A former Fulbright Fellow, she has published articles in *International Migration Review*, *Journal of Latin American Geography*, *Social Science and Medicine*, *Migration Studies* as well as the *Journal of American Ethnic History*. Her current research is exploring health inequalities in Central Pennsylvania.

Emily Turner '22

Political Science Major and double minor in Sociology and Legal Studies at Bucknell University



Emily Turner '22 is a Political Science major and double minoring in Sociology and Legal Studies from Saratoga Springs, NY. Working with Professor Elizabeth Durden, she has been a research assistant studying the social determinants of health of white and nonwhite women and analyzed the reception of immigrants both historically and today in Virginia. She is also working on an independent study with the Bucknell Center for Sustainability and the Environment assisting Montgomery County in making a greenhouse gas inventory and an accompanying climate action plan. Emily enjoys learning about different social issues and hopes to attend law school in the future.

Deborah Sills

Associate Professor of Civil & Environmental Engineering at Bucknell University



Deborah Sills is an Associate Professor in the Department of Civil and Environmental Engineering at Bucknell University. Her research and teaching focus on energy recovery from biomass—such as algae, animal manure, and wastewater. In response to the CoVID19 pandemic, she (in collaboration with Marie Pizzorno, Biology) is using wastewater based epidemiology to monitor SARS-CoV-2 in Bucknell's sewers.

Riley Doyle '22

Environmental Engineering Major at Bucknell University



Riley Doyle '22 is an Environmental Engineering major from Essex Fells, NJ. She has been working with Professor Deborah Sills on various projects ranging from energy and resource recovery generated from algae and agricultural plastic waste to wastewater. As part of her research on monitoring SARS-CoV-2 through wastewater-based epidemiology, she is troubleshooting a new RNA extraction method developed at UC Berkeley. Riley enjoys learning about public health issues and has an internship at HRSD, a water utility in Virginia in their Research and Development department this summer.



2021 Sustainability Symposium

ORAL PRESENTATIONS

Oral Session 1: Regulations, Standards, and Values

A CROSS-DISCIPLINARY ANALYSIS OF SUSTAINABILITY AND BUSINESS PERFORMANCE: FINDING NEW METRICS

Tom Geurts, Department of Accounting and Financial Management, Bucknell University; **Beate Klingenberg**, School of Sciences, The International Institute Lorenzo de' Medici, Florence Italy; **Bryan Scutari**, Department of Accounting & Financial Management, Bucknell University.

At the intersection of the operations management and financial reporting literature, the importance of impact measurement of activities towards operational excellence has long been recognized. Of specific interest are effects on financial performance of continuous improvement frameworks that target quality (e.g. Total Quality Management (TQM), Six Sigma, ISO9000, Corbett et al., 2005, Chatzoglou et al., 2012), cost efficiencies (e.g. Lean Manufacturing) or combinations thereof; but also environmental management systems (EMS, e.g. ISO14001) and on a more systemic scale, the achievement of sustainability, e.g. the United Nation's Sustainable Development Goals (SDGs) (Mura et al., 2018). Firms that aspire reaching one of more of these SDGs need to establish sustainable initiatives while simultaneously ensuring long-term corporate viability (Elkington, 1994).

With the introduction of ISO 14001 by the International Standards Organization in 1996, firms receive certification when achieving appropriate Environmental Management Systems – a stepping stone towards systemic sustainability initiatives. One of the benefits of ISO 14001 implementation – besides improved environmental performance - could be improved financial performance, through higher efficiency, less waste, and market signaling (Johnstone and Labonne, 2009). However, the evidence in the literature is inconclusive. Klingenberg, Timberlake, Geurts, and Brown (2013), argued and to a certain account showed that this could be the result of using the wrong metrics. This follow-up research by Klingenberg, Geurts and a Bucknell student, Bryan Scutari, supported by a generous grant of the Institute of Management Accountants, is now exploring better metrics to measure the impact of ISO 14001 on the financial performance of firms. This oral research presentation discusses the historical development of ISO 14001, analyzes how the implementation of ISO 14001 affects the financial performance of firms, and how that results in the development of appropriate metrics.

DEMOCRACY DEFEATED DISCURSIVELY: ANDREW WHEELER AND THE DEREGULATION OF THE FOSSIL FUEL INDUSTRY

John Mirsky, Department of Environmental Studies and Sciences, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Jessica Pouchet**, Department of Environmental Studies and Sciences, Bucknell University.

With over 70% of the U.S. population believing that climate change is a serious problem that merits immediate confrontation, it is both surprising and a serious ecological threat that the Environmental Protection Agency (EPA) furthered over 50 deregulatory actions during the Trump Presidency. While previous research has mostly been focused on large economic models and social structures, this project takes a semiotic approach in addressing the issue by analyzing the speech of former EPA administrator Andrew Wheeler in its relationship with this outcome. Through a detailed content analysis of a 3-hour confirmation hearing and a 10-minute news interview, I analyze how Wheeler strategically employs specifically-indexed terms in a way characterized by Aaron Stibbe's forms of erasure. Findings reveal that Wheeler utilizes all three of Stibbe's forms of erasure to highlight the importance of certainty and other neoliberal tenets in an attempt to align his deregulatory agenda with these tenets. The void-form was most prevalent, indicative of the lack of resistance met by Wheeler in congress. These actions of Wheeler make difficult the possibility of regulatory action in congress, where neoliberalism has been shown to be highly prized. Frequency analyses find that the term certainty is utilized most frequently by Wheeler. In light of such findings, it may be fruitful to analyze the speech of other government officials through this lens to allow for meaningful praxis.

TECHNOLOGY ENABLED 6Rs FRAMEWORK FOR GLOBAL SUSTAINABILITY

Victor Udo, Office of Campus Sustainability, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Peter Jansson**, Department of Electrical Engineering, Bucknell University.

The Covid 19 pandemic, ongoing climate change challenges and the demand for racial justice and equity has resulted in heightened interest in sustainable development and global sustainability. Progressive organizations are integrating environmental, social and governance (ESG) impact investments, disclosures and reporting into their management to achieve balanced stakeholder (employees, customers, investors, and others) results. Organizations consist of employees, leaders and investors who work effectively with other stakeholders to deliver service to their customers. Employees retain the culture and values of the organizations. For any organization to meet their ESG targets, employees must be incentivized to demonstrate sustainability values and behaviors. Bucknell University for instance is integrating diversity, equity and inclusion (DEI) along with sustainability acumen into employee's performance appraisal processes.

What behaviors will enable organizations to meet ESG targets and contribute towards global sustainability? This paper presents a framework of behavioral values that will help organizations contribute to equitable global sustainable development (EGSD) and overall sustainability. A framework that can help organizations drive global sustainability behaviors is focused on these elements: Reducing consumption, Recycling of materials, Reuse of assets, Restoring treasures, Replenishing ecosystems and Resourcing of supplies (6Rs). The first three of the 6Rs (reduce, recycle, and reuse) are primarily focused on preservation and waste elimination. The last three (restoring, replenishing, resourcing) are critical to equity and overall global sustainability – social sustainability, technological sustainability, and environmental sustainability. Technological sustainability focuses on the culture of tools, infrastructure, and knowledge utilization to optimize limited global resources. This will enable implementation of the 6Rs behavioral framework for social and environmental sustainability.

Oral Session 2: Sustainable Living & Climate Change

WILLIAMSPORT: RIVERTOWN RENAISSANCE

Judith Meyers-Olinsky, Lycoming Arts Council, 46 W 4th St, Williamsport, PA 17701.

At the end of the 20th Century, industrial loss, social changes, and moving to the suburbs had led to small town decline across rural America, including in the Pennsylvania rivertowns. In Williamsport, a major rivertown of the Susquehanna River, we brought people back to town, enhanced community and created a renaissance through art and design. The Main Street Program was the revitalization method we used. Main Street is a program of the National Trust for Historic Preservation designed to save America's little downtowns and their history. The Main Street Program consists of four areas of focus: Organization, Design, Economic Restructuring and Promotion. What happened in Williamsport, what our Main Street Program fostered, is part of a national trend of the regionalization of the arts in America. This national trend is helping to create more sustainable communities throughout our nation. Regional arts are participatory. Instead of consuming, we create and we share what we create with each other and the community. Less consumption and more community is creating lifestyle changes that will help us to face the 21st Century challenges of technology, globalization, and climate change.

SOIL ORGANIC CARBON AT BUCKNELL UNIVERSITY: LAND MANAGEMENT CONTROLS FOR SOC% AND CARBON SEQUESTRATION

Shaun Parrish, Department of Geology and Environmental Geosciences, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Ellen Chamberlin**, Department of Geology and Environmental Geosciences, Bucknell University.

In this final project for Geomorphology (GEOL316) I used field and lab analysis techniques in combination with peer-reviewed literature to analyze the Soil Organic Carbon% (SOC%) and carbon sequestration found across varying locations on Bucknell's campus as a result of different types of land management techniques (LM) as well as how they can be adjusted to help the university combat climate change/ carbon emissions. Geomorphology (GEOL316) is an upper level geology class that studies physical processes shaping the Earth's surface and the evolution of resulting landforms. Soil cores were taken at 0m and 50m along a 50m transect at 4 locations on Bucknell's campus and a Public Farm with 0m at a higher elevation and 50m at a consecutively lower elevation. These 8 core samples were then analyzed in a lab to calculate Soil Organic Matter% (SOM%) → SOC% using an approximated conversion factor of 1.72 (DPIRD, 2020). It was found that the highest SOC% found was the 50m core on Bucknell Farm at 5.97% and the lowest SOC% found was the 0m core on the Public farm at 2.97%. The cores taken at the other two field sites (Lawn, Grove) were found to contain SOC% on the lower end of the above range. Bucknell Farm produced the highest SOC% with a LM portfolio of organic N-based fertilizer, deep rooted conscious planting, no-tillage, and winter cover cropping. The Lawn, Grove, and Public farm (P-farm) produced lower SOC% with LM practices of inorganic pellet N-based fertilizer use (Lawn, Grove, P-Farm), non-native monocultured grass lawns (Lawn, Grove), tilling (P-Farm), and overall soil depletion without regenerative or mitigative efforts. The implementation of new LM practices such as the introduction of earthworm populations, reforestation/ agroforestry, conversion from inorganic fertilizer to organic N-based fertilizer, no tillage or reduced tillage, and the replacement of nonnative grass monocultures to native grass polycultures are all suitable and practical methods to increase SOC% across campus and further combat climate change on a University and community wide scale not commonly considered.

SUSTAINABLE RESIDENTIAL MICROGRID WITH PERMACULTURE – A BUILDING BLOCK IN SUSTAINABLE COMMUNITIES OF THE FUTURE

Peter Jansson, Department of Electrical Engineering, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Victor Udo**, Office of Campus Sustainability, Bucknell University.

Established initially as a research station by the Bucknell University Sustainable Energy Research Team (BUSERT), the microgrid was created to demonstrate off-grid operation of a residential home using the power systems of a PV Array and natural gas generator to supplement typical grid power. Over the past six years the microgrid site has evolved to demonstrate more climate friendly alternatives to energy storage and to demonstrate the benefits of permaculture and organic practices that can be applied in to typical residential settings. The authors share the key elements of the systems employed at the site to decrease its carbon footprint overtime and to capture carbon in the process. The technologies include: electric hybrid transportation, photovoltaic array, ultra-high efficiency natural gas heating, load management control via the microgrid Raspberry-Pi, pyrolysis, pollinator gardens, perennial gardens, natural herb gardens and fruit and nut trees, organic compost supplementation and garbage/organics composting, rainwater capture, etc.

During the past few years the site has experienced increases in the insect (particularly bees), amphibian and small mammal populations as the landscape has become increasingly organic in nature. From a technology standpoint the microgrid has operational capability to pull power from the grid, send excess generation to the grid or operate in an islanding mode (without need for the grid). Taken in combination this installation has the ability to operate to minimize costs or to minimize carbon for the homeowner. It represents one small site which now demonstrates multiple ways that homes can contribute to reducing carbon in the future (through reduction in use or sequestering onsite) as well as becoming more self-sufficient in terms of the production of local organic produce for the occupants and their neighborhood.



Oral Session 3: Food Justice and Waste

FIGHTING FOOD WASTE WITH PORTION SIZES

Camillo Lazarczyk, Department of Management & Operations, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Simon Behr**, Department of Management & Operations, Bucknell University; **Vivien Wildes**, Department of Management & Operations, Bucknell University.

The US wastes nearly 40% of our food, creating 125-160 billion pounds of waste annually, leading to high emission rates, resource depletion, and food insecurity. Research Question: What are the most effective waste mitigation and management strategies in the restaurant industry that could be utilized to produce a more sustainable environment? A survey administered on campus to classmates to investigate habits, behaviors, knowledge, and potential solutions around food waste yielded significant differences in how much of a meal was thrown out between fast food restaurants, full service restaurants, and buffets. While 25% of respondents throw out 11% or more of their meal at fast food restaurants, the amount of respondents throwing out 11% or more of their meal swells to 37% at full service restaurants. Asked why they throw this food out the most common responses included: Too large portions, ordering too much, inconsistent appetite, and leftovers brought home being thrown out. We deduce the differences are due to one size fits all plates, which are typically over the recommended calorie count. While a variation of small, medium and large sizes are often offered at fast food restaurants, no such options exist at full service restaurants. Males said the portion size of their meal correlated to their appetite 69% of the time but females said the correlation only occurred 57% of the time. Presented with various food waste mitigation strategies respondents were most in favor of the idea of customized menus with multiple portion options. 92% of respondents said they were at least somewhat likely to purchase a smaller portion for less cost. Meanwhile, 55% of respondents are somewhat likely to order smaller food portions for the identical price of the larger meal. Therefore in order to reduce food waste we propose implementing multiple portion options at restaurants.

BEYOND FOOD DESERTS: URBAN AGRICULTURE FOR SOCIAL JUSTICE AND THE CASE OF WASHINGTON, DC.

Alana Brodie, Department of Earth & the Environment, Franklin & Marshall College, P.O. BOX 3003, Lancaster, PA 17604-3003; **Eve Bratman**, Department of Earth & the Environment, Franklin & Marshall College.

For cities looking to create more sustainable food systems, utilizing urban agriculture is an attractive prospect. With the myriad of approaches to urban agriculture, however, understanding the distinct qualities of different agri-food approaches is imperative when deciding which approaches to prioritize and how to conceptualize their respective assets. The literature on urban food security often focuses on urban agriculture without adequate attention to the larger systems in which food is produced and consumed. I build upon existing literature that critiques the urban food movement and draw upon political ecology approaches that look at the deeper patterns and modalities of inequality in urban food systems. This paper contributes a novel typology of the approaches to urban food production and distribution through a critical political ecology lens. It examines the underlying forces of inequality with regard to how those approaches impact across racial and economic lines and considers time scales of those impacts. After establishing the typology of urban food production and analysis, this paper offers a case study of Washington DC. The city has been heralded internationally for its approach to addressing food justice (Milan Urban Food Policy Pact, 2019) and still, DC has room for improvement. Centrally, this work argues that innovation and system level change is being achieved in the Washington DC context through individual and organizational initiatives, while significant policy gaps remain.

A photograph of a single red apple with a green stem and leaf, resting on a surface of severely cracked and parched earth. The cracks in the soil are deep and irregular, forming a mosaic of polygonal shapes. The overall color palette is dominated by the reddish-brown of the soil and the vibrant red of the apple.

2021 Sustainability Symposium

POSTER PRESENTATIONS

EFFECT OF NITRATES ON ALGAE BLOOM FORMATION

Nelson Anaya-Archila, Department of Environmental Engineering and Earth Sciences, Wilkes University, 84 West South Street, Wilkes-Barre, PA 18766; **Meena Spitz**, Department of Environmental Engineering and Earth Sciences, Wilkes University; **Melanie Fouts**, Department of Environmental Engineering and Earth Sciences, Wilkes University; **Saritha Karnae**, Department of Environmental Engineering and Earth Sciences, Wilkes University.

One of the largest threats to aquatic ecosystems are harmful algae blooms (HABs) which are caused by excess levels of nutrients such as phosphorus and nitrogen. Agricultural runoff is a relevant issue in North East Pennsylvania (NEPA) and a leading source of phosphorus and nitrogen into water bodies. Excess of nitrates in soils that are not taken up by plants can seep into private drinking water wells. The overabundance of nitrates causes adverse human health effects as well as environmental havoc. Nitrates in drinking water can cause severe health problems for infants and the elderly, as well as minor to moderate problems for younger healthy people. According to the EPA, the lowest unnatural concentration of nitrates in drinking water is 1mg/L, which indicates an anthropogenic presence, and the maximum contaminant level (MCL) is 10mg/L, at which adverse human health effects are known to occur. In order to determine the relationship between algae growth and the presence of nitrates, *Anabaena cyanobacteria* was exposed to contaminant concentrations of 1 mg/L, 5 mg/L, and 10 mg/L based on the EPA standards. The algae content was measured using a spectrometer. The correlation between absorbance and nitrate concentration was analyzed to determine how algae growth varies with nitrate contamination. Preliminary results showed that an overabundance of nitrates such as 10 mg/L causes excess algae growth, it can be assumed that increased algae growth, absorbency values around 0.227, is indicative of higher nitrate concentrations. Therefore, it follows that increased algae populations implies a risk of nitrate contamination in drinking water.

CLIMATE ACTION PLANNING FOR THE CITY OF SHAMOKIN

Maggie Barton, Center for Sustainability & the Environment, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837;
Shaunna Barnhart, Center for Sustainability & the Environment, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837.

In response to climate change, many local governments are supporting state and federal greenhouse gas (GHG) reduction targets with the development of their own plans for climate mitigation and adaptation to build their own resiliency. The Pennsylvania Department of Environmental Protection (DEP) has developed a program with ICLEI to aid local governments in this effort. For this collaboration, I conducted a greenhouse gas inventory for 2018 in the City of Shamokin, Pennsylvania in the fall of 2020. These results are used to inform a Climate Action Plan for the city. The inventory shows the following distribution of emissions: the transportation sector with 41.68% followed by the residential energy sector with 23.82%, the commercial energy sector with 18.09%, the solid waste sector with 12.56%, and the industrial energy sector with 3.21%. Objectives and actions are developed in partnership with the community through the development of a task force. For transportation, the emissions reduction strategy is to reduce the vehicle miles travelled by creating a more walkable/bikeable and economically viable downtown. The residential and commercial energy sectors will focus on the end use energy efficiency and potentially renewable energy generation. The emissions from the waste sector are based largely on organic matter, so the plan will focus on waste reduction and composting. There is room to focus on proper disposal and e-waste for ancillary benefits to the community. The Climate Action Plan is focused primarily on reducing greenhouse gas emissions, but there is an attempt to include mitigation efforts and concerns of environmental justice. The aim is to increase overall resiliency in the community.

NATURE'S UNIFYING PATTERNS: SUSTAINABLE BIOMIMICRY

Donna Ebenstein, Department of Biomedical Engineering, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837.

In fall 2020, I added a sustainability component to my elective course, BMEG 431: Biomimetic Materials. The Biomimicry Institute (biomimicry.org) defines biomimicry as “the practice of looking to nature for inspiration to solve design problems in a regenerative way.” The implication is that it is not enough to look to nature for design solutions to specific problems, but that rather you should apply “Nature’s Unifying Patterns” to ensure that the designs are implemented in a sustainable way that is compatible with our natural world. According to this site (<https://toolbox.biomimicry.org/core-concepts/natures-unifying-patterns/>), Nature:

- uses only the energy it needs and relies on freely available energy,
- recycles all materials,
- is resilient to disturbances,
- tends to optimize rather than maximize,
- provides mutual benefits,
- runs on information,
- uses chemistry and materials that are safe for living beings,
- builds using abundant resources, incorporating rare resources only sparingly,
- is locally attuned and responsive, and
- uses shape to determine functionality.

To introduce these patterns, we took a field trip to the BCSE to find examples of these patterns in both the natural environment and in the choices made in designing the site, such as how to collect and distribute water. Throughout the rest of the course, we evaluated each new biomimicry example we studied against these criteria. Finally, the class did a service project with the Bucknell Farm. After visiting the farm, the students brainstormed projects they could do to promote Nature’s Unifying Patterns at the farm. They came up with two projects compatible with the Farm’s goals and Nature’s Unifying Patterns: (1) a native plant pollinator garden, and (2) water swales for a future orchard to naturally enhance irrigation of the trees. A clickable map of both sites was also created by the remote students. Both projects were completed by the end of the semester.

REGENERATIVE AGRICULTURE ON THE BUCKNELL FARM

Nicole Feledy, Department of Civil & Environmental Engineering, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Gilliam**, Paige, Department of Civil & Environmental Engineering, Bucknell University, **Courtney Abbott**, Department of Civil & Environmental Engineering, Bucknell University, **Matthew Starble**, Department of Civil & Environmental Engineering, Bucknell University, **Leni Adams**, Department of Civil & Environmental Engineering, Bucknell University, **Deborah Sills**, Department of Civil & Environmental Engineering, Bucknell University.

The Bucknell Farm is planning on planting an orchard to cultivate various fruit trees. The proposed location of the fruit trees is on a slope. To prevent runoff of rainwater downslope, the Bucknell Farm would like to implement a form of passive irrigation. Passive irrigation uses water from the environment in contrast to active irrigation which takes water from a municipal source. The Bucknell Farm has already constructed two bioswales, which is a passive method of irrigation that slows down rainwater and allows it to seep into the soil instead of running off. Bioswales consist of a swale and berm. A swale is a long shallow trench from which the soil is removed and piled on the downhill side to create the berm. The trees will be planted in the berm to hold the soil in place and utilize the rainwater that gets absorbed. Professor Deborah Sill's Sustainable Design Course has been working with the farm to measure soil moisture adjacent to the bioswale and in other parts of the farm to evaluate the effectiveness of bioswales in improving soil moisture.

CO2 VENTILATION ON BUCKNELL'S CAMPUS

Alexa Ghiz, Department of Civil & Environmental Engineering, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **David Olson**, Department of Civil & Environmental Engineering, Bucknell University, **Andrew Pogue**, Department of Civil & Environmental Engineering, Bucknell University, **Deborah Sills**, Department of Civil & Environmental Engineering, Bucknell University.

Carbon dioxide monitors have been used by Professor Sills' Sustainable Design course to provide information about CO2 levels in different environments on and off of Bucknell's campus. Carbon dioxide levels can be representative of ventilation in a given area, but also should be examined with caution because they can be affected by other factors. Measuring ventilation is important because of the way that airborne viruses spread through aerosol particles. This is especially important on Bucknell's campus as ventilation readings can give an indication on the level of risk for spreading COVID-19. The main findings through measuring the carbon dioxide on campus was that ventilation in campus settings was generally pretty good. This is specifically apparent in classrooms, study spaces, and dining halls. Dorm rooms and residential spaces generally had less ventilation and higher CO2 levels compared to educational spaces on campus. This result broadly explains the importance of letting students have the ability to be in-person for class and other campus activities. This result may also explain that the spread of COVID-19 may happen more often in residential spaces. These results could provide insight to potential policy changes in the coming years.

A NEW TICK IN TOWN: DISTRIBUTION AND DENSITY OF THE INVASIVE ASIAN LONGHORNED TICK (*HAEMAPHYSALIS LONGICORNIS*) IN PENNSYLVANIA

Keith Price, Pennsylvania Department of Environmental Protection, 400 Market St, Harrisburg, PA 17101; **Bryn Witmier**, Pennsylvania Department of Environmental Protection; **Rebecca Eckert**, Pennsylvania Department of Agriculture, 2301 N Cameron St, Harrisburg, PA 17110; **Christian Boyer**, Pennsylvania Department of Environmental Protection; **Matt Helwig**, Pennsylvania Department of Environmental Protection.

Since the recent introduction of the Asian longhorned tick (*Haemaphysalis longicornis* Neumann) in the United States, quantitative surveillance information remains lacking. We conducted statewide, active tick surveillance from May to August 2019 and report data on *H. longicornis* geographical distribution and population density in Pennsylvania. We collected 615 *H. longicornis* from four counties. Across samples recovering *H. longicornis*, mean density of *H. longicornis* was 9.2/100 m², comparably greater than *Ixodes scapularis* Say (8.5/100 m²). Density of *H. longicornis* was also significantly greater in August, largely driven by larvae, and greater in recreational habitat types (12.6/100 m²) and in Bucks County (11.7/100 m²), situated adjacent to the location of the first U.S. discovery of intense infestations. These data are among the first to document *H. longicornis* from statewide tick surveillance and provide initial measures of population density enabling more quantitative characterizations of distributional patterns.

THE INFLUENCE OF THE TRANSPORT OF PM 2.5 AND OZONE ON LANCASTER COUNTY AIR QUALITY

Michella Salvitti, Department of Earth Science, Millersville University, 40 Dilworth Rd, Millersville, PA 17551; **Richard Clark**, Department of Earth Science, Millersville University.

The collateral impact of emissions present in the atmosphere is exacerbated by the increase in ambient air temperatures. Utilizing the Environmental Protection Agency's (EPA) outdoor air quality data from AirNow, we focus on the pollutants ozone and PM_{2.5} in Lancaster, Pennsylvania. This study is focused on days that recorded daily ozone and PM_{2.5} Air Quality Index (AQI) values that fell within a range of air quality that is unhealthy for sensitive groups to hazardous quality. Over the past two decades, 2000-2020, the days that reached AQI values within the range of focus decreased.

The most populated region of the United States is the Northeast Corridor. A megalopolis with a high concentration of human activity can cause environmental health problems. Historically, the New York-Newark, Washington-Baltimore-Arlington, and Philadelphia-Reading-Camden regions make the American Lung Association's State of the Air Report's top 25 Most Polluted Cities in the country for ozone. In the most recent State of the Air report, Lancaster, Pa was ranked 27 of 203 metropolitan areas for annual particle pollution. We generated Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) backward trajectory models starting at Lancaster, Pa for each day with ozone exceedances between 2010 and 2020. That decade recorded 78 days with high ozone values. Of those 78 days, 44% of days have models that show air particles from metropolitan areas along the Northeast Corridor present in Lancaster air.

MONTGOMERY COUNTY LOCAL GREENHOUSE GAS INVENTORY AND CLIMATE ACTION PLAN

Emily Turner, Center for Sustainability & the Environment, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837;
Shaunna Barnhart, Center for Sustainability & the Environment, Bucknell University.

In response to climate change and global warming altering the environment, local governments are responding by seeking to create plans to combat the changes. This independent study with the Bucknell Center for Sustainability and the Environment involves working with Montgomery County Consortium of Communities (MCCC) to create their Greenhouse Gas Inventory and an accompanying Local Climate Action Plan (LCAP). MCCC was established in 1981 and is a regional coalition of 62 counties in Southeastern Pennsylvania. As part of a state wide cohort, the Department of Environmental Protection and ICLEI-Local Governments for Sustainability are helping to support local governments in developing LCAPs to assist Pennsylvania in achieving its climate goals. Using data from the Delaware Valley Regional Planning Commission, a MCCC greenhouse gas inventory was created and documented on ClearPath. This inventory was then used to inform a LCAP, a process that also included creating a task force within the community to identify hazards, vulnerabilities, projection goals, reduction goals, and strategies. The results exemplified that the greatest emissions of carbon were from commercial energy, transportation and mobile sources, and residential energy. Furthermore, the greatest hazards of the communities were drought and rising temperatures which would impact citizens, infrastructure, and other things. Therefore, MCCC LCAP created a task force of multiple stakeholders to reduce emissions. This LCAP creates a unifying proposal for the coalition of communities to adapt to similar goals and strategies to mitigate climate change. Acknowledging the importance for local governments to lead their own change, MCCC hopes to address sustainability dilemmas by halting emissions and extreme weather impacting local PA communities.

THE IMPORTANCE OF VENTILATION IN COVID-19 TRANSMISSION

Andrés Valenzuela, Department of Civil & Environmental Engineering, Bucknell University, 1 Dent Drive, Lewisburg, PA 17837; **Laura Le**, Department of Civil & Environmental Engineering, Bucknell University, **Siwon Sung**, Department of Civil & Environmental Engineering, Bucknell University, **Kevin Richten**, Department of Civil & Environmental Engineering, Bucknell University, **Leah Henk**, Department of Civil & Environmental Engineering, Bucknell University, **Skye Romero**, Department of Civil & Environmental Engineering, Bucknell University; **Daniela Sculli**, Department of Civil & Environmental Engineering, Bucknell University; **Patricia Cupay**, Department of Civil & Environmental Engineering, Bucknell University; **Deborah Sills**, Department of Civil & Environmental Engineering, Bucknell University.

The COVID-19 virus has been a part of everyone's lives for over a year but there are still many misconceptions about how the virus is transmitted. In this poster we will show educational materials we created that aim to clarify the main transmission method of the virus, which is through respiratory droplets and aerosols. Respiratory droplets (diameter of 10-100 microns) or aerosols (diameter less than 10 microns) come from an infected person's mouth or nose when they breathe, talk, sneeze, or cough. In a poorly ventilated room, these particles can linger in the air and infect others. In addition to wearing masks properly, ventilation can reduce COVID-19 transmission. Ventilation brings in outdoor air to dilute air particles related to COVID-19, and also other air pollutants and pathogens. Measuring CO₂ is one way to estimate how often air is being exchanged in a room, with higher CO₂ levels could indicate a low level of ventilation. Students in CEEG 443 measured CO₂ concentrations on and around campus. Our measurements show that ventilation can be improved by opening up windows or by using mechanical ventilation. As the pandemic continues, understanding the power of ventilation and its role in virus transmission is more important than ever.

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ADDITIONAL RESOURCES

Oral & Poster Presentations

Resources Shared During Keynote Panel

Charles Lee:

Fears, Darryl and Brady Dennis. April 6, 2021. “‘This is environmental racism’: How a protest in a North Carolina farming town sparked a national movement,” *Washington Post*. <https://www.washingtonpost.com/climate-environment/interactive/2021/environmental-justice-race/>

- This Washington Post article talks about the genesis of the environmental justice movement in the US. It highlights Ben Chavis, Dollie Burwell, Vernice Miller-Travis, Beverly Wright, Peggy Shepard and many other colleagues whose work are important parts of the historical arc of the EJ story, as well as Charles Lee’s role as the architect of the two landmark events which propelled EJ onto the national stage, i.e., the Toxic Wastes and Race in the US report and the First National People of Color Environmental Leadership Summit.

Lee, Charles. 2020. “Game Changer in the Making? Lessons from States Advancing Environmental Justice Through Mapping and Cumulative Impacts Strategies” (*Environmental Law Reporter*, vol. 50, no. 3, March 2020). <https://www.eli.org/sites/default/files/docs/50.10203.pdf>

- This article was recognized by the *Environmental Law and Policy Annual Review* as one of the best environmental law or policy ideas of 2020.

Lee, Charles. 2021. “Confronting Disproportionate Impacts and Systemic Racism in Environmental Policy” (*Environmental Law Reporter*, vol. 51, no. 3, March 2021). https://www.eli.org/sites/default/files/docs/elr_pdf/51.10207.pdf

Allison Acevedo:

Pennsylvania Department of Environmental Protection, Environmental Justice Office.

To learn more about Environmental Justice areas in Pennsylvania, visit this DEP website:

<https://www.dep.pa.gov/PublicParticipation/OfficeofEnvironmentalJustice/Pages/PA-Environmental-Justice-Areas.aspx>

Resources Shared During Keynote Panel *(continued)*

Friar Michael Lasky:

You can learn more about Little Portion Farm here: <https://www.littleportionfarm.org/>

Faith Alliance for Revitalization is a multi-faith, multi-agency, and multi-stakeholder collaborative partnership working to rebuild and revitalize the City of Shamokin, PA, and the surrounding communities. Learn more here: <https://www.franciscancenterpa.org/faith-alliance-for-revitalization-far>

- At the Franciscan Voice, you can find newsletters to learn more about current happenings and news with Little Portion Farm and the revitalization work in the Shamokin area: <https://franciscanvoice.org/newsletters/>

Sandy Spieler:

To learn more about Sandy Spieler's work, visit her website: <https://sandyspieler.com/>

The poem referenced her talk, "Give The Police Department To The Grandmothers" by activist and writer Junauda Petruscan can be found here: <https://www.mprnews.org/story/2020/12/28/south-mpls-poet-stirs-the-imagination-with-poem-about-police-reform>

Resources Shared During Other Sessions

National Governors Association. (n.d.) *Rural Prosperity through the Arts and Creative Sector: A Rural Action Guide for Governors and States*. <https://www.nga.org/ruralarts/>

Villani, John. (1998) *The 100 Best Small Art Towns in America: Where to Discover Creative Communities, Fresh Air, and Affordable Living*.

CONFERENCE COMMITTEE

Shaunna Barnhart, Ph.D.

Director, Places Studies Program
Center for Sustainability and the Environment

Milton G. Newberry, III, Ph.D.

Director, Sustainable Technology Program
Center for Sustainability and the Environment

Peter Jansson, Ph.D.

Associate Professor, Department of Electrical Engineering
Faculty Director, Center for Sustainability & the Environment

Samantha Myers

Operations Manager, Center for Sustainability and the Environment

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Office Assistant, Center for Sustainability and the Environment

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Library & Information Technology

Jeffrey Campbell

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Library & Information Technology

