

# Abstracts

2019 Annual Meeting of NESTVAL

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Aaron Adams  
*University of Connecticut*

## **A Comparative Usability Assessment of Augmented Reality 3-D Printed Terrain Models and 2-D Topographic Maps**

Throughout history, cartographers have adopted new technological advances to facilitate spatial visualization. The printing press, aerial photography, and computer technology are just a few examples of this. In the 21st century, society is experiencing unprecedented rates of technological development, and many of these technologies offer potential benefits to facilitate spatial visualization. It is necessary to test the merits of these new technologies against the status quo to determine if it is worth investing the resources in implementing. The purpose of this research is to test a combination of two of these emerging technologies, augmented reality (abbreviated AR) and 3D printing, against traditional topographic maps to determine if they warrant further investigation as possible cartographic tools. To resolve this, I administered a series of spatial visualization tests to human test subjects to assess their performance with the different topographic representation. When I performed an analysis of the test scores, I found that subjects given the AR 3D printed terrain model performed better than those given a 2D map product. The results of this research will advise on the benefits of terrain models created using augmented reality and 3D printing and will inform future research on the topic.  
*Keywords: 3D Spatial Visualization, 3D Printing, Augmented Reality, Cartography, Terrain Model*

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Stephen Axon  
*Southern Connecticut State University*

## **The Answer: Sustainability Science. The Question: Climate Emergency Declaration.**

Framing responses to the climate crisis requires a diversity of interventions, policies, market-based approaches. However, it is clear that a focus on education alone is unable to target the deep-rooted unsustainabilities that pervade within U.S. politics, economics, and society. Rather, sustainability science perspectives – and approaches – are needed to overcome the shortcomings and barriers that face the climate emergency. Education, and the provision of information,

without further interventions that target climate-related actions are unlikely to change behaviour. This is particularly noticeable given the inequalities and inequities that exist within the American education system. Sustainability science is emerging as a dynamic and evolving transdisciplinary effort addressing the symbiosis between human activity and the environment, providing visions and scenarios indicating transition pathways towards global sustainability while elucidating relevant decisions and agents. To that end, sustainability science is purpose-bound and aimed at action; links science and policy in an integrated participatory manner; and interdisciplinary, if not transdisciplinary. Moving towards a science of sustainability allows for the involvement of both academic and social extended communities to become involved in addressing the multi-faceted unsustainabilities that face U.S. communities while also being directly engaged in identifying, creating, and implementing policies and solutions. In this paper, I present a constructive critique of education-centric approaches to climate change while offering suggestions where a critically responsive applied sustainability science could lead to transformational change in the dominant unsustainable regime that prevails in the U.S. *Keywords: Sustainability Science, Climate Emergency, Applied Sustainability, Public Engagement, Equity, Equality*

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**Darren Bardati**

*Bishop's University, Québec, Canada*

### **Participatory Agroecological Assessment of Farmers' Capacity to Adapt to Climate Change in Malawi**

The author of this study developed a heuristic technique called 'participatory agroecological assessment' for use by smallholder farmers in Malawi to examine their vulnerability to threats due to changing climatic conditions. Rooted in a participatory action research paradigm, they collected data jointly with Malawian farmers near Chilanga, Kasungu District, through detailed observations of landscape and farm plot scale conditions, and through interviews with key informants over the span of four weeks in June 2016. Farmers participated in workshops to co-construct a set of twenty-four assessment indicators, based on contextually appropriate agroecological practices, to perform the assessment. The findings of the assessment provide empirical evidence about the farming system's vulnerability to drought, while also serving as recommendations to guide farmers in their transition toward agroecological practices, thereby enhancing their adaptive capacity to climate change. *Keywords: Agroecology, Participatory Action Research, Adaptive Capacity, Climate Change, Malawi*

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**Katrishia Bell**

*Eastern Connecticut State University*

### **Let's Not Sugar Coat It**

Many suffer from diabetes which can be a serious, life-threatening disease. States in the southeast are known for high rates of obesity and physical inactivity which are leading contributors to diabetes. If untreated, diabetes can have negative effects, thus, evaluating the spatial distribution of diabetes prevalence and statistically evaluating the influence of physical inactivity and obesity, as well as socioeconomic factors, to explain diabetes prevalence is critical in determining an approach to reduce diabetes in this area. Results indicated that clustering of high rates of diabetes occurred in Alabama, Mississippi, Georgia, and Tennessee. Although physical inactivity, obesity, and all socioeconomic variables except educational attainment were significant in explaining diabetes prevalence (95% confidence interval), the global regression model only explained 64% of diabetes prevalence rates in the southeast. The variability in the strength of all socioeconomic and health factors identified as significant in predicting diabetes suggests that the southeastern states would benefit from participating more heavily in the CDC's state and local public health prevention programs which include lifestyle change and education recognition related programs.

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**Erick Bora**

*Eastern Connecticut State University*

### **Breathless in the Southeast: How Do We Stop it?**

COPD, currently the 4th leading cause of death worldwide, is projected to become more problematic by 2030 unless appropriate actions are taken to reduce the major risk factors that contribute to COPD. However, the spatial distribution of individuals with COPD and the many potential factors that contribute to this disease make prevention methods difficult to discern at a national level. Thus, COPD must be evaluated at a local scale. This study analyzed the spatial distribution of COPD prevalence per county for the area south of the Ohio River and east of the Mississippi River which has experienced the highest COPD prevalence in the United States. Additionally, this study statistically analyzed the significance of socioeconomic, air quality, physical inactivity, household size, smoking, and occupation in predicting observed rates of COPD. Results show that high COPD rates clustered in eastern Kentucky, western Virginia, and southern Missouri, which correlated with areas of high smoking rates. Smokers, age, construction workers, healthcare workers, and physical inactivity were statistically significant in predicting high COPD prevalence. Thus, medical and healthcare professionals should focus on addressing these issues in this area of the country to reduce the risk of COPD.

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**Matthew Bourdon**

*University of Massachusetts Amherst*

### **General Overview of How Geospatial Technologies are Used for Mineral Rights and Ownership Within the Oil & Gas Industry**

As the world proceeds to develop new technological systems to better our way of life, both for personal and commercial use, the Oil & Gas Industry drives its attention to digital mapping and spatial databases to enhance the industry's efficiency. Companies in many of the oil and gas producing states, such as Texas, use spatial data to understand and organize what lands and assets are available for purchase. When said company chooses to buy land, they may also have to acquire the resources located beneath the surface at an additional cost. Transactions like this are happening everyday, all over the country. Geospatial systems come into hand because they allow buyers and sellers to look for lands under their own specifications. Companies that deal only with the buying and selling of properties can store their assets within a geospatial database and upload new information when it comes about. Having the data stored online or in private databases allows buyers and sellers that are not from the area or state to have the right to understand what's on the market. This project will provide an overview of how such data is stored and what methods are used for organizing it. *Keywords: Royalties, oil, gas, geospatial data, mapping, Texas.*

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**Robert S. Bristow and Anna Therien**

*Westfield State University*

### **Cultural Resource Monitoring of the Appalachian Trail with LiDAR**

Monitoring cultural resources in parks and protected areas is greatly enhanced using Light Detection and Ranging (LiDAR). For this example, a pilot inventory of cultural resources is illustrated for the United States National Park Service lands that protect the Appalachian Trail (AT) in Massachusetts. A history of the National Park lands will begin with settlement patterns in the 19th century Berkshire County through the beginning of the 20th century when the lands reverted to natural forest cover and the property was then managed by a local timber company. Fast forward to the 21st century and advanced remote sensing technology aids in the discovery of this lost history. To help in the resource monitoring, these remote sensing data are corroborated with historic records to identify the historical archaeological resources in the corridor. The findings are then added to existing management plans to help protect the national park with a more complete understanding of the historical human impacts in the backcountry of New England. *Keywords: LiDAR, Appalachian Trail, Cultural Resources, National Parks*

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J. Morgan Carney

*University of Massachusetts Amherst*

### **“A Right to Know”: State Level Combined Sewage Overflow Notification Policies in the Northeastern United States**

Combined Sewer Systems (CSS) are commonly found in Northeastern cities built prior to 1900. CSS allows for a single pipe to carry stormwater, sanitary sewage, and industrial sewage. In the event that a system's capacity is surpassed due to heavy rainfall or an increase in waste input, it overflows into a spillway pipe that then sends the contents directly into rivers. These events, known as Combined Sewage Overflows (CSO's), are detrimental to human health as well as the local environment, and have become more frequent with continued urban population growth and increasingly extreme weather systems. This survey-based study focused on CSO notification policies in the Northeastern United States, and primarily utilized interviews with state environmental officials. It was designed in-house by Massachusetts Rivers Alliance to offer a means of measuring success, while simultaneously promoting a deeper understanding of implementation requirements, long-term funding needs, and notification system outreach. Such information is potentially instrumental as the State of Massachusetts is in the midst of an effort to create a new CSO notification policy in the Commonwealth (see Bill H.3976). This poster highlights the report's findings – that the State of New York is the lead example of effective CSO notification policy the region: New York State has over 30,000 subscribers who are receiving up-to-date information on active outfalls, has disconnected over 500 CSO outfalls in the last 25 years, and was able to successfully utilize existing public infrastructure to build out an effective CSO alert system at minimal cost. *Keywords: US Northeast, Water Quality, Hazard Notification, Environmental Policy*

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Travis Davis

*University of Maine at Farmington*

### **Physical Geography and Materials Testing in an Environmental Internship**

In Spring 2019 I was hired on as an intern for the quality control (QC) division of Pike Industries for Plant 806 out of Wells, Maine. Through my internship I was taught about the properties of specific materials sold from the plant as well as how they interacted with each other when mixed with asphalt. With this poster I intend to describe my duties as a QC intern for Pike Industries and draw from my experience to identify relationships between the materials I tested and what roles the same materials play in the construction of road and bridge infrastructure throughout the state. This poster will also serve as an example for what is required of intern while working for Pike Industries. I also reflect on how my personal experience as a Geography

and Environmental Planning major prepared me (and didn't prepare me) for this particular form of physical geography internship. *Keywords: Internship, materials testing, physical geography, quality control (QC), quarry, New England, geology*

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**Brad Dearden**

*University of Maine at Farmington*

### **Globalized Spaces and the Ocular: Views On Uneven Development in Urban Areas of Developing Regions**

Relevant literature suggests that still photographs and video recordings convey both literal and nuanced meanings of human activities and place. Importantly, existing literature also suggests that such visual depictions can ascribe new meaning to places and the processes that shape them. Markedly visual forms of advertising from MNCs/TNCs that situate within commercial city-space, for instance, infer an essential 'branding' of places associated with globalized interests. Vestiges of such globalizing endeavors are evident in monetary form and in their visual exemplifications upon the landscape. Such visual artifacts increasingly occupy select spaces in the urban geographies of developing countries, often as part of a trajectory that encourages development under a scenario of expanded markets. As an approach to analyzing these manifestations and the interpretations they evoke, this study contextualizes the author's still photographs and video recordings of Guatemala City, Beijing, and Kathmandu – places exhibiting fundamental differences but imprinted with activities common to globalization and development. Outcomes from this research suggest that visual media forms can be productive as means to identify and examine this global-local phenomenon, namely the expansive, recurrent commercial forms that prosper in the global marketplace amidst local spaces of deprivation and the consequent cultural landscape juxtapositions they elicit. *Keywords: Urban development, globalization, visual media*

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**Georgianna V. Driver and Marcos Luna**

*Salem State University*

### **If Trees Could Talk: Can Tree Health be Used as an Indicator to Help Identify Methane Leaks?**

Leaks from natural gas pipelines underneath urban communities across the country have recently come to the fore as a potentially significant source of human-caused methane (CH<sub>4</sub>) emissions. These downstream leaks of methane are often due to aging and corroding pipes as well as accidents. In addition to being a powerful greenhouse gas, methane leaks pose health and safety hazards for nearby residents, and represent economic losses for communities and utilities.

Researchers have proposed many methods to locate and identify pipeline leaks, but none to date have demonstrated efficient and replicable methods of leak detection and verification. One common sign of methane leaks is dying vegetation, specifically stressed trees. This study uses data from a citywide street tree census combined with street level methane measurements to analyze the relationship between ambient methane concentrations and tree health. Understanding this relationship may offer city authorities and utilities another way of identifying methane leaks and provide a way to quantify natural gas leak impacts for communities. This analysis was conducted in the City of Salem, Massachusetts, USA. *Keywords: Methane leaks, underground pipelines, corrosion, tree health, stressed vegetation, leaks, greenhouse gas emissions, economic loss*

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**Ana Mesquita Emlinger**  
*Salem State University*

### **100% Of Active Student Participation is Possible! (Do These Activities in Your Class...)**

Research is solid about active class participation as a way to improve critical and higher level thinking skills and enthusiasm in the classroom. The challenge is how to engage more than the often 2 or 3 talkers that usually dominate our classroom discussions, giving us a false idea of successful class participation. How can we encourage the quieter students to communicate their opinions? Understanding communication as more than verbal language is a key element in effective teaching. Non-verbal communication can be powerful and motivate students with different behavioral and learning styles, diverse backgrounds and life experiences. Communication is the foundation of almost every human interaction, and it has to be understood as more than simply choosing the right words. In this presentation you will get to know two strategies that ensure 100% of class participation in a dynamic and supportive way.

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**Paul B. Frederic**  
*University of Maine at Farmington*

### **New England Clean Energy Connect: Power Transmission Through Rural Maine**

I examine a proposed 145mile (234 km) corridor and transmission line through rural economically stressed west central Maine to transport Canadian hydro generated power to markets on the New England electric grid. Massachusetts represents nearly half that market. In 2016 that state enacted legislation to reduce its dependency on fossil fuel produced electrical energy. A plan was developed to purchase renewable non-fossil electricity from hydropower in Québec. Central Maine Power Company (CMP), a Spanish owned enterprise, won a contract to build a

transmission line through Maine. The proposed project, known as the New England Clean Energy Connect (NECEC), is facing substantial opposition from the fossil fuel industry, selected environmental groups and some recreational interests. Proponents are many of the municipalities that benefit from an expanded tax base, labor because of construction jobs, electric rate payers, potential broadband users and people that encourage reduced fossil fuel consumption. In February 2019 Maine Governor Mills and many stakeholders reached agreement to support NECEC. My research methods include monitoring the ongoing permitting process and interviewing leaders in each of host municipalities along the route to determine rationale for decisions. NECEC is working its way through the permitting process with a projected timeline of 2019 for all permits and 2022 for all construction. As of September 11, 2019 the Maine Public Utilities Commission had issued one of the four permits needed by CMP. However, the next few months are critical as the mix of major players to weigh in continues to change. **Keywords:** New England, western Maine, energy policy, power transmission, rural conflict.

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**Juliette Gale, Sandie Murray, Cindy Sellers, Nick Geron, and Marc Healy**  
*Clark University*

### **Stewardship Approaches and Communication Networks in the Greening the Gateway Cities Program In Leominster and Pittsfield, Massachusetts**

The Greening the Gateway Cities Program (GGCP) in Massachusetts is a tree-planting program facilitated by the Department of Conservation and Recreation (DCR) with the goal of increasing energy efficiency by increasing canopy cover. This research examines how tree stewardship and actor communication within the GGCP network influence the effectiveness of the program. We investigate how these networks influence resident perceptions and discourses surrounding the GGCP. In the summer of 2019, a total of 50 interviews were conducted in Leominster and Pittsfield Massachusetts with tree recipients, organizations, city officials, and DCR staff who participated in the GGCP. Interviews were analyzed in NVivo data analysis software using the Policy Arrangement Approach developed by Park & Youn (2013). Communication throughout the GGCP networks plays critical roles in the stewardship and survivorship of program trees. The analysis found that the DCR's relationships with community partners, the city, and residents were the most prevalent within the GGCP network. Although DCR foresters maintain many trees during the program, concern was emphasized for the future health of the GGCP trees when stewardship would then depend on tree stewards and the city. Among other challenges, actors also addressed communication gaps between rental property owners and underrepresented actors. Overall, the majority of discourses regarding the GGCP from residents and city official were supportive and positive. **Keywords:** *Greening The Gateway Cities Program, communication networks, tree care, urban tree planting, urban tree stewardship, Policy Arrangement Approach*

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Adam Gallaher<sup>a</sup>, Marcello Graziano<sup>b</sup>, Brian Becker<sup>b</sup>, Bin Li<sup>b</sup> and Benjamin Heumann<sup>b</sup>  
*University of Connecticut<sup>a</sup> and Central Michigan University<sup>b</sup>*

### **Spatial Statistical Analysis of Grid Optimization in Connecticut, Quantifying the Relationship Between Tree-Trimming and Power Outages**

Tree-trimming operations (TTOs) are costly, yet widely used grid-management procedures utilized by electric utility companies globally. As diffused generation, electrification of the economy, and climate change pose challenges to utility companies, power grids and their reliability play an increasingly important role for developed and developing regions. Using data from a uniquely detailed dataset of outages and tree-trimming operations from 2009-2015 undergone by Eversource Energy in Connecticut, this study identifies the relationship between tree-trimming operations and power outages from three perspectives: i) number of outages; and ii) number of affected customers for occurred outages; and iii) duration of occurred outages. Methodologically, we employ three sets of models: Panel Fixed-Effect, Spatial-lagged models and a Temporally Spatial Autoregressive models. Areal units are author-specified raster, with a size of 2by2km (preferred), and 4by4km (as a robustness check). This modelling strategy accounts for both spatial and temporal relationships. Our results show that at the 2-km cell size TTO translate to 4.17% fewer tree-associated outages per year. In addition, occurring outages affected 465,187 fewer customers. These results are consistent at a lower resolution. In addition, TTOs have been capable of reducing storm-related effects consistently throughout the period. Our work represents a novel approach in the quality of the grid-level data and the temporal coverage utilized. Our results are particularly relevant to utility companies and policymakers in areas exposed to climate change such as the U.S. Eastern Atlantic Coast, and they support further expansion of expensive, yet effective TTOs in densely forested regions. *Keywords: Spatial Statistics, Tree-Trimming, Grid Resiliency, Reliability*

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Timothy J. Garceau  
*Central Connecticut State University*

### **An Assessment of Traffic Safety in Roundabouts within a New England Municipality**

While roundabouts have been shown to provide safety benefits as compared with signalized intersections, they have faced public resistance and therefore been slow to diffuse across the country. One place where roundabouts have gained favor is Keene, New Hampshire which has five roundabouts in operation and another two planned. Building on previous research which identified air quality improvements as a result of Keene's roundabout conversions, this research will assess the impacts on the safety of users within the intersections. As the northeast has

begun transitioning to roundabouts for intersections in our region, this research is particularly timely in contributing to the outreach, design and implementation of roundabout conversions.

*Keywords: Urban, Transportation, Traffic Safety*

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**Michaela Garland**

*Southern Connecticut State University*

### **Evaluating, Initiating, and Incubating Blue Economy Development – Case of the Long Island Sound Region**

Amidst the growing concern for the state of the oceans during the climate emergency, numerous reports have been released highlighting the size and future growth of the ocean economy. Both the National Oceanic and Atmospheric Administration and the Organization for Economic Co-operation and Development have reported that the ocean economy has increased and is expected to continue to grow. Because of the climate emergency and its effects on the ocean as well as the reports regarding the growing ocean economy there has been an increasing need for an integrated approach to ocean management. Within the last few years, the Blue Economy paradigm has gained worldwide attention among government organizations, politicians, academics, and businesses as being a new integrated approach to ocean management that connects environmental, social, and economic sustainability by promoting the improvement of human wellbeing and social equity, while also reducing environmental risks and ecological scarcities. Given this emerging paradigm, it is important to acknowledge the blue economy potential on a local, regional level. Long Island Sound, located between Connecticut and New York, holds high potential for collaboration within the maritime industry surrounding the blue economy concept because of its geographic proximity as being an inland urban sea. Therefore, using Economic National Ocean Watch's county-level data set, this paper's aim is to provide an estimate for the blue economy in Long Island Sound and to highlight the potential significance of a blue economy cluster for sustainable regional economic development in the maritime industry.

*Keywords: Blue Economy; Long Island Sound; incubators, regional economic development*

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**John Hayes**

*Salem State University*

### **University Pedagogy About Global Climate Change Science and Policy: Perspectives from a Geographer**

The prevention of climate change is now a historical footnote. Pedagogy about global climate change now focuses on mitigation of greenhouse gas emissions and climate change impacts, and adaptation to climate change and its resultant sea level rise and coastal flooding, stronger

storm events, more frequent incidences of heat waves and droughts, etc. This is my fourth year of teaching a freshmen-level course titled “Global Climate Change: Causes and Consequences” at Salem State University. My course includes climate change science and policy, natural and human sources of greenhouse gases, the effects of climate change on physical, ecological, and human systems, and what needs to be done to mitigate the potential damage from climate change. The course utilizes a geographic perspective as it explores the physical and human dimensions of climate change. The latter third of the course focuses on solutions, resiliency planning, adaptation planning, climate change activism, and climate change and energy-related legislation by both the federal government and Massachusetts state government. This presentation will offer suggestions and lessons learned about climate change instruction and how we prepare students to navigate a world that is changing before our eyes and how to resolve the climate crisis that we face. *Keywords: Climate change, pedagogy, climate change policy, human-earth interactions*

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**C. Patrick Heidkamp**

*Southern Connecticut State University*

### **On Economic Geography, Transdisciplinarity & Critical Pragmatism**

On the premise the grand challenges of our time: the all too real threat of climate change, the increasing inequality in terms of livelihood opportunities and the increasingly polarizing discourse in the political arena, I have argued elsewhere (GCEG in Cologne 2018), that if economic geography is to make a significant contribution not only to the discussion of, but also to the implementation of sustainability transitions, it needs to embrace a focus that is distinctly environmental while maintaining a rootedness in not only analyzing but also redressing uneven development. I believe that this is best accomplished by subscribing to a critical pragmatist framework and in a transdisciplinary research setting. This paper outlines how such a research approach might be implemented. *Keywords: Economic Geography, Pragmatism, Transdisciplinarity*

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**Carlos Hernandez and Nat Trumbull**

*University of Connecticut*

### **Assessing the carbon footprint of maritime freight routes to the Cape and Islands: Prospects of electrification on Vineyard and Nantucket Sounds**

This paper assesses and compares the carbon footprints of several scenarios for providing auto and truck freight to the Cape and islands. Our analysis is based on data provided by the Cape Cod Commission, the Martha's Vineyard Commission, and the Steamship Authority. As a quasi-public entity, the Steamship Authority has been slow to begin to reduce its carbon

footprint. Many of its ferries are older and have lower fuel efficiencies/high carbon emissions. The paper begins with an examination of the institution of the Steamship Authority and its current governing structure as it has been shaped by its 1960 Enabling Act. The paper explores how the Steamship Authority's passenger/auto/freight operations might attain carbon footprint reductions and begin to meet Massachusetts low-carbon targets and policies. Electrification of ferries to Martha's Vineyard and Nantucket is under active public discussion and could be based on technology already in use in Europe and being considered by Washington State Ferries (1, 2). Electrification could significantly reduce, if not eliminate, the Steamship Authority's current carbon footprint. The prospects for ocean wind farm and electricity generation in the larger region of the Steamship Authority's operations provides a logical source of renewable energy for an electrified ferry system. Political discourse over the value of an electrified ferry system may hinge in large part on other potential reductions in transportation-related carbon emissions in Massachusetts and includes consideration of the availability and cost of other renewable electrical energy available to the Commonwealth.

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**Sungmin Jang**  
*University of Connecticut*

### **Baseball Game Attendance Change and Ballpark Relocation: Will Relocation Boost Attendance?**

On June 4, 2014, the Mayor of Hartford announced that the city would build a new ballpark to bring a minor league baseball team, the New Britain Rock Cats, to Hartford. The city planned to invest \$60 million and the relocation of the baseball team was intended to expand the Central Business District and ultimately to revitalize the inner city of Hartford. How about the impact on the baseball team itself? How would the team be affected by the new surroundings? This paper focuses on the change of the regular season home attendance of Major League Baseball (ten teams: five American League East Division teams and five National League East Division teams) and Minor League Baseball teams (Double-A Level, 12 Eastern League teams), and the extent to which factors affected the nature and size of attendance, such as population and average income, relocation time, ballpark size, and team performance. Compared to the difference between the patterns of Major League and Minor League teams, this paper recognized that Minor League teams' attendance was influenced by locational factors without exception, and especially, relocation of the team's home ballpark, whereas Major League baseball teams had an impact on the local economy. Lastly, the Rock Cats' attendance in the 2016 season when the new ballpark opening was planned was projected based on city population, ballpark size, and average gap before and after ballpark relocation. *Keywords: Sports and geography, stadium relocation, baseball team attendance*

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Wenjing Jiang  
*Clark University*

### **Uncertain and Uneven Transitions: Alternative Agricultures, Produced Nature and Planned Inequality in Rural China**

With emerging concerns for environment and equality, we have witnessed increasing efforts globally to re-organize property, production and social relations in the countryside. Yet in practice, the transitions for alternatives often end up with uncertain and uneven outcomes, raising the need to examine the geography and contingency of agrarian transitions. Through an intensive, multi-scalar case study of Chengdu in Southwest China, this paper offers a materialist explanation of why some places have witnessed certain transitions (e.g., transition from grain-based agriculture to agricultural production based on commercial crops) earlier and more successfully than others, and how certain products and modes of agricultural production become dominant in certain places. Comparing the past and present plans and the trajectories of agricultural development of multiple sites in three counties, my research traces the origins, conditions, and contingencies of agricultural specialization in contemporary China at both regional (county level) and micro (village and sub-village levels) scales.

The unevenness of agricultural development, I argue, should not be explained as following the “natural” laws, because local economic and ecological conditions have long been under interventions from state policies, regional and local plans and associated resource allocations in agricultural infrastructure. Rather, policies and plans, by naturalizing the produced nature and constructing the suitable conditions for sustainability, often end up reinforcing the uncertainty and unevenness of rural development. Bringing in socio-ecological perspectives to regional development theories, this paper contributes to a dialectic understanding of continuity and change in agrarian and broader social transformation. *Keywords: Agrarian transitions, unevenness, uncertainty, agricultural specialization, China*

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Jeffery Kreeger  
*Central Connecticut State University*

### **A Variety Of Gis Analyses In Tourism And Hospitality**

While GIS use is in its infancy stage for the Tourism industry, GIS analyses has been utilized even less in the Hospitality industry. This presentation demonstrates various spatial analyses. Distances were utilized for analyzing Resort Owner demographics and restaurant cluster analysis was used to analyze restaurant grouping as well as neighborhood population demographics and psychographics. Revenue Management techniques were used to analyze Hotel ADR and Occupancy Percentages based on proximity to sporting venues. Gravity modeling was also dem-

onstrated for retail stores (but could just as easily be used for restaurants or attractions) using Euclidian Distances (as the crows fly) as well as Network Analyst (driving) distances. Comment cards were also analyzed from a national restaurant to determine calendar effects of restaurant efficiencies. Respondent proximity was considered in a study that compares Hotel stays against Airbnb stays. Although this presentation does not dive deeply into any one methodology, it instead endeavors to present a variety of GIS techniques to stimulate use in related areas. The purpose of this presentation is to give a summary of some GIS analyses that are being introduced in the Tourism and Hospitality fields in the hopes of encouraging further exploration in these fields. *Keywords: GIS, Recruitment, Revenue Management, Spatial Analysis*

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**Roopa Krithivasan**  
*Clark University*

### **Making collective wildlife management work: crop-protection institutions in Himachal Pradesh, India**

Forest-agriculture interfaces provide important habitats for protected species. For farmers, however, living alongside wildlife — particularly megafauna that consume and destroy crops — stresses livelihoods and compounds economic and climate pressures. Scholars identify collaborative, participatory crop protection and monitoring as important tools to mitigate crop depredation, safeguard livelihoods, and support conservation goals. Yet few studies evaluate the social and ecological conditions under which communities participate in collective wildlife management. Situating my research in Himachal Pradesh, India — where conflicts between farmers and wildlife including macaques, boar, and antelope are widespread — I leverage the Social-Ecological System (SES) Framework (Ostrom 2007) to investigate why some communities have retained collective crop-protection practices while others have not. While the SES Framework traditionally assumes that resource users are strictly human, I argue for the inclusion of non-human animal actors as participants in the SES whose actions fundamentally shape institutions and landscapes. Drawing from interviews, focus groups, and participatory mapping products representing seven purposively sampled villages, I find that shared dependence on agriculture, perceived fairness of collective choice rules, and spatially clustered agricultural areas are associated with continued collective protection. Because wildlife modify activities to avoid detection, collective institutions are particularly stable when their practices are adaptive. Results contribute to the growing body of work considering animal agency in wildlife management, and suggest that the extended SES framework can offer a diagnostic tool to identify communities with the potential to successfully adopt collective wildlife management. *Keywords: Human-wildlife interactions; institutions; social-ecological systems; animal agency; India*

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Laura LaMontagne, Judith Otto, and Niall Stephens  
*Framingham State University*

### **Panel Discussion: Transdisciplinary Collaboration In Climate Change Pedagogy: A Case Study**

This panel discussion is led by three Framingham State faculty members (Communication Arts, Economics, and Geography) who were selected to participate as fellows in the McAuliffe Initiative on Climate Education (MICE) in AY18-19. The charge to the faculty fellows was to create, curate and disseminate best practices in developing the new field of climate change pedagogy by working in trans-disciplinary groups. The three panelists will describe the components of their respective course projects and the connections between them, highlighting both the opportunities and the challenges in operationalizing real-world projects across three disciplines and three courses. Panel attendees will then be invited to participate in a broader discussion about how students best learn about and respond to the challenges of climate change across scales and across disciplines in practical, hands-on projects that can effect change by citizens and government officials. *Keywords: climate change education, transdisciplinarity, environmental economics, media studies*

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Devon Lechtenberg  
*Capitol Regional Council of Governments, Hartford, CT*

### **A Network and Spatial Autocorrelation Analysis of New England Commuting Patterns**

The New England commuting network is analyzed from both a network analytical and spatial perspective. Network analysis emphasizes structural elements of connectivity within the network in contrast to spatial analysis that emphasizes attribute variation as a result of location. Combining these two approaches results in an analysis that can aid in our understanding of commuting patterns across large regions. Whereas previous research has sought to explain and predict accessibility using network analytical tools, this study instead seeks to model network connectivity in the form of degree of node using spatial analysis, specifically geographically weighted regression (GWR). It will be shown that outward-bound network links (out-degree of node) can be approximated using predictor variables such as resident working population, density of road network, accessibility, and mean travel time, among others. The results could shed light on how both network and spatial attributes make attractive from a commuting perspective. *Keywords: New England, transportation geography, network analysis*

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Mary D. Lemcke-Stampone  
*University of New Hampshire*

### **Overview: Chapter 18 Northeast, Fourth National Climate Assessment, Vol II – Impacts, Risks, and Adaption in the United States**

The Northeast region’s diverse climate and landscape is central to the cultural identity, quality of life, and economy of its residents, which makes them vulnerable to the impacts of climate change. The Northeast region is warming faster than the nation as a whole and is projected to reach 2°C above the pre-industrial era by 2035. Additionally, rates of sea level rise and ocean warming are projected to exceed the national average by end of century. This presentation provides an overview of the impacts of climate change on the Northeast region identified in Volume II of the recently released Fourth National Climate Assessment (2018). In order to capture the region’s geographic diversity, the chapter spans the urban-rural divide and provides a physiographic cross-section of interconnected natural and socioeconomic systems that are vulnerable to climate change impacts from rising sea levels, changes in seasonality, and increased precipitation. Vulnerability to climate change varies across the region and the impacts faced by rural and urban communities are distinct. In response to present, and to prepare for future climate change impacts, communities across the Northeast are engaged in a variety of adaptation efforts at local, state, and regional scales.

*Keywords: Northeast, climate change, National Climate Assessment*

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Matt McCourt  
*University of Maine at Farmington*

### **Maine’s CMP Corridor as a “Paracommons”: The Spatial Politics of Financialization, Accumulation, and the Maine Woods**

Schemes for linking Québec hydropower to electricity users in the northeastern US have produced decades-long controversies that have visited each of the New England states. Maine’s Spanish-owned utility monopoly, Central Maine Power (Iberdola/Avangrid), proposed the most recent transmission project, the New England Clean Energy Connect (NECEC), or CMP corridor, a \$1 billion 145-mile corridor high voltage line transmitting electricity from Hydro-Québec to Massachusetts through western Maine. Supporters of the CMP Corridor highlight the project’s carbon impacts, rate savings, construction jobs, mitigation package, and property tax impacts. But the CMP Corridor has also drawn intense grassroots opposition, as well as astroturf campaigning by Maine-based power generators, for its impacts on fisheries, wildlife, recreational tourism, scenic amenities, and development of domestic renewables. The opposition—and support—has been dismissively characterized as N/YIMBY politics, but witnesses during multiple sessions of public testimony articulated a wide range of perspectives and spatial politics, contesting the financialization at the heart of the Corridor, calling out the project’s



susceptibility to rebound, and engaging in a wider critique that can effectively understood as competing claims on the “paracommons” (Lankford) represented by renewables development in and through the Maine Woods. *Keywords: CMP Corridor, paracommons, financialization, Maine*

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**Ethan Mehlin and Vincent Breslin**  
*Southern Connecticut State University*

### **GIS Color Contour Mapping of the Spatial Trends in Sediment Physical Properties and Metal Contamination in Connecticut Harbors**

Students and faculty at the Werth Center for Coastal and Marine Studies have examined the spatial trends in Connecticut harbor sediment metal contamination. Geo-referenced sediment surface grab samples from 14 harbors over 19 years (2001-2019) have been examined for sediment grain size, loss on ignition and heavy metals (copper, zinc, and mercury). The organization and presentation of the harbor data in its current form in spreadsheets is useful for scientific analyses but a less than optimal format for decision-makers. Contour maps using NOAA sediment quality thresholds are highly visual and are useful in identifying areas in harbors where benthic marine organisms may be adversely affected due to contaminated sediment. Sediment metal concentrations and physical properties (grain-size and loss on ignition) were mapped in ArcMap 10.5.1 according to categories defined using sediment quality guidelines and known sediment grain-size categories. These points were analyzed using inverse distance weighting, resulting in maps that were then edited in Arcmap to have the same color scheme and comparable scale categories. Each parameter scale was created with seven or eight categories; the highest range for metals was defined by the Effects Range Median for each respective metal while the lowest category was equal to or less than each metals' respective crustal abundance. These maps can be useful in identifying areas within harbors for shellfish habitat restoration/expansion, identifying areas of concern for dredging projects, inform harbor development activities, and highlight areas of concern for sediment resuspension (storm events). *Keywords: GIS mapping, Sediment contamination, Connecticut, harbors*

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**Matthew D. Miller**  
*Southern Connecticut State University*

### **The Bathymetric Rises and Falls of New Haven Harbor**

As part of coastal environments, harbors are subject to an array of forces that impact their bathymetry. Erosional processes, water currents, tectonic uplift, and anthropogenic factors all contribute to the changes in bathymetry coastal areas experience through time. This study examines the bathymetric history of New Haven Harbor through the use of nautical charts

dating from 1846 to 2017 and discusses the forces that have changed the coastline and depths within the harbor. In addition to the natural sediment movement processes in any coastal environment, New Haven Harbor has experienced significant modifications of the harbor floor and coastline by people in order to aid navigation to and within the harbor. These modifications, and their impacts, become evident through the mapping of the shoreline through time and the interpolation of bathymetric layers using the depth measurements from the nautical charts. By using the rates of bathymetric change in the harbor, as calculated through the interpolated bathymetric layers, times to the breaching of the water's surface by the harbor floor are determined. *Keywords: New Haven, harbor, bathymetry, coastal, dredging*

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**Jesse Minor and Matt McCourt**  
*University of Maine at Farmington*

### **Using Role-Based Assignments For Critical Encounters During Field Trips**

Full student engagement on field trips can prove challenging to promote and maintain. We present results of a pilot experience with first-year, mostly first-generation college students on an intensive week-long field trip that occurred before the beginning of their first semester. Our course, titled "Making Change in Maine," was centered around encounters with 20 'changemakers' engaged in creative solutions to rural sustainability in interior and coastal Maine. These changemakers represented a wide range of interests ranging from disruptive philanthropy and community development to local food, public safety, and waste management. Before each encounter, students were assigned formal roles with concrete responsibilities to the group, including acting as spokesperson, photographer, asking big-picture or follow-up questions, being attendant to factual details or setting, and "caring" for the group. Pairs of students rotated through the various role assignments over the course of the trip. Assigned roles allowed division of labor and created teams within which students could strategize about tasks and reflect on the experiences. Pre- and post-trip assessments reveal that students report greater comfort with skills such as teamwork (55%), "caring" for others and innovation (44%), and monitoring/evaluating information (33%). Students report greater capacity in habits such as group speaking (55%), organization (33%), and planning (28%). Students report lower frequencies of skills such as leadership (11%) and decision making, logistics, and implementation (5%) and in habits such as tolerance for uncertainty (5%). Pre- and post-assessment show student growth through the assigned roles, which map onto traits that predict college success and retention. *Keywords: Assessment, experiential education, field-based pedagogy, First Year students, Geography education, retention*

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Laura Cristina Abreu Molina  
*Southern Connecticut State University*

### **Perceptions of Climate Justice Among Southern Connecticut State University Students**

It is becoming increasingly clear that we are in a state of climate crisis. Global temperatures are rising, ecosystems are dying, and developing nations are experiencing the impacts at a heavier rate than developed nations. As global climate change calls for action, the climate justice movement aims to address it. The purpose of this study is to better understand university students' knowledge of, and attitudes towards, the climate crisis and climate justice. This research is of particular importance given that the university recently signed a climate emergency declaration. This is an exploratory project which employs quantitative and qualitative approaches, since it has been shown that a mixed methods approach provides depth and breadth of understanding on a given subject. This paper presents initial findings from the study outlining key themes underpinning student understandings towards, perceptions of, and engagements with, the climate crisis and climate justice. This paper concludes with implications for engagement and practical applications for implementing climate actions through triangulating the similarities and differences between students' perceptions towards the climate and climate justice with a university being one of the first in the U.S. to declare a climate emergency. *Keywords: Climate Crisis, Climate Justice, Climate Emergency, Student Engagement*

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Josh Nolan  
*University of Massachusetts Amherst*

### **"A Huge Extension Cord" Deliberations Over The Northern Pass And The Role Of Local Communities In Transmission Infrastructure**

In order to shift away from carbon-based electricity production, transmission infrastructures must be reconfigured. As the State of Massachusetts drives to access new low-carbon energy, a primary target is Québec hydropower. Interconnecting hydropower generation sites in Québec to the carbon and electricity markets in Massachusetts necessitates the construction of high-voltage transmission lines through Northern New England. This, in turn, requires the permission of authorities along the transmission routes.

The various impacts of power lines on communities along their route had not been the focus of Massachusetts policies, but political opposition has descended from New Hampshire and Maine where Eversource and Central Maine Power have proposed high voltage lines. The Northern Pass transmission project was the center of controversy in New Hampshire. To interconnect to the Québec grid, the Northern Pass was proposed across 190 miles in New Hampshire.

Ultimately, despite Eversource's efforts, the project was defeated in protests, in boardrooms, and finally in the State Supreme Court. The power line's opposition is embedded in historical relationships between places and peoples. Northern New England has unique political geography allowing for populist activism, as well as historical grievances towards southern New England exploiting and despoiling the North's lands and waters. Undeterred, hopeful investors are charting alternative transmission routes from the Canadian border to Massachusetts. There are lessons from the fight over the Northern Pass that inform emerging local struggles in new proposed transmission routes. This has the potential to open opportunities for democratic agency in the transformation of New England's grid. *Keywords: Energy Democracy, Energy Planning, Decarbonization, Hydropower, Northern Pass, Landscape Preservation, Scenic Resources, Outdoor Recreation and Tourism*

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**John F. Obrycki<sup>a</sup> and Maitreyi Mazumdar<sup>b</sup>**

*Department of Neurology, Boston Children's Hospital<sup>a</sup> and Harvard T.H. Chan School of Public Health<sup>b</sup>*

### **Multi-study opportunities to explore spatial distributions of water arsenic in Bangladesh**

The combination of climate change and its associated effects on water quality are of particular concern in Bangladesh. Several decades ago, much of the country shifted from surface water sources to tubewells as a mechanism to avoid water-borne diseases. However, Bangladeshis were exposed to elevated levels of water arsenic that were naturally-occurring in the groundwater. Multiple health effects were documented throughout the country, and the British Geological Survey conducted a widespread sampling of tubewells to evaluate the extent of the water arsenic problem. Water arsenic concentrations are variable even over small distances, making full documentation of the water arsenic problem difficult and pointing to the need for additional water quality testing. This study provides a novel combination of water quality data from three studies with approximately 550 water arsenic tubewell samples collected throughout Bangladesh. These samples were collected as part of National Institutes of Health-funded research projects that investigated health effects of arsenic exposure. The water arsenic concentrations were mapped and compared to the previously collected data from the British Geological Survey to identify regions where spatial variability in water arsenic concentrations may require further testing to protect public health. Multiple areas were identified where small-distance spatial variability could be of concern for developing predictive exposure equations. As available water resources change due to the effects of climate change and potential human migrations, research is needed to ensure that safe water sources are available in Bangladesh. *Keywords: Bangladesh, water arsenic, spatial distribution*

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Shannon Reault, Haoyu (Novak) Chen, Benjamin Ryan, Nicholas Geron, and Marc Healy  
*Clark University*

### **An Analysis of Juvenile Tree Health in Massachusetts' Greening the Gateway Cities Program**

The Greening the Gateway Cities Program (GGCP) is a Massachusetts state program aiming to increase urban canopy cover in order to decrease home energy costs in neighborhoods that meet environmental justice criteria. This study presents an analysis of GGCP tree mortality and site conditions that affect growth and vigor in Leominster and Pittsfield. Juvenile tree survivorship and vigor were evaluated in relation to genus, planting location, and tree structure. In June-July 2019, 867 (Leominster) and 926 (Pittsfield) trees were surveyed, via stratified random sample. Results show above average juvenile tree survivorship (Leominster- 90%, Pittsfield 87%) compared to previously surveyed gateway cities (87%). Site type demonstrated a stronger influence on tree health compared to land-use, especially in the site type case of sidewalk cutout. Residential trees planted within five feet of impervious surfaces displayed significantly higher vigor than those planted beyond five feet ( $p = 0.0198$ ). In contrast, non-residential trees did not display a significant trend. Furthermore, significantly more ( $p = 0.0012$ ) street trees are living (94%) in comparison to other maintained areas (87%), which indicates that street trees are not impacted by proximity to impervious surfaces. Low mortality in street trees could be linked to contrasting stewardship practices that occur between street trees and other maintained trees. *Keywords: Greening The Gateway Cities Program, tree vigor, survivorship, land use, site type, distance to impervious surface*

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Shaina Rogstad  
*University of Massachusetts Amherst*

### **A critical perspective on temperature targets as a climate metric: a case study of Antarctica**

The goals of the international efforts to combat climate change as set forth in the Paris Agreement are defined based on global mean surface temperature. However, the exclusive focus on temperature as a metric of climate change severity can overshadow consideration of other climate factors. Global climate model simulations of the future impacts of meltwater from the Antarctic Ice Sheet (AIS) show a delay in global mean surface temperature rise, however other impacts of an AIS collapse have wide reaching detrimental effects. AIS collapse will lead to substantial increases in global mean sea level, increases in storm surge and coastal flooding, and changes in sea ice extent which will impact biodiversity. The delay in global mean surface temperature rise caused by an AIS collapse could be interpreted as allowing more time for the temperature threshold to be reached. Yet, the collapse simultaneously exposes island nations to catastrophic sea level rise impacts. In this presentation I use a critical perspective to analyze the

case study of Antarctic meltwater impacts and how they relate to the temperature targets put forth in the Paris Agreement. *Keywords: Climate change, sea level rise, Paris Agreement, climate negotiations*

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**Allyson Rokita**  
*Plymouth State University*

### **Investigating the Geographic Components of Human Trafficking in New Hampshire**

Human trafficking is a form of irregular migration characterized by the recruitment of people via force fraud, or coercion for the sake of exploiting them for labor or sex. Despite the nexus between population and economic geography and human trafficking, there is meager literature on the subjects' intersection on a national scale. To stitch these subjects together on a state wide scale, a study using geographic variables, including the location of opioid overdoses, shall be compared to the locations of leads, investigations, and prosecutions of human trafficking cases, throughout New Hampshire as provided by the New Hampshire Human Trafficking Task Force. The data shall be illustrated by ArcGIS. The purpose of this presentation is to discuss possible indicators of modern day slavery and to refine the methodology of this proposed study before the research project is executed. *Keywords: Human Trafficking, New Hampshire, Undergraduate Student, Population Geography*

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**Aiden Saulnier**  
*University of Maine*

### **Is it really Industrially Compostable?**

Industrial Compostables (ICs), which on average produce 68% less Greenhouse Gasses than petroleum-based plastic (Kushner 2019), have rapidly risen in popularity over recent years. ICs present themselves as an environmentally-conscious alternative to standard single-use papers and plastics at a time when the U.S. Recycling Industry is in major disarray. Unfortunately, with less than 300 Industrial Compost facilities in the U.S., many of these products will end up contaminating recyclables and going into the waste stream, where their breakdown is not significantly different from non-compostables.

During a two-week trial period, the breakdown capability following ICs was measured in a partially active compost pile at the Tom Eastler Memorial Compost Site: Polylactic acid/PLA (plant-based plastic) cups, straws, utensils, bags, as well as plant-based paper plates and bowls were among the test-subjects. Although test results were not fully conclusive, it is evident that

among all products tested, PLA bags degraded the fastest, especially when in a shadier, more moist part of the pile.

This study sets guidelines for a future Community Bio-Scrap Drop, which will likely gain major popularity with people who live in apartment buildings, and may not have access to a large enough outdoor space to operate their own home tumbler.

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**Anna Therien**  
*Westfield State University*

### **Focusing Regional Conservation through Local Town-Based Plans**

Wildlands and Woodlands (W&W) is a conservation vision for New England that calls for protection of 70% of forests and 7% of farmland. This is a regional goal for New England, but actual success of this vision will depend on decisions and objectives of landowners and communities. I studied these issues in the Pioneer Valley, which is located in the western part of Massachusetts and is made up of three counties; Franklin, Hampden, and Hampshire. In total there are 69 towns and most of them have Open Space and Recreation Plans (OSRPs) which are created from input and feedback from the townspeople. These documents provide a comprehensive explanation of the community, the natural resources they have, community surveys/opinions, goals, objectives, and a seven-year plan to complete the objectives they outline. We collected 63 OSRPs and obtained data from them, mainly focusing on their goals/objectives and their seven-year action plans. These data were combined into an excel sheet with different categories. I then took the text we had collected from the OSRPs and quantified it. By doing this I was able to quantify and analyze town goals. The resulting Excel sheet and maps made from the data are tools that can help inform land trust, planning, and community partners in a developing regional conservation partnership to advance their conservation work in a way that makes sense for different regions and towns.

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**Jacqueline M. Vadjunec**  
*National Science Foundation, Geography and Spatial Sciences*

### **Writing Effective National Science Foundation (NSF) Proposals in Geography and Related Fields**

This outreach session is intended for faculty members, professional geographers, and graduate students who engage in geographic or related spatial scientific research and who wish to learn how to prepare effective proposals for NSF. A Program Director from the Geography and Spatial Sciences (GSS) Program at the National Science Foundation (NSF) will discuss research

grant opportunities at NSF, and will highlight ways to improve the quality and competitiveness of a proposal. The session will include details about the review process, including the intellectual merit and broader impacts review criteria. Ample time for Q&A will be provided. *Keywords:* *National Science Foundation, grant writing, funding opportunities*

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Eve Vogel<sup>a</sup>, Josh Nolan<sup>a</sup>, Emily Chang<sup>b</sup>, and Steve Hayes<sup>c</sup>

*University of Massachusetts Amherst<sup>a</sup>, Union of Concerned Scientists<sup>b</sup>, and Texas A&M<sup>c</sup>*

### **Québec Hydropower For a Green Massachusetts? Tracing the Policies and Politics of Renewable Power as a Socioecological Fix.**

To reduce climate change, many advocate large-scale development of renewable power. Yet as critical authors have recently shown, renewable energy development is often as much a product of capital seeking a “spatial fix,” new locations for investment and profit. It is also a “socioecological fix,” transforming socioenvironments in ways that spatially locate potential political challenges near the site of infrastructure, not necessarily near the sites of decision making. We examine the drive for renewable electricity in Massachusetts; the interrelated drive for large hydropower development in Québec, Canada; and the local and regional decision making around construction of one specific hydropower project in Québec and a transmission line proposed to connect the Québec and Massachusetts grids.

We argue Massachusetts’ and Québec’s approaches must be understood within the context of their shared, though distinct, history of neoliberal electrical restructuring in the late 1990s, and their equally shared desires to promote economic development with affordable energy. In the Romaine River hydropower project, these forces are playing out with a four-dam project on a recently pristine river, and a bilateral financial settlement with several bands of the Innu nation. Only in New Hampshire, where a major transmission line was proposed, and the material connections between supply and demand could not be missed, did the drive for development and the resistance to landscape change join into an integrated public policy debate.

Our work is built on multi-state, binational media archives, supplemented and triangulated with interviews as well as critical and historical literature. *Keywords: Key Words: Renewable energy, socioecological fix, Hydro-Québec, Massachusetts Global Warming Solutions Act, electric restructuring*

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Stephen Young  
*Salem State University*

**Bringing Climate Changes Issues to the Public Through Art and Science Exhibitions.**

Every day in the science journals there are more and more articles about how our climate is changing as well as articles about the current and future detrimental effects. Yet as a society we continue with our destructive activities. Scientists are now engaging the public in a number of different ways to bring about changes in our societal behavior. One avenue is through public exhibitions. This presentation will discuss the recently launched art & science exhibition: Climate Change: Taking action with modern mapping techniques. This exhibition focuses on the North Shore of Massachusetts and is made up of three components: 1) large format posters mapping sea-level rise, the urban heat island effect and a ranking of the resiliency of land covers on the North Shore, 2) drone imagery (still and video) of the Great Marsh (ground zero for sea-level rise on the North Shore) and 3) conceptual art challenging the viewers about climate change on the North Shore. *Keywords: Climate change, art and science, exhibitions*

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