SOUTHEAST
Climate Adaptation Science Center

SE CASC Regional Science Symposium Poster & Tools Session Table Assignments

Table Number	Presenter Name	Presentation Title/Abstract
17	**Jennifer Cartwright**, USGS Lower Mississippi-Gulf Water Science Center (Professional)	**Title: Islands of rare-plant biodiversity in the southeast: new approaches for climate-change assessments** The southeastern U.S. landscape contains a variety of small, unusual geologic and topographic features such as sinkholes, springs, bedrock outcrops, and cliff overhangs. Because of their small size, such landscape features are commonly overlooked in regional-scale assessments of climate-change effects on ecosystems. However, these landscape features often function as hotspots of rare-species biodiversity, particularly for plants and invertebrates. Because these insular ecosystems are geographically small, spatially isolated, and anchored to the landscape by geologic and topographic features, assessing and mitigating climate-related risks to biodiversity may require different sets of tools and approaches than are commonly applied to large-scale ecosystems. A recently published framework for these ecosystems builds on many decades of site-level investigations in individual insular ecosystems and proposes that changes in physical stress levels (e.g. hydrologic variability, temperature extremes, nutrient limitation, or soil geochemistry) which tip the scales between rare plants and their competitors may be a principal way in which regional climate change translates to habitat alteration for many rare species. Local-scale threats to individual species or whole ecosystems can be anticipated using this framework, allowing the design of targeted strategies for rare-species conservation.
23	**Frances O'Donnell**, Auburn University (Professional)	**Title: Developing a scientific basis for climate-informed stream restoration projects** Stream restoration projects reclaim riparian ecosystems from anthropogenic degradation and mitigate water pollution. In the short-term after new projects are constructed, they are vulnerable to setbacks and failures if large precipitation events occur while vegetation is still establishing. In the long-term, restored streams must withstand high flow events of increasing magnitude and frequency. Our research seeks to understand how restored streams respond to high flows associated with extreme precipitation events. We are working to better understand how the timing and characteristics of vegetation planting during a restoration affect the development of bank stability during the vegetation establishment period. We grew common riparian species in streambank microcosms and measured soil stability parameters at four and eight months after planting using root pull-out tests and Iowa Borehole Shear tests. Riparian woody species substantially increased soil cohesion after just four months of growth. Soil cohesion due to roots was 2.4 kPa for Silky Dogwood (Cornus amomum) and 1.6 kPa for Black Willow (Salix negra). The rapid stabilization suggests that consulting seasonal climate forecasts before performing stream restoration could prevent project failures due to extreme events. We are currently using the measured soil and root parameters to analyze bank stability under a range of conditions using slope stability modeling software (Slide). We are also investigating how high flow events impact recently restored streams by applying a river hydraulics model (HEC-RAS) to a stream in Alabama that was restored four months before high flows associated with Hurricane Irma. The model provides estimates of the sediment dynamics and flow velocity around in-stream structures. We plan to use the model to improve the design of instream structures to withstand and function properly during high flows.
26	**Rachel Billiot-Bruleigh**, University of New Orleans, Haskell Environmental Research Studies	**Title: Lost Among the Skeletons: Mapping the potential for live oak ghost forests in Southeast Louisiana & exploring cultural losses** Live oak forests in southeast Louisiana are largely fragmented and considered imperiled environments due to anthropogenic development and habitat change. Saltwater intrusion into freshwater forests, from human activity such as canal dredging and natural processes such as storm

	Program (Professional)	flooding, contribute to ecosystem conversion and plant migration that changes environmental dynamics. Indigenous relationships with the land are at risk due to habitat conversion. In this study, I explored the biocultural importance of live oak forests for Indigenous communities in southeast Louisiana and how the relationship to these forests would be affected by saltwater intrusion. Using GIS imaging and overlay analysis, I mapped remnant old-growth forests in St. Bernard, Jefferson, and Plaquemines Parish and associated risk factors for saltwater conversion. Cultural relationships were explored through interviews and previous records of plant uses and burial sites. I found that live oak forests act as cultural protections for the way they provide food and medicinal plants, guard burial grounds, and shelter against intense heat or strong storms. As saltwater intrusion erodes ancestral mounds and kills off culturally important plants, ecological and cultural well-being are put at risk.
24	**Jennifer Summers**, University of Tennessee Knoxville (Student)	**Title: A century of change in a coastal marsh plant** Rapid evolution might better enable species to cope with pressures arising from climate change, such as greater inundation and salinity exposure from sea level rise. Soil-stored seed banks are a largely untapped resource for assessing whether at-risk populations evolve in response to climate change corollaries. Prior work has shown that temporal patterns of population genetic variation can be reconstructed from plants resurrected from the century-long seed banks of the foundational coastal marsh sedge Olneyâ€™s bulrush (Schoenoplectus americanus). In this study, we resurrected plants to test the hypothesis that S. americanus exhibits heritable variation in salinity and inundation tolerance, and that tolerance has shifted since the early 20th century. I recovered and germinated seeds from radionuclide-dated sediment to create ancestral (ca. 1900) and descendant (ca. 2000) cohorts for a common garden experiment. Ancestral and descendant cohorts contained nine genotypes each cloned out for multi-factorial treatments: exposure to an inundation stress gradient spanning a 60 cm range of elevation, fully crossed with contrasting salinity conditions (15 vs 0 ppt), and competition with a naturally co-occurring species (Spartina patens). Mean aboveground biomass production did not significantly differ between the ancestral cohort and descendant cohorts, though descendant plants exhibiting greater production. Descendant plants competed better than ancestral plants, producing greater biomass in competition treatments. Ancestral plants exhibited a higher mortality rate when compared to descendants, with mortality peaking at the deepest inundation. Interactions between salinity, competition and inundation had the largest effect on biomass. Cohort identity and individual were both factors in biomass responses to stressor exposure. For example, biomass variance differed, with ancestral plants exhibiting greater variance. These findings somewhat suggest that modeling marsh plant a
12	**Melody Hunter-Pillion**, North Carolina State University (Professional)	**Title: Caribbean Oral History: Stories That Help Us Prepare For The Future** Stories are tools. This project demonstrates the use of oral histories as powerful, yet often overlooked and underutilized tools in the Caribbean's ability to weather catastrophic storms, chronic ecological conditions, and climate change. By collecting and preserving oral histories, this project creates a repository of firsthand information that can be used by resource managers, and the community members they serve, as tools for future resiliency. During a 2018 Caribbean drought workshop in San Juan, Puerto Rico, an interdisciplinary team from N.C. State University and the University of Maryland collected the stories of nine individual resource managers from Puerto Rico and the U.S. Virgin Islands. Using oral history protocols, framed by the project's oral history adviser, the team conducted interviews in English and Spanish. The project's multimedia specialist recorded the interviews in video and audio formats. These recorded narratives share first person observations of people, animals, and plants during and after specific weather events. Testimonies also reveal the science needs of communities and resource managers by

		providing firsthand experiences, including identified gaps in resources as they occurred real-time during a climate crisis. We learn how narrators responded to gaps and how past narratives informed their experiences. Full interview transcripts and media files are accessible through the Digital Library of the Caribbean (dLOC). Users can access the dLOC repository through a portal on the project's NCSU website, which includes narrator's photographs and video vignettes. Through oral narratives, the past provide us with invaluable knowledge of weather, plants, animals, ecosystems, and natural and cultural resources. Each narrative is unique to an individual's lived experience and is perishable unless collected. Historical narratives serve as a tool, not only to learn about the past, but also to develop resiliency for the future.
21	**Jared Bowden**, North Carolina State University (Professional)	**Title: Characterizing precipitation changes within Puerto Rico from high-resolution climate change model experiments: From challenges to possible opportunities for future freshwater resources** A decline in the amount of future precipitation within the subtropics is a notable feature of global climate projections. However, global climate models are unable to resolve the complex climates of subtropical islands and known to underestimate rainfall intensity, and these model limitations pose many challenges for scientists concerned about climate impacts. This study dynamically downscales two global climate models at mid-century over Puerto Rico to better characterize precipitation changes in a warmer climate and help explain physical drivers associated these changes. The simulations reveal a plausible "elevational buffer" to the largescale subtropical precipitation decline – a relatively larger decline in the rainfall amounts for coastal regions compared to the inner-most and highest mountains. The "elevational buffer" is found to be more robust during the wetter season (May-October) compared to the dry season (November-April). Additionally, the "elevational buffer" is found to be closely associated with changes in the diurnal cycle with the largest reductions in mean rainfall during the afternoon hours for the lowest elevations. The frequency of the most intense rainfall does not significantly change with an exception of likely more intense rainfall associated with tropical cyclones, which are poorly represented in our downscaling experiment. Overall, these highresolution climate model experiments provide additional insight into climate change for Puerto Rico, and these experiments are likely useful to other scientists and managers wanting to explore various opportunities to adapt to likely more limited freshwater resources in the future.
22	**Jacob Rudolph**, North Carolina State University (Student)	**Title: Heavy breathing after the storm: Lingering effects of extreme weather events on coastal carbon cycling** Flooding from extreme weather events (EWE), such as hurricanes, exports large amounts of organic matter to estuaries and coastal waters globally. Recent evidence has shown that EWEs have been increasing in frequency and intensity and have major effects on the biogeochemistry of coastal ecosystems. In 2016, wetland-derived organic matter from Hurricane Matthew's floodwaters caused an immense impact to the Neuse River Estuary and Pamlico Sound in eastern North Carolina. Degradation of increased organic matter in coastal waters from extreme events like Matthew can lead to production of carbon dioxide (CO_2), which has implications for global carbon (C) cycling and coastal water quality and habitat. Examples include increased and sustained respiration of organic matter which contributes to hypoxia and acidification of coastal waters. Dissolved inorganic and organic C were quantified in the weeks following Hurricane Matthew across the Neuse River watershed to evaluate the effect of this storm on the coastal carbon cycle of the Nation's 2nd largest estuarine complex, Pamlico Sound. Over a period of 58 days following the hurricane's passage, we calculated that 7.82×1010 g C was exported to the Neuse River Estuary and Pamlico Sound. The vertical release of CO_2 from the estuary and sound was roughly a third of the lateral export: 7.88×1010 g CO_2. For context, the average annual CO_2 release from a single automobile is ca. 4.66×106 Gg CO_2. Thus, this single event released an amount of CO_2 equivalent to the annual release of roughly 17,000 automobiles, in just 15% of the time. Moreover, this event kept Pamlico Sound as a weak CO_2 source to the atmosphere in the weeks following the storm. Understanding how these

		storms create lingering impacts to biogeochemistry and water quality of the Southeastern and Gulf coasts can help determine how societal and economic resources will be affected by EWE in the future.
29	**Roberto Mera**, North Carolina State University (Professional)	**Title: Applied Climate Experience at the NC State Climate Change and Society Program** The Applied Climate Experience (ACE) is the capstone project for the CCS Master's degree. It is an opportunity for hands-on experience with a variety of hosts ranging from NOAA to communication leaders in the industry. We pair students with mentors from climate-sensitive fields at the beginning of the program in their desired field of study and career path. This exposes students to exciting opportunities to display their talents and network with potential employers. The ACE project is designed to be flexible for the student. The student may choose to work on it throughout the school year or limit it to the summer after classes have ended. Some of the current and past projects include adoption of policies by Environmental Advisory Boards in North Carolina, risk analysis for importations of fruit flies, investigating the scope and relevance of climate action at NC State University in drafting a second climate action plan, developing the SE CASC Tribal Resources Web App and Web page, transition from agricultural crops to solar power generation, oral histories of drought and extreme weather in the Caribbean, coastal resiliency against the threat of sea level rise and rising groundwater table and its implications for public health and safety at Nags Head, NC,
27	**Erica Henry**, North Carolina State University (Professional)	**Title: Maintaining historic disturbance regimes increases species' resilience to catastrophic hurricanes** As habitat loss and fragmentation, urbanization, and global climate change accelerate, conservation of rare ecosystems increasingly relies on human intervention. However, any conservation strategy is vulnerable to unpredictable, catastrophic events. Whether active management increases or decreases a system's resilience to these events remains unknown. Following Hurricane Irma's landfall in our habitat restoration study sites, we found that rare ecosystems with active, human-imposed management suffered less damage in a hurricane's path than un-managed systems. At the center of Irma's landfall, we found Croton linearis' (a locally rare plant that is the sole host for two endangered butterfly species) survival and population growth rates in the year of the hurricane were higher in previously managed plots than in un-managed controls. In the periphery of Irma's circulation, the effect of prior management was stronger than that of the hurricane. Marinating the historical disturbance regime thus increased the resilience of the population to major hurricane disturbance. As climate change increases the probability and intensity of severe hurricanes, human management of disturbance-adapted landscapes will become increasingly important for maintaining populations of threatened species in a storm's path. Doing nothing will only accelerate extinction.
30	**Brent Murry**, US Fish and Wildlife Service (Professional)	**Title: Developing flow policies to balance the water needs of humans and wetlands requires a landscape scale approach inclusive of future scenarios and multiple timescales** Wetlands may be particularly susceptible to altered flow regimes as they are directly impacted by water flows at a variety of time scales. In Puerto Rico, contemporary water management is decreasing freshwater recharge to wetlands and contributes to the salinization of important coastal wetlands as sea levels rise. Further, downscaled climate models predict an increase in drought frequency, intensity, and duration by mid-century. Conflicts over water allocation seem imminent between human and ecological needs. Current minimum flow policies are insufficient given the complexities of ecosystem processes and the changes in precipitation patterns and sea level rise that are expected in the future. Improved flow policies need to be established that reflect the functional relationships between specific representative ecological resources and components of the natural flow regime across all relevant time scales. Similarly, flow policies need to be developed within a landscape scale to implicitly address the socio-ecological trade-offs as well as the complexities of

		water management. Multi-disciplinary collaborations will be essential for increasing our resiliency to anticipated future changes.
31	**Kathryn Jewell**, North Carolina State University (Student)	**Title: Emerging conservation priorities among directors and commissioners of wildlife agencies in the Southeast United States** Wildlife conservation agencies in the Southeast United States have faced local challenges emerging from global phenomenon including rapid urbanization, declines in the proportion of hunters, and emerging wildlife diseases for several decades. Climate change is emerging as another global phenomenon with local impacts on wildlife conservation. The Southeast Climate Adaptation Science Center (SE-CASC) is a subset of the National Climate Adaptation Science Center, managed by the United States Geological Survey. Their purpose is to work with wildlife agencies to solve challenges associated with climate change. In order to determine how best the SE-CASC can serve in this role, we interviewed agency leaders and commissioners in SEAFWA states about critical conservation challenges they faced in recent decades, and plan to face in the future. We utilized a naturalistic qualitative approach. Preliminary results suggest urbanization of rural land and rural culture represents the most important challenge to wildlife conservation from the perspective of wildlife management leadership in SEAFWA states. Declining funding and relevancy of wildlife management was viewed as emerging from urbanization. Other critical issues included invasive species and wildlife diseases. These challenges were viewed as likely to persist into the future given rapid human population growth in the region. Climate change was not a common concern but was linked to other challenges including landscape fragmentation and water management challenges. These results suggest future climate science must be integrated with social and geographic aspects of urbanization to address core priorities for SEAFWA states.
18	**Tricia Kyzar**, University of Florida (Student)	**Title: Challenges and Opportunities for Sustaining Southeastern US Coastal Wetlands and Oyster Reefs** Estuaries are experiencing increasing pressure from encroaching development, altered watershed dynamics, rising seas, and increasing intensity, frequency, and duration of storm events. As populations in coastal areas swell the impacts of human activities; pollution, shoreline hardening, over harvesting, and other impacts are magnifying these pressures. With these rapidly changing inputs to already complex ecosystems it is difficult to identify the greatest threats. The goal of this study is to identify the most important threats to these ecosystems, the knowledge gaps relevant to these questions, and potential strategies for protection and management of coastal wetlands. To address these questions across the southeastern United States from Mississippi through North Carolina, population and land use data were analyzed, experts in estuary management and science were surveyed, and outcomes from stakeholder workshops were synthesized. Coastal counties in this region experienced an average increase of 26% in population density from 1996 to 2016. Correspondingly, surveyed experts reported that development, upstream alterations to freshwater flow, and shoreline hardening were among the most significant threats to these coastal ecosystems. Based on their input, improving the available science and opportunities for collaboration among resource managers will be key to improving and protecting estuarine habitats. Additionally, engaging people from all sectors (government, residents, businesses, visitors, etc.) will be vital to reducing human induced impacts and improving the health of these coastal environments as together we respond to the increasing pressures of global change.
35	**Lindsey Smart**, North Carolina State University (Professional)	**Title: Participatory Mapping of Cultural Ecosystem Services Impacted by Coastal Squeeze** Development and a rising sea squeeze coastal ecosystems, limiting their ability to provide a range of services that support human health and well-being. Accounting for all of these services leads to better-informed climate adaptation and planning decisions. However, cultural ecosystem services are particularly difficult to measure, value, and monetize, because they are by definition intangible and locally specific. We developed an iterative participatory mapping approach to identify and value

		cultural ecosystem services important to long-term residents of Johns Island in South Carolina, in order to give the same consideration to those as other ecosystem services that are more easily and more commonly mapped. We combined stakeholder-developed maps of cultural ecosystem services with geospatial modeling to assess threats to these services from urban sprawl and sea level rise. We also identified important opportunities to conserve and support adaptation in places that provide multiple ecosystem services. On Johns Island, cultural ecosystem services, which are often located near existing development, are more vulnerable to threats from both urbanization and sea level rise than provisioning or regulating services. The highest values for provisioning or regulating ecosystem services are found farther from these developed areas, limiting the spatial overlap between these different ecosystem services. However, there are specific locations important for both cultural and other ecosystem services, such as carbon sequestration, agricultural production, and coastal protection. We suggest that identifying these opportunities to protect both biophysical ecosystem services and locally-relevant cultural resources will be critical to the success of any forward-looking and equitable planning or adaptation policies.
34	**Jelena Vukomanovic**, North Carolina State University (Professional)	**Title: Incorporating Stakeholder-Derived Conservation Priorities into Models of Coastal Land-use and Land Cover Change** Rapid population growth in coastal South Carolina is exerting considerable development pressure on rural areas, threatening the Lowcountry's unique set of natural and cultural resources. Mitigating these threats requires development of appropriate planning strategies for both urban growth and conservation. These strategies should include local stakeholder perspectives in addition to expert knowledge, as a failure to include these perspectives can lead to ineffective and unpopular initiatives. Our goal was to co-develop conservation solutions for threatened natural- and working landscapes on Johns Island in coastal South Carolina. We used a combination of focus groups and participatory mapping workshops to identify the conservation priorities of long term residents on Johns Island. We used the narratives and maps of priorities from these exercises to develop three hypothetical conservation scenarios that include the following: (1)coastal protective services, (2) working lands, and (3) cultural ecosystem services. We implemented these scenarios in an urban simulation model (FUTURES) to examine alternate futures of development from 2010-2060. We evaluated the spatial patterns of development for all three scenarios and found that traditional conservation approaches, as reflected in the coastal protective services and working lands scenarios, do little to ameliorate the trade-offs between development and cultural ecosystem services. This indicates that we need to consider alternate conservation mechanisms that specifically target cultural ecosystem services if we are to address priorities related to the intangible benefits nature provides. Our findings suggest that the integration of stakeholder opinions and preferences into dynamic simulations of landscape-scale processes can serve as decision- support tools that aid in the development of more relevant, acceptable, and locally-specific policy instruments for resource protection.
13	**Michael Caslin**, North Carolina State University (Student)	**Title: Forests After Florence: Application of 360° Photography and Oral History to Document Hurricane Impacts on Urban Forests and Communities in Coastal North Carolina** With climate change, the increase in frequency of hurricanes has become the new normal. Academic commitments following a disaster are especially challenging. Prior research has demonstrated high rates of stress amongst students following natural disasters. Our aim is to promote science learning through community-engaged research as a pathway to persistence for disaster-impacted students. NC State University (NCSU), like many schools in North Carolina, has many students who were impacted by Hurricane Florence. Many are also low-income or from ethnic minority backgrounds. Research documents the importance of science learning that is connected with local communities and broader societal issues for student persistence. Students also value being able to apply STEM training to solve real world problems affecting their communities.

		Of the 4,797 NCSU students impacted in 2018, we selected 50 to participate in a learning experience focusing on student resilience and hurricane impacts in urban forests. Most students come from the coastal plain which is most susceptible to hurricane damage. Initial surveys found that 21.9% of students (N=110) indicated some level of impact ranging from moderate to substantial, 18.8% indicated major impacts, and 32.3% reported minor impacts. Students reporting a lower level of social integration experience the highest impact. The majority of students strongly agree that temperatures and frequency of hurricanes is likely to increase in the future. Most students also report a high affinity for a diversity of tree species in their neighborhood forest despite relatively moderate knowledge of the local species. During summer 2019, students documented damage to the forests in their communities through: 1. 360° photography at 566 sites, and 2. oral history interviews with community members. This combination of immersive visuals and oral history narratives helps us develop a rich understanding on how both communities and local ecosystems respond to hurricanes and how we build greater resilience.
8	**Julie Whitbeck**, Jean Lafitte National Historical Park and Preserve / National Park Service (NPS) (Professional)	**Title: The Barataria elevation-hydrology array: a landscape scale tool for scientific understanding and resource management** Aware of the rapid rate of relative sea level rise in the Mississippi River delta, and already observing increased flooding at the Preserve itself, in the mid 1990s park resource managers and ecological scholars prioritized understanding the consequences of increasing hydroperiod for the ecological integrity of the Preserve's predominantly freshwater coastal wetlands. They sought tools that would enable observation of change over time and prediction of future change. In 1998, they established a 5 hectare research and monitoring plot in a mature bottomland hardwood ecosystem, spanning a 1 meter elevation gradient. In the next decade, scientists added more long-term research plots and a transect traversing the Preserve's geological backbone. Here we introduce our newest tool, the elevation and hydrology monitoring array. The array consists of 13 stations established along a transect perpendicular to the Mississippi River distributary channel that shaped this landscape, plus 6 stations at key park infrastructure sites. The transect captures most of the geological, hydrological and ecological variation in the upper Barataria Basin. We have installed a benchmark rod, a surface marker horizon and a water level well at each station, and we have provided a surface elevation table collar for all but the floating marsh benchmarks. These stations leverage established vegetation monitoring plots, and they are augmented by a spatially-intensive array of water level loggers deployed across the area of greatest topographic relief and including an impounded area. Can these tools help the park prepare for changing conditions? With similar tools along coasts worldwide, can they inform coastal management at regional scales? How can they contribute to building scientific understanding? Using the Barataria Preserve as a case study, we describe our aspirations for learning from the elevation and hydrology array and from the portfolio of change-observing tools it joins.
19	**Paul Armsworth**, University of Tennessee, Knoxville (Professional)	**Title: Predicting shifts in climatically suitable conditions for vertebrate species of the central and southern Appalachian mountains** Ecosystems of the central and southern Appalachian mountains have a critical role to play in safeguarding US biodiversity. These ecosystems are rich in endemic species and will provide an important refuge and conduit for species moving to change track changing climatic conditions. We used environmental niche models to predict potential range shifts throughout the coming century of 258 amphibian, bird, mammal and reptile species within the region. We focused on species that depend on forested ecosystems and are of regional policy concern. In the aggregate, the models do not predict overall losses of climatically suitable conditions for species. However, this aggregate picture masks local declines. For example, the models predict pronounced losses of suitable habitat and turnover in community composition in the Blue Ridge and Cumberland Plateau and Mountains,

		particularly for amphibian and mammal species. We also correlated the outputs of the environmental niche models with an alternative approach focused on identifying climatically resilient sites based on geological and topographic conditions. We found a positive, if somewhat weak association, between an index of climate resiliency and present and future richness of mammals and amphibians predicted by the niche models. We found no associations between the two for birds and amphibians. This niche modeling work is part of a larger project that is taking a portfolio approach to future-proofing conservation strategies against uncertainty in potential climate shifts and in future land use change.
33	**Lise Montefiore**, North Carolina State University (Student)	**Title: Integrating climate and land use change to capture historical water quality variability among coastal watersheds in the Southeast United States** Changes in climate and land use and land cover (LULC) alter estuarine nutrient loads. Process-based water quality models are commonly used to assess how upstream changes in hydrology and land management influence downstream estuarine water quality. However, these models are data-intensive and computationally-expensive, which limits their applicability at large spatiotemporal scales. The present work aims to develop a model integration framework for use in estuarine eutrophication vulnerability assessments that accounts for eutrophication drivers including LULC and climate, as well as physiographic characteristics of estuaries that may make them susceptible to the effects of increased nutrient loading. A lumped-parameter water quality model was scaled and used to compute the historical nutrient loads for 25 coastal watersheds that drain to estuaries along the Southeast U.S. coasts. This model used the NRCS curve number method to estimate runoff as a function of net rainfall and LULC, and nutrient loading through a range of landscape-specific nutrient export coefficients. Model inputs included historical Multivariate Adaptive Constructed Analogs of climatic observations from 1975 to 2005 and the 2001 National Land Cover Databases. Estuaries' susceptibilities to eutrophication via nutrient loading were estimated based on total freshwater inflow and system geomorphology. Estimated nutrient loads were compared against the Regional Nutrient SPARROW Model Assessments, the 1999 National Estuarine Eutrophication Assessments, and observed nutrient load trends reported by the National Water Quality Assessment program. Results showed that the model was unable to capture exact nutrient loads in relation to SPARROW, but effective at ranking estuaries in terms of their nutrient loads. This finding demonstrates that the model offers utility for qualitative determination of estuarine eutrophication potential.
36	**Emily Reed**, North Carolina State University (Student)	**Title: Landscape Genetics of an Invasive Species in an Urban-Rural Landscape** Urban ecosystems can facilitate all stages of the invasion process. A wealth of historic literature provides evidence into the importance of cities for introduction of invasive species, and recent research has focused on the contribution of urban systems to their successful establishment and spread, especially considering global climate and land-use change. Landscape genetic studies can reveal how anthropogenic features drive dispersal and gene flow in invasive populations. I explore the impact of urban landscapes on gene flow in the tiger mosquito Aedes albopictus, one of the most successful invasive species across the globe. I collected mosquitoes across Wake County, North Carolina as part of a statewide survey monitoring Aedes mosquito populations and assemblages. I sampled 15 locations over 11 weeks using egg traps and built genomic libraries of 192 Ae. albopictus individuals using double digest restriction-site associated DNA sequencing (ddRADseq). I collected spatial data to characterize landscape features across the county from Wake County Government, NC Department of Transportation, and USGS National Land Cover Database. With these data, I built resistance surfaces to test hypotheses about how landscape features influence Ae. albopictus gene flow and dispersal. I found that developed open spaces (mostly vegetated lawns, parks, & golf courses) facilitated gene flow, while impervious surfaces acted barriers to gene flow. This research contributes to a growing body of work that demonstrates how genetic data can enhance our knowledge of how environmental processes affect dispersal, distribution, and evolution of invasive

		species at fine scales. These studies can improve existing programs for controlling invasive species and will help fill knowledge gaps needed for effective, adaptive management.
16	**Haofan Li**, North Carolina State University (Student)	**Title: Hourly PM2.5 Concentration Modeling for Kigali, Rwanda Using Historical Meteorological Data from August to December 2017** Ambient air pollution, especially fine particulate matter (PM2.5) and ozone (O3), is highly associated with premature human mortality. The World Health Organization (WHO) estimates that in 2016, ambient air pollution caused about three thousand deaths in Rwanda. Measurement of these parameters is the first step towards reducing pollution, but air pollutants monitoring is scarce to non-existent in large parts of Africa. In Rwanda, major air pollution sources can be expected to include transportation, thermal power generation, and domestic biofuel use, as well as regional biomass burning and dust, where residential bio-duel burning for cooking is reported to be one of the main contributors of PM2.5. To identify what portion of PM2.5 is coming from residential biomass burning (stove cooking using charcoal and wood), this research focused on using a computational box model to estimate the PM2.5 concentration over Kigali, Rwanda only due to stove cooking. Then use the modeled data to compare with on-site PM2.5 measurements from low cost sensors (RAMPs), to conduct PM2.5 source apportionment for Kigali. The model utilizes hourly historical meteorological data (windspeeds and PBL heights) from GMAO satellite data from August 1st 2017 to December 31st 2017, to model the hourly PM2.5 Concentration for the time frame. The model was able to identify about 2/3rd of the PM2.5 emission is from residential stove cooking, and the rest is traffic related PM2.5 emissions. This modeling research is a component of a big picture air pollution in Kigali research, and the paper has been submitted to and currently being reviewed by Atmospheric Environment.
20	**Jennifer Costanza**, North Carolina State University (Professional)	**Title: The Future of America's Forests and Rangelands: An Overview of the Resources Planning Act Assessment** The Forest and Rangelands Renewable Resources Planning Act (RPA) of 1974 requires the USDA Forest Service to prepare an assessment of renewable natural resources on the nation's forests and rangelands every 10 years. The RPA Assessment provides a snapshot of current U.S. forest and rangeland conditions and trends on all ownerships, identifies drivers of change, and projects conditions 50 years into the future. Resources covered in the RPA Assessment include forests, rangelands, urban forests, forest products, carbon, wildlife and fish, biodiversity, outdoor recreation, wilderness, and water. The RPA Assessment examines how the interaction of economic, social, and biophysical factors affect the productivity of forest and rangeland ecosystems, and their ability to meet increasing demands for goods and services. By developing spatially explicit scenarios of socioeconomic and climatic change, scientists can project how these changes influence ecological processes and alter future resource availability. Many of the individual resource analyses provide information at the State, County, and sub-County scales, offering a science-based, nationally consistent resource that can inform policy choices and natural resource decisions for public and private land managers. Recent RPA Assessments and Updates have shown that the interaction of socioeconomic and biophysical drivers â€“ including land development, climate change, and natural disturbances â€“ continue to influence the extent, pattern, and conditions of forest and rangeland ecosystems, and their ability to meet increasing demands for goods and services. These effects vary regionally and locally, requiring flexible adaptation and management strategies. In addition to the decadal report and associated 5-year updates, supporting documents are produced with more detailed information about methods and results. RPA Assessment documents are available at: https://www.fs.fed.us/research/rpa/.

7	**Shubhi Sharma**, Duke University (Student)	**Title: Generative models for community reorganization under climate change** Niche models are essential tools in predictive ecology, often used to predict impact of climate change on species distribution. For example, niche models can be used to track expansion of species ranges to northern latitudes, one of the earliest signs of a warming world. Recently, a new set of models have become the centerpiece of this effort. Technological and statistical advances have enabled a class of multivariate models that allow ecologists to jointly model abundance of species across multiple taxa, therefore incorporating response of abundance to environmental predictors while accounting for inter-specific interactions. Joint models are used for several purposes in ecology such as estimating residual correlation patterns, grouping species by environmental response, and quantifying effect size of abundance-environment relationships. We specify a joint statistical model for abundance across many taxa, and hence predict in a single model the effect of environmental predictors on abundance, while accounting for inter-specific interaction. Using this model, we estimate relative-abundance weighted habitat suitability for over 300 species of birds, trees, carabids, and small mammals under climate change scenarios RCP 4.5 and RCP 8.5 for two future time periods (2049-2069 and 2079-2099). In our analysis, we incorporate two sets of predictors: climate variables and remote sensing derived variables. The results of this analysis are used to create a webtool that allows users to plot current and future predicted habitat suitability of a species of interest, compare habitat suitability of multiple species, compare climate and remote sensing models, and plot community shifts for multiple groups of species under climate change scenarios.
10	**Casey Thornbrugh**, United South and Eastern Tribes (Professional)	**Title: BIA Tribal Climate Resilience Liaison Program**
9	**Suresh Subedi**, US Geological Survey (Professional)	**Title: Predicting the impacts of future sea level rise on specialist snake species in the imperiled pine rockland ecosystem of South Florida** Predicting the impacts of future sea level rise on specialist snake species in the imperiled pine rockland ecosystem of South Florida Suresh Subedi Abstract: Pine rockland habitats have undergone a significant reduction in area in the Florida Keys. Low-lying islands and coastal areas are becoming increasingly vulnerable to high tide flooding, which is rapidly increasing in frequency, depth and extent, making these areas and the pine rockland habitat they contain at particular risk to the threat of sea level rise. I evaluated changes in habitat under future sea level rise conditions for two native snake species, Rim Rock Crowned snake (Tantilla oolitica) and Key Ringneck snake (Diadophis punctatus acrinus), both of which are state-listed endangered species and are under consideration for federal listing. I used recent and historical species records to determine the current extent of available habitat in South Florida. I then predicted habitat loss and/or degradation under various regional sea level rise and projected high tide scenarios in their current habitat in south Florida (mainland and Florida Keys). My results predict that salt water intrusion will negatively affect upland habitat by 2050 with 80% of the existing pine rockland habitat degraded with 42 cm of sea level rise. Moreover, short-term stochastic events, such as storm surge and king tides, will increasingly inundate the root zone of pine and other terrestrial vegetation before complete inundation. My results further predict that most of the terrestrial habitat used by these species will be underwater by 2080, indicating that sea level rise will likely change current pine rockland habitat into more halophytic habitat (mangrove or salt marsh wetland) in about 50 to 60 years. Therefore, immediate mitigation actions may be needed to conserve upland habitat for specialist species where they are threatened by detrimental habitat modification global climate change.
11	**Ashlyn Shore**, Southeast Climate	**Title: Tribal Resources WebApp**

	Adaptation Science Center (Professional)	In alignment with the SE CASC's objective of working with Tribal Nations and Indigenous Communities to better understand their specific vulnerabilities to climate change and to help them adapt to these impacts, this tool has been developed to provide fundamental resources for climate change adaptation that consider traditional knowledges. Currently, there is not an efficient way for Tribal Nations nor researchers to find resource contacts, information on various Tribal Nations, or initial climate change data. This tool resolves that deficit by providing a web-based platform that hosts climate adaptation resources and general resources for and about Federally Recognized Tribes and State Recognized Tribes. In addition, this tool is valuable for traditional western scientists interested in informing themselves about Tribal Nations and incorporating traditional knowledge into climate change adaptation. The webpage, https://secasc.ncsu.edu/tribal-resources/ contains an interactive click-map of climate adaptation resources considering traditional knowledges for Tribes that can guide and supplement adaptation decisions. Also hosted on this page is the Tribal Resources WebApp which contains geographic information about State and Federally recognized Tribes in the southeast, including web links to connect users with a first-hand account of the Tribe's story. Additionally, phone and email information for designated Tribal points of contact are highlighted to link users with relevant Tribal climate change adaptation experts.
4&5	**James Cronin,** U.S. Geological Survey (Professional)	**Title: Quantitative, spatial decision support tools for establishing Brown Pelican, Black Skimmer, and Gull-billed Tern habitat objectives** Quantitative, spatial decision support tools for establishing Brown Pelican, Black Skimmer, and Gull-billed Tern habitat objectives. James Patrick Cronin1*, Blair E. Tirpak1*, Leah L. Dale2*, Virginia L. Brink2*, John M. Tirpak3*, William G. Vermillion4*, and Barry C. Wilson4*. 1U.S. Geological Survey, Wetland and Aquatic Research Center; 2Cherokee Nation Technology Solutions, in support of the U.S. Geological Survey; 3U.S. Fish and Wildlife Service; 4Gulf Coast Joint Venture, U.S. Fish and Wildlife Service * Street address of all offices is 700 Cajundome Blvd, Lafayette, LA 70506 Restoration programs for the Gulf of Mexico are increasingly funding coastal habitat managers to implement a variety of restoration actions to meet species needs and recover injuries. There is uncertainty about the ability of these management actions to achieve population objectives because species are often stressed by factors that interact and differentially influence them across large scales (e.g., habitat loss and degradation, predation, and human disturbance). This challenge makes it difficult for managers to establish habitat objectives and translate them into the actions necessary to meet population objectives. In this study, we developed interactive quantitative, spatial models that predict the number of nests for Brown Pelican (Pelecanus occidentalis), Black Skimmer (Rynchops niger), and Gull-billed Tern (Gelochelidon nilotica) at sites across the Northern Gulf of Mexico. We then used both the modeling results and established population objectives to derive habitat objectives for each species. Visitors to our demonstration booth will be able to run model scenarios and inspect spatial outputs. The findings and conclusions in these tools are those of the author(s) and do not necessarily represent the views of the U.S. Geological Survey or the U.S. Fish and Wildlife Service.
1	**Katie Warnell**, Nicholas Institute for Environmental Policy Solutions, Duke University (Professional)	**Title: Ecosystem Service Map Products to Support Conservation Planning** Ecosystem services, the benefits that people receive from nature, provide an additional lens through which to view landscape conservation and restoration. By considering how management actions affect ecosystem services, managers can engage new partners, plan projects to maximize total benefits for stakeholders, and more effectively communicate the value of management to decision makers. Through our work with the Southeast Climate Adaptation Science Center, we have mapped several ecosystem services at the landscape level across the southeastern United States. These maps incorporate both the supply of ecosystem services (where ecosystems have the capacity to provide a service that could be of use to people) and the demand for those services (where people or other entities use or appreciate the service). We use this information to identify target areas for

		conservation and restoration at the regional scale. Map products for several ecosystem service analyses, including wild pollination, recreational birding, and open space access, are now available for download from ScienceBase. Products include regional priority areas at the county and watershed levels as well as underlying information that enables users to refine the prioritization for specific areas of interest. During this tool demonstration, we will show how ecosystem services map products can be used individually, in combination, and alongside other spatial conservation information to guide planning and communication about landscape-level conservation. We look forward to hearing your ideas about how ecosystem services mapping could inform your work and welcome your feedback about how we can make these products more useful to the SE CASC community.
14	**Karen McNeal**, Auburn University (Professional)	**Title: Eye-Tracking for Understanding Climate Decision Support Tools** Eye-tracking technology is a robust tool that allows the researcher to understand where and for how long a user is attending to various features of visual stimuli. It tracks a users' eye-movements on a screen or in the real-world to analyze their interactions with a wide range of information. It can be used to evaluate decision support systems that are developed to help managers understand the impacts of climate change for their specific needs. Researchers at Auburn University are using this technology for past and on-going projects with the SECASC. Come by to check out this technology yourself!
15	**Beth Stys**, Florida Fish and Wildlife Conservation Commission (Professional)	**Title: Florida Conservation Planning Atlas** The Florida Conservation Planning Atlas (CPA) is a data discovery, visualization, and analytical platform for stakeholders throughout Florida. The CPA was developed to create a common platform to increase collaboration based on the Florida Conservation Blueprint â€“ representing landscape conservation priorities and actions that sustain natural and cultural resources. With the Florida CPA users can search for spatial datasets, visualize supported projects, and learn more about landscape scale conservation science and design in the region. The CPA also allows its users to create groups of members from several organizations who may have the same conservation goals. Within a group, you can perform analyses, upload data, and share information for other group members to use. Tools found on the CPA include the Climate Adaptation Explorer, Conservation Actions Tracker, Fire Map Viewer, Simple Map Viewer and Advanced Mapper. The Climate Adaptation Explorer (CAE) provides information about climate impacts to Florida's species and habitats along with actionable adaptation strategies to help mitigate those impacts. The Conservation Actions Tracker (CAT) helps the user capture and share conservation actions, such as restoration projects. The Fire Map Viewer allows the user to view and explore the foot prints of fires occurring across the state of Florida. These fire foot prints can be queried against multiple datasets, including land cover, species habitat, and management ownership. The Simple Map Viewer provides a simple way to explore conservation data across Florida at the watershed level, including Florida's conservation assets, species, and other conservation priorities. You can use this tool to find watersheds with the highest priorities based on your criteria. The Advanced Mapper empowers the user to combine and overlay spatial data from many sources, including conservation priorities, species, and habitat information within Florida.
2	**Rachel Kirpes** US Fish & Wildlife Service (Professional)	**Title: Strategic Conservation Assessment of Gulf Landscapes tools** Strategic Conservation Assessment of Gulf Landscapes The Strategic Conservation Assessment of Gulf Landscapes (SCA) project is led through a cooperative partnership between Mississippi State University and the U.S. Fish and Wildlife Service, in direct collaboration with a core team of RESTORE Council agency representatives, conservation planners, as well as the broad community of

		stakeholders representing non-governmental conservation organizations, corporate entities, and private landowners with interest in Gulf Coast Conservation. The goal of the SCA project is to develop land conservation planning tools that will enable users to identify the multitude of benefits that can be achieved through conservation of Gulf Coast lands. We will have two tools for users to test drive at the Southeast Climate Adaptation Science Center Regional Symposium including an Inventory of Gulfwide Plans and Priorities and a Gulf Coast Conservation Prioritization Tool (CPT). The Gulf Coast Conservation Prioritization Tool (CPT) has as its primary audience the members of the RESTORE Council. However, the tools are relevant to the broad land conservation community, including land trusts, federal and state agencies, nongovernmental organizations as well as private industry. The CPT is a project evaluation tool that will enable a user to evaluate a proposed conservation project or suite of projects. The tool requires users to identify a project footprint or area of interest and offers users multiple pathways for project evaluation. Individual users can prioritize the goals and attributes that reflect their values and evaluate projects accordingly or can utilize a randomly generated weighting scheme to evaluate how well the project areas meet all goals and priorities. PRESENTER: Jennifer Roberts Mississippi State University jennifer.roberts@msstate.edu
3	**Rene Collini**, NGOM Sentinel Site Cooperative/Mississippi State University/MS AL Sea Grant (Professional)	**Title: New Localized Two-Pagers for Gulf of Mexico Federally-Managed Lands** Federally-managed lands along the Gulf of Mexico coast are highly vulnerable to sea-level rise. In some areas, high rates of relative sea-level rise are already negatively impacting critical coastal habitat and infrastructure. Without locally-relevant information on the range of potential future sea levels and their impacts, it is very difficult to adequately develop long-term plans for federally-managed parks, reserves, and preserves along the Gulf Coast. A recently released dataset (Sweet et al., 2017) provides regional (1 degree latitude x 1 degree longitude) projections of future relative sea-level rise, taking into account climatic signals and vertical land motion. These data, while extremely valuable, were not easily accessible or translatable. Our project team adapted existing two-pagers available for these data to specifically address federally-managed lands across the Gulf of Mexico (e.g., National Wildlife Refuges, National Parks, National Estuarine Research Reserves). As sea levels rise, coastal flooding will become more frequent and occur in more places. In addition to the potential effects on low-lying roads, buildings, and infrastructure, sea-level rise is expected to lead to more nuisance flooding and increased saltwater intrusion, which may transform many coastal ecosystems. Under higher sea-level rise scenarios, some ecosystems may be lost, while others may move upslope at the expense of less flood- or salt-tolerant ecosystems. Our demo will cover where these two pagers can be found and how they can inform discussions around sea-level rise preparedness and planning.
6	**Kathie Dello**, State Climate Office of North Carolina (Professional)	**Title: The Fire Weather Intelligence Portal** The Fire Weather Intelligence Portal (FWIP), accessible at https://climate.ncsu.edu/fwip/, is a real-time monitoring tool for weather and fire risk information developed by the State Climate Office of North Carolina. The FWIP offers easy access to past, current, and short-term forecast conditions for a variety of point-based weather parameters measured or calculated using weather station observations, along with gridded datasets such as high-resolution weather, drought, and fire danger indices. Originally created with support from the North Carolina Forest Service beginning in 2011 and expanded across the southeastern US in 2017 with support from the USDA Southeast Regional Climate Hub, the FWIP has been used by foresters, land managers, and state and federal agencies across the region to plan prescribed burns, analyze historical conditions affecting burn success, and track environmental indicators of drought and fire danger, including National Fire Danger Rating System indices. Development of the FWIP is ongoing, with recent and planned additions including organic soil moisture monitoring observations from four sites in eastern North Carolina, atmospheric dispersion and stability parameters calculated using the National Blend of Models forecasts, and data from the National Weather Service's Fire Weather Forecast products.

32	**David Reidmiller** USGS	**NCA 4**
28	**Rachel Sussman** Global Change Fellows Program (Student)	Title: Global Change Fellowship Program The Global Change Graduate Fellows Program is designed to train the next generation of global change scientists by providing financial, scientific, and professional development support for graduate students who are interested in multi-disciplinary research. They come together across disciplines to discover, collaborate, and share their knowledge with diverse stakeholders. This program is sponsored by the DOI Southeast Climate Adaptation Science Center and NC State University.
37	**Kate Jones** Global Change Fellows Program (Student)	**Title: Southeast Climate Adaptation Science Center** The Southeast Climate Adaptation Science Center is part of a network of eight Climate Adaptation Science Centers managed by the U.S. Geological Survey National Climate Adaptation Science Center. We work with natural and cultural resource managers to gather the scientific information and build the tools needed to help fish, wildlife, and ecosystems adapt to the impacts of changing climate and land use.