Poster/Tools Networking Session Directory

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POSTERS

Presenter Name	Presentation Title/Abstract
	Theme: Adaptation Challenges & Successes
Jena (Ally) Brown, Auburn University	**Title: Evaluating the Usability of the EzGCM Climate Modeling Toolkit and its Impact on Undergraduate Students' Understanding of the Climate Modeling Process and Perceptions of Climate Change Science** Complex Global Climate Models, or GCMs, are one of the primary tools used by scientists to make projections about the future of Earth's climate system. Despite their importance in climate science, inaccessibility to models combined with their complexity leaves many students and educators unaware of the interworking's of climate models. However, EzGCM, an educational climate modeling webtool, was created to teach about the modeling process. The goal of this two-part study is to evaluate the usability of the EzGCM software and to measure how the tool influences students' understanding of the climate modeling process and perceptions of climate change. The first part of the study will implement eye-tracking, a technology that is used to monitor where and for how long participants view a given webpage, with entry level college students (n=60) to evaluate the user satisfaction, accuracy, and efficiency of EzGCM in order to help designers identify improvements to this web tool. After an improved version of the tool is established, subsequent research will measure the efficacy of EzGCM as a teaching tool by implementing the webtool into the lab section of an introductory undergraduate course and measuring content knowledge through pre-post tests and thematic coding of completed student products. Through this research, lessons learned about usability from the first study will fortify user-centered design frameworks that can be incorporated into new scientific pedagogical tools. Additionally, an inquiry-based lesson plan teaching climate modeling using EzGCM will be validated so that other universities can incorporate it into their climate curriculum. This presentation will provide an overview of the study design and methodological approach and include preliminary data collected to date.
Michael Flynn, National Park Service	**Title: Coastal Adaptation Planning at Cape Hatteras National Seashore** National Seashores are cherished public lands with rich environmental, cultural, and historic resources. Cape Hatteras National Seashore is one such coastal asset that is both bountiful yet vulnerable, with historic lighthouses, critical habitats, and recreational amenities alike facing threats of sea level rise and continual storm and climate change impacts. Over 3 million visitors to the Seashore in 2021 set an annual visitation record. Historic resources such as Bodie Island Lighthouse and Ocracoke Lighthouse are among the most visited sites, yet these assets are also among those most vulnerable to flooding, compromised structural integrity, and reduced accessibility. Future challenges to the protection and management of such resources are already being felt in the form of storms, extreme rainfall, and recurrent compound flooding. Such threats are also coincident with increasing visitation and recreational demand. This poster examines the science-based data that is being collected and management efforts underway to inform future planning, intervention, or adaptation to sea level rise and barrier island evolution. The poster identifies the opportunities for mitigation and adaptation as well as potential environmental tipping points and limits to resilience by assessing frequency and magnitude of flooding events and shoreline change.
Geneva Gray, North Carolina	**Title: Extreme Precipitation in a Warmer World**

State University	The urban environment is especially vulnerable to extreme precipitation events due to the density of infrastructure and population. The stochasticity of extreme precipitation creates a technical barrier to producing outcomes in these high-density locations. This project blends downscaling methods through a storylines lens to provide multiple scenarios and levels of information to decision makers and community members. Collaborating with municipal practitioners defined the parameters of the study and conversations with community leaders provided a much needed lived-experience perspective.
Courtney Hotchkiss, North Carolina State University	**Title: Archaeological Site Stewardship in a Changing Climate: Lessons on Meaningful Engagement with Tribal Nations** Policy Memo 14-02 from the director of the National Park Service (NPS) states that cultural resources need to prepare for climate change impacts by integrating a variety of input to inform the prioritization of sites and landscapes Archaeological sites are a type of cultural resource that will require special attention to sensitive locational information, disturbance to context, and sudden exposure of known and/or undocumented sites Archaeological sites are often the culture heritage and important places of associated Tribal Nations, and, therefore, adaptation planning must include their values, perspectives, and input This research offers insights into engagement efforts with NPS staff and citizens and staff of Tribal Nations for meaningful engagement and collaboration.
Richard Nisbett, Forest Partners International	**Title: The Artful Science of Community Engagement: Participatory Design for Rewilding, Regeneration, Restoration** Emerging from the social sciences—particularly the field of development anthropology—participatory action research (PAR) has been used broadly on the frontlines of development in the Global South. Three novel orientations from classical anthropology are key design features: participant-observation, comparative analyses and deep historical context--because local history is both a barrier and a bridge to the possible. The participatory approach is a process that maximizes participation and buy-in, seeking to empower the community, align the expectations and priorities of, and leverage the resources and expertise of, the partnering stakeholders. It attempts to level the playing field and elicit diverse voices and lived experiences in order to create a new space for collaborative action, recognizing that capacity building entails upskilling in both the technical and social dimensions of collaborative implementation. PAR process is: (1) interactive, consensus oriented; (2) iterative; (3) reflexive; (4) adaptive/ transformational; and (5) intentional. Accordingly, PAR designs employ hybrid quantitative and qualitative methods using rigorous inferential statistics to validate tools and techniques for implementation, monitoring and impact evaluation. PAR methods and techniques have been applied extensively for community mobilization, engagement and intervention. This presentation will briefly touch on the history, theoretical basis, strategic designs, tool & techniques and professional principles & ethics of PAR for community engagement. It will focus on two case studies of highly effective PAR strategies: the WHO's community-directed interventions and CIFOR's adaptive collaborative management (of natural resources). Both interventions deployed in several communities in multiple countries across the Southern Tropics among populations characterized as resource-poor, remote locality, high poverty, food insecure, and high illiteracy yet both demonstrated efficacy and replicability in reaching targets set by multi-lateral international agencies. I conclude with lessons learned and recommendations towards building a community of practice for ecological rewilding, regeneration and restoration.
Barrett Ristroph, Ristroph Law, Planning, and Research	**Title: Community Relocation in the Gulf South** Conversations about adaptation often overlook the need for communities to adapt in ways that allow them to stay together. Indeed, the 2017 Louisiana Coastal Master Plan only includes one line regarding community relocation, despite the fact that many communities along the coast will be lost due to flooding, subsidence, erosion, and coastal storms. Across the Gulf South, there is a need for a dialogue about how communities can relocate as a whole, what are the best practices and funding strategies

	currently available, and what policy changes should be pursued to facilitate this form of adaptation. This poster considers communities that are imminently threatened by climate change and other environmental impacts, their desire to persist as communities, and what options are available to them. The work is formed by my assistance of Alaskan indigenous communities with relocation and adaptation, my work in Louisiana, and my service on a National Academies of Science committee on community relocation in the Gulf South. The presentation does not represent the view of the National Academies or anyone other than myself.
Jennifer Rote, The Nature Conservancy	**Title: From Concept to Management – Applying The Nature Conservancy's Managing for Climate Resilience Guidance to 4 Florida Preserves** In late 2021, a team of science and stewardship staff from The Nature Conservancy (TNC) internally published, "Managing for Climate Resilience of The Nature Conservancy Preserves and Managed Lands in the Eastern United States" to serve as an initial compilation and synthesis of actionable climate change research and provide a framework for incorporating principles of climate resilience into land management. We defined 'managing for climate resilience' as an adaptive management process that maintains the resilience of and/or improves the ability of a terrestrial system in adapting to a changing climate. This work is intended to complement TNC North America's Resilient Sites analysis, which identifies a network of lands across the continental United States with the physical properties and landscape connections that may buffer the impacts of climate change by giving species the room to move and adapt. The Florida Chapter of TNC has embarked on a project to apply this guidance to 4 preserves within our Center for Conservation Initiatives (CCI). We are working with the Northern Institute of Applied Climate Science (NIACS) to apply their Climate Adaptation Workbook, which was identified as a tool within the guidance, to the preserves. The results of this project will be climate informed management strategies and monitoring incorporated into our management plans. This project will also be utilized as an additional case study to share within TNC's stewardship network, building off a number of TNC Chapters who have applied the NIACS workbook, increasing the habitats considered and understanding of this tool within TNC.
Sara Martin, Mississippi State University and MS-AL Sea Grant	**Title: Lessons learned from a living shorelines assistance program** Natural shorelines provide ecosystem services that are integral to maintaining healthy and resilient coastal ecosystems and communities. However, anthropogenic and environmental stressors are reducing the extent of natural shorelines and, thus, their capacity to provide critical ecosystem services. Small-scale private property owners own an overwhelming majority of waterfront property in coastal Mississippi and Alabama. Therefore, environmentally-focused management of private shorelines can provide large-scale benefits. Unfortunately, the most common shoreline management strategies for private property owners are hardened structures (e.g., bulkheads and seawalls) that are known to impair coastal ecosystems. An alternative to hardened shorelines is living shorelines, which are a collection of shoreline stabilization techniques that incorporate natural materials such as native shoreline plants. To promote living shorelines with private property owners, the Mississippi-Alabama Sea Grant Living Shorelines Program and its partners began producing guidance documents, offering technical assistance, and conducting trainings for private property owners and contractors. Throughout these interactions, property owners and contractors have expressed their potential barriers to living shoreline adoption and needs (living shoreline research, communication, and training). In this presentation, we will discuss the status of addressing those barriers and needs as well as introduce some new living shoreline assistance programs in Mississippi and Alabama.
Theme: Changing Southeastern Landscapes	
Elyssa Collins,	**Title: Predicting flood damage probability across the conterminous United States**

North Carolina State University [Presented by **Georgina Sanchez**, North Carolina State University]	Floods are the leading cause of natural disaster damages in the United States, with billions of dollars incurred every year in the form of government payouts, property damages, and agricultural losses. The Federal Emergency Management Agency oversees the delineation of floodplains to mitigate damages, but disparities exist between locations designated as high risk and where flood damages occur due to land use and climate changes and incomplete floodplain mapping. We harnessed publicly available geospatial datasets and random forest algorithms to analyze the spatial distribution and underlying drivers of flood damage probability (FDP) caused by excessive rainfall and overflowing water bodies across the conterminous United States. From this, we produced the first spatially complete map of FDP for the nation, along with spatially explicit standard errors for four selected cities. We trained models using the locations of historical reported flood damage events (n = 71 434) and a suite of geospatial predictors (e.g. flood severity, climate, socio-economic exposure, topographic variables, soil properties, and hydrologic characteristics). We developed independent models for each hydrologic unit code level 2 watershed and generated a FDP for each 100 m pixel. Our model classified damage or no damage with an average area under the curve accuracy of 0.75; however, model performance varied by environmental conditions, with certain land cover classes (e.g. forest) resulting in higher error rates than others (e.g. wetlands). Our results identified FDP hotspots across multiple spatial and regional scales, with high probabilities common in both inland and coastal regions. The highest flood damage probabilities tended to be in areas of low elevation, in close proximity to streams, with extreme precipitation, and with high urban road density. Given rapid environmental changes, our study demonstrates an efficient approach for updating FDP estimates across the nation.
Ken Krauss, U.S. Geologic Survey	**Title: Nutrient Loading and Mangrove Forest Response at J.N. “Ding” Darling NWR on Sanibel Island, Florida, USA** Of the critical threats that mangrove forests face globally, eutrophication is among the more subtle and slow to manifest. Contemporary development and watershed management has increased loading of phosphorus (P) into some estuaries. One source, the Caloosahatchee River, flows southwest across the historical Everglades and terminates at a mangrove-lined estuary within J.N. “Ding” Darling National Wildlife Refuge. There, soil total P concentrations are as high as 3-4x that of other south Florida mangroves, raising questions about whether such P loading is reducing mangrove resilience. We report on a three-year study that measured stand productivity and surface elevation change on plots fertilized with nitrogen (N) or P versus background levels (control) to elicit potential threshold responses for modeling future change. We discovered only modest influences of additional N and P loading on productivity, with litterfall production and diameter growth increment in both N and P treatments being suppressed versus unfertilized controls. Soil surface elevation change in N- or P-fertilized plots within fringe and basin zones did not differentiate from controls but differed between zones due to different geomorphological processes. The discovery of subtle rather than large responses of mangroves to N and P loading contrasts to the responses of stunted mangroves from the wider Caribbean region. These results suggest that Ding Darling mangroves may be at their threshold of responsiveness from decades of previous nutrient loading. The reduced rate of litterfall in nutrient treatments, specifically P plots, and lower rates of production (litterfall and roots) compared to oligotrophic sites might suggest that high nutrient loading can be an additional stressor reducing production and resiliency to SLR. We provide additional inference through wetland sustainability modeling (WARMER). Any management protocol that reduces river-borne nutrient loading to oligotrophic mangroves may also reduce future uncertainty of mangrove resilience to different rates of future sea-level rise.
Margaret Lawrimore, NC State University - Center for Geospatial Analytics	**Title: Forecasting scenarios of human mobility and shifts in development patterns driven by future flood hazard conditions** Climate change and sea level rise induced flooding is expected to lead to large scale human migration in the US. Climate migrants—driven by interacting forces such as environmental hazards, economic advantages, natural amenities, and comfortable temperatures—are likely to reshape landscapes and threaten natural resources. Forecasting scenarios of human mobility and

	changing development patterns is crucial for anticipating the need for new policies and/or investments to protect people and assets and manage resources. Here, we leverage recent advances made to the open source land change model FUTure Urban Regional Environment Simulation (FUTURES 3.0), to forecast retreat and resettlement of at-risk residents threatened by future flood hazard conditions. We used a three-county test case location in coastal South Carolina that includes the fast-growing Charleston Metropolitan Area to visualize anticipated nearby and widespread migration fluxes. The flexibility of FUTURES 3.0 accommodates user-specific scenarios of change to represent the influence of land use policies, alternative management strategies, and the inclinations or adaptive capacities of different communities.
Megan Malish, University of Oklahoma	**Title: Climate Change Induced Alterations of Connectivity in Three Southeastern Watersheds** Changes in stream drying patterns and watershed connectivity have the potential to greatly impact ecological systems. Stream drying is increasing due to changes in climate, land use, and societal water use in many regions. Here, we quantify spatiotemporal drying patterns in three watersheds in the Southeastern United States: West Prong Little Pigeon River, TN; Mayfield Creek, AL; and Chickasawhatchee Creek, GA. We used a hydrological model to simulate daily stream flow under current and future climate scenarios. For each scenario, we calculated temporal metrics of drying (dry days, dry periods, dry period duration) and metrics of spatial connectivity (wet length, number of dry stream fragments, length of dry stream fragments, and dendritic connectivity index). Finally, we will look for evidence of the presence of connectivity thresholds in the watersheds by modeling the relationships between daily discharge and dendritic connectivity index. Given that habitat connectivity is essential to ecosystem structure and function, our results underscore the need for water management strategies that recognize the potential for outsized impacts of increased stream drying on freshwater ecosystems and the services they provide.
Michelle Moorman, USFWS	**Title: Hanging in the balance: Long-term trends in coastal wetland dynamics in the South Atlantic Basin in the face of sea-level rise** Coastal wetland ecosystems provide important habitat for many of the US Fish and Wildlife Service's trust species, and they deliver critical ecological functions. Two recognized threats to coastal wetland stability and the wildlife that depend on these ecosystems are the projected accelerated rates of sea level rise and wetland subsidence. Projections, particularly static inundation models, led the National Wildlife Refuge System to undertake systematic monitoring on refuges across the country to determine our coastal wetland ecosystems' potential resiliency in the face of sea level rise. This will provide critical information to identify management actions needed to resist, accept, or direct ecological transformations of coastal wetlands in the National Wildlife Refuge System. The Coastal Wetland Elevation Monitoring Program has monitored site-specific surface elevation and accretion trends for priority coastal wetland habitats on refuges across the South Atlantic Basin since 2012. We have determined rates of wetland elevation change and compared results to estimates of sea level rise across four coastal habitat types; oligohaline marshes, salt marshes, forested wetlands, and pocosin wetlands. This network was designed to provide surveillance monitoring for the purpose of projecting the trajectory of our coastal wetland habitats for management. With the information from 10 years of surveillance, managers can now consider these trajectories to help inform their decisions regarding coastal wetland conservation.
Justine Neville, U.S. Geologic Survey	**Title: Marshes in Flux: Surface Elevation Change Trends Across the Southeastern United States** Coastal wetlands are heralded as some of the most valuable ecosystems in the world, but these systems have been undergoing accelerated change due in part to climate change driven sea level rise. The viability of coastal wetlands in the face of sea level rise is a contentious topic with no consensus across researchers globally. One way that wetlands can resist and adapt to sea level rise is by vertically adjusting via accretion at rates equal to or greater than relative sea level rise, but much of this

	work focuses on singular sites with short-temporal records (1-3 years). Until recently the primary method for measuring surface elevation change, vertical accretion, and shallow subsidence was still in its infancy, inhibiting large scale analyses and syntheses of coastal wetland change due to sea level rise. Now that the surface elevation table – marker horizon (SET- MH) method has come of age, we present a regional scale synthesis of coastal wetland elevation change spanning the southeastern United States, covering both the southeastern Atlantic and Gulf Coasts. Results reveal high spatial variability in elevation trends of coastal wetlands. From these results we suggest hypotheses of dominant mechanisms which influence this spatial variability.
Georgina Sanchez, North Carolina State University - Center for Geospatial Analytics	**Title: Improving forecasts of societal responses to sea level rise and frequent flooding** Policy-relevant flood risk modeling must capture interactions between physical and social processes to accurately forecast impacts from scenarios of sea level rise and inland flooding due to climate change. We present the first land change model to integrate three components of future flood risk relevant to decision-making: exposure, flood hazard, and adaptive response. Specifically, we developed a new version of an open source land change model (FUTURES 3.0) that can probabilistically predict urban growth while also simulating human migration and other response actions. We found that simultaneously modeling urban growth, flood hazard change, and adaptive response predicted an intermediate amount of total developed land exposed to future flooding compared to modeling approaches that either did not account for urban growth or did not account for adaptive response. Our flexible, scenario-based approach advances local to national-scale efforts to evaluate tradeoffs between adaptation strategies in response to global anthropogenic change.
Hang Song, Auburn University - Geoscience Department	**Title: Temperature, Precipitation, and Vapor Trends of 3018 Counties in the US. Mainland (1981-2020)** Global warming is the top topic mentioned nowadays. In the US, the trends of county-level climate data could be used to observe and analyze the climate change in different parts of the US mainland. Also, when compared with the county demographic data, the relationship between climate data and human behaviors could be studied. The author collected the daily climate data of all the 3108 countries in the USUS mainland (States without Hawaii and Alaska) between 1981 and 2020. Trends maps of the six different climate data show the changing rate of climate data can help understand the differences among each part of the USUS in the past 40 years.
Theme: Impacts on Habitats, Animals, People	
Scott Alford, University of Florida - Nature Coast Biological Station	**Title: Watershed Modification Effects on Coastal Ecosystems: A Synthesis from Key Gulf of Mexico Estuaries** Estuaries of the Gulf of Mexico contain valuable wetlands that provide numerous ecosystem services and functions, including supporting diverse ecosystems, providing productive fisheries, and buffering wave energy from storm events. Freshwater from terrestrial runoff combined with coastal marine waters to drive estuarine environmental conditions, subsequently determine ecological processes within coastal systems. However, land-use to meet the needs of a growing human population and climate-induced changes throughout watersheds also alter water availability and quality, affecting estuary-derived natural resources. We summarized five case studies from major watersheds that feed northern Gulf of Mexico estuaries (Galveston Bay, TX; Mississippi River Delta, LA; Big Bend of Florida; South Florida) to examine effects of watershed modification on coastal ecosystems. Studies were selected to provide comprehensive descriptions of watershed modifications on estuaries of the Gulf of Mexico. Based on these examples, we developed a conceptual model describing effect pathways of changes in freshwater inflow on coastal ecosystems. Our synthesis indicated that anthropogenic modification of watersheds affects estuarine food webs by affecting seasonal processes through timing and quantity of

	fluvial resources, altering species interactions through changes in community structure, and impacting foundation species on which ecosystems services depend (e.g., oysters, seagrasses). These effects will most likely be exacerbated by climate change. Watershed management presents an opportunity to mitigate threats to coastal natural resources, but these efforts often require cooperation across multiple levels of government and stakeholders to balance conflicts of inland and coastal interests.
Amanda Beard, Jackson State University	**Title: Urban Heat Islands: Radial Climate Effects of Heat Islands** Urbanization has had multiple effects, positive and negative, on society and nature resulting from manipulation of the environment. A very prominent issue is urban heat islands, which may be exacerbated by climate change. Heat islands are concentrated urban areas that emits higher temperatures than surrounding areas. The most common example of a heat island is parking lots, especially those constructed of asphalt material. As human settlements evolved, so has the way we live, requiring accommodations in how to respond to accompanying environmental and associated health risks. Hardscaped areas, heavily paved roads, and other materials that absorbs excessive amounts of heat are more likely to produce heat islands. Specifically in areas that are densely urban like metropolitan cities. In densely populated urban areas, persons living in or near heat islands can be adversely affected economically and environmentally. However, there are ways to help reduce these extreme hotspots by considering environmentally friendly material, design tactics, and introducing green environmental initiatives, or enforcing greener environmental policies and regulations. With the most effective technology, building materials, policy and regulations, decision-makers can make rational decisions while considering the benefits derived from creating greener and healthier environments as well as the consequences for failing to confront this serious environmental risk. The purpose of this research is to demonstrate the risks associated with heat islands in densely populated urban areas. Data for the study are drawn from the Environmental Protection Agency, National Oceanic and Atmospheric Administration, and tools that track the intensity of heat island emissions through multiple units of measurements. Research that is analyzed will conclude the effects of heat islands economically and environmentally while proposing solutions to help reduce heat island emissions.
Jared Bowden, North Carolina State University	**Title: Exploring Relationships Between Emerging Climate Change Signals and Species Range Shifts** There is a need to bridge conservation efforts with climate science and modeling to better understand and identify emerging issues for species as the planet warms. Recently, new methods and technical capabilities have resulted in significant improvements in efforts to quantify uncertainty related to natural climate variability when considering emerging climate change signals. This is particularly important for conservation and adaptation efforts because natural climate variability will remain an often-dominant contributor to near-term climate trends, and many natural resource management decisions operate on the scale of years to decades. Moreover, there is significant variability in observed species range shifts and differences in exposure to climate change may explain some of the variability amongst species. To assess the extent to which climate exposure can explain observed shifts, we need to identify regions that have experienced detectable changes in those aspects of the climate system that species are sensitive to. It is also important to better understand how historical and projected future climate change signals overlap with current efforts to monitor species distributions, which can be applied to help target future monitoring and conservation efforts. For example, areas where strong climate signals are anticipated to emerge but current species monitoring efforts are limited, especially if they harbor significant diversity, could be ideal places to invest in monitoring. This study uses initial condition large ensembles from several global climate models to quantify the Time of Emergence (ToE) of a climate change signal for 11 biologically relevant temperature metrics for the period 1901-2100. The ToE for these different temperature metrics is combined with a comprehensive literature review of species range shifts to test the hypothesis that species range shifts coincide with climate change signals that have emerged beyond that of natural variability. This study also is motivated by the need to understand where scientists may need to expand species monitoring

	efforts including where climate signals have emerged within the observational record but species monitoring is limited, and places where the climate models indicate signals will emerge in the near future. Improving our ability to explain past and future species range shifts will help to improve management and conservation efforts.
Haven Cashwell, Auburn University	**Title: Enhancing Climate Resiliency and Climate Communication in Southeastern United States through Co-Production** This current research on climate resiliency is divided into three different projects. The first project includes eye-tracking a decision support system known as CAnVAS which stands for Climate Analysis and Visualization for the Assessment of Species Status. CAnVAS shows how endangered species in the Southeastern United States will be impacted by climate change. Eye-tracking will be conducted with stakeholders in the United States Fish and Wildlife Service (USFWS) to accurately gauge how USFWS biologists will engage with this tool since they will need to include climate information in species status assessments for endangered species. The second project involves testing the same CAnVAS tool in the classroom setting to gauge undergraduates' perspectives and understanding about how climate change is going to impact endangered species in the Southeastern United States. The third project involves working with two underserved communities in North Carolina to understand how these communities conceptualize both climate change and climate change adaptation. This will be accomplished by working with members in these communities to create expressed mental models to illustrate how citizens of these communities conceptualize these topics. These three projects all use the concept of co-production. Co-production is the process of science makers collaborating with science users to create a successful product (Meadows et al. 2015). For the first two projects, CAnVAS has been developed in partnership with the State Climate Office of North Carolina and stakeholders in the USFWS. The third project is directly working with community members and researchers to develop expressed mental models. Overall, these three projects hope to enhance climate resiliency in various ways across the southeast by showing how endangered species will be impacted by climate change and how community members can communicate and educate others about climate change.
Marcello DeVitis, Southeastern Grasslands Initiative	**Title: Southeastern Grasslands Initiative: We work to conserve, restore, and promote native grasslands throughout the Southeast** The Southeastern Grasslands Initiative (SGI) is a conservation organization based out of Austin Peay State University's Center of Excellence for Field Biology, Clarksville, Tennessee. SGI's mission is to integrate research, consultation, training, and education, along with the administration of grants, to create innovative solutions to address the multitude of complex issues facing the conservation and sustainable management of the Southeastern grasslands (including balds, barrens, dunes, glades, meadows, prairies, river scours, and savannas) and grassland-related (open wetlands: fens, bogs, freshwater and salt marshes, open woodlands) ecosystems. These habitats harbor 50% of the terrestrial biodiversity of the southeastern US and support disproportionate numbers of rare plant and animal species and in some cases qualify as global or regional hotspots of biodiversity. However, they have been reduced by approximately 90-99% since European settlement, as the result of agriculture, overgrazing and replacement by non-native grasses, urbanization, and succession to forests (afforestation) via fire suppression and/or other factors. Surviving remnants of these target habitats now face a variety of threats and challenges, including: invasive species and climate change; lack of public education and public awareness; declining expertise in botany and field biology; diminished resources such as staffing and seed banking facilities; and scarcity of appropriate native plant materials needed for conservation. Also, historically, the southeastern US has experienced a higher frequency and cost from billion-dollar natural disaster events, which affect native ecosystems as well as human infrastructure. These losses and natural disasters have huge impacts on native ecosystems and human well-being. Since 2017, SGI has developed several programs, such as the Rare Plant, the Habitat Management, and the Native Seed Programs to implement eight conservation strategies, which include seed-banking, improving native seed resources, and supporting land owners with the restoration and management of their lands.

Luke Evans, University of Florida	**Title: The future of invasion risk posed by the pet trade** The Southeast US currently deals with the largest-scale management implications of invasive species. Climate change is projected to increase invasive species establishment. If established, the sheer number of species, especially those from the exotic pet trade, threatens to overwhelm management efforts. We performed a nationwide assessment, ranging from in-store visits to online sales, to characterize the world's largest market for exotic pets and assessed the current and future risk posed to native systems. We found a diverse marketplace, characterized by largely tropical species. Future climate change threatens a 37% increase in climate suitability which in turn equates to over ⅓ of the land area in the USA becoming suitable for invasion by 2050. These changes will have broad management implications across the USA, however the Southeast will see the largest increases in potential establishment, outside of traditionally at risk regions, such as South Florida. Rapid growth in this industry, especially at the southernmost latitudes, is expected to further exacerbate current findings. Increases in species establishment threaten native systems and is estimated to result in billions of dollars in additional management costs per annum.
Megan Johnson, North Carolina State University	**Title: Recent patterns and possible climate-driven changes in Southeastern wildland fire smoke impacts** Land managers in the Southeastern U.S. use prescribed fire extensively to meet objectives such as wildfire risk reduction, maintaining wildlife habitat, and supporting fire-dependent species. However, climate change will likely affect the use of prescribed fire as well as wildfire risk in the region. Wildland fire (wildfire and prescribed fire) is one of the largest sources of fine particulate matter air pollution (PM2.5) in the U.S. and is associated with negative impacts on human health. The Southeast has one of the largest populations living at the wildland-urban interface, which may be particularly vulnerable to health impacts from smoke. Using archived NOAA smoke forecasts, projections of climate-driven changes in fire activity, U.S. EPA EQUATES and National Fire Emissions Inventory (NFEI) datasets, census demographic data, and indices of existing social and environmental stress, we identify the populations in the Southeast most frequently experiencing wildland fire PM2.5. The NFEI and EQUATES datasets differentiate prescribed fire and wildfire emissions, allowing us to quantify and compare their contributions to regional air pollution. Demographic analysis of populations regularly experiencing smoke allows us to explore whether particularly vulnerable subgroups are disproportionately impacted by prescribed fire. Analysis using the U.S. EPA environmental justice indices allows us to determine whether this environmental stressor is adding further strain to already stressed groups. We use spatial analysis of projections of climate-driven changes to favorable prescribed burning conditions and wildfire burned area to examine where smoke impacts could change in the region. Further, using chemical transport modeling and applying these projections of future fire activity to EQUATES datasets, we can examine possible mid-century scenarios of change in wildland fire PM2.5. By examining how smoke impacts may change, this work can help to identify where shifts in the benefits and detriments of wildland fire activity may occur and who may be most affected.
Kate Jones, North Carolina State University	**Title: Prescribed fire smoke scenarios using projected climate, housing development, and management priorities** Populations are growing and wildland-urban interface (WUI) communities are expanding in the southern Appalachians, all while land managers set goals to increase the frequency and extent of prescribed burning. Climate change increases uncertainty for mid- to long-term management plans due to anticipated changes in historic fire regimes and concern about shrinking prescribed burn windows. Despite the surety of both climate change and community expansion, community- and climate-adapted

	management strategies are uncommon in long-term fire management plans. This research responds to the issues of community smoke exposure, WUI development, and climate change using a long-term, scenario-based modeling approach. Practitioners and researchers have co-developed three management scenarios — Business As Usual, Climate Adaptive Management, and Increased Fire Use and Frequency — to represent the variety of prescribed fire use in western North Carolina. Each management scenario will be run under two climate scenarios: hotter+wetter & hotter+drier. Across the management scenarios, fire use areas, fire frequency, fire size, seasonality, and other burn prescription parameters will be adjusted based on practitioner projections and estimates of future fire use. Using the landscape change model, LANDIS-II, projected forest change, including dynamic fuels and fire emissions, will be linked with VSMOKE to model multi-decadal smoke dispersal. Spatial patterns of cumulative smoke dispersal through time will be overlaid with existing social vulnerability indices and projected WUI expansion to compare community smoke exposure across climate and management scenarios. This work will allow managers to explore outcomes from various fire management strategies under different climate and development conditions and geographically link cumulative smoke from these different management strategies with affected neighboring human communities.
Kyle Lesinger, Auburn University	**Title: Flash drought forecast skill in subseasonal prediction models over the contiguous United States** Flash droughts are rapid developing dry extreme climate phenomena at the subseasonal timescale, which can threaten different human-natural systems, such as agriculture, water resources, hydropower generation, ecosystem service, and public health. Previous research has identified prediction skill of temperature, precipitation, and root-zone soil moisture (RZSM) within the contiguous United States (CONUS) related to specific flash drought event, i.e., the 2012 Central US drought. However, no research has comprehensively assessed the prediction skill of evaporative demand and RZSM flash drought indices in retrospective forecasts (reforecast) of state-of-the-art subseasonal prediction models over a long period. In this study, we evaluate the reforecast flash droughts estimated using the NASA Goddard Earth Observing System Model, Version 5 (GEOS-5) and the NOAA Global Ensemble Forecast System, version 12 (GEFSv12) reforecast datasets during 2000-2015. Observational references used for the evaluation include the merged observation-reanalysis SoilMERGEv2.0 (SMERGE) data for RZSM and gridded surface meteorology (gridMET) data for evaporative demand. The deterministic and probabilistic forecast skill for RZSM and evaporative demand anomalies are assessed using the anomaly correlation and the contiguous rank probability score (CRPS), respectively. The Heidke Skill Score (HSS) is used to assess categorical forecast skill of lower 30th (upper 70th) anomalies for RZSM and evaporative demand, respectively, and is used to identify the skill in forecasting onset of flash drought based on RZSM and evaporative demand indices. We also examined the models' performance for predicting the 2012 Central US drought at the subseasonal timescale. The results of flash drought forecast skill will be presented, compared, and discussed at different lead times, seasons, and locations over the CONUS for both models based on RZSM and evaporative demand. The findings will improve our understanding of flash drought predictability and inform skill performance of operational flash drought forecasts.
Tia Offner, Mississippi State University	**Title: Habitat utilization of fringing marsh and adjacent submerged landscape by nekton in a Gulf of Mexico tidal oligohaline environment** Salt marshes and submerged aquatic vegetation (SAV) serve as important habitat for numerous species of fish and macroinvertebrates. Specifically, fringing salt marshes and SAV adjacent to the marsh provide shelter and food for fishes and macroinvertebrates at both juvenile and adult stages. However, there is a significant gap regarding the role of fringing marshes and SAV as habitat for fish and macroinvertebrates in tidal oligohaline environments. Such environments are common across the Mississippi sound, which provides critical economic, commercial, and recreational services in Mississippi and Alabama. To better understand this gap, we are using fyke nets to capture the nekton that utilize the fringing marsh, and seines to capture the nekton that utilize the adjacent SAV in Back Bay, MS, once a month for a full calendar year. The nekton captured is identified to a species level,

	enumerated, and measured for size and weight. With this information, we will assess usage of fringing marsh and adjacent SAV as habitat by the oligohaline nekton community. Results from this study will help guide future conservation and management efforts for brackish estuarine communities.
Carrie Radcliffe, Southeastern Center for Conservation at Atlanta Botanical Garden	**Title: Southeastern Plant Conservation Alliance** The Southeastern Plant Conservation Alliance (SE PCA) is a diverse partnership that bridges gaps between local and national efforts while collaborating to restore and prevent the loss of plant diversity. This is achieved by building capacity, facilitating novel partnerships, and leveraging shared resources to stimulate collective success in our region. To date, the formation of the SE PCA has allowed partners to leverage funding and conservation actions to address the following actions: Advocating for plants With other nationally recognized groups, we urged the Biden administration to prioritize the conservation of native plants and ecosystems. We also developed a free-access information sheet on regional conservation needs, goals and activities. Ex Situ Gap Analysis The SE PCA partnered with Botanic Gardens Conservation International - U.S to conduct an ex situ gap analysis to evaluate regional ex-situ collections of priority species and identify gaps needing to be filled to meet conservation needs for priority species. Improving Recovery Outcomes for the Endangered Species Act With funding and collaboration from USFWS, we have defined 13 high-priority federally listed species and are implementing pilot projects for 5 in 2021- 2022. Primary objectives for this innovative project also include on-the-ground conservation action (including research and management), education & outreach to partners and landowners, support for local Plant Conservation Alliances, the promotion of public and private land partnerships, and facilitation of working groups and workshops. List of Regional Species of Greatest Conservation Need (RSGCN) We are currently working with NatureServe, Terwilliger Consulting, and the Southeast Association of Fish & Wildlife Agencies to create the nation's first Regional Species of Greatest Conservation Need (RSGCN) for plants, which directly enhance data, consistency, capacity, and awareness for plant conservation - both during the development process and as a result of associated research, restoration, regulatory, outreach, and leadership efforts.
Ashlynn Smith, Southeast Center for Conservation - Atlanta Botanical Garden	**Title: Plant conservation partnerships help protect Chapman’s rhododendron from impacts of climate change** The Southeast Center for Conservation at Atlanta Botanical Garden leads innovative strategies and leverages partnerships to conserve imperiled plants and natural communities across the Southeast United States. The Center has Field Teams located in north Georgia and the Florida panhandle. These Field Teams, with ex situ support from the Atlanta-based Conservation Greenhouse, Safeguarding Nursery, Seed Bank, and Micropropagation and Conservation Genetics Laboratories, allow important in situ conservation work to be accomplished in the critically threatened Mountain Bogs of Southern Appalachia as well as along the Gulf of Mexico, including the Apalachicola River watershed, a hotspot for biodiversity and endemism. One example of applied plant conservation that utilizes in situ field support, infrastructure and expertise from ex situ facilities at the Center, as well as external partnerships is Chapman’s rhododendron (Rhododendron chapmanii). Chapman’s rhododendron is not only Federally Endangered, but also endemic to the Florida panhandle, making it susceptible to climate change, particularly shifts in fire return intervals and sea level rise. It was already a ‘very rare plant’ when first reported by Alvan Wentworth Chapman in 1860, but due to plant collections for the horticulture industry as well as habitat

	alteration and destruction, the number of individuals has declined by nearly 50% in some areas (NatureServe.org). The Center has partnered with USFWS, Florida's St. Joseph Bay State Buffer Preserve, and Florida Natural Areas Inventory (FNAI) in order to protect this species from further decline. To date, the Center has collected leaf tissue samples from nearly every population in Florida for genetic analysis, initiated a detailed demographic study at the St. Joseph Bay State Buffer Preserve to inform management action, preserved seed in the Conservation Seed Bank, and propagated cuttings for both ex situ safeguarding and outplantings. FNAI has created species distribution models and searched for additional populations. Their results will also inform appropriate outplanting locations which will take place this fall. This work serves as a model for what can be accomplished through strong collaborations and conservation partnerships.
Laura Villegas, Earth Economics	**Title: Urban Heat Mitigation Mapping to measure economic effects of impacts on human health and help make recommendations for more equitable and resilient communities** The IPCC acknowledges heat waves have become more frequent in recent years. Elevated temperatures increase mortality and morbidity risks for vulnerable populations (e.g., those 65 and older). The combination of temperature increases and aging populations suggests that urban heat mitigation will become increasingly important to public health. It is known that urban trees can mitigate heat island effects, providing shade and evaporative cooling. We have created a prototype spatial tool in R that estimates the mortality and morbidity (and associated costs) due to the cooling effect of current tree canopy cover for urban areas throughout the US, focusing on populations aged 65 and older. The tool combines modeled results from public health and environmental economics research with cost and demographic data from national and regional sources to estimate avoided hospitalization and human life costs at the Census tract level. The tool contextualizes these costs by demographic data (race, sex, income level) to support comparisons across urban communities.

TOOLS

Presenter Name	**Title/Abstract**
Theme: Adaptation Challenges & Successes	
Kyla Bloyer, American Society of Adaptation Professionals	**Title: Introduction of Ready-To-Fund Resilience Toolkit and ASAP to Practitioners** The American Society of Adaptation Professionals (ASAP) connects and supports climate adaptation professionals to advance innovation and excellence in the field of climate change adaptation. ASAP members are building essential climate resilience for communities, ecosystems, and economies. ASAP helps them strengthen their professional network, exchange best practices and practical advice, and accelerate innovation, leading to a more equitable and effective climate adaptation practice. The toolkit was created alongside a partnership with Climate Resilience Consulting and was designed as a self-guided resource for local government staff and the technical assistance providers who support them to: ● More effectively operate within the resilience funding and finance system. ● Better prepare themselves to receive funding and finance for climate resilience-building. ● Create equity through resilience funding and finance. The Toolkit walks users through ten characteristics to integrate into climate resilience projects to ensure they're ready to receive the funding and finance needed for success. It provides tips for overcoming challenges such as lack of resources, funding, or political will

	and a mismatch between older plans and community needs.
Ashlyn Shore, National Environmental Modeling and Analysis Center	**Title: Asking the Tough Questions: Allowing User Research to Guide the Evolution of the U.S Climate Resilience Toolkit** The US Climate Resilience Toolkit (CRT) (toolkit.climate.gov) was launched in 2014 with the goal of helping people find and use tools, information, and reliable data to build climate resilience. Since then, the climate adaptation field has dramatically evolved as more people now than ever are invested in managing their climate-related risks and opportunities and helping their communities become more resilient to extreme events. The CRT is seeking to evolve and accommodate, or adapt, to this welcomed increase in the number and type of people involved in climate resilience planning. Understanding some of the key users who are involved in resilience planning— the practitioners and the local resilience champions (or local decision-makers)—helps inform what people need when creating climate resilience plans and what federal resources are needed to support those activities. User research interviews help to illuminate the behaviors, needs, and motivations of site users and the development of personas and journey maps can guide how best to design websites and applications to meet the needs of the end-users. UNC Asheville's National Environmental Modeling and Analysis Center (NEMAC) partnered with NOAA's Climate Program Office (CPO) to conduct user research of the CRT in preparation for the redesign of the CRT website. These results have informed the development of an initial prototype for the CRT. During this session, attendees can interact with the updated website and participate in live usability testing to provide feedback that will inform further development of the website.
Theme: Changing Southeastern Landscapes	
Rebecca Allee, NOAA Office for Coastal Management	**Title: Sea Level Rise Viewer** Visualization of potential impacts from coastal flooding, land subsidence, and sea level rise is a powerful teaching and planning tool. The Sea Level Rise Viewer brings this capability to coastal communities, providing coastal managers and scientists with a preliminary look at coastal flooding and sea level rise impacts. The viewer is a screening-level tool that uses nationally consistent data sets and analyses. Data, maps, and map services provided can be used at several scales to help gauge trends and prioritize actions for different sea level and flooding scenarios. NOAA's Office for Coastal Management recently completed a data update to the Sea Level Rise Viewer, one of the most popular tools on the Digital Coast. This update included the new sea level rise projections. The tool is presented in a Web mapping application format and can be accessed at coast.noaa.gov/ditgitalcoast/tools/slr. This presentation will provide a description of the tool's features. In particular, we will demonstrate local flooding scenarios and marsh migration.
Hilary Morris, Southeast Conservation Adaptation Strategy (SECAS)	**Title: The Southeast Conservation Blueprint** The Southeast Conservation Adaptation Strategy (SECAS) is a regional conservation initiative that spans the Southeastern United States and Caribbean. Started in 2011, SECAS brings together diverse partners like NGOs, state and federal agencies, private businesses, tribes, partnerships, local governments, community groups, and universities around a shared vision of the future. SECAS works to design and achieve a connected network of lands and waters that supports thriving fish and wildlife populations and improved quality of life for people. The primary product of SECAS is the Southeast Conservation Blueprint, a living, spatial plan that identifies the most important areas for conservation and restoration across the region. The Blueprint serves as the roadmap for achieving the SECAS Goal: a 10% or greater improvement in the health, function, and connectivity of Southeastern ecosystems by 2060. To date, more than 250 people from

	over 100 organizations have used or are using the Southeast Blueprint to help bring in new funding and inform their conservation decisions. So far, the Blueprint has helped secure over $55 million in funding to protect and restore over 82,000 acres. Historically, the Blueprint has stitched together smaller subregional plans into one integrated map. In October 2022, based on feedback from the wider conservation community, SECAS will release an updated version of the Blueprint that uses consistent methods and indicators across 15 states. This new Blueprint is based on 37 spatially explicit indicators representing terrestrial, freshwater and marine/estuarine ecosystems, as well as a connectivity analysis. It identifies priority areas for a connected network of lands and waters capable of sustaining natural and cultural resources in the face of future change. In this Tools Café, SECAS staff will showcase the current suite of tools for using the Southeast Blueprint and SECAS Goal, and preview improvements planned for the upcoming release of Blueprint 2022.
Theme: Impacts on Habitats, Animals, People	
John Cartwright, Mississippi State University	**Title: GeoCoast: A Decision-Support Tool for Visualizing Coastal Inundation** GeoCoast is an interactive, web-based tool for visualizing coastal inundation from sea level rise and storm surge. It was developed using Esri ArcGIS AppBuilder and allows users to visualize the impacts of inundation on roads, buildings, critical infrastructure, and transportation in a three-dimensional (3D) environment. GeoCoast uses a ground elevation model and 3D buildings generated from ZLR LiDAR data collected along the Mississippi Gulf Coast in 2015. Users can choose to visualize inundation using a variety of scenarios including a simple linear superposition model data, NOAA's sea level rise data from the Digital Coast, NOAA's effects of sea level rise program, and ADCIRC surge model data. The surge model data includes hindcast runs for storms such as Katrina that greatly impacted the northern Gulf Coast. Using routing analysis, users can visualize the impact of inundation on transportation. Users can select two locations or buildings on the map and generate a route. Users can also generate a service area for a location or critical infrastructure such as a hospital, fire station, or police station. The service area allows a user to see the impact of inundation on accessibility and travel time for that location or critical infrastructure. By changing the inundation, users can visualize how the route or service area is affected by sea level rise or storm surge. Current efforts are focused on expanding data simulations to include other areas of the northern gulf coast. GeoCoast: https://geoproject.hpc.msstate.edu/geocoast3d/
Haven Cashwell, Auburn University	**Title: Evaluation of CAnVAS Decision Support System with Stakeholders in USFWS to Improve Species Status Assessments** Calling all United States Fish and Wildlife Service (USFWS) stakeholders…we need your help! We need participants for an eye-tracking study that will take place at the symposium. For this tool session, eye-tracking of the navigational website known as CAnVAS will be conducted with showcasing of the eye-tracking tool and software, as well as allowing for research to take place. The navigational CAnVAS website (https://products.climate.ncsu.edu/canvas/) has been developed by the State Climate Office of North Carolina to benefit stakeholders in the USFWS by supporting the incorporation of climate information in species status assessments (SSAs). This work aims to test CAnVAS with stakeholders in order to ensure it is useful for this population and appropriate for stakeholder use. Research will be conducted through eye-tracking with participants being

	stakeholders in the USFWS. While being eye-tracked, the stakeholders will follow prompts to guide them through the live navigational website and answer questions about the website. Then, there will be an immediate interview after the stakeholders finish eye-tracking to ask the stakeholders about how they liked the website, if they would use this website for SSAs, etc.. Results from this current study will be able to help to verify the usability of the website and to ensure that this website will be able to be used at its full potential for SSAs by stakeholders in the USFWS. Also, results from this study could provide any changes that the stakeholders would like to see on the website. IRB approval has been obtained from Auburn University to conduct this research.
Kristine Evans, Mississippi State University	**Title: Dynamic Land Conservation Planning in the Gulf of Mexico Coastal Region via the Strategic Conservation Assessment Tool Suite** In the U.S. Gulf of Mexico Coastal Region (GCR), there are numerous complex social-environmental challenges related to our changing climate, increasing land use and resource extraction, and other environmental stressors. To respond to and prepare for changes in climate and land use, decision-makers need rigorous information about ecosystems and socioeconomically vulnerable areas. Land and resource decision makers have an unprecedented opportunity for land conservation that considers climate concerns in the GCR and identifies optimal projects to meet conservation goals under programmatic priorities. As part of the Strategic Conservation Assessment of Gulf Coast Landscapes (SCA) project, GIS experts developed three web-based geospatial planning conservation assessment tools through a co-production of knowledge process that involved more than 650 conservation stakeholders in the Gulf Coast Region. The SCA web-based geospatial tools were designed to provide evaluation and comparison of existing and future projects based on user-defined priorities encompassed by RESTORE Goals. The Tools have been helping land and resource managers evaluate co-benefits of potential land conservation projects. Following a process of multi-stakeholder charrettes, participants were provided multiple opportunities for input into content and design of these tools through a series of stakeholder charrettes in 2018, 2020, and 2022. User feedback gathered over the life of the SCA project has led to improved tool functionality and performance, along with applicability and relevance. We will demonstrate how our tools allow for seamless project prioritization, assessment of benefit, and visualization, and we will demonstrate how the tools integrate and collectively support strategic conservation across the Gulf Coast Region. Those interested will have an opportunity to walk through the tools with an SCA team member and can explore how the tools may be applied to inform their conservation decisions.