



**2022 SOUTHEAST CLIMATE
ADAPTATION SCIENCE SYMPOSIUM**
September 19-21, 2022



Southeast Climate Adaptation Science Symposium

September 19-21, 2022

Gulf Shores, AL

[Southeast Climate Adaptation Science Symposium Webpage](#)

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Table of Contents

Table of Contents	2
Symposium Summary	3
Session Summaries	3
Plenary Session: Visualizing Change in the Southeast	3
Plenary Session: Management Challenges for Climate Adaptation	4
Plenary Session: Centering Justice and Equity to Advance Climate Adaptation	5
Plenary Session: Connecting Conservation Across Scales	6
Plenary Session: Adaptation in Action	7
Breakout Session: Climate Impacts & Adaptation for At-risk Species	8
Breakout Session: Holistic Cultural and Natural Resource Management	9
Breakout Session: Monitoring for Changing Climate and Adaptation	10
Breakout Session: Changing Fire Management in the Southeast	11
Breakout Session: Nature-based Solutions for Climate Adaptation and Resilience	13
Breakout Session: Evaluation of Actionable Science	14
Breakout Session: Cultivating Coastal Resilience to Global Change	15
Breakout Session: Hydro-Climate Events and Extremes	16
Breakout Session: Biological Invasions in the Southeast U.S.: Impacts, Management, and What's On the Horizon	18
Plenary Session: Global Change Fellows Lightning Talks/Early Career Roundtable	19
Plenary Session: Poster/Tools Networking Session	19
Plenary Session: World Cafe Session	19
Optional Session: Introduction to Working with Tribal Nations	20
Next Steps	20
Appendix	20

Symposium Summary

The Southeast Climate Adaptation Science Center hosted the 2022 Southeast Climate Adaptation Science Symposium in Gulf Shores, AL, on September 19-21, 2022. The **goals** of the symposium were to:

- Support climate adaptation efforts by sharing science resources and tools and providing natural and cultural resource managers and regional experts with an opportunity to share lessons learned and best practices.
- Discuss and identify gaps and needs for actionable science production and delivery that meets the requirements of managers for on-the-ground application.
- Provide a venue for researchers, managers, and other resource people to share information about current activities, plans, and opportunities for collaboration.

The symposium structure incorporated a mix of plenary sessions and 3 blocks of concurrent breakout sessions, as well as opportunities for networking and information sharing during Poster/Tools and World Cafe sessions. In addition, networking opportunities were encouraged through a field trip and short tours during extended lunch breaks and post session times. The agenda is attached as Appendix A.

The audience at this symposium included 164 researchers and managers working in the southeastern U.S (including the U.S. Caribbean) on climate impacts and adaptation for fish, wildlife, habitat, and cultural resources. It included decision makers and practitioners from state fish and wildlife agencies, federal organizations, Tribal Nations and Tribal organizations, and non-governmental organizations involved with managing natural resources in the southeastern US. A full list of registered participants is provided in Appendix B.

Session Summaries

Plenary Session: Visualizing Change in the Southeast

The first plenary session led by Ryan Boyles (USGS - SE CASC)¹ set the stage for projected changes in the Southeast, providing context for how landscapes are changing with regard to climate, water, and ecosystems. Four speakers were featured in this session: Adam Terando (USGS - SE CASC), Jacob LaFontaine (USGS), Georgina Sanchez (NCSU), and Amanda Sesser (US FWS - SECAS). First, Adam Terando presented “Visualizing Change: The Climate Change Context.” Through his presentation, he emphasized how carbon dioxide levels are at their highest point in the past 3 million years and that such levels are causing three big changes: harder rainfall, warmer temperatures, and rising sea levels. Jacob LaFontaine followed Dr. Terando’s presentation with his talk, “Visualizing Change in the Southeast: Potential Future Hydrologic Response to Future Climate.” His presentation revealed that the timing of “high flows” is changing due to climate change. Dr. LaFontaine advocated for a nationally consistent hydrologic framework to effectively study the future of hydrologic responses. After this presentation, Georgina Sanchez began her talk, “Envisioning Future Southeast Landscapes” where she discussed how land-use change must be considered when planning for a resilient

¹ Appendix C provides definitions for acronyms used in presenter affiliations.

future both ecologically and socially. Lastly, Amanda Sesser concluded this session with her presentation, “Visualizing the Future of Landscape Conservation” where she echoed Dr. Sanchez’s sentiment of preparing for a future of land-use change, specifically urban sprawl. Dr. Sesser described the vision of the Southeast Conservation Adaptation Strategy (SECAS) to set goals and metrics to determine what we are doing well currently and where there is room for improvement to develop a connected network of lands and waters.

This session revealed that increased temperatures, more extreme precipitation, modification of hydrologic balances, rising sea levels, and rapid development of natural areas are all changing the landscape of the Southeastern U.S. With these known causes of change in the Southeastern US, challenges still remain, such as compound events, tipping points, the influences of uncertainty in modeling approaches, linkages between complex systems, and the difficulty of quantifying human responses. This session concluded with the message that we can guide the future of conservation decisions and create a sustainable society for future generations.

Plenary Session: Management Challenges for Climate Adaptation

The second plenary session led by Katherine Smith (USGS-SE CASC) addressed the pressing climate adaptation challenges and related science needs of natural resource managers and communities in the southeastern US. This session included a panel consisting of Kier Klepzig (Jones Center), Brian Branciforte (FL FWC), Rafael Gonzalez (USFWS), Mitzi Reed (MBCI), and Monique Harden (DSCEJ). Examples of climate adaptation challenges were shared during the session. For example, Kier Klepzig discussed the importance of prescribed fire for the restoration and maintenance of longleaf pine ecosystems and some of the challenges and trade offs associated with implementing prescribed fire under changing climate conditions. Several panelists noted that climate literacy and education remains a need and a barrier to climate adaptation. There have been increased efforts to engage local communities in partnerships and shared decision-making from the outset. Brian Branciforte highlighted some of the steps FL FWC is taking to understand and address climate impacts. Rafael Gonzalez shared how the US Fish and Wildlife Service aspires to move from planning agency to action by working with partners to implement climate adaptation efforts on the ground. Mitzi Reed discussed Tribal priorities and how they shifted during the pandemic to healthcare and education. She also noted the many successes with Tribes shaping conservation and adaptation discussions. Monique Harden concluded this session with a discussion about Environmental Justice forums that bring community members and stakeholders together to talk about climate impacts and priorities. She gave specific examples of the work done by the Deep South Center for Environmental Justice and shared how New Orleans has made significant strides in transitioning to a renewable, yet equitable, energy economy. By working with the coalition, Energy Future New Orleans, the city has become the first in the Southeast region to have a mandatory renewable energy portfolio. Unfortunately, these efforts are not without challenges as pushback arises within legal frameworks that do not consider community needs (i.e., health and wellness).

Plenary Session: Centering Justice and Equity to Advance Climate Adaptation

This plenary session was led by Mia Wavrek (USGS-ORISE), Regina Neal-Mujahid (USGS), and Emily Brooks (USGS) and was accompanied by the following speakers: Mary Williams (DSCEJ), Louise Vaughn (USFWS), Joey Owle (EBCI), and Donya Frank-Gilchrist (USGS). The panel addressed challenges and opportunities to progress climate justice goals in the Southeast region. They expressed that successful, community-led responses to climate change require us to center justice, equity, and community autonomy. It is also necessary to pursue self-determination in our conservation research and management programs, from how and with whom our organizations or communities partner, to how we conduct scientific research, to how we think about and measure the impacts of our work. Examples of justice- and equity-oriented climate adaptation research projects, applications, and partnerships from across the Southeast and Caribbean, as well as lessons learned and best practices for delivering just and equitable outcomes were all shared during this session.

Mary Williams began this session with her talk, “Building Equitable Partnerships Among Vulnerable Communities and HBCU's.” She discussed these partnerships, such as the Deep South Center for Environmental Justice’s work with Dillard University and New Harmony High School to engage youth in capacity building and climate resiliency efforts to protect these climate vulnerable regions. Next, Louise Vaughn presented, “Building equity metrics in Southeast Conservation Adaptation Strategy Conservation Blueprint,” where she discussed the Southeast Conservation Blueprint. She explained how the blueprint identifies the highest priority areas where conservation action will be most impactful based on natural and cultural resource indicators. Joseph “Joey” Owle then followed Ms. Vaughn with his talk, “Finding Environmental Justice issues in a “pristine” landscape” where he discussed the formation of an EBCI-led partnership to remove Ela Dam from the Oconaluftee River. Finally, Donya Frank-Gilchrist presented, “Stakeholder Engagement for Natural Hazards Research in the Caribbean.” She discussed the Caribbean Project and its efforts in connecting with USGS and natural hazards experts to better understand risks in the region; they intend to facilitate workshops and publish a database of resources.

This session identified the following areas of improvement in science to promote climate justice and equity:

- Scientists need to be aware of historical inequities that have led to increased vulnerabilities and decreased resiliency of underrepresented communities.
 - Some partners could benefit from resources on engaging with stakeholders in a non-extractive way (can look to DSCEJ's 'Communiversality' model)
 - Seeking and engaging justice and equity experts (the USGS EJ Task Force, for example) can help prevent further harm
- Tribal Nations and local stakeholders should be empowered to co-lead projects and partnerships, but they need support from committed partners
- True support comes from listening and giving partners the space to identify and share self-identified needs; Research teams should be mindful of assuming the needs of stakeholders and rightsholders and recognize that priorities may differ.
- Expertise comes from both researchers and community members

- Co-develop projects and resources with stakeholders and local experts early and maintain two-way Communication
- Actionable science means making sure the data collected is accessible, easily understood, and useable by the community and other stakeholders
- Equitable access is a high priority for the federal government and many other organizations because parks and green spaces are not equitably distributed

Plenary Session: Connecting Conservation Across Scales

This plenary session was led by Mitchell Eaton (USGS - SE CASC) and Stephanie Romañach (USGS) with the following speakers: Todd Schenk and Victoria Hymel (VT), Caleb Hickman (EBCI), Hilary Morris (SECAS), and Louise Vaughn (SECAS). This diverse group of scientists and managers shared their experiences and perspectives regarding the challenges and considerations of implementing cross-scale conservation practices and adaptation strategies. Adaptation of natural resource management in response to change is strongest when tight feedback loops produce more immediate signals of costs and benefits, most commonly at highly localized scales and over short time horizons. As problems increase in scope, attenuation of perceived risks and benefits over larger scales and across jurisdictions adds considerable challenges to finding solutions via collaborative decision making. Scale mismatch represents another challenge for managing natural systems, variously characterized as institutional governance misaligned with the biophysical or temporal scale of the resource, or information mismatch in which knowledge is produced at a scale that is of limited use for decision making.

Todd Schenk and Victoria Hymel began this session with their talk, “Multi-Stakeholder Adaptive Management: Overview & Lessons Learned Across Contexts and Time,” discussing how flora and fauna are largely ignorant to geographical and agency jurisdictional boundaries. Habitat ranges frequently extend across state, tribal, and national boundaries; multiple agencies at different levels of government are typically responsible for different components of what might be considered as a need for holistic conservation strategies; and stakeholders external to government play fundamental roles in conservation and, conversely, may pose threats to it. These complex realities necessitate effective collaboration across political boundaries, across scales, across agencies, and with other stakeholders. At the same time, the dynamic nature of socio-ecological systems necessitates ongoing, adaptive management. This is increasingly true as we face accelerating climate change and other drivers of global change. Experiments in and full-scale implementations of multi-stakeholder adaptive management (e.g., collaborative adaptive management or CAM) have occurred in fits and starts, and with limited success. Learning from past successes and failures with collaborative adaptive management and other cross-scale, multi-stakeholder efforts is critically important as the need for such shifts in ecological management become more acute. This presentation introduced CAM as a core concept, and shared some lessons learned (from existing literature) on challenges and opportunities.

Next, Hillary Morris and Louise Vaughn presented: “Timing is everything: Using landscape-scale data to inform conservation decisions,” in which they talked about the Southeast Conservation Adaptation Strategy (SECAS) as a regional conservation initiative that spans the Southeastern

United States and Caribbean. The primary product of SECAS is the Southeast Conservation Blueprint, a living, spatial plan that identifies priority areas for a connected network of lands and waters across the region. This presentation highlighted how the Blueprint's "lean startup" revision cycle helps overcome the mismatch between the oftentimes slow pace of conservation planning, the rapid pace of landscape change, and the brief window of conservation opportunity. In addition, they explored how investing in capacity to help users interpret and implement the Blueprint helps bridge the regional scale of the plan to conservation actions happening at local scales. Hilary and Louise shared how regular updates and close collaboration with users have improved both the quality of the Blueprint and its relevance to conservation decision-makers.

Lastly, Caleb Hickman presented, "The long view: Development of a 500-year climate adaptation planning framework," where he made the observation that climate change planning horizons are typically limited to approximately a single human generation (e.g. 30-year planning horizon). In addition, convention from an economic perspective is to employ temporal discount rates that reduce the present-day-value of future adaptation actions and benefits. Over longer time horizons, such a framework would result in severely undervaluing century-scale strategies designed to sustain ecosystem health and societal well-being. Consistent with their multi-century or millennial-scale use of, and connection to lands in southern Appalachia, the Eastern Band of Cherokee Indians (EBCI) support a vision of land stewardship that looks seven generations into the future. The SE CASC is partnering with EBCI to help develop multi-generational and regional-scale adaptation plans that will consider the effects of changing climates on valued natural resource dynamics, human demography and land use, and the ability of tribal members to maintain their cultural practices and management of resources for tribal benefits.

Plenary Session: Adaptation in Action

This session was led by Jen Cartwright (USGS - SE CASC) and was accompanied by five speakers: Mike Osland (USGS), Erin Seekamp (NCSU), Greg Cope (NCSU), Renee Collini (MSU), and Jaime Collazo (USGS & NCSU). It presented a variety of case studies of successful climate-adaptation projects in the Southeast. The speakers facilitated discussions of adaptation actions to address project successes, lessons learned, and science priorities to inform ongoing adaptation efforts.

Mike Osland began the session with his talk, "Enhancing the Adaptive Capacity of Coastal Wetlands in the Face of Sea-Level Rise and Coastal Development." He described a recent project that addressed the question, "In the face of accelerating sea-level rise, where can coastal wetlands adapt by migrating landward into adjacent upslope and upriver ecosystems?" Through working with partners, this project assessed barriers to and opportunities for migrating coastal wetlands to protect against rising sea levels.

Next, Erin Seekamp presented, "Protecting Cultural Resources in the Face of Climate Change." She discussed a National Park Service order to maximize heritage values while also prioritizing resources for adaptation and the project done to address these issues. An Optimal Preservation (OptiPres) Model was created to assist in prioritization and planning. This model is adaptable to

local conditions and values and allows for transparency especially in the evaluation of value processes.

Greg Cope followed Dr. Seekamp with his presentation, “Impacts of Sea Level Rise and Associated Salinity Changes on At-risk Native Freshwater Mussels and Their Habitats in Atlantic Coastal Rivers.” He discussed a project that addressed the question of, “How will at-risk native freshwater mussels respond physiologically to sea-level rise and associated increases in salinity?” This project conducted acute and chronic toxicity tests with Instant Ocean® Sea Salt and larval (glochidia) and juvenile life stages of 3 Atlantic Slope mussel species. From these efforts, it was determined that larvae (glochidia) are the most sensitive life stage of freshwater mussels to Instant Ocean® Sea Salt and represent the life stage bottleneck for potential adaptation to increasing salinity.

Renee Collini then presented, “Facilitating Accurate and Effective Application of Coastal Marsh Models.” Here, Dr. Collini discussed a project that worked with land managers and researchers from across the Gulf and Southeast to enhance the application of marsh models, determining which models to use for what projects.

Lastly, Jaime Collazo concluded this session with his virtual talk, “Strategic Habitat Conservation and Adaptive Strategies for the Conservation of Coqui Frogs in Puerto Rico.” He discussed a project that assessed two adaptation strategies to inform decisions: managed translocations and identifying climate-resilient habitats to promote recovery and pre-listing conservation of 3 endangered and 12 at-risk *Eleutherodactylus* species. This project downscaled data sets to 2060 essential pieces of information to track the threat response relationship for frogs. The translocation of surrogate species was also used to understand adaptation.

Together, the speakers in this session relayed three key points for the SE CASC community to consider:

- Importance of integrating management partner needs and priorities early in project timelines
- Challenge of mismatch in timelines between project funding, student contracts, and management time horizons
- Successes in moving climate adaptation forward: learning from past projects, building and iterating.

Breakout Session: Climate Impacts & Adaptation for At-risk Species

This session led by John Tirpak (FWS) and Ryan Boyles (USGS-SE CASC) discussed the risk that climate change poses on species both listed and petitioned for threatened and endangered status. This session included a panel consisting of four speakers: Darren Miller (NCASI), Mona Papes (UTK), Laura Thompson (USGS), and Tim Male (EPIC). Together, these speakers explored current practices and research related to managing at-risk species in southeastern ecosystems with perspectives from a panel of species managers, scientists, and policy-thinkers. They engaged participants in a discussion on future direction of climate adaptation for at-risk species.

Darren Miller began this session with a discussion about the National Council for Air and Stream Improvement (NCASI), defining who they are as a non-profit that provides technical support and research for member companies (mainly in the forestry sector). Next, Mona Papes presented, “Shifts in species’ distributions under changing climatic conditions” where she explained the challenges to species distribution modeling, determining where species will be in the future. Then, Laura Thompson presented “Persist in place or shift in space?” where she discussed the Resist-Accept-Direct (RAD) framework for making management decisions. By considering the various strategies that exist under *resisting*, *accepting*, or *directing* ecosystem transformations, there is nothing left out of the decision space. The results are all-encompassing, yet mutually exclusive, and are capable of being applied to various components throughout the ecosystem. Lastly, Tim Male discussed the Environmental Policy Innovation Center (EPIC) identifying challenges prevalent in decision-making especially in wake of an uncertain future due to climate change. He explained that if we continue to wait for complete information to make a decision, we risk losing many species and places due to inaction.

This session identified the following issues:

- Addressing climate risks to threatened and endangered species requires a holistic approach – with coordination between researchers, industry, policy-makers, decision-makers and managers working together to drive change.
- Decision paralysis is a real danger in this area, however the drivers behind paralysis can differ by sector (e.g. red tape, publish or perish, a focus on details still under debate, general risk aversion, etc.).
 - Not making a decision is also a decision!
- A major issue is how to quickly and effectively incorporate new science into decision making - collaboration and trust building is key.
- Case studies and adaptable frameworks like RAD may lead to quicker decision making and help translate science to action.

Breakout Session: Holistic Cultural and Natural Resource Management

This session was led by Erin Seekamp (NCSU) and April Taylor (SC CASC) and featured three panelists: Juan Cancel (Seminole Tribe of Florida), Courtney Hotchkiss (NCSU), and Brian Zettle (USACE). The panel discussion focused on breaking down the silos of natural resource or cultural resource management. Current challenges facing weaved management were shared from a Tribal Nation perspective, a resource management agency perspective, and a university researcher perspective. Strategies for holistic management to weave Traditional and western knowledge systems were additionally provided for building future collaborations.

Juan Cancel began the session with his talk, “A Tribal Historic Preservation Office’s Call for Holistic Management.” He expressed the importance of weaving indigenous traditional ecological knowledge (ITEK) into present-day science while protecting the privacy and integrity of the tribes. Courtney Hotchkiss followed Mr. Cancel with her talk, “A Researcher’s Call for Holistic Management,” where she discussed what got her thinking about holistic management as a researcher. She expressed that she noticed a division between cultural and natural

resources and argued that we need to look beyond our siloed disciplines. Lastly, Brian Zettle presented, “A Practitioner’s Call for Holistic Management” where he explained that federal agencies hold joint listening sessions and collaboration meetings with Tribal partners regularly.

This session identified the following issues that need to be addressed:

- Cultural & natural resources are not isolated from one another. “Culture doesn’t stop at the fence.”
 - Create space for Indigenous Peoples to tell their own stories & share unique perspectives.
- Developing shared terminology at the outset is critical. Words matter.
- Weaving knowledge systems: engage for Indigenous Peoples & ITEK in project development, budgets, resource planning, decision-making, & policies.
 - Academia & Federal agencies should begin educating staff in how to engage with Indigenous Peoples & how to weave ITEK within the goals of their organizations.

Breakout Session: Monitoring for Changing Climate and Adaptation

This session, led by Greg Steyer (USGS) and Scott Phipps (AL DCNR), was accompanied by four speakers: Beth Stys (USFWS), Mike Osland (USGS), Chris Kelble (NOAA), and Brian Branciforte (FL FWC). This session illustrated how we are monitoring the direct effects of climate change drivers on terrestrial species, wetland habitats, and coastal and marine resources, and explored how these data can inform the barriers, opportunities and tradeoffs to range shifts for species, habitats and ecosystems. It included presentations framing the topic followed by a panel represented by federal, state and academic representatives that discussed with the audience questions, such as What additional baseline information do we need to document anticipated climate-induced range shifts? What system-level indicators are informing conservation and restoration adaptation planning? and How can monitoring enhance knowledge on risks, impacts, consequences and available adaptation options?

Beth Stys began this session with her talk, “Responding to the Challenge of Climate Change in Natural Resource Management.” She discussed how the US Fish and Wildlife Service is addressing the complex challenge of climate change and associated system transformations by integrating climate adaptation as a guiding principle throughout the agency. This includes questioning assumptions based on past conditions, developing and using new tools and frameworks to guide decisions, and creating a climate literate workforce. The Service is working with internal programs and external partners to implement the Climate Change Action Program, a unified approach to climate adaptation and mitigation.

Next, Mike Osland presented, “Climate Change and Sea-level Rise Impacts to Coastal Wetlands.” He expressed that coastal wetlands are highly vulnerable to climate change and rising sea levels, which can lead to coastal wetland loss, migration, and transformation. In addition to elucidating critical thresholds and coastal wetland regime shifts expected in our region, this presentation also discussed data needs for better anticipating and preparing for the transformative effects of climate change and accelerated sea-level rise.

Then, joining virtually, Chris Kelble shared his presentation, “Monitoring Marine Ecosystem and Resources for Climate Change and Future Adaptation,” where he explored the underlying monitoring needed to produce indicators of climate change and adaptation. He expressed how the need to understand how climate change is impacting marine ecosystems is the critical first step in forming effective adaptation plans.

Brian Branciforte concluded this session with his talk, “Applying Climate Adaptation Planning to Improve Management of Species of Greatest Conservation Need (SGCN) In Florida.” This presentation briefly described climate adaptation planning efforts which have directly applied to “Species of Greatest Conservation Need” in Florida. He deployed two species examples to showcase the Florida Key Deer and the Least Tern and illustrated how to examine species distributions, expected impacts, adaptation actions, trigger points, and monitoring to establish priority actions.

Needs identified in this session include:

- Developing new and adapting frameworks for defining thresholds/trigger points and setting metrics for “success”
- Taking action with less than ‘perfect’ data followed by a commitment to changing course as monitoring and understanding improve
- Prioritizing monitoring improvements in the areas (topics, geographies) that are currently most limited & being willing to write into grants funding for long-term monitoring
- Developing and/or expanding regional coordinated monitoring networks

Breakout Session: Changing Fire Management in the Southeast

This session was led by Adam Terando (USGS - SE CASC) and Kevin Hiers (USGS/Tall Timbers) and was accompanied by the following panelists: Scott Covington (USFWS), Marcus Williams (USFS), Brett Williams (Eglin AFB), Kirsten Lackstrom (USC), and Kevin Hiers (USGS/Tall Timbers).

This session discussed fire management, and in particular the use of prescribed fire, a well-established practice in the Southeast US. This reflects the confluence of human-objectives, ecosystems, and environmental conditions that have in turn led to this region experiencing the largest annual area of intentional fire in the US. However, anthropogenic climate change poses a challenge to this robust application of fire. Risks associated with the maintenance, reduction, or increased use of fire must be considered given the potential damage to ecosystems, operations, and surrounding human communities. Through this session, the speakers explored these risks, but also potential adaptation pathways related to these management considerations.

The session began with a presentation by Scott Covington entitled, “Changing Fire Management in the Southeast: Tools Needed to Help Manage for Climate Change.” During his presentation Mr. Covington addressed current fire management in the Southeast, the benefits of prescribed burns, and influences of fire intervals.

Next, Marcus Williams shared his presentation, “A synopsis of current and future precipitation trends in the Southeastern United States: Implications for Fire Managers.” Dr. Williams discussed the relationship between precipitation and wildfire, current trends in precipitation in the Southeastern US, 2016 and flash droughts, and future precipitation patterns. He expressed how current trends display an increase in fall precipitation along with a decrease in summer precipitation. Climate models predict heavier rainfall events with more dry spells in between. An increased frequency in flash droughts is also predicted for the future.

Brett Williams followed Marcus Williams with his talk, “Burning into an Uncertain Future: Adaptive Fire Management at Eglin AFB.” His presentation expressed that climate change is likely presenting, or will present, significant planning and operational challenges to wildland fire managers in the Southeastern Coastal Plain. Wildland fire behavior in the Southeast is primarily dictated by vegetative fuels composition, structure and arrangement within the context of a suite of weather and atmospheric condition variables during combustion. Climate change may cause unpredictable changes to both fuel and weather conditions across these coastal landscapes through hurricanes, storm surges, and erratic swings in weather patterns. These potentially novel conditions will require fire managers to begin adapting wildfire preparedness and response strategies, as well as prescribed fire planning and implementation, to an uncertain future. This talk will explore one approach to adapting fire management to an uncertain future at Eglin AFB in the Florida Panhandle.

Kirsten Lackstrom then presented, “Prescribed fire in longleaf pine ecosystems: Fire managers’ perspectives on priorities, constraints, and future prospects.” This presentation reported results from a survey of almost 300 fire managers from across the Southeast. This survey was designed to elicit baseline information on the goals, practices, and challenges associated with longleaf pine prescribed burning programs, and particularly how they expect changing land use and climate conditions to affect their ability to achieve longleaf pine conservation objectives into the future.

Lastly, Kevin Hiers concluded this session with his talk, “Projecting Potential Fire Regimes Under Climate Change in the SE.” Mr. Hiers discussed a recently completed project that evaluated potential fire regimes for the continental US under RCP 4.5 and 8.5 by applying the PC2FM model on the full MACA ensemble of downscaled climate projections. PC2FM is a simple process-based approach to relating fire regimes to climate variables, which has been calibrated to tree ring data on fire frequencies. Within the SE region, the project’s analysis of ensemble results at mid- and end-of-century across “pyromes” show a trend towards increasing fire frequency. It was further evaluated if these projected future fire regimes represent analogous conditions in the present landscape could provide guidance for long-term expectations in forest change.

Common ideas expressed by the speakers were:

- Wildland-urban interface (WUI) is a common constraint for fire management.
 - e.g., Smoke management, boundary issues with invasives, & creates a need for consistent outreach at scale.

- Partnerships build capacity & support shared goals at large spatial and temporal scales.
 - Shared resources design for data collection, processing, storage, access
- Climate uncertainty: Act local, think global. Constrained windows to accomplish Rx Burns. Frameworks like RAD (Resist Accept Direct) could help to expand options/opportunities

Breakout Session: Nature-based Solutions for Climate Adaptation and Resilience

This session was led by Katie Warnell (Duke) and Kelly Guilbeau (USFWS) and consisted of the following speakers: Dana Nunez Brown (Dana Brown & Associates), Carter Smith (Duke University), Mary Kate Brown (TNC-Alabama), and Katie Warnell (Duke University). The session explored the state of the science on how the integration of nature-based solutions in large-scale restoration efforts as well as within local community projects can support climate adaptation and resilience while providing a broad suite of ecosystem services. Case studies were used to describe implementation and approaches for measuring effectiveness of nature-based solutions such as living shorelines and wetlands in coastal areas and urban greenspace to retain stormwater runoff.

Dana Nunez Brown began this session with her talk, “Every Square Foot of Land Must Multi-Task.” Through her session, Ms. Brown portrayed how nature-based solutions can be integrated into planning and design to provide many beneficial services: managing stormwater, conserving open space, providing distributed recreation space, improving air quality, improving water quality, providing habitat above and below ground, reducing air temperature, facilitating more activity, and supporting healthy communities. Next, Carter Smith presented her talk, “Living shorelines: What We Know and What We Don't Know.” This presentation provided an overview of living shorelines including a discussion of the most commonly studied designs, metrics that are used to measure success, and research gaps. Mary Kate Brown followed Dr. Smith’s presentation with her talk, “Bayou La Batre, A Newly Restored and Resilient Waterfront Community.” Together with the City of Bayou La Batre, the Alabama Department of Conservation and Natural Resources, Mobile County, and the National Fish and Wildlife Foundation, The Nature Conservancy implemented a large-scale restoration project committed to protecting and preserving the coastal community of Bayou La Batre. Mrs. Brown explained how this project aimed to protect against future storms and coastal hazards as well as revitalize the locally important waterfront area by restoring, enhancing, and protecting the shoreline habitats and providing improved community access for recreation and fishing opportunities. Katie Warnell concluded this session with her talk, “Tracking socio-economic effects of ecosystem restoration: Advances and challenges from the Gulf of Mexico Ecosystem Service Logic Models and Socio-Economic Indicators (GEMS) project.” Ecosystem restoration projects often have social and economic goals as well as environmental ones, but socio-economic outcomes are rarely measured during project monitoring. This presentation highlighted key findings – both challenges and advances – from the GEMS project, which worked with restoration practitioners, funders, and stakeholders in the Gulf of Mexico to identify socio-economic outcomes and metrics of interest for restoration in the region.

The following points were addressed by this session:

- Nature-based solutions have several names and applications, but all focus on simultaneous benefits to both ecological and human systems
- Examples include living shorelines and urban stormwater management
 - Opportunity: Need to work with a variety of stakeholders and engineers
 - Challenge: Permitting can vary by state and price tag can be high
- Enhanced monitoring is a primary need.
 - Ecological vs. social-economic metrics
 - Short-term vs. long-term benefits
 - Grey vs. green infrastructure
 - Impacts to equity (cost, potential harms)

Breakout Session: Evaluation of Actionable Science

This session was led by Paul Armsworth (UTK) and was accompanied by LaDon Swann (MS-AL Sea Grant), Amanda Hyman (VT), and Rafael Gonzalez (USFWS). The goal of actionable science is to undertake research that will provide information practitioner partners can use. But how do we evaluate whether an actionable science project has been successful at achieving this goal? This session discussed suitable evaluation methods for actionable science projects. It also explored lessons from past actionable science projects regarding what project characteristics led to research seeing greater uptake by practitioner partners.

LaDon Swann began this session with, “Sea Grant Process for Producing and Evaluating Actionable Science.” The presentation described how the Mississippi-Alabama Sea Grant Consortium integrates its education and engagement program into funded research projects to expedite the process of moving research discovery into application. Then, Amanda Hyman gave her talk, “Distinct Pathways to Use Versus Academic Contribution in Climate Adaptation Research.” Here, Dr. Hyman talked about a project that evaluated Phase 1 SE CASC projects. By interviewing SE CASC leadership and surveying project PIs and project partners, the research team explored what project characteristics led to academic contributions and use of research products and results. Only meeting frequency influenced use, while project's budgets, familiarity of project PIs with partners, and the level of involvement of partners influenced academic contributions. Rafael Gonzalez concluded this session with his talk, “An overview of actionable science and research activities with/in USFWS.” Through his presentation, Mr. Gonzalez defined actionable science, the science used by the FWS and how/where it is being used, and the challenges/opportunities of using this actionable science.

This session identified the following issues for the science community to consider:

- Reaffirmed by research and experience – thorough coproduction is critical to actionable science, must monitor and improve it
- Data quickly becomes outdated, but effective tools can be useful (and updated) for many years to come – invest in responsive and iterative development
- Decision-making is complex and not fully understood; but education, engagement, and evaluation can make sure our science is part of the process. Support and institutionalize these!

Breakout Session: Cultivating Coastal Resilience to Global Change

This session was led by Karen McNeal (Auburn University), Renee Collini (PLACE:SLR), and Christina Mohrman (GOMA). It was accompanied by the following speakers: Will Underwood (AL DCNR), George Ramseur (Moffatt & Nichol), Beth Stys (US FWS), and Kirk Fusco (DEP-FL). In this session, participants learned about current efforts in coastal landscape resilience from a panel of key stakeholders in the Gulf of Mexico and Atlantic Coastal regions where speakers discussed actionable science research gaps, priorities, and needs for their region. Key problems around coastal and ecosystem management and restoration, landscape resilience and species management, modeling of the ocean-land continuum and natural hazards, and communication and adaptation challenges and opportunities were discussed through a participant regional network of researchers and managers.

Will Underwood began this session with, “Shifting Shorelines, Rising Tides, and Emerging from the Ashes: Adaptive Capacity in Natural Systems” where he expressed the benefits of local knowledge, familiarity of landscapes, and public engagement in conservation management. Next, George Ramseur presented, “Coastal Resilience: challenges, successes and needs.” During his presentation, he discussed the Louisiana, Mississippi, Alabama, Coastal System (LMACS) which aims to establish a consistent, comprehensive science planning domain that accommodates the full functional extent of the estuary from a feasible restoration action perspective. Then, Beth Stys gave her talk, “Coastal Adaptation on National Wildlife Refuges in the Southeast” where she shared case studies for coastal monitoring strategies that might apply to the Gulf. One example was the Alligator River National Wildlife Refuge project that made the refuge more resilient as a result of artificial reefs and tidal flap gates. Ms. Stys also shared feedback on the successful establishment of a living shoreline, including an oyster breakwater, smooth cordgrass planting, and mangrove planting in the Pelican Island National Wildlife Refuge in Florida. Finally, Kirk Fusco concluded this session sharing coastal resilience successes on the Atlantic side of Florida, such as shoreline nesting, wave abatement, and shoreline restoration efforts. He expressed that although there is no “one size fits all” solution for restoration, pre-monitoring sets projects up for success and viability.

This session identified the following needs to consider:

- Need: Long-term data and a holistic synthesis of information related to coastal resilience in the southeast.
 - This will help establish reference frames and baselines from which to plan adaptive management strategies regarding living shorelines and other projects.
 - Need: Making data and journals accessible to stakeholders and managers
- Collaboration: Co-production throughout projects and evaluation to ensure the science is meeting goals and metrics.
 - Need: Include partners such a social scientists and education researchers on projects about coastal resilience
- Challenge: Permitting has been presented as a large hurdle to coastal resilience.
 - Opportunity: Building partnerships can help to ease this issue.

Breakout Session: Hydro-Climate Events and Extremes

This session was led by Jacob LaFontaine (USGS) and Meredith Muth (NOAA). The following speakers presented in this session: Champagne Cunningham (USGS-TSU), Gregory Cope (NCSU), Simeon Yurek (USGS), Adam Terando (USGS - SE CASC), Jacob LaFontaine (USGS), Jared Bowden (NCSU), Jacob LaFontaine (USGS), Ryan Boyles (USGS - SE CASC), and Kasia Nikiel (ORISE - SE CASC). Information regarding the characterization of, and potential changes in, climate-driven hydrologic extremes such as flooding are needed to support successful planning and science-based decision-making by resource managers who must address complex issues and competing interests. Hydrologic events and extremes not only impact water quantity, but also water quality, species dynamics, and overall ecosystem condition. This session focused on providing examples of the state of the science regarding characterizing, predicting, and projecting the occurrence of hydrologic extremes and related impacts. Presentations were followed by a panel discussion about the future direction of research efforts concerning this topic.

Champagne Cunningham began this session with her talk, “Hydrologic extremes and their relations to HABs,” where she discussed the role of hydrologic extremes on the occurrence of harmful algal blooms (HABs), how climate change could affect the rate at which we currently experience HABs, and the effects of HABs on the environment.

Then, Greg Cope presented, “Responses of Native Freshwater Mussels to Hydrologic Extremes.” This presentation addressed the lethal and sublethal responses of mussels to drought, flood, and in-stream flow management. Endpoints discussed were survival, behavior, physiology, and reproduction, as well as changes in chemical and physical habitat that affect abundance and distribution. Published case studies were used as relevant examples.

Simeon Yurek followed Dr. Cope with his talk, “Hazards, threats, risks, and tradeoffs in watershed management decision making driven by global climate change,” where he expressed how climate change is altering the seasonal timing and magnitude of river flood pulse regimes in the southeastern United States. Water managers must balance multiple, potentially conflicting stakeholder objectives including flood abatement, drought mitigation, conservation of natural resources, and water availability for multiple constituencies. Land managers must make difficult decisions on where to invest or conserve land given uncertainty in river flood dynamics. Water control regulations which were developed for flood regimes of the past may have radically different performance under new climate and streamflow regimes of the future. This talk discussed the Sustainable Rivers Program, which is a National partnership between The Nature Conservancy, The U.S. Army Corps of Engineers, and the USGS focused on co-production of adaptive management policies in study “Learning Watersheds” across the country. Here, we focus on the Roanoke and Cape Fear Rivers in North Carolina and review hazards, threats, risks, and tradeoffs in management decision making driven by global change processes for these systems.

Then, Adam Terando followed Dr. Yurek presenting, “How Does a Warming Planet Affect Precipitation in the Southeast?” Here, Dr. Terando gave a brief overview of the global processes

that are shaping the precipitation response to global warming and how these changes could play out in the Southeast in the coming years.

Next, Jared Bowden presented his talk, “Modeling Climate Extremes in a Warmer Climate.” Jared discussed that a major risk to our environment and way of life in the future as the climate warms is not only shifts in the mean climate but the makeup of changes in the mean climate via changes in extremes events. Modeling how extreme weather (e.g., hurricanes) and climate (e.g., prolonged drought) events may evolve as the climate warms is complex and numerous datasets are available to stakeholders to help make informed decisions about climate change. This talk discussed datasets and methods available to stakeholders considering how climate change may impact extreme events in the future. Each method and dataset has limitations and downstream applications should be conscious of these limitations before use. Finally, research directions targeted at improving the representation of future climate extremes were discussed from a personal viewpoint.

Finally, Jacob LaFontaine and Kasia Nikiel co-presented, “Simulated Hydrologic Response in the Southeastern U.S. for Historical and Potential Future Climate and Land Cover Conditions.” The ability to base decisions upon quantitative analyses of aquatic resources is a critical need of managers today, with increasing attention placed on the need for water availability information at ungaged locations. Understanding the changes in the distribution and quantity of, and demand for, water resources in response to climate variability and change is essential to planning for, and adapting to, future climatic conditions. In order to plan for future conditions and challenges, it is important that land-, water-, and cultural-resource managers understand the limitations and uncertainties associated with the characterization of these changes when making management decisions. Dr. LaFontaine part of the presentation provided a description of hydrologic modeling simulations that are being developed for historical and potential future climate and land cover conditions to provide information about water availability and streamflow characteristics in the Southeastern U.S. Dr. Nikiel explored PRMS hydrologic limitations using the Altamaha River Watershed in Georgia as a case study. This presentation showed the breadth of data available and demonstrated some of the potential applications and expected ranges in various future climate scenarios.

This session identified the following areas of improvement:

- Better alignment of physical and social science is needed to support defining management thresholds at all scales. This helps determine what events we are willing to accept and plan for vs. those we can't.
- Developing decision frameworks to help managers use range of viable models in most relevant ways. Don't let the uncertainty get in the way of the good.
- Can we better align data product availability to managers' needs? Seek manager feedback on visualization, communication, and scale/resolution of most useful products.

Breakout Session: Biological Invasions in the Southeast U.S.: Impacts, Management, and What's On the Horizon

This session was led by Deah Lieurance (UF) and Wesley Daniel (USGS) with talks from Wesley Daniel (USGS), Emily Reed (VT), Jess Hartshorn (Clemson), and Deah Lieurance (UF). Biological invasions are a significant threat to biodiversity, ecosystem functioning, human health, and the economy of the United States (U.S.). Currently, the Southeast U.S. is a hotspot for biological invasions. This region has some of the highest numbers of terrestrial and aquatic plant and animal invaders. This session presented information about current invaders in the region, how we coordinate the management of invasive species, and what efforts are underway to identify future invaders.

Wesley Daniel began this session with two talks. First, he shared a presentation by Ian Pflugsten and himself entitled, "Nonindigenous Aquatic Species Database Flood and Storm Tracker Mapper." Storm surge and flooding events can assist the expansion and distribution of nonnative aquatic species through the connection of adjacent watersheds, backflow of water upstream of impoundments, increased downstream flow, and/or creation of freshwater bridges along coastal regions. The Nonindigenous Aquatic Species (NAS) program's Flood and Storm Tracker (FaST) maps were developed to help natural resource managers with post-storm nonindigenous aquatic species detection and assessment efforts. The FaST maps were developed to be easily accessible, informative, and provide the most up-to-date information to resource managers about potential new invasions and act as an additional tool for early detection and rapid response (EDRR) systems. These maps provide natural resource managers with information on which species may have invaded and where to look. Once a species is introduced, the best chance of eradication or containment is as an emerging population.

Wesley Daniel followed this presentation with another presentation, "National Horizon Scan of Vertebrate Organisms on Trade and Hotspot Analysis." Often when an exotic organism in the pet trade enters the country, there is little if any information on the effects that organism may have on the environment or the economy if it escapes captivity. Additionally, other organisms could be hidden or hitchhiking on or within the primary organism being traded, which could have unintended consequences to the environment or economy. The goal of the National Horizon Scan is to determine the risks of a large number of exotic vertebrate organisms in the trade to establish, spread, and cause negative impacts to the environment, economy, and/or human health. Species identified as high risk could be listed as injurious and barred from importation.

Emily Reed then followed Dr. Daniel with her presentation, "Invasive Species State Policies in the SECASC region," where she presented an analysis of invasive species policies in SECASC states, including regional trends, discontinuities, and gaps. Dr. Reed discussed potential drivers of patterns and biological/management insights gained from studying invasive species policy.

Next, Jess Hartshorn gave her presentation, "Forest health at the Intersection of Climate Change and Invasive Species Management." Here, Dr. Hartshorn expressed how climate change is altering invasions of forest pests and pathogens through changes to host distribution,

abiotic disturbances, pest/parasite synchrony, and more. The way we respond to invasive species in light of climate change will depend on many factors and is constantly changing. Novel ways of monitoring invasive species, quantifying their impacts, and managing their spread are needed to ensure the continued health and productivity of southeastern forests.

Finally, session lead Deah Lieurance concluded this session with her talk, “Southeast Regional Invasive Species and Climate Change Management Network.” Effective invasive species management and policy is contingent on information generated by research and the applicability of research depends on its responsiveness to the needs of resource managers and policy makers. As climate change is expected to further facilitate the spread and impacts of invasive species, it is especially important to incorporate climate-science with invasive species research and management. Deah provided a short overview of how the Southeast Regional Invasive Species and Climate Change (SE RISCC) Management Network is working to bridge the gap between land managers and researchers to facilitate information exchange regarding climate-science informed invasive species research and management and prepare for the combined effects of invasive species and climate change in the Southeast US.

This session identified the following needs:

- Universal technology
- Cross-border cohesiveness of regulation
- Research that informs management
- Prevention

Plenary Session: Global Change Fellows Lightning Talks/Early Career Roundtable

This session was led by Aranzazu Lascurain (NCSU - SE CASC) and featured seven former Global Change Fellows offering lightning talks on their climate decision focused research and conservation. The Global Change Fellows who presented talks were as follows: Geneva Gray (NCSU), Courtney Hotchkiss (NCSU), Megan Johnson (NCSU), Kate Jones (NCSU), Justine Neville (USGS), Ambar Torres Molinari (NCSU), and Laura Villegas (Earth Economics). PDF files of the talks can be found in [online Symposium resources](#).

Plenary Session: Poster/Tools Networking Session

This session led by Kristen Fontana (NCSU - SE CASC) was intended for students, researchers, managers, and partners to present current research findings, partner resources, and management-relevant tools. A total of twenty-eight (28) and seven (7) tools were presented during this session. A table of participants and summaries is provided in Appendix D and pdf files of many of the posters can be found in [online Symposium resources](#).

Plenary Session: World Cafe Session

This session led by Cari Furiness (NCSU - SE CASC) was designed to facilitate directed conversations and knowledge sharing organized around specific topics and around specific organizations. Participants chose which tables they visited based on their individual interests. Participants rotated after 15 minutes. Organizational tables provided resources and discussion with stakeholders about management and research partner organizations, while topical tables

supported focused discussions on specific topics related to actionable science research and outcomes. A detailed directory of World Cafe topics is provided in Appendix E.

Optional Session: Introduction to Working with Tribal Nations

This optional session led by Casey Thornbrugh (USET - SE CASC) and Marie Schaefer (USGS - SE CASC) provided an introduction to how to ethically co-create science with Tribal Nations. Areas covered included: How to build relationships, How does Tribal sovereignty impact projects, Case examples of ethical projects; Participants will leave with a set of tools to use to build relationships with Tribal Nations. Participants got together in groups to discuss their experiences working with Tribes.

Next Steps

The ideas and scientific gaps and needs identified in the combined and breakout sessions will inform future science priorities for SE CASC. Several meeting opportunities of SE CASC partners during the symposium facilitated this transfer. Feedback from participants will inform the goals and structure of future SE CASC regional science symposia. In addition to gathering findings from plenary and breakout presentations and discussions in the Moving Priorities Forward session, we implemented a Post Symposium Survey, receiving about a 29% (28.65%) response rate, a total of 47 out of 164 confirmed attendees.

Feedback from the survey revealed satisfaction in the informative and constructive nature of the sessions, particularly their ability to provide insights from various perspectives. The optional Tribal training session was a highly valued piece of the symposium in addition to the Poster/Tools Networking Session and the World Cafe. Participants were also very pleased with the opportunities for networking and meaningful face-to-face engagement offered through this symposium.

When considering future symposia, the SE CASC may consider providing guidelines for session leads and speakers to either highlight in advance the technical level of their presentation or to share their information in a manner that is more accessible to non-experts in that topic. While participants were impressed by the breadth of knowledge within and throughout the sessions, some were unable to fully grasp some technical details.

Overall, attendees were very pleased with the 2022 Southeast Climate Adaptation Science Symposium in Gulf Shores, AL, recognizing the hard work that went into planning and organizing a comprehensive, inclusive regional science symposium.

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Appendix A: Detailed Agenda

Appendix B: Participant Directory

Appendix C: Acronym Key

Appendix D: Poster/Tools Session Abstracts

Appendix E: World Cafe Directory

Session Types:	Plenary	Breakout	Plenary Small Group
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**2022 SOUTHEAST CLIMATE
ADAPTATION SCIENCE SYMPOSIUM**
September 19-21, 2022
The Lodge at Gulf State Park, Gulf Shores, AL



Monday, September 19, 2022

Time	Session Title/Leads	Speakers	Session Description	Location
7:00 AM	Registration and Coffee			The Burrow + Ballroom Foyer II & III
8:00 AM	Opening	Becky Irwin (NCSU-SE CASC), Katherine Smith (USGS-SE CASC), Chris Head (Poarch Band of Creek Indians)	Welcome, Symposium Overview	Gulfview Ballroom II
8:30 AM	Visualizing Change in the Southeast <i>Lead:</i> Ryan Boyles (USGS - SE CASC)	Adam Terando (USGS - SE CASC), Georgina Sanchez (NCSU), Jacob LaFontaine (USGS), Amanda Sesser (US FWS - SECAS)	This session will set the stage for projected changes in the Southeast, providing context for how landscapes are changing with regard to climate, water, and ecosystems.	Gulfview Ballroom II
9:15 AM	Management Challenges for Climate Adaptation <i>Lead:</i> Katherine Smith (USGS-SE CASC)	Mitzi Reed (MBCI), Kier Klepzig (USFS), Rafael Gonzalez (USFWS), Monique Harden (DSCEJ); Brian Branciforte (FL FWC)	This panel will address the pressing climate adaptation challenges and related science needs of natural resource managers and communities in the Southeastern US.	Gulfview Ballroom II
10:00 AM	BREAK			Ballroom Foyer II & III
10:30 AM	Breakout Session 1			
	Climate Impacts & Adaptation for At-risk Species <i>Leads:</i> John Tirpak (USFWS), Ryan Boyles (USGS-SE CASC)	Laura Thompson (USGS), Mona Papes (UTK), Tim Male (EPIC), Darren Miller (NCASI)	Changing climate is an added source of risk for threatened and endangered species. This session will explore current practices and research related to managing at-risk species in southeastern ecosystems with perspectives from a panel of species managers, scientists, and policy-thinkers. The panel will engage participants in a discussion on future direction of climate adaptation for at-risk species.	Live Oak
	Holistic Cultural and Natural Resource Management <i>Leads:</i> Erin Seekamp (NCSU), April Taylor (SC CASC)	Brian Zettle (USACE), Courtney Hotchkiss (NCSU), Juan Cancel (Seminole Tribe of Florida)	This panel discussion will focus on breaking down the silos of natural resource or cultural resource management. Current challenges facing integrated management will be shared from a Tribal Nation perspective, a resource management agency perspective, and a university researcher perspective. Strategies for holistic management to integrate Traditional and western knowledge systems will be provided for building future collaborations.	Gulfview Ballroom IV
	Monitoring for Changing Climate and Adaptation <i>Leads:</i> Greg Steyer (USGS), Scott Phipps (AL DCNR)	Beth Stys (USFWS), Mike Osland (USGS), Brian Branciforte (FWCC), Chris Kelble (NOAA)	This session will illustrate how we are monitoring the direct effects of climate change drivers on terrestrial species, wetland habitats, and coastal and marine resources, and will explore how these data can inform the barriers, opportunities and tradeoffs to range shifts for species, habitats and ecosystems. It will include presentations framing the topic followed by a panel represented by federal, state and academic representatives that will discuss with the audience questions such as "What additional baseline information do we need to document anticipated climate-induced range shifts? What system-level indicators are informing conservation and restoration adaptation planning? and How can monitoring enhance knowledge on risks, impacts, consequences and available adaptation options?"	Gulfview Ballroom III

12:00-2:00 PM	Lunch (on your own)			
12:15-1:00 PM	<i>Optional: Tour of the Lodge</i>	Chandra Wright (The Lodge at Gulf State Park)	Join us on this 45-minute tour to learn about the history of the Lodge and take a look at some of the elements that make it one of the most sustainable resorts in the world.	Meet at back of Lobby (by the mock sea turtle nest)
2:00 PM	Centering Justice and Equity to Advance Climate Adaptation <i>Leads:</i> Mia Wavrek (USGS-ORISE), Regina Neal-Mujahid (USGS), Emily Brooks (USGS)	Louise Vaughn (USFWS), Donya Frank-Gilchrist (USGS), Mary Williams (DSCEJ), Joey Owle (EBCI)	Successful, community-led responses to climate change require us to center justice, equity, and community autonomy and self-determination in our conservation research and management programs, from how and with whom our organizations or communities partner, to how we conduct scientific research, to how we think about and measure the impacts of our work. This session features examples of justice- and equity-oriented climate adaptation research projects, applications, and partnerships from across the Southeast and Caribbean, as well as lessons learned and best practices for delivering just and equitable outcomes. Finally, the panel will address challenges and opportunities to progressing climate justice goals in the Southeast region.	Gulfview Ballroom II
2:45 PM	Connecting Conservation Across Scales <i>Leads:</i> Mitchell Eaton (USGS-SE CASC), Stephanie Romafach (USGS)	Caleb Hickman (EBCI), Todd Schenk/Victoria Hymel (VT), Hilary Morris (SECAS), Louise Vaughn (SECAS)	Adaptation of natural resource management in response to change is strongest when tight feedback loops produce more immediate signals of costs and benefits, most commonly at highly localized scales and over short time horizons. As problems increase in scope, attenuation of perceived risks and benefits over larger scales and across jurisdictions adds considerable challenges to finding solutions via collaborative decision making. Scale mismatch represents another challenge for managing natural systems, variously characterized as institutional governance misaligned with the biophysical or temporal scale of the resource, or information mismatch in which knowledge is produced at a scale that is of limited use for decision making. In this plenary session, we will hear from a diverse group of scientists and managers on their experiences and perspectives regarding the challenges and considerations of implementing cross-scale conservation practices and adaptation strategies.	Gulfview Ballroom II
3:30 PM	BREAK			Ballroom Foyer II & III
4:00 PM	Global Change Fellows Lightning Talks/Early Career Roundtable. <i>Lead:</i> Aranzazu Lascurain (NCSU-SE CASC)	Geneva Gray (NCSU), Courtney Hotchkiss (NCSU), Megan Johnson (NCSU), Kate Jones (NCSU), Ambar Torres Molinari (NCSU), Justine Neville (USGS), Laura Villegas (Earth Economics)	Present and former fellows will present talks related to conservation and climate decision focused research.	Gulfview Ballroom II
4:30-6:00 PM	Poster/Tools Networking Session: Sharing Science and Tools to Support Adaptation to Climate and Land Use Change <i>Leads:</i> Kristen Fontana (NCSU-SE CASC)		Network with students, researchers, managers, and regional experts as they showcase their research and resources and share management-relevant tools.	Gulfview Ballroom I
6:15-6:45 PM	<i>Optional: Birds, Turtles, & Mice – Oh My!</i>	Chandra Wright (The Lodge at Gulf State Park)	Join us for a short 30-minute beach walk to learn about the habitat around the Lodge and some of the protected creatures that can be found here (as well as the efforts to help them).	Meet on Dunes Terrace
Tuesday, September 20, 2022				
7:00 AM	Registration and Coffee			The Burrow + Ballroom Foyer II & III

8:00 AM	Adaptation in Action <i>Lead:</i> Jen Cartwright (USGS-SE CASC)	Mike Osland (USGS), Jaime Collazo (USGS & NCSU), Greg Cope (NCSU), Renee Collini (Mississippi State), Erin Seekamp (NCSU)	This session will present a variety of case studies of successful climate-adaptation projects in the Southeast. Discussion of adaptation actions will address project successes, lessons learned, and science priorities to inform ongoing adaptation efforts.	Gulfview Ballroom II
8:45 AM	Breakout Session 2			
	Changing Fire Management in the Southeast <i>Leads:</i> Adam Terando (USGS-SE CASC), Kevin Hiers (USGS/Tall Timbers)	Kevin Hiers (USGS/Tall Timbers), Brett Williams (Eglin AFB), Kirsten Lackstrom (USC), Scott Covington (USFWS), Marcus Williams (USFS)	Fire management, and in particular the use of prescribed fire, is a well-established practice in the Southeast US. This reflects the confluence of human-objectives, ecosystems, and environmental conditions that have in turn led to this region experiencing the largest annual area of intentional fire in the US. However, anthropogenic climate change poses a challenge to this robust application of fire. Risks associated with the maintenance, reduction, or increased use of fire must be considered given the potential damage to ecosystems, operations, and surrounding human communities. Here we will explore these risks, but also potential adaptation pathways related to these management considerations.	Gulfview Ballroom III
	Nature-based Solutions for Climate Adaptation and Resilience <i>Leads:</i> Katie Warnell (Duke), Kelly Guilbeau (USFWS)	Mary Kate Brown (TNC-Alabama), Dana Brown (Dana Brown & Associates), Carter Smith (Duke University), Katie Warnell (Duke University)	This session will explore the state of the science on how the integration of nature-based solutions in large-scale restoration efforts as well as within local community projects can support climate adaptation and resilience while providing a broad suite of ecosystem services. Case studies will describe implementation and approaches for measuring effectiveness of nature-based solutions such as living shorelines and wetlands in coastal areas and urban greenspace to retain stormwater runoff.	Gulfview Ballroom II
	Evaluation of Actionable Science <i>Lead:</i> Paul Armsworth (UT)	Amanda Hyman (VT), LaDon Swann (MS-AL Sea Grant), Rafael Gonzalez (USFWS)	The goal of actionable science is to undertake research that will provide information practitioner partners can use. But how do we evaluate whether an actionable science project has been successful at achieving this goal? This session will discuss suitable evaluation methods for actionable science projects. It will also explore lessons from past actionable science projects regarding what project characteristics led to research seeing greater uptake by practitioner partners.	Gulfview Ballroom IV
10:15 AM	BREAK			
10:45 AM	World Cafe <i>Lead:</i> Cari Furiness (NCSU-SE CASC)		This session will consist of organizational tables and topical tables that participants join on a rotating basis. Organizational tables provide resources and discussion with stakeholders about management and research partner organizations, while topical tables will support focused discussions on specific topics related to actionable science research and outcomes.	Gulfview Ballroom II
12:45-2:45 PM	Lunch (on your own)			
1:00-1:45 PM	<i>Optional: Tour of the Lodge</i>	Chandra Wright (The Lodge at Gulf State Park)	Join us on this 45-minute tour to learn about the history of the Lodge and take a look at some of the elements that make it one of the most sustainable resorts in the world.	Meet at back of Lobby (by the mock sea turtle nest)
2:45 PM	Breakout Session 3			

	Cultivating Coastal Resilience to Global Change <i>Leads:</i> Karen McNeal (Auburn), Renee Collini (PLACE:SLR), Christina Mohrman (GOMA)	Will Underwood (AL DCNR), George Ramseur (Moffatt & Nichol), Kirk Fusco (DEP-FL), Beth Stys (USFWS)	In this session we will learn about current efforts in coastal landscape resilience from a panel of key stakeholders in the Gulf of Mexico and Atlantic Coastal regions where speakers will discuss actionable science research gaps, priorities, and needs for their region. Key problems around coastal and ecosystem management and restoration, landscape resilience and species management, modeling of the ocean-land continuum and natural hazards, and communication and adaption challenges and opportunities will be discussed through a developing participant regional network of researchers and managers during the session.	Gulfview Ballroom II
	Hydro-Climate Events and Extremes <i>Leads:</i> Jacob LaFontaine (USGS), Meredith Muth (NOAA)	Champagne Cunningham (USGS/TN State University), Adam Terando (USGS-SE CASC), Jacob LaFontaine (USGS), Jared Bowden (NCSU), Gregory Cope (NCSU), Simeon Yurek (USGS), Ryan Boyles (USGS-SE CASC), Kasia Nikiel (ORISE/SE CASC)	Information regarding the characterization of, and potential changes in, climate-driven hydrologic extremes such as flooding are needed to support successful planning and science-based decision-making by resource managers who must address complex issues and competing interests. Hydrologic events and extremes not only impact water quantity, but also water quality, species dynamics, and overall ecosystem condition. This session is focused on providing examples of the state of the science regarding characterizing, predicting, and projecting the occurrence of hydrologic extremes and related impacts. Presentations will be followed by a panel discussion about the future direction of research efforts concerning this topic.	Gulfview Ballroom III
	Biological Invasions in the Southeast U.S.: Impacts, Management, and What's On the Horizon <i>Leads:</i> Deah Lieurance (UF), Wesley Daniel (USGS)	Emily Reed (Virginia Tech), Wesley Daniel (USGS), Deah Lieurance (UF), Jess Hartshorn (Clemson)	Biological invasions are a significant threat to biodiversity, ecosystem functioning, human health, and the economy of the United States (U.S.). Currently, the Southeast U.S. is a hotspot for biological invasions. This region has some of the highest numbers of terrestrial and aquatic plant and animal invaders. This session will present information about current invaders in the region, how we coordinate the management of invasive species, and what efforts are underway to identify future invaders.	Gulfview Ballroom IV
4:15 PM	BREAK			Ballroom Foyer II & III
4:45 PM	Moving Priorities Forward <i>Lead:</i> Rebecca Irwin (NCSU-SE CASC)		Report out on gaps identified in Breakouts and Combined sessions, connect back to partner perspectives and map to potential science initiatives.	Gulfview Ballroom II
6:00 PM	ADJOURN			
6:15 PM	<i>Optional: Tour of the Gulf State Park Interpretive Center</i>	Chandra Wright (The Lodge at Gulf State Park)	The Interpretive Center is Alabama's most environmentally friendly building, built to achieve LEED Platinum and full Living Building Challenge certification (as well as being the first-ever FORTIFIED Commercial facility). On this 30 minute tour, we'll explore the unique design features of the Interpretive Center and learn how the facility generates its own energy and drinking water.	Meet in the Ballroom Foyer to receive parking passes and then drive to the Interpretive Center (carpool is suggested).

Wednesday, September 21, 2022

Time	Session Title	Leads	Session Description	Location
9:30-10:00 AM	COFFEE SERVICE			Ballroom Foyer II & III
10-11:30 AM	Introduction to Working with Tribal Nations	Casey Thornbrugh (USET-SE CASC), Marie Schaefer (USGS-SE CASC)	An introduction to how to ethically co-create science with Tribal Nations. Areas to be covered include: How to build relationships, How does Tribal sovereignty impact projects, Case examples of ethical projects; Participants will leave with a set of tools to use to build relationships with Tribal Nations.	Gulfview Ballroom III
12:30-5:00 PM	Field Trip to Fort Morgan State Historic Site and surrounding area	Jackie Sablan (USFWS), Heather Tassin (Fort Morgan State Historic Site)	Learn about climate challenges for management of this important cultural resource as well as the surrounding dune and marsh habitats on this field trip to Fort Morgan State Historic Site at the mouth of Mobile Bay. Registration and payment required.	Meet in hotel main lobby by 12:15PM



Participant Directory

First Name	Last Name	Organization/Agency/Affiliation	Email	Pronouns
Scott	Alford	University of Florida - Nature Coast Biological Station	scott.alford@ufl.edu	He/Him
Rebecca	Allee	NOAA Office for Coastal Management	becky.allee@noaa.gov	She/Her
Mike	Allen	UF/IFAS Nature Coast Biological Station	msal@ufl.edu	He/Him
Paul	Armsworth	University of Tennessee, Knoxville	p.armsworth@utk.edu	He/Him
Aaron	Baumgardner	Catawba Nation	aaron.baumgardner@catawba.com	He/Him
Amanda	Beard	Jackson State University	j00946475@students.jsu.edu	She/Her
Kyla	Bloyer	American Society of Adaptation Professionals	kbloyer@adaptpros.org	She/Her
Jared	Bowden	North Carolina State University	jhbowden@ncsu.edu	He/Him
Ryan	Boyles	USGS	rboyles@usgs.gov	He/Him
Brian	Branciforte	Florida Fish and Wildlife Conservation Commission	brian.branciforte@myfwc.com	He/Him
Jenny	Brennan	Southern Environmental Law Center	jbrennan@selcsc.org	She/Her
Dana	Brown	Dana Brown & Associates, Inc.	dbrown@danabrownassociates.com	She/Her
Mary Kate	Brown	The Nature Conservancy	mkbrown@tnc.org	She/Her
Jena (Ally)	Brown	Auburn University	JZB0184@Auburn.edu	She/Her
Beth	Brown	Interested	KYBricks4Kidz@gmail.com	She/Her
Ellen	Brown	USGS	ellenbrown@usgs.gov	She/Her
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Appendix C – Acronym Key

AFB: Air Force Base

AL DCNR: Alabama Department of Conservation Natural Resources

DEP-FL: Florida Department of Environmental Protection

DSCEJ: Deep South Center for Environmental Justice

EBCI: Eastern Band of Cherokee Indians

EPIC: Environmental Policy Innovation Center

FL FWCC: Florida Fish and Wildlife Conservation Commission

HBCU: Historically Black Colleges and Universities

ITEK: Indigenous traditional ecological knowledge

MBCI: Mississippi Band of Choctaw Indians

MSU: Mississippi State University

NCASI: National Council for Air and Stream Improvement

NCSU: North Carolina State University

NOAA: National Oceanic and Atmospheric Administration

ORISE: Oak Ridge Institute for Science and Education

PLACE:SLR: Program for Local Adaptation to Climate Effects: SLR

SECAS: Southeast Conservation Adaptation Strategy

SE CASC: Southeast Climate Adaptation Science Center

TSU: Tennessee State University

UF: University of Florida

USACE: United State Army Corps of Engineers

USET: United South and Eastern Tribes

USC: University of South Carolina

USFS: United States Forest Service

US FWS: United States Fish and Wildlife Service

USGS: United States Geological Survey

UTK: University of Tennessee Knoxville

VT: Virginia Tech



Poster/Tools Networking Session Directory

September 19, 2022

POSTERS

Presenter Name	Presentation Title/Abstract
Theme: Adaptation Challenges & Successes	
Jena (Ally) Brown , Auburn University	<p>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</p> <p>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.</p>
Michael Flynn , National Park Service	<p>Title: Coastal Adaptation Planning at Cape Hatteras National Seashore</p> <p>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.</p>
Geneva Gray , North Carolina	<p>Title: Extreme Precipitation in a Warmer World</p>



State University	<p>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.</p>
Courtney Hotchkiss , North Carolina State University	<p>Title: Archaeological Site Stewardship in a Changing Climate: Lessons on Meaningful Engagement with Tribal Nations</p> <p>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.</p>
Richard Nisbett , Forest Partners International	<p>Title: The Artful Science of Community Engagement: Participatory Design for Rewilding, Regeneration, Restoration</p> <p>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.</p> <p>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.</p>
Barrett Ristroph , Ristroph Law, Planning, and Research	<p>Title: Community Relocation in the Gulf South</p> <p>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</p>



	<p>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.</p>
Jennifer Rote, The Nature Conservancy	<p>Title: From Concept to Management – Applying The Nature Conservancy’s Managing for Climate Resilience Guidance to 4 Florida Preserves</p> <p>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.</p> <p>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.</p>
Sara Martin, Mississippi State University and MS-AL Sea Grant	<p>Title: Lessons learned from a living shorelines assistance program</p> <p>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.</p>
Theme: Changing Southeastern Landscapes	
Elyssa Collins,	Title: Predicting flood damage probability across the conterminous United States



<p>North Carolina State University</p> <p>[Presented by Georgina Sanchez, North Carolina State University]</p>	<p>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.</p>
<p>Ken Krauss, U.S. Geologic Survey</p>	<p>Title: Nutrient Loading and Mangrove Forest Response at J.N. “Ding” Darling NWR on Sanibel Island, Florida, USA</p> <p>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.</p>
<p>Margaret Lawrimore, NC State University - Center for Geospatial Analytics</p>	<p>Title: Forecasting scenarios of human mobility and shifts in development patterns driven by future flood hazard conditions</p> <p>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</p>



	<p>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.</p>
<p>Megan Malish, University of Oklahoma</p>	<p>Title: Climate Change Induced Alterations of Connectivity in Three Southeastern Watersheds</p> <p>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.</p>
<p>Michelle Moorman, USFWS</p>	<p>Title: Hanging in the balance: Long-term trends in coastal wetland dynamics in the South Atlantic Basin in the face of sea-level rise</p> <p>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.</p> <p>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.</p>
<p>Justine Neville, U.S. Geologic Survey</p>	<p>Title: Marshes in Flux: Surface Elevation Change Trends Across the Southeastern United States</p> <p>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</p>



	<p>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.</p>
<p>Georgina Sanchez, North Carolina State University - Center for Geospatial Analytics</p>	<p>Title: Improving forecasts of societal responses to sea level rise and frequent flooding</p> <p>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.</p>
<p>Hang Song, Auburn University - Geoscience Department</p>	<p>Title: Temperature, Precipitation, and Vapor Trends of 3018 Counties in the US. Mainland (1981-2020)</p> <p>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 counties 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.</p>
<p>Theme: Impacts on Habitats, Animals, People</p>	
<p>Scott Alford, University of Florida - Nature Coast Biological Station</p>	<p>Title: Watershed Modification Effects on Coastal Ecosystems: A Synthesis from Key Gulf of Mexico Estuaries</p> <p>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</p>



	<p>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.</p>
<p>Amanda Beard, Jackson State University</p>	<p>Title: Urban Heat Islands: Radial Climate Effects of Heat Islands</p> <p>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.</p>
<p>Jared Bowden, North Carolina State University</p>	<p>Title: Exploring Relationships Between Emerging Climate Change Signals and Species Range Shifts</p> <p>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.</p> <p>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</p>



	<p>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.</p>
<p>Haven Cashwell, Auburn University</p>	<p>Title: Enhancing Climate Resiliency and Climate Communication in Southeastern United States through Co-Production</p> <p>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.</p>
<p>Marcello DeVitis, Southeastern Grasslands Initiative</p>	<p>Title: Southeastern Grasslands Initiative: We work to conserve, restore, and promote native grasslands throughout the Southeast</p> <p>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.</p>



Luke Evans, University of Florida	<p>Title: The future of invasion risk posed by the pet trade</p> <p>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 1/3 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.</p>
Megan Johnson, North Carolina State University	<p>Title: Recent patterns and possible climate-driven changes in Southeastern wildland fire smoke impacts</p> <p>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 (PM_{2.5}) 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.</p> <p>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 PM_{2.5}. 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 PM_{2.5}. 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.</p>
Kate Jones, North Carolina State University	<p>Title: Prescribed fire smoke scenarios using projected climate, housing development, and management priorities</p> <p>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</p>



	<p>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.</p>
<p>Kyle Lesinger, Auburn University</p>	<p>Title: Flash drought forecast skill in subseasonal prediction models over the contiguous United States</p> <p>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.</p>
<p>Tia Offner, Mississippi State University</p>	<p>Title: Habitat utilization of fringing marsh and adjacent submerged landscape by nekton in a Gulf of Mexico tidal oligohaline environment</p> <p>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,</p>



	<p>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.</p>
<p>Carrie Radcliffe, Southeastern Center for Conservation at Atlanta Botanical Garden</p>	<p>Title: Southeastern Plant Conservation Alliance</p> <p>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:</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<p>Ashlynn Smith, Southeast Center for Conservation - Atlanta Botanical Garden</p>	<p>Title: Plant conservation partnerships help protect Chapman's rhododendron from impacts of climate change</p> <p>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.</p> <p>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 (<i>Rhododendron chapmanii</i>). 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</p>



	<p>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.</p> <p>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.</p>
Laura Villegas, Earth Economics	<p>Title: Urban Heat Mitigation Mapping to measure economic effects of impacts on human health and help make recommendations for more equitable and resilient communities</p> <p>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.</p>

TOOLS

Presenter Name	Title/Abstract
Theme: Adaptation Challenges & Successes	
Kyla Bloyer, American Society of Adaptation Professionals	<p>Title: Introduction of Ready-To-Fund Resilience Toolkit and ASAP to Practitioners</p> <p>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.</p> <p>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:</p> <ul style="list-style-type: none">• 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. <p>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</p>



	and a mismatch between older plans and community needs.
Ashlyn Shore, National Environmental Modeling and Analysis Center	<p>Title: Asking the Tough Questions: Allowing User Research to Guide the Evolution of the U.S Climate Resilience Toolkit</p> <p>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.</p> <p>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.</p>
Theme: Changing Southeastern Landscapes	
Rebecca Allee, NOAA Office for Coastal Management	<p>Title: Sea Level Rise Viewer</p> <p>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/digitalcoast/tools/slr. This presentation will provide a description of the tool's features. In particular, we will demonstrate local flooding scenarios and marsh migration.</p>
Hilary Morris, Southeast Conservation Adaptation Strategy (SECAS)	<p>Title: The Southeast Conservation Blueprint</p> <p>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.</p> <p>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</p>



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



	<p>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.</p>
<p>Kristine Evans, Mississippi State University</p>	<p>Title: Dynamic Land Conservation Planning in the Gulf of Mexico Coastal Region via the Strategic Conservation Assessment Tool Suite</p> <p>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.</p> <p>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.</p>



World Cafe

September 20, 2022

Format: After a brief introduction, participants choose a table of interest to join for discussion according to the Table Topic. After 15 minutes, participants will rotate from that table to another table of their choice. This process will continue for 7 rounds.

TOPICAL TABLES

Table #	Table Topic
1	<p>Challenges and Successes to Achieving Coastal Resilience <i>Karen McNeal (Auburn University), Katie Warnell (Duke University), Ally Brown (Auburn University)</i></p> <p>Coastal resilience is threatened by climate-related changes including sea level rise, more intense hurricanes, and changes to rainfall patterns. Management of coastal habitats and communities to enhance their resilience requires high-quality, relevant scientific information and data. The SE CASC coastal resilience working group has identified a need to gather information about research gaps from key stakeholders to ensure that SE CASC research funding for coastal resilience is directed toward questions of critical relevance for managers. At this table we will discuss participant ideas about science needs and gaps, potential collaborations related to coastal resilience research, and opportunities or improvements in processes for connecting science to managers.</p>
2	<p>Climate Change, Collaboration & SWAPs: Unpacking Drivers of Change and Opportunities for Transboundary Collaboration in State Wildlife Action Planning <i>Todd Schenk (VT), Tori Hymel (VT)</i></p> <p>Climate change is rapidly altering our ecosystems with many implications, including shifting the ranges of species of greatest conservation need across state boundaries. This will necessitate new forms of collaboration both between states and with external stakeholder partners. The objectives for this table are to unpack: a) how various states are (or are not) integrating climate factors into their SWAPs and the implications of differences in how they are making sense of this data; b) how states currently collaborate both with their neighbors and with other stakeholders; and, most importantly, c) how collaboration—particularly transboundary across state lines—might be better facilitated and supported.</p>
3	<p>Collaborations Between Tribal Nations and the Climate Adaptation Community <i>Casey Thornbrugh (USET)</i></p> <p>How do Tribal nations and the Climate Adaptation Community network have more reciprocal collaborations? What does co-creating science between Indigenous knowledges/sciences and western sciences look like?</p> <p>For Tribal staff, what type of expertise are you looking for that the Climate Adaptation Community could perhaps fulfill? For Climate Adaptation Community, what barriers and opportunities are you encountering in collaborating with Tribal nations?</p>



4	Communication Strategies Across the Science to Action Continuum <i>Michelle Jewell, other NCASC comms</i> Do you have science communication stumbling blocks? Are you communicating uncertainty in a way that's understandable and trust-building? Who are your top audiences and why should you only aim for them? This table is led by the N-CASC science communications team and is here to answer your scicomm questions. Bring your toughest comms challenges so we can workshop a solution.
5	Eye Tracking for Climate Data Visualization <i>Haven Cashwell (Auburn University)</i> 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.
6	Incorporating Climate Change into SWAP Revisions <i>Paul Armsworth (UT), Mona Papes (UTK)</i> Discussions at this table will focus on data, concepts and approaches that can help states and other actors integrate climate change better into wildlife action plans. They will be led by members of one of SE CASC's ongoing Working Groups that is focused on the upcoming revision of State Wildlife Action Plans in the Southeast. We will cover vulnerability assessments, niche model outputs, and ways to embed wildlife actions plans into a wider regional context.
7	SE CASC Future Science Needs/Priorities (a) <i>Jen Cartwright (USGS)</i> What science questions related to climate adaptation do you feel are in greatest need of prioritization for research? What are major knowledge gaps in your field of research or that affect your ability to manage natural resources? What are the emerging questions that are of increasing importance, that were not as much on your radar 5-10 years ago? These 3 tables will provide the opportunity for Symposium participants to share their thoughts and inform future



	SE CASC science directions.
8	SE CASC Future Science Needs/Priorities (b) <i>Katherine Smith (USGS)</i> What science questions related to climate adaptation do you feel are in greatest need of prioritization for research? What are major knowledge gaps in your field of research or that affect your ability to manage natural resources? What are the emerging questions that are of increasing importance, that were not as much on your radar 5-10 years ago? These 3 tables will provide the opportunity for Symposium participants to share their thoughts and inform future SE CASC science directions.
9	SE CASC Future Science Needs/Priorities (c) <i>Ryan Boyles (USGS)</i> What science questions related to climate adaptation do you feel are in greatest need of prioritization for research? What are major knowledge gaps in your field of research or that affect your ability to manage natural resources? What are the emerging questions that are of increasing importance, that were not as much on your radar 5-10 years ago? These 3 tables will provide the opportunity for Symposium participants to share their thoughts and inform future SE CASC science directions.
10	Southeast Regional Invasive Species and Climate Change <i>Deah Lieurance (UF IFAS), Wes Daniel (USGS)</i> The RISCC management networks reduce the joint effects of climate change and invasive species by synthesizing relevant science, sharing the needs and knowledge of managers, building stronger scientist-manager communities, and conducting priority research. The Southeast is particularly important because many potential invasions are currently suppressed by cooler climates. As the climate changes, the Southeast may serve as a possible source of invasion towards other RISCC regions. The goal of the SE RISCC is to improve invasive species management in the face of climate change by: a) identifying information needs for invasive species management, and b) developing a strategy to address these needs via information sharing and research In this roundtable discussion, we seek to identify priority research and monitoring needs and will discuss initiatives that support natural resource managers across the region.


ORGANIZATIONAL TABLES

Table #	Table Topic
11	Conserving an Intact and Enduring Appalachian Landscape: Designing a Corridor in Response to Climate Change appalachiantrail.org <i>Cassidy Lord (Appalachian Trail Conservancy)</i> In 2021, the Appalachian Trail Conservancy (ATC) convened a group of experts to form a Climate Advisory Group (CAG) to build awareness of the impacts of climate change across this



	<p>unique region and identify opportunities to safeguard public safety, economic stability, and ecological health. Their recommendations are included in the report “Conserving an Intact and Enduring Appalachian Landscape: Designing a Corridor in Response to Climate Change.” The report is a tool, made available to the public by ATC and the CAG, to identify climate-smart actions and opportunities that can be incorporated into conservation strategies and strategic planning efforts.</p> <p>During the World Café, participants will explore local, regional, and state level activities that address threats and implement actions outlined in the report.</p> <p>W ATLP World Cafe Description.docx</p>
12	<p>Gulf Research Program nationalacademies.org/gulf/gulf-research-program <i>Sherrie Forrest, Charlene Milliken, Pete Nelson (National Academies of Sciences, Engineering, and Medicine)</i></p> <p>The Gulf Research Program (GRP) of the National Academies of Sciences, Engineering, and Medicine is a 30-year, \$500 million program created in 2013 in the wake of the Deepwater Horizon disaster. The GRP supports studies, projects, research, and other activities that develop and apply science, engineering, and medical knowledge to enhance offshore energy safety, environmental protection and stewardship, and human health and community resilience. The GRP complements its grant making and research activities with fellowships and other education programs designed to foster the next generation of Gulf talent. The GRP’s activities are designed to increase the ability of the citizens of the Gulf to translate scientific, engineering, and medical knowledge into meaningful action.</p>
13	<p>Mississippi-Alabama Sea Grant Consortium (MASGC) masgc.org <i>Sara Martin (Mississippi State University & Mississippi-Alabama Sea Grant)</i></p> <p>The mission of Mississippi-Alabama Sea Grant Consortium (MASGC) is to provide integrated university- and college-based research, communications, education, extension and legal programs to coastal communities that lead to the responsible use of ocean and coastal resources in Alabama and Mississippi and the Gulf of Mexico through informed personal, policy and management decisions.</p> <p>To fulfill this mission, MASGC commits to interdisciplinary environmental scholarship and community-based natural-resource management. The tools available in support of the MASGC mission are applied interdisciplinary research, outreach, education and legal services using both targeted and cross-cutting approaches. These tools are utilized in local, state, regional, national and international arenas.</p>
14	<p>National Environmental Modeling and Analysis Center (NEMAC) nemac.unca.edu <i>Ashlyn Shore (National Environmental Modeling and Analysis Center)</i></p> <p>The National Environmental Modeling and Analysis Center (NEMAC) is an applied research center at the University of North Carolina Asheville. Our aim is to help society understand the changing world and learn from the space between where science is made and where science is used. We empower our partners by creating data-driven products to ensure a more resilient</p>



	<p>future for all.</p> <p>NEMAC was instrumental in co-developing the U.S. Climate Resilience Toolkit with NOAA's Climate Program Office. The Toolkit, designed to help local governments build climate resilience, is the federal flagship website for climate adaptation and resilience work across the nation. The Toolkit is frequently updated with climate resilience case studies, tools, reports, and data products, and we commonly receive requests for expert advice.</p> <p>Developing geospatial mapping products aids our partners in effectively illustrating and communicating change with important decision makers and users. In collaboration with the National Fish and Wildlife Foundation, we have developed a total of nine Coastal Resilience Assessments with a corresponding interactive mapping tool to view, analyze, and download Assessment data. This information is useful for local stakeholders to help inform their decision-making about the potential of resilience-related projects that have dual benefits for both people and wildlife.</p> <p> NEMAC World Cafe Description.docx</p>
15	<p>Southeastern Plant Conservation Alliance (SE PCA), Atlanta Botanical Garden (ABG), and the Southeastern Center for Conservation Research at ABG <i>Carrie Radcliffe, Sarah Norris, Ashlynn Smith (Atlanta Botanical Garden/ Southeastern Plant Conservation Alliance)</i></p> <p>The Atlanta Botanical Garden has more than 30 years of experience in the conservation and recovery of rare and threatened plant species through research, propagation, collaborative restoration and habitat management. Through conservation of imperiled species and natural communities across the southeastern United States, Caribbean, and Ecuador, the Garden helps protect the natural heritage of one of North America's most biodiverse regions.</p> <p>Through its Southeastern Center for Conservation & Research, the Atlanta Botanical Garden advances the science of conservation through research, collaborations, and native species recovery programs that include conservation collections at the garden and applied conservation activities that support preservation of species in their native habitats. Conservation programs, training, and capacity building derived from the activities of the Southeastern Center for Conservation support the Garden's commitment to serving the needs of the community and making the connection between people and plants.</p> <p>The Southeastern Plant Conservation Alliance (SE PCA), housed primarily at the Garden, is a cross-cutting partnership of public and private conservation professionals working in the Southeastern United States. The SE PCA seeks to bridge gaps between local and national efforts by fostering regional cooperation and promoting a diversity of partners. The Alliance is tailored to multiple interests to provide training opportunities, fill information gaps, identify conservation needs, prioritize efforts, and work collaboratively to conserve imperiled plants. It provides a forum where they share information on the conservation status and needs of imperiled plants throughout the region, without being limited by state or agency boundaries.</p>
16	<p>The Jones Center jonesctr.org <i>Kier Klepzig (The Jones Center at Ichauway)</i></p>



The Jones Center is located on Ichauway, a 29,000 acre property of pristine longleaf pine, over a hundred wetlands, two rivers in rural southwestern Georgia. Ichauway was established in the 1920s by Robert W. Woodruff, who became the long-term chairman of The Coca-Cola Company.

Research programs at the Jones Center focus on understanding the ecology, restoration and management of the longleaf pine ecosystem; and the water resources, wetlands and aquatic ecosystems of the southeastern Coastal Plain. Ichauway is located in the heart of the historic range of longleaf pine. Longleaf pine ecosystems are among the rarest and most biologically diverse in North America and are increasingly a focus of conservation efforts. Southwest Georgia is also a hydrologically unique karst region that serves as the major recharge area for one of the nation's most prolific and heavily used aquifers, the Upper Floridan aquifer. We balance basic research of these systems with applied work of relevance to the natural resource management and conservation communities and see the Center as a crossroads for research and practice. The Center's research is integrated under three programmatic areas: Woods, Water, and Wildlife.