



SOUTHEAST

Climate Adaptation Science Center

2017-2024 Center Report



The background of the page is a photograph of a beach. In the foreground, there is a wide, sandy beach. In the middle ground, two brown horses are standing on the sand, facing left. In the background, the ocean waves are breaking, and the sky is filled with soft, white clouds.

FROM THE DIRECTORS

At the Southeast Climate Adaptation Science Center (SE CASC), our mission is to support the needs of natural and cultural resource managers with science and tools to navigate a changing climate. In a region shaped by diverse ecosystems, rich biodiversity, and a deep connection between heritage and the environment, the challenges associated with adaptation are vast – but so, too, are the opportunities for innovation and collaboration.

During Phase 2 (2017-2023), SE CASC continued to foster strong partnerships across federal, state, tribal, and academic institutions to ensure that the best science is available to inform decision-making. Through co-produced research, stakeholder engagement, and capacity-building efforts, we have worked to bridge the gap between climate science and on-the-ground action. Our team remains committed to delivering actionable work that safeguards fish, wildlife, water, land, and people from the impacts of climate change. Preserving these resources is not just a scientific challenge, it is our duty to future generations.

This report highlights key projects, emerging research, and the meaningful collaborations that define our work. It is a testament to the dedication of researchers, partners, and stakeholders who share our vision of a thriving, resilient Southeast.

Together, we are safeguarding America's natural legacy, ensuring that the resources we rely on endure for generations to come.

— **CONSORTIUM DIRECTOR REBECCA IRWIN
AND USGS DIRECTOR KATHERINE SMITH**

FROM THE ASSISTANT DIRECTOR


The second phase of the Southeast CASC was a time of outstanding growth and activity built upon the lessons learned and ideas generated during the preceding years. We added five great Consortium institutions, overcame obstacles with changing administrations and leadership, and engaged more deeply and broadly with USGS and university researchers and managers from federal, tribal, and state agencies and regional organizations. This has led to research partnerships that incorporated co-production more fully, generating science that is useful and used and techniques to measure and improve that impact.

We honed the Global Change Fellows program to effectively provide students with climate science literacy, skills in science communication and structured decision making, experience with decision-focused and partner-engaged science, and connections with a variety of professionals, increasing the leverage of their impact and their success as they enter the climate adaptation workforce.

SE CASC's research paradigm embraces work on Exposure (what does climate change look like at a particular place?), Impacts (what does that mean for resources we care about?), and Adaptation (how do we make climate-smart decisions for those resources?). A prime example is the project Strategic Habitat Conservation and Adaptive Strategies for the Conservation of Coqui Frogs in Puerto Rico, which encompassed work all along that continuum and will inform real options for management of iconic and threatened species in the next phase of the SE CASC.

We are proud of our work to date and excited for what's to come.

— **CONSORTIUM ASSISTANT DIRECTOR CARI FURNESS**



THE CHALLENGES
ASSOCIATED WITH
ADAPTATION ARE VAST –
BUT SO, TOO, ARE
THE OPPORTUNITIES
FOR INNOVATION AND
COLLABORATION.

Pictured here: Wild horses in Corolla Beach, North Carolina

FISH



8

projects

6

fellows

10

publications

PROJECT HIGHLIGHT

THE PROJECT **BROOK TROUT POPULATION RESPONSES TO CLIMATE VARIATION ACROSS THE SOUTHEAST** EXAMINED HOW CLIMATE CHANGE AFFECTS BROOK TROUT IN THE APPALACHIAN MOUNTAINS. These native fish have become restricted to small headwater streams and are vulnerable to rising temperatures.

Researchers analyzed stream temperature data from 200+ locations and developed models using data from 300+ sites. They studied how habitat factors, especially groundwater, influenced trout resilience.

The project produced regional datasets, advanced models, and vulnerability maps to guide conservation. Findings helped prioritize habitat restoration, translocations, and non-native species removal to protect brook trout populations.



[HTTPS://GO.NCSU.EDU/SECASC-BROOK-TROUT](https://go.ncsu.edu/secasc-brook-trout)

PUBLICATIONS

- ★ [Clarifying Science Needs for Determining the Impact of Climate Change on Harmful Algal Blooms in the Southeastern United States](#)
- ★ [Facilitating Accurate and Effective Application of Coastal Marsh Models](#)
- ★ [Climate- and Land-Cover-Induced Shifts in the Distribution and Abundance of Invasive Fish and Their Impacts on Native Fish Communities in the Tennessee and Cumberland River Basins](#)
- ★ [Brook Trout Population Responses to Climate Variation Across the Southeast](#)
- ★ [Improving Support for Regional Conservation Efforts in the Region Managed by the Southeastern Association of Fish and Wildlife Agencies](#)
- ★ [Characterizing Climate Change Impacts on Species Ecology to Support Species Status Assessments](#)
- ★ [The Long View: Development of a 500-year Climate Adaptation Planning Framework with the Eastern Band of Cherokee Indians](#)
- ★ [Impacts of Sea Level Rise and Associated Salinity Changes on At-risk Native Freshwater Mussels and Their Habitats in Atlantic Coastal Rivers](#)

ILLUSTRATIONS BY EMILY NASTASE, 2022-23 GLOBAL CHANGE RESEARCH FELLOW

WILDLIFE

19 18 80

projects

fellows

publications

PROJECT HIGHLIGHT

THE PROJECT *ASSESSING THE CLIMATE VULNERABILITY OF WILD TURKEYS ACROSS THE SOUTHEASTERN U.S.* EXAMINED HOW CLIMATE CHANGE AND HUNTING PRACTICES AFFECTED WILD TURKEY POPULATIONS IN THE SOUTHEAST. Researchers analyzed over a decade of reproductive data from six states to assess the combined effects of climate and hunter harvest on wild turkeys. They found that wild turkeys are unlikely to make significant changes in nesting timing in response to climate change, potentially leading to mismatches between nesting periods and optimal environmental conditions.

The findings suggest that managers may need to adjust hunting seasons and bag limits to ensure sustainable turkey hunts and populations.



[HTTPS://GO.NCSU.EDU/SECASC-TURKEY](https://go.ncsu.edu/secasc-turkey)

PUBLICATIONS

- ★ [Climate Impact Summaries for Rare-Plant Biodiversity in the Southeastern U.S.](#)
- ★ [Informing Climate-adaptive Forest Management for Breeding Bird Habitat in the Southern Appalachians](#)
- ★ [Accounting for Ecological Impacts of Climate Change in State Wildlife Action Plans: A Comparison of Model-Based and Index-Based Vulnerability Assessments](#)
- ★ [Improving Support for Regional Conservation Efforts in the Region Managed by the Southeastern Association of Fish and Wildlife Agencies](#)
- ★ [Science to Inform the Management of Mangrove Ecosystems Undergoing Sea Level Rise at Ding Darling National Wildlife Refuge, Sanibel Island, Florida](#)
- ★ [An Assessment of Invasive Species Range Shifts in the Southeastern U.S. and Actions to Manage Them](#)
- ★ [Characterizing Climate Change Impacts on Species Ecology to Support Species Status Assessments](#)
- ★ [Analysis and Visualization of Climate Information to Support USFWS Species Status Assessments](#)
- ★ [Synthesizing Climate Change Impacts on Wildlife Health and Identifying Adaptation Strategies](#)
- ★ [The Future of Culturally Important Species in North America](#)
- ★ [Understanding Impacts on Southeastern Grasslands from Climate Change, Urban Expansion, and Invasive Species](#)
- ★ [Identifying the Ecological and Management Implications of Mangrove Migration in the Northern Gulf of Mexico](#)
- ★ [The Long View: Development of a 500-year Climate Adaptation Planning Framework with the Eastern Band of Cherokee Indians](#)
- ★ [Advancing Climate Change Adaptation Strategies for High Elevation and Endangered Lowland Coqui Frogs in the U.S. Caribbean](#)
- ★ [Strategic Habitat Conservation and Adaptive Strategies for the Conservation of Coqui Frogs in Puerto Rico](#)
- ★ [Impacts of Sea Level Rise and Associated Salinity Changes on At-risk Native Freshwater Mussels and Their Habitats in Atlantic Coastal Rivers](#)
- ★ [Developing Future Habitat Condition Scenarios for Wildlife in the Imperiled Pine Rockland Ecosystem of South Florida](#)
- ★ [Assessing the Climate Vulnerability of Wild Turkeys Across the Southeastern U.S.](#)
- ★ [Informing Management of Waterfowl Harvest in a Changing Climate](#)

WATER

17 24 70

projects

fellows

publications

PROJECT HIGHLIGHT

THE PROJECT ASSESSMENT OF WATER AVAILABILITY AND STREAMFLOW CHARACTERISTICS IN THE SOUTHEASTERN U.S. EVALUATED WATER RESOURCES ACROSS THE SOUTHEAST UNDER CURRENT AND POTENTIAL FUTURE CLIMATE AND LAND COVER CONDITIONS. Recognizing that each watershed has unique features affecting water flow, researchers employed hydrologic models to estimate streamflow, especially in ungaged areas. By grouping gaged and ungaged

watersheds, they provided accurate regional water availability estimates.

The project's outcomes assist natural resource managers in planning for the water needs of both human communities and ecosystems, offering insights into how changes in climate and land cover may impact water distribution and quantity.



[HTTPS://GO.NCSU.EDU/SECASC-WATER-AVAIL](https://go.ncsu.edu/secasc-water-avail)

PUBLICATIONS

- ★ [Advancing Climate Change Adaptation Strategies for High Elevation and Endangered Lowland Coqui Frogs in the U.S. Caribbean](#)
- ★ [Climate- and Land-Cover-Induced Shifts in the Distribution and Abundance of Invasive Fish and Their Impacts on Native Fish Communities in the Tennessee and Cumberland River Basins](#)
- ★ [Brook Trout Population Responses to Climate Variation Across the Southeast](#)
- ★ [Strategic Habitat Conservation and Adaptive Strategies for the Conservation of Coqui Frogs in Puerto Rico](#)
- ★ [Impacts of Sea Level Rise and Associated Salinity Changes on At-risk Native Freshwater Mussels and Their Habitats in Atlantic Coastal Rivers](#)
- ★ [Developing Future Habitat Condition Scenarios for Wildlife in the Imperiled Pine Rockland Ecosystem of South Florida](#)
- ★ [Examining Diverse Management Objectives and Broadening Stakeholder Engagement for Climate Adaptation Planning of Historic Structures Within the National Park System](#)
- ★ [Assessing the Climate Vulnerability of Wild Turkeys Across the Southeastern U.S.](#)
- ★ [Informing Management of Waterfowl Harvest in a Changing Climate](#)
- ★ [Developing a Cave Conservation Management Toolbox by Exploring Cave Microclimates and Biodiversity Patterns](#)
- ★ [Evaluating Ecosystem-Based Adaptation Options for Coastal Resilience](#)
- ★ [Communicating Future Sea-Level Rise Scenarios for Gulf Coast National Wildlife Refuge and National Park Lands](#)
- ★ [Department of the Interior Nature-Based Solutions Roadmap](#)
- ★ [Water, Water Everywhere: Adapting Water Control Operations and Floodplain Conservation Planning to Global Change](#)
- ★ [Integrating Sea Level Rise Scenarios into Everglades Restoration Planning](#)
- ★ [Enhancing Coastal Adaptation Planning at Gulf Islands National Seashore](#)
- ★ [Assessment of Water Availability and Streamflow Characteristics in the Southeastern U.S. for Current and Future Climatic and Landscape Conditions](#)

LAND

20 29 79

projects

fellows

publications

PROJECT HIGHLIGHT

THE STUDY *CLIMATE CHANGE WILL DECREASE PRESCRIBED FIRE OPPORTUNITIES IN SOUTHEASTERN U.S.* EXAMINED HOW CLIMATE CHANGE COULD AFFECT PRESCRIBED BURNING IN THE SOUTHEAST. Prescribed burns are essential for managing ecosystems and reducing wildfire risks.

Researchers analyzed key weather conditions—relative humidity, temperature, and wind speed—to determine suitable days for burning. They compared historical data (1976–2005) with future climate projections under two scenarios: one with continued greenhouse gas emissions growth (RCP 8.5) and another with reduced emissions (RCP 4.5).

The study found that, by the end of the century, suitable burn days in summer could decrease from 64.9% historically to 40.6% under RCP 4.5 and 21.9% under RCP 8.5. Some areas might experience fewer than 10% of days meeting burn criteria. Additionally, spring burn windows are expected to become more variable and unpredictable. These findings suggest that land managers may face challenges in conducting prescribed burns, potentially increasing wildfire risks and impacting fire-dependent ecosystems.

[HTTPS://GO.NCSU.EDU/SECASC-RXFIRECC](https://go.ncsu.edu/secasc-rxfirecc)

PUBLICATIONS

- ★ [Developing a Cave Conservation Management Toolbox by Exploring Cave Microclimates and Biodiversity Patterns](#)
- ★ [Clarifying Science Needs for Determining the Impact of Climate Change on Harmful Algal Blooms in the Southeastern United States](#)
- ★ [Understanding Prescribed Fire Management in the Context of Climate Change and Landscape Transformation](#)
- ★ [Understanding Impacts on Southeastern Grasslands from Climate Change, Urban Expansion, and Invasive Species](#)
- ★ [Future of Fire: Development of an Early Warning System to Identify Changing Prescribed Burn Opportunities Across Southeast US Fire-Adapted Habitats](#)
- ★ [Evaluating Ecosystem-Based Adaptation Options for Coastal Resilience](#)
- ★ [Facilitating Accurate and Effective Application of Coastal Marsh Models](#)
- ★ [Ecosystem Services Mapping Datasets](#)
- ★ [Clarifying Science Needs for Southeastern Grasslands](#)
- ★ [Communicating Future Sea-Level Rise Scenarios for Gulf Coast National Wildlife Refuge and National Park Lands](#)
- ★ [Identifying the Ecological and Management Implications of Mangrove Migration in the Northern Gulf of Mexico](#)
- ★ [The Long View: Development of a 500-year Climate Adaptation Planning Framework with the Eastern Band of Cherokee Indians](#)
- ★ [Department of the Interior Nature-Based Solutions Roadmap](#)
- ★ [Water, Water Everywhere: Adapting Water Control Operations and Floodplain Conservation Planning to Global Change](#)
- ★ [Integrating Sea Level Rise Scenarios into Everglades Restoration Planning](#)
- ★ [Best Practices for Project Design: Effectively Addressing Natural Resource Management Needs](#)
- ★ [Effects of Urbanization on the Conservation Value of Forests](#)
- ★ [Enhancing Coastal Adaptation Planning at Gulf Islands National Seashore](#)
- ★ [Improving Scenarios of Future Patterns of Urbanization, Climate Adaptation, and Landscape Change in the Southeast](#)
- ★ [Assessment of Water Availability and Streamflow Characteristics in the Southeastern U.S. for Current and Future Climatic and Landscape Conditions](#)

PEOPLE PROJECTS

13

projects

15

fellows

85

publications

PROJECT HIGHLIGHT

THE PROJECT *EXAMINING DIVERSE MANAGEMENT OBJECTIVES AND BROADENING CLIMATE ADAPTATION STRATEGIES FOR HISTORIC BUILDINGS* AIMED TO IMPROVE THE STEWARDSHIP OF HISTORIC STRUCTURES VULNERABLE TO CLIMATE CHANGE IMPACTS. Researchers assessed how sea-level rise, flooding, and erosion threaten cultural heritage sites.

They developed strategies to prioritize preservation efforts, considering the historical significance and vulnerability of each site. The project emphasized transparent decision-making, incorporating input from communities connected to these resources.

Outcomes included tools to help managers allocate resources effectively, ensuring that adaptation plans align with both conservation goals and stakeholder values.

[HTTPS://GO.NCSU.EDU/SECASC-HIST](https://go.ncsu.edu/secasc-hist)

PUBLICATIONS

- ★ [The Long View: Development of a 500-year Climate Adaptation Planning Framework with the Eastern Band of Cherokee Indians](#)
- ★ [Department of the Interior Nature-Based Solutions Roadmap](#)
- ★ [Water, Water Everywhere: Adapting Water Control Operations and Floodplain Conservation Planning to Global Change](#)
- ★ [Examining Diverse Management Objectives and Broadening Stakeholder Engagement for Climate Adaptation Planning of Historic Structures Within the National Park System](#)
- ★ [Integrating Sea Level Rise Scenarios into Everglades Restoration Planning](#)
- ★ [Assessing the Climate Vulnerability of Wild Turkeys Across the Southeastern U.S.](#)
- ★ [Informing Management of Waterfowl Harvest in a Changing Climate](#)
- ★ [Best Practices for Project Design: Effectively Addressing Natural Resource Management Needs](#)
- ★ [Effects of Urbanization on the Conservation Value of Forests](#)
- ★ [Enhancing Coastal Adaptation Planning at Gulf Islands National Seashore](#)
- ★ [The Future of Culturally Important Species in North America](#)
- ★ [Improving Scenarios of Future Patterns of Urbanization, Climate Adaptation, and Landscape Change in the Southeast](#)
- ★ [Assessment of Water Availability and Streamflow Characteristics in the Southeastern U.S. for Current and Future Climatic and Landscape Conditions](#)

PEOPLE FELLOWS

PROJECT HIGHLIGHT

THE GLOBAL CHANGE RESEARCH FELLOWS PROGRAM IS DESIGNED TO TRAIN THE NEXT GENERATION OF SCIENTISTS BY PROVIDING FINANCIAL, SCIENTIFIC, AND PROFESSIONAL DEVELOPMENT SUPPORT FOR GRADUATE STUDENTS INTERESTED IN MULTIDISCIPLINARY RESEARCH. Participants collaborate across disciplines to enhance climate change science, aiming for impactful and ethical contributions.

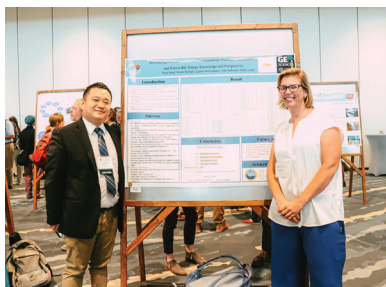
[HTTPS://GO.NCSU.EDU/SECASC-FELLOWS](https://go.ncsu.edu/secasc-fellows)

55

fellows

*studying multiple
— and overlapping —
topic areas*

FISH	6
WILDLIFE	18
▶ WATER	24
LAND	29
PEOPLE	15





PEOPLE SYMPOSIUM & MORE

GLOBAL CHANGE FIELD INTENSIVE

IN 2018, THE SE CASC LAUNCHED THE FIRST FIELD INTENSIVE AS THE KICKOFF TO THE GLOBAL CHANGE RESEARCH FELLOW PROGRAM.

The intensive is a week-long, place-based deep dive that was originally hosted at the Great Smoky Mountains Institute at Tremont. This immersive experience served as the starting point for the Fellows' year, grounding participants in the interdisciplinary foundations of climate adaptation science.

During the intensive, fellows engaged deeply with climate science, research methods, and community-based approaches to global change. Through a mix of fieldwork, facilitated discussions, and hands-on workshops, they explored topics such as ecological monitoring, science communication, traditional ecological knowledge, and stakeholder engagement. The setting in the Smokies fostered a strong sense of cohort identity and encouraged reflection on the role of scientists in collaborative, actionable climate research.

This first field intensive laid the groundwork for all annual intensives to come, even during pandemic years, guiding the fellows' journey into co-produced climate adaptation science while emphasizing interdisciplinary collaboration, cultural awareness, and meaningful engagement.

SOUTHEAST CLIMATE ADAPTATION SCIENCE SYMPOSIUM

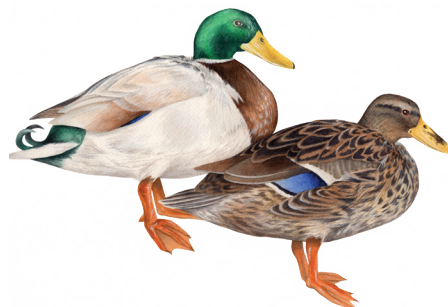
THE 2022 SOUTHEAST CLIMATE ADAPTATION SCIENCE SYMPOSIUM TOOK PLACE SEPT. 19–21, 2022, at The Lodge at Gulf State Park in Gulf Shores, Alabama. The event brought together approximately 160 researchers, resource managers, Tribal partners, students, and adaptation professionals working across the southeastern U.S. and Caribbean. With the theme of actionable, co-produced science, the symposium featured a mix of plenary sessions, concurrent breakout discussions, and networking forums aimed at integrating climate research with real-world decision-making. Highlights included keynote panels on visualizing landscape change, addressing management challenges under climate pressures, and centering justice and equity in adaptation strategies. A field trip to Fort Morgan Historic Site and marsh habitats on the final day provided hands-on insight into coastal adaptation challenges. The event was a dynamic platform for sharing resources, identifying science-action gaps, and strengthening collaborative adaptation efforts across the region.

WEBINAR SERIES

SE CASC hosted a six-part webinar series on the key messages from the **Fourth National Climate Assessment (Volume II)**, with a focus on *Chapter 19 (The Southeast)*, *Chapter 15 (Tribes & Indigenous Peoples)*, and *Chapter 20 (U.S. Caribbean)*. Each session featured a chapter author or subject-matter expert presenting on major regional findings, supported by downloadable guides:

- ★ **Webinar 1:** [Urban health risks in the Southeast](#) — presented by Paul Schramm (CDC)
- ★ **Webinar 2:** [Rising flood risk in coastal/low-lying areas](#) — with Doug Marcy (NOAA)
- ★ **Webinar 3:** [Transformations in natural ecosystems](#) — led by Mike Osland (USGS)
- ★ **Webinar 4:** [Economic & health impacts on rural communities](#) — from Kirstin Dow (USC/CISA)
- ★ **Webinar 5:** [Impacts on U.S. Caribbean](#) — presented by Bill Gould (USDA Caribbean Climate Hub)
- ★ **Webinar 6:** [Effects on Tribes and Indigenous Peoples](#) — by Rachael Novak (BIA) & Casey Thornbrugh (United South & Eastern Tribes)

The campaign aimed to make the dense scientific content of NCA4 accessible to Southeast stakeholders by breaking complex assessments into focused 1-hour sessions supported by concise guides.



SE CASC BY THE NUMBERS

2,905

webinar registrations
(2019 – 2024)

86,637

newsletter opens

55

Global Change
Research Fellows

300

science symposium attendees

47,106

minutes watched on our
YouTube channel

218

peer-reviewed publications

	<i># fellows</i>	<i># publications</i>
FISH	6	10
WILDLIFE	18	80
WATER	24	70
LAND	29	79
PEOPLE	15	85



SOUTHEAST
Climate Adaptation Science Center

Thank you to all of those who made Phase 2 of the Southeast Climate Adaptation Science Center a success, including:

Derek Aday, Ryan Boyles, Kyla Bloyer, Ellen Brown, Jen Cartwright, Steph Courtney, Harry Daniels, Mitch Eaton, Cari Furiness, Kristen Fontana, Emily Fort, Rebecca Irwin, Aranzazu Lascurain, Deja Perkins, David Reidmiller, Brittany Salmons, Marie Shaefer, Ashlyn Shore, Katherine Smith, Adam Terando, and Casey Thonbrugh.