



2022-23 Annual Report

NECASC

Northeast Climate Adaptation Science Center

Helping Fish, Wildlife, Water, Land & People Adapt to the Impacts of Climate Change

The Year in Actionable Science: A Message from Our Leadership



NE CASC Fellow Montana Airey shares her research findings at a recent multi-day fellows intensive in Adirondack Park, New York.

We are thrilled to report that the past year has been highly productive at NE CASC! During this time, we have significantly advanced our core mission: providing actionable science to resource managers so they can incorporate the most informed understanding of climate change into their decision-making. Recently, our growing understanding of the centrality of relationships to actionable science has led us to expand our interactions with stakeholders across our region. Toward that end, we have held multiple open houses, launched a new “Tool Talk” discussion series, and organized a webinar that describes how NE CASC works. Collectively, these events have opened new pathways for collaborating with us and further energized our vibrant community. We thank everyone who has participated or partnered with us to move climate adaptation forward in our region!

The pages that follow detail our many recent research highlights, accomplishments that helped two of our team members, Anthony D’Amato and Michelle Staudinger, earn AFWA Climate Adaptation Leadership Awards. We are very proud of this honor, the fifth occasion that NE CASC work has garnered prestigious Climate Adaptation Leadership Awards in the past five years.

We are also delighted to report that our leadership ranks have expanded with the appointment of Carrie Brown-Lima as our new Regional Administrator. An authority on invasive species management and climate change, Carrie possesses immense expertise in integrating science into resource management. Like the rest of our team, Carrie is excited to build on our existing research portfolio and expand our network of collaborators in the coming year. We look forward to seeing you soon at one of our many events!

—Bethany Bradley, Carrie Brown-Lima & Jon Woodruff

Our Work

Driven by an academic consortium consisting of nine research institutions, the Northeast Climate Adaptation Science Center assembles a team of climate scientists, ecologists, hydrologists and biologists to work with natural resource managers in developing actionable science that will inform their decision making. Our recently realigned geographical footprint, which includes 14 states, is highlighted in dark blue on the map below along with our consortium members.



We pursue our mission by focusing on four main research areas:

- **Climate impacts** to, and vulnerability of, **fish, wildlife**, and their **habitats**
- Effectiveness and transferability of **adaptation actions and strategies**
- **Social, cultural, and economic considerations** in vulnerability assessments and adaptation strategies
- **Landscape-scale conservation strategies** in a changing climate

2022-23 In Numbers

40
Publications

58
Presentations

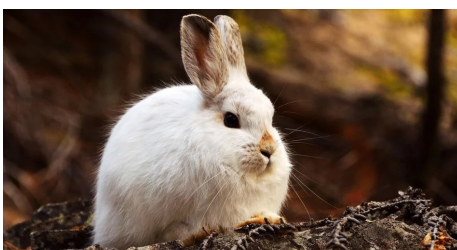
49
Research Fellows

Project & Personnel Updates



Salt Marshes and Sea-Level Rise

A new study by **Jon Woodruff** and **Brian Yellen** reveals that salt marshes, key habitats threatened by sea-level rise, can thrive despite higher water levels. To reach this conclusion, researchers examined the aftermath of an infamous Nor'easter that caused high tides in a storm-shortened tidal river to increase by the same magnitude of sea-level rise expected along the New England coast. Defying expectations, salt marshes are thriving. Results suggest that sediment generated by eroding coastal bluffs has allowed nearby marshes to rebound. This work indicates that sediment, often viewed as waste, may actually help maintain ecological function.



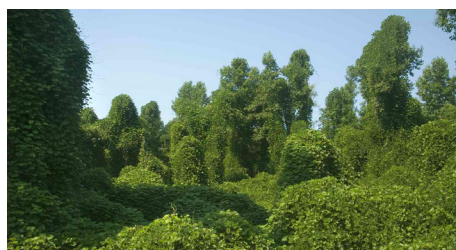
Predicting Species Persistence

The NE CASC region sits at the southern range edge for a number of species that are at the limit of their temperature tolerances and are expected to be particularly vulnerable to climate change. Investigating this hypothesis, **Toni Lyn Morelli** and **Alexej Siren** partnered with a wide-ranging team of state and federal resource managers to assess snowshoe hare range limits and better predict how this species will respond to global change. The team found that differences in resource availability affected population density and fluctuations; this information can be used to improve conservation and management of snowshoe hare and other climate-adapted species.



Preserving Ash in the Face of EAB

Devastating forests across the region, emerald ash borer (EAB) ranks as the costliest invasive forest insect in U.S. history. Given the cultural, ecological and economic importance of ash forests, a collaboration between **Anthony D'Amato** and several Tribal partners argues for the novel integration of adaptive and pest management strategies. To guide these efforts, D'Amato and his collaborators propose a new decision-making framework for adapting to EAB and other invasive insects. This approach advocates for considering preservation in the context of three key concepts: preservation value, preservation approach, and preservation strategy.



The Global Undercount of Invasives

Although invasive species threaten ecosystems across the globe, there is no reliable understanding of how many invasive plant species actually exist. Led by **Bethany Bradley**, a new NE CASC study pinpoints the unknowns that must be addressed to manage invasive species globally. This analysis mined a database of 5,893 studies to paint the most complete picture so far of the world's invasive species. Its findings reveal that a systematic, geographically uneven undercount of invasive plants has taken place. Consequently, floristic studies in understudied areas must be conducted to produce a global map of invasive species, a potentially critical tool for helping combat new invasions.

Carrie Brown-Lima Joins NE CASC as Regional Administrator



NE CASC recently welcomed Carrie Brown-Lima as our new USGS Regional Administrator. As a member of our leadership team, she is partnering with Bethany Bradley and Jon Woodruff, NE CASC University Codirectors, to develop our long-term strategic plan and enhance collaboration with our network of partners.

Carrie brings 25 years of experience in natural resource management to her new role. During a career that has spanned multiple countries and addressed myriad ecosystems, she has led development of numerous initiatives that integrate science into natural resource decision-making and policies. For the past nine years, she served as the Director of the New York Invasive Species Research Institute. With Bethany Bradley and Toni Lyn Morelli, she also cofounded the Regional Invasive Species and Climate Change (RISCC) Management Network, a widely replicated model for addressing the dual threats of invasive species and climate change.

New & Completed Projects

In the past year, NE CASC awarded over \$2.3 million to launch 7 new research efforts that will inform natural and cultural resource climate adaptation initiatives in the region. This work addresses a variety of topics, including salt marsh conservation, species monitoring programs, new regional climate change data syntheses, and climate-adaptive population supplementation. Additionally, a project assessing intertidal biodiversity on the Boston Harbor Islands was completed. More info about these projects is available here: www.necasc.umass.edu/2023-projects.

Center Highlights

Buying Time with Runnels: NE CASC Research Helps Respond to Urgent Problem of Salt Marsh Degradation & Sea-Level Rise

New England salt marshes serve as essential habitat for fish and migratory birds, help maintain ocean water quality, act as natural flood barriers, and combat climate change. Though they safeguard the health of coastal ecosystems, these wetlands are imperiled by rising sea level and a damaging legacy of human development, a combination that is drowning them from the inside out.

Improving marsh health has become a priority for NE CASC researchers **Alice Besterman** and **Linda Deegan**, who have long been working to assess the efficacy of a climate adaptation technique known as runneling. A channeling method that drains marshes of impounded water, promotes revegetation, and restores tidal hydrology, runneling extends the life of drowning marshes in the face of sea level rise by providing time for managers to implement new adaptation strategies and for marshes to rejuvenate themselves via



While sea level rise has contributed to the growing problem of salt marsh degradation, a ditching technique known as runneling may help restore their health.

upland migration.

Although runneling has become a popular management strategy for marsh restoration and mosquito control, data from controlled scientific studies testing its efficacy are limited. To fill this knowledge gap, the NE CASC team aims to transform informal knowledge about runneling into a formal study that will inform regulators and researchers about how the technique functions mechanistically. Deegan and Besterman are thus collecting data that reveals how runneling impacts marsh vegetation density and variety, soil characteristics, water level and quality, and sediment dynamics.

Such a comprehensive study is essential to gaining acceptance for runneling among state and federal regulatory authorities, who have long discouraged interventions on salt marshes due to unsuccessful past



management efforts. This skepticism has resulted in lengthy permitting processes that require review by multiple agencies before new approaches can be used. “While my office has been granted access to a streamlined permitting process due to our focus on mosquito control, runneling projects still require nine months of review before they are approved,” said Diana Brennan, wetlands coordinator for the Bristol County Mosquito Control Project. “This means that we can initiate only one runneling project per year at a time when many more are urgently needed due to the rapid pace at which salt marshes are dying off.”

By providing data needed to persuade skeptical regulators that runneling benefits rather than harms marshes, this research may offer a rare opportunity to break the current cycle of salt marsh decline in the Northeast.

Tribal Engagement Highlights

United Southern & Eastern Tribes

United South and Eastern Tribes (USET) hired **Dr. Steph Courtney** as Assistant Climate Resilience Liaison for the Northeast CASC. Steph comes from a background in geology, science education, and climate change communication. The recipient of a doctoral degree from Auburn University, Steph completed her PhD in 2022. As a graduate student, she became familiar with the CASC network through her involvement with research that was funded by the Southeast CASC. Steph has spent much of her initial year as a liaison building relationships with Tribal Nation staff members at conferences and USET meetings. She has also given several presentations on climate

change adaptation and best practices for engaging with Tribal Nations. Steph's addition to the USET staff represents a significant increase in capacity devoted to assisting Tribal Nations and Communities with climate adaptation planning and implementation. At USET, she has joined **Dr. Casey Thornbrugh**, Tribal Climate Liaison and Program Manager, in serving Tribal populations across the region.

Climate Change Resilience Camp

The USET Climate Change Program hosted its first in-person Climate Resilience Camp in July of 2022. The camp was hosted by the Penobscot Indian Nation and held at the Schoodic Institute on Wabanaki lands. Twenty-two

staff from eight Tribal Nations participated along with two NECASC representatives. At the camp, key contributions were made by NE CASC researcher **Darren Ranco**, a member of the center's academic leadership team, a citizen of Penobscot Nation, and leader of an effort to increase Wabanaki adaptive capacity. The five-day camp encompassed a wide range of activities, including presentations, field trips, and breakout groups focused on climate adaptation planning. At the end of the week, each team presented on the work they had completed during the workshop and their plans for continuing climate adaptation in their communities. The camp proved to be an energizing experience and will be held again in the future.

Education & Outreach

Building the Future of Climate Adaptation: The CAST Program

People of color comprise 10% of the national environmental workforce, yet they account for approximately 40% of the U.S. population. To help remedy this inequity, the National Climate Adaptation Science Center (NCASC) has created the Climate Adaptation Scientists of Tomorrow Program (CAST), which provides students of color with experience in climate adaptation research to encourage their development as climate adaptation professionals.

NCASC launched the CAST program in 2021 through a network-wide competition that awarded seed funds to four regional centers, including NE CASC. Led by **Bethany Bradley** and **Toni Lyn Morelli**, the NE CASC CAST Program immerses students in cutting-edge research, incorporates them into professional networks, and provides them with mentorship. “Bethany and

“Prior to CAST, I didn’t understand my career options in climate adaptation. Now, I not only understand them, but I also want to obtain a job as a climate adaptation researcher”

—*Fatima Quiroz, CAST Student*

I have adopted a holistic approach to CAST,” Morelli said. “We developed a research opportunity that supports students intellectually, professionally, and socially to heighten their interest in climate adaptation science.”

So far, the program has earned rave reviews from participants, including

this year’s four-student cohort. “Not only did I learn a lot about climate adaptation science, but my passion for it increased as my knowledge grew,” said Fatima Quiroz, a junior at Mexico State University. “Prior to CAST, I didn’t understand my career options in climate adaptation. Now, I not only understand them, but I also want to obtain a job as a climate adaptation researcher.” Quiroz’s growing knowledge is evidenced by the fact that she recently presented her NE CASC work at a regional academic conference, something her fellow CAST participants are also planning.

While participants credit the program with facilitating their success, Morelli says their growth reflects their talents. “We’ve been fortunate to recruit great students for this opportunity,” she said. “I can’t wait to see what the future holds for them in climate adaptation science.”

CAPS: Aligning Species Traits & Climate Change

Last summer, an NE CASC team led by **Peter McIntyre** convened 35 practitioners of population supplementation (e.g., stocking and planting) to discuss how trait diversity within species can contribute to managing priority populations under climate change. The expertise of attendees spanned aquatic, terrestrial, and marine coastal fauna and flora, and participants represented more than 25 agencies, NGOs, and institutions.

The primary goal of the workshop was to co-develop the concept of Climate-Adaptive Population Supplementation (CAPS), which aligns climate-associated traits—like thermal or drought tolerance—of propagated species with the environmental conditions that they are expected to experience in the future. By recognizing the variation in climate resilience among different strains or cultivars of species that are routinely planted and stocked across the U.S.,



Led by Peter McIntyre, the CAPS Workshop brought together a varied group of managers, researchers, and NGO staff who are finalizing a manuscript detailing CAPS best practices.

CAPS seeks to maximize the viability and productivity of these managed populations. The result will be more cost-effective planting and stocking as well as more robust populations of valued fish, tree, and other species.

Breakout groups facilitated interaction between participants with diverse taxonomic expertise and organizational affiliations, focusing discussion on how climate change has been incorporated into supplementation practices and how CAPS might aid management of shifting landscapes. Collectively, workshop participants produced a set of best practices to inform practitioners who wish to use CAPS to bolster



populations against the effect of climate change. Workshop participants are currently advancing the CAPS concept by expanding upon these guidelines in a peer-reviewed manuscript.

“As someone involved with seagrass restoration, I found the workshop immensely helpful,” said Phil Colarusso an EPA marine biologist and workshop participant. “Within my network, I have considered approaches similar to the CAPS concept for some time. But participating in this workshop and learning about techniques from other areas has informed my thinking and will help guide my exploration of this concept in future projects.”