



# 2021 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 Directors



NE CASC Fellow Al Freeman shares her research findings with resource managers during a field tour of a large-scale, co-produced forest experiment in Vermont.

Despite the substantial challenges of COVID, NE CASC had a highly productive year in which we strengthened partnerships with resource managers, helped expand the regional climate adaptation science community, and produced innovative, actionable science. Some examples include the completion of a groundbreaking analysis of exceptional coastal warming in the Northeast, a comprehensive assessment of biodiversity across the Boston Harbor Islands, and the development of a novel framework for balancing the priorities of carbon reduction and habitat preservation. Additionally, our work on invasive species and climate change through the RISCC network received an AFWA Climate Adaptation Leadership Award. A high point in the year for us was our regional climate adaptation science symposium, which attracted 500+ participants and helped us deepen our ongoing dialogue and connection with resource managers.

The past year brought a change to the geography of the CASC network with the addition of a new Midwest CASC and the accompanying adjustment of our regional footprint (See map at right). Our smaller area will allow us to serve resource managers in the Northeast even more effectively in the future.

Recent months also saw a change in center leadership, with Bethany Bradley and Jon Woodruff becoming University Codirectors. We look forward to building upon the outstanding work of our Founding University Director, Richard Palmer, who is enjoying a well-earned retirement .

For the coming year, we are hopeful that we will see more of you in person as we continue pursuing our mission to deliver impactful science to resource managers across the Northeast.

—Bethany Bradley, Katherine Smith & 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, which also lists 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

## 2021 In Numbers

29  
Publications

45  
Presentations

37

Research Fellows

# Project & Personnel Updates



## Rapid Tidal Marsh Development

NE CASC research shows that Hudson River Estuary marshes are growing upward at a rate two to three times faster than sea level rise, suggesting that they will be resilient to accelerated sea level rise in the future. Led by **Jon Woodruff** and **Brian Yellen**, this research addresses a global concern regarding tidal marshes—that they will be drowned by rising seas—while also providing land trusts and state agencies with a framework for implementing land acquisition and conservation strategies. Tidal marshes have become important along the Hudson River due to their many benefits, including serving as a first line of defense against coastal flooding.



## Biodiversity & Boston Harbor

NE CASC is monitoring both the impacts of climate change—including sea level rise, extreme storms, warming waters, and invasive species—and the effects of experimental adaptation actions on the Boston Harbor Islands National Recreation Area (BOHA). Because climate change and the response to it have major implications for BOHA's coastline, a team led by **Michelle Staudinger** is assessing intertidal biodiversity in the area's mixed coarse substrates, a common but understudied coastal habitat. The team has completed a historical inventory of known biodiversity in BOHA and will soon document non-native invasive species on the islands.



## Forest Carbon & Wildlife Habitat

A key challenge that natural resource managers face is protecting wildlife while mitigating climate change through forest carbon storage, goals that may be incompatible in some ecosystems. This project, led by **Anthony D'Amato** and **Caitlin Littlefield**, reviews existing research regarding this overlooked tension while also exploring four Northern Forest case studies where trade-offs between the two are abundantly clear. Ultimately, it suggests that actively identifying these trade-offs and critically evaluating consequences of stand-level management on carbon and wildlife can facilitate landscape-scale climate adaptation that supports both varied habitats and maximizing forest carbon.



## Exceptional Coastal Warming

A recent study by **Ambarish Karmalkar** and **Radley Horton** reveals that the coastal Northeast is heating faster than most other regions of North America. This heating is linked to the climate change-induced slowing of the Atlantic Meridional Overturning Circulation (AMOC), which acts as a conveyor belt by moving warm water from the tropics to the North Atlantic, cooling it, and pushing it southward. AMOC's decline has caused rapid warming of the Northwest Atlantic, a phenomenon that has led to an acceleration in rising temperatures along the eastern seaboard, from Maine to Delaware, due to the increasing importance of warmer ocean winds in shaping the region's climate.

## Bradley, Woodruff Named University Co-Directors



NE CASC recently welcomed Bethany Bradley and Jon Woodruff as our new University Co-Directors. In these roles, they have begun partnering with Katherine Smith, the center's Federal Director, to articulate NE CASC's vision, formulate our long-term strategic plan, and enhance collaboration with our network of partners.

Both co-directors are faculty members at UMass Amherst, host institution for NE CASC. A professor in the department of environmental conservation, Bradley is the co-founder of the award-winning Regional Invasive Species and Climate Change (RISCC) Management Network. Woodruff, a sedimentologist and professor of geosciences, recently authored the sea-level rise section of the *Boston Climate Ready* report and has recently published work resolving questions about salt marsh resiliency and the factors governing slope formation for New England Beaches, work that has major implications for understanding impacts of sea level rise.

## New & Completed Projects

In the past year, NE CASC awarded over \$4 million to launch 14 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 resilience, the connectedness of climate change refugia, enhancing Tribal adaptive capacity, brook trout persistence in warming streams, strategies for combating invasive species, and protecting aquatic biodiversity. Additionally, two projects were completed—on water quality in the Upper Mississippi watershed and adaptation science for forest habitats and bird communities. To learn more, go to: [www.necasc.umass.edu/2021-projects](http://www.necasc.umass.edu/2021-projects).

# Center Highlights

## RISCC Network Wins Association of Fish & Wildlife Agencies Climate Adaptation Leadership Award for Natural Resources

The Association of Fish and Wildlife Agencies (AFWA) recently presented its 2021 Climate Adaptation Leadership Award to the Northeast Regional Invasive Species and Climate Change (RISCC) Network. Established in 2016, RISCC is led by two NE CASC scientists—**Bethany Bradley** and **Toni Lyn Morelli**—as well as **Carrie Brown-Lima** of the New York Invasive Species Research Institute.

RISCC was chosen for the award based on its success in effecting important, sustainable change through its work at the interface of climate change and invasive species, two of the most prominent global threats to ecosystems. Their intersection is particularly challenging in the Northeast, which has become a hotspot for future plant invasions because invasive species prevalent in southern states are shifting their ranges northward in response



*RISCC workshops have helped develop a regional community to combat harmful range-shifting invasive species, whose northward expansion has been facilitated by climate change.*



to global warming. RISCC seeks to reduce the compounding effects of invasive species and climate change by synthesizing relevant science, sharing the needs and knowledge of managers, building stronger scientist-manager communities, and conducting priority research.

“It’s an incredible honor to be selected for this national award, especially since RISCC started as a discussion between friends just five years ago,” said Bradley, the university codirector for NE CASC. “I remember talking with Toni Lyn Morelli and Carrie Brown-Lima and realizing that a lot of what I’d consider well-known to scientists wasn’t making it out into the community of managers, something we wanted to change.”

These efforts, explain RISCC’s collaborators, have yielded major dividends. “RISCC has been incredibly effective in breaking down barriers

between academic researchers and invasive plant managers,” said Jullie Richburg, lead ecologist for The Nature Conservancy. “One of its greatest accomplishments has been to bring together agencies across the region who are involved in designating species as invasive for regulation or prohibition. This is important because invasive plants don’t respect political boundaries, making the kind of coordinated regional planning that RISCC has envisioned a necessity.”

As RISCC moves forward, it is poised to achieve an even greater future impact. “I’m just as excited about what the next five years will hold for RISCC as I am about the past five years,” said Morelli, a research ecologist for NE CASC. “Four other regional CASCs have established their own invasive species initiatives based on the RISCC model, and it’s inspiring to see our template adopted—and succeed—across the country.”

## Tribal Engagement Highlights

### Building Wabanaki Adaptive Capacity

Led by Visiting Principal Investigator **Darren Ranco** from the University of Maine, an NE CASC team has begun laying the foundation for a regional network that will enhance Tribal adaptive capacity in the upper Northeast. Toward this end, the team spent much of the past year conducting outreach needed to center the research questions, data collection methods, outputs, and research protocols of Wabanaki people, knowledge, and values. This work will help create a *Wabanaki Climate Adaptation and Adaptive Management Workbook* based on the groundbreaking *Tribal Adaptation Menu* developed by a multi-organizational collaboration that included NE CASC personnel.

### NE CASC Symposium

Last fall, representatives of ten Tribal Nations and five inter-Tribal organizations participated in NE CASC’s Northeast Climate Adaptation Science Symposium, which featured an opening invocation by Sub-Chief Kenneth Jock of the Saint Regis Mohawk Tribe and a keynote address by Kelsey Leonard of the Shinnecock Nation. Tribal representatives also moderated or served as speakers for an additional six sessions, including panel discussions on climate adaptation justice and the integration of biophysical science with social and cultural concerns. A major highlight of the opening session was a geographical, historical, and contemporary acknowledgment of Tribal Nations in the NE CASC region.

### United Southern & Eastern Tribes

NE Tribal Climate Liaison **Casey Thornbrugh** and his colleagues from the United Southern and Eastern Tribes (USET) organized two major events to support their continued development of the USET climate change resilience program. Last winter, Thornbrugh led a multi-day writing retreat that facilitated the development of climate adaptation plans for eight Tribal Nations by providing participants with technical guidance and feedback on their drafts. Thornbrugh also recruited NE CASC researchers to present their work on key climate adaptation topics and moderate discussion panels at last summer’s Tribal Climate Resilience Camp, which drew participation from eight Tribal Nations.

# Education & Outreach

## NE CASC Fellow Assists Tribal Nation in Herring Restoration

For millennia, river herring spawned in rivers along the Atlantic coast. In recent decades, however, the obstruction of spawning rivers by dams and other impediments has combined with overfishing and habitat degradation to cause significant declines in this population. Despite harvest restrictions and other management measures, herring populations haven't rebounded.

The growing scarcity of herring has undermined the culture and food security of Tribal Nations such as the Wampanoag Tribe of Gay Head (Aquinnah), who have traditionally depended upon these fish for many needs. Due to the importance of herring to their Tribal identity, the Wampanoag have assumed a leading role in restoring the herring population on Martha's Vineyard. To complement these efforts, NE CASC fellow [Asha Ajmani](#)

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*“Through NE CASC, I have been provided with invaluable opportunities to enhance my understanding of Indigenous knowledge systems and culture while simultaneously enhancing my Tribal engagement and collaboration skills.”*

—*Asha Ajmani*

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is collaborating with the Wampanoag Natural Resources Department in tagging hundreds of herring with passive integrated transponders (PIT). These devices will allow the team to identify herring spawning locations, determine if spawning is compromised by poor water quality or the presence of predators,

and map the herring food web. This information will play a vital role in developing more effective strategies for managing the herring population.

Ajmani, who helped organize an NE CASC course exploring how Indigenous knowledge can be used to enhance climate adaptation, has found her experience on Martha's Vineyard transformative: “My research here coupled with the experience of learning from Tribal Elders through the NE CASC class has significantly enhanced my understanding of climate adaptation,” she said. “Rather than seeing it narrowly as a series of discrete issues, I have learned to view adaptation holistically, to seek positive outcomes for all species in an ecosystem rather than privileging economic or other human imperatives over those of the fish or wildlife that are critical to our survival.”

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## Successful Symposium Draws 500 Participants

More than 500 members of the climate adaptation science community participated in the 2021 Northeast Regional Climate Adaptation Science Symposium, which was held via Zoom last October. Designed to present NE CASC research on key topics, engage with resource management perspectives, and help forge a stronger regional climate adaptation science community, the symposium attracted participants representing 60 federal or state agencies, 50 non-governmental organizations, and 10 Tribal Nation agencies.

“The symposium was a great success,” said [Jon Woodruff](#), NE CASC University Codirector and UMass Amherst Professor of Geosciences. “Turnout exceeded our expectations, and the fact that so many resource managers, Tribal representatives, and scientists attended this event attests both to the value of our science and to the strength of our partnerships.”



Plenary speakers (from left to right): Sub-Chief Kenneth Jock of the Saint Regis-Mohawk Tribe, water rights scholar Kelsey Leonard, and NE CASC Founding University Director Richard Palmer.

NE CASC science and partnerships were highlighted throughout the event's two days by its 55 speakers. Focal points included cumulative and interactive threats, vulnerability and needs assessments for key resources, building adaptive capacity, landscape-scale conservation, adaptation strategies, aquatic flows, translational science, integrating climate information into regional fish and wildlife planning, and landscape-scale conservation design.

Distilling several key symposium themes, Founding NE CASC University Director [Richard Palmer](#) offered closing remarks that both reflected on NE CASC's early development and provided

a roadmap for its future growth. “From the outset of the center, we knew that NE CASC would not engage in ordinary science that focused on churning out publications,” Palmer said. “Instead of meeting numerical quotas, NE CASC has always been governed by an unconventional approach to science that draws strength from collaboration with our resource management colleagues. By continuing to focus on strengthening these relationships, we will not only enhance our now well-established tradition of producing innovative science, but we will also ensure that our science benefits ecosystems, resources, and society more broadly.”