North Carolina Collaboratory

ANNUAL REPORT

December 1, 2025

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Front and back cover features aerial digital orthophotography merged with LiDAR elevation data of Yancey County, North Carolina after Hurricane Helene wreaked havoc across the western portion of the state.

Letter from the Executive Director

When I teach "Science for Hyperpartisan Times" at the University of North Carolina at Chapel Hill, I often remind my students that research has the greatest impact when it is both timely and trusted. That principle guided the creation of the North Carolina Collaboratory in 2016, and it continues to shape how we deploy university research to meet the State's most pressing challenges today.

This year, a large part of our work has been defined by two themes: rapid-response research in the aftermath of Hurricane Helene and a bold new investment in K–12 education through the launch of Collaboratory's Office of Learning Research.

When Hurricane Helene hit, it left behind catastrophic flooding and widespread devastation in western North Carolina (WNC). Within days, the Collaboratory figured out how to mobilize emergency funding from our discretionary research dollars to support 21 research micro-grants across our three western-most universities: Appalachian State, Western Carolina and UNC Asheville. These projects ranged from monitoring drinking water quality to assessing infrastructure damage and community resilience. The appropriate timing of research team deployment during recovery operations is a complicated decision, and the Collaboratory knew the best decisions would be made by the academic faculty, staff, and students living in, and serving, the communities impacted by the storm.

In addition to our WNC micro-grant program, the Collaboratory also launched a $4 million dollar initiative to acquire airborne high-resolution LiDAR and digital orthophotography across thirteen of our state's hardest-hit counties. At its core, this project seeks to quantify what was lost—equipping communities and policymakers with the data they need to grasp the scale of damage, target recovery resources more effectively, and build more resilient infrastructure for the future.

Together, these efforts illustrate the Collaboratory's dual mission: responding in real time to the needs of communities and their local governments while also investing in knowledge that will shape the State's future. Nowhere is that forward-looking investment clearer than in our work in education.

With the support of the North Carolina (NC) General Assembly, the Collaboratory has launched the Office of Learning Research, which is designed to connect cutting-edge research directly to classroom practice and policy decisions, helping educators, parents, and lawmakers improve outcomes for North Carolina's 1.5 million K-12 students. Early projects already underway include examining the effects of cell phone use in schools and evaluating the impact of high-dosage tutoring. By embedding research within the everyday challenges of classrooms, our work in this space will bring the same pragmatic, solutions-oriented approach that has defined our work in environment, health, and resilience into the education sphere.

Through the foresight of the NC General Assembly and the dedication of our State's academic institutions, we are making science immediate, actionable, and deeply relevant for all North Carolinians. Even our brand has matured alongside our work, with the Collaboratory's logo and tagline now registered trademarks—another signal of the institution's lasting impact.

As we approach our ten-year anniversary, we remain focused on the future: ensuring that the Collaboratory continues to be a trusted bridge between academic research and evidence-driven, real-world solutions for the next decade and beyond.

Jeffrey Warren, PhD
Executive Director, NC Collaboratory

United States of America

United States Patent and Trademark Office

collaboratory
science. policy. solutions.

Reg. No. 7,806,208

Registered May 27, 2025

Int. Cl.: 9, 35, 36, 41

Service Mark

Trademark

Principal Register

The University of North Carolina at Chapel Hill (NORTH CAROLINA state university)
Campus Box 1500, 015 Lenoir Hall
Chapel Hill, NORTH CAROLINA 27599

CLASS 9: Downloadable publications in the nature of newsletters in the field of environmental and economic components of the management of natural resources, new technologies for habitat, environmental and water quality improvement, and public health, and in the field of research to be used to inform the public, policymakers, and the policy-making process with research findings and relevant data

FIRST USE 9-15-2022; IN COMMERCE 9-15-2022

CLASS 35: Providing public policy information in the field of the environmental and economic components of the management of natural resources, new technologies for habitat, environmental and water quality improvement, and public health, the foregoing to be used to inform the public, policymakers, and the policy-making process with research findings and relevant data, for developing and disseminating relevant best practices to interested parties, for those who lead or participate in projects across the State of North Carolina, and to make policy, research, funding, and other recommendations to the policymakers, and for identifying, pursuing, and supporting research and development opportunities through research and development, including, but not limited to, opportunities and partnerships between institutions of higher education, government agencies, nonprofit organizations, and both private and public businesses

FIRST USE 4-25-2022; IN COMMERCE 4-25-2022

CLASS 36: Financial services, namely, funding and financially supporting research for the environmental and economic components of the management of natural resources, new technologies for habitat, environmental and water quality improvement, and public health, research to be used to inform the public, policymakers, and the policy-making process with research findings and relevant data, including at institution of higher educations, including historically minority-serving institutions; Providing grants for technology research and development for institutions of higher education, government agencies, nonprofit organizations, and both public and private businesses

FIRST USE 4-25-2022; IN COMMERCE 4-25-2022

CLASS 41: Educational services, namely, teaching and training students and faculty to engage in and administer neutral and unbiased research and advice on science policy

Acting Director of the United States Patent and Trademark Office

Our Story

The North Carolina (NC) Collaboratory is a research funding agency that partners with academic institutions to transform research into practical information for use by State and local governments.

Since our establishment in 2016 by the NC General Assembly the Collaboratory has stewarded over $250 million in appropriations from the legislature, investing in more than 700 research projects.

Initially focused on environmental and natural resources in our early years the scope of the Collaboratory's portfolio has expanded to include projects focused on public health, education, energy, technology, and infrastructure. Our portfolio has since become large and complex enough that it's been split into two divisions – physical sciences and social sciences.

During the course of 2025 the Collaboratory launched several critical initiatives, many of which are detailed later in this report. These issues include a new focus on leveraging research to:

- **Support recovery efforts in western North Carolina post Hurricane Helene**
- **Improve K-12 education across the state**
- **Strengthen the foster care system through parent recruitment and retention**

As the Collaboratory approaches its 10th anniversary in July of 2026, we remain committed to our mission, to providing the latest information and data for decision-making, and to addressing the State's most pressing challenges.

MISSION STATEMENT:

The Collaboratory funds and facilitates academic research focused on partnerships with State and local governments in order to provide expertise, generate data, develop technologies, and translate research into tangible benefits for North Carolinians.

NC Collaboratory Supports Launch of West Virginia Collaboratory

In the summer of 2025, the NC Collaboratory had the honor of hosting a delegation from West Virginia, including legislative staff from the House and Senate as well as leaders from the state's major universities. The purpose of the visit was to share the Collaboratory's model for connecting higher education research with state policymaking and to provide guidance for West Virginia as they consider establishing their own state-focused research collaborative.

During their visit to Raleigh, the West Virginia team met with key figures across the NC General Assembly, including Senate President Pro Tempore Phil Berger, senior staff from Speaker Destin Hall's office, and Senate Majority Leader Michael Lee. These discussions offered insights into how legislative support, appropriations, and academic collaboration intersect for the Collaboratory to deliver timely, evidence-based policy solutions. The delegation also visited NC Pure, UNC-Chapel Hill's PFAS research lab, to see how cutting-edge scientific research has translated into actionable outcomes for state agencies and communities.

The delegation from West Virginia visits UNC-Chapel Hill.

The delegation from West Virginia visits the NC General Assembly.

NC Collaboratory members visit the West Virginia Legislature. Photo by Perry Bennett.

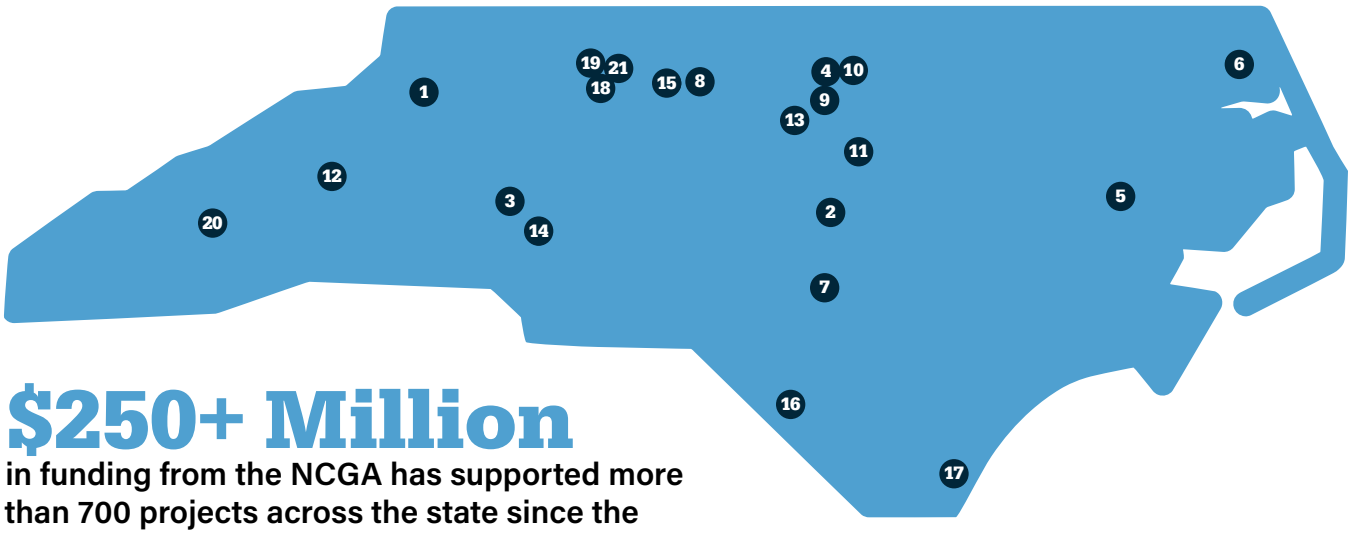
While in North Carolina, the delegation's schedule included meetings with UNC-Chapel Hill leadership, including Chancellor Lee Roberts, Vice Chancellor of Research Penny Gordon-Larsen, and other senior staff including, Paul Newton the Vice Chancellor and General Counsel and Nate Knuffman the Vice Chancellor for Finance and Operations.

These sessions highlighted best practices in research governance, multi-institutional collaboration, and communicating complex findings to policymakers and the public. The delegation left with a clear understanding of how the Collaboratory manages a diverse research portfolio while maintaining transparency, accountability and producing a measurable impact.

Collaboratory members visit the West Virginia Legislature. Photo by Perry Bennett.

Following the NC visit, members of the NC Collaboratory traveled to Charleston, West Virginia, in July to continue the exchange. Over several days, the NC Collaboratory team toured Marshall University, West Virginia State University (WVSU), and West Virginia University (WVU), visiting research centers and innovation hubs and meeting with faculty and administrators. From Marshall's Advanced Manufacturing Center to WVSU's Integrated Research and Extension Building, the tours highlighted the academic strengths and infrastructure that could potentially support a state-based research collaborative. These site visits allowed both teams to consider how such a model could be structured in West Virginia to align with legislative priorities while reflecting the unique capacities of its universities.

Funded Institutions



$250+ Million

in funding from the NCGA has supported more than 700 projects across the state since the Collaboratory was started.

1 Appalachian State University

2 Campbell University

3 Davidson College

4 Duke University

5 East Carolina University

6 Elizabeth City State University

7 Fayetteville State University

8 North Carolina Agricultural and Technical State University

9 NCCentral University

10 North Carolina School of Science and Mathematics

11 NC State University

12 University of North Carolina Asheville

13 The University of North Carolina at Chapel Hill

14 University of North Carolina Charlotte

15 UNC Greensboro — Find your way here

16 UNC Pembroke

17 UNCW

18 University of North Carolina School of the Arts

19 Wake Forest University

20 Western Carolina University

21 Winston-Salem State University

2025
New Project Highlights

Hurricane Helene: Science in Action for Recovery and Resilience

On September 27, 2024, Hurricane Helene unleashed catastrophic flooding across western North Carolina, fueled by 20–30 inches of rainfall—an event with less than a one-in-a-thousand chance of occurring. Entire communities faced widespread damage to homes, infrastructure, and natural systems.

In the weeks that followed, the Collaboratory mobilized an unprecedented response: pairing immediate research investments with advanced mapping technology to help the region recover and prepare for the future.

Rapid-Response Research Grants

Within days of the storm, the Collaboratory launched a rapid grants program to fund urgent, community-focused research across western NC. Partnering with academic institutions across the State—including Appalachian State University, Davidson College, UNC Asheville, UNC-Chapel Hill, and Western Carolina University—the program supported 21 projects spanning flood modeling, infrastructure assessment, community recovery, and emergency communication.

Many projects focused on collecting perishable post-storm data—high-water marks, sediment deposits, ecological impacts, and community displacement—before they disappeared. Others targeted long-term resilience, exploring infrastructure vulnerabilities, ecological restoration, and protection strategies for at-risk species and populations.

These efforts were designed to:

- Improve understanding of Helene's short- and long-term impacts
- Support local, state, and federal agencies in post-disaster planning
- Identify policy and preparedness gaps in communication and infrastructure systems
- Strengthen the scientific foundation for future recovery and resilience in western NC communities

> ***"These rapid grants represent what the Collaboratory does best—bringing interdisciplinary science directly to the communities that need it, when they need it most"***
> —Jeffrey Warren, PhD, Collaboratory Executive Director

A member of the LiDAR mapping team works on one of the planes.

LiDAR mapping team.

Supporting Learning Recovery After the Storm

In response to Hurricane Helene, the Collaboratory funded studies to understand the impact of learning loss in thirteen of the hardest-hit counties in western NC. Beginning in summer 2025, researchers began to evaluate learning recovery programs serving grades 4–8. These studies will track attendance, test scores, and student engagement while also capturing the perspectives of educators and families.

The findings will inform how NC can design effective learning recovery programs in the future—not just after natural disasters, but whenever communities face disruption.

Mapping Recovery:
LiDAR & Digital Orthophotography

While rapid grants captured ground-level conditions, another Collaboratory-led effort took to the skies. In partnership with the NC Department of Public Safety's Division of Emergency Management, the Collaboratory launched a high-resolution LiDAR (Light Detection and Ranging) and digital orthophotography initiative to map the storm's impact across thirteen of the hardest-hit counties: Ashe, Avery, Buncombe, Burke, Davie, Haywood, Henderson, Jackson, McDowell, Mitchell, Rutherford, Watauga, and Yancey.

Funded by $4 million in redirected digital engineering appropriations, the project aims to quantify what was lost, provide actionable data for recovery, and support resilience planning for years to come.

LiDAR generates precise 3D models of terrain and structures, capable of detecting features as small as power lines, mailboxes, or individual trees. Combined with aerial imagery corrected for topographic distortion, the dataset delivers both visual and measurable insight into storm damage.

A Coordinated Effort

Geospatial firms ESP Associates, GPI Geospatial, and NV5 Global conducted flights in January–March 2025 during "leaf-off" conditions, ensuring maximum visibility of ground features. The process met rigorous U.S. Geological Survey and North Carolina Emergency Management standards for positional accuracy and quality control.

> ***"What the Collaboratory is collecting is going to be really helpful to the counties—giving them a visual representation of post-Helene conditions. The data will be used by DOT, private companies, and agencies from the Geological Survey to local emergency managers."***
>
> —Gary Thompson, NC DPS Assistant Director for Risk Management

By focusing on counties with presidential disaster declarations and verified structural impacts, resources were deployed where they would make the greatest difference.

From Data to Decision-Making

Hard drives with county-specific datasets were delivered directly to local governments, with all information also made publicly accessible via NC OneMap, the State's geospatial data portal. Researchers at the UNC Institute for Risk Management and Insurance Innovation are using the data to compare pre- and post-storm conditions—producing the first comprehensive parcel-level economic loss assessment of its kind in the region.

This "before-and-after" model not only strengthens FEMA recovery requests but also allows planners to simulate how future storms might behave in a transformed landscape.

Lasting Impact

Together, the rapid-response research grants and the LiDAR mapping initiative embody the Collaboratory's mission: bringing science, policy, and community needs into alignment.

By acting quickly, fostering partnerships, and leveraging both ground-level and aerial data, the Collaboratory has built tools and knowledge that will serve western NC long after Hurricane Helene fades from headlines—ensuring communities are not only able to recover, but also to face the future with greater resilience.

One of the planes used for LiDAR mapping.

Hurricane Helene Images

Yancey County • Nearest Town: Murchsion, NC • River in Photo: Cane River

Imagery shows the impact of Hurricane Helene. The top photo is an image from 2022, before Hurricane Helene. The bottom photo is an image of the same area, taken in 2025, after Hurricane Helene wreaked havoc on the area.

Yancey county 2022.

Yancey county 2025.

Hurricane Helene Images

Burke County • Nearest Town: Glen Alpine, NC • River in Photo: Muddy Creek

Imagery shows the impact of Hurricane Helene. The top photo is an image from 2022, before Hurricane Helene. The bottom photo is an image of the same area, taken in 2025, after Hurricane Helene wreaked havoc on the area.

Burke county 2022.

Burke county 2025.

Hurricane Helene Images

McDowell County • Nearest Town: Marion, NC • River in Photo: Mill Creek

Imagery shows the impact of Hurricane Helene. The top photo is an image from 2022, before Hurricane Helene. The bottom photo is an image of the same area, taken in 2025, after Hurricane Helene wreaked havoc on the area.

McDowell county 2022.

McDowell county 2025.

Hurricane Helene Images

Henderson County • Nearest Town: Bat Cave, NC • River in Photo: Broad River

Imagery shows the impact of Hurricane Helene. The top photo is an image from 2022, before Hurricane Helene. The bottom photo is an image of the same area, taken in 2025, after Hurricane Helene wreaked havoc on the area.

Henderson county 2022.

Henderson county 2025.

Hurricane Helene Images

Buncombe County • Nearest Town: Swannanoa, NC • River in Photo: Swannanoa River

Imagery shows the impact of Hurricane Helene. The top photo is an image from 2022, before Hurricane Helene. The bottom photo is an image of the same area, taken in 2025, after Hurricane Helene wreaked havoc on the area.

Buncombe county 2022.

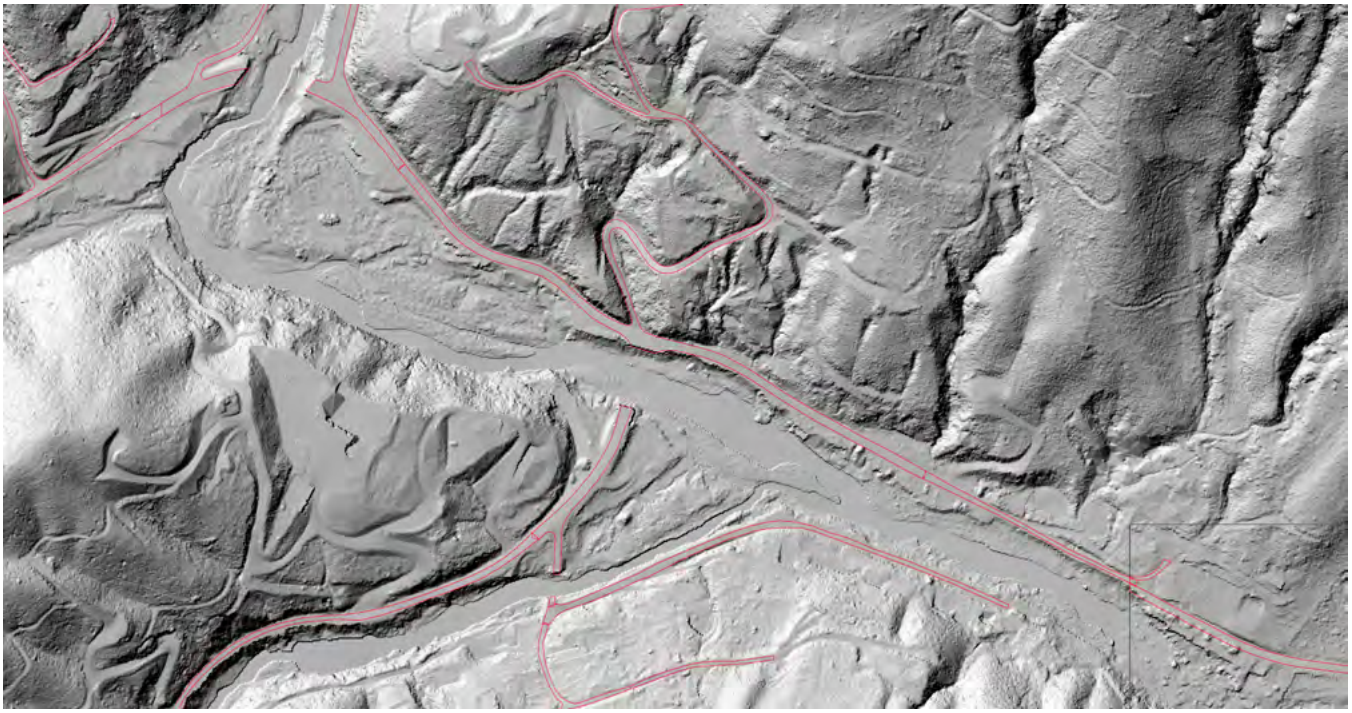
Buncombe county 2025.

Hurricane Helene LiDAR Images

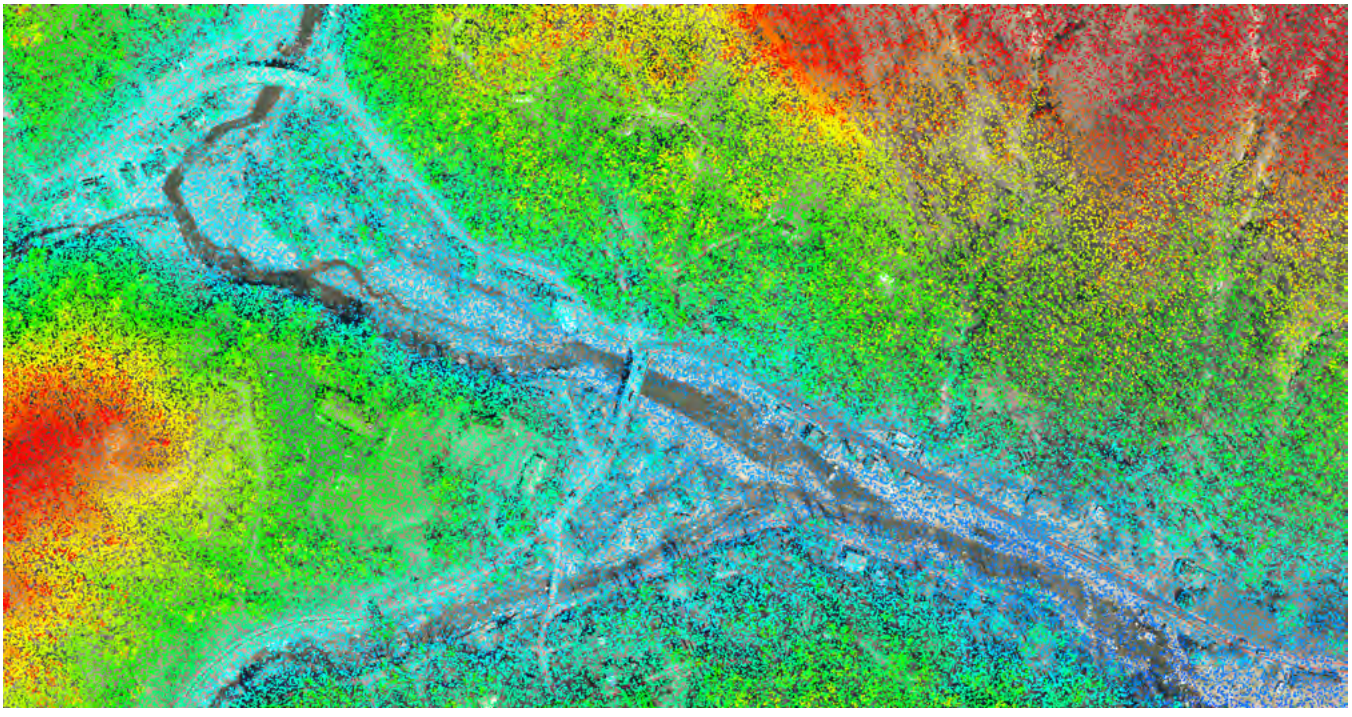
Henderson County

LiDAR imagery shows the impact of Hurricane Helene.

Henderson county hillshade image.



Henderson county ortho-LiDAR image.

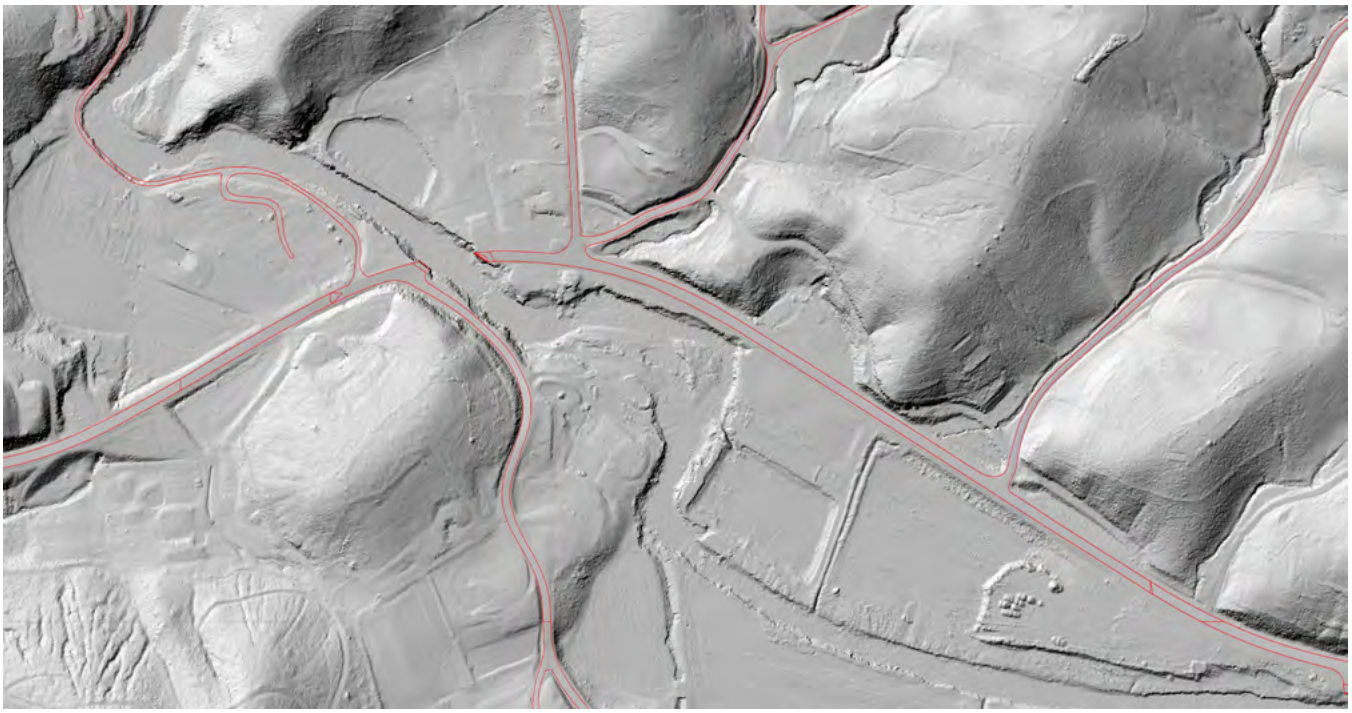


Hurricane Helene LiDAR Images

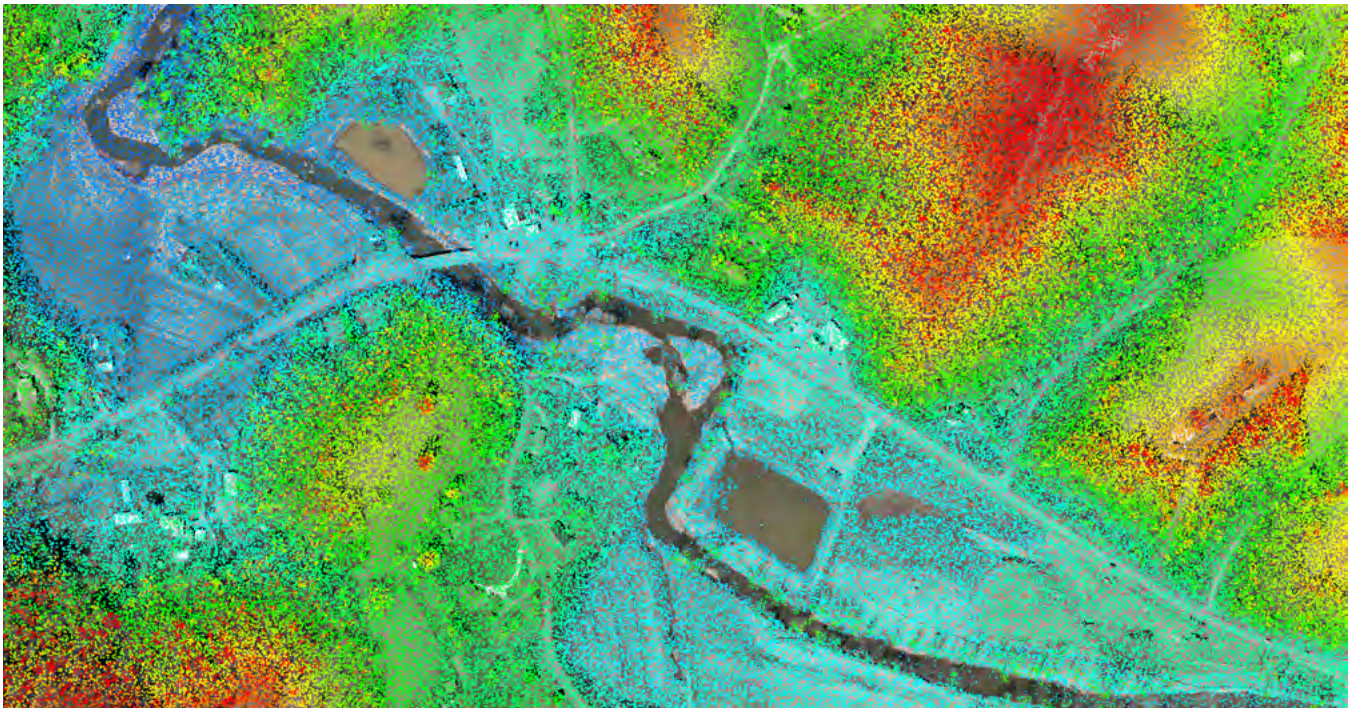
Buncombe County

LiDAR imagery shows the impact of Hurricane Helene.

Buncombe county hillshade image.



Buncombe county ortho-LiDAR image.



Rapid Response at Hyco Lake

In July 2025, Tropical Storm Chantal caused record flooding at Hyco Lake, raising water levels up to nine feet in some areas and forcing the Person-Caswell Lake Authority (PCLA) to close the lake to all motorized boating. The flooding not only disrupted recreation but also impacted a vital economic asset for the region—Hyco Lake serves as the cooling water supply for Duke Energy's Roxboro plant, one of the 10 largest electricity-generating units in the United States.

Recognizing the urgency of recovery, the Collaboratory acted within days to connect PCLA with university research resources. On July 11, Collaboratory staff reached out to UNC Wilmington's (UNCW) Center for Marine Science, securing a commitment for a sidescan sonar survey to assess submerged hazards to navigation, public health, and safety. The UNCW team mobilized quickly, completing the survey July 28–31. By August 11, processed data and revised reports were delivered to PCLA, and within three days the Collaboratory launched a public resource page with findings available online.

Research team on Hyco Lake conducting sonar survey. Photo courtesy of UNCW.

The lake reopened to all activities on August 16—just over five weeks after the storm—supported by the critical information generated through this project. Beyond the scientific results, this effort demonstrated the Collaboratory's ability to rapidly deploy academic expertise and specialized equipment to meet the urgent needs of local governments and communities recovering from natural disasters.

The research vessel from UNCW on Hyco Lake.

Strengthening North Carolina's Education Systems: The Collaboratory's K–12 Research Portfolio

Building a Statewide Education Research Hub

In the past year, the Collaboratory has built a strong foundation for its new K–12 education research portfolio. With dedicated staff and support from university and State partners, this effort is already shaping conversations around some of the most pressing issues in North Carolina schools.

The Office of Learning Research (OLR) at the Collaboratory has worked to:

- Build visibility with state education leaders and policymakers
- Launch collaborations with researchers across UNC System campuses and beyond
- Identify opportunities for research-practice partnerships that connect evidence directly to classrooms and communities

Investing in Critical Education Research

So far, the Collaboratory has invested more than $1.4 million in education studies. These projects span both legislative priorities and emerging issues raised by schools and communities.

Our research portfolio covers challenges that affect every corner of NC, including:

- Recruitment and retention of educators
- School safety and cell phone policies
- Family engagement in student learning
- Principal working conditions
- Innovative uses of AI in classrooms
- Support for the State's Schools for the Deaf and Blind
- Recovery efforts for students impacted by Hurricane Helene
- Effective math instruction and early literacy
- Chronic absenteeism and student mental health

NC Learn workshop event.

From Legislation to Action

In 2024, the Collaboratory was charged by the NC General Assembly to strengthen the State's education research capacity. That mandate has quickly gained momentum. This strong legislative support reflects a shared commitment: providing schools and communities with evidence-based solutions that work.

Program Highlights

Measuring the Impact of the Opportunity Scholarship Program

Principal Investigators:
Anna Egalite, PhD (NCSU), Matthew Springer, PhD (Basis Policy Research)

Researchers are studying NC's Opportunity Scholarship Program, the nation's largest universal school voucher program. The project will identify the best ways to compare the academic performance of students using scholarships with those in public schools. It will also look at the program's effects beyond test scores, such as student well-being, long-term educational paths, and broader social outcomes.

Improving Education for Schools for the Deaf and Blind

This project focuses on strengthening NC's three specialty schools for Deaf and Blind students. Researchers will identify best practices in teaching, school operations, and support services, while also considering staffing and funding needs. These studies will provide practical policy recommendations to ensure these schools are well-positioned to help students succeed while maintaining independence and long-term stability.

Cell Phone Use and Student Learning

Principal Investigator:
Mitch Prinstein, PhD (UNC-CH)

Educators often report that cell phone use disrupts classrooms. This study is investigating how school policies that limit device use affect academics, behavior, social development, and mental health. By comparing schools with different policies, the research will provide evidence-based recommendations on how technology should (or should not) be used during the school day.

Listening to School Leaders: Principal Working Conditions Survey

Principal Investigator:
Timothy Drake, PhD (NCSU)

Principals and assistant principals play a critical role in schools but there has been little systematic data collected to understand their needs. This project is pilot testing a new NC Principal Working Conditions (PWC) Survey designed specifically for school administrators. The survey aims to capture challenges school leaders face and help shape policies to improve their working conditions—and, ultimately, the quality of education statewide.

The Value of School-Based Mental Health Programs

Principal Investigator:
Jane Cooley Fruehwirth, PhD (UNC-CH)

This study will evaluate the benefits and costs of Project AWARE, a school-based mental health program running in several NC counties. Researchers will calculate the true costs of implementing comprehensive, school-based mental health programs and quantify the benefits in economic terms. The results will guide State leaders as they consider expanding and sustaining mental health support for students.

Looking Ahead

In its first year after being formally codified within the Collaboratory, OLR has moved from concept to impact:

Operational: Fully staffed and actively managing a diverse research portfolio
Trusted: Building credibility with education leaders and policymakers
Actionable: Funding projects that address urgent challenges facing schools today

By connecting world-class researchers with real education needs, the Collaboratory is ensuring NC has the knowledge and tools to strengthen public education—today and for the future.

Enhancing Foster Care Through Research and Partnerships

Across North Carolina, children in foster care and the families who support them face complex challenges—ranging from a shortage of foster homes to delays in family court and workforce shortages in county social services. The Collaboratory is working with partners across the State to bring evidence, innovation, and collaboration to these pressing issues.

Research-Practice Partnerships in Action

The Collaboratory's foster care work is built on research-practice partnerships (RPPs), which bring researchers and county Departments of Social Services (DSS) together to solve problems side by side. These teams identify local needs, design studies, and test solutions, ensuring that research responds directly to the realities on the ground.
In 2025, these partnerships have taken shape across four counties, where DSS directors and university researchers are co-developing projects to strengthen foster parent recruitment and retention, improve child permanency outcomes, and address systemic barriers in the courts and mental health systems.

Jackson County Department of Social Services foster care kickoff event.

Jackson County Department of Social Services foster care kickoff event.

Rapid Evidence Reviews

To guide decision-making, the Collaboratory is funding a series of rapid evidence reviews—short, accessible summaries of existing research that respond to urgent questions from counties and State partners.

The first review, led by Duke University's Nick Carnes, PhD, examines NC's foster home shortage in the years since COVID-19.

Two additional reviews are underway: one focused on best practices in kinship care, centered on supporting grandparents and relatives who step in as caregivers, and another on placement utilization, including why families decline foster placements and how data can better track foster care needs.

These reviews are designed to be "living resources," giving DSS directors and policymakers actionable insights they can use immediately.

Clay, Jackson, Rowan, Rutherford: Problems of Practice

Some Populations Are More Difficult to Place

County Partner: Clay County
Research Partner: East Carolina University

Clay County will focus on recruitment and retention of foster parents as it relates specifically to teenage populations and populations that have greater medical or mental health needs. They will investigate strategies to increase placement rates with an emphasis on reducing out-of-county placements.

Lack of Staff Capacity to Recruit and Retain Foster Families

County Partner: Jackson County
Research Partner: UNC-Chapel Hill

Jackson County will focus on examining policies and procedures relating to recruitment and retention of staff dedicated to supporting foster families at the county and state-level. They will also be exploring public-private partnerships as a possible solution.

Current Foster Families are Unwilling to Take Placements

County Partner: Rowan County
Research Partner: UNC-Chapel Hill

Rowan County will be focused on placement utilization. The group will investigate ways to help increase placement rates within their current foster parent pool while also emphasizing the role of kinship care. They will also examine ways to help recruit new foster parents and kinship caregivers in ways that better prepare them to address the complex needs of children in the system.

Agency Role in Recruiting and Retaining Foster Parents

County Partner: Rutherford County
Research Partner: Duke University

Rutherford County will focus on what agency norms should be in place to successfully recruit and retain foster parents. They will examine outreach programming, barriers to recruitment and retention, and how communication between agency stakeholders and families help to recruit, retain, and support foster families.

Legislative meeting to discuss foster care in North Carolina.

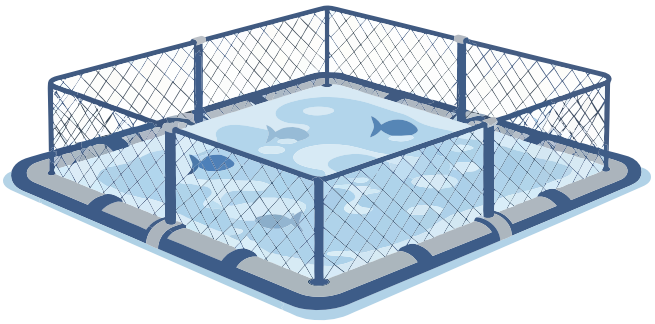
Protecting North Carolina's Marine Fisheries Resources

On June 30, 2025, the Collaboratory's research team submitted to the legislature a study report: "The Status of North Carolina's Marine Fisheries and Coastal Habitats with Recommendations to Enhance Marine Public Trust Resources and Management Outcomes."

The report was a requirement of legislation passed in 2021 by the NC General Assembly that mandated a multi-year study. In part the study was tied to the 25th anniversary of the NC Fisheries Reform Act and the 50th anniversary of the Coastal Area Management Act.

The study team was led by Joel Fodrie, PhD, Director of the UNC-Chapel Hill Institute of Marine Sciences, and included researchers from NC State University, East Carolina University, and UNC Wilmington. Over the last three years, the study team has worked in coordination to evaluate the variety of factors that contribute to a healthy fishery and identify reasonable management interventions. The research team represents expertise in fish biology/ecology, estuarine ecology, fisheries management, and environmental governance.

UNC-Chapel Hill professor Joel Fodrie.



The Study identified several critical findings and made recommendations in the following areas:

Recommendation 1:
Reform North Carolina fisheries management with an independent science and statistical committee

Recommendation 2:
Enhance stakeholder participation, trust, and management transparency

Recommendation 3:
Adopt an ecosystem-based management approach to gauge the health of the North Carolina Fisheries

Recommendation 4:
Halt or reverse patterns of habitat loss and degradation

Recommendation 5:
Re-evaluate the Primary Nursery Area network and create an adaptive framework for protecting critical nursery areas

More detailed information on the study, its findings and recommendations can be found at: https://collaboratory.unc.edu/wp-content/uploads/sites/476/2025/06/legislative-recommendations-report.pdf

High Performance Computing for Innovative Research

In 2023, the NC General Assembly made a recurring appropriation of $2 million in non-reverting funds to the Collaboratory to support digital engineering activities at constituent institutions of the UNC System.

To fulfill this legislative mandate, the Collaboratory has established a new mechanism for providing offsite, cloud-based HPC resources for academic research projects including, but not limited to, advanced simulations, machine learning, artificial intelligence, and other complex tasks requiring substantial processing power and data storage. The Collaboratory aims to use these resources to facilitate real-time access to central processing units (CPUs), graphics processing units (GPUs), and large-scale, cloud-based data storage to advance cutting-edge research for the benefit of the State.

One of the first projects being supported through this resource is led by Dr. Jack Edwards, a professor of mechanical and aerospace engineering at NC State University who is using the resource to advance research across multiple projects related to hypersonic technology, including:

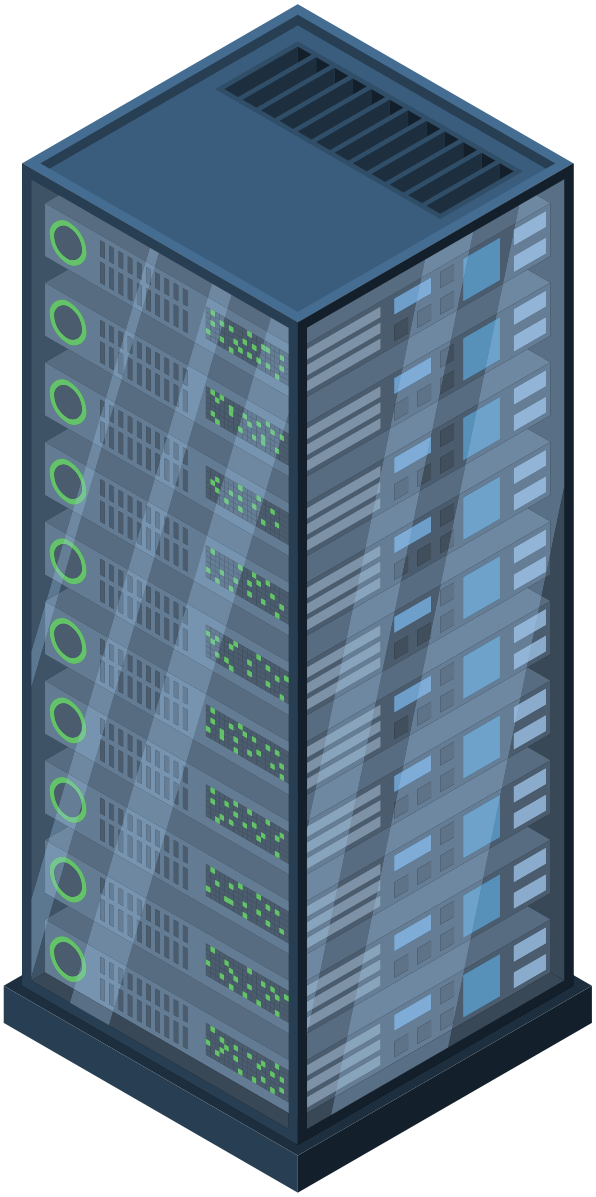
1. Understanding how air behaves in hypersonic wind tunnels to improve ground-based testing of high-speed vehicles.

2. Simulating scramjet engine tests to help translate short-duration lab results into real-world flight insights.

3. Predicting how a new scramjet engine designs perform during extreme maneuvers, such as when one hypersonic vehicle tries to intercept another.

4. Improving the software used in these simulations so that more research can be done with the same computing resources.

Collectively, these activities require millions of CPU hours. Through this support, the Collaboratory aims to strengthen NC's competitiveness for securing future research funding from federal agencies, such as the Department of Defense and NASA, while advancing the State's leadership in hypersonic technology research and development.



On the Horizon: Harnessing Artificial Intelligence for State Impact

Artificial intelligence (AI) is rapidly reshaping how research, policy, and public service intersect. Recognizing its transformative potential, the Collaboratory is proactively exploring how AI can be applied to serve North Carolina's State agencies and their partners. Rather than pursuing AI as a purely technical endeavor, the Collaboratory is focused on strategically bridging university expertise with practical, state-level needs—ensuring that AI initiatives are responsive, actionable, and aligned with public priorities.

Through this forward-looking approach, the Collaboratory aims to build enduring collaborations between universities and State agencies, co-developing solutions that are both data-driven and contextually grounded.

A key component of this strategy is strengthening North Carolina's statewide AI capacity and talent pipeline. By leveraging the collective expertise of public institutions, the Collaboratory seeks to cultivate the next generation of AI researchers, practitioners, and policy analysts who are equipped to address complex societal problems. This commitment also ensures that the State retains a robust, sustainable foundation for long-term innovation, with universities serving as catalysts for applied solutions that have measurable impact.

Looking ahead, the Collaboratory's AI initiatives are designed not just to experiment with new tools but to create lasting, scalable frameworks for research, education, and service that empower State agencies, advance public understanding, and strengthen North Carolina's leadership at the intersection of technology and policy.

Researcher Spotlight:
Artificial Intelligence to Support Storm Recovery

With support from the NC General Assembly the Collaboratory is supporting research that harnesses the power of artificial intelligence (AI). One example of utilizing AI for impact in the state is the research being led by UNC-Chapel Hill professor Antonia Sebastian.

Sebastian and her research team's focus on flood resiliency helps decision-makers prepare for and respond to these challenges, combines big data, numerical models, and artificial intelligence to better understand where and why flooding occurs. Sebastian's work is designed to deliver actionable insights – the kind that local govern-

UNC-Chapel Hill professor Antonia Sebastian.

ments, emergency managers, and businesses can use to reduce losses, strengthen infrastructure investments, and safeguard communities.

Sebastian and her research team are using AI to develop new tools critical to monitoring and understanding flood risk and recovery. For example, in a Collaboratory-funded study, researchers are using large language models and vision learning to prototype a tool that can rapidly identify building occupancy from 360° street view imagery. By conducting repeat-pass drive-by surveys in areas impacted by Helene (and Chantal), researchers demonstrated the model's performance and utility for monitoring household recovery.

Importantly, that model offers significant time and cost savings relative to current approaches that require conducting door-to-door household surveys and can be used to quantify damage patterns after major disasters, allowing for faster and more targeted disaster response.

Ultimately, Sebastian's goal is to make advanced flood science directly useful to the people shaping policy and managing risk on the ground. By leveraging AI and large-scale data, her research can support more efficient flood mapping, smarter land-use planning, and cost-effective flood mitigation strategies. These tools allow state and local leaders to move from reactive disaster spending to proactive investments in resilience – protecting lives, reducing taxpayer burden, and building sustainable communities.

> ***"The work we are doing in western NC aims to address questions related to the economic resilience and rate of recovery of households and communities in the wake of Helene. Our goal is to understand what was damaged during the flood, what is rebuilt and when, and how this translates to community resilience over the long-term."***
>
> — UNC-Chapel Hill professor Antonia Sebastian

UNC-Chapel Hill professors Antonia Sebastian and Miyuki Hino.

A Trusted Resource to the North Carolina General Assembly

Since its creation by the legislature in 2016 at the heart of the Collaboratory's mission has been to serve as a resource to legislators, legislative staff and state agencies by providing the latest data and information that can inform policymaking and lead to management actions.

As such, over the last nine years the Collaboratory has submitted dozens of reports to the legislature, presented before legislative committees on timely topics, and served as a resource to gather evidenced based information for decision-making by lawmakers.

Summarized below are two new significant studies directed to the Collaboratory in the current legislative session: one examining the laws regarding surface water transfers; and the second evaluating the link between mental health and criminal justice issues.

As part of its process to carry out these studies as comprehensively as possible, the Collaboratory will develop research teams, plan scopes of work for the research needed, engage relevant stakeholders and policy-makers, and later shape findings and recommendations prior to submitting a final report to the legislature.

House Bill 850: Moratorium on Surface Water Transfers

In the 2025 legislative session the NC General Assembly approved legislation that would place a moratorium on the issuance of certificates for surface water transfers, which are often referred to as inter-basin transfers.

As part of this new session law the Collaboratory was directed to study the current statutory process for the certificate approval and to make recommendations for revision of the process. The legislation directs the Collaboratory to study a number of factors, including the impacts of transfers on upstream and downstream communities.

The report for this legislative study is due in 2027 at the convening of the NC General Assembly.

House Bill 307: Iryna's Law

In this legislation passed in late September, the Collaboratory is directed to study mental health and the justice system. The legislative language provides the authority for the Collaboratory to gather new data, conduct stakeholder engagement and develop a long-term research plan.

Specifically, the legislative language mandates the Collaboratory to study:

• The intersection of mental health in the justice system for both adults and juveniles in North Carolina, including initial response, mental health evaluation, inpatient and outpatient involuntary commitment, incarceration, post-release monitoring and treatment, and any other items the Collaboratory deems relevant.

• The availability of house arrest as a condition of pretrial release in each county or judicial district.

• Methods of execution other than those currently authorized by State law.

Under the law the Collaboratory will provide an initial report to the legislature in April 2026 and final report in March 2027.

2025
Current Project Updates

NC PURE: Removing Forever Chemicals

The NC Collaboratory was tasked by the NC General Assembly with addressing PFAS contamination, including GenX, by coordinating expertise, technology, and instrumentation across the UNC System and other state institutions. The legislation provided dedicated funding for staffing, equipment, and project implementation, while requiring that a portion of any revenue from state-funded technologies flow back to the public.

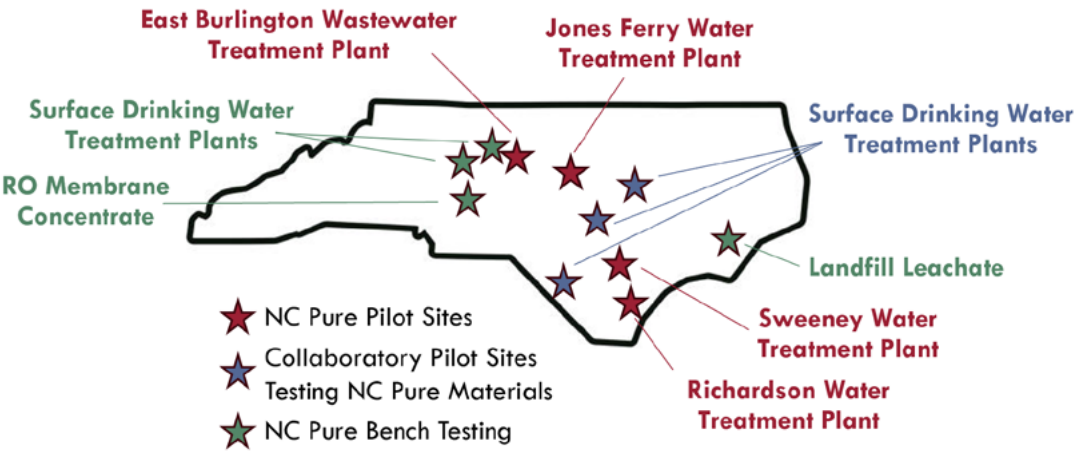
This mandate makes the Collaboratory rare in academia: it is explicitly designed to turn research into actionable solutions that directly benefit citizens. NC Pure exemplifies this approach, piloting innovative PFAS filtration technologies in real-world water systems while creating measurable public impact and accountability.

Today, the project—known as NC Pure—has developed a proprietary resin capable of removing even the most difficult short-chain PFAS. Perhaps more impressive is that it's outperforming commercial alternatives. The technology is now being piloted at six water systems across the state, from surface and groundwater utilities to a municipal wastewater facility.

Collaboration That Crosses Boundaries

NC Pure brought together experts from different corners of UNC-Chapel Hill in ways rarely seen in traditional academia. Professor Frank Leibfarth of the Chemistry Department teamed up with Dr. Orlando Coronell's Department of Environmental Sciences and Engineering to refine the PFAS-removal resin for practical, on-the-ground testing. This type of cross-disciplinary partnership ensured the solution was not only scientifically sound but operationally feasible.

Dr. Frank Leibfarth (right) shares research updates with (from right to left) UNC Chancellor Lee H. Roberts, NC Collaboratory Executive Director Jeff Warren, Vice Chancellor for Finance and Operations Nathan Knuffman, and Vice Chancellor for Research Penny Gordon-Larsen.



Beyond the university, NC Pure partners with six North Carolina water systems—from municipal wastewater plants to major surface and groundwater utilities—including

- Orange Water and Sewer Authority
- Cape Fear Public Utility Authority
- East Burlington
- Harnett Regional Water, and
- City of Goldsboro.

Pilots with these utilities generate actionable data that improve treatment performance, inform compliance costs, and provide safer drinking water to residents.

Dr. Frank Leibfarth in his research lab.

Researcher Spotlight: Frank Leibfarth

In 2018 the NC General Assembly funded the Collaboratory to begin harnessing the power of academic research to address the PFAS challenges facing the state.

Collaboratory Executive Director Dr. Jeffrey Warren posed a challenge to UNC-Chapel Hill's Chemistry Department: "Our state, like many others, has a PFAS problem. How can we get it out of the environment?" That challenge caught the attention of Dr. Frank Leibfarth, who proposed a bold new approach. The Collaboratory provided seed funding in 2019 to bring the concept to life. After successful lab-scale proof of concept, the NC General Assembly invested $10 million in 2021 to expand the effort.

In October Leibfarth was awarded the 2025 Blavatnik National Award for Young Scientists. The unrestricted award is $250,000 and is the largest prize for early-career researchers. Leibfarth was recognized for his trailblazing work to remove forever chemicals from drinking water.

> ***"NC PURE aims to develop materials to remove per- and polyfluoroalkyl substances (PFAS) from North Carolina's drinking water and wastewater in a way that is more efficient and more cost-competitive than the current solutions. To do this, we work together."***
>
> — Dr. Frank Leibfarth

NC PFAS Testing Network

The NC PFAS Testing Network is a group of multi-disciplinary academic researchers from higher education institutions across North Carolina. The Network conducts fundamental and applied research on per- and polyfluoroalkyl substances (PFAS), including occurrence in drinking water, environmental fate and transport, exposure and toxicology, and mitigation technologies.

This program is part of the Collaboratory, established through a legislative mandate and funded by the NC General Assembly.

During 2025, the Network had close to two dozen active projects assessing and working to mitigate PFAS across North Carolina.

State Partnership:

The Network partnered with the Department of Environmental Quality for a PFAS summit meeting. The convening included agency leadership, technical staff and PFAS researchers to exchange expertise, align priorities, and collaboratively identify critical issues.

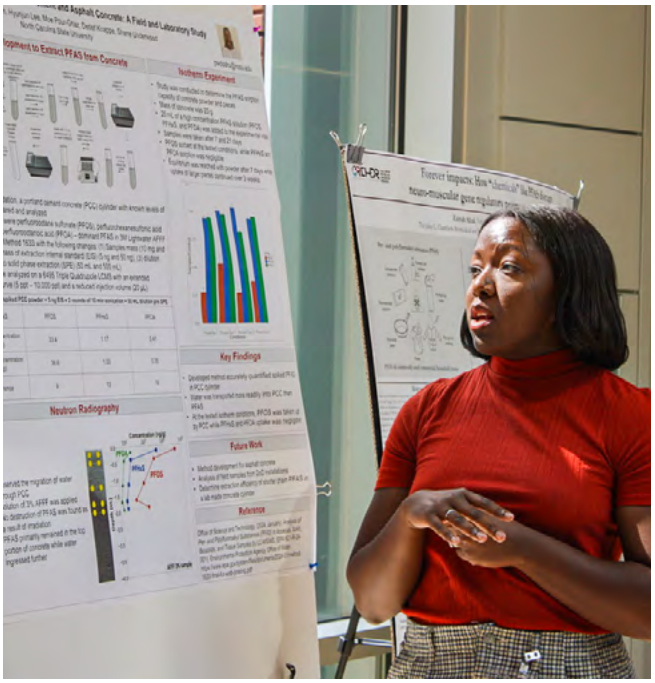
PFAS Testing Network conference.

Local Government Partnerships:

Established a training and consulting partnership with the Cape Fear Public Utility Authority (CFPUA) to support the installation of an in-house instrument for rapid PFAS analysis for operational monitoring, helping CFPUA optimize the lifetime of the facility's GAC filters and reduce cost burdens on local citizens.

Researchers from UNC Wilmington developed a new isotope-tracing method for PFOA. Now, they are applying the method in partnership with the NC DEQ to determine the impact of the Alamance County landfill on residence drinking water wells.

Air Testing Campaign – a collaborative study between FSU, NCSU, UNCW, and ECU to investigate the atmospheric transformations, occurrence and deposition of unique PFAS near field and distal from the Fayetteville Works Facility – this will fill a critical knowledge gap in understanding the atmospheric occurrence and fate of unique PFAS and will aid atmospheric modeling efforts within the state of NC.



PFAS Testing Network conference.

Supporting the Firefighting Community

The Firefighter Cohort Study has enrolled 701 firefighters from 23 counties in the NC, analyzing blood samples and deploying silicone wristbands to improve understanding of occupational PFAS exposure and identify activities that may lead to higher PFAS exposures.

An NC State University research team continued to study AFFF toxicity compared to non-fluorinated alternatives and partnered with the NC Office of the State Fire Marshal to train firefighters statewide to safely and effectively use non-fluorinated foam alternatives.

A research group collected samples from nearly 400 wells at fire stations statewide to assess PFAS contamination, partnering with other researchers for future analysis. Their results will provide a comprehensive picture of PFAS contamination at fire stations across the state, informing future PFAS management decisions.

The NC Collaboratory provided almost $1 million in funding to the Office of the State Fire Marshal for the construction of a live fire training simulator capable of supporting PFAS-free foam training at the NC Emergency Training Center. Located in Stanly County, the training center was built to be the most advanced emergency training center in the country.

North Carolina firefighters training.

When a Mosquito Bite Becomes a Call for Better Science

In July 2024, five-year-old Granger Horney of Marion, NC suddenly became ill. At first, he was weak, then he developed vomiting and seizures. His parents rushed him to a hospital in western NC, where doctors discovered that Granger was infected with La Crosse virus—a rare, mosquito-borne illness that can cause severe brain inflammation.

With no vaccine or standard treatment for La Crosse virus, at Mission Hospital in Asheville, medical staff worked to reduce pressure around Granger's spinal cord and administered medicine to reduce his fever. Within hours of treatment, Granger began recovering.

La Crosse virus is spread by the eastern treehole mosquito, Aedes triseriatus, through its bite. Symptoms may appear days or weeks later. While adults often have no symptoms or only mild illness, children are at higher risk of developing severe, potentially life-altering complications.

What is La Crosse Virus?

La Crosse virus (LACV) is a mosquito-borne disease transmitted by the eastern treehole mosquito (Aedes triseriatus). These mosquitoes thrive in the hardwood forests of southeastern Ohio, eastern Tennessee, and western North Carolina.

While adults infected with the virus usually experience mild symptoms or are asymptomatic, children under the age of 18 are more likely to experience severe, life-altering symptoms. For example, severe cases of the disease are often characterized by encephalitis (inflammation of the brain) which can lead to high fever, seizures, brain swelling, disorientation, vomiting, or paralysis.

Turning a Scary Experience into Research That Helps Others

When Granger was stable, his family agreed to join the Collaboratory-funded and UNC-Chapel Hill and Western Carolina University-led study of La Crosse virus.

The goals are to:

• Use blood samples from children like Granger, and sometimes their caregivers, to study how some people are able to fight off the infection.

> ***"The collaboration between UNC-Chapel Hill and Western Carolina University offers an opportunity to improve our understanding of these diseases in North Carolina, develop prevention and treatment strategies, and help patients and their families."***
>
> — Myron Cohen, MD, director of the Institute for Global Health and Infectious Diseases at the UNC School of Medicine

Researchers gather samples in the field.

• Trap and test mosquitoes around homes affected by the virus, to understand which mosquitoes are involved and where they breed.

• Develop better tools for diagnosing the disease earlier, improve treatment options, and potentially work toward prevention or vaccines.

Awareness:

Many people—including parents and doctors—have never heard of La Crosse virus, even in regions where it occurs often. This research helps raise awareness about symptoms, risk factors, and prevention.

Prevention:

By mapping where infected mosquitoes are breeding and learning how people are exposed, researchers hope to give communities practical tools to reduce risk. Things like checking for standing water in tree holes, wearing repellent, and using protective behaviors are part of the response.

Long-term Impact:

With better diagnostic tools and a clearer understanding of how the virus spreads, the goal is to reduce severe cases, extensive recoveries, and long-term health problems for affected individuals.

Looking Forward:

Granger has recovered and is back at school and even playing baseball. His family's willingness to participate in research is helping scientists gather rare samples and insights that could benefit many children.

The Collaboratory has helped to connect hospitals, university researchers, State funds, and local families to address this neglected disease. By doing so, we're building tools that help today and strengthen our health system for tomorrow.

Researchers gather samples in the field.

Researcher Spotlight: Nab Dasgupta Leading an Innovative Effort to Respond to the Opioid Crisis

Three years after the first opioid settlement funds arrived in North Carolina, counties have made significant progress in implementing evidence-based abatement and prevention strategies in their communities. As counties continue to develop and implement programs, overdose deaths and overdose-related emergency room visits are showing promising signs of decline.

The Collaboratory supports a broad portfolio of opioid abatement research projects that bring together academic researchers and local practitioners who are working to reduce opioid use and harm. The Collaboratory launched competitive funding opportunities in 2022 and 2024 and has since funded over 40 projects that address challenges identified by practitioners, communities, governments, and policymakers.

One of those projects supported by the Collaboratory is led by UNC-Chapel Hill scientist Nab Dasgupta, PhD, who has garnered national attention and acclaim. In 2023 Dasgupta was recognized by TIME 100 Next for the efforts of his Street Drug Lab in addressing the opioid crisis.

In 2025 he was awarded the highly coveted MacArthur "Genius" Fellowship given to recipients who have demonstrated extraordinary creativity. This honor placed him among a select group of innovators whose ideas and work are shaping the future of their fields and society at large.

Dagupta's lab focuses on street drugs, which pose great risk to individuals and to public health. Dasgupta and his team study the ways in which street drugs are changing and share lifesaving information with the public.

One of the most important things about Dasgupta's work is that it goes beyond research in a lab. Rather, it has real world application across North Carolina.

In addition to his groundbreaking opioid work, Dasgupta is now providing support to another Collaboratory project. Researchers at the UNC Department of Chemistry's Mass Spectrometry Core Lab are working on ways to accurately test the amount of THC and CBD in popular cannabis products like gummies, candies, oils, and vapes made by North Carolina-based companies. This testing helps make sure product labels are accurate and ensure consumer safety.

Dr. Nabarun Dasgupta.

> ***"One of the things that differentiates this project from others that I've worked on is that it's not a research project – it's a service. Our primary objective is for it to be a public service that is a benefit to public health in North Carolina. With the Collaboratory funding, we are able to offer our service, for free, to any public health program, health department, or clinic in North Carolina."***
> — Dr. Nabarun Dasgupta

This innovative and out-of-the-box approach to public health issues is a hallmark of Dasgupta's work, and it continues to play a critical role in serving the people of North Carolina. The approach which blends research with service has also elevated Dasgupta to a leading voice on addressing the opioid crisis at the national level.

Investing in Research at Historically Minority-Serving Institutions

The NC General Assembly established the Historically Minority Serving Institution program within the Collaboratory in 2021. The program is designed to provide sustained funding and build research capacity for the UNC System's six historically minority serving institutions: ECSU, FSU, NC A&T, NCCU, UNCP and WSSU. The program is supported by recurring appropriation of $1.5 million annually.

Each institution has the ability to identify research priorities at their campus and ensure the research funds are advancing their mission. The program's keys to success are:

- Individualized approach based on the needs of each Institution
- Key personnel interaction before, during, and after the performance period
- Customer service and support for seasoned and novice faculty equally

Examples of projects funded in 2025:

Elizabeth City State University

Advancing drone technology through interdisciplinary collaboration to develop AI-enhanced unmanned aircraft systems for diverse applications.

Fayetteville State University

Establishing a sustainable aquaponics system to enhance student learning and address food insecurity in underserved communities.

North Carolina Agricultural and Technical State University

Using machine learning to improve wetland mapping and flood management by integrating topographic and hydrographic data.

North Carolina Central University

Establishing an Office of Research Development to enhance faculty support and increase extramural funding at NCCU.

UNC-Pembroke

Assessing PFAS contamination in private wells near industrial sites to inform mitigation strategies and protect public health.

Winston-Salem State University

Expanding virtual reality training for nursing students to improve critical thinking and decision-making through immersive simulations.

Researcher Spotlight:
Enhancing Operational Safety with AI Driven Drone Technology

One researcher illuminating the capabilities of artificial intelligence (AI) is Sambit Bhattacharya, PhD, who is researching the application of AI for the advancement of drone technology at Fayetteville State University.

After conversations with the Department of Defense (DoD) and the North Carolina Department of Transportation (NCDOT), where he learned of search operations challenges, Bhattacharya was inspired to develop a drone-based solution. When potential fractures in storm drains, under tall bridges, etc., occur, laborers must enter these confined and possibly dangerous areas to make assessments. However, drones offer an alternative to accessing these areas, minimizing human risk. The catch: the drones cannot effectively navigate through such spaces independently.

In response to this challenge, Bhattacharya is working on applying AI to drones to enable autonomous operation.

Dr. Sambit Bhattacharya.

Incorporating AI into drones enables them to conduct comprehensive search operations efficiently, making it essential for GPS-denied or wireless-denied locations where obtaining exact coordinates is nearly impossible due to physical limitations.

“This will give us the ability to look through the eyes of the drone,” Bhattacharya explained.

Fayetteville State University students in the Bhattacharya drone lab.

Next Generation Energy

During the 2023 legislative session, the NC General Assembly allocated $15 million in next-generation energy research. The Collaboratory is investing these funds in identifying and supporting research that advances emerging energy technologies, strengthens the resilience of our grid, and positions North Carolina to leverage the economic development opportunities of the energy transition.

The Collaboratory has partnered with academic institutions, research organizations, government agencies, and businesses to support applied research on technologies and capabilities, including lithium batteries, small modular nuclear reactors, green hydrogen, grid modeling, supply chains, workforce development, and more.

Photo by the American Public Power Association on Unsplash

Grid Resilience

The importance of a reliable and resilient grid is critical to North Carolina. The Collaboratory has funded two projects at NC State University that will help prepare the grid for the unexpected and reduce the time and costs of repairing outages.

• The first project develops a comprehensive modeling tool to help utilities predict storm-related grid infrastructure damage, enabling them to pre-position crews and resources before a weather event and optimize deployment afterward.

• The second project assesses the vulnerability of Duke Energy Carolinas' service area to low-tech attacks on substations and provides a list of substations to prioritize for added protection, compelled by the 2022 Moore County incident.

In 2024, the Collaboratory funded a project at UNC Charlotte to develop an integrated transmission and distribution planning tool to help grid planners model future grid needs, such as the impact of the large-scale adoption of EVs, data centers, solar and battery technology. So far, significant headway has been made in creating the modeling tool through student contributions, collaboration with NC State University, and partnership with Corvid Technologies, enabling high-performance, simultaneous computing. The project team has also assembled an outside stakeholder group that includes utilities, policymakers, and others to discuss use cases.

Catalyzing the Battery Industry in North Carolina

North Carolina's abundant mineral resources and favorable business climate have attracted many companies across the battery storage value chain. To support this growing network, the Collaboratory is supporting the NC Battery Industry Partnership, a two-year initiative led by the Appalachian State Energy Center. This effort brings together com-

panies, nonprofits, state agencies, and educational institutions working throughout the battery storage lifecycle—from upstream materials and midstream manufacturing to downstream deployment, recycling, and end-of-life recovery. Key partners include ForgeNano, FlexGen, Celgard, Toyota, Duke, Strata Energy, and institutions such as the NC Department of Commerce, E4 Carolinas, NCBCE, and NC State University's Industry Expansion Solutions, offering a 'one-stop shop' of support for the industry.

The partnership fosters dialogue, collaborative problem-solving, and industry advancement through in-person meetings, virtual working groups, and site visits. A recent output is an interactive map that identifies the locations of companies with battery-related operations across North Carolina, highlights key economic data, and pinpoints gaps in the value chain.

Energy Storage

Our state faces climbing energy demands as the population grows, new data centers emerge, and technologies become increasingly electrified. Efforts to meet our state's net zero emissions by 2050 climate goal also usher in the deployment of intermittent renewable energy sources, making research and investment into energy storage paramount.

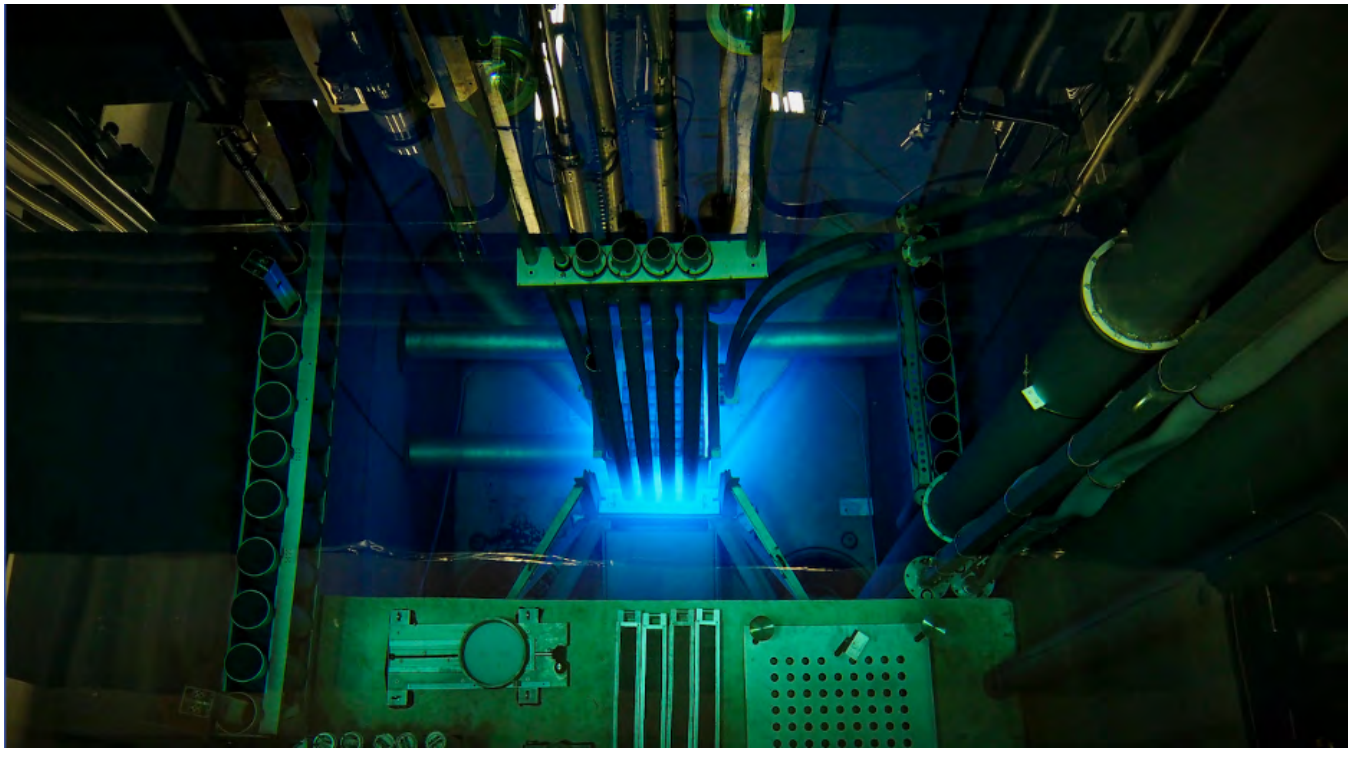
To assess NC's energy storage needs, the Collaboratory funded the report: *Supercharging Energy Storage Innovations in North Carolina*. Authored by researchers at UNC-Chapel Hill, the report analyzes the economic landscape of the energy storage capacity in NC, models scenarios that impact the growth trajectory of renewable energy and storage adoption, and provides a summary of ongoing storage technology research and development across industry and academic institutions. It also and offers recommendations to accelerate this progress, such as expanding collaboration between basic and applied scientists, increasing available data on storage use, and boosting investments in long-duration storage.

To read the report visit: https://innovate.unc.edu/new-report-north-carolinas-growing-energy-needs-and-why-energy-storage-matters-now-more-than-ever/

Nuclear

North Carolina is looking to advanced nuclear technologies as a source of low-carbon and reliable energy. To support this effort, the Collaboratory has funded two projects at NC

Source: NC State University https://www.ncsu.edu/clean-energy-study



State University. The first project is developing a comprehensive digital simulator of GE-Hitachi's BWRX-300 small modular reactor to showcase the technology's operations and passive safety features to future technicians, operators, and customers. The other, conducted in partnership with the Electric Power Research Institute, leverages NC State's test reactor to identify knowledge gaps in the nuclear industry and inform the design of training programs that will prepare the future nuclear workforce.

To learn more about the Collaboratory's energy research portfolio, check out the 2024 Next Generation Energy Report.
https://collaboratory.unc.edu/wp-content/uploads/sites/476/2025/03/next-generation-energy-report.pdf

Researcher Spotlight:
Hemali Rathnayake is Working to Revolutionize the Lithium Mining Industry

Dr. Hemali Rathnayake.

Lithium, known as "white gold", is a crucial element in rechargeable batteries that power electric vehicles, consumer electronics, and energy storage systems. Demand is at an all-time high, but the widely used methods of refining lithium ore into cathode-grade lithium carbonate are time-consuming, inefficient, and resource-intensive. Dr. Hemali Rathnayake and her team at the University of North Carolina at Greensboro (UNCG) are changing that narrative with their development of the Nano Mosaic solid-phase extraction (SPE) technology.

On October 2nd, she showcased this technology at an open house hosted by Minerva Lithium, bringing together stakeholders to not only celebrate the technology but to accelerate its commercial rollout by informing potential investors of its potential to revolutionize the industry in North Carolina and beyond.

The current methods of extracting lithium from hard rock or water resources, such as brining, can take anywhere from weeks to years. The SPE process reduces this to just 48 hours. It also addresses two of the primary concerns surrounding lithium extraction: environmental harm and its social consequences. Traditional methods require 30,000 gallons of freshwater to produce one metric ton of lithium carbonate, while Nano Mosaic only requires 5,000 gallons.

Increased efficiency and reduced labor and resource needs also mean lower production costs, making domestically produced lithium more cost-competitive with Chinese cathode-grade lithium, which currently dominates the global markets.

According to Dr. Rathnayake, North Carolina is "sitting on a gold mine." The U.S. Geological Survey holds there to be three spodumene deposits, located around Bessemer City, Cherryville, and Kings Mountain in Southwestern NC. Together they contain an estimates 426,000 metric tons of lithium, enough to supply batteries for around 50 million electric vehicles.

In 2023, the Collaboratory provided nearly one million dollars in funding for Dr. Rathnayake's research, helping it reach pilot-scale capabilities and showing its potential to revitalize lithium mining in NC while driving job creation and economic growth.

For Dr. Rathnayake, the most rewarding parts of this journey have been watching her idea evolve from a concept to a patented, pilot-tested technology, and watching her students grow alongside it. As a professor of nanoscience and nanoengineering at UNCG, she sees the research as both a breakthrough and a learning experience to prepare future technicians and researchers.

Building Wastewater Treatment Infrastructure

In 2021 the NC General Assembly appropriated $20 million from the American Rescue Plan Act to establish the Innovative Highly Treated Wastewater Pilot Program led by the Collaboratory. The Collaboratory is working with the UNC Environmental Finance Center to support the deployment of new wastewater treatment facilities at five towns across North Carolina:

- **Ansonville**
- **Boonville**
- **Hot Springs**
- **Lansig**
- **Maysville**

The expectation is that construction on this projects will move forward in 2026.

Delivery of Treatment Plant for Hot Springs in October, 2025.

Tar Heel Bus Tour 2025: Bridging Carolina to Coastal Conservation

From May 14 to 16, 2025, the Tar Heel Bus Tour embarked on its spring edition—routed eastward after last fall's cancellation due to Hurricane Helene. The tour continued its long-standing tradition of connecting UNC faculty and leaders with North Carolina's communities, shining a spotlight this year on coastal resilience and environmental innovation.

Tar Heel Bus Tour 2025.

A Visit to Pine Island Audubon Sanctuary

One of the tour's most compelling stops brought participants to the Pine Island Audubon Sanctuary in Corolla—a 2,600-acre mosaic of marsh, maritime forest, and beaches nestled between Currituck Sound and the Atlantic Ocean. At Pine Island, the Carolina Drone Lab (under the UNC Institute for the Environment), in partnership with Elizabeth City State University and Audubon of NC, showcased its cutting-edge drone-based work—made possible with funding from the NC Collaboratory.

Tar Heel Bus Tour visits the Pine Island Audubon Sanctuary.

Pine Island Audubon Sanctuary.

Why This Matters to North Carolinians

The drone initiative at Pine Island exemplifies how the Collaboratory's support translates into State-wide impact:

Local resilience:
High-precision data informs restoration design—such as sediment elevation techniques—and helps safeguard vital marsh ecosystems.

Research collaboration:
ECSU's aviation expertise and drone program made hands-on student involvement possible, building workforce capacity in environmental science.

Visibility:
The Bus Tour's visit brought the Collaboratory-funded work directly to UNC leadership, underscoring the University's connection to investment in North Carolina's environmental and community well-being.

Pine Island Audubon Sanctuary.

Collaboratory Operations

Research Compliance and Administration

Stewardship of State Dollars

The NC Collaboratory's research portfolio is funded almost exclusively by the NC General Assembly. As such, the Collaboratory takes its duty to be responsible stewards of state dollars very seriously.

The Collaboratory has established an internal database which tracks all 700 of our funded projects at every stage of the research process, including proposal, funding agreement, and final report. Each project is categorized based on funding source and institution and every action taken with a project, such as a budget amendment or no-cost extension is loaded into the database.

We are currently evaluating new database software solutions to more effectively store and manage project files. This effort aims to improve transparency, streamline data access, and enhance our ability to generate clear, actionable metrics tied to key deliverables. These improvements will support more informed reporting and accountability to the NC General Assembly.

Financial Review

Over the last several years the Collaboratory has worked closely with the NC Pandemic Recovery Office to ensure that reporting and compliance requirements are being met for projects funded through the CARES Act and the American Rescue Plan Act.

• The Collaboratory continues to work with staff at UNC-Chapel Hill's Office of Sponsored Research to complete our first round of desk audits with Deloitte on behalf of OSBM for the American Rescue Plan Act portfolio.

• To date, 39 desk audits have been conducted. This will be an annual process with them, and we will meet with them again this fall as well as in spring 2026.

During 2025 the Collaboratory hired additional staff on the finance team. Staff is currently undergoing training to facilitate monthly desk audits for the state appropriations portfolio. This will help ensure ongoing compliance, accurate reporting, and effective oversight of appropriated funds.

NC Collaboratory office.

Project Selection Process

The NC Collaboratory has funded approximately 700 research projects since its establishment in 2016 with each of these individual projects being chosen for numerous factors. In some instances, the NC General Assembly mandates that the Collaboratory focus on a specific issue with a deadline for a formal legislative report summarizing the research by a certain time.

In other cases, the Collaboratory has discretion in identifying the scope of the topic and team to conduct the research.

Within this realm of discretionary projects, the Collaboratory utilizes staff review and external feedback to help guide the selection process.

This type of external review can take several forms, such as:

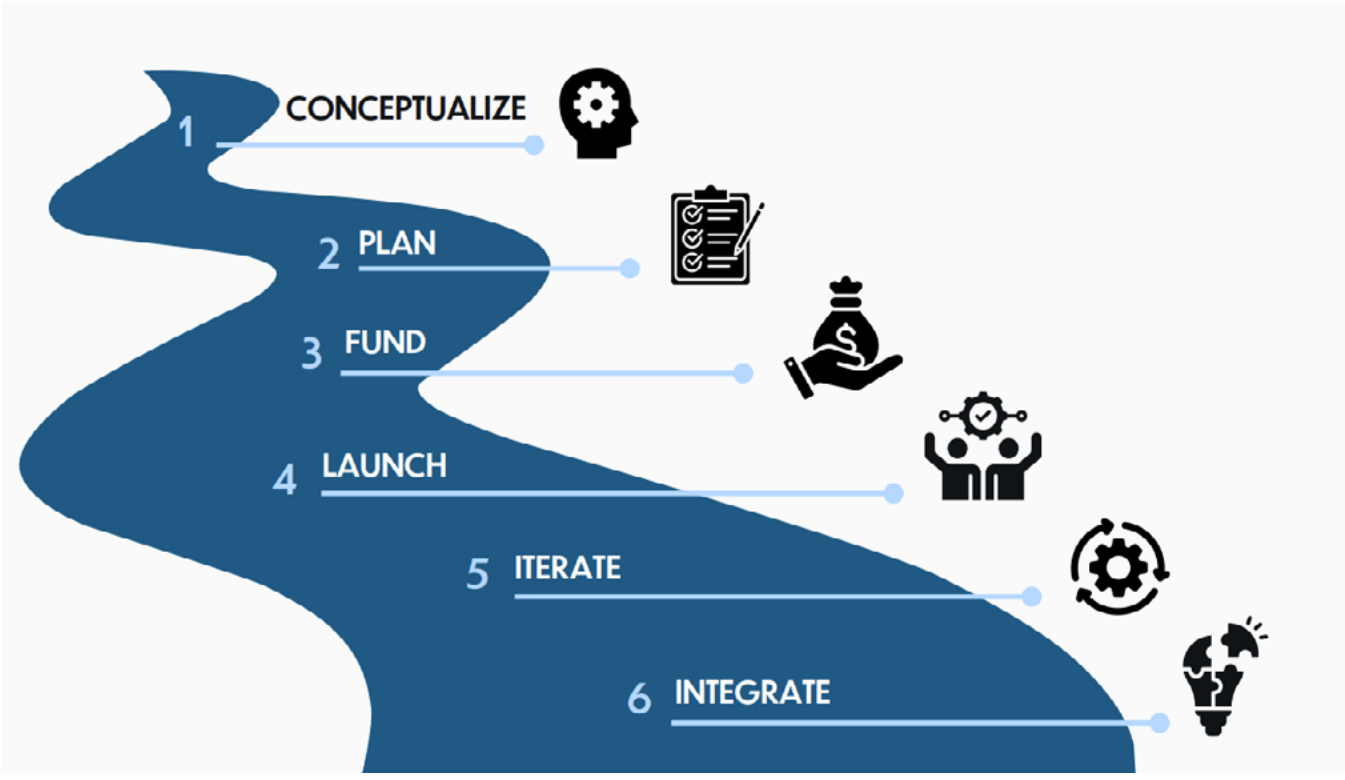
• Request for Proposals (RFPs) in which the Collaboratory announces a funding opportunity in which a review panel evaluates proposals;

• Projects that are assisted by partners in the selection, such as the Department of Public Instruction for education projects or the Department of Environmental Quality in the case of wastewater infrastructure funding;

• The Collaboratory's Advisory Board recommends issues and primary investigators to lead research projects.

The project selection process to the completion of the research varies for each project based on scope and timeliness but generally follows the same pattern as outlined below in six stages.

Project selection process graphic.



Collaboratory Team

NC Collaboratory Staff

Jeff Warren, PhD
Executive Director

Greer Arthur, PhD
Research Director, Physical Sciences

Michelle Bunce
Executive Assistant

Preston Clark
Program Manager

Jeni Corn, PhD
Research Director, Social Sciences

Laurie Farrar
Finance Director

Susan Fratazzi
Grants Manager

David Lambeth, JD
Strategic Research and Compliance Director

Robert Moore
Program Manager

Gail Noble
Financial Analyst

Claire Revere
Communication Director

Blair Rhoades
Strategic Advisor

Liza Rodler
Senior Program Manager

Steve Wall, JD
Senior Research Advisor

NC Collaboratory Advisory Board Members

Al Segars, PhD, Chair - PNC Distinguished Professor of Strategy and Entrepreneurship, UNC Kenan-Flagler Business School

Anita Brown-Graham, JD, Director, ncIMPACT Initiative UNC School of Government

Jaye Cable, PhD, Senior Associate Dean for Natural Sciences

Dedric Carter, PhD, UNC Vice Chancellor for Innovation, Entrepreneurship and Economic Development, Chief Innovation Officer

Greg Characklis, PhD, Director, UNC Institute for Risk Management and Insurance Innovation

Greg Copenhaver, PhD, Director, UNC Institute for Convergent Science

Jeff Greene, PhD, Associate Dean for Research and Faculty Development, UNC School of Education

Rick Luettich, PhD, Director, Center for Natural Hazards Resilience

Mike Piehler, Director, UNC Institute for the Environment, Chief Sustainability Officer

Collaboratory Team

NC Collaboratory Student Intern Staff

Each semester the Collaboratory hires UNC-Chapel Hill undergraduate and graduate students for paid internships. The Collaboratory student staff is critical to our research impact and our educational mission.

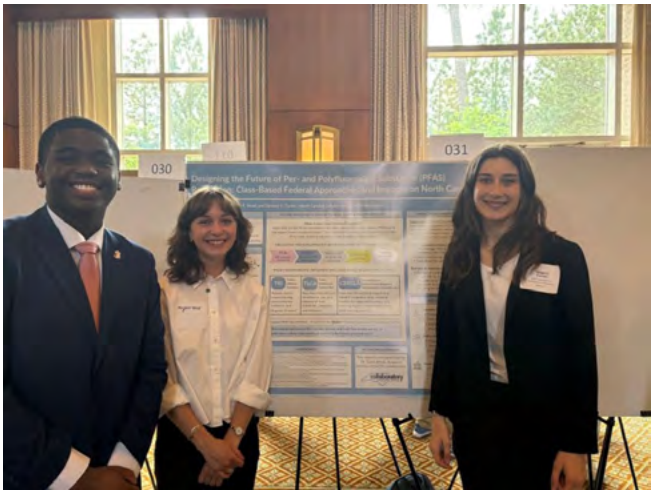
Collaboratory students conduct background research on timely policy topics, assist in drafting legislative reports, develop policy briefs, work in labs, and support our communications efforts.

2025 Student Interns (spring, summer and fall semesters)

Grant Alexander
Monica Cardoso
Miranda Coe
Danielle Deavers
Tiana Dinham
Silas Durham
Victoria Farella
Margot Francini
Reagan Gulledge
Caroline Hines
Rose Houck
Perrin Jones
Juliet Larkin
Alexander Markley
Sarah Masters
Jenna Mayfield
Hannah McCloskey
Maggie Mead
Leah Morrisey
Fatima Perez-Dominguez
Rebecca Rice
Amalie Shah-Khan
Carlisle Shore
Cole Smith
Sierra Stubbs
Anne Tie
Chorley Truitt
Natalia Trujillo
Zach Tucker
Emery Van Voorhis
Katie Whittington
Chloe Williamson
Miranda Zwack

Fall 2025 student interns.

Collaboratory interns presenting at the 2025 UNC-Chapel Hill Undergraduate Research Symposium.

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