



NC STATE UNIVERSITY

WORKSHOP ON DISASTER RESEARCH @ NC STATE

Insights from Hurricane Florence and
other Events

Apr 18 | 2:45PM-6PM
Hunt Libraries

Program

The central purpose of the workshop is to share research in response to 2018's Hurricane Florence and other events and to identify opportunities to leverage rapid-response research to advance long-term and large-scale research, education, and engagement initiatives. The event is co-sponsored by the Office of Research and Innovation (ORI), Civil, Construction and Environmental Engineering Department, College of Design, College of Natural Resources, Center for Geospatial Analytics, and the NC State Global Water, Sanitation, and Hygiene (WaSH) Cluster. Participants will have the opportunity to present 2 minute flash talks of their research, engage in networking, and participate in small-group discussions to foster interdisciplinary collaboration and identify needed resources to support disaster research at NC State.

2:45 - 3:00 Check-in

3:00 - 3:05 Welcome

3:05 - 4:30 Flash Talks and Networking Breaks

4:30 - 4:45 Presentation by Dr. Gavin Smith, College of Design, NC State

4:45 - 5:00 Networking Break

5:00 - 6:00 Small Group Break-Out Session

Conveners



Name: Angela Harris

Email: aharris5@ncsu.edu

Position & Department: Faculty, Civil, Construction, and Environmental Engineering

Research Interests: I conduct research related to detection and management of fecal contamination to protect human health and the environment. I conduct research both domestically and abroad, particularly with focuses in access to safe drinking water in low-income country contexts and water quality after extreme flooding events.

Keywords: Microbial contamination, feces management, surface water, drinking water



Name: Gavin Smith

Email: gavin_smith@ncsu.edu

Position & Department: Faculty, Landscape Architecture

Research Interests: My research interests include hazard mitigation, disaster recovery and climate change adaptation; disaster resilient design; disaster and climate change adaptation governance; the role of gubernatorial leadership in disaster recovery; and the translation of research findings to practice.

Keywords: Disaster Recovery, Hazard Mitigation, Climate Change Adaptation



Name: Bethany Cutts

Email: bbcutts@ncsu.edu

Position & Department: Faculty, Parks, Recreation & Tourism Management/ CGA

Research Interests: I research environmental justice & local sustainability initiatives as part of recovery.

Keywords: Community-based participatory research, documentary film, environmental justice, social network analysis, social vulnerability mapping

Participant Directory



Name: Emily Berglund

Email: emily_berglund@ncsu.edu

Position & Department: Faculty, Civil Engineering

Research Interests: My research investigates sociotechnical systems, which are systems in which human decision-making affects resource availability and infrastructure performance, and feedback from resources and infrastructure systems affect human decisions. This research asks “How do human behaviors and choices affect the performance of engineered infrastructure systems?” My research develops agent-based models of sociotechnical systems to simulate feedback mechanisms and adaptive behaviors among society, infrastructure, and environmental systems.

Keywords: sociotechnical systems, modeling, agent-based modeling, surveys, social media, rescue operations



Name: Tom Birkland

Email: tabirkla@ncsu.edu

Position & Department: Faculty, Public Administration

Research Interests: My key research themes are disasters and public policy, public policy theory and disasters, interdependent infrastructure systems, and disaster policy in the Arctic.

Keywords: public policy, disaster policy, hazard mitigation



Name: Matthew Booker

Email: mmbooker@ncsu.edu

Position & Department: Faculty, History, Science, Technology and Society

Research Interests: I am interested in what we can learn from history about what makes communities resilient. I'm also interested to what degree disasters are what Ted Steinberg calls "unnatural disasters" in which historical conditions, planning, and even disaster response exacerbate the crisis.

Keywords: Environmental history, urban aquaculture, visual narratives

Name: Gene Bressler

Email: gene_bressler@ncsu.edu

Position & Department: Faculty, Landscape Architecture

Research Interests: Challenging current suburban planning and design paradigms



Name: Aranya Chakraborty

Email: achakra2@ncsu.edu

Position & Department: Faculty, Electrical and Computer Engineering

Research Interests: My research is in the area of electrical power and energy systems. I am interested in developing sustainable micro-grids using renewable energy sources and energy storage that can provide uninterrupted power to customers while a hurricane or any other natural disaster is going on.

Keywords: Power systems, renewable energy, control systems, machine learning



Name: Nancy Creamer

Email: nancy_creamer@ncsu.edu

Position & Department: Faculty, Center for Environmental Farming Systems and Horticultural Science

Research Interests: I am primarily interested in sustainable agriculture and local foods impact and climate change.

Keywords: sustainable food systems

Name: Fred Cabbage

Email: fred_cabbage@ncsu.edu

Position & Department: Faculty, Forestry and Environmental Resources

Research Interests: My projects center on developing green infrastructure to mitigate floods and extreme weather events on farms, forests, and rural communities.

Keywords: flood control, natural infrastructure, farms, forests, governance



Name: Morgan DiCarlo

Email: mdicarl@ncsu.edu

Position & Department: PhD Student, Civil, Construction, and Environmental Engineering

Research Interests: I am studying how social media and crowdsource platforms are used to seek help and communicate technical information during natural disasters. We are ultimately planning to develop a model of human-flood interactions.

Keywords: information diffusion; social media; agents-based modelling; Hurricanes Florence and Michael

Name: Casey Dietrich

Email: jcdietrich@ncsu.edu

Position & Department: Faculty, Civil, Construction, and Environmental Engineering

Research Interests: I am interested in the development of computational models for wind waves and coastal circulation, and then application of these models to high-resolution simulations of ocean behavior. My goals are to understand how coastlines are threatened during storms, how materials are transported in the coastal environment, and how to communicate these hazard risks for use in decision support.

Keywords: waves, storm surge, coastal flooding



Name: Barbara Doll

Email: bdoll@ncsu.edu

Position & Department: Faculty, NC Sea Grant; Biological & Agricultural Engineering

Research Interests: My work focuses on ecological restoration. I lead a team of extension engineers with experience in watershed and river modeling. We provide engineering analysis to help communities identify sources and mitigation opportunities to address flooding in eastern North Carolina. I am also working to evaluate the potential use of natural infrastructure (wetlands, floodplain expansion, timber planting) to reduce the impacts of flooding.

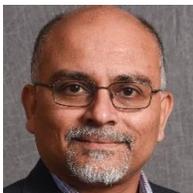
Name: Ken Dulaney

Email: kadulane@ncsu.edu

Position & Department: Staff, Electrical and Computer Engineering

Research Interests: FREEDM does research on power electronics and power systems. I am interested in ways that our technologies could be applied to electric utilities to speed storm recovery and what other technologies are needed. There is a need to increase resiliency but not sacrifice reliability.

Keywords: Electric Utilities, power electronics



Name: Rudra Dutta

Email: rdutta@ncsu.edu

Position & Department: Faculty, Computer Science

Research Interests: My interests are in global consideration of large computer network systems: Internet architecture, Internet of Things, Software Defined Networking, Aerial networking, networking security, performance optimization of networked systems.

Keywords: Internet architecture, Internet of Things, Software Defined Networking, Aerial networking



Name: George Elvin

Email: gelvin@ncsu.edu

Position & Department: Faculty, Architecture

Research Interests: The Resilient Building Framing System draws on a variety of North Carolina building traditions from pole barn construction to computer numerically controlled mass timber construction to create a unique building system capable of resisting hurricane-force winds.

Keywords: Resilient design, hazard mitigation, coastal architecture, hurricane resistance, resilience



Name: Ryan Emanuel

Email: reemanue@ncsu.edu

Position & Department: Faculty, Forestry and Environmental Resources

Research Interests: I am an environmental scientist studying hydrological processes (flooding, water quality) associated with natural disasters in eastern NC. The broader impacts of my work focus on disproportionate impacts of natural disasters on vulnerable communities, particularly indigenous peoples.

Keywords: Hydrology, climate change, water quality, indigenous peoples



Name: Emine Fidan

Email: eneminef@ncsu.edu

Position & Department: PhD Student, Biological and Agricultural Engineering

Research Interests: My research interests are understanding the surge and retreat of flood waters after a natural disaster, such as Hurricane Florence. I plan on implementing geospatial analytics and machine learning to build high-resolution spatio-temporal flood maps.

Keywords: flood mapping, remote sensing, spatiotemporal imagery, geographic information systems, machine learning, time series, socio-environmental predictors

Name: Andrew Fox

Email: aafox@ncsu.edu

Position & Department: Faculty, Landscape Architecture

Research Interests: I study community resilience, natural infrastructure, hazard mitigation, climate adaptation, sustainable and low impact development, and land and water resource conservation

Keywords: landscape analysis, community design, resilience, flooding, conservation

Name: Mo Gabr

Email: gabr@ncsu.edu

Position & Department: Faculty, Civil, Construction and Environmental Eng

Research Interests: My research interest include the impact of climate change, in the form of continuous land subsidence and rising sea level, on the integrity and reliability of flood-defense infrastructure. My work utilizes in situ testing and sensor-based approaches, including remote sensing with in-ground instrumentation for validation, to develop damage models for assessing the health of these structures and providing early warning of deteriorating systems.

Keywords: dams, erosion, flood, levees, resilience, soils, scour



Name: Geneva Gray

Email: gmely2@ncsu.edu

Position & Department: PhD Student, Marine, Earth, and Atmospheric Sciences

Research Interests: My research is on how design storms inform engineers and hydrologists on local historical flooding risk. How do design storms change under future climate scenarios?

Keywords: climate change, extreme weather, flooding



Name: Ismail Guvenc

Email: iguvenc@ncsu.edu

Position & Department: Faculty, Electrical and Computer Engineering

Research Interests: I study the use of 4G/5G wireless technologies and unmanned aerial systems for public safety communications and disaster recovery.

Keywords: 4G, 5G, wireless, drones, UAV, UAS, public safety communications



Name: Roy He

Email: rhe@ncsu.edu

Position & Department: Faculty, Marine, Earth, and Atmospheric Sciences

Research Interests: I am a Goodnight Innovation Distinguished Professor in the Department of Marine, Earth, and Atmospheric Sciences at North Carolina State University. My research expertise spans from coastal circulation dynamics and air-sea interaction to biophysical interactions. As the director of the Ocean Observing and Modeling Group, I conduct coastal ocean observations, remote sensing data analyses, and leads the development of prediction models of ocean circulation, air-sea-wave interactions, physical-biogeochemical couplings, as well as data assimilation.

Keywords: 1) Coastal ocean circulation dynamics; 2) Marine physical-biogeochemical interactions; 3) Air-sea interactions; 3) Satellite oceanography; 4) Numerical modeling and data assimilation; 5) Coastal ocean observing systems.



Name: David Hill

Email: david_hill@ncsu.edu

Position & Department: Faculty, Architecture

Research Interests: I am the Co-Director of the Coastal Dynamics Design Lab in the College of Design

Keywords: Architecture, Landscape Architecture, community planning and design



Name: Gracie Hornsby

Email: gmhornsby@ncsu.edu

Position & Department: Undergraduate Student, Civil, Construction, and Environmental Engineering

Research Interests: I am interested in microbial source tracking in environmental waters to assess the effectiveness of waste management practices.

Keywords: Microbial Source Tracking, Fecal Contamination



Name: Justyna Jeziorska

Email: jajezi@ncsu.edu

Position & Department: Other, Center for Geospatial Analytics

Research Interests: I monitor landscape changes using Unmanned Aerial Systems. I use geospatial analytics for understanding surface processes with the use of high resolution data obtained by the UAS.

Keywords: UAS, UAV, drone, GIS, hydrology, photogrammetry



Name: Madhusudan Katti

Email: mkatti@ncsu.edu

Position & Department: Faculty, Forestry & Environmental Resources

Research Interests: I am interested in studying the Resilience of Socio-Ecological Systems—particularly cities—to extreme environmental perturbations from anthropogenic and other factors, and in how understanding how biodiversity responds to such influences.

Keywords: urban ecology, biodiversity, trees, birds, anthropocene



Name: Josh Kearns

Email: jpkearns@ncsu.edu

Position & Department: Faculty, Civil, Construction, and Environmental Engineering

Research Interests: I am interested in chemical toxins, water and health in the developing world.

Keywords: adsorption, biochar, micropollutants, contaminants of emerging concern, engineering for developing communities



Name: Detlef Knappe

Email: knappe@ncsu.edu

Position & Department: Faculty, Civil, Construction, and Environmental Engineering

Research Interests: In the Knappe group, we are interested in characterizing water quality to support risk assessment, environmental policy, and the selection and design of water treatment processes. More recently, we have become interested in human exposure assessment. We develop analytical methods and workflows to identify contaminants in water, food, urine, and blood serum, and we develop and assess materials and treatment approaches for the removal of contaminants from water.

Keywords: Source water protection, physical-chemical (and sometimes biological) water treatment processes, environmental analytical chemistry (mass spectrometry), targeted and non-targeted analysis

Name: Whitney Knollenbe

Email: wgknolle@ncsu.edu

Position & Department: Faculty, Parks, Recreation & Tourism Management

Research Interests: I am interested in how tourism destination stakeholders (tourism employers/employees; destination residents; local policymakers) make decisions about recovery in

a post-disaster context. This would aim to go beyond the current prescriptive approach for disaster-response planning to understand how plans are actually utilized and whether they are effective in aiding stakeholders in the recovery decision-making process.

Keywords: Tourism Destinations; Decision-making; communities; planning; Tourism businesses; residents; policy

Name: Jay Levine

Email: jflevine@ncsu.edu

Position & Department: Faculty, Marine, Earth and Atmospheric Sciences

Research Interests: I prepare students to participate in the incident command system used during disaster response. I am interested in fecal contamination of surface waters from livestock operations, municipalities and septic systems.

Keywords: Epidemiology, Freshwater ecosystems, Freshwater invertebrates

Name: Frank Lopez

Email: fmlopez@ncsu.edu

Position & Department: Staff, ORI: Sea Grant/WRRI

Research Interests: Extension: community resilience; climate adaptation; local policy

Name: Christopher Mayhorn

Email: chris_mayhorn@ncsu.edu

Position & Department: Faculty, Psychology

Research Interests: I conduct warnings and risk communications research that focuses on human information processing.

Keywords: natural hazards, technological hazards, decision making, warnings



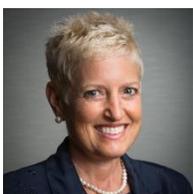
Name: Maria Mayorga

Email: memayorg@ncsu.edu

Position & Department: Faculty,

Research Interests: My goal is to optimally allocate resources for disaster preparedness and response. Preparedness work includes inventory propositioning decisions. Response work focuses in assignment of spontaneous volunteers to tasks. Specific to Florence, we seek to understand the dynamics of volunteer convergence and have conducted interviews of volunteers, volunteer coordinators and beneficiaries.

Keywords: Operations Management, Volunteer Preparedness, Optimization, Simulation, Inventory Prepositioning



Name: Marian McCord

Email: mmccord@ncsu.edu

Position & Department: Faculty, Forest Biomaterials



Name: Brina Montoya

Email: bmmorten@ncsu.edu

Position & Department: Faculty, Civil, Construction, and Environmental Engineering

Research Interests: I am Assistant Professor in Civil Engineering at North Carolina State University. My research interests focus on bio-mediated soil improvement to improve soil behavior when subjected to natural and anthropogenic hazards including earthquake-induced liquefaction, coastal erosion and scour, and energy-related byproduct instability.

Keywords: soil shear strength, erosion, infrastructure, soil improvement, bio-cementation



Name: Kelly Lynn Mulvey

Email: klmulvey1@ncsu.edu

Position & Department: Faculty, Psychology

Research Interests: My research focuses on social development in intergroup contexts, with attention to pathways to STEM interests for students from underrepresented backgrounds.

Keywords: STEM, intergroup, attitudes, stereotypes, identity, persistence



Name: Natalie Nelson

Email: nnelson4@ncsu.edu

Position & Department: Faculty, Biological and Agricultural Engineering

Research Interests: I focus on connections between land cover, land use, and water quality. Application of data analytics and integrated modeling for environmental and agricultural assessment and prediction.

Keywords: Modeling, machine learning, water quality, environmental monitoring, remote sensing

Name: Lamyaa Negm

Email: lmnegm@ncsu.edu

Position & Department: Post-doctoral Researcher, Biological and Agricultural Engineering



Name: Elizabeth Nichols

Email: egnichol@ncsu.edu

Position & Department: Faculty, Forestry and Environmental Resources

Research Interests: My current research focuses on (1) integrated forest systems to support the food, energy, and water nexus, (2) short-rotation forest systems for bioenergy, wastewater treatment, and groundwater recharge, (3) participatory science with communities for water resource quality and quantity, (4) ecosystem services of forest water reuse systems, and (5) green infrastructure forest systems to manage climate extremes.

Keywords: Groundwater, Forests, Wastewater, organic contaminants of concern, exposomes

Name: Ozioma Nwachukwu

Email: obnwachu@ncsu.edu

Position & Department: Master's Student, Environmental Engineering

Research Interests: I am interested in water quality and microbial source tracking of fecal contamination in the environment.

Name: Darby Orcutt

Email: dcorcutt@ncsu.edu

Position & Department: Faculty, Libraries

Research Interests: I am interested in public engagement and interdisciplinary collaboration

Keywords: Hurricane impacts in North Carolina

Name: Christopher Osburn

Email: closburn@ncsu.edu

Position & Department: Faculty, Marine, Earth, and Atmospheric Sciences

Research Interests: Determining the effects of extreme weather events on the biogeochemistry of coastal waters. Specific interests include organic matter and nutrients and subsequent effects on water quality for coastal stream, wetlands, and estuaries. Use of remote sensing from unoccupied aerial vehicles and surface water vehicles and in-situ sensors to assess ecosystem and water quality responses to extreme events.

Keywords: Carbon, water quality, biogeochemistry, dissolved oxygen, remote sensing



Name: Osman Ozaltin

Email: oyoaltin@ncsu.edu

Position & Department: Faculty, Industrial and Systems Engineering

Research Interests: My research interests span theoretical, computational, and applied aspects of mathematical programming, focusing on stochastic optimization problems arising in personalized

medicine, humanitarian logistics, public health and healthcare delivery. My methods include large-scale optimization, stochastic programming, and bilevel programming.

Keywords: Personalized medicine, humanitarian logistics, influenza vaccine distribution, sepsis

Name: Kyle Paret

Email: keparet@ncsu.edu

Position & Department: PhD Student, Industrial and Systems Engineering

Research Interests: I model and simulate spontaneous volunteer response in post disaster setting. I am interested in discrete event simulation and agent based modeling applications.

Keywords: Spontaneous Volunteer Convergence, Simulation, Task Uncertainty

Name: Walt Robinson

Email: warobin3@ncsu.edu

Position & Department: Faculty, State Climate Office/Marine, Earth, and Atmospheric Sciences

Research Interests: I use a hierarchy of models to investigate how climate change affects the risk of severe flooding rains in the Southeast.

Keywords: Extreme rainfall, climate change, weather and climate services

Name: Hayden Rudd

Email: hrudd@ncsu.edu

Position & Department: Masters Student, Forestry and Environmental Resources

Research Interests: Water quality issues as a result of extreme flooding events

Name: Jennifer Runkle

Email: jrrunkle@ncsu.edu

Position & Department: Faculty, North Carolina Institute for Climate Studies

Research Interests: I am an Environmental Epidemiologist with wide-ranging experience translating population-based science into action-based solutions for a variety of stakeholders. My research interests include examining the health effects of climate change and variability, with particular interests in characterizing localized impacts for vulnerable populations like pregnant women and outdoor workers. I am interested in advancing the science around how social and environmental factors work independently and jointly to influence climate-health outcome associations and using this information to identify community-level pathways to resilience.

Keywords: mental health impacts of extreme weather events



Name: Elizabeth Sciaudone

Email: ejsciaud@ncsu.edu

Position & Department: Faculty, Civil, Construction, & Environmental Engineering

Research Interests: My research interests include coastal highway vulnerability, coastal processes modeling and analysis, coastal zone management, climate change effects on the coastal environment, and renewable energy potential of coastal resources.

Keywords: coastal erosion, shoreline change, highway vulnerability, GIS, remote sensing, coastal modeling



Name: Sara Shashaani

Email: sshasha2@ncsu.edu

Position & Department: Faculty, Industrial and Systems Engineering

Research Interests: My interests are in simulation optimization, optimization and machine learning.

Keywords: rare high impact random events, risk analysis, infrastructure systems resilience

Name: Rebecca Ward

Email: rebecca_ward@ncsu.edu

Position & Department: Staff, State Climate Office of North Carolina - College of Sciences

Research Interests: My interests are in exploring: How and where do people learn about weather and climate hazards? Who are the information intermediaries during (and in advance of) severe weather events within communities, and what types of professional development would best prepare them to act in this role? Specific to hurricanes: How do NC residents think about preparedness during and outside of hurricane season, and how does this change in response to experiencing a hurricane?

Name: Mary Watzin

Email: mwatzin@ncsu.edu

Position & Department: Staff, Dean's Office - College of Natural Resources

Name: Susan White

Email: snwhite3@ncsu.edu

Position & Department: Staff, NC Sea Grant/NC Water Resources Research Institute/NC Space Grant



Name: Jessica Whitehead

Email: j_whitehead@ncsu.edu

Position & Department: Staff, North Carolina Sea Grant

Research Interests: I am interested in the communication of weather warnings and disaster preparation, response, and recovery information to NC residents. I am also interested in the effective use of scientific information and impacts for planning that reduces the impacts of future disasters, including climate change, designed and co-produced with NC communities and organizations. Lastly, I am interested in the emergence of and improved coordination of volunteer disaster efforts for emergency response (Voluntary Organizations Active in Disasters, Community Organizations Active in Disasters) and how those groups may be better mobilized and leveraged into long term recovery in rural areas.

Keywords: climate adaptation, risk communication, disaster resilience, emergency management

Name: Casey Williams

Email: cjwilli8@ncsu.edu

Position & Department: Master's Student, Industrial and Systems Engineering

Research Interests: I focus on the utilization of spontaneous volunteers in post-disaster relief.

Keywords: volunteers, spontaneous, optimization, process flow, post-disaster

Name: Cassandra Workman

Email: clworkma@ncsu.edu

Position & Department: Faculty, Sociology & Anthropology

Research Interests: I am interested in community risk and resilience, biopsychosocial risks associated with hurricanes, the linkage between water insecurity and food insecurity before & after flood events.

Keywords: Qualitative methods, health risks, psychosocial outcomes, food insecurity, water insecurity

Name: Raju Vatsavai

Email: rrvatsav@ncsu.edu

Position & Department: Faculty, Computer Science

Research Interests: I research knowledge discovery from big data, real-time analytics with applications to food, energy, water, and national security.

Keywords: Data Mining, Machine Learning, High-performance Computing, Remote Sensing, Spatiotemporal Big Data.

Name: Lilliana Velasquez Montoya

Email: lvelasq@ncsu.edu

Position & Department: Post-doctoral Researcher, Civil Engineering

Research Interests: I research coastal morphodynamics, GIS-based spatial and temporal analysis applied to assess morphological evolution of coastal landforms, numerical modeling of sediment transport, estuarine dynamics, and coastal morphology.

Keywords: Coastal Morphology, numerical modeling, infrastructure vulnerability, Hurricanes



Name: Olivia Vila

Email: ofvila@ncsu.edu

Position & Department: PhD Student, Parks, Recreation, and Tourism Management

Research Interests: I am interested in using citizen science to engage communities around issues of disaster recovery in an attempt to build local capacity.

Keywords: Disaster recovery, long-term recovery, community engagement, citizen science, capacity, self-efficacy, qualitative

Cover photo credits (clockwise, top left):

1) Hurricane Florence photographed from the International Space Station, Sept. 10, 2018. Photo by NASA.

2) Aerial view from a South Carolina National Guard UH-60 Black Hawk helicopter from McEntire Joint National Guard Base, of Florence, Nichols, Conway and Waccamaw, South Carolina, impacted by floodwaters, September 21, 2018 Photo by S.C. Air National Guard.

3) U.S. Army Soldiers help evacuate residents affected by Hurricane Florence with the use of a High Mobility Multi-purpose Wheel Vehicle. Sept. 19, 2018 Photo by U.S. Army.