



## RESEARCH SUMMARY

Extreme heat is a significant issue across the southeast, with an estimated 18,000 of 19,000 properties in Auburn AL under a major heat risk. In Auburn, summer temperatures are expected to increase from an average of 90 in 2024 to 95 degrees by 2050. As many sports and activities are conducted during summer (May-August), understanding how this increase in heat may impact individuals is imperative. Fan and spectator safety is a major concern for Auburn Athletics. The increase in the heat index is of most concern. The heat index is a combination of air temperature and humidity, with a heat index above 90 degrees being considered dangerous or extreme heat. Presently, during game days when the temperature exceeds 90 degrees the Auburn Campus Safety and a local air conditioning company deploy cooling stations (fans, tent/shading, water stations) around campus and throughout the stadium. Heat injury/illness can result from exposure to prolonged amounts of heat and humidity without relief or fluid intake. These are classified as: 1) heat cramps, painful muscle cramps and spasms; 2) heat exhaustion, the body is unable to cool itself properly and severe loss of water and salt; and 3) heat stroke, body is unable to regulate heat and can lead to death. Heat stroke is further divided into regular heat stroke and exertional heat stroke, the latter occurring during high levels of physical activity in the heat. The National Weather Service reports heat was the leading cause of weather-related deaths in the United States (U.S.) over a 10-year (2011-2020) and 30-year (1991-2020) average. This is expected to increase as global temperatures climb, with 2024 predicted to be the hottest year on record. Alabama recorded 19 related heat deaths in 2018; 22 in 2019; 17 in 2020 and 10 in 2021. Auburn Campus Safety notes the number of calls and reports regarding heat related illnesses from fans during sporting events has increased significantly since 2020. Auburn University must address this issue. This project will provide the actionable data required to guide the data driven response Auburn University needs to ensure the safety of its students and fans.

EDUCATION	Auburn University – Department of Geosciences Ph.D. Earth System Science Rural Studies (Minor)	Expected August 2025 GPA: 4.0 Course Hours: 28
	Auburn University – Department of Geosciences M.S. Geography	August 2022 GPA: 4.0 Course Hours: 30
	University of Louisville – Department of Physics/Geography B.S. Atmospheric Science Minor - Environmental Analysis Certificate – Applied Geospatial Technologies	May 2020 GPA: 3.5 Course Hours: 145

## COURSEWORK

- Calculus I, II, III, IV
- Urban Climatology
- Physical Meteorology
- Atmospheric Thermodynamics
- Climate Change Communication

## TECHNICAL SKILLS

- Quantitative Methods
- Nat. Haz. Risk & Resilience
- Atmospheric Dynamics
- ArcMap/ArcPro (GIS)
- ERDAS/ENVI (RS)
- TerrSet cellular automata model
- C++/C#/Python
- SPSS (Statistics)
- Office & Adobe Suite
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## APPLIED EXPERIENCE

Oak Ridge National Laboratory Assistantship – August 2021 to December 2021  
Acting as a Graduate research assistant with Oak Ridge National Laboratory on their Integrated Multisector Multiscale Modeling (IM3) project. Aiding with literature review, code development and paper drafting.

Urban Heat Island Research – November 2018 to October 2019  
Acting as an Undergraduate research assistant through the UofL's Geography department. Monitoring weather stations around Jefferson County Public Schools to study Louisville's heat island effect. <https://simplebooklet.com/thethinker-summer2019#page=6>

Louisville National Weather Service Intern – January 2019 to May 2019  
Acting as an Undergraduate intern at the Louisville NWS office. Learning about forecasting techniques, daily work life of a NWS employee, creating Storm Spotter Training material and other tasks.

## WORK EXPERIENCE

Auburn University  
Graduate Teaching Assistant – August 2022 to Present  
Acting as a Graduate Teaching Assistant within the Department of Geosciences at Auburn University.

- Fall 2022* – Concepts of Science GTA (1)
- Spring 2023* – Concepts of Science GTA (1)
- Fall 2023* – Concepts of Science co-head & Introduction to GIS & Quantitative Methods GTA (3)
- Spring 2024* - Concepts of Science head GTA (1)
- Fall 2024* – Weather and Climate lab GTA (1)

Auburn University  
NSF Climate Resilience Traineeship (un-Funded) – August 2022 to Present  
A program that aims to train the next generation of scientists and leaders who can help build resilient communities that are prepared for, can effectively respond to, and quickly recover from damaging hazard events in the southeastern United States.

Auburn University  
NSF Climate Resilience Traineeship (Funded) – August 2020 to August 2022  
A program that aims to train the next generation of scientists and leaders who can help build resilient communities that are prepared for, can effectively respond to, and quickly recover from damaging hazard events in the southeastern United States.

Auburn University  
Graduate Research Assistant – August 2020 to August 2022  
Acting as a Graduate Research Assistant studying the effects of migration within the Southeastern United States. How hazards may have shaped migration patterns into Southeastern cities and how vulnerability is spatially distributed across the United States.

Christina L. B. Envirome Institute  
GIS Analyst/Research Assistant - December 2019 to July 2020  
Responsible for conducting image analysis, data manipulation and construction of geospatial datasets. Tasked with creating a novel Normalized difference Vegetation Index (NDVI) variable for Public Health analysis attempting to link greenness and cardiovascular disease mitigation.

University of Louisville  
Undergraduate Teaching Assistant – August 2019 to May 2020  
Responsible for teaching introductory meteorology courses, student/teacher correspondence and grading daily assignments.

University of Louisville  
REACH One-on-One Tutor – August 2019 to December 2019  
Responsible for tutoring students in Introduction to Physics I & II (heat, statics, electricity, magnetism, optics) and Introduction to Meteorology. Created lesson plans, and reviewed homework and testing material with students on a weekly basis.

PROFESSIONAL  
MEMBERSHIPS

American Association of Petroleum Geologists  
American Meteorological Society  
American Association of Geographers  
Geological Society of America  
Southeastern Division of the American Association of Geographers  
Scouts of America – Eagle Scout  
University of Louisville Geography Alumni Council

CLUBS/  
ACTIVITIES

American Association of Petroleum Geologists – Treasurer ‘22  
Graduate Student Ambassadors [1887 Society Ambassador] – ‘22, ‘23, ‘24  
Graduate Student Council – Senator ‘24  
Geography Student Organization – Vice President ‘23  
Sigma Gamma Epsilon - Delta Beta Chapter Treasurer & Social Media Chair ‘22  
Gamma Theta Upsilon  
Auburn University Fencing Club  
Club de Espanol  
Marine Biology Club  
UofL American Meteorological Society

PRESENTATIONS

Ryan, Brandon and Mitra, Chandana. *Beat the Heat: Informing Alabama Residents about the Impacts of Extreme Heat on the Body*. Poster presented at the Outreach and Engaged Scholarship Symposium; September 3-4, 2024; Auburn, Alabama.

Ryan, Brandon; Mitra, Chandana; and Gann, Ashley. *Understanding how Extreme Heat Impacts Fan Safety within a Sports Stadium at a Southeastern University*. Poster

presented at: Emerging Risks from Concurrent, Compounding and Record-breaking Extreme Heat across Sectors; July 10-12, 2024; Columbia University, New York, New York.

Pendola, A., Perrone, F., & Ryan, B. *Does subject matter matter? Subject and distance in teacher labor markets*. [Paper Presentation] American Educational Research Association Annual Meeting; April 12-14, 2024. Philadelphia, PA

Ryan, Brandon; Mitra, Chandana; Gann, Ashley. *Freeze Warning No Longer in Effect: Understanding Heating within Jordan Hare Stadium and its Impact on Fan Safety*. Poster presented at: Auburn University NRT Climate Research Symposium; March 19, 2024; Auburn, AL.

Ryan, Brandon and Mitra, Chandana. *On the Frontlines: Investigating Human Migratory Patterns into southeast U.S. Small and Medium Sized Cities (SMSC) due to Hurricane Events*. Paper presented at: International Association for Urban Climate; August 28-September 1, 2023; Sydney, AUS.

Ryan, Brandon; Mitra, Chandana. *A Desert in a Sea of Pines: STEM Education in Rural America*. Poster presented at: Auburn University NRT Climate Research Symposium; March 21, 2023; Auburn, AL.

Ryan, Brandon; Mitra, Chandana. *A Synthesis of Literature on STEM (Science, Technology, Engineering, Math) and ESS (Earth System Science) Education in Rural America*. Poster presented at: American Meteorological Society; January 8-12, 2023; Denver, CO (virtual).

Ryan, Brandon; Mitra, Chandana. *Analyzing Vulnerability to Climate Change Over Time and Climatically Induced Migration within the Southern United States (SEUS)*. Poster presented at: Southeast Division of the American Association of Geographers; November 21, 2022; Atlanta, GA.

Ryan, Brandon; McNeal, Karen; and Mikulak, Haylie. *Addressing Resiliency to Climate Hazards and Disasters through Data-Informed Decision Making*. Poster presented at: NSF NRT Annual Meeting; October 11-13, 2022; Blacksburg, Virginia.

Ryan, Brandon; Mitra, Chandana; McNeal, Karen. *Change: Defining a Decade*. Poster presented at: NSF NRT Annual Meeting; October 11-13, 2022; Blacksburg, Virginia.

Youngquist, Kristin; Shrestha, Megha; Ryan, Brandon; Mitra, Chandana. *Small and medium sized cities (SMSC) should also be climate informed, resilient and sustainable – A scoping review on research foci among SMSC globally*. Poster presented at: International Association for Urban Climate; August 29-September 1, 2022; Sydney, AUS (virtual).

Ryan, Brandon and Mitra, Chandana. *Investigating Human Mobility Patterns into Seven Southeast United States Urban Counties and its Relationship to Climatic Vulnerability*. Poster presented at: International Association for Urban Climate; August 29-September 1, 2022; Sydney, AUS (virtual).

Ryan, Brandon; Mitra, Chandana; McNeal, Karen; Rogers, Stephanie. *A Decade of Disaster: Analyzing Climate Change and Extreme Weather Event Impacts on Human Migration and Vulnerability in the Southeastern United States (2004 – 2018)*. Poster

presented at: Auburn University NRT Climate Research Symposium; March 21, 2022; Auburn, AL.

Ryan, Brandon; Mitra, Chandana; McNeal, Karen; Rogers, Stephanie. *No Place to Call Home: Climate-induced Migration and Climatic Vulnerability in the American Southeast*. Paper presented at: American Association of Geographers; February 25, 2022; New York City, NY (virtual).

Ryan, Brandon; Mitra, Chandana. *Facing Disaster: Assessing Human Migration Patterns in the Southeastern United States due to Climate-related Weather Events from 2004-2018*. Poster presented at: Southeast Division of the American Association of Geographers; November 22, 2021; Florence, AL.

Youngquist, Kristin; Shrestha, Megha; Ryan, Brandon; Mitra, Chandana. *Do we need to pay attention to small and medium-sized cities too? A scoping review of these city forms*. Poster presented at: Southeast Division of the American Association of Geographers; November 22, 2021; Florence, AL.

Ryan, Brandon. *Analysis of Future Urban Growth of the Columbus-Dothan-Panama City Urban Climate Archipelago*. Poster presented at: Southeast Geological Society of America; April 1-2, 2021; Auburn, AL.

## PUBLICATIONS

Pendola, Andrew, Frank Perrone, and Brandon Ryan. (2024). From School to School: Examining the Contours of Switching Schools within the Special Education Teacher Labor Market. (EdWorkingPaper: 24-1014). Retrieved from Annenberg Institute at Brown University: <https://doi.org/10.26300/g81p-e337> [Pre-Print]

Youngquist, K., Shrestha, M., Ryan, B., & Mitra, C. (2023). "A global scoping review on sustainability, climate migration, and climate resilience of small and medium-sized cities (SMSC)." *Urban Climate*, 49, 101546. <https://doi.org/10.1016/j.uclim.2023.101546>

Ryan, Brandon; Mitra, Chandana; McNeal, Karen; Rogers, Stephanie. 2022. "Analyzing Climate Change and Extreme Weather Event Impacts on Human Migration and Vulnerability in the Southeastern United States (2004 – 2018)." *AUETD*. URI: <https://etd.auburn.edu/handle/10415/8381>. Available 8 August 2023. [Amended]

Ryan, Brandon (2020) "Analysis of Writing Practices: Business Writing in a Scientific World," Cardinal Compositions: Vol. 4, Article 5.

## OTHER PUBLICATIONS

Acknowledged for work as an analytical technician: Coleman, C. J., Yeager, R. A., Pond, Z. A., Riggs, D. W., Bhatnagar, A., & Arden Pope, C. 2022. "Mortality risk associated with greenness, air pollution, and physical activity in a representative U.S. cohort." *Science of The Total Environment*, 824, 153848. <https://doi.org/10.1016/j.scitotenv.2022.153848>.

Acknowledged for work as an analytical technician: Yeager, R., R. H. Holm, K. Saurabh, J. L. Fuqua, D. Talley, A. Bhatnagar, and T. Smith. 2021. "Wastewater Sample Site Selection to Estimate Geographically Resolved Community Prevalence of COVID-19: A Sampling Protocol Perspective." *GeoHealth* 5 (7): e2021GH000420. <https://doi.org/10.1029/2021GH000420>.

MEDIA  
SPOTLIGHTS

<https://www.fox10tv.com/2024/06/27/new-equipment-coming-jordan-hare-stadium-auburn/>

Interview with the Weather Channel (Group) on September, 21<sup>st</sup> 2023.

[https://auburntigers.com/news/2014/8/27/Fans\\_encouraged\\_to\\_take\\_heat\\_precautions](https://auburntigers.com/news/2014/8/27/Fans_encouraged_to_take_heat_precautions)

<https://www.wtvm.com/2023/08/23/auburn-university-combatting-heat-related-sickness-with-stadium-heat-sensors/>

<https://www.cbs42.com/news/local/auburn-university-students-begin-new-study-to-help-fans-beat-the-heat/>

<https://whnt.com/weather/valleywx-blog/auburn-university-studying-hot-spots-in-jordan-hare-to-help-protect-fans/>

<https://www.wsfa.com/video/2023/08/24/auburn-university-combatting-heat-related-sickness-with-stadium-heat-sensors/>

OUTREACH/  
SERVICE

Letters to a Pre-Scientist – August to December 2024

Letters to a Pre-Scientist connects students to STEM professionals through snail mail to broaden students' awareness of what STEM professionals look like and do at work and inspire all students to explore a future in STEM.

STEM Summer Bridge Program – June 10<sup>th</sup>, 2024

Informing middle school students from around Alabama about Urban Heat Islands, with an interactive talk and demonstration.

Earth Day Extravaganza – April 22<sup>nd</sup>, 2024

Communicating about the Geoscience Department and spreading awareness about climate science!

Geography Awareness Week – November 10<sup>th</sup> & 17<sup>th</sup>, 2023.

Talking to undergraduate students about the field of geography and GIS, current research at Auburn University and the various opportunities within the field of geosciences.

Destination STEM – October 20<sup>th</sup>, 2023

Destination STEM is an interactive experience and open house where sixth through ninth grade students are invited to Auburn University to explore opportunities in the sciences and mathematics!

Geoscience Peer Mentor Program – Fall 2023 to Present

Advise and assist new graduate students within the geosciences department at Auburn University.

Camp War Eagle – June 26<sup>th</sup>, 2023

Talking to undergraduate students about the Department of Geography at Auburn University and the various opportunities within the field of geosciences.

Guest Lecture – March 27<sup>th</sup>, 2023

Talking with Climate Science II undergraduate students within the school of Wildlife and Forestry at Auburn University. This lecture dealt with climate change's impacts on individuals' mobility. Titled, *Climate Migration*.

1887 Society Ambassador Events – Fall 2022 to Present

Consisted of outreach events for the Graduate School at Auburn University. Work events such as the 3 Minute Thesis Competition and Faculty Author Awards, along with providing tours to prospective students from HBCUs and being a representative for the University.

Jr. Mad Scientist – November 1<sup>st</sup>, 2022

STEAM event with local K-12 students and the public to learn about science and research at Auburn University.

Guest Lecture – April 1<sup>st</sup>, 2022

Talking with Climate Science II undergraduate students within the school of Wildlife and Forestry at Auburn University. This lecture dealt with climate change's impacts on individuals' mobility. Titled, *Analyzing Climate Change and Extreme Weather Event Impacts on Human Migration and Vulnerability in the Southeastern United States (2004 – 2018)*.

Geography Awareness Week – November 10<sup>th</sup> & 17<sup>th</sup>, 2021

Talking to undergraduate students about the field of geography and GIS, current research at Auburn University and the various opportunities within the field of geosciences.

Geography Awareness Fair – September 16<sup>th</sup>, 2021

Talking to undergraduate students about research, academic and graduate opportunities within the Department of Geography at Auburn University.

COSAM Open House – August 25<sup>th</sup>, 2021

Talking to interested undergraduate students about the National Science Foundation Climate Resilience Traineeship research opportunity at Auburn University.

Auburn University Liquid Galaxy Display – Fall 2021

Television display in the Auburn University Library showcasing a three-minute thesis research video. Publicly available for students to learn about my research.

Highlands Middle School Outreach – June 30<sup>th</sup>, 2021

Teaching students at Highlands Middle School in Union Springs, Alabama about Urban Heat Islands and water availability.

REU Graduate Student Panel – May 17<sup>th</sup>, 2021

Talking to undergraduate students enrolled in one of the summers REU's at Auburn University.

Conservation Day Community Outreach – April 23<sup>rd</sup>, 2021

Communicating conservation science and recycling to residents, students, and families in the Auburn-Opelika area.

Earth Day Extravaganza – April 22<sup>nd</sup>, 2021

Communicating research poster over Urban Heat Islands and pollution to students of Auburn University

## OTHER ACADEMIA

1887 Society Ambassador – August 2022 to Present

Acting as an Ambassador for the Graduate School at Auburn University. Opportunities to share Auburn University with prospective and new students, welcome guests and alumni to campus, and develop leadership and networking skills to enhance their education beyond the classroom.

Graduate Student Council Senator – August to December 2024

Act as a graduate representative for the Department of Geosciences, in order to improve the livelihood of fellow graduate students.

Graduate Advisory Board Outstanding PhD Student Award – April 12<sup>th</sup>, 2024

Annual award voted on by faculty and Graduate Advisory Board members for the most Outstanding PhD student within the geosciences department.

COSAM Dean's Research Award (Master's Student) – April 4<sup>th</sup>, 2022

The annual Dean's Research Awards program celebrates the outstanding achievements of both faculty and students who make significant contributions and help to elevate our college to greater achievements through high-impact research.

3 Minute Thesis Competition Finalist – November 11<sup>th</sup>, 2021

Competition in which an individual must convey his/her research to a non-technical audience within a 3-minute timeframe. Finished within the top-ten finalist throughout all Auburn University Graduate Schools.

## CONFERENCES

Poster presented at the Outreach and Engaged Scholarship Symposium; September 3-4, 2024; Auburn, Alabama.

Attended the 2024 City of Auburn Neighborhood Conference; August 17, 2024; Auburn, Alabama.

Poster presented at: Emerging Risks from Concurrent, Compounding and Record-breaking Extreme Heat across Sectors; July 10-12, 2024; Columbia University, New York, New York.

Poster presented at: Auburn University NRT Climate Research Symposium; March 19, 2024; Auburn, AL.

Attended the National Rural Education Association; November 15-17, 2023; Chattanooga, TN.

Poster presented at: Auburn University NRT Climate Research Symposium; March 21, 2023; Auburn, AL.

Attended the National Science Teacher Association; March 22-25, 2023; Atlanta, GA.

Poster presented at the American Meteorological Society; January 8-12, 2023; Denver, CO (virtual).



Poster presented at the Southeast Division of the American Association of Geographers; November 21-22, 2022; Atlanta, GA.

Poster Presented at the NSF NRT Annual Meeting; October 11-13, 2022; Blacksburg, Virginia.

Poster presented at the International Association for Urban Climate; August 29-September 1, 2022; Sydney, AUS (virtual).

Poster presented at the Auburn University NRT Climate Research Symposium; March 21, 2022; Auburn, AL.

Paper presented at the American Association of Geographers; February 25, 2022; New York City, NY (virtual).

Poster/s presented at the Southeast Division of the American Association of Geographers; November 22, 2021; Florence, AL.

Poster presented at the Southeast Geological Society of America; April 1-2, 2021; Auburn, AL.