

# MARGARET A LAWRIKORE

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## EDUCATION

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**North Carolina State University (NCSU | Center for Geospatial Analytics)** Raleigh, NC  
*Ph.D. Geospatial Analytics* *Expected May 2025*

- Dissertation topic: Understanding the Influence of Zoning on Historical and Projected Land Use

**North Carolina State University (NCSU | College of Natural Resources)** Raleigh, NC  
*Bachelor of Science: Environmental Sciences* *May 2020*

- Concentration: Geospatial Information Science (GIS)
- Minors: Computer Programming and Bassoon Performance
- GPA: 4.0/4.0
- Degree Honors: Dean's List (2016-2020), valedictorian

## RESEARCH INTERESTS

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My primary goal is to harness and analyze big data to support actionable science. Through my Ph.D., I will work towards this goal by modeling the human dimensions of land-use change. Specifically, I will focus on zoning, a common land-use planning tool. Given data gaps and inconsistency, first, I will utilize high-performance computing to train machine learning models to predict zoning. Next, I will empirically quantify the influence of zoning on historical land use. Finally, I will incorporate these data into an existing urban growth model and utilize computational steering to assess user-driven urban planning scenarios through time. This updated model will allow users to better assess the social and environmental impacts of land use change and planning.

## RESEARCH EXPERIENCE

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**Graduate Research Assistant** August 2021 - Present  
*Center for Geospatial Analytics | NCSU* *Raleigh, NC*

- Advisors: Dr. Georgina Sanchez and Dr. Ross Meentemeyer
- Projects:
  - Leveraging machine learning and high performance computing to predict municipal zoning codes in NC
  - Collaborating on manuscript assessing the unintended consequences of FEMA's 100-year floodplain
  - Processing and visualizing data for manuscript forecasting land change in response to sea-level rise and frequent flooding

**Research Assistant** September 2019 - June 2021  
*Center for Geospatial Analytics | NCSU* *Raleigh, NC*

- **NCDOT Tool Development** | February 2021 - June 2021
  - Created web tools for road development projects for the North Carolina Department of Transportation
- **PoPS Development** | May 2020 - February 2021
  - Implemented eight additional dispersal kernels for Pest or Pathogen Spread (PoPS) model
  - Added deterministic functionality to C++library in PoPS model
- **FUTURES Development** | September 2019 - May 2020
  - Performed sensitivity analysis of FUTURES Urban Growth Model to test parameter uncertainty resulting from calibration of the Patch-Growing Algorithm
  - Assisted in updating FUTURES to reduce uncertainty found through the sensitivity analysis

**Undergraduate Research Assistant** May - August 2019  
*North Carolina Institute for Climate Studies* *Asheville, NC*

- Built a geospatial database of 10 datasets at four spatial scales over a 20-year period
- Used spatial-temporal scan software (SaTScan) to perform analysis of suicide rates in NC from 2000 to 2017

## PUBLICATIONS

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### Published

Sanchez, G.M., Petrasova, A., Skrip, M., Collins, E., **Lawrimore, M.A.**, Vogler, J.B., Terando, A., Vukomanovic, J., Mitasova, H., Meentemeyer, R.K. (2023). Projecting societal responses to sea level rise and frequent flooding identifies policy-relevant scenarios most likely to lower flood risk. *Sci Rep* 13, 18869. <https://doi.org/10.1038/s41598-023-46195-9>

**Lawrimore, M.A.**, Sanchez, G.M., Cothron, C., Tulbure, M.G., BenDor, T.K., Meentemeyer, R.K. (2023). Predicted Spatially Complete Zoning Map of North Carolina [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.8136886>

Sugg, M.M., Woolard, S., **Lawrimore, M.A.**, Micheal, K.D., Runkle, J.D. (2021). Spatial Clustering of Suicides and Neighborhood Determinants in North Carolina, 2000 to 2017. *Appl. Spatial Analysis* 14, 395–413. <https://doi.org/10.1007/s12061-020-09364-1>

### Under Review

**Lawrimore, M.A.**, Sanchez, G.M., Cothron, C., Tulbure, M.G., BenDor, T.K., Meentemeyer, R.K. Creating Spatially Complete Zoning Maps Using Machine Learning. Submitted to *Computers, Environment and Urban Systems*.

### In Preparation

Sanchez, G.M., **Lawrimore, M.A.**, Petrasova, A., Vogler, J.B., Collins, E., Petras, V., Harper, T., Butzler, E. Unintended consequences of floodplain management policies. Manuscript in preparation for *Science of the Total Environment*.

## PRESENTATIONS

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**Lawrimore, M.A.**, et al. (April 2024). Creating Spatially Complete Zoning Maps Using Machine Learning. IALE-NA. Oklahoma City, OK. Oral presentation.

**Lawrimore, M.A.**, et al. (December 2023). Spatially Interactive Modeling of Urban Growth and Human Migration Driven by Future Flood Hazard Conditions. AGU23. San Francisco, CA. Oral presentation.

**Lawrimore, M.A.**, et al. (October 2023). Forecasting Human Mobility and Development Patterns Driven by Future Flood Hazard Conditions. Envisioning Urban Futures Symposium. NCSU, Raleigh, NC. Poster presentation.

**Lawrimore, M.A.**, et al. (March 2023). Creating Spatially Continuous Zoning Maps Using Machine Learning. CNR Graduate Research Symposium. NCSU, Raleigh, NC. Poster presentation.

**Lawrimore, M.A.**, et al. (November 2022). Smart Zoning for Coastal Flood Adaptation and Resilience. North Carolina Coastal Conference. Raleigh, NC. Poster presentation.

**Lawrimore, M.A.**, et al. (September 2022). Forecasting Scenarios of Human Mobility and Shifts in Development Patterns Driven by Future Flood Hazard Conditions. 2022 Southeast Climate Adaptation Science Symposium. Gulf Shores, AL. Poster presentation.

## GRANTS AND FELLOWSHIPS

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PI: Sanchez, G.M.; **I: Lawrimore, M.A.** (Awarded) Amount: \$10,000. Smart Zoning for Coastal Flood Adaptation and Resilience. NC Sea Grant program. September 2022 - September 2023.

**Lawrimore, M.A.** (Awarded) Amount: \$4,000. University Graduate Fellowship (2021-2022). North Carolina State University.

## AWARDS

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IALE-NA Student Travel Award (Spring 2024) Amount: \$500.

North Carolina State University Center for Geospatial Analytics Travel Award (Fall 2023). Amount: \$800.

First Prize - Outreach. Predicting Municipal Zoning in Wake County, NC. 2022. NCSU Graduate Student Association Infographic Contest.

Honorable mention. Flood-prone Development in Charleston, SC. 2022. NCSU Research Image Contest.

Work showcased across University promotional materials, websites, and social media 10+ times from 2022-2023.

## LEADERSHIP

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### Co-President

May 2023 - May 2024

*Geospatial Graduate Student Organization | NCSU*

*Elected March 2023*

- Organize and lead events, organization spokesperson, student advocate, student-administration liaison

### Teaching Assistant

January 2023 - May 2023

*Fundamentals of Geospatial Information Science and Technology*

- Hold weekly office hours, proof-read assignment materials, grade and provide feedback on assignments

### Mentorship

August 2021 - May 2022

*Center for Geospatial Analytics | NCSU*

- Mentored undergraduate research assistant on lab protocols, data and time management, and how to transition from undergraduate studies to the workforce

## VOLUNTEER WORK

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### Civic Tech Volunteer

March 2023 - Present

*Code for the Carolinas / National Zoning Atlas*

- Co-lead bi-weekly meetings to introduce volunteers to civic tech volunteering.
- Assist the organization in gathering zoning data for North and South Carolina and contribute to the North Carolina Zoning Atlas

## TECHNICAL SKILLS

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- **Programming Languages:**

Proficiency in Python and R

Experience with C++, C, Bash and HTML

- **Geographic Information Systems (GIS):**

GRASS GIS, QGIS, ArcGIS Pro, ArcMap

- **Spatio-temporal Modeling:**

FUTURE Urban-Regional

Environment Simulation (FUTURES),

Pest or Pathogen Spread (PoPS),

SaTScan Spatial-temporal analysis