Margaret A. Lawrimore

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Education

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

- Dissertation topic: Harnessing big data to model future land change dynamics

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

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 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

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

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 Global Environmental Change.

Presentations

Lawrimore, M.A., et al. (Accepted, presenting December 2023). Spatially Interactive Modeling of Urban Growth and Human Migration Driven by Future Flood Hazard Conditions. AGU23. San Fransico, 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

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

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

Awards

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

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

Civic Tech Volunteer March 2023 - Present

Code for the Carolinas / National Zoning Atlas

- Volunteer weekly to assist the organization in gathering zoning data for North and South Carolina and contribute to the North Carolina Zoning Atlas

Technical Skills

- **Programming Languages**: Python, R, C++, C, Bash, HTML, Java
- **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