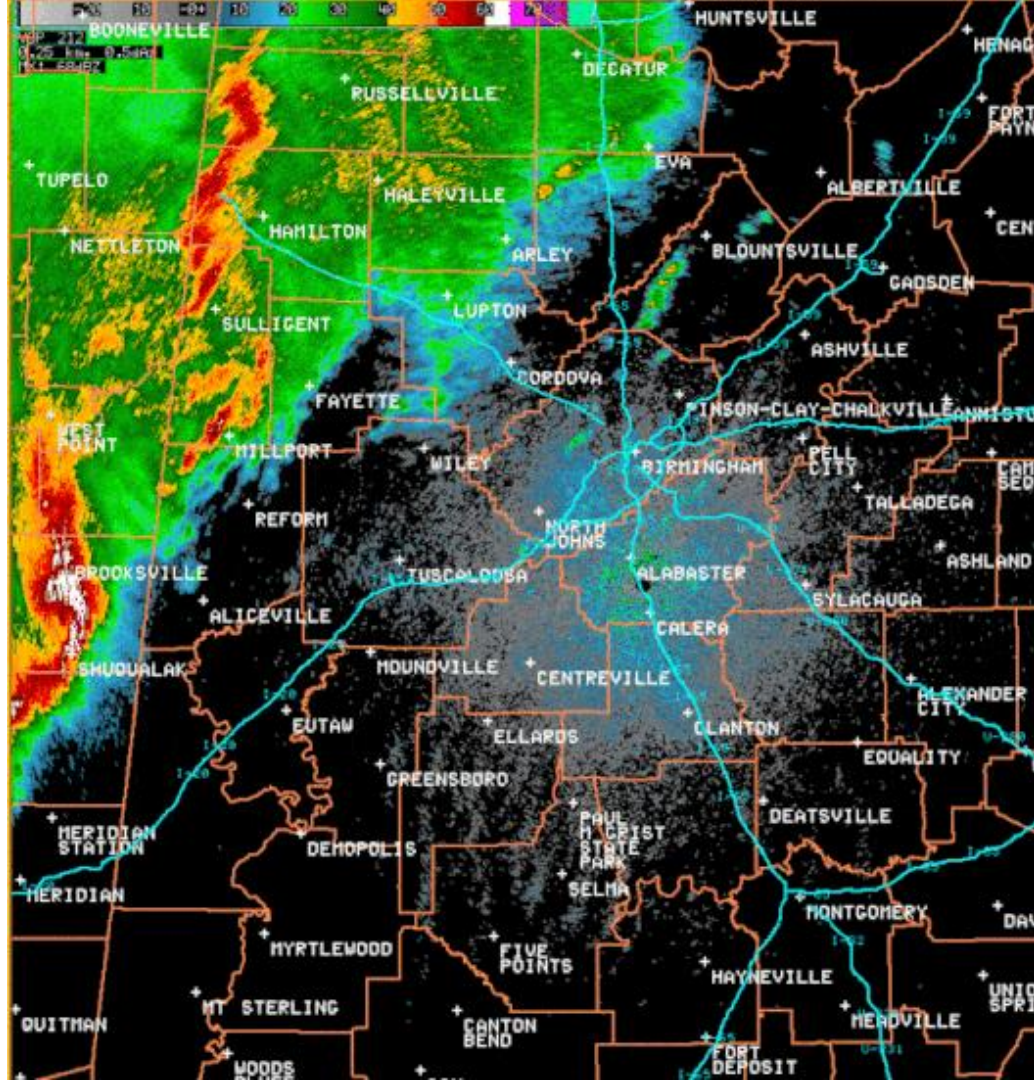


Social Vulnerability, Storm Mode, and Tornado Warning Outcomes

Amanda Wagner

Stephen Strader, PhD

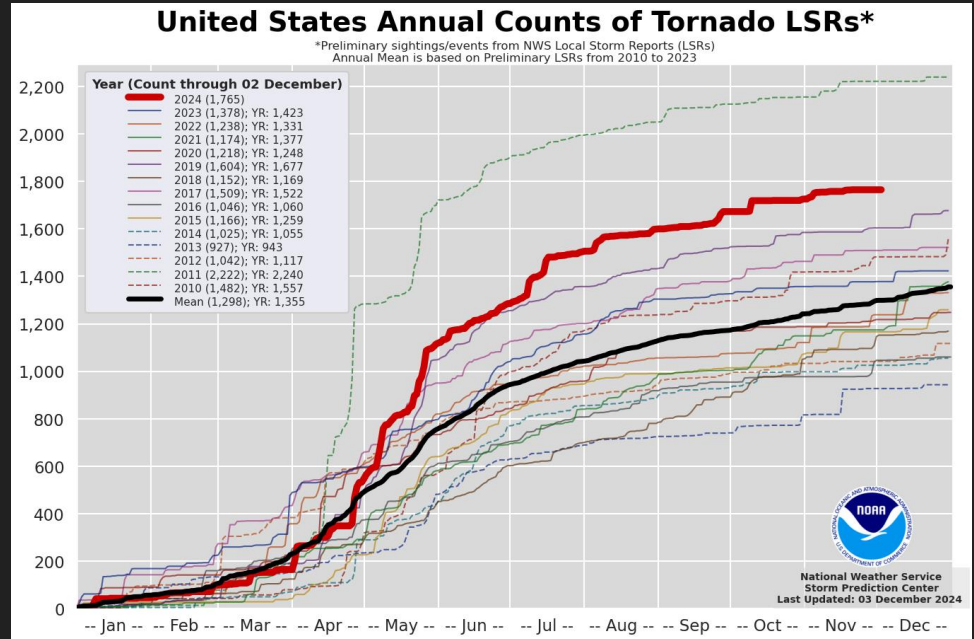


Motivation

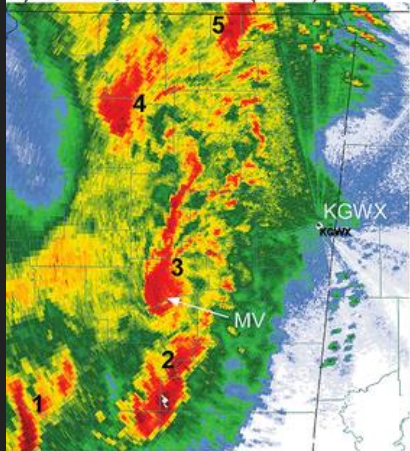
26 Georgia tornadoes in 2024



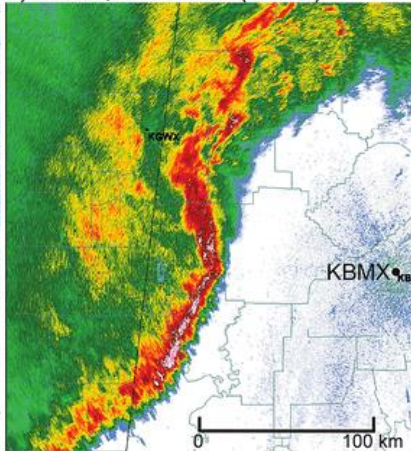
Newnan, GA EF4 Tornado 2021



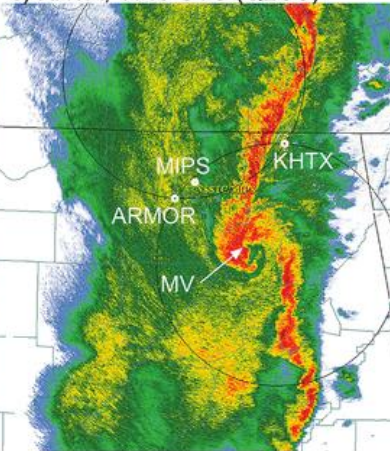
a) KGWX, 0735 UTC (MCS)



b) KBMX, 0940 UTC (QLCS)



c) KHTX, 1140 UTC (QLCS)



d) KHTX, 1648 UTC (QLCS)



e) KGWX, 2038 UTC (supercells)



f) KBMX, 2219 UTC (supercells)



What is storm mode and why is it important?

How are these relationships impacting communities?



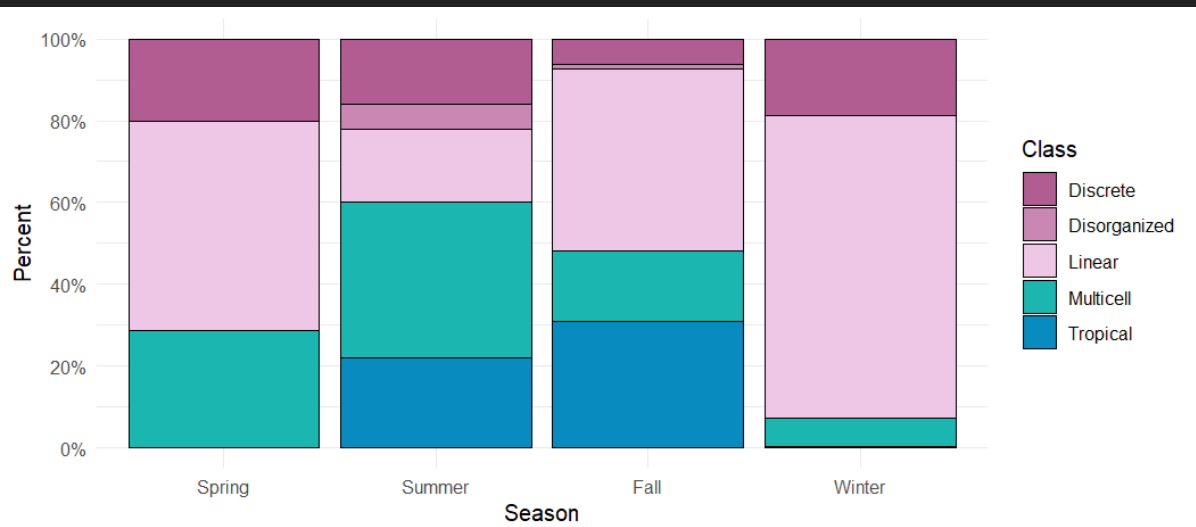
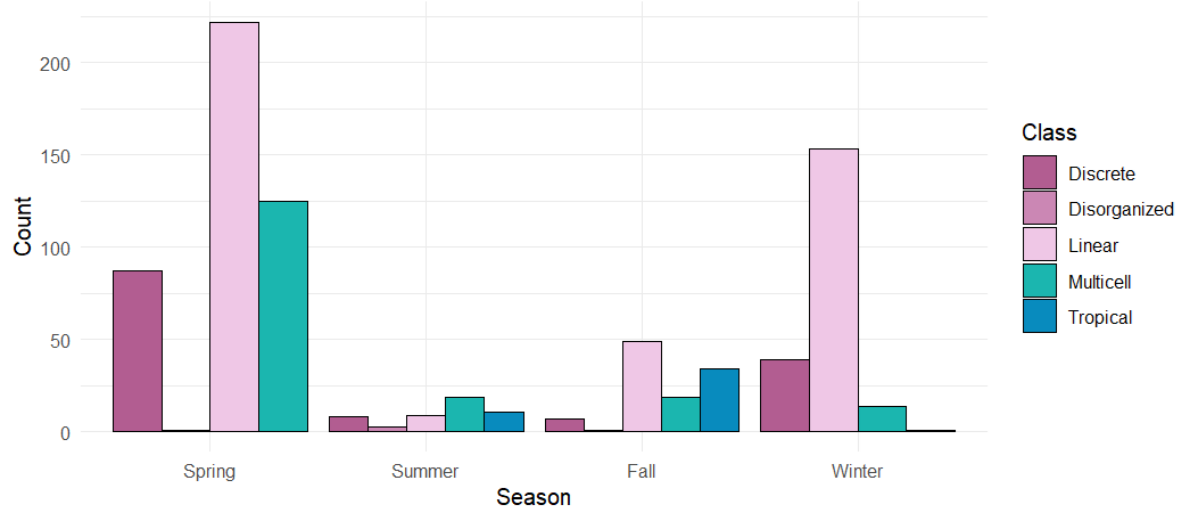
Hazard type
Seasonality, time of day

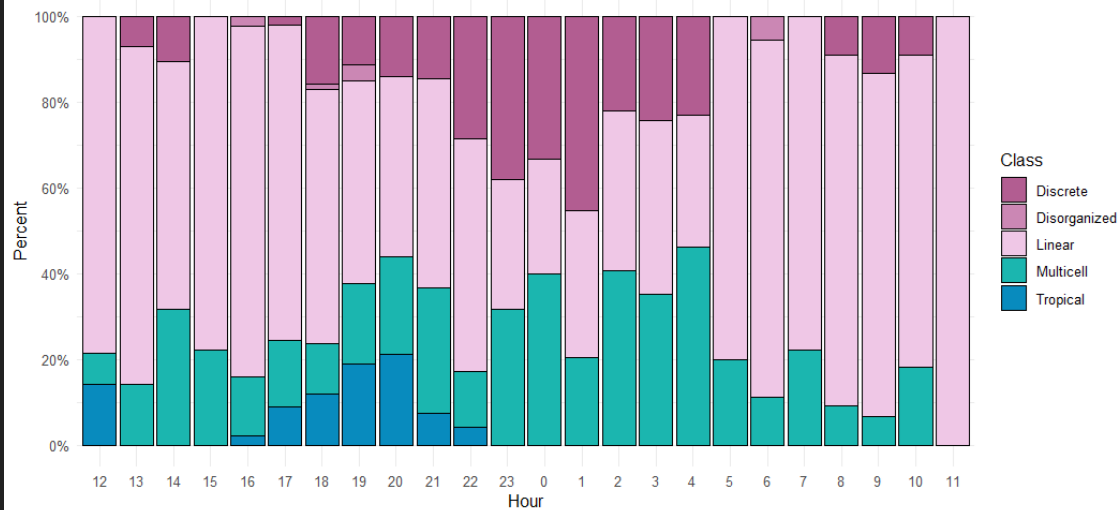
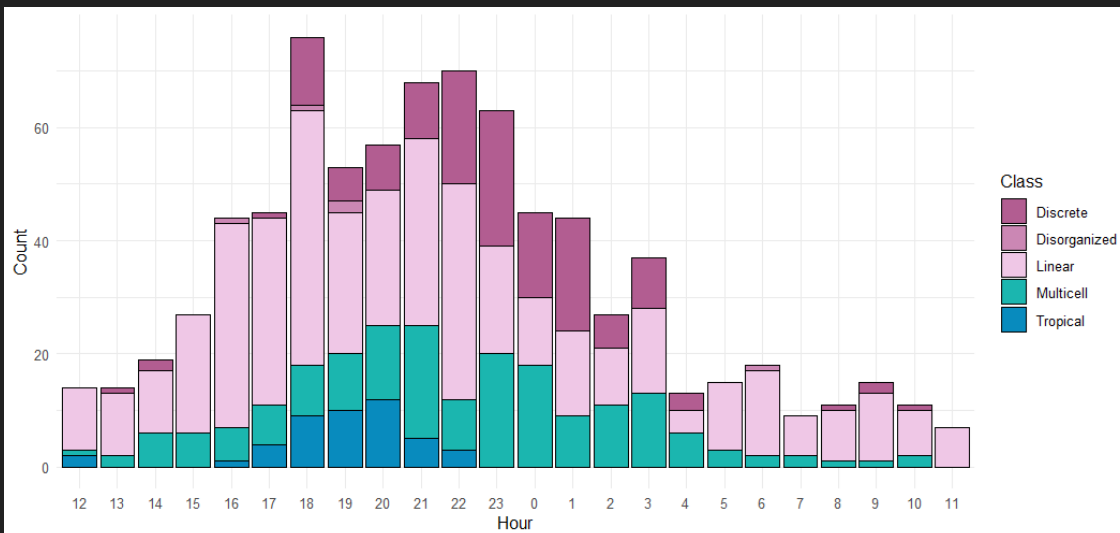


Perception
Response

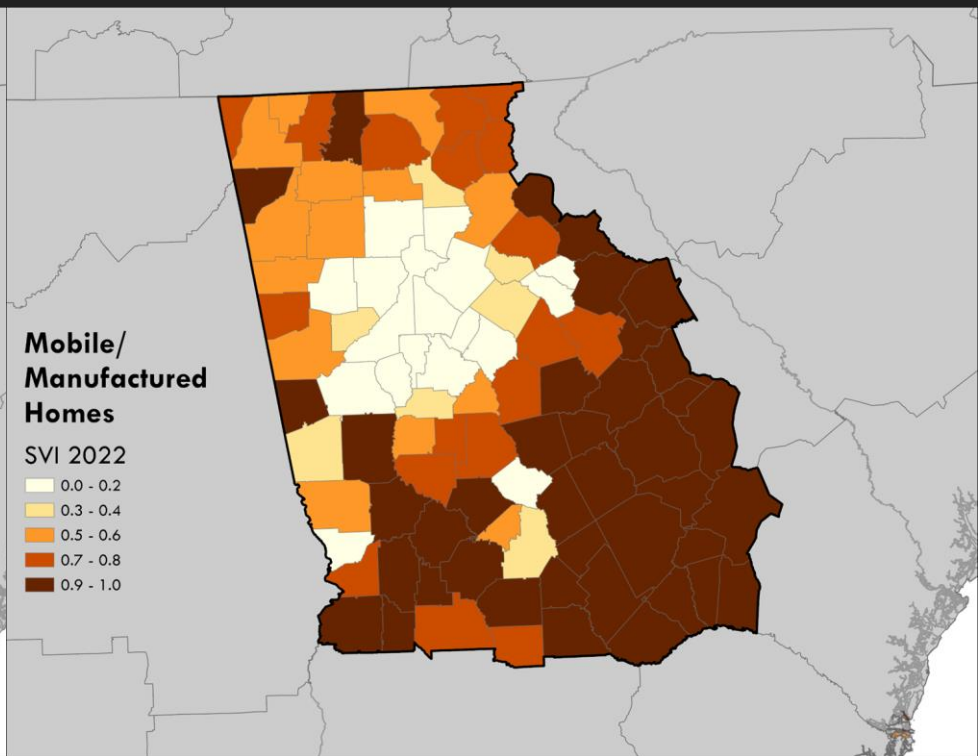
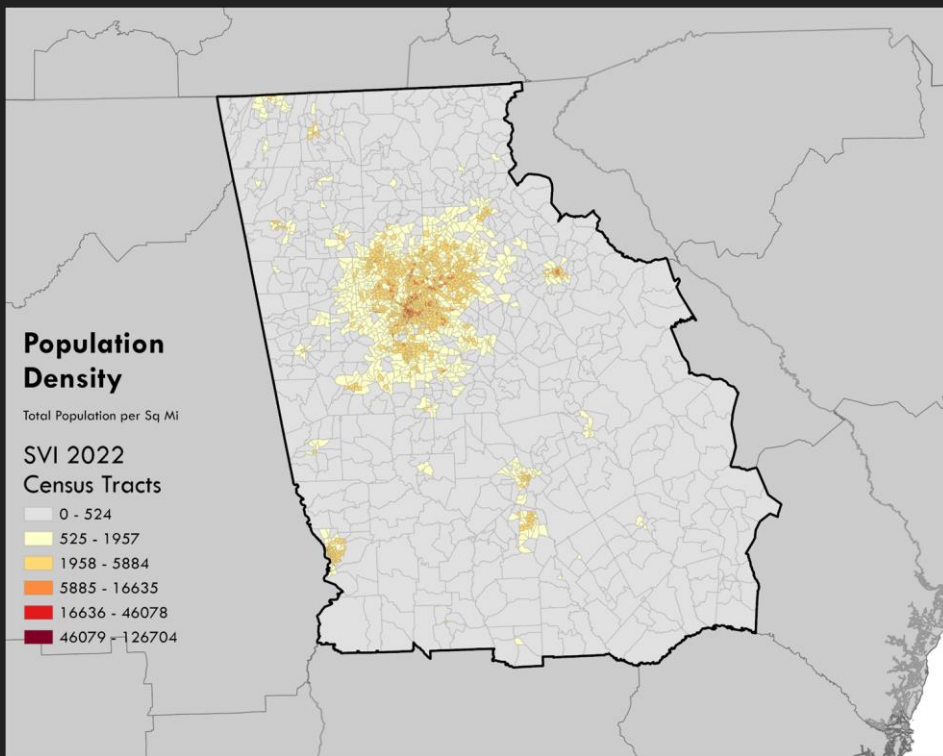


Degree of impacts
Comprehension
Recovery

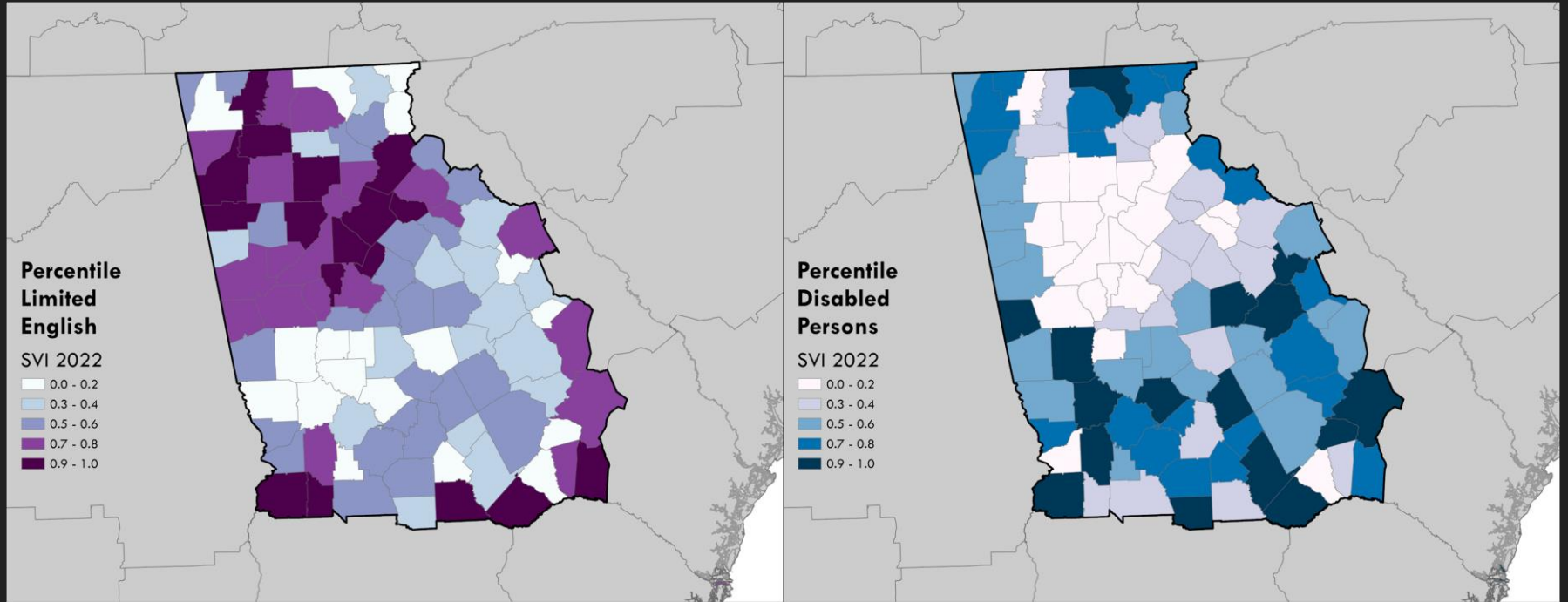




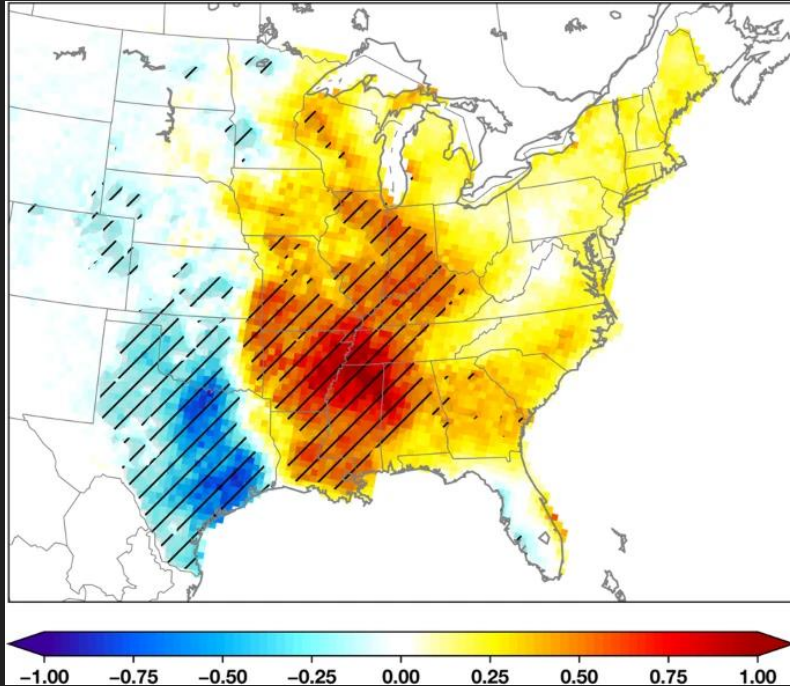
Urban vs. Rural Vulnerabilities



Different populations require different resources

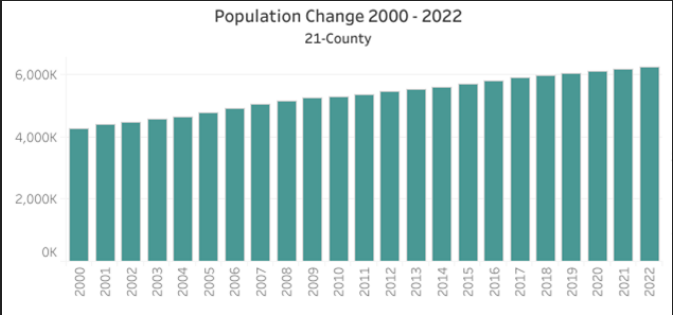


Shift in tornado environments

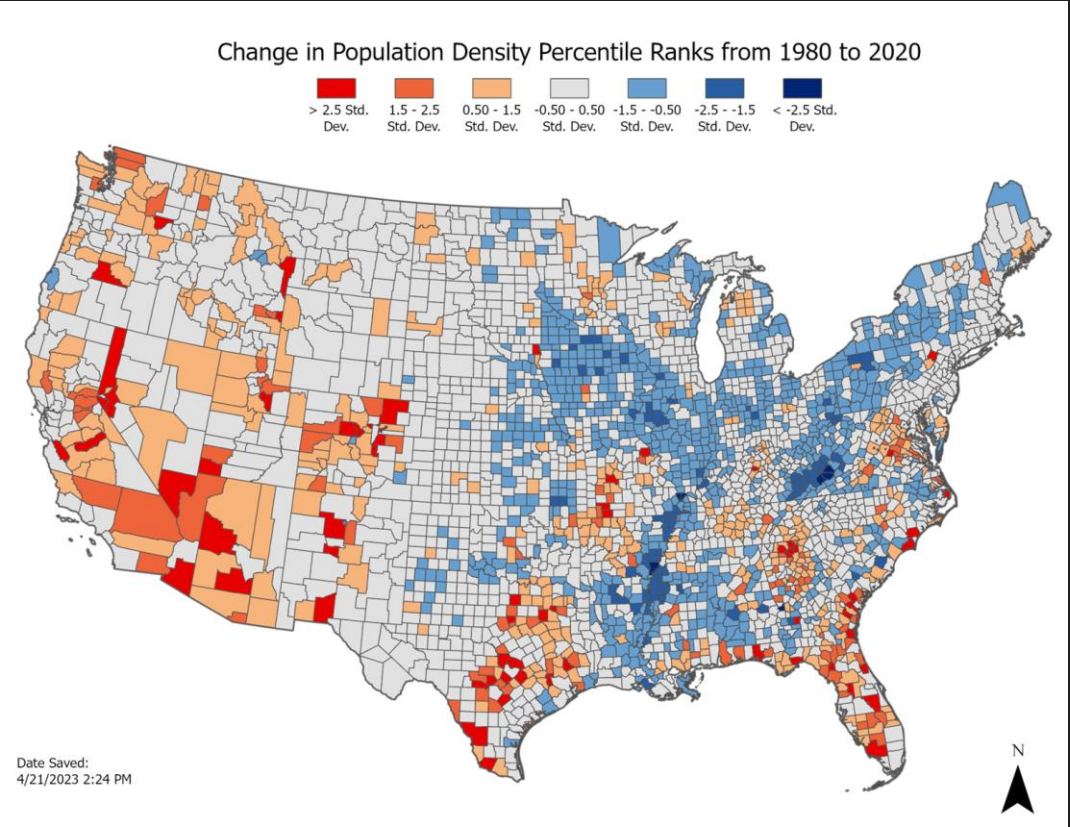


*Theil-Sen slope of 1979–2017 annual grid-point sum of Max daily STP
Gensini and Brooks (2018)*

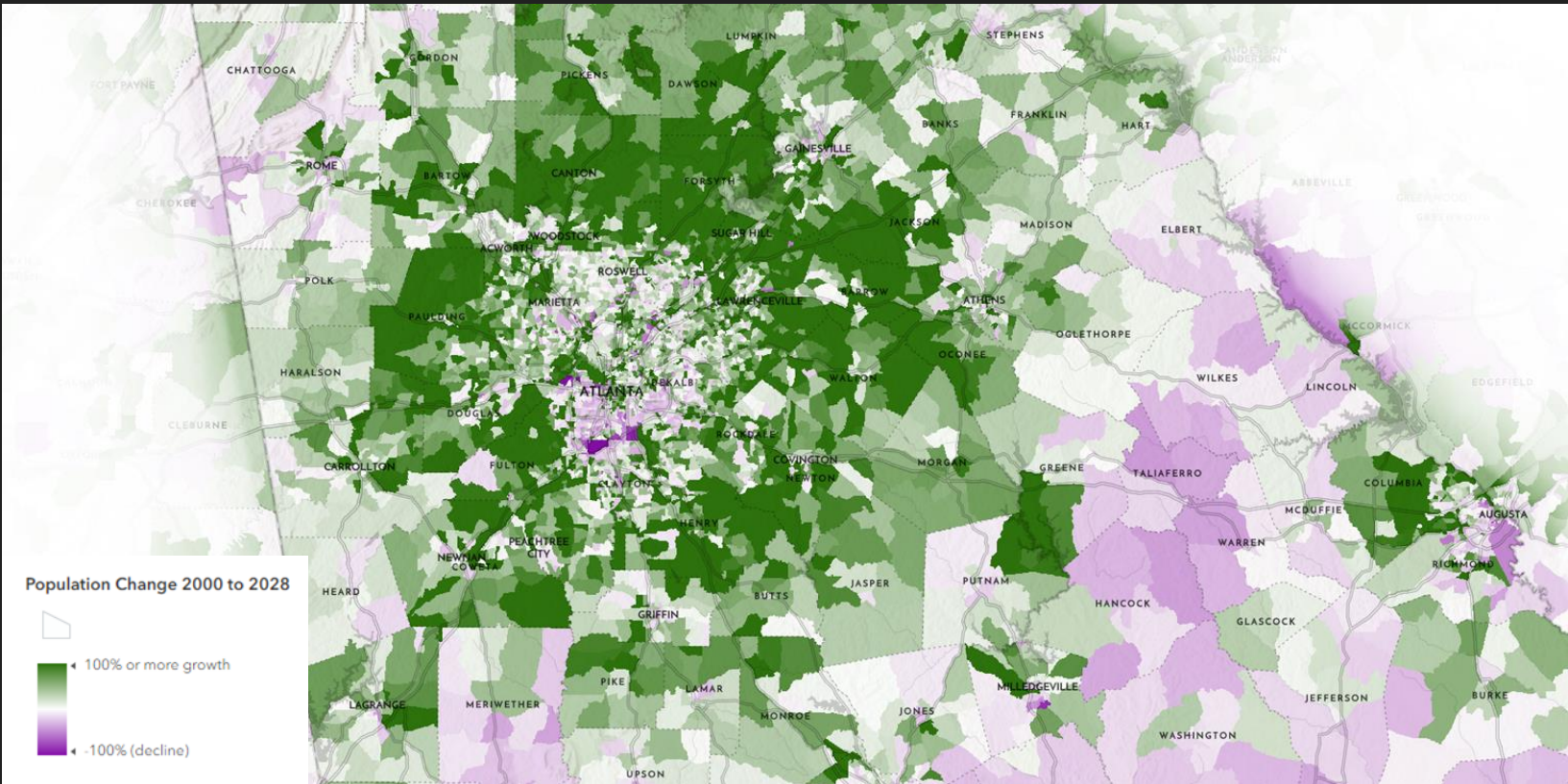
Population Change



Atlanta Regional Commission



Suburban Growth

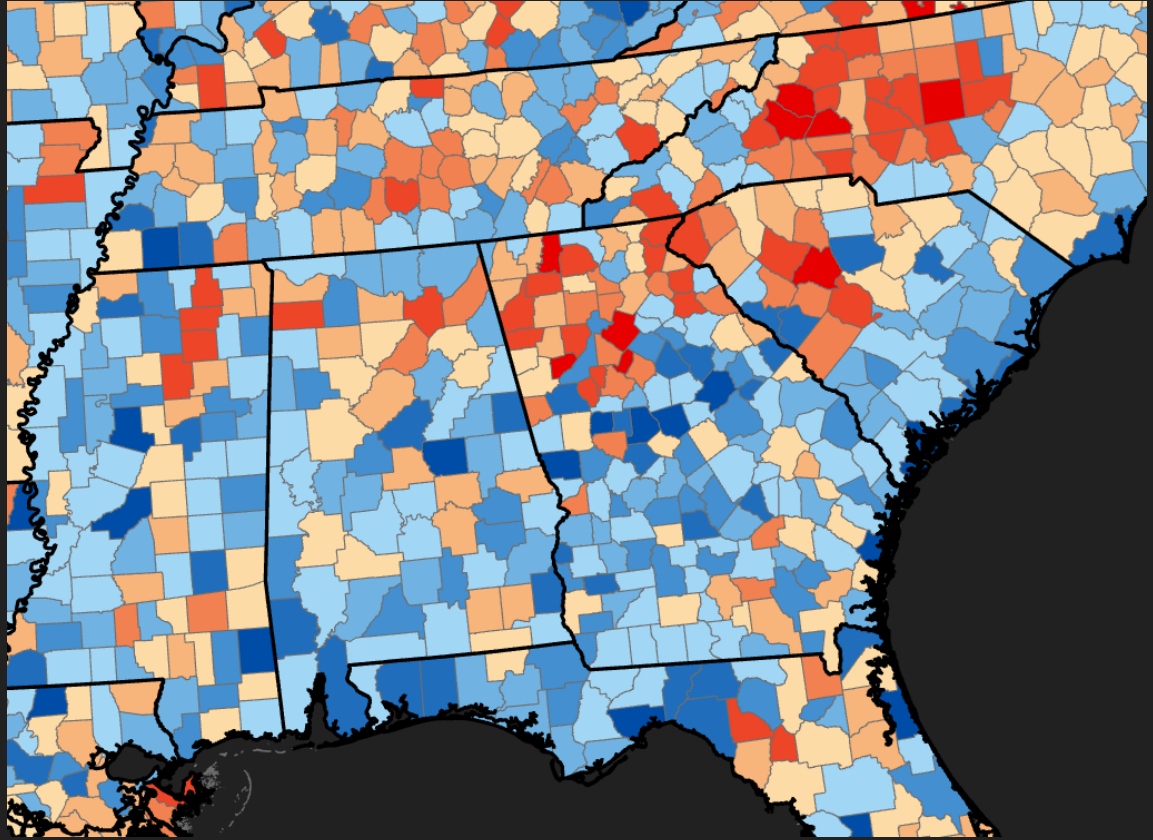


Change in Overall Vulnerability: 1980 to 2020

Counties in Georgia that are more vulnerable now are more urbanized and more diverse

Counties that are less vulnerable are typically less diverse, older, and losing population

But there are exceptions to these generalizations



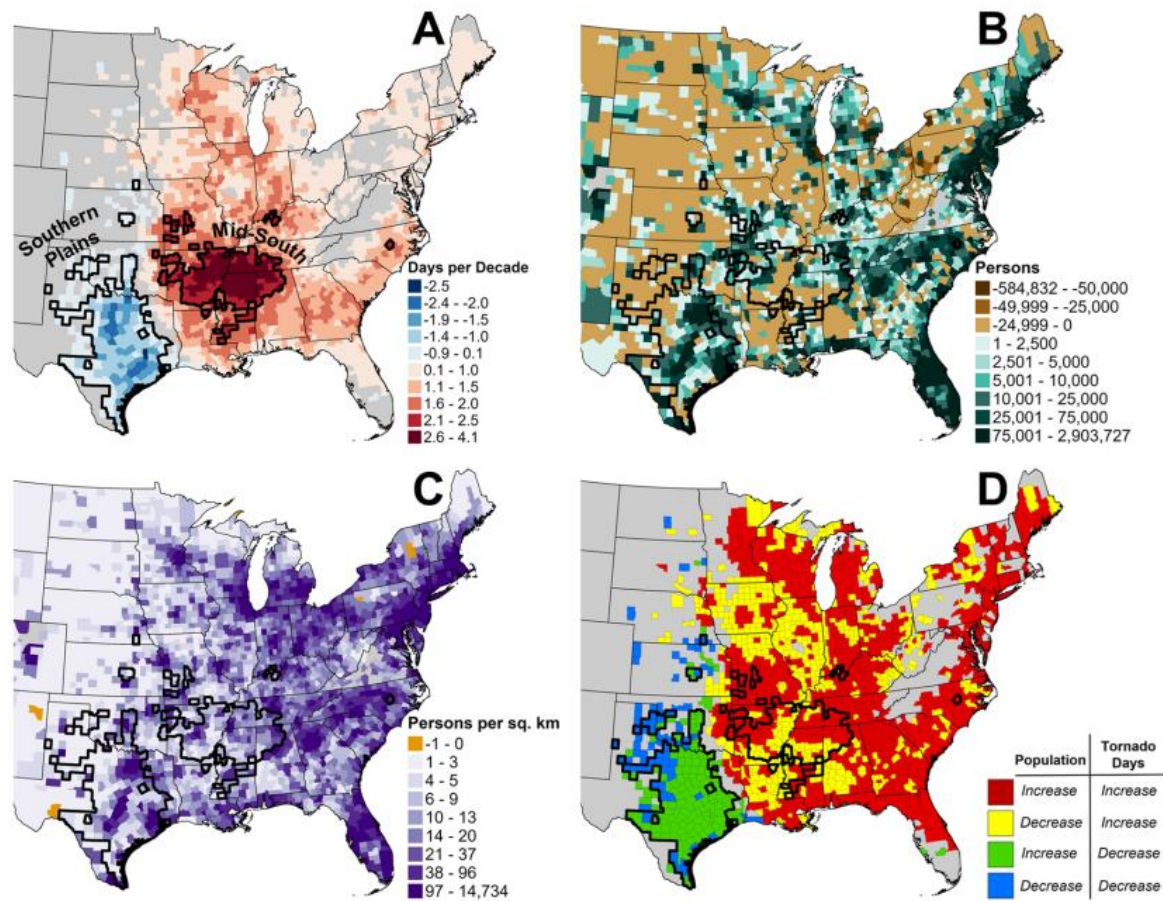
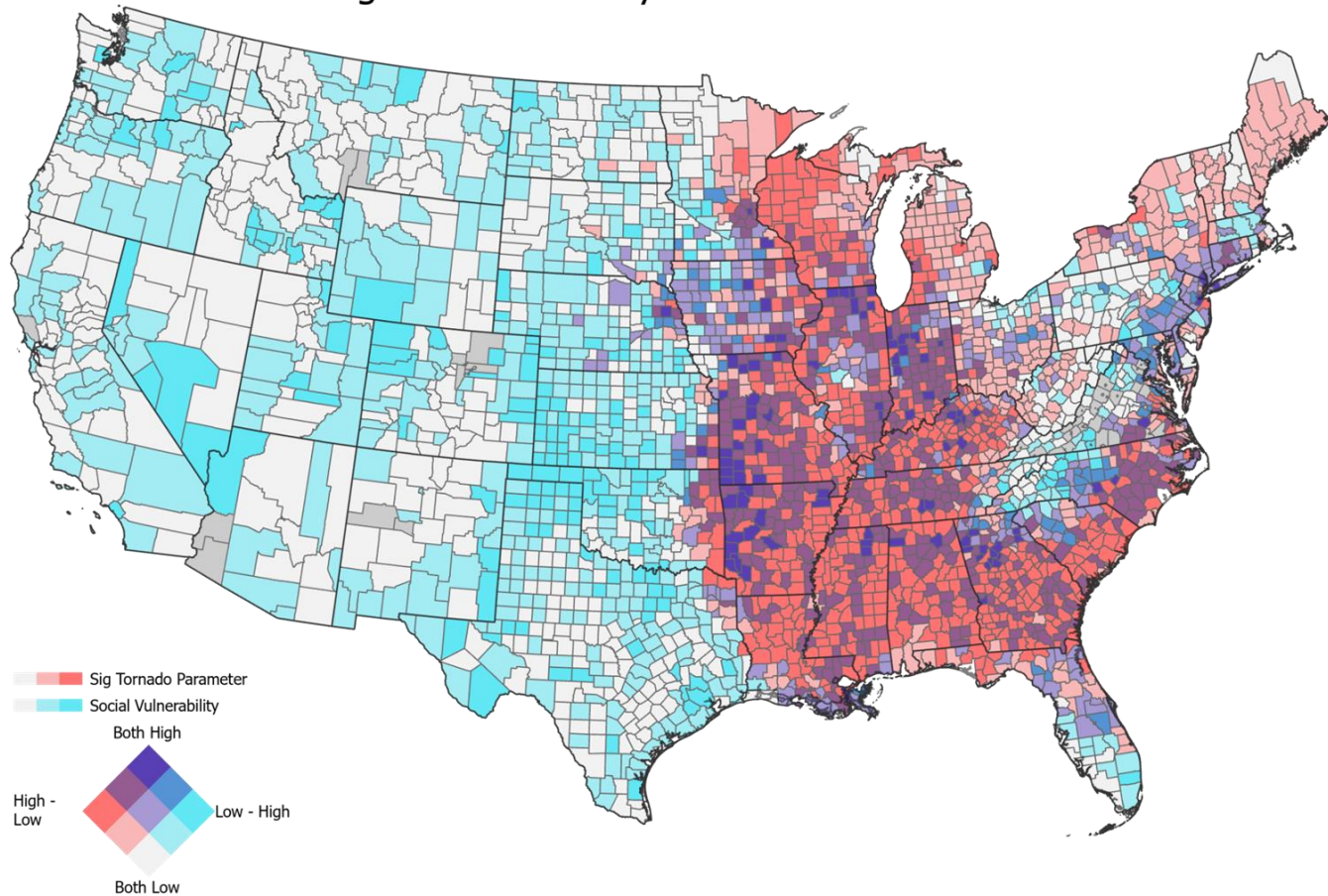


Fig. 1 | Tornado risk and societal exposure changes. County-level change (1980–2020) in the **A** favorable number of tornado days per decade as measured by the annual accumulation of significant tornado parameter (STP). Bold (black) outlined counties denote those that are within the 95th (Mid-South) or 5th (Southern Plain) percentile ranking for changes in tornado days from 1980 to 2020.

Counties with no change in decadal tornado days or those removed from analyses are colored gray. Also provided are county-level absolute changes in **B** the number of persons and **C** population density (persons per km²) from 1980 to 2020. Panel **D** highlights the county-level combinations of increasing or decreasing tornado days paired with increasing or decreasing population from 1980 to 2020.

Social Vulnerability and Tornado Environments: The change in vulnerability and STP from 1980 to 2020



How we can best improve upon the social vulnerability challenges?

Rural vulnerability:

- Limited infrastructure, resources, and funding

Urban vulnerability:

- Neighborhood-level solutions
- Account for diversity

Recommended actions

Targeted outreach, education, mitigation, and preparedness

Equitable action - balancing exposure, risk, vulnerability

Reaching underserved groups

Questions?

Amanda Wagner

amanda.wagner@noaa.gov

Stephen Strader, PhD

stephen.strader@villanova.edu