Heat Maps That Matter: Pinpointing Vulnerable Neighborhoods for Real-World Impact

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C3HE
A NOAA CAP team

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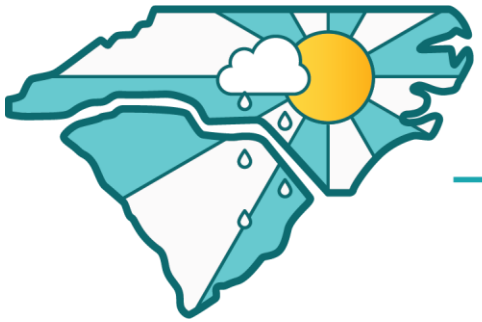
By integrating social science, physical science, and regional knowledge, the C3HE team and participating groups co-produce solutions that are tailored to meet unique local needs and priorities.

Focusing our efforts on underserved and at-risk populations, we strive to support communities that are disproportionately exposed to climate hazards and other compounding social inequities.



Carolinas Collaborative on Climate, Health, and Equity

A NOAA CAP team

https://carolinascap.org

Comprehensive plans

- Updates required at least every 10 years
- The 2020 South Carolina Disaster Relief and Resilience Act (SC Code §48-62-10)
  - Amended South Carolina Local Government Comprehensive Planning Enabling Act of 1994
  - REQUIRE LOCAL COMPREHENSIVE PLANS TO INCLUDE A RESILIENCE ELEMENT."
    - Resilience Element (10): This element includes an inventory of existing resiliency conditions, promotes resilience planning, design and development, and is coordinated with adjacent jurisdictions and agencies.

Fountain Inn, Greenville County – 10,416

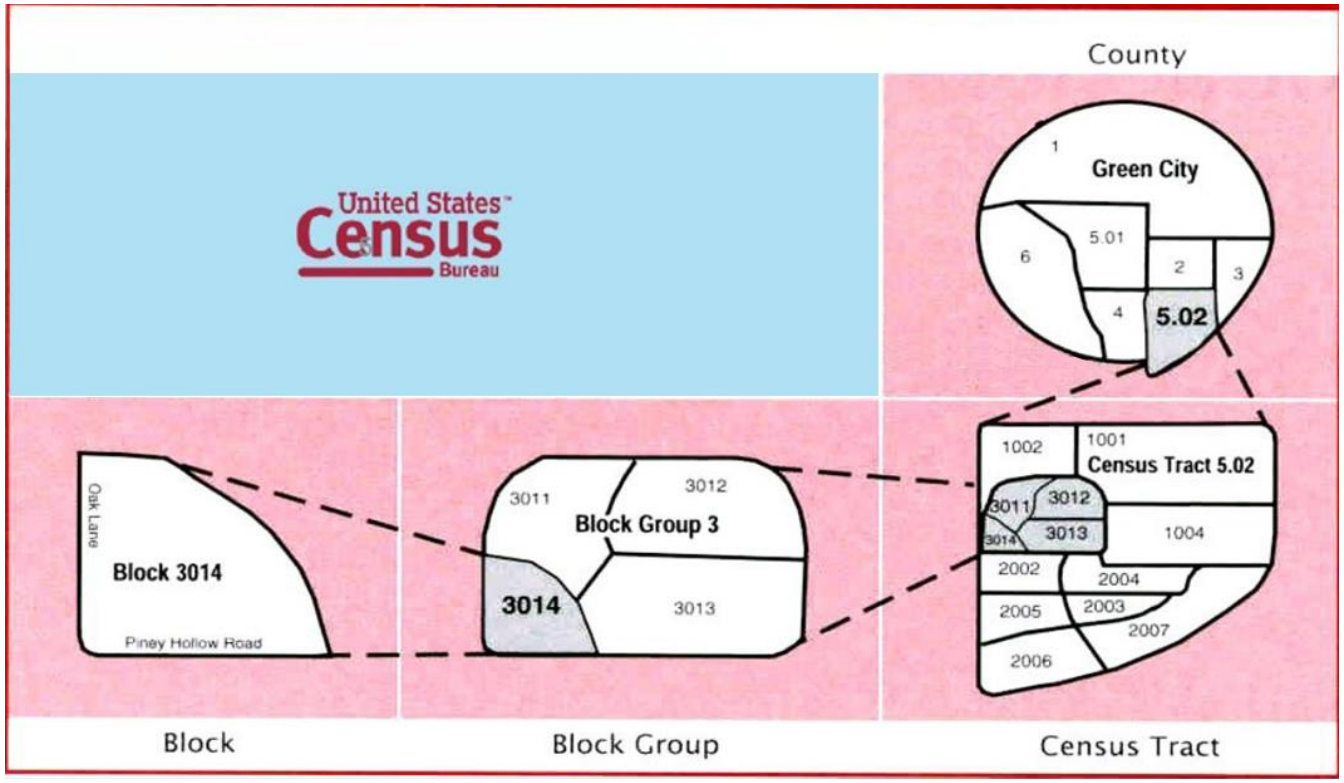
Table of Contents

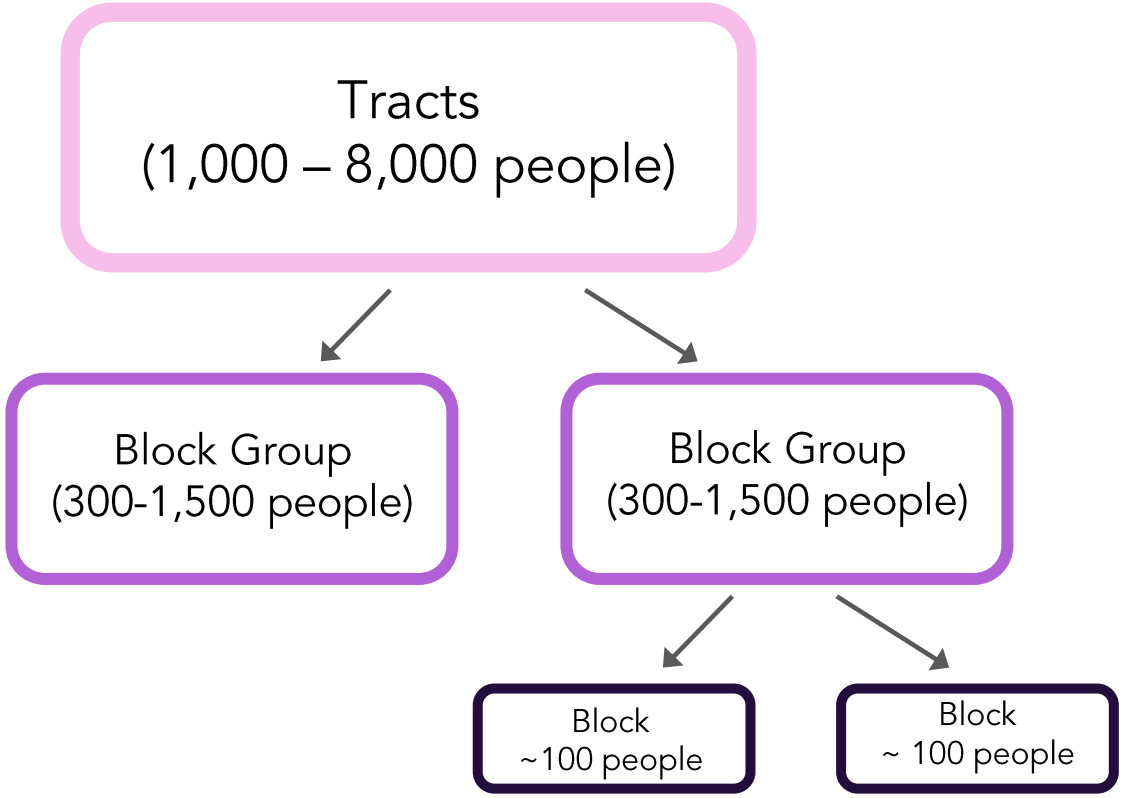
INNvision

Data

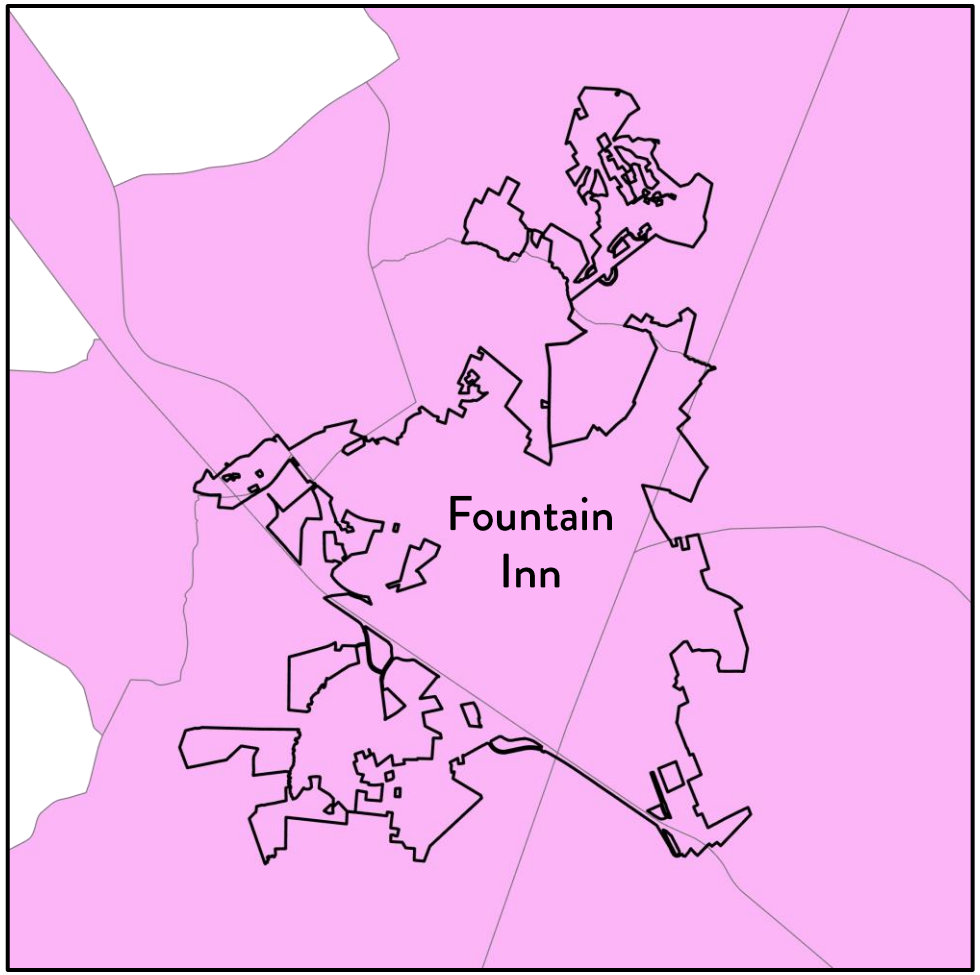
- Census demographics
  - Living alone
  - Seniors living alone (age 65+)
  - Children age 0-5
  - Renter-occupied
  - Ethnicity
  - Race: Black
- Landsat 8 or 9
  - Land surface temperature

Reminder: Census geographies

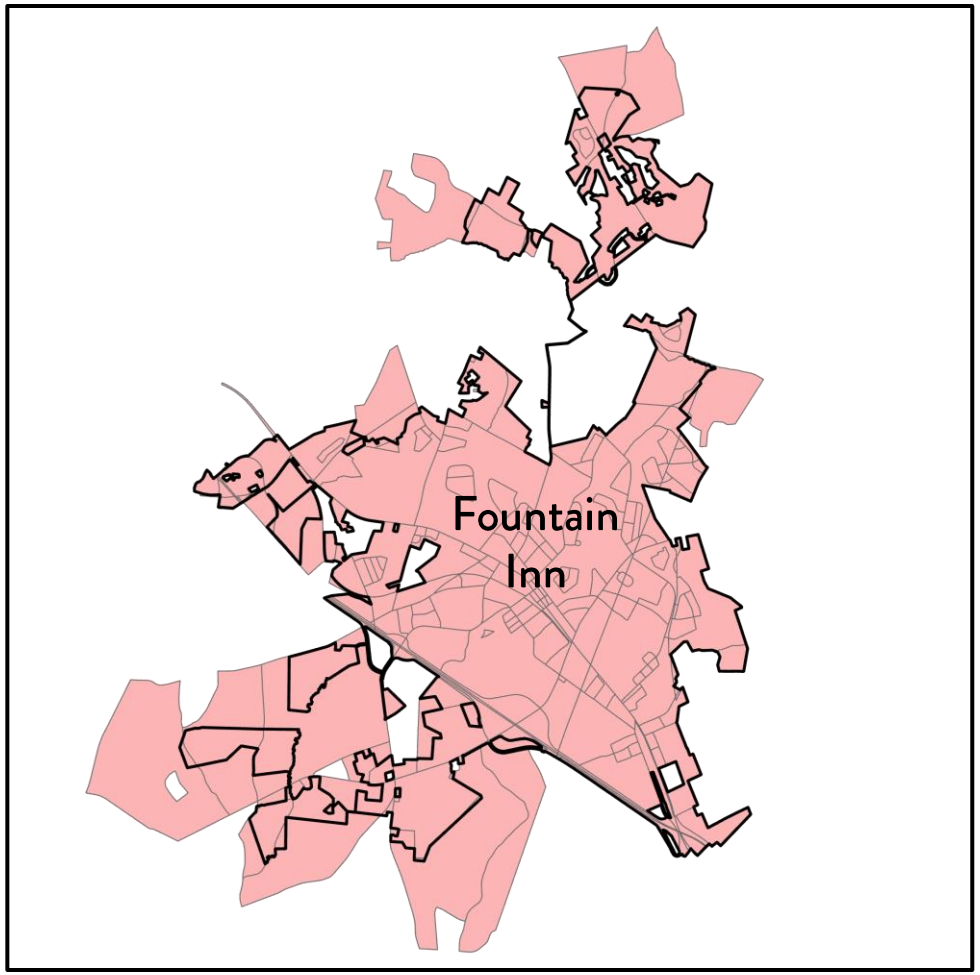




Census blocks for hyper-local analysis



Tracts

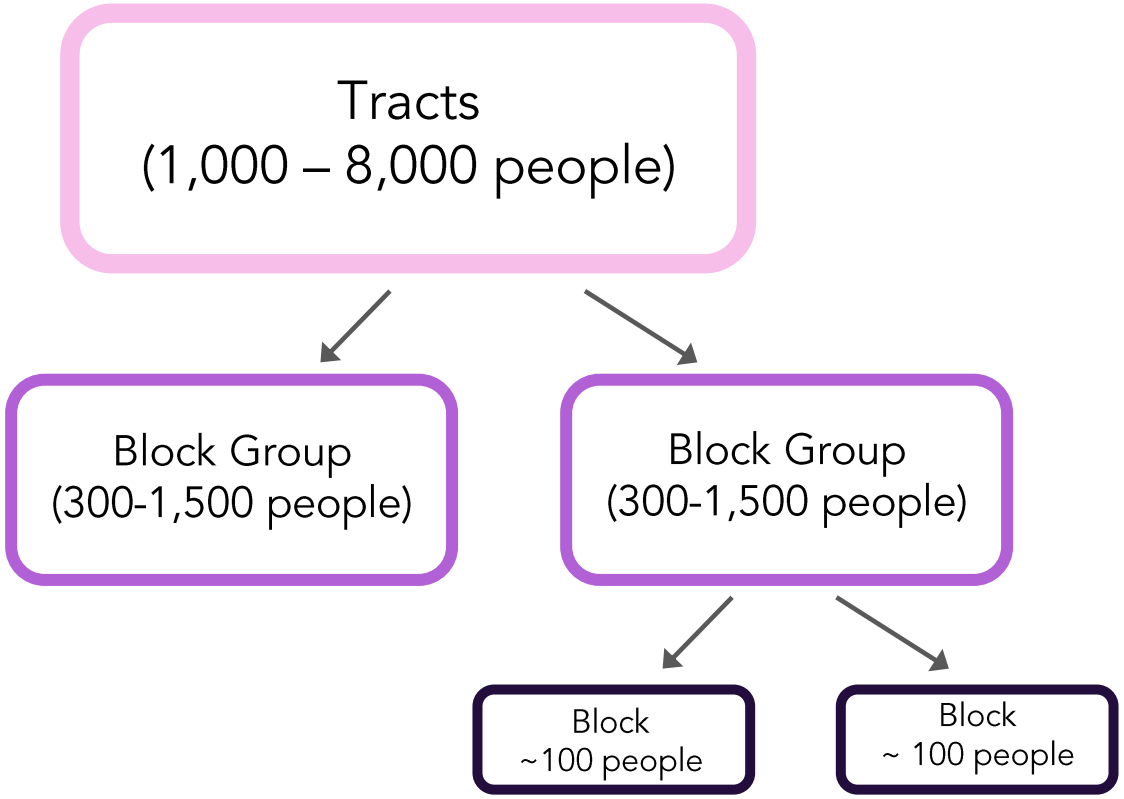


Blocks

Noise problem

- The Census Bureau adds noise to the data to protect respondent confidentiality.

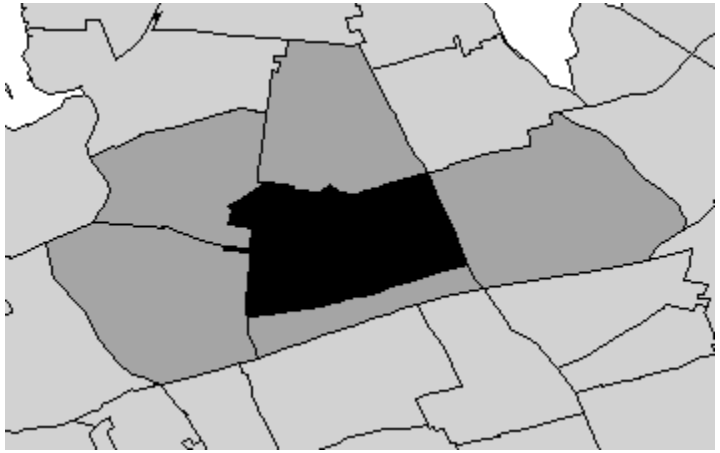
- Solution:
  Aggregate blocks



Max-p clustering

Creating the maximum number of homogenous clusters (“regions”) from a set of Census Blocks that meet certain criteria thresholds.

Rook contiguity



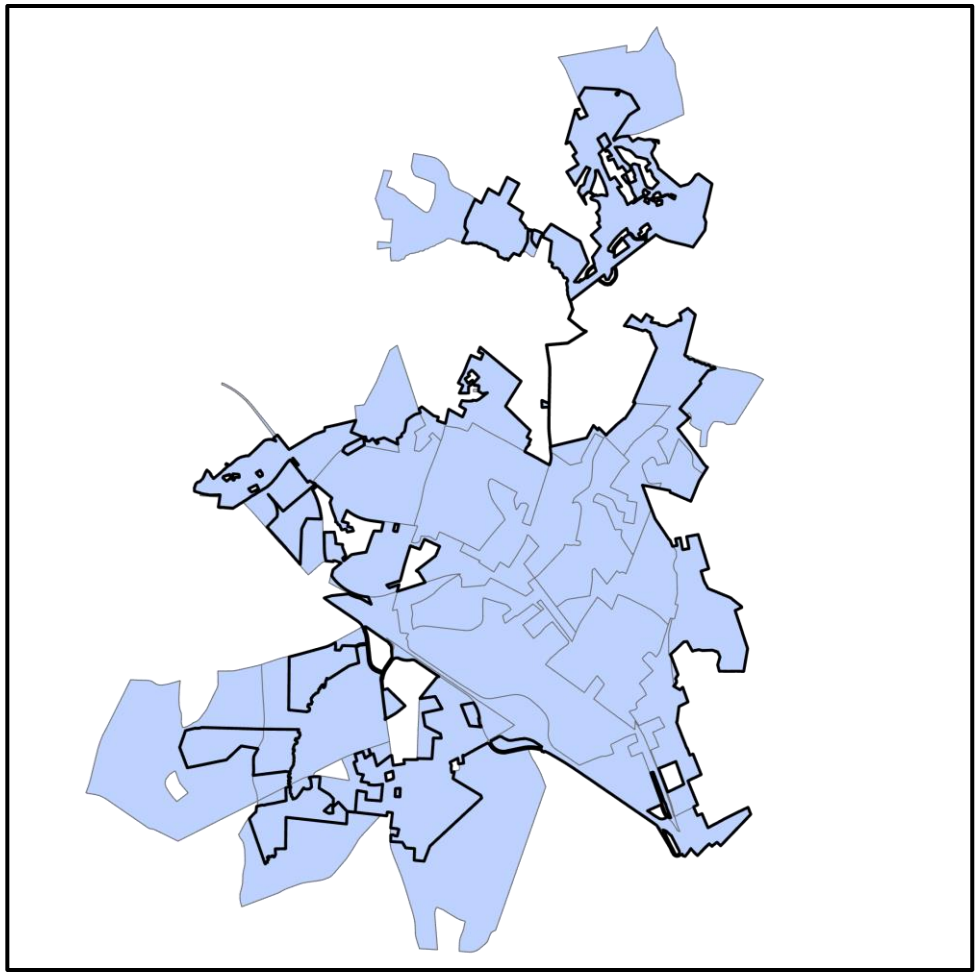
Threshold: at least 450 people

Homogeneity:

- Population density
- Renter-occupied percent
- Living alone (65+) percent
- Children 0-5 percent
- White alone race percent

Max-p clustering

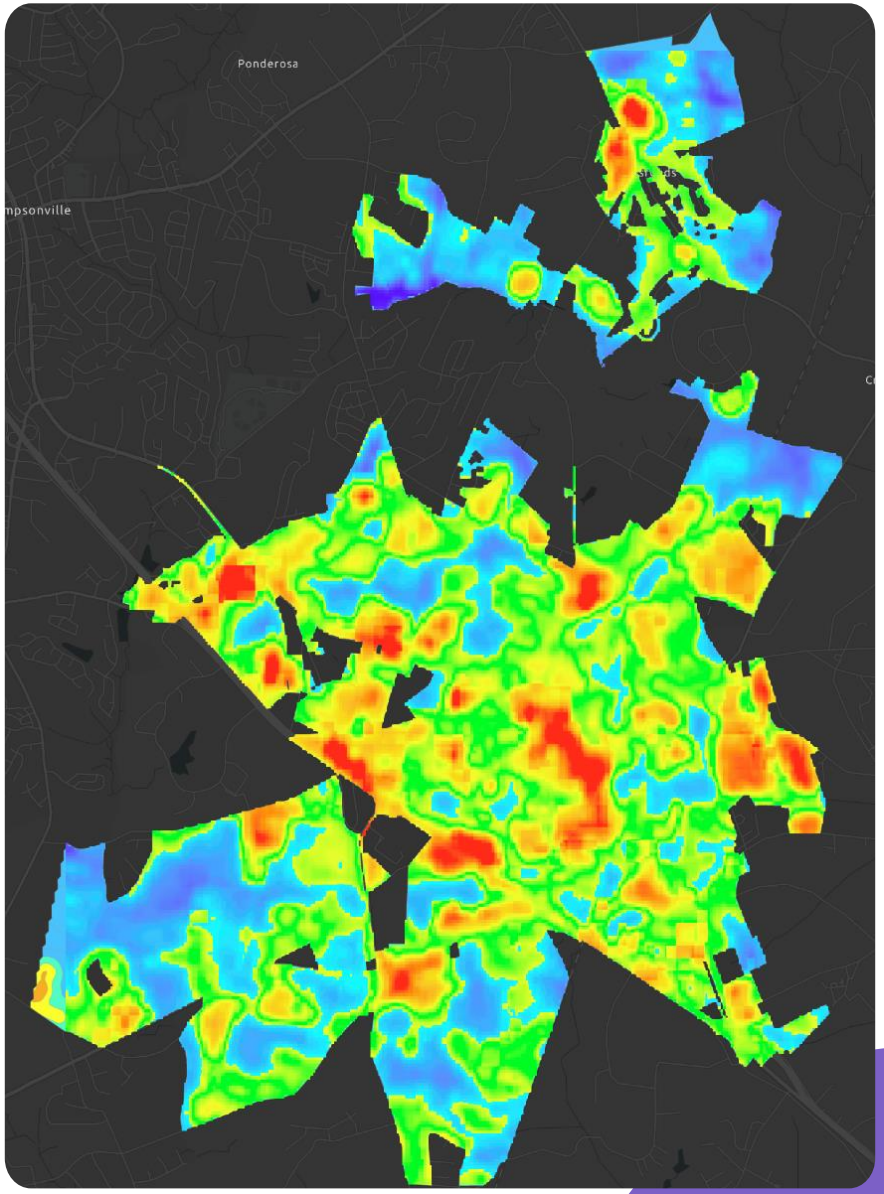
245 Blocks



18 Clusters/Regions

Land surface temperature

1. Identify a hot summer afternoon
2. Download Landsat 8 or 9 raster
3. Calculate LST with bands 4, 5, and 10
4. Save the min, max, median, and average temperature for each region



Risk scores

Demographic variable subscore

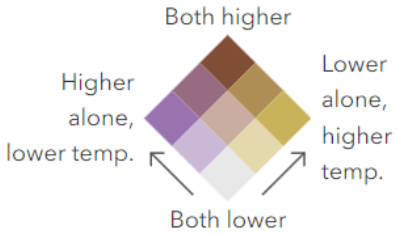
LST subscore

Demographic variable subscore + LST subscore =
Demographic variable risk score

Population living alone

People living alone

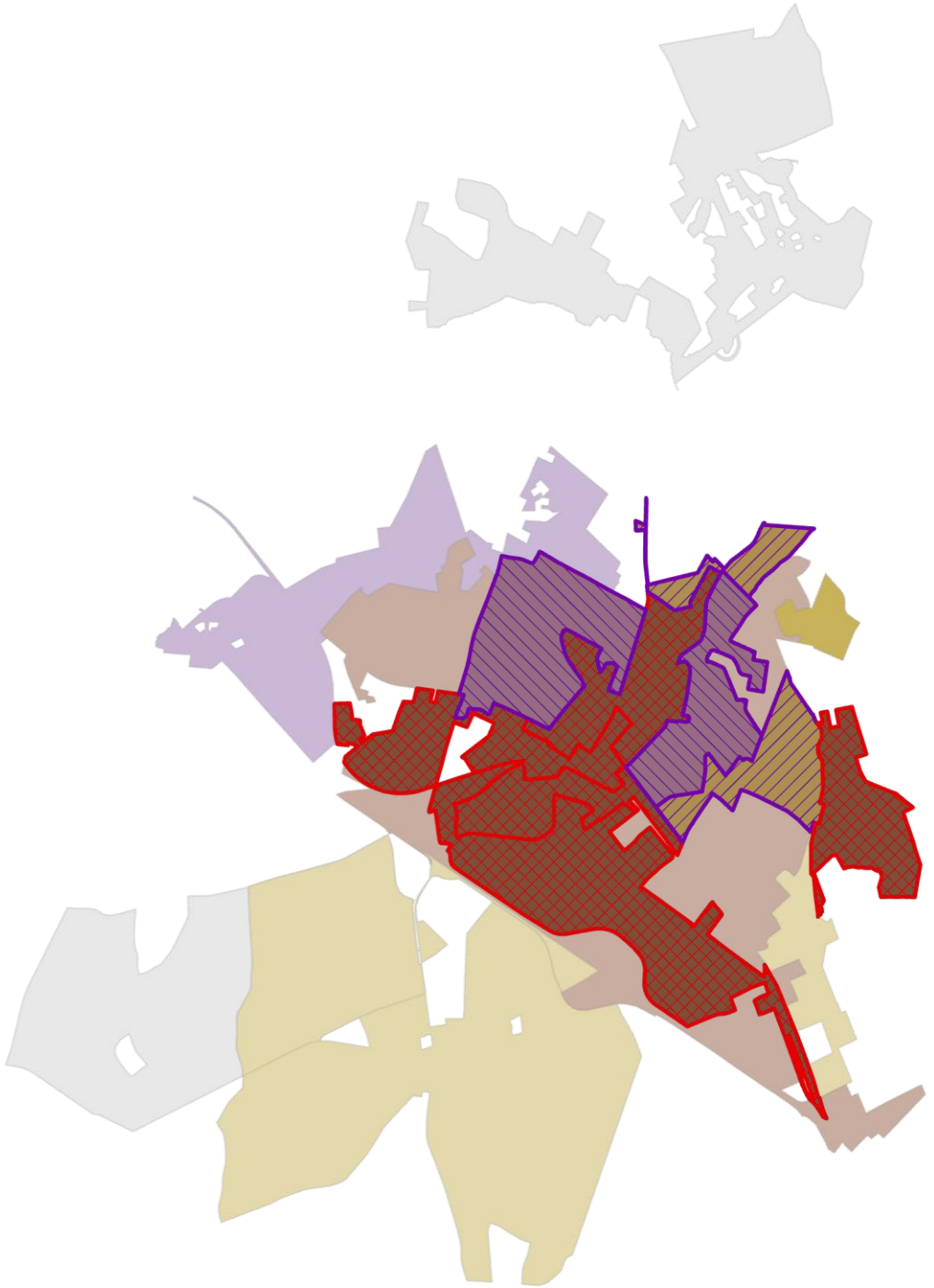
Median land surface temperature



Moderate alone, high temperature

High alone, moderate heat

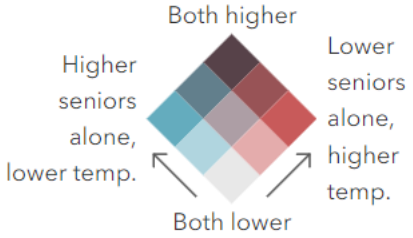
High alone, high heat



Seniors living alone (age 65+)

People aged 65 or older living alone

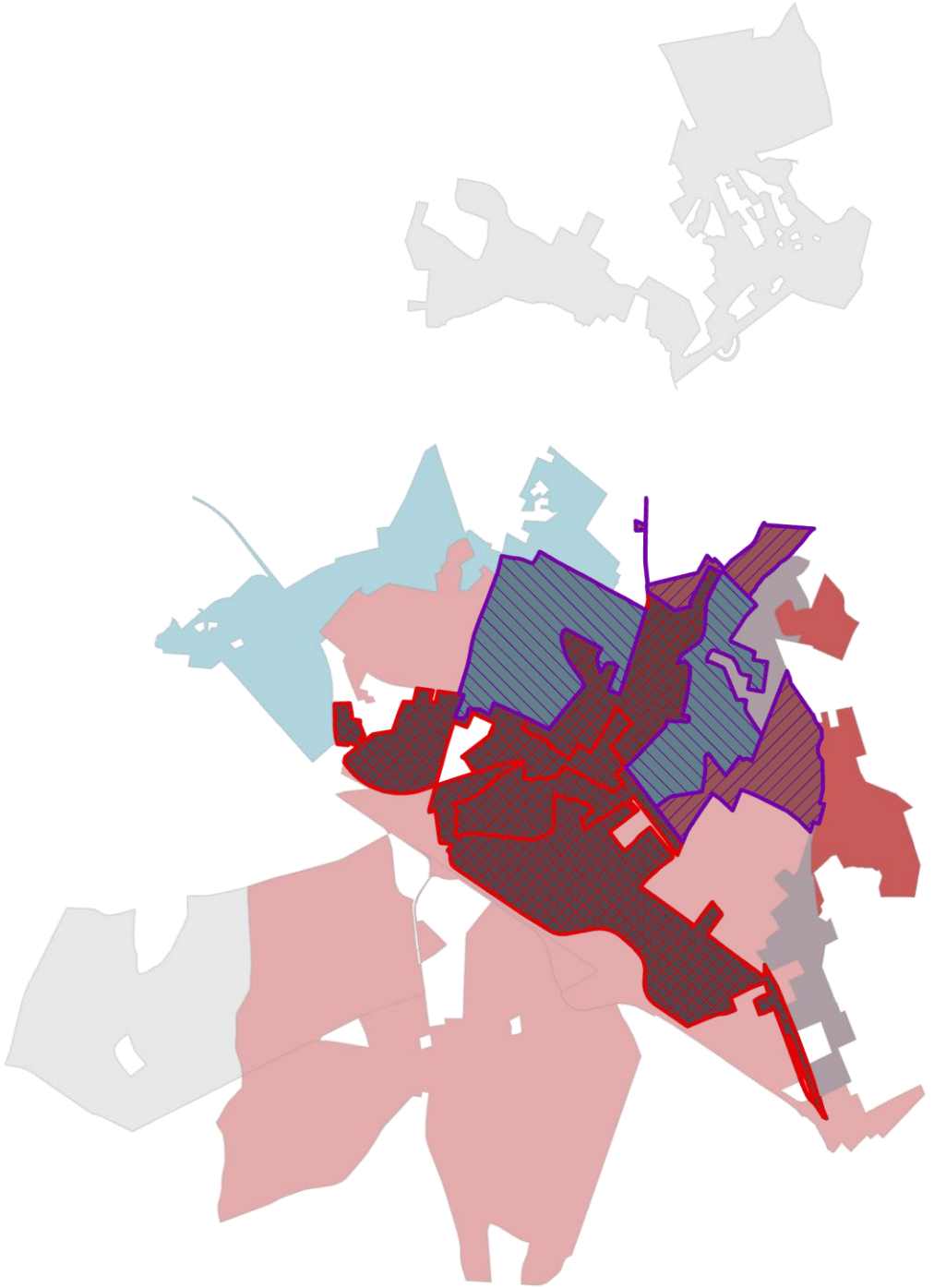
Median land surface temperature



Moderate seniors alone, high temperature

High seniors alone, moderate heat

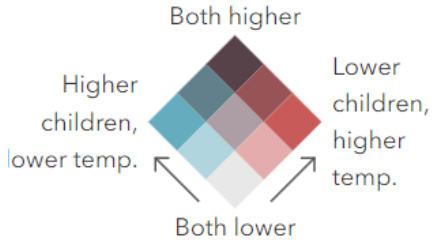
High seniors alone, high heat



Young children (age ≤ 5)

Children aged 0 to 5

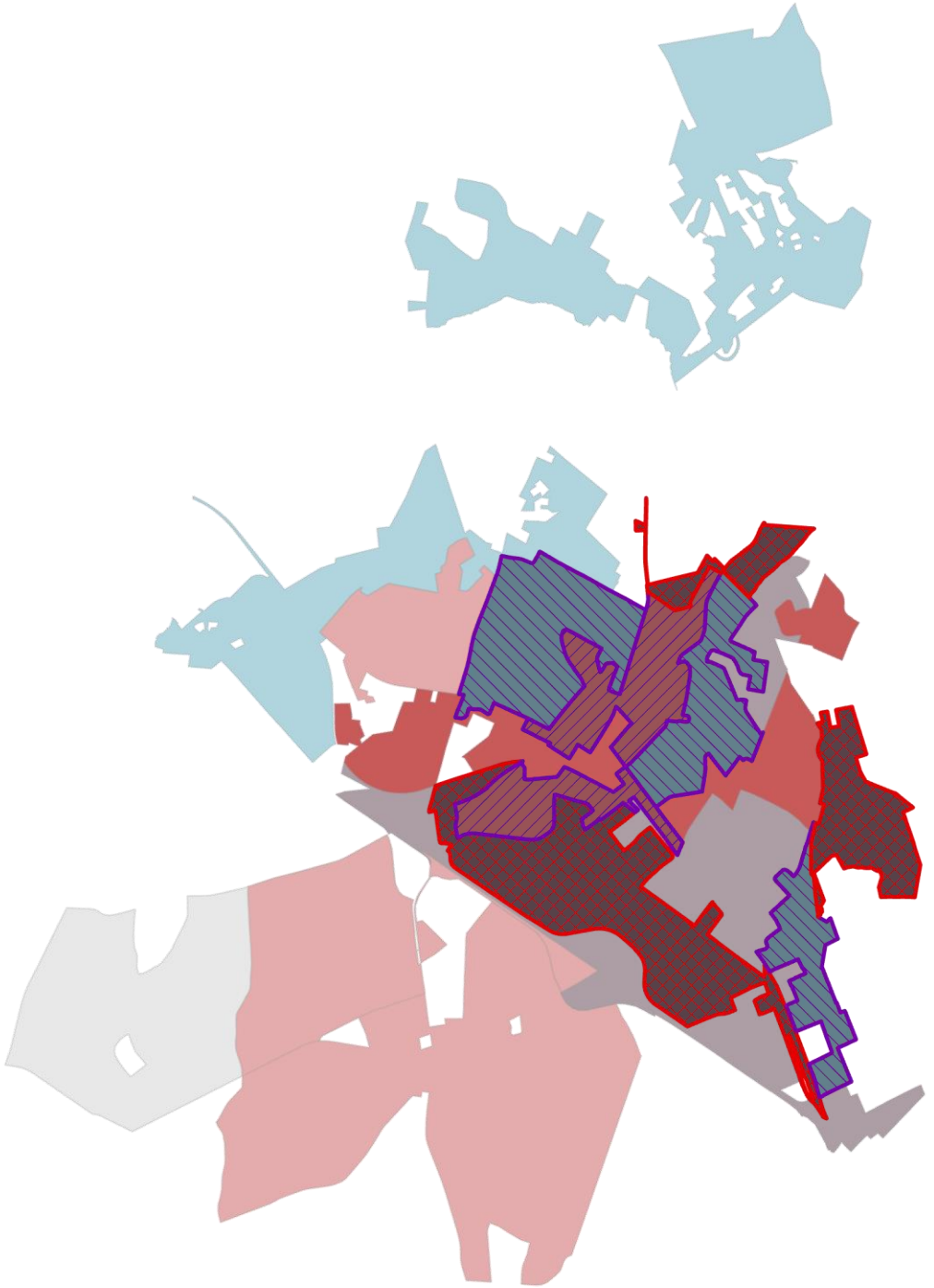
Median land surface temperature



Moderate children, high temperature

High children, moderate heat

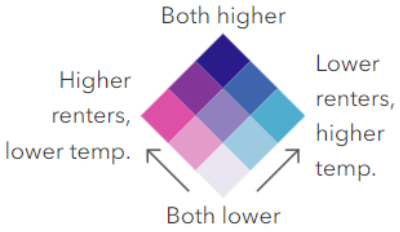
High children, high heat



Renters

Renter-occupied households

Median land surface temperature



Moderate renters, high temperature

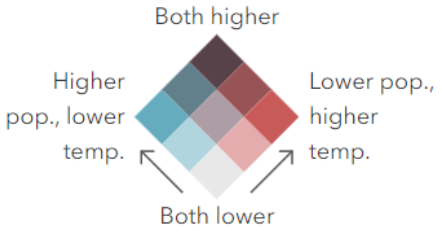
High renters, moderate heat

High renters, high heat

Hispanic or Latino population

↖ Hispanic or Latino

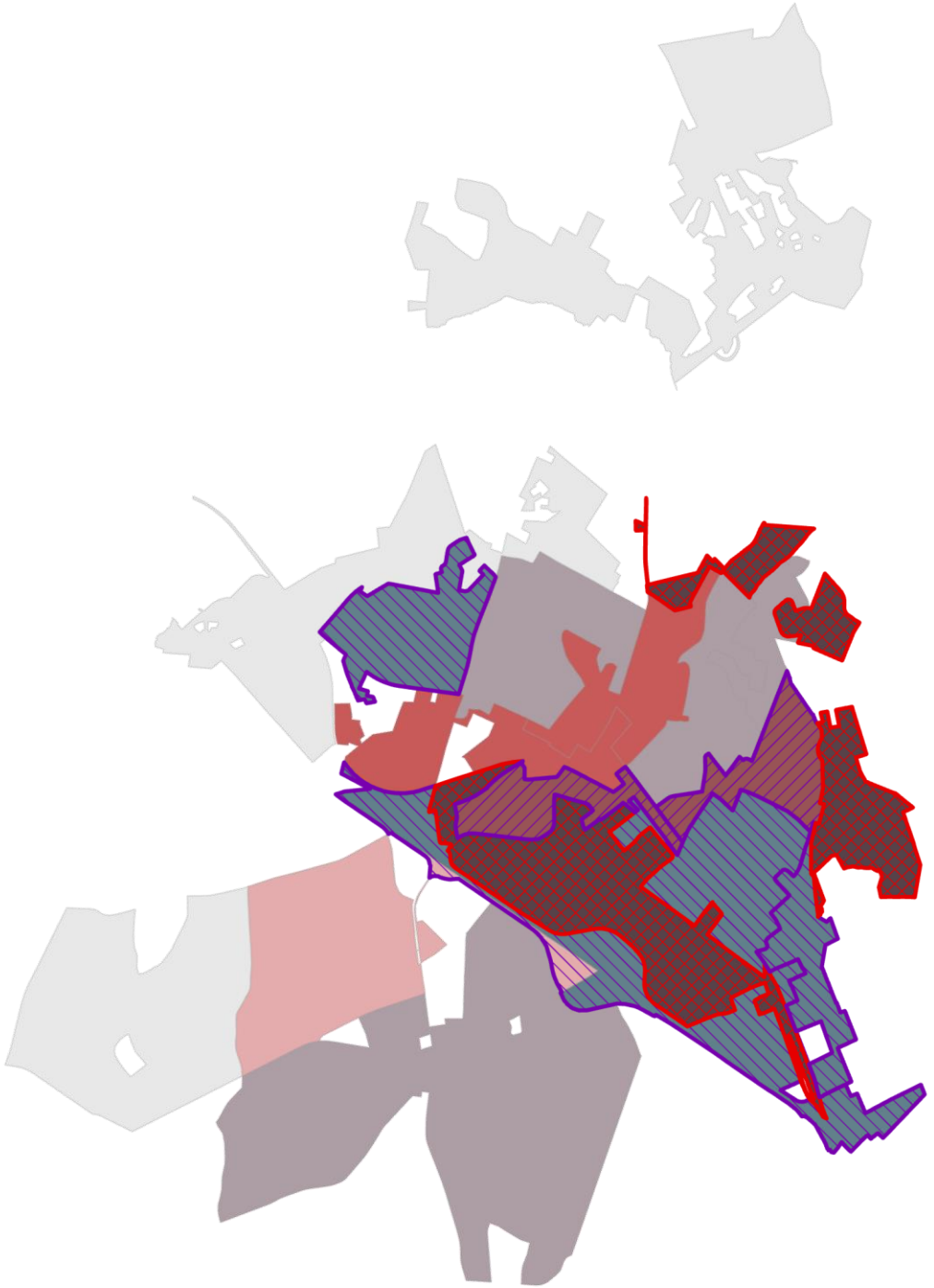
↗ Median land surface temperature



Moderate pop., high temperature

High pop., moderate heat

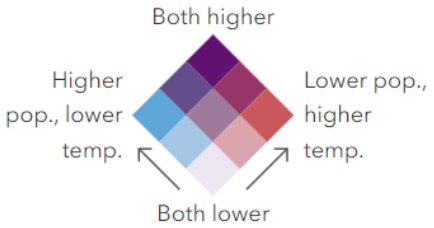
High pop., high heat



Black population

↖ Black or African American alone

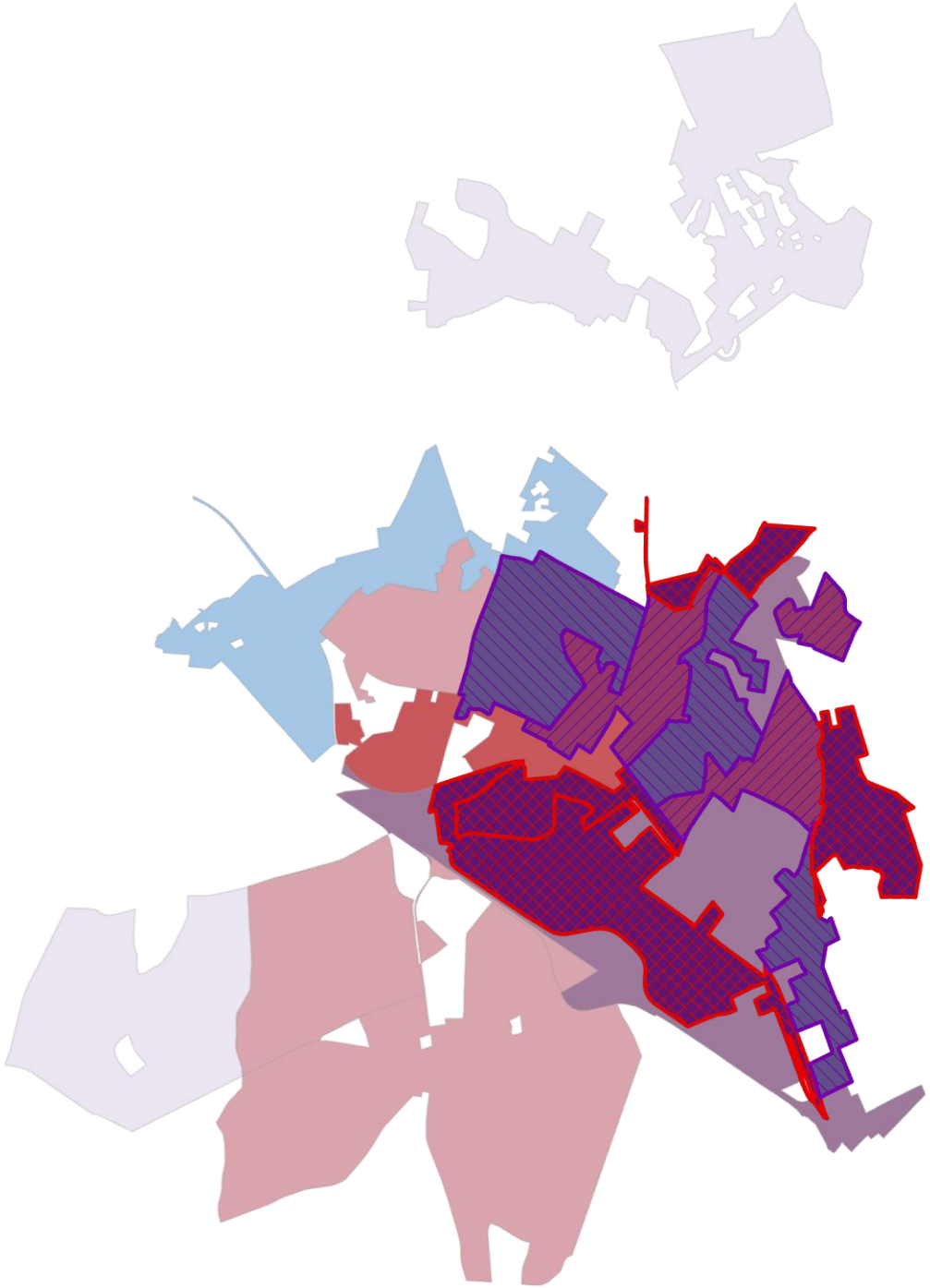
↗ Median land surface temperature

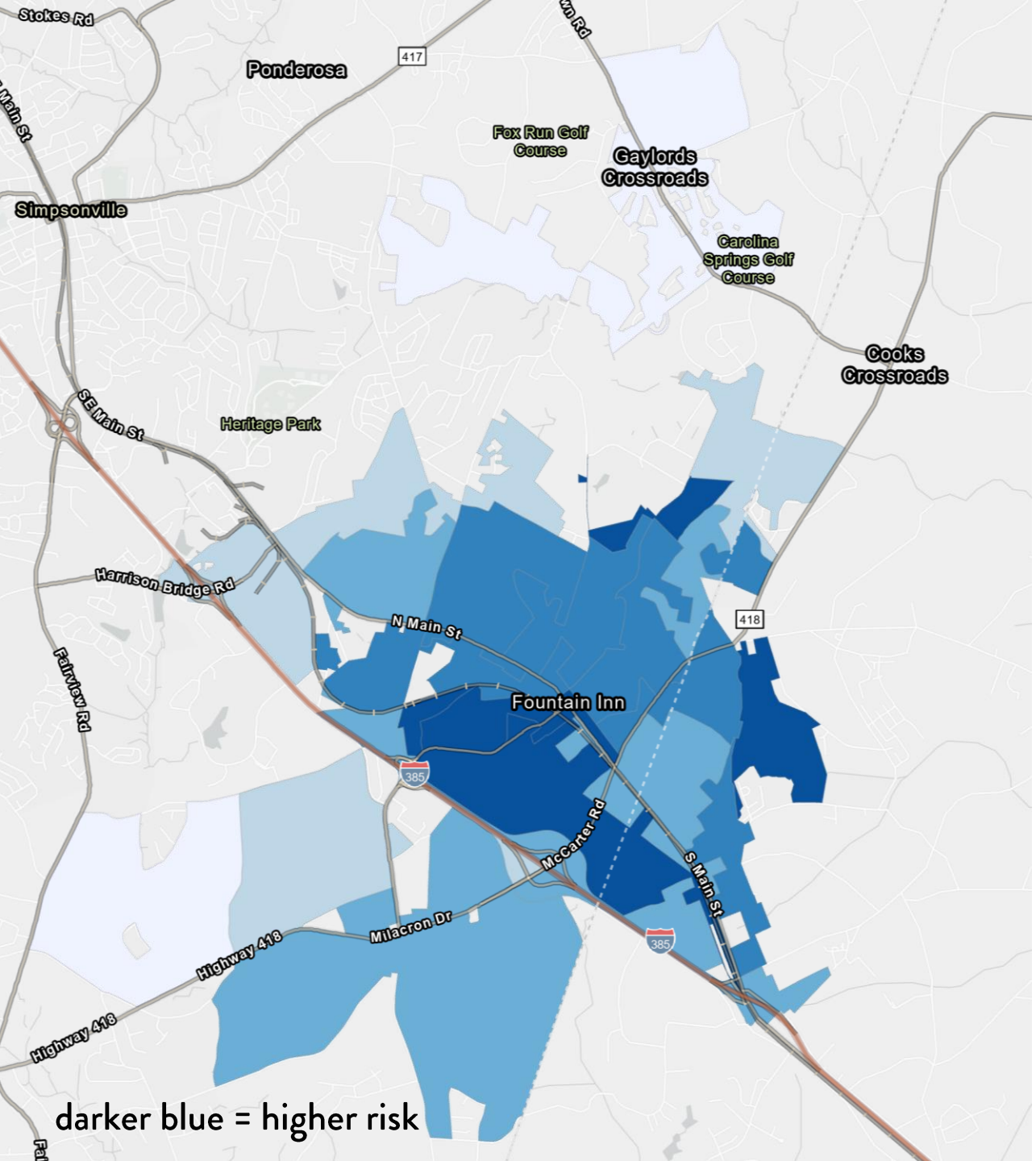


Moderate pop., high temperature

High pop., moderate heat

High pop., high heat





Composite risk score

Living alone risk score
\+ Black population risk score
\+ Children 0-5 risk score
\+ Hispanic population risk score
\+ Living alone (65)+ risk score
\+ Renters risk score

Composite risk score

Composite risk

Region ID	4	12	5	16
Total population	1008	724	498	470
Living alone	1	1	1	0.5
Black residents	1	1	1	1
Children	1	1	0.5	1
Hispanic residents	1	1	0.5	1
Seniors living alone	1	0.5	1	0.5
Renters	1	0.5	1	0
Composite risk	12	11	11	10

Example: Region 12

Reasons for high composite risk:

- High heat
- Lots of young children
- Lots of people living alone
- High Black and Hispanic population

Example: Region 12

Reasons for high composite risk:

- High heat
- Lots of young children
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- High Black and Hispanic population

Recommendations Integrate Resilience Across Elements

1. **Improve tree canopy in at-risk areas with high surface temperatures.** Focus on areas where high heat intersects with social vulnerability.
2. **Add shade to bus stops.** The two bus stops that are currently located in Fountain Inn are in areas covered by pavement.
3. **Introduce a tree ordinance.** Discourage large-scale tree canopy removal and create tree planting funds to supplement tree loss from development.
4. **Provide education to caretakers and individuals that are at risk.** In particular, expectant parents, elderly residents, young children, residents from under-resourced communities, and those with pre-existing medical conditions.

Future goals

- Work with additional municipalities
- Handle existing neighborhood boundaries
  - For example: Greenville's special emphasis neighborhoods
- Involve community in the process

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