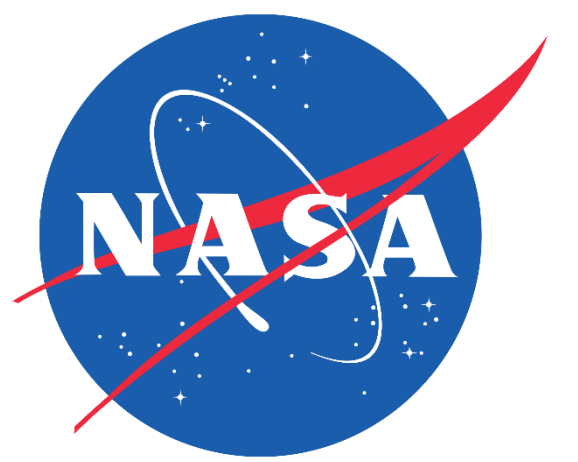




Assessing Land Surface Temperature, Vegetation Cover, and Compounding Vulnerability Factors to Identify High Priority Areas for Cooling Initiatives in Philadelphia, Pennsylvania



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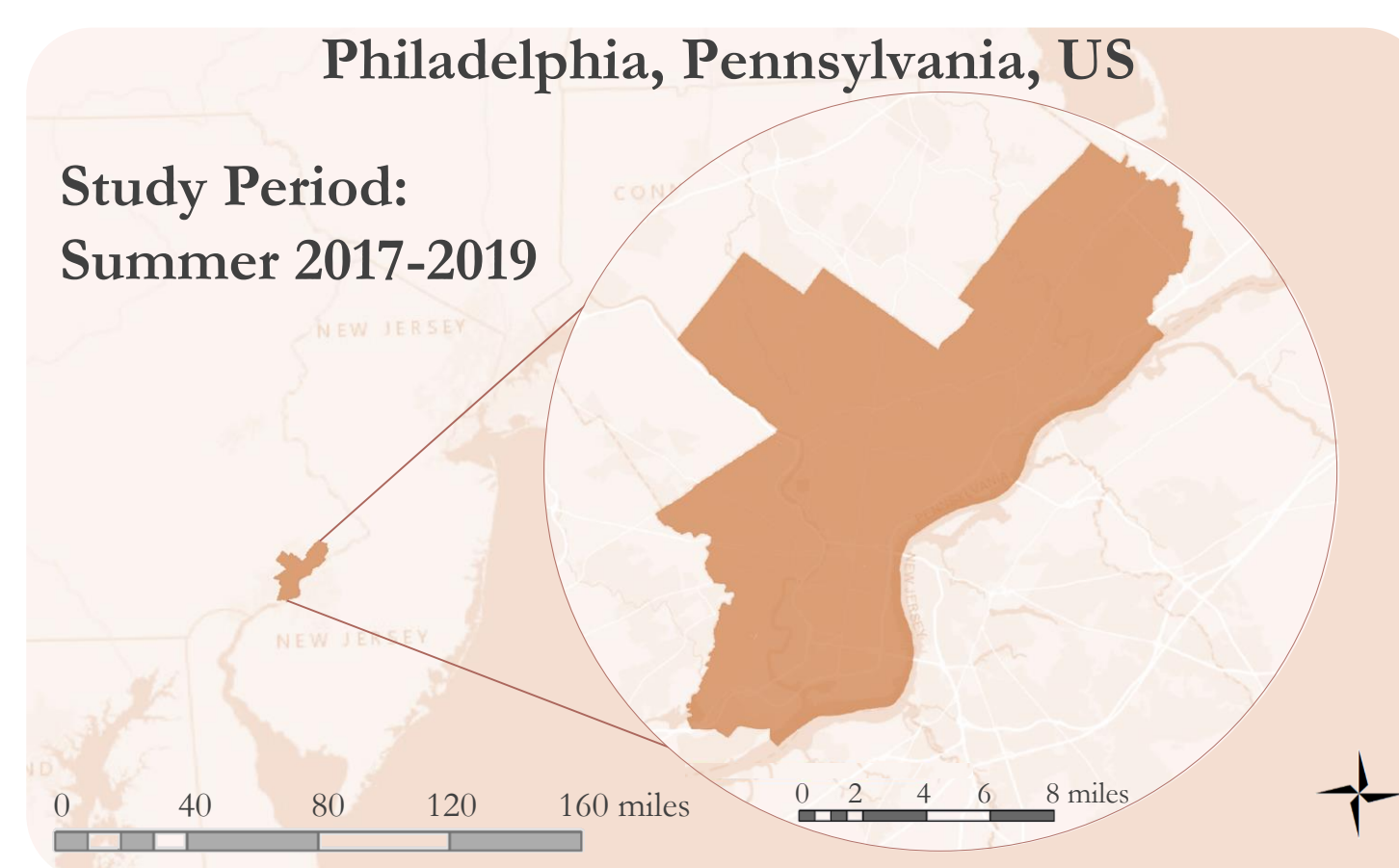
Abstract

Concerns about the effects of extreme heat and poor air quality are increasing in North America's largest urban centers. In Philadelphia, environmental and public health groups are concerned about how these phenomena disproportionality affect marginalized communities and populations, which often have extensive impervious surfaces and little access to green space. In order to address these concerns, the Philadelphia Department of Public Health and the Office of Sustainability seek to effectively prioritize cooling initiatives to reduce urban heat and decrease air pollutants. We evaluated land surface temperature (LST) and the Normalized Difference Vegetation Index (NDVI), as a measure of overall greenness, obtained from NASA Earth observations Aqua and Terra Moderate Resolution Imaging Spectroradiometer (MODIS), and the Ecosystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS). These analyses were combined with local tree inventory, air quality, and socioeconomic data through a multivariate analysis to identify areas where new trees or cooling adaptations are most needed. The results and data of this project can be used by our partners to inform both short-term heat relief planning and a long-term, multi-agency heat response.

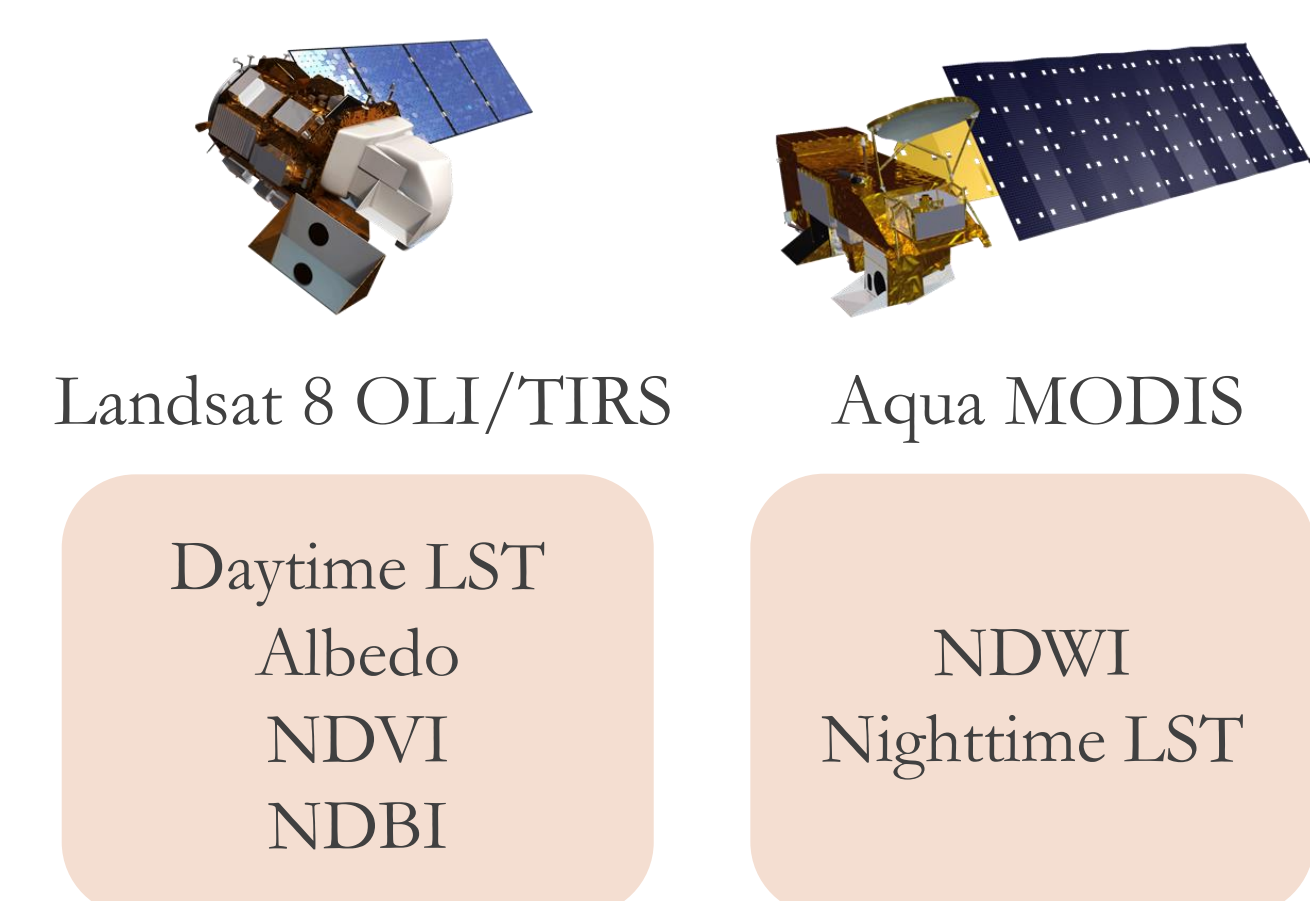
Objectives

- ▶ **Assess heat vulnerability** within Philadelphia based on socioeconomic data, health data, and environmental factors derived from Earth observations
- ▶ **Identify priority areas** for heat mitigation and resilience-building strategies through principal component analysis
- ▶ **Provide Heat Vulnerability Index map** to be made available to the public
- ▶ **Highlight tree planting** initiative opportunities in vulnerable census tracts

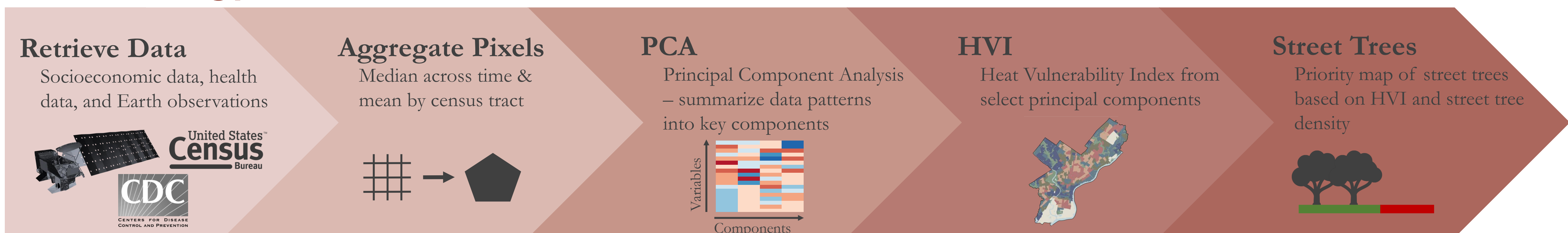
Study Area



Earth Observations

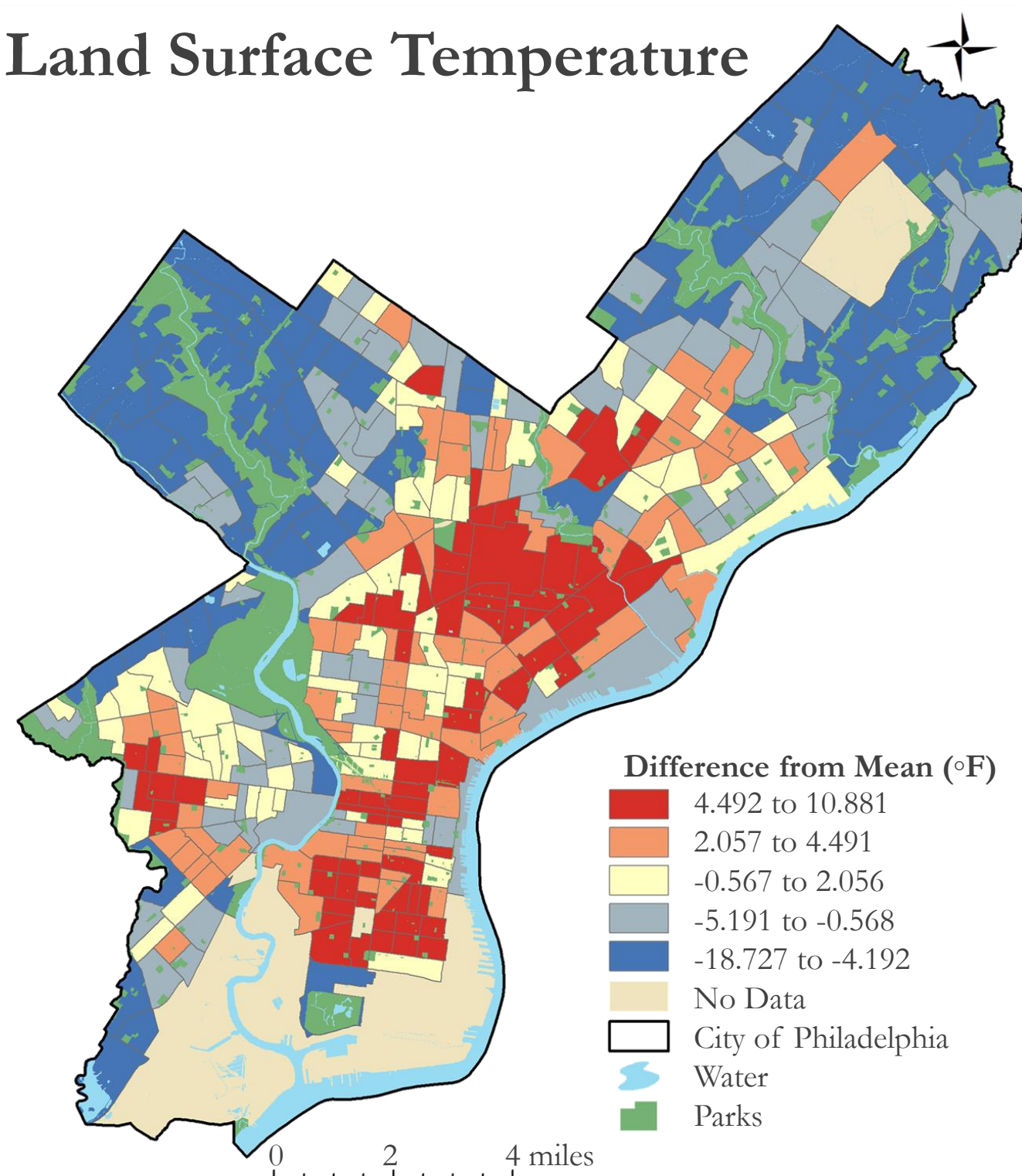


Methodology

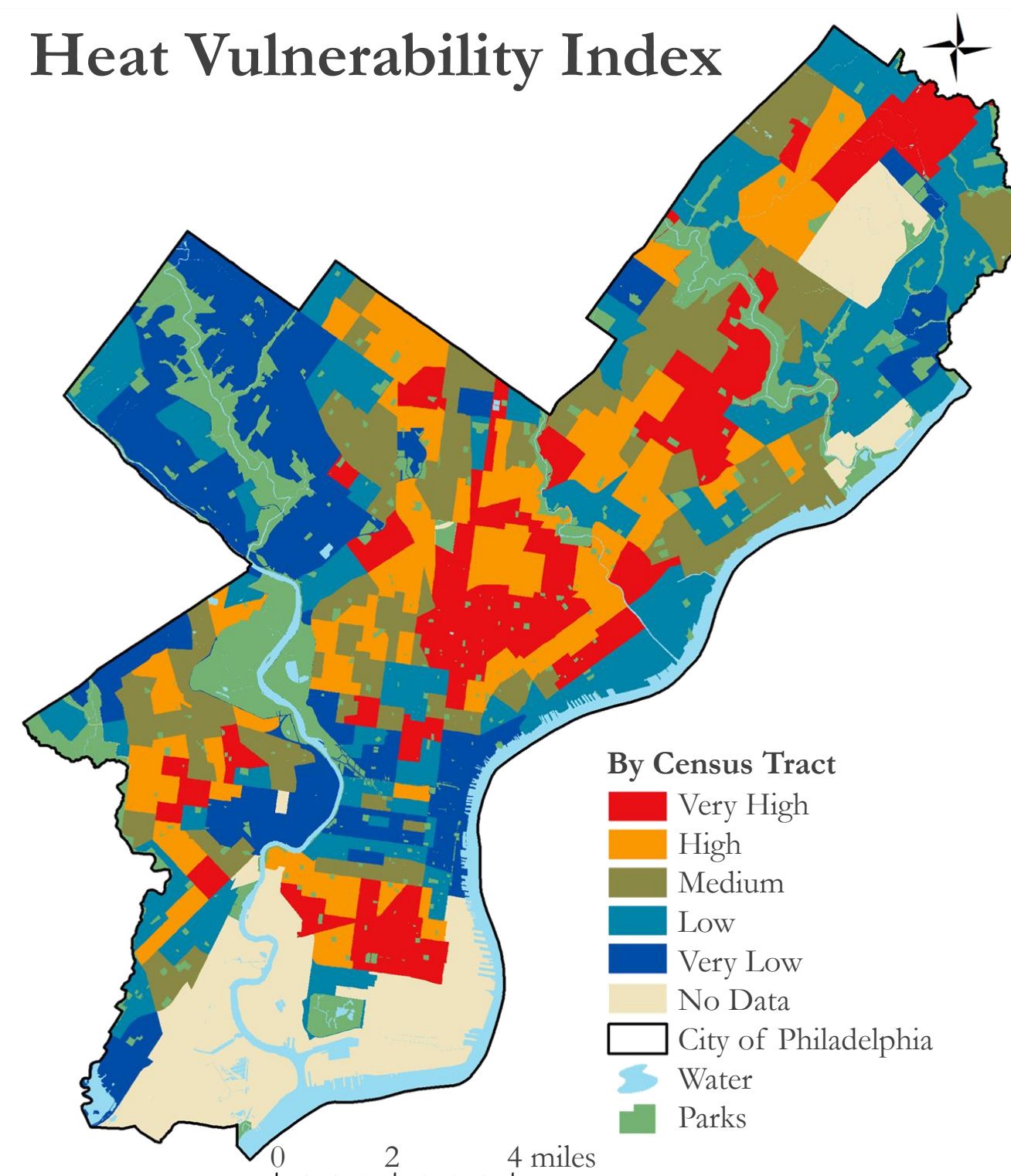


Results

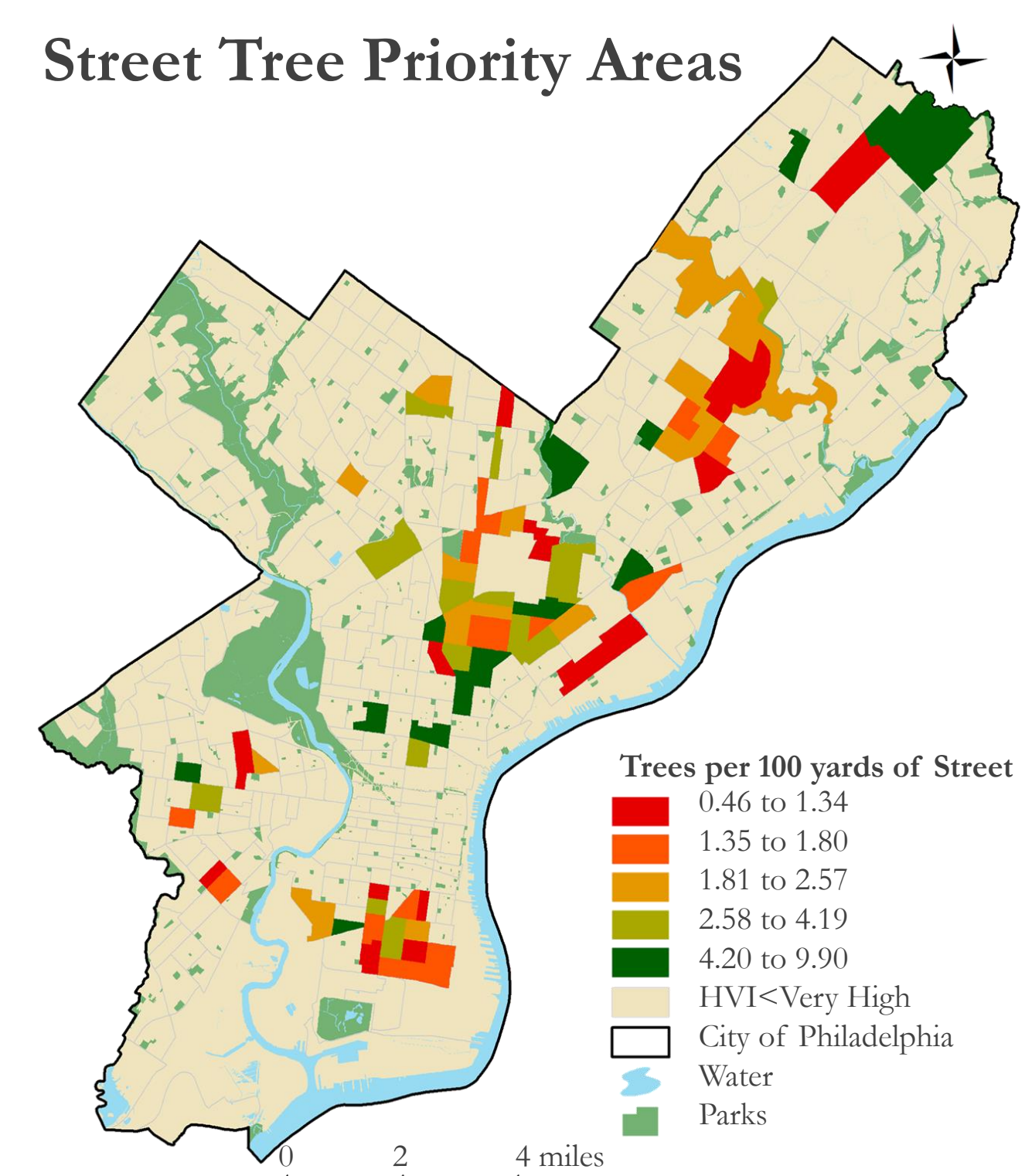
Land Surface Temperature



Heat Vulnerability Index



Street Tree Priority Areas



Conclusions

- ▶ The highest heat exposure in Philadelphia is in densely populated residential areas.
- ▶ Four principal components (PC1 – socioeconomic factors and chronic health conditions, PC2 – heat exposure and satellite-derived environmental variables, PC3 – a ge and age related illness, PC4 – socio-cultural drivers of heat vulnerability) explain 80% of variance in data.
- ▶ A total of 74 census tracts clustered were identified as high-risk areas for heat-related illnesses. They were classified as 'Very High' for HVI and would benefit most from resilience building and cooling intervention.
- ▶ Fifteen of these census tracts also had very low tree density (lower 20th percentile) and should be targeted for tree planting initiatives.

Project Partners

- ▶ Philadelphia Department of Public Health
- ▶ City of Philadelphia, Office of Sustainability

Acknowledgements

NASA DEVELOP:
Dr. David Hondula - Science Advisor, Arizona State University
Crystal Wespestad - NASA DEVELOP Fellow/Lead

Partners:
Philadelphia Department of Public Health: **Jason Hammer, Jessica Caum, & Alexandra Skula**
City of Philadelphia, Office of Sustainability: **Saleem Chapman**