Identifying Optimal Regions within New Jersey's Pine Barren Forest for Urban Development Based on Wildfire Risk and the Wildland Urban-Interface Theory

Abstract

As New Jersey's population increases, more of this population is relocating to the wildland-urban interface (WUI) of the south-central Pinelands region. Due to this increase in human activity coupled with local environmental conditions, local authorities are concerned about an increased possibility of wildfires that could damage both the area's infrastructure and ecosystem. To counteract this risk, it is necessary to develop methods for accurate wildfire assessment and mitigation efforts. This project partnered with the New Jersey Pinelands Commission (NJPC) to develop a Fire Risk Assessment Tool that identifies areas with high fire risk based on land cover characteristics. The team incorporated vegetation indices derived from Landsat 8 Operational Land Imager (OLI) and Sentinel-2 Multi-Spectral Instrument (MSI), land-use classification derived from LANDFIRE data and elevation into a fuzzy logic model to generate a 30 x 30 m Fire Risk Assessment Map. The map was used to analyze fire susceptibility in the Pinelands WUI and to identify optimal areas for urban expansion. Fifty-three percent of the total area within the Pinelands WUI was classified as having a moderate fire risk, while high and extremely-high fire risk accounted for 13%. An estimated 200,000 acres of land with a low to moderate risk of fire were identified as areas that would be suitable for development. The results and maps produced will be used by the New Jersey Pinelands Commission to guide urban development planning and decision making.

Objectives

▸ **Classify** fire risk throughout the study area and ensure the usability of the Fire Risk Assessment Tool by use by the New Jersey Pinelands Commission

▸ **Analyze** fire risk in the Pinelands WUI to aid our partners in identifying suitable areas for urban development

▸ **Locate** areas where our partners should apply fire mitigation efforts to minimize fire induced economic and infrastructure losses
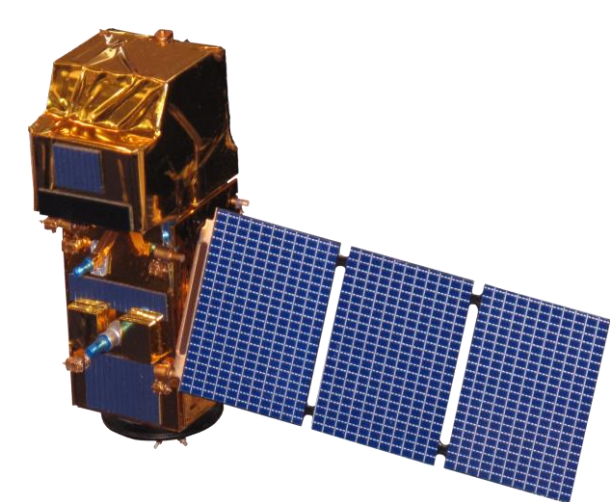
Project Partner

▸ New Jersey Pinelands Commission

Study Area

Pinelands Management Area
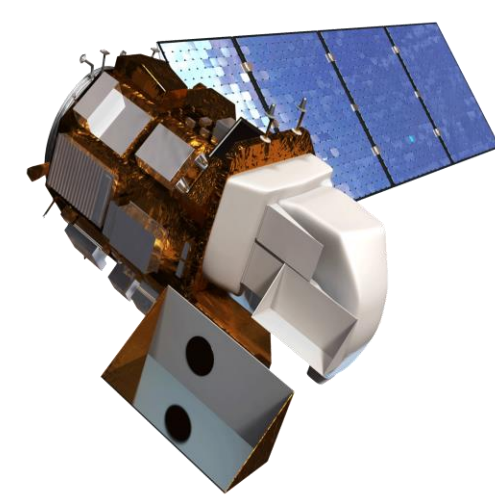Study Area
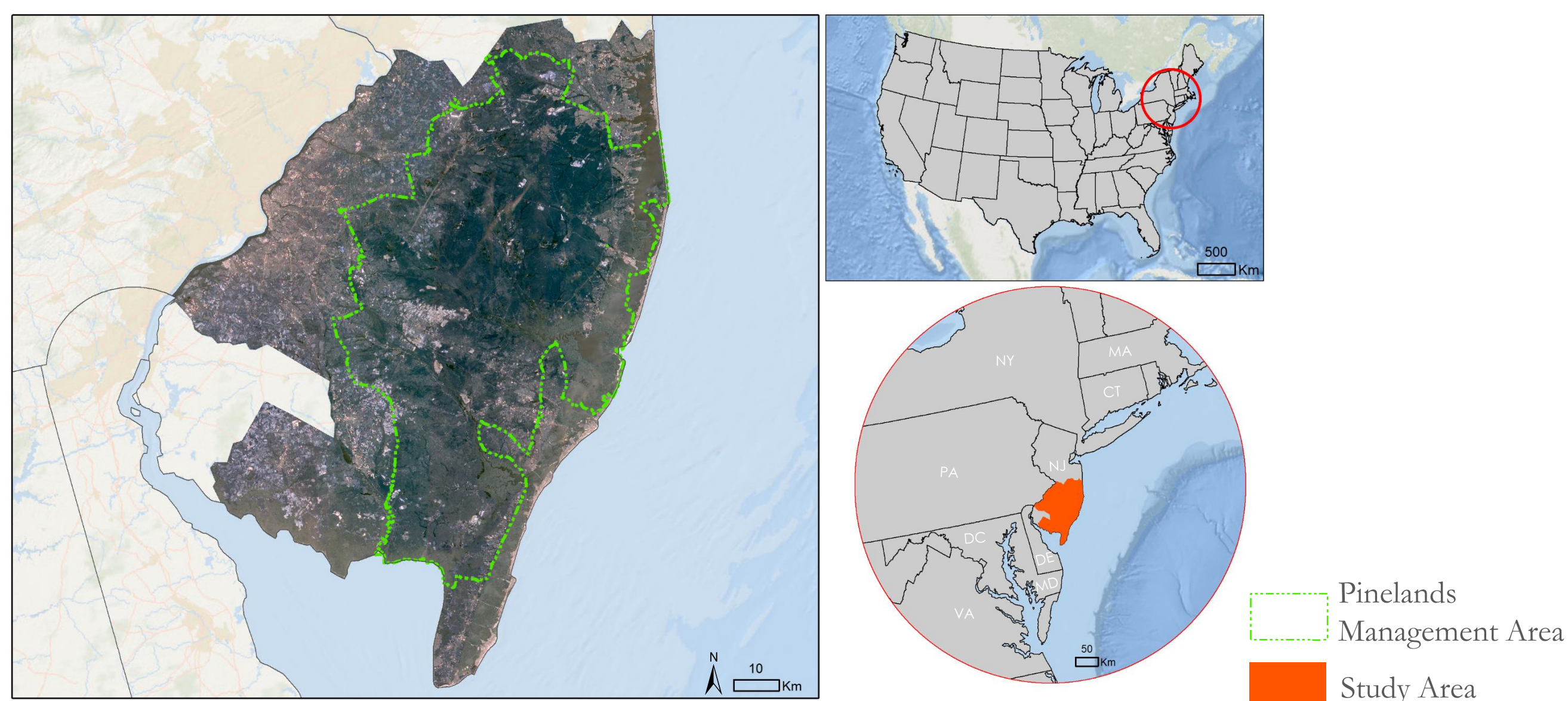
Earth Observations

Sentinel-2 Multi-Spectral Instrument (MSI)

Landsat 8 Operational Land Imager (OLI)

Team Members

Man Kumari Giri
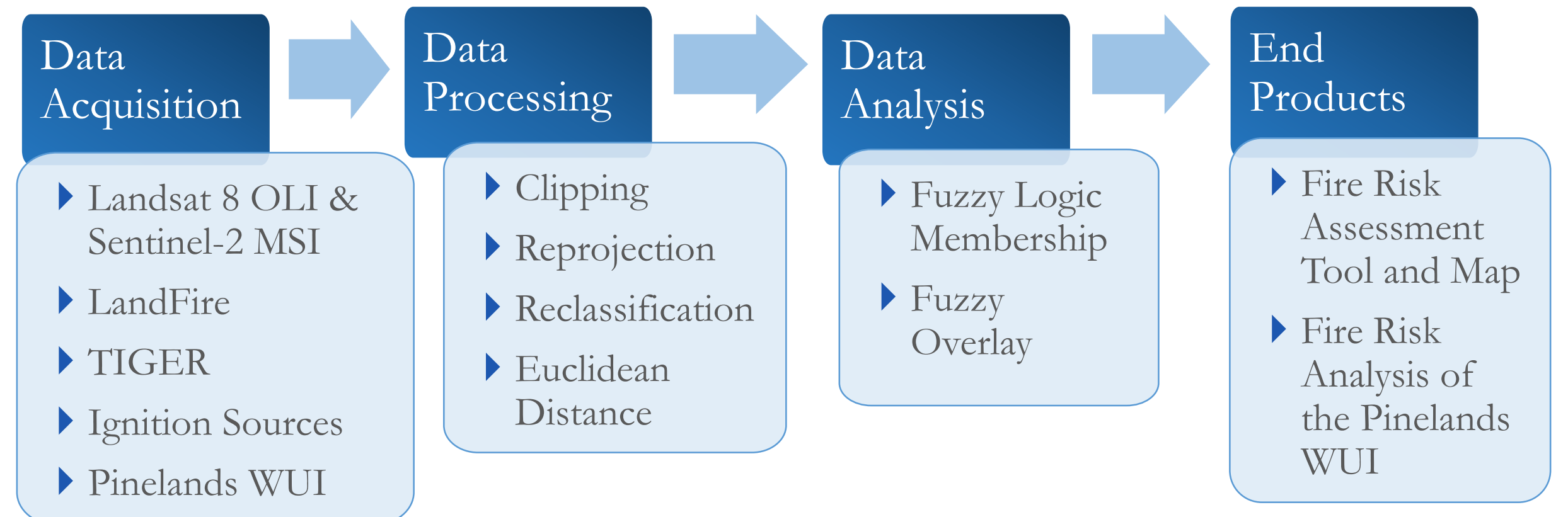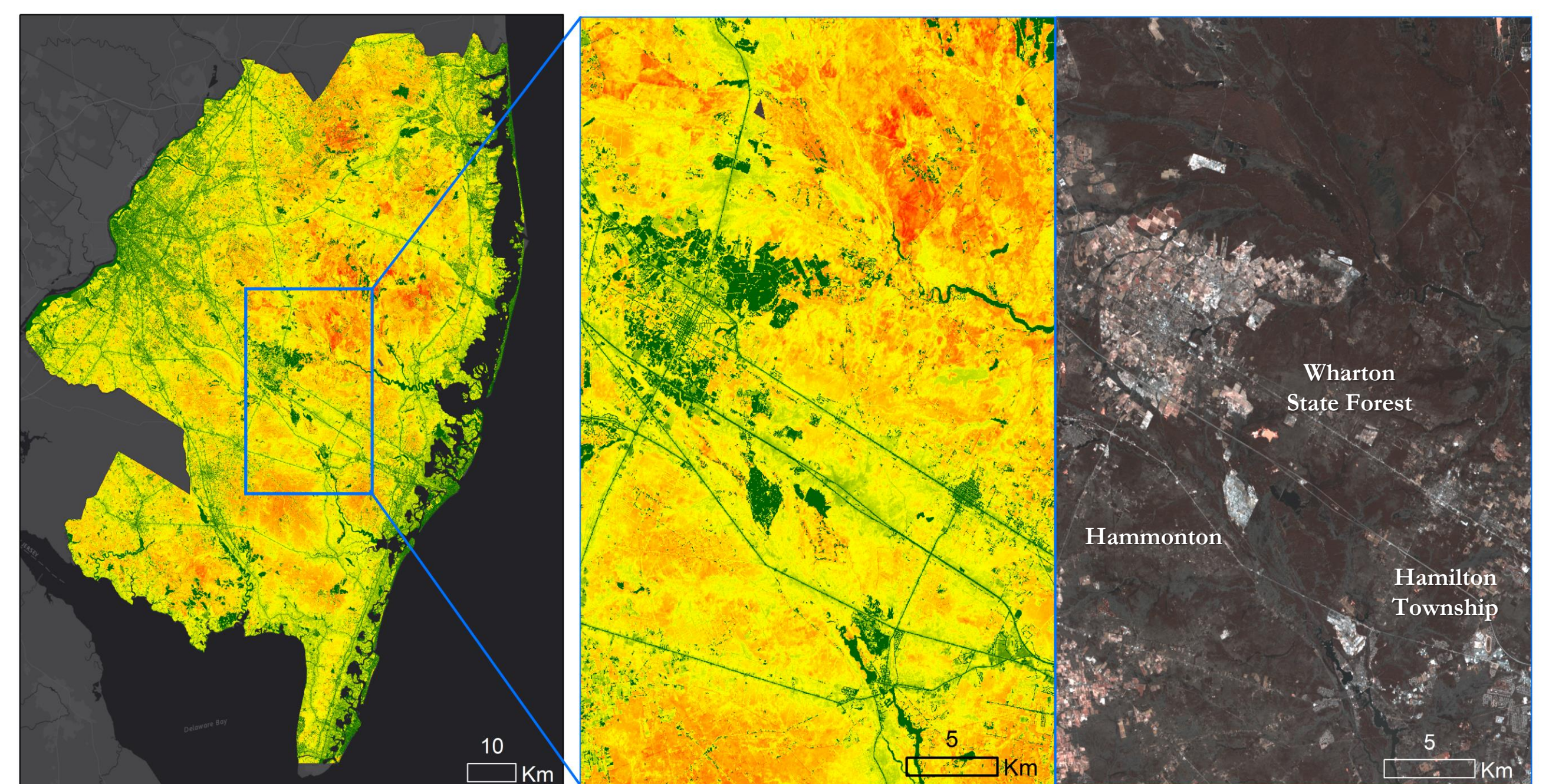Project Lead

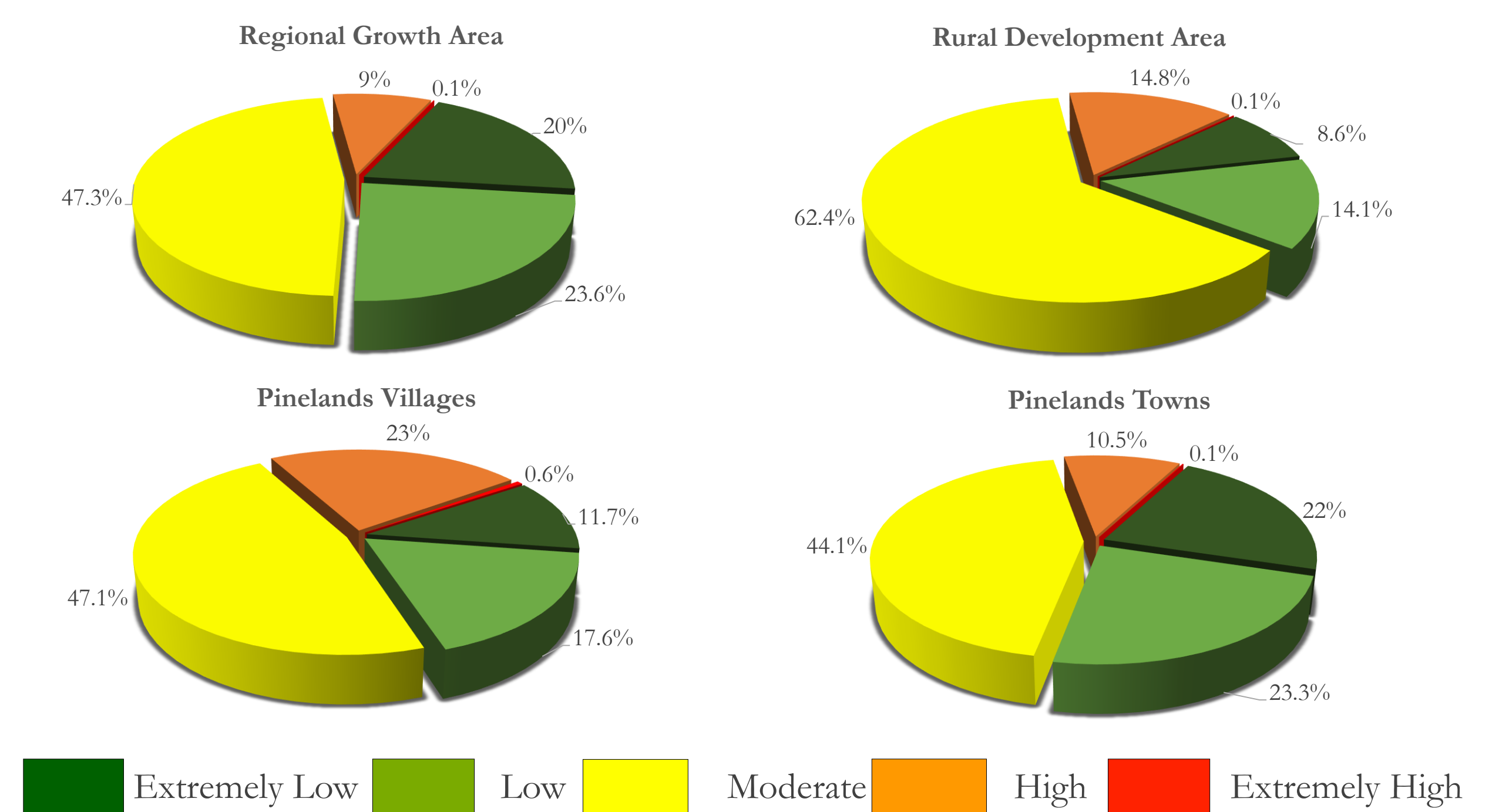Mercedes Bartkovich

Olivia Buchanan

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Methodology

Data Acquisition	Data Processing	Data Analysis	End Products
▸ Landsat 8 OLI & Sentinel-2 MSI ▸ LandFire ▸ TIGER ▸ Ignition Sources ▸ Pinelands WUI	▸ Clipping ▸ Reprojection ▸ Reclassification ▸ Euclidean Distance	▸ Fuzzy Logic Membership ▸ Fuzzy Overlay	▸ Fire Risk Assessment Tool and Map ▸ Fire Risk Analysis of the Pinelands WUI

Results

Fire Risk Assessment Map

Wharton State Forest

Hammonton

Hamilton Township

Fire Risk Analysis of the Pinelands WUI

Regional Growth Area
9% 0.1% 20% 47.3% 23.6%

Rural Development Area
14.8% 0.1% 8.6% 62.4% 14.1%

Pinelands Villages
23% 0.6% 11.7% 47.1% 17.6%

Pinelands Towns
10.5% 0.1% 22% 44.1% 23.3%

■ Extremely Low ■ Low ■ Moderate ■ High ■ Extremely High

Conclusions

▸ 53% of the Pinelands WUI were classified as moderate to low fire risk areas, while only 13% were classified as high to extremely high fire risk areas.

▸ Approximately 200,000 acres of the WUI would unsuitable for development based on fire risk.

▸ The New Jersey Pinelands commission will use the Fire Risk Assessment Map for urban development decision-making and planning.

▸ The Fire Risk Assessment Tool will be used by our partner to generate up-to-date fire risk maps in the future.

Acknowledgements