

Utilizing Earth Observations to Assist Groundwork New Orleans in Reducing Flood Vulnerability in New Orleans

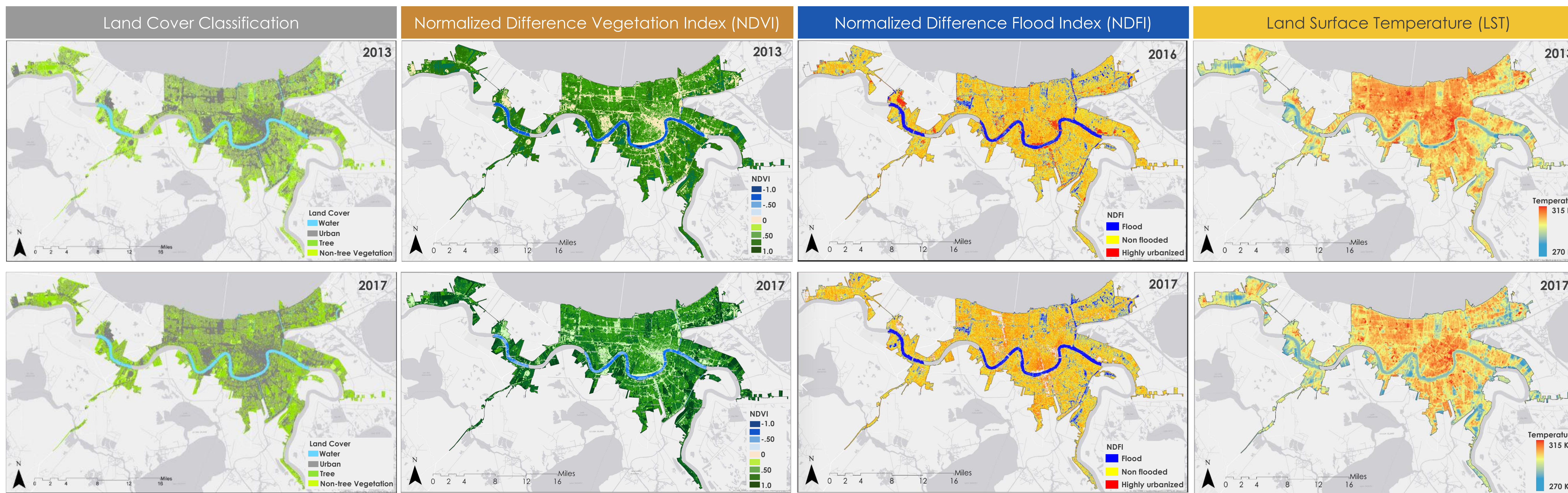


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Abstract

The geographical setting of the city of New Orleans makes it particularly vulnerable to flooding. Much of the heavily populated areas of the city sit at elevations below sea level. The city itself is situated at the mouth of the Mississippi river along the Gulf of Mexico coast and lies within a subtropical climate marked by frequent severe storms. The susceptibility of the city to flooding is exacerbated by rising sea level and continuing land subsidence. Many areas of the city experience frequent localized flooding that causes damage to commercial and residential property. Groundwork New Orleans (GWNO), a local trust of the non-profit organization Groundwork USA, works to mitigate flooding in underserved communities within the city through the implementation of green infrastructure projects such as tree planting campaigns. The current methods of site selection for tree planting projects involve costly and time-consuming in-situ measurements. The New Orleans Urban Development project partnered with GWNO to create several map products using Earth Observations and remote sensing to assess the impacts of GWNO projects up to present, as well as to build the partner's capacity in remote sensing to supplement their current planning practices. Landsat 8 Operational Land Imager (OLI) and Sentinel-2 Multispectral Instrument (MSI) scenes from the summer of 2013 through 2017 were utilized to create land cover classifications to examine changes in urban tree canopy and to calculate the Normalized Difference Vegetation Index (NDVI) to study changes in impervious surface cover. Landsat 8 Thermal Infrared Sensor (TIRS) imagery collected during the same time period was utilized to assess changes in the land surface temperature and was compared with land classification and NDVI products. Sentinel-1 C-Band Synthetic Aperture Radar (C-SAR) imagery collected for dates of a known flood event was used to generate flood extent maps to highlight vulnerable areas for comparison with the other end products.

Results



Conclusions

- ▶ Flood extent analysis showed an increasing trend in the spatial pattern of flooded areas from 2016 to 2017 in the eastern half of New Orleans. The City Park, Seabrook, and areas near the Lower Ninth Ward regions are more vulnerable to frequent flooding.
- ▶ Land surface temperature decreased from 2013 to 2017. Within the urban areas, impervious surfaces had higher land surface temperatures than areas with more green space. Downtown New Orleans is more vulnerable to the urban heat island effect.
- ▶ Land cover classification demonstrated a slight increase in urban land cover and tree cover, as well as an decrease in non-tree vegetation between 2013 and 2017.

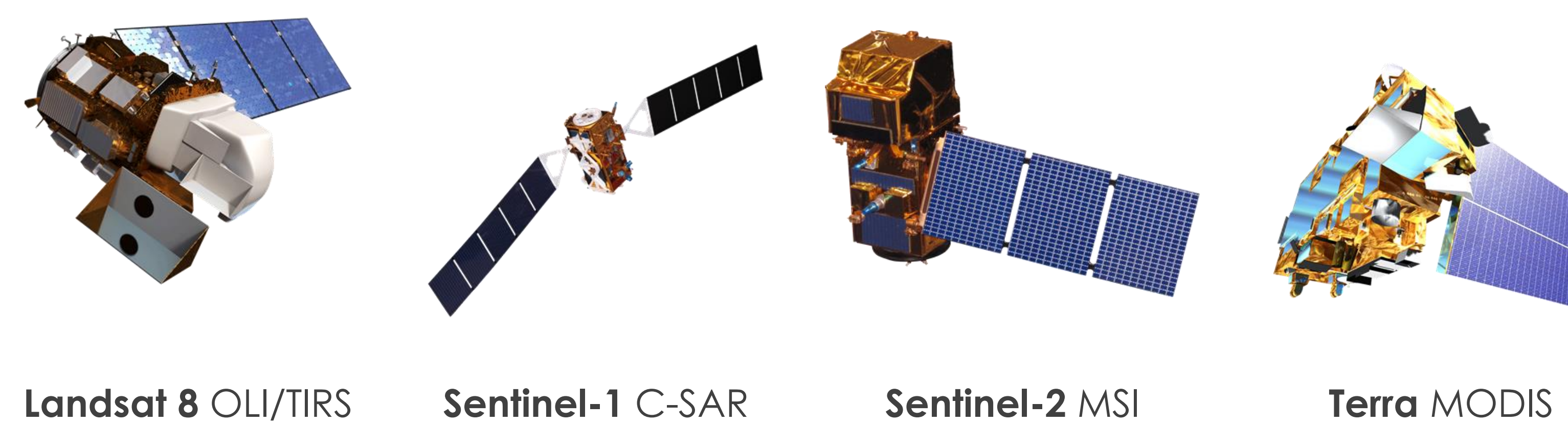
Objectives

- ▶ Identify and monitor canopy cover and gray infrastructure changes to quantify the impacts of the green initiatives of Groundwork New Orleans (GWNO)
- ▶ Produce discrete-time analysis of flood extent utilizing Normalized Difference Flood Index
- ▶ Monitor land surface temperature to determine urban heat island effects on municipal zones with high exposure to surface runoff.

Project Partner

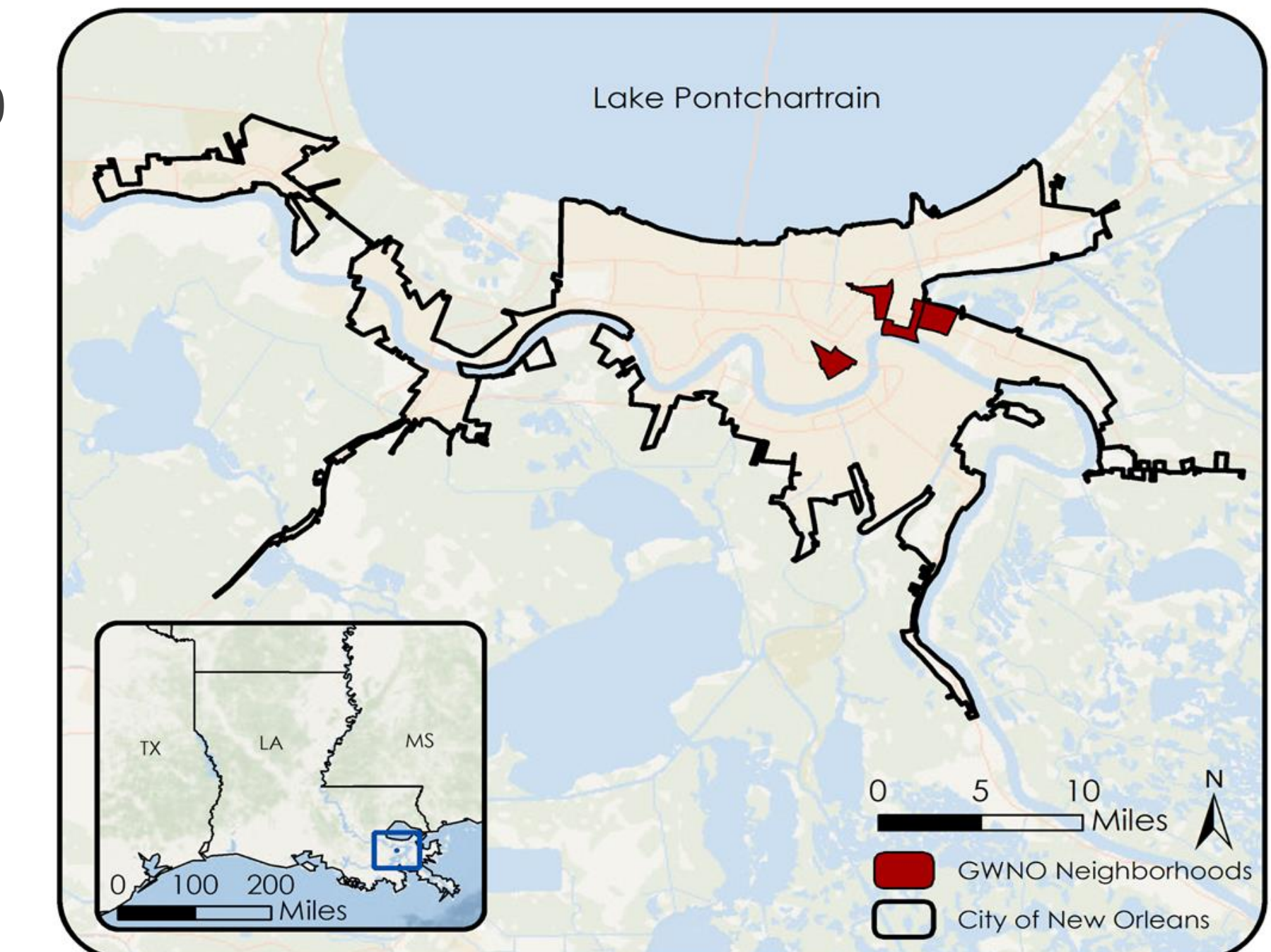
Groundwork USA, Groundwork New Orleans

Earth Observations

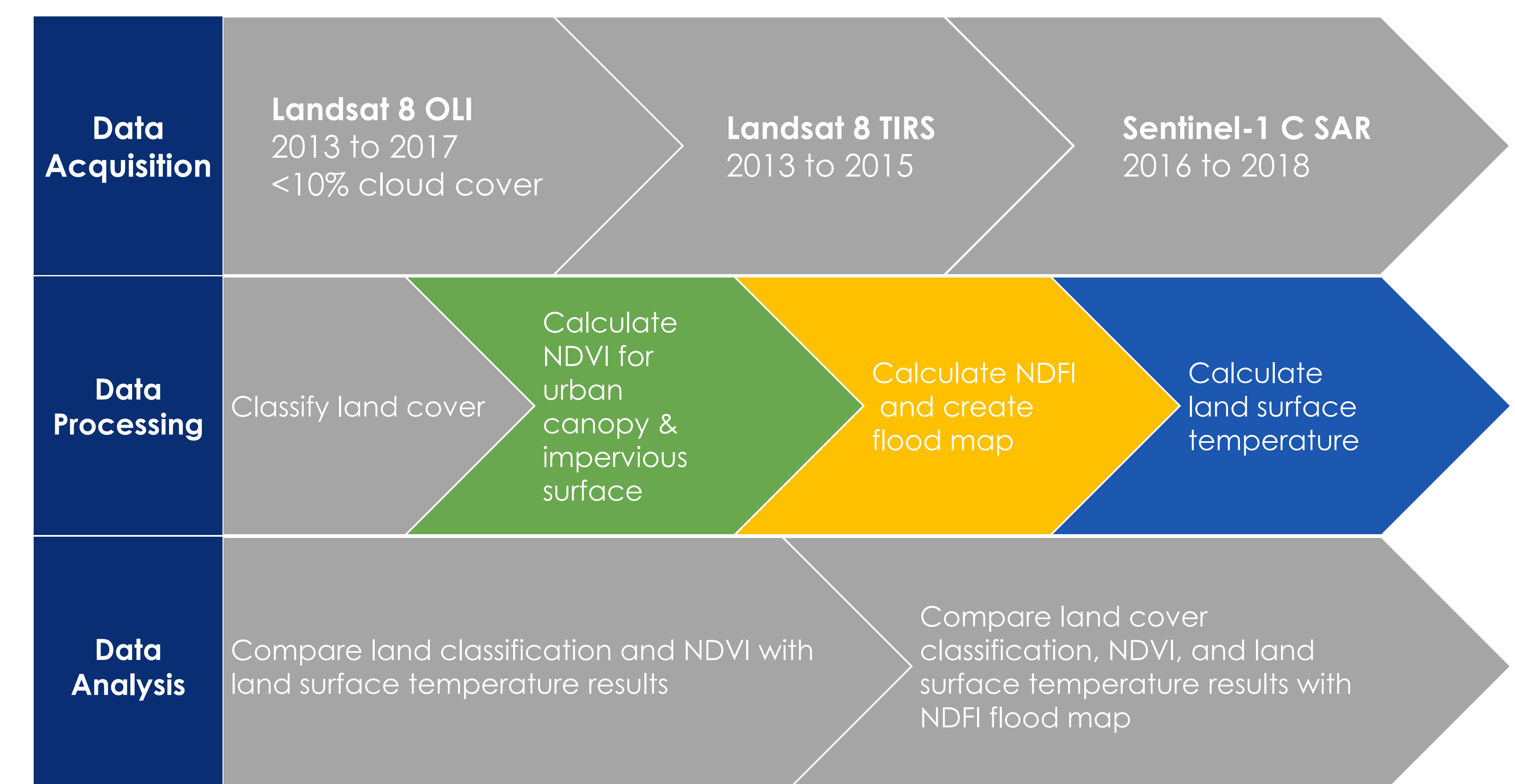


Study Area

- ▶ New Orleans urban areas defined by the United States Census Bureau in 2010
- ▶ Neighborhoods and areas where GWNO specifically operates include:
 - ▶ Lower Ninth Ward
 - ▶ Bywater
 - ▶ St. Roch
 - ▶ Central City
 - ▶ Intersection of Claiborne & Saint Bernard Avenues

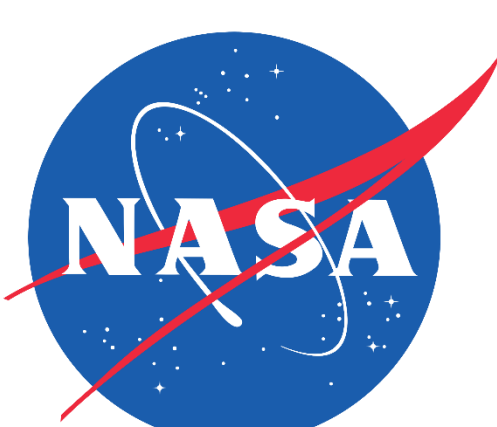


Methodology



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Project Video



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Questions?

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