

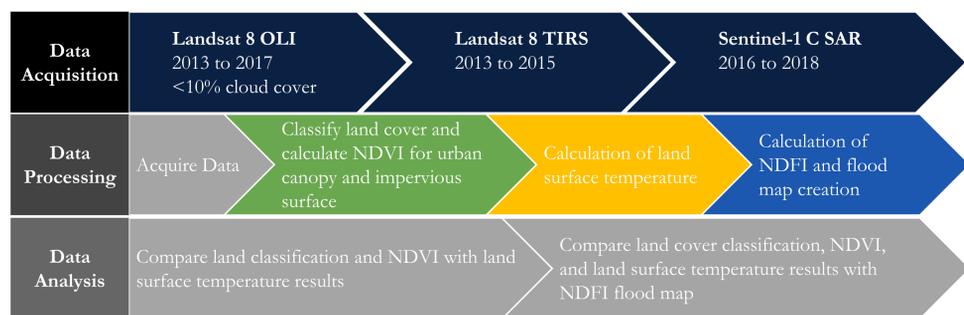
# Utilizing Earth Observations to Assist Groundwork New Orleans to Reduce Flood Vulnerability in New Orleans, Louisiana Metropolitan Area



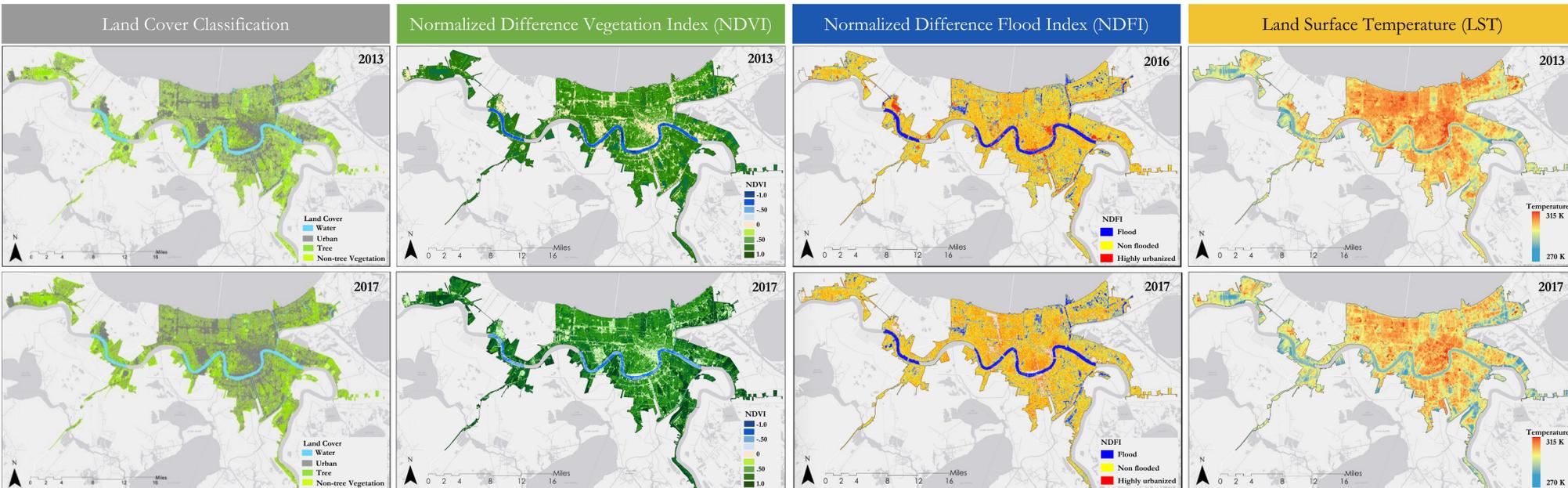
## Abstract

Flooding in New Orleans, Louisiana has increased in intensity and frequency due to sea level rise and land subsidence. Considered one of the rainiest cities in the country, New Orleans often experiences localized street flooding, causing damages to homes and businesses. Groundwork New Orleans (GWNO) is dedicated to increasing urban resilience to flooding by implementing green infrastructure. However, the current practices for site selection and assessment implemented by GWNO are costly and time consuming. NASA and ESA Earth observation data were acquired and used to create end products that can supplement GWNO's current methods. The project utilized Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS), Sentinel-2 Multispectral Instrument (MSI), Sentinel-1 C-Band Synthetic Aperture Radar (C-SAR), and Terra Moderate Resolution Imaging Spectroradiometer (MODIS) imagery from 2013 to 2018. Data were acquired for summer months with consideration to the Atlantic hurricane season to quantify the impact of GWNO's tree planting campaigns and provide additional data to supplement GWNO's current practices towards mitigating flood risk in the area. The team used remote sensing and geospatial analysis to map areas with high surface runoff and flood vulnerability. A land cover classification product and Normalized Difference Vegetation Index (NDVI) assessment were produced to monitor changes in urban tree canopy and impervious surface cover. The Normalized Difference Flood Index (NDFI) and Normalized Difference Flood Vegetation Index (NDFVI), along with land surface temperature data were computed to create a discrete-time series analysis of flood extent along with outlining shallow water in short vegetation and monitor the urban heat island effect in flood vulnerable communities. Project end products will provide GWNO with geospatial evidence of the effectiveness of their current tree-planting project for increasing the urban tree cover and improving community resilience to flooding over time.

## Methodology



## Results



## Conclusions

- ▶ Flood extent analysis shows an increasing trend in the spatial pattern of flooded areas from 2016 to 2017 in the south eastern part of the city. The city park region, the Seabrook region, and areas near to the lower ninth ward region are more vulnerable to frequent flood.
- ▶ Land surface temperature shows a slight decreasing trend from 2013 to 2017. Within the urban areas, impervious space shows higher land surface temperature than areas with more green space. The downtown area in New Orleans is more vulnerable to urban heat island effect.
- ▶ Land cover classification demonstrated an increase in the area represented by the urban class between 2013 and 2017 within the overall study area and GWNO project neighborhoods, along with a decrease in both tree and non-tree vegetation.

## Acknowledgements

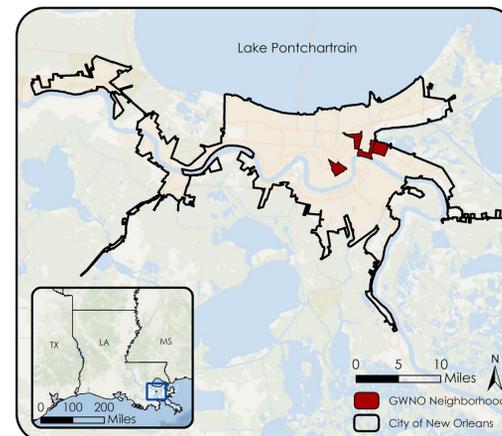
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## Objectives

- ▶ **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

## Study Area

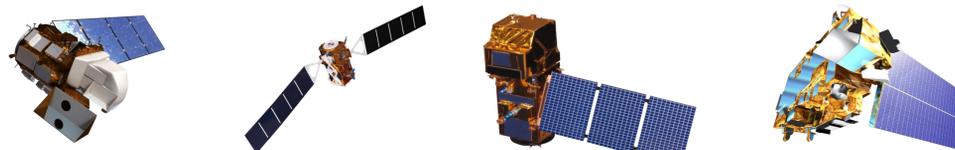
- ▶ New Orleans urban areas defined by United States Census Bureau 2010
- ▶ Neighborhoods and areas where GWNO specifically operates include:
  - Lower Ninth Ward
  - Bywater
  - St. Roch
  - Central City
  - Intersection of Claiborne Ave. and Saint Bernard Ave.



## Project Partner

Groundwork USA, Groundwork New Orleans

## Earth Observations



Landsat 8 OLI/TIRS    Sentinel-1 C-SAR    Sentinel-2 MSI    Terra MODIS

