Central Park Ecological Conservation

Assessing Tree Health Conditions in New York City's Central Park with Earth Observation Data

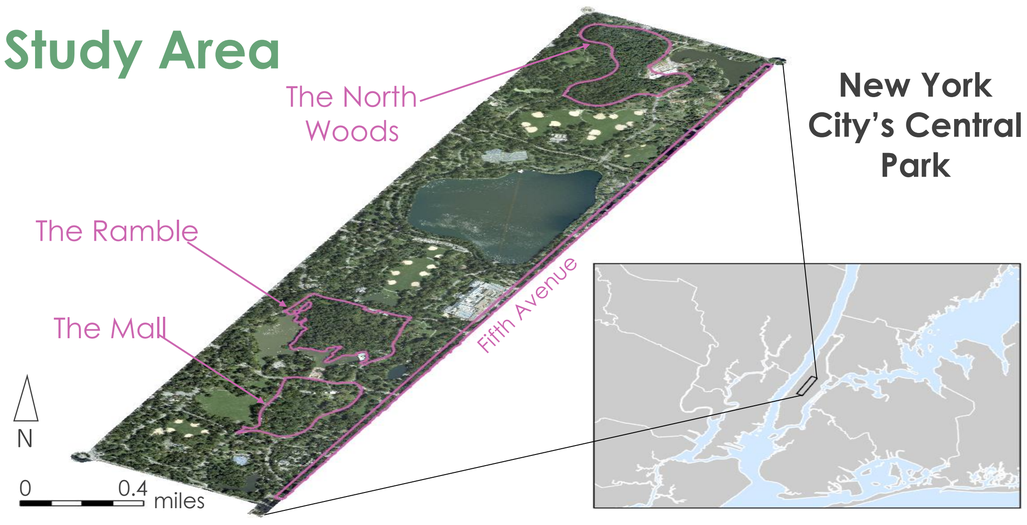
Project Synopsis

Central Park, a natural retreat from New York City's stresses, is culturally significant and requires careful ecological monitoring, particularly due to the threat of Dutch elm disease (DED) to its American elm trees each vegetation season. This project aimed to monitor Central Park's ecosystem and validate the feasibility of using NASA Earth observations (EO) to detect and predict Dutch elm disease occurrences. The findings will support improved ecological management and the preservation of the park's tree health.

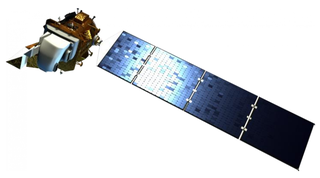
Objectives

- **Monitor** land surface phenology in Central Park and determine tree canopy change from 2014 to 2023 using Landsat 8 and Landsat 9
- **Understand** the spread factors of Dutch elm disease such as temperature and precipitation
- **Validate** the detection of tree health status and Dutch elm disease occurrences using NASA Earth observations

Study Area



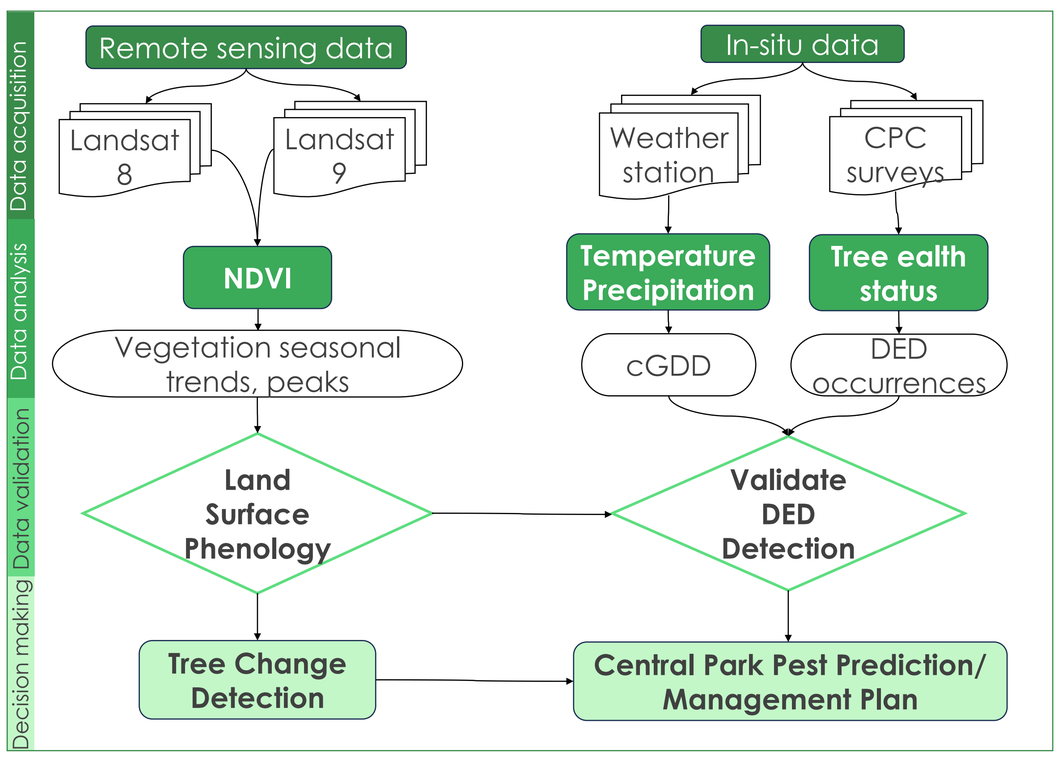
Earth Observations



Landsat 8 OLI

Landsat 9 OLI-2

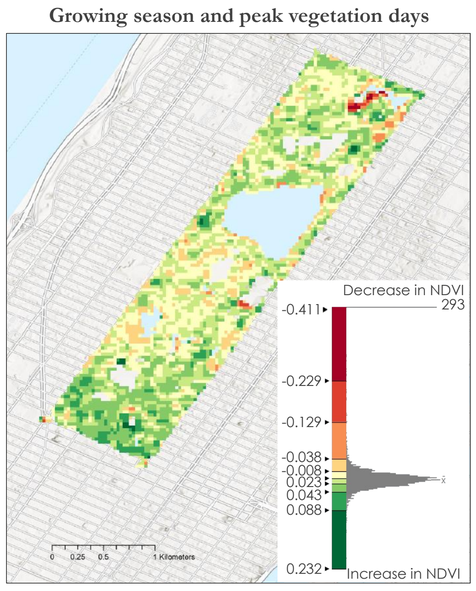
Methodology



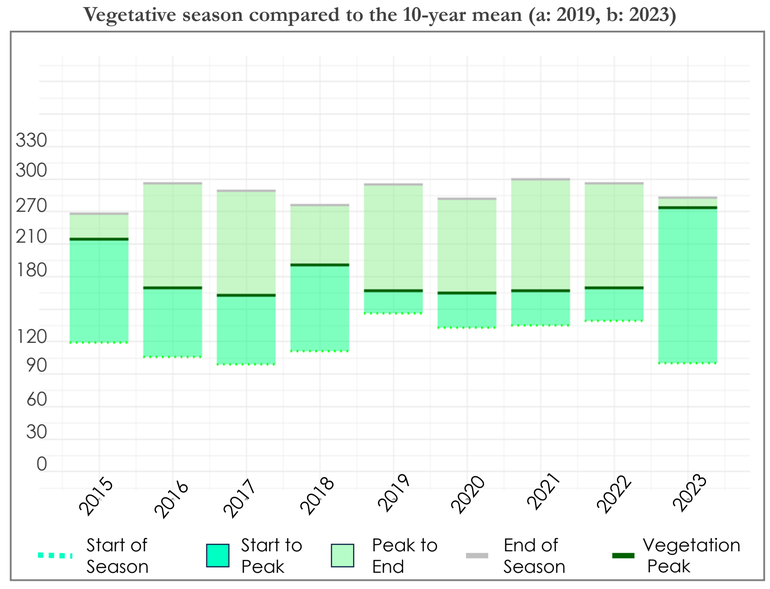
Results

Land Surface Phenology

Growing season and peak vegetation days

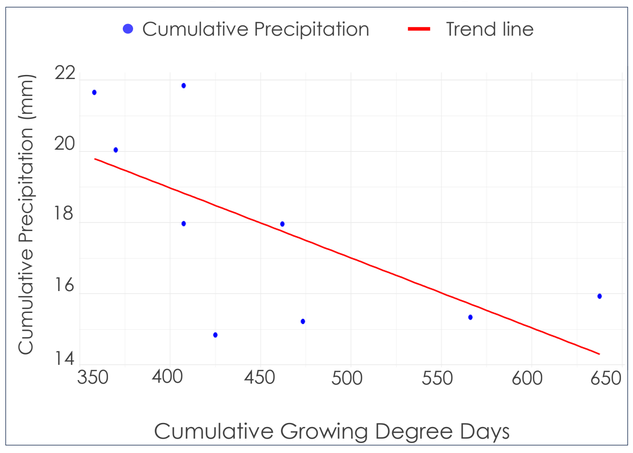


Vegetative season compared to the 10-year mean (a: 2019, b: 2023)

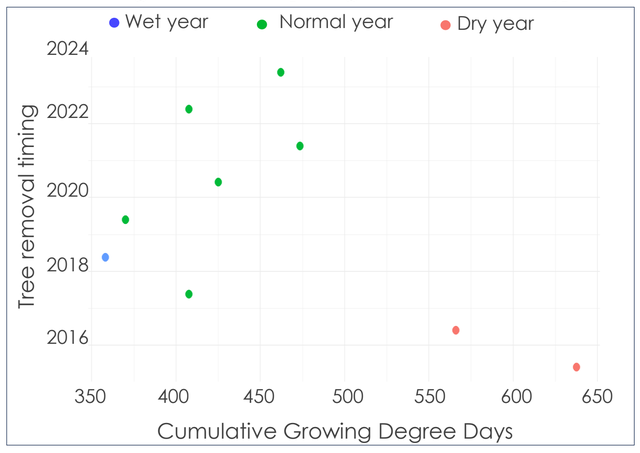


DED Spread Factors

Relationship Between cGDD and Precipitation



Validating the Relationship using DRY vs WET Year Type



Detecting DED through NASA EO Validation: Logistic Regression

- **Healthy Trees:** The model's precision is 0.37, recall is 0.47, and F1-score is 0.41, indicating a moderate performance with a tendency to produce incorrect predictions.
- **Unhealthy Trees:** The model demonstrates higher accuracy with a precision of 0.76, recall of 0.67, and F1-score of 0.71, showing stronger detection capability for unhealthy trees.
- **Overall Performance:** The logistic regression model performs better in identifying unhealthy trees than healthy ones, reflected in the higher F1-score for unhealthy trees.

Conclusions

- **NASA Earth Observations:** Successfully identified tree canopy seasonality, change, and anomalies in Central Park but in-situ validation could enhance precision
- **DED Spread and Remote Sensing:** Adequate precipitation is key for Elm bark beetles' spread, and while remote sensing shows promise for detecting Dutch Elm Disease, challenges include resolution limitations and validation methods

Project Partner

- Central Park Conservancy

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