

Assessing New York City Living Shorelines

An Ecosystem- and Community-based Learning Approach

CUNY CREST Institute

In Partnership with

NOAA North Atlantic Research Team (NART)

Urban Waters Federal Partners, NY Region

Science Resilience Institute, Jamaica Bay (SRIJB)

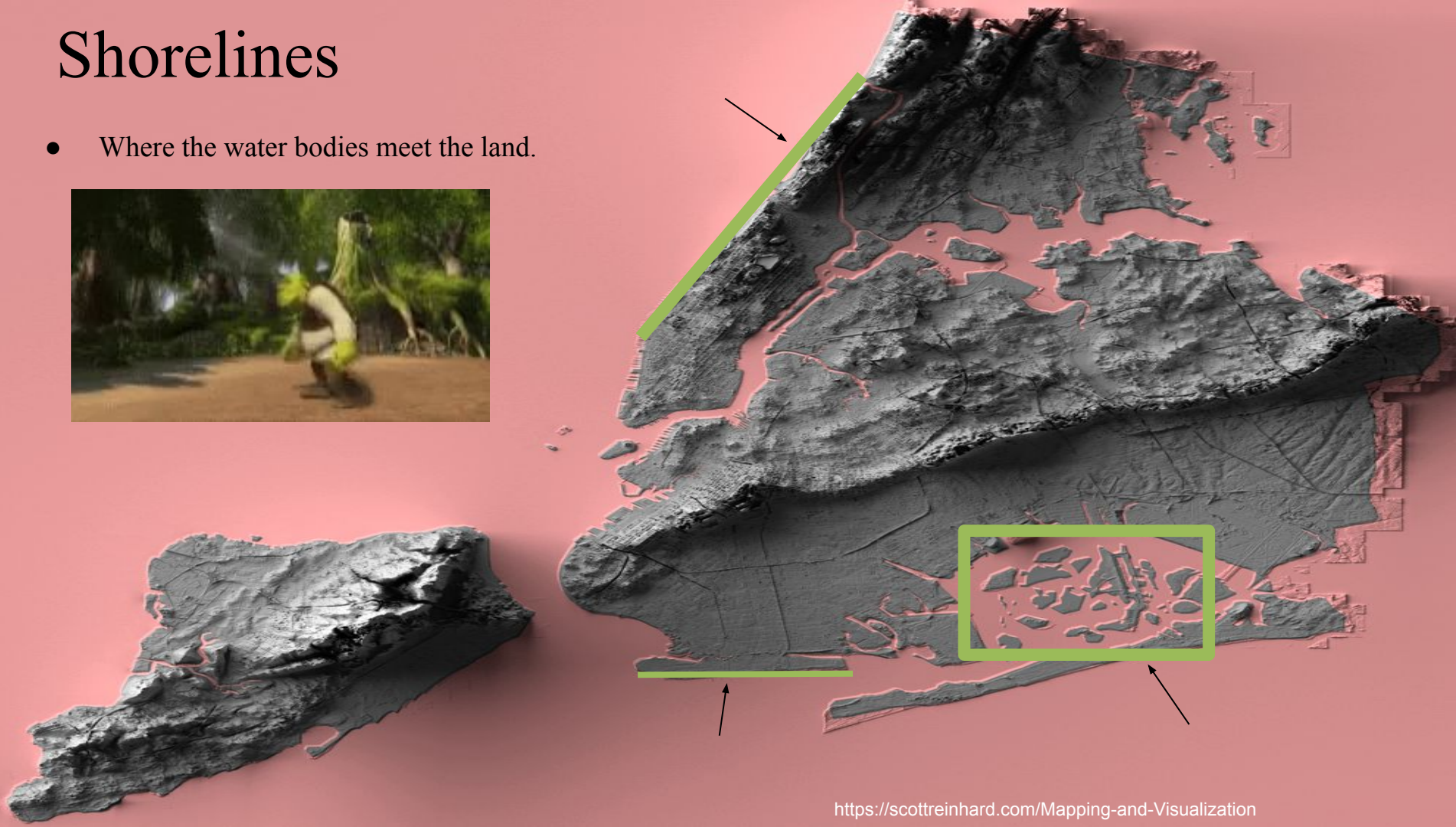
Nature Area Conservancy (NAC)

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Shorelines

- Where the water bodies meet the land.



Assessing New York City Living Shorelines

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What are *living shorelines*? Why are they crucial for ecosystems?



Why

How to monitor shorelines for effective remediation and protection



How

Shoreline locations/sites in NYC region



Where

Community, Officials, Resource Managers



Who

Better Shoreline Protection, Habitat
Conservation and Management Practices



What

What are *living shorelines*? Why are they crucial for *ecosystems*?

Ecological Benefits



One sq. mile of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually



Living shorelines improve **water quality**, provide fisheries **habitat** and increase **biodiversity**



Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy



Marshes trap sediment from tidal waters allowing them to **grow in elevation** as sea level rises

Environmental Impacts



33% of shorelines in the U.S will be **hardened** by **2100**, decreasing fisheries habitat and biodiversity



Living shorelines are **more resilient** against storms than bulkheads



Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**

Some shoreline locations/sites in NYC region

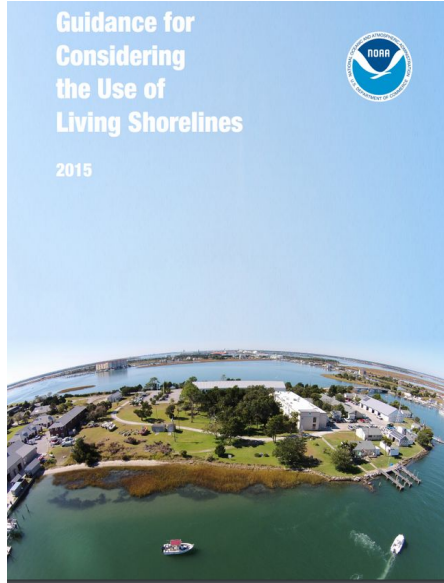


Pugsley Park in Bronx, NY



Starlight Park in Bronx, NY

What we will do this summer

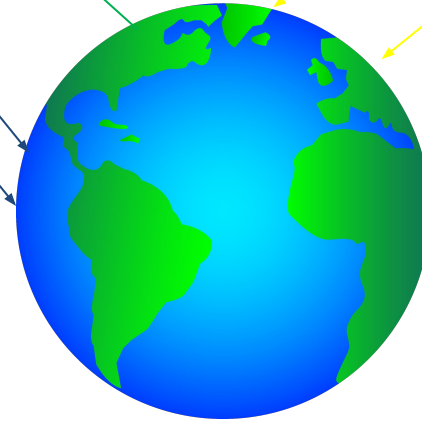
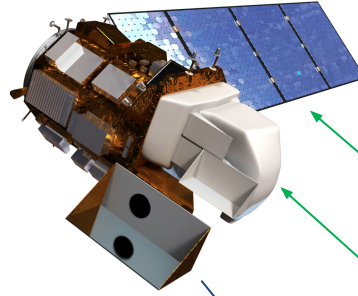
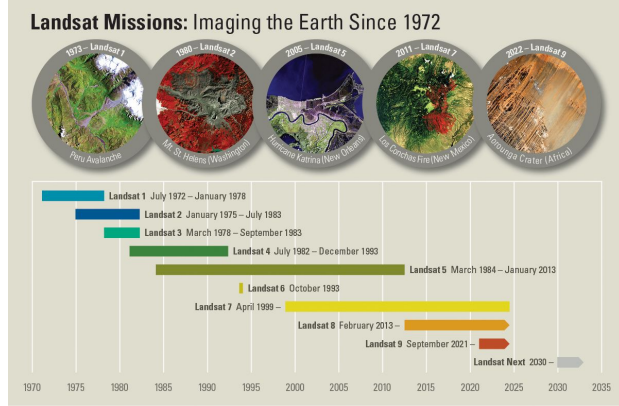


- Satellite imagery of NYC shoreline sites (Landsat, NDVI, NASA/EOSDIS, Google Earth)
- NYC Opendata (Digital Elevation Models, 311 Flooding, Demographic data (EJ))
- Data Analysis – Vegetation dynamics, accretion/erosion, habitats loss/impacts)
- GIS – StoryMap, GitHub, web tool

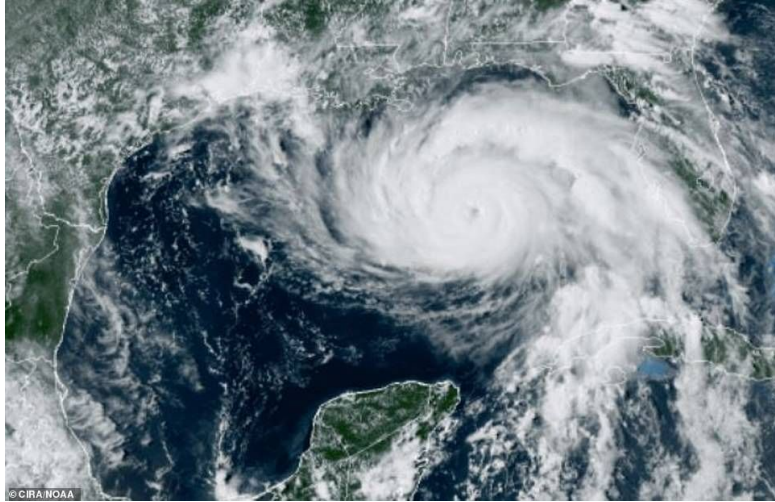


<https://www.habitatblueprint.noaa.gov/>

Satellite Images



Satellite Images



Source :
<https://www.dailymail.co.uk/sciencetech/article-9942933/NASA-images-Hurricane-Ida-space.html>



Source:
<https://www.nytimes.com/2021/09/02/nyregion/ida-new-york-flood.html>

Satellite Images



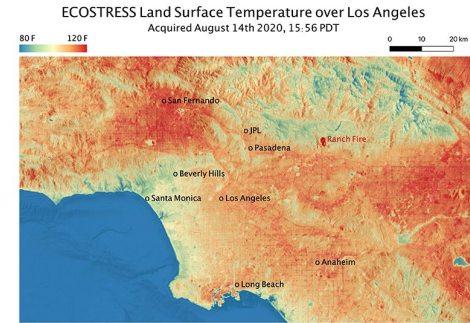
Landsat 8

- Uses: Monitoring agriculture, forestry, land use, urban planning, water quality, and disaster management.



Sentinel 2

- Uses: Monitoring agriculture, forestry, land use, urban planning, water quality, and disaster management.



ECOSTRESS

- Uses: Studying how plants use water, monitoring plant stress, understanding how ecosystems respond to changes in water availability.

Satellite Images



Data Analysis

01

Vegetation Dynamics

- **Importance:** Helps understand the health of ecosystems and how they respond to changes like climate change and human activities.
- **Tools:** NDVI (Normalized Difference Vegetation Index) to measure vegetation health using satellite data.

02

Accretion/erosion

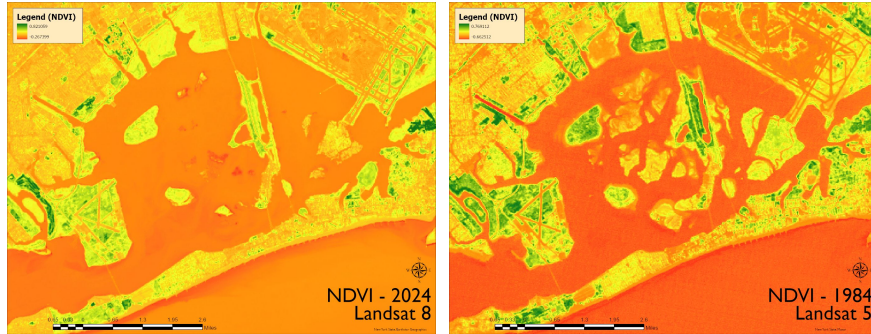
- **Importance:** Affects coastal areas, riverbanks, and agricultural lands.
- **Tools:** GIS (Geographic Information Systems) to map and analyze areas of accretion and erosion.

03

Habitat loss/impacts

- **Importance:** Leads to the decline or extinction of species and the disruption of ecosystems.
- **Tools:** GIS and remote sensing to identify areas of habitat loss and assess the impact on biodiversity.

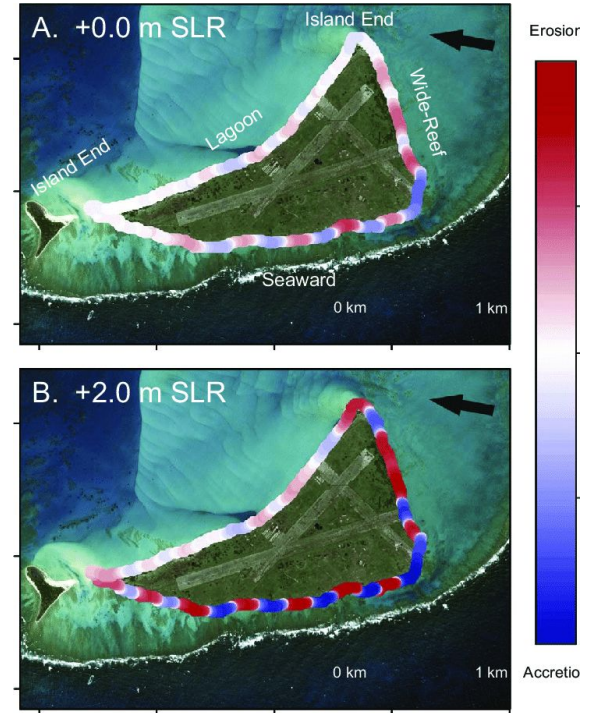
Data Analysis



Vegetation Dynamics

Image source: "Living shorelines around NYC"

Tarafdar Aqeel



Accretion/ Erosion

Imagery Source: "Midway Islands, NWHI, 2010" Digital Globe.

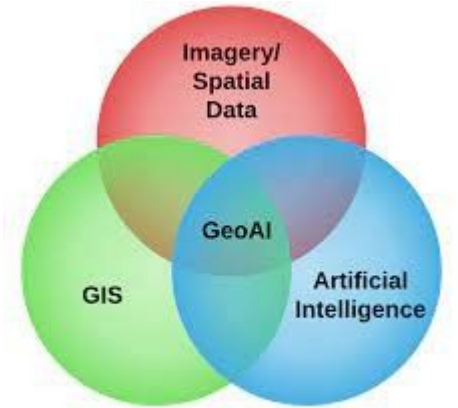
Sharing work – Story Maps

- Storymaps as a web tool!
- Good writing practice
- Showcase your work to the world



Geo AI

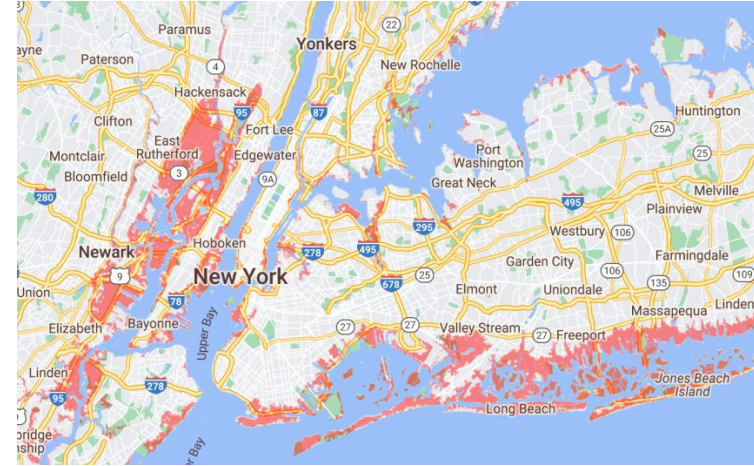
- **Geo AI** combines **geospatial data** with **artificial intelligence** to identify patterns and make predictions:
 - ❑ Analyzes **large datasets** quickly
 - ❑ Identifies (changes) patterns in environmental data
 - ❑ Helps in **predictive modeling** for shoreline changes



GeoAI = GIS + Artificial Intelligence

Applications of Geo AI

- ❑ Monitoring **shoreline erosion**
- ❑ Monitoring **sediment transport**
- ❑ Predicting the **impact of sea-level rise**
- ❑ Identifying areas at **risk of flooding**
- ❑ Analyzing **vegetation changes** over time



Source:

<https://pix11.com/news/interactive-map-shows-which-us-cities-will-be-underwater-in-2050/>

Learning outcomes

- Deeper **Understanding of NYC Urban Ecosystem** and its services in the face of climate change
- Community / **Stakeholder Engagement** and Collaboration
- Data **Collection, Assessment, Interpretation**
- Use of **Satellite Imageries and GIS tools**
- Writing and Oral **Communication skills**