

National Aeronautics and
Space Administration

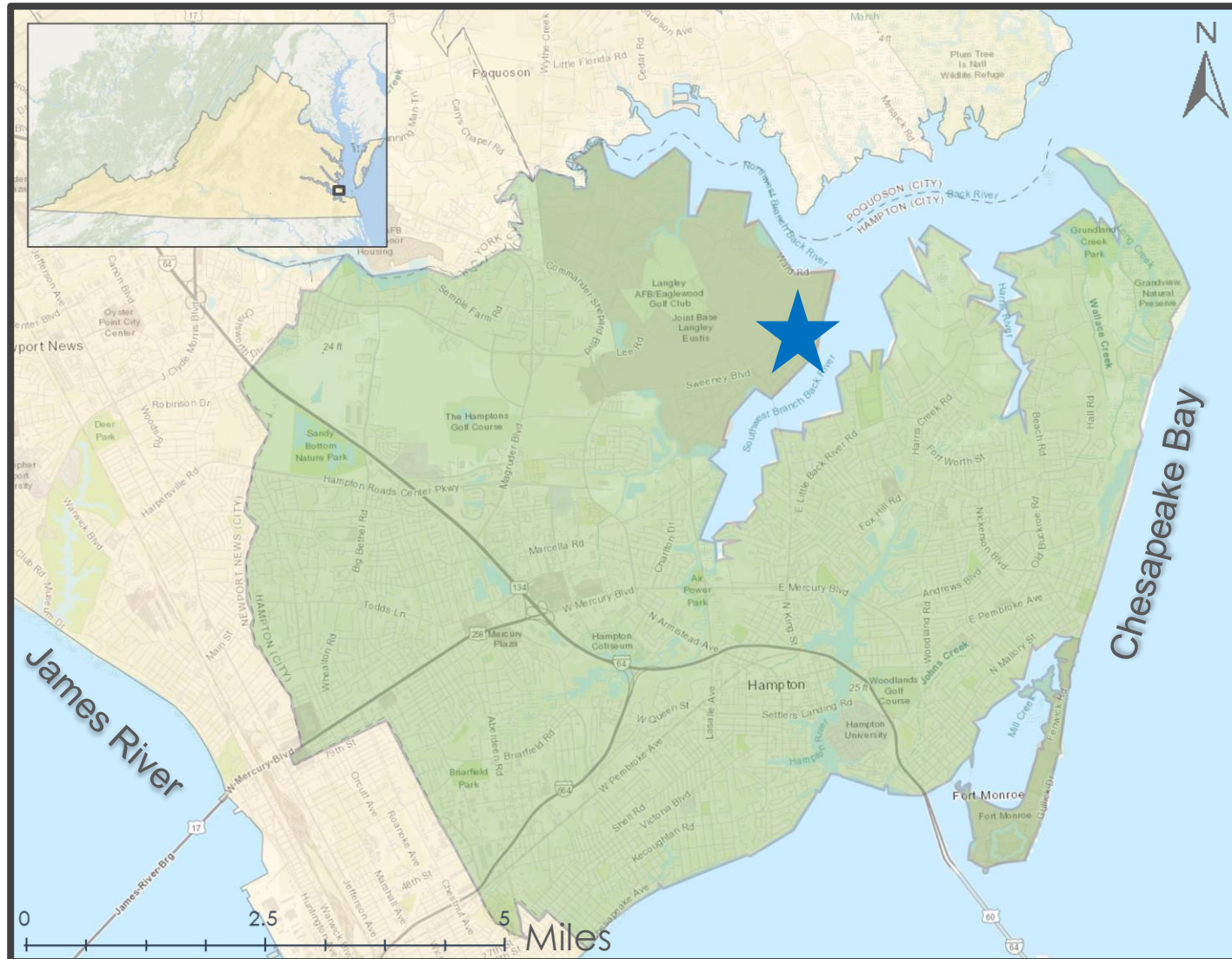


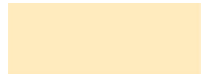
Enhancing Coastal Management by Monitoring Hampton's Coastline and Barrier Island Transgression with the Aid of NASA Earth Observations

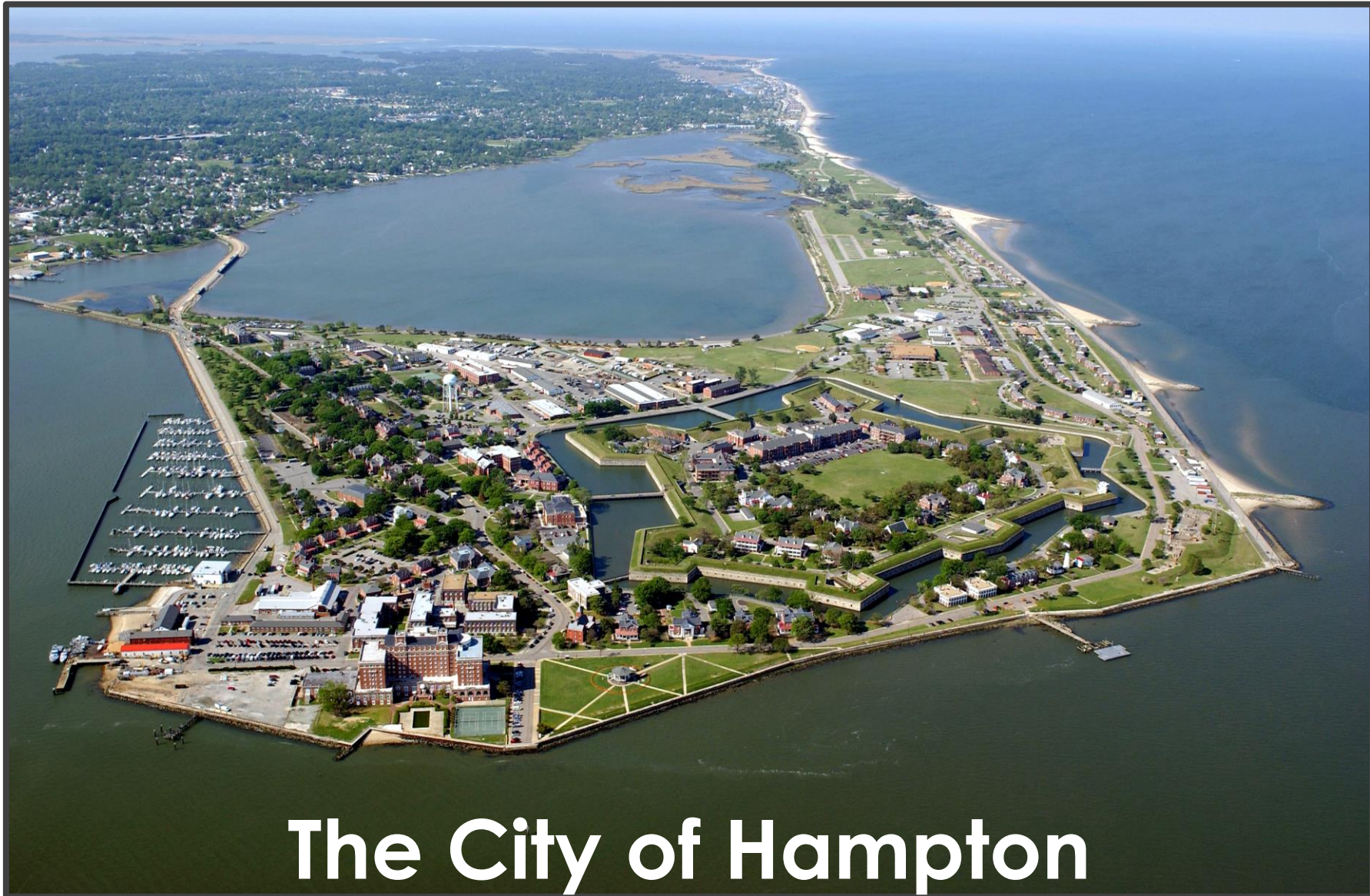
Holly Gould,
Eric Deutsch, Danielle
Ruffe, & Shaifali Prajapati



Study Area: Hampton, VA



-  City of Hampton
-  Virginia
-  DEVELOP National Program Office



The City of Hampton

Community Concerns



The shoreline is the city's first defense against storm events



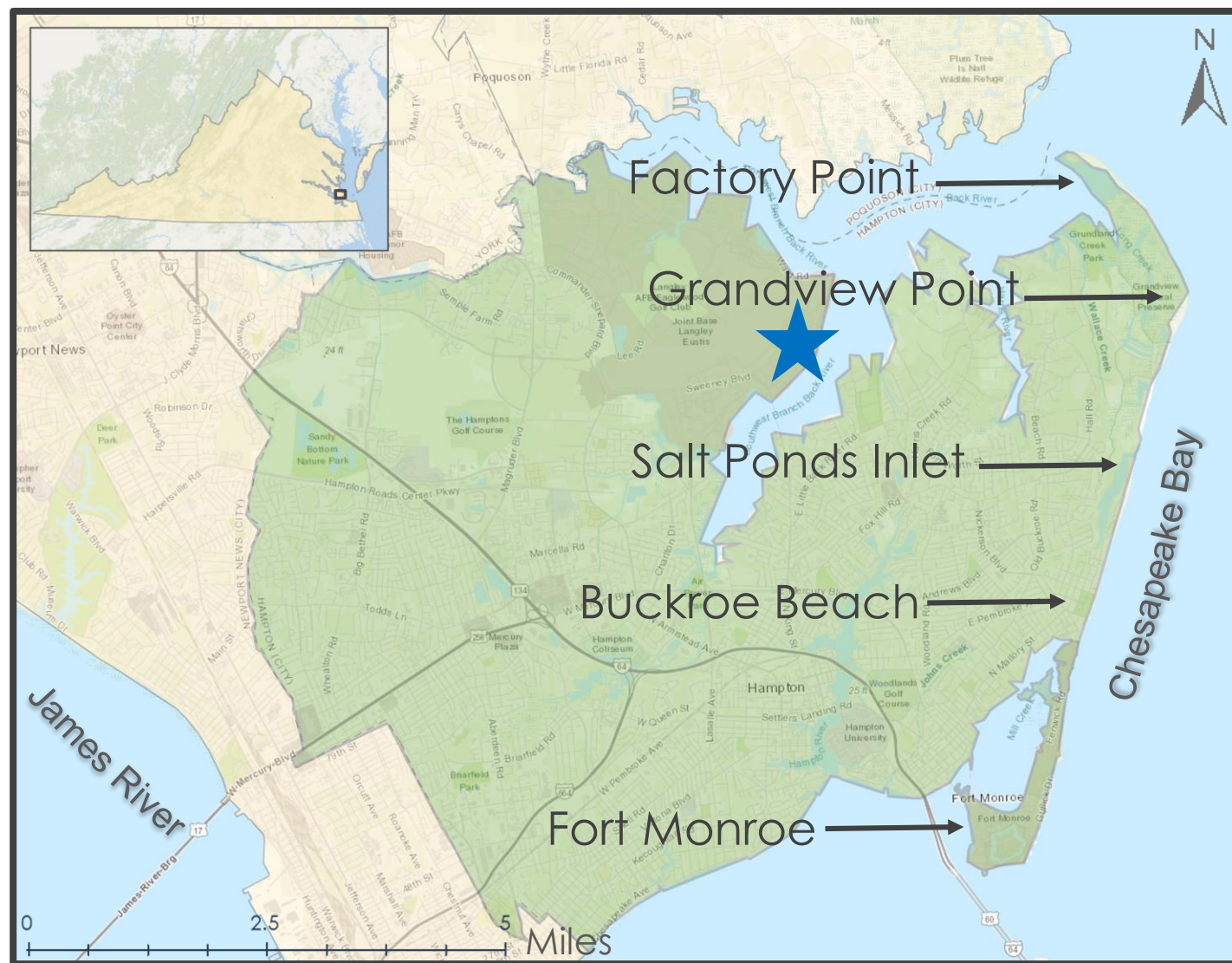
The damage to developed areas due to flooding and shoreline loss



The need for public awareness on the risk presented by shoreline loss



Focus Areas



City of Hampton



Virginia



DEVELOP National
Program Office

Objectives



- ▶ **DEVELOP** an efficient method for analyzing long-term shoreline changes
- ▶ **IDENTIFY** the city's regions vulnerable to coastal erosion
- ▶ **AID** the city's shoreline conservation efforts
- ▶ **CREATE** a tool for public awareness addressing the city's coastal concerns and management efforts

Objectives

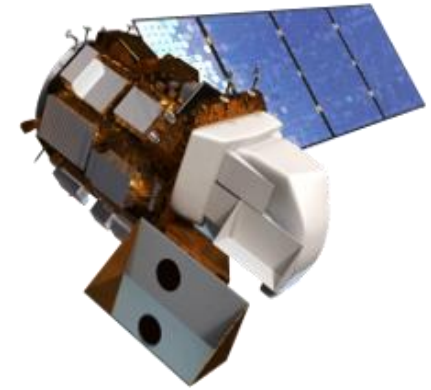


- ▶ **Coastline Change Maps** showing the change of the City's shoreline over
 - ▶ 5-year
 - ▶ 10-year
 - ▶ 30-year
- ▶ **Erosion Risk Map** to identify areas in the city that have a high risk of erosion
- ▶ **ArcGIS Story Map** created for public awareness

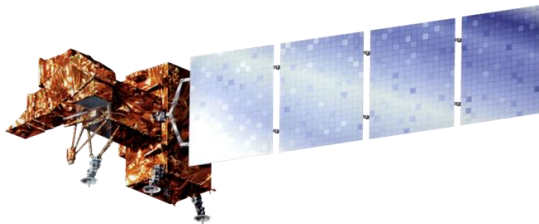
NASA Earth Observations



Landsat 5 TM



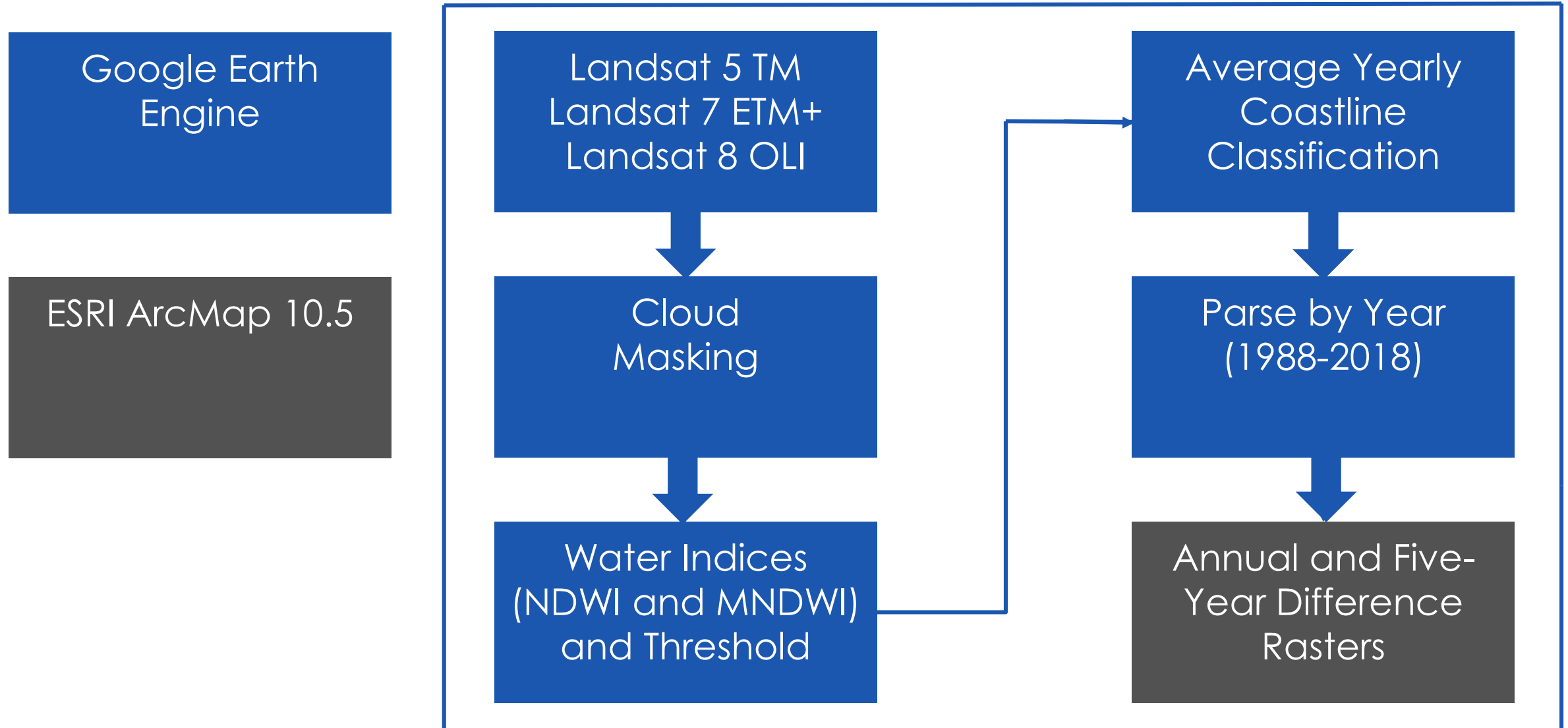
Landsat 8 OLI



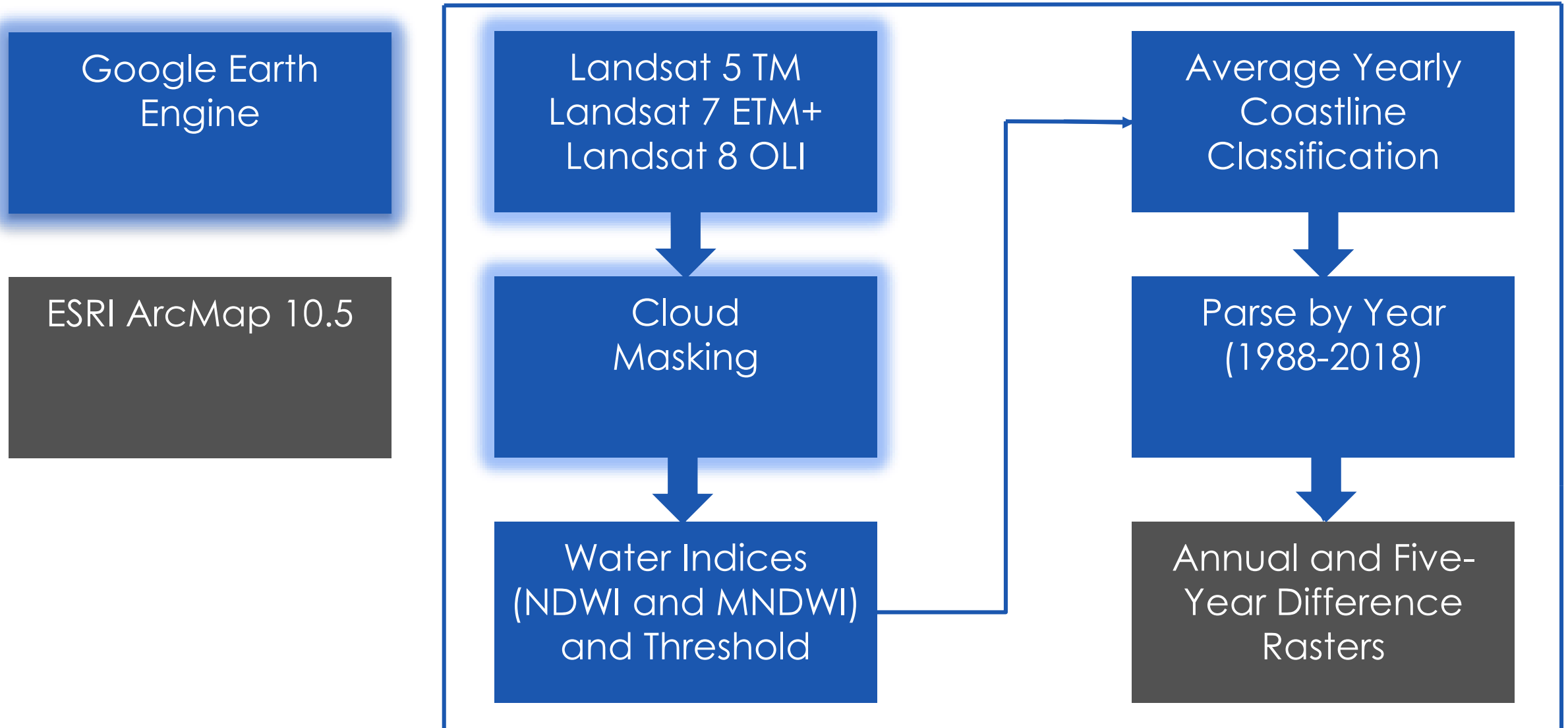
Landsat 7 ETM+

1988 - 2018

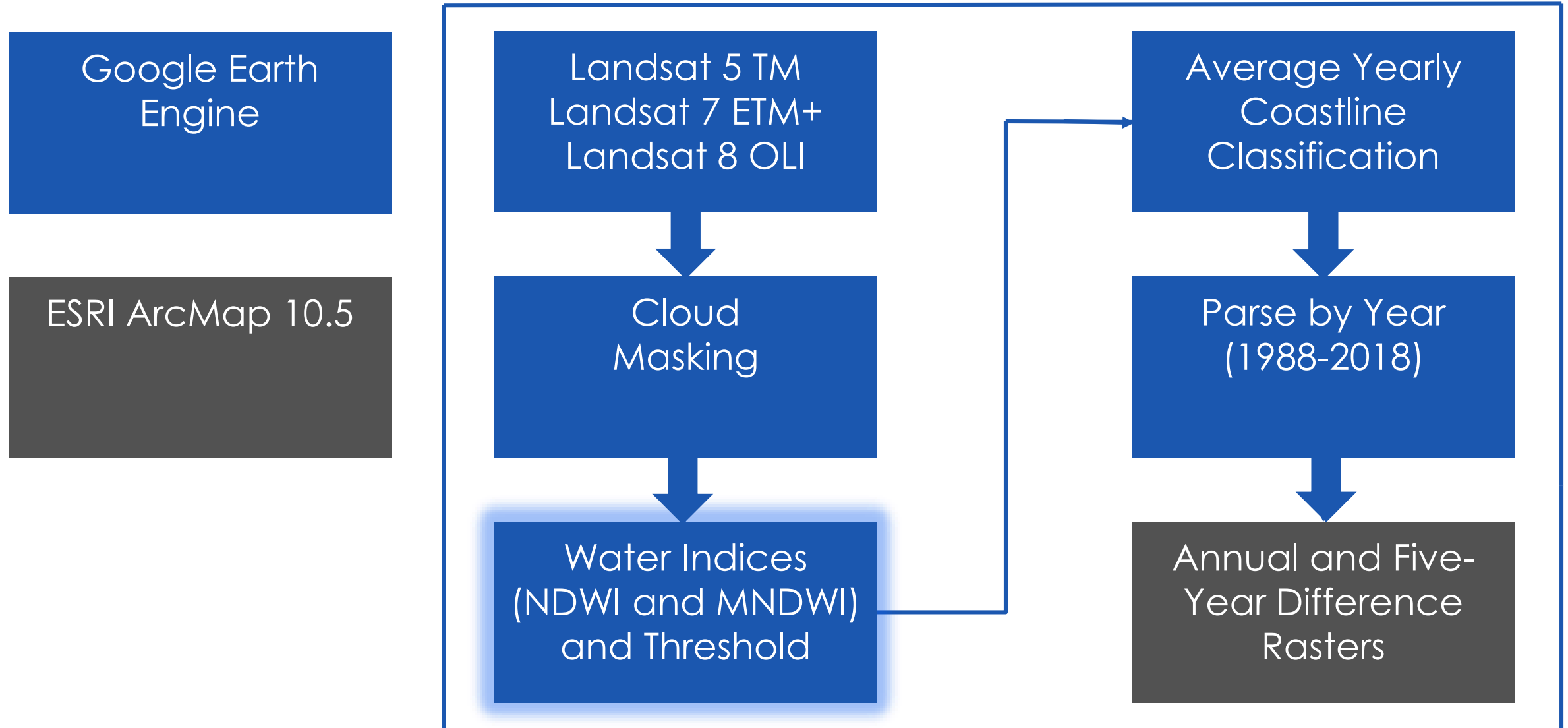
Methodology: Coastal Change



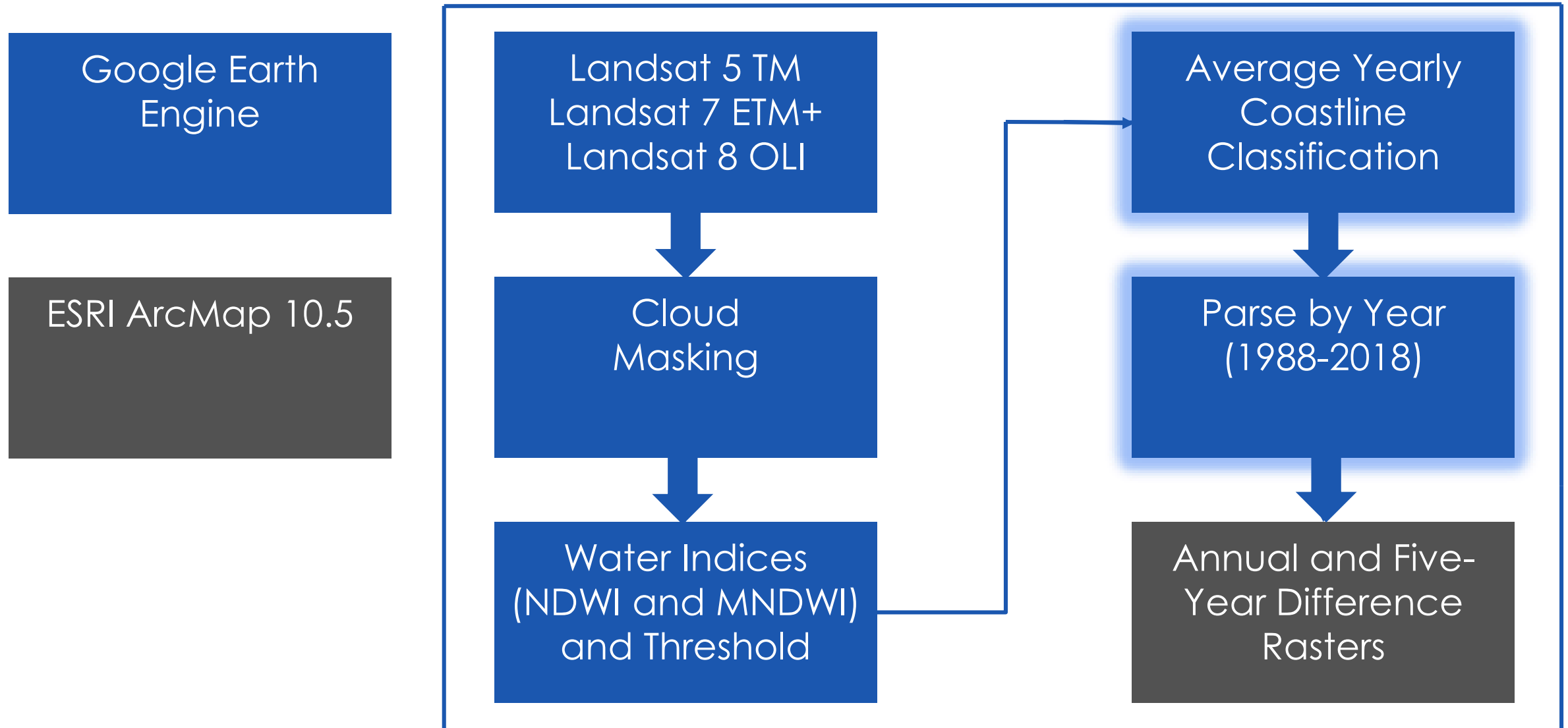
Methodology: Coastal Change



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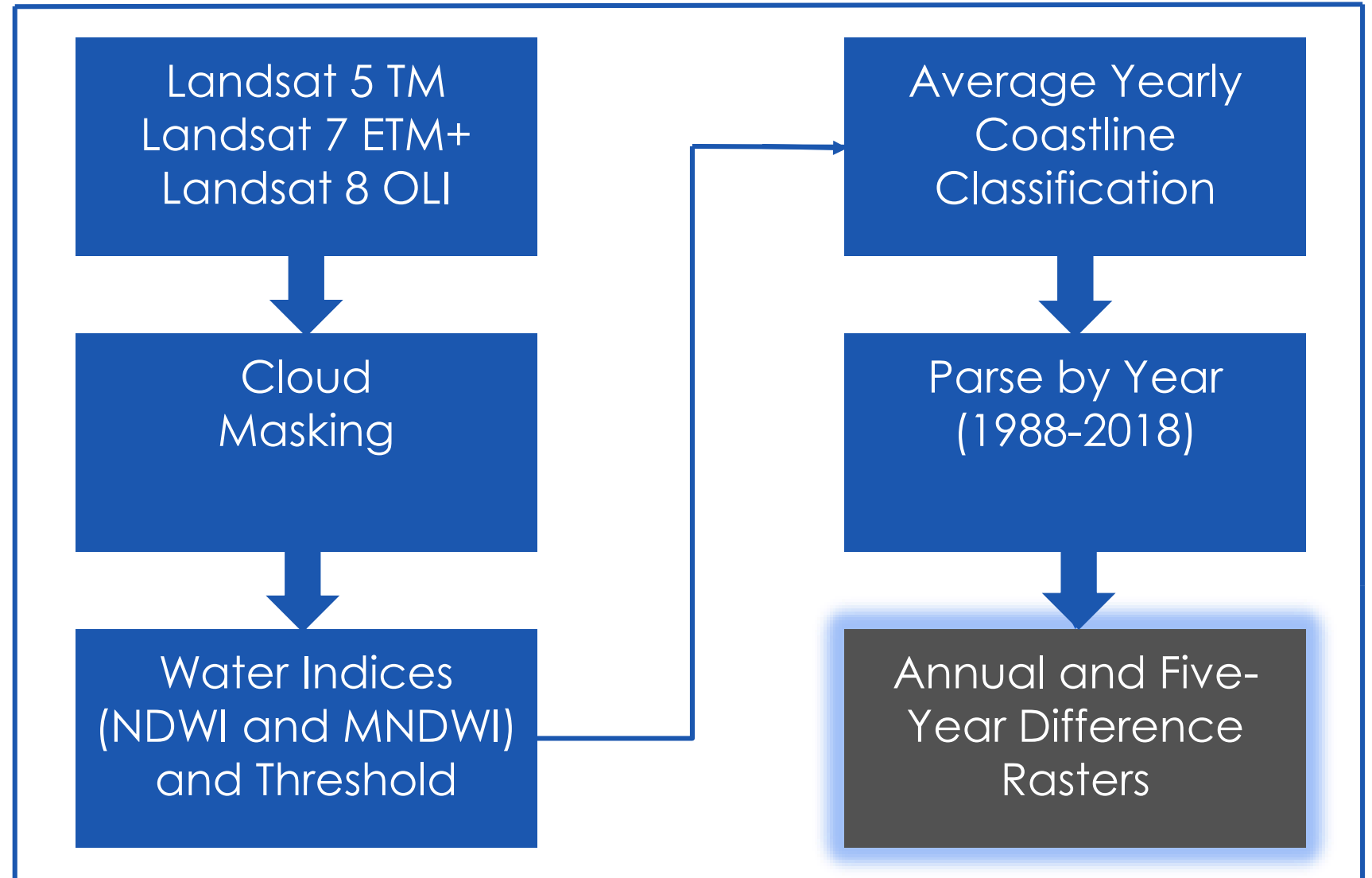
Methodology: Coastal Change



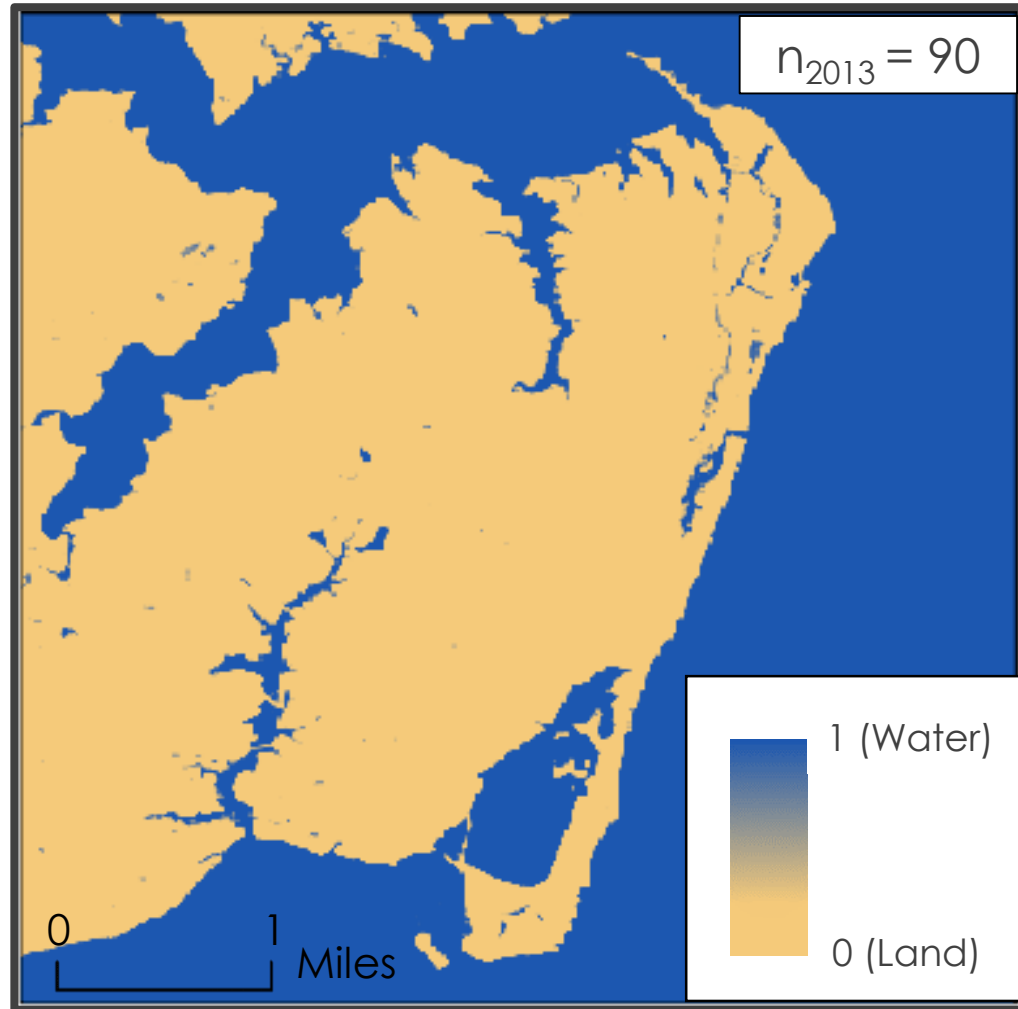
Methodology: Coastal Change

Google Earth
Engine

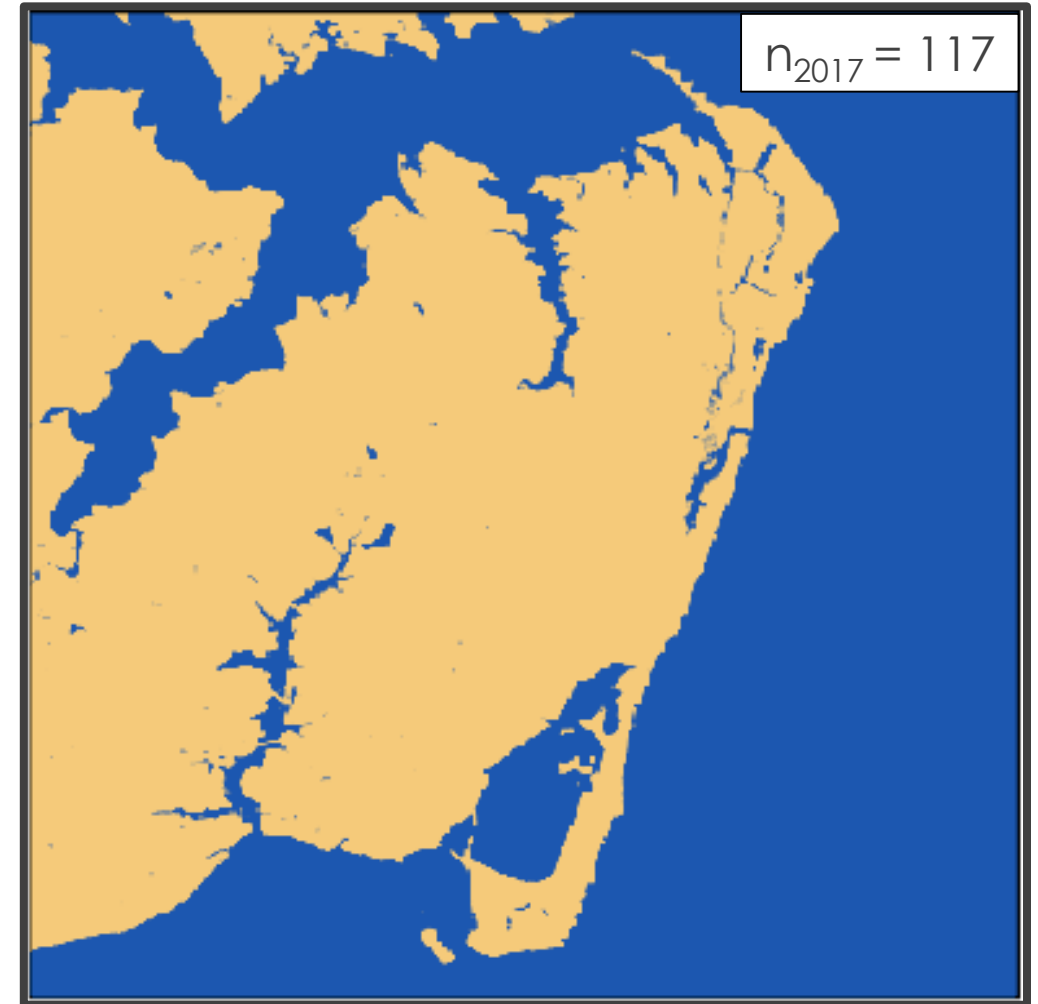
ESRI ArcMap 10.5



Coastal Change Maps



2013

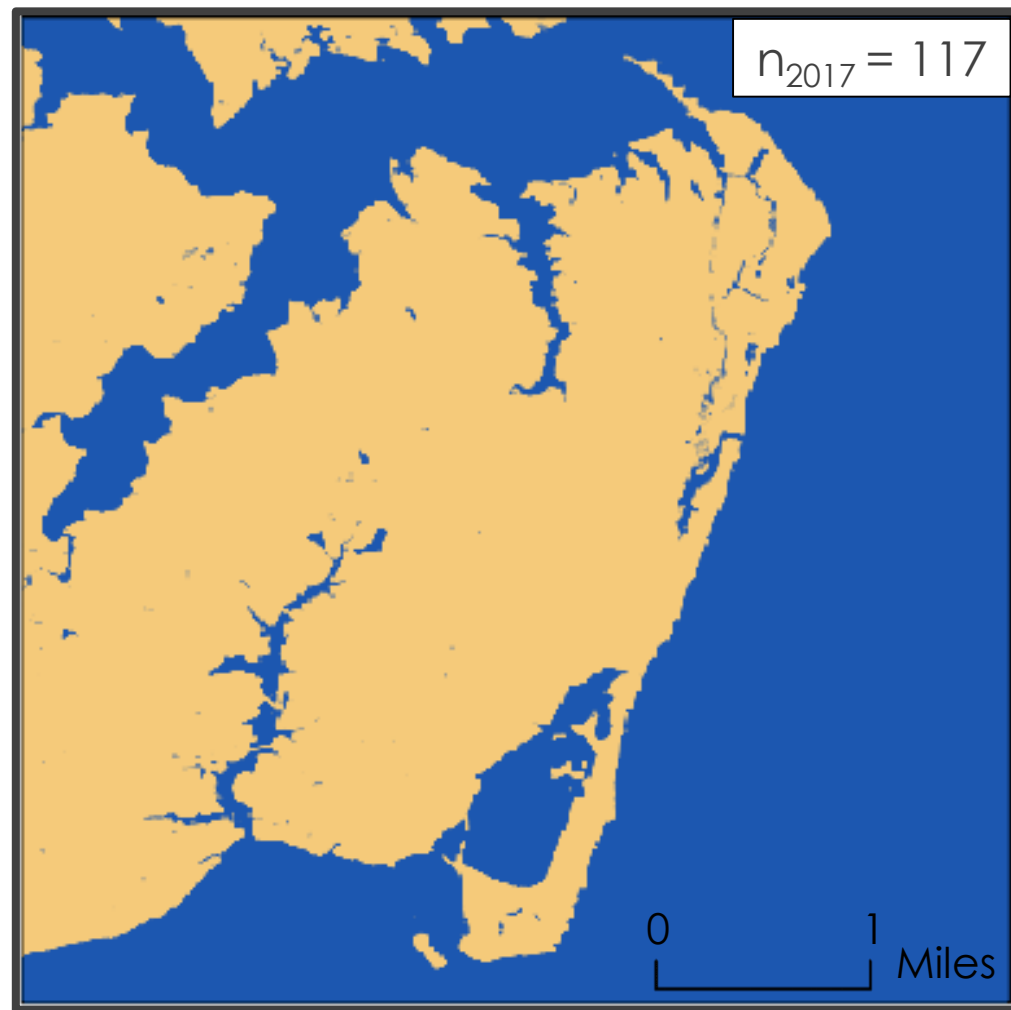


2017

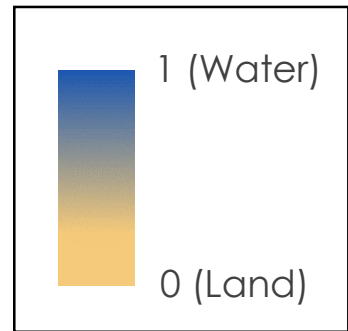
Coastal Change Maps

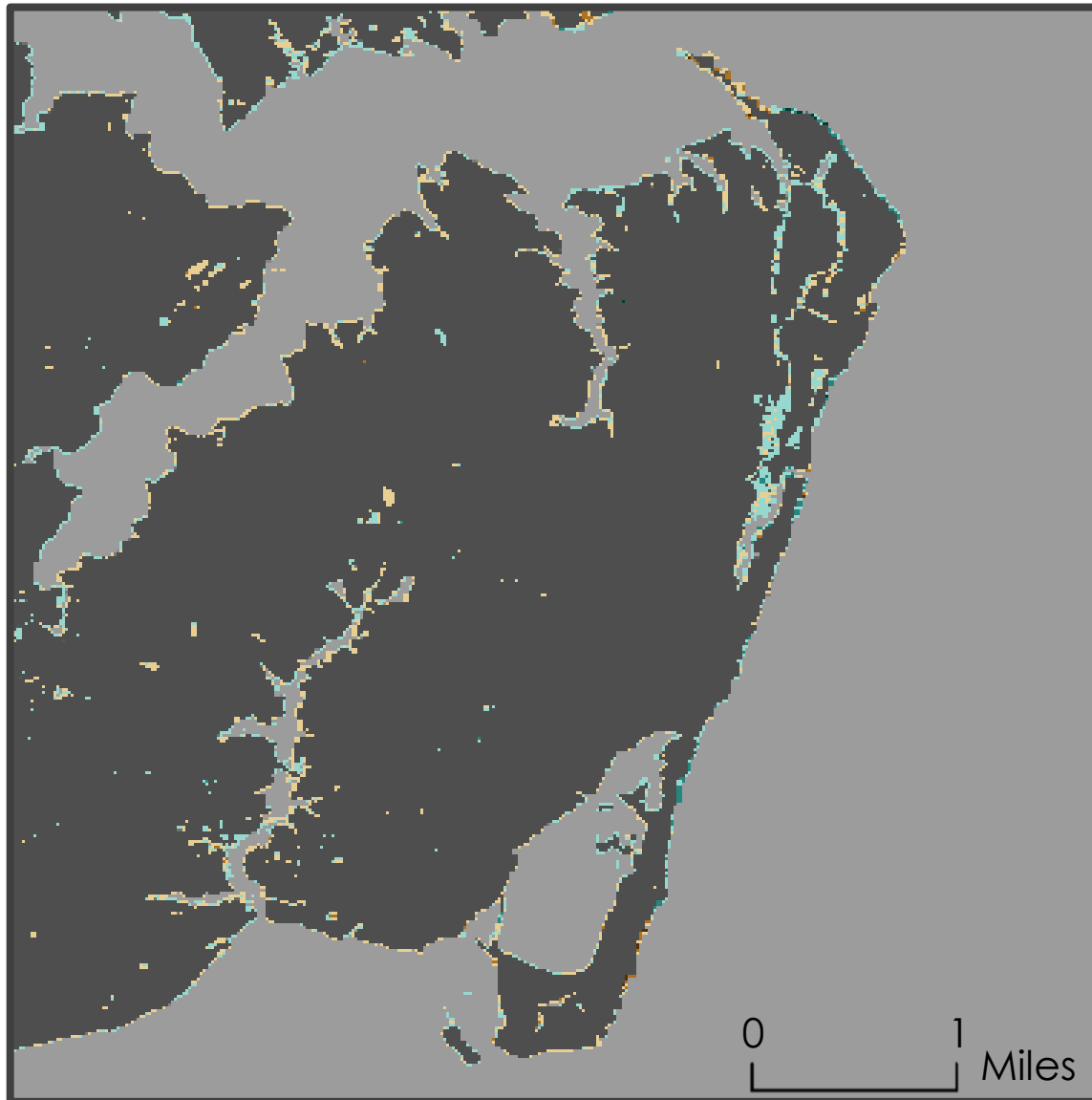


2013

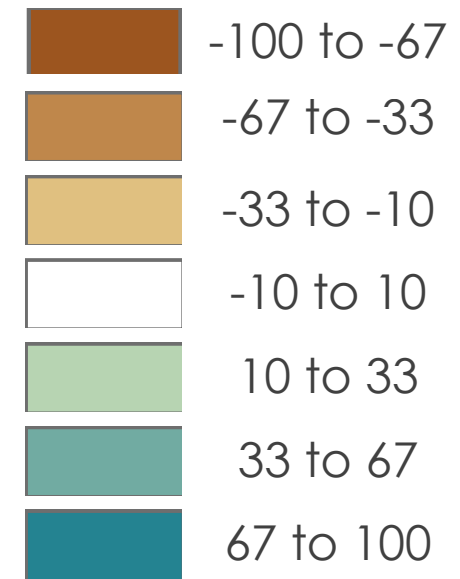


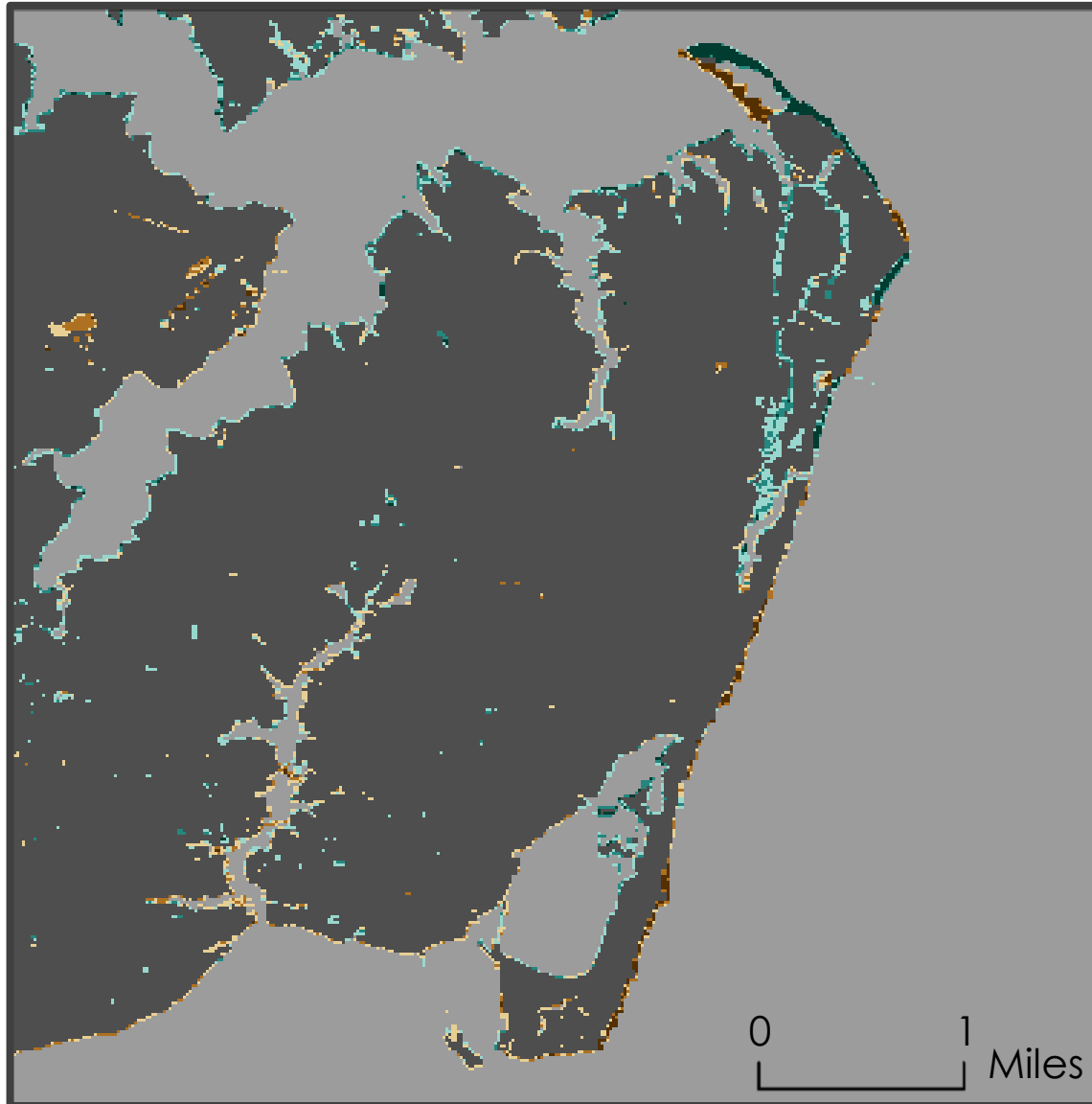
2017



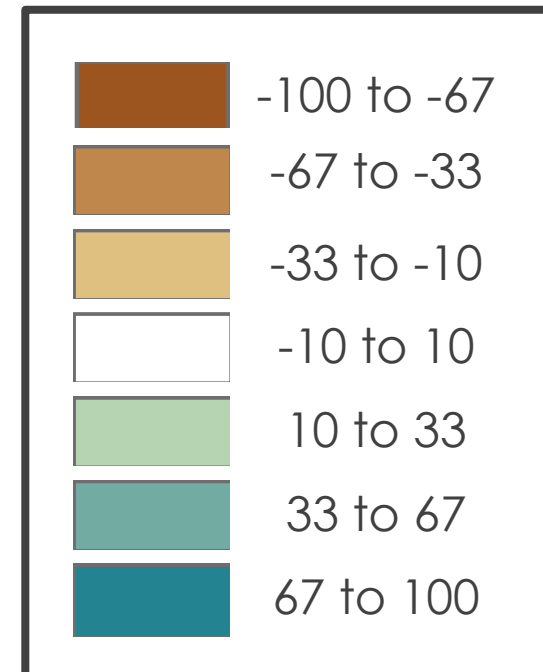


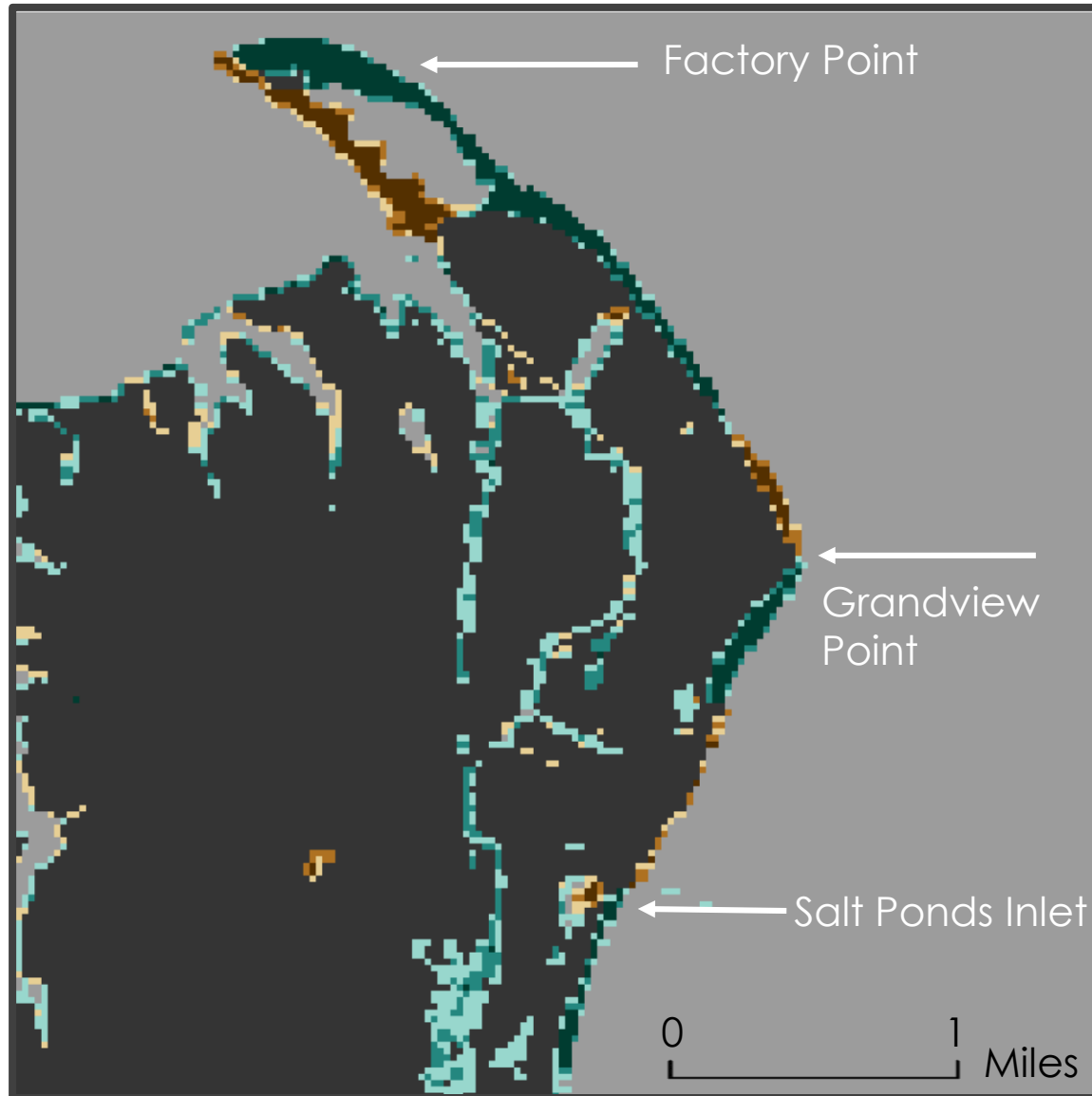
Change in Average Percent of Pixel Covered by Water Over Time 2013 to 2017



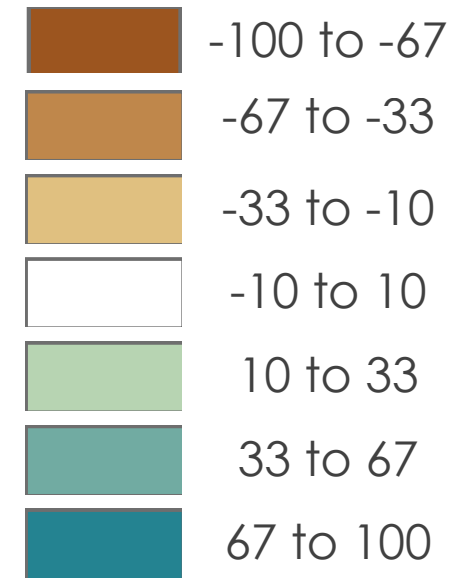


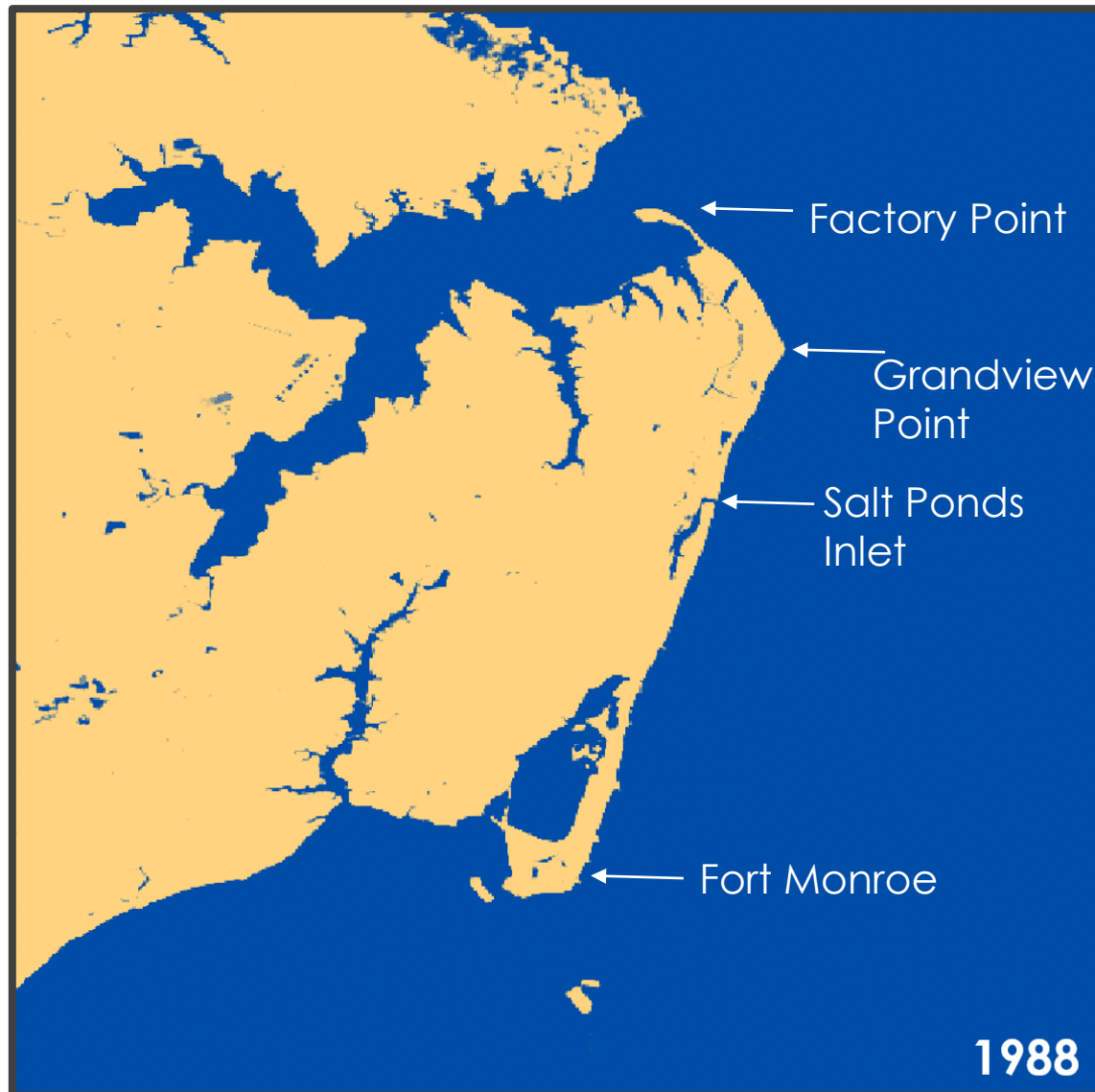
Change in Average Percent of Pixel Covered by Water Over Time 1988 to 2017



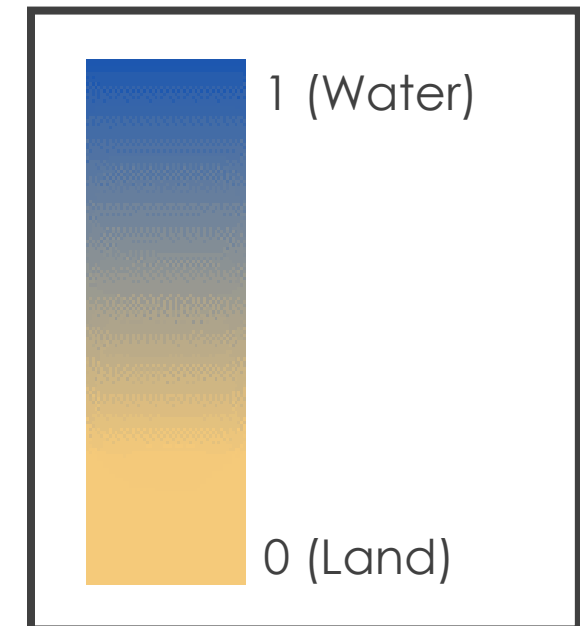


Change in Average Percent of Pixel Covered by Water Over Time 1988 to 2017



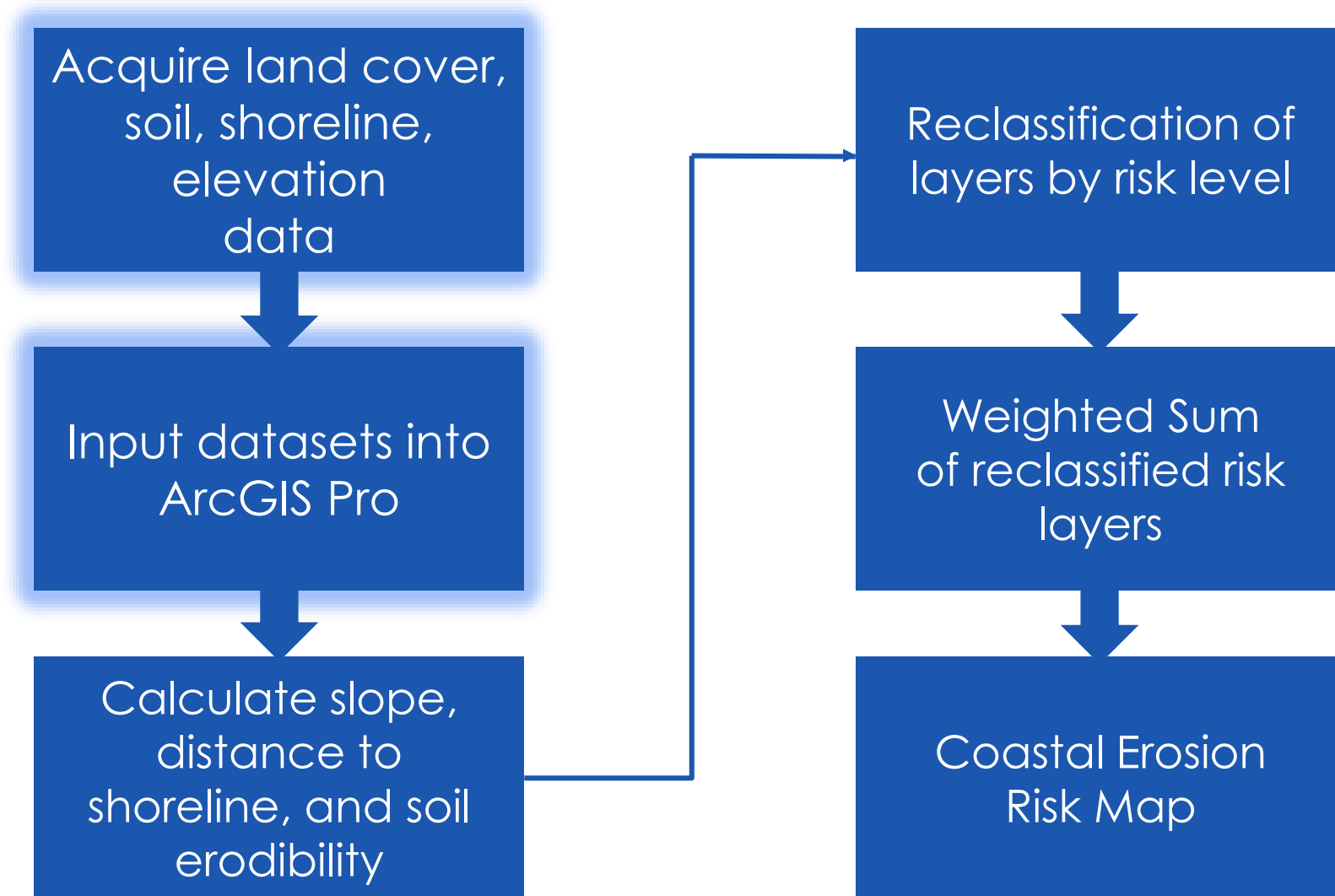


Hampton's Coastline from 1988 through 2017



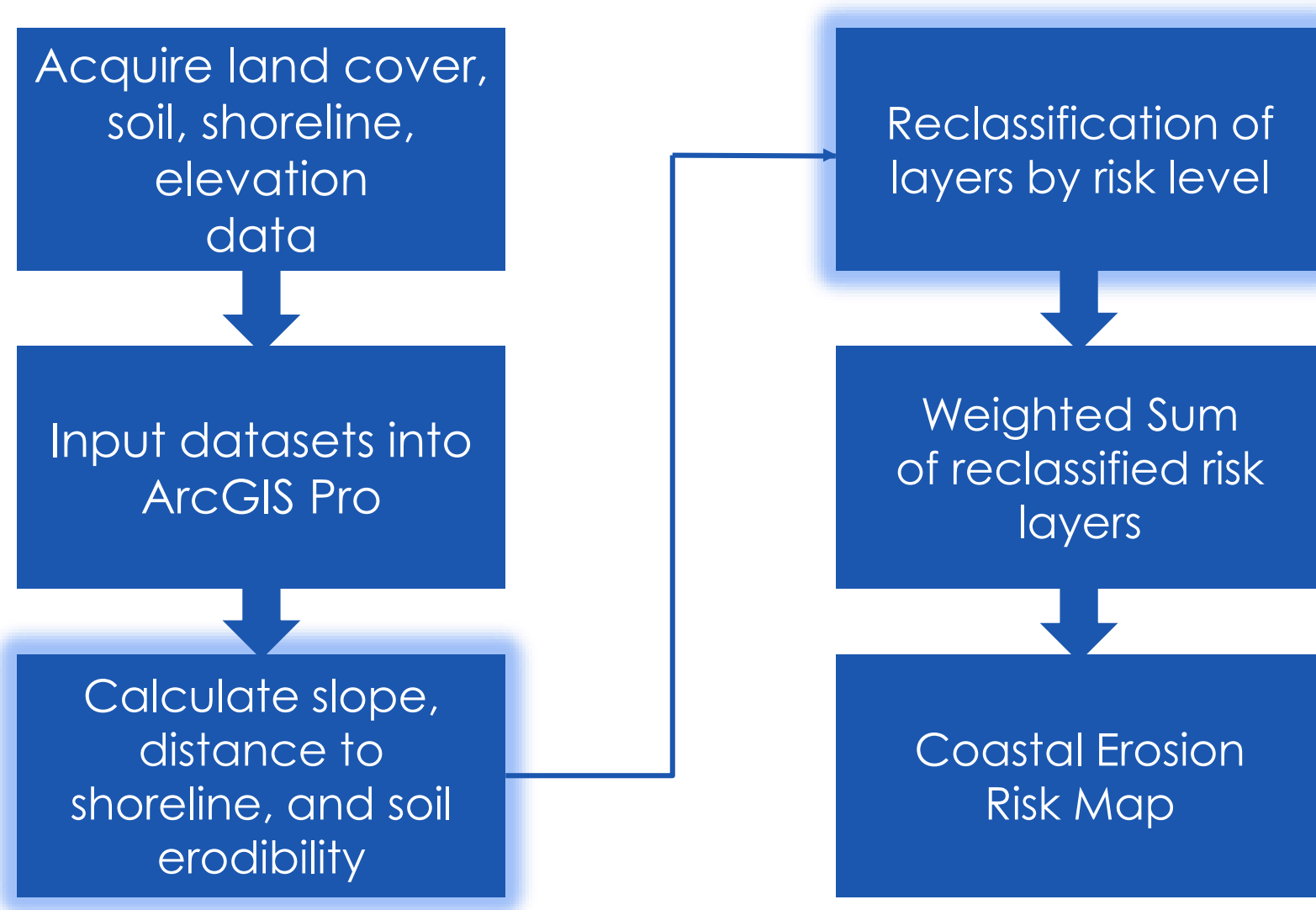


Methodology: Risk Map



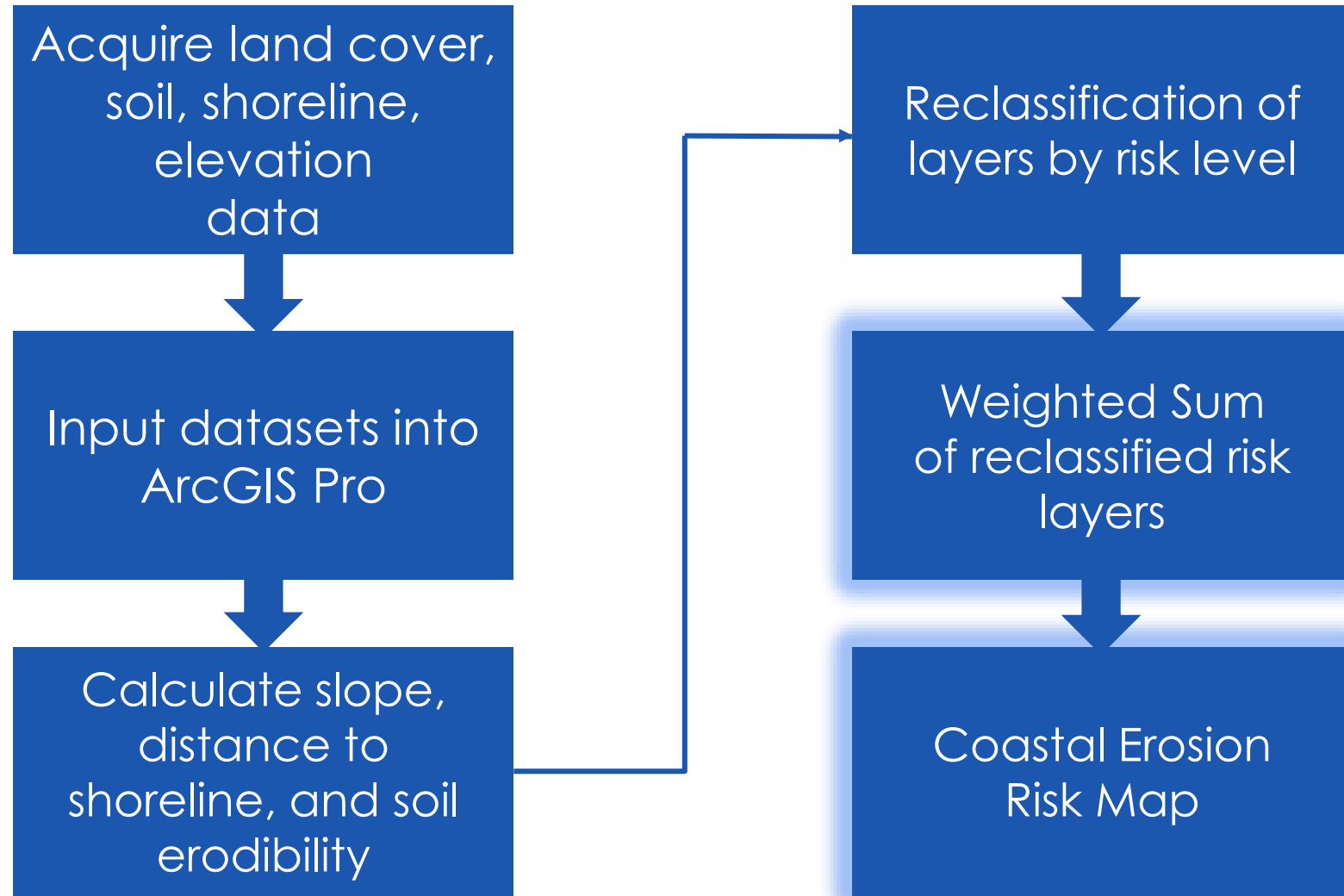


Methodology: Risk Map



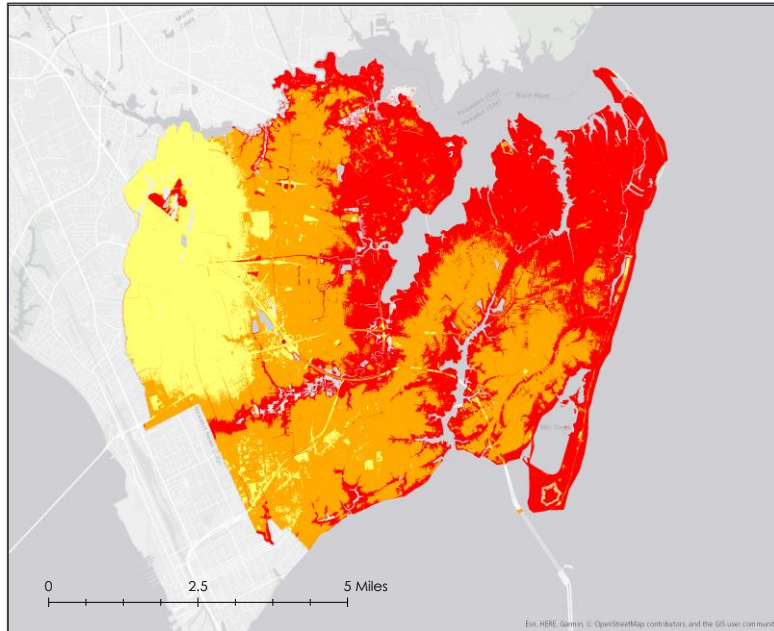


Methodology: Risk Map



Individual Risk Factors

Elevation:

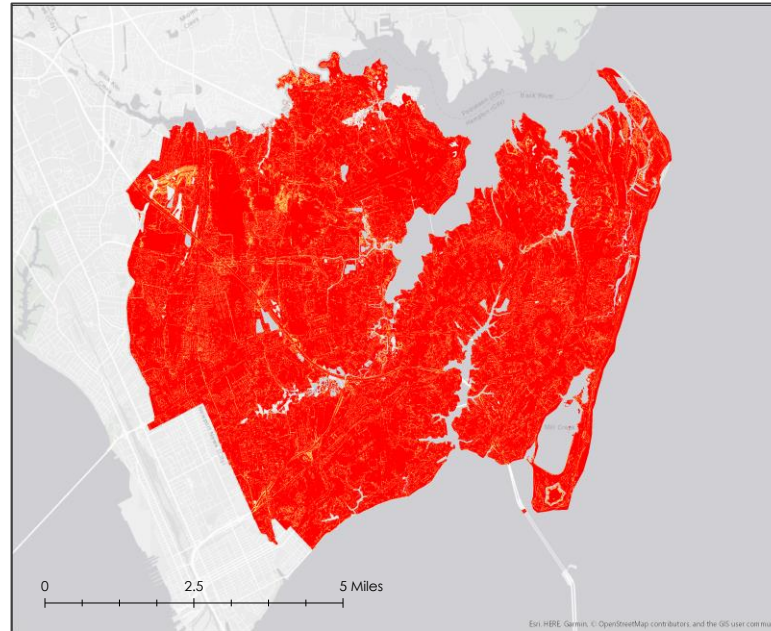


Risk Level



Low High

Slope:

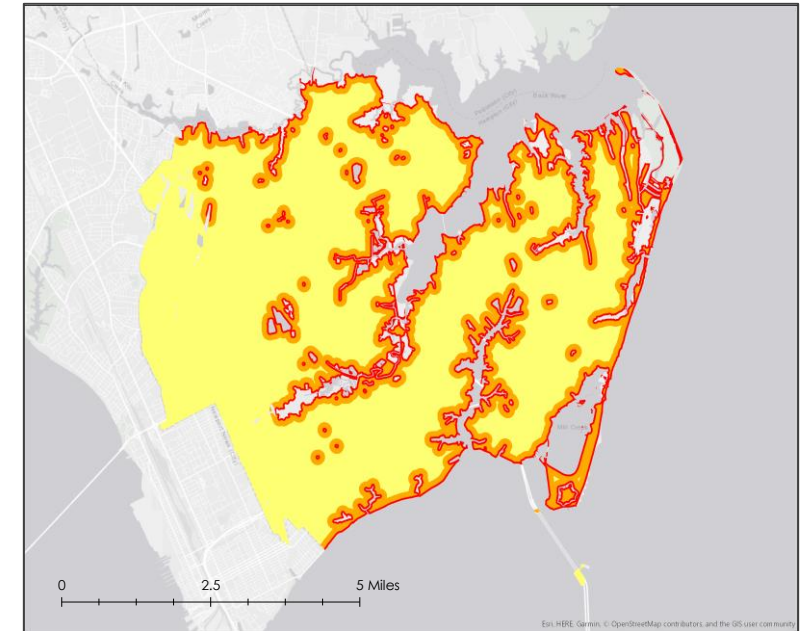


Risk Level



Low High

Distance to Water:



Risk Level



Low High

Individual Risk

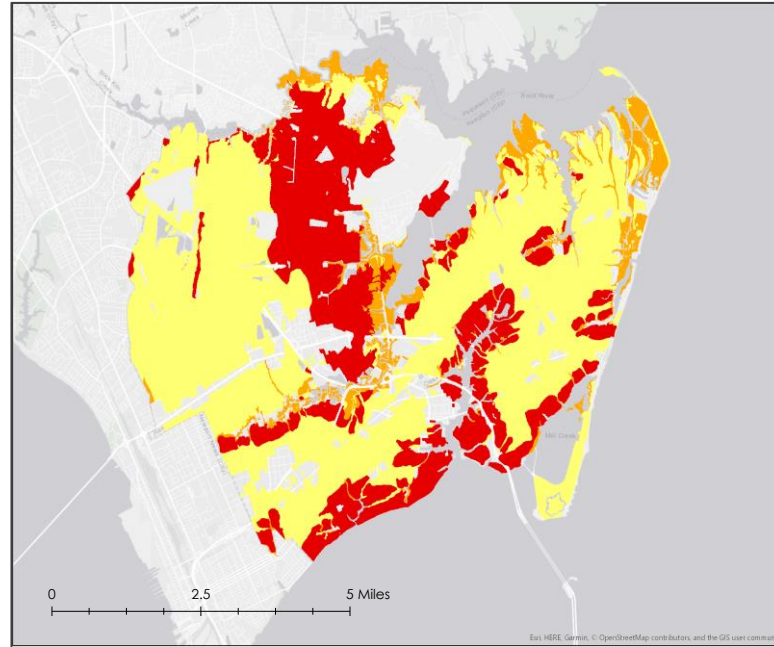
Shoreline Change:



Risk Level



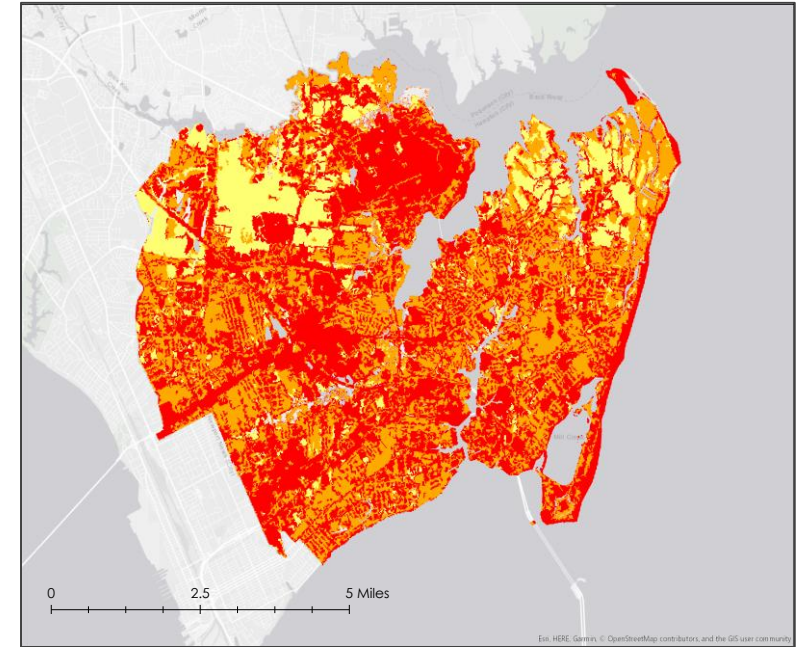
Soil Erodibility:



Risk Level



Land Cover:

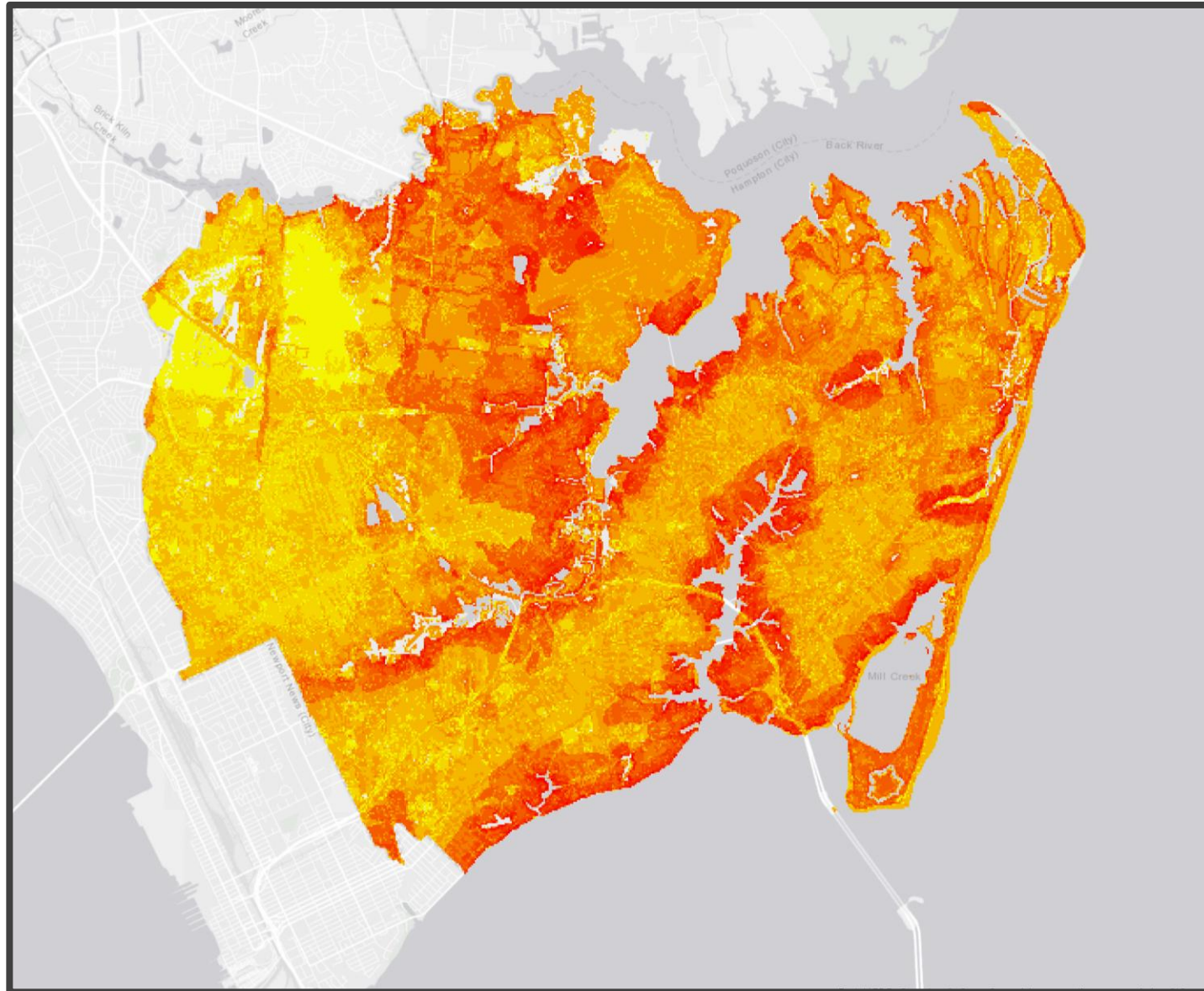


Risk Level





Coastal Erosion Risk Map



Risk Level



High

Low



Errors or Uncertainties

Shoreline Change:

- ▶ Cloud masking algorithm removes pixels from rasters
- ▶ Threshold values to mitigate hardware degradation are determined through visual inspection

Erosion Map:

- ▶ Datasets limited to certain time periods and cannot account for most recent changes
- ▶ No direct scales for coastal erosion risk available



Conclusions

Hampton's Defined High Risk Areas:

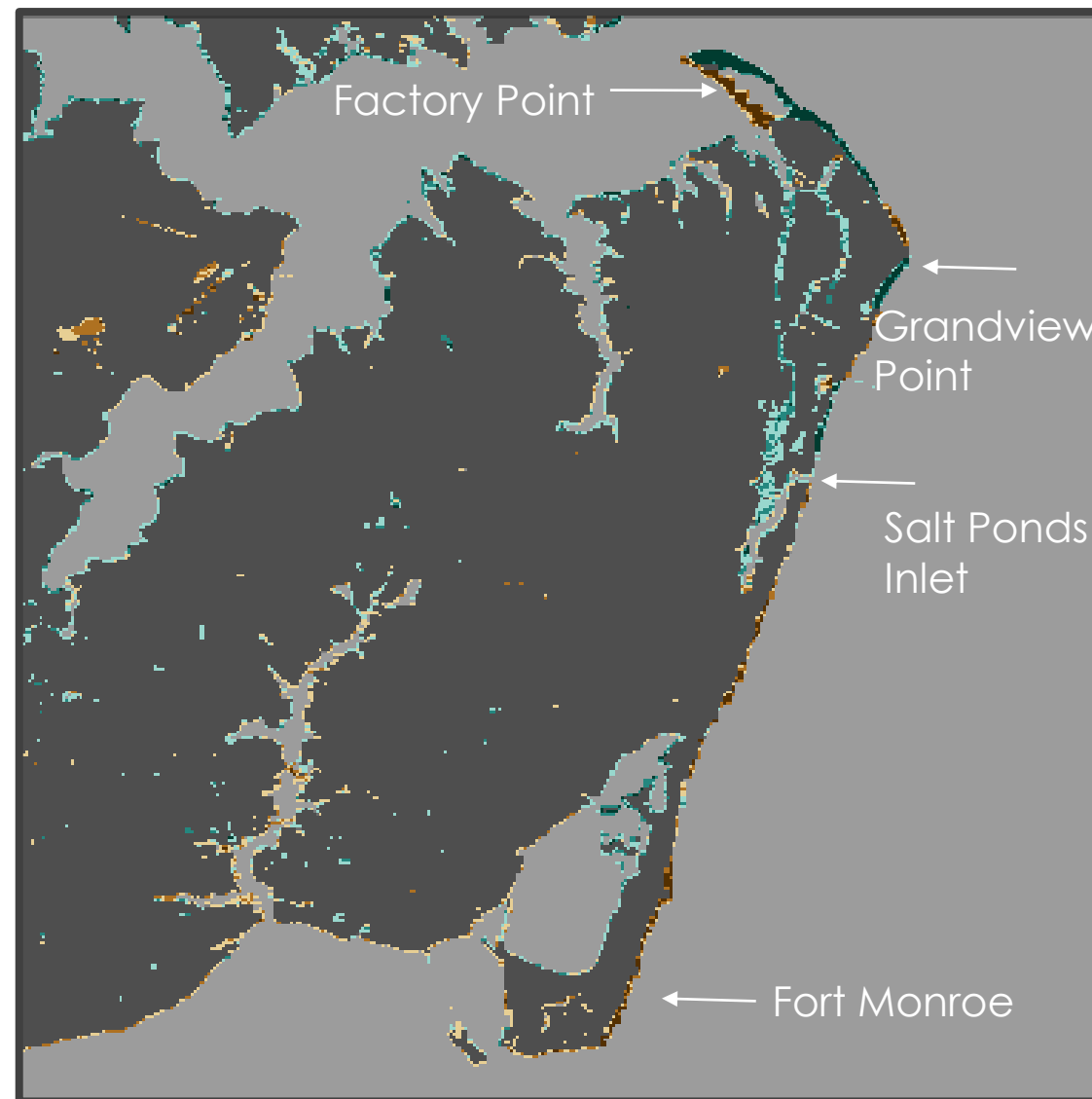
- ▶ Factory Point, Grandview Point, and the Salt Ponds Inlet

Hampton's Defined Low Risk Area:

- ▶ Fort Monroe

Shoreline change maps allows for the city to analyze areas of high coastal erosion after major storm events

- ▶ Hurricane Isabel and Hurricane Michael



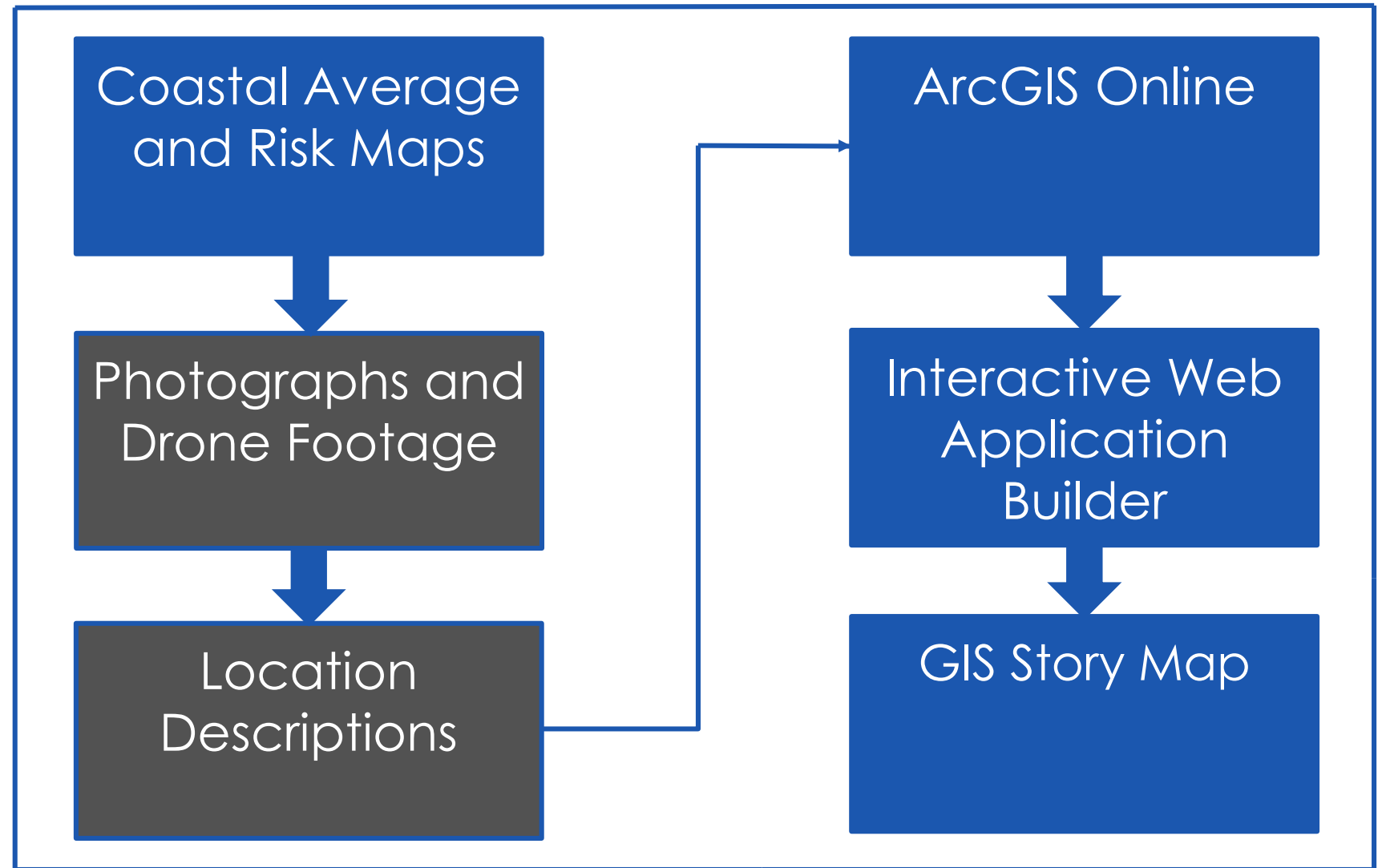
Change from 1988-2018



GIS Story Map

NASA DEVELOP
TEAM

City of Hampton

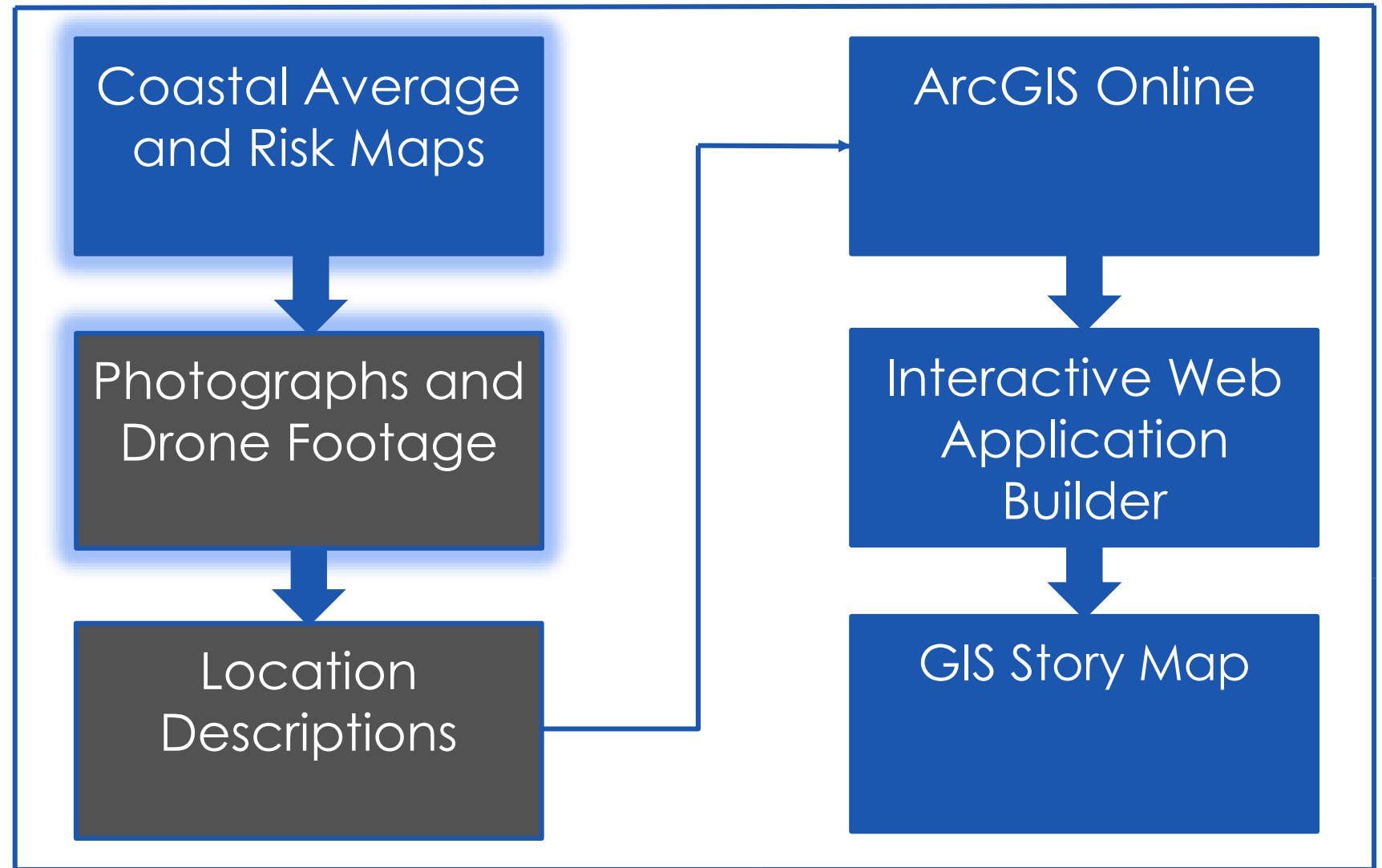




GIS Story Map

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City of Hampton





GIS Story Map

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TEAM

City of Hampton

Coastal Average
and Risk Maps

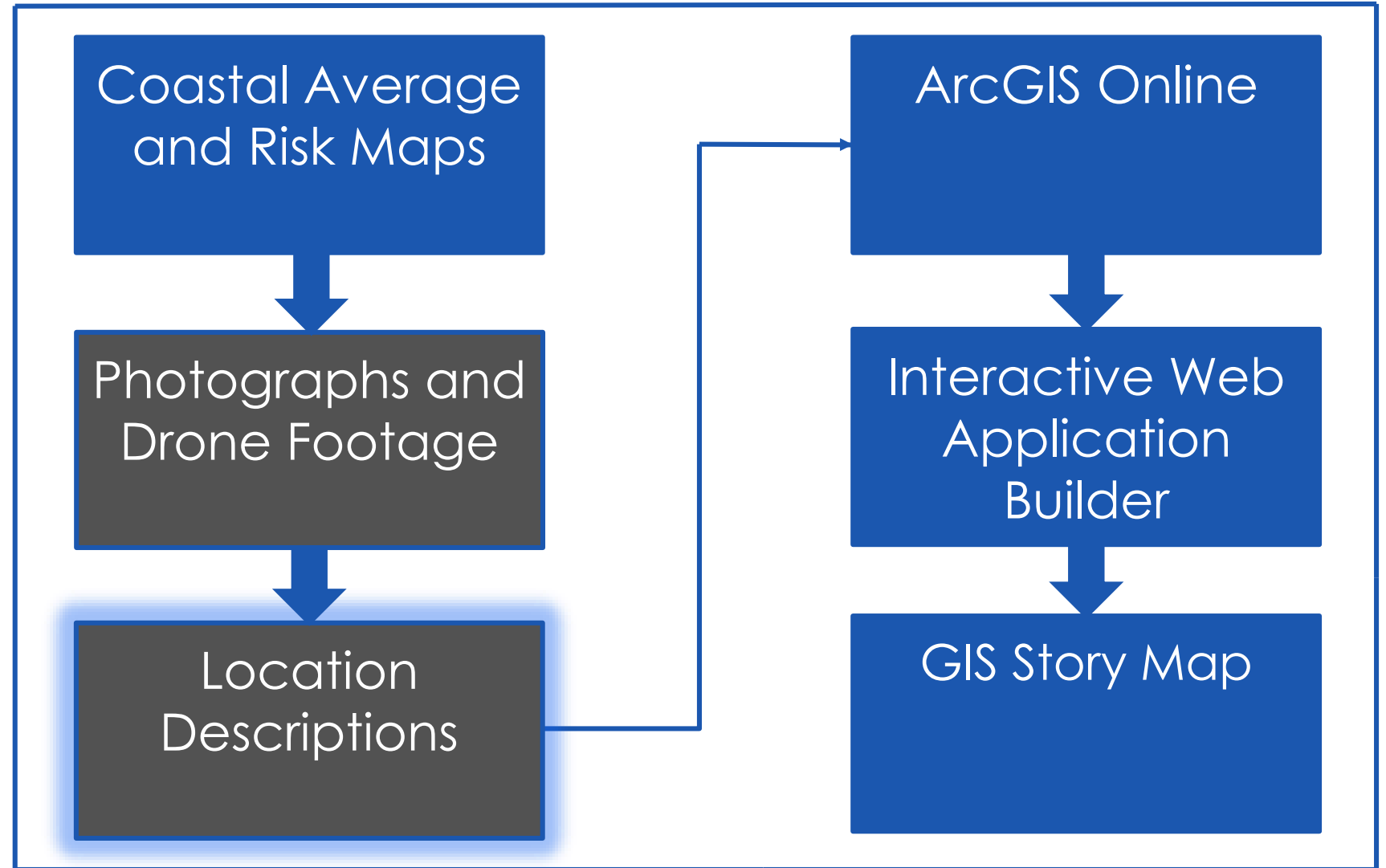
Photographs and
Drone Footage

Location
Descriptions

ArcGIS Online

Interactive Web
Application
Builder

GIS Story Map





GIS Story Map

NASA DEVELOP
TEAM

City of Hampton

Coastal Average
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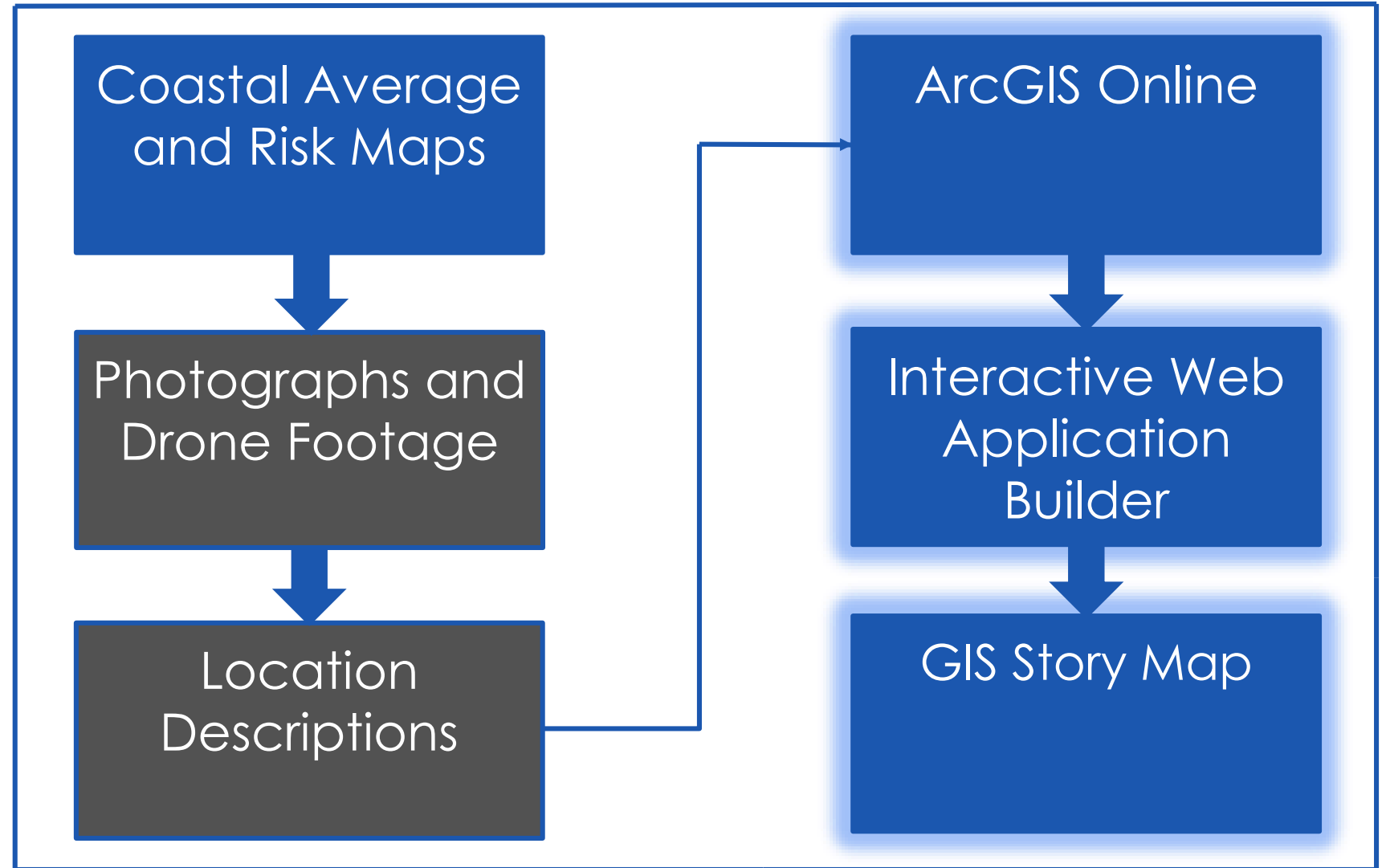
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GIS Story Map





Acknowledgements

The Hampton Roads Urban Development Team

- ▶ **Danielle Ruffe**
- ▶ **Eric Deutsch**
- ▶ **Shaifali Prajapati**

The City of Hampton Government Officials:

- ▶ **Bruce Sturk** | Director of Federal Facilities
- ▶ **David Imburgia** | Environmental and Sustainability Manager
- ▶ **Lucy Stoll** | City Planner
- ▶ **Allan Lambert** | GIS Manager
- ▶ **Brian Lewis** | Water Resources Engineer
- ▶ **Terry O'Neill** | Director of Community Development

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Matthew Tisdale | NASA Atmospheric Science Data Center

Patrick Frier | Center Lead at DEVELOP Langley

