

NATIONAL COASTAL MAPPING PROGRAM UPDATE AND TOOLS



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Regional Sediment Management In-Progress Review and Regional RSM

Differences, Techniques, and Challenges Meeting

15 May 2018



US Army Corps
of Engineers



National Coastal Mapping Program

(500 m) Topo

Hydro (1,000 m)

Goals

- Develop regional, repetitive, high-resolution, high-accuracy elevation and imagery data
- Build an understanding of how the coastal zone is changing
- Facilitate management of sediment and projects at a regional, or watershed scale



US Army Corps
of Engineers.



JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE



Stennis International Airport
Kiln, MS



Dewberry



UNIVERSITY of NEW HAMPSHIRE



NORTHROP GRUMMAN



WOOLPERT
DESIGN | GEOSPATIAL | INFRASTRUCTURE



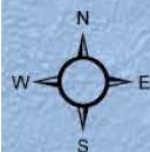
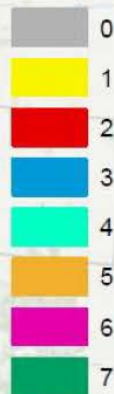
US Army Corps of Engineers



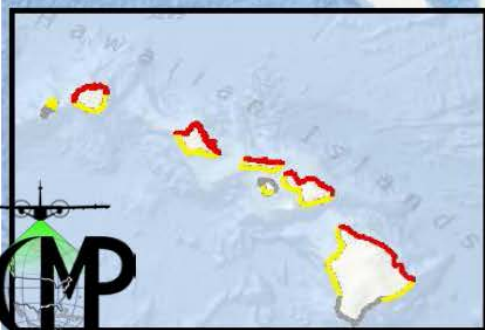


National Coastal Mapping Program Progress

Number of surveys since 2004



0 125 250 500 Miles



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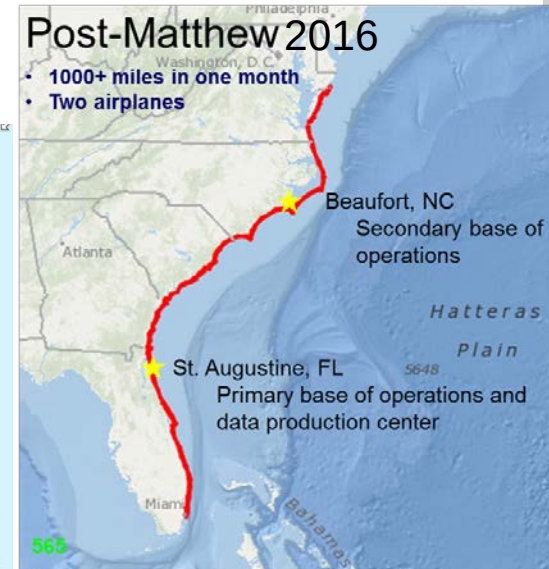
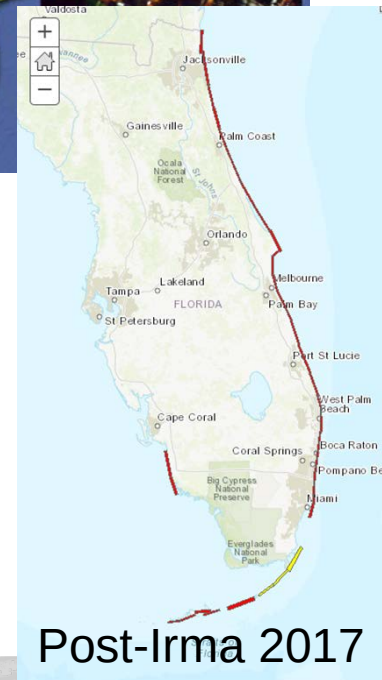
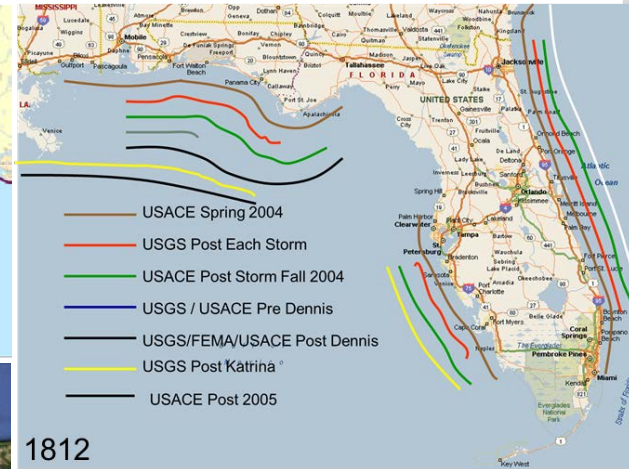
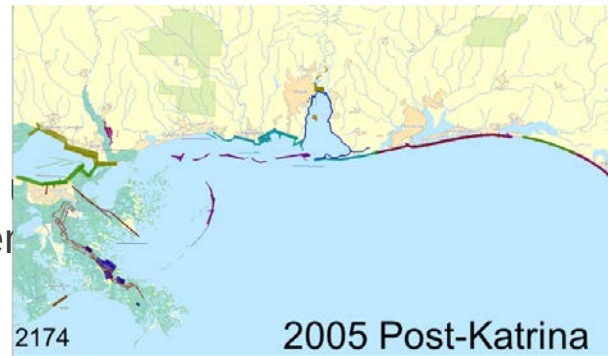
Service Layer Credits: Esri, DeLorme, GEBCO, NOAA, National Geographic

JALBTCX POST-STORM LIDAR FLIGHTS

2004-2005 (Charley, Frances, Ivan, Jeanne, Dennis, Wilma)

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- Quantify project impacts
 - Beaches, navigation channels/structures, placement, ecosystem restoration
- Quantify regional impacts
- Calculate volume and shoreline change
- Respond to legislation/congressional requests
- Assess damage to buildings, roads
- Quantify volumes of debris
- Determine eligibility and volume for FEMA PA protective measures
- Prepare for the next storm
- Validate and improve our predictive capability
- Establish a baseline for recovery
- Provide the next pre-event dataset
- Quantify resilience?



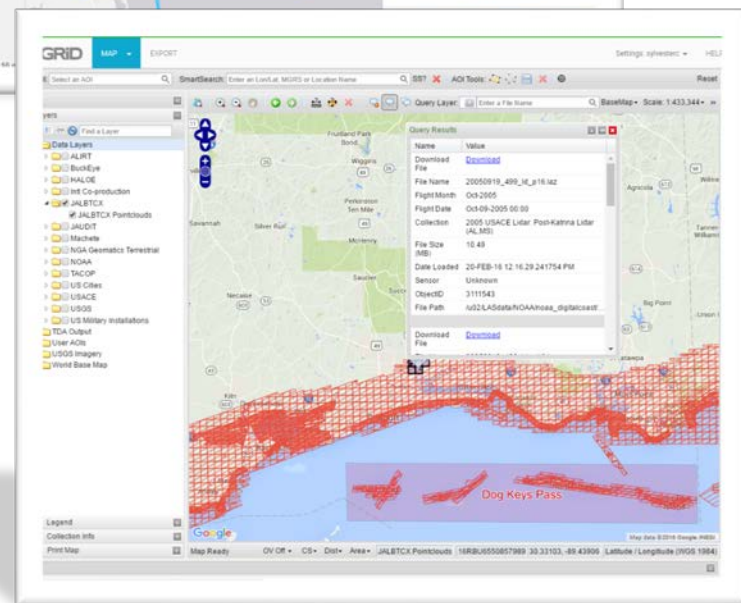
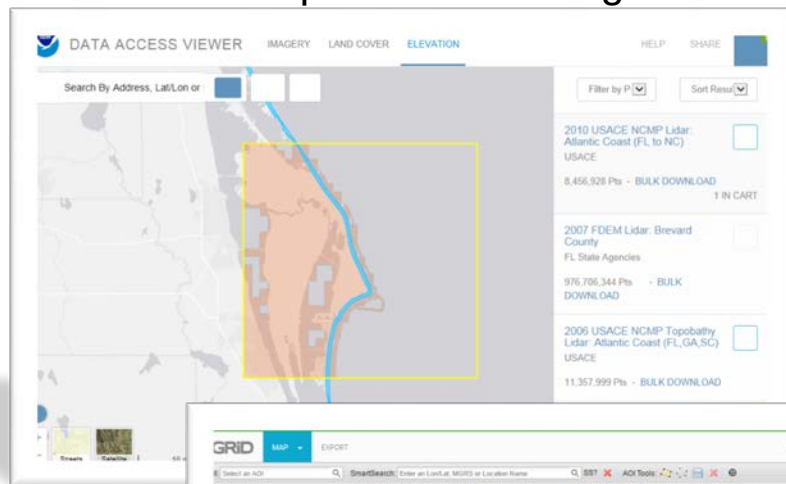
NCMP DATA ACCESS

- USACE District Office
- USACE Geospatial Repository and Data Management System (GRiD)
- NOAA OCM (Digital Coast) and NCEI (Boulder)
- USGS St. Petersburg, FL, and Sioux Falls, SD
- By request to jalbtcx@usace.army.mil

JALBTCX web services

<https://usace-ags.esriemcs.com/arcgis/rest/services/JALBTCX>

<https://coast.noaa.gov/dataviewer/>

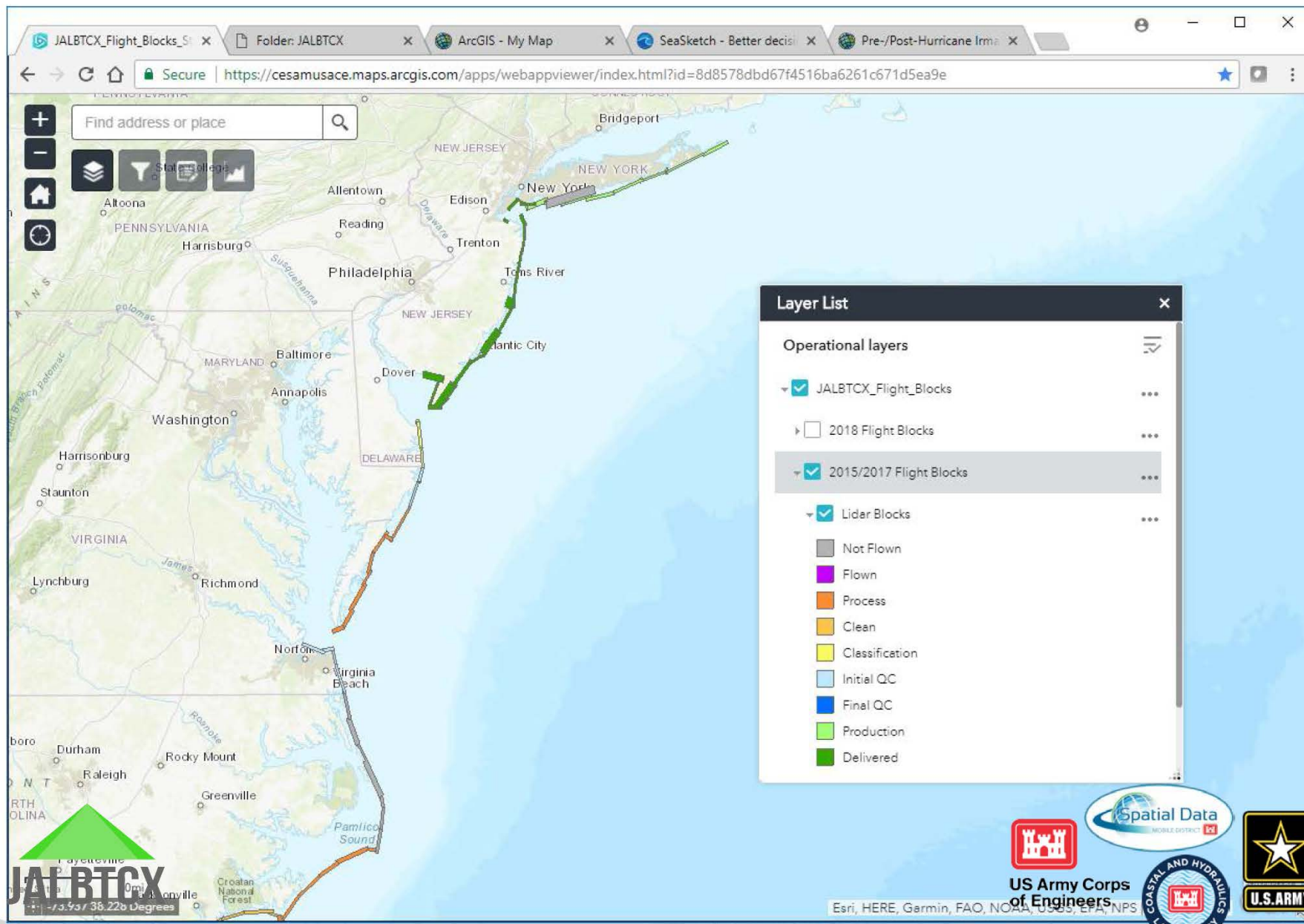


<https://griduc.rsgis.erdc.dren.mil/griduc/corpsmap/>

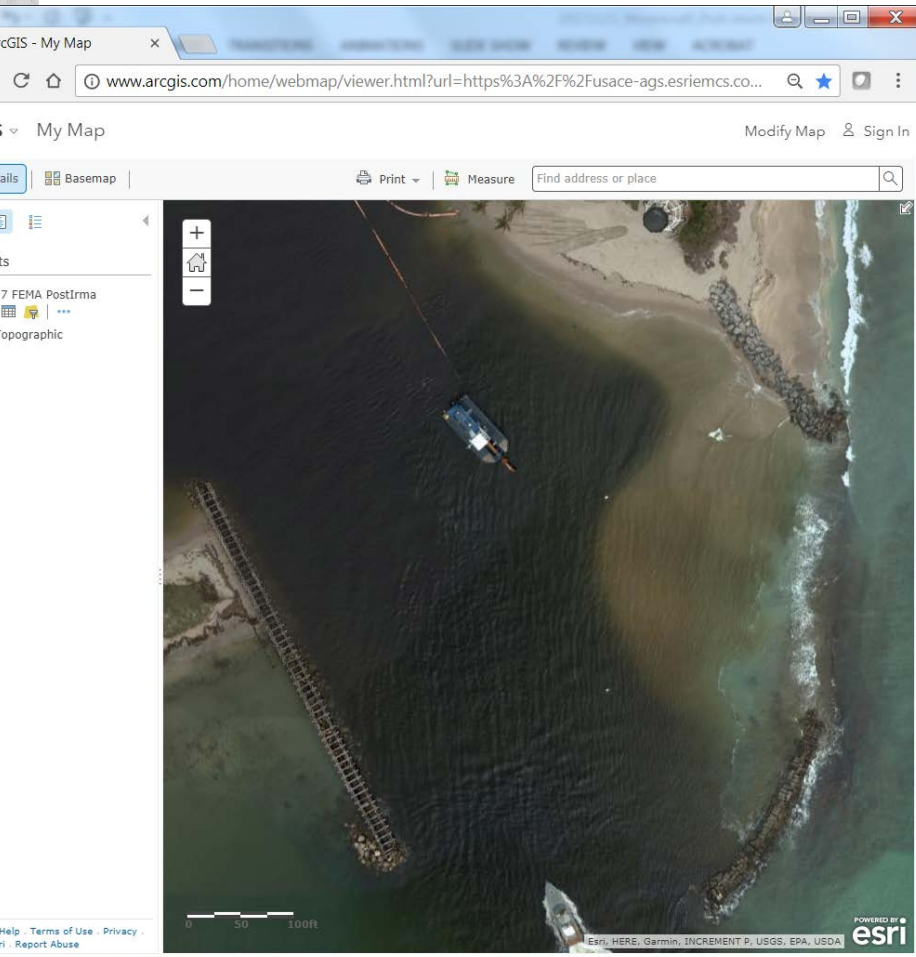


JALBTCX FLIGHT BLOCK STATUS

8

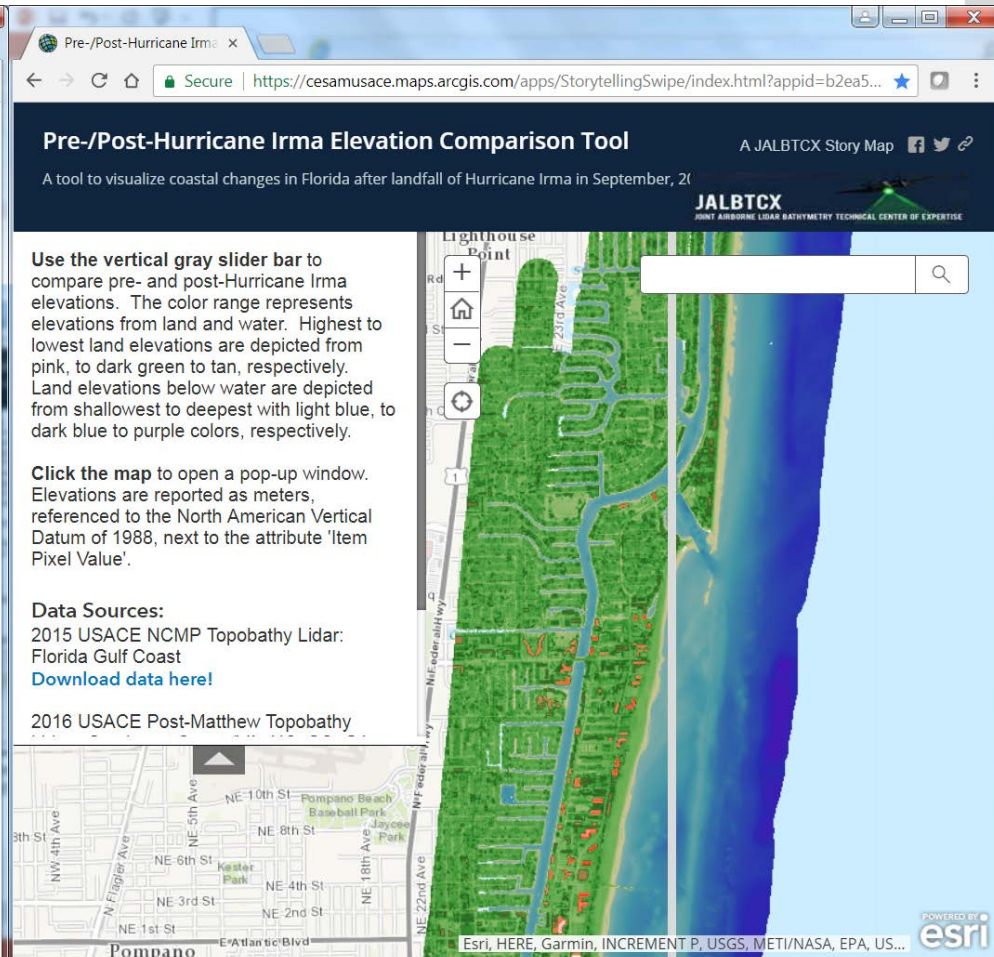


JALBTCX WEBSERVICES AND MAPS



http://www.arcgis.com/home/webmap/viewer.html?url=https%3A%2F%2Fusace-ags.esriemcs.com%2Farcgis%2Frest%2Fservices%2FJALBTCX%2F2017_FEMA_PostIrma%2FImageServer&source=sd

JALBTCX



<https://cesamusace.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=b2ea57b7d3864f8a97058705228c4b93#>



US Army Corps of Engineers.



JALBTCX STORYMAPS

JALBTCX Support for Emergency Response

A JALBTCX ...

JALBTCX

The Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) performs emergency response mapping on behalf of the U.S. Army Corps of Engineers (USACE) and other Federal partners. Mapping conducted under the USACE Emergency Response

US Army Corps of Engineers

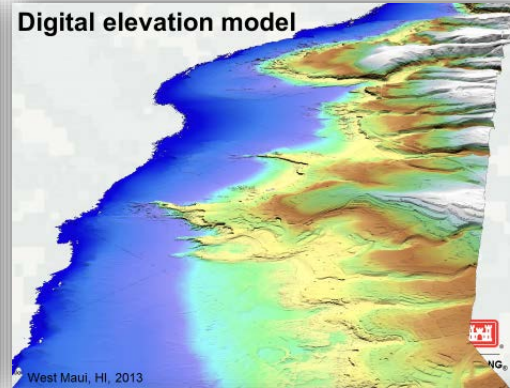
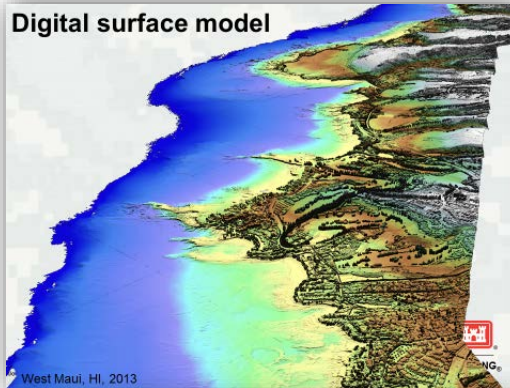
Spatial Data

COASTAL AND HYDRAULICS LABORATORY

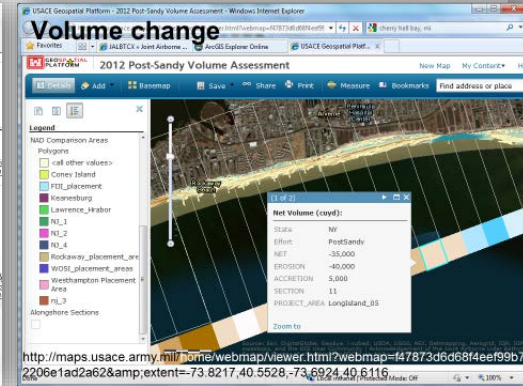
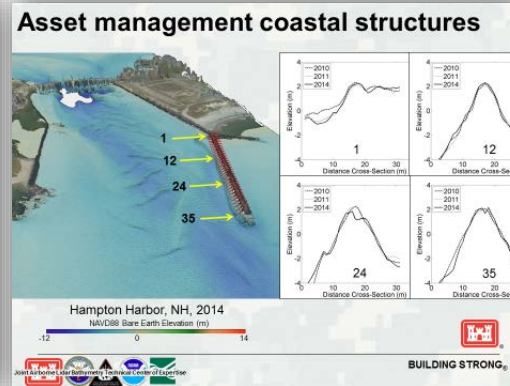
U.S. ARMY

JALBTCX PRODUCTS FOR COASTAL ENGINEERS

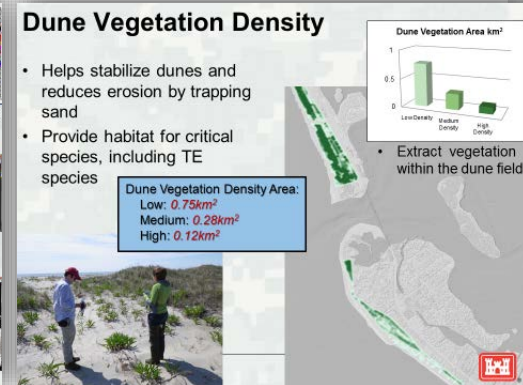
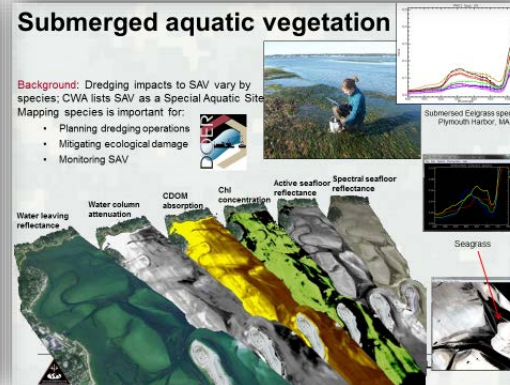
Basic lidar
and imagery
products



Advanced
lidar products*



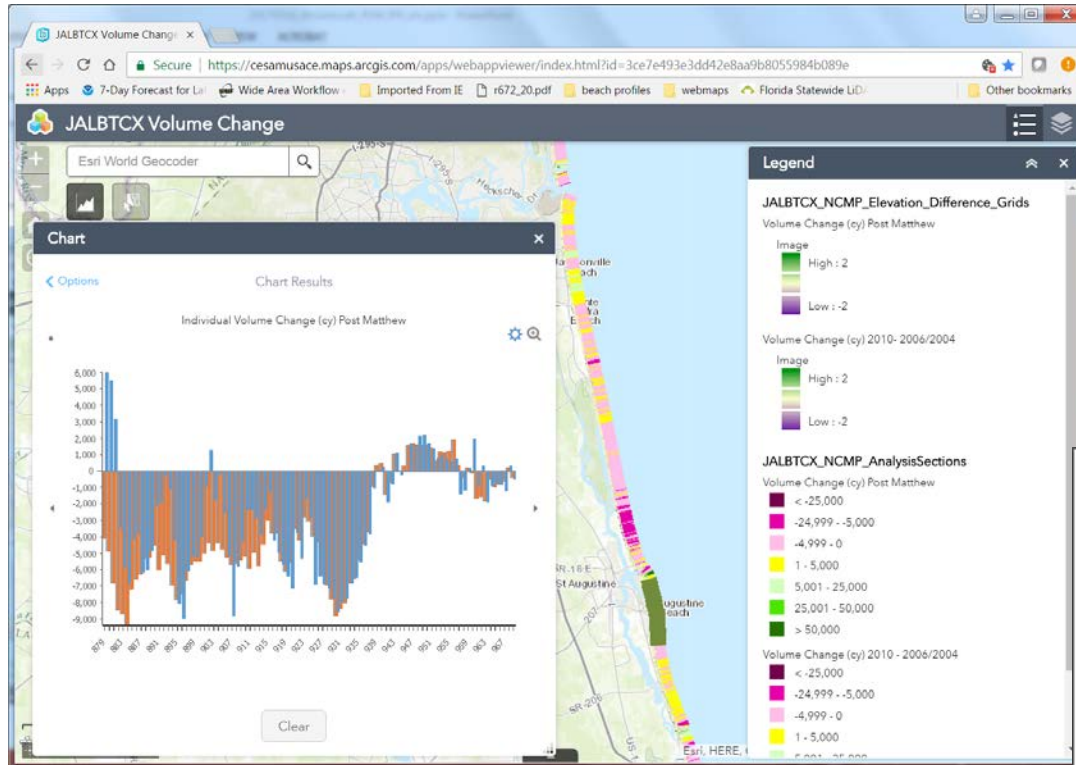
Fusion
products*



*Leveraging ERDC
CHL and EL R&D



JALBTCX TOOLBOX—VOLUME AND SHORELINE CHANGE



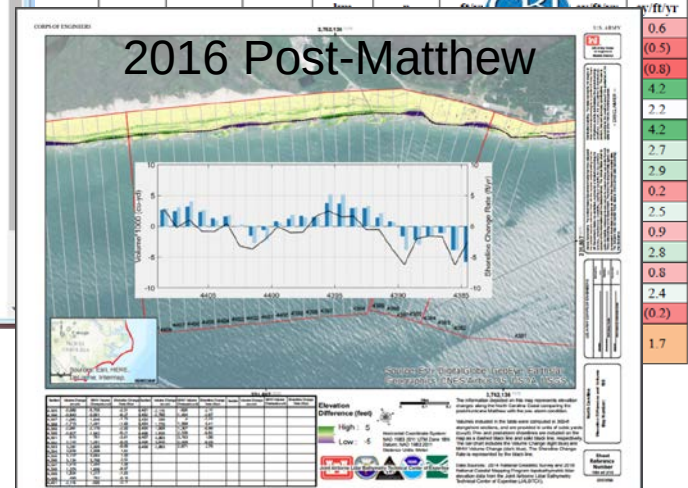
<https://usace.maps.arcgis.com/apps/webappviewer/index.html?id=d1ee0da4887046edbc9ff05c66d40708>

Volume computations
2012 pilot project

Volume change
2012 post-Sandy

Volume Change
2013 web services

2015 East coast volumes



METRICS FOR ENGINEERING, PLANNING, RESTORATION, AND RESILIENCE

Geomorphic: elevation/depth, slope, dune characteristics, beach width, substrate size, volume/elevation change, distance to shoreline or dune peak, foredune continuity, channel shape/gradient and other structural characteristics

Environmental: terrestrial and aquatic habitat/vegetation type (e.g., SAV, wetlands), TES, invasives, cover density/diversity, fragmentation/connectivity, substrate type, impervious surface, height of vegetation above ground

Water: stream length, watershed size, salinity, turbidity, chlorophyll, toxicity E
exposure

Used in:

Mapping sea turtle nesting habitat suitability

Landscape evolution models

Mapping susceptibility to breaching events

Identifying opportunities for RSM

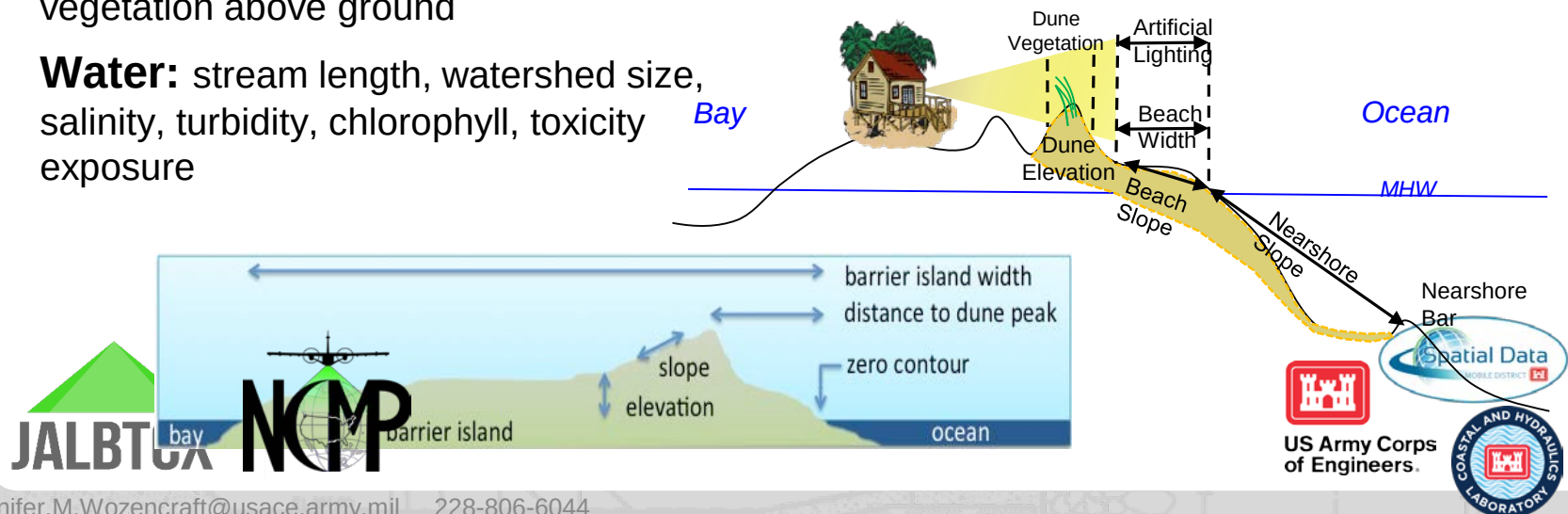
Coastal infrastructure assessment

Beach project monitoring

Ecosystem goods and services valuation

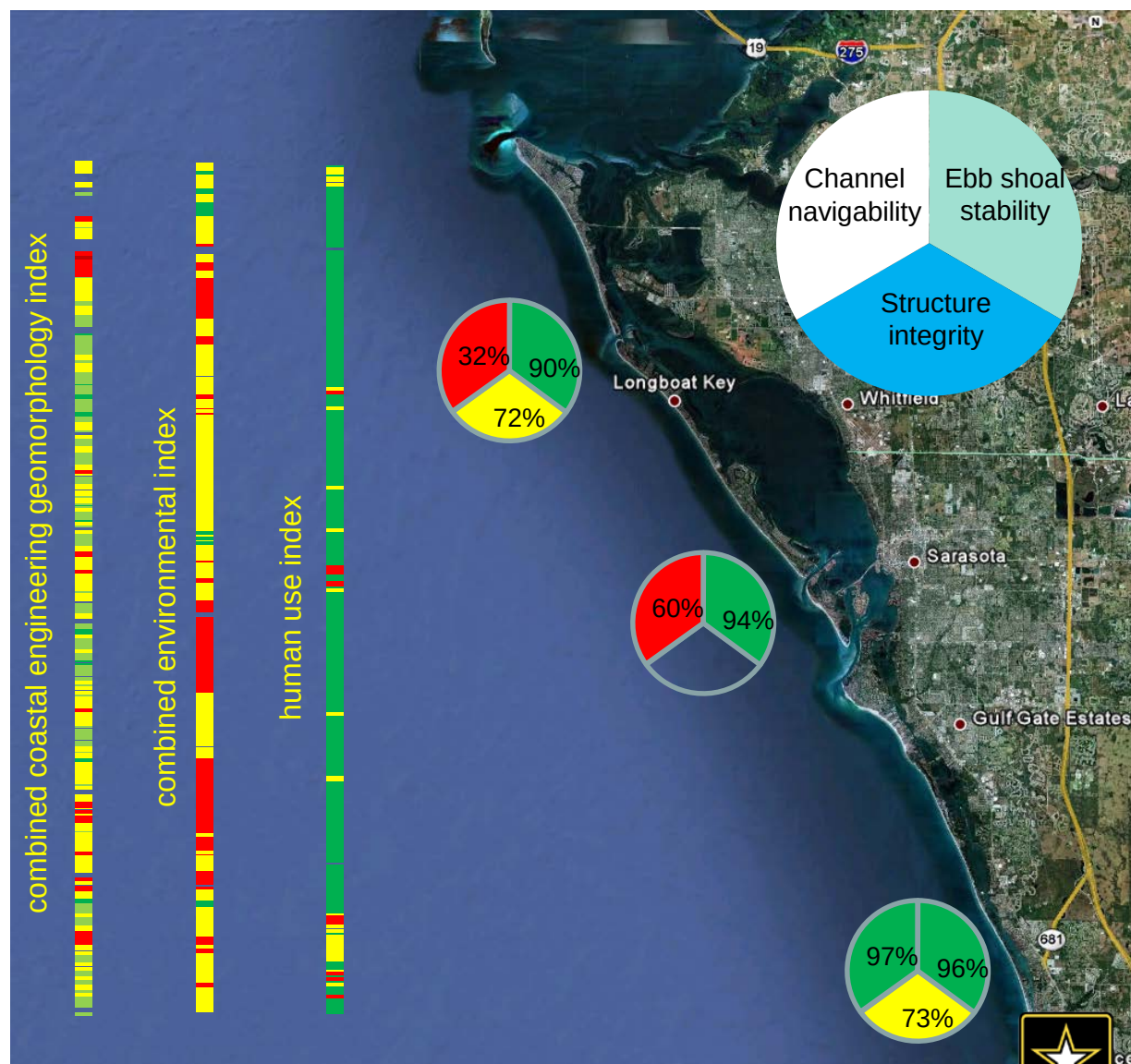
Quantifying coastal resilience

TES conservation webtool

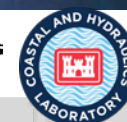


COASTAL DASHBOARD

- Green
 - accreting shoreline
 - high dune
 - wide beach
 - critical habitat
 - more natural landscape
- Yellow
 - stable shoreline
 - medium dune and beach width
 - some critical habitat
 - more developed
- Red
 - eroding shoreline
 - low dune
 - narrow beach
 - no critical habitat
 - developed landscape

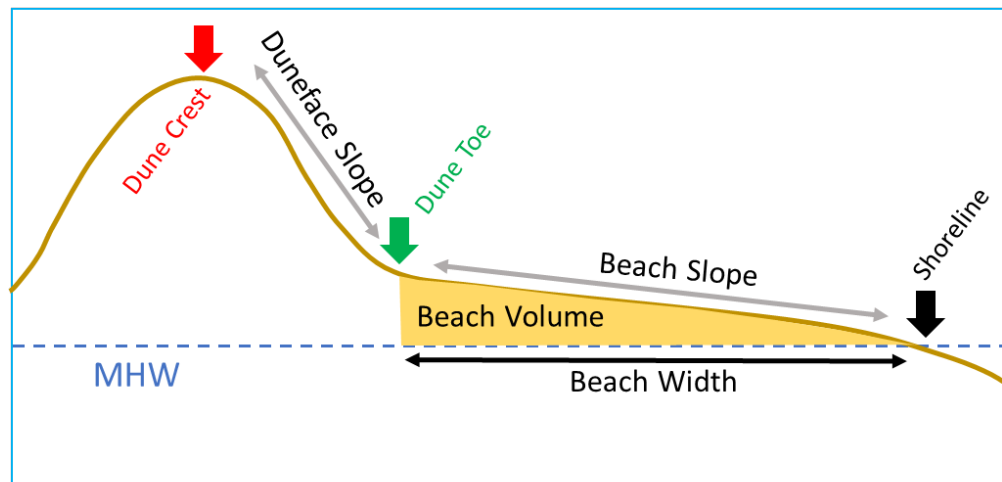


US Army Corps of Engineers.

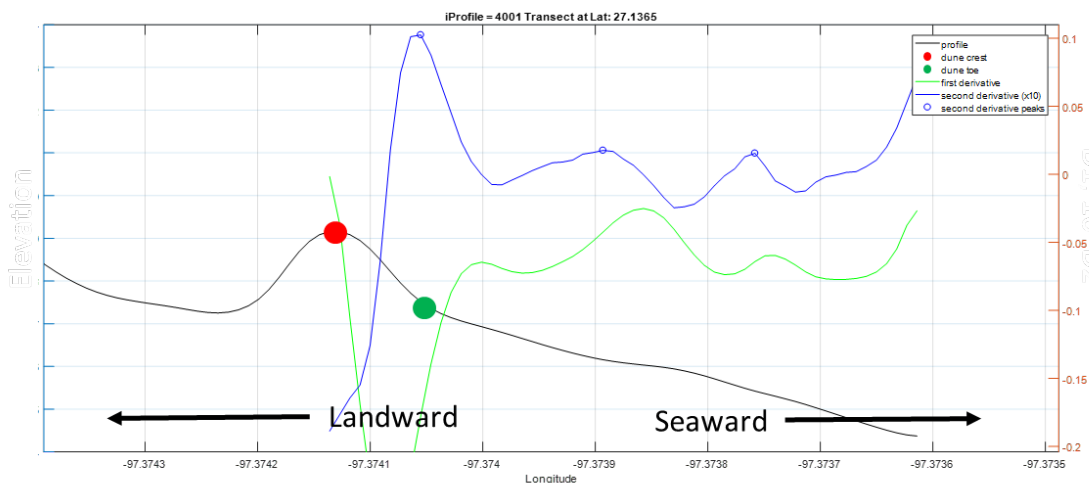
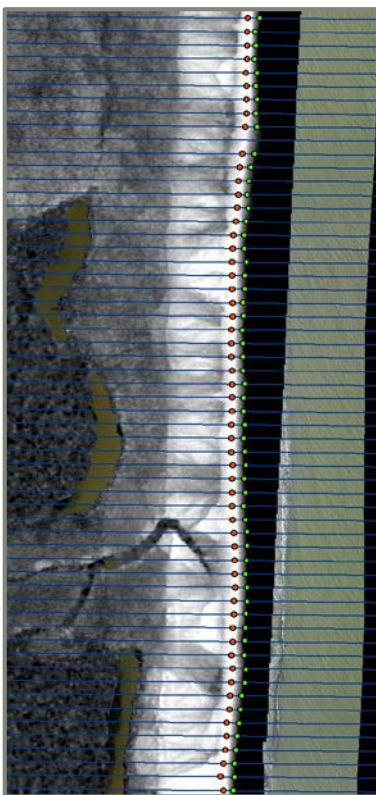


GEOMORPHIC PARAMETERS

- Foredune Crest & Toe
- Duneface slope
- Beach width & slope
- Beach volume
- Highest Dune Ridge

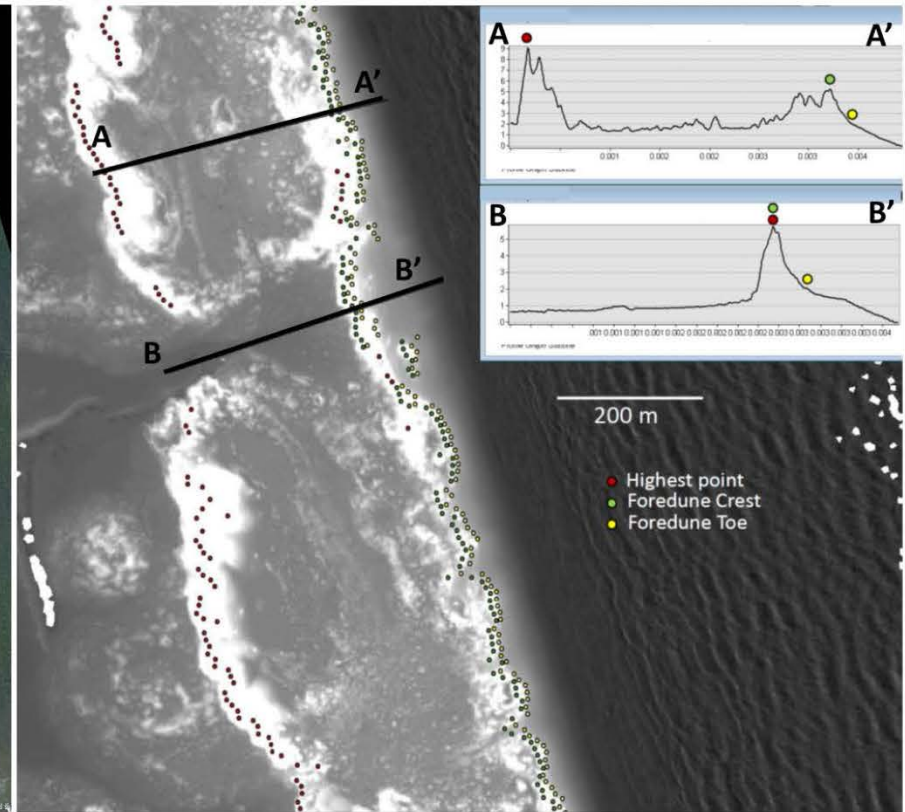


Points chosen
along transects
10 m spacing

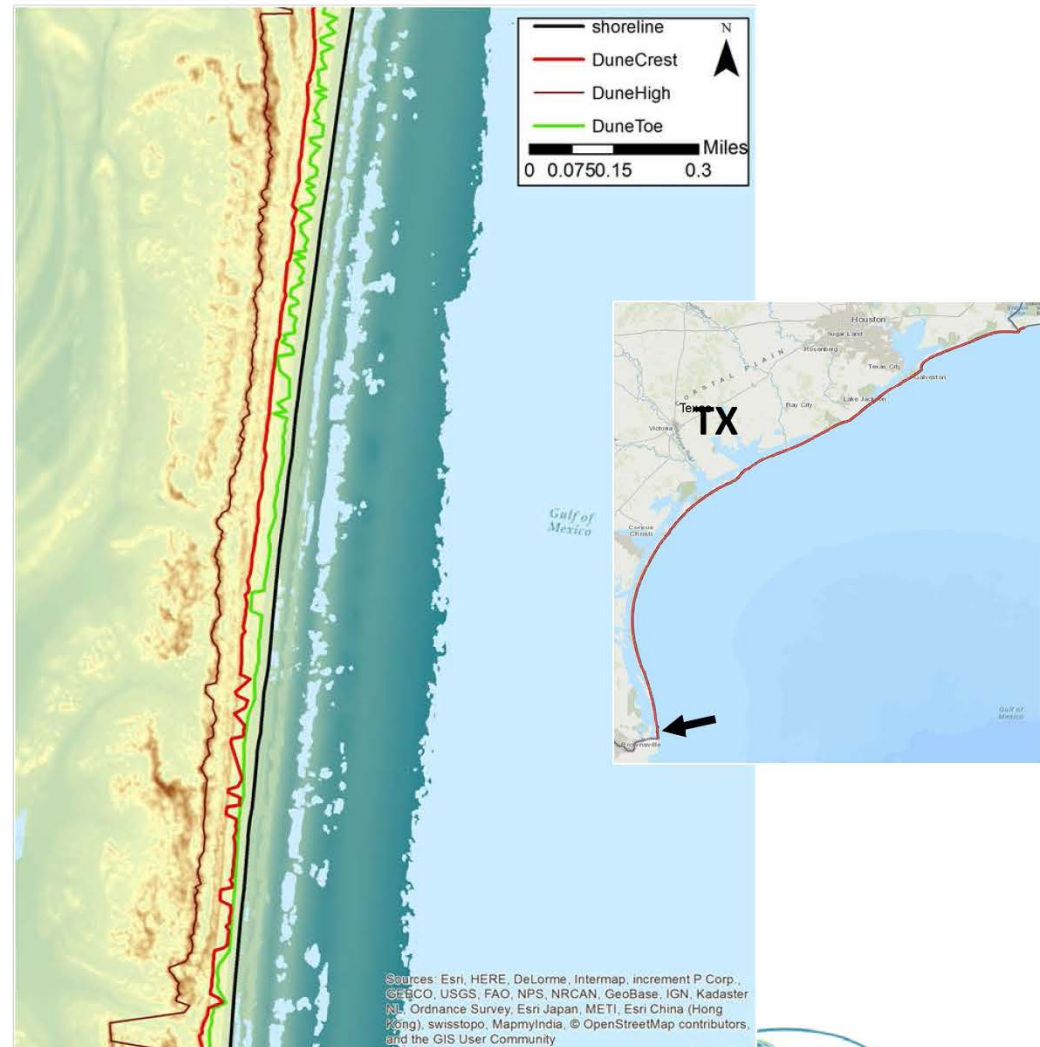
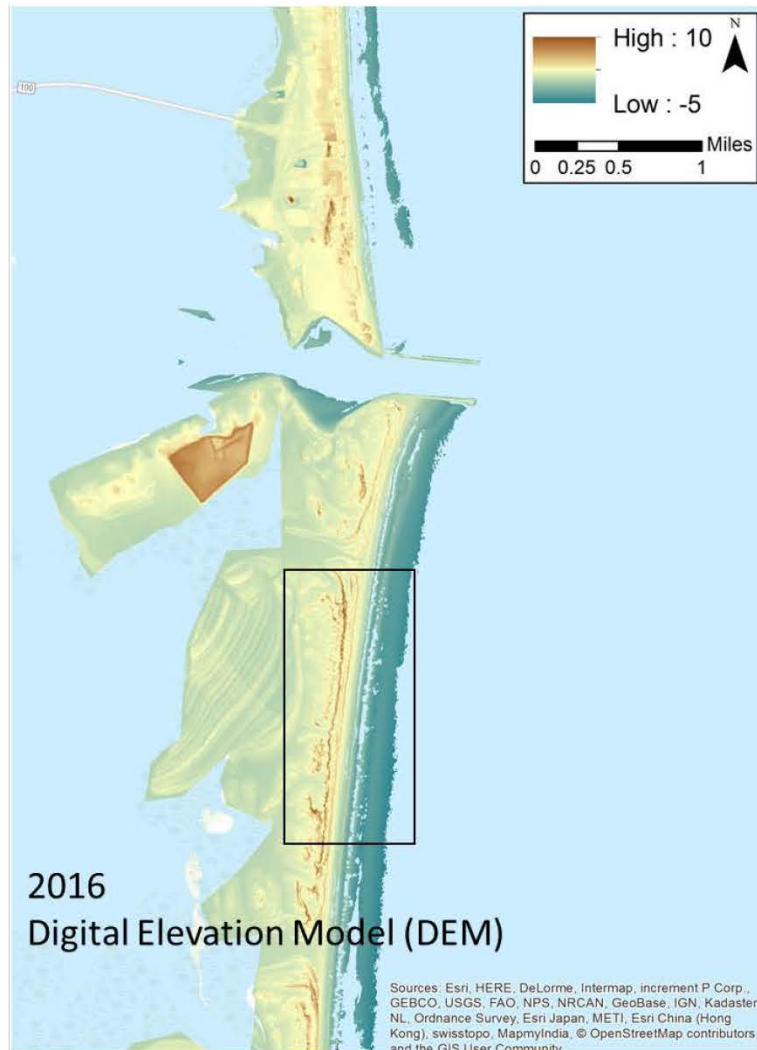


GEOMORPHIC PARAMETERS

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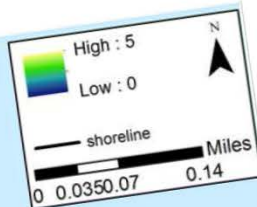


GEOMORPHIC PARAMETERS

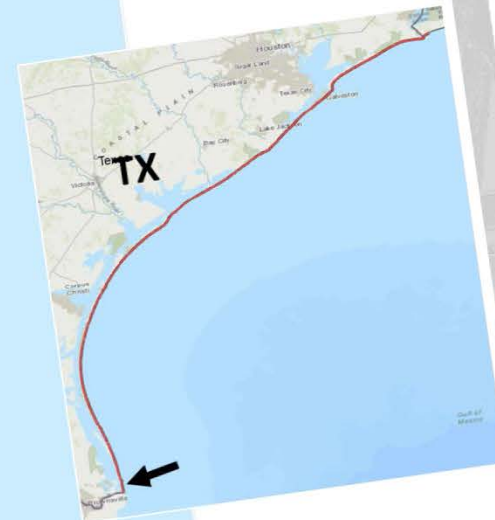
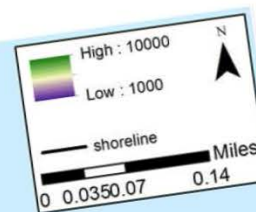


GEOMORPHIC PARAMETERS

Beach Slope



Beach Volume



- Shoreline to Dune Toe
- 100-m bins

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

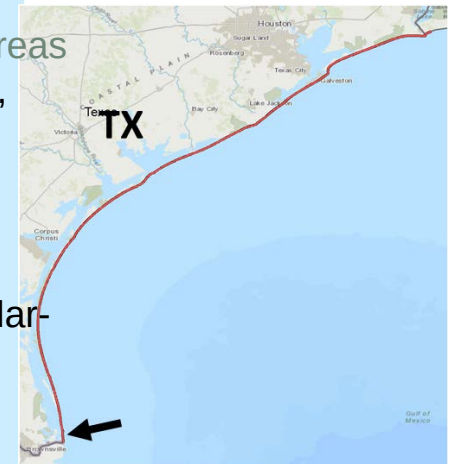
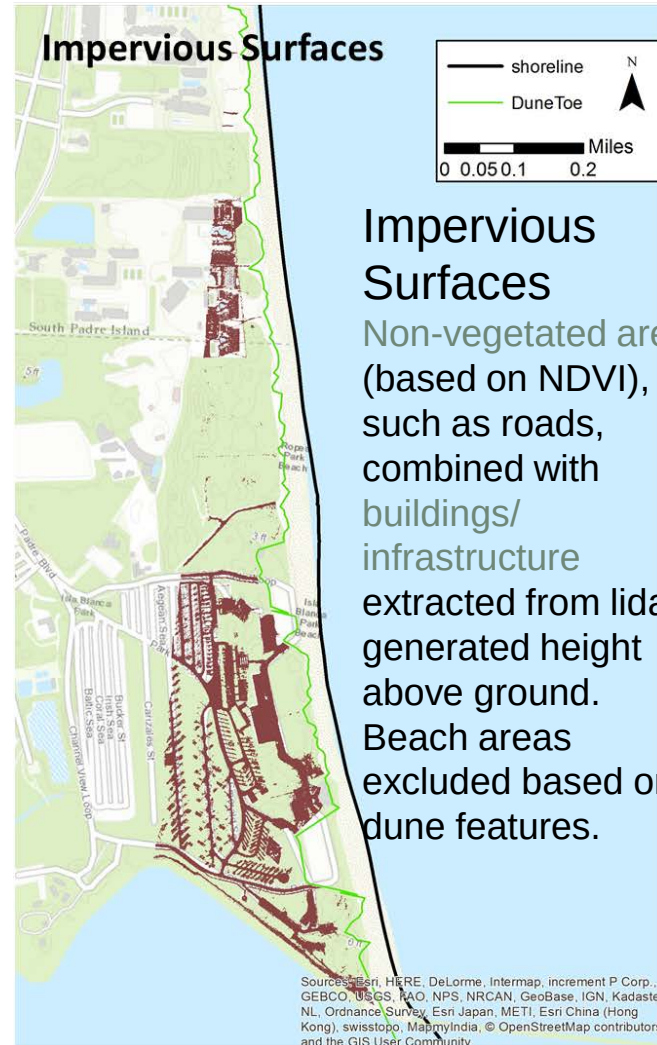
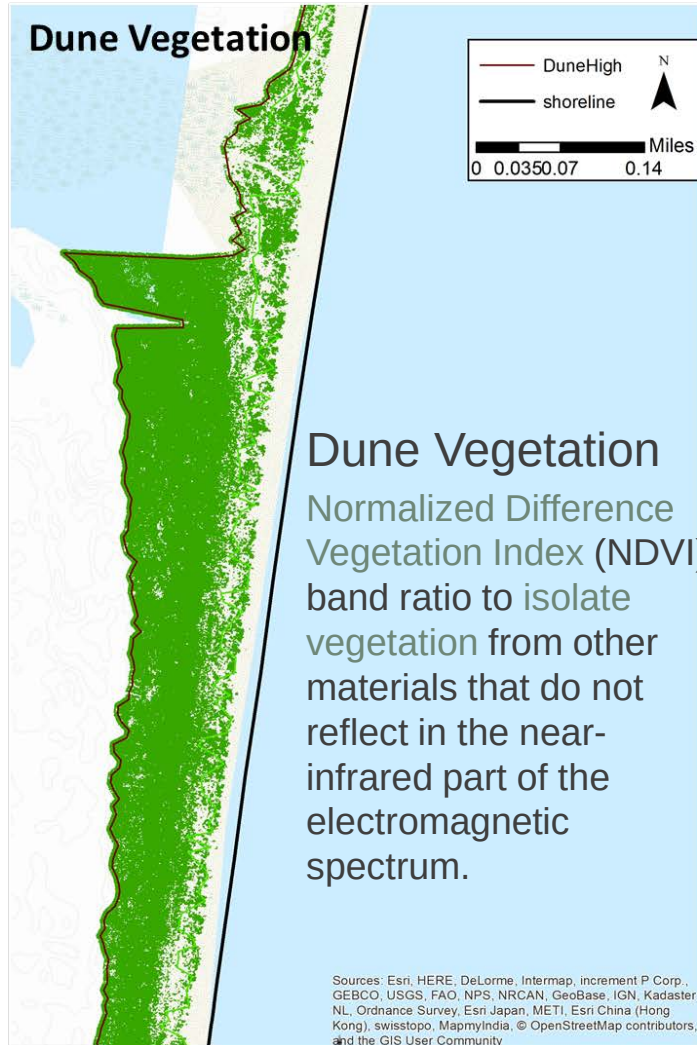
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



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ENVIRONMENTAL PARAMETERS



CONCEPTUAL MODEL



Weighting Scheme

$$\begin{aligned}
 \text{Resiliency} = & 0.7 \left\{ \left(0.7 \frac{\text{Dune Peak}}{\text{Max Dune Peak}} \right) + 0.2 \left(\frac{\text{Barrier Island CS Volume}}{\text{Max B.I.C.S. Volume}} \right) \right. \\
 & \left. + 0.1 \left(\frac{\text{Max Shoreline Erosion} - \text{Shoreline Erosion}}{\text{Max Shoreline Erosion}} \right) \right\} \\
 & + 0.2 \left\{ 0.45 \left(\frac{\text{Barrier Island Width}}{\text{Max B.I. Width}} \right) + 0.1 \left(\frac{\text{Beach Width}}{\text{Max Beach Width}} \right) \right. \\
 & + 0.04 \left(\frac{\text{Slope of Beach}}{\text{Max Slope of Beach}} \right) + 0.03 \left(\frac{\text{Slope to Depth of Closure}}{\text{Max Slope to D. of Closure}} \right) \\
 & + 0.3 \left(\frac{\text{Impervious Area}}{\text{Max Impervious Area}} \right) + 0.2 \left(\frac{\text{Dune Veg. Coverage}}{\text{Max Dune Veg. Coverage}} \right) \\
 & + 0.05 \left(\frac{\text{Height of Veg. above Ground}}{\text{Max Height Veg. above Ground}} \right) + 0.05 \left(\frac{\text{Bay Volume}}{\text{Max Bay Volume}} \right) \\
 & + 0.05 \left(\frac{\text{Max. Relative Sea Level Change} - \text{Rel. Sea Level Change}}{\text{Max. Rel. Sea Level Change}} \right) \Big\} \\
 & + 0.1 \left\{ 0.15 \left(\frac{\text{Tidal Prism}}{\text{Max Tidal Prism}} \right) + 0.6 \left(\frac{\text{Max Breach History} - \text{Breach Hist.}}{\text{Max Breach Hist.}} \right) \right. \\
 & \left. + 0.25 \left(\frac{\text{Dune Toe}}{\text{Max Dune Toe}} \right) \right\}
 \end{aligned}$$

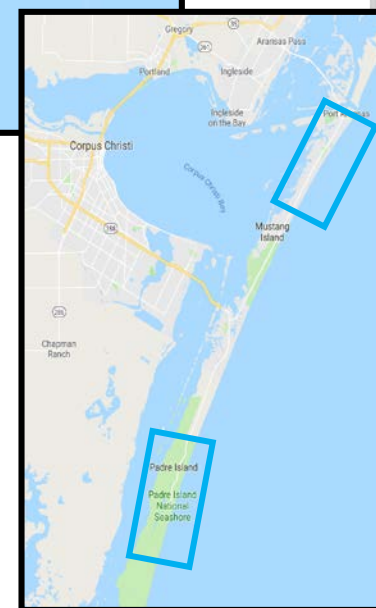
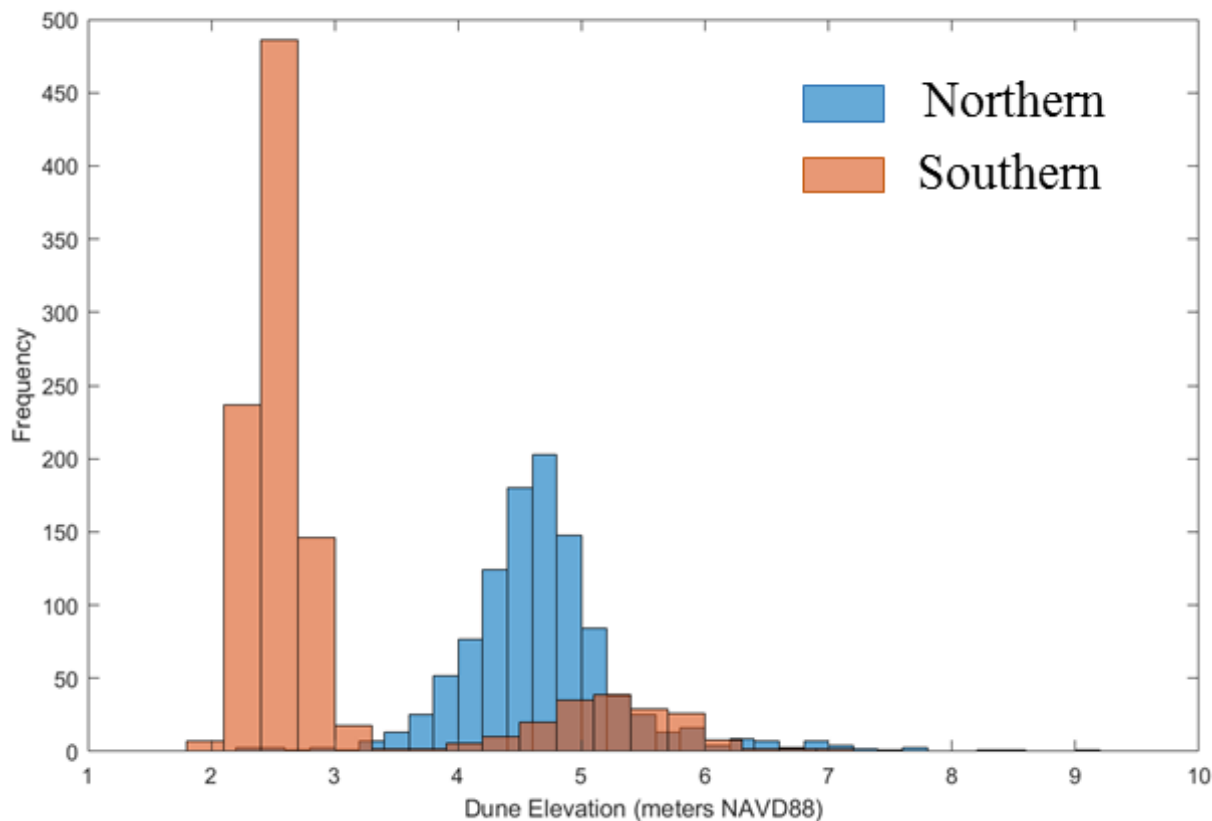
Tier 1

Tier 2

Tier 3



GEOMORPHIC PARAMETERS

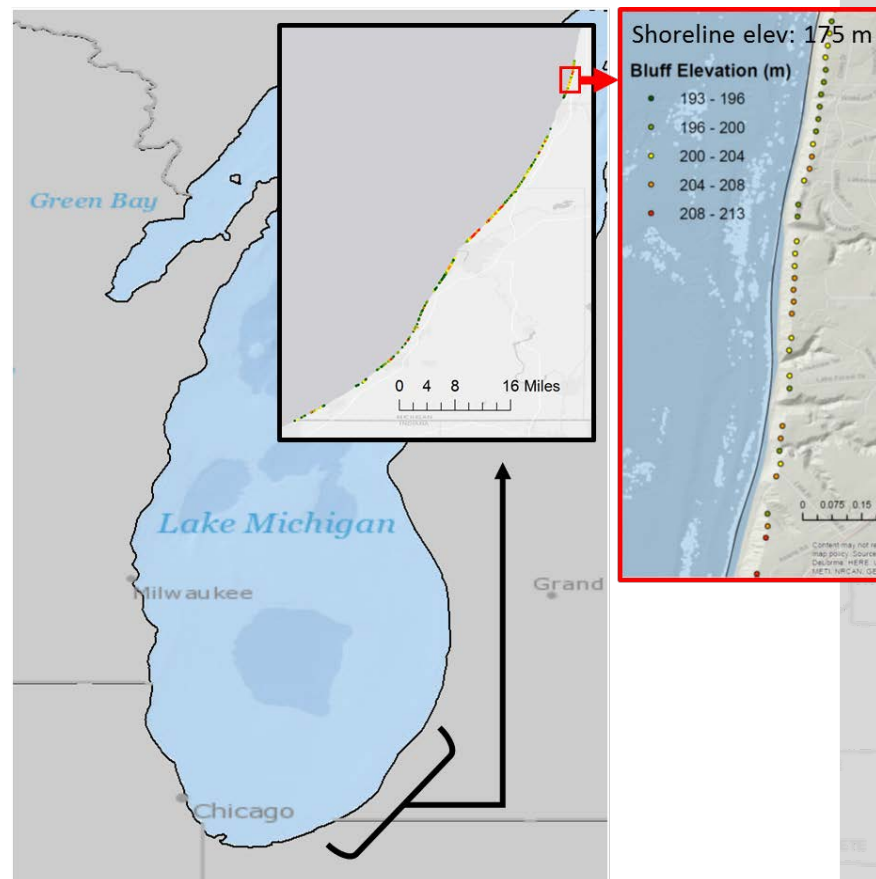


Challenge: How do we compare regions?



WHAT'S NEXT

- Ongoing surveys in South Carolina
- Surveys in Puerto Rico for FEMA
 - Beach erosion quantities
- Surveys in New England, Lakes Erie and Ontario
- Support to LRD for bluff extraction
 - Great Lakes Coastal Resiliency Study
- JALBTCX Workshop, 26-28 June
- Implementing Total Propagated Uncertainty
- New system specification
- Update to new reference system



QUESTIONS?

Send us your NCMP/JALBTCX data story!
Did we save you \$ or time?
Allow you to do analysis that could not have been done another way?

Time-lapse of a night flight, Long Island, NY, September 2017

