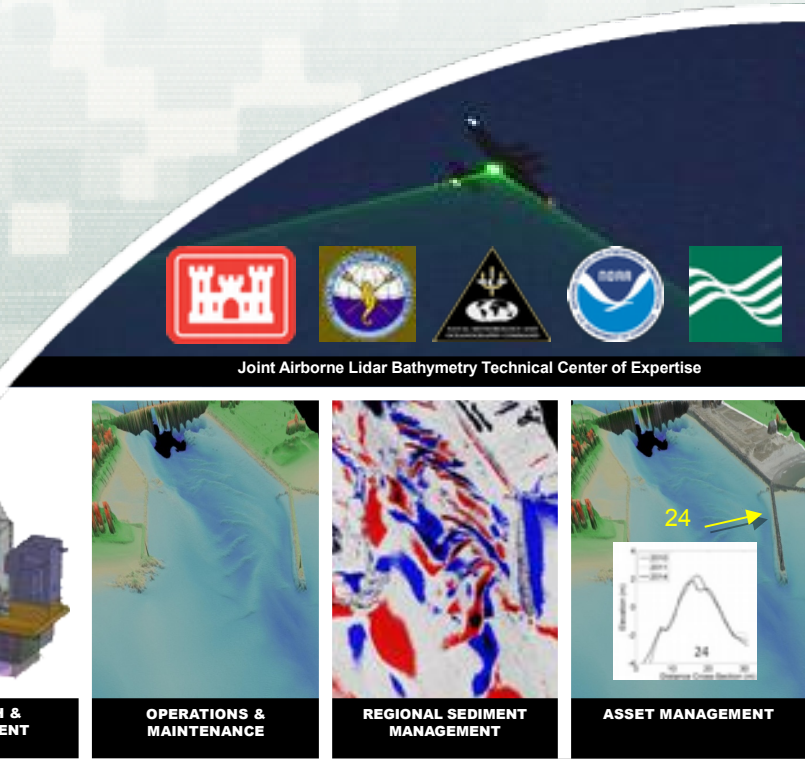
USACE Post-Matthew Survey Operations, Mapping Products and Services

Charlene Sylvester
Physical Scientist
Mobile District / JALBTCX Operations

NC GICC Federal Interagency Committee Meeting
Wilmington, NC
26 January 2017



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US Army Corps of Engineers
BUILDING STRONG®

Spatial Data
MOBILE DISTRICT

Agenda

- JALBTCX and the USACE National Coastal Mapping Program (NCMP)
- Post-Matthew operations overview
- Rapid response lidar products
- Data products for emergency response
- 2017 NCMP planning and coordination

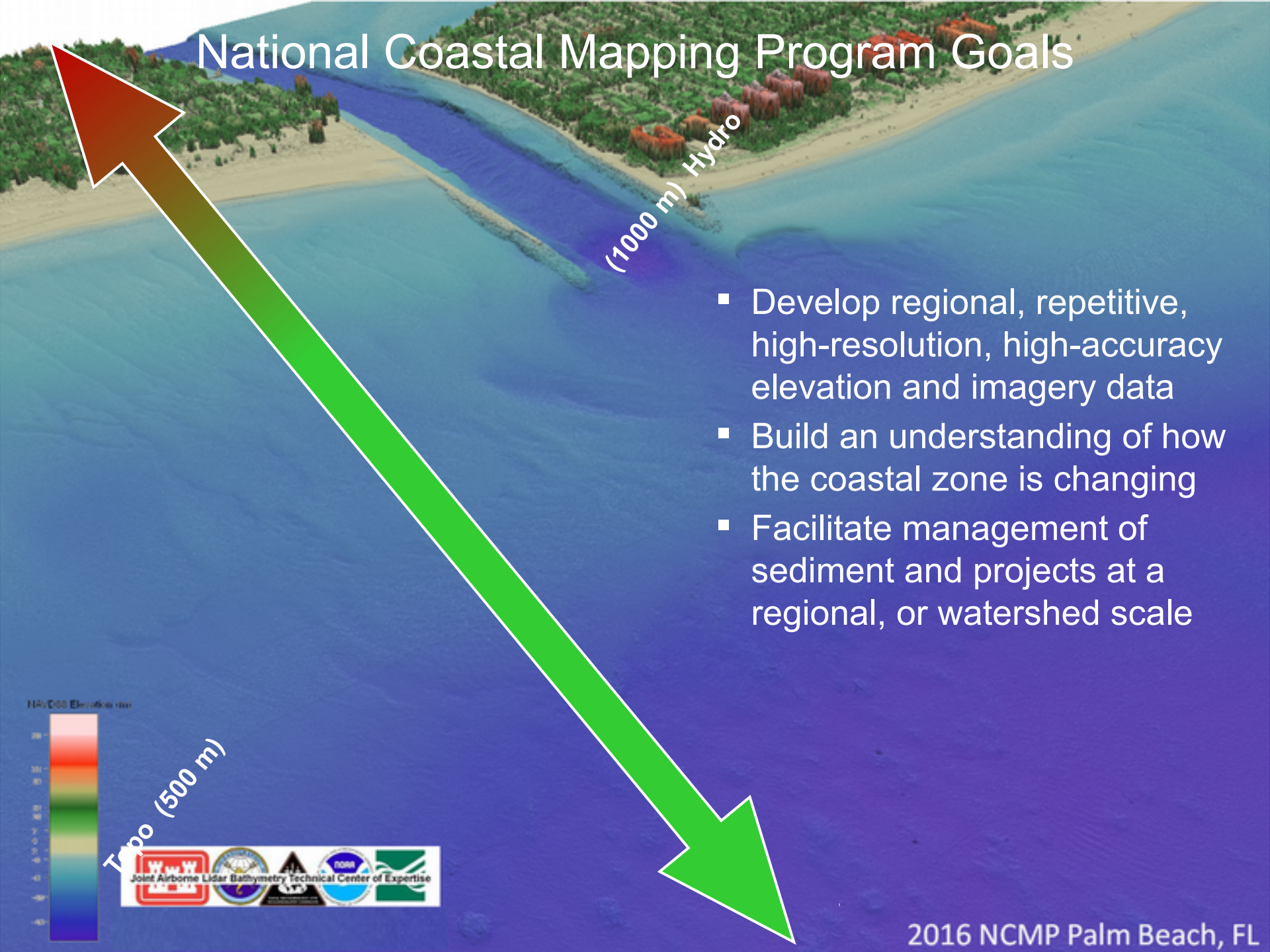
Joint Airborne Lidar Bathymetry Technical Center of Expertise

Director: Jennifer Wozencraft

Annual Technical Workshop, June or July 2017
Myrtle Beach, Charleston or Wilmington - TBD

Optech
Spatial Data
US Army Corps of Engineers
ONR
CBI
Dynamic Aviation
tres
MAGNOLIA
UNIVERSITY OF NOTRE DAME
Beuhead
AHAB
FUGRO
Virginia Tech
TEXAS A&M UNIVERSITY
UNIVERSITY of NEW HAMPSHIRE
GEOMATICS DATA SOLUTIONS
NOAA
USGS

National Coastal Mapping Program 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

2016 NCMP Palm Beach, FL

Coastal Zone Mapping and Imaging Lidar

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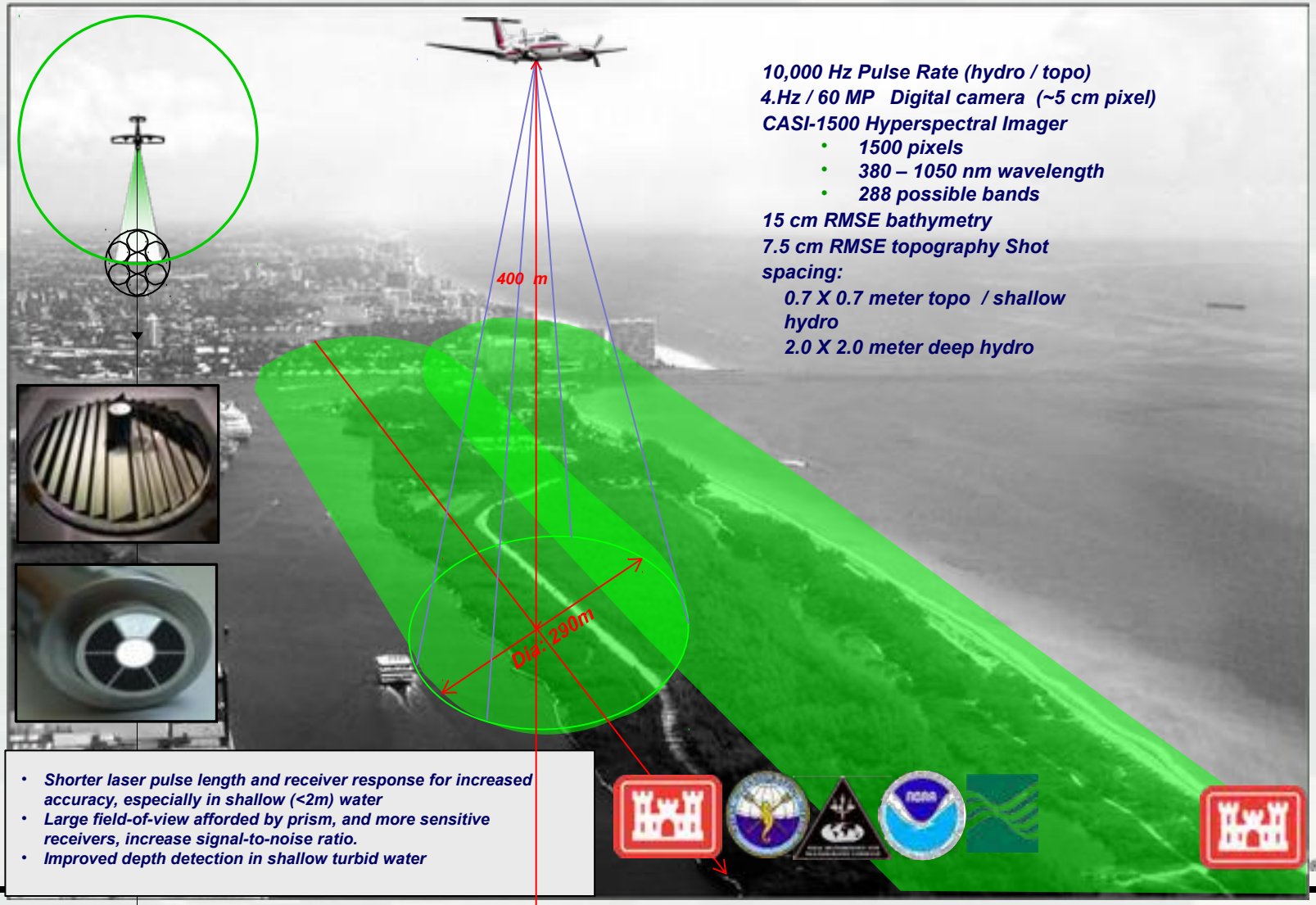
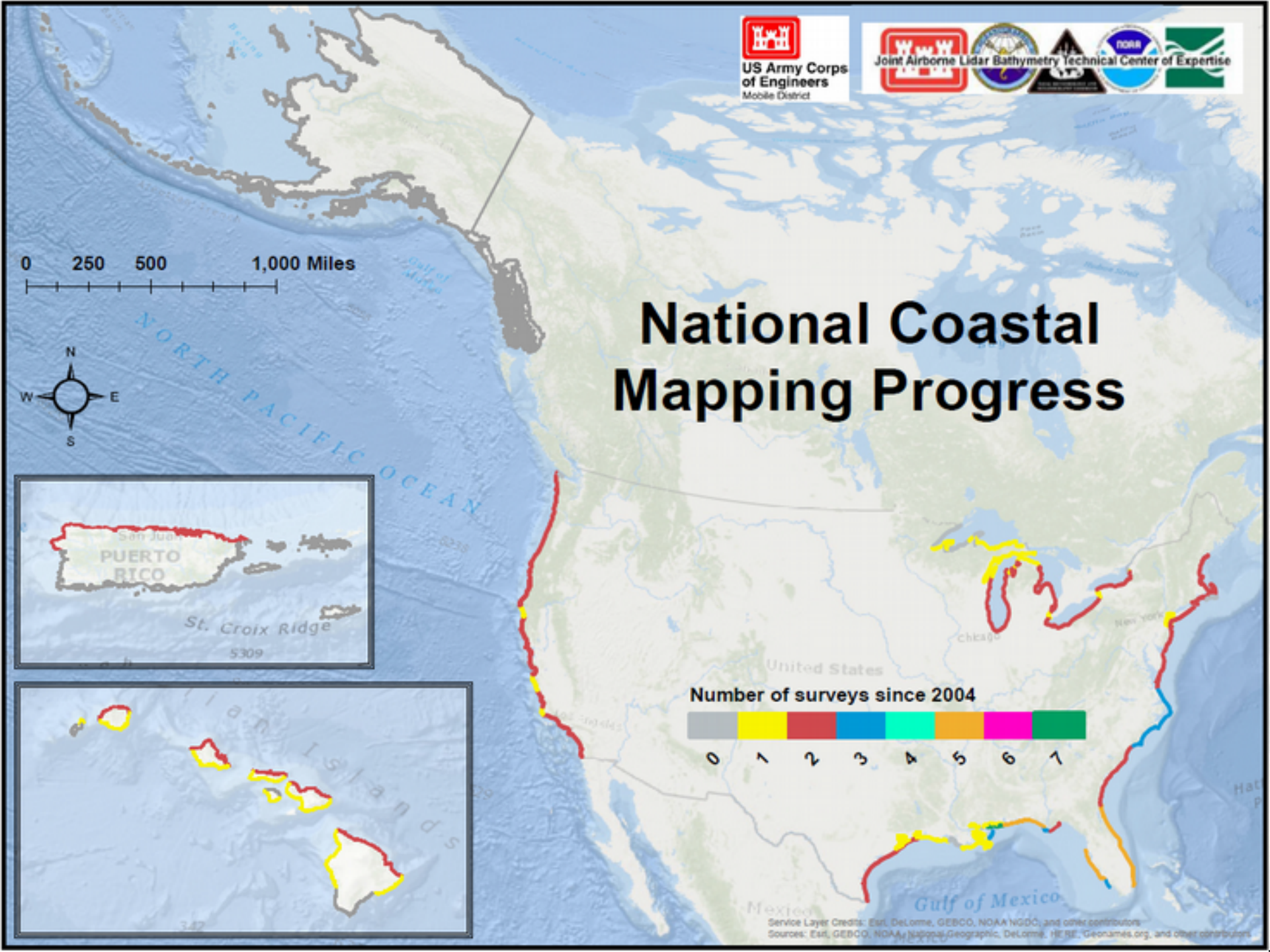
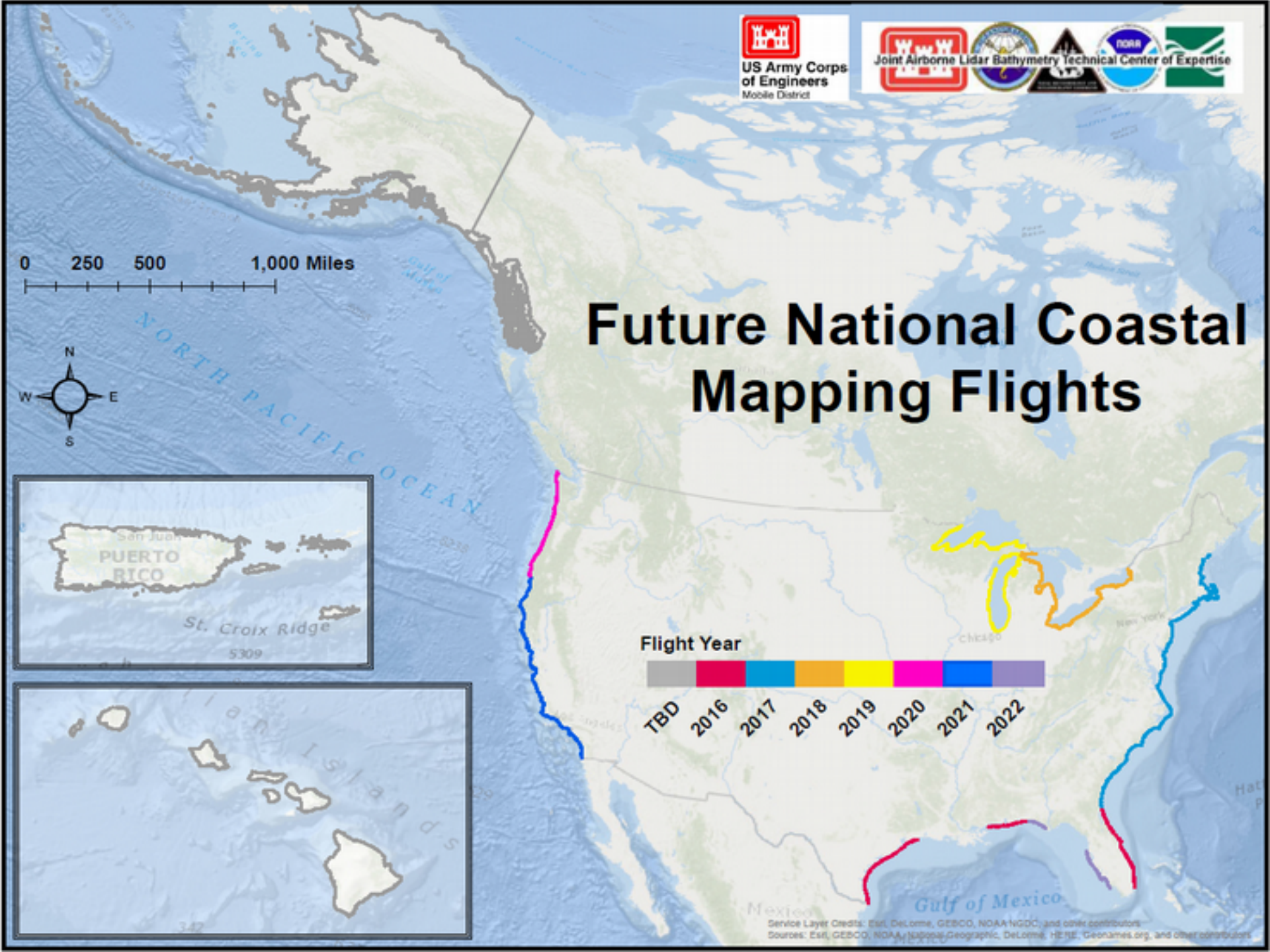


10,000 Hz Pulse Rate (hydro / topo)
4.Hz / 60 MP Digital camera (~5 cm pixel)
CASI-1500 Hyperspectral Imager
- *1500 pixels*
- *380 – 1050 nm wavelength*
- *288 possible bands*

15 cm RMSE bathymetry
7.5 cm RMSE topography Shot spacing:
0.7 X 0.7 meter topo / shallow hydro
2.0 X 2.0 meter deep hydro

- *Shorter laser pulse length and receiver response for increased accuracy, especially in shallow (<2m) water*
- *Large field-of-view afforded by prism, and more sensitive receivers, increase signal-to-noise ratio.*
- *Improved depth detection in shallow turbid water*


US Army Corps of Engineers
Mobile District
Joint Airborne Lidar Bathymetry Technical Center of Expertise
National Coastal Mapping Progress
0 250 500 1,000 Miles
N
W
E
S
NORTH PACIFIC OCEAN
PUERTO RICO
St. Croix Ridge
5309
Hawaiian Islands
United States
Gulf of Mexico
Number of surveys since 2004
0 1 2 3 4 5 6 7
Service Layer Credits: Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors
Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors


US Army Corps of Engineers
Mobile District
Joint Airborne Lidar Bathymetry Technical Center of Expertise
0 250 500 1,000 Miles
N
W
E
S
NORTH PACIFIC OCEAN
Future National Coastal Mapping Flights
PUERTO RICO
San Juan
St. Croix Ridge
5309
Hawaiian Islands
Flight Year
TBD
2016
2017
2018
2019
2020
2021
2022
Gulf of Mexico
Chicago
Service Layer Credits: Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors
Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

Basic NCMP Data Products

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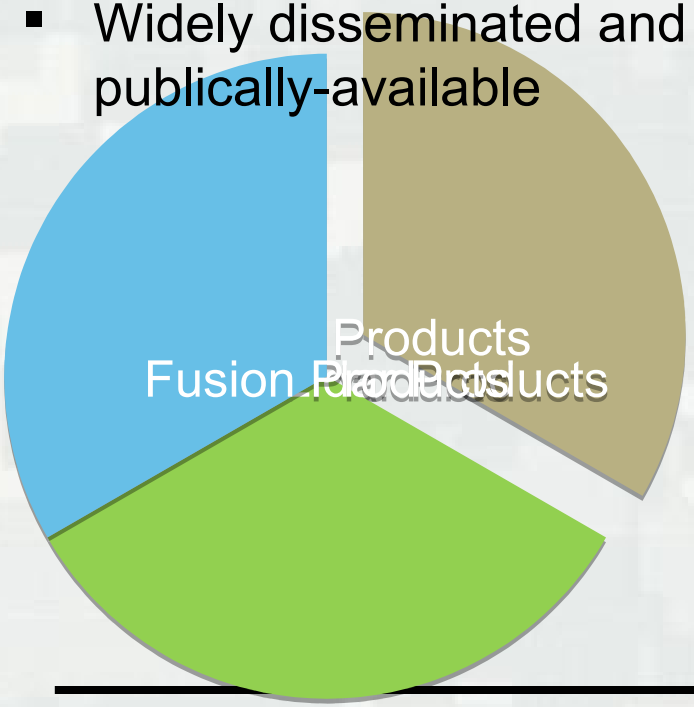
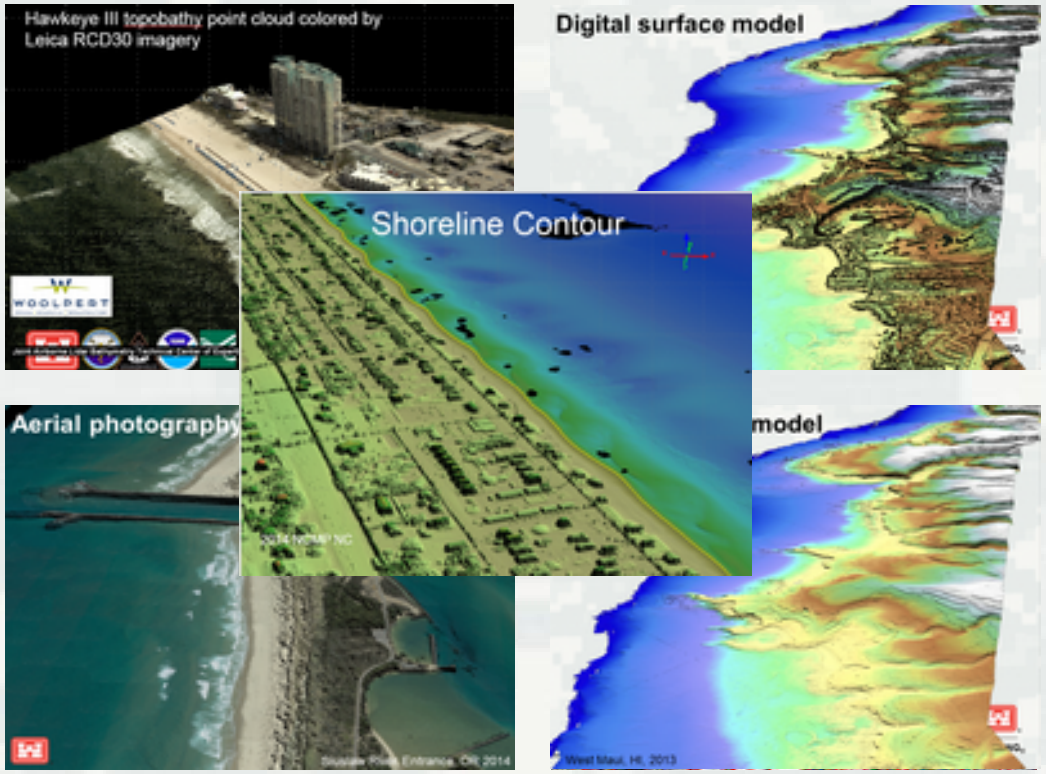
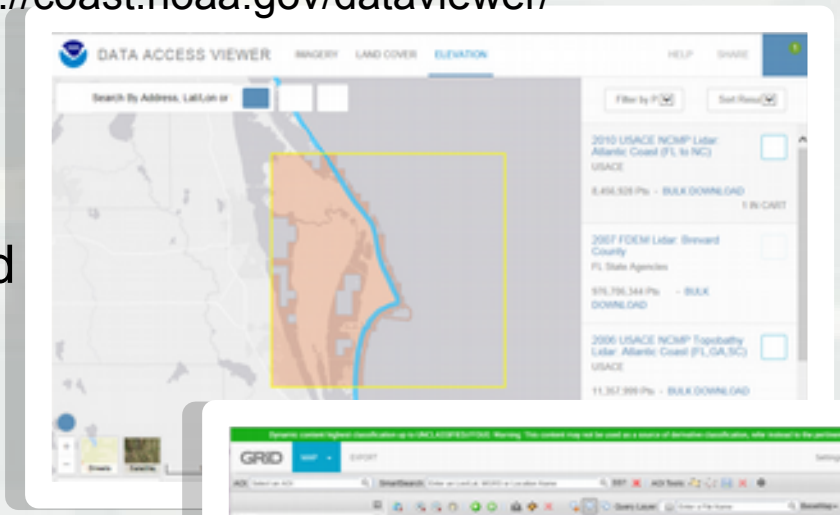
- Standard product suite
- Born in 2004 and have evolved since
- Workflows promote ease of use and re-use
- Widely disseminated and publically-available



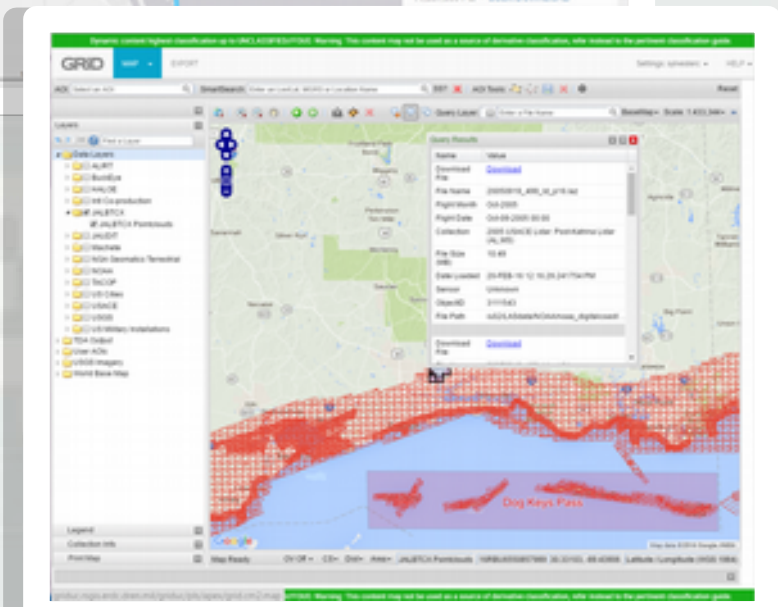


NCMP Data Access

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



- 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



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

Advanced Lidar Products

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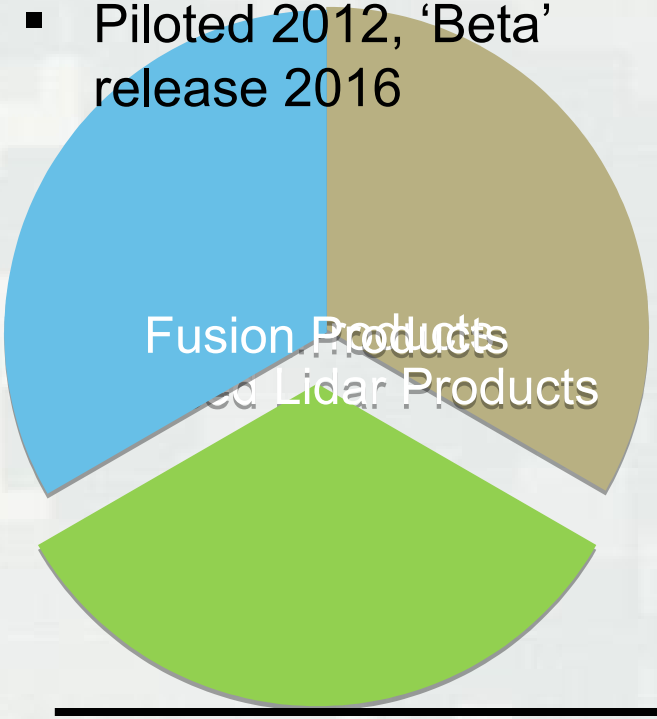
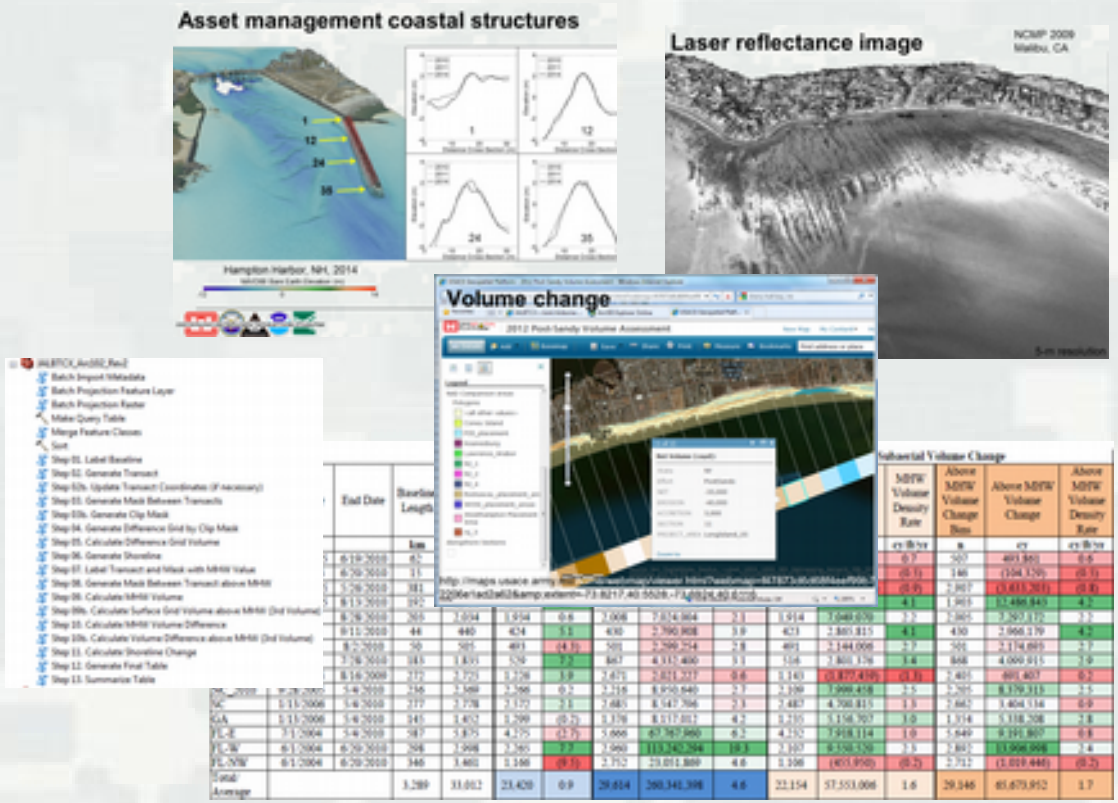
- Extraction of metrics for beach characterization and development of regional coastal engineering indices
- Piloted 2012, ‘Beta’ release 2016



Leveraging ERDC R&D Expertise



- Dune height
- Beach width
- Shoreline change
- Volume change

Fusion Data Products

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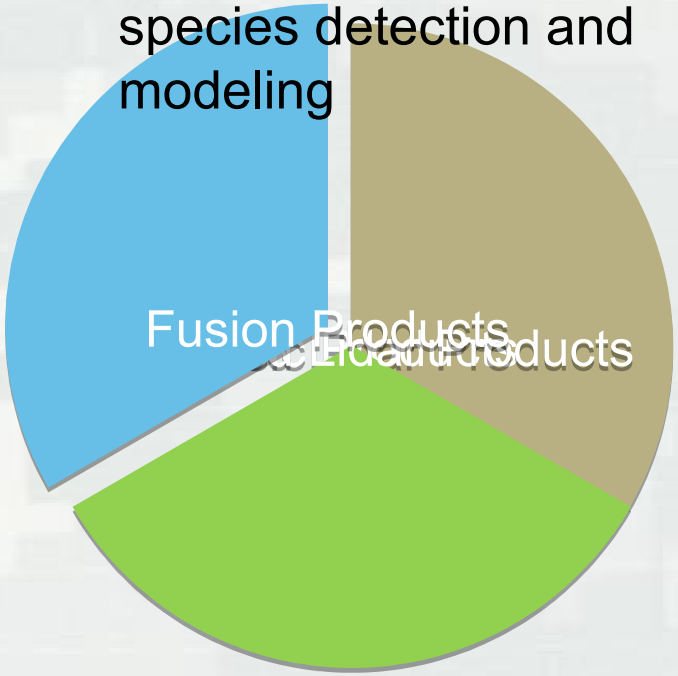
- Fusion of lidar-derived metrics with spectral information for habitat characterization and monitoring, and critical species detection and modeling



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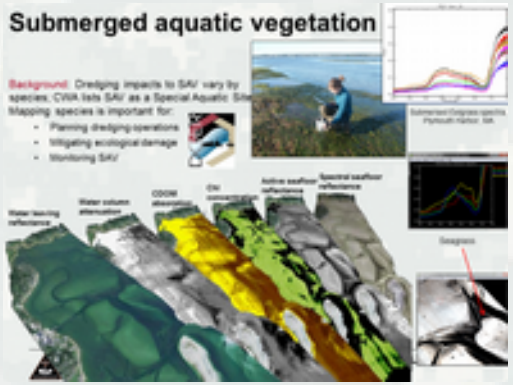

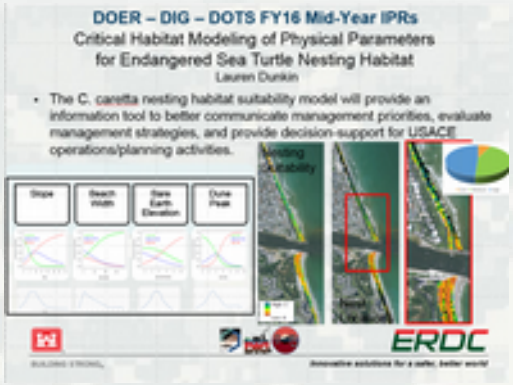

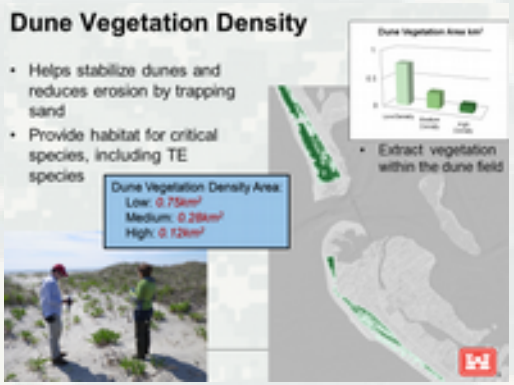

- ❖ Dune vegetation
- ❖ SAV
- ❖ Land cover
- ❖ Water quality indicators

2016 NCMP Operations

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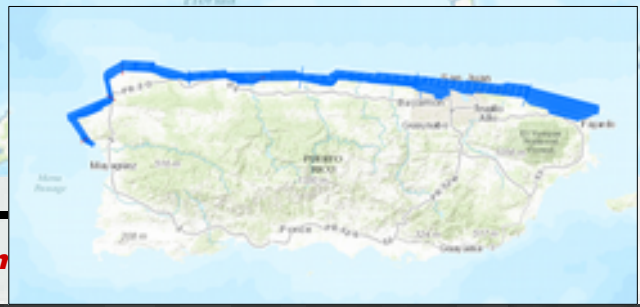
Panhandle
329 flight lines
21 July – 6 Sept
47 days
39 flights

Florida
588 flight lines
17 May – 20 July
64 days
52 flights

Texas
941 flight lines
7 Sept – 17 October
40 days
67 flights
Dual Aircraft Operations

Puerto Rico
521 flight lines
22 Jan – 10 Feb
11 May – 16 May
24 days
27 flights



2016 Post-Matthew Operations Overview

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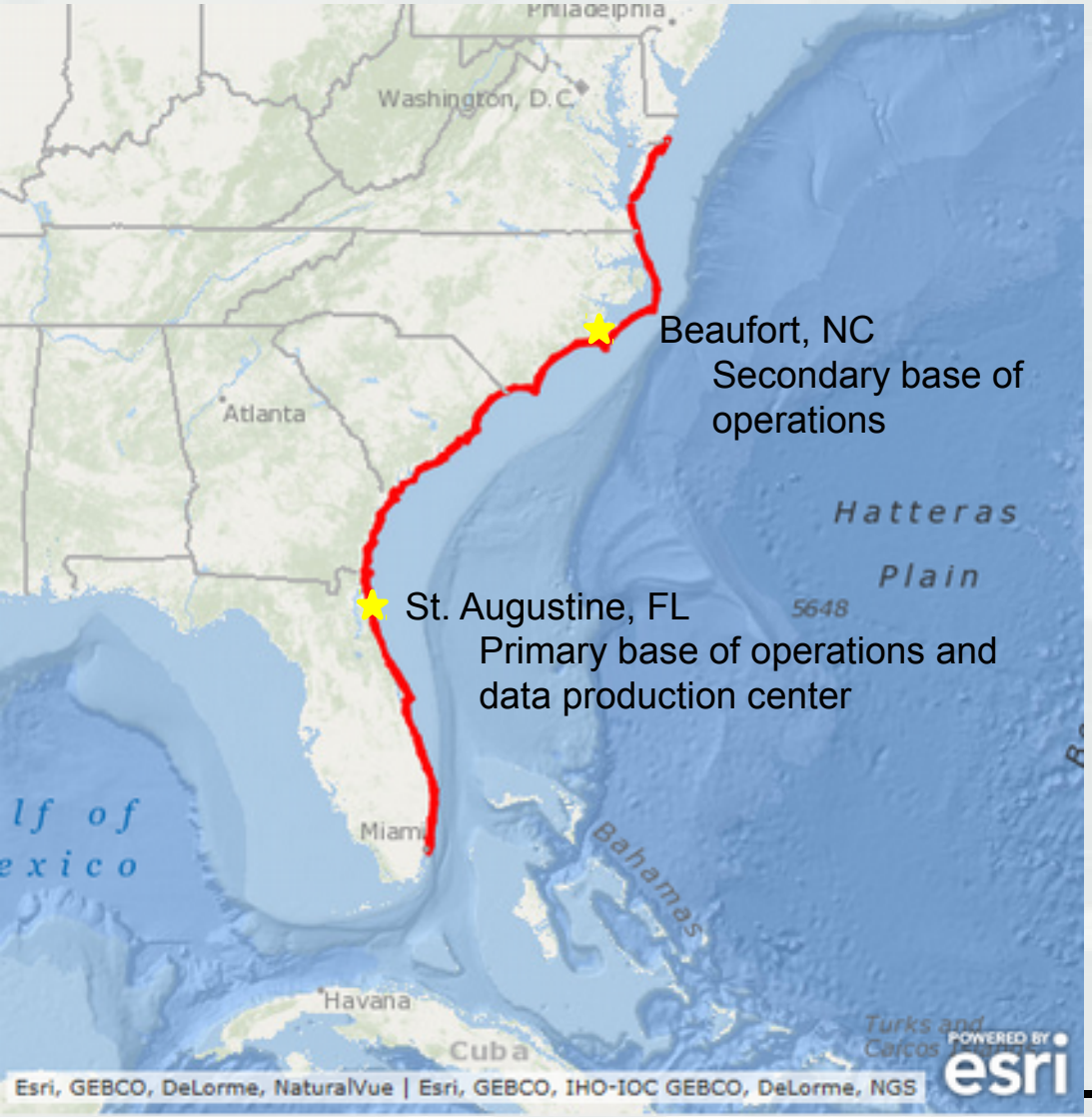


Key Biscayne, FL to VA/MD Border

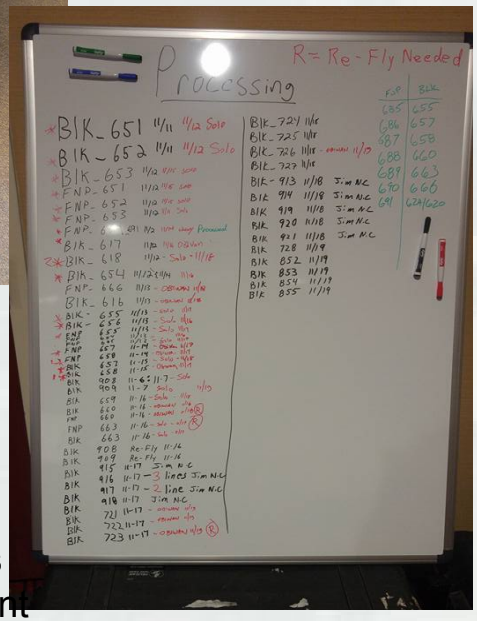
- Dual aircraft operations
- 991 flight lines
- 27 Oct – 2 Dec
- 36 days
- 76 flights

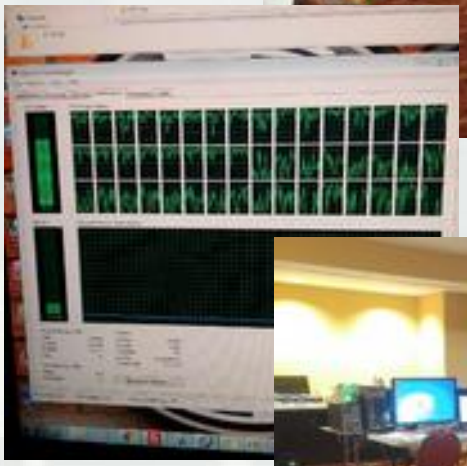
- 4 ground-truth teams (USGS)

- 24-hr field office
- Rapid-response data product deliveries
- Advanced lidar products for emergency response

Post-Matthew Operations and Production Center – St. Augustine, FL

7 – 20 people / 24-hr ops





Mob: 27 Oct
De-mob: 17 Dec

12 workstations
24 monitors
2 field support boxes
Networking equipment
4 GPS base stations

Post-Matthew Survey Control

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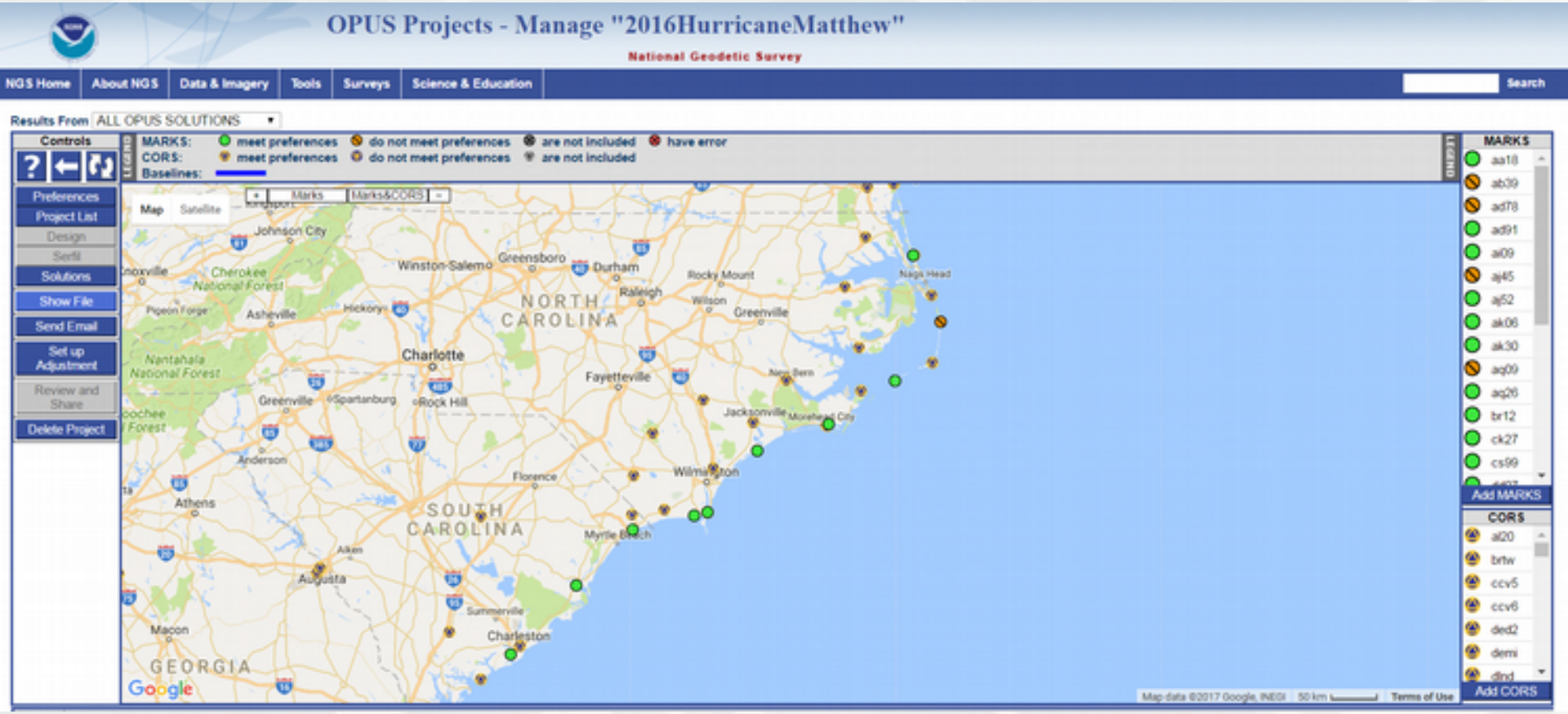
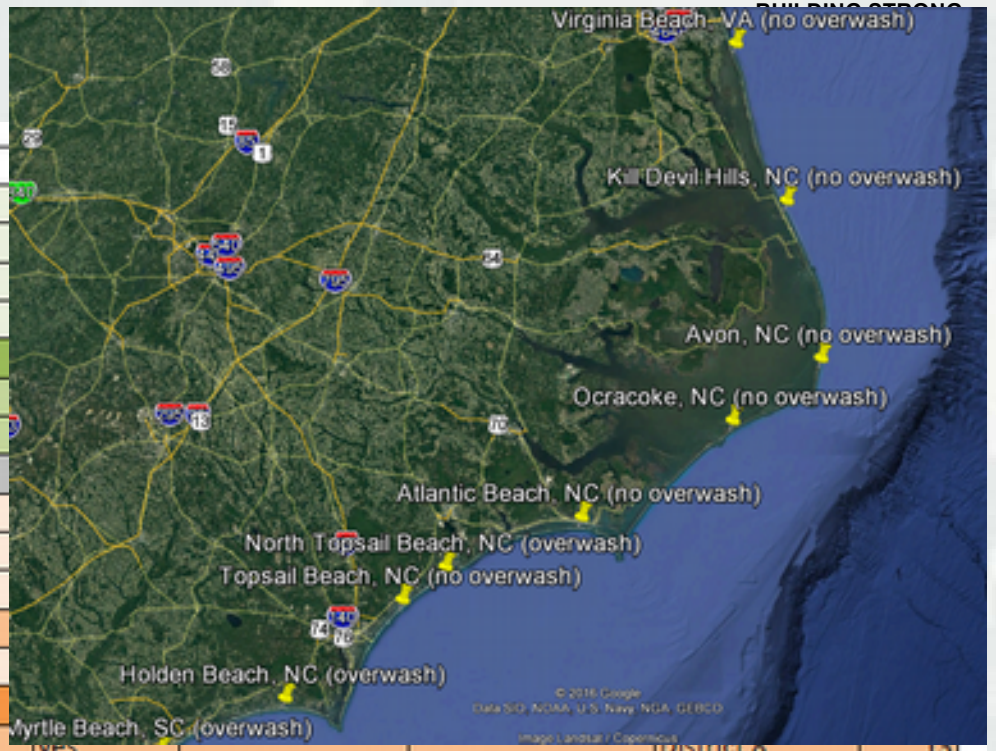
- GNSS base every 30 km
- NGS monuments in the 2011 adjustment
- Secure location (i.e. airport)
- 3 occupations to establish coordinates
- All occupations processed and verified in Opus Projects



Post-Matthew Ground Truth Locations

Ground-truth data acquired by USGS, a JALBTCX partner



Longitude	Latitude	Location	State					
-80.07566773060	26.31310308590	Deerfield Beach	FL					
-80.09284778300	27.01430013400	Jupiter Isl	FL					
-80.36767394000	27.69254016400	Indian River Shores	FL					
-80.60569005000	28.27613202000	Cocoa Beach	FL					
-80.74604795100	28.81063976670	Canaveral	FL					
-81.13955668210	29.50628632610	Flagler Beach	FL					
-81.35589437440	30.16215084960	Ponte Vedra Beach	FL					
-81.43145400000	31.01100300000	Jekyll Island***	GA					
-81.34169300000	31.18519800000	Sea Isl	GA					
-80.84668300000	31.99078700000	Tybee Isl	GA					
-80.67970500000	32.20760600000	Hilton Head Island	SC					
-80.31385343800	32.49082791500	Edisto Beach	SC					
-79.71812565000	32.81674940000	Isle of Palms	SC					
-79.15621900000	33.34343600000	Debidue Isl	SC					
-78.90458631200	33.66921707900	Myrtle Beach	SC	yes			District 8	13
-78.25914619190	33.91407399730	Holden Beach	NC	yes			Brunswick	14
-77.65895144000	34.34171256000	Topsail Beach	NC	no			Pender	15
-77.43809852380	34.48360742470	North Topsail Beach	NC	yes			Onslow	16
-76.73935686000	34.69733911000	Atlantic Beach	NC	no			Carteret	17
-75.95963460000	35.10261714000	Ocracoke	NC	no		Ferry?	Carteret	18
-75.49778956990	35.36327878790	Avon	NC	no	Cape Hatteras NS		Dare	19
-75.66751730080	36.03039443430	Kill Devil Hills	NC	no			Dare	20
-75.92661182240	36.70070609310	Virginia Beach	VA	no			Virginia Dare	21
-75.77991902330	37.29622988970	Cobb Island	VA	no		Checking: VIMS	Eastern Shore	22
-75.37830423000	37.85356672000	Sthrn Assateague Isl	VA	no			Eastern Shore	23
Cell Phones	These locations are approximate; adjust to be within 500m of waterline for use as control for lidar survey.							

Workflow for Rapid Response Lidar Products

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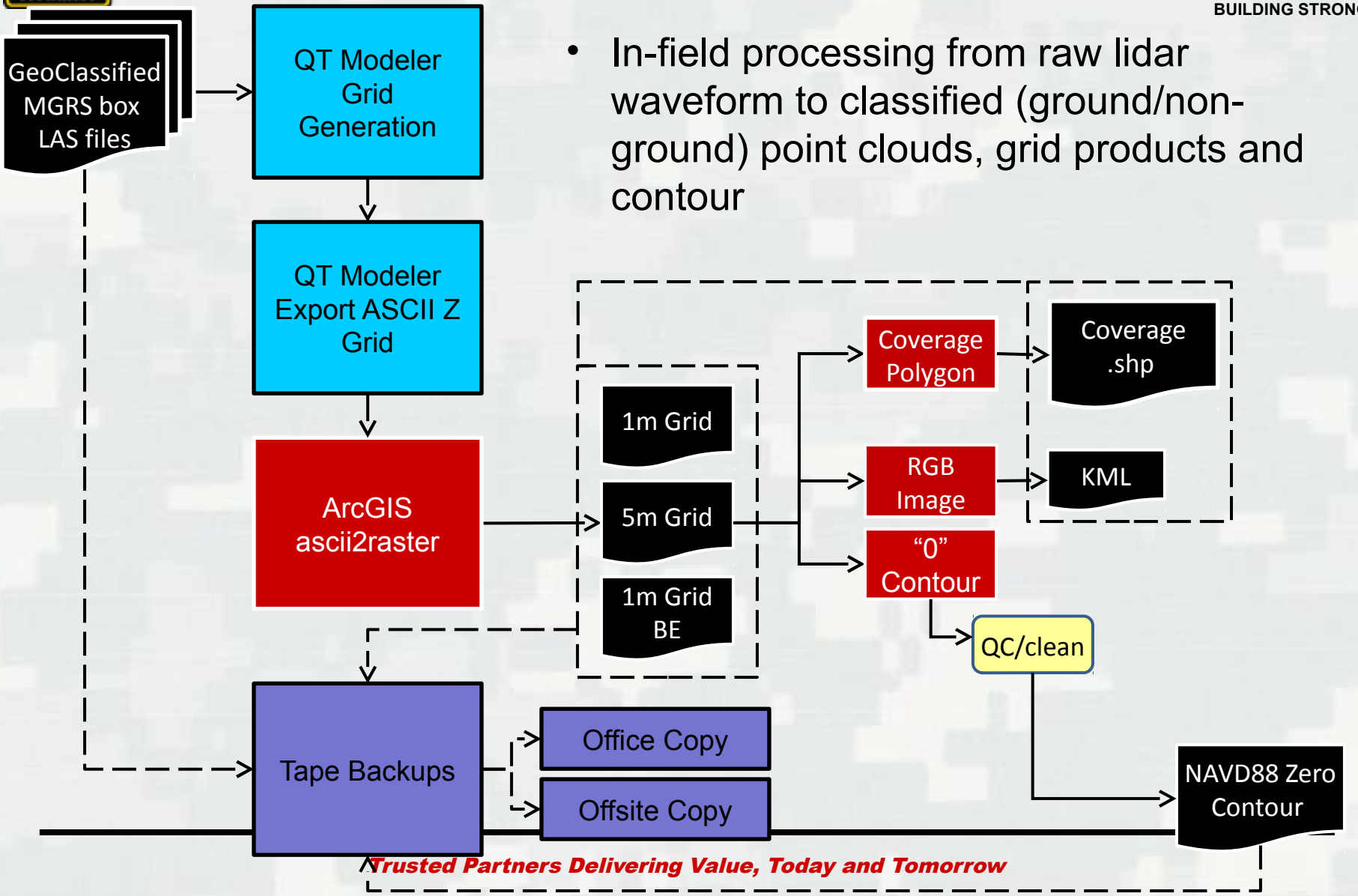
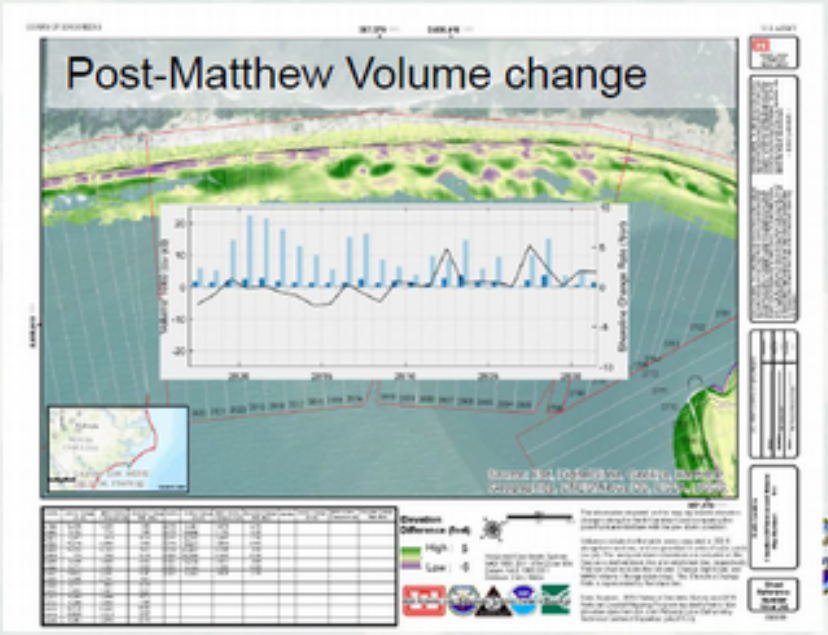
- In-field processing from raw lidar waveform to classified (ground/non-ground) point clouds, grid products and contour



Advanced Lidar Products for Emergency Response

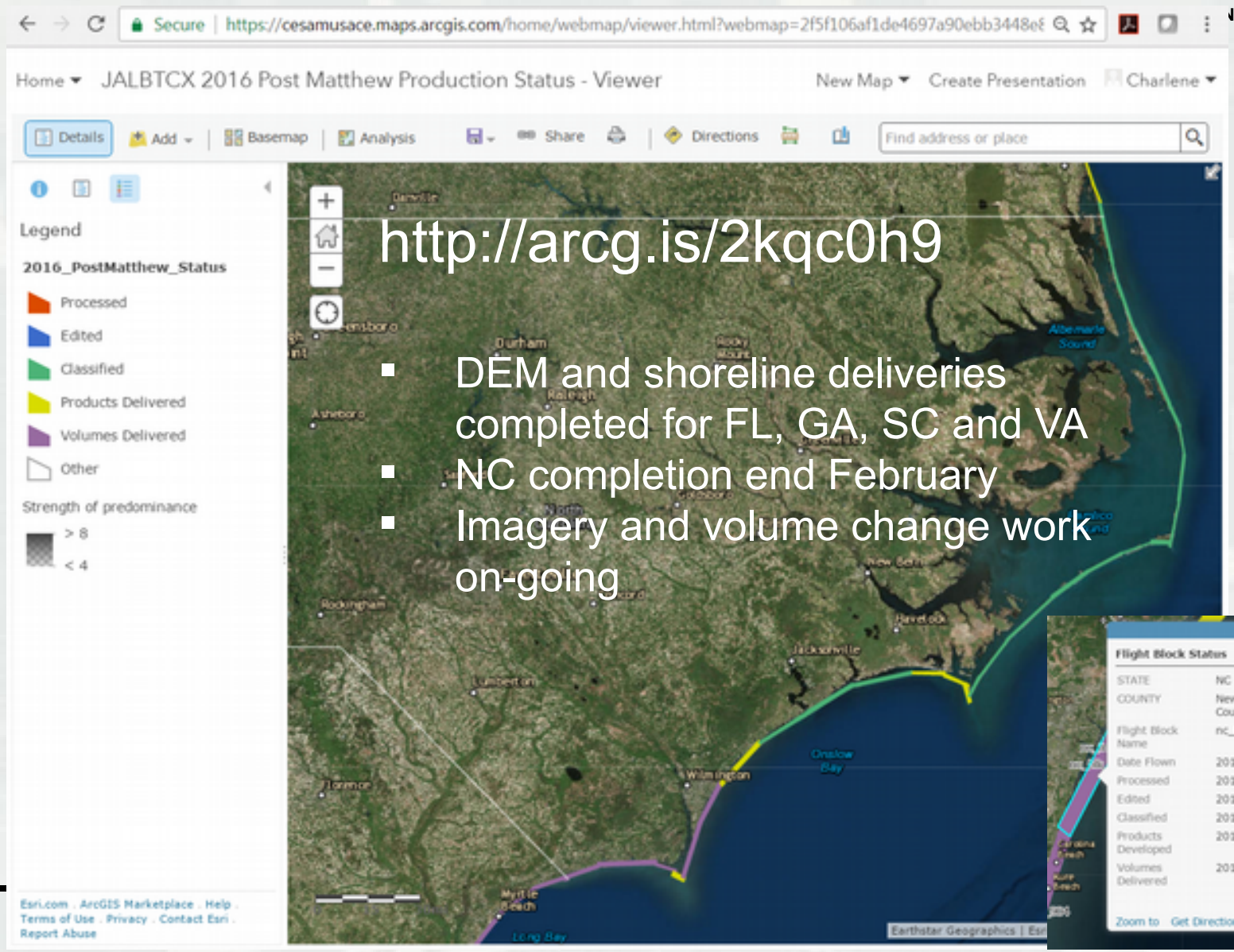
- **Operations**: provide streamlined method to generate volume/shoreline change datasets on a regional scale
- **Planning**: generate map products that can be used to communicate between agency partners to identify priority areas that would benefit from beneficially using sediment
- **R&D**: provide input for SBAS (Sediment Budget Analysis System)
- **Post-Storm**: Hurricane Matthew emergency response – volume change analysis for FL, GA, SC, NC, & VA



East Coast Volume Change (2005 – 2010)

State	Start Date	End Date	Baseline Length	Number of Transects	Average Shoreline Change Rate	Volume Density Rate	MHW Volume Density Rate	Above MHW Volume Density Rate
			km	n	ft/yr	cy/ft/yr	cy/ft/yr	cy/ft/yr
ME	10/19/2005	6/19/2010	62	633	(0.4)	13.5	0.7	0.6
NH	11/01/2005	6/20/2010	15	152	(1.0)	2.6	(0.5)	(0.5)
MA	11/11/2005	5/26/2010	381	3,834	(2.8)	(2.8)	(0.9)	(0.8)
NY	10/26/2005	8/13/2010	192	1,921	6.9	4.5	4.1	4.2
NJ	9/2/2005	8/28/2010	203	2,034	0.6	2.1	2.2	2.2
DE	9/3/2005	9/11/2010	44	440	5.1	3.9	4.1	4.2
MD	9/3/2005	8/2/2010	50	505	(4.3)	2.8	2.7	2.7
VA	9/8/2005	7/28/2010	183	1,835	7.2	3.1	3.4	2.9
NC_2009	9/28/2005	8/16/2009	272	2,725	3.9	0.6	(1.3)	0.2
NC_2010	9/28/2005	5/4/2010	236	2,369	0.2	2.7	2.5	2.5
SC	1/13/2006	5/4/2010	277	2,778	2.1	2.3	1.3	0.9
GA	1/13/2006	5/4/2010	145	1,452	(0.2)	4.2	3.0	2.8
FL-E	7/1/2004	5/4/2010	587	5,875	(2.7)	6.2	1.0	0.8
FL-W	6/1/2004	6/20/2010	298	2,998	7.7	19.3	2.3	2.4
FL-NW	6/1/2004	6/20/2010	346	3,461	(9.5)	4.6	(0.2)	(0.2)
Total/ Average			3,289	33,012	0.9	4.6	1.6	1.7

Post-Matthew Data Production Status Map



https://cesamusace.maps.arcgis.com/apps/webappviewer/index.html?id=96ebeaa39fc4493f8478c88cb0c755ef

Post Matthew

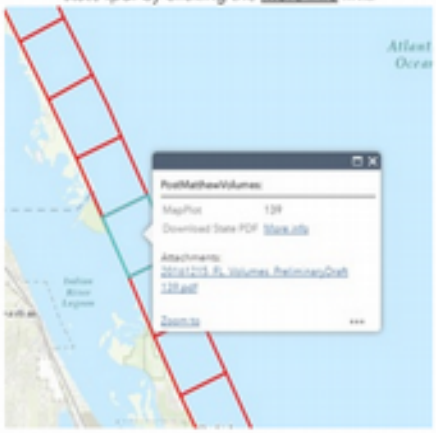
Secure | https://cesamusace.maps.arcgis.com/apps/webappviewer/index.html?id=96ebeaa39fc4493f8478c88cb0c755ef

Apps | USACE GRiD | Internal USACE Webr | External Portal | Jalbtcx Web Services | Metadata Manager | GeoPlatform - SeaSke | US Federal Mapping | Other bookmarks

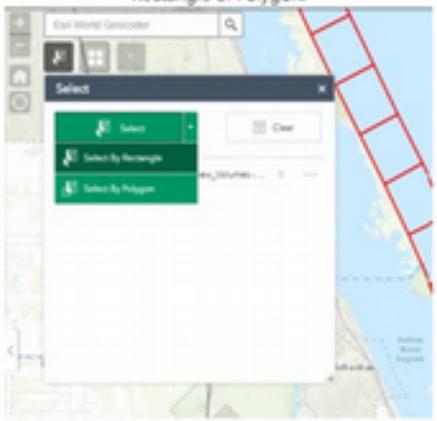
Post Matthew

with Web AppBuilder for ArcGIS

Click a box to open the pop-up to download that box's .pdf map under the Attachments, or download the full state .pdf by clicking the More info link.



If you wish download multiple boxes, click the select arrow, then on the Select pulldown choose either Rectangle or Polygon.



Draw your area of interest on the map to select multiple boxes. This will open a results window that lists the

Esri World Geocoder

Legend

JALBTCX_NCMP_Post_Matthew_Volumes - PostMatthewVolumes

Complete

In Progress

Wilmington

Carolina Beach

Kure Beach

Oak Island

Southport

10mi

-77.617 34.070 Degrees

Post-Matthew Volume Change Viewer

Post Matthew

Secure | https://cesamusace.maps.arcgis.com/apps/webappviewer/index.html?id=96ebeaa39fc4493f8478c88cb0c755ef

Apps | USACE GRiD | Internal USACE Webr | External Portal | Jalbtcx Web Services | Metadata Manager | GeoPlatform - SeaSke | US Federal Mapping | Other bookmarks

Post Matthew

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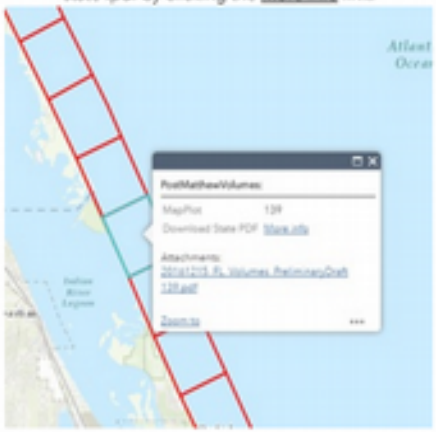

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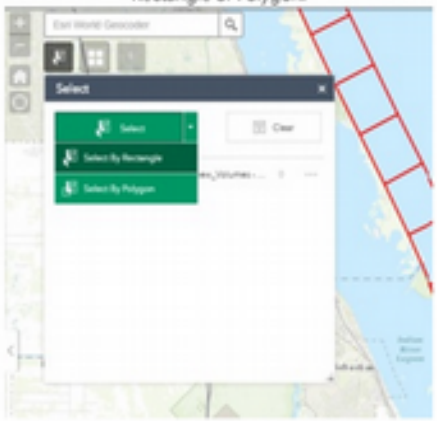

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Esri World Geocoder

Legend

JALBTCX_NCMP_Post_Matthew_Volumes - PostMatthewVolumes

Complete

In Progress

PostMatthewVolumes: NC_177

Download State PDF More info

Attachments:

20161223_NC_Volumes_Draft_177.pdf

Zoom to

NC_177

NC_178

NC_179

NC_180

Andrew Jackson Hwy

Wilmington

COLUMBUS BRUNSWICK

Town Creek

Carolina Beach

Sunny Point Military Ocean Terminal

Shallotte

Oak Island

Southport

Sunset Beach

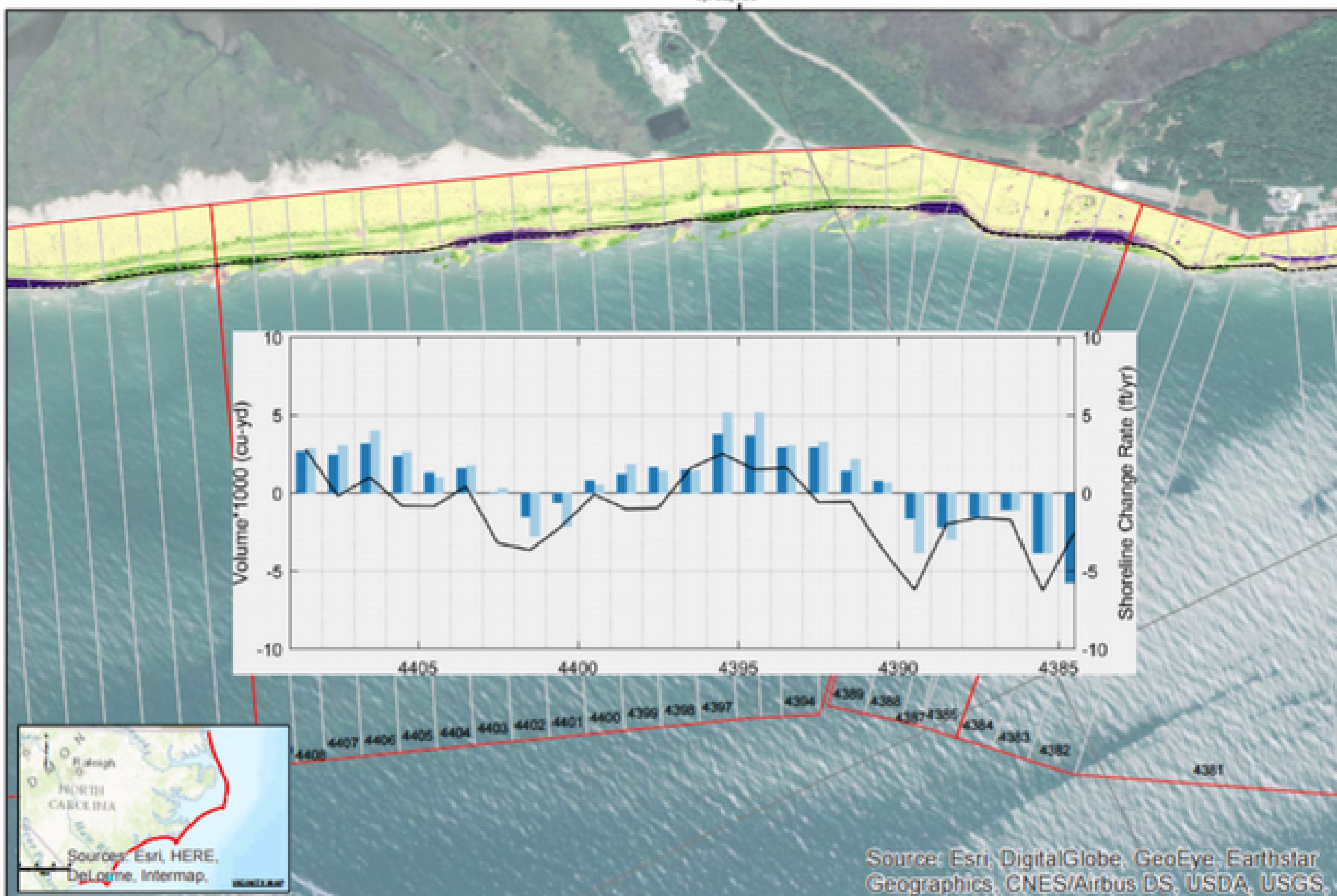
Long Bay

10mi

-77.842 33.624 Degrees

CORPS OF ENGINEERS

U.S. ARMY



3,762,136

Section	Volume Change (cu-yd)	MHW Volume Change (cu-yd)	Shoreline Change Rate (ft/yr)	Section	Volume Change (cu-yd)	MHW Volume Change (cu-yd)	Shoreline Change Rate (ft/yr)	Section	Volume Change (cu-yd)	MHW Volume Change (cu-yd)	Shoreline Change Rate (ft/yr)
4,385	-4,060	-4,765	-2.61	4,401	-2,116	-505	-2.11				
4,386	-3,843	-3,851	-6.27	4,402	-2,760	-1,494	-3.67				
4,387	-1,085	-1,046	-1.73	4,403	268	-4	-3.23				
4,388	-1,710	-1,491	-1.60	4,404	1,770	1,568	0.41				
4,389	-2,981	-2,176	-2.50	4,405	1,268	1,327	-0.86				
4,390	-3,827	-1,642	-6.21	4,406	2,638	2,326	-0.82				
4,391	615	761	-2.61	4,407	4,061	3,163	1.00				
4,392	2,145	1,261	-0.05	4,408	3,060	2,460	-0.05				
4,393	3,261	2,406	-0.60	4,409	2,863	2,571	2.76				
4,394	3,036	2,608	1.62								
4,395	5,127	3,684	1.50								
4,396	5,124	3,760	2.52								
4,397	7,470	1,294	1.58								
4,398	1,279	1,658	-0.97								
4,399	1,834	1,317	-1.03								
4,400	490	782	-0.10								
4,401	-2,116	-505	-2.11								

Elevation Difference (feet)

High : 5

Low : -5

Horizontal Coordinate System: NAD 1983 2011 UTM Zone 18N
Datum: NAD 1983 2011
Distance Units: Meter

Joint Airborne Lidar Bathymetry Technical Center of Expertise

The information depicted on this map represents elevation changes along the North Carolina Coast comparing the post-Hurricane Matthew with the pre- storm condition.

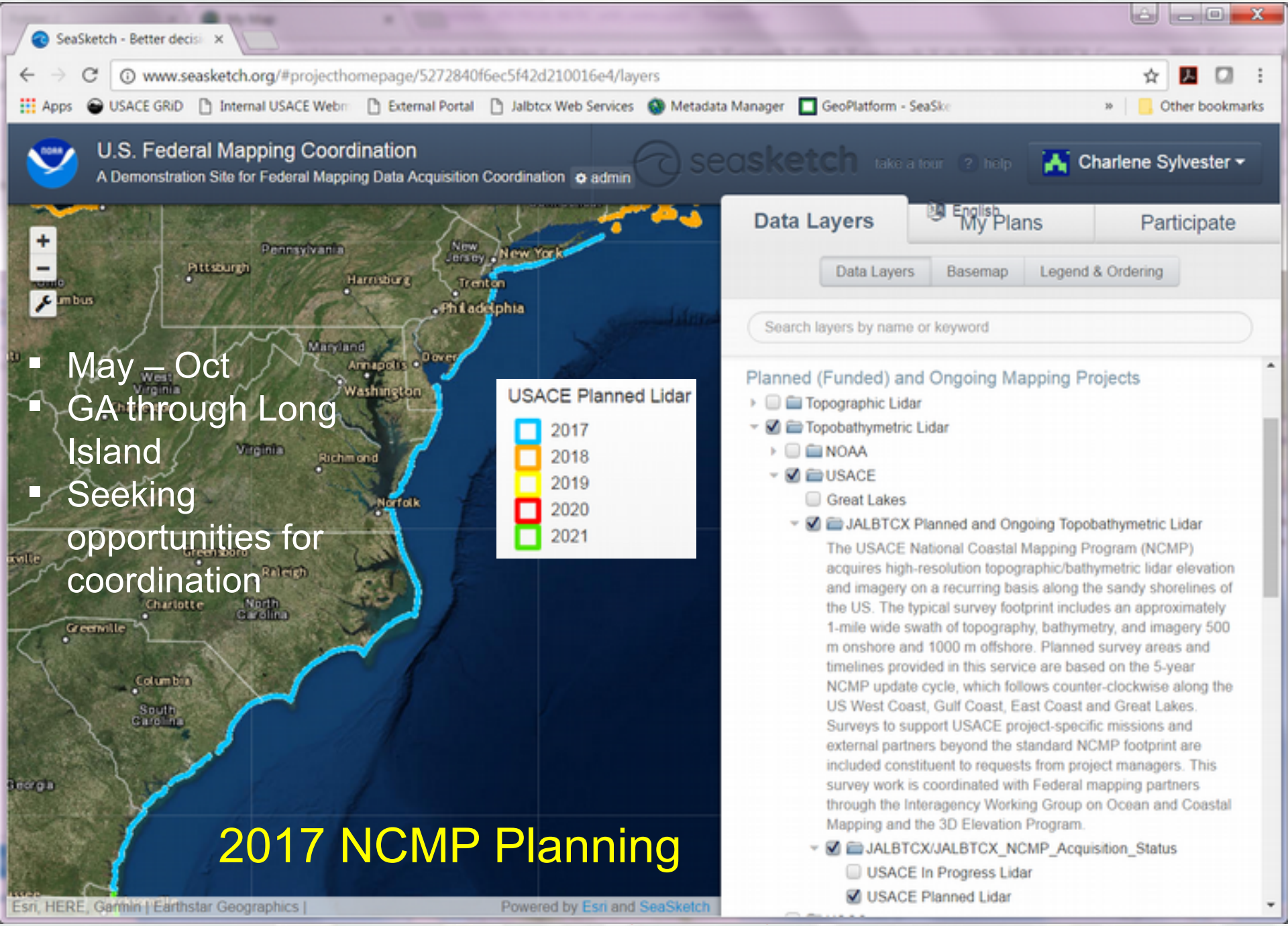
Volumes included in the table were computed in 300-ft alongshore sections, and are provided in units of cubic yards (cu-yd). Pre- and post-storm shorelines are included on the map as a dashed black line and solid black line, respectively. The bar chart includes the Volume Change (light blue) and MHW Volume Change (dark blue). The Shoreline Change Rate is represented by the black line.

Data Sources: 2014 National Geodetic Survey and 2016 National Coastal Mapping Program topobathymetric lidar elevation data from the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX).

-- DISCLAIMER --

US ARMY CORPS OF ENGINEERS

Sheet Reference Number 180 of 210



- May – Oct
- GA through Long Island
- Seeking opportunities for coordination

2017 NCMP Planning

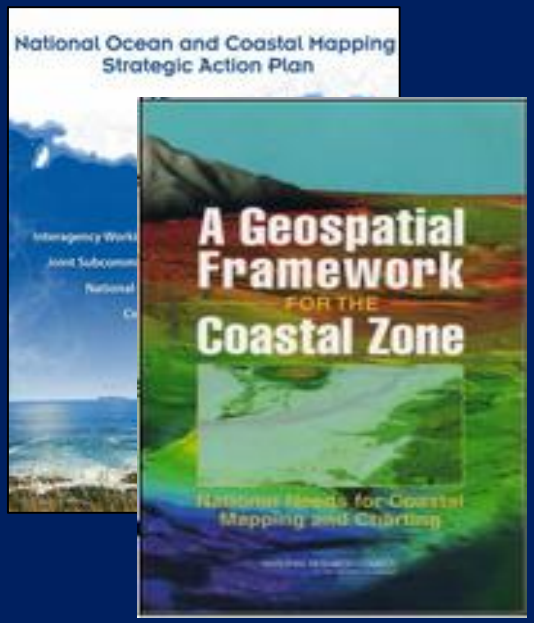
Thank you!

charlene.s.sylvester@usace.army.mil

The Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM)

WHO:

- NOAA
- USGS
- USACE
- NAVO
- BOEM
- NSF
- NGA
- USCG
- EPA
- FEMA
- NASA
- *and other appropriate Federal agencies involved in ocean and coastal mapping.*



- Co-chaired by NOAA, USGS, and USACE
- Charged with facilitating "the coordination of ocean and coastal mapping activities and avoid[ing] duplicating mapping activities…"
- Ocean and Coastal Mapping Integration Act of 2009: develop an "Ocean and Coastal Mapping Plan"
- National Ocean Policy: develop a topobathy lidar plan, National Coastal Mapping Plan