



**Florida Department of Environmental Protection**

# **The Impact of Hurricane Irma on the Coast of Florida**

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& Peter Bacopoulos**

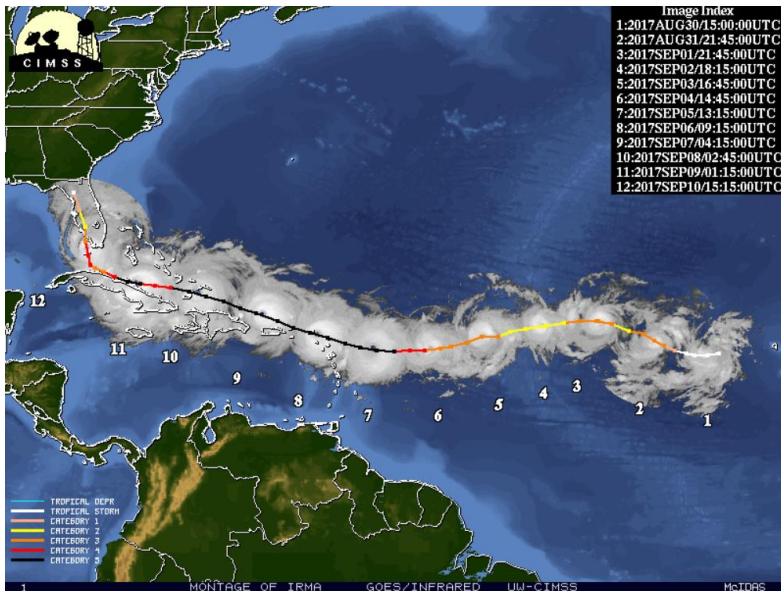
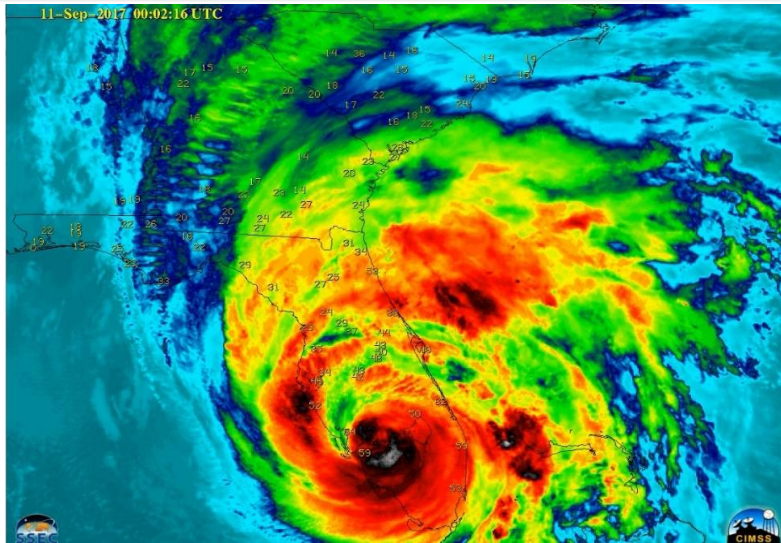
**Division of Water Resource Management**

**February 8, 2018**





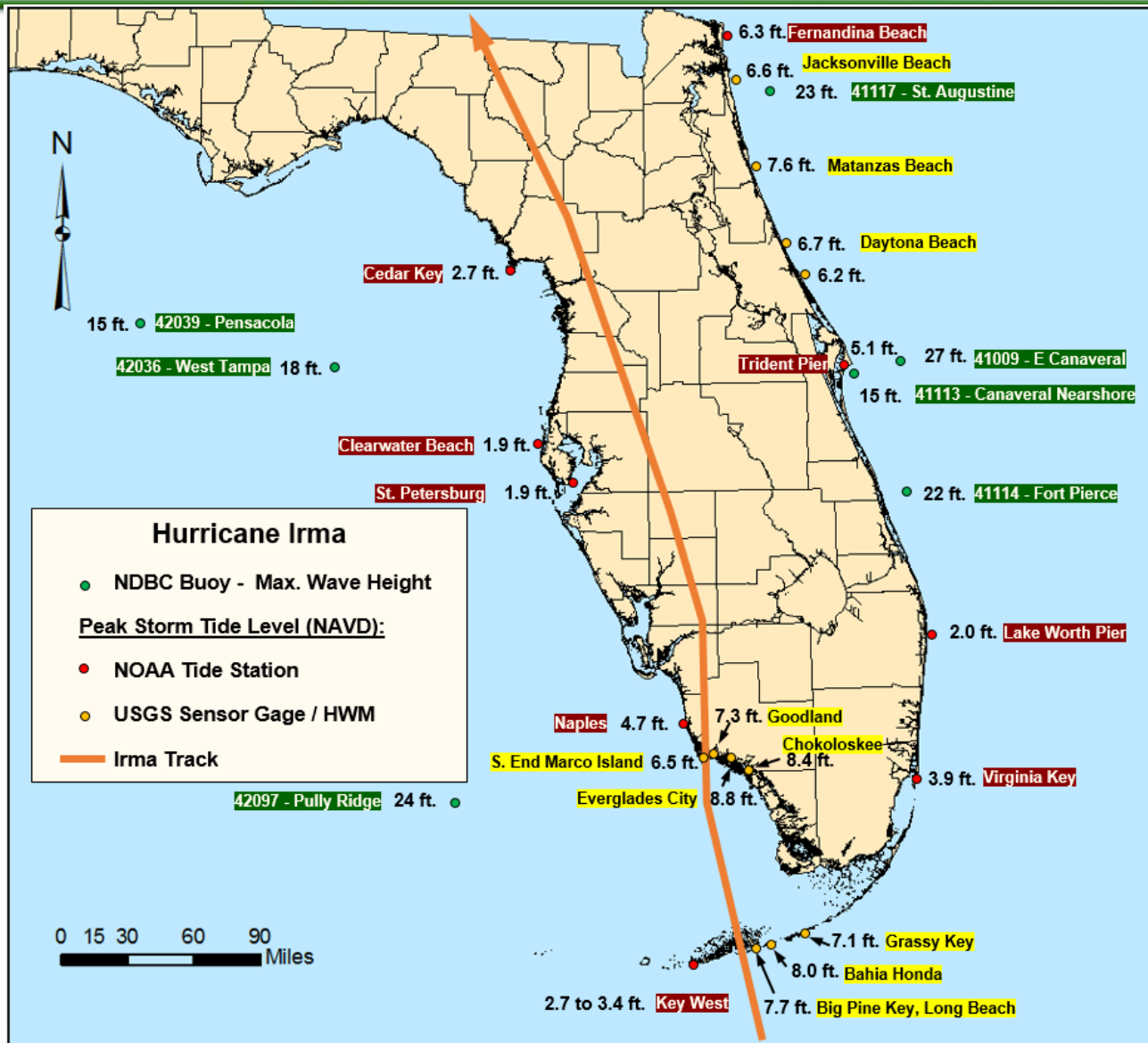
# Overview: Hurricane Irma



- Made landfall as Category 4 on September 10, 2017, in the Florida Keys, and again on the Florida mainland at Marco Island
- Florida's first landfall of a major hurricane since Hurricane Wilma (near Marco Island, 2005)
- Northerly track up the peninsula - most of the state impacted by winds, rain, and/or storm surge



# Irma's Tides and Waves





# Coastal Impact Evaluation

- Two EHG damage assessment teams deployed immediately following the storm
- Detailed damage assessments conducted in Collier, Lee, Charlotte, Sarasota, Manatee, St. Johns, Flagler, Volusia, Brevard, and Monroe Counties
- A total of 240 miles of beaches were assessed by the damage assessment teams



# Major Structure Damage Atlantic & Gulf Coasts

County	# Single-Family Dwellings with Major Damage	# Multifamily Dwellings <sup>1</sup> with Major Damage	# Other Major Structures <sup>2</sup> with Major Damage	Total # of Structures with Major Damage <sup>3</sup>
St. Johns	136	32	3	171
Flagler	61	7	10	78
Volusia	69	26	11	106
Brevard	55	126	36	217
Palm Bch	0	0	1	1
Collier	188	24	19	231
Lee	1	2	3	6
Charlotte	1	0	0	1
Sarasota	0	0	1	1
Manatee	0	0	1	1
<b>TOTAL</b>	<b>511</b>	<b>217</b>	<b>85</b>	<b>813</b>



# Armoring Damage

County	Armoring Damage in Feet
St. Johns	3,470
Flagler	160
Volusia	100
Brevard	50
Broward	60
Monroe	8,725
Collier	3,575
Lee	30
<b>TOTAL</b>	<b>16,170 (3.06 miles)</b>

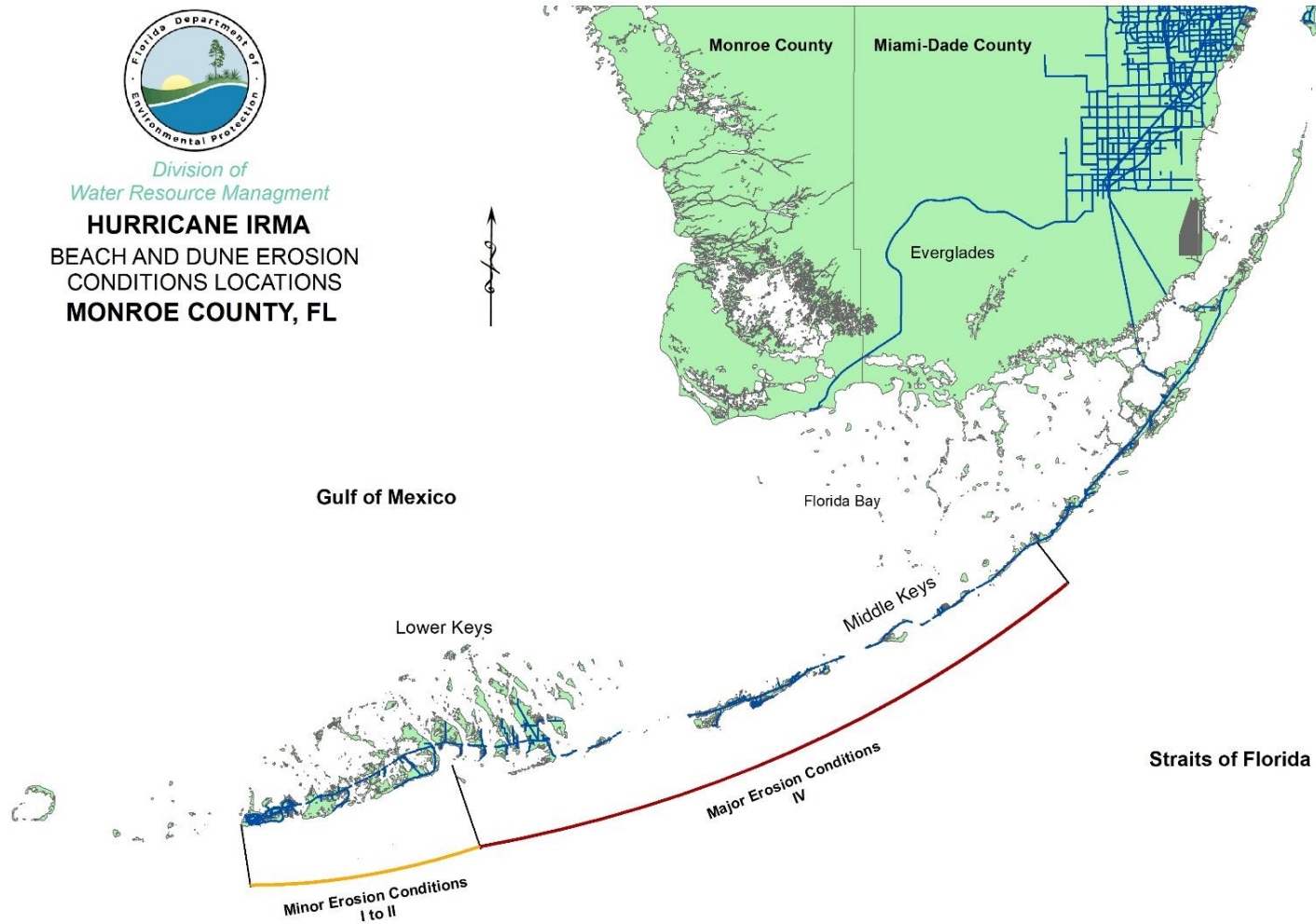


# Monroe County



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## HURRICANE IRMA BEACH AND DUNE EROSION CONDITIONS LOCATIONS MONROE COUNTY, FL





# Beach Erosion in the Florida Keys



- The eye of Hurricane Irma made landfall at Cudjoe Key on Sept. 10, 2017
- Major beach erosion along the Florida Keys from Sea Oats Beach to Cudjoe Key (Condition IV)
- Minor beach erosion between Cudjoe Key and Key West (Conditions I-II)





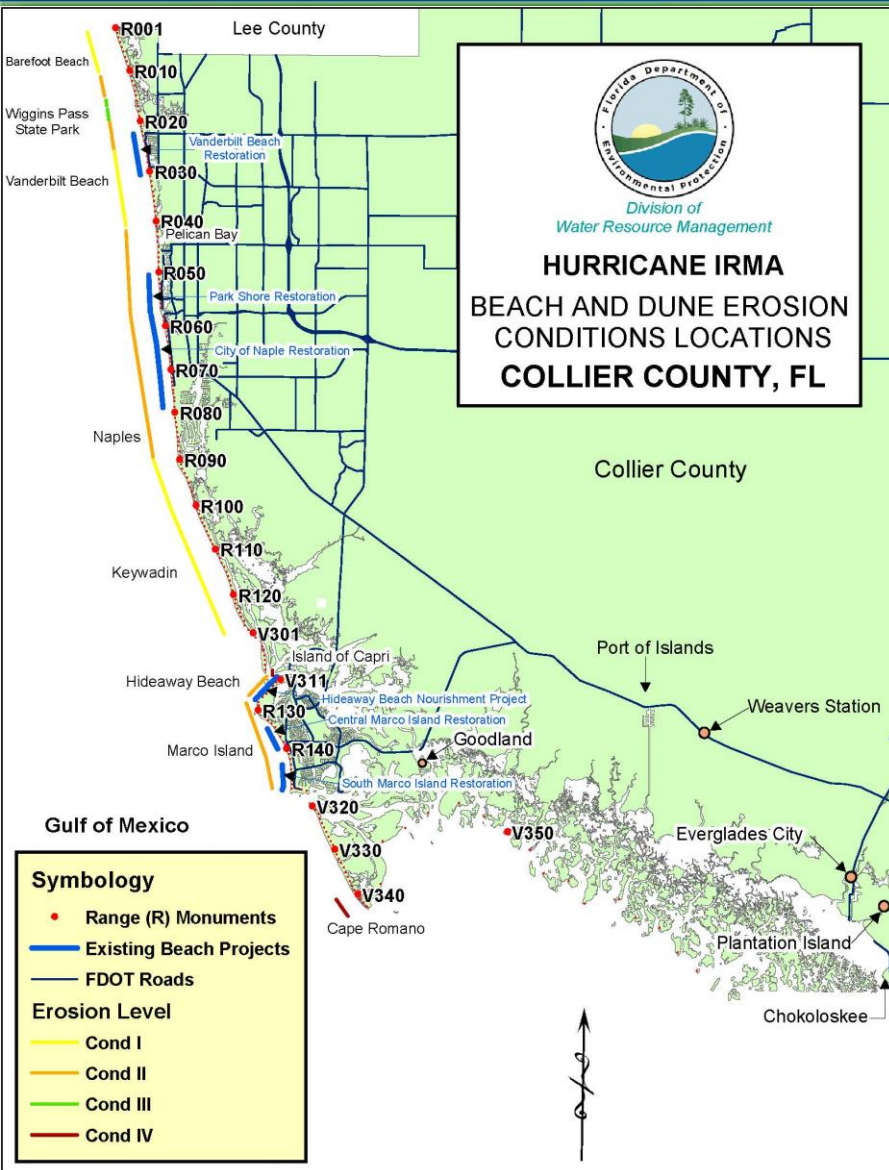
# Structural Damages in the Keys



- Max. Wind – 133 mph
- Peak Tide - +8.0 ft NAVD (measured by USGS)
- 1,179 Buildings Destroyed
- 8,725 ft Seawalls & Revetments Damaged



# Collier County



- 2<sup>nd</sup> landfall at Marco Island as Category 3
- Peak tide –
  - +8.8 ft NAVD Everglades City
  - +8.4 ft NAVD Chokoloskee
  - +7.3 ft NAVD Goodland
  - +6.5 ft NAVD S. Marco Island
- Cape Romano – Major Erosion



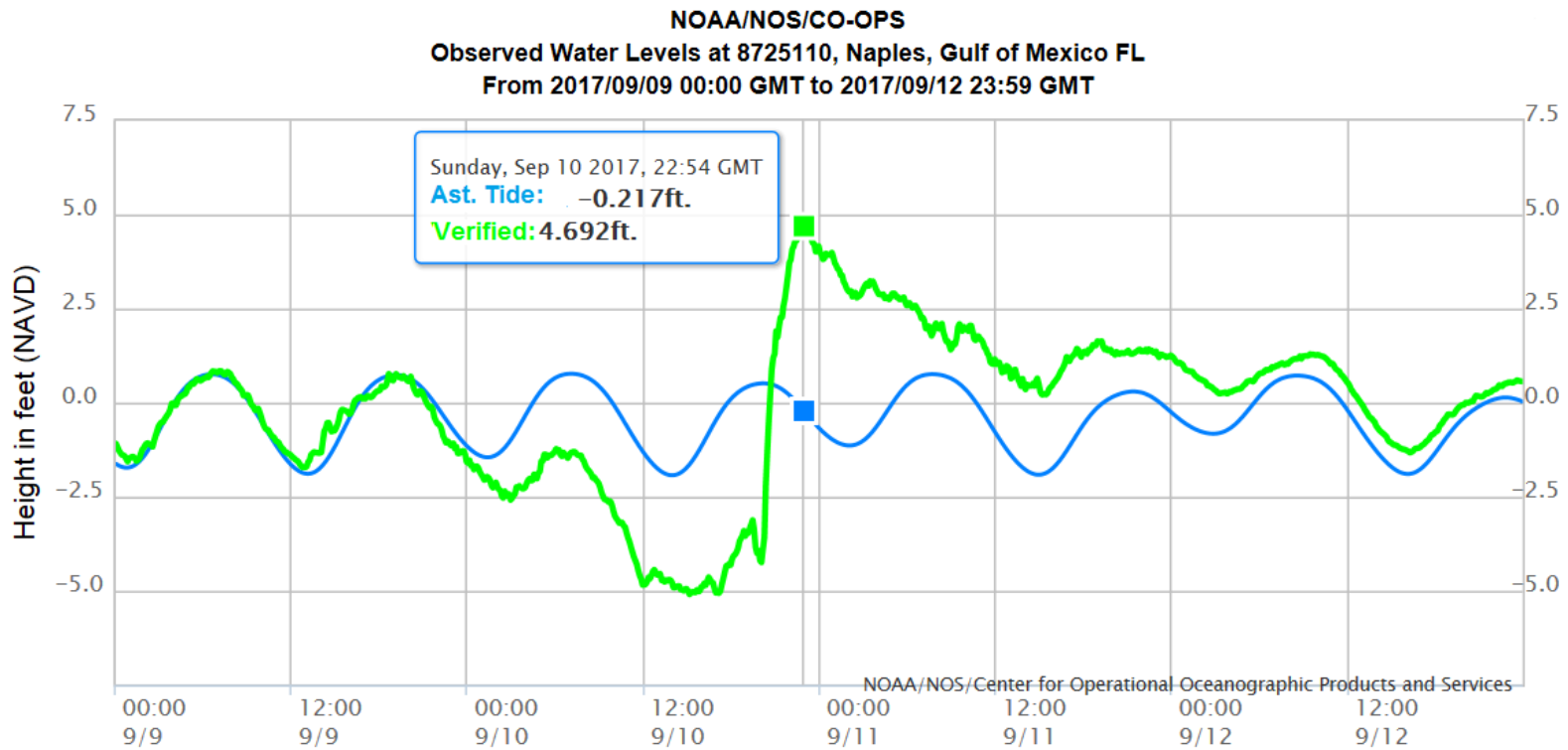
# Collier County



- Major beach and dune erosion at Wiggins Pass (Now critical in state park)
- Significant erosion at the north end of Marco Island
- Major damage to 231 major structures  
Barrier islands – 15 major structures  
5 communities adjacent the 10,000 Islands – 216 major structures damaged
- 3,575 feet of armoring damaged or destroyed, including 3,000 feet of revetment at south end of Marco Island
- Lee thru Pinellas Counties –  
9 major structures damaged  
Generally minor erosion with hotspots

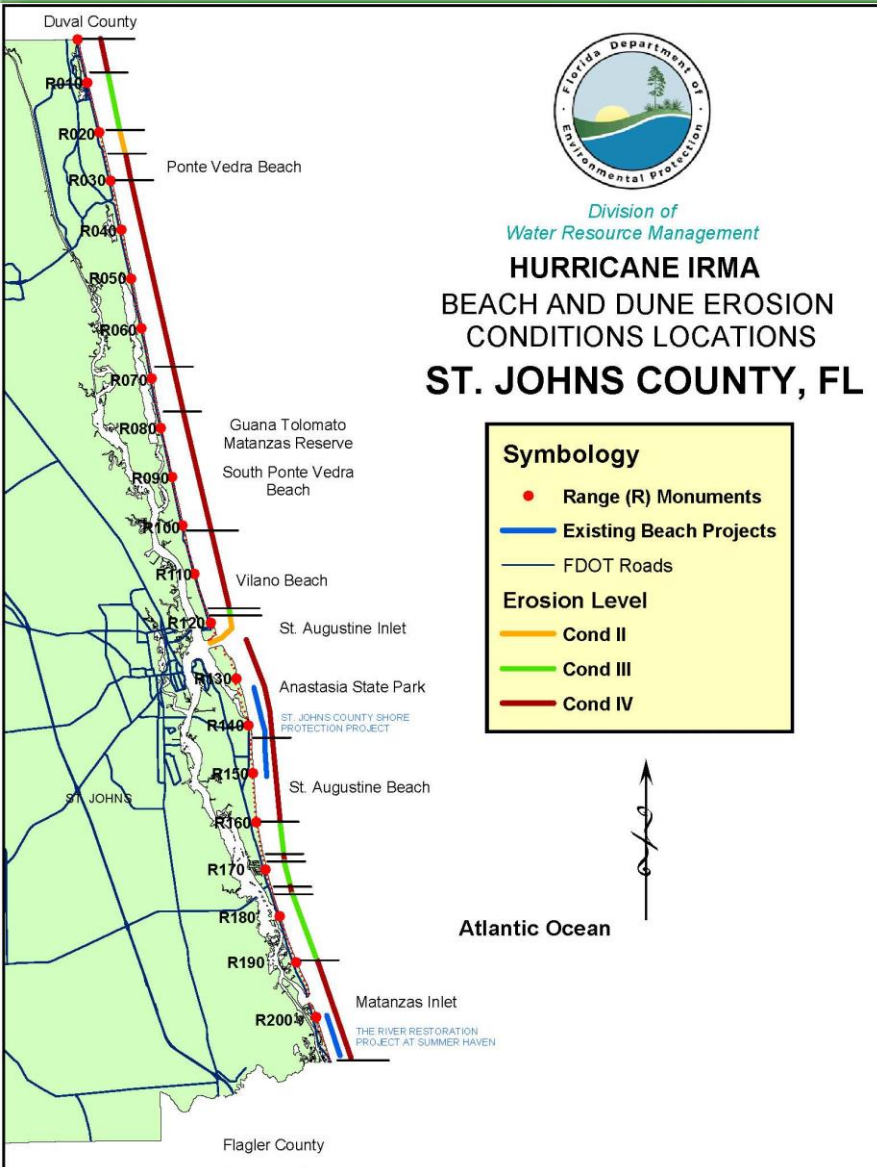


# Squat & Surge along Gulf Coast





# St. Johns County



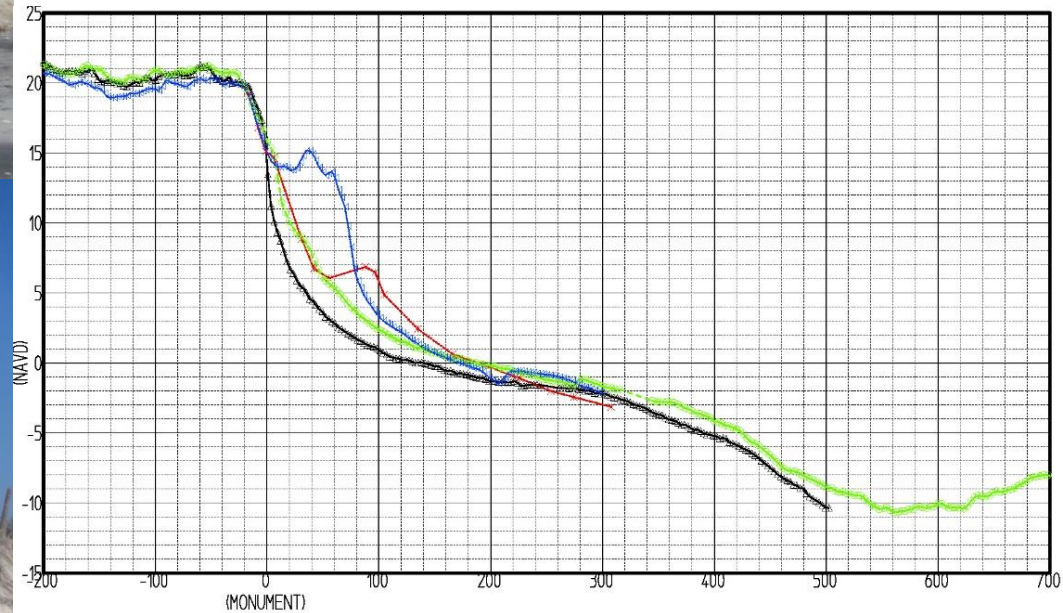
- Peak tide at Matanzas Inlet – +7.6 ft NAVD
- Major beach and dune erosion
- 171 major structures damaged with 15 destroyed incl. 136 single-family dwellings
- 115 buildings in imminent danger from future storms (1 already destroyed)
- 3,470 feet of armoring damaged or destroyed



# Northern St. Johns County – Ponte Vedra



- Severe impacts north of St. Augustine Inlet
- Ponte Vedra R26-R31 now critical



BEACH PROFILE  
 2017-SEP POST-IRMA LIDAR  
 2017-JUN/JUL FDEP SURVEY  
 2016 POST-MATTHEW LIDAR  
 2016 PRE-MATTHEW LIDAR

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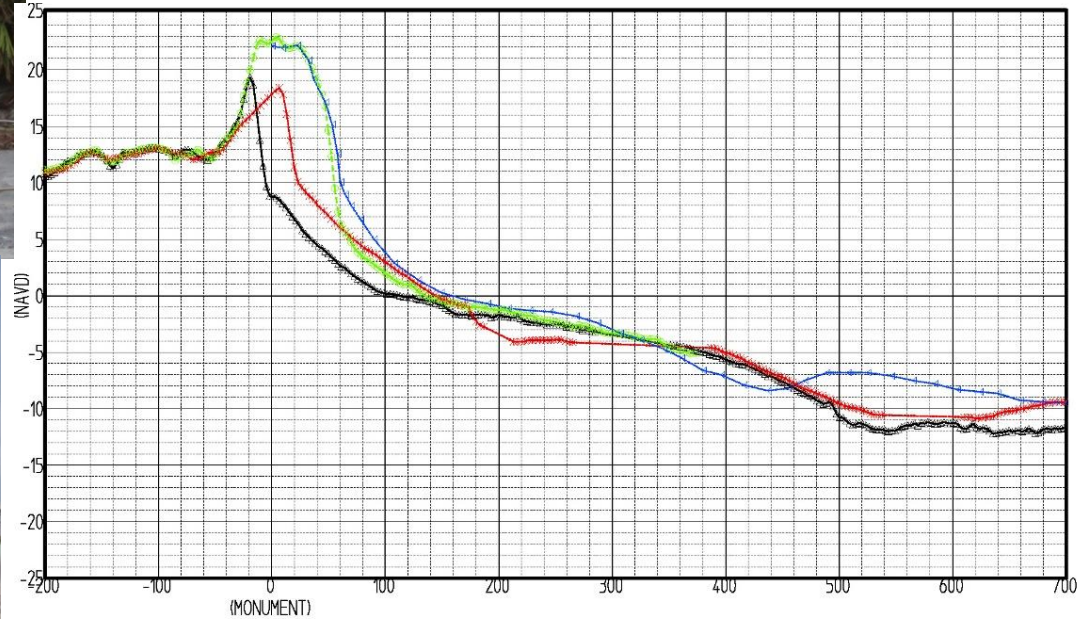
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 Mon. Est.: JUN1972  
 DOT DATE:  
 BEACH DATE: 00SEP17  
 OFFSHORE DATE:



# Northern St. Johns Co. – South Ponte Vedra & Vilano Beach



- Critical erosion area extended northward – R76-R84
- Total area critical now R76-R117 8.1 miles



BEACH PROFILE	
—●—	2017-SEP POST-IRMA LIDAR
—●—	2016 POST-MATTHEW LIDAR
—●—	2016 PRE-MATTHEW LIDAR
—●—	2015-JUN/JUL M&E SURVEY

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Range: R-094  
 Mon. Est: JUN1972  
 DOT DATE:  
 BEACH DATE: 00SEP17  
 OFFSHORE DATE:



# St. Johns County – Erosion Volumes

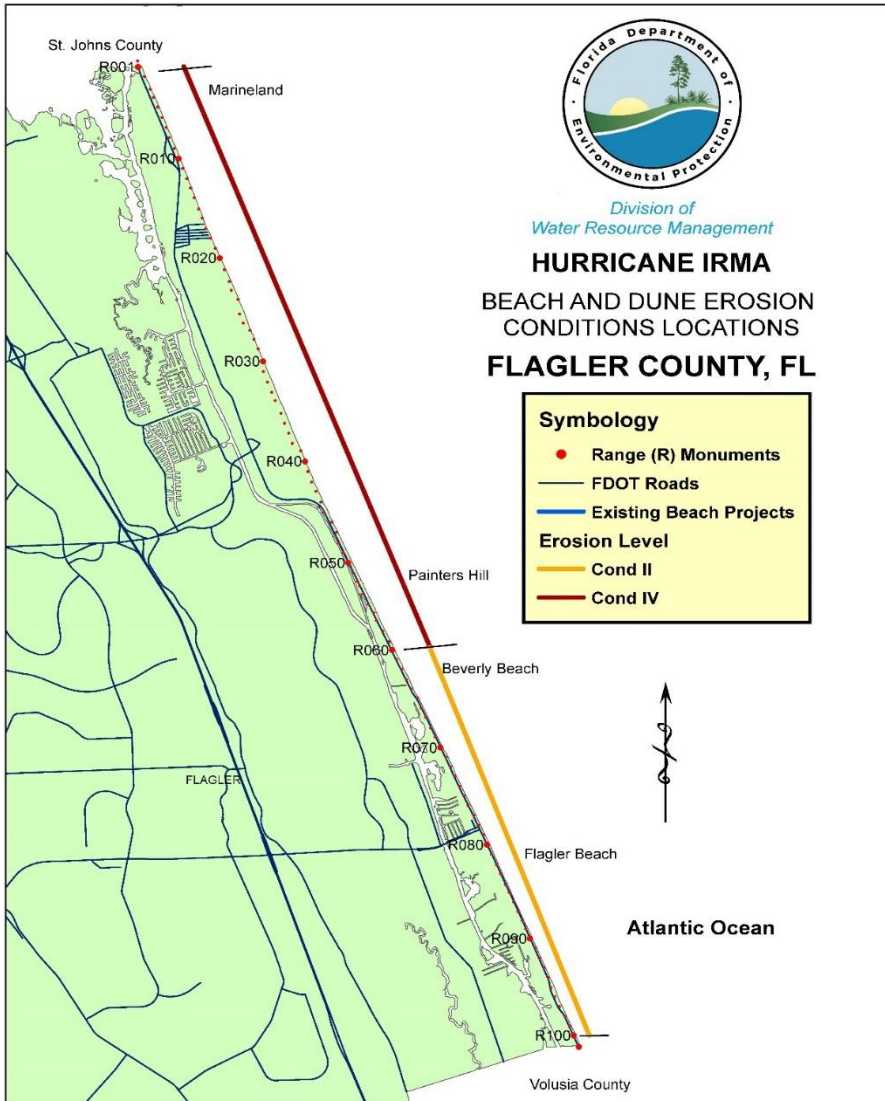
Location	FDEP Monuments	Volume Change above MHW (cy)	Average Dune Recession at the 9-foot Contour (feet)	Average Shoreline Change (feet)
Ponte Vedra	R-1 to R-46	-472,997	-22.3	-24.3
GTM Reserve	R-46 to R-67	-104,907	-27.9	-11.6
S Ponte Vedra	R-67 to R-101	-117,251	-11.7	-19.5
Vilano	R-101 to R-122	-113,927	-12.8	-20.1
Anastasia SP	R-123 to R-141	-134,261	-4.4	-37.7
St. Augustine	R-141 to R-196	-559,466	-6.0	-59.7
Summer Haven	R-197 to R-209	-16,108	NA	15.1
Countywide	R-1 to R-209	-1,518,917	-12.9	-30.5

Erosion volumes calculated from pre- and post-storm LIDAR surveys flown by US Army Corps of Engineers and represent volume lost above MHW





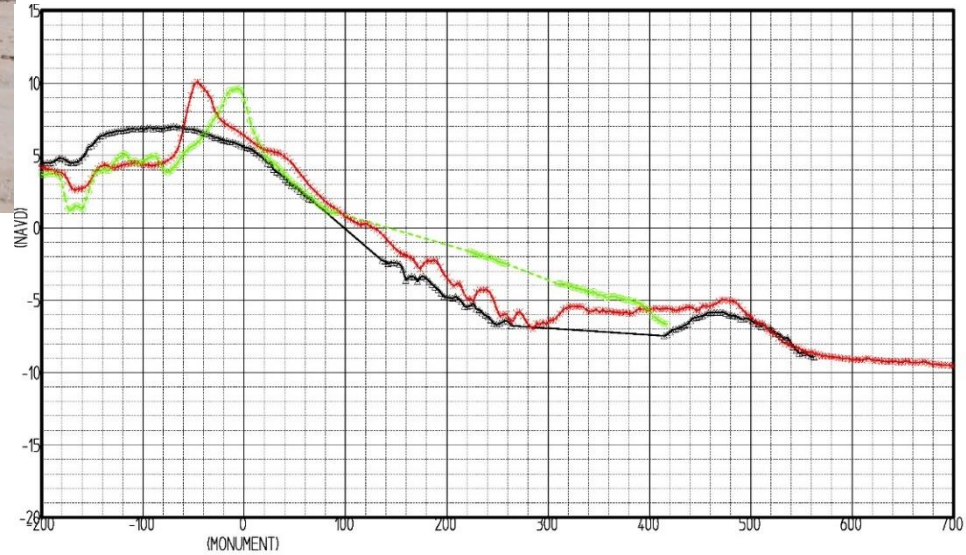
# Flagler County



- Peak tide at Matanzas Inlet – +7.6 ft NAVD
- R1-R60 major beach / dune erosion  
R60-R100 minor beach / dune erosion
- Approx. ¼ million cy lost above MHW
- 78 major structures damaged incl. 61 single-family dwellings
- 33 buildings in imminent danger from future storms
- No further damage to A1A or armoring along A1A as experienced in Matthew



# Dune breach at Washington Oaks State Park



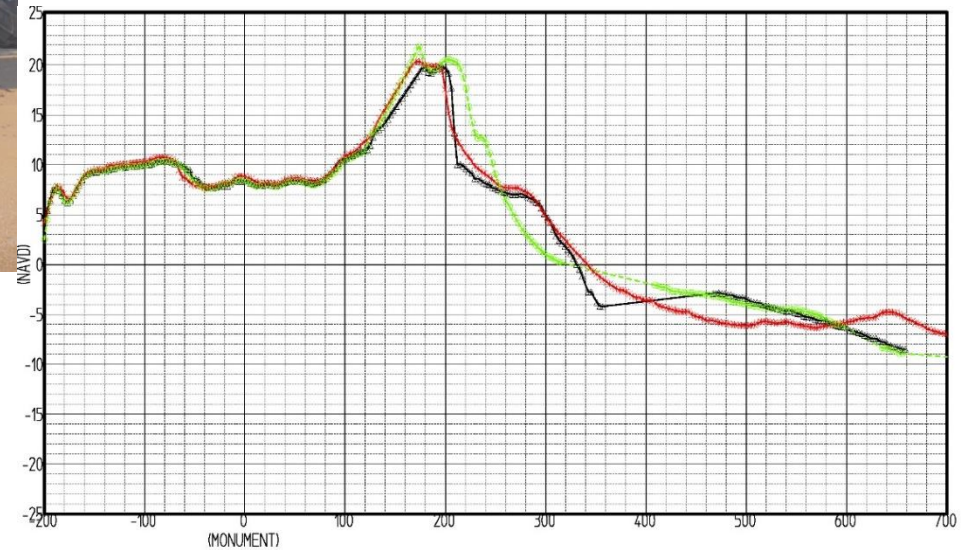
BEACH PROFILE  
— 2017-SEP-POST-IRMA LIDAR  
— 2016-POST-MATTHEW LIDAR  
— 2016-PRE-MATTHEW LIDAR

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Range: R-14  
Mon. Est: MAY1972  
DOT DATE:  
BEACH DATE: 00SEP17  
OFFSHORE DATE:



# Painter's Hill, R50-R57, Flagler County



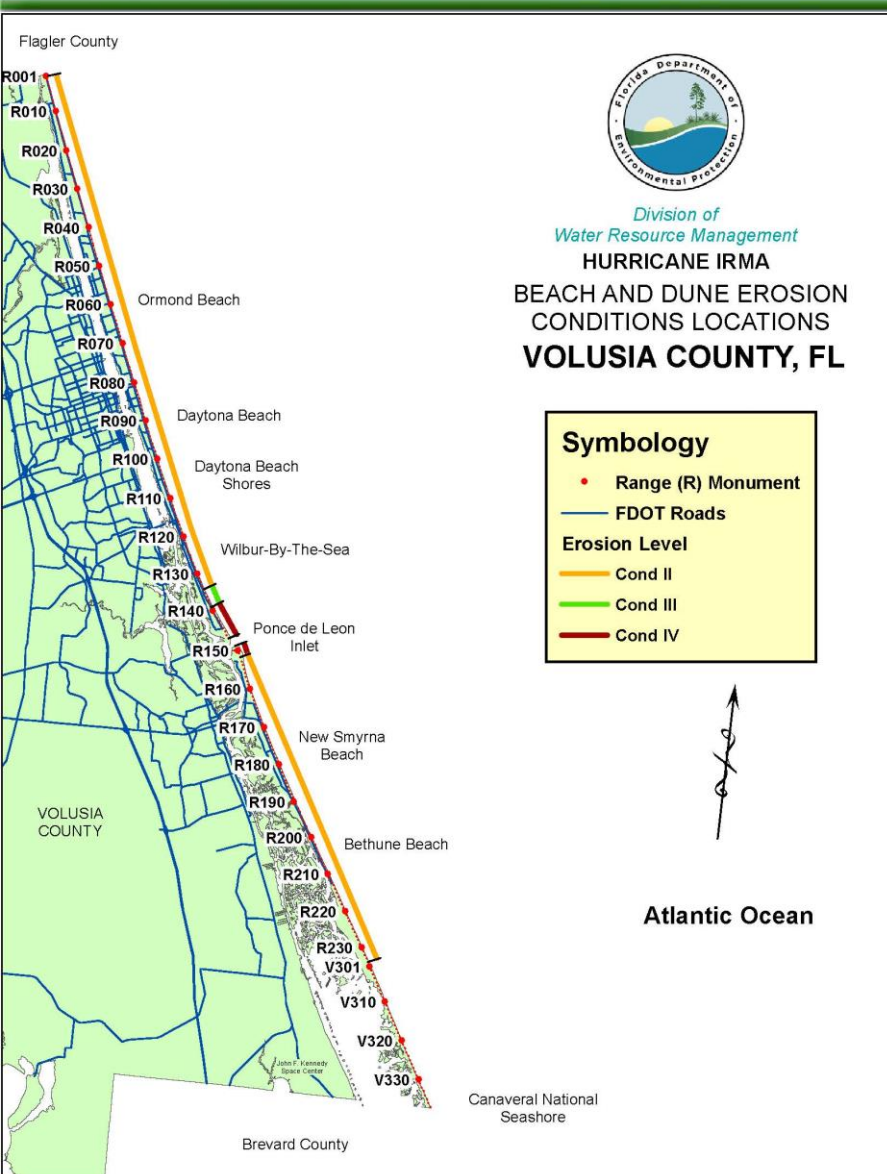
BEACH PROFILE  
2017-SEP POST-IRMA LIDAR  
2016 POST-MATTHEW LIDAR  
2016 PRE-MATTHEW LIDAR

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Range: R-51  
Mon. Est: MAY1972  
DOT DATE:  
BEACH DATE: 00SEP17  
OFFSHORE DATE:



# Volusia County



- Peak storm tides measured –  
+6.7 ft NAVD north Volusia  
+6.2 ft NAVD south Volusia
- Substantial beach/dune recovery countywide post-Matthew
- R24-R33 1.6 miles of shoreline in northern Volusia County designated critically eroded following Hurricane Matthew
- Minor beach/dune erosion from Irma except 1.7 mi north and 0.5 mi south of Ponce Inlet with major beach/dune erosion
- Close to 1 million cy lost above MHW countywide



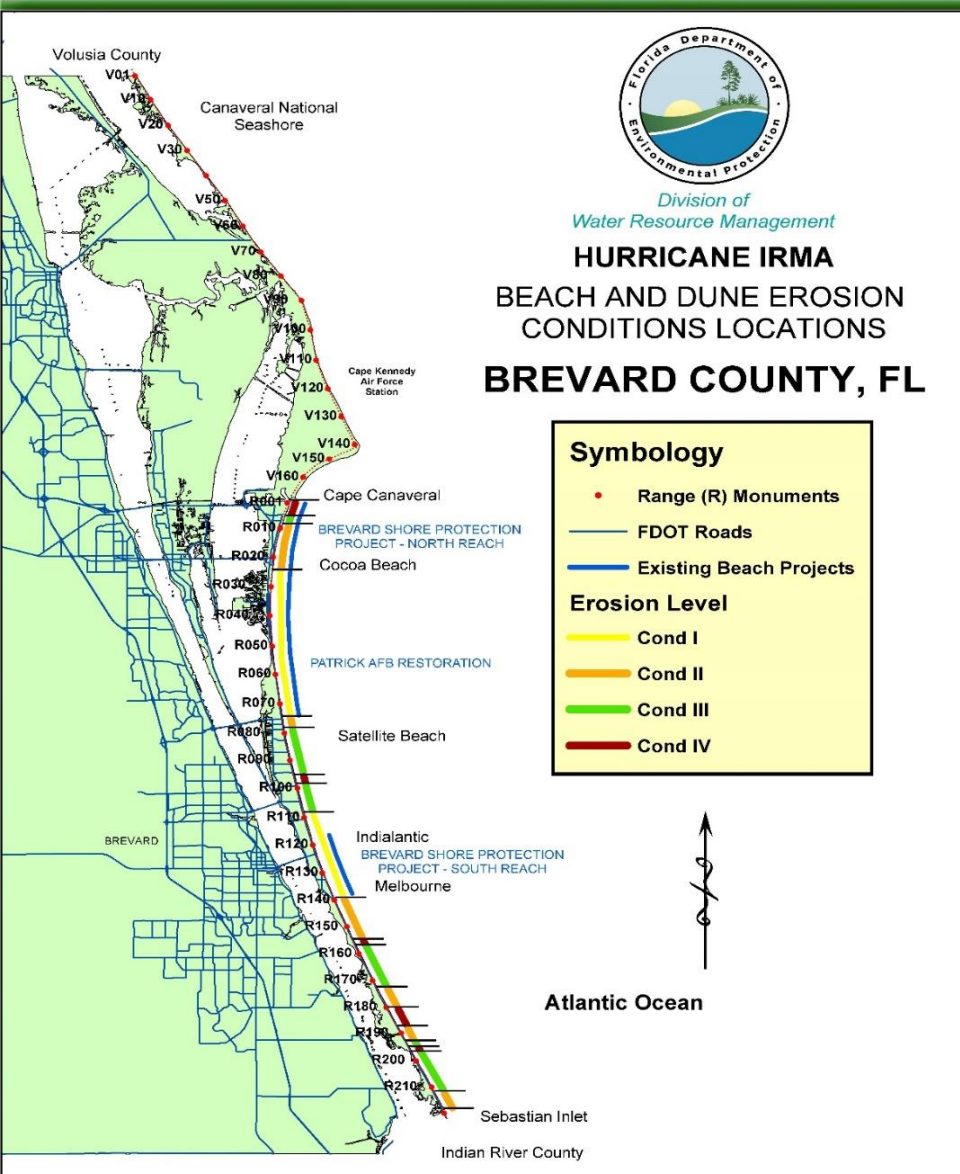
# Volusia County



- Major damage to 106 major structures
- County sustained mostly wind damage from Irma
- 225 feet of major damage to boulder mound north jetty at Ponce de Leon Inlet



# Brevard County



- Peak tide at Port Canaveral – +5.1 ft NAVD
- Wave uprush observed to add about 2 feet to the storm surge causing dune erosion
- Wind caused major damage to 217 major structures (only 3 damaged by Matthew)



# Brevard County



- Beach project areas appeared to fare best. Dune erosion added to Matthew's impact.
- Major beach/dune erosion observed near Canaveral Inlet, along Indian Harbor Beach, and in the south county area





# Coastal Tornadoes



- Irma's rain bands brought cross-shore tornadoes
- Matanzas Shores tornado(es)
  - 4 condominium bldgs destroyed
  - 5 condominium bldgs damaged
  - 8 SFD's damaged
- Indialantic tornado(es)
  - 1 condominium bldg destroyed
  - 1 condominium bldg damaged
  - 6 SFD's damaged
  - 2 commercial bldgs damaged
  - 1 motel damaged





# Questions?

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