



# The Impact of Hurricane Michael on the Coast of Northwest Florida

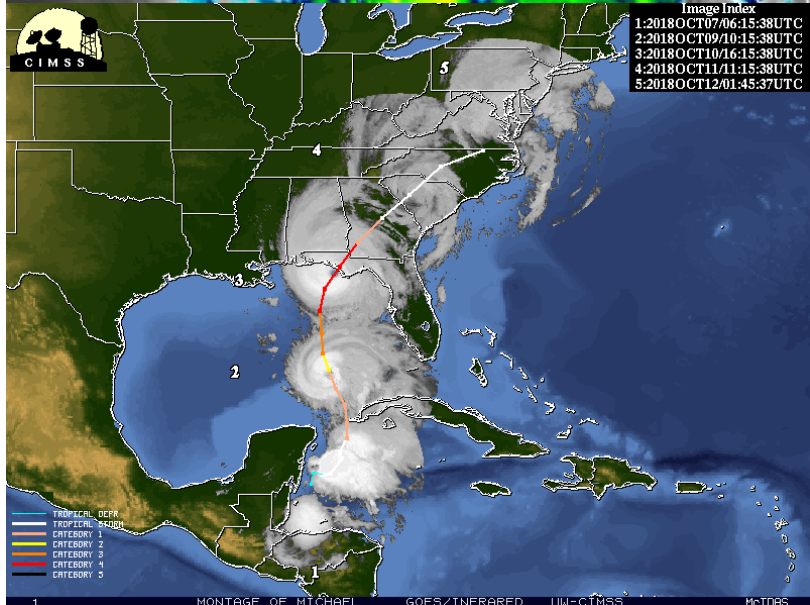
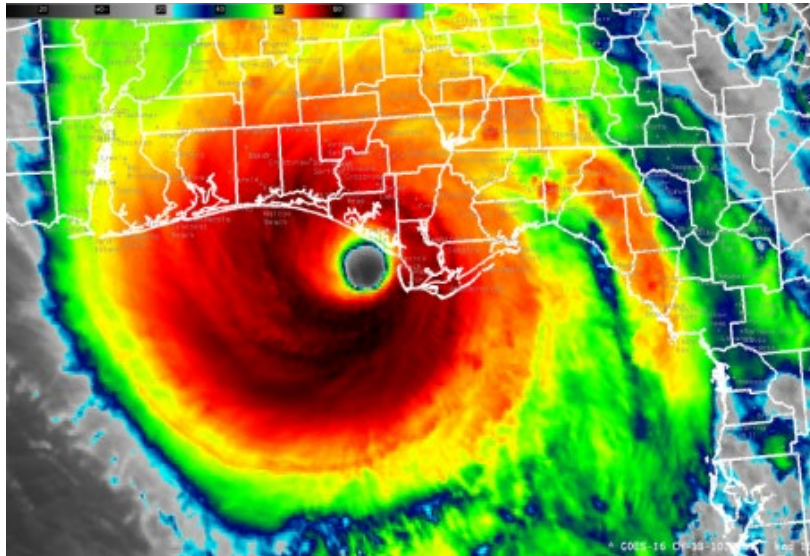
Ralph Clark, P.E.

Division of Water Resource Management

February 8, 2019



# Overview: Hurricane Michael



- Made landfall as a Category 4 on October 10, 2018 in Northwest Florida on Crooked Island, Tyndall Air Force Base
- Maximum sustained winds near 155 mph and barometric pressure at 919 mb at landfall
- Third strongest hurricane to hit continental US in recorded history (since 1851)



# Severe Inland Wind Damages



- **Tyndall Air Force Base sustained major damages to all major structures**
- **Major disaster declared for Bay, Gulf, Calhoun, Holmes, Jackson, Gadsden, Franklin, Leon, and Wakulla Counties**
- **Major disaster to the forests of north Florida**
- **Entered Georgia as a Category 3 – first major hurricane to hit Georgia since 1898**





# Coastal Impact Evaluations

- **FDEP damage assessment teams deployed immediately following the storm**
- **Detailed damage assessments conducted in Walton, Bay, Gulf, Franklin, and Wakulla Counties**
- **A total of 153 miles of beaches were assessed by the damage assessment teams**





# Major Structural Damages

County	# Single-Family Dwellings Damaged	# Multifamily Dwellings Damaged	# Other Major Structures Damaged	Total # Damaged
Bay	1,324	128	118	1,570
Gulf	840	88	56	984
Franklin	160	3	2	165
Wakulla	4	0	2	6
<b>TOTAL</b>	<b>2,328</b>	<b>219</b>	<b>178</b>	<b>2,725</b>

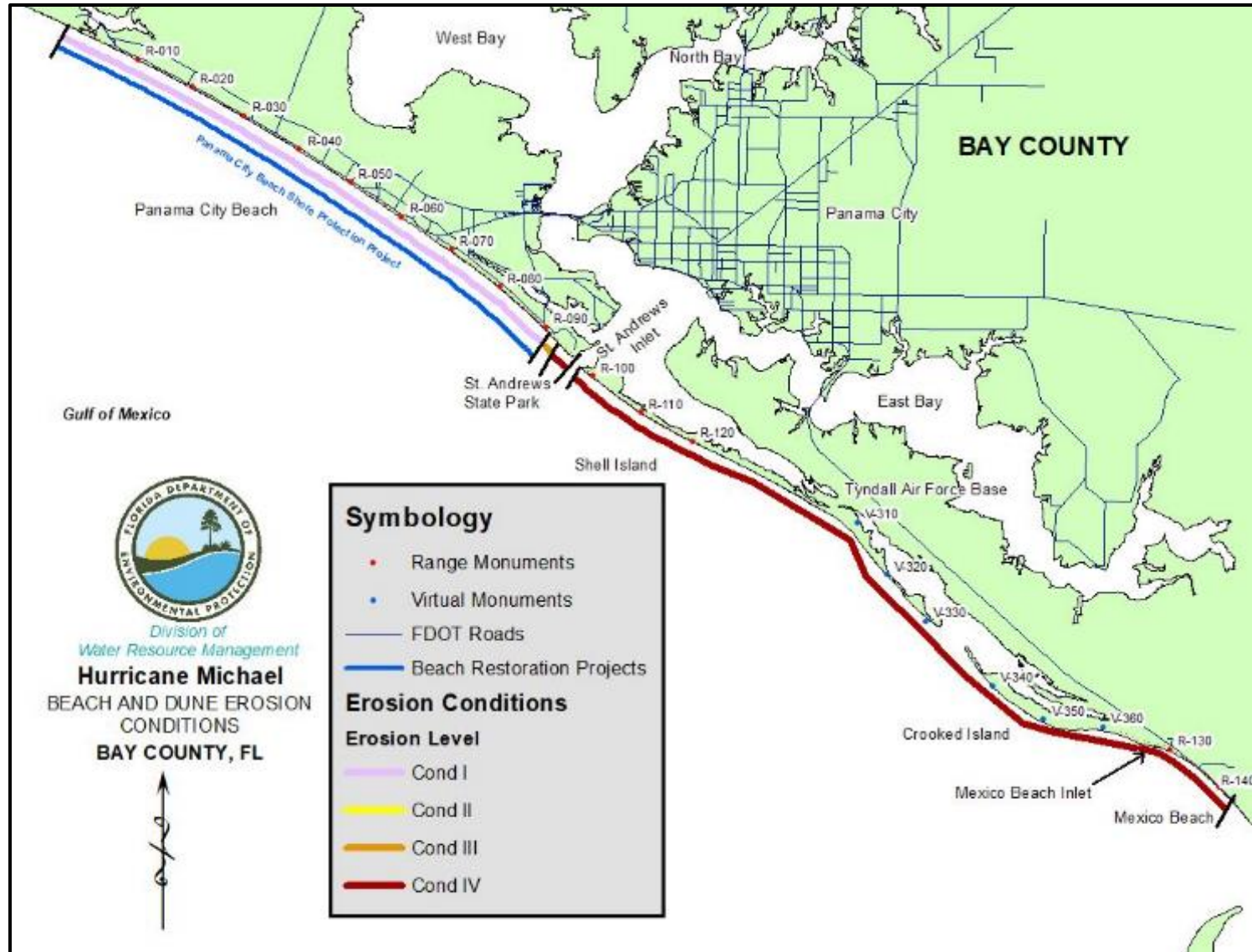


# Armoring Damage

County	Armoring Damage in Feet
Bay	1,560
Gulf	1,870
Franklin	4,670
Wakulla	100
<b>TOTAL</b>	<b>8,200</b>



# Bay County







# Wind Damages in Panama City

- **Severe wind damages in Panama City and eastern Panama City Beach**
- **All major damage along Panama City Beaches was due to the wind**
- **466 major structures damaged including 6 destroyed along Panama City Beach**





# Erosion: Panama City Beaches

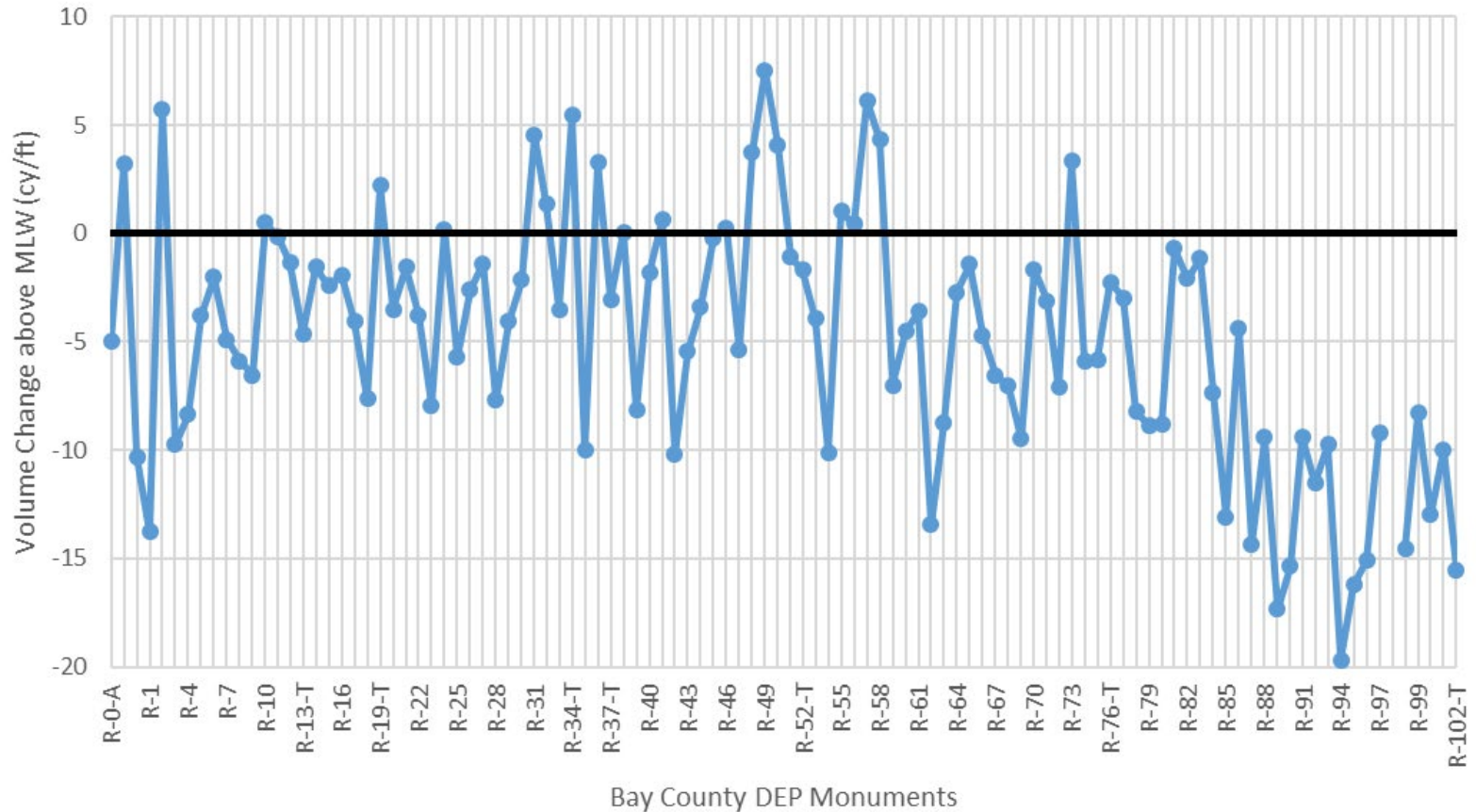


- **Shore Protection Project (R0-R92) – 546,000 cy eroded**
- **The project protected Panama City Beaches from all surge, wave, and erosion damages**
- **In contract, pre-project damages from Hurricane Opal were 471 buildings and numerous seawalls**
- **Outside of the SPP, St. Andrews State Park sustained major dune erosion**



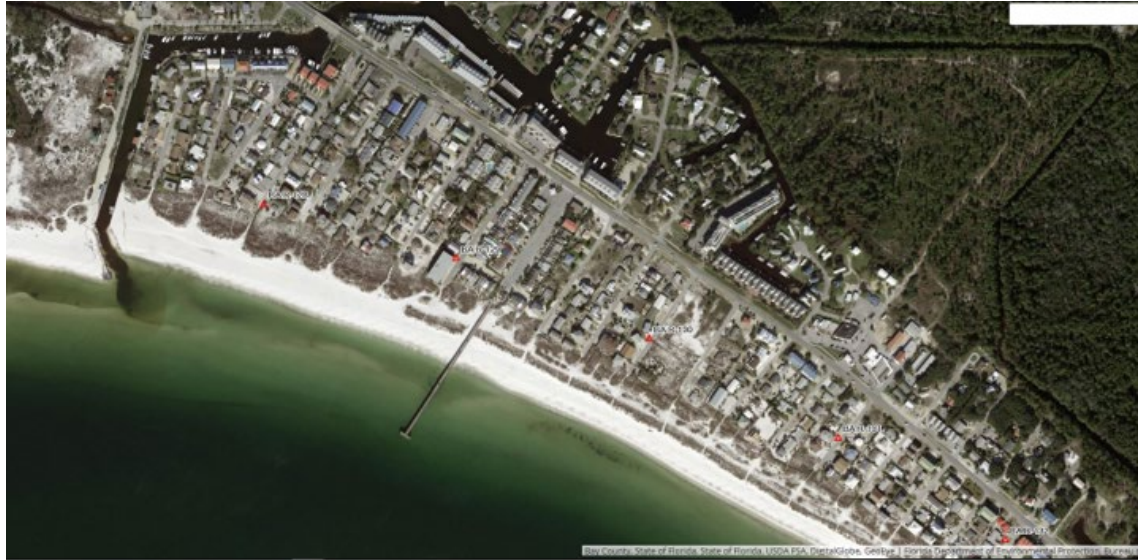
# Panama City Beach Erosion

Panama City Beach Volume Change After Hurricane Michael  
May 2018 to October 2018





# Ground Zero: Mexico Beach



- Sustained the greatest damage from the storm surge, waves, and winds exceeding coastal building standards
- 99% of development seaward of US98 sustained major damage, including 80% of buildings destroyed
- 1,102 buildings with major damage, including 595 destroyed within Coastal Building Zone



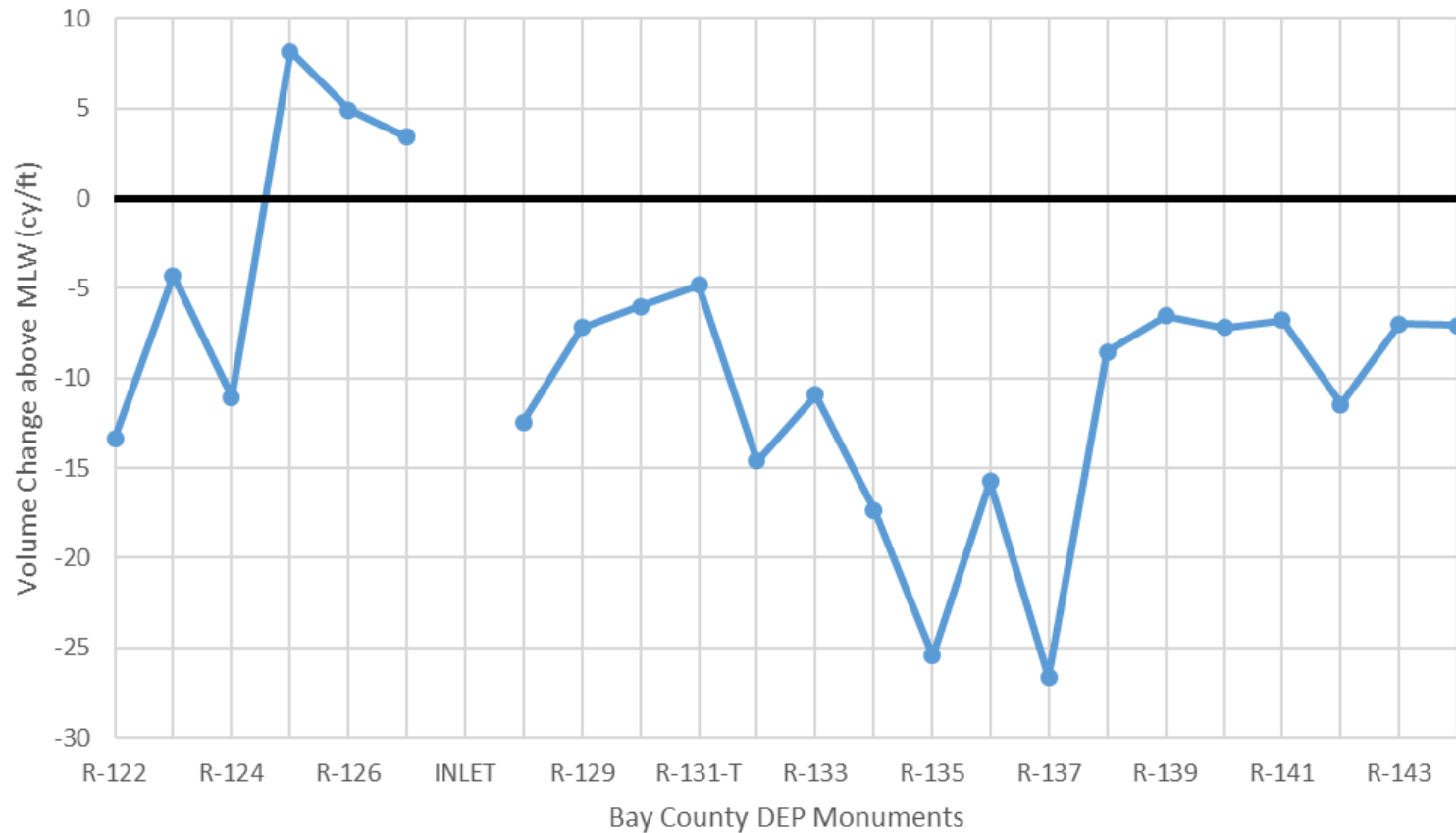
# Mexico Beach

- **100-year storm surge only +12.2 ft NAVD. Surge gauge on pier piling measured +15.6 NAVD (280 year event)**
- **High water marks were measured by USGS between +17.6 ft and +21.2 ft NAVD**
- **Wave uprush to +30 ft NAVD exacerbated the flooding**
- **Inlet to county line (R128-R144) – 190,000 cy lost above MLW or -11.6 cy/ft**



# Mexico Beach Erosion

Mexico Beach Volume Change Above MLW After Hurricane Michael  
October 2016 to October 2018





# Mexico Beach Canal Debris





# Mexico Beach (R127-R128)







# Mexico Beach (R129)





# Mexico Beach Damage



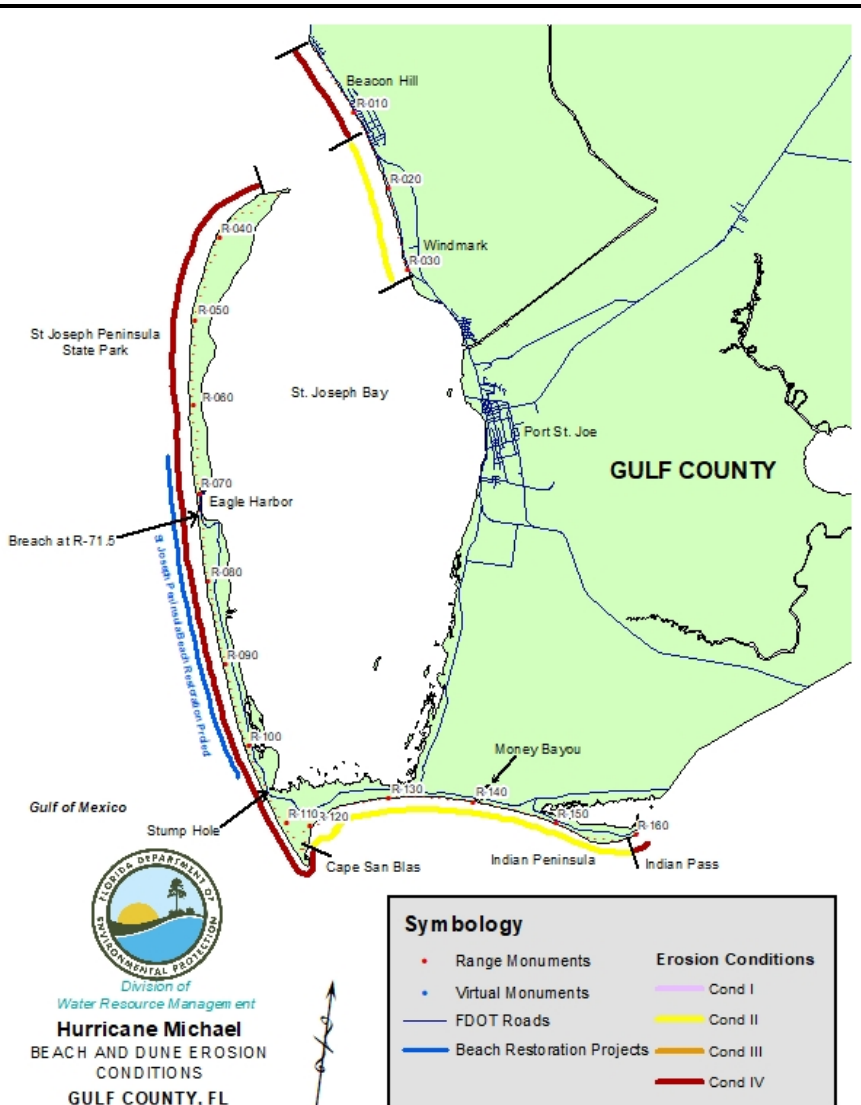


# House Rolled by Surge and Wind





# Gulf County



- Peak surge +21.2 ft NAVD at north county line
- Extreme impacts along Beach Hill from surge, waves, and wind
- Major beach and dune erosion along Beacon Hill and St. Joseph Peninsula
- Barrier breach at Eagle Harbor
- Road destroyed at Stump Hole
- 660 ft of Cape San Blas lost to erosion
- Major damage to 984 buildings county-wide in Coastal Building Zone, including 176 destroyed



# Gulf County Erosion

	DEP Monuments	Avg. Erosion (cy/ft)	Eroded Volume (cy)	Avg. Net (cy/ft)	Net Erosion
Beacon Hill / Windmark	R1-R31	-7.8	-233,760	-1.3	-37,710
St. Joseph's Island	R32-R71	-31.2	-1,288,135	-22.0	-911,129
Michael's Cut	R71-R73		-288,733		-172,237
St. Joseph's Peninsula	R73-R106	-17.9	-617,260	-15.0	-522,357
Cape San Blas	R107-R112	-16.3	-91,408	-15.7	-87,628
Indian Peninsula	R119-R161	-12.3	-502,110	-5.3	-210,054
Total			-3,021,405		-1,941,114



# Beacon Hill Damage



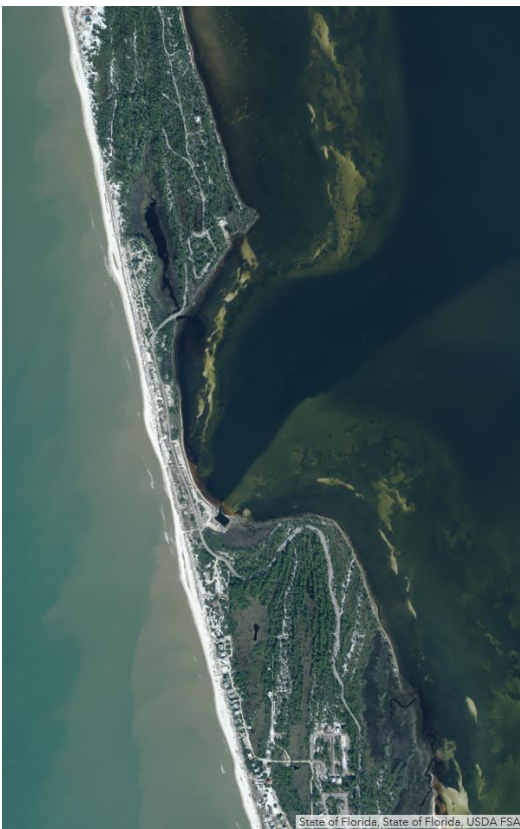


# Port St. Joe

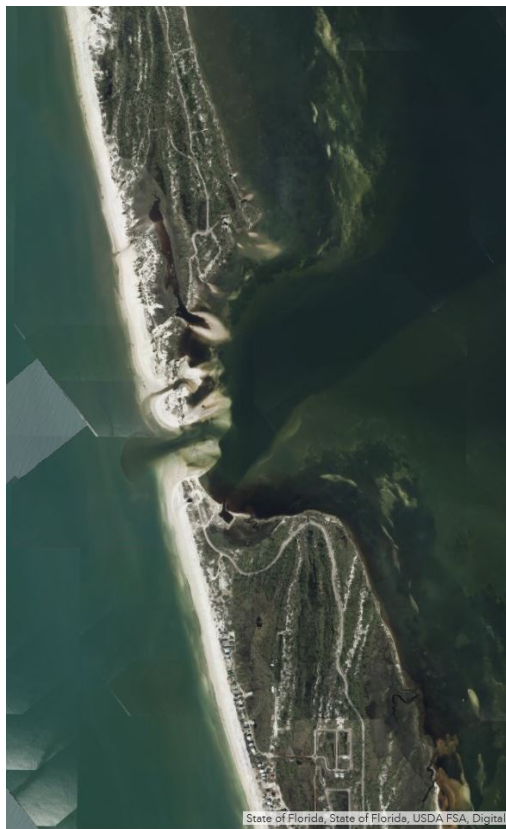




# Barrier Breach at Eagle Harbor



State of Florida, State of Florida, USDA FSA



State of Florida, State of Florida, USDA FSA, DigitalGlobe

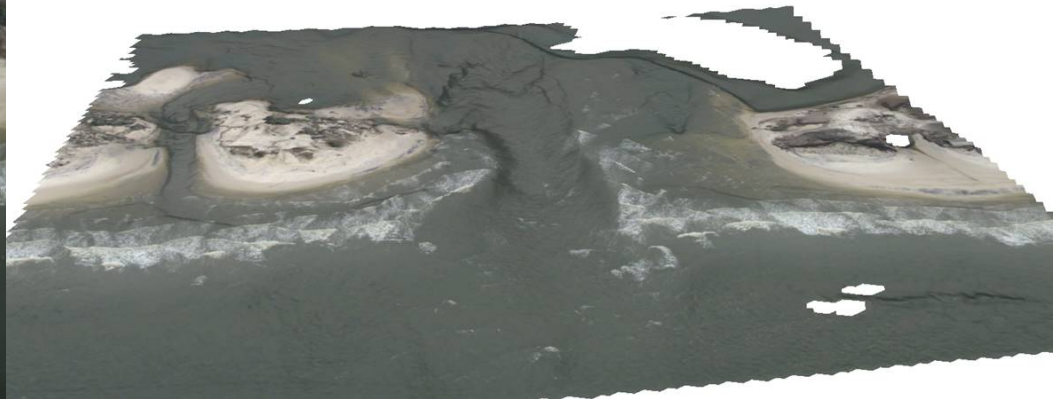
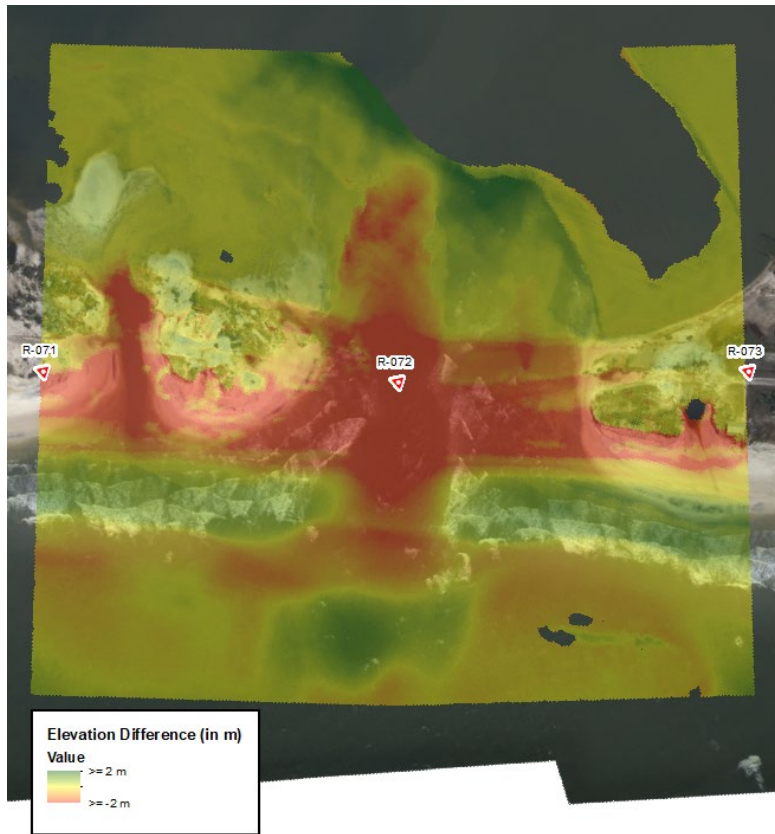






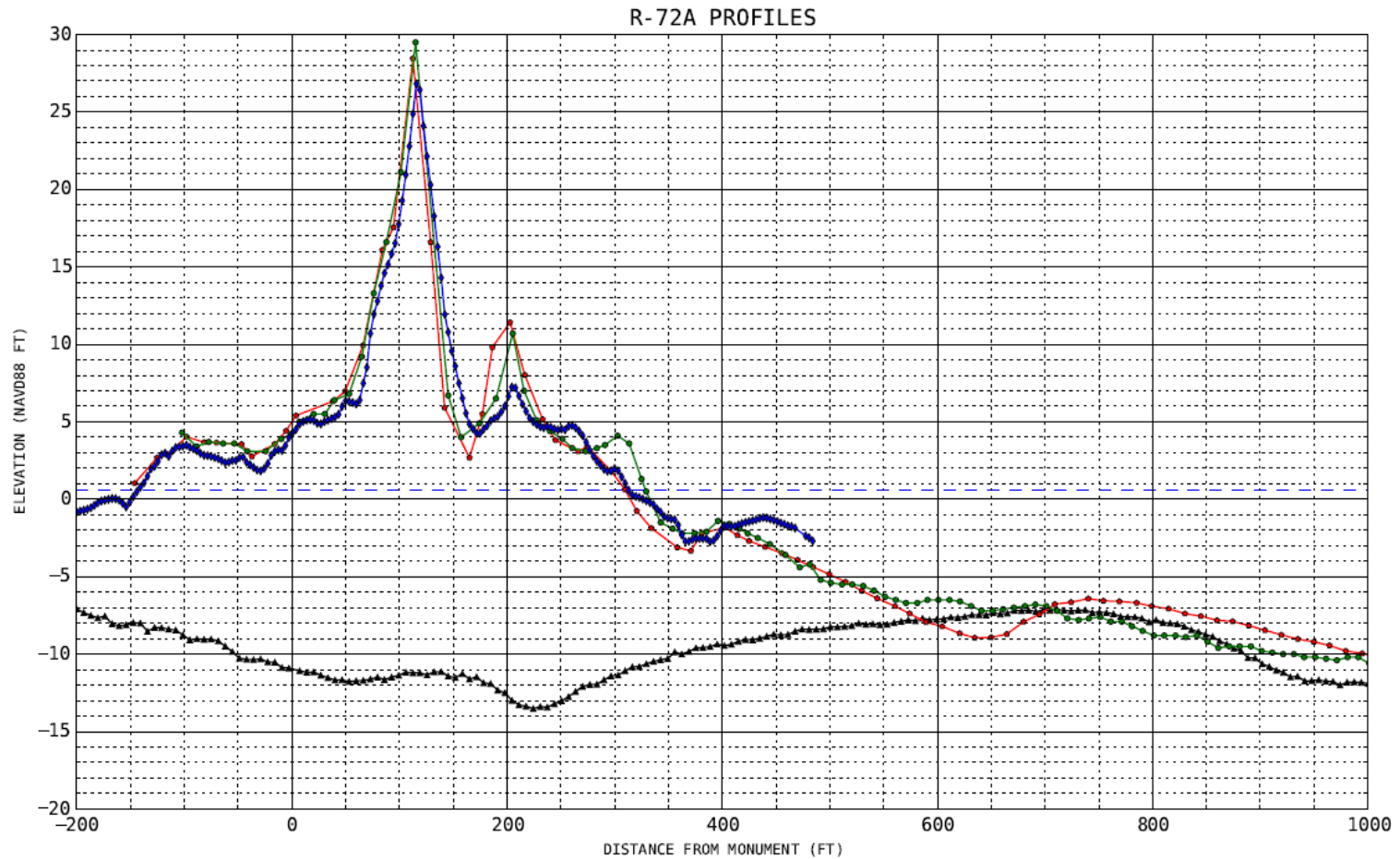
# Barrier Breach at Eagle Harbor

- **Approx. 288,700 yd<sup>3</sup> of erosion**
- **Approx. 116,500 yd<sup>3</sup> of accretion**
- **Approx. 172,200 yd<sup>3</sup> of overall loss**





# Eroded Profile Across Breach



- ▲— 2018-NOV POST-MICHAEL BY USACE-DEM
- 2014-AUG 60-MONTHS BY PRI
- 2011-AUG 24-MONTHS BY PRI
- ◆— 2010-JAN MONITORING BY USACE-DEM
- - - MHW CONTOUR (0.6 FT)

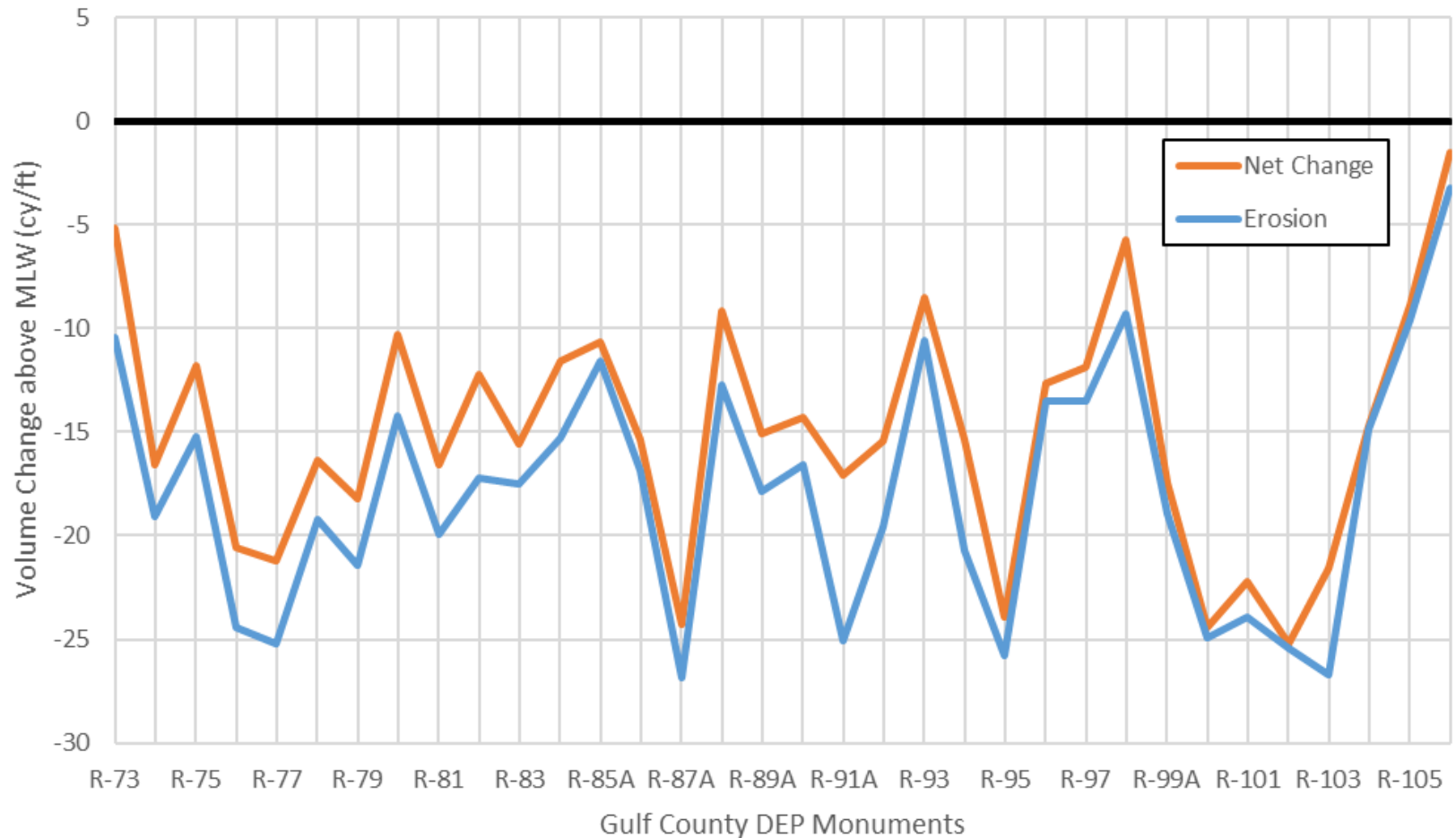
GULF  
PROGRAM SUPPORT GIS  
DIVISION OF WATER RESOURCE MANAGEMENT  
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

RANGE: R-72A  
EST DATE: JUN1983  
SURVEY DATE: 00NOV18  
AZIMUTH: 255.0



# St. Joseph Peninsula Erosion

St. Joseph Peninsula Volume Change After Hurricane Michael  
May 2017 or June 2018 to October 2018





# St. Joseph Peninsula



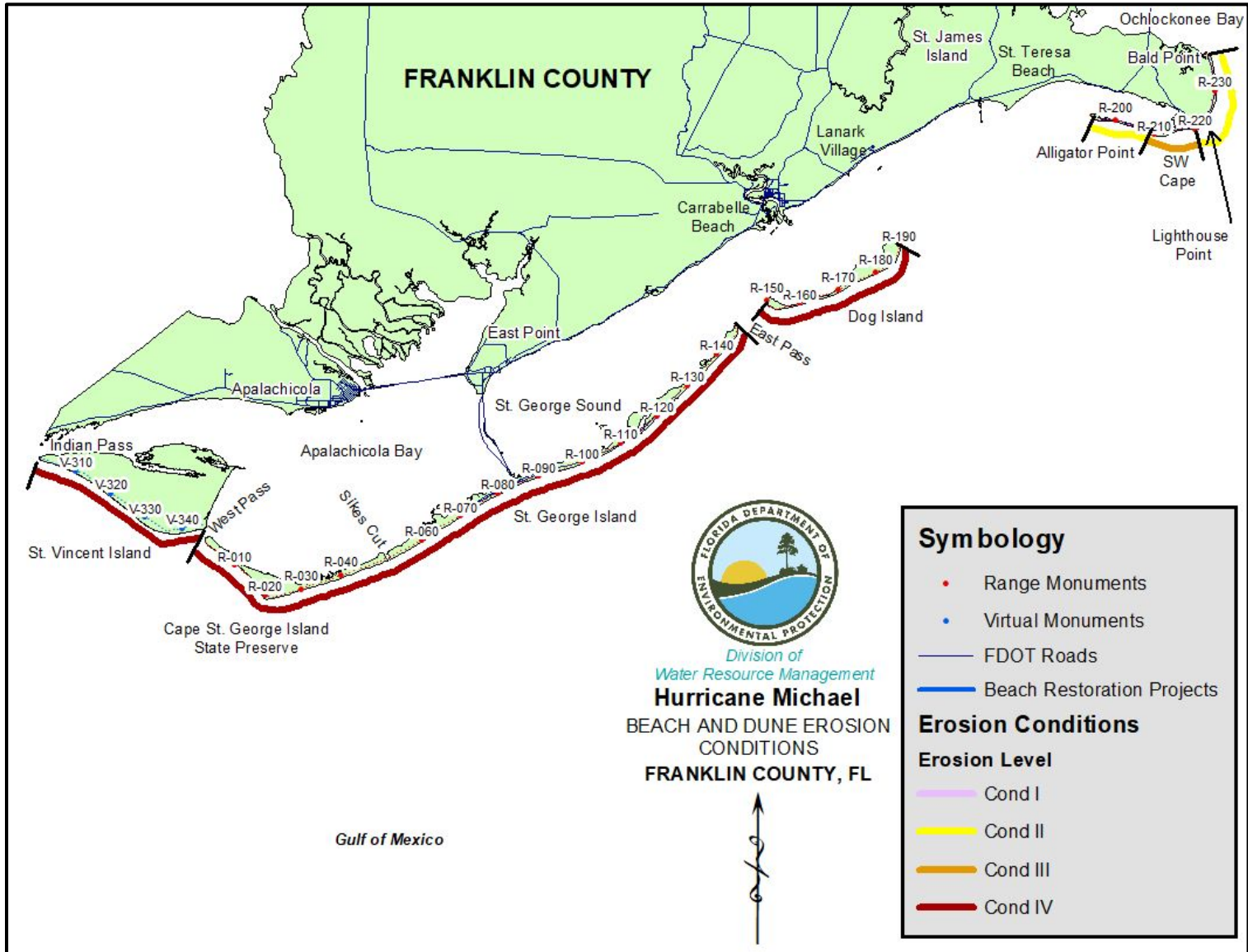


# Stump Hole, Cape San Blas, Money Bayou





# Franklin County





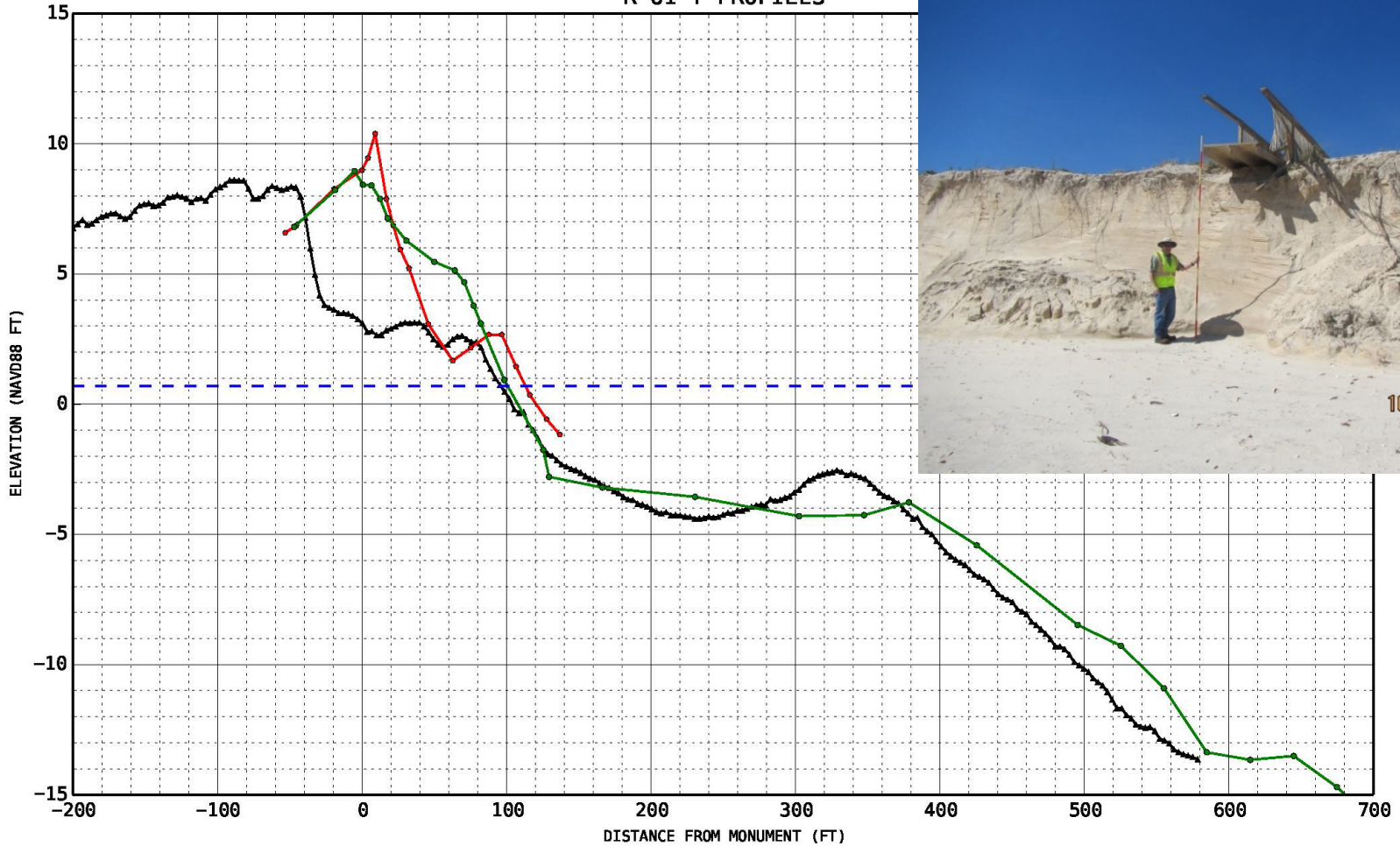
# Franklin County Erosion

	DEP Monuments	Avg. Erosion (cy/ft)	Eroded Volume (cy)	Avg. Net (cy/ft)	Net Erosion Volume
Little St. George Island	R1-R51	-11.9	-541,967	-4.7	-182,537
St. George Island: Sike's Cut to East Pass	R52-R149	-13.5	-1,391,838	-9.3	-955,395
Alligator Point to Lighthouse Point	R194-R220	-4.6	-122,757	0.5	13,603
Lighthouse Point to Bald Point	R221-R239	-2.6	-48,031	3.6	72,015
<b>Total</b>			<b>-2,104,594</b>		<b>-1,052,315</b>



# St. George Island Plantation

R-61-T PROFILES



- 2018-OCT MONITORING BY USACE-LIDAR
- 2017-FEB MONITORING BY DEP
- 2008-OCT MONITORING BY DEP
- - - MHW CONTOUR (0.7 FT)

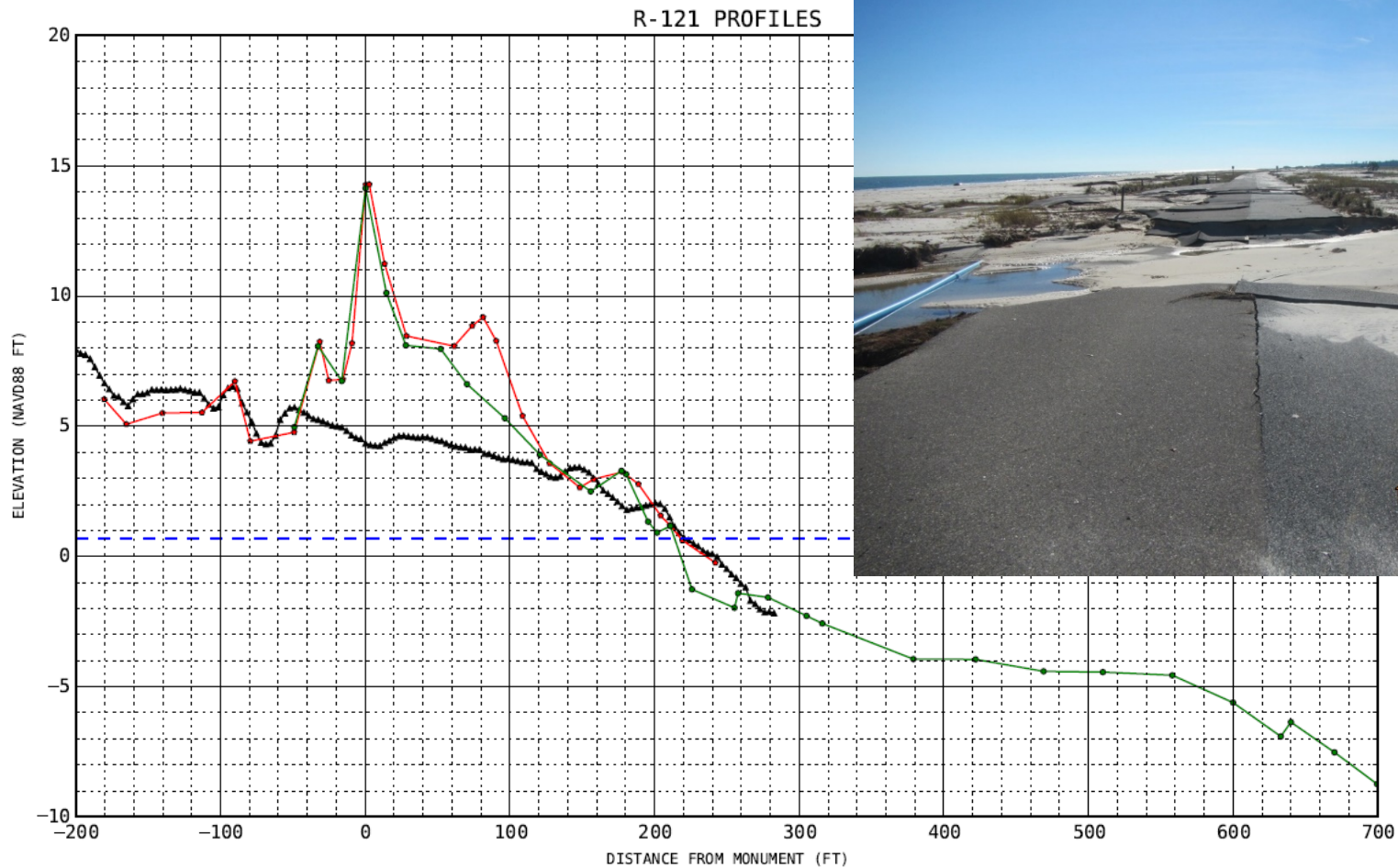
FRANKLIN  
 PROGRAM SUPPORT GIS  
 DIVISION OF WATER RESOURCE MANAGEMENT  
 FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

RANGE: R-61-T  
 EST DATE: FEB1980  
 SURVEY DATE: 31OCT18  
 AZIMUTH: 150.0





# St. George Island State Park



- 2018-OCT MONITORING BY USACE-LIDAR
- 2017-FEB MONITORING BY DEP
- 2008-OCT MONITORING BY DEP
- - - MHW CONTOUR (0.7 FT)

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

RANGE: R-121  
EST DATE: JUL1996  
SURVEY DATE: 31OCT18  
AZIMUTH: 140.0



# Eastern Franklin County Impacts



- Dog Island – major damage to 25 buildings, including 12 destroyed
- Worse impact than Elena, Kate, or Dennis
- Alligator Point to Bald Point – major damage to 44 SFDs, including 5 destroyed
- 3,000 ft road destroyed and over 4,500 ft of armoring damaged



# Contact Information

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