

*Hurricane Damage Assessment Report for 2016:
Florida's Beaches and Dunes*

**Division of Water Resource Management
Florida Department of Environmental Protection**

July 2017



Executive Summary

The State of Florida was significantly impacted by two hurricanes, Hermine and Matthew, during the 2016 Atlantic Hurricane Season. Florida Governor Rick Scott signed an Executive Order (EO) related to Hurricane Hermine on August 31, 2016. The Department of Environmental Protection (DEP) issued an Emergency Final Order (EFO) on September 3, 2016, following impacts along the Gulf Coast, to waive specific rules and statutes addressing the need for immediate storm response and recovery actions. The EFO was extended one more time and then expired on October 30, 2016.

Governor Scott signed an EO related to Hurricane Matthew on October 3, 2016, with DEP issuing a companion EFO two days later on October 5, 2016, in anticipation of impacts along the southeastern Atlantic coastline. Both the EO and EFO for Hurricane Matthew were extended several times until the final expiration date of May 23, 2017.

The most significant damages during the 2016 hurricane season occurred in Northeast Florida (Duval through Indian River Counties), especially along critically eroded beaches that have not yet been restored. Sand losses were documented along Gulf Coast counties from Franklin County south through Charlotte County and along most of the Atlantic Coast counties for these two storms.

DEP developed this hurricane damage assessment report to quantify the damages caused by the storms, and to develop storm repair strategies. This plan outlines management strategies that incorporate emergency and on-going federal, state and local efforts to repair and restore the hurricane-related damages to beaches and dunes that are vital to Florida's health, safety and economic welfare.

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Introduction

Hurricane Hermine, a Category One hurricane, made landfall on September 2, 2016, along the Gulf Coast of Florida near St. Marks. Much of peninsular Florida's sandy shoreline along the Gulf of Mexico was affected. Hurricane Matthew, a major Category Three hurricane, tracked northward and just offshore of Florida's East Coast on October 6 and 7, 2016. Nearly all of the state's sandy shoreline fronting the Atlantic Ocean was affected. DEP presents this hurricane damage assessment report to address recovery efforts for the state's beaches and dunes. This report outlines management strategies that incorporate on-going and emergency federal, state and local efforts to repair and restore hurricane-related damages to beaches and dunes that are vital to Florida's health, safety and economic welfare.

This report focuses on the projects that could be constructed to provide a reasonable level of protection to upland development and infrastructure along Florida's impacted beaches during the 2017 Atlantic Hurricane Season. The report also explains how these activities fit within the context of Florida's statewide [Strategic Beach Management Plan](#), which is designed to provide long-term protection to the state's sandy beaches. In some cases, projects that were already in the planning stages may be expedited as a result of this report. Funding for several necessary projects has already been appropriated by the Florida Legislature, and no additional funds are necessary. In other cases, new projects and activities that were not already a part of the ongoing program will be required. In all cases, the report works to coordinate the recovery efforts with long-term maintenance activities using both regular program appropriations and emergency funding provided by federal, state, and local sources, to achieve the most efficient recovery of impacted beaches and dunes.

In reviewing this report, it is important to understand that the preferred strategy, and the most effective, long-term protection for Florida's sandy beaches, is beach restoration and periodic maintenance nourishment. This entails pumping dredged sand from an offshore source to the beach or providing sand from an upland mine via truck haul and shaping it to provide a higher and wider beach profile and, in most cases, a protective dune feature. This report includes strategies for the construction of beach or dune restoration projects to provide protection to upland development and infrastructure. Dune restoration projects included in this report will offer emergency protection when designed to blend into the remaining contiguous, vegetated dunes. Any reconstructed dunes will also aid in the natural recovery process and serve as interim storm protective measures until appropriate long-term management strategies can be implemented.

This report provides descriptions of recommended activities by county, for both short-term and long-term recovery. Project locations along the shoreline are identified in this report using DEP range/reference "R monuments", which are spaced roughly 1,000 feet apart along the coast. The post-storm survey data and follow-up field inspection reports have been fully analyzed, and the new critically eroded beaches are listed in the 2017 [Critically Eroded Beaches Report](#). This report is a supplemental planning document used for identifying beaches that will be included in the Strategic Beach Management Plan.

Storm Overviews

Hurricane Hermine

Hurricane Hermine was the first hurricane to make landfall in Florida since Hurricane Wilma in 2005. The Category One hurricane reached its maximum sustained winds of 80 miles-per-hour just before reaching the Big Bend Coast near the town of St. Marks in Wakulla County, on September 2, 2016 (*Figure 1* and *Figure 2*). Coastal damages from winds, waves and storm tides were sustained from Alligator Point in Franklin County southward through Charlotte County on the Southwest Coast of Florida. Although significant damages were sustained from winds and flooding along the Big Bend coast, the most significant damage to Florida's sandy beach coastlines was experienced in Franklin County and Pinellas County southward through Charlotte County.

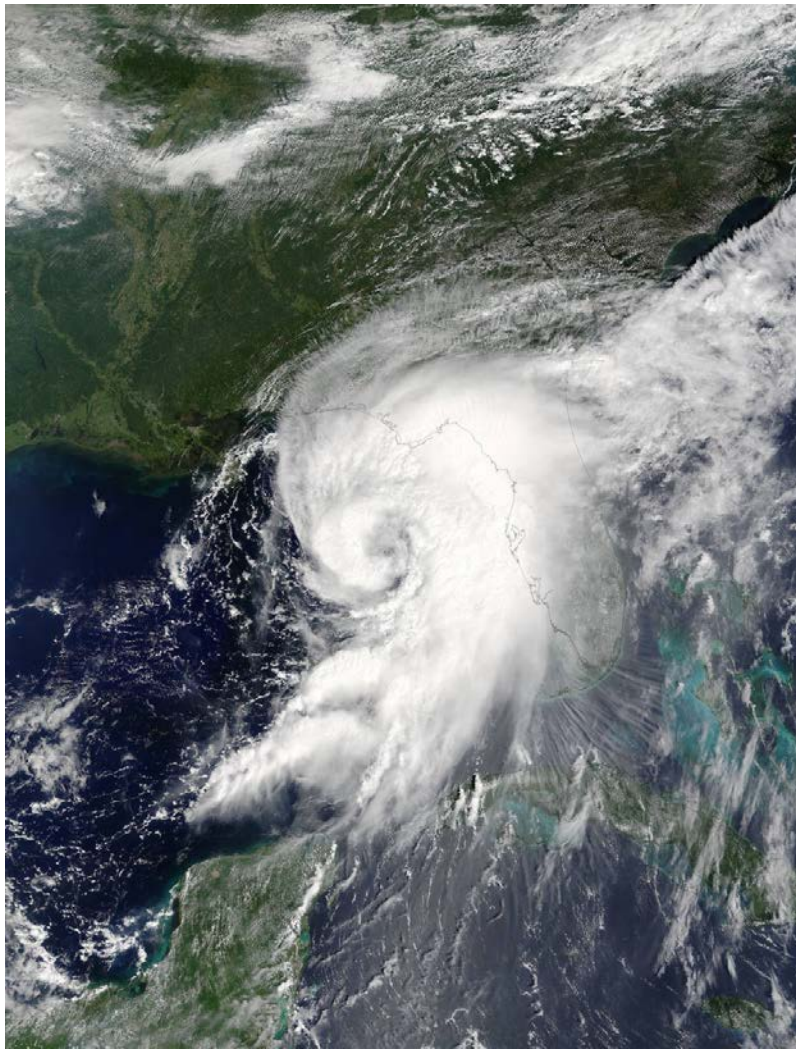


Figure 1. NASA image of Hurricane Hermine (September 2, 2016).

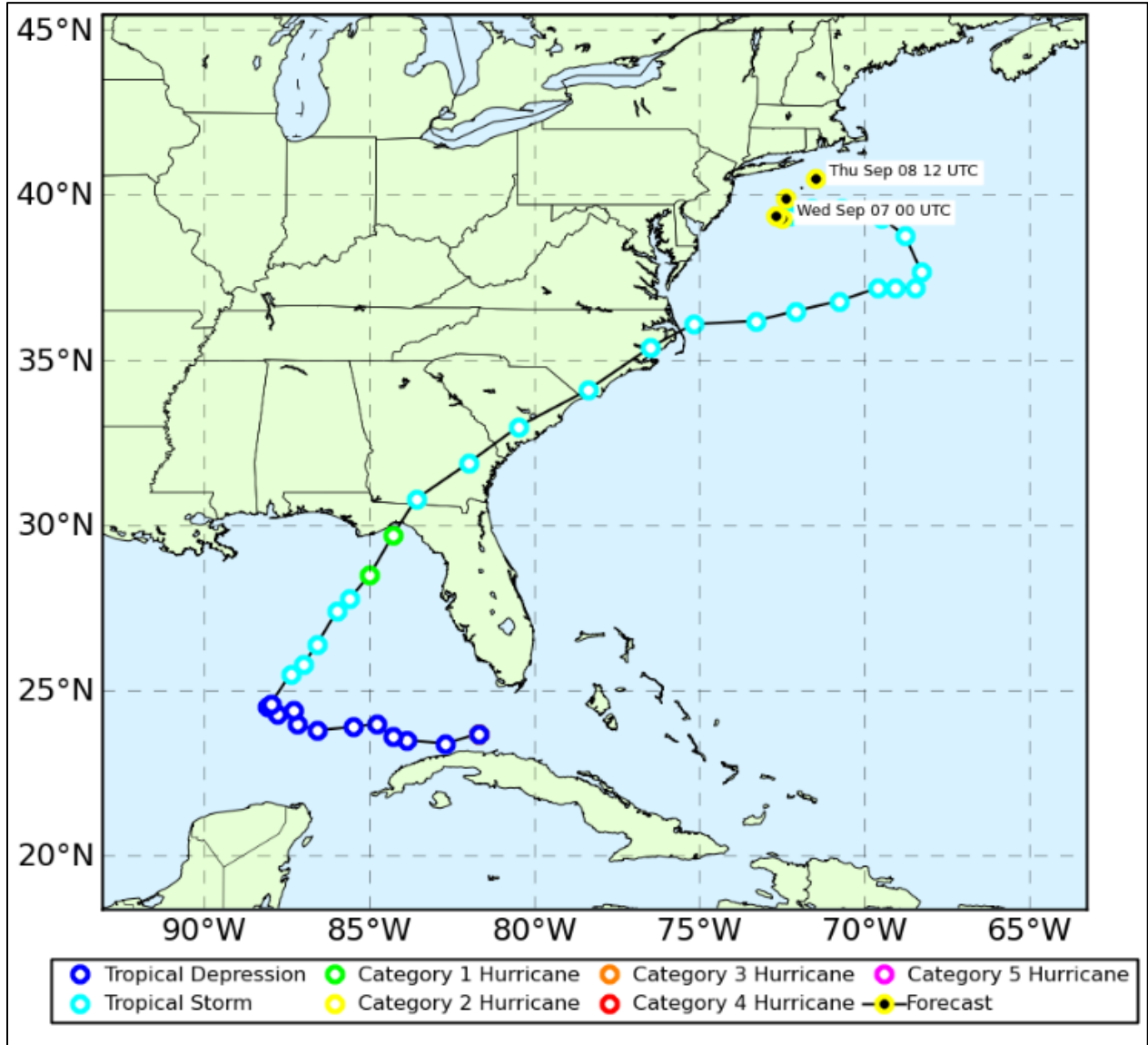


Figure 2. Forecast track of Hurricane Hermine for National Hurricane Advisory 38 (Valid September 9, 2016) by the National Hurricane Center.

Damages Sustained During Hurricane Hermine

The storm damage along the Florida Gulf Coast is attributable to the storm tides and wave energy associated with Hurricane Hermine. The estimated storm surge along the Florida Gulf Coast was +5 feet North America Vertical Datum (NAVD). Landfall of the Category One hurricane occurred in the Florida Big Bend region, which lacks abundant sandy beaches. Coastal damage was most significant in Franklin County between the Southwest Cape and Bald Point, which saw more than 4,000 feet of road damaged or destroyed, approximately 2,500 feet of rock revetment damaged, and 800 feet of armoring damaged or destroyed (*Figure 3* and *Figure 4*). This stretch of Franklin County also experienced major beach and dune erosion. In Southwest Florida, from Pinellas County through Sarasota County, minor to moderate beach and dune erosion was sustained.



Figure 3. Damage to Chip Morrison Drive at the Southwest Cape, Alligator Point.



Figure 4. Alligator Point Road and revetment damage, Alligator Point.

Hurricane Matthew

Between October 6 and 7, 2016, Hurricane Matthew, a major Category Three hurricane, tracked northward along and just offshore of Florida's East Coast (*Figure 5 & Figure 6*). Nearly all of the state's sandy beach shoreline fronting the Atlantic Ocean and Straits of Florida was affected by Hurricane Matthew's wind, waves and storm tides. Hurricane Matthew made its closest approach along Northeast Florida, causing the greatest impact in that region since Hurricanes Frances and Jeanne in 2004. For St. Johns and Flagler Counties in Northeast Florida, Matthew's impact was the most severe since Hurricane Dora made landfall at St. Augustine in 1964.

Immediately following the impact of Hurricane Matthew, post-storm damage assessment teams from DEP and the U.S. Army Corps of Engineers (USACE) Jacksonville District conducted detailed inspections and assessments of the beach and dune erosion conditions and coastal structural damages in Duval, St. Johns, Flagler, Volusia, Brevard, Indian River and St. Lucie counties.

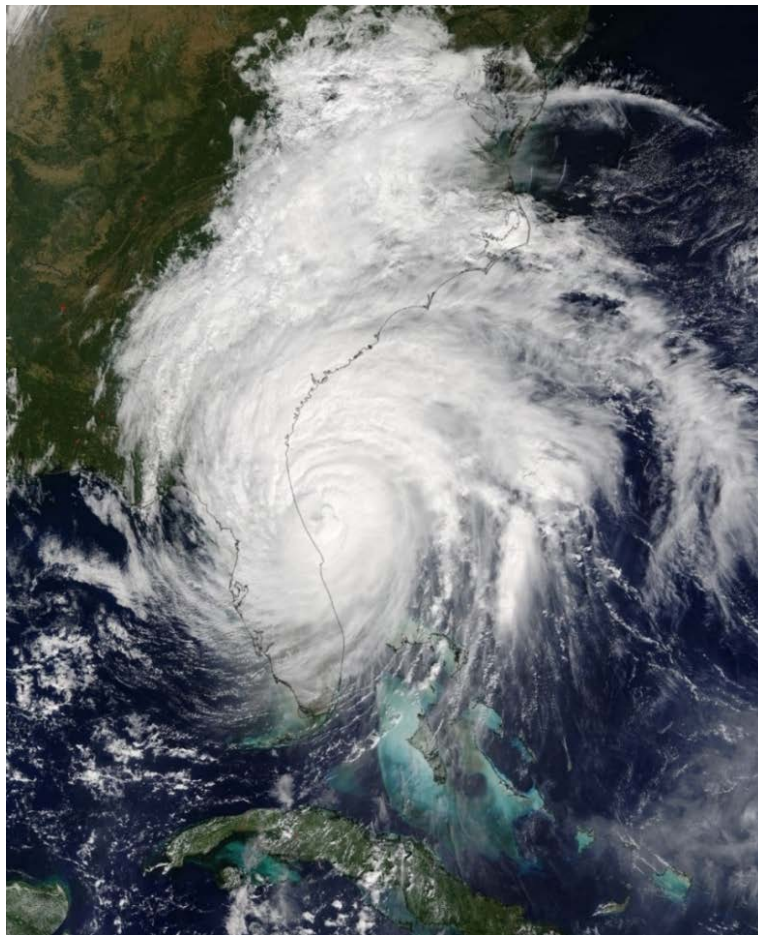


Figure 5. NASA satellite image of Hurricane Matthew (October 6, 2016).

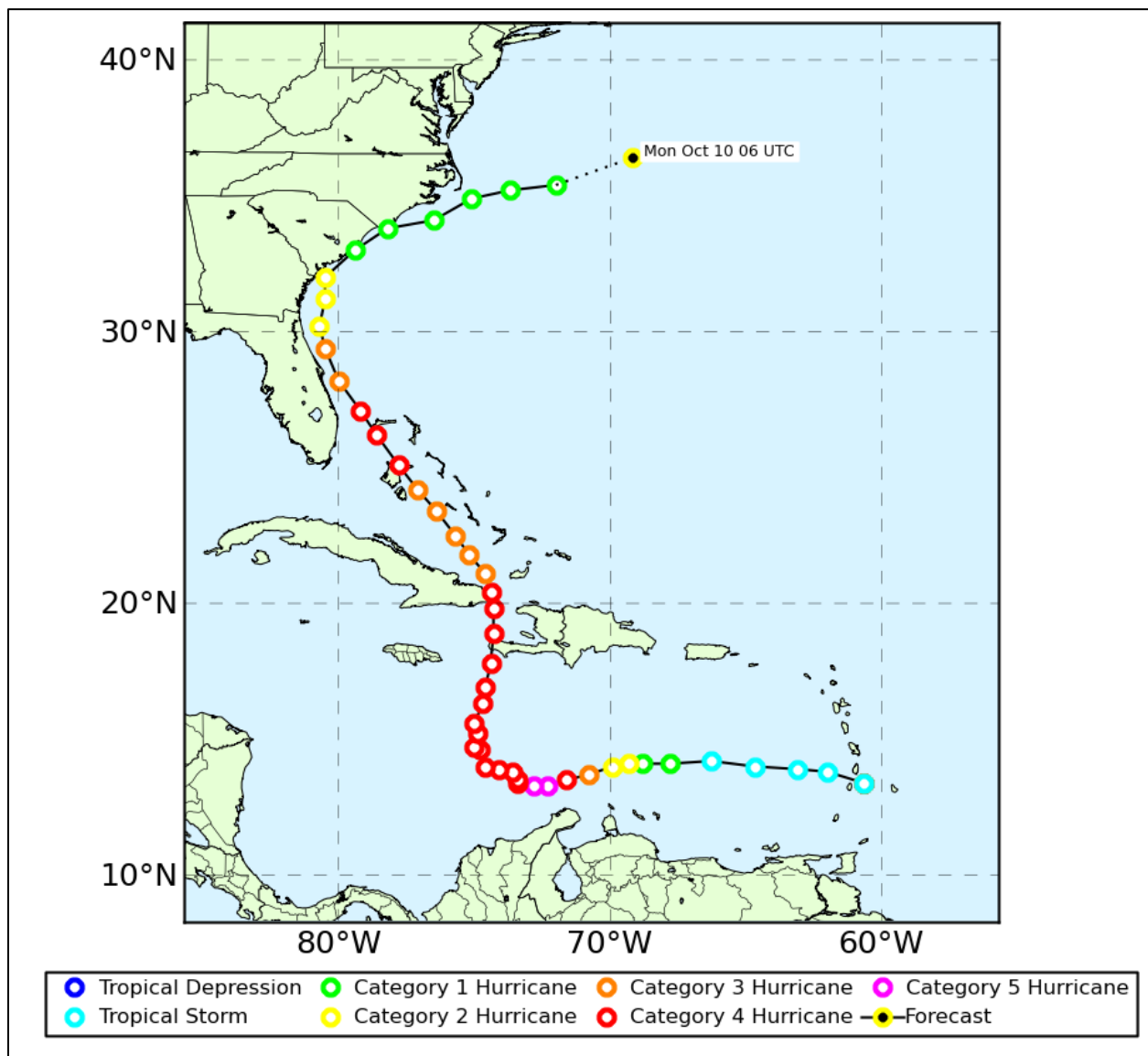


Figure 6. Forecast track of Hurricane Matthew for National Hurricane Advisory 47.

Damages Sustained During Hurricane Matthew

The storm damage along Florida's Atlantic Coast is attributable to the high winds, high energy wave conditions and storm surge flooding associated with Hurricane Matthew. Although maximum winds were measured in excess of 110 miles-per-hour (mph) offshore, maximum wind gusts over the coast of Florida ranged from a measured 55 mph at the Lake Worth Pier in Palm Beach County, 85 mph at Kennedy Space Center and 91 mph at the Daytona Beach Airport. At Flagler Beach, a maximum storm tide of +7 feet North America Vertical Datum (NAVD) was measured by the U.S. Geological Survey. This storm tide level is equivalent to a 30-year return interval storm tide event for Flagler County. National Oceanic and Atmospheric Administration data buoys offshore from Ft. Pierce and Fernandina Beach, measured maximum significant wave heights of 23.6 feet and 19.7 feet, respectively.

The East Coast of Florida has 362.7 miles of barrier island beaches between the St. Marys River entrance at the Florida/Georgia state line southward to Cape Florida in Miami-Dade County. Roughly 212 miles of these beaches along six counties, from the St. Johns River entrance at Jacksonville southward through Vero Beach, sustained major beach and dune erosion, with the majority of structural damages experienced during the 2016 hurricane season (*Figure 7*). In addition, a breach in the barrier island at Summer Haven in southern St. Johns County was created by Hurricane Matthew, and a major dune breach occurred at Washington Oaks State Park in Flagler County. Storm surge and wave overtopping of the dunes caused inland flooding along most of northern Flagler County.

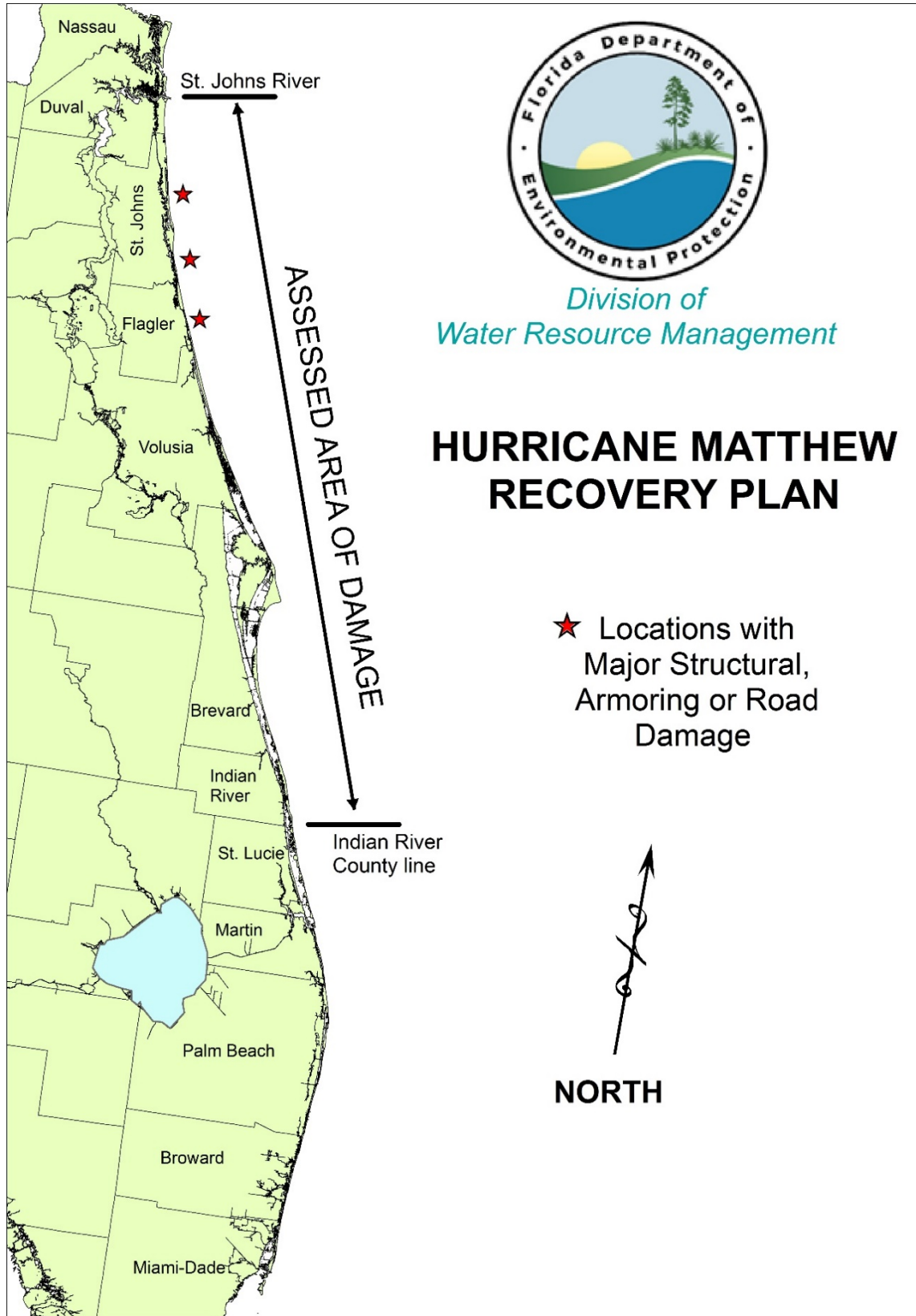


Figure 7. Assessed area on east coast of Florida with major beach and dune erosion

The eye of Hurricane Matthew did not make landfall in Florida and therefore, the severe damage did not extend very far inland. The major structural damage was generally limited to development and infrastructure directly fronting the Atlantic Ocean. Much of the major structural damage to residences and commercial buildings in Flagler and Volusia Counties was caused by high winds and flying debris. High winds caused damage to roofs, siding, windows and walls. However, in the St. Johns County communities of South Ponte Vedra, Vilano Beach and Summer Haven, which had a narrow beach and where uplands were not protected by a beach restoration project, the storm surge and waves were high enough to cause structural damage to upland development, particularly to structures built before establishment of the Coastal Construction Control Line (CCCL) or the current Florida Building Code's coastal building standards (*Table 1* and *Figure 8*). In addition to damage to major structures, there was widespread damage to minor structures, including beach and dune access walkways, boardwalks, gazebos, signs and utilities. In South Ponte Vedra and Vilano Beach, there were approximately 265 homes or properties with nonstructural damages (including damage to breakaway expendable understructure elements and septic systems) and/or damage to minor structures (including dune walkovers, patios and decks). In isolated low-lying areas of Flagler County, there was nonstructural flooding damage due to the storm surge overtopping the dunes. Flooding along the Intracoastal Waterway was also experienced in St. Johns, Flagler and Volusia counties.

Table 1. Summary of Major Structural Damage to Major Structures by Hurricane Matthew.

County	# Single-Family Dwellings Damaged	# Multifamily Dwellings ¹ Damaged	# Other Major Structures ² Damaged	Total # Damaged ³
Duval	0	0	1	1
St. Johns	85	1	0	86
Flagler	11	6	4	21
Volusia	30	35	10	75
Brevard	0	1	2	3
Indian River	0	0	1	1
TOTAL	126	43	18	187

¹ Multifamily dwellings include condominiums, townhouses, apartments, hotels, and motels.

² Other major structures include commercial buildings (restaurants, stores, beach bars, etc.), recreational buildings, and non-habitable major structures (e.g., piers, pools, pavilions and parking lots).

³ Not included in this summary are minor structures (e.g., walkways, decks, driveways, patios, etc.), coastal and shore protection structures (e.g., seawalls, revetments, sills, groins, jetties), minor damage to major structures, or structures located inland of the coastal building zone.



Figure 8. Examples of structural damages to major structures in St. Johns County.

In St. Johns, Flagler and Volusia counties, there was also substantial damage to coastal armoring (seawalls, bulkheads, revetments, retaining walls, etc.) and paved roads, specifically State Road A1A. Numerous timber seawalls were destroyed, many vinyl composite seawalls were damaged along South Ponte Vedra and Vilano Beach in northern St. Johns County, and a major federal rock revetment was destroyed along Summer Haven in southern St. Johns County. In Flagler County, four seawalls were destroyed in Painters Hill, and State Road A1A was damaged where it was in close proximity to the beach. In northern Flagler Beach, there were segments of road damage between 21st Street North and 23rd Street North. The road damage was more severe in southern Flagler Beach, where the road was damaged between 11th Street South and 21st Street South. This area of southern Flagler Beach also saw a mile-and-one-half of rock revetment destroyed. There was additional damage to State Road A1A in northern Volusia County north of Ormond Beach. Throughout Volusia County, nearly a mile of revetments and walls were damaged or destroyed. *Table 2* summarizes the armoring and road damage, and *Figure 9* shows examples of damage to roads and armoring.

Table 2. Summary of Oceanfront Armoring and Road Damage Caused by Hurricane Matthew.

County	Armoring Damage in Feet	Road Damage in Feet
Duval	0	0
St. Johns	7,690	5,170
Flagler	8,286	3,350
Volusia	3,820	195
Brevard	0	0
Indian River	0	550
TOTAL	19,796	9,265



Figure 9. Examples of damages to paved roads and coastal armoring.

Florida's beaches and dunes protected the uplands from the potential of more devastating impacts. **It is noteworthy that where a beach restoration project existed, damage to upland buildings, armoring and infrastructure was minimal** (Table 3). Damage was also minimal where a healthy natural beach and dune system existed prior to the storm. Recovery of these beaches and dunes is necessary to provide adequate protection from future storm events. It is important to note that repair to structural damages is not eligible for state cost-share through DEP's Beach Management Program.

Table 3. Beach Restoration Projects Sustained Minimal Damage to Major Structures, Armoring and Roadways.

Beach Restoration Projects	Project Length (Feet)	# of Major Structures with Damage	Armoring Damage (Feet)	Road Damage (Feet)
Duval County Shore Protection Project	53,328	1*	0	0
St. Johns County Shore Protection Project	20,064	0	290	0
Brevard County Shore Protection Project – North Reach	49,632	0	0	0
Patrick Air Force Base Beach Project	21,120	0	0	0
Brevard County Shore Protection Project – South Reach	20,064	0	0	0
Indian River County – Ambersand Nourishment	14,256	0	0	0
Indian River County – Wabasso Beach Nourishment	34,848	0	0	0
Indian River County Sector 7 Beach Nourishment	10,735	0	0	0
TOTAL	224,047	1*	290	0

*Jacksonville Beach Fishing Pier lost 300+ feet from its seaward end.

2016 Hurricane Impacts to Beaches and Dunes

DEP, in concert with local and federal agencies, conducted impact assessments of sandy beaches fronting Florida's Gulf of Mexico and Atlantic Ocean for all areas impacted by Hurricane Hermine and Matthew. More than 500 miles of beach was impacted to a measurable degree. **Property and upland development located landward of beaches that had been restored fared much better than areas where the beaches were eroded and narrow.**

The storms removed sand from the restored beaches, but much of the material remained within the nearshore. Narrow beaches outside of beach restoration projects that were subjected to combined storm surge and wave impacts had significant dune erosion that, in some instances, undermined upland structures and roadways. There will be some natural recovery of these beaches, as sand is gradually transported by waves back onto the berm from the nearshore area. In other cases, the sand is too far off the beach, and natural recovery will be slow, subjecting the upland structures and habitat to further erosion from winter storms and the 2017 Atlantic Hurricane Season. Some of these areas will require varying levels of assisted recovery activities, ranging from dune restoration to full-scale beach nourishment, which will reasonably protect the upland structures and infrastructure during the next hurricane season.

The beach and dune recovery recommendations in this report are based on field observations and the professional experience of DEP's coastal engineering staff with hurricane impacts and recovery. These recommendations were developed to guide DEP's regulatory and funding programs to facilitate maximum feasible recovery. The recovery strategies identified in this report would, if implemented, accelerate the natural recovery of the impacted beach and dune systems through the partial reconstruction of these systems. Dune restoration alone may provide a limited level of storm protection. Long-term strategies to fully restore a beach and dune system are also included in this report.

St. Johns County Pre- vs. Post-Matthew Volume Results

Light Detection and Ranging (LiDAR) data was collected by USACE for the Atlantic Coast of Florida in May-July 2016. After Hurricane Matthew impacted Florida's East Coast, the USACE again collected LiDAR data in Oct-Dec 2016. This LiDAR data was refined into 3-foot grid sizes as Digital Elevation Model (DEM) layers, in which only ground data was used. These datasets are the basis for calculating the erosion that occurred due to Matthew as seen in *Figure 10*. Profiles were then extracted by DEP from the DEMs at DEP R monument locations. The area to be studied is the coastline beginning at the

residences adjacent to the Guana River Preserve southward to the St. Augustine Inlet. This encompasses South Ponte Vedra through Vilano Beach at DEP R monuments R67 to R122, for a total of approximately 11 miles of shoreline.

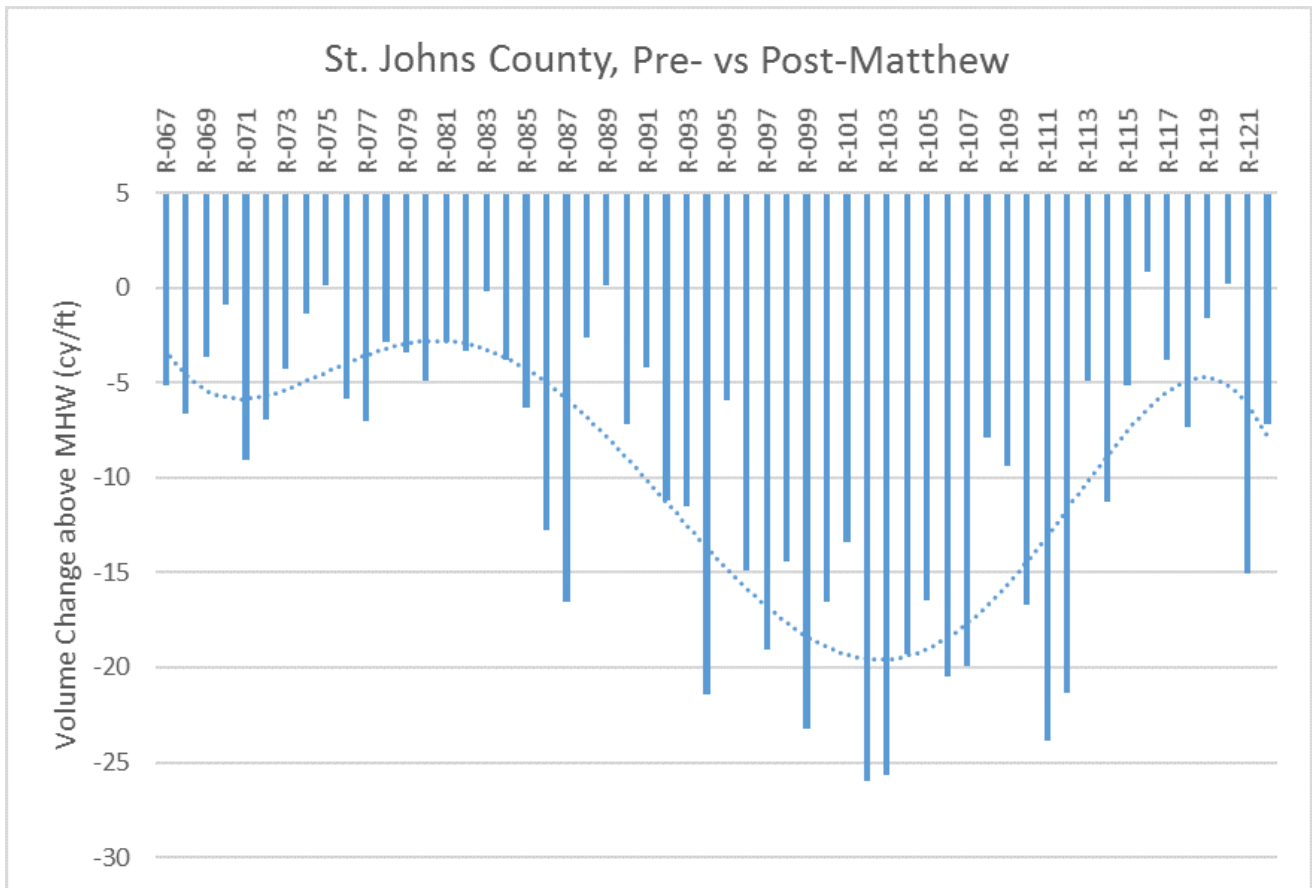
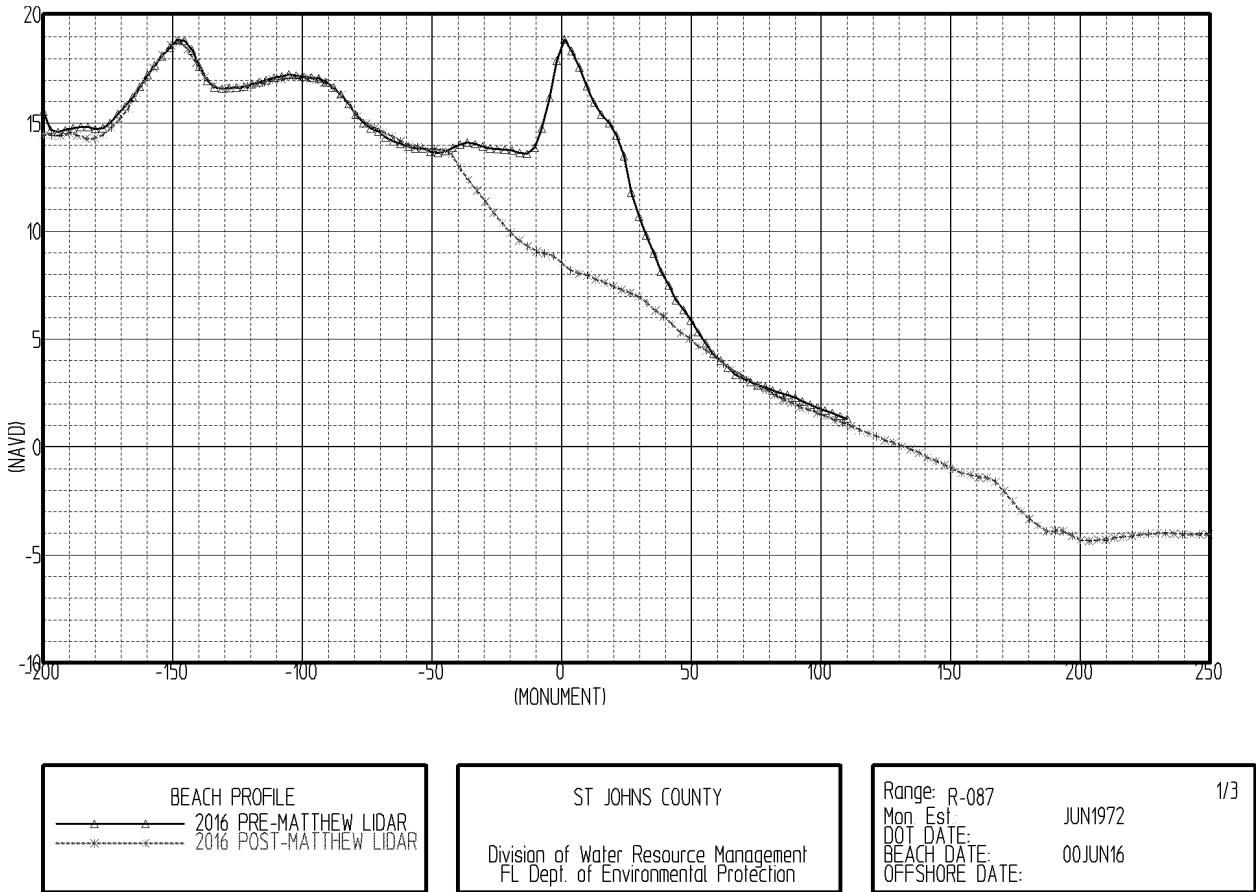


Figure 10. Volume change caused by Hurricane Matthew in St. Johns County.

For the comparison calculations, the profile starting point is approximately located at the post-Matthew erosion extent on the primary dune when compared to the pre-Matthew profile. The volume was then measured from this starting point seaward until the mean high water line (MHWL) of 1.75 feet-NAVD was reached. One weakness of LiDAR data is the inability to detect ground elevations in areas covered with turbid water. The datasets used here can only be used for analysis above the MHWL. *Figure 10* is the graph of the cross-sectional area change for each DEP R monument profile. A fifth-order polynomial trend line is also overlain on the graph. The results of these calculations show a net loss of 549,000

cubic yards (cy) of material spanning the 57,600 feet of shoreline. This equates to an average 9.5 cy/ft of erosion caused by Hurricane Matthew in South Ponte Vedra and Vilano Beach.

Figure 11 shows a sample profile plot at R87. This profile had an above-average amount of erosion of -16.5 cy/ft. Note how the Pre-Matthew data ends at roughly the one-foot contour.



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Figure 11. Profile plot of DEP R Monument R87 in St. John's County.

Typically, during a storm event such as Hurricane Matthew, one would expect to see a portion of the eroded material show up as accretion on the lower contours, or as overwash deposits on the upland portions. St. Johns County results do not show this to be the case, which leads to the conclusion the eroded material can be found below the mean high water (MHW) contour. However, a lack of data in this nearshore region means this cannot be proven.

Another method of qualitatively measuring storm impact is to calculate the recession of some representative contour caused by a storm. This section of St. Johns County has a seasonal high water (SHW) elevation of 8.7 feet-NAVD. The change in feet of the nine-foot contour was calculated for each

survey monument profile and is shown in *Figure 12*. Note that negative values represent recession, i.e. erosion. The average recession of the nine-foot contour caused by Hurricane Matthew in South Ponte Vedra and Vilano Beach is 25.6 feet.

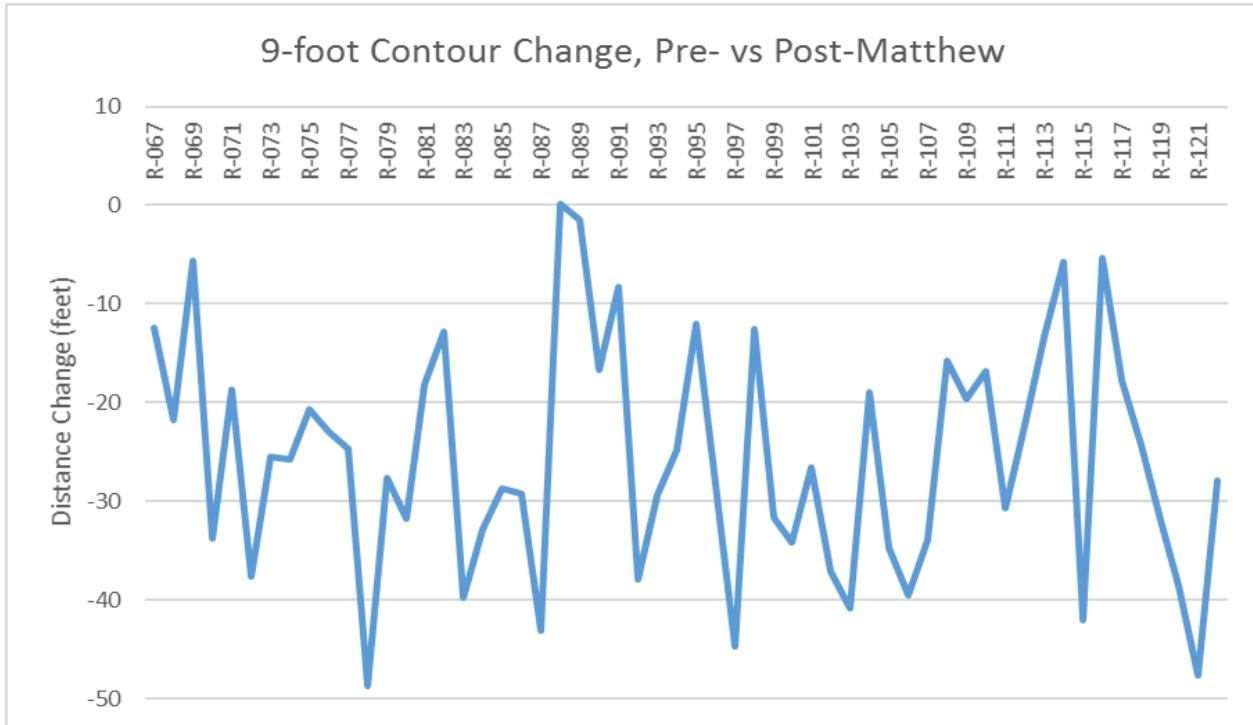
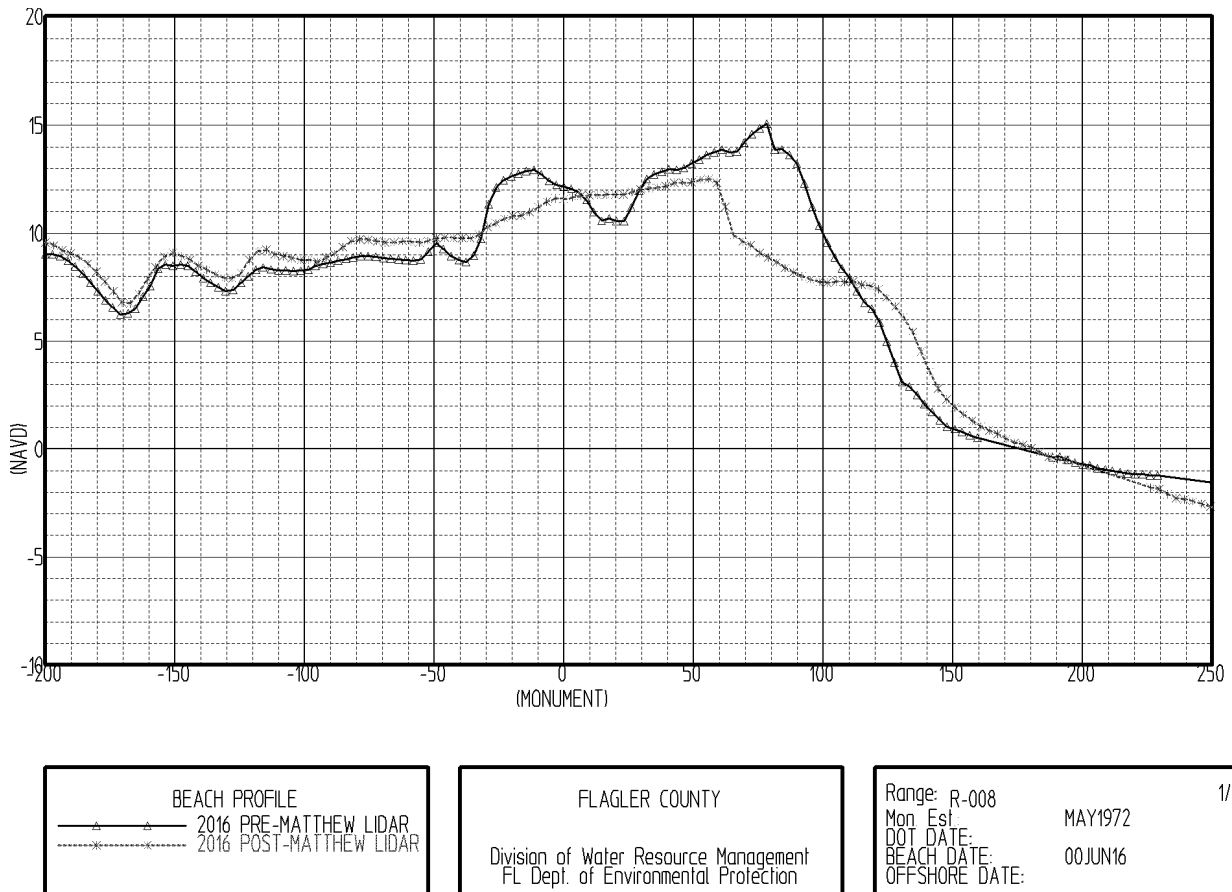


Figure 12. The Nine-foot Contour Change in St. Johns County, Pre- vs. Post-Hurricane Matthew (2016).

Flagler County Pre- vs. Post-Matthew Volume Results

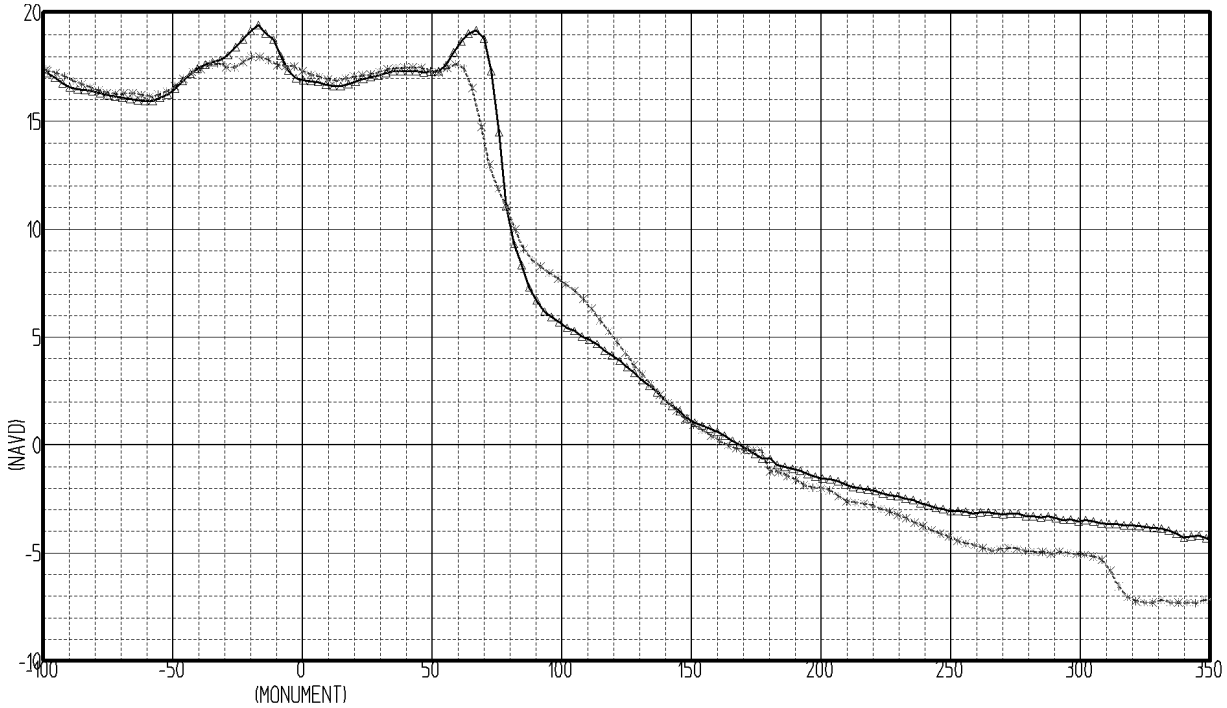
Data from the same dataset described above in St. Johns County was used to calculate the volume change caused by Hurricane Matthew for the whole shoreline of Flagler County, as seen in *Figure 12*. Flagler County's erosion trend differed generally from St. Johns County, in that the eroded material from the dune system remained mostly within the beach system above the MHW contour, with much more prevalent overwash deposits. *Figure 13* and *Figure 14* show sample plots of profile changes at DEP survey monuments R8 and R85 in Flagler County. Note the accretion below the eight-foot contour, as well as the deposits of material scattered in areas landward of the frontal dune at R8. A comparison of pre- and post-storm volume and contour changes at an individual survey profile does not illustrate the erosion caused by Hurricane Matthew to Flagler County beaches. Erosion, accretion and net volume change were calculated with reference to different elevation contours to provide a clearer picture of the storm impact. For the comparison calculations, the profile beginning point is approximately 40 feet

landward of the post-Matthew erosion extent on the primary dune when compared to the pre-Matthew profile.



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Figure 13. Profile plot of DEP's R Monument R8 in Flagler County.



<p style="text-align: center;">BEACH PROFILE</p> <p>—▲— 2016 PRE-MATTHEW LIDAR</p> <p>- - - * - - - 2016 POST-MATTHEW LIDAR</p>	<p>FLAGLER COUNTY</p> <p>Division of Water Resource Management FL Dept. of Environmental Protection</p>	<p>Range: R-085 1/3</p> <p>Mon Est: MMM1999</p> <p>DOT DATE:</p> <p>BEACH DATE: 00JUN16</p> <p>OFFSHORE DATE:</p>
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06-07-17

Figure 14. Profile plot of DEP's R Monument at R85 in Flagler County.

Volume changes are calculated above the contour, as listed in column one in *Table 4* below. Note that MHWL is 1.45 feet-NAVD. All volume changes shown in columns two, three and four are the summation totals for all monument locations divided by the number of monuments, which yields the county-wide averages.

Table 4. Volume changes above multiple contours in Flagler County.

NAVD Contour in ft.	Erosion cy/ft	Accretion cy/ft	Total cy/ft
1.45	-4.80	3.94	-0.86
5	-4.53	2.33	-2.20
7	-4.42	1.38	-3.04
8	-4.27	1.06	-3.21
9	-3.96	0.84	-3.12
10	-3.49	0.71	-2.79

This data shows that approximately 82% of the eroded material remained above the MHWL contour in the form of accumulation or overwash deposits. When accounting for the DEP R monument spacing and total county length of 94,400 feet, the total volume change above the MHW contour is a net loss of approximately 84,000 cy. The maximum net erosion occurred above the eight-foot contour, and the total volume change is a loss of approximately 307,000 cy.

Storm Damage Maps and Photographs

Post-storm assessments conducted by DEP, local governments, USACE and FEMA were used to photo-document damages and provide correlations between impacted areas and restoration projects statewide. Post-storm erosion conditions were qualitatively assessed for the impact of Hurricane Matthew. Post-storm beach and dune erosion conditions are classified on a scale as I, II, III or IV, with IV being the most severe erosion, as seen in *Figure 15*. This report includes individual maps and photographs for the counties most significantly impacted on the Atlantic Coast: Duval (*Figure 16*), St. Johns (*Figure 17*), Flagler (*Figure 18*), Volusia (*Figure 19*), Brevard (*Figure 20*) and Indian River (*Figure 21*). The maps detail erosion conditions and identify the locations of major highway damage, as well as damage to coastal armoring. The erosion conditions are represented on the maps by different colored lines. The individual county maps also note the location of existing beach restoration projects (blue lines). The maps are followed by photographs showing the most significant damage observed to upland development, roadways and armoring in the affected counties due to Hurricane Matthew. Photograph descriptions note damages by the DEP R monuments. The DEP R monuments are also noted on the individual county maps.

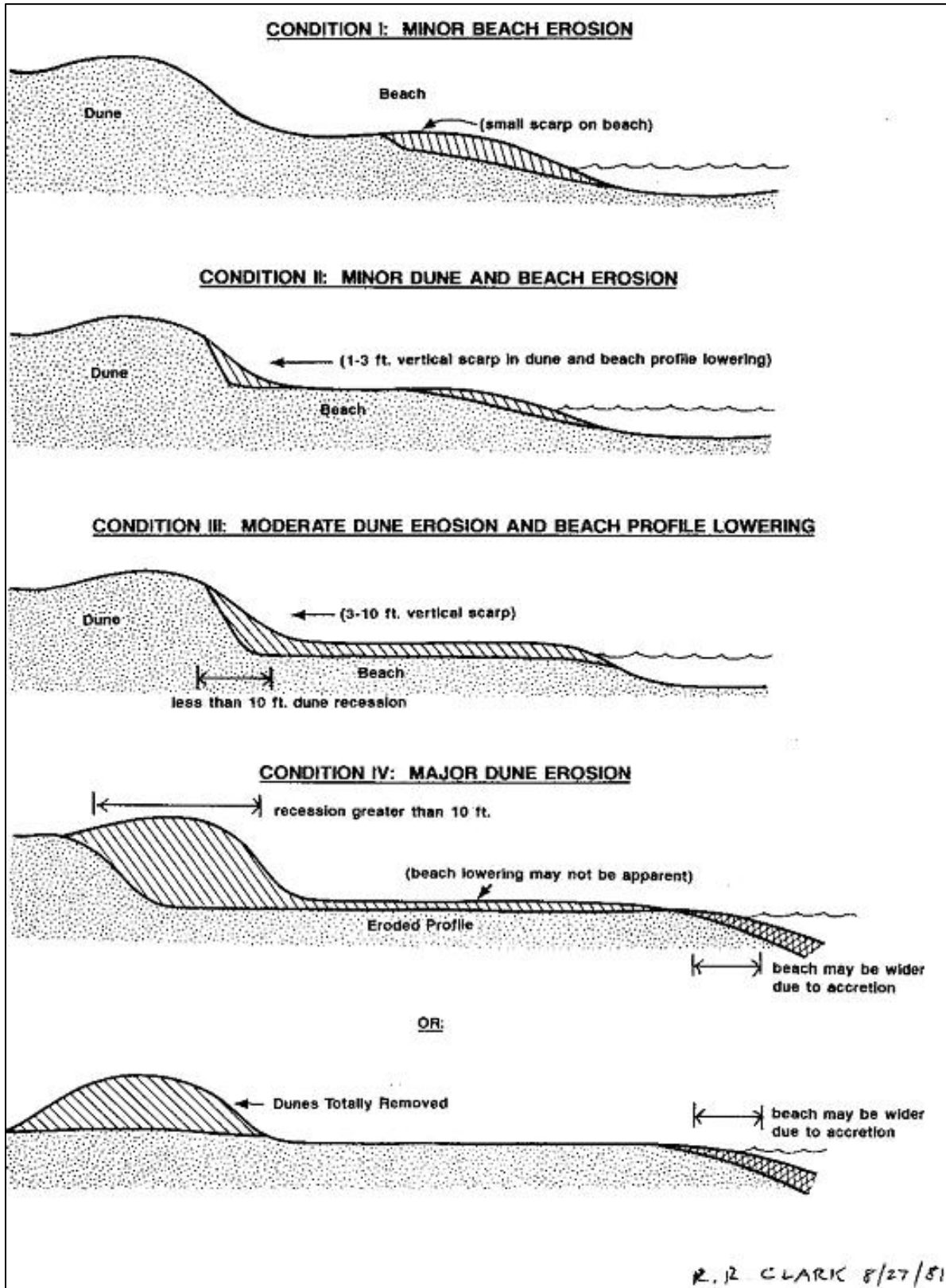


Figure 15. Illustration of post-storm beach and dune erosion conditions.

Damage Assessment of Duval County

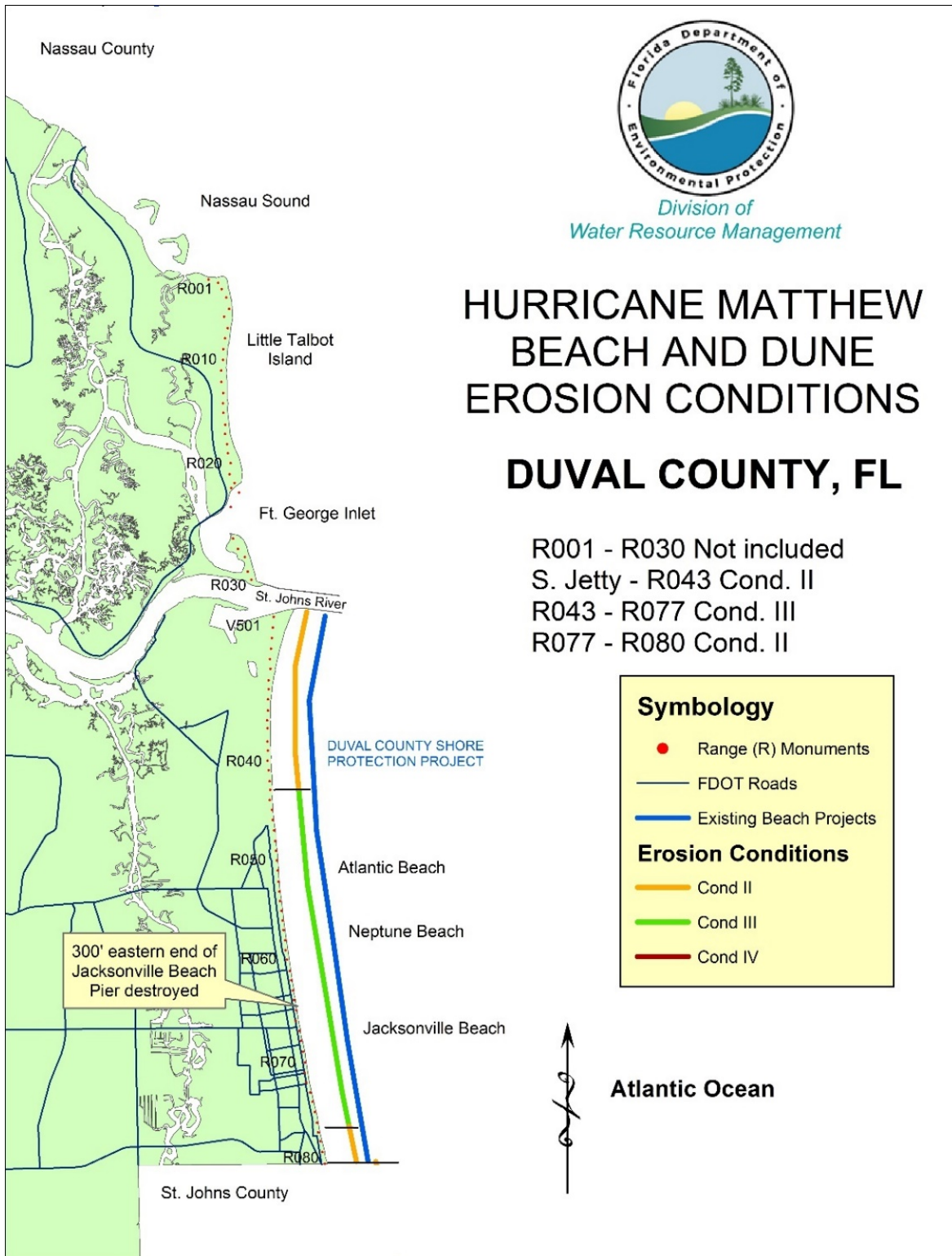


Figure 16. Post-storm beach and dune erosion conditions in Duval County.



Figure 16a. Over 300 feet of the eastern end of the Jacksonville Beach Fishing Pier was destroyed, Duval County (R65).



Figure 16b. Beach deflation and dune erosion, Jacksonville Beach, Duval County (R-72).

Damage Assessment of St. Johns County

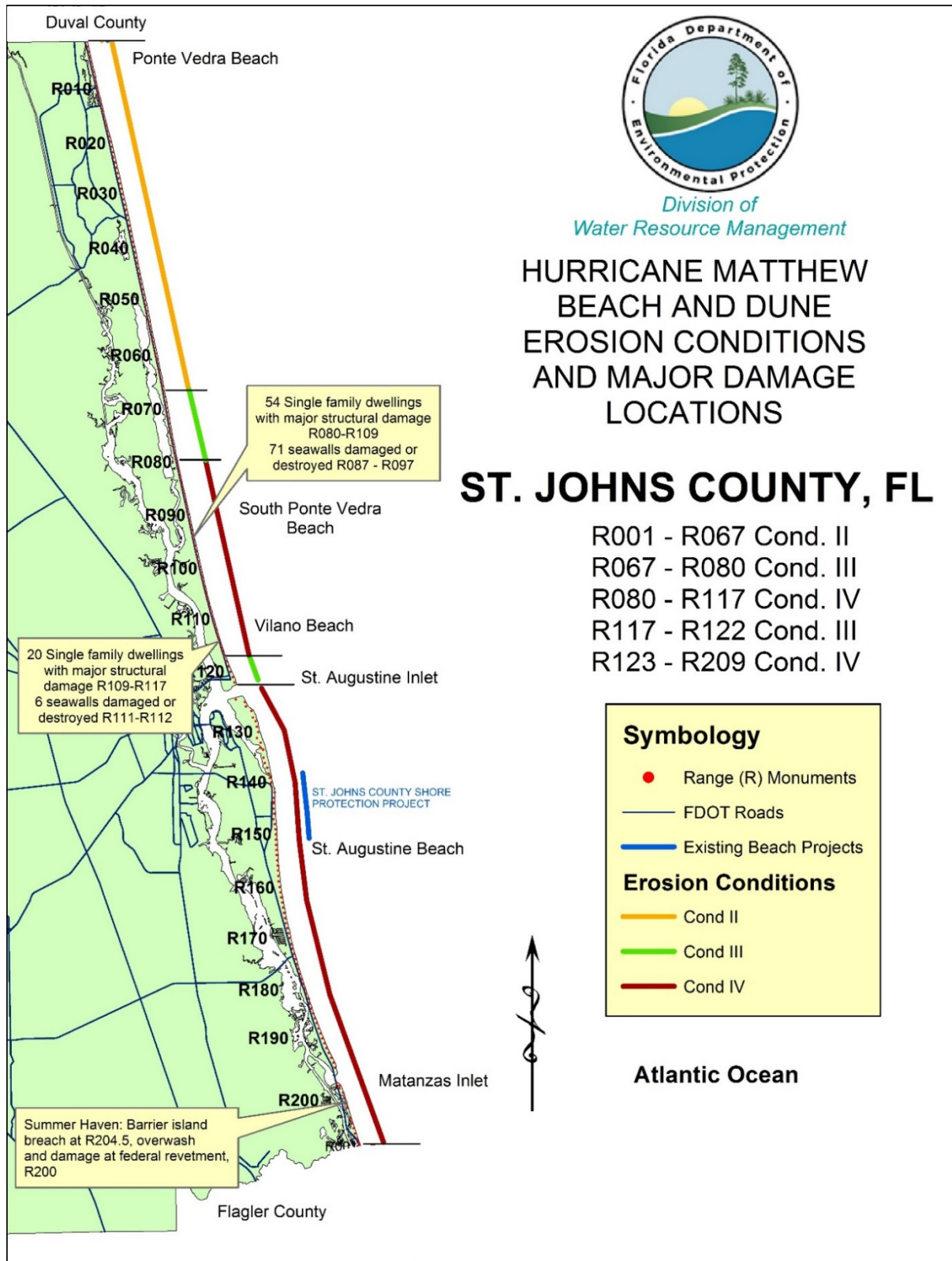


Figure 17. Post-storm beach and dune erosion conditions in St. Johns County.



Figure 17a. Timber seawall and single-family dwelling destroyed in South Ponte Vedra, St. Johns County (R088+250').



Figure 17b. Composite seawall with concrete cap destroyed in South Ponte Vedra, St. Johns County (R089+300').



Figure 17c. Major dune erosion and major structural damage to a single-family dwelling in South Ponte Vedra, St. Johns County (R87).



Figure 17d. Major dune erosion and major structural damage to single-family dwellings in South Ponte Vedra, St. Johns County (R87).



Figure 17e. Before and after photos of an impacted segment of Vilano Beach, St. Johns County (R104).
[Photos courtesy of U.S. Geological Survey]



Figure 17f. Before and after photos of barrier breach creating a new tidal inlet at Summer Haven, St. Johns County (R204.5) [Photos courtesy of U.S. Geological Survey].



Figure 17g. Major damage to the federal rock revetment and total loss of Old AIA at Summer Haven, St. Johns County (R199).

Damage Assessment of Flagler County

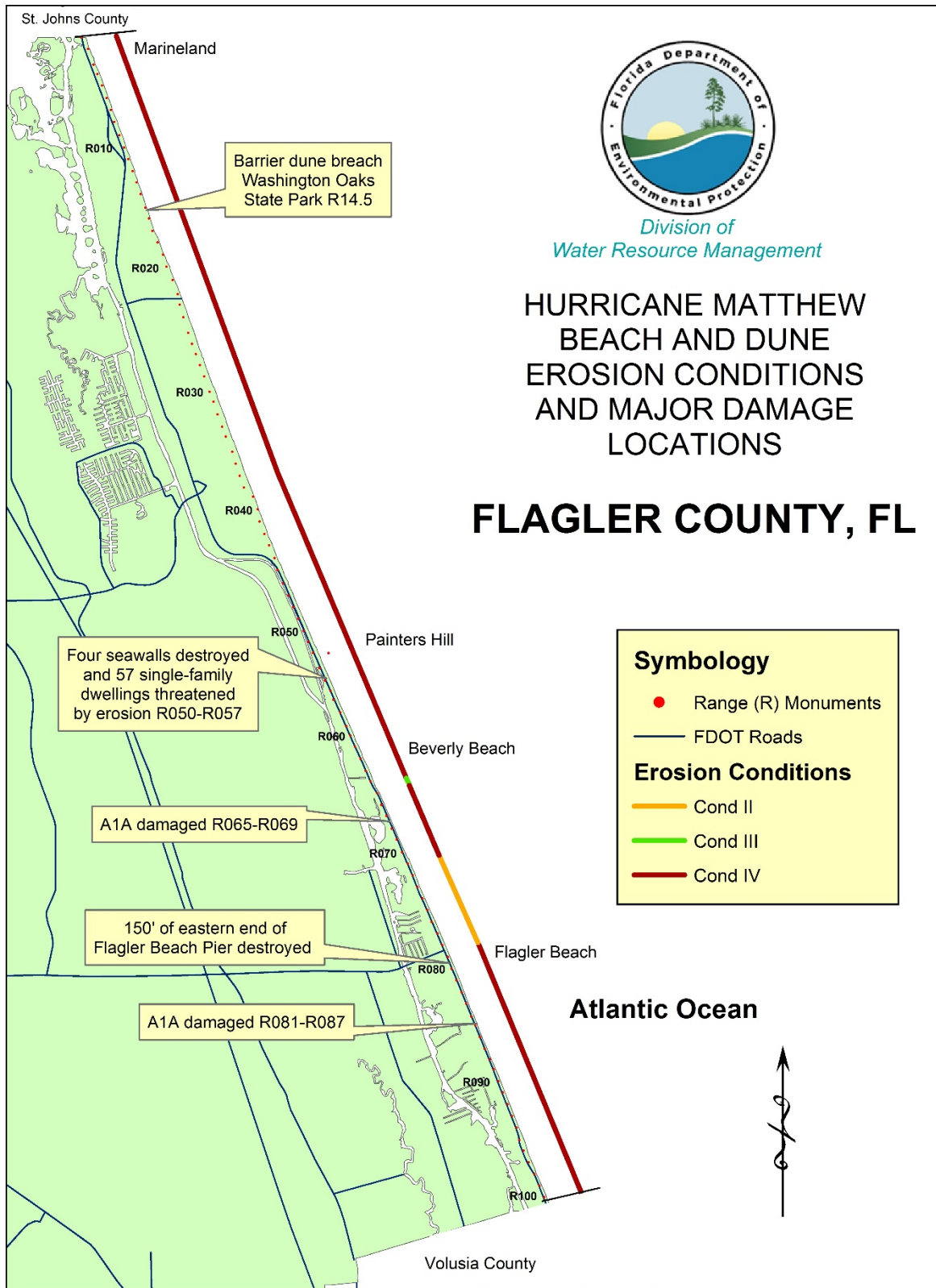


Figure 18. Post-storm beach and dune erosion conditions in Flagler County.



Figure 18a. Barrier dune breach at Washington Oaks State Park, Flagler County (R14.5).



Figure 18b. Rock revetment and State Road A1A destroyed in Flagler Beach (R84.5).

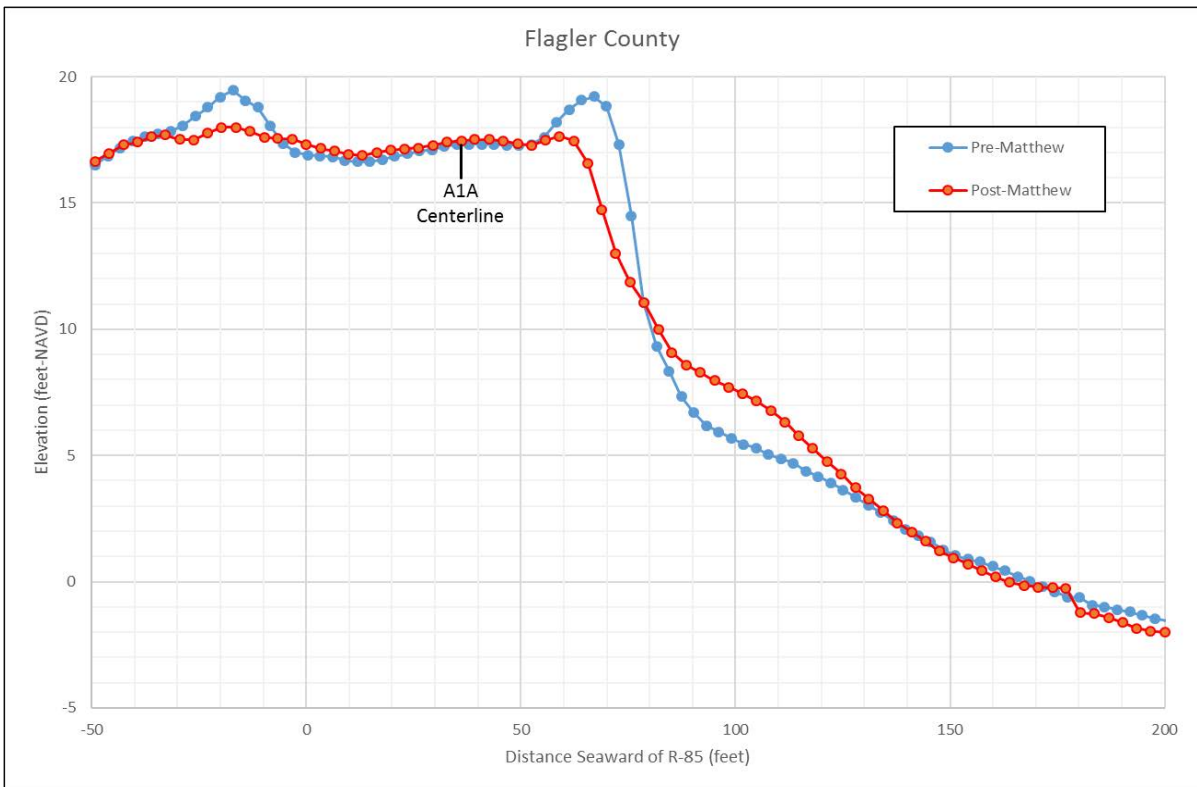


Figure 18c. Top: Rock revetment and State Road A1A destroyed at Flagler Beach at R-85. Bottom: graph showing pre-Matthew and post-Matthew profile at R-85.



Figure 18d. Before and after photos of Flagler Beach showing rock revetment and State Road A1A destroyed between 14th St. South and 15th St. South (R83) [Photos courtesy of U.S. Geological Survey].

Damage Assessment of Volusia County

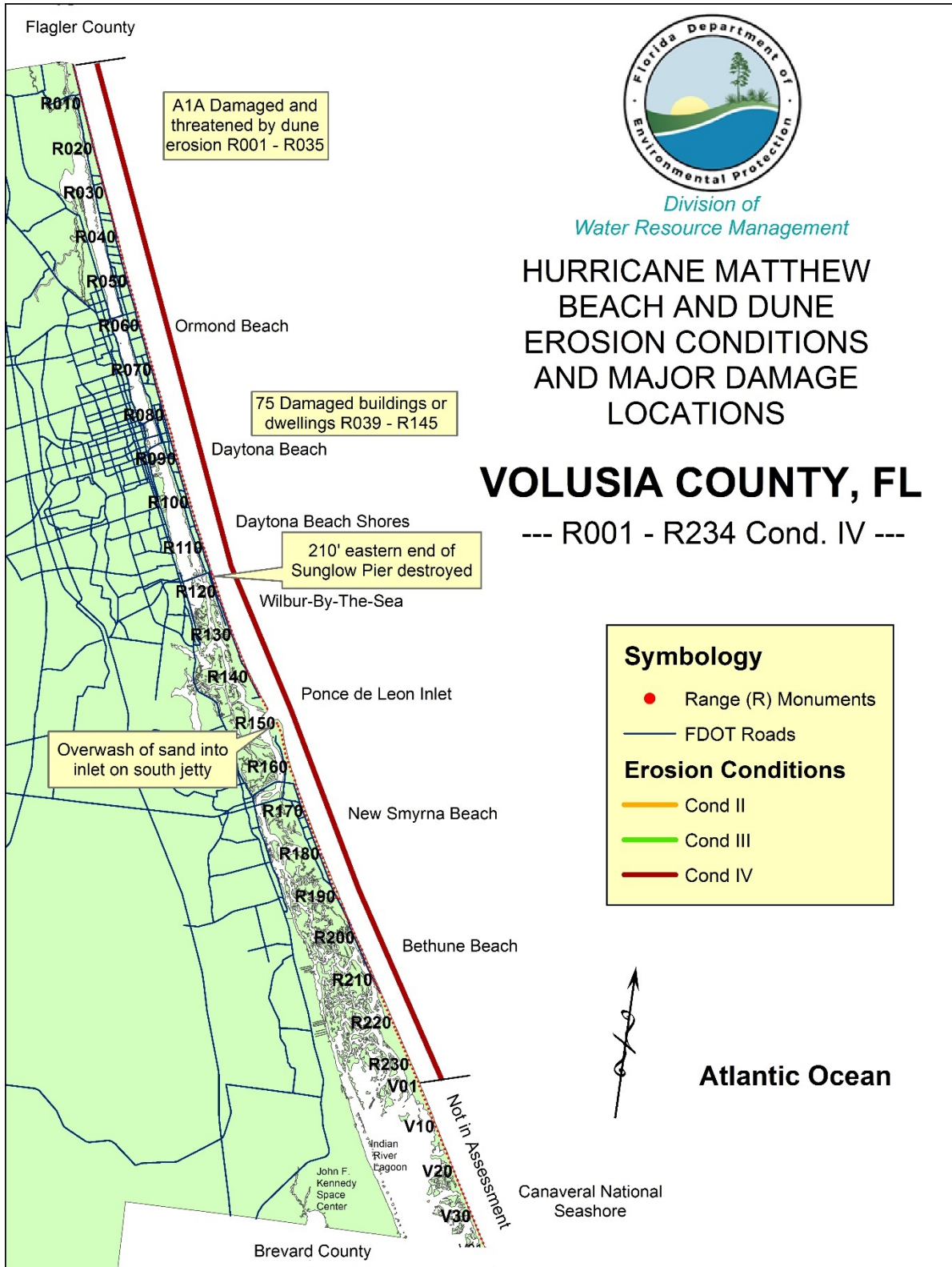


Figure 19. Post-storm beach and dune erosion conditions in Volusia County.



Figure 19a. Major beach and dune erosion and damage to State Road A1A in northern Volusia County (R29.5).



Figure 19b. Failure of a concrete seawall in Wilbur-By-The-Sea, Volusia County (R123.4).

Damage Assessment of Brevard County

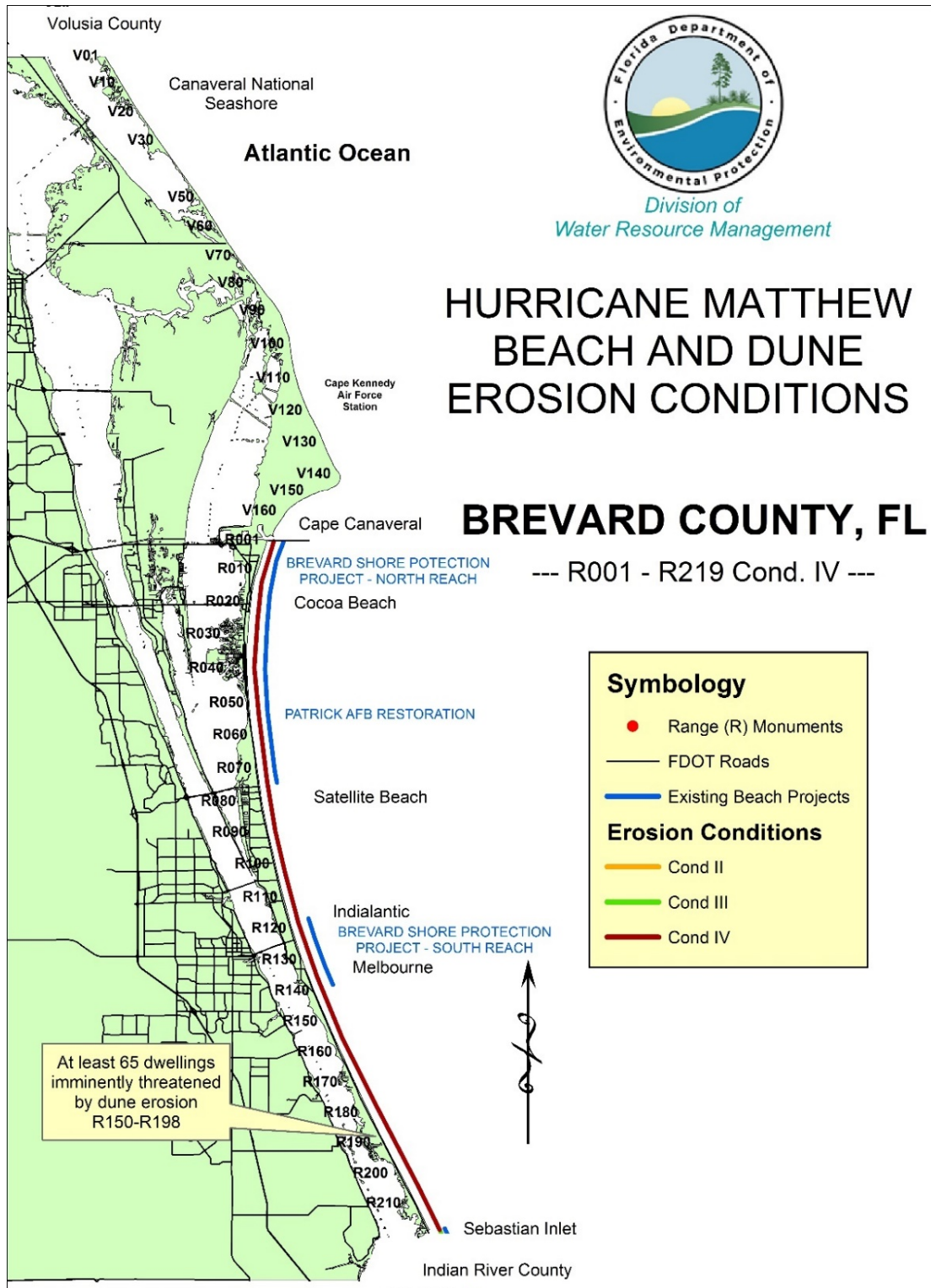


Figure 20. Post-storm beach and dune erosion conditions in Brevard County.



Figure 20a. Major beach and dune erosion threatening structures in south Brevard County (R151).



Figure 20b. Major beach and dune erosion undermining a swimming pool in south Brevard County (R158.7).

Damage Assessment of Indian River County

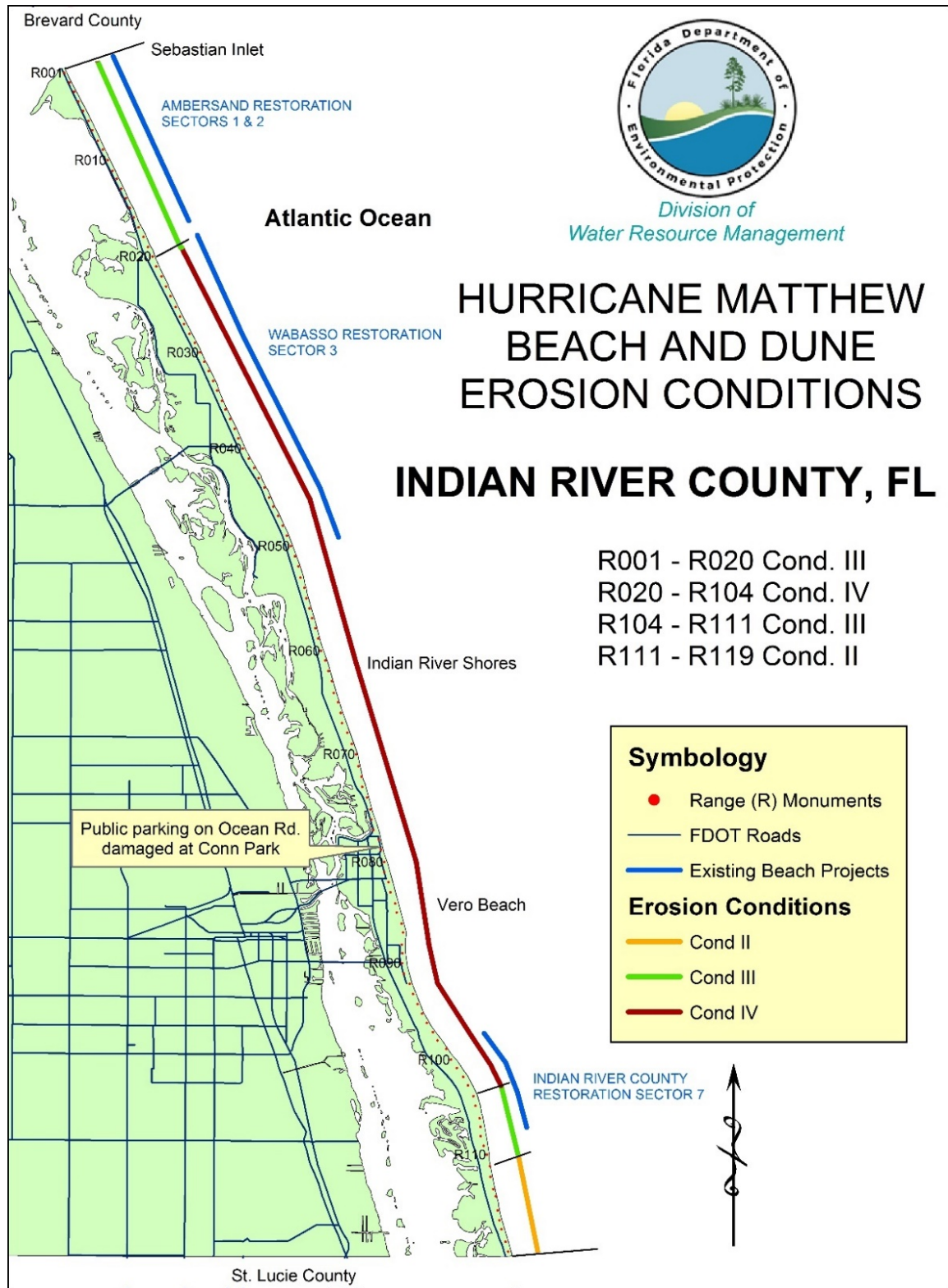


Figure 21. Post-storm beach and dune erosion conditions in Indian River County.



Figure 21a. Major beach and dune erosion undermining parking area along Ocean Drive at Conn Park in Vero Beach, Indian River County (R79).



Figure 21b. Major beach and dune erosion with a 10-foot high vertical scarp in Indian River County (R34).

Statewide and Regional Management Strategies for Beach and Dune Recovery

Recommended Management Strategies by County

For Nassau, St. Lucie, Martin, Palm Beach, Broward and Miami-Dade Counties on the Atlantic Coast, and all of the affected counties along the Gulf Coast, the recovery recommendations are limited to the current adopted strategies set forth in DEP's [Strategic Beach Management Plan](#). The use of alternative sand sources not specifically listed in the Strategic Beach Management Plan will be considered for cost-sharing for storm recovery efforts, although these sand sources may require additional regulatory authorization on a project-specific basis. Dune vegetation is a recommended component to all dune restoration efforts, where practicable.

For Duval, St. Johns, Flagler, Volusia, Brevard and Indian River Counties, additional specific post-storm recovery strategies are recommended as follows:

Duval County

Jacksonville's beaches (St. Johns River to South Duval County Line, V501–R80)

Construct maintenance nourishment and dune restoration of the federal Duval County Shore Protection Project.

- Construction of the federal nourishment for a major portion of the project began in September 2016 and was completed in May 2017. It is expected that USACE will provide emergency funding to replace material lost within the design template. The remaining maintenance volume will be cost-shared by USACE, state and local governments.
- Dune restoration is not federally authorized and may require sand to be cost-shared by the state and local governments.

St. Johns County

Ponte Vedra (R1–R46) and Guano Tolomato Matanzas National Estuarine Research Reserve (R46–R67)

Most upland structures in this area are located behind the CCCL in an area with a healthy dune system. The beach and dune system in this area may be expected to naturally recover.

- Should segments of this shoreline be determined threatened in a local hurricane recovery plan, and DEP agrees with such a determination, assisted recovery will be recommended.

South Ponte Vedra and Vilano Beach (R67–R117)

Complete federal feasibility study for potential beach restoration at South Ponte Vedra and Vilano Beach (R84–R117).

- Conduct dune restoration for the entire segment as an interim measure.
- Project is intended to supplement the emergency berms that may be funded by FEMA.
- Initiate a bypassing protocol to place material from the St. Augustine Inlet complex in a project area between R84–R117, in accordance with the adopted inlet management plan.

South Vilano Beach (R117–R122)

Most upland structures in this area are located behind the CCCL in an area with a healthy dune system. The beach and dune system in this area may naturally recover.

Anastasia State Park (R123–R137)

Initiate dune restoration.

- Construct dune restoration within the portion of the state park not located within the St. Johns County Shore Protection Project.

St. Augustine Beach (R141–R150) and a portion of Anastasia State Park (R137–R141)

Accelerate the maintenance nourishment of the federal St. Johns County Shore Protection Project (R137–R150).

- Construction of the federal nourishment is expected to begin in 2017. It is anticipated that USACE will provide emergency funding to replace material lost from the design template. The remaining maintenance volume is to be cost-shared by USACE, state, and local governments.
- Dune restoration is not federally authorized and may require sand to be cost-shared by the State and local governments.

Crescent Beach to Matanzas Inlet (R150–R194)

Most upland structures in this area are located behind the CCCL in an area with a healthy dune system. The beach and dune system in this area may be expected to naturally recover. Should segments of this shoreline be determined threatened in a local hurricane recovery plan, and DEP staff agrees such a determination, assisted recovery will be recommended.

Summer Haven (R200–R209)

Complete Summer Haven Restoration Project.

- Emergency closure of the barrier breach at R204 has been completed.
- Complete the beach and dune restoration with material from either the Intracoastal Waterway or the permitted Summer Haven River Restoration Project. State funds were previously provided for the river restoration project.

Flagler County

Flagler County, North (R1–R14)

A long tract of coquina rock naturally outcrops along the beach in this segment. The beach and dune system in this area may naturally recover. Should segments of this shoreline be determined threatened in the local hurricane recovery plan, and DEP staff agrees with such a determination, assisted recovery will be recommended.

Washington Oaks Gardens State Park (R14–R16)

Construct dune restoration.

- Maintain emergency closure of dune breach with periodic placement of sand fill from immediately south of the rock outcrop at R14 to the park's beach access at R14.5.

Marineland Acres (R16–R24), The Hammocks (R24–R48), Painters Hill and Beverly Beach (R48–R65), Flagler Beach, North (R65–R80), and Flagler Beach, South (R97.5–R100.9)

Construct dune restoration.

- Project is intended to supplement the emergency berms that may be funded by FEMA.
- The addition of sand to raise dune crest elevation at pedestrian walkways to the height of the adjacent dune will reduce future breaching.

Flagler Beach, South (R80–R94)

Accelerate the design, permitting and construction of the federal beach restoration project.

- Federal feasibility study is complete, and authorization is anticipated in the federal 2016 Water Resources Development Act. Initiation of the project is dependent upon a Congressional appropriation.

Gamble Rogers State Park (R95–R97.5)

Construct dune restoration.

Volusia County

North Peninsula State Park (R1–R16), Ormond-by-the-Sea (R16–R39.6) and Ormond Beach, North (R39.6–R57)

Construct dune restoration.

- After eight months, the dunes along Ormond Beach, North (R39.6-R57) have substantially recovered through natural processes.

Ormond Beach, South (R57–R66), Daytona Beach (R67–R93), Daytona Beach Shores (R93–R122) and Wilbur-by-the-Sea (R122–R128)

Construct beach and dune restoration.

- After eight months, the dunes along Daytona Beach Shores between R118 and R122, and Wilbur-by-the-Sea (R122-R128), have substantially recovered through natural processes.

Town of Ponce Inlet (R128–R146)

Construct dune restoration.

- After eight months, the dunes in this area have substantially recovered through natural processes.

New Smyrna Beach, North (R150–R160.5)

The beach and dune system in this area may naturally recover.

New Smyrna Beach, South (R160.5–R194)

Construct beach and dune restoration with material from either the Intracoastal Waterway or maintenance dredging of the federal navigation project at Ponce de Leon Inlet.

Bethune Beach (R194–R196.7, R203–R208)

The beach and dune system in this area may naturally recover adjacent to the coquina boulder revetments.

Bethune Beach (R196.7–R202)

Construct dune restoration.

- This segment is in a gap between two armored sections of shoreline. Dune restoration will aid in protecting the road in this segment.

Brevard County

Canaveral and Cocoa Beach (R1–R53)

Construct maintenance nourishment of the North Reach segment of the federal Brevard County Shore Protection Project.

- Project area will likely receive sand from the Port Canaveral Inlet Sand Bypass V in 2017/2018. Project will be fully funded by USACE.
- It is anticipated that USACE may provide emergency funding to replace material lost within the design template and, when the project nears its nourishment interval, conduct a full federal beach nourishment. Project will be fully funded by USACE.

Satellite Beach and Indian Harbor Beach (R75.3–R118)

Restore dunes as needed on an interim measure, prior to constructing the federal beach restoration project (Mid-Reach segment).

- Federal beach restoration is anticipated to begin in 2017, with the construction of a mitigation reef, followed by beach restoration. State funding share was previously appropriated.
- Non-federal dune nourishment may be required as an interim measure. Project is intended to supplement the emergency berms that may be funded by FEMA.

Indialantic and Melbourne Beach (R118–R139)

Construct maintenance nourishment of the South Reach segment of the federal Brevard County Shore Protection Project and restore the non-federal dune feature.

- It is expected that USACE will provide emergency funding to replace material lost within the design template and, when the project nears its nourishment interval, conduct federal beach nourishment. State funds will be requested through the annual funding request process when USACE plans the next beach nourishment event.

South Brevard County (R139–R219)

Construct dune restoration.

- Project is intended to supplement the emergency berms that may be funded by FEMA.

Indian River County

Sebastian Inlet State Park and Ambersand Beach (R1–R17)

Bypass sand from the Sebastian Inlet sand trap and Dredged Material Management Area to Ambersand Beach.

- Maintenance dredging activities at Sebastian Inlet can be used to extend the nourishment cycle of a portion of the Ambersand Beach Restoration project. State funding was previously appropriated.

Orchid Island including Wabasso Beach, Sector 3 (R17–R51.3)

Construct nourishment of the beach restoration project.

- Dune nourishment may be required as an interim measure until the next scheduled nourishment.

Indian River Shores (R51.3–R72) and Vero Beach (R72–R86)

Construct dune restoration.

- Project is intended to supplement the emergency berms that may be funded by FEMA.

Rio Mar and Vero Beach, South (R86–R97)

The beach and dune system in this area may be expected to naturally recover.

Vero Beach, Sector 7 (R97–R108)

Construct dune restoration and accelerate feasibility study for beach restoration.

- Project is intended to supplement the emergency berms that may be funded by FEMA.

South Indian River County (R108–R119)

The beach and dune system in this area may be expected to naturally recover.

Recommended Management Strategies for Regional Initiatives

Three regional initiatives are proposed to assist with recovery efforts: (1) collection of survey data in storm impacted areas; (2) statewide analysis of storm impacts using LiDAR; and (3) re-evaluation of coastal armoring policy.

Post-storm hydrographic surveys and evaluations of storm impacts and recovery strategies of restored beaches for local government project sponsors.

- Topographic and bathymetric surveys of restored beaches were collected by the local government project sponsors to quantify storm erosion losses of sand from restored beaches. This information is the basis for the design and cost estimates needed for state and federal assistance with post-storm recovery activities. This request is to reimburse the local governments for costs already incurred.

Statewide analysis of coastal LiDAR surveys and update of storm erosion model to assist coastal stakeholders with the planning and design of future projects.

- USACE has collected pre- and post-storm LiDAR surveys of the beach and offshore zone of Florida's coast for 2016. DEP has a unique opportunity to use these three-dimensional data sets to conduct beach and dune erosion assessments statewide, especially in areas that have not yet been restored and are most vulnerable to storm impacts. LiDAR data can significantly enhance the results previously obtained using conventional surveys. With a new LiDAR approach, DEP will have a 100% coverage of the critical beach front uplands and subaqueous nearshore bathymetry to depth of closure. The erosion analysis will then be compared to DEP's historical survey database to track long-term erosion trends, to update critical erosion designations, and to develop beach management strategies for potential project areas. The data can also be used to update the Storm-induced Beach Change (SBEACH) Storm Erosion Numerical Model, which is used for storm damage prediction and analysis of the vulnerability of coastal development and infrastructure, the primary factor in the design of beach restoration projects. The three-dimensional data can be used for various additional analysis, studies, models, and maintenance and renewal activities of the coastal system infrastructure. It could also improve and enhance emergency planning, and better describe impacted flood and inundation areas. This innovative approach to storm impact and vulnerability analysis will allow DEP to assist local governments and citizens with the planning and design of future coastal construction.

Assess implementation of coastal armoring policies to identify recommendations to strengthen proactive planning efforts and regulatory consistency.

- Evaluate response to beach and dune erosion and impacts to coastal structures in the five most impacted coastal counties to determine: (1) if existing regulatory criteria provides adequate protection to upland development and infrastructure; and (2) if existing engineering design criteria provides adequate structural requirements for storm damage reduction. The evaluation is intended to be a tool to guide future regulatory policy for coastal stakeholders, and state and federal resource agencies.

Summary of Recovery Activities

Based on the collaborative efforts of local sponsors, FEMA, USACE and DEP, sand losses from Hurricanes Hermine and Matthew have been surveyed or estimated for affected areas along the Atlantic and Gulf Coasts of Florida. In areas where restoration has been completed, post-storm surveys will be compared to existing monitoring data to quantify losses. In areas where no project currently exists, local sponsors will rely upon pre- and post-storm LiDAR data collected by USACE. Based on final calculated sand losses, replacement cost estimates will be determined using the most cost-effective sand source available. Sand sources can include offshore dredge sand, upland mines or dredge material from a nearby inlet or Intracoastal Waterway.

Proposed and Completed Projects for Hurricane Recovery

Projects are listed in three sub-categories, from north to south along the Atlantic shoreline, and not based on any prioritized order: (1) federal projects, (2) county-wide initiatives for new projects, (3) existing projects. Volumetric losses may be estimates, until survey data or LiDAR data is available and final damage assessments are complete. It should be noted that two emergency dune restoration projects have been completed in Brevard County and Indian River County. Information on these two projects can be found on page 50 of this report.

Federal Projects

- USACE was actively constructing beach nourishment for the **Duval County Shore Protection Project** when Hurricane Matthew impacted the state and county. The non-federal dune and federal beach project provided protection for upland development, but due to the erosion from Hurricane Matthew approximately 205,000 cubic yards of sand and vegetation was lost.
- It is anticipated that USACE will begin construction on the **St. Johns County Shore Protection Project** in 2017/2018. The project included a non-federal dune feature that sustained damages of approximately 100,000 cubic yards.
- The **Flagler County Hurricane and Storm Damage Reduction Project** was authorized for federal participation in the Water Resources Development Act (2016). The project will restore the beach and dune along the segment of State Road A1A that was severely impacted.

New Projects

St. Johns, Flagler, and Volusia Counties sustained impacts to beaches and dunes with damages to upland structures in specific locations. Each county will have the potential to use pre- and post-storm LiDAR topographic data supplied by USACE to evaluate county-wide storm losses and design interim repair measures.

Brevard County South Beaches (R139-R129) lost a surveyed volume of 96,500 cubic yards of sand from the dune. Emergency dune work completed at the South Beaches of Brevard County was completed in late March 2017, with the placement totaling 99,384 cy of sand between R143 to R213. FEMA eligibility has not yet been determined.

Vero Beach/Sector 5 project (R72-R86) lost a surveyed volume of 130,091 cubic yards of sand from the dune. Emergency dune work completed in Indian River County with placement of 112,500 cy of material between R10 and R105.4. Of the 112,500 cy, only 800 cy was placed in 2016 and the remainder (111,700 cy) was placed in 2017. Of the 111,700 cy, the Sebastian Inlet District placed 30,742 cy of material between R10 and R17 in 2017. FEMA eligibility has not yet been determined.

Existing Projects

Projects are listed geographically and not based on any prioritized order. The list begins with projects impacted by Hurricane Hermine, followed by projects impacted by Hurricane Matthew. All projects on the list are engineered beaches that have previously received dune and/or beach nourishment. Volumetric losses may be estimates until survey data is available and final damage assessments are complete.

Hermine Impacted Projects

- Non-federal **Anna Maria Island/Coquina Beach project (Manatee County, R7-R10, R36-R41.3)** lost a surveyed volume of 23,200 cubic yards of sand, placed during the nourishment in 2014.
- Non-federal **Longboat Key Nourishment project (Manatee and Sarasota Counties, ME/R42-SA/R29)** lost a surveyed volume of 143,960 cubic yards of sand.
- Non-federal **Lido Key Nourishment project (Sarasota County, R35-R43.2)** lost a surveyed volume of 41,300 cubic yards of sand.

- Non-federal **South Siesta Key Nourishment project (Sarasota County, R67-R77)** lost a surveyed volume of 61,505 cubic yards of sand.

Matthew Impacted Projects

- Non-federal **South Amelia Island Nourishment project (Nassau County, R60-R80)** lost a surveyed volume of 227,400 cubic yards of sand.
- **Brevard County Mid-Reach (R75.3-R118)** segment lost a surveyed volume of 125,000 cubic yards of sand from the dune, last nourished in 2014, and an additional 79,000 cubic yards of sand outside of the 2014 nourishment template.
- Non-federal projects in **Indian River County** sustained damages to engineered beaches and dunes. FEMA funds have been requested for the repair of sand losses.
 - **Wabasso Beach/Sector 3 project (R30-R51.3)** lost a surveyed volume of 244,400 cubic yards of sand placed during the beach restoration project completed in 2012.
 - **Sector 7 project (R99-R108)** lost a surveyed volume of 81,800 cubic yards of sand from the dune.
- Non-federal **South St. Lucie County Restoration project (St. Lucie County, R98-R115)** lost a surveyed volume of 101,784 cubic yards of sand.
- Non-federal **Bathtub Beach/Sailfish Point Restoration project (Martin County, R98-R115)** lost a surveyed volume of 101,784 cubic yards of sand.
- Non-federal **Jupiter Island project (Martin County, R98-R115)** lost a surveyed volume of 220,000 cubic yards of sand.
- Non-federal projects in **Palm Beach County** sustained damages to engineered beaches and dunes. FEMA funds have been requested for the repair of sand losses.
 - **Jupiter/Carlin Beach project (Palm Beach County, R13.5-R19)** lost a surveyed volume of 60,000 cubic yards of sand from the beach and dune.
 - **Singer Island project (Palm Beach County, R60.5-R69)** lost a surveyed volume of 9,000 cubic yards of sand from the dune.
- Non-federal projects in the **Town of Palm Beach** sustained damages to engineered beaches and dunes. FEMA funds have been requested for the repair of sand losses.

- **Reach 1 project (Palm Beach County, R76-R79)** lost a surveyed volume of 29,407 cubic yards of sand from the beach and dune.
- **Mid-Town project (Palm Beach County, R89-R102)** lost a surveyed volume of 49,278 cubic yards of sand from the beach and dune.
- **Phipps project (Palm Beach County, R116-R126)** lost a surveyed volume of 56,395 cubic yards of sand from the beach and dune.
- **Reach 8 project (Palm Beach County, R129-R134)** lost a surveyed volume of 7,375 cubic yards of sand from the beach and dune.

- Non-federal projects in the **City of Boca Raton** sustained damages to engineered beaches and dunes. FEMA funds have been requested for the repair of sand losses.
 - **Central Boca project (Palm Beach County, R216-R222)** lost a surveyed volume of 59,350 cubic yards of sand from the beach and dune.
 - **South Boca project (Palm Beach County, R223-R227.9)** lost a surveyed volume of 27,710 cubic yards of sand from the beach and dune.

- Non-federal **Hillsboro/Deerfield project (Broward County, R6-R12)** lost a surveyed volume of 37,500 cubic yards of sand.

Agency Coordination and Planning

This report contains implementation strategies involving the need for state, federal and local agency cooperation. Successful implementation of these strategies will require extensive coordination to address multiple funding sources, cost-effectiveness of designs, potential impacts to nesting marine turtles, and potential impacts to environmental resources. While the plan contains several short-term measures, such as dune restoration, to address immediate threats, it should be recognized that long-term implementation activities will continue for several years as beach restoration and maintenance nourishment activities are completed.

A primary goal of agency coordination is the integration of various funding opportunities intended to minimize, where possible, the fiscal and personnel resource impacts to any one agency. DEP has initiated, and will continue to provide, coordination with federal and local government agencies to facilitate cost-sharing opportunities. It is expected that the implementation of many of the recovery activities will involve multiple agencies. One agency may fund the data collection, another may fund the design and permitting, and yet another may be responsible for the actual construction. Successful implementation will be directly related to agency coordination.

Each of the implementation strategies recommended in this report will require coordination with state and federal resource agencies, such as the Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service. Many of the proposed measures will require state and/or federal permits. DEP has already initiated consultation meetings with the appropriate state and federal agencies to coordinate activities and facilitate streamlined permitting where feasible.

Funding Opportunities

Funding for the strategies outlined in this report is limited to six state and federal public assistance programs. The following summarizes the funding programs that will be used for implementation.

1. **FEMA administers a public assistance program to assist state and local governments with storm recovery activities.** Although beach and dune restoration is not a specific recovery program area, FEMA recognizes the storm protection value that beaches provide, and offers funding assistance under two program areas. Final project eligibility determination and cost-sharing percentages are not yet available from FEMA.

One of FEMA's programs, ***Category B: Emergency Protective Measures***, can provide a small volume of sand to prevent flooding to developed upland properties. To qualify, a property (public or private development) must be threatened by a five-year return interval storm event. Properties are evaluated on a case-by-case basis, with qualifying properties eligible to receive funding to construct a small berm or dune feature. Because some properties qualify while others do not, there is typically little continuity of the constructed berms, thereby limiting their storm protection value. Due to this lack of continuity, it is important that implementation of strategies in this report include provisions to "fill in the gaps" to provide a continuous line of dune protection, and where appropriate, increase the level of protection above that provided by FEMA.

A second FEMA program, ***Category G: Permanent Work***, is intended to assist with the repair of public facilities. Qualifying non-federal beach projects are eligible for replacement of the sand that was lost because of the storm. Eligible costs would include design, permitting and construction of the beach "repair." Federally funded beach projects (USACE projects) are not eligible under the program. To date, there are approximately 52 miles of non-federal restored beaches within the impact areas that may qualify under Category G.

2. **USACE provides public assistance under a variety of programs that could assist in beach and dune restoration activities.** Two program areas, navigation and shore protection, specifically provide beach restoration and nourishment opportunities.

The ***Navigation Program*** consists of numerous projects, specifically authorized by Congress, to maintain a system of harbors and waterways. Maintenance dredging of authorized channels and waterways often results in suitable material available for placement on adjacent beaches.

Opportunities to obtain this maintenance-dredged material are actively pursued by DEP to ensure

that all suitable material is placed directly on the state's beaches, in lieu of offshore disposal areas. In instances where beach placement is the most cost-effective disposal option, it is done so at no cost to state or local governments. In other instances, the additional cost for beach placement is borne by state or local governments.

The ***Federal Shore Protection Project Program*** works directly with local governments to construct beach restoration projects for the primary purpose of protecting developed upland properties. After detailed feasibility studies, projects are individually authorized by Congress for construction and long-term maintenance. Authorized projects usually have a maintenance period of 50 years, during which periodic beach nourishment is conducted to maintain the designed storm protection values. Under the program, the federal government can provide between 50% to 80% of the total project costs. The remaining non-federal cost is the responsibility of the local sponsor and the state as cost-sharing partners.

In addition, USACE provides technical and financial assistance in response to natural disasters. Financial assistance can be provided under Public Law 84-99 to repair damage to federally authorized shore protection projects. Based upon the findings of special project investigation reports, qualifying projects are eligible for 100% federal funding of the cost to replace the material lost from the design template during the storm events.

3. **Florida's Beach Management Program works with local governments to achieve protection, preservation and restoration of the State's sandy beach shoreline.** The program is a comprehensive, long-range, statewide plan for restoring and maintaining critically eroded shoreline, accomplished through implementation of the statewide Strategic Beach Management Plan and the statewide Long-Range Budget Plan. Financial assistance is available for eligible shore protection and preservation activities. Eligible activities include construction of beach restoration projects and beach nourishment activities, project design and engineering studies, environmental studies and monitoring, inlet management planning, inlet sand transfer, dune restoration and protection activities, and other beach erosion prevention related activities. DEP annually requests an appropriation from the Florida Legislature to implement priority projects.
4. **The Flood Mitigation Assistance Program is funded by FEMA and administered through a partnership with the Florida Division of Emergency Management (FDEM).** FDEM has the authority and responsibility for developing and maintaining a State Standard Hazard Mitigation Plan, reviewing Flood Mitigation Assistance Program sub-applications, recommending technically

feasible and cost effective sub-applications to FEMA, and providing pass-thru funding for FEMA awarded project grants to eligible sub-applicants.

5. **DEP's Clean Water State Revolving Fund (CWSRF) Program is a low-interest loan program that assists local governments with planning, designing, and constructing infrastructure projects that reduce or eliminate a source of pollution.** Projects eligible for CWSRF loans include wastewater collection, transmission, treatment and disposal, stormwater treatment facilities and nonpoint source projects. Loan terms are generally 20 years, with interest rates as low as 0%. Loans with longer terms, up to 30 years, are available for small, financially disadvantaged systems and wastewater projects sponsored by these systems are eligible for principal forgiveness or grants. Between \$170 and \$200 million in low interest loans is available annually. Where septic tanks are threatened or damaged by coastal erosion, the CWSRF can be used as a funding source for the conversion of septic tanks to municipal sewer systems.
6. **The Clean Water Act has a Section 319(h) Nonpoint Source Grant Program that provides a federal grant to state and local governments for a portion of the costs of converting from septic to sewer.** Eligible septic-to-sewer activities include installation of lateral pipes from homes or businesses to the sewer pipe at the road, the connection fee to hook up to a central sewer, installation of a grinding station on the homeowner's property, and abandonment of the septic tanks if the unused septic tanks continue to pollute. Projects should include a minimum 40% non-federal match, as 319(h) funding may not exceed 60% of the total eligible project cost. The cost reimbursement grant to the government entity is structured to either pay directly for the costs, or to reimburse the private property owners for costs incurred. The program awards \$5 to \$6 million annually.

State Funds Allocated

Executive Orders 16-230 and 17-16 allocated \$15.8 million in emergency funding for emergency beach and dune repairs.

Under executive authority, Governor Rick Scott announced on January 27, 2017, that emergency funding of \$15.8 million would be made available for emergency beach and dune repairs in response to the damage caused by Hurricane Matthew in St. Johns, Flagler, Volusia and Brevard Counties. The emergency funding was intended for immediate use to address critically eroded beaches where there was an imminent threat to beachfront structures, such as roadways, homes and businesses.

1605 Fixed Capital Outlay (SB 1590 and HB 1213) for Beach Recovery of Hurricanes Hermine and Matthew from General Revenue: \$13,333,333

“Funds in Specific Appropriation 1605 are provided for the purpose of beach and dune repair projects in response to the damages caused by Hurricane Matthew. These funds, in addition to unobligated emergency dune repair funds previously provided in Executive Orders by the Governor, will constitute the state’s share of project costs, and will be used to match up to 50 percent of the total costs, unless otherwise specified, with the balance being covered by federal and/or local funds. The Department of Environmental Protection is authorized to distribute the funds appropriated in this act among identified projects in the [Department’s December 2016 draft preliminary hurricane recovery report](#) to effectively implement recovery and leverage matching funds. Funds will be provided to projects identified in the Department’s report in the following priority order: new dune restoration projects in St. Johns and Flagler Counties; dune reconstruction projects landward of Federal project areas; and, with remaining funds, for the 12.5 percent state match for FEMA Category G projects based on areas in greatest need of repair and timeliness to construct.”