2024 Hurricane Season – Florida's Southwest Gulf Coast

Hurricane Helene & Hurricane Milton

Post-Storm Beach Conditions and Coastal Impact Report

Office of Resilience and Coastal Protection

Florida Department of Environmental Protection

March 2025

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I. Introduction

Hurricane Helene made landfall on September 26, 2024, at approximately 11:10 p.m. Eastern Daylight Time (EDT), just east of the mouth of the Aucilla River in Taylor County in the Big Bend region of Florida as a Category 4 hurricane on the Saffir-Simpson hurricane intensity scale. Two weeks later, Hurricane Milton made landfall on October 9, 2024, at approximately 8:30 p.m. Eastern Standard Time (EST) as a Category 3 hurricane at Siesta Key, Sarasota County on the Gulf coast of Florida.

Helene came ashore with maximum sustained winds of 140 mph and impacted two thirds of the Gulf coast of Florida. Helene brought 11 to 13 feet storm surge to the Big Bend where it made landfall and had 4 to 8 feet storm surge in southwest Florida. High water marks were observed between +2 ft to +9 ft NAVD in Manatee, Sarasota, Charlotte and Lee counties. Anna Maria Island was completely inundated by Helene's storm surge and approximately 3 to 5 feet of storm surge covered the entire island. The conditions were worsened when Hurricane Milton came ashore with significant storm surge that created havoc along with wind damages. Another devastating aspect of Milton was the formation of an unusually high number of tornadoes along the track. Over 40 tornadoes were spotted across the Florida Peninsula that caused widespread wind damage as Milton's track crossed the state from west to east. In Florida, 25 people died due to Helene and 6 people died from Milton's tornadoes. Beach erosion and structural damage was the greatest along the southwest coast of Florida, severely devastating Manatee, Sarasota and Charlotte counties. On the central and southeast coast of Florida, tornadoes associated with Milton caused major damage to upland properties and infrastructure.

This report documents the post-storm beach conditions and coastal impact of both Hurricane Helene and Hurricane Milton on the southwest Gulf coast of Florida. It will assist the Florida Department of Environmental Protection (Department) and local governments to identify areas where storm erosion has left upland development and infrastructure vulnerable to imminent damage from future storms, where sand berms could be placed to fortify and assist in the recovery of the beach and dunes, and where expedited permitting procedures are needed to assist homeowners in repairs and reconstruction. This report will support a recovery plan to be prepared by the Department recommending potential beach nourishment and dune restoration funding to address coastal erosion.

The Department developed this Post-Storm Beach Conditions and Coastal Impact Report to quantify the coastal damage caused by both Hurricane Helene and Hurricane Milton. This report provides a qualitative and quantitative assessment of storm impact, beach and dune erosion, and structural damage to the coastal regions of Florida fronting the Gulf of America. Although extensive structural

damage occurred well inland of the coast, the damage assessment in this report specifically focuses on damage within the Coastal Building Zone of 1,500 feet upland of the Coastal Construction Control Line (CCCL), as defined in Chapter 161, Florida Statutes.

II. Procedures Employed for Evaluating Coastal Impacts of Hurricanes Helene and Milton

Immediately following the impacts of Hurricane Helene, damage assessment teams were dispatched to the affected coastal areas. The damage assessment teams deployed in southwest Florida from the Department included: Guy Weeks, Planning Manager; Kristen Becker and Nathan Bonanno, Coastal Engineering Specialists; Shane Duinkerken and Chad Jones, Beaches Surveyors. Office support was provided by Ted Kiper and Kevin Copeland, GIS Specialists and Shamim Murshid, Program Administrator. The post-storm damage assessment teams conducted detailed damage assessments for the following counties: Pinellas, Manatee, Sarasota, Lee, and Collier. Additional data, information, and assistance was provided to the Department staff by various state parks staff, county officials, and various private coastal engineering firms.

The post-storm damage assessment teams conducted detailed field inspections and assessments of the beach and dune erosion conditions and coastal structural damages within the Coastal Building Zone using criteria consistently employed by Department staff over the past 40 years. The damage assessment teams evaluated major damages to buildings including roof damage, siding damage, other structural damage and flooding damage on residential and commercial buildings, including single-family dwellings, multifamily dwellings, and other major structures such as swimming pools, fishing piers, parking lots, roads, restaurants, public and commercial buildings, etc. Damages were also assessed for rigid coastal and shore protection structures including seawalls, revetments, groins, and jetties. The damage assessment teams logged observations into computer tablets and field books while inspecting the beach and dune erosion conditions and structures. **Figure 1** reflects a segment of coast showing the Coastal Building Zone, which extends to 1,500 ft. landward of the CCCL and is displayed on the tablets by the yellow line, while the red line is the CCCL. The colored dots in **Figure 1** are the data points that were collected in the field and posted on a geographic information system (GIS) map layer.

Following Hurricane Milton, the Department's Office of Resilience and Coastal Protection (ORCP) contracted the acquisition of oblique aerial videography using Camera Copters for post-storm damage assessments along the southwest coast of Florida from Pinellas through Collier Counties. Department staff assessed storm impacts from the videography and documented relevant information regarding beach

erosion conditions and structural damage. This initiative was extremely useful in completing the post-storm damage assessment in a more efficient manner as it was logistically challenging to deploy damage assessment teams in the field for two back to back hurricanes within a couple of weeks.

Post-storm reports have been prepared by the Department staff since 1979 and are available on the Department's website. The post-storm reports and the recovery plans developed by Department staff are shared with coastal stakeholders and local governments, the Florida Legislature, and the Federal Emergency Management Agency (FEMA). The summary of post-hurricane damage assessment data collected after both Hurricane Helene and Hurricane Milton can be viewed in section V of this report. Section VI presents detailed discussion along with photographs for each coastal county in southwest Florida.

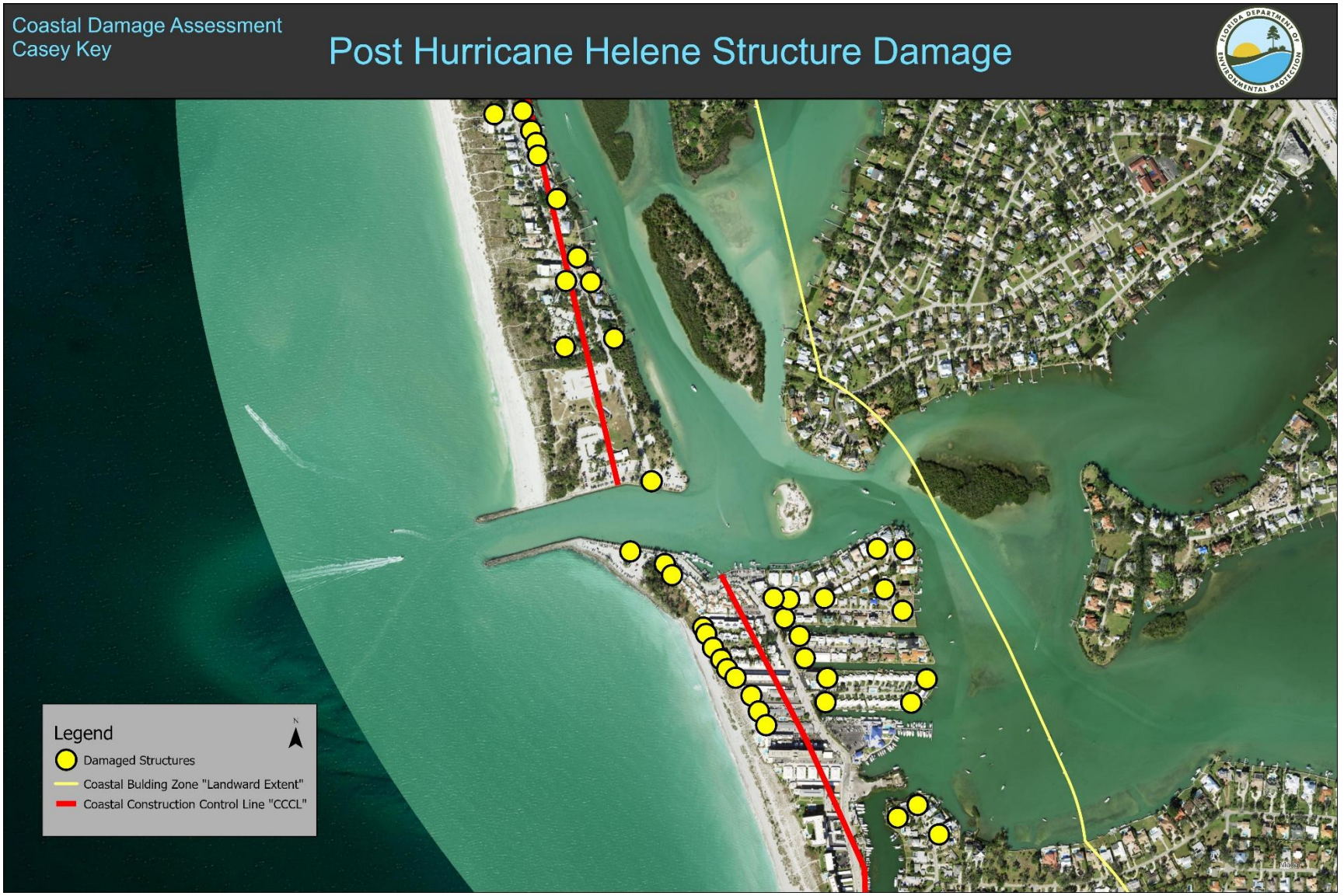

Figure 1. A snapshot of DEP data points collected at Casey Key in Sarasota County after Hurricane Helene within the coastal building zone that goes landward to the yellow line.

III. Hurricane Helene: September 23 – 282, 2024

Throughout Monday, September 23, the National Hurricane Center (NHC) tracked a broad area of low pressure in the northwestern Caribbean Sea. At 11:00 a.m. Tuesday, September 24, the system was designated Tropical Storm Helene with maximum sustained winds of 45 mph. By Tuesday evening, Helene had become better organized with 60 mph winds while drifting west-northwestward. At 11:00 a.m. EDT, Wednesday, September 25, the NHC upgraded Helene to a hurricane with maximum sustained winds of 80 mph with a turn north-northwestward as it moved through the Yucatan Straits between Cuba and Yucatan.

Wednesday afternoon, as Helene moved northward into the southeastern Gulf of America, hurricane warnings were issued for the Big Bend region of Florida. Throughout Wednesday evening and Thursday morning, Helene tracked northward and then north-northeastward. Wave heights off Naples measured from a NOAA weather buoy at Pulley Ridge peaked at 29.9 feet. Offshore from Tampa Bay, waves peaked at 24.9 feet. Thursday morning, with the 8:00 a.m. EDT advisory, the NHC upgraded Helene to a Category 2 hurricane on the Saffir Simpson hurricane intensity scale citing maximum sustained winds of 100 mph.

Thursday afternoon, the NHC issued an intermediate advisory at 2:25 p.m. EDT noting that Air Force Hurricane Hunter aircraft had found maximum sustained winds had increased to 120 mph making Helene a Category 3 major hurricane. Helene was also expanding in size and had become a very large hurricane with wind, wave and storm surge impacts spreading along the entire southwest coast of Florida.

At 6:20 p.m. EDT, Thursday, September 26, the NHC issued an intermediate advisory that NOAA aircraft had found maximum sustained winds of 130 mph making Helene an extremely dangerous Category 4 hurricane moving into the Big Bend of Florida. Thursday evening, Helene made landfall at about 11:10 p.m. just east of the mouth of the Aucilla River in Taylor County with maximum sustained winds of 140 mph and a central pressure of 938 millibars (27.70 inches). **Figure 2** illustrates the track history of Hurricane Helene overlayed on satellite imagery.

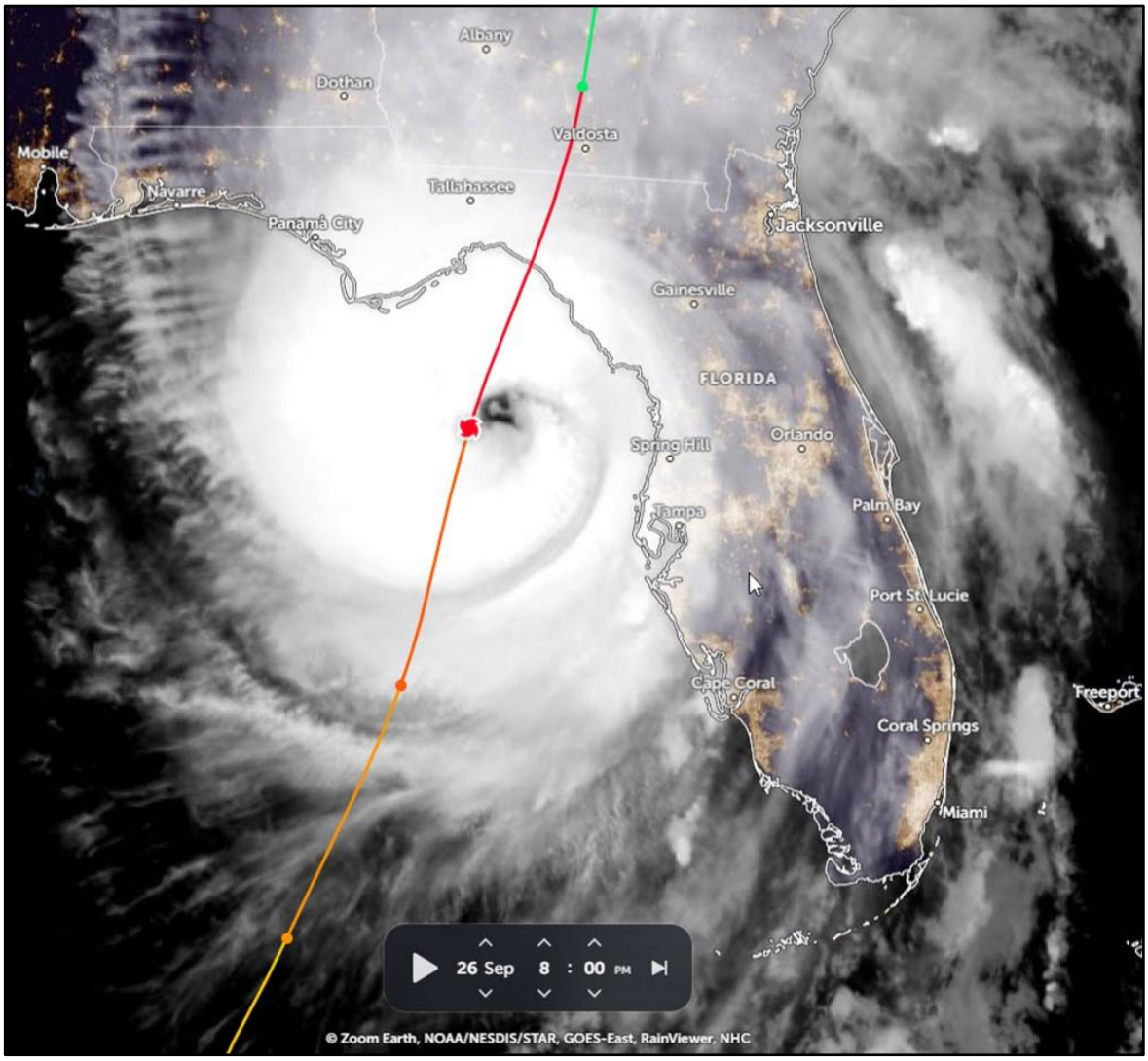

Figure 2. Hurricane Helene track overlayed on satellite imagery (source: Zoom Earth).

Although Hurricane Helene was not a direct hit on the southwest Florida counties, while moving northward into the southeastern Gulf of America, its onshore winds pushed ashore a major storm surge along the coast of Pinellas, Manatee and Sarasota counties. A NOAA tide gauge at Clearwater Beach recorded a maximum water level of +7.62 feet-NAVD (**Figure 3**). Further south, at the entrance to Tampa Bay, another NOAA tide gauge at Port Manatee recorded a maximum water level of +6.60 feet-NAVD (**Figure 4**). Staff observations and local reports revealed that the powerful storm surge completely eroded and flattened dunes on numerous locations along the coast. The enormous volume of dune and upper beach sand was then deposited inland on the beachside properties and nearby streets.

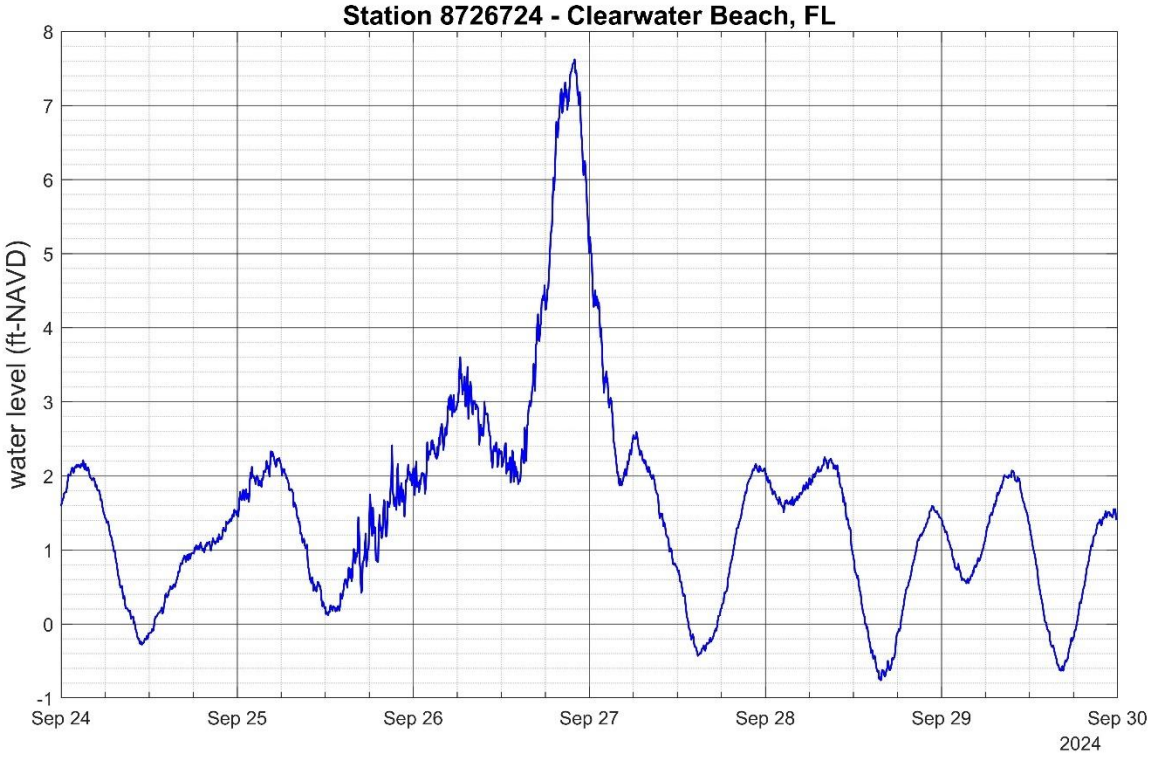

Figure 3. Water level elevations at Clearwater Beach, FL (Data Source: NOAA).

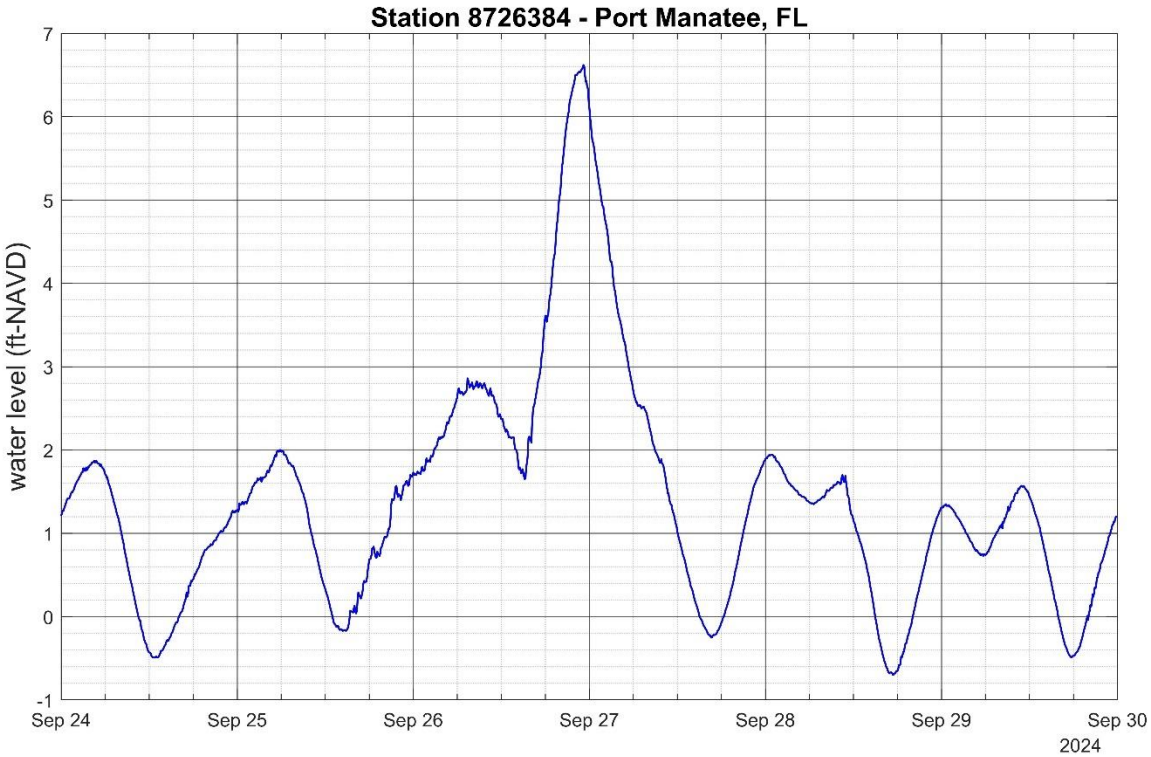

Figure 4. Water level elevations at Port Manatee, FL (Date source: NOAA).

IV. Hurricane Milton: October 5 – 10, 2024

Hurricane Milton was the second major hurricane to make landfall on Florida's coastline during the 2024 hurricane season two weeks after Hurricane Helene. The system spawned from a tropical depression that formed over the southwestern Gulf of America on Saturday morning, October 5. By 4:00 p.m. CDT, it became Tropical Storm Milton with a maximum sustained winds of 40 mph and was moving slowly north-northeastward at nearly 3 mph. Sunday morning, October 6 at 7:00 a.m. CDT, Milton strengthened as the maximum sustained wind increased to near 60 mph with higher gusts and continued its north-northeastward movement. Tropical-storm-force winds were extended outward up to 35 miles from the center. By 7:00 p.m., Milton became a Category 1 hurricane with maximum sustained winds of 85 mph, while a Hurricane Hunter aircraft observation estimated a minimum central pressure of 981 mb.

After midnight on Monday, October 7 at 1:00 a.m. CDT, Milton was moving erratically through the southern Gulf of America with a maximum sustained wind speed of 90 mph. By 6:00 a.m. CDT, data from a NOAA Hurricane Hunter aircraft indicated that Milton had strengthened to a major Category 3 hurricane with maximum sustained winds of 120 mph. By 10:55 a.m., Milton rapidly intensified into a Category 5 hurricane with maximum sustained winds of 160 mph and minimum central pressure of 925 mb. By 4:00 p.m. CDT, the maximum sustained winds increased to near 180 mph and the pressure dropped to 905 mb. At this stage, the eye of the hurricane was moving toward the east about 10 mph.

Milton's intensity fluctuated as it went through an eyewall replacement cycle in the western Gulf of America. After passing off the coast of the Yucatan Peninsula of Mexico on Tuesday, October 8, it turned northeastward towards Florida and entered the zone with more increasing wind shear that resulted in losing some strength. At 4:30 p.m. CDT, Milton's eye was about 475 miles southwest of Tampa, Floria with an observed maximum sustained wind near 165 mph. At 10:00 p.m., still a Category 5 hurricane, Milton's hurricane-force winds extended outward up to 30 miles from the center and tropical-storm-force winds extended outward up to 140 miles. The minimum central pressure estimated from Hurricane Hunter aircraft observations was 915 mb.

On Wednesday, October 9 at 11:00 a.m. EDT, the center of Hurricane Milton tracked toward the northeast near 17 mph with a maximum sustained wind near 145 mph. The storm lost some strength over the day and was downgraded to a Category 3 hurricane as it approached landfall. At 8:30 pm, with sustained winds of 120 mph, Milton made landfall near Siesta Key in Sarasota County as a

Category 3 hurricane. The storm tracked east across the state and entered the Atlantic Ocean where it became extratropical and eventually dissipated on October 12. **Figure 5** illustrates the track history of Hurricane Milton overlayed on satellite imagery.

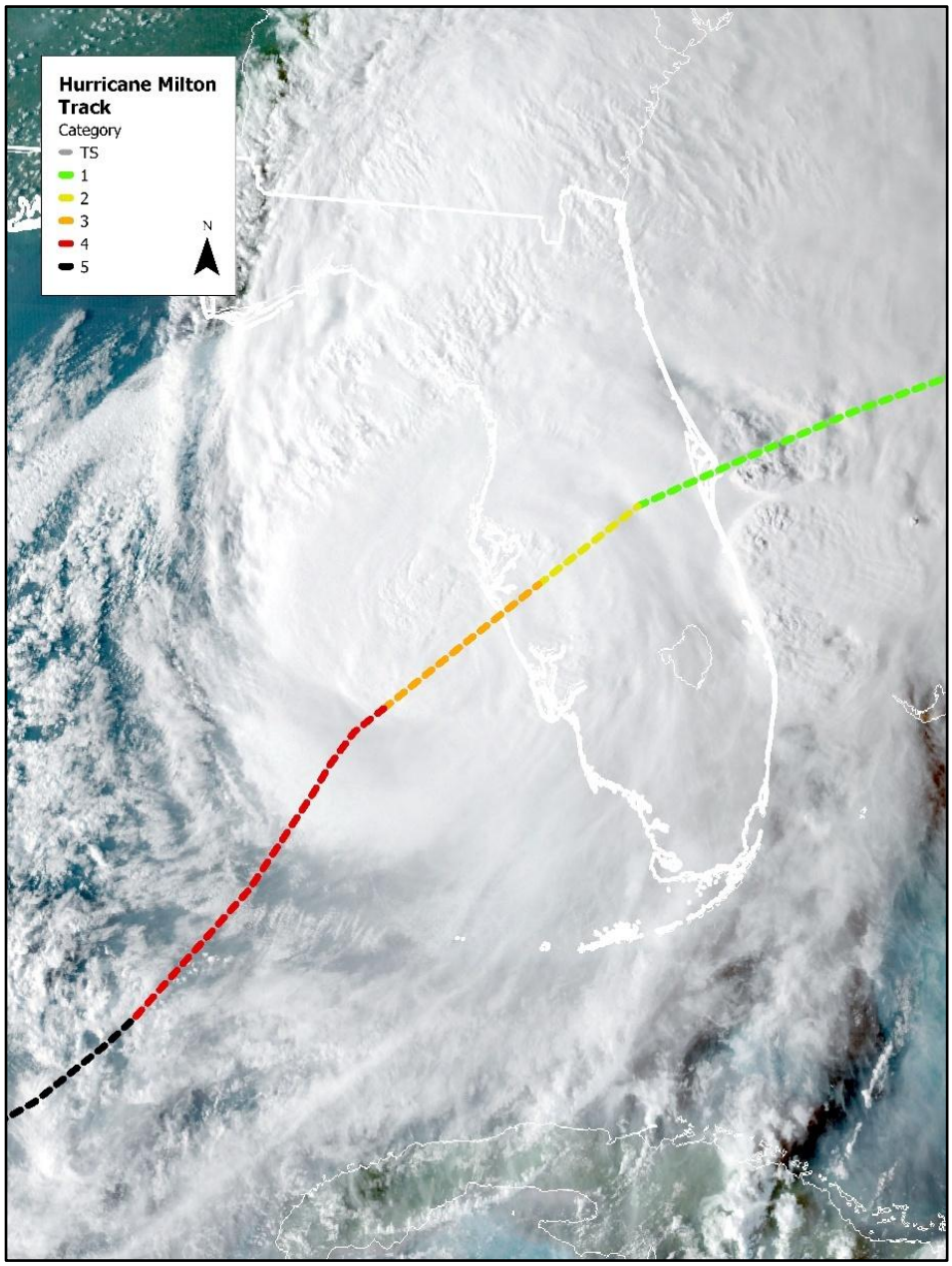

Figure 5. Hurricane Milton track (Source: Zoom Earth).

Being on the north side of Milton's landfall, the Tampa Bay area was spared from the devastating storm surge, although the heaviest rainfall and highest winds occurred around and just north of the eyewall in the Tampa Bay and Sarasota areas. Total rainfall of 10 – 19 inches soaked southern Pinellas County, coastal Hillsborough County and western Manatee County. **Figure 6** shows the statewide rainfall distribution that occurred during the passage of Hurricane Milton.

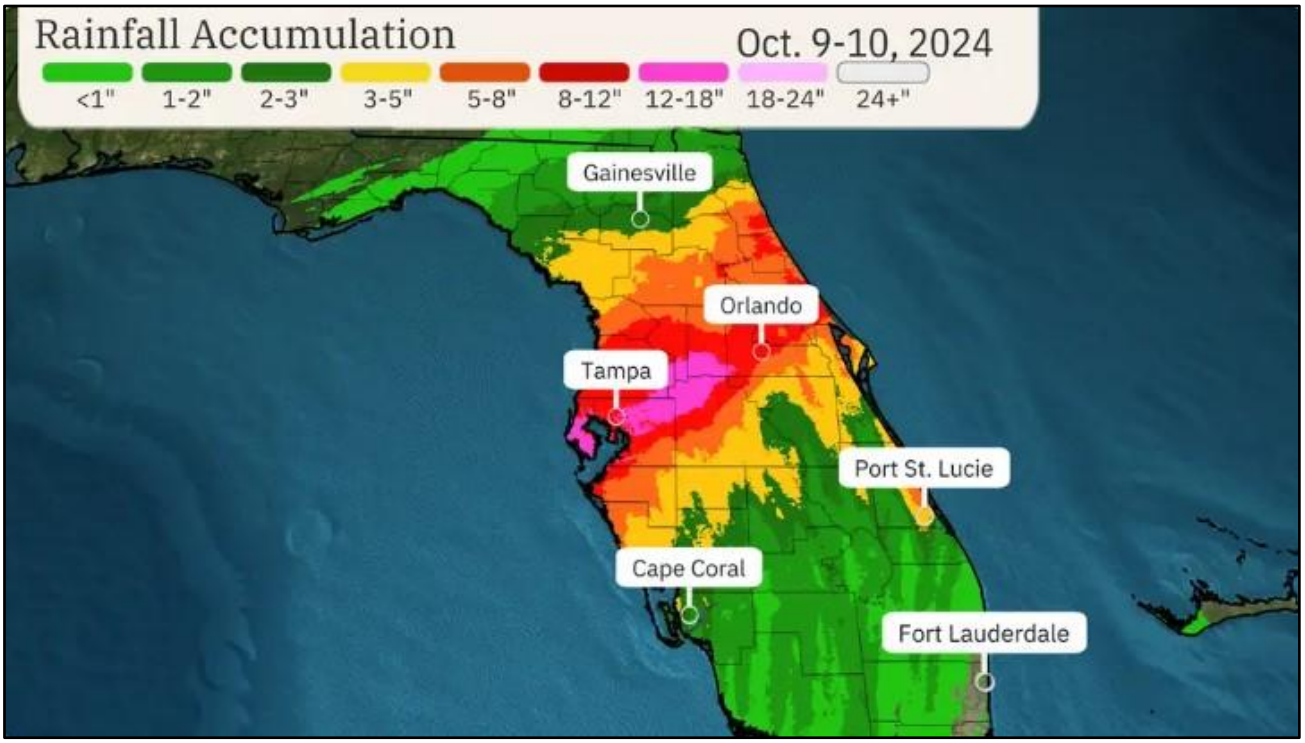

Figure 6. Statewide rainfall distribution during the passage of Hurricane Milton (Source: Weather.com).

Areas to the south of Milton's landfall, particularly Sarasota County, sustained the greatest impact due to the storm surge with strong onshore winds. U.S. Geological Survey (USGS) installed a special storm-tide sensor at the Venice Fishing Pier in Sarasota County that recorded a maximum storm tide of +7.32 feet-NAVD (**Figure 7**). Further south at Blind Pass in Lee County, another USGS storm-tide sensor recorded a maximum storm tide of +5.86 feet-NAVD (**Figure 8**).

Another devastating aspect of Milton was the formation of numerous tornadoes along the track. It spawned over 40 tornadoes across the Florida peninsula and caused widespread wind damage as it made landfall and tracked east across the state. **Figure 9** shows 19 of the tornado tracks that were concentrated over east central Florida on October 9, 2024.

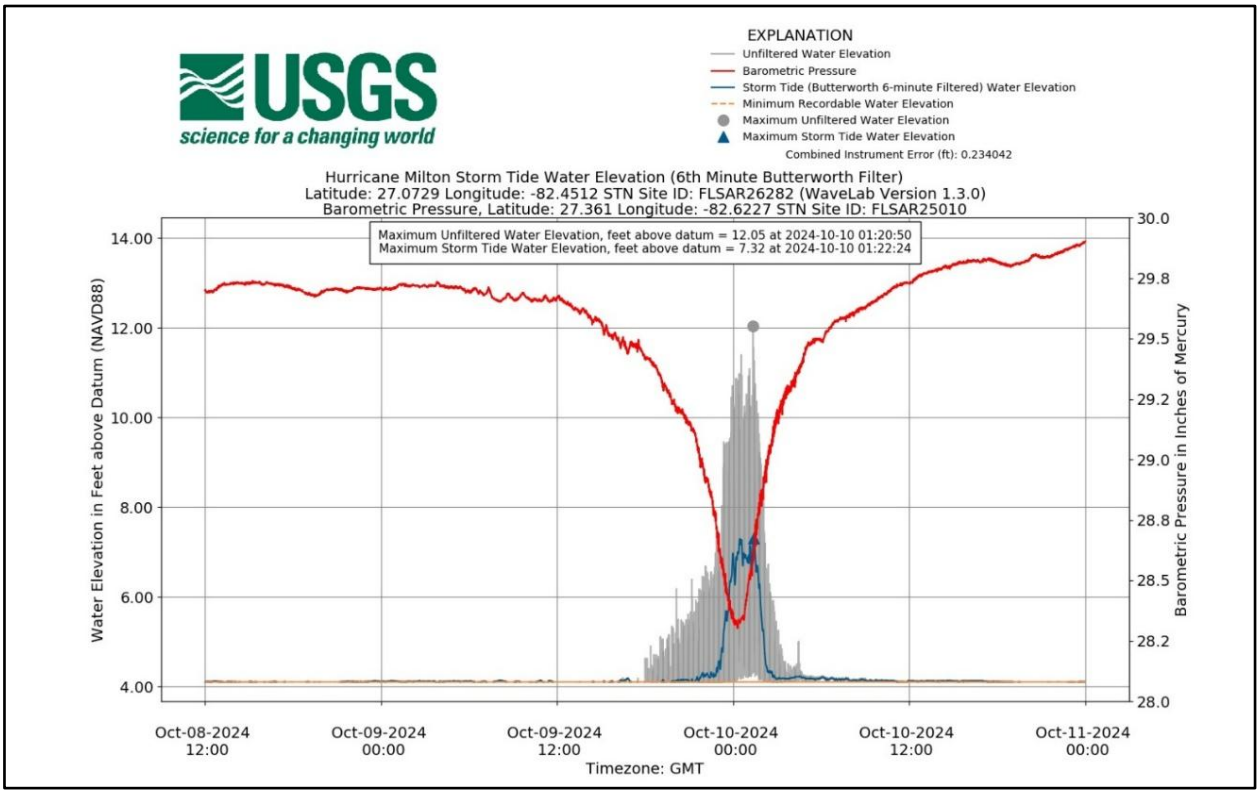

Figure 7. Water level elevation and atmospheric pressure at Venice Fishing Pier in Sarasota County (Source: U.S. Geological Survey).

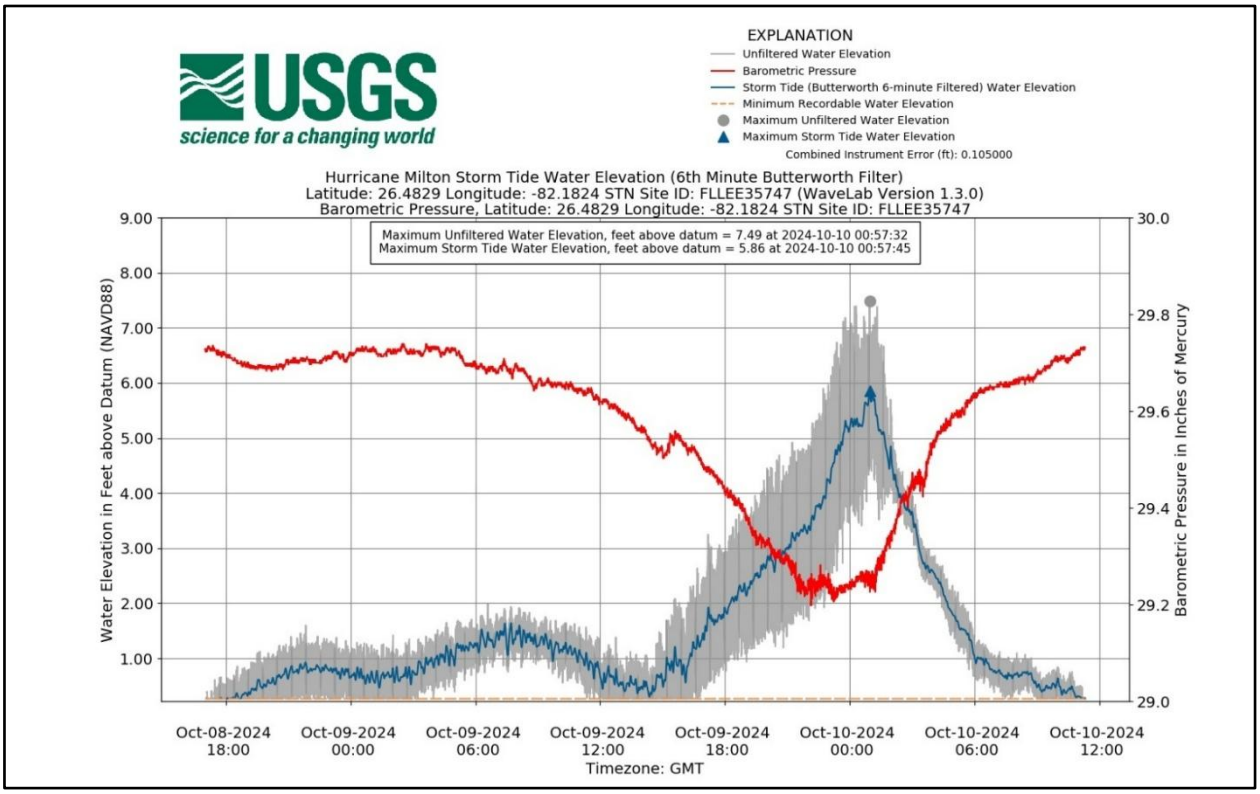

Figure 8. Water level elevation and atmospheric pressure at Blind Pass in Lee County (Source: U.S. Geological Survey).

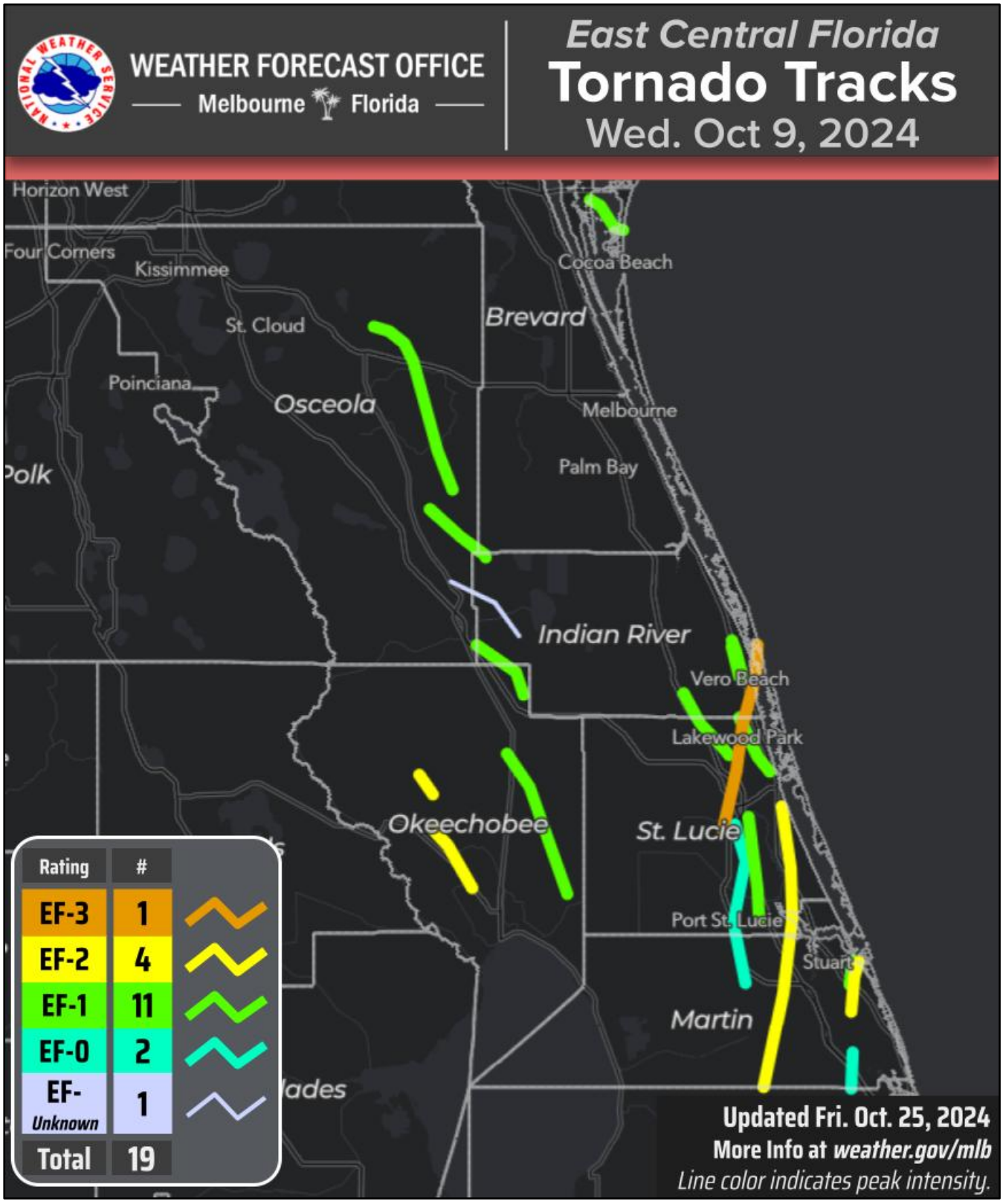

Figure 9. Tornado tracks over east central Florida (Source: National Weather Service).

V. Hurricane Helene and Hurricane Milton Impact Summary and Overview

This section provides a summary of the beach and dune erosion, and structural damage that occurred in the more substantially affected coastal counties in southwest Florida.

Table 1 lists beach and dune erosion conditions starting from Pinellas County and continuing southward through Collier County. Reference or Range ("R") monuments are survey markers established and maintained since 1972 by the Department that are spaced approximately every 1,000 feet to measure beach and dune conditions. A graphic depiction of the classification of beach erosion conditions is provided in **Figure 10**.

On the east coast of Florida, windshield surveys were conducted by Department staff from Nassau through Indian River County. Also, Department staff received information and reports from local government staff regarding the beach and dune erosion conditions for most of the Florida's coastal counties on the Atlantic coast. At different locations on the Atlantic coast, minor beach and dune erosion was observed characterized by sporadic scarp formation and intermittent beach deflation at isolated locations due to storm surge associated with Hurricane Milton. In Volusia County, many of the vehicular beach access ramps were damaged or destroyed and minor to moderate beach profile deflation was observed.

Table 1. Beach and Dune Erosion Summary.

Pinellas County

Locations	Range Monuments	Erosion Condition
Anclote Key	V-325 to V-326	IV
Three Rooker Bar	V-326 to V-335	IV
Honeymoon Island	R-1 to R-15	IV
Caladesi Island	R-16 to R-30	IV
Clearwater Beach	R-30 to R-37	III
Clearwater Beach	R-37 to R-42	IV
Clearwater Beach	R-42 to R-44	III
Clearwater Beach	R-44 to R-46	IV
Clearwater Pass	R-46 to R-50	IV
Sand Key	R-51 to R-54	III
Sand Key	R-54 to R-57	II
Sand Key	R-70 to R-71	IV
Sand Key	R-71 to R-81	II
Sand Key	R-81 to R-82	III
Sand Key	R-82 to R-84	IV
Sand Key	R-84 to R-85	III
Sand Key	R-85 to R-89	II
Sand Key	R-89 to R-91	III
Sand Key	R-91 to R-93	II
Sand Key	R-93 to R-95	III

Sand Key	R-95 to R-96	II
Sand Key	R-96 to R-102	III
Sand Key	R-102 to R-122	IV
Treasure Island	R-122 to R-125	III
Treasure Island	R-126 to R-130	IV
Treasure Island	R-130 to R-136	III
Treasure Island	R-136 to R-142	IV
Treasure Island	R-142 to R-143	III
Long Key/St. Pete Beach	R-144 to R-149	IV
Long Key/St. Pete Beach	R-149 to R-150	III
Long Key/St. Pete Beach	R-150 to R-156	IV
Long Key/St. Pete Beach	R-156 to R-162	III
Shell Key	R-166 to R-167	IV
Mullet Key/Ft. DeSoto Park	R-167 to R-176	II
Mullet Key/Ft. DeSoto Park	R-176 to R-180	III
Mullet Key/Ft. DeSoto Park	R-180 to R-181	IV
Mullet Key/Ft. DeSoto Park	R-181 to R-182	III
Mullet Key/Ft. DeSoto Park	R-182 to R-183	IV
Mullet Key/Ft. DeSoto Park	R-183 to R-184	III
Mullet Key/Ft. DeSoto Park	R-184 to R-190	IV
Mullet Key/Ft. DeSoto Park	R-190 to R-192	III

Hillsborough County

Locations	Range Monuments	Erosion Condition
Egmond Key	R-1 to R-13	IV

Manatee County

Locations	Range Monuments	Erosion Condition
Passage Key	-	IV
Anna Maria Island	R-1 to R-41	IV
Longboat Key	R-42 to R-67	IV

Sarasota County

Locations	Range Monuments	Erosion Condition
Longboat Key	R-1 to R-29	IV
Lido Key	R-30 to R-44	IV
Siesta Key	R-45 to R-114	IV
Venice Beach and Caspersen Beach	R-115 to R-148	IV
Manasota Key	R-148 to R-182	IV

Charlotte County

Locations	Range Monuments	Erosion Condition
Manasota Key and Englewood Beach	R-1 to R-21	IV
Don Pedro Island and Little Gasparilla Island	R-22 to R-57	IV
Gasparilla Island	R-58 to R-68	IV

Lee County

Locations	Range Monuments	Erosion Condition
Gasparilla Island	R-1 to R-26	IV
Cayo Costa	R-27 to R-65	IV
North Captiva	R-66 to R-82	IV
Captiva Island	R-83 to R-100	IV
Captiva Island	R-100 to R-109	III
Sanibel Island	R-110 to R-119	IV
Sanibel Island	R-119 to R-143	III
Sanibel Island	R-143 to R-174	IV
Ft. Myers Beach	R-175 to R-176	IV
Ft. Myers Beach	R-176 to R-180	III
Ft. Myers Beach	R-180 to R-181	IV
Ft. Myers Beach	R-181 to R-203	III
Ft. Myers Beach	R-203 to R-205	IV
Ft. Myers Beach	R-205 to R-209	III
Ft. Myers Beach	R-209 to R-210	IV
Lover's Key State Park	R-211 to R-221	IV
Big Hickory Island	R-222 to R-225	IV
Bonita Beach	R-225 to R-239	IV

Collier County

Locations	Range Monuments	Erosion Condition
Barefoot Beach	R-1 to R-16	IV
Delnor-Wiggins Pass State Park	R-17 to R-23	IV
Vanderbilt Beach	R-23 to R-32	III
Vanderbilt Beach and Park Shore	R-32 to R-45	IV
Naples	R-45 to R-79	III
Naples	R-79 to R-89	IV
Keewaydin Island	R-90 to R-127A	IV
Marco Island	R-128 to R-135	IV
Marco Island	R-135 to R-148	II

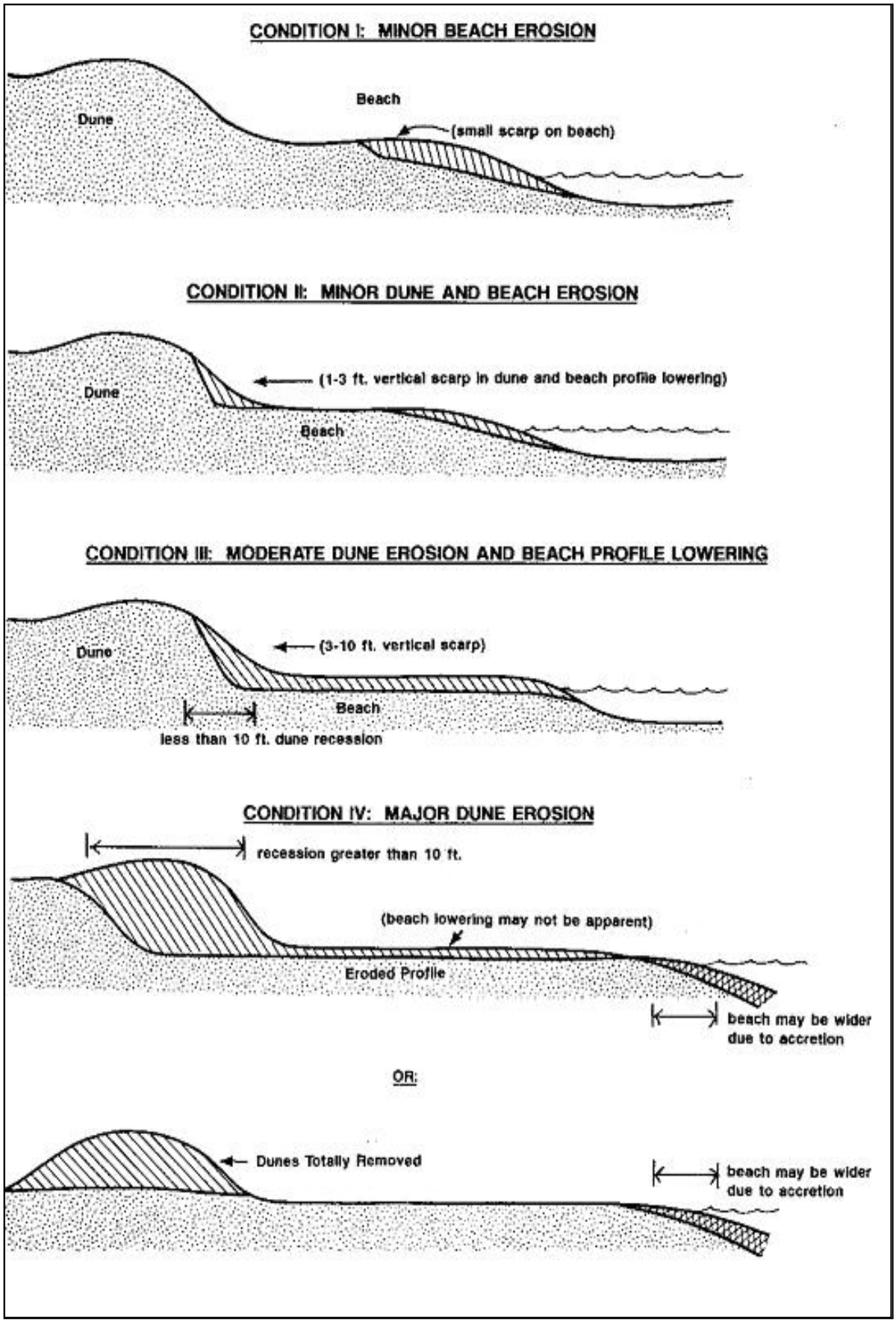

Figure 10. Beach Erosion Conditions I to IV.

Major Structural Damage

A summary of damage to coastal armoring, including seawalls, bulkheads, revetments, or other rigid coastal protection structures fronting on the Gulf of America and Atlantic Ocean, is provided in **Table 2**. See Appendix A or **Figure 150** that describes the different damage levels to coastal armoring structures. Not included in this table is damage to retaining walls, concrete block walls, or concrete gravity walls that do not provide protection from erosion and storm tides and waves or armoring on interior tidal waters. Also not included are jetty structures constructed for navigation at ports and inlets. Hurricane Helene caused major damage to 233 major structures in Pinellas, Manatee and Sarasota Counties, including 70 that were destroyed. Hurricane Milton caused major damage to another 320 major structures. The majority of severe structural damages occurred in Sarasota and Charlotte Counties. In total, for the two hurricanes combined, 553 major structures were subjected to major structural damage in southwest Florida counties within the Coastal Building Zone. An overall summary of structural damage to major structures is given in **Table 3.** A more detailed description of these impacts by each county is provided in Section VI of this report.

Table 2. Summary of coastal armoring damage caused by Hurricane Helene & Hurricane Milton along the southwest coast of Florida.

Hurricane Helene – Armoring Damage		
County	**Major Damage (Feet)**	**Minor Damage (Feet)**
Pinellas	0	342
Manatee	0	0
Sarasota	10,551	0
TOTAL	**10,551 (2.0 miles)**	**342**

Hurricane Milton – Armoring Damage		
County	**Major Damage (Feet)**	**Minor Damage (Feet)**
Pinellas	0	0
Manatee	90	0
Sarasota	8,795	0
Charlotte	7,250	0
Lee	2,620	0
Collier	300	0
Total	**19,055 (3.6 miles)**	**0**
2024 Total	**29,606 (5.6 miles)**	**342**

Note: see Appendix A or Figure 150 that describes the different damage levels to coastal armoring structures.

Table 3. Summary of major structural damage to major structures by Hurricane Helene and Hurricane Milton along the southwest coast of Florida.

Hurricane Helene – Major Structural Damages				
County	**# Single-Family Dwellings Damaged**	**# Multi-family Dwellings[1] Damaged**	**# Other Major Structures[2] Damaged**	**Total # Damaged[3]**
Pinellas	61	33	14	108
Manatee	46	0	9	55
Sarasota	57	3	10	70
TOTAL	**164**	**36**	**33**	**233**

Hurricane Milton – Major Structural Damages				
County	**# Single-Family Dwellings Damaged**	**# Multi-family Dwellings[1] Damaged**	**# Other Major Structures[2] Damaged**	**Total # Damaged[3]**
Pinellas	0	0	0	0
Manatee	11	30	4	45
Sarasota	86	32	38	156
Charlotte	88	8	15	111
Lee	6	1	0	7
Collier	1	0	0	1
Total	**192**	**71**	**57**	**320**
2024 Total	**356**	**107**	**90**	**553**

1) Multi-family 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 (i.e., piers, pools, pavilions and parking lots).

3) Not included in this summary are minor structures (i.e., walkways, decks, driveways, patios, etc.), coastal and shore protection structures (i.e., seawalls, revetments, sills, groins, jetties), minor damage to major structures, structures located inland of the coastal building zone, or structures with hydrostatic flooding damage caused by the storm surge or storm water runoff.

VI. Detailed Damage Assessment by County

The counties with the most significant damages are discussed individually as follows. This includes the southwest Florida counties extending from Pinellas through Collier.

Each detailed county summary is preceded by a county map showing the qualitative beach and dune erosion conditions graphically displayed. Each detailed county summary also includes photographic examples of the type of damage sustained.

Pinellas County

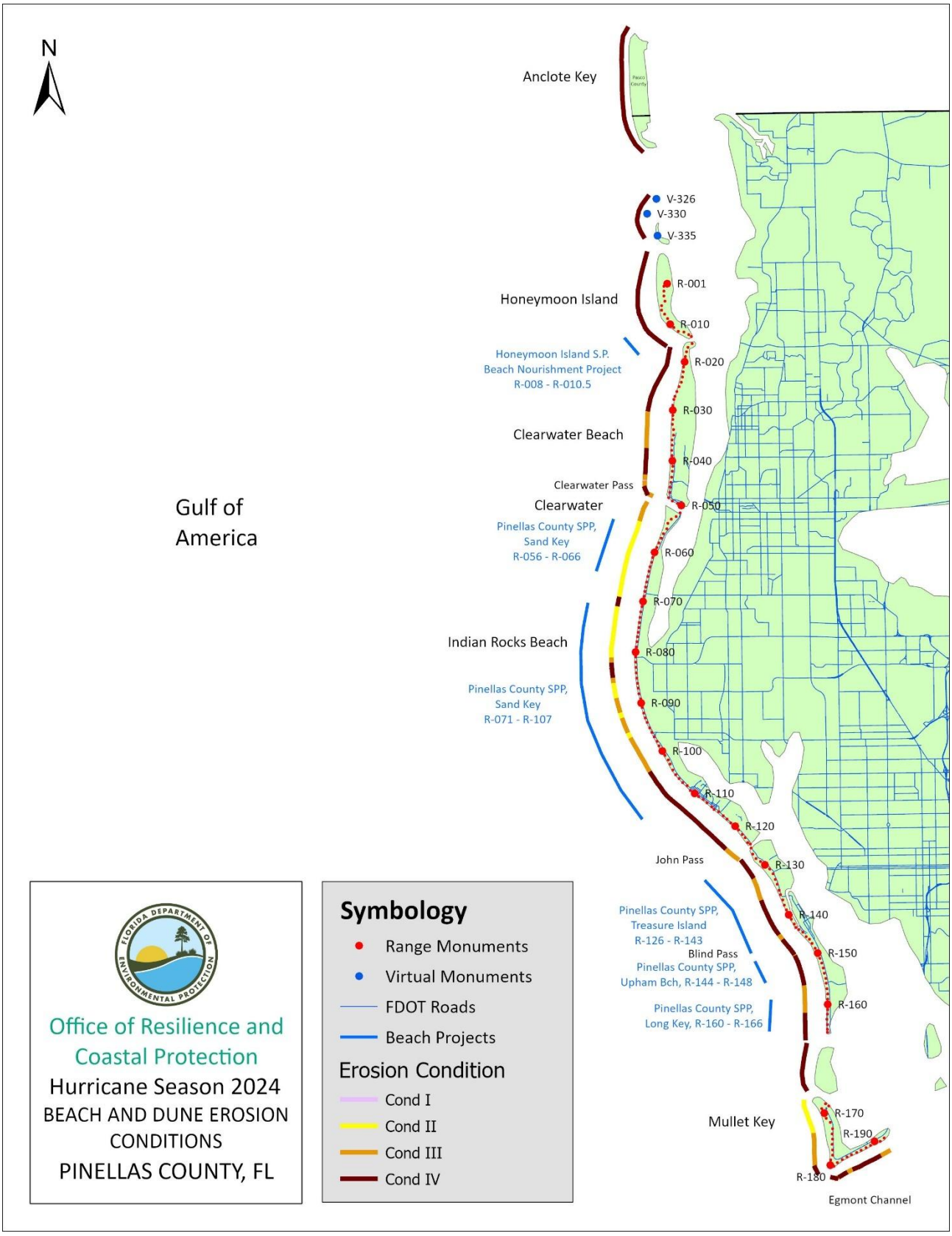

Figure 11. Pinellas County Beach and Dune Erosion Conditions from Hurricane Helene and Milton.

Pinellas County

Pinellas County is located on Florida's southwest coast fronting the Gulf of America (

Figure 11**)** and has 39.3 miles of beaches extending from Anclote Key in Pasco County to the Southwest Channel entrance to Tampa Bay in Hillsborough County. The coast of Pinellas County includes a portion of Anclote Key, Honeymoon Island, Caladesi Island, Clearwater Beach Island, Sand Key, Treasure Island, Long Key, Shell Key, and Mullet Key. Pinellas County has 6 inlets: Hurricane Pass, Clearwater Pass, Johns Pass, Blind Pass, Pass-a-Grille, and Bunces Pass. Coastal Pinellas County includes the following beach communities and major parks: Anclote Key State Park, Honeymoon Island State Park, Caladesi Island State Park, Clearwater Beach, Bellair Beach, Bellair Shore, Indian Rocks Beach, Indian Shores, Redington Shores, Redington Beach, Madeira Beach, Treasure Island, St. Petersburg Beach, Pass-a-Grille Beach, Shell Key Preserve, and Fort DeSoto Park (on Mullet Key).

Storm Effects and Erosion Conditions

Hurricane Helene

The northern-most island in Pinellas County is Anclote Key, which is a state park intersected by the county line separating Pasco County and Pinellas County. Anclote Key was substantially impacted by the offshore passage of Hurricane Helene and sustained major beach and dune erosion (condition IV). To the south, the uninhabited small island of Three Rooker Bar also sustained major beach and dune erosion (condition IV).

To the south, Honeymoon Island is a state park. The southern 1.4 miles of Honeymoon Island is designated critically eroded and has a beach restoration project with stabilizing groins. Hurricane Helene caused Honeymoon Island to sustain major beach and dune erosion (condition IV). Hurricane Pass separates Honeymoon Island from Caladesi Island to the south. Caladesi Island, which is also a state park, sustained major beach and dune erosion (condition IV) from Helene.

Caladesi Island and Clearwater Beach Island were historically separated by Dunedin Pass, which is now closed. Clearwater Beach Island sustained segments of both moderate beach and dune erosion (condition III) and major beach and dune erosion (condition IV). Clearwater Pass separates Clearwater Beach Island from Sand Key to the south. Most of the northern half of Sand Key (R-50 to R-100) sustained minor to moderate beach and dune erosion (condition II to III). Most of the southern stretch of Sand Key (R-100 to R-120) sustained major beach and dune erosion (condition IV), which substantially impacted beach front development. Most of Sand Key is a federal beach restoration project in need of post-storm nourishment.

In the worst impacted areas, the beach became narrower, losing 30 to 50 ft of width and the storm surge pushed the beach material landward to the top portion of the dune crest into upland property owners' yards,

homes/buildings, structures, or primary roads. In most cases there was between 3 to 6 feet of sand on top of existing properties or on the roadways where it deposited as overwash.

Johns Pass separates Sand Key from Treasure Island to the south. South of Johns Pass, (R-126 to R-143), Treasure Island sustained moderate to major beach and dune erosion (condition III or IV). Blind Pass separates Treasure Island from Long Key to the south. Long Key sustained intermittently moderate to major beach and dune erosion (condition III to IV).

Pass-a-Grille separates Long Key from Shell Key to the south. Shell Key, a nature preserves, and bird sanctuary, sustained major beach and dune erosion (condition IV). Bunces Pass separates Shell Key from Mullet Key to the south. Mullet Key, which is Ft. DeSoto County Park, sustained minor to moderate beach and dune erosion (condition II to III) along the west shoreline and moderate to major beach and dune erosion (condition III to IV) along the south shoreline adjacent Egmont Channel at the entrance to Tampa Bay.

Hurricane Milton

Pinellas County was substantially in the lee and north of the eye of Hurricane Milton during the hurricane's landfall to the south in Sarasota County. The wind during Milton was substantially blowing offshore and there was a set-down in the tide levels until the hurricane had passed inland. As the winds changed to a more easterly direction, storm tides increased, and additional beach erosion was sustained along the Pinellas County coastline.

See additional comparisons photos taken by Pinellas County Public Works – Coastal Management staff of the erosion conditions and damages following Hurricanes Helene and Milton.

Figure 12. Major beach and dune erosion (condition IV) due to Hurricane Helene at Honeymoon Island State Park (R-8).

Figure 13. Major beach and dune erosion (condition IV) at Honeymoon Island State Park following Hurricanes Helene and Milton (R-8.5). Note overwash sand on the park's parking areas.

Figure 14. Flooding water mark (left) and overwash sand (right)along Gulf Boulevard following Helene's storm surge, Clearwater Beach (R-44 to R-46).

Figure 15. Major beach erosion (condition IV) along Belleair Beach due to Helene (R-66 to R-67).

Figure 16. Indian Shores beach dwellings impacted by overwash sand from Helene's storm surge at R-83 (left) and R-91 (right).

Figure 17. Major beach and dune erosion (condition IV) following Helene and Milton on Treasure Island (R-131).

Figure 18. Overwash due to Helene's storm surge on Treasure Island near R-137 (left) and R-139 (right).

Figure 19. Major beach and dune erosion (condition IV) following Helene and Milton on Treasure Island (R-141).

Storm Damage

Hurricane Helene

Coastal communities in Pinellas County sustained structural damages due to storm surge and waves. A total of 108 major structures sustained major structural damage due to Hurricane Helene, including 61 single-family dwellings, 33 multifamily dwellings and 14 other major structures. Most of these damages occurred in the communities of Madeira Beach (Sand Key), Treasure Island, and St. Pete Beach. In addition to the major structural damages, numerous structures within the Coastal Building Zone were flooded without major structural damage. **Figures 20** through **24** show examples of the damage in Pinellas County.

Figure 20. Coastal armoring damage at Clearwater Pass due to Hurricane Helene near R-47.

Figure 21. Damage to single family dwelling on Treasure Island due to Hurricane Helene near R-141.

Figure 22. Damage of dwellings in St. Pete Beach due to Hurricane Helene near R-166.

Figure 23. Seawall damage in Treasure Island/ Sunset Beach due to Hurricane Helene near R-139.

Figure 24. Back barrier damage to buildings in Madeira Beach due to Milton near R-121.

Manatee County

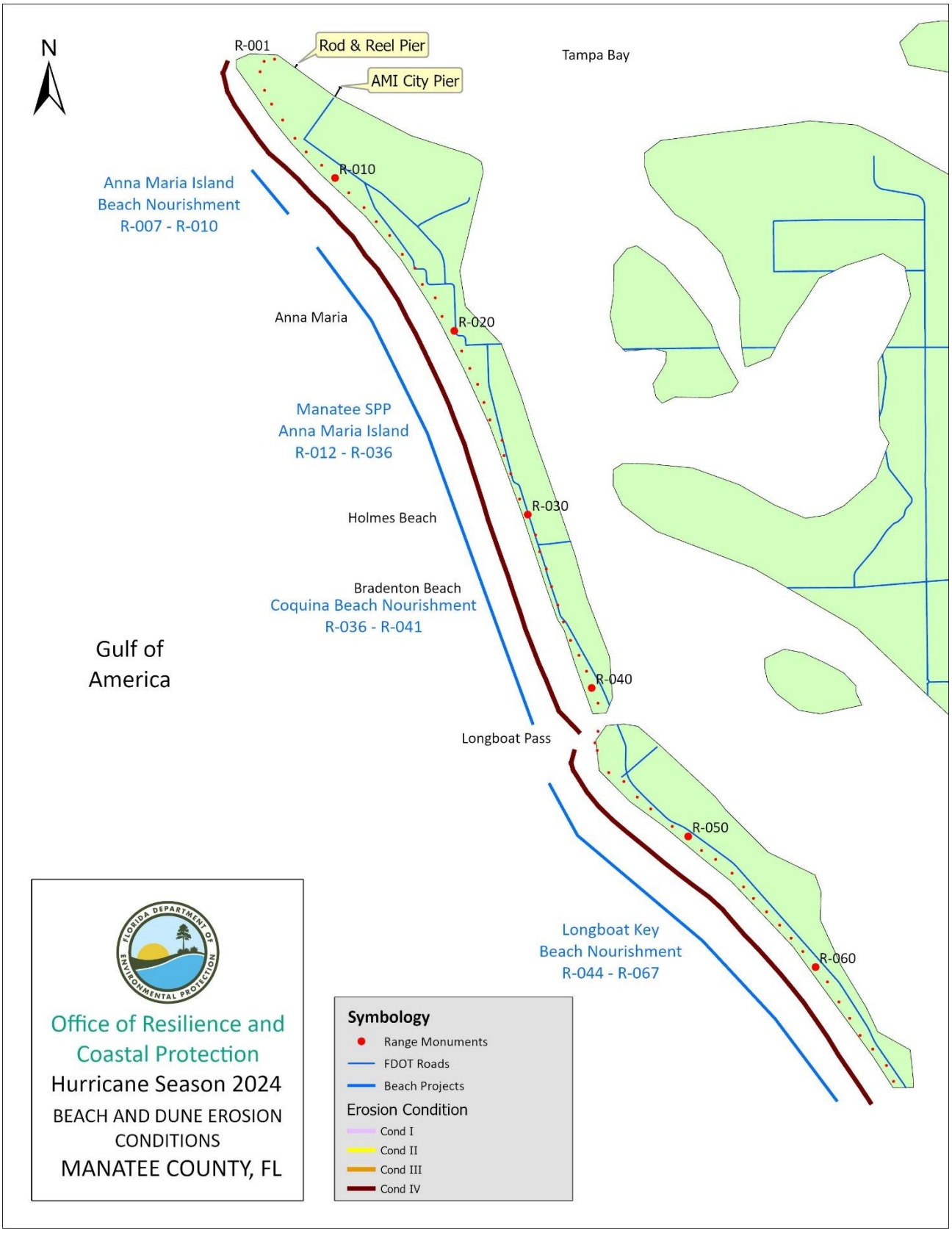

Figure 25. Manatee County Beach and Dune Erosion Conditions from Hurricanes Helene and Milton.

Manatee County

Manatee County is located on Florida's southwest coast fronting the Gulf of America (**Figure 25)** and has 12.6 miles of beaches which extend from the Southwest Channel southward from Hillsborough County to approximately halfway southward onto Longboat Key (R-67) at the Manatee/Sarasota County line. The coast of Manatee County includes Passage Key, Anna Maria Island and Longboat Key, which includes Greer Island at the north end of Longboat Key. Manatee County has two inlets: Passage Key Inlet and Longboat Pass. Coastal Manatee County includes the following beach communities: City of Anna Maria, City of Holmes Beach, City of Bradenton Beach, and the Town of Longboat Key.

Storm Effects and Erosion Conditions

Manatee County's beaches sustained 12.6 miles of major beach and dune erosion (condition IV) between R-1 and R-67, as described in **Table 1** and shown in **Figure 27 – Figure 31** on Anna Maria Island and **Figure 32 – Figure 34** on Longboat Key.

North of Anna Maria Island, the small island of Passage Key was reduced to an intertidal shoal as most of the former island has now become submerged (**Figure 26**). The erosion to Anna Maria Island and Longboat Key by Hurricane Helene caused the beach width to become narrower, losing approximately 20 to 50 feet of width. Helene's storm surge pushed sand from the frontal beach landward to the top portion of the dune crest into upland property yards, homes, buildings, structures, and roadways. In most cases on Anna Maria Island there was between 3 to 4 feet of sand on top of existing elevations of the dune crest zone. Hurricane Milton caused additional erosion effects, however, most of the beach erosion and relocated sand was the result of the storm surge from Hurricane Helene (**Figures 28** through **30**). All of Anna Maria Island was flooded by Hurricane Helene's 6.6 to 7 feet of storm surge and higher wave uprush causing 3 to 4 feet of floodwaters impacting island properties.

Longboat Key's engineered beach lost approximately -407,300 cy of sand from above the survey closure of (-16 ft, NAVD88) from pre-storm to post-storm of Hurricanes Helene and Milton. Most of the Key's beach sand shifted or was misplaced due to the three hurricanes of 2024 (Debby, Helene and Milton), with Hurricane Helene causing most of the erosion that accounted for approximately 80 percent or more of the beach erosion since 2021. The dunes on Longboat Key were stripped of vegetation due to the storm surge from Hurricane Helene, see **Figure 32**. The Post-Helene and Milton Engineering Report (Foth | Olsen, 2024) was prepared for the Town of Longboat Key documenting the sand losses and damages on the Key.

Figure 26. Passage Key north of Anna Maria Island reduced to only a sandbar with no vegetation due to the storm surge impacts of Hurricanes Helene and Milton.

Figure 27. Major beach and dune erosion (condition IV) following Helene and Milton at 68th Street, Anna Maria Island near R-14.

Figure 28. Beach sand piled up on either side of roadway following road scraping of Helene's overwash deposit at 66th Street, Anna Maria Island near R-14.

Figure 29. Beach sand piled up on either side of the roadway following road scraping of Helene's overwash deposit at Avenue E, Anna Maria Island near R-24.

Figure 302. Beach sand piled up on either side of roadway following road scraping of Helene's overwash deposits on Anna Maria Island.

Figure 31. Major beach and dune erosion (condition IV) and stock-piled sand after Helene and Milton, at Coquina Beach, Anna Maria Island near R-37.

Figure 32. Major beach erosion (condition IV) due to Helene on northern Longboat Key near R-48.

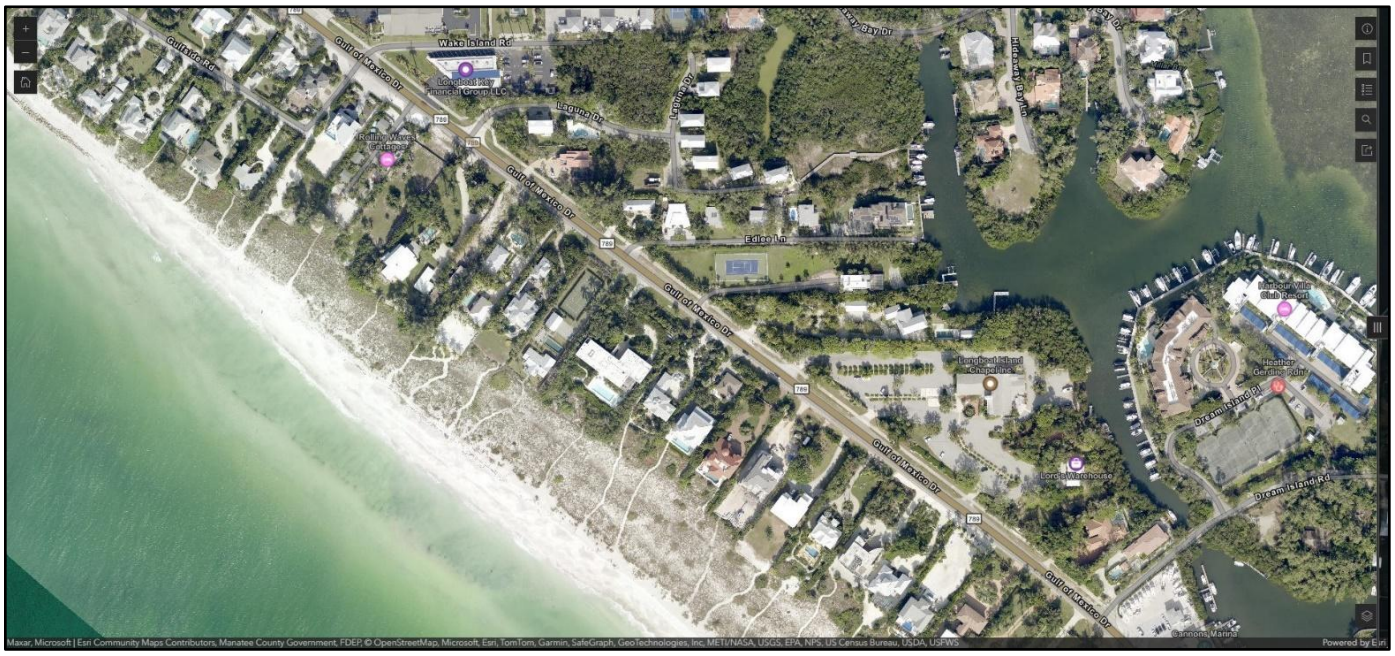

Figure 333. Healthy beach conditions in 2023 before Hurricanes Helene and Milton on Longboat Key, R-51 to R-53 (NOAA).

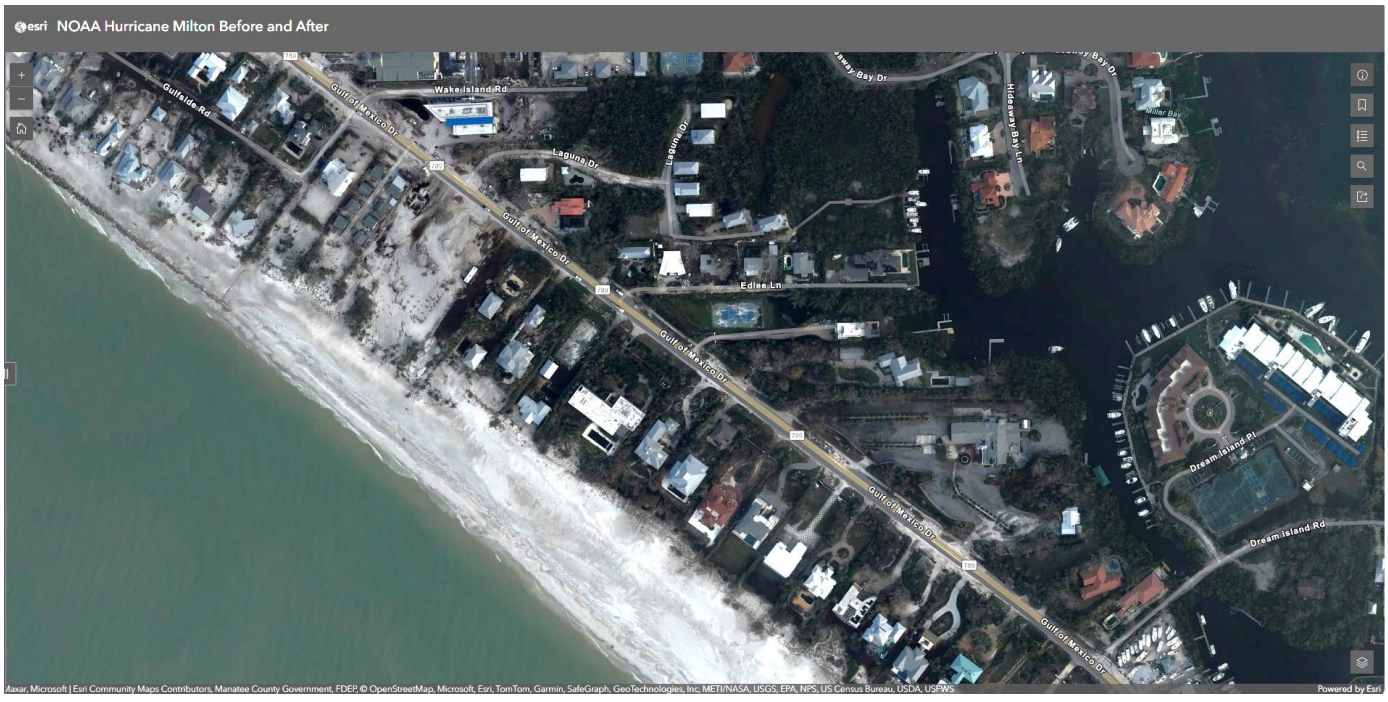

Figure 34. Major beach and dune erosion (condition IV) following Helene and Milton on Longboat Key, R-51 to R-53 (NOAA).

Storm Damage

Hurricanes Helene and Milton caused major structural damage within the Coastal Building Zone of Manatee County. In addition, most single-family dwellings on Anna Maria Island sustained major flooding without structural damage. The dwellings within the Coastal Building Zone experienced 3 to 4 feet of storm surge flooding from Hurricane Helene. This storm surge flooding impacted two large mobile home parks on Anna Maria Island and one on Longboat Key. On the northeast end of Anna Maria Island, the Rod & Reel Pier, built in 1947, sustained major damage by Helene, and subsequently, the pier and the terminal two-story restaurant building were completely destroyed by Milton (**Figures 35** and **36**). Nearby, the historic Anna Maria City Pier, constructed in 1911, was destroyed and the terminal grill building had major damage (**Figures 37** through **39**).

Helene and Milton caused major structural damage to 100 major structures within the Coastal Building Zone of Manatee County. This included 57 single-family dwellings, 30 multifamily dwellings and 13 other major structures. In addition, widespread nonstructural damage was caused by the storm surge flooding and sand overwash throughout Anna Maria Island and Longboat Key. By December of 2024, the City of Bradenton Beach condemned 25 buildings/homes within the city. One of the condemned homes floated onto the public roadway on 12th Street south of R-35 (**Figure 44**)**.** There was also approximately 25 feet of road damage due to storm surge on the southeast corner of 5th Avenue and 51st Street on Anna Maria Island near R-18. Many additional locations on Anna Maria Island and Longboat Key had road coverage with 2 to 5 feet of sand, which were mainly at street ends adjacent to the beach. In addition, there was approximately 90 feet of major rock revetment damages on Longboat Key between R-49.3 to R-50.5. Engineered structures on Longboat Key experienced damage with two panels being lost from the permeable adjustable groins (PAG) near R-13 and T Head groins with rock displacement near Longboat Pass**. Figures 40** through **51** show examples of the damage on Anna Maria Island and Longboat Key from Hurricanes Helene and Milton.

Figure 35. Major deck damage to the Rod and Reel Pier by Hurricane Helene at the northeast end of Anna Maria Island near R-1.

Figure 36. The northeast end of Anna Maria Island following both Hurricanes Helene and Milton showing the Rod & Reel Pier and two-story restaurant destroyed.

Figure 37. The Anna Maria Island City Pier was still operational after Helene along with the restaurant and bait shop at Pine Avenue.

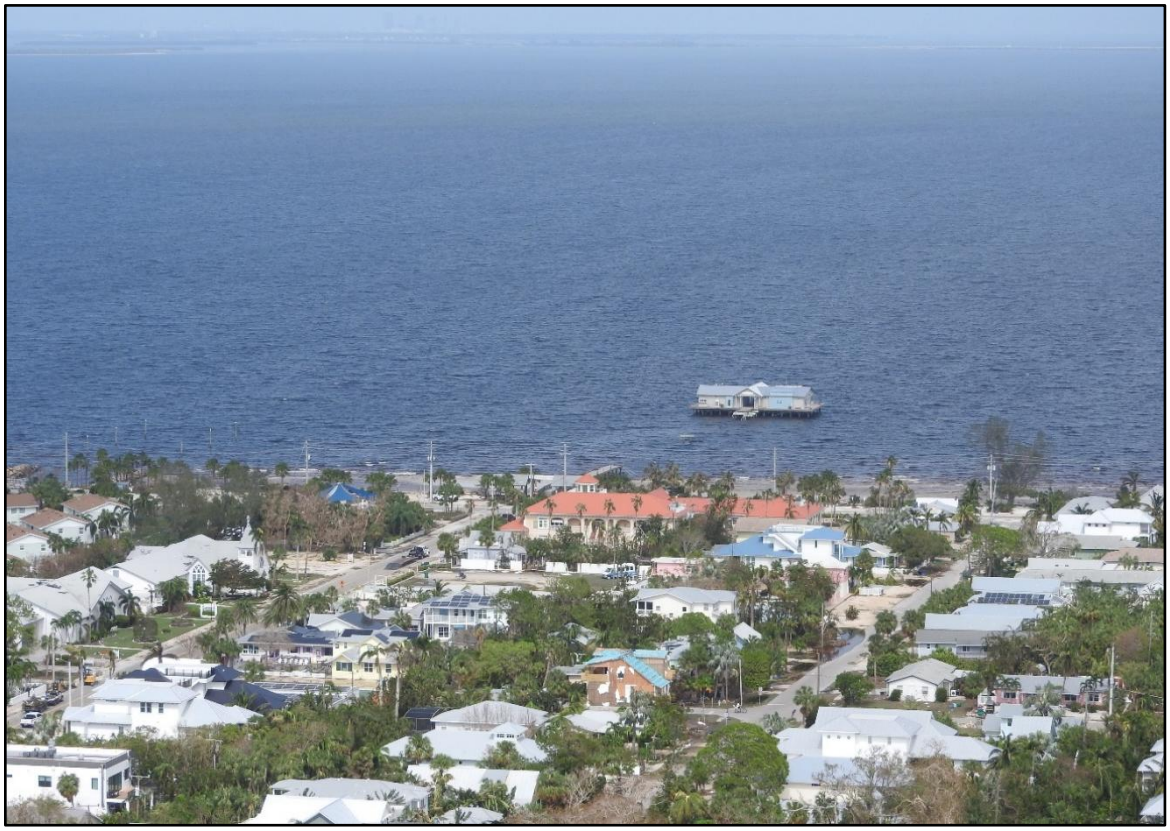

Figure 38. Milton destroyed the Anna Maria Island City Pier and damaged the restaurant and bait shop at Pine Avenue.

Figure 39. Milton destroyed the Anna Maria Island City Pier and damaged the restaurant and bait shop at Pine Avenue.

Figure 40. A single-family dwelling destroyed by Helene's storm surge on Anna Maria Island next to another home with major first floor damage near Avenue F near R-23.

Figure 41. A gulf-fronting single-family dwelling on Anna Maria Island destroyed by Helene near 23rd Street North at R-28.

Figure 424. A single-family dwelling on Anna Maria Island with major first floor damage from Helene's storm surge near 23rd Street North at R-28.

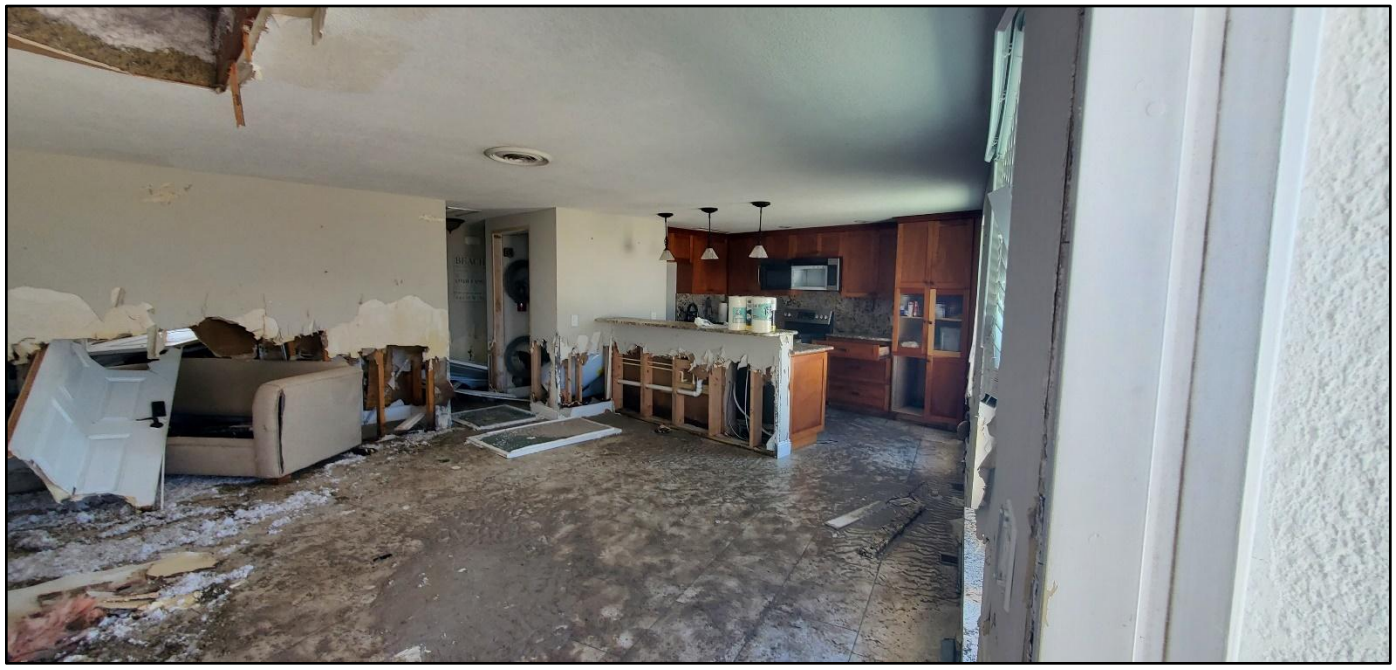

Figure 435. The interior of a single-family dwelling flooded by Helene's storm surge on Anna Maria Island near R-34.

Figure 44. Helene's storm surge carried a dwelling into the middle of 12th Street South To the bayside from the Gulfside near R-35 on Anna Maria Island.

Figure 45. Major beach and dune erosion (condition IV) due to Helene and Milton on Anna Maria Island (R-35). Note the home toppled due to wind from Milton (red arrow) and the home impacted by Helene's storm surge that was carried into the middle of 12th Street South (yellow arrow).

Figure 46. A single-family dwelling flooded by Helene's storm surge on Anna Maria Island. Note the high water mark above the outdoor shower handle and the front window base.

Figure 476. Flood ruined household items piled next to a dwelling impacted by Helene's storm surge on Anna Maria Island.

Figure 48. First floor flooding damage, seawall damage and major erosion (condition IV) following Helene and Milton on northern Longboat Key near R-49.

Figure 497. A single-family dwelling destroyed, armoring damage and major beach and dune erosion (condition IV) following Helene and Milton on Longboat Key near R-50.

Figure 50. A single-family dwelling destroyed by Helene on northern Longboat Key near R-50.

Figure 51. A single-family dwelling destroyed by Helene and major erosion (condition IV) on northern Longboat Key, near R-50.

Sarasota County

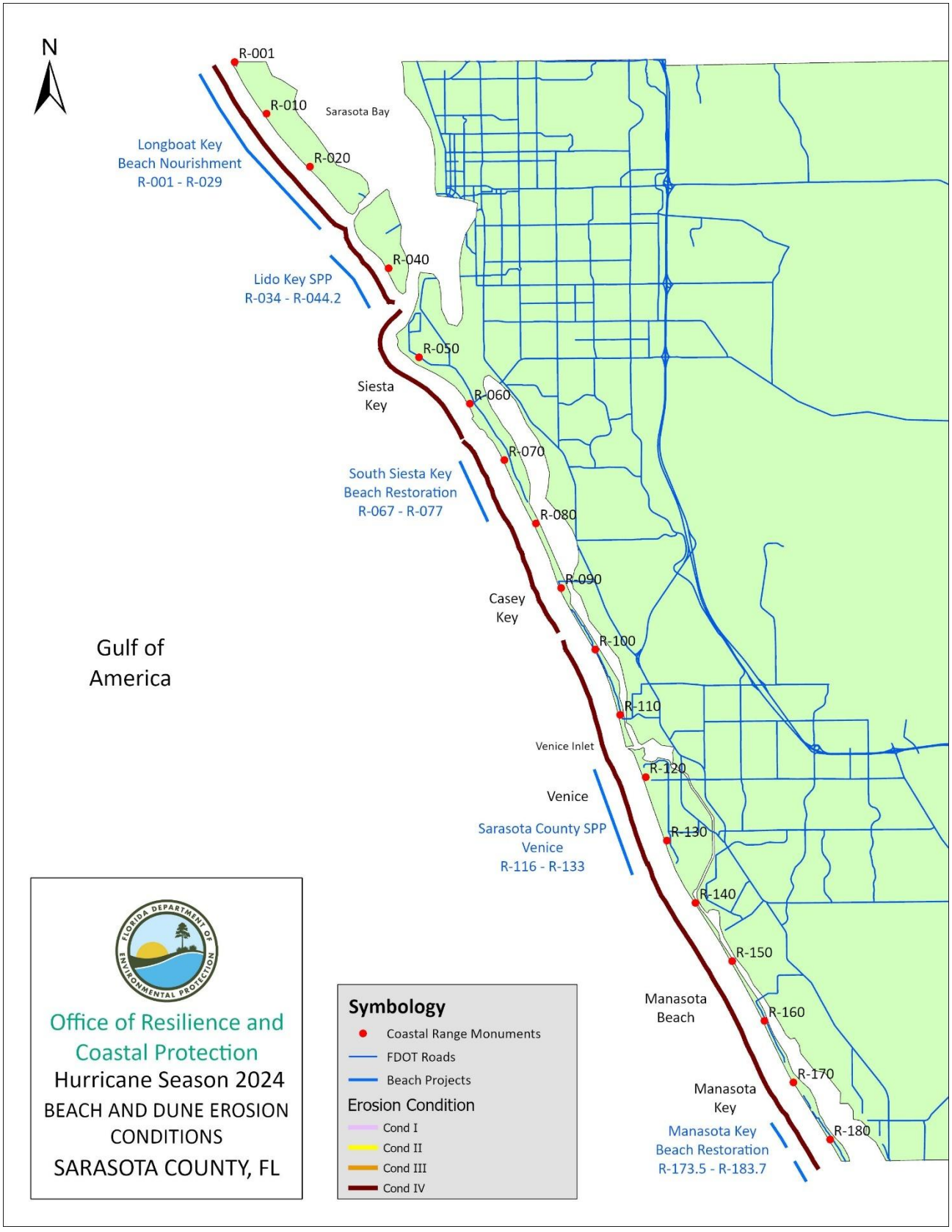

Figure 52. Sarasota County Beach and Dune Erosion Conditions from Hurricanes Helene and Milton.

Sarasota County

Sarasota County is located on Florida's southwestern coast fronting the Gulf of America (**Figure 52**) and has 34.7 miles of beaches extending southward from Manatee County to Charlotte County. The coast of Sarasota County includes the southern half of Longboat Key, Lido Key, Siesta Key, Casey Key, a mainland segment along Venice, and a northern segment of Manasota Key. Sarasota County has three inlets: New Pass between Longboat Key and Lido Key, Big Sarasota Pass between Lido Key and Siesta Key, and Venice Inlet between Casey Key and the City of Venice. Coastal Sarasota County includes the following beach communities: Town of Longboat Key, Lido Key within the City of Sarasota, and City of Venice.

Storm Effects and Erosion Conditions

Hurricane Milton made landfall on Wednesday, October 9th at 8:30 p.m. EDT, with the geographic center of the eye crossing Siesta Key in Sarasota County. Sarasota County sustained the greatest impacts from Hurricane Milton on the coast of Florida as Milton caused the greatest damages from Anna Maria Island in Manatee County and southward to Casey Key.

The entire 34.7 miles of beaches (R-1 – R-183), including Longboat Key, Lido Key, Siesta Key, Casey Key, Venice Beach and Manasota Key experienced major beach and dune erosion (condition IV) due to both Hurricane Helene and Hurricane Milton. Hurricane Helene created most of the storm surge flooding and overwash sand in Sarasota County while passing offshore before making landfall in north Florida's Big Bend coast. In contrast, two weeks later Hurricane Milton came ashore as a Category 3 major hurricane and made landfall at Siesta Key causing erosion, flooding and wind damage. Helene caused the beach to become narrower, losing 20 to 50 feet of width and the storm surge pushed the frontal beach landward to the top portion of the dune crest into upland property yards, homes/buildings, structures and roads. In most cases there was between 2 to 6 feet of sand on top of existing elevations at the dune crest zone particularly on Casey Key and Manasota Key.

Longboat Key had much of its beach sand shifted or misplaced due to the three hurricanes of 2024 (Debby, Helene and Milton), with Hurricane Helene causing most of the erosion that accounted for approximately 80 percent or more of the beach erosion since 2021. The dunes on Longboat Key were stripped of vegetation due to the storm surge from Hurricane Helene, see **Figure 32**. The Post-Helene

and Milton Engineering Report (Foth | Olsen, 2024) that was prepared for the Town of Longboat Key documenting the sand losses and damages on the Key.

Midnight Pass opened for the first time since 1983 due to Helene and Milton. Helene initially breached the barrier at the inlet's old location and this breach nearly closed as sand filled in the breach. Two weeks later, Milton reopened the breach making it significantly large at approximately 131 feet wide and 12 feet deep **(Figures 66** through **69**). As of this publication, the breach has continued to develop into an inlet showing initial signs of hydraulic and geographic stability.

See the Beach and Dune Condition Report with photos taken by the Sarasota County Planning and Development/Environmental Protection Division staff of the erosion conditions following Hurricanes Helene.

Figure 53. Major beach and dune erosion (condition IV) following Helene and Milton on Longboat Key (R-2 to R-3).

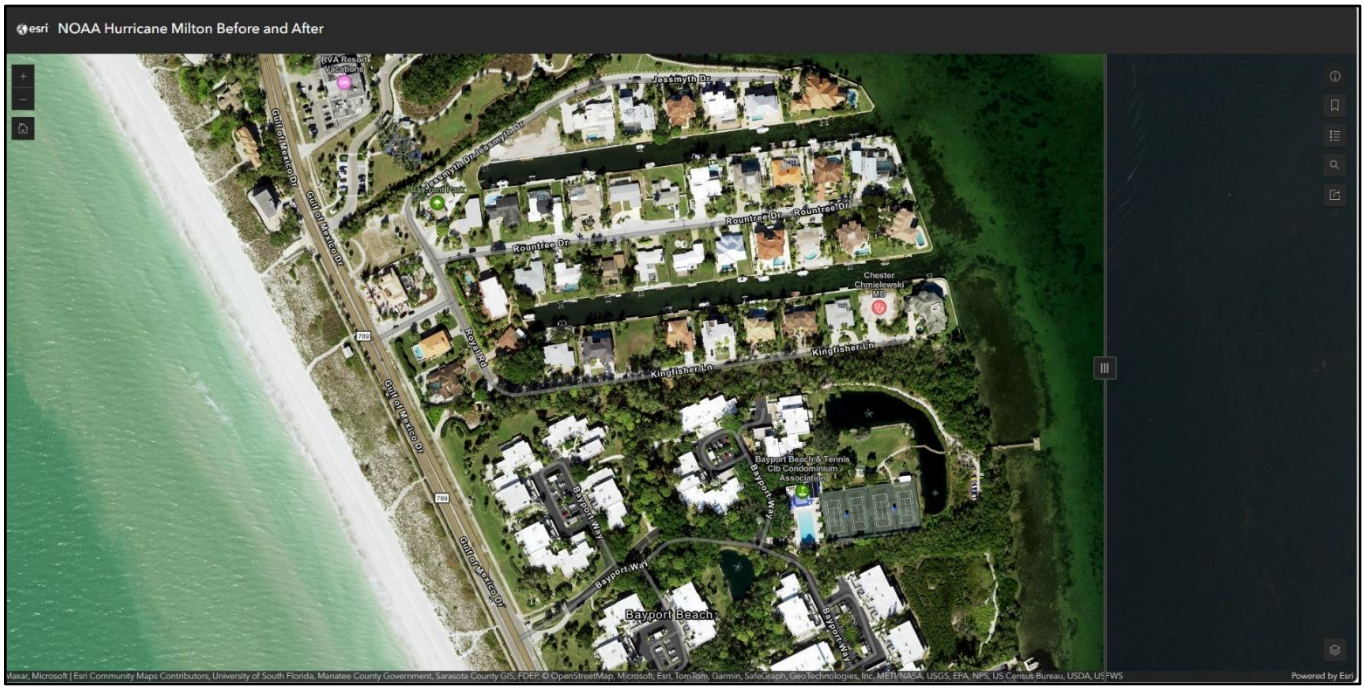

Figure 548. Healthy beach conditions in 2023 before Hurricanes Helene and Milton on Longboat Key near the Sarasota County line between R-2 to R-3 (NOAA).

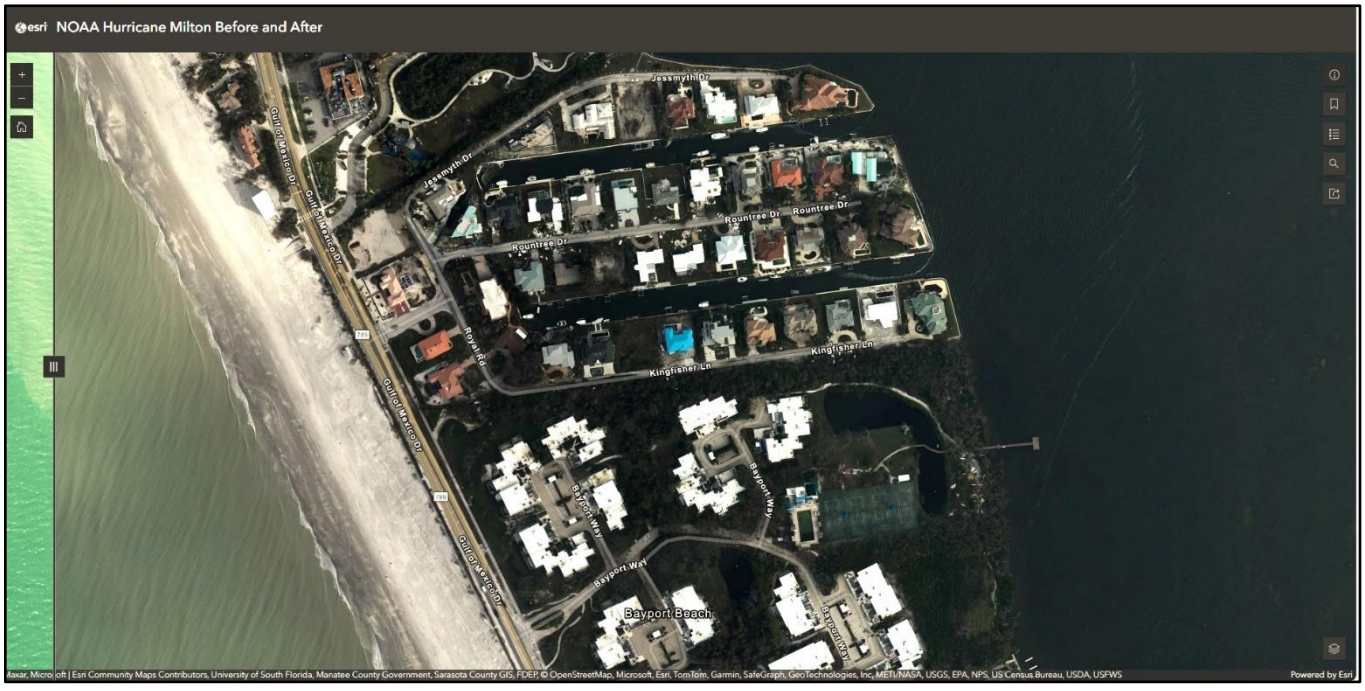

Figure 55. Major beach and dune erosion (condition IV) following Helene and Milton on Longboat Key between R-2 to R-3 (NOAA).

Figure 569. High water mark above a garage window base on home near St. Armands Circle off North Boulevard of the Presidents, Lido Key.

Figure 5710. Major damage to a Lido Key hotel from Helene's storm surge and overwash deposit of approximately three to four feet of beach sand near R-40.

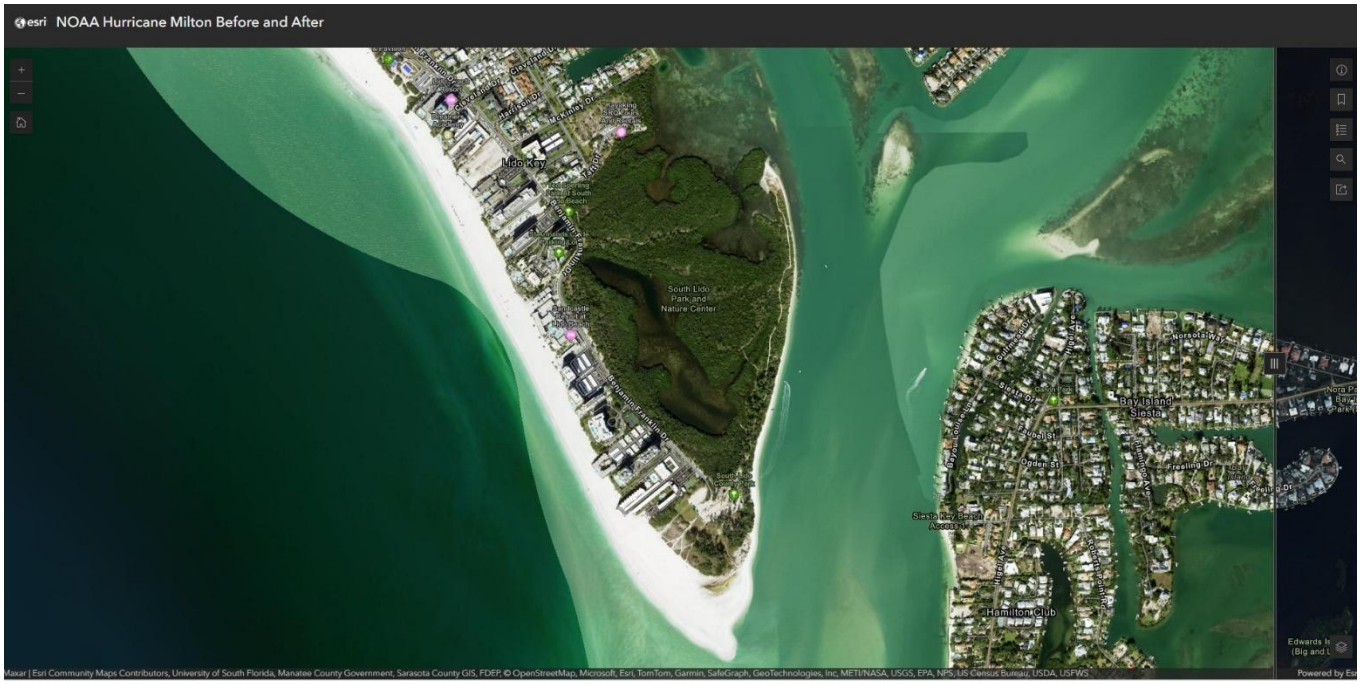

Figure 58. Healthy beach conditions on Lido Key before Hurricanes Helene and Milton in 2023 near R-40 to R-44 (NOAA).

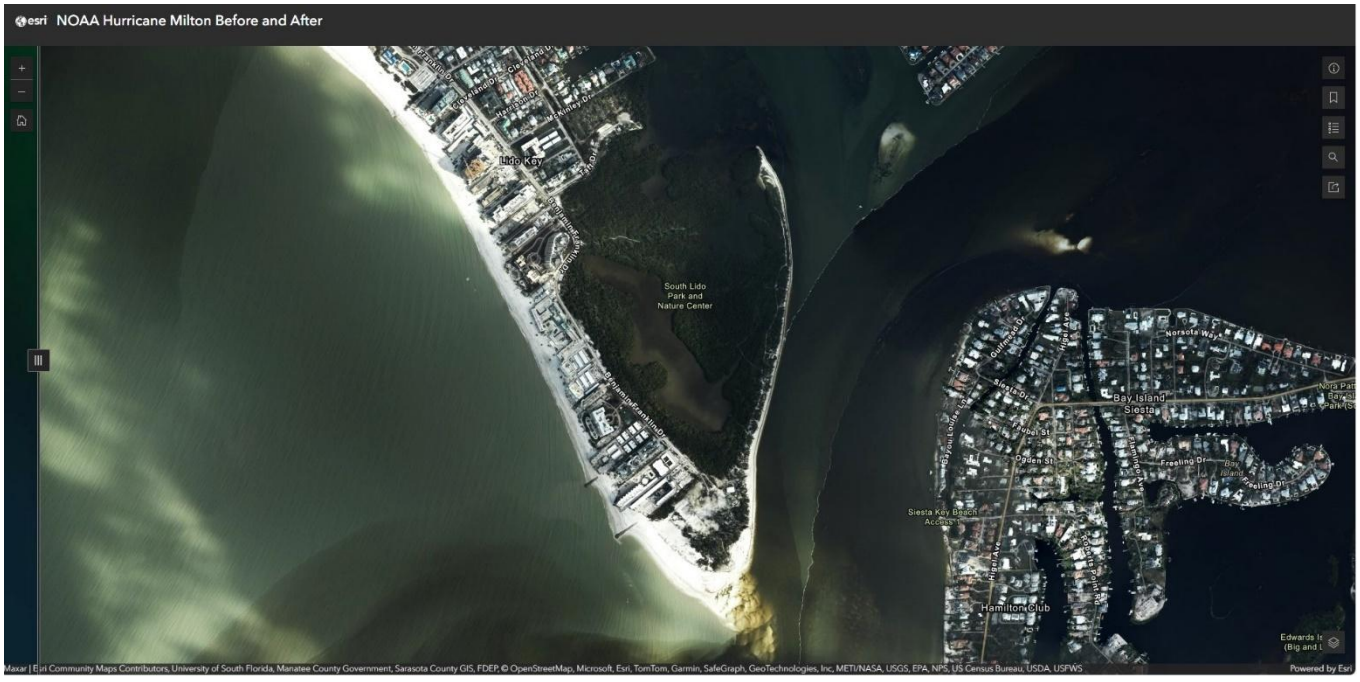

Figure 59. Eroded beach conditions on Lido Key after Hurricanes Helene and Milton in October 2024 near R-40 to R-44 (NOAA).

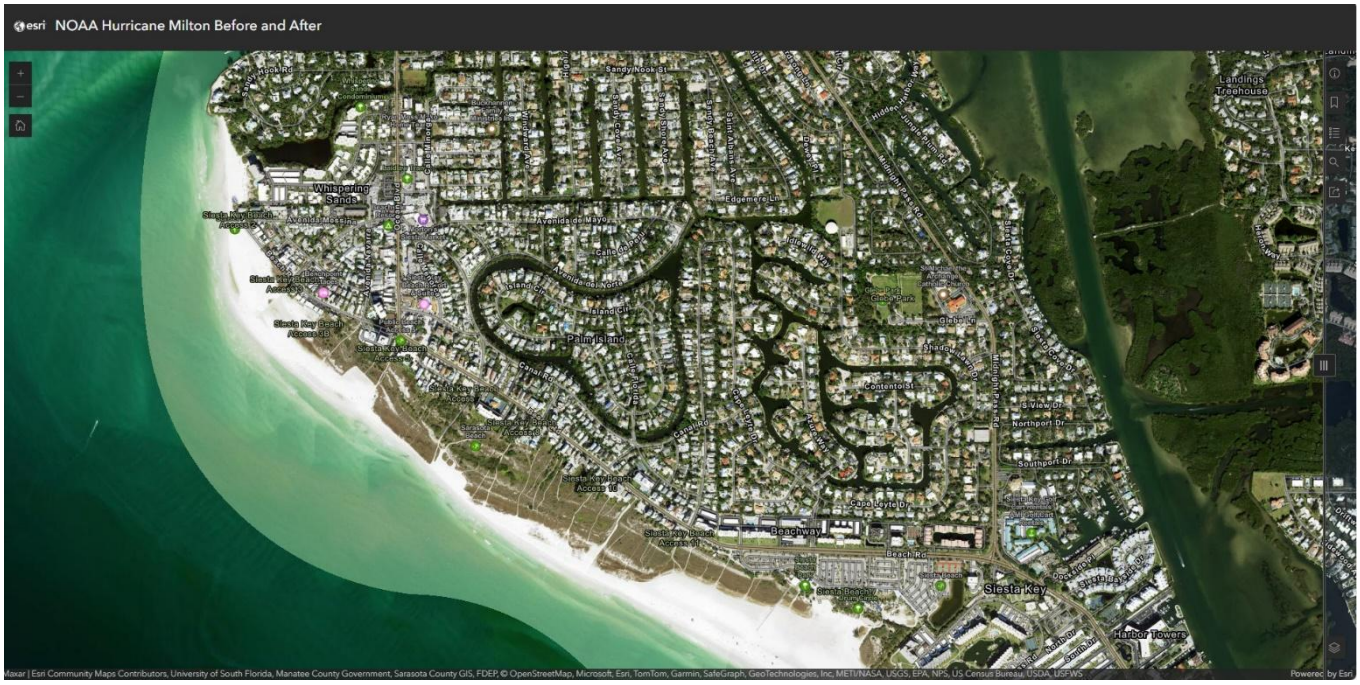

Figure 6011. Healthy beach conditions on northern Siesta Key before Hurricanes Helene and Milton in 2023 near R-45 to R-54 (NOAA).

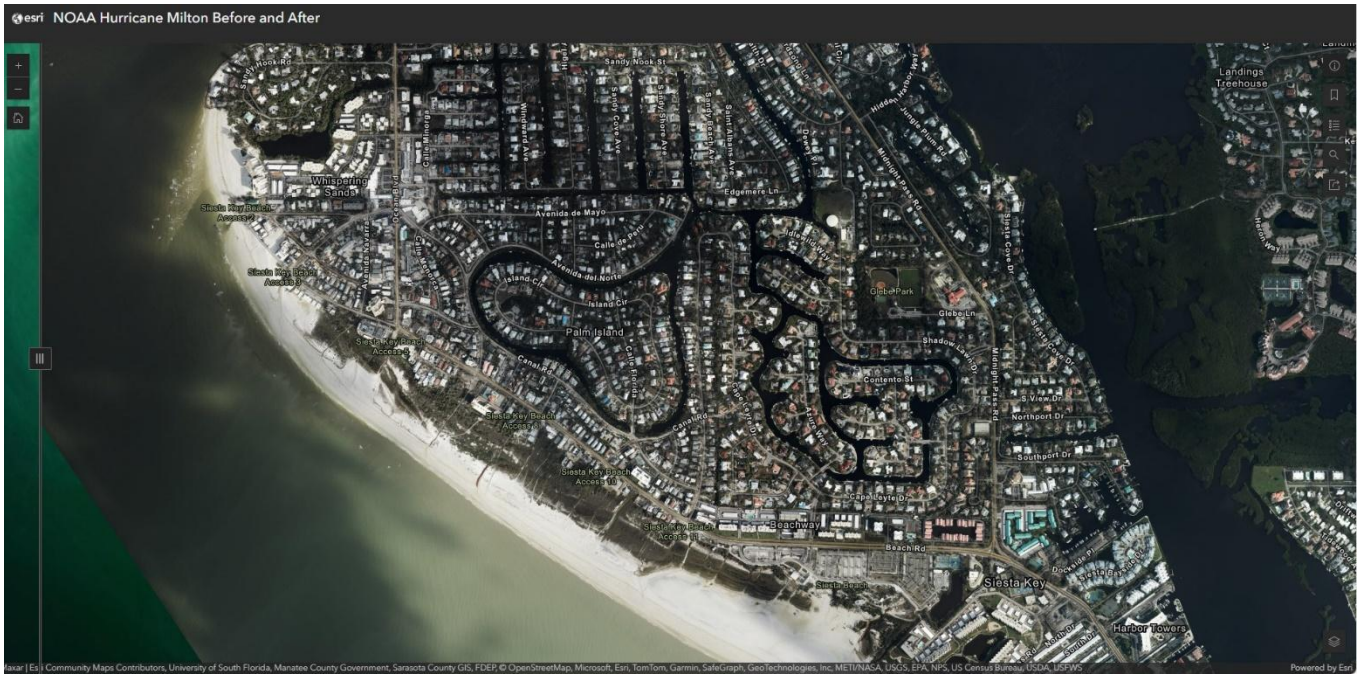

Figure 6112. Eroded beach conditions on northern Siesta Key after Hurricanes Helene and Milton in October 2024 near R-45 to R-54 (NOAA).

Figure 62. Major erosion (condition IV) with an escarpment at +8 to +9 feet on Siesta Key at Point of Rocks near R-62.

Figure 63. Storm surge damages to home and yard from Helene and Milton on Siesta Key near R-67. Note: Mercedes convertible buried in 3 to 4 feet of overwash sand.

Figure 64. Yard, car and road sanded over due to Helene's overwash on Siesta Key near R-70.

Figure 65. Single-family dwelling with ground floor damage on Siesta Key at Turtle Beach north of Midnight Pass near R-77.

Figure 66. Breach of the barrier island near R-78 due to Helene at the site of Midnight Pass which has been closed since 1983.

Figure 67. Enlarged breach near R-78 at Midnight Pass due to Milton. Photo taken on October 11, 2024.

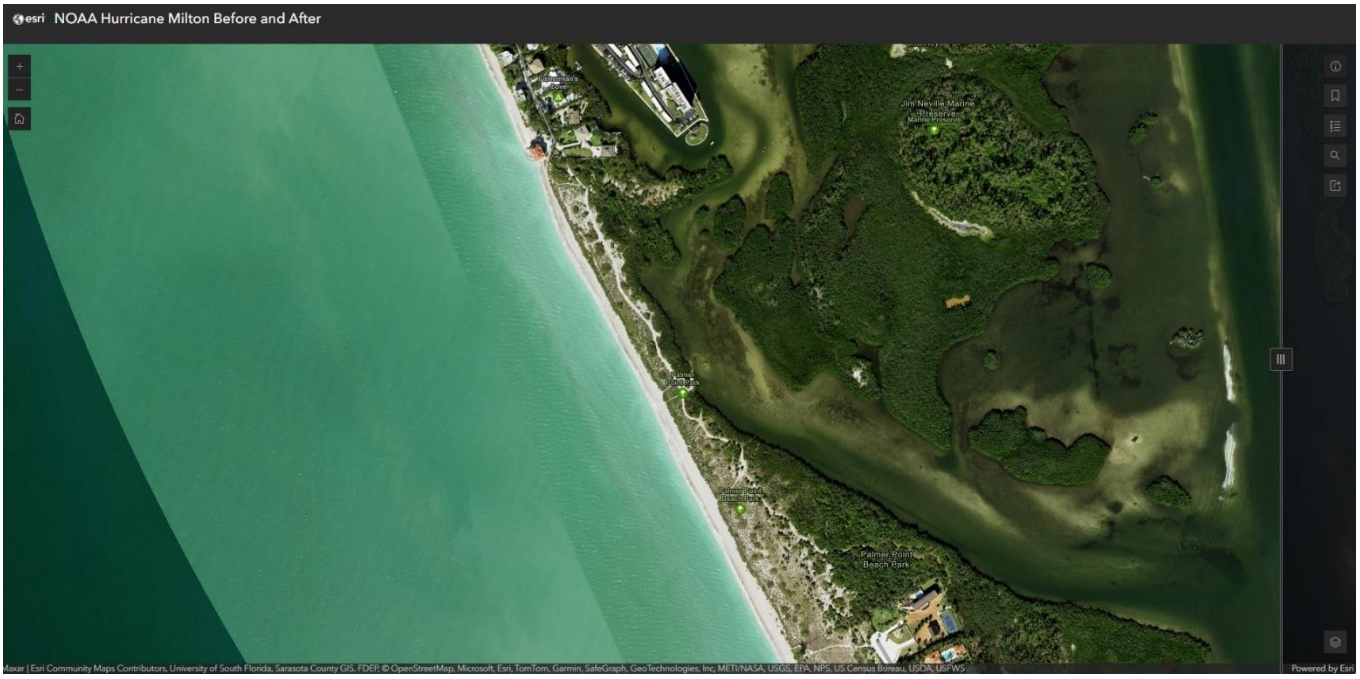

Figure 68. Site of the historic location of Midnight Pass near R-78 before Hurricane Helene and Milton (NOAA, January 2023).

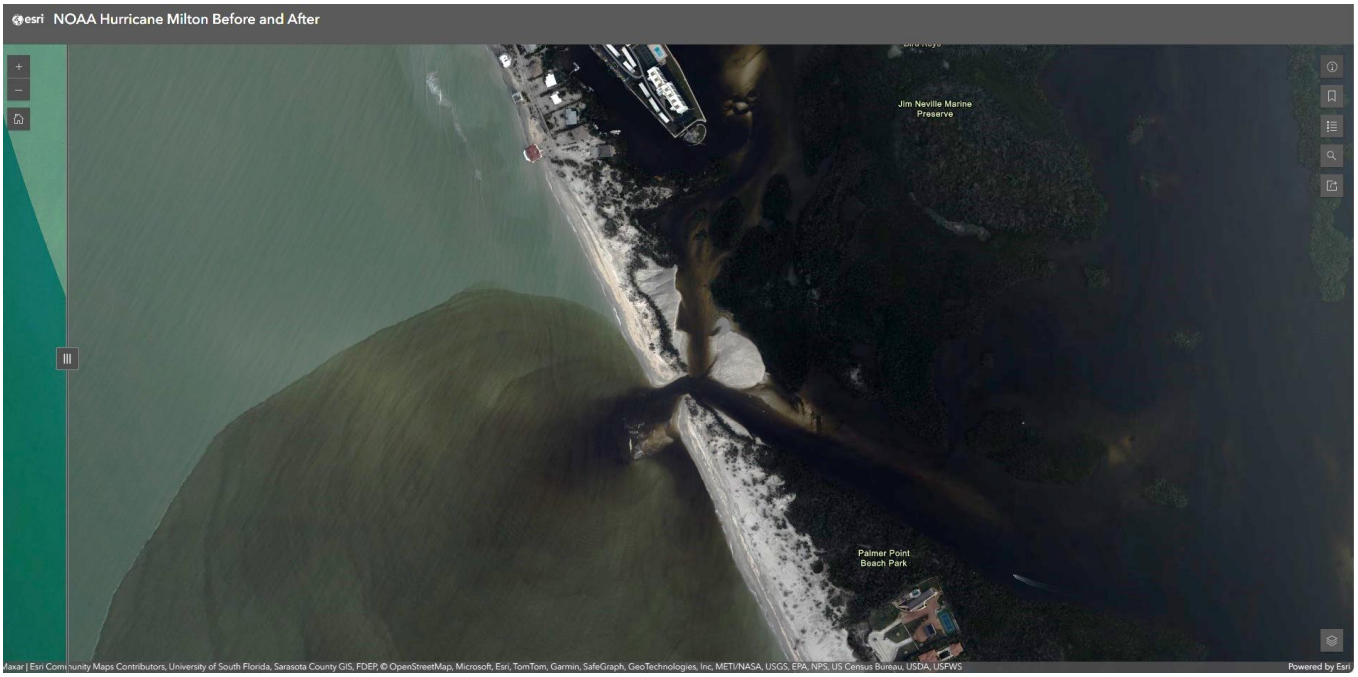

Figure 69. Breach at the historic site of Midnight Pass near R-78 after Hurricanes Helene and Milton (NOAA, October 2024).

Figure 70. Storm surge overwash impacts including a ruptured gas line on Casey Key near R-87.

Figure 71. Approximately 2 feet of sand overwash covering concrete table leg and impacting buildings due to Helene's storm surge at Venice Beach near R-116.

Figure 72. Major beach and dune erosion (condition IV) and storm surge overwash following Helene and Milton on Venice Beach near R-117.

Figure 73. Major beach and dune erosion (condition IV) due to Helene's storm surge with approximately 4 feet of overwash sand on the dune crest at Venice Beach near R-126.

Figure 74. Mailbox post buried Helene's overwash at Venice Beach near R-130.

Figure 75. Major beach and dune erosion (condition IV) and major road damage at Caspesan Beach near R-136.

Figure 7613. Major beach and dune erosion (condition IV) due to Helene on Manasota Key near R-173.

Figure 77. High water mark on garage door on Manasota Key (R-173).

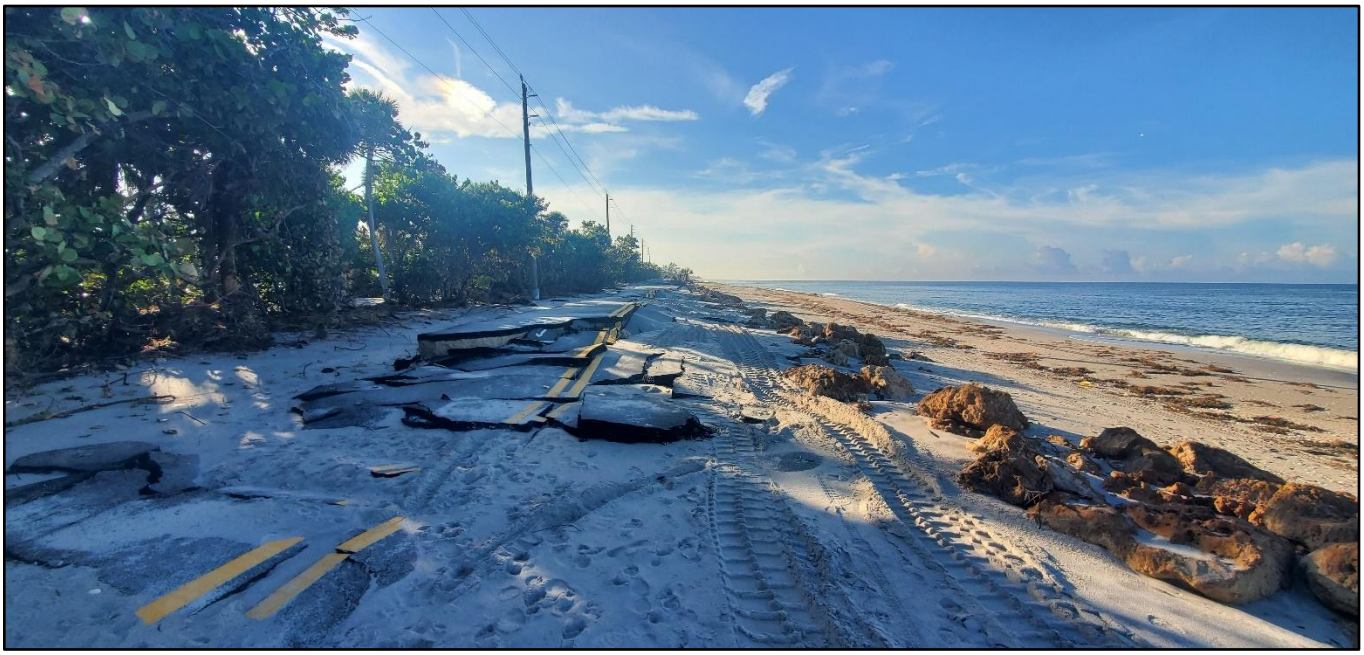

Figure 78. Major beach and dune erosion (condition IV) and major road damage at Blind Pass County Park near R-174.5.

Figure 79. Major beach and dune erosion (condition IV) and major road damage at Blind Pass County Park near R-176.

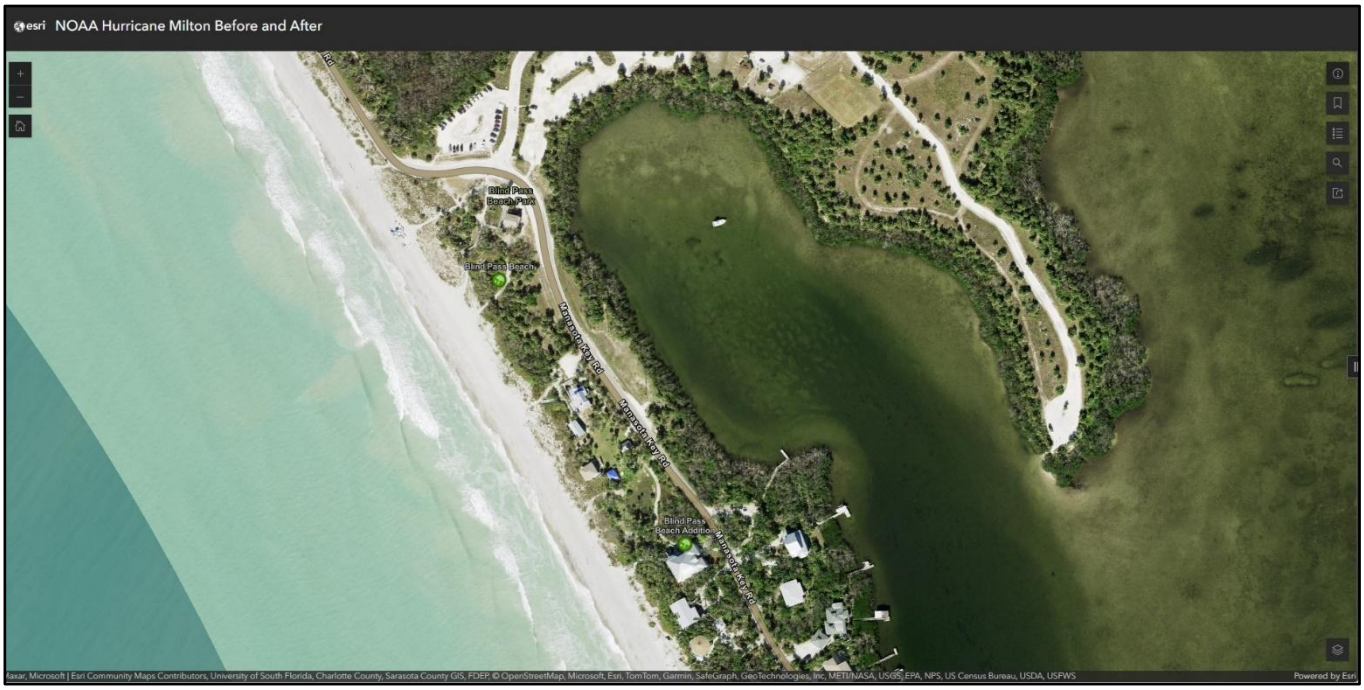

Figure 8014. Blind Pass County Park in 2023 before Helene and Milton near R-177 (NOAA).

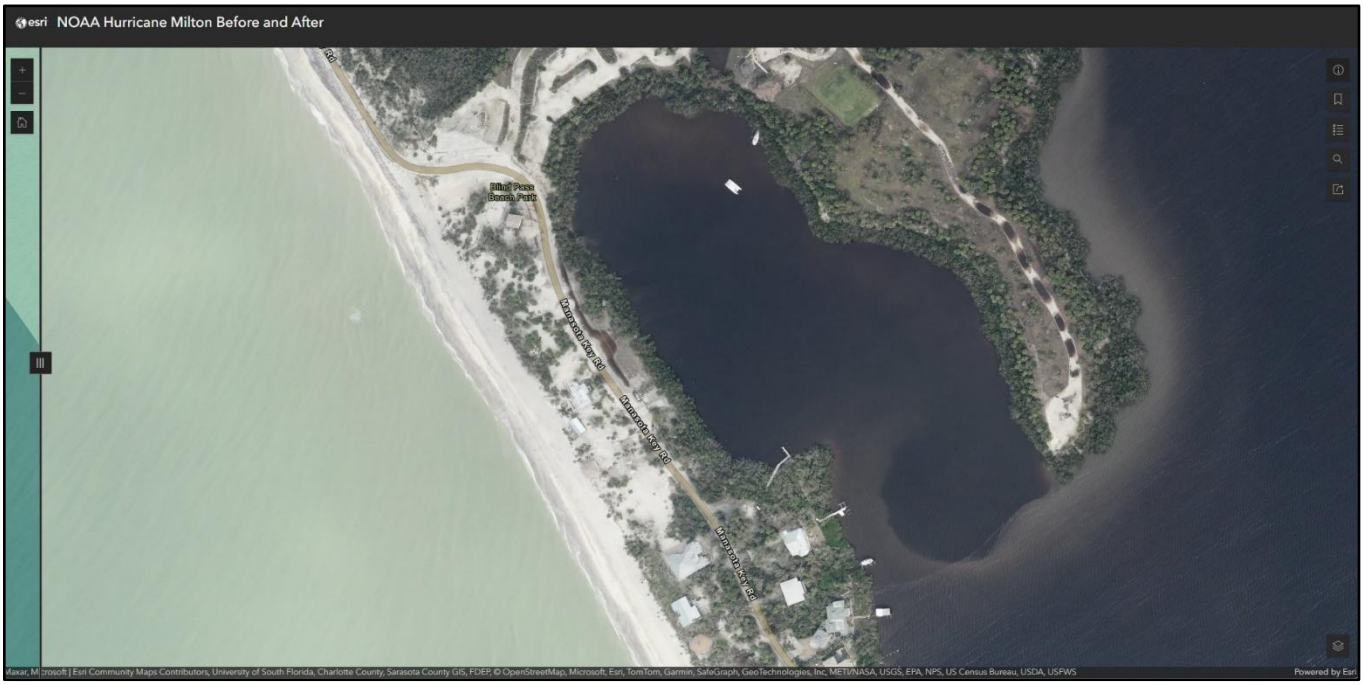

Figure 81. Blind Pass County Park after Helene and Milton near R-177 (NOAA, October 2024).

Figure 82. Flooding on Manasota Key Road from Helene near R-180.

Storm Damage

Coastal communities in Sarasota County sustained major structural damage due to storm surge, high wind and waves from both Hurricanes Helene and Milton. Helene and Milton caused major structural damage to 226 major structures within the Coastal Building Zone of Sarasota County that included 143 single-family dwellings, 35 multifamily dwellings and 48 other major structures. In addition, numerous structures within the Coastal Building Zone sustained nonstructural flooding damage and sand overwash on Siesta Key, Casey Key, Venice Beach and Manasota Key.

Major road damage was sustained on Siesta Key with approximately 300 feet of damage between R-46 and R-47 on Casey Key with approximately 2,772 feet of damage between R-84.5 and R-88, and on Manasota Key with approximately 1,800 feet of damage between R-175 and R-176. It should be noted that there were many additional locations with road footage that were covered by 2 to 5 feet of sand in various locations on Siesta Key, Casey Key and Manasota Key. Major damage also occurred to the Venice Inlet jetties. **Figures 98 and 99** show damages to the south jetty. Two commercial buildings, the eatery at North Jetty Beach Park and the eatery at Humphris Park were destroyed (**Figures 95 and 97**). Total 19,346 feet (3.7 miles) of major armoring damages of seawalls and revetment was sustained along Casey Key, Venice Inlet, and Manasota Key. Engineered structures on Longboat Key experienced damage with two panels being lost from the permeable adjustable groins (PAG) near R-13 and T Head groins with rock displacement near Longboat Pass.

Figure 83. Single-family dwelling damaged by Helene's storm surge on Longboat Key near R-10.

Figure 84. Major structural damage to single-family dwelling due to the storm surges of Helene and Milton on Siesta Key near R-67.

Figure 85. Major damage to rock revetment (level III) and to single-family dwelling on Siesta Key near R-67.

Figure 86. Damaged and sanded beach cabanas impacted by Helene's storm surge at Turtle Beach on Siesta Key near R-71.

Figure 87. Dwelling destroyed by Helene at Turtle Beach on the bayside of Siesta Key near R-76.

Figure 88. Major damage to single-family dwelling by Helene at Turtle Beach on Siesta Key near R-77.

Figure 89. Major road and revetment damages from Helene's storm surge on Casey Key near R-85.

Figure 90. Single-family home substantially destroyed on Casey Key near R-87.

Figure 91. Multi-family dwelling destroyed on Casey Key near R-90.

Figure 92. Single-family dwelling destroyed and a pool filled with sand by Helene on Casey Key near R-91.

Figure 93. Single-family dwelling with major ground floor damage by Helene on Casey Key near R-92.

Figure 94. Single-family dwelling with major first floor damage by Milton on Casey Key, near R-95.

Figure 95. The North Jetty Grille destroyed by Helene at Venice Inlet near R-114.

Figure 96. Major damage to the jetties of Venice Inlet by Helene and Milton.

Figure 97. Jetty Jacks eatery destroyed by Helene at the Venice Inlet south jetty, R-115.

Figure 98. Major damage to Humphris Park and Venice Inlet south jetty and bulkhead by Helene, R-115.

Figure 99. Major damage to Venice Inlet south jetty and bulkhead by Helene, R-115.

Figure 100. Storm surge damages to Venice Beach apartments near R-117.

Figure 101. Single-family dwelling and seawall destroyed by Helene on Manasota Key near R-171.

Figure 102. Single-family dwellings destroyed by Milton on Manasota Key near R-171.

Figure 103. Single-family dwelling destroyed by Helene on Manasota Key near R-172.

Figure 104. Single-family dwelling destroyed by Helene on Manasota Key near R-173.

Figure 105. Single-family dwelling destroyed and major revetment damage by Milton on Manasota Key, R-173.

Charlotte County

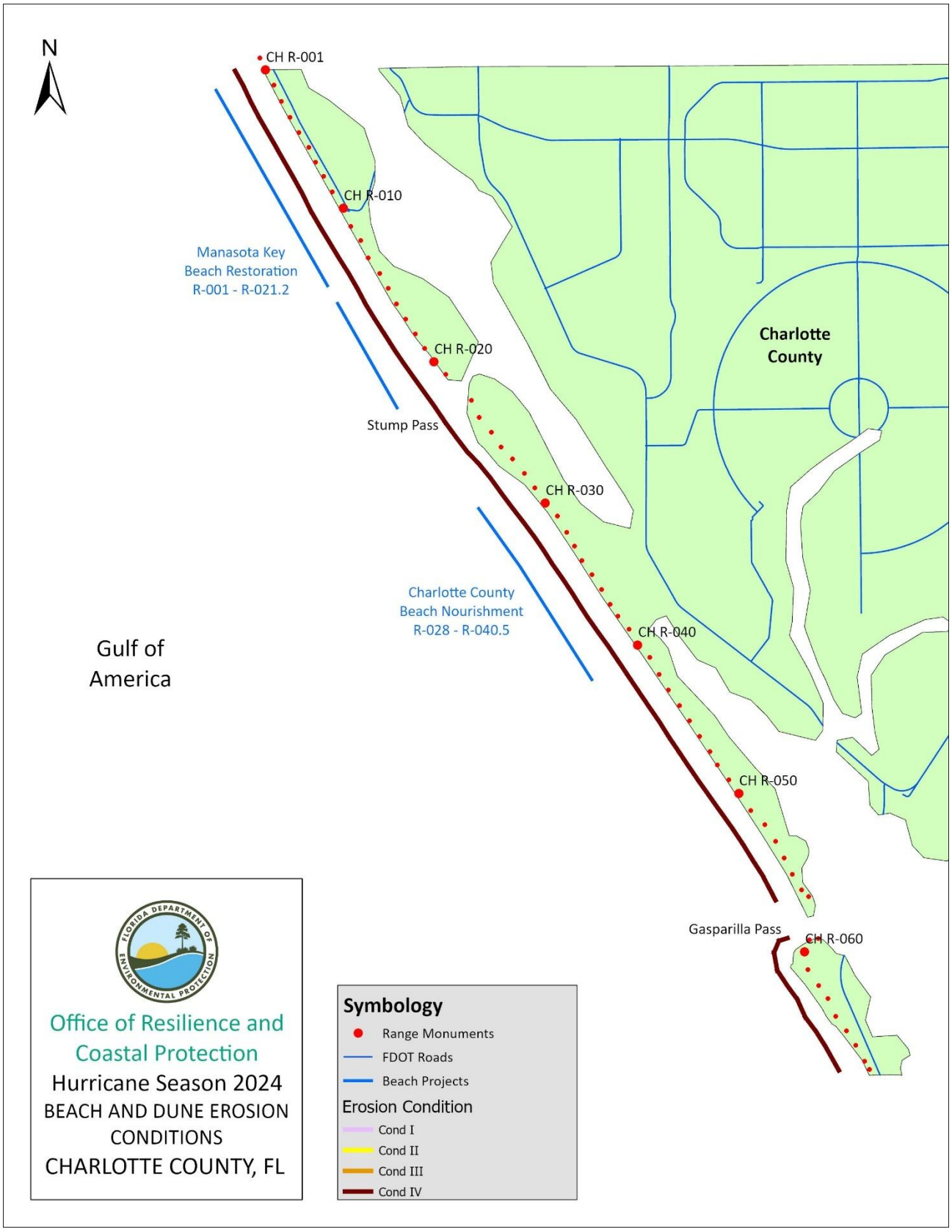

Figure 106. Charlotte County Beach and Dune Erosion Conditions from Hurricanes Helen and Milton.

Charlotte County

Charlotte County is located on Florida's southwestern coast fronting the Gulf of America (**Figure 106**) and has 12.2 miles of beaches extending southward from Sarasota County to Lee County. The coast of Charlotte County includes the southern half of Manasota Key, the Knight Island-Bocilla Island-Little Gasparilla Island barrier complex (also known as Don Pedro Island), and the northern mile and a half of Gasparilla Island. There are two natural inlets in Charlotte County: Stump Pass between Manasota Key and Knight Island, and Gasparilla Pass between Little Gasparilla Island and Gasparilla Island. Coastal Charlotte County includes the beach community of Englewood Beach and Stump Pass State Park.

Storm Effects and Erosion Conditions

The entire 12.2 miles of beaches (R-1 – R-68), starting at Manasota Key, Don Pedro Island, Knight Island, Little Gasparilla Island and Gasparilla Island experienced major beach and dune erosion (condition IV) due to both Hurricane Helene and Hurricane Milton. Helene created most of the storm surge flooding and overwash sand while passing offshore before making landfall in north Florida's Big Bend coast. Two weeks later Milton came ashore as a Category 3 major hurricane making landfall to the north at Siesta Key. The erosion from Helene and Milton caused the width of the beach to become narrower, losing 20 to 50 feet of width. The storm surge from both storms pushed the frontal beach landward to the top portion of the dune crest into upland properties, homes/buildings, structures and roads. In most cases there was between 2 to 6 feet of sand on top of existing elevations of the dune crest zone particularly on Manasota Key.

Milton caused a large breach of Manasota Key at the north end of Stump Pass State Park south of the bathhouse between R-16 and R-17. The breach area was subject to significant overwash from Helene, but did not breach until Milton made landfall on Siesta Key two weeks later (**Figure 110**).

Figure 107. Major beach erosion and rock revetment damage following Milton at Englewood Beach near R-2.

Figure 108. Major beach erosion and storm surge overwash following Milton at Englewood Beach near R-6.

Figure 109. Major beach erosion and sand overwash deposited in parking lot at Englewood Beach Park due to Helene and Milton near R-9.

Figure 110. A major breach on Manasota Key in Stump Pass State Park by Milton (R-17).

Figure 111. Storm surge discharge gullies at the Palm Island development on Don Pedro Island (R-26).

Figure 112. Storm surge discharge gullies on Don Pedro Island near R-34.

Figure 113. Major beach and dune erosion and storm surge overwash at Don Pedro Island State Park near R-43.

Storm Damage

Coastal Charlotte County sustained major structural damages due to the storm surge, waves and hurricane force winds of Helene and Milton. A total of 111 major structures sustained major structural damage within the Coastal Building Zone, including 88 single-family dwellings, eight multifamily dwellings and 15 other major structures. In addition to the major structures with major structural damage, most of the other structures within the Coastal Building Zone sustained nonstructural flooding damage due to storm surge from Helene.

Figure 114. Major beach erosion, rock revetment damage and single-family dwellings destroyed by Milton at Englewood Beach near R-2.

Figure 115. Multi-family dwellings damaged by Milton at Englewood Beach near R-4.

Figure 116. Multi-family dwellings damaged and destroyed by Milton at Englewood Beach near R-8.

Figure 117. Multifamily dwellings with major damages due to Milton at Englewood Beach near R-9.

Figure 118. Single-family dwellings destroyed on Little Gasparilla Island by Milton near R-49.

Figure 119. Single-family dwellings destroyed on Little Gasparilla Island by Milton near R-49.

Lee County

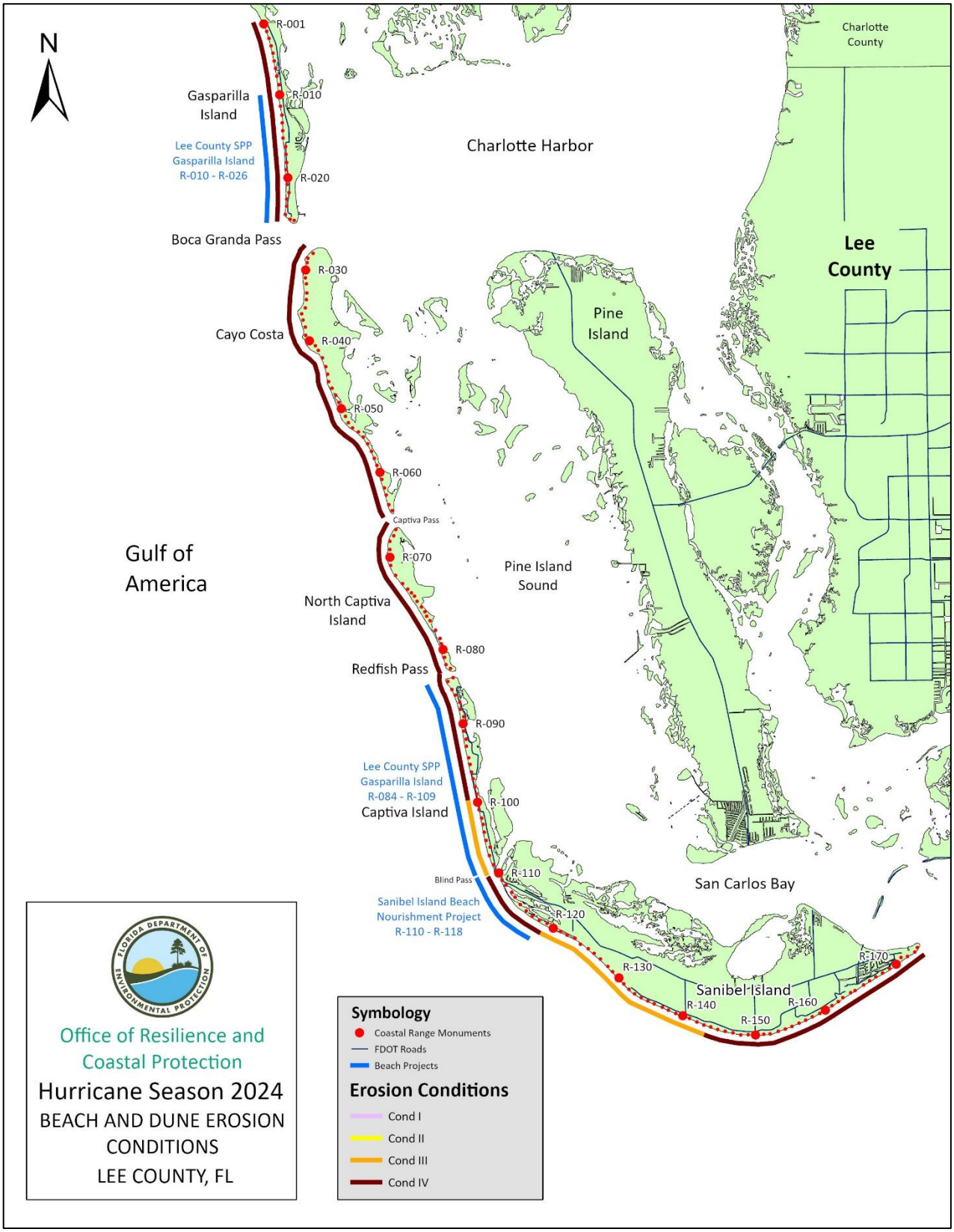

Figure 120. Lee County (North Section) Beach and Dune Erosion Conditions from Hurricanes Helene and Milton.

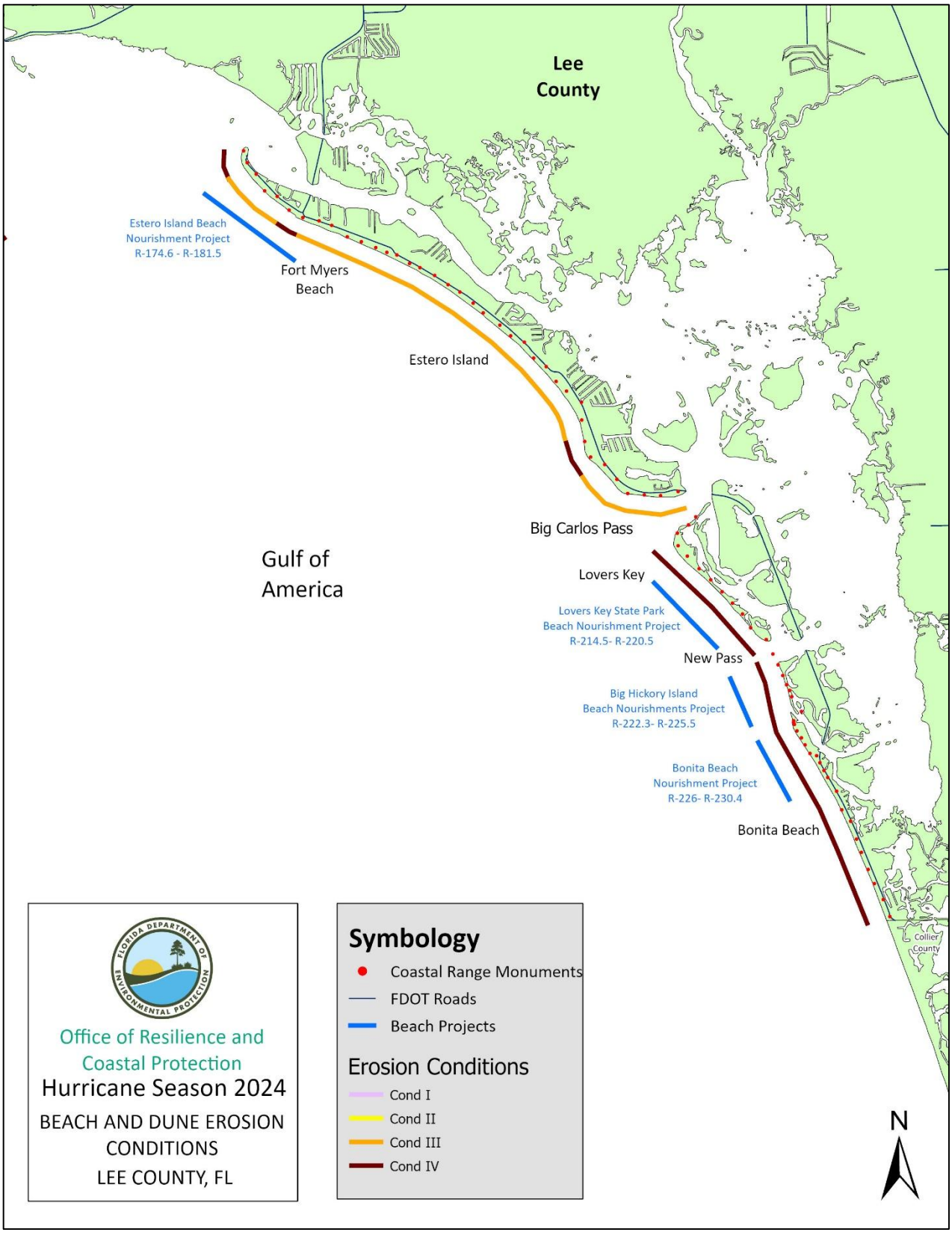

Figure 121. Lee County (South Section) Beach and Dune Erosion Conditions from Hurricanes Helene and Milton.

Lee County

Lee County is located on Florida's southwestern coast fronting the Gulf of America (**Figures 120** and **121**) and has 47.3 miles of beaches extending southward from Charlotte County to Collier County. The coast of Lee County includes most of Gasparilla Island, Cayo Costa Island, North Captiva Island, Captiva Island, Sanibel Island, Estero Island, Lovers Key, Big Hickory Island, and Bonita Beach on Little Hickory Island. Lee County has eight coastal inlets including Boca Grande Pass, Captiva Pass, Redfish Pass, Blind Pass, San Carlos Bay Entrance, Big Carlos Pass, New Pass, and Big Hickory Pass.

Storm Effects and Erosion Conditions

The entire 47.3 miles of beaches (R-1 – R-239), starting at Gasparilla Island, Cayo Costa, North Captiva Island, Captiva Island, Sanibel Island, Estero Island, Lover's Key State Park, Big Hickory Island, and Bonita Beach experienced moderate to major beach and dune erosion (conditions III and IV) due to both Hurricanes Helene and Milton. Helene caused most of the storm surge flooding and overwash sand in Lee County as it was passing off the coast of southwest Florida. Two weeks later, Milton came ashore as a category 3 major hurricane making landfall at Siesta Key two counties to the north. The erosion from Helene and Milton caused the width of the beach to become narrower, losing 20 to 30 feet of width. The storm surge from both storms pushed the frontal beach landward to the top portion of the dune crest into upland properties, homes/buildings, structures and roads. In most cases there was between 2 to 6 feet of sand on top of existing elevations of the dune crest zone.

See the Estero Island Hurricane Recovery – Post-Helene and Milton Engineering Assessment Summary Report (Coastal Engineering Consultants, 2024) prepared for the City of Ft. Myers Beach documenting the sand losses and damages on Estero Island.

Figure 122. Major beach and dune erosion (condition IV) due to Helene and Milton on Gasparilla Island near R-11.

Figure 123. Water hazards on the Gasparilla Golf Club Course due to Milton near R-12.

Figure 124. Major beach and dune erosion (condition IV) due to Helene and Milton on Gasparilla Island at R-13.

Figure 125. Helene's storm surge flooding at R-18, typical of the island-wide flooding of 1 to 2 feet on Gasparilla Island (Photo courtesy of a Gasparilla Island resident).

Figure 126. Interior of a house flooded by Helene at R-18 on Gasparilla Island (Photo courtesy of a Gasparilla Island resident).

Figure 127. Major beach and dune erosion and storm surge overwash due to Helene and Milton at Gasparilla Island State Park and at a historic church building at R-26.

Figure 128. Major beach and dune erosion (condition IV) and stranded boat on Cayo Costa near R-63.

Figure 129. Major beach and dune erosion (condition IV) and storm surge overwash on an airport runway on North Captiva Island near R-67.

Figure 130. A breach to North Captiva Island and substantial overwash due to Helene and Milton at R-79.

Figure 131. Substantial overwash and breaching of North Captiva Island due to Helene and Milton near R-79.

Figure 132. Major beach and dune erosion (condition IV) due to Helene and Milton at South Seas Plantation on Captiva Island near R-85.

Figure 133. Major beach and dune erosion (condition IV) due to Helene and Milton on Sanibel Island near R-153.

Figure 134. Storm surge discharge gullies following Milton on Sanibel Island near R-162.

Figure 135. Looking south at newly developed sandbar off the north end of Estero Island (Ft. Myers Beach) with major beach and dune erosion (condition IV) near R-175.

Figure 136. Major beach and dune erosion (condition IV) due to Helene and Milton at south end of Estero Island (Ft. Myers Beach) near R-210.

Figure 137. Nearshore storm-built sandbar with major beach and dune erosion (condition IV) due to Helene and Milton at Lover's Key State Park near R-213.

Figure 138. Major beach and dune erosion (condition IV) due to Helene and Milton at Lover's Key State Park near R-218.

Storm Damage

There were seven major structures assessed to have major structural damage from Hurricane Milton throughout Lee County within the Coastal Building Zone. This included six single-family dwellings and one multifamily dwelling. Also, approximately 700 feet of armoring damage was sustained along the coast on Gasparilla Island.

Figure 139. Major structural damage to the Gasparilla Inn Beach Club following Milton on Gasparilla Island near R-14.

Figure 140. Beach erosion and major seawall/revetment damage at the Boca Bay Pass Club following Helene and Milton near R-25.

Figure 141. Rock revetment damage at South Seas Plantation at Redfish Pass on Captiva Island near R-84.

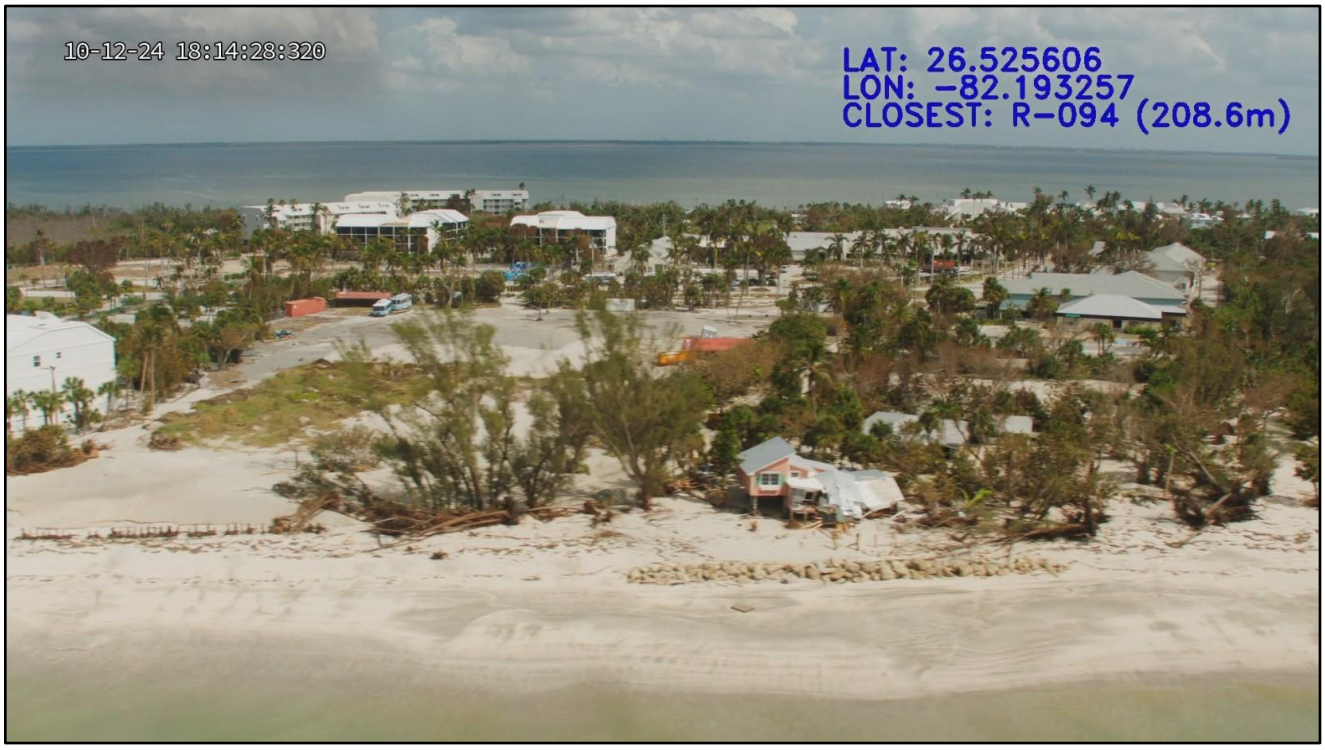

Figure 142. Single-family dwelling was destroyed at Captiva Island near R-94.

Figure 143. 500 feet of road damage along Captiva Drive on Captiva Island near R-96.

Figure 144. 120 feet of road damage on northern Sanibel Island near R-110.

Collier County

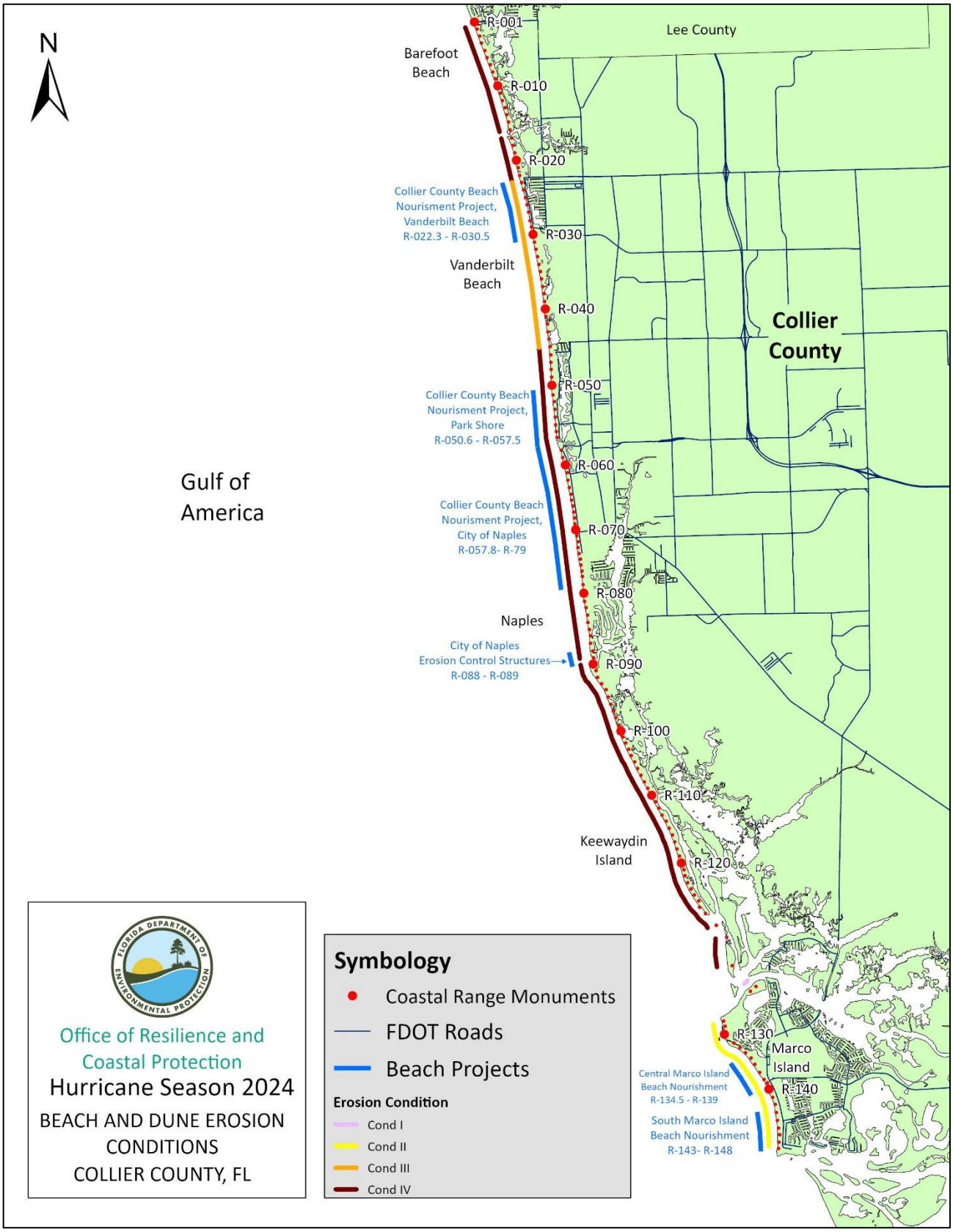

Figure 145. Collier County Beach and Dune Erosion Conditions from Hurricanes Helene and Milton.

Collier County

Collier County is located on Florida's southwestern coast fronting the Gulf of America (**Figure 145**) and has 34.1 miles of beaches extending southward from Lee County to the southwest tip of Cape Romano. Coastal Collier County includes the following beach communities and major parks: Lowdermilk Park, Barefoot Beach County Park, Delnor-Wiggins Pass State Park, Vanderbilt Beach, Park Shore, Naples, Keewaydin Island, Sea Oat Island, Isle of Capris, Hideaway Beach, Marco Island, Kice Island, Morgan Island, Cape Romano, Goodland, Weavers Station, Everglades City, Plantation Key, and Chokoloskee.

Storm Effects and Erosion Conditions

Collier County has 31.7 miles of beaches (R-1 to R-135), starting at Barefoot Beach, Vanderbilt Beach, Park Shore, Naples, Keewaydin Island and Marco Island, which sustained moderate to major beach and dune erosion (condition III and IV) due to both Hurricanes Helene and Milton. In addition, there was minor beach and dune erosion (condition II) for 2.4 miles at Resident's Beach on Marco Island (see **Table 1**). Helene caused storm surge flooding and overwash sand in Collier County while passing off the coast of southwest Florida. The conditions were exacerbated two weeks later when Hurricane Milton came ashore as a category 3 major hurricane three counties to the north. The erosion from Helene and Milton caused the width of the beach to become narrower, losing 20 to 30 feet of width. The storm surge from both storms pushed the frontal beach landward to the top portion of the dune crest into upland properties, homes/buildings, structures and roads. In most cases there was between 2 to 6 feet of sand on top of existing elevations of the dune crest zone.

Figure 146. Major beach and dune erosion (condition IV) from Helene and Milton's storm surge which filled the pool with overwash sand at Barefoot Beach near R-5.

Figure 147. Major beach and dune erosion (condition IV) and storm surge overwash due to Helene and Milton at Park Shore/Naples near R-50.

Figure 148. Major beach and dune erosion (condition IV) at Naples near R-87.

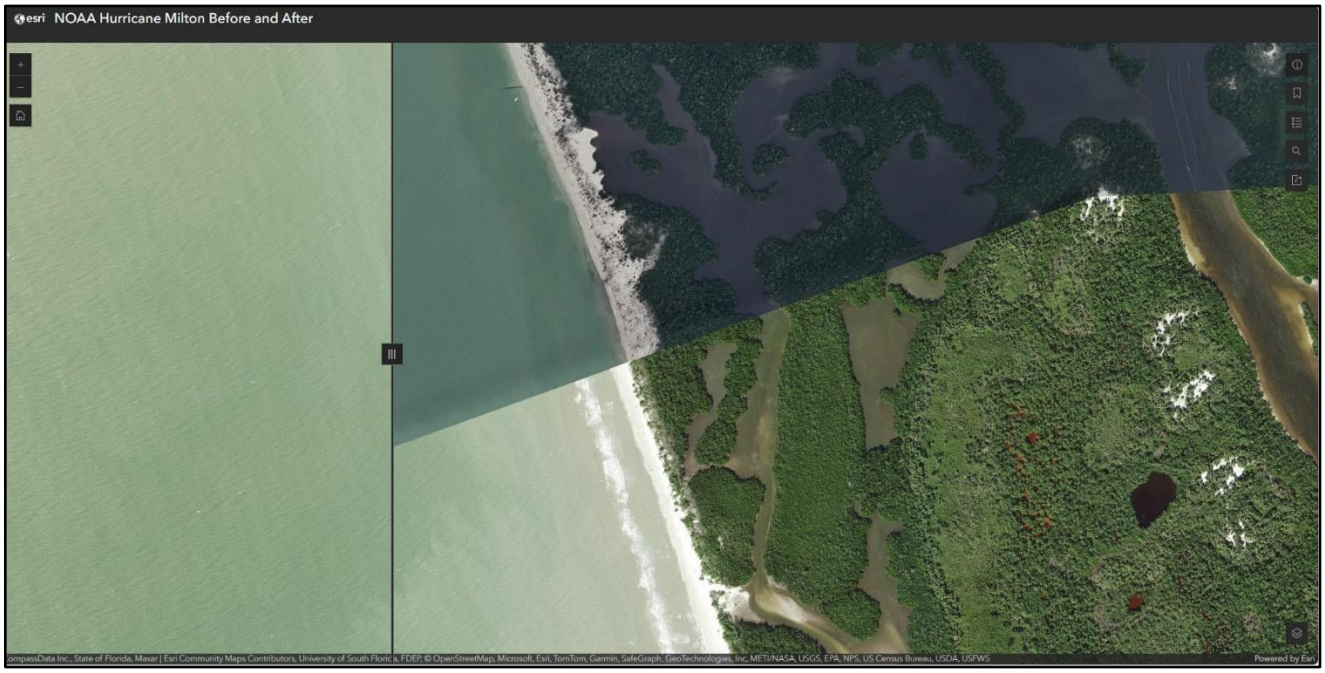

Figure 149. Major beach and dune erosion and overwash that completely rolled over the island landward along Keewaydin Island (split screen comparative aerials showing before conditions at bottom in 2023 and post Milton conditions at top near R-96).

Storm Damage

Collier County sustained only one major structural damage due to storm surge, high wind and waves. The major damages documented by DEP was one single-family dwellings and no multifamily dwellings or other major structures damages were documented. Aside from major structural damages, most of the major structures within the Coastal Building Zone sustained flooding damage.

References:

Coastal Engineering Consultants, 2024. *Estero Island Hurricane Recovery – Post-Helene and Milton Engineering Assessment Summary Report,* 10 p.

Foth Infrastructure & Environment, LLC | Olsen Associates, Inc.,2024. *Post-Hurricanes Helene & Milton FEMA Category G Design Analysis,* 33 p.

Pinellas County – Public Works, 2024. *Pre- and Post-Hurricanes Helene and Milton Photos of Beach and Dune Conditions Document,* 127 p.

Sarasota County – Planning and Development Services, 2024. *Post-Hurricane Helene Beach and Dune Condition Report for unincorporated coastal areas of Sarasota County, Florida,* 38 p

Appendix A

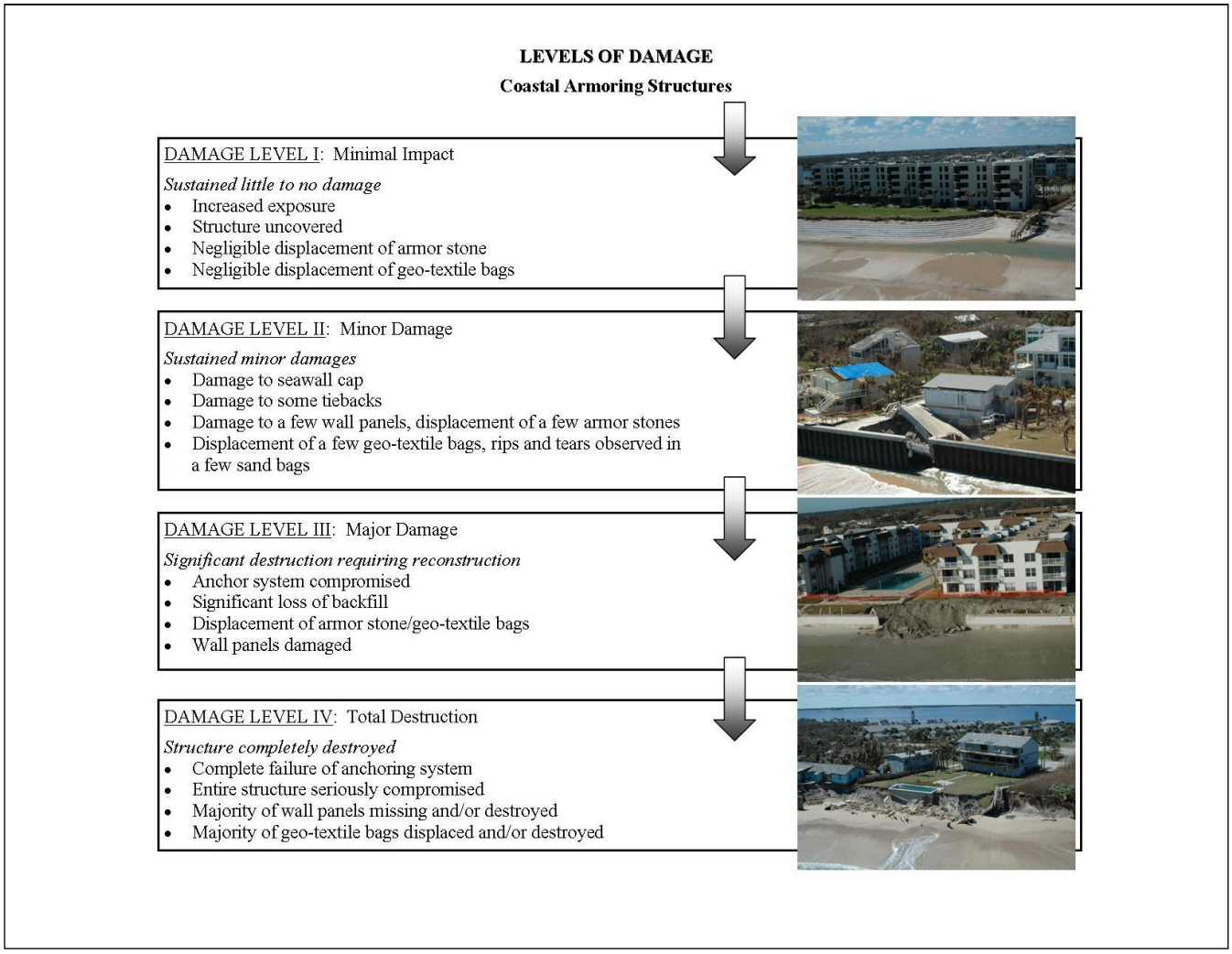

Figure 150. DEP's Coastal Engineering graphic describing the levels of damage (I – IV) to coastal armoring structures, including seawalls and revetments.