

*Hurricane Sally Post-Storm
Beach Conditions and Coastal Impact Report*

**Office of Resilience and Coastal Protection
Florida Department of Environmental Protection**

November 2020



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I. Introduction

The eye of Hurricane Sally made landfall Sept. 16, 2020, near Gulf Shores, Alabama, immediately west of the Alabama/Florida state line. At landfall, Sally was a strong Category 2 hurricane on the Saffir-Simpson hurricane intensity scale, with maximum sustained winds of 105 mph and a minimum central pressure of 965 mb (28.50 inches).

Hurricane Sally was the first hurricane to effect Pensacola, in west Florida, since hurricanes Ivan (2004) and Dennis (2005). Given that Sally's strongest winds, waves and storm surge were on the hurricane's east side, Florida's northwest coast was substantially affected. Beach erosion and coastal damage was the greatest along Escambia County, while Santa Rosa County eastward through Gulf County received the fringe effect of the hurricane. This report documents the post-storm beach conditions and coastal impact of Hurricane Sally in northwest Florida.

The Florida Department of Environmental Protection (DEP) developed this post-storm beach conditions and damage assessment report to quantify the damages caused by Hurricane Sally. This report provides an assessment of storm impact, beach and dune erosion and structural damages to the northwest coastal regions of Florida fronting the Gulf of Mexico. Although structural damage occurred inland, the damage assessment in this report specifically focuses on damage within the coastal building zone as defined in Chapter 161, Florida Statutes.

Following the impact of Hurricane Sally, three damage assessment teams were dispatched to the coastal areas affected by Sally. The damage assessment teams and their area of coverage were as follows –

- **Team 1:** Guy Weeks, Planning Manager and Jeohusua Lugo, Engineer – Escambia, Santa Rosa and Okaloosa counties
- **Team 2:** Shane Duinkerken, Surveyor and Chad Jones, Surveyor – Walton County
- **Team 3:** Ralph Clark, P.E., Coastal Engineer and Mike Manausa, Coastal Engineer – Bay and Gulf counties

In addition to the damage-assessment teams, Beaches Field Services staff conducted windshield surveys from Escambia to Gulf counties. Windshield surveys are as the term implies – quick, spot assessments of typical erosion hotspots or significant shoreline areas. They provided additional information throughout the affected area. Also, staff from the Beaches, Inlets and Ports and Beaches Funding Assistance programs conducted joint inspections with local government representatives and Federal Emergency Management Agency (FEMA) representatives at beach restoration and nourishment project

sites along northwest Florida. These joint inspections were to obtain initial sand loss assessments of engineered beaches, which may be eligible for FEMA funding assistance to replace those losses.

Additional data, information and assistance was provided to the damage-assessment teams by Escambia and Bay counties. Post-storm vertical aerial photography provided by the National Oceanic and Atmospheric Administration (NOAA) also supported the damage assessments for this report.

This report is a preliminary document and additional data and information will be added when available.

II. Hurricane Sally, Sept. 11-16, 2020

Hurricane Sally – the seventh hurricane of the 2020 hurricane season for the Atlantic Ocean, Caribbean Sea and Gulf of Mexico – spawned from a tropical system that formed near the Bahamas off southeast Florida. On Sept. 11, this system organized into the season’s 19th tropical depression. The depression moved ashore in Miami-Dade County, Florida, in the early morning of Saturday, Sept. 12, and continued to cross south Florida through the day. At 2 p.m. EDT, the depression reached tropical storm strength and was named Sally as it moved into the Gulf of Mexico near Naples.

Overnight and throughout the day Sunday, Sept. 13, Tropical Storm Sally slowly moved west northwestward in the Gulf of Mexico. Sally’s center remained northwest of the major convection with south and central Florida sustaining heavy rainfall, which led to local flooding. The middle to lower Florida Keys sustained between 10 and 12 inches of rain over 24 hours, with additional heavy rainfall along the southwest Florida coast from Naples to Clearwater. As wind shear over the northwestern quadrant of the storm weakened late in the day, Sally slowly became better organized and showed signs of strengthening.

On Monday morning Sept. 14, a NOAA Hurricane Hunter aircraft investigating Sally determined the system had strengthened into a hurricane with maximum sustained winds of 85 mph and an estimated minimum central pressure of 985 mb (29.09 inches). Sally did not move much through the day as a center reformation took place and late afternoon advisories indicated strengthening to a Category 2 hurricane on the Saffir-Simpson hurricane intensity scale with maximum sustained winds of 100 mph. Sally continued a slow west-northwesterly track at about 3 mph and the outer rain bands began impacting northwest Florida.

Throughout Tuesday Sept. 15, Sally meandered slowly toward the north central Gulf of Mexico with a somewhat weaker intensity as a Category 1 hurricane with maximum sustained winds of 80 mph. By

evening, the track had readjusted to north northeastward at 2 mph, showing the hurricane had made its anticipated northward turn.

Sally strengthened overnight, and early Wednesday Sept. 16, was again a Category 2 hurricane with winds of 105 mph. A wind gust of 98 mph was measured in the northern eyewall by a NOAA buoy located 50 miles southeast of Mobile. Hurricane-force winds started along the coast of Alabama and west Florida. A wind gust of 75 mph was measured at the Pensacola Naval Air Station. Wave heights peaked south of Mobile, Alabama at 26.9 feet.

On Sept. 16, at about 4:45 a.m. CDT, the eye of Hurricane Sally made landfall near Gulf Shores, Alabama, as a Category 2 hurricane with maximum sustained winds of 105 mph and a minimum central pressure of 965 mb (28.50 inches), see **Figure 1**. Following landfall, a wind gust of 99 mph was reported at Dauphin Island, Alabama, and a wind gust of 86 mph was observed at the Pensacola Naval Air Station. Sally continued to track north northeastward at a very slow 3 mph.

By noon on Sept. 16, the center of rapidly weakening Hurricane Sally moved over Escambia County, Florida. Storm tides from the Gulf of Mexico flowed through Pensacola Pass and caused substantial flooding of downtown Pensacola. A wind gust of 81 mph was measured at Tate High School near Pensacola. Through the afternoon, Sally moved across west Florida into southeastern Alabama, and was downgraded to a tropical storm with maximum sustained winds of 60 mph. Slow-moving Sally was a prodigious rain producer causing between 20 and 30 inches of rain in the Pensacola area. As Sally weakened to a depression and then to a remnant low pressure area over the next couple of days, it brought substantial rainfall and flooding in eastern Alabama, Georgia and the Carolinas. Wind gust data that is described above was available from reporting stations throughout northwest Florida and is illustrated in **Figure 2**.



Figure 1. Hurricane Sally track with landfall near Gulf Shores, Alabama (Source: CIMSS/University of Wisconsin-Madison).



Figure 2. Maps strategic wind data reports along the coast of northwest Florida by presenting peak wind gusts from selected weather monitoring stations.

Storm tide data in northwest Florida is available from NOAA recording tide gauges at Pensacola and from the U.S. Geological Survey (USGS) in Panama City Beach and East Pass at Destin. **Figure 3** shows a peak tide level from Hurricane Sally of +6.86 feet NAVD (North American Vertical Datum) and was measured at the Pensacola station by NOAA. The water level produced by Hurricane Sally at Pensacola is preliminarily the third-highest water level on record for the Pensacola location. The only higher water levels were 9.54 ft MHW (Mean High Water) in 2004 (Hurricane Ivan) and 7.42 ft. MHW in 1926 (the Miami Hurricane).

Figure 4 shows a tide level reaching a peak of +4.41 feet NAVD that was measured at East Pass, Destin, by USGS. **Figure 5** shows a tide level reaching a peak of +4.76 feet NAVD that was measured at Panama City Beach by NOAA. Wave data from the National Data Buoy Center (NDBC) buoy station 42012 – located 44 miles southeast of Mobile, Alabama offshore, – was available and recorded a maximum significant wave height of 26.9 feet at 1:40 a.m. CDT Sept. 16. A graph depicting the peak storm tide levels and wave height during Sally is presented in **Figure 6**.

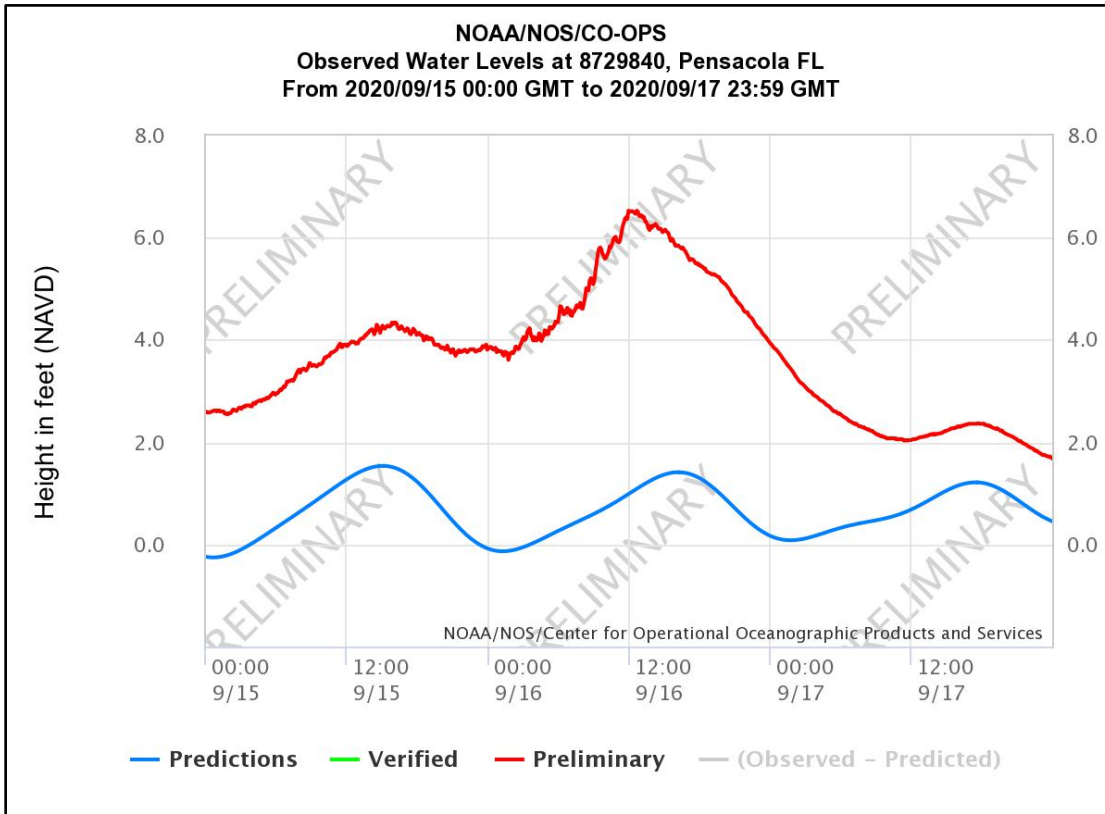


Figure 3. Measured storm tide levels at Pensacola during Hurricane Sally [Data from NOAA].

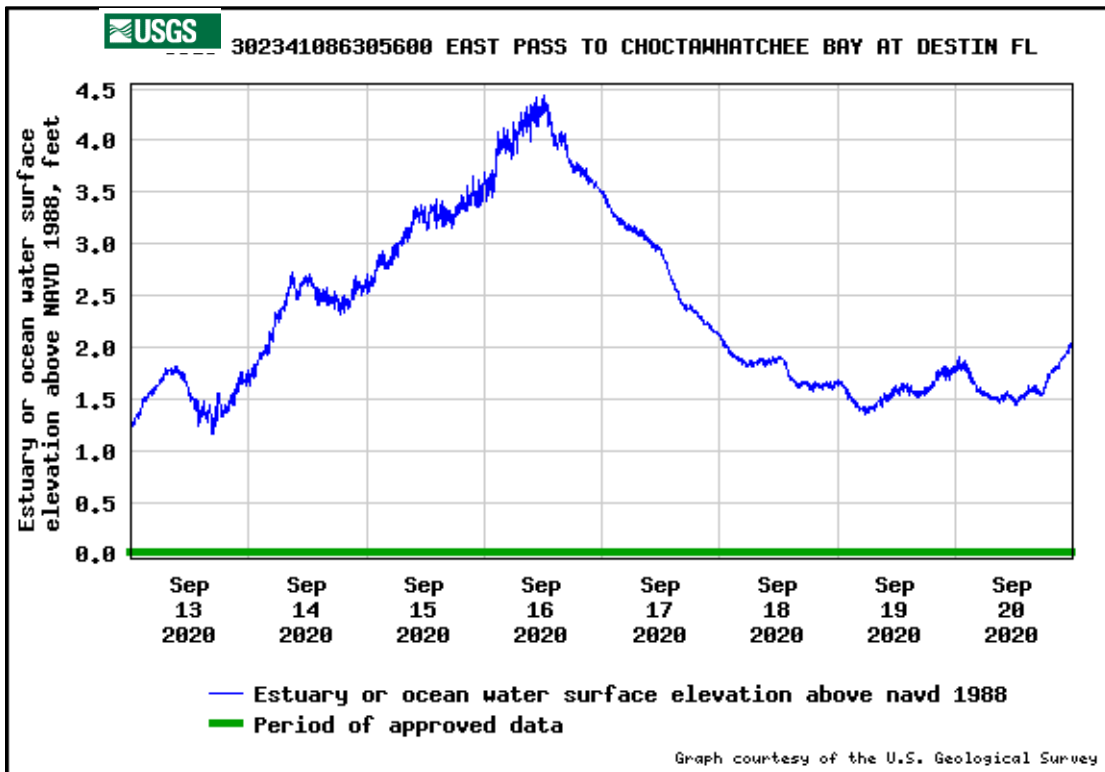


Figure 4. Measured storm tide levels at East Pass, Destin, during Hurricane Sally [Data from USGS].

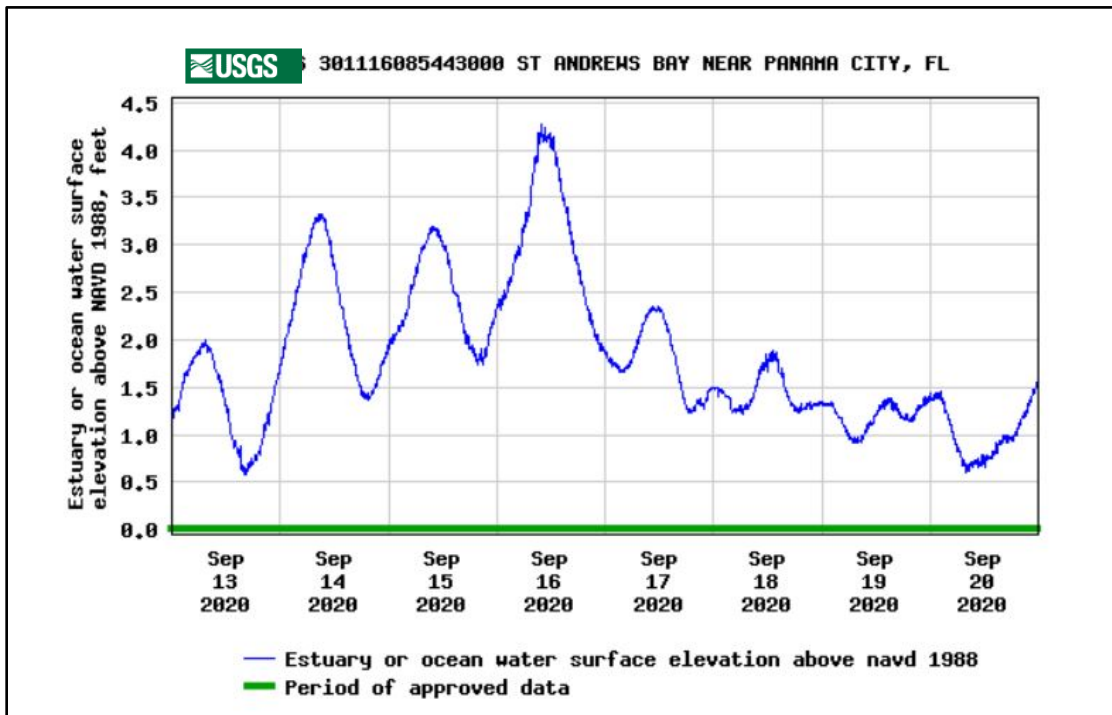


Figure 5. Measured storm tide levels at Panama City Beach during Hurricane Sally [Data from USGS].

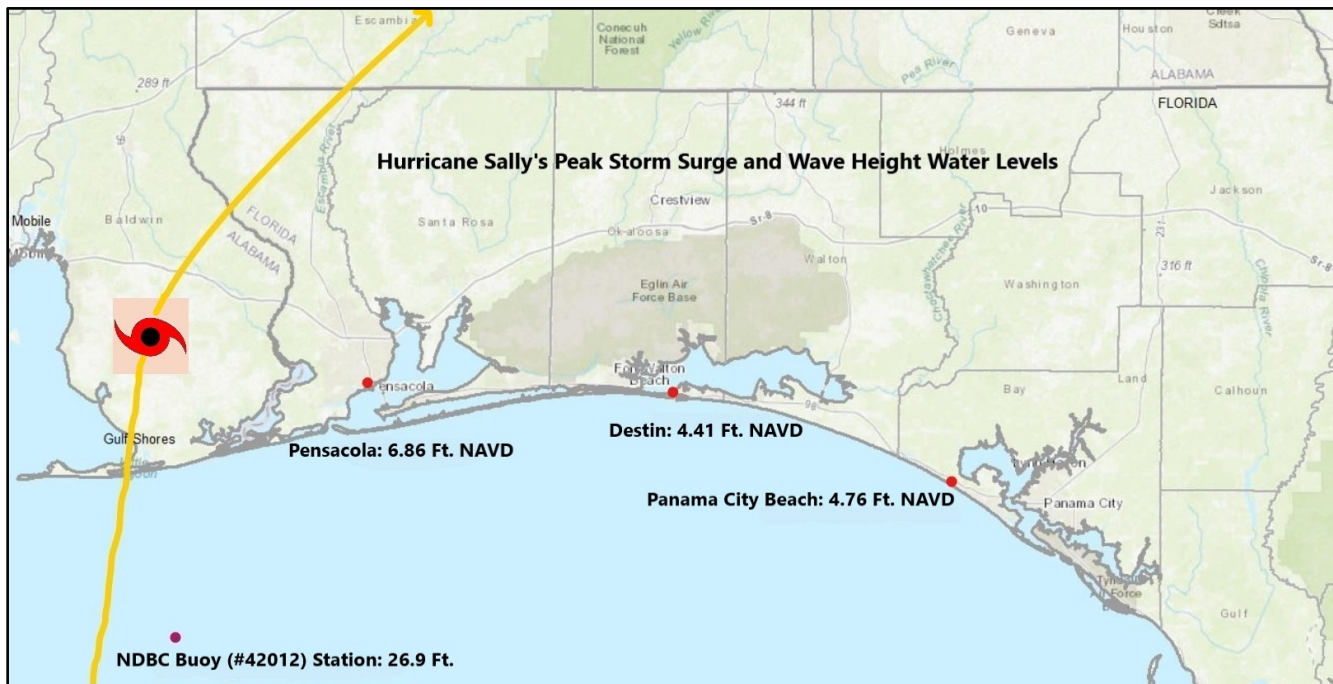


Figure 6. Hurricane Sally peak storm tide levels and the maximum offshore wave height [Data sources – NDBC, NOAA and USGS].

III. Hurricane Sally Impact Summary and Overview

This section provides a summary of the beach and dune erosion and structural damage that occurred in the impacted northwest Florida coastal counties: Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf and Franklin, as shown below in **Figure 7**.

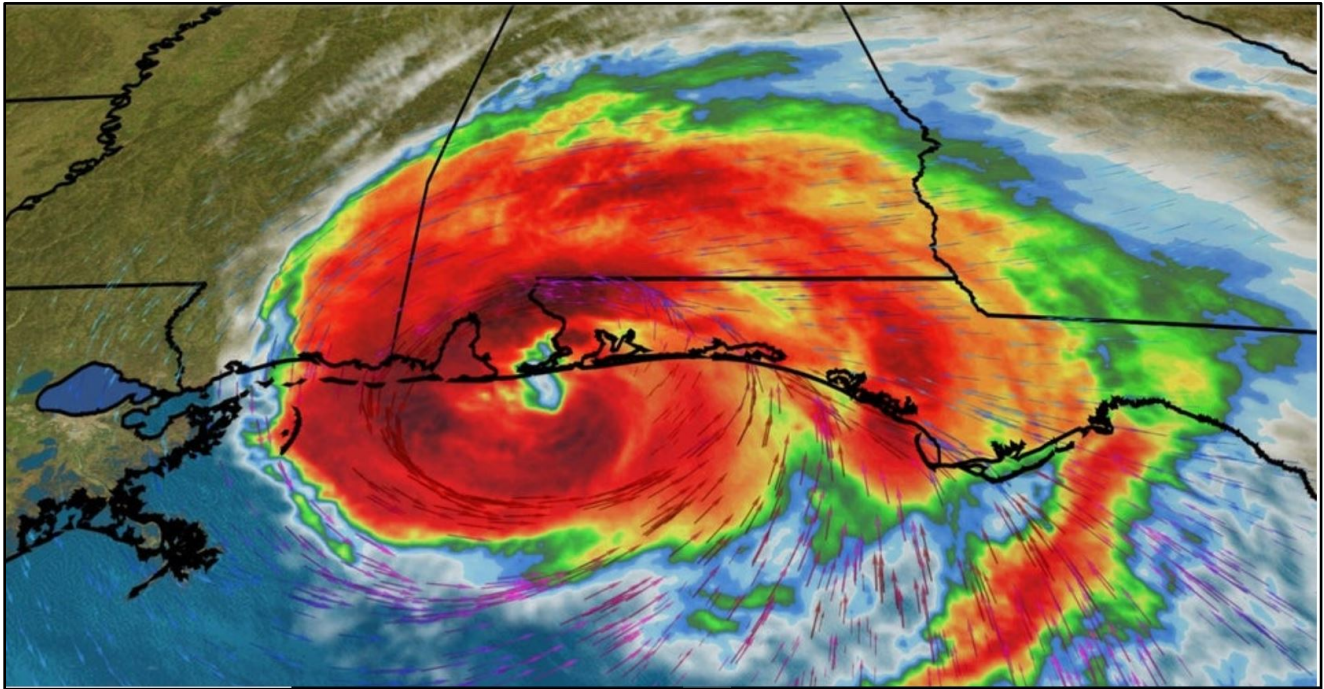


Figure 7. Satellite image of Hurricane Sally at landfall near the Alabama-Florida state line [Source: NOAA and Weather Channel].

Table 1 lists beach and dune erosion conditions starting with Escambia County and continuing eastward to Franklin County. Areas with no erosion are listed as [0]. Range or Reference (“R”) monuments are historical survey markers established by DEP. A graphic depiction of the classification of beach erosion conditions is provided in **Figure 8**.

Table 1. Post-storm beach and dune erosion summary for Hurricane Sally.

Escambia County

Locations	Reference Monuments	Erosion Condition
Perdido Key	R1 – R2	I
Perdido Key	R2 – R3	II
Perdido Key	R3 – R7	I
Perdido Key	R7 – R8	III
Perdido Key	R8 – R13	II
Perdido Key	R13	IV
Perdido Key	R13 – R15	III
Perdido Key	R15 – R18	II
Perdido Key	R18 – R20	III
Perdido Key	R20 – R23	III to II
Perdido Key	R23 – R24	IV
Perdido Key	R24 – R26	II
Perdido Key	R26 – R27	III
Perdido Key	R27 – R29	II
Perdido Key	R29 – R30	III
Perdido Key	R30 – R32	II
Perdido Key – Gulf Islands National Seashore	R32 – R35	II
Perdido Key – Gulf Islands National Seashore	R35 – R68	IV
Ft. Pickens – Gulf Islands National Seashore	R68 – R81	Unknown
Ft. Pickens – Gulf Islands National Seashore	R81 – R82	IV
Ft. Pickens – Gulf Islands National Seashore	R82 – R85	Unknown
Ft. Pickens – Gulf Islands National Seashore	R85 – R107	IV
Pensacola Beach	R107 – R117	IV
Pensacola Beach	R117 – R118	Unknown
Pensacola Beach	R118 – R119	III
Pensacola Beach – salient adjacent pier	R119 – R121	II
Pensacola Beach	R121 – R128	III
Pensacola Beach	R128 – R138	IV
Pensacola Beach	R138 – R139	III
Pensacola Beach	R139 – R146	Unknown
Pensacola Beach	R146 – R147	IV
Santa Rosa Is. – Gulf Islands National Seashore	R147 – R151	Unknown
Santa Rosa Is. – Gulf Islands National Seashore	R151 – R192	IV

Santa Rosa County

Locations	Reference Monuments	Erosion Condition
Navarre Beach	R192 – R194	III
Navarre Beach	R194 – R196	IV
Navarre Beach	R196 – R197	III
Navarre Beach	R197 – R200	II
Navarre Beach	R200 – R201	I

Locations	Reference Monuments	Erosion Condition
Navarre Beach	R201 – R207	II
Navarre Beach	R207 – R208	III
Navarre Beach – salient at pier (R209)	R208 – R211	II
Navarre Beach	R211 – R212	III
Navarre Beach	R212 – R213	II
Navarre Beach	R213 – V501	III
Eglin Air Force Base	V501 – V516	III

Okaloosa County

Locations	Reference Monuments	Erosion Condition
Eglin Air Force Base	V516 – V553	Unknown
Okaloosa Island	R1 – R4	III
Okaloosa Island	R4 – R9	II
Okaloosa Island	R9 – R11	I
Okaloosa Island	R11 – R13	II
Okaloosa Island – salient east of pier	R13 – R14	I
Okaloosa Island	R14.5	III
Okaloosa Island	R15 – V601	II
Eglin Air Force Base	V601 – V622	Unknown
East Pass – Norriego Point	N.A.	I
Destin – Holiday Isles	R17 – R19	III
Destin – Holiday Isles	R19 – R22	II
Destin – Holiday Isles	R22 – R23	Unknown
Destin – Holiday Isles	R23 – R25	IV
Destin	R25 – R26	III
Destin	R26 – R28	II
Destin	R28 – R30	Unknown
Destin	R30 – R33	II
Henderson Beach State Park	R33 – R35	III
Henderson Beach State Park	R35 – R39	II
Destin	R39 – R42	II
Destin	R42 – R43	II to III
Destin	R43 – R44	III
Destin	R44 – R45	Unknown
Destin	R45 – R46	III
Destin	R46 – R47	II
Destin	R47 – R48	IV
Destin	R48 – R49	II
Destin	R49 – R50	III
Destin	R50 – Walton R1	II

Walton County

Locations	Reference Monuments	Erosion Condition
Miramar, Tang-o-Mar, Sandestin, Topsail Hill SP	R1 – R30	II
Topsail Hill SP	R30 – R31	III
Topsail Hill SP	R31 – R34	IV
Topsail Hill SP, Beach Highlands, Dune Allen	R34 – R46	II
Dune Allen	R46.5	IV
Dune Allen	R47 – R50	II
Dune Allen	R50.5	IV
Dune Allen, Walline County Park	R51 – R52	II
Dune Allen, Blue Mtn., Gulf Trace	R52 – R69	Unknown
Grayton Beach State Park	R69 – R71	II
Grayton Beach, Grayton Beach State Park	R71 – R77	II to III
Watercolor	R77 – R79	II
Seaside, Seagrove Beach	R79 – R87	Unknown
Seagrove Beach	R88	IV
Seagrove Beach	R89 – R96	Unknown
Seacrest Beach	R96 – R112	II
Seacrest Beach	R112.5 – R113.5	IV
Dana Beach, Rosemary Beach, Inlet Beach	R114 – R127	II

Bay County

Locations	Reference Monuments	Erosion Condition
Panama City Beaches	R1 – R92	I to II
St. Andrews State Park	R92 – R97	IV
Shell Island	R98 – V009	unknown
Crooked Island	V009 – R127	unknown
Mexico Beach	R127 – R144	I

Gulf County

Locations	Reference Monuments	Erosion Condition
Beacon Hill	R1 – R13	I
Windmark	R14 – R31	I
St. Joseph Peninsula (State Park)	R32 – R51	unknown
St. Joseph Peninsula (State Park)	R51 – R71	I
St. Joseph Peninsula (breach area)	R71 – R72	II
St. Joseph Peninsula (incl. State Park)	R72 – R82	I
St. Joseph Peninsula	R82 – R83	II
St. Joseph Peninsula	R83 – R96	I
St. Joseph Peninsula (Aruba Drive)	R96 – R97	IV
St. Joseph Peninsula	R97 – R102	II
St. Joseph Peninsula (S of Sunrise/Sunset Condo)	R102 – R103	IV
Stump Hole	R103 – R106	III
Cape San Blas – west shore	R106 – R118	IV
Cape San Blas – east shore	R119 – R133	II
Indian Peninsula	R133 – R150	0

Locations	Reference Monuments	Erosion Condition
Indian Peninsula	R150 – R153	I
Indian Peninsula	R153 – R154	II
Indian Peninsula	R154 – R157	I
Indian Peninsula	R157 – R160	0
Indian Pass	R160 – R161	II

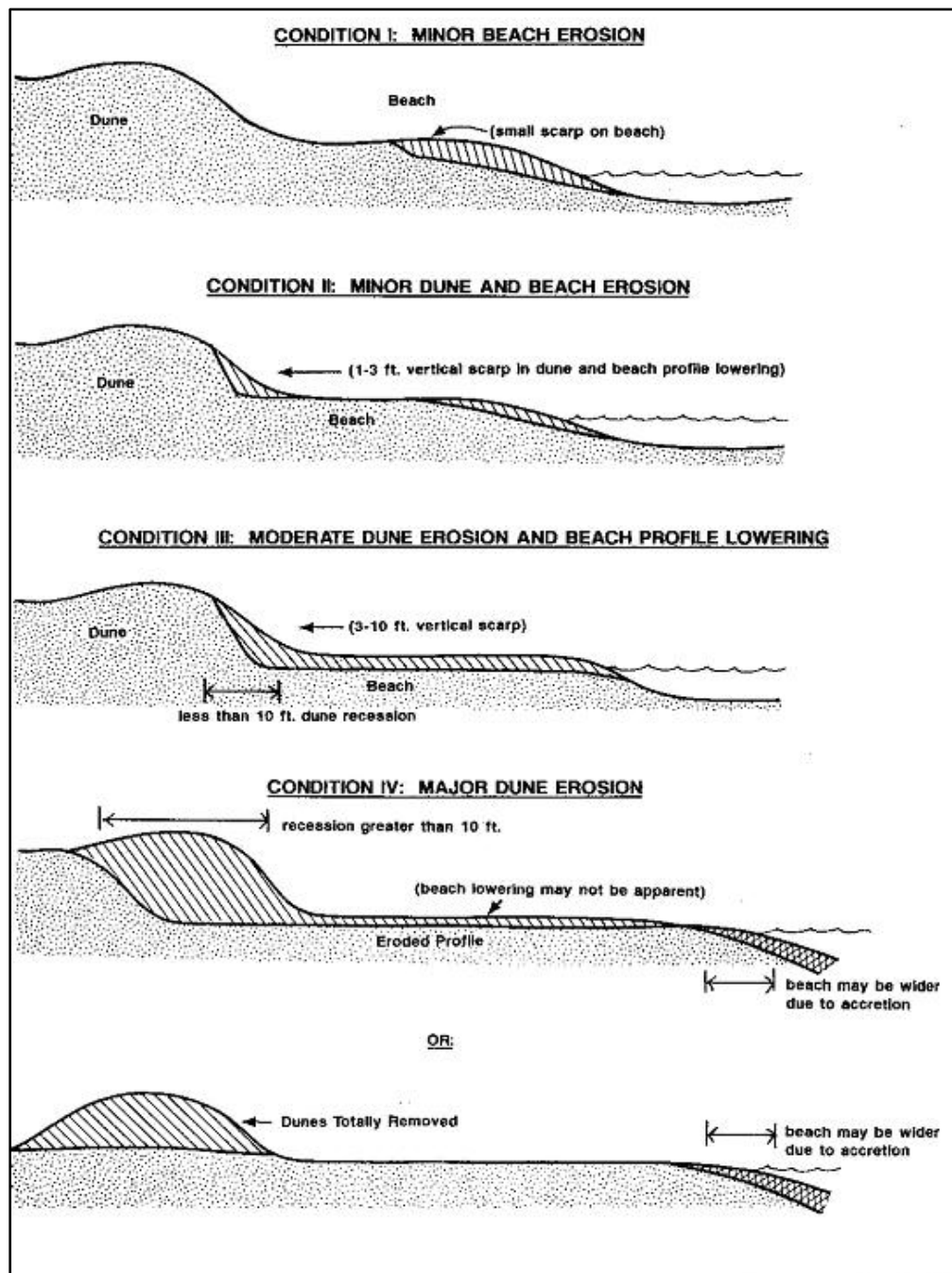


Figure 8. Post-storm beach and dune erosion conditions (I to IV).

Major Structural Damage

An overall summary of structural damage to major structures is given in **Table 2**. A summary of damage to coastal armoring, including seawalls, bulkheads, retaining walls, revetments, sills or other rigid coastal protection structures, is provided in **Table 3**. Not included in this table is damage to rigid shore-protection structures such as groins and breakwaters or navigation structures, such as jetties. A more detailed description of these impacts by specific location is provided in Section IV of this report. **Figure 9** and **Figure 10** provide an aerial photo comparison of the worst impacted coastal segment on Perdido Key, where three barrier island breakthroughs occurred.

Table 2. Summary of major structural damage to major structures in the Coastal Building Zone by Hurricane Sally in northwest Florida.

County	# Single-Family Dwellings Damaged	# Multifamily Dwellings ¹ Damaged	# Other Major Structures ² Damaged	Total # Damaged ³
Escambia	181	89	22	292
Santa Rosa	29	2	0	31
Okaloosa	4	5	4	13
TOTAL	214	96	26	336

- 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 uninhabitable 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.

Table 3. Summary of coastal armoring damage caused by Hurricane Sally.

County	Armoring Damage in Feet
Escambia	370
Santa Rosa	113
TOTAL	483



Figure 9. Pre-Hurricane Sally aerial photo comparison of the three barrier island breakthrough area on Perdido Key (R60-R63) [Source: NOAA aerial photography].



Figure 10. Post-Hurricane Sally aerial photo comparison of the three barrier island breakthroughs on Perdido Key (R60-R63) [Source: NOAA aerial photography, 09-2020].

IV. Storm Impacts by County

The impacts are further described in this section of each county illustrating the erosion conditions from **Table 1** on county maps and photos taken in the field.

Escambia County

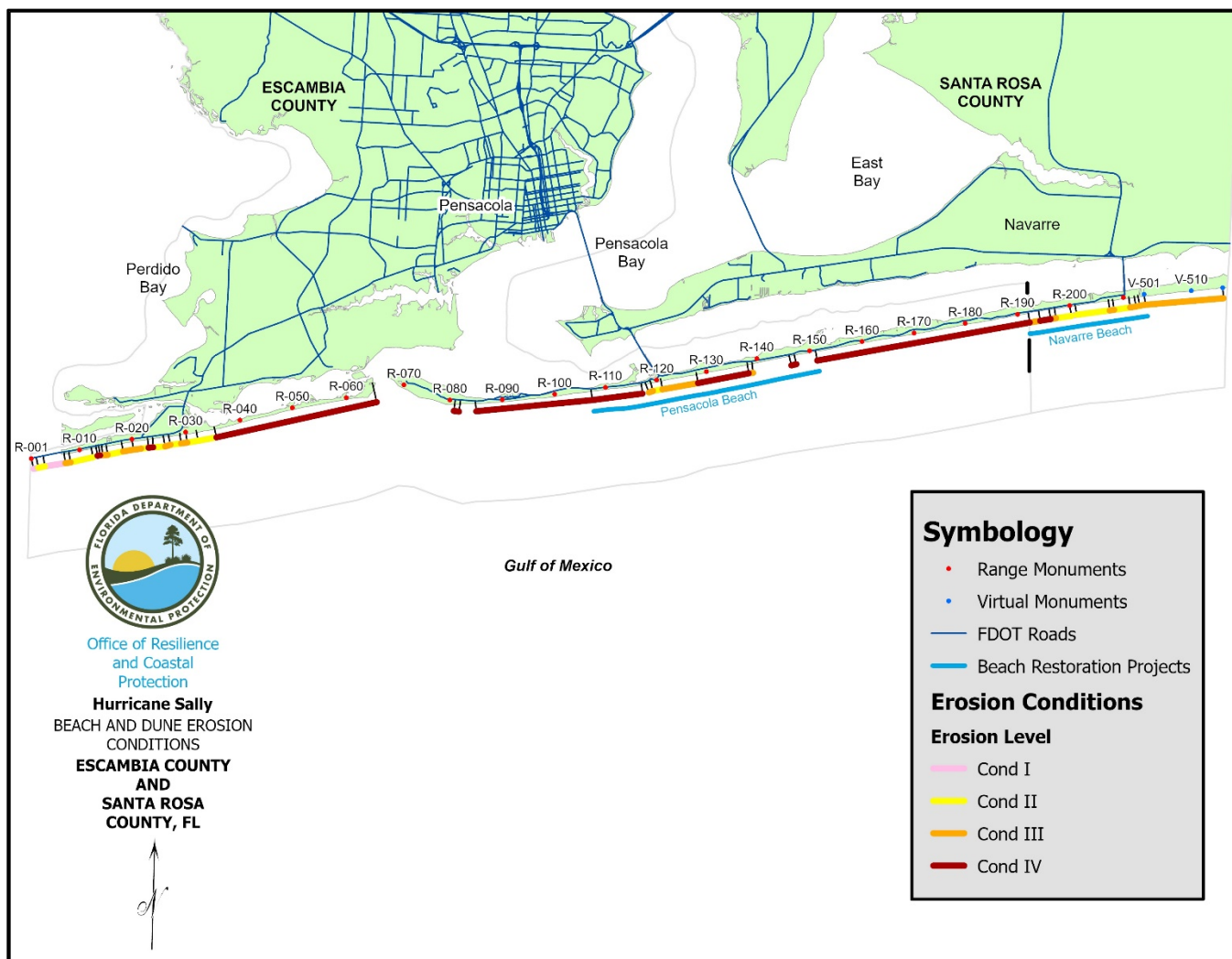


Figure 11. Escambia County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Escambia County generally ranged between 5 and 6.5 feet above sea level. The NOAA tide gage at Pensacola measured a peak tide of +6.86 feet NAVD near 12:30 p.m. CDT on Wednesday, Sept. 16, following landfall (**Figure 3**). Based on storm surge modeling by the Beaches and Shores Resource Center (FSU, 2009), this surge elevation is comparable to a 12-year return interval storm surge event.

Hurricane Sally, a Category 2 at landfall, did the greatest damage to Florida's Escambia County when the eye passed just to the immediate west in Gulf Shores, Ala. Along the developed western half of Perdido Key (R1-R32), beach and dune erosion conditions (**Figure 11**) generally ranged from Condition II (minor beach and dune erosion) to Condition III (moderate beach and dune erosion) except for Condition IV (major dune erosion) at the following erosion hotspots:

- R13 where the dune was breached causing road damage
- R23-R24

Along the undeveloped eastern 6 miles of Perdido Key (R32-R67), major dune erosion (Condition IV) was sustained within the Gulf Islands National Seashore. Numerous overwash fans are observed along the national seashore with three new barrier island breakthroughs at R60, R61 and R63 (**Figure 10**).

Pensacola Pass separates Perdido Key and Santa Rosa Island, which spans three counties. On Santa Rosa Island, the western 2.5 miles (R68-R85) have not been assessed at Fort Pickens. Between Fort Pickens and Pensacola Beach (R85-R107), major dune erosion (Condition IV) extended for more than 4 miles of the Gulf Islands National Seashore with numerous washover fans.

Pensacola Beach (R107-R146) was particularly hard hit with at least two-thirds of the beachfront properties sustaining Condition IV (major dune erosion) and around one-third sustaining Condition III (moderate beach and dune erosion). The only area sustaining Condition II (minor beach and dune erosion) was the beach salient at the Pensacola Beach fishing pier. To the east, most of the nearly 9 miles of Gulf Islands National Seashore (R146-R192) sustained Condition IV (major dune erosion) with numerous overwash fans along the national seashore. Bowden Way, the paved road along the length of the national seashore, was substantially covered with sand from the overwash deposits.

Figure 12 through **Figure 18** are photos that show the major beach and dune erosion (Condition IV) along Escambia County beaches.



Figure 12. Major dune erosion on Perdido Key, R23 to R24.



Figure 13. Major dune erosion at Fort Pickens Unit of Gulf Islands National Seashore, R106.



Figure 14. Major dune erosion in western Pensacola Beach, R108.



Figure 15. Major dune erosion in Pensacola Beach, R111.



Figure 16. Major dune erosion in Pensacola Beach, R129.



Figure 17. Major dune erosion, Pensacola Beach, R130.



Figure 18. Major dune erosion, Pensacola Beach, R134.

Storm Damage

Although the eye of Hurricane Sally made landfall to the immediate west near Gulf Shores, Alabama, most of the worst damage occurred east of the eye in west Florida. Flooding damage was greatest in Pensacola, with 6.5-foot storm surge along with more than 20 inches of rainfall. Hurricane Sally caused the greatest damages in Florida in Escambia County. In the Coastal Building Zone of Perdido Key and Pensacola Beach, 292 major structures sustained major structural damage. Of those 292, four major structures were destroyed, all on Perdido Key. The structural damages were mostly due to Hurricane Sally's winds. Because Hurricane Sally damaged roofs and siding, the extreme rainfall caused extensive damage inside buildings. However, the flooding – particularly throughout Pensacola Beach – caused substantial nonstructural damage and introduced large volumes of overwash sand onto the ground floors of buildings (flooded and sanded).

On Perdido Key, 136 major structures sustained major structural damage, including 71 single-family dwellings, 50 multi-family dwellings and 15 other major structures. There was one major structure with understructure damage, and four structures in which the first floor was flooded and sanded. In addition,

there was 370 feet of armoring damage and 260 feet of road damage. The road damage was at R13, at a breach in the dune line.

In Pensacola Beach, 156 major structures sustained major structural damage, including 110 single-family dwellings, 39 multi-family dwellings and seven other major structures. There were also 17 major structures with understructure damage and 157 buildings with their first floor flooded and sanded.

Of special note in Pensacola Beach was the storm effects on the 1,470-foot-long, concrete Pensacola Beach Fishing Pier, which was constructed in 2001. Previously, Hurricane Ivan – a 200-year return interval storm surge event in 2004 – and Hurricane Dennis, another major hurricane in 2005, caused substantial damage to breakaway deck sections along the length of the pier, but inflicted no major structural damage. With Hurricane Sally, once again, breakaway deck sections and breakaway rails were dislodged; however, no major structural damage appears to have occurred (see **Figure 26** and **Figure 27**). As designed, the dislodging of breakaway deck sections and rails by the vertical uplift forces of breaking storm waves, eliminates much of the structural resistance, allowing enhanced survival of the concrete pier frame.

DEP has kept records of storm damage in the Coastal Building Zone in Escambia County for more than 40 years. After Hurricane Ivan in 2004, Hurricane Sally caused the greatest number of structures damaged over this period (**Table 4**).

Table 4. Number of Major Structures with Major Structural Damage – Comparison of Hurricane Sally with Prior Hurricanes in Escambia County.

Year	Storm Event	Number of Structures
2020	Hurricane Sally	292
2005	Hurricane Katrina	2
2005	Hurricane Dennis	126
2004	Hurricane Ivan	231*
1998	Hurricane Georges	8
1995	Hurricane Opal	124
1995	Hurricane Erin	14
1979	Hurricane Frederic	96
TOTAL		893*

* Complete data records were not obtained for Hurricane Ivan in Escambia County. Estimates of Ivan damage were much greater than reported.

See **Figure 19** through **Figure 29** for examples of structural damage in Escambia County.



Figure 19. Commercial building destroyed by wind, Perdido Key, R24.



Figure 20. Multi-family dwelling destroyed by wind, Perdido Key, R26.



Figure 21. Swimming pool destroyed by waves and erosion, Perdido Key, R30.



Figure 22. Sand-filled geotextile armoring structure destroyed next to multi-family dwelling with understructure damage, Perdido Key, R32.



Figure 23. Typical flooding at ground level, Perdido Key.



Figure 24. Major roof damage to multi-family building, Perdido Key.



Figure 25. Major roof damage on the Pensacola Inn, Pensacola Beach, R123.



Figure 26. Pensacola Beach Fishing Pier with breakaway deck sections and handrails displaced, but no major structural damage, R120.5.



Figure 27. Pensacola Beach Fishing Pier with breakaway handrails displaced, but no major structural damage, R120.5.



Figure 28. Typical flooding and understructure damage to breakaway walls in Pensacola Beach, R138.



Figure 29. Flooding during the storm at the Pensacola Inn, Pensacola Beach. [Courtesy of Pensacola resident]

Santa Rosa County

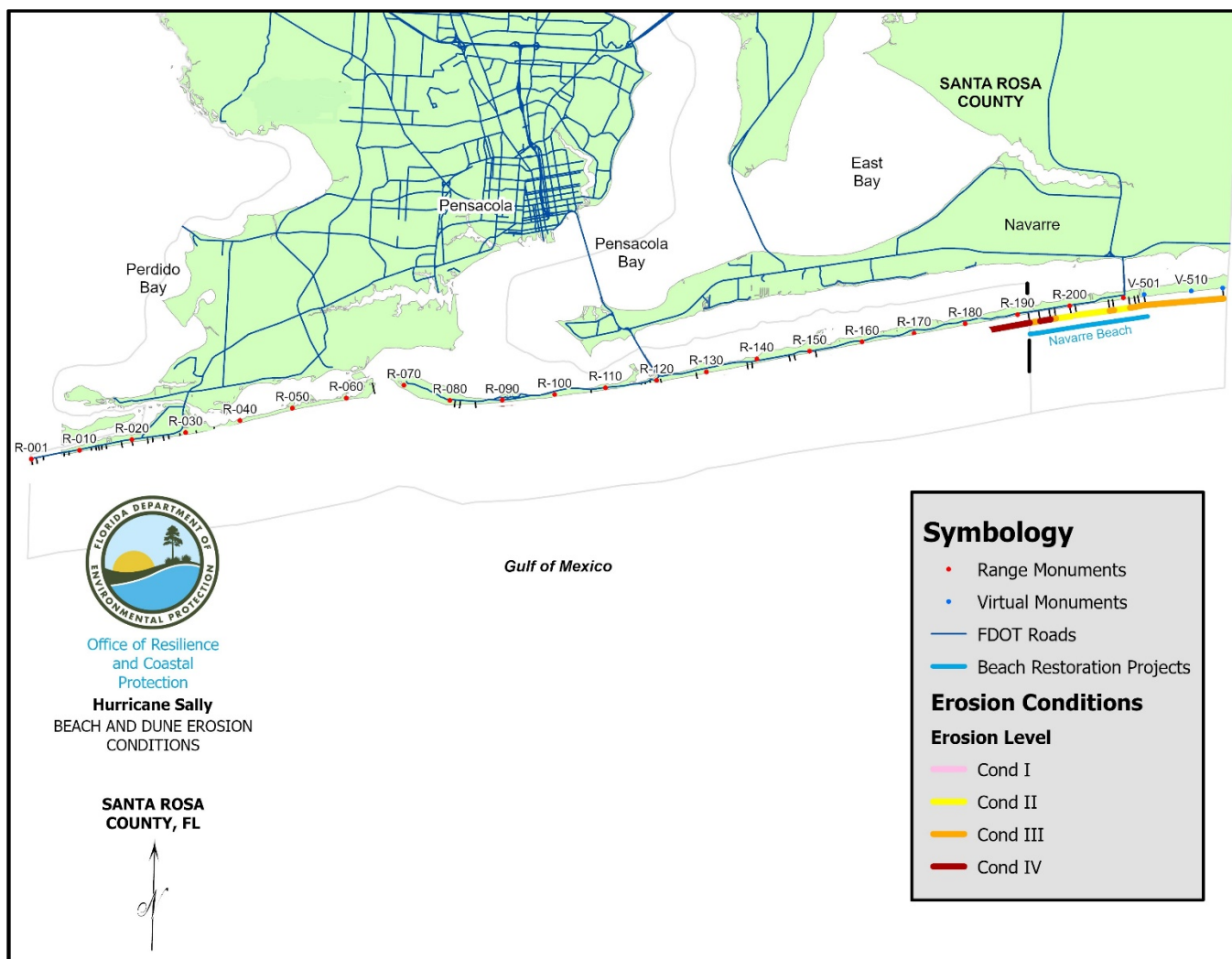


Figure 30. Santa Rosa County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Santa Rosa County generally ranged between 6.5 feet measured in Pensacola and over 4 feet measured in Destin. Based on storm surge modeling by the Beaches and Shores Resource Center (FSU, 2009), this surge elevation is comparable to a five-year return interval storm surge event for Santa Rosa County.

Santa Rosa County sustained a fringe impact from Hurricane Sally. Along the developed western 4.1 miles of Santa Rosa County (R192.5-R213.5) beach and dune erosion conditions generally ranged from Condition II (minor beach and dune erosion) to Condition III (moderate beach and dune erosion). The western 1 mile of Navarre Beach (R192.5-R197) – adjacent to the highly eroded National Seashore to the west – sustained the worse erosion conditions with Condition IV (major dune erosion) to Condition

III (moderate beach and dune erosion), see **Figure 31**. A salient of lesser erosion exists adjacent the Navarre Pier (R208-R211; Condition II). To the east of Navarre Beach, Condition III (moderate beach and dune erosion) extended along the Eglin Air Force Base.



Figure 31. Major to moderate beach and dune erosion in western Navarre Beach, Santa Rosa County, R194.

Storm Damage

Santa Rosa County did not sustain the substantial damages seen in Escambia County, which was in the dominant wind field of Hurricane Sally. In the Coastal Building Zone of Navarre Beach, 31 major structures sustained major structural damage. This included 29 single-family dwellings and two multi-family dwellings. There were also 37 major structures with understructure damage and 157 buildings with their ground floor flooded and sanded. The major structural damages were mostly due to Hurricane Sally's winds. Likewise, the wind damages to roofs and siding allowed Hurricane Sally's extreme rainfall to cause extensive damage to the building's interior. However, as occurred in Pensacola Beach, the storm surge flooding caused notable nonstructural damage and introduced large volumes of overwash sand onto the ground floors of buildings.

See **Figure 32** through **Figure 36** for examples of damage in Santa Rosa County.



Figure 32. Major siding damage to a single family dwelling, Navarre Beach, R203.



Figure 33. Major siding damage to a multi-family building, Navarre Beach, R201.5.



Figure 34. Typical understructure damage due to the storm surge, Navarre Beach, R195.



Figure 35. Understructure damage, Navarre Beach, R203.5.



Figure 36. No damage to the Navarre Fishing Pier, the longest pier on the Gulf of Mexico, R209.5.

DEP has kept records of storm damage in the Coastal Building Zone in Santa Rosa County for more than 40 years. After Hurricane Ivan in 2004, Hurricane Sally caused the greatest number of structures damaged over this period (**Table 5**).

Table 5. Number of Major Structures with Major Structural Damage - Comparison of Hurricane Sally with Prior Hurricanes in Santa Rosa County.

Year	Storm Event	Number of Structures
2020	Hurricane Sally	31
2005	Hurricane Katrina	2
2005	Hurricane Dennis	133
2004	Hurricane Ivan	71*
1998	Hurricane Georges	6
1995	Hurricane Opal	106
1995	Hurricane Erin	20
1979	Hurricane Frederic	5
TOTAL		374*

* Complete data records were not obtained for Hurricane Ivan in Santa Rosa County, where damages were greater than for Opal or Dennis.

Okaloosa County

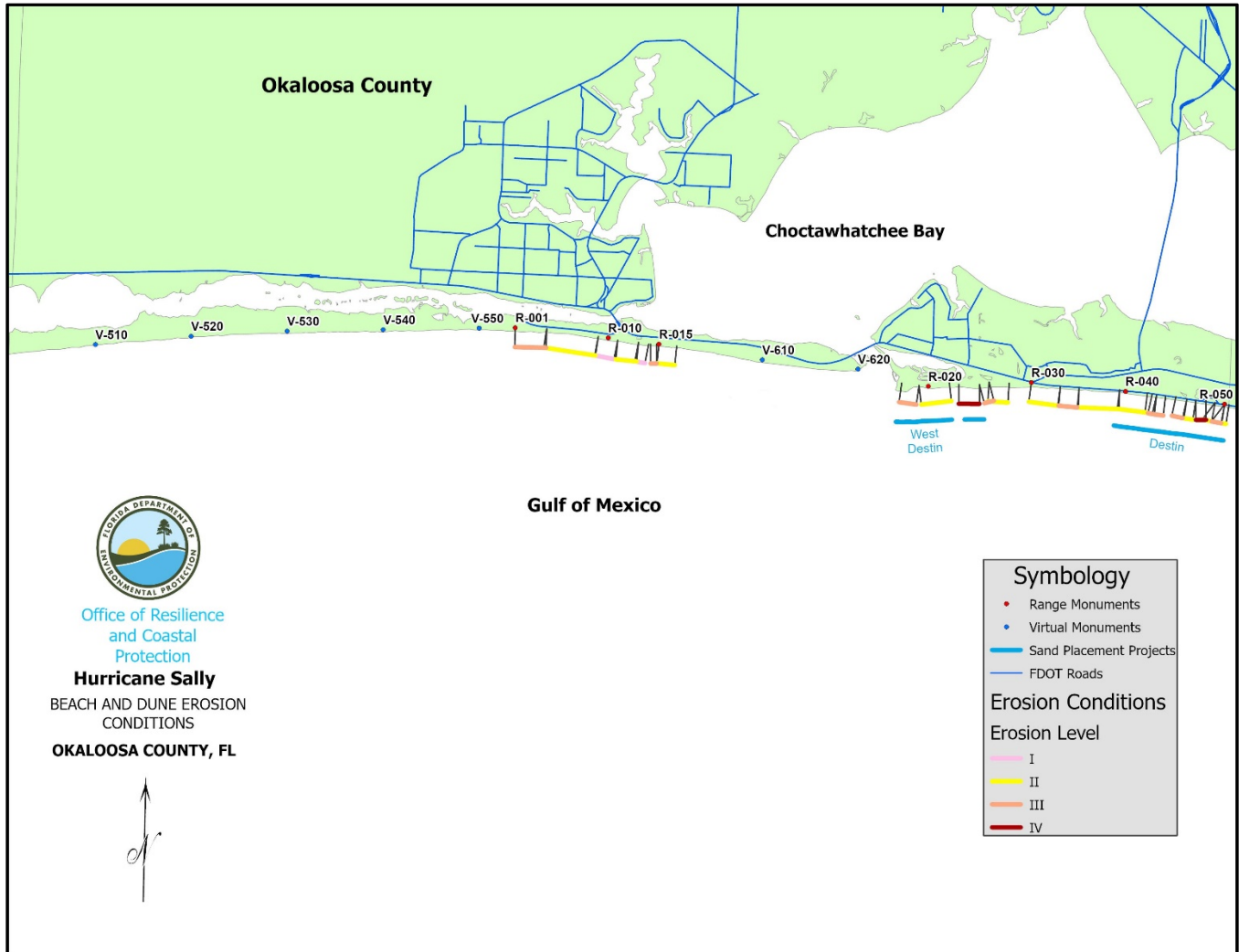


Figure 37. Okaloosa County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Okaloosa County were over 4 feet as measured in Destin by the USGS (**Figure 4**). Based on storm surge modeling by the Beaches and Shores Resource Center (FSU, 2009), this surge elevation is comparable to a five-year return interval storm surge event for Okaloosa County.

Okaloosa County sustained a fringe impact from Hurricane Sally. Countywide beach and dune erosion conditions generally ranged from Condition II (minor beach and dune erosion) to Condition III (moderate beach and dune erosion) except for Condition IV (major dune erosion) hotspots at:

- R23-R25 at the eastern end of the West Destin Beach Restoration Project. This was a known erosion hotspot that was adversely impacted by the bifurcation of the project between R21 and R23.
- R47-R48 at the eastern end of the county within the Eastern Destin-Walton County Beach Restoration Project. This was a known erosion hotspot having been severely impacted by Hurricane Opal in 1995.

The mix of erosion conditions is not unusual for an area withstanding a fringe impact from a hurricane. Santa Rosa Island and Destin have historically presented rhythmic beach cusps alongshore, and this shoreline feature alone can account for the difference between sustaining minor, moderate or major dune erosion. Basically, the wider the beach, the lesser the impact. The two hotspots of major dune erosion have historically narrow beaches, notwithstanding being part of a beach restoration project.

Roughly 70% of the Okaloosa County shoreline is federal land and part of the Eglin Air Force Base. There is heightened state interest in the nearly 4-mile segment of Eglin shoreline between the beach community of Okaloosa Island and East Pass. The east half of this segment is within the designated area of inlet influence, and monitoring of the shoreline change directly affects inlet bypassing in accordance with the adopted East Pass Inlet Management Implementation Plan (July 24, 2011).

Figures 38 through 42 show the major beach and dune erosion (Condition IV) along Okaloosa County beaches.



Figure 38. Moderate beach and dune erosion in western Okaloosa Island on Santa Rosa Island near R2.



Figure 39. Moderate beach and dune erosion in Okaloosa Island, R114.5.



Figure 40. Major dune erosion at Sandpiper Village, Destin, R24.



Figure 41. Major dune erosion at James Lee Park, Destin, R47.



Figure 42. Major dune erosion in eastern Destin, R48.

Storm Damage

Okaloosa County did not sustain the considerable damages seen in Escambia County to the west, which was in the dominant wind field of Hurricane Sally. In the Coastal Building Zone of Okaloosa County, 13 major structures sustained major structural damage. This included four single-family dwellings, five multi-family dwellings and four other major structures. The major structural damages mostly were due to Hurricane Sally’s winds. An example of the wind damage is seen in **Figure 43**.



Figure 43. Typical roof damage in Okaloosa Island, R4.

The department has kept records of storm damage in the Coastal Building Zone in Okaloosa County for more than 40 years. Hurricane Sally is compared with other hurricane impacts over this period (**Table 6**).

Table 6. Number of Major Structures with Major Structural Damage – Comparison of Hurricane Sally with Prior Hurricanes in Okaloosa County.

Year	Storm Event	Number of Structures
2020	Hurricane Sally	13
2005	Hurricane Katrina	2
2005	Hurricane Dennis	47
2004	Hurricane Ivan	194
1998	Hurricane Georges	2
1995	Hurricane Opal	229
1995	Hurricane Erin	0
1979	Hurricane Frederic	0
TOTAL		487

Walton County

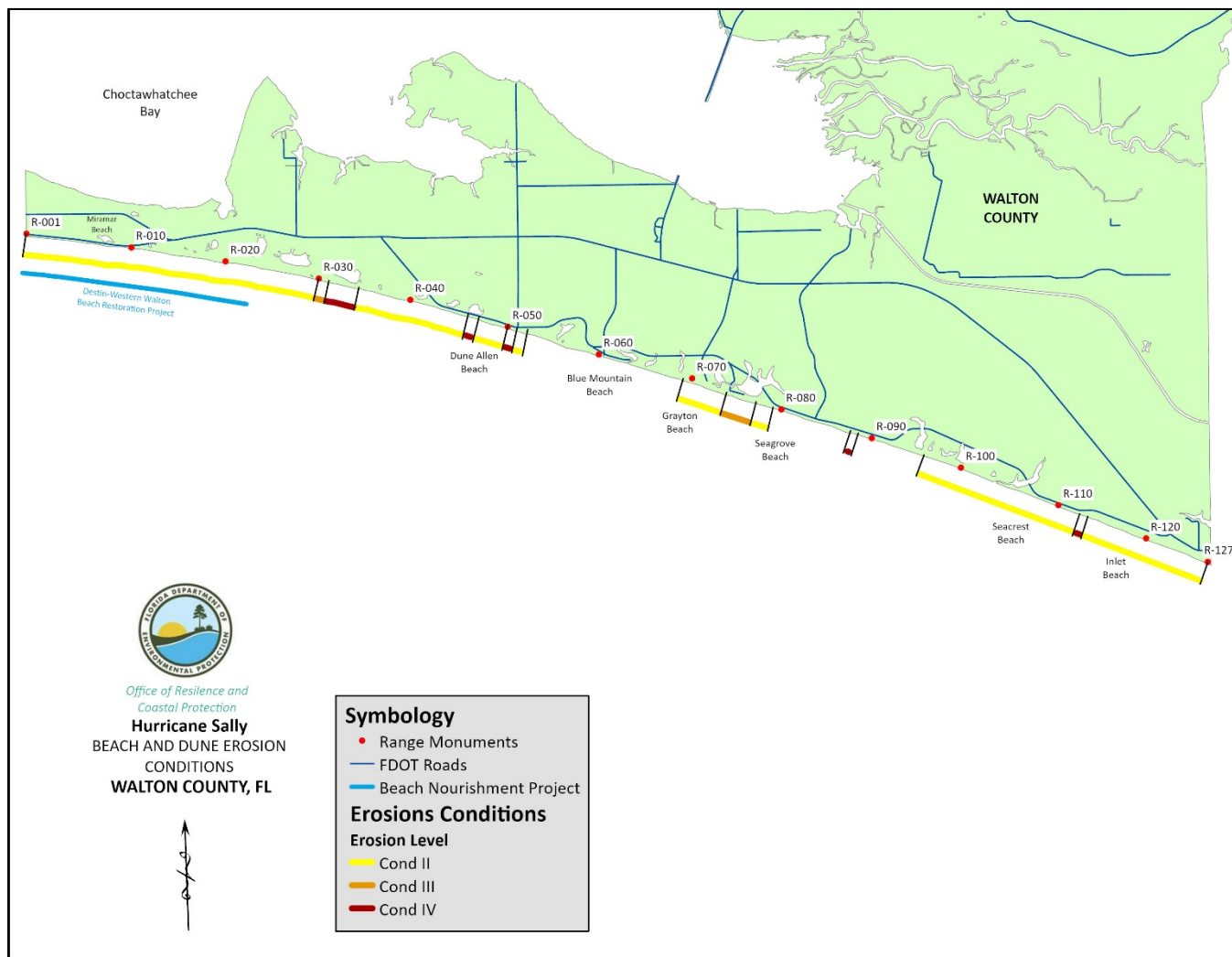


Figure 44. Walton County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Walton County were over 4 feet as measured in Destin by the USGS (**Figure 4**) and as measured in Panama City Beach by NOAA (**Figure 5**). Based on storm surge modeling by the Beaches and Shores Resource Center (FSU, 2009), this surge elevation is comparable to a five-year return interval storm surge event for Walton County.

Walton County sustained a fringe impact from Hurricane Sally. Countywide beach and dune erosion conditions were generally Condition II (minor beach and dune erosion) except for Condition IV (major dune erosion) at the following erosion hotspots:

- R32-R34

- R46.5
- R50.5
- R88 (this may be a larger area)
- R112.5-R113.5

Roughly 4% of the county’s shoreline (at least 1 mile out of a total of 25.6 miles) sustained major dune erosion. Typically, these areas are trouble spots with engineered dunes sited too far seaward due to the threatened nature of upland development. Due to heavy rainfall from Hurricane Sally, the coastal dune lakes along the Walton County coast discharged large volumes of water through their outlets across the beaches. These various coastal lake outlets caused Condition II to IV dune erosion adjacent to their banks.

Figures 45 through 52 show the major beach and dune erosion (Condition IV) along Walton County beaches.



Figure 45. Dune erosion at Morris Lake Outlet in Topsail Hill State Park, R28.5.



Figure 46. Major dune erosion in Topsail Hill State Park, R32.



Figure 47. Major dune erosion in Dune Allen Beach, R50.5.



Figure 48. Major dune erosion exposing peat layer in Seacrest Beach, R112.5.



Figure 49. Major dune erosion in Seacrest Beach, R112.5.



Figure 50. Major dune erosion exposing peat layer in Seacrest Beach, R113.



Figure 51. Major dune erosion and exposure of armoring structures, R113.5.



Figure 52. Erosion scarp in Camp Hellen State Park at the Lake Powell Outlet, R127.

Storm Damage

Walton County sustained no major damage to major structures.

Bay County

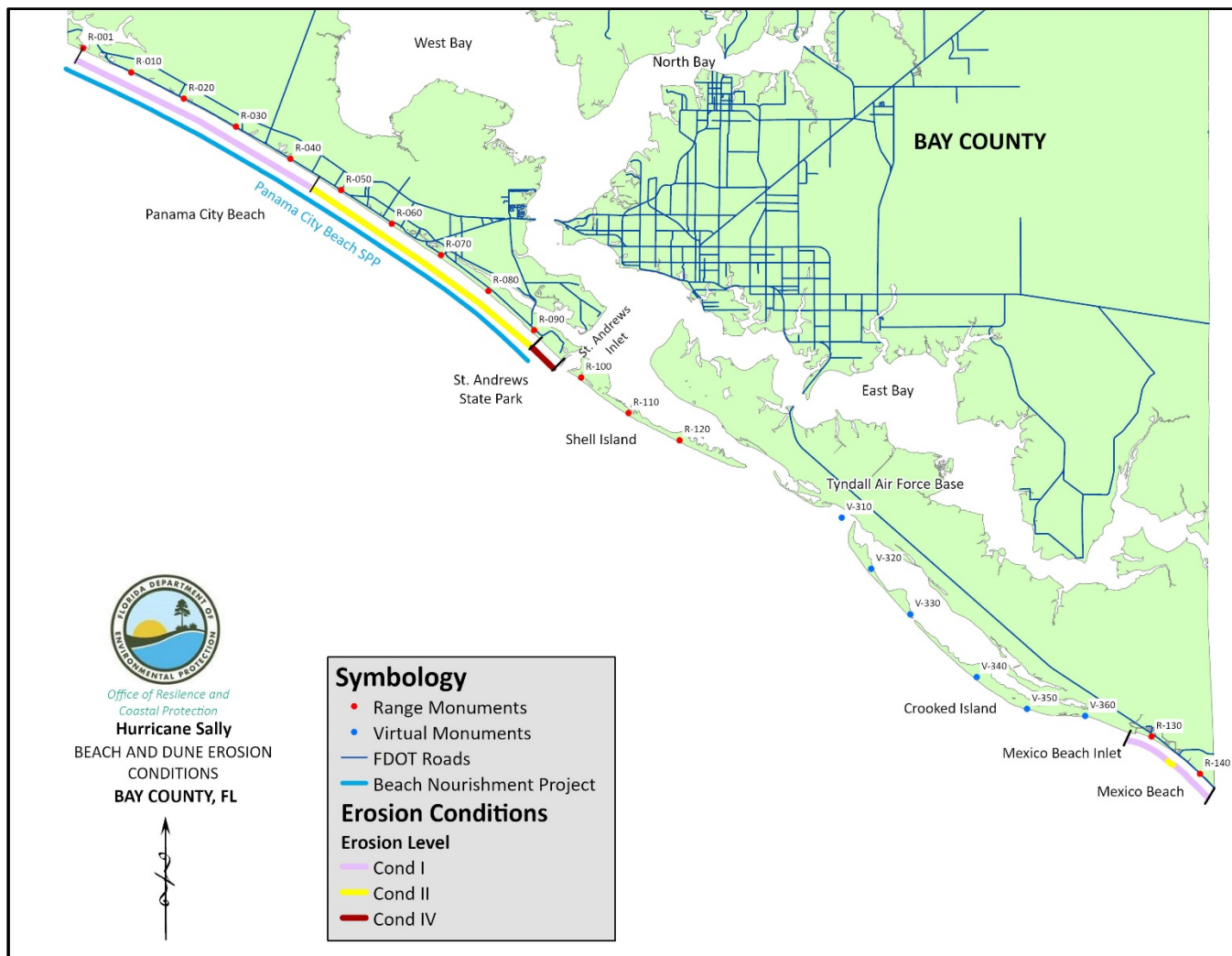


Figure 53. Bay County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Bay County were over 4 feet as measured in Panama City Beach by NOAA (**Figure 5**). Based on storm surge modeling by the Beaches and Shores Resource Center in counties to the west, this surge elevation is likely comparable to a five-year return interval storm surge event for Bay County.

Bay County sustained a distant fringe impact from Hurricane Sally. Countywide beach and dune erosion conditions were generally Condition I (minor beach erosion) to Condition II (minor beach and dune erosion) except for Condition IV (major dune erosion) at St. Andrews State Park (R92-R97). Even though the erosion was Condition I to Condition II, a significant volume of sand within the Panama City Beaches Shore Protection Project (R1-R92) was transported cross-shore into the nearshore zone.

Tropical Storm Cristobal in early June caused a major breach between the state park uplands and the west jetty of St. Andrews Inlet, a federal navigation channel. Regular inlet navigation channel maintenance dredging was to commence with fill placement in the breach area; however, Hurricane Sally delayed dredging and caused the breach to double in size, at least, with a substantially greater tidal flow. The state park uplands were severely impacted by Hurricane Sally with much of the dune erosion being carried through the breach into the inlet. In addition, the inlet's west shoreline along the state park north of the Gator Lake breakwaters and groin, sustained severe erosion into the upland bluff.

Figures 54 through 60 show the severe erosion at the breach in St. Andrews State Park. **Figure 61** shows erosion at Mexico Beach.



Figure 54. Looking across the breach during Hurricane Sally toward the west jetty at St. Andrews Inlet (R97) [Courtesy of Scott Robinson, FDEP].



Figure 55. The breach after Tropical Storm Cristobal in June prior to Hurricane Sally.



Figure 56. The breach after Tropical Storm Cristobal in June prior to Hurricane Sally.



Figure 57. Looking past the eroded park uplands toward the breach and west jetty after Hurricane Sally (R97).



Figure 58. Major dune erosion along St. Andrews State Park (R92-R97) following Hurricane Sally.



Figure 59. Major dune erosion with park infrastructure damage (R96) following Hurricane Sally.



Figure 60. Severe erosion of state park uplands along the west shoreline of St. Andrews Inlet north of the Gator Lake breakwaters and groin.



Figure 61. Isolated minor beach and dune erosion (Condition II) in Mexico Beach adjacent the El Governor Hotel (R134.3).

Storm Damage

Bay County sustained no major damage to major structures.

Gulf County

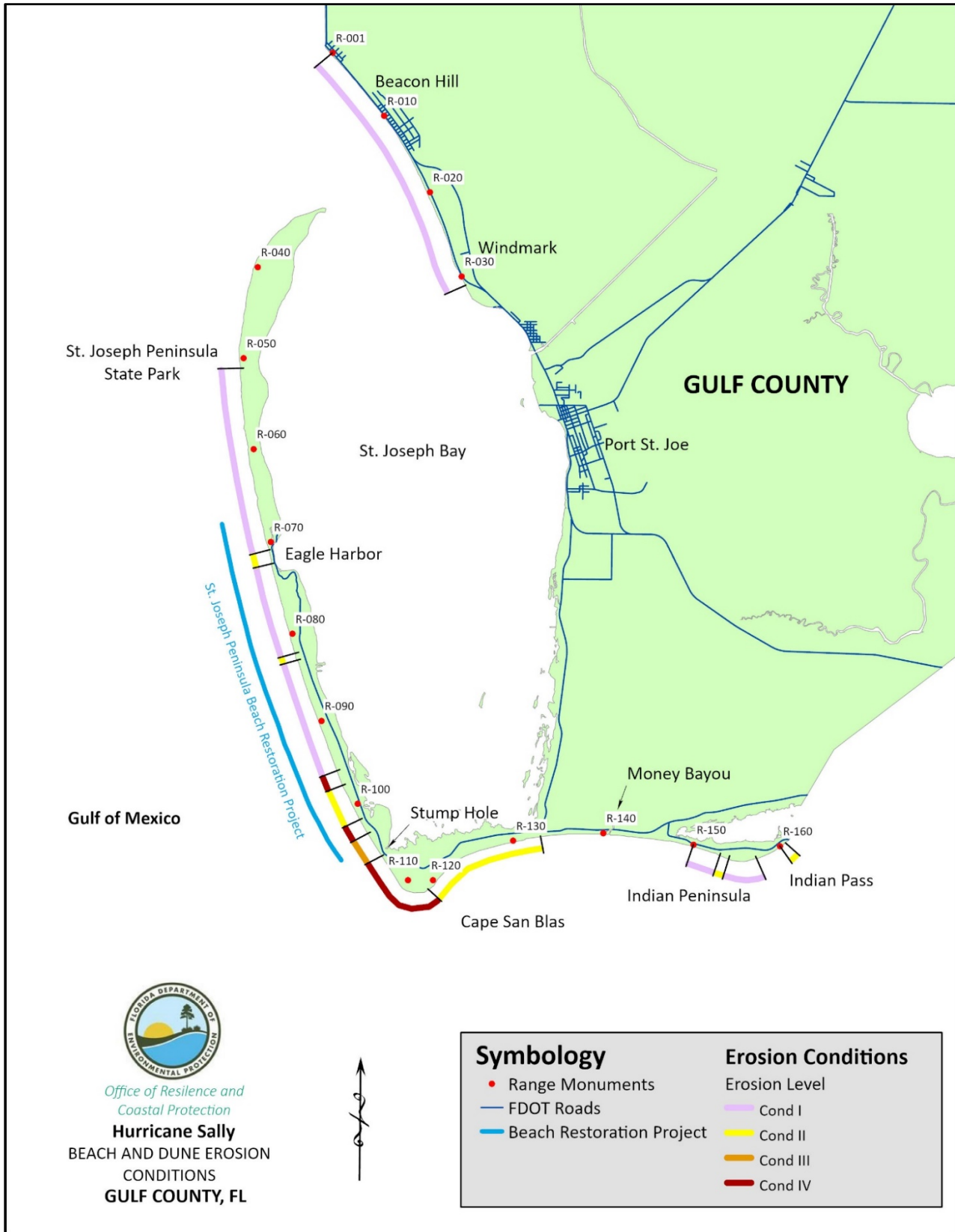


Figure 62. Gulf County beach and dune erosion conditions from Hurricane Sally.

Storm Effects and Erosion Conditions

The storm tides of Hurricane Sally in Gulf County appeared to be over 4 feet as measured in Panama City Beach by NOAA (**Figure 5**). Based on storm surge modeling by the Beaches and Shores Resource Center in counties to the west, this surge elevation is likely comparable to a five-year return interval storm surge event for Gulf County.

Gulf County sustained a distant fringe impact from Hurricane Sally. County-wide beach and dune erosion conditions were generally Condition I (minor beach erosion) to Condition II (minor beach and dune erosion) except for Condition IV (major dune erosion) at erosion hotspots on St. Joseph Peninsula and Cape San Blas at:

- R97 – near Aruba Drive.
- R103 – north of Stump Hole.
- R107-R119 – entire west shoreline of Cape San Blas. This area has experienced persistent chronic erosion into the forested uplands.

Figures 63 through 65 show the major beach and dune erosion (Condition IV) along Gulf County beaches.



Figure 63. Major dune erosion at R97 near Aruba Drive.



Figure 64. Major dune erosion at R103, north of Stump Hole in Gulf County.



Figure 65. Major dune erosion continues along the entire west shoreline of Cape San Blas (R107-R118).

Figures 66 through 68 show other storm impacts along Gulf County beaches.



Figure 66. Minor beach and dune erosion at the dune repair section of the Hurricane Michael (2018) inlet breakthrough in the St. Joseph Peninsula State Park (R71-R72).



Figure 67. Back dune flooding along Indian Peninsula (R148-R149).



Figure 68. Money Bayou open and flowing (R140).

Storm Damage

Gulf County sustained no major damage to major structures.

V. Summary of Hurricane Sally's Impacts

The Department has kept records of storm damage in the Coastal Building Zone in Escambia, Santa Rosa and Okaloosa Counties for over 40 years. After Hurricane Ivan in 2004, Hurricane Sally caused the greatest number of structures damaged over this period. See **Table 7** to compare major structural damages dating back to 1979.

Table 7. A comparison of major structural damage to major structures by Hurricane Sally to other hurricanes in the last 40 years from department records.

Year	Storm Event	Escambia County	Santa Rosa County	Okaloosa County
2020	Hurricane Sally	292	31	13
2005	Hurricane Katrina	2	2	2
2005	Hurricane Dennis	126	133	47
2004	Hurricane Ivan	231*	71*	194
1998	Hurricane Georges	8	6	2
1995	Hurricane Opal	124	106	229
1995	Hurricane Erin	14	20	0
1979	Hurricane Frederic	96	5	0
TOTAL		893*	374*	487

* Complete data records were not obtained for Hurricane Ivan in Escambia County and Santa Rosa County, where damages were greater than for Opal or Dennis.

Summary

Hurricane Sally was a Category 2 hurricane and the eighth storm of the 2020 hurricane season to make landfall in the continental United States, and one of eight storms to effect the northern Gulf of Mexico coastline. Hurricane Sally made landfall at Gulf Shores, Alabama, near the Alabama Florida state line. The most severe damages – which happened to the right (east) of the hurricane's eye at landfall – occurred at Perdido Key, Pensacola, Pensacola Beach (Escambia County) and Navarre Beach (Santa Rosa County). Hurricane Sally caused major beach and dune erosion in six northwest Florida counties. A total of 336 major structures sustained major structural damage within the Coastal Building Zone of Escambia, Santa Rosa and Okaloosa counties. Escambia County had three new barrier island breakthroughs at the eastern end of Perdido Key and Pensacola experienced its third-highest recorded water level from a hurricane.

As a result, significant flooding occurred in Escambia and Santa Rosa counties due to storm surge at the backside of the barrier islands from Old River and Santa Rosa Sound.

The 2020 Atlantic hurricane season was a record year of a total of 30 named storms and 12 making landfall and affecting the United States. This document will assist the department and local governments in identifying areas where storm erosion has left upland development and infrastructure vulnerable to imminent damage from future storms, where beaches and dunes may be restored and where expedited permitting procedures are needed to assist homeowners with repairs and reconstruction.