Strategic Beach Management Plan:

Southwest Gulf Coast Region

Office of Resilience and Coastal Protection

Florida Department of Environmental Protection

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Lido Key Shore Protection Project being constructed in 2020 near R41. Photo courtesy of Camden Mill, P.E., with the City of Sarasota. See additional construction photos of beach nourishment projects.

Introduction – Southwest

The **Southwest Gulf Coast Region** has a total of 186.5 miles of beaches, of which 106.2 miles are critically eroded and 66.7 miles are actively managed. There are also 33 inlets/passes within the Southwest Gulf Coast Region. Nine of those passes have an inlet management plan (IMP). For additional inlet management and sand bypassing information, see the Annual Inlet Report. For additional beach management, project information, or strategies see the current Critically Eroded Beaches Report, the joint coastal permits by County or the local government funding requests by County web pages.

Each subregion listed below will have the introductory paragraph that lists the miles of coastline and erosional events or storms that have affected the subregion. Each title within the subregion will list the coastal location, the county, and the range (R) survey markers for the critical erosion area. For inlets, river entrances or passes, the title, the county and the adjacent range survey markers will be stated. In addition, there will be a subregion map highlighting the critical erosion areas and the managed project areas. Finally, references to coastal reports will also be listed at the end of each subregion.

For more specific information concerning projects or strategies along Florida's coastline, see the following links for the other six coastal regions of Florida. For background information, see the Strategic Beach Management Plan's Introduction.

Strategic Beach Management Plan's Introduction
Northeast Atlantic Coast Region
Central Atlantic Coast Region
Southeast Atlantic Coast Region
Florida Keys Region
Big Bend Gulf Coast Region
Panhandle Gulf Coast Region

For additional information pertaining to beach and ocean conditions, coastal associations, educational institutions, or government agencies, see these related coastal sites.

The State of Florida was significantly impacted by two hurricanes in 2022, Hurricane Ian and Hurricane Nicole. For additional information on funding to address recovery for the beaches and

dunes, see the Hurricanes Ian and Nicole Recovery Plan. For all other hurricane-related material and the post-storm impact reports, visit DEP's Office of Resilience and Coastal Protection hurricane web page.

Pinellas Barriers

There are 39.3 miles of beaches in the **Pinellas Barriers** subregion, which extends from Anclote Key in Pasco County to the Southwest Channel entrance to Tampa Bay in Hillsborough County, as shown on Figure 1. There are 23.0 miles of critically eroded beaches in this subregion, of which 14.8 miles have been restored.

Erosion is attributed to winter frontal systems, tropical storms and hurricanes, and the effects of inlets including Hurricane Pass, Clearwater Pass, John's Pass, Blind Pass, Pass-a-Grille, Bunces Pass, and Egmont Channel. The most erosive storms were Hurricane Agnes (1972), subtropical storms in June of 1974 and June of 1982, Hurricane Elena and Tropical Storm Juan (1985), Tropical Storm Josephine (1996), Hurricanes Frances (2004), Hurricane Jeanne (2004), Tropical Storm Debby (2012), Tropical Storm Colin (2016), Hurricane Hermine (2016), and Hurricane Irma (2017).

Strategies for Inlets and Critically Eroded Beaches

Honeymoon Island, Pinellas County, R6–R12

This is a 1.4-mile segment of critically eroded beach on the southern Gulf shoreline of Honeymoon Island at Honeymoon Island State Park. The project history for this segment of shoreline is described in Table 1. A dredge and fill project using primarily limestone and some sand was conducted along the Gulf shoreline of Honeymoon Island (R8-R12) in 1969, using material from a borrow area located approximately 1,500 feet offshore of the island. A groin field was constructed with concrete-filled bag groins located at approximately R8.5, R10, and R12, near the south end of the beach fill. In 1989, beach nourishment was conducted using approximately 230,000 cubic yards (cy) of sand from an upland source. That material eroded quickly over the next two years. A feasibility study was completed in 1999, recommending beach nourishment and a terminal structure. A second study was completed in 2004. This study recommended beach nourishment north of R10 with the addition of erosion control structures.

Maintenance dredging of the Hurricane Pass navigation channel was conducted in 2000 with the placement of approximately 12,500 cy of beach quality material between R10 and R12.

Phase I of the non-federal **Honeymoon Island Beach Restoration Project** (R7-R10.5) was completed in December 2007, using approximately 140,000 cy of sand from a realigned inlet channel across the ebb tidal shoal of Hurricane Pass. The project design consisted of debris removal and a beach berm at elevation +5 ft NGVD. The existing concrete geotextile container groin located just north of R10 was replaced by a lower profile rubble mound structure. The groin was extended in length and a T-head groin was added.

Phase II of the non-federal Honeymoon Island Beach Restoration Project (R-7 to R-10.5) consisted of the construction of three additional T-groins, removal of a portion of the undermined parking lot, and construction of a beach, using approximately 162,890 cubic yards of sand from the same borrow area used for Phase I and an adjacent area to the south. Construction of Phase II began in August 2014 and was completed in November 2015. The project design included a retreat of the north parking lot approximately 70 feet landward. The latest nourishment was completed in July 2021 after Hurricane Elsa (2021), with placement of 158,641 cy, plus an additional 11,000 cy, between R7 and R9.5 from the sand spit at the southern end of Honeymoon Island. The next nourishment is scheduled for 2027/2028.

Table 1. Honeymoon Island Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
1989	230,000	Upland borrow area	R7.5-R11	0.7
2007	140,000	Hurricane Pass ebb shoal	R8-R10.5	0.5
September 2015	162,890	Hurricane Pass ebb shoal	R7-R10.5	0.7
July 2021	169,641	Spit at south end of island	R7-R9.5	0.6

Strategy: Maintain the project through monitoring and nourishment using sand from bypassing, inlet channel maintenance; design and construct additional beach erosion control structures.

Hurricane Pass, Pinellas County, R15-R16

Hurricane Pass is a natural inlet where a navigation channel was dredged in 1989. A feasibility study of navigation improvements was completed in 1999; this study recommended maintenance dredging and placement of the dredged sand on Honeymoon Island. Maintenance dredging of the navigation channel was conducted in 2000 with the excavation of approximately 12,500 cy of beach quality material that was placed on the beach on Honeymoon Island. Approximately 140,000 cy of beach quality sand from the straightened inlet channel across the ebb tidal shoal was dredged and placed on Honeymoon Island in 2007. In 2015, 162,890 cy of beach quality material was dredged from the ebb shoal and placed on Honeymoon Island.

Strategy: Continue to monitor the inlet channel and borrow area and place beach compatible sand from maintenance dredging on the adjacent eroded shoreline of Honeymoon Island.

Clearwater Pass North Shore, Pinellas County, R47-R49

This is a 0.5-mile segment of critically eroded inlet shoreline beach on Clearwater Pass at the southern end of Clearwater Beach Island. Clearwater Beach Island is approximately three miles long and is situated south of Caladesi Island, north of Sand Key, and adjacent to Clearwater Pass. The first beach restoration project in Florida may have begun as early as 1949, at Clearwater Beach, during which approximately 50,000 cy of sand were pumped from the bay or harbor to the city owned property on the beach. The project was sponsored by the City of Clearwater. Approximately 150,000 cy of sand was placed around 1,500 ft of the southwesterly curve of the island in a beach restoration project in 1951, in response to a 1950 storm. Most of the eroded inlet shoreline has been armored with concrete bulkheads. Private property owners along the inlet shoreline constructed five rubble mound groins to stabilize the inlet beach in 1986. Since 2000, erosion of the crenulated beaches between the groins accelerated and a project to construct boulder T-groins and breakwaters was proposed in 2006. This project was not constructed due to issues with local governments and property owners. A new project was proposed in 2014 for two of the properties along 765 ft of shoreline between R48 and R49, to include the construction of two T-groins, and three boulder Ts on three existing groins, as well as the placement of approximately 3,200 cy of beach fill obtained from Clearwater Pass. Construction of the groins and the sand placement between the groins was completed in 2017.

Strategy: Physical monitoring through regional surveys.

Clearwater Pass, Pinellas County, R47-R51

Clearwater Pass is an altered inlet stabilized with two jetties constructed in 1975 (south jetty) and 1981 (north jetty), and includes a federal navigational channel maintained by the U.S. Army Corps of Engineers (USACE). The navigation channel was first dredged in 1960. Material from maintenance dredging in 1967, 1969, and 1973 was disposed in the Gulf harbor and uplands. In 1977, beach compatible dredged material was placed as nourishment on the Sand Key shoreline, south of the pass. The City of Clearwater purchased a hydraulic dredge and between 1981 and mid-1984, dredged and placed nearly one million cy of beach compatible sand on the Sand Key shoreline (R51-R60). Since 1985, the entrance channel has not required dredging to maintain design channel depths. In 1994, maintenance dredging of the Gulf Intracoastal Waterway produced approximately 7,000 cy of sand that was truck hauled to Sand Key Park. In 2015/2016 Clearwater Pass was dredged by the city and material was stockpiled at R50. Some of that material was utilized in 2017 by the private properties along Clearwater Pass between R48 and R49. The USACE dredged the Gulf Intracoastal Waterway near Clearwater Pass in summer 2018. Marquesas beach improvements were completed in February 2022 with construction of three rock T-groins and sand placement between R49.2 and R50 and the placement of 11,000 cy of maintenance-dredged material from Clearwater Pass that was mixed with 7,300 cy of upland sand. A seagrass mitigation site was constructed near Willadel Drive Marina across the Clearwater Harbor and intracoastal waterway.

Strategy: Place beach compatible sand from maintenance dredging on adjacent eroded beaches.

Sand Key, Pinellas County, R56-R115.4

This is an 11.3-mile segment of critically eroded beach on the Gulf shoreline of Sand Key. Beach restoration and nourishment have been conducted throughout this area, except at the Town of Belleair Shore (R66-R71), Redington Beach (R109-113) and Madeira Beach (R114), where a groin field was constructed in the late 1950s.

The Sand Key project is federally authorized until 2043 and is part of the federal **Pinellas County Shore Protection Project**, which authorizes beach restoration and nourishment of Clearwater Beach Island, Sand Key, and Treasure Island, and nourishment of Long Key. The nourishment interval for Sand Key is every five years. The design consists of a beach berm at elevation +4.1 to + 4.8 NAVD 88, depending on location.

The project history for the Sand Key segment of shoreline is described in Table 2. The Sand Key segment was restored in four construction phases between 1988 and 1998. Previously, a breakwater was constructed in 1986 at Redington Shore (R101). In 1988, restoration at Redington Shore and the northern 0.8 mile of North Redington Beach (R99-R107) was completed using sand from the John's Pass ebb shoal. In 1990, restoration at Indian Rocks Beach (R72-R85) was completed using sand from the Egmont Channel Shoal. In 1992, restoration from Indian Shore to North Redington Beach (R85-R107) was completed using sand from the Egmont Channel Shoal. In 1998, restoration of Belleair Beach and the southern 0.8 mile of Clearwater Beach (R56-R66) on Sand Key was completed. The Sand Key restoration project included construction of 9.18 acres of artificial reef to mitigate for adverse impacts to nearshore hardbottom.

During a second phase of construction in 1999, nourishment between R71-R107 of Sand Key was completed using sand from the Egmont Channel Shoal. In response to the 2004 hurricane season, nourishment of the entire Sand Key segment (R56 to R66 and R71 to R107) of the Pinellas County Beach Erosion Control Project was accelerated, with construction completed in August of 2006.

Approximately 1,250,000 cy of material were dredged from the offshore Borrow Area L, located approximately 12 to 15 miles west of Sand Key in federal waters. Sand was placed at Clearwater Beach between R-56 to R-66, at Indian Rocks Beach between R-71 to R-82, at Indian Shores Beach between R-82 to R-100, and at Redington Beach between R-101 to R-107. Nourishment began in May 2012, and construction was completed in November 2012. The 2018 nourishment was completed in November 2018, with placement of approximately 1,299,858 cy of material between R58 and R108.7. The next nourishment is expected to occur in 2024/2025, if the necessary easements are obtained for the federal project.

Table 2. Pinellas County Shore Protection Project - Sand Key segment history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
July 1988	300,000	John's Pass ebb shoal	R99-R107	1.5
December 1990	1,300,000	Egmont Channel, Eastern Shoal	R72-R85	2.6

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
December 1992	850,000	Egmont Channel, Eastern Shoal	R85-R107	4.2
1998 through October 1999	2,612,166	Egmont Channel, Eastern Shoal	R56-R66 & R71- R107	8.8
August 2006	1,700,000	Egmont Channel, Eastern Shoal	R56-R66 & R71- R107	8.8
November 2012	600,000	Offshore Borrow Area L	R56-R66	1.9
November 2012	650,000	Offshore Borrow Area L	R71-R107	6.9
November 2018	1,299,858	Egmont Shoals	R58-R65.8 & R71-R83 & R87-R96 & R97.4-R98.8 & R99.4-R103.1 & R105.1-R108.7	14.2

Source: USACE – Jacksonville District

Strategy: Maintain project through monitoring and nourishment using bypassing and offshore sources.

John's Pass, Pinellas County, R125-R126

John's Pass is a stabilized inlet with a federal navigation channel maintained by the USACE. Maintenance dredging of the entrance channel is conducted as needed every five to ten years, and the material is bypassed to Treasure Island beaches. The ebb shoal has been used as a sand source for several nourishment projects. The management strategy listed below is based in part upon a 1993 inlet management study. A terminal structure was built in 2000 on the south side of the Pass to stabilize the Treasure Island project and minimize sediment transport into the Pass. The Department of Environmental Protection (Department or DEP) contracted with the University of South Florida (USF) in 2014 to conduct a new IMP study for John's Pass. The study was completed in 2016 and the Department adopted a new IMP in 2018 based on the sediment budget and modeling work performed during the study. Discussion of the strategies in greater detail can be found in the John's Pass – Inlet Management Plan.

A local study was conducted by USF staff in 2021 on the sand build-up on the north side of the pass to determine the causes and best strategies on how to best deal with the sand accumulation within the pass.

Strategy: 1) Conduct a comprehensive beach and inlet hydrographic monitoring program; 2) sand bypassing shall be performed by transferring beach compatible material from the John's Pass navigation channel, channel side borrow area, and ebb shoal borrow areas to the adjacent designated critically eroded gulf-fronting beaches to the south of the inlet, giving first priority to the eroding segment between DEP Range Survey Monuments R126 and R130, and second priority to the southern Treasure Island beaches between R135 and R143; 3) the initial target inlet sand bypassing quantity shall be 21,000 cubic yards per year to Sunshine Beach south of the inlet (R126-R130); 4) the source of sediment for meeting the target sand bypassing quantity shall be the John's Pass navigation channel and the channel side borrow area.

Treasure Island, Pinellas County, R126-R143

This is a 3.5-mile segment of critically eroded beach on Treasure Island. The Treasure Island segment is part of the federal **Pinellas County Shore Protection Project**, which is authorized until April 2022. Pinellas County is the local sponsor for the project, which consists of a beach berm at elevation +4.8 ft NAVD 88.

The project history for this segment of shoreline is described in Table 3. Initial restoration on Treasure Island occurred in 1969 between R132 and R141. Nourishment along short segments of shoreline has been conducted every three to five years using sand from Blind Pass, Pass-A-Grille, an offshore borrow area, the Egmont Channel Shoal, and bypassing of maintenance dredged material from John's Pass. Nourishment has created a wide beach along the central Gulf shoreline (R128-R137). The construction of a groin near R141 in 1976 and the extension of the groin on the north side of Blind Pass (R143) during 1983 stabilized the southern segment of Gulf shoreline. In 1996 and 2000, nourishment was conducted within a localized area of erosion between R138 and R144 using sand from the John's Pass navigation channel and the Egmont Channel Shoal borrow area. A terminal groin at the north end of the island was constructed in 2000.

In response to the 2004-2005 hurricane seasons, nourishment of the Treasure Island segment of the federal Pinellas County Beach Erosion Control Project was accelerated. Construction was completed in September 2006 using sand excavated from the Egmont Channel Shoal.

Both the north and south ends of the island were nourished in 2010 with sand dredged from John's Pass and John's Pass Ebb Shoal. Although the expected fill volumes for Sunshine Beach (R126.2 to R129.5) and Sunset Beach (R137.4 to R141.6) were 160,000 cy and 200,000 cy respectively, the borrow area had insufficient sand. The final fill volumes were 127,260 cy at Sunshine Beach and 125,423 cy at Sunset Beach. Due to Tropical Storm Debby in 2012, the USACE placed approximately 300,516 cy of sand on Treasure Island in 2014, using material from Egmont Shoal. The next nourishment for Treasure Island is scheduled for summer of 2018.

For emergency interim purposes only, the City of Treasure Island is authorized to excavate up to a maximum of 134,000 cy of sand from the beach between R130.5 and R133, with placement between R136 to R141 and between the south jetty at John's Pass to R128. The borrow area shall not be excavated to a cut depth to exceed -3.0 NGVD and the berm elevation at the fill sites shall be no more than +5 NGVD. Treasure Island completed a beach nourishment again in November 2018 with placement of 277,652 cy at Sunshine Beach (R126 and R128) and Sunset Beach (R136-R142). The next nourishment is expected to occur in 2024/2025, if the necessary easements are obtained for the federal project.

Table 3. Pinellas County Shore Protection Project - Treasure Island sand placement history.

Year	Volume (cy)	Sand Source	Project Location by R monument	Length (mi)
1969	790,000	Offshore borrow area	R132-R141	1.8
1971	75,000	O'Brien's Lagoon	R131-R132	0.2
1972	155,000	Blind Pass	R140-R141	0.2
1976	380,000	Offshore borrow area	R135-R142	1.3
December 1978	32,000	Blind Pass	R135-R142	1.3
1981	53,500	John's Pass	R127-R130	0.6
1983	220,000	Blind Pass	R138-R142	0.8
October 1986	550,000	Pass-a-Grille shoals	R129-R141	2.4

Year	Volume (cy)	Sand Source	Project Location by R monument	Length (mi)
1991	56,000	John's Pass	R127-R129	0.4
July 1996	51,300	West Egmont Shoal	R138-R143	0.4
August 2000	40,000	John's Pass, Blind Pass & Pass-a-Grille shoals	R126-R129	2.1
August 2000	348,722	John's Pass, Blind Pass & Pass-a-Grille shoals	R136-R143	2.1
September 2004	225,000	Pass-a-Grille shoals	R136-R141	1.0
August 2006 *	77,970	West Egmont Shoal	R126-R128	1.4
August 2006 *	106,302	West Egmont Shoal	R136-R141	1.4
October 2010	252,683	John's Pass, Attachment Lobe & Blind Pass	R126-R128 & R136-R141	1.4
August 2014	66,892	East Egmont Shoal	R126-R128	1.4
August 2014	232,407	East Egmont Shoal	R136-R141	1.4
November 2018	277,652	John's Pass & Egmont Shoals	R126B-R128A & R136A-R142	1.5

Source: USACE – Jacksonville District and *Emergency Project

Strategy: Maintain the project through monitoring and nourishment with sand from John's Pass, the Egmont Channel Shoal or offshore sources, as needed.

Blind Pass, Pinellas County, R143-R144

Blind Pass is an altered inlet without a maintained navigation channel. The channel and ebb shoal have been dredged every four to five years by the USACE as a sand source for nourishment on Treasure Island and Long Key. In 1983, the terminal jetty on the north side of Blind Pass (R143) was extended seaward. In 1986, an attached breakwater was constructed as an extension to the south jetty. The management strategy listed below is based in part upon a 1992 inlet management study. In 2006, the south jetty was sand-tightened by placing additional armor stone to close the existing 40-foot gap between the jetty and the detached breakwater. The Department contracted with the University of

South Florida in 2014 to conduct a new inlet management study for Blind Pass. The study was completed in 2016 and the Department adopted a new IMP in 2017 based on the sediment budget and modeling work performed during the study. Discussion of the strategies in greater detail can be found in the Blind Pass - Inlet Management Plan.

Strategy: 1) Conduct a comprehensive beach and inlet hydrographic monitoring program; 2) sand bypassing shall be performed from Blind Pass entrance channel borrow area to the adjacent gulf-fronting beaches both to the north and to the south of the inlet within designated critically eroded areas between R136 and R148; 3) sand bypassing quantities shall be 31,000 cy per year south of the inlet and 12,000 cy per year to the north, and the source of the material for the sand bypassing quantities shall be from the Blind Pass entrance channel borrow area.

Long Key, Pinellas County, R144-R166

There is a 4.1-mile segment of critically eroded beach on Long Key. Nourishment of Upham Beach (R144-R147) of the Long Key segment of the **Pinellas County Shore Protection Project** has been conducted at least every five years since 1980, using sand from Blind Pass, Pass-a-Grille and Egmont Channel Shoal. The project is federally authorized until 2030. Shore protection structures have been built at the north and south ends of the island. The local sponsor for Long Key is Pinellas County.

The Upham Beach project design consists of a beach berm at elevation +4.8 ft NAVD 88 to protect the existing dune and upland development. Despite construction of the breakwater extension to the south jetty at Blind Pass, severe erosion continued along the northern Gulf shoreline. The USACE studied the use of a groin field to slow erosion of the beach fill in 1999 but determined that it would not meet the economic requirements of the federal project authorization. Nourishment using sand from Blind Pass and John's Pass was completed in 2000 and 2004. Further nourishment was accelerated following impacts from the 2004 and 2005 hurricane seasons, and construction was completed in September 2006. Regular nourishment was completed again in 2010 with sand from Blind Pass. Due to damages sustained during Tropical Storm Debby in 2012, the USACE placed approximately 160,545 cy from Egmont Channel Shoal in 2014. Upham Beach was recently nourished with 150,854 cy of sand from Blind Pass in June 2019. The project history for this segment of shoreline is described in Table 4.

The Pass-a-Grille Beach project design used a beach berm elevation of +4.1 ft NAVD in the latest project, which was constructed in 2014. Pass-a-Grille Beach was restored in 1986 and nourishment of approximately 5,000 ft of beach impacted by Hurricane Frances and Jeanne, using sand from Pass-a-Grille Channel, was completed in November 2004. Due to damages sustained during Tropical Storm Debby in 2012, the USACE placed 140,053 cy from Egmont Channel Shoal in 2014.

Pinellas County completed the construction of five geotextile T-head groins in the vicinity of Upham Beach (R144.5-R146) in January 2006. Each T-head groin consists of a series of stacked geotextile sand-filled tubes. To mitigate for impacts to the downdrift beach, 85,000 cy of beach fill was placed in conjunction with the 2004 federal maintenance nourishment project. The geotextiles have been repaired in 2008 and 2011 due to rips. Five geotextile tubes were removed from T-2 as a public safety measure in 2016 due to rips, tube movement and instability, and loss of sand in the tubes. A project consisting of replacement of the five geotextile T-head groins with four new T-head rock groins was authorized by the Department in 2012. Construction of the rock groins was completed in August 2018 and nourishment at Upham Beach was completed in June 2019 with the placement of 150,854 cy of material. The Long Key beach nourishment project at Pass-a-Grille is scheduled for construction in 2024/2025, if the necessary easements are obtained for the federal project.

Table 4. Pinellas County Shore Protection Project - Long Key Segment history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
March 1980	253,760	Blind Pass	R144-R146	0.5
October 1986	96,712	Pass-a-Grille's Ebb Shoal	R144-R146	0.4
October 1986	73,000	Pass-a-Grille's Ebb Shoal	R160-R165	1.0
January 1991	229,950	Pass-a-Grille's Ebb Shoal	R144-R146	0.4
June 1996	252,950	West Egmont Shoal	R144-R146	0.4
May 2000	358,900	Blind Pass & John's Pass	R144-R146	0.4
August 2004	366,092	Pass-a-Grille's Ebb Shoal	R144-R146	0.4

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
August 2004	147,000	Pass-a-Grille's Ebb Shoal	R160-R165	1.0
October 2004	41,670*	Pass-a-Grille Channel & Ebb Shoal	R144-R146	0.4
September 2006	104,636	West Egmont Shoal	R144-R146	0.4
October 2010	159,572	Blind Pass	R144-R146	0.4
August 2014	156,748	East Egmont Shoal	R144-R146	0.4
August 2014	140,053	East Egmont Shoal	R160-R166	1.1
June 2019	150,854	Blind Pass	R144-R146	0.4

Source: USACE – Jacksonville District and *Emergency Project

Strategy: Maintain the project through monitoring and nourishment using sand from inlet bypassing and offshore sources; monitor performance of the rubble/rock groin field at Upham Beach.

Pass-a-Grille, Pinellas County, R166-R167

Pass-a-Grille is a natural inlet that includes a federal navigation project. The inlet is just south of Long Key and Pass-a-Grille Beach (R166). Navigation improvements to the authorized channel were completed in 1966. Dredged material from Pass-a-Grille Pass was placed on Long Key in 1986.

Dredging of the Pass-a-Grille channel and ebb shoal was conducted in 2004, with the sand used to nourish Upham Beach, Sunset Beach, and Pass-a-Grille Beach. Maintenance dredging has not been required to maintain navigable depths. The Department contracted with the University of South Florida in 2017 to conduct a new inlet management study for Pass-a-Grille. The study was completed in 2018 and the Department adopted a new IMP in early 2019 based on the sediment budget and modeling work performed during the study. Discussion of the strategies in greater detail can be found in the Pass-a-Grille - Inlet Management Plan.

Strategy: 1) Conduct a comprehensive beach and inlet hydrographic monitoring program; 2) sand bypassing shall be performed from the Pass-a-Grille navigation channel and ebb shoal to the adjacent gulf-fronting beaches to the north of the inlet, Pass-a-Grille Beach, between FDEP Reference Monuments R160 and R166; 3) on an average annual basis, the initial target inlet sand bypassing quantity to Pass-a-Grille Beach shall be 14,000 cubic yards per year; 4) the source of sediment for meeting the target sand bypassing quantities shall be the Pass-a-Grille navigation channel, channel margin linear shoal and north lobe of the ebb shoal; 5) additional sediment up to an annualized quantity of 50,000 cubic yards per year may be obtained from the Pass-a-Grille ebb shoals for beach nourishment projects on Sand Key, Treasure Island and Long Key.

Bunces Pass, Pinellas County, R166-R167

Bunces Pass is an ebb tide-dominated natural inlet south of Shell Key and just north of Mullet Key and R167. Bunces Pass has an ebb-tidal delta that is superimposed on the larger Egmont Channel (Tampa Bay Entrance) ebb delta. The inlet is historically stable, and the main channel with a maximum depth of over 20 ft has not changed in width or alignment in over 140 years. The ebb shoal has a dynamic morphologic history and has recently become emergent. Pinellas County completed an inlet management study of both Pass-a-Grille and Bunces Pass in 2018. Bunces Pass is an unaltered inlet and therefore an inlet management plan is unnecessary and not required by Florida Statute.

Mullet Key, Pinellas County, R176-R182

Mullet Key is managed by Pinellas County as Ft. DeSoto Park and has a 1.1-mile segment at the south end that is designated as critically eroded. In 1973, a federal beach erosion control project was constructed at Mullet Key that consisted of beach restoration along the Gulf shoreline (R173-R179) using 700,000 cy of sand obtained from the Egmont Channel. The project included construction of a groin and revetment at the southwest point of the island. In 1977, beach nourishment was conducted along the project area and along the bay shoreline (R181-R191) using sand from channel deepening in Tampa Harbor. The federal project was deauthorized in 1990.

In conjunction with the 2006 maintenance dredging of Tampa Harbor, the USACE placed approximately 350,000 cy of sand (R177-R179.5 and R181-R183) and rehabilitated the groin at the southwest point of the island.

Pinellas County recently conducted a feasibility study (2014) to address coastal erosion at Ft. De Soto Park at the north end of Mullet Key.

Strategy: Maintain the beach with suitable and available material from navigational dredging and other available sources.

Egmont Channel, Hillsborough County

Egmont Channel is located between Mullet Key and Egmont Key. The Tampa Harbor Navigational Project passes through Egmont Channel. Sand dredged from the Egmont Channel Shoal has been used for several nourishment projects and may contain a substantial quantity of sand for project needs in the area over the next 15 years.

Strategy: Bypass beach quality dredge material from the navigation channel to the eroding beaches of Egmont Key; continue to use Egmont Channel Shoal as a borrow area for Pinellas County Shore Protection Project segments.

Egmont Key, Hillsborough County, R1.5-R11

Egmont Key has a 1.6-mile segment of federal land managed by the State of Florida's Division of Recreation and Parks as Egmont Key State Park. In 1997, Pinellas County and the state conducted a feasibility study to evaluate long-term solutions to the erosion threatening historical and natural resources on the island. The study recommended beach restoration with erosion control structures. Due to the lack of a local sponsor, the recommendations of this feasibility study were not pursued. As an interim measure, sand placement using maintenance dredged material from the St. Petersburg Harbor navigation project and construction of two sand-filled geotextile groins occurred in 2000.

During the 2004 hurricane season the geotextile tube groins were damaged. In 2006, the two sand-filled geotextile tube groin structures on the north end of Egmont Key were reconstructed in conjunction with sand placement using maintenance dredged material from the federal Tampa Harbor Navigation Project. This event placed approximately one million cy of sand on the beach and in the nearshore of Egmont Key.

A reconnaissance level federal study began in January 2002 to examine erosion protection for the historic structures located on the west side of the Island. This reconnaissance level study was completed in 2003 with the recommendation of no further action by the USACE. However, in 2004 Congress directed the USACE to conduct a full feasibility study. The Egmont Key Feasibility Study was completed in February 2009. The USACE Feasibility Report concluded that the project was not

economically justified. In addition to the inability to prove economic feasibility, the project also does not have a non-federal Sponsor; therefore, the report recommends no further action. The USACE completed beach nourishment again in March 2015 at two placement areas, with 222,068 cy of material placed between R2.5 and R5 and 68,479 cy of material placed between R7 and R8. The material had been maintenance dredged from the Tampa Harbor Navigation Channel. Comprehensive monitoring of Egmont Key is being conducted as part of a study of beneficial reuse of dredged material by the USACE Engineering Research and Development Center. Placement of material in the nearshore has occurred in 2017 and 2018. The USACE placed approximately 500,000 cy at Egmont Key in 2019. Additional beach nourishment occurred at Egmont Key in the winter of 2022/2023 with placement of approximately 468,000 cy of material from the Tampa Bay channel with placement between R2 to R10. The next channel dredging event by the USACE will begin in the fall of 2023.

Strategy: Monitor; maintain the beach with suitable material from navigational dredging; utilize non-beach compatible maintenance dredge material for nearshore placement if no adverse impact on the environment.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Pasco County, Pinellas County, Clearwater, Belleair Beach, Belleair Shore, Indian Rocks Beach, Hillsborough County, Indian Shores, Redington Shores, North Redington Beach, Redington Beach, Madeira Beach, Treasure Island, St. Pete Beach, and the USACE. Participants with the Department as sponsors of beach management projects include Pinellas County and the USACE. This area contains several islands managed by the Division of Recreation and Parks, including Anclote Key, Three Rooker Bar, Honeymoon Island, and Caladesi Island. In addition, public park lands on Mullet Key are managed by Pinellas County. Egmont Key is a Florida State Park that is cooperatively managed by the Division of Recreation and Parks, the U.S. Fish & Wildlife Service, and the U.S. Coast Guard. Project cost estimates and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple beach nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks. Opportunities in this subregion include:

1. Continue a sediment management strategy that uses beach compatible sand from maintenance dredging of navigation projects in the maintenance of projects.

2. Continue to link project segments, such as Treasure Island and Long Key, for construction and continue to implement the regional monitoring program of the combined projects.

3. Further investigation is needed to determine if maintenance dredged material from the Tampa Harbor or other federal navigation projects could be placed in the nearshore zone adjacent to the Egmont Key Gulf shoreline.

Environmental Protection

The protection of marine turtles, manatees, shorebirds, hardbottom, seagrasses and their habitats are primary environmental concerns within this subregion. Sensitive areas for shorebirds include Anclote Key, Honeymoon Island, Caladesi Island, St. Pete Beach, Clearwater Pass, Sand Key, Indian Rocks Beach, Indian Shores, Mullet Key, and Egmont Key. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has not been restricted during the marine turtle nesting season of May 1 through October 31. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. Artificial reefs as mitigation to offset adverse impacts to nearshore hardbottom caused by the Sand Key project have been constructed. The Pinellas County Aquatic Preserves boundaries extend offshore of the Pinellas County shoreline into the Gulf of Mexico, and the Boca Ciega Bay Aquatic Preserve boundary extends seaward out to 100 yards from the mean high water line along the western and southern shorelines of Mullet Key. Projects located within and near the Aquatic Preserve boundaries require additional protection, including more stringent water quality standards than in non-aquatic preserve waters, during permitting and construction to ensure preservation of the existing conditions.

During the Tampa Bay oil spill of August 1993, the beaches and nearshore areas at the project site were inundated by oil. Oil from this spill was encountered while dredging Blind Pass in 1999; however, no such contaminated sediment was discovered during either the subsequent dredging of John's Pass, which is the next inlet to the north of Blind Pass, nor during the dredging of Pass-a-Grille Channel in 2004, the inlet to the south. An environmental cleanup lead by the U.S. Coast Guard and the USACE removed the oil from the pass.

Sand Sources

A feasibility study identified several potential borrow areas for beach restoration and nourishment of Honeymoon Island, and additional investigation during the design of Phase 2 determined the ebb shoal of Hurricane Pass to be an acceptable borrow area. Additional sand sources include maintenance dredging from Hurricane Pass and potential bypassing of sand from an accreted spit on the north side of Hurricane Pass. Additional resources are to be investigated including the ebb shoal off the north end of Honeymoon Island as part of a proposed study of Hurricane Pass by the Florida Bureau of Design and Construction in 2023/2024. Johns Pass channel and ebb shoal and Blind Pass channel have been used for several beach nourishment projects and appear to contain a substantial quantity of sand for future project needs. Pass-a-Grille and Grande Canal have beach quality sand sources for the purpose of bypassing material to the beach. The Egmont Channel Shoal has also been used for several beach nourishment projects and appears to contain a substantial quantity of sand for future project needs over the next 15 years. Additional investigation of offshore areas off Sand Key has been completed. Approximately 1.2 million cy of beach compatible sand in federal waters 12 to 14 miles west of Clearwater Pass was used for the 2012 Sand Key nourishment project. Most of the maintenance dredged material obtained from the Tampa Harbor navigation project is placed in confined upland disposal sites or an open water offshore disposal area because its excessive silt content is not suitable for beach placement. A regional sediment management strategy that uses beach quality sand from upland dredged material management areas and the maintenance dredging of the navigation projects should continue to be incorporated into the maintenance of the beach restoration projects. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

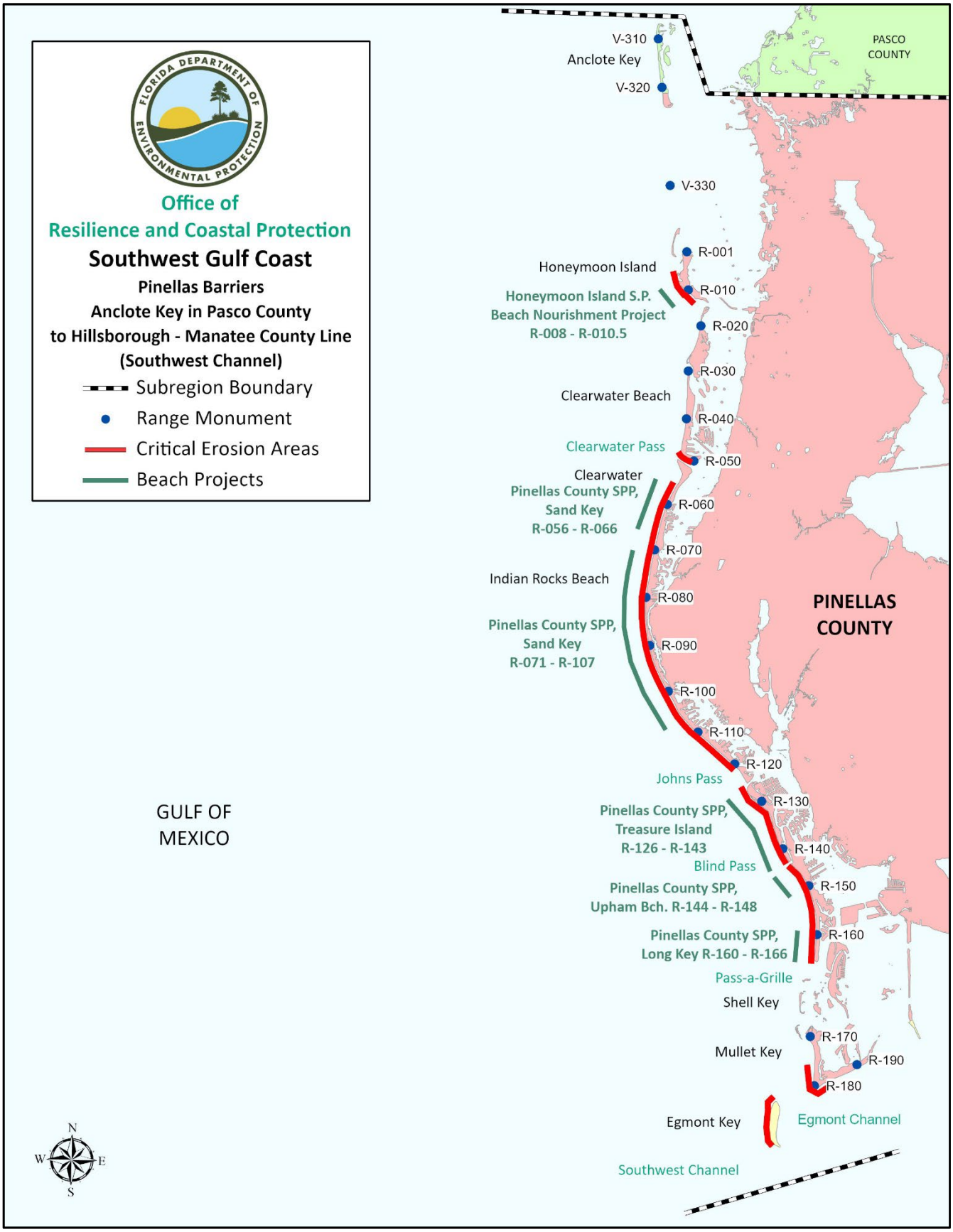

Figure 1. Map of Pinellas Barriers subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Sarasota Barriers North Reach

There are 21.4 miles of beaches in the **Sarasota Barriers North Reach** subregion, which extends from the Southwest Channel entrance of Tampa Bay in Manatee County to Sarasota Point (R45) on the northwest end of Siesta Key in Sarasota County, as shown on Figure 2. There are a total of 20.8 miles of critically eroded beaches in this subregion (13.0 miles in Manatee County and 7.8 miles in Sarasota County), of which 17.7 miles have been restored and maintained.

Erosion is attributed to winter frontal systems, tropical storms and hurricanes, and the effects of the inlets including Passage Key Inlet, Longboat Pass, New Pass, and Big Sarasota Pass. The most erosive storms in recent years were the "No-Name Storm" in 1982; Hurricane Elena and Tropical Storms Bob and Juan (1985); Tropical Storm Josephine (1996); Hurricanes Frances, Ivan, and Jeanne (2004); Hurricane Wilma (2005), Tropical Storm Debby (2012), Tropical Storm Colin (2016), Hurricane Hermine (2016), and Hurricane Irma (2017).

Strategies for Inlets and Critically Eroded Beaches

Countywide Studies and Projects

In 2003, the Sarasota and Charlotte County Beach Restoration Study was completed. The purpose of the study was to investigate the extent and nature of Gulf shoreline erosion and examine the technical, regulatory, and financial feasibility of large-scale erosion control actions for consideration in the development of the Strategic Beach Management Plan. The study area included all the unincorporated shoreline of Sarasota County and Charlotte County to Gasparilla Pass. The Town of Longboat Key, the City of Sarasota, the City of Venice, and Gasparilla Island were excluded because they have pursued their own studies and erosion control projects. The study area totals more than 32 miles of shoreline and represents an effort by the State to address these issues on a regional basis. A Baseline Coastal Resilience Analysis of Sarasota County was conducted in May 2021, addressing the first two steps within the Florida Resilient Coastlines Program framework. The first step established context for the coastal setting through the determination of the active and historical shoreline changes occurring along coastal ranges with no record of past sediment management projects. Afterwards, the second step involved conducting a countywide vulnerability assessment of the coastal communities and infrastructure. This determined the susceptibility of all land above the designated MHHW line to simulations of a 1-in-50-year storm surge and up to 3 feet of predicted sea level rise. This coastal resiliency analysis will be followed by further research endeavors of countywide vulnerability that

will potentially lead to the development of adaptation alternatives to be adopted and implemented by the county.

Passage Key, Manatee County, V301-V302

Passage Key is a National Wildlife Refuge established in 1905, currently with 0.3 mile of critical beach erosion. The island was severely eroded by a hurricane in 1921. Dredging has been conducted in the ebb shoal and there is a need to evaluate the borrow site for use as a future sand source for beach nourishment projects.

Strategy: Monitor.

Passage Key Inlet, Manatee County

Passage Key Inlet is the southern pass in the entrance to Tampa Bay. It is south of Passage Key and north of Anna Maria Island. Dredging has been proposed in the ebb shoal and there is a need to evaluate the impact of dredging this borrow site. The county initiated an inlet study in 2021 to evaluate sand sources and alternatives on how to best manage the inlet. The study is scheduled to be completed in early 2023.

Strategy: Complete an inlet management study and adopt an IMP and continue to monitor the impacts from dredging the ebb shoal of Passage Key along the north end of Anna Maria Island.

Anna Maria Island, Manatee County, R1-R41

This is a 7.9-mile segment of critically eroded beach comprising the entire Gulf shoreline of Anna Maria Island. The **Manatee County Shore Protection Project** is authorized until 2043.The project history for this segment of shoreline is described in Table 5. The federal restoration has been completed along 4.6 miles of Gulf shoreline from R12-R36. A total of 6.2 miles of shoreline has been restored on the island with the addition of non-federal segments of shoreline from R7-R10 (0.6 mile) and R36-R41.3 (1.0 mile). The local sponsor is Manatee County. The federal project design consists of a beach berm at elevation +4.0 ft NAVD 88 to protect the existing dune and upland development.

Restoration of the federal **Manatee County Shore Protection Project** was completed at Holmes Beach and Bradenton Beach (R12-R36) in 1993 using sand from an offshore borrow area. The construction of the restoration project directly impacted hardbottom and included construction of 7.3 acres of artificial reef to mitigate for adverse impacts to nearshore hardbottom. Restoration was completed along the north end of the island (R7-R10) and the first nourishment was completed

between R12-R36 in May 2002 using sand from an offshore borrow area. In response to the 2004 hurricane season, nourishment for the federal project was accelerated with construction completed in the summer of 2006. Due to contractor difficulties and the marine turtle nesting season, the design template was not fully nourished at that time. In 2007, a feasibility study was completed that studied the expansion of the project to the north, from R1-R7.

Construction of the nonfederal project in the City of Anna Maria (R7-R10) that placed 24,000 cy and restoration of the **Coquina Beach Nourishment Project** segment (R36-R41.3) with placement of 204,773 cy was completed in May 2011. Subsequently, a geotextile tube was installed along the north side of the existing Coquina Beach jetty in April 2012 to observe the effects of sand-tightening the structure. Due to damages sustained during Tropical Storm Debby in 2012, the USACE placed approximately 973,839 cy of material at Holmes Beach and Bradenton Beach (R12-R36) in 2014. Non-federal nourishment for Coquina Beach was also completed in 2014 to address losses from Tropical Storm Debby and restore the full project template with placement of 332,112 cy from R33 to R40.7, including an overlapping taper section with the federal project area between R33 and R36.

A feasibility study investigating replacement alternatives for the Cortez Beach groins was conducted in 2012 and the replacement groin project was approved by the Department. The groins protect Gulf Drive between R34-R36 within the boundaries of the federal project. Construction for the replacement of the groins with three permeable adjustable groins (PAGs) was completed in December 2016. In 2018/2019 the County initiated a study of the terminal groin at Coquina Beach to identify an optimal design of the structure.

Environmental monitoring of the effects of the restoration project on hardbottom indicated that impacts occurred because of the 1993 project beyond those impacts mitigated by the construction of the 7.3 acres of artificial reef. To mitigate for the additional impacts and for impacts to hardbottom from the extension of the 2002 project, the local sponsor constructed an additional 0.44 acre of artificial reef. An artificial reef of 4.87 acres was constructed in the fall of 2011 as mitigation for nearshore hardbottom burial resulting from the Coquina Beach restoration. The actual constructed mitigation was 0.82 acre more than required by the permit and the Department agreed that this excess mitigation can be applied for impacts related to future projects. The 2014 Coquina Beach Nourishment Project required 0.52 acre of upfront mitigation, resulting in a remaining excess of 0.30 acre of mitigation within the 2011 Artificial Reef. The 2020 **Manatee County Shore Protection**

Project placed a total of 815,000 cy of sandy material on the beach between R12 and R33.5 and the county Coquina project placed an additional 235,000 cy that all came from the Passage Key ebb shoal. A third segment placed 98,300 cy from the Longboat Pass navigation channel between R33 to R41 to replace material lost due to impacts from Hurricane Hermine (2016) and Hurricane Irma (2017). The next nourishment is scheduled for 2026/2027.

Table 5. Manatee County Shore Protection Project and local County Project history.

Date Completed	Volume (cy)	Source	Project Location (by R monument	Length (mi.)
February 1993	2,320,000*	Offshore	R12-R36	4.6
May 2002	1,900,000*	Passage Key ebb shoal	R7-R10 and R12-R36*	0.6 and 4.6
June 2006	213,000*	Passage Key ebb shoal	R12-R32	3.8
April 2011	24,709	Passage Key ebb shoal	R7-R10	0.6
April 2011	204,773	Passage Key ebb shoal	R36-R41.3	1.0
March 2014	973,839*	Passage Key ebb shoal	R12-R36	4.6
April 2014	332,112	Passage Key ebb shoal	R33-R40.7	1.1
October 2020	815,000*	Passage Key ebb shoal	R12-R33.5	4.5
November 2020	235,000	Passage Key ebb shoal	R33.5-R41.5	1.4
March 2021	98,300	Longboat Pass	R33 to R41	1.4

*Federal Project

Strategy: Maintain the project through monitoring and nourishment using sand from offshore sources; place beach quality sand from maintenance dredging of the navigation projects on eroding beaches, including R-1 to the Rod and Reel Pier; design necessary structures and rehabilitate the terminal groin at Coquina Beach.

Longboat Pass, Manatee County, R41-R42

Longboat Pass is an altered inlet between Anna Maria Island to the north and Longboat Key to the south and includes a federal navigation channel authorized by the USACE. Initial dredging of the authorized channel was completed in 1977. Maintenance dredging of the channel has been conducted

by the USACE in 1982, 1985, 1991, and 1997. The dredged sand has been placed on the adjacent Gulf shorelines of Anna Maria Island and Longboat Key in the areas of greatest need. An island-wide beach restoration project along the majority of Longboat Key utilized 1,955,000 cy from the ebb shoal in 1993. Longboat Pass project activities receive regional sediment management support by the USACE to manage the sediments in a manner that maximizes natural and economic opportunities for the coastal system.

A feasibility study was completed in 2008 by the Department and the West Coast Inland Navigation District to evaluate alternatives that could mitigate the impacts to the adjacent shorelines resulting from the past inlet dredging activities. Analysis included studying the sediment budget at the inlet, evaluating sand bypassing at the inlet, determining the potential impact of the modified dredging on the efficiency of the natural bypassing at the inlet, and environmental impacts of the proposed dredging. Based on recommendations of the study, flood shoal sand traps were identified as sand sources for bypass to adjacent eroding shorelines. The first dredging event was completed in July 2014, with material placed at the North End of Longboat Key. Areas of shoaling were identified within the Longboat Pass Flood Shoal as potential sand traps to be established as a renewable local sand source for beach fill for the adjacent shorelines on Anna Maria Island to the north and Longboat Key to the south. Two sand traps were established within the flood shoal region in 2014, one of which included a portion of the interior federal channel. The two sand traps generated approximately 100,000 cubic yards of sand, which were placed on the north end of Longboat Key. The Town of Longboat Key participated in sponsoring the construction, which addressed an emergency condition in which upland habitable structures were becoming threatened due to erosion.

Manatee County and the Town of Longboat Key completed a joint IMP study for Longboat Pass in November 2011, with revision in December 2012. Primary focus of the study was to assess coastal processes of Longboat Pass and vicinity. Also emphasized was improvement of regional sediment management to conserve sediment resources, using efficiencies of the erosion control programs, and maintaining navigation while protecting natural resources. The study concluded that the inlet navigation channel should be dredged on a cycle that approximates a 4-year interval with material placement alternating between the two islands, or an 8-year interval with the material being split 50/50 between the two islands. The Department issued a navigational maintenance dredging and beach nourishment permit in March 2015. A sediment budget update was submitted to the Department and Town in February 2019 for Longboat Pass. Manatee County is planning to repair, replace or sand tighten the north jetty of Longboat Pass in 2024. The county sponsored a study on the Coquina Beach

Shoreline Stabilization and Longboat Pass jetty reconstruction and the study was completed in December 2021.

Strategy: Monitor and develop a sediment budget sufficient for the adoption of an IMP, in conjunction with further dredging in Longboat Pass flood shoals as a sand resource.

Longboat Key, Manatee County, R42-R67 through Sarasota County, R1-R29

This is a 10.2-mile segment of critically eroded beach comprising the entire Gulf shoreline of Longboat Key. The federal **Sarasota County Shore Protection Project** authorizes restoration of 2.4 miles of shoreline on Longboat Key in Sarasota Counties. The Town of Longboat Key has elected not to pursue the federal shore protection project. The **Longboat Key Beach Nourishment Project** history is described in Table 6.

The project design for Longboat Key consists of a 50-foot-wide beach berm at elevation +5 ft NGVD. Construction of 2.52 acres of artificial reef to mitigate for anticipated adverse impacts to nearshore hardbottom was required. Of the 2.52 acres of planned artificial reef, only one acre was constructed. To offset the impacts of the acreage that was not built, the Town of Longboat Key agreed to employ adaptive management and monitoring techniques designed to promote colonization of desired species on the existing artificial reef. The Town also agreed to construct the additional acreage later.

The **Longboat Key Beach Restoration Project** (R46ME-R29ST) was completed using sand from the ebb shoals of Longboat Pass and New Pass, with placement of 3,130,000 cy of material on the beach in 1993. Nourishment of the central segment of the project (R62ME-R14ST) was conducted using sand from an offshore borrow area in 1997. The project included sand-filled geotextile sills and groins installed at localized areas displaying accelerated erosion trends.

In 1998, an extension of the terminal groin at the south end of the island was completed. In 2001, nourishment from R10.5 to R14 was conducted on Longboat Key. In 2003, maintenance dredging of New Pass was conducted, with placement of 100,000 cy of dredged material on Longboat Key between T22 to R28 in Sarasota County.

A Longboat Key beach nourishment was completed in the summer of 2006 with beach placement of 1,790,000 cy of sand. The project was constructed to a berm elevation of +7.0 ft (NGVD) between T1 and R15 and between R24 and R26 in Sarasota County. The berm elevation for the remaining project fill area is +6 ft NGVD. The 2006 nourishment involved the placement of two distinct types of

borrow material: (1) a coarser fill to be used as a base layer in areas of historically high erosion; and (2) a significantly finer lighter colored material (similar to native sand) to be used as a cap layer over the coarse base and used as a single fill layer in the remaining project fill areas. The local sponsor completed construction of 1.5 acres of artificial reef to mitigate for adverse impacts to nearshore hardbottom in July of 2006, fulfilling the mitigation requirements for the project.

Construction of two PAGs was completed in 2010, designed to enhance the project in the area from R12 to R14. The north end of Longboat Key was nourished in June 2011 using sand from offshore and again in 2014 using flood shoal material. Due to the high erosion rate, two more PAGs have been designed for the north end of the island and were constructed in 2015, which included placement of 9,375 cy in the vicinity of the groins. A sediment budget update was submitted to the Department and Town in February 2019 for Longboat Pass. The Department issued permit modifications (Permit Nos. 0300119-007-JM and 0300119-008-JM) to the Town to build three additional T-head rock groins north of the PAGs and two south of the PAGs in 2020/2021 at North Longboat Key. A truck haul of beach fill of the central gulf beaches began in April 2016 and beach nourishment of the north and south gulf beaches using the borrow areas within the adjacent inlets (Longboat Pass and New Pass) was completed in the fall of 2016, with a total of 687,700 cy of material placed along 4.7 miles of Longboat Key beaches. The north end of Longboat Key at R44 received approximately 22,000 cy of material in August/September 2018. The Town of Longboat Key nourished the beach in five segments with a total placement of 1,099,000 cy between R42 ME and R29 ST and built five low-crested permeable rock groins at the north end of Longboat Key in 2021 between R42 and R45 ME. The Water Resources Development Act (WRDA) of 2022 was signed and approved by Congress to conduct a federal feasibility study for all of Longboat Key. The Town of Longboat Key's next large-scale nourishment is scheduled for 2025/2026.

Table 6. Longboat Key Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
May 2001	105,280	Offshore of R-48 Whitney Beach	R10.5-R14 ST	0.7
2003	100,000	New Pass	T22-R28 ST	1.1
July 2006	1,790,000	Offshore	R44 ME-R29.5 ST	9.8

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
June 2011	139,867	Offshore Borrow Area IX	R44-R46.5 ME	0.5
July 2014	98,000	Flood Shoal	R42-R46 ME	0.8
2015	9,375	Upland	R44.5 ME	0.1
July 2016	139,000	Upland	R67 ME-R10.8 ST	2.0
July 2016	45,700	Upland	R13-R15.7 ST	0.4
July 2016	20,300	Upland	R62-R64 ME	0.5
September 2016	212,900	New Pass Ebb Shoal	R24-R28 ST	0.8
September 2016	30,200	Longboat Pass Ebb Shoal	R44.7-R45.5 ME	0.2
October 2016	185,200	Longboat Pass Ebb Shoal	R48-R50.7 ME	0.5
October 2016 *	21,100	New Pass Ebb Shoal	R26.5-R28 ST	0.3
October 2016 *	33,300	Upland	R28-R29 ST	0.2
September 2018	22,000	Upland	R44 ME	0.1
April 2021	188,900	Passage Key Ebb Shoal	R21 – R26 ST	0.9
April 2021	79,800	Longboat Pass	R48.5 – R50.5 ME	0.5
May 2021	405,400	Passage Key Ebb Shoal	R66 ME – R15 ST	2.9
July 2021	198,400	New Pass	R25.5 – R29.4 ST	0.7
September 2021	226,500	Passage Key Ebb Shoal	R42-R45.5 ME	0.5

*Emergency Truck Haul due to Hurricane Hermine in September 2016.

Strategy: Maintain the project through monitoring and nourishment using sand from bypassing and offshore sources; conduct preliminary design to rehabilitate terminal groin.

New Pass, Sarasota County, R29-R30

New Pass is an altered inlet between Longboat Key to the north and Lido Key to the south and includes a federal navigation channel maintained by the USACE. The inlet provides access to the

entrance of the turning basins at Payne Terminal and Sarasota's City Pier. Initial dredging of the authorized channel was completed in 1964. Maintenance dredging of the entrance channel has been conducted every three to five years by the USACE. There were three inlet studies conducted in the early 1990's. The City of Sarasota has dredged the New Pass ebb shoal for Lido Key in 2009, 2015, and 2019. The ebb shoal was also dredged in 2016 and 2021 for placement on Longboat Key. The Town and the County in 2021 have initiated an inlet study to determine the best alternatives for managing the inlet's sand resources to develop a sediment budget and an updated inlet management plan.

Strategy: Update the sediment budget and adopt an IMP for future use of the sediment source to nourish Longboat Key and Lido Key.

Lido Key, Sarasota County, R31-R44.5

This is a 2.4-mile segment of critically eroded beach along the Gulf shoreline of Lido Key. A 0.3-mile segment of critically eroded inlet shoreline is located on the north end of Lido Key fronting New Pass (1500 ft east of R31-R31). Restoration has been conducted along the central Gulf shoreline of the island. The local sponsor is the City of Sarasota. The federally authorized project design consists of a beach berm at elevation +4 ft NAVD 88 and provides five years of advance nourishment to protect the existing dune and upland development. The project history for this segment of shoreline is described in Table 7.

Early investigations of erosion in the late 1950's by the University of Florida led to the construction of a curved groin at R38 and a perpendicular groin at R38.5. The curved groin at R38 was removed in 2009/2010. The City of Sarasota conducted restoration along Coolidge Park (R35-R38.4) in 1970. The beach has been nourished with sand from maintenance dredging of the New Pass navigation channel (see table below). Beach nourishment was conducted at R35 to R40 using sand from an offshore borrow area in 1998. Beach nourishment was conducted again at R36.5 to R44.2 from an offshore sand source in 2001 and in 2003.

The USACE completed a feasibility study in 2002. Recommendations from the study included restoration of 8,280 ft of shoreline from R-35 to R-43 with 460,200 cy of design fill and 614,500 cy of advance fill, for a total of 1,074,700 cy. The Corps identified three offshore borrow areas for the 50-year life of the project and has also investigated Big Sarasota Pass as a potential sand source. The feasibility study also recommends the construction of three groins varying in length from 320 to 650 ft along the southern portion of the study area, with the northernmost groin at approximately R42.5 and

the southern groin at the southern tip of Lido Key. The initial construction of the federal **Lido Key Shore Protection Project** was constructed in 2020.

In response to the 2004 hurricane season, nourishment was conducted by the City of Sarasota, with construction completed in April 2009 utilizing sand from New Pass. Tropical Storm Debby caused severe erosion along Lido Key's shoreline in 2012, with initial estimate of sand loss at 130,000 cy. Construction was conducted in early 2015 with placement of approximately 222,800 cy of beach quality sand from the New Pass southern ebb shoal, with placement on Lido Key. In April 2019, the city placed approximately 200,000 cy of sand from New Pass's ebb shoal and channel onto Lido Key Beach between R37 and R43.8. The next nourishment placed approximately 817,880 cy of sandy material in 2020 between R36.5 and R44 from the Big Sarasota Pass channel and ebb shoal. The pay volume was 683,084 cy for the November 2020 project. Two groins were constructed in spring of 2021 with groin # 1 constructed at R42.5 and groin # 2 was constructed at R43.1.

Table 7. Lido Key Shore Protection Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
1964	121,000	New Pass	R35-R38.5	0.6
1970	350,000	New Pass	R35-R38.5	0.6
June 1974	246,000	New Pass	R35-R38	0.5
October 1977	400,000	New Pass	R35-R38	0.5
1982	92,000	New Pass	R35-R38	0.5
1985	239,000	New Pass	R35-R38	0.5
1991	177,000	New Pass	R34.5-R38	0.6
1996	178,000	New Pass	R34.5-R38	0.6
May 1998	285,000	Offshore	R35-R40	0.8
April 2001	360,000	Offshore	R36.5-R44.2	1.4
February 2003	125,000	New Pass	R35.5-R43.2	1.4
April 2009	464,000	New Pass ebb shoal & channel	R34-R44	1.6

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
March 2015	222,800	New Pass ebb shoal & channel	R37-R43.3	1.1
April 2019	200,000	New Pass ebb shoal & channel	R37-R43.8	1.2
December 2020	683,084*	Big Sarasota Pass ebb shoal and channel	R36.5-R44	1.4

*Pay Volume

Strategy: Maintain the project through monitoring and nourishment using sand from inlet and offshore sources.

Big Sarasota Pass, Sarasota County, R44-R45

Big Sarasota Pass is a natural inlet between Lido Key to the north and Siesta Key to the south. The inlet has not been altered by channel excavation or jetty construction; however, the Siesta Key shoreline has been armored with bulkheads and revetments, which have prevented the inlet channel from migrating further southward. There is a proposal by the USACE to excavate a beach fill borrow site on the inlet's ebb tidal delta. A peer reviewed sediment budget was developed from the Sarasota County Comprehensive Inlet Management Program of Big Pass and New Pass Management Alternatives report, (2008). The USACE developed a study of Big Sarasota Pass sediment mining alternatives in connection with the Lido Key Shore Protection Project, dated June 2014.

Strategy: Monitor; adopt an IMP.

Siesta Key, Sarasota County, R44A-R45

This is a 0.8-mile segment of critically eroded inlet shoreline on the north shore of Siesta Key, adjacent to Big Sarasota Pass. Threatened private development along this segment of shoreline has been armored with bulkheads and rock revetments. The northern shoreline of Siesta Key, fronting on the pass, has been substantially armored.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Manatee County, Sarasota County, City of Anna Maria, City of Holmes Beach, City of Bradenton Beach, Town of Longboat Key, City of Sarasota, the West Coast Inland Navigation District, and the USACE, all of which participate as

sponsors of beach management projects. Project cost and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks. Opportunities in this subregion include refining the existing sediment management strategy that uses beach quality sand from the maintenance dredging of Longboat Pass and New Pass for maintenance of the beach restoration projects on Longboat Key and Lido Key.

Environmental Protection

The protection of marine turtles, shorebirds, manatees and hardbottom/reef habitat are primary environmental concerns within this subregion. Sensitive areas for shorebirds include Passage Key, Anna Maria Island, Longboat Key (Manatee and Sarasota County), Lido Key, and Siesta Key. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has been restricted during the marine turtle nesting season of May 1 through October 31. Project design and method of construction are restricted to avoid and minimize adverse impacts to the listed species and their habitat. The Lido Key beach nourishment site is adjacent to the Sarasota Bay Estuarine System (Outstanding Florida Waters), which extends into Big Sarasota Pass, and portions of New Pass are also located within the Sarasota Bay Estuarine System.

Sand Sources

Potential offshore borrow areas have been identified during design of restoration projects; however, these sand sources are not adequate to meet the needs of projects in this subregion over the next 15 years. A regional sand search and inventory should be performed to locate and characterize beach compatible sand. A study to investigate the impact of the Passage Key borrow areas on the surrounding ebb shoal complex and the beaches of north Anna Maria Island is underway. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

The federal Bureau of Ocean Energy Management (BOEM) through the Minerals Management Program (MMP) is responsible for the use of offshore sand resources located outside of state waters and within federal waters on the Outer Continental Shelf. MMP has initiated regional management of sand sources, where feasible, to manage the growing need for these sand sources. The Longboat Key project in Manatee County and Sarasota County has obtained sand sources through the MMP leasing program. The Department is working with BOEM to encourage coordination of sand sources within each region of the state to protect the shoreline of Florida.

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

Figure 2. Map of Sarasota Barriers North Reach subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Sarasota Barriers South Reach

There are 18.9 miles of beaches in the Sarasota Barriers South Reach subregion, which extends from Sarasota Point (R45) on the northwest end of Siesta Key to the north end of Manasota Key (R143) in Sarasota County, as shown on Figure 3. There are 11.6 miles of critically eroded beaches in this subregion, of which 5.4 miles have been restored.

Erosion is attributed to winter frontal systems, tropical storms and hurricanes, and the effects of Venice Inlet. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1974, the Subtropical Storm of June 1982, Hurricane Elena (1985), Tropical Storm Juan (1985), Tropical Storm Josephine (1996), Hurricanes Frances and Jeanne (2004), Tropical Storm Fay (2008), Tropical Storm Debby (2012), Tropical Storm Colin (2016), Hurricane Hermine (2016), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Countywide Studies and Projects

The Sarasota and Charlotte County Beach Restoration Study was completed in 2003. The purpose of the study was to investigate the extent and nature of Gulf shoreline erosion and examine the technical, regulatory, and financial feasibility of large-scale erosion control actions for consideration in the development of the Strategic Beach Management Plan. The study area included all the unincorporated shoreline of Sarasota County and Charlotte County to Gasparilla Pass. The Town of Longboat Key, the City of Sarasota, the City of Venice, and Gasparilla Island were excluded because they have pursued their own studies and erosion control projects. The study area totals more than 32 miles of shoreline and represents an effort by the state to address these issues on a regional basis.

North Shore of Siesta Key, Sarasota County, R46-R48.4

This is a 0.4-mile segment of critically eroded beach on the northern Gulf shore of Siesta Key, immediately south of Sarasota Point. This area is contiguous with a 0.8-mile segment of critically eroded inlet shoreline on the north shore of Siesta Key adjacent to Big Sarasota Pass. The area has been armored with rock revetments. A feasibility study was conducted for Sarasota and Charlotte Counties; this study recommended beach nourishment with structures. At this time, the local sponsor has decided not to proceed with projects in this critically eroded area.

South Siesta Key, Sarasota County, R64-R77

This is a 2.4-mile segment of critically eroded beach on the southern Gulf shore of Siesta Key, south of Point O' Rocks. In March 2007, Sarasota County completed restoration of the **South Siesta Key Beach Restoration Project** (R67-R77) by placing approximately 850,000 cy of sand from two offshore borrow sites. The project design consists of a beach berm at elevation +7 ft NGVD tapering to elevation +6 ft NGVD and provides ten years of advance beach nourishment to protect the existing dune and upland development. In 2014, Sarasota County completed an offshore sand search and located additional sand sources for maintenance of the 2007 beach project. Nourishment was completed again in May 2016 with placement of approximately 713,563 cy of material at Turtle Beach between R66.7 and R77.5 from an offshore borrow area. The original 2007 project design was enhanced as part of the 2016 project by the addition of an attached, submerged sand berm along the southern one-third of the project. Shortly after construction in 2016, the project experienced storm damage impacts from Hurricane Hermine. With an agreed upon sand loss volume of 92,505 cubic yards, FEMA originally agreed to defer repair funding until the next anticipated project renourishment in 2026. In late 2019, FEMA and FDEM recommended that an interim truck haul project would allow the beach repair to be completed, thereby allowing FEMA to close the disaster. Related permit mods are under review to add the use of upland sand sources.

Sarasota County is currently pursuing an interim truck haul project to repair storm damage impacts from Hurricane Hermine. Construction is anticipated in the Spring of 2023, with a sand volume of 92,505 cubic yards to be placed within the limits of the permitted project. Based on performance of the interim project, it may allow the next full nourishment to be deferred to a later date than 2025/2026.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore sources or upland sources.

Casey Key, Sarasota County, R81-R100.3

This is a 3.7-mile segment of critically eroded beach on the northern Gulf shore of Casey Key. The area has been extensively armored with rock revetments. A feasibility study was conducted and recommended beach restoration by the USACE in 1984. In 2020, a feasibility study for Casey Key was conducted by private property owners within Casey Key to evaluate the ongoing shoreline stability within Casey Key from south of South Siesta Key to the north side of Venice Inlet. The feasibility study identified areas of high and moderate erosion as a basis for development of strategies

for long term protection to the island and improved resiliency. In 2022, an initial report for Casey Key involving assessment of shoreline changes and nearshore resources was completed.

Strategy: Monitor and complete the feasibility study to determine environmentally acceptable designs for beach restoration; design and construct a beach restoration project.

Venice Inlet, Sarasota County, R114-R115

Venice Inlet (also known as Casey's Pass) is part of the federal Intracoastal Waterway Navigation Project. From 1937 to 1938, the USACE stabilized Venice Inlet by constructing two jetties that extended approximately 500 ft into the Gulf of Mexico. The revetment along the south beach was extended from 930 ft to 988 ft in 1940. Repairs to the jetties were made in 1949 and 1955. Small volumes of maintenance dredged material have been removed on an infrequent basis from the inlet channel since navigation improvements were constructed in 1938.

The Department adopted the Venice Inlet Management Study Implementation Plan in September 1998 that specifies the placement of beach compatible maintenance dredged material or offshore material on downdrift beaches. The combined total of material from all sources shall equal or exceed 64,620 cy on an average annual basis.

A regional feasibility study of coastal inlets co-sponsored by the Department and the West Coast Inland Navigation District (WCIND) completed in 2008 identified areas of persistent shoaling within the flood shoal region of Venice Inlet. Design and permitting were completed for the stabilization of Snake Island inside of Venice Inlet along with the establishment of a flood shoal sand trap as a renewable sand resource for sand placement onto Venice Beach downdrift of Venice Inlet. The first phase consisting of the stabilization of Snake Island inside Venice Inlet was completed in 2014, including erosion control structures and sand from adjacent shoal areas. This project also resulted in protection of cultural resources off the southwest tip of Snake Island. Phase two involving the dredging of the remainder of the flood shoal sand trap is designed and permitted. Approximately 18,000 cy of material was dredged from the inlet channel and the GIWW channels, with completion of dredge work in November 2019 and sandy material placed on Venice Beach near R116.

Strategy: 1) Place all beach compatible inlet channel and flood shoal impoundment basin dredged material on adjacent eroding beaches to balance the inlet sediment budget; 2) supplement dredged material with sand from offshore borrow areas; 3) the combined bypassing total from all sources shall

equal or exceed 64,620 cy on an average annual basis; 4) monitor inlet and with data collected, update the sediment budget and IMP.

Venice, Sarasota County, R116-R143

This is a 5.1-mile segment of critically eroded beach on the downdrift shore south of Venice Inlet. The Venice segment of the federal **Sarasota County Shore Protection Project** authorizes restoration of 5.6 miles of shoreline until 2046. A restoration project was constructed along 3.3 miles of shoreline at Venice (R116-R133) south of the inlet in two phases (between August 1994 and May 1996) using approximately 1,923,000 cy of sand from borrow areas offshore of Manasota Key. In November 1997, a total of 3.14 acres of artificial reef were constructed offshore of R130 to mitigate for adverse impacts to nearshore hardbottom.

In August 2005, the City of Venice completed nourishment of the **City of Venice Beach Nourishment Project** (R116-R133) using 672,208 cy of sand from five offshore borrow sites. The project design consists of a beach berm at elevation +8.4 ft NAVD to protect the existing dune and upland development. Environmental monitoring of the restoration project indicated additional coverage of nearshore hardbottom which was not mitigated by the 3.14 acres of artificial reef constructed in conjunction with the restoration project. The City of Venice constructed an additional 7.3 acres of artificial reef to compensate for these impacts. The nourishment project also includes maintenance and extension of existing stormwater outfall pipes along the project area shoreline.

Design and permitting tasks for the 3.2-mile beach nourishment project occurred in 2014. The beach nourishment project was completed in April 2015 with placement of approximately 720,000 cy of offshore material along 3.2 miles of shoreline between R116.3 and R133.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore sources.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Sarasota County, City of Venice, West Coast Inland Navigation District and the USACE, which participates with the Department as sponsors of beach management projects. Project cost estimates and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks. Opportunities in this subregion include implementing beach erosion control projects for critically eroded beaches on Casey Key and restoring the remaining critically eroded shoreline in the Venice segment.

Environmental Protection

The protection of marine turtles, shorebirds, manatees and hardbottom/reef habitat are primary environmental concerns within this subregion. Siesta Key is a sensitive area for shorebirds. Sensitive areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has been restricted during the marine turtle nesting season of May 1 through October 31. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. The Gulf Intracoastal Waterway in the vicinity of Venice Inlet is located within the Sarasota Bay Estuarine System, an Outstanding Florida Water where more stringent water quality standards apply.

Sand Sources

Potential borrow areas have been identified during design of beach restoration; however, these sand sources are not adequate to meet the needs of projects in this subregion over the next 15 years. Sand searches should be conducted to identify future sources of sand for projects. A regional sediment management strategy that uses beach quality sand from the maintenance dredging of the navigation projects should be incorporated into the maintenance of the beach restoration projects. There remains sand in the offshore borrow area for potential use in the next nourishment of South Siesta Key. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

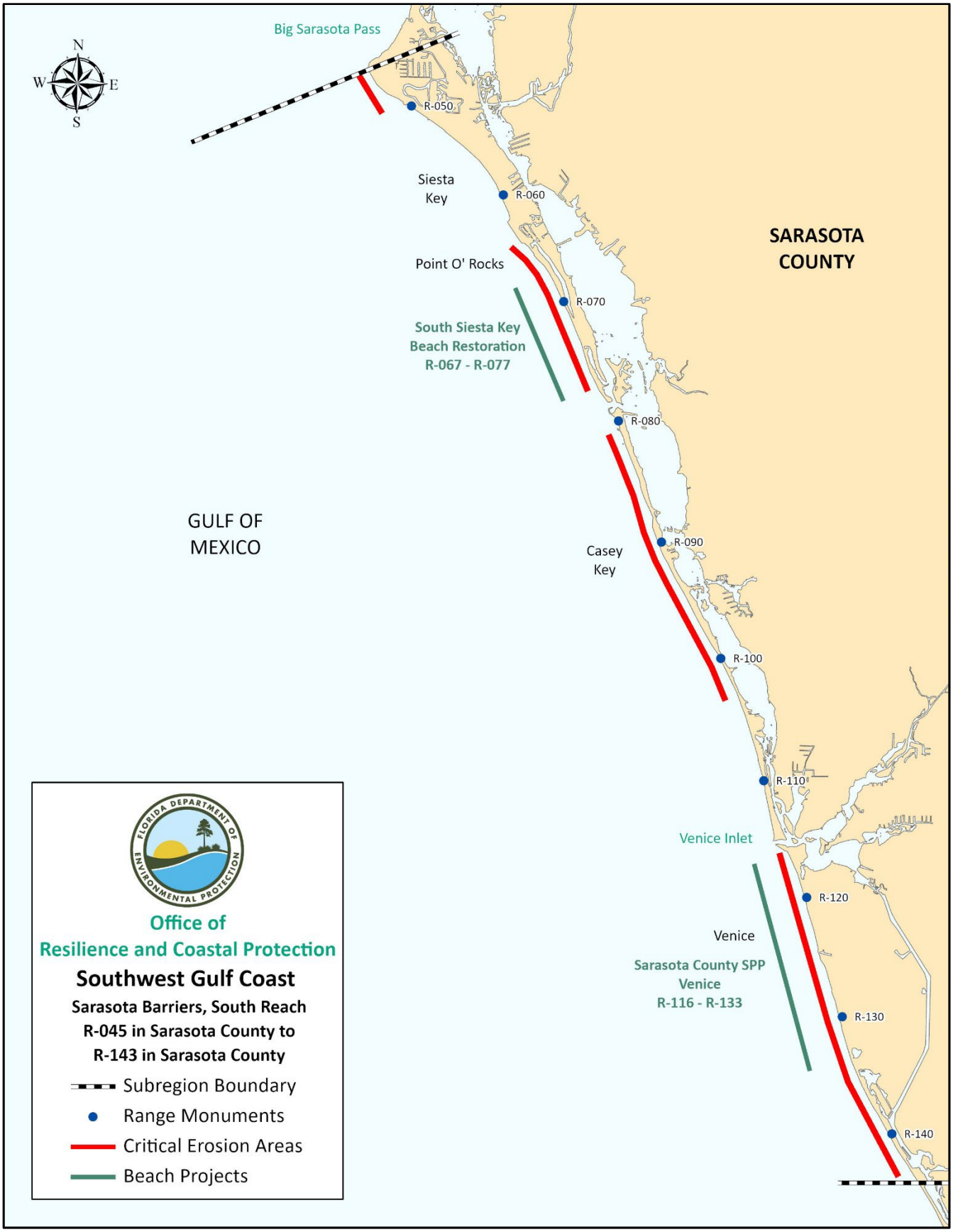

Figure 3. Map of Sarasota Barriers South Reach subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Manasota Barriers

There are 18.9 miles of beaches in the **Manasota Barriers** subregion, which extends from the north end of Manasota Key (R143) in Sarasota County to Gasparilla Pass (R60) in Charlotte County, as shown on Figure 4. There is a total of 11.3 miles of critically eroded beaches in this subregion (4.8 miles in Sarasota County and 6.5 miles in Charlotte County), of which 3.3 miles have been restored and are managed.

Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of the inlets, which include Stump Pass and Gasparilla Pass. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1974, the Subtropical Storm of June 1982, Tropical Storm Bob and Hurricane Elena (1985), Tropical Storm Juan (1985), Tropical Storm Keith (1988), Tropical Storm Josephine (1996), Tropical Storm Gabrielle (2001), Tropical Storm Fay (2008), Tropical Storm Debby (2012), Tropical Storm Colin (2016), Hurricane Hermine (2016), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Countywide Studies and Projects

In 2003, the Sarasota and Charlotte County Beach Restoration Study was completed. The purpose of the study was to investigate the extent and nature of Gulf shoreline erosion and examine the technical, regulatory, and financial feasibility of large-scale erosion control actions for consideration in the development of the Strategic Beach Management Plan. The study area included all the unincorporated shoreline of Sarasota County and Charlotte County to Gasparilla Pass. The Town of Longboat Key, the City of Sarasota, the City of Venice, and Gasparilla Island were excluded because they have pursued their own studies and erosion control projects. The study area totals more than 32 miles of shoreline and represents an effort by the state to address these issues on a regional basis.

Manasota Key, Sarasota County, R146.5 – R148.3

This is an approximately 0.3-mile long segment of critically eroded beach on Manasota Key in southern Sarasota County. This segment has been subject to recent erosion caused by Tropical Storms Debby (2012), Colin (2016), and Hermine (2016).

Strategy: Conduct physical monitoring and perform post-storm dune restoration.

Manasota Key, Sarasota County, R160 - R183.7 and Charlotte County, R1- R21.2

This is an approximately 8.3-mile long segment (4.5 miles in Sarasota County and 3.8 miles in Charlotte County) of critically eroded beach on Manasota Key that includes Englewood Beach and the Stump Pass Beach State Park. The history of Manasota Key projects is summarized in**Table** 8. In July 2003, 100,000 cy of sand were placed on 0.5 mile of Manasota Key beaches (R14.5 to R17). Sand sources for the 2003 placement event included material dredged from the realignment of Stump Pass and the Stump Pass ebb shoal. Maintenance dredging of Stump Pass completed in June 2006 placed approximately 155,060 cy of sand onto the beach from R14 to R18. An experimental submerged groin system was installed in 2005 and 2006, as described below in the Innovative Technologies section. It was removed in 2008, when a third-party review determined that the system was increasing erosion in the area.

Maintenance dredging of Stump Pass was completed in May 2011, removing a total amount of 373,720 cy. Of that amount, 156,250 cy of sand were placed over approximately one mile of beach from R14.5 to R20, along the Manasota Key and Stump Pass Beach State Park shoreline. The updrift beach fill area includes a variable berm width at +5 ft (NAVD) crest elevation with a downward slope of 1/100 to the seaward edge of the berm, which slopes to the toe of fill at 1/15 slope. Charlotte County received a permit in 2015 to restore adjacent shorelines and construct a terminal groin at the south end of Stump Pass Beach State Park (R-21.3). Material dredged from Stump Pass in the amount of 145,380 cy was placed south of R18 and to approximately R21 in May 2017. The terminal groin construction was completed in June 2017 with an additional 23,000 cy of excavated sandy material from the terminal groin footprint that was placed on Manasota Key. The Department issued a permit to both Charlotte and Sarasota Counties for a beach restoration project in May 2019. Sand will be placed along the beach for the **Manasota Key Beach Restoration Project** in Sarasota County from R173.4 to R177.5 and further south between R180.7 to R183.7. In Charlotte County, the sand was placed between R1 to R13.2 and further south between R14.4 to R15.3. The beach restoration project was constructed and completed in May 2020 and included nourishment of the northern fill segment of the Charlotte County Erosion Control Project on Knight Island/Don Pedro Island.

Table 8. Manasota Key and Stump Pass Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
August 1981	110,000	Stump Pass	R16-R19 Charlotte County	0.6
July 2003	100,000	Stump Pass realignment and ebb shoal	R14.5-R17 Charlotte County	0.5
June 2006	155,060	Stump Pass	R14-R18 Charlotte County	0.9
May 2011	156,250	Stump Pass	R14.5-R20 Charlotte County	1.0
May 2017	145,380	Stump Pass	R18-R21 Charlotte County	0.7
May 2020	578,600	Offshore	R1-R13.2 and R14.4 to R15.3 Charlotte County	2.5
May 2020	301,680	Offshore	R173.4-R177.5 and R180.7-R183.7 Sarasota County	1.9
June 2022	100,000	Stump Pass	R18-R21 Charlotte County	0.7

Charlotte County conducted a beach erosion study for the northern section of the County. This study included an assessment of initial beach restoration to address the critically eroded beaches along Manasota Key that extend from the Sarasota/ Charlotte County line to Stump Pass Beach State Park. The study identified significant nearshore hardbottom resources and developed a plan to offset project impacts to these protected resources. The study included conceptual restoration plans, inventoried sand sources, prepared construction budgets, provided stakeholder coordination, and outlined innovative cost-sharing opportunities. Due to the chronic erosion that has occurred along this shoreline segment and recent storm events of Tropical Storm Colin (2016) and Hurricane Irma (2017), the County deemed the project a priority after declaring the critical erosion an emergency and issuing temporary stabilization permits to multiple properties. The County proceeded with the feasibility study, design and permitting in 2016/ 2017 for the Manasota Key Beach Restoration Project.

The County submitted a permit application in December 2017 for the Manasota Key Beach Restoration Project to extend the beach fill from the current permitted limits at R9 to the Sarasota/Charlotte County

line at R1 with a taper into Sarasota County. The application included the plan formulation, alternatives analysis, beach fill, and borrow area design. The application also included the design of a mitigation reef to offset impacts to nearshore hardbottom.

Communications between Charlotte County and Sarasota County resulted in the two counties signing an interlocal agreement to study beach erosion on Manasota Key from a regional approach. The agreement was also to develop restoration alternatives to extend the beach fill limits to the north, which will enhance project performance. Sarasota County conducted an additional model study to extend the beach fill north from R175 to R173.4. A major modification to the permit was pursued to implement the additional work; the Department issued the modified JCP permit in December 2019. The regional Manasota Key Beach Restoration Project completed construction in May 2020 with a total placement of 880,280 cy between R173.4 in Sarasota County and R15.3 in Charlotte County. There were two gaps in each county project segments.

Strategy: Monitor and maintain the project through sand bypassing and with offshore or upland sand sources.

Stump Pass, Charlotte County, R21-R22

Stump Pass was a natural inlet until a navigation channel was dredged in 1981, and the total volume removed from the inlet channel and ebb shoal borrow area was 925,000 cy. The Stump Pass inlet channel dredging of 140,000 cy with only 110.000 cy that was considered beach compatible was placed on the beach north of the pass within the Stump Pass Beach State Park between R16 and R19. The remainder of the finer dredged material was placed in a disposal area on Grove City Key. The southern lobe of the ebb shoal was dredged in early 1995 that placed 225,000 cy of material between R27.5 and R30 on Knight Island. Dredging of a small interim navigation channel in 1998 through the natural ebb channel was conducted pending implementation of an inlet management and navigation plan. 89,000 cy of dredged material was placed on the Knight Island shoreline adjacent to the pass and the Gulf shoreline beginning approximately one mile south of Stump Pass in 1998. In 2003, a joint beach nourishment and navigation project was implemented, and the Stump Pass channel was realigned. The small interim navigation channel was dredged again in 2001. Maintenance dredging of the Stump Pass channel was completed in June 2006, with a total of 453,260 cy of dredged material placed on Manasota Key, Knight Island, and Don Pedro Island. Stump Pass was dredged again in 2011, removing 373,720 from the pass with placement on adjacent shorelines. Charlotte County received a permit to restore adjacent shorelines of Stump Pass and construct a terminal groin on the

south end (R21.3) of Stump Pass Beach State Park. Charlotte County was issued a Joint Coastal Permit by the Department in September 2015. The Stump Pass - Inlet Management Plan was finalized by the Department in June 2016. The inlet bypassing and nourishment project was completed in 2017. The terminal groin construction was completed in June 2017 using an additional 23,000 cy of excavated sandy material from the terminal groin footprint that was placed on Manasota Key. Stump Pass was dredged again in June 2022 with over 200,000 cy placed both north and south of the pass. The next inlet bypassing project is scheduled for 2025.

Strategy: 1) Continue the comprehensive beach and inlet hydrographic monitoring program; 2) complete the initial construction of the beach restoration project to the design specifications authorized by the joint coastal permit; 3) continue to bypass sediment from Stump Pass, including the Stump Pass channel, ebb and flood shoals, to the adjacent gulf-fronting beaches both to the north and to the south of Stump Pass within areas designated as critically eroded between R9 and R40.5; 4) the initial target Stump Pass bypassing quantities shall be the placement of 25,000 cubic yards per year to the south and 6,000 cubic yards per year to the north; 5) the source of sediment for meeting the target bypassing quantities shall be the Stump Pass channel and borrow area; 6) sediment dredged from Stump Pass may also be placed within the Palm Island Fill Area along the south shoreline of Stump Pass north of R22 to mitigate critical inlet shoreline erosion; 7) monitor effects of the terminal groin on adjacent beaches

Knight Island and Bocilla Island, Don Pedro Island, Charlotte County, R28-R40.5

This is a 2.3-mile segment of critically eroded beach on the merged segment of Knight Island and Bocilla Island that includes the former Bocilla Pass. The project history for this segment of shoreline is described in Table 9. In 1995, the **Charlotte County Beach Restoration Project** was completed along the northern Gulf shoreline of Knight Island (R27.5-R30) by Charlotte County. Dredged material from the interim navigation channel at Stump Pass was placed below the mean high-water contour along the southern portion of the beach restoration project area in 1998 and 2001.

Dredging during the Stump Pass realignment in 2003 and maintenance dredging of the channel in 2006 resulted in the placement of sand in this critically eroded area, along with vegetated dunes. A subsequent inlet maintenance project was conducted in 2011, which included the excavation of a total of 373,720 cy of sand, with placement of 217,470 cy along Knight Island and Don Pedro Island at the R22 area and between R31.5 and R39. An additional three placement events took place just south of the inlet, with placement of 12,590 cy on the Shorebird Fill Area along the shoreline of Knight Island

between R24 and R26. This placement was along a 0.25-mile segment of shoreline that included dune vegetation as mitigation for shorebird habitat losses resulting from the severing of the spit (2003) at the south end of Manasota Key. There was also placement in February 2011 of 47,690 cy along the inlet shoreline of Palm Island Fill Area from R22 to the north 1,300 ft. Finally, in April 2011, there was an additional placement of 28,330 cy at the same area between 500 ft to 1,300 ft north of R22. Future maintenance dredging of Stump Pass calls for placement of dredged material along adjacent shorelines to the north and south. The Knight and Don Pedro Island fill area includes a variable berm width at +3.9 ft (NAVD) crest elevation with a downward slope of 1/100 to the seaward edge of the berm, which slopes to the toe of fill at 1/15 slope. The Stump Pass - Inlet Management Plan was finalized by the Department in June 2016. The inlet bypassing and nourishment project was completed in June 2017, with sand placement from Stump Pass of 88,100 cy onto the Palm Island inlet shoreline near R22. A minor modification was processed to add the Manasota Key Beach Project borrow areas, corridors, and beach fill template design criteria for consistency, noting the County intends to construct the projects concurrently under one mobilization. The next nourishment project for the Knight and Don Pedro Island fill was completed in June 2020 with placement of 340,980 cy between R32 to R40.

Table 9. Charlotte County (Knight Island/Don Pedro Island) Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
January 1995	255,000	Southern lobe of the Stump Pass ebb tidal shoal	R27.5-R30	0.6
1998	89,000	Dredging of the Stump Pass interim navigation channel through the natural ebb channel	R29-R39	1.8
June 2003	628,000	Stump Pass realignment	R29-R40	2.0
June 2006	298,200	Stump Pass	R29-R40	2.0
May 2011	217,470	Stump Pass	R22 to the north 1,300 ft. area and R31.5 to R39	1.8

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
June 2017	88,100	Stump Pass	R22 to the north 1,300 ft. area	0.2
June 2020	340,980	Offshore	R32 - R40	2.0
June 2022	100,000	Stump Pass	R22 – R25	0.4

Strategy: Maintain the project through monitoring and nourishment through sand bypassing and using sand from offshore sources; monitor.

Little Gasparilla Island, Charlotte County, R47.5-R49.5

This is a 0.4-mile segment of critically eroded beach on Little Gasparilla Island south of the former Little Gasparilla Pass that is now closed. This area is eroded due to the effects of the former Little Gasparilla Pass.

Strategy: Perform physical monitoring.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Sarasota County, Charlotte County, West Coast Inland Navigation District, Division of Parks and Recreation, and the USACE, all of which participate with the Department as sponsors of beach management projects. Project cost estimates and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks.

At this time, the only opportunity for project coordination that has been identified in this subregion is the placement of beach compatible sand from Stump Pass on adjacent critically eroded beaches.

Environmental Protection

The protection of marine turtles, shorebirds, manatees, both hardbottom and reef habitat, and seagrass beds are environmental concerns within this subregion. Sensitive areas for shorebirds include Stump Pass, Knight Island, Little Gasparilla Island, and Gasparilla Island. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. Marine turtle nesting season is from May 1 through October 31, and nourishment projects have been permitted/constructed during marine turtle nesting season in this subregion in 2003, 2006, and 2011; local government will likely seek permission to do so for the next nourishment. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. Stump Pass in the vicinity of Lemon Bay is located in a shellfish harvesting area and the Lemon Bay Aquatic Preserve, Outstanding Florida Waters. Projects located within and near the Aquatic Preserve boundaries require additional protection, including stricter water quality standards than in non-aquatic preserve waters, during permitting and construction to ensure preservation of the existing conditions.

Sand Sources

Sufficient offshore sand sources for beach nourishment over the next 10-15 years have been identified. A regional sand search and inventory should be performed to locate and characterize beach compatible sand. The counties have obtained permits in 2015 and 2019 for offshore sand sources and, when combined with sand bypassing, will provide 10-15 years of sand for the projects extending from R173 (ST) to R40 (CH). A regional sediment management strategy that uses beach quality sand maintenance dredged from the navigation projects should be incorporated into the maintenance of the beach nourishment projects. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

Innovative Technologies

During the summer of 2005 and the spring of 2006, an experimental submerged geotextile groin field consisting of six low-profile geotextile groins was installed below mean high water between R19 and R21 in Stump Pass Beach State Park in Charlotte County. The installation could not be completed entirely during the summer of 2005 and was completed in 2006. The stated purpose of the groin field

was to reduce the southerly drift of littoral material that re-enters Stump Pass. The project was evaluated on its ability to retain material placed on the park shoreline and reduce infilling in the Pass, thereby reducing the frequency of maintenance dredging. The third-party review of the innovative project determined that the project was causing additional erosion to park shoreline and recommended removal, which was so ordered and completed in 2008.

Additional Information

The introduction at the beginning of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

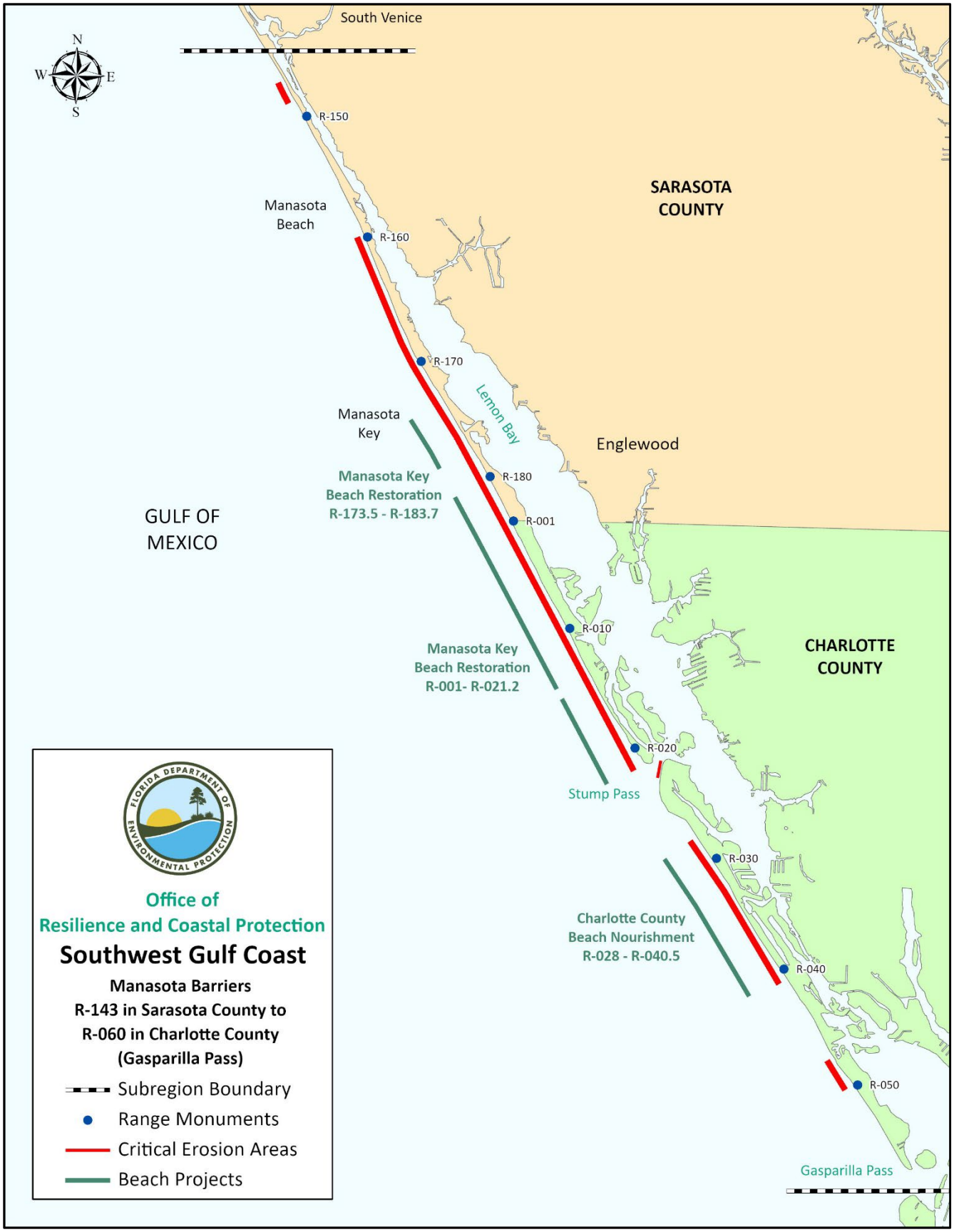

Figure 4. Map of Manasota Barriers subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Charlotte Harbor Complex

There are 36.8 miles of beaches in the **Charlotte Harbor Complex** subregion, which extends from Gasparilla Pass (R60) in Charlotte County to the San Carlos Bay Entrance (R174) in Lee County, as shown on Figure 5. There are 13.4 miles of critically eroded beaches in this subregion, of which 9.7 have been restored.

Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of inlets including Boca Grande Pass, Captiva Pass, Redfish Pass, and Blind Pass. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1974, the Subtropical Storm of June 1982, Tropical Storm Bob (1985), Hurricane Elena (1985), Tropical Storm Juan (1985), Tropical Storm Keith (1988), Tropical Storm Gabrielle (2001), Hurricane Charley (2004), Tropical Storm Debby (2012), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Gasparilla Island, Lee County, R7-R26.7

This is a 4.0-mile segment of critically eroded beach along the southern Gulf shore of Gasparilla Island, including portions of Gasparilla Island State Park (R16.5 area and R22.5 - R26A). The project history is described in Table 10. Sand from the maintenance dredging of Boca Grande Pass was placed along the southern portion of this area in 1981, 1993, and 1997; however, maintenance dredging of the inlet is not anticipated in the future. The federal **Lee County Shore Protection Project** authorizes restoration and associated shore protection structures, as needed, for eroding beaches on Gasparilla Island, Captiva Island, and Estero Island. Lee County is the local sponsor of the Gasparilla Island segment of the federal project and completed the Section 934 Study in 2019 to extend the authorization to 2056.

The USACE completed a General Reevaluation Report for Gasparilla and Estero Islands in January 2000. The recommended project for the two islands was later modified to provide for restoration of 2.8 miles of shoreline on Gasparilla Island (R11-R24). A terminal groin at the south end of the island adjacent to Boca Grande Pass was considered uneconomical and not recommended. The Department and Lee County initiated engineering design and permitting in January 2000 to construct the project on a reimbursement basis with the federal government. The final design included a segmented breakwater located approximately 325 ft offshore of R25, two T-head groins in the vicinity of R26, and restoration from R10 to R26 using sand from an offshore borrow area at the Boca Grande Pass ebb

shoal. The beach nourishment portion of the restoration project was completed in April 2007 with actual placement of 1,072,781 cy of sand. The design specifications consisted of a beach berm at an elevation +5 ft NGVD sloping to +4.2 ft NGVD to protect the existing dune and upland development. The local sponsor decided not to build the structures because of accretion in the area immediately prior to the restoration, and budgetary concerns. The 2007 project also included removal of 27 derelict coastal structures and construction of 0.9 acre of artificial reef offshore of R11 to mitigate for adverse impacts to nearshore hardbottom. To repair damages sustained during Tropical Storm Debby (2012), the USACE placed approximately 433,424 cy of sand on 2.9 miles of beach between R10 and R24.5. Construction was completed in December 2013.

Construction was completed in 2004 on a toe scour rock revetment (design elevation of +4 ft NGVD) constructed along 791 linear ft of the Belcher Road seawall between R24.5 and R25.5. This revetment provides protection to Gasparilla Island State Park infrastructure, including the roadway. The restoration project completely buried the rock revetment, although it was subsequently exposed. The seawall cap at Belcher Road was reconstructed and the revetment was rehabilitated by the Department's Division of Recreation and Parks in 2014. Boca Grande Pass North Shore, 1000 ft east of R26.7, is considered a 0.2-mile segment of critically eroded inlet shoreline and is where Gasparilla Island State Park is located. Gasparilla Island beach nourishment occurred again in July 2019 to repair erosional losses from Hurricane Irma (2017) with placement of approximately 141,972 cy of material on 1.1 miles of beach between R10.2 to R15.3, and an additional 139,666 cy of material on 0.5 mile of beach from R24 to R26.5 within Gasparilla Island State Park. The county and state intend to maintain the state park in conjunction with the construction schedule of the federal beach nourishment project schedule. The next nourishment is scheduled for 2025.

Table 10. Lee County Shore Protection Project **-** Gasparilla Island Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
April 2007	1,072,781	Boca Grande Pass Ebb Shoal	R10-R26	3.1
December 2013	433,424	Boca Grande Pass Ebb Shoal	R10-R24.5	2.9
June 2019	141,972	Boca Grande Pass Ebb Shoal	R10.2-R15.3	1.1
June 2019	139,666	Boca Grande Pass Ebb Shoal	R24-R26.5	0.5

Strategy: Maintain the project through monitoring and nourishment using sand from offshore or inlet sources; conduct a preliminary engineering design to maintain and improve the two existing groins.

Boca Grande Pass, Lee County, R26-R27

Boca Grande Pass is south of Gasparilla Island and north of Cayo Costa Island. The federal **Charlotte Harbor Navigation Project** extends through Boca Grande Pass. Initial dredging of the authorized channel was completed in 1912. Maintenance dredging of the entrance channel has been conducted every two to three years from 1971 until the last dredging in 1999. The dredged sand has been placed offshore, except in 1981, 1993, and 1997, when it was placed on the adjacent Gulf shoreline of Gasparilla Island. The USACE completed a study in 1991 recommending that maintenance dredged material from the Charlotte Harbor navigation project be placed on the Gulf shoreline of Gasparilla Island to provide storm protection and recreational benefits. However, future maintenance dredging is unlikely due to closure of a local oil shipping terminal, which previously necessitated the maintenance dredging.

Strategy: If maintenance dredging occurs, place beach compatible sand on the shoreline of Gasparilla Island in conjunction with the restoration project.

Northern Shore of North Captiva Island, Lee County, R66-R71

This is a 1.0-mile segment of critically eroded beach on the northern shore of North Captiva Island, including 1,000 ft of inlet shoreline east of R66 (0.2 mile) adjacent to Captiva Pass. This area is expected to undergo periods of accretion and erosion because of the changes to the inlet channel and the ebb shoal. Analysis of historical shoreline positions indicates a long-term erosion trend that extends from R-66 through approximately R-70 but is of concern near R-67. Recent erosion from 2016 has threatened existing structures in this area, prompting an updated engineering study and development of erosion control alternatives. Engineering alternatives are still under consideration at the local level.

Strategy: Monitor and evaluate erosion control alternatives.

Southern Shore of North Captiva Island, Lee County, R79-R82.3

This is a 0.8-mile segment of critically eroded beach on the southern Gulf shore of North Captiva Island adjacent to Redfish Pass. Shore protection structures were constructed on the property at the south terminus of the island in 1998 and restored in 2010 to the design specifications to correct

damages from Hurricane Charley. During Hurricane Charley in 2004, the segment of beach from R78 to R79 was breached, forming an opening known locally as Charley's Cut. Charley's Cut remained open for several years but closed naturally by 2009.

Strategy: Monitor in conjunction with the monitoring program for Redfish Pass and evaluate performance of existing shore protection structures.

Redfish Pass, Lee County, R82-R83

Redfish Pass, formed by a hurricane in 1921, provides recreational boating access through a relatively deep channel that has not required maintenance dredging except in portions of the interior flood shoal. Construction of a terminal groin at the north end of Captiva Island adjacent to Redfish Pass began in 1977 and was completed in 1981. In 1981 and in 1988/1989, the ebb shoal was used as a sand source for beach nourishment of Captiva Island. Completed in 1995, an inlet management study was sponsored by the Captiva Erosion Prevention District (CEPD), but not formally adopted by the Department. The 1995 study showed the adverse impact of ebb shoal dredging on North Captiva Island. In 1998, T-head groins were constructed by private interests on the south end of North Captiva Island, as recommended in the study. The terminal groin on Captiva was substantially damaged by Hurricane Charley in 2004. During the summer of 2006, the terminal groin on Captiva Island adjacent to Redfish Pass was extended 100 ft seaward and reconstructed in conjunction with the Captiva-Sanibel Beach Nourishment Project. The CEPD conducted an inlet management study in 2018/2019. The department developed a final IMP in 2022 that includes strategies to manage Redfish Pass.

Strategy: Implement strategies of new IMP that are the following: **1.) a comprehensive beach and inlet hydrographic monitoring program** shall be conducted to promote bypassing and recovery of ebb shoal features, evaluate the performance and impact of any sand bypassing and nourishment projects and to periodically update the inlet sediment budget. Beach and nearshore surveys between at least R77 on North Captiva Island to R100 on Captiva Island shall be conducted. Periodic inlet hydrographic surveys to include the inlet channel and the ebb and flood shoals should also be conducted between at least R81 to R85. The monitoring program should also consider the integrity and stability of the inlet features including the inlet channel and ebb shoal features. Along with topographic and hydrographic surveys of the inlet system and adjoining beaches, hydraulic monitoring may be conducted to enhance future modeling input data for investigations of inlet management alternatives; **2.) sand bypassing shall be performed from the Redfish Pass ebb shoal to the adjacent gulf-**

fronting beaches. An initial bypassing event from the ebb shoal is limited to approximately 240,000 cubic yards to be placed south onto Captiva Island and any subsequent ebb shoal dredging may only be considered acceptable following substantial recovery of ebb shoal and further analysis quantifying any direct adverse impact on adjacent beaches. The quantity of material to be bypassed shall be based on available ebb shoal deposition quantities documented through the monitoring protocol of Strategy #1 above. Impacts from the dredging of the ebb shoal on the adjacent beaches north of the inlet shall be restored prior to, or as part of, the following dredging event; **3.) on an average annual basis, the initial target inlet sand bypassing quantity shall be 30,000 cubic yards per year to the south.** This target quantity may be modified or updated based on a minimum of four years of additional monitoring data indicating a change in the sediment budget. Based on monitoring data and analysis sand may also be placed on adjacent beaches north or south of the inlet as determined by the need to address ongoing erosion within the inlet area of influence as shown in the monitoring data; 4.) t**he source of sediment for meeting the target sand bypassing quantities in Strategy #3 shall be the Redfish Pass ebb shoal borrow areas as authorized by permit.** Alternative 10b identified in APTIM (2019) shall be prioritized since it is expected to refill in the shortest time, but other alternatives may also be considered for further geotechnical and engineering design and permitting to develop an environmentally acceptable project with minimal impacts to inlet features and adjacent beaches. Acceptable beach quality sand may also be obtained from inland sand mines or offshore sources to achieve the target sand bypassing quantities.

Captiva Island, Lee County, R83-R109

This is a 5.0-mile segment of critically eroded beach that includes the entire Gulf shoreline of Captiva Island and a 0.2-mile segment of inlet shoreline adjacent to Redfish Pass. Beach restoration and nourishment have been conducted and terminal groins have been constructed at each end of the project area. The project history for this segment of shoreline is described in Table 11. In 1981, restoration was conducted along the northern portion of the Captiva Island (R84-R94) segment of the **Lee County Shore Protection Project** without federal participation. In 1988/1989, nourishment of this area and restoration of the remainder of Captiva Island was completed on a federal reimbursement basis. In 1996, nourishment of Captiva Island and the northern Gulf shoreline of Sanibel Island (R110-R114) was completed using sand from an offshore borrow area. Nourishment of Captiva Island (R85-R109) in conjunction with nourishment of the northern shoreline of Sanibel Island (R110-R118) was completed in January 2006. Due to a series of storms that impacted the area before and during construction, a supplemental nourishment project by the USACE placed approximately 99,000 cy of

sand on Captiva Island in April 2008. Nourishment was completed again in December 2013 without federal cost sharing. The elevation of the currently permitted beach berm inclines from +6.5 ft NAVD 88 at the dune line to +4.5 ft (NAVD) at the crest of the foreshore face of the berm, where it transitions to a seaward slope of 1:10 (V:H) to the existing profile. The Captiva Island segment is federally authorized until 2037. The beach nourishment project began construction in September 2021 and was completed in November 2021 with placement of 845,600 cy of material along 4.85 miles of shoreline between R84 to R109. The nourishment interval is normally every eight to ten years, but due to Hurricane Ian (2022), the next nourishment is to be determined once the post-storm surveys have been reviewed

Table 11. Lee County Shore Protection Project (Captiva Island) history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument	Length (mi.)
October 1981	655,500	Redfish Pass ebb shoal	R84-R94	1.9
April 1989	1,595,000	Redfish Pass ebb shoal	R85-R109	4.8
April 1996	817,300	Offshore	R84-R109	5.0
January 2006	1,000,000	Offshore	R85-R109	4.8
April 2008	99,000	Offshore	R85-R86 and R94- R96	0.52
December 2013	783,369	Offshore	R84-R109	4.85
November 2021	845,600	Offshore	R84-R109	4.85

Strategy: Maintain the project through monitoring and nourishment using sand from offshore sources.

Blind Pass, Lee County, R109-R110

Blind Pass is a historic natural inlet, but shoaling has frequently closed the pass since the opening of Redfish Pass. In 1972, a terminal groin was constructed at the south end of Captiva Island to protect the bridge across Blind Pass. In 1988, the groin was extended by 100 ft to stabilize the restoration project at the south end of the island. The Department and the Captiva Erosion Prevention District (CEPD) sponsored an inlet management study that was completed in 1993, but never formally adopted by the Department. CEPD has since placed fill on northern Sanibel Island during each of the Captiva nourishment projects in 1996, 2006 and 2013. The Department then required mitigation of

these impacts by the CEPD and mitigative fill was placed on northern Sanibel Island during the 1996 Captiva nourishment project. Blind Pass closed in 2000 and remained functionally closed until 2009. The portion of Blind Pass seaward of the bridge was mechanically dredged in March 2001. Blind Pass opened briefly during Hurricane Charley in 2004.

In cooperation with the CEPD and the City of Sanibel, Lee County restored Blind Pass in 2009, which was adversely impacted by the mitigative nourishment project. Called the Blind Pass Ecozone Restoration and Bypassing Project, it established a Gulf tidal connection with Wulfert and Roosevelt Channels. The project was designed mainly as a hydrographic restoration and water quality project to re-establish flushing in the back-bay areas of Clam Bayou and Dinkins Bayou, part of the Pine Island Sound ecosystem. 136,900 cy of sand was placed on downdrift beaches and nearshore of Sanibel Island between R112 and R114, with another 11,100 cy placed in an upland disposal site in 2009. After significant shoaling of the pass, the pass was dredged again in 2012/2013, removing 63,300 cy of material seaward of the bridge and placing the sand on northern Sanibel Island between R116 and R118. The project also removed 37,600 cy of material from the pass landward of the bridge, which was placed on northern Sanibel Island between R112 and R114. There was a gap of several months between the seaward and landward work. Lee County completed bypassing material from Blind Pass in June 2017. The bypass material was placed on Sanibel Island, with 67,060 cy going to the North Beach fill area between R112 to R114.2, and 22,640 cy placed within the South Beach fill area between R116 and R118, for a total bypass amount of 89,700 cy to Sanibel Island. An inlet management study was initiated in 2016 and completed in November 2018. The Department developed the Blind Pass IMP, which was adopted in August 2019 to implement best management strategies on the adjacent eroding beaches. The Blind Pass/ inlet bypassing project is expected to occur in 2024.

Strategy: 1) A comprehensive beach and inlet hydrographic monitoring program shall be conducted; 2) sand bypassing shall be performed from the Blind Pass channel to the adjacent gulf-fronting beaches to the south of the inlet between FDEP Reference Monuments R110.5 and R116, on an average annual basis, the initial target inlet sand bypassing quantity shall be 21,000 cubic yards per year; 3) the source of sediment for meeting the target sand bypassing quantities in IMP Strategy #3 shall be the Blind Pass channel; 4) beach quality sand may also be obtained from inland sand mines or offshore sources to supplement the target sand bypassing quantities; 5) design and construct tidal connections to Pine Island Sound through a Wulfert Channel extension and a Sunset Bay connection that have been shown to improve inlet stability and natural sand bypassing that are environmentally acceptable; 6) conduct a

detailed feasibility and engineering investigation to further evaluate and design a shore-parallel spur structural alternative for the terminal groin that will enhance natural sand bypassing to reduce erosion along northern Sanibel Island.

Northern Shore of Sanibel Island, Lee County, R109-R118

This is a 1.7-mile segment of critically eroded beach on the northern Gulf shore of Sanibel Island. The project history for this segment of shoreline is described in Table 12. As mitigation for the adverse impacts of the Captiva Island groin extension (1988), restoration of the northern Gulf shoreline of Sanibel Island (R110-R114) was conducted in conjunction with nourishment of Captiva Island in 1996, with placement of 237,100 cy. Nourishment was completed in conjunction with the Captiva project (R85-R109) in January 2006 (R110-R118) and again in December 2013 (R110-R116). Sanibel Island also received maintenance dredge material from the Blind Pass Ecozone Restoration Project in 2009 (R112-R114) and in 2012/2013 (R116-R118 and R112-R114). The pass was dredged in 2012/2013, removing 63,300 cy of material seaward of the bridge and placing the sand on northern Sanibel Island between R116 and R118. The project also removed 37,600 cy of material from the pass landward of the bridge, which was placed on northern Sanibel Island between R112 and R114. The pass was dredged again in 2017 with material placement on Sanibel Island. During this event 67,060 cy of material went to the North Beach fill area between R112 to R114.2 and 22,640 cy was placed within the South Beach fill area between R116 and R118, for a total bypass amount of 89,700 cy to Sanibel Island.

Erosion persisted along the north end of Sanibel Island threatening the Sanibel Captiva Road which is the only evacuation route for the north end of Sanibel Island and all of Captiva Island. A shore protection project was completed in 2020 protecting approximately 550 feet of threatened evacuation route and approximately 5,000 cy of beach quality sand from an upland mine was placed seaward of the project in the vicinity of R-111.

The elevation of the currently permitted beach berm slopes from +6.5 ft. (NAVD 88) at the dune line to +4.5 ft. (NAVD 88) at the crest of the foreshore face of the berm, where it transitions to a seaward slope of 1:10 (V:H) to the existing profile. The County and City plan to perform a truck haul project in the amount of 70,000 tons in 2023 to restore the beaches near R111, due to the critical erosion caused by Hurricane Ian (2022). The Blind Pass/ inlet bypassing project is expected to occur in 2024.

Table 12. Sanibel Island Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument	Length (mi.)
April 1996	237,100	Offshore	R110.5-R114	0.74
January 2006	305,000	Offshore	R110-R116 (excluding a 900-foot gap at Clam Bayou) and R116 to R118	1.6
August 2009	136,900	Blind Pass	R112-R114	0.38
August 2012	63,300	Blind Pass	R116-R118	0.38
April 2013	37,600	Blind Pass	R112-R114	0.38
December 2013	80,823	Offshore	R110-R116	1.1
June 2017	89,700	Blind Pass	R112-R114.2 and R116-R118	0.8

Strategy: Maintain the project through monitoring and nourishment using sand from offshore, upland and inlet sources.

Gulf Pines Subdivision, Sanibel Island, Lee County, R129-R133

This is a 0.9-mile segment of critically eroded beach on the central Gulf shore of Sanibel Island at Gulf Pines subdivision. Concurrent with the Sanibel Restoration Project in 1996, but under a separate contract with the dredging contractor, the City of Sanibel constructed a restoration project along the Gulf Pines (R129-R133) segment of the island, placing 229,000 cy of sand from an offshore borrow area. A 15-year permit was issued in 2019 by the Department to conduct dune and berm projects between R129.5 to R136.

Strategy: Conduct dune restoration and monitor.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Charlotte County, Lee County, Captiva Erosion Prevention District, City of Sanibel, West Coast Inland Navigation District, and the USACE, all of which participate with the Department as sponsors of beach management projects. The island of Cayo Costa and a number of properties on Gasparilla and North Captiva Island are managed by the Division of Recreation and Parks. Project cost estimates and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of two or more projects proposed by two or more local sponsors that are entering the same phase and can demonstrate significant anticipated cost savings through joint contracting. Opportunities in this subregion include continued coordination of Captiva and Sanibel nourishment; future construction of the remainder of the Estero Island segment of the federal shore protection project under a single contract with nourishment projects in the subregion if the same type of dredge vessel can be used.

Environmental Protection

The protection of marine turtles, shorebirds, manatees and hardbottom and reef habitat are primary environmental concerns within this subregion. Sensitive areas for shorebirds include Gasparilla Island, Cayo Costa, North Captiva Island, Captiva Island, and Sanibel Island. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has not been restricted during the marine turtle nesting season of May 1 through October 31. Sanibel Island applies a self-imposed restriction to construction activities on the beach during sea turtle nesting season. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. The Gasparilla Sound - Charlotte Harbor Aquatic Preserve boundary is located in the vicinity of south Gasparilla Island and Boca Grande Pass. Pine Island Sound Aquatic Preserve encompasses much of the inland waters of this subregion and has a boundary that crosses Redfish Pass and Blind Pass. Projects located within and near the Aquatic Preserve boundaries require additional protection, including more stringent water quality standards than in non-aquatic preserve waters, during permitting and construction to ensure preservation of the natural conditions.

Sand Sources

Sand sources to meet the needs of future projects in this subregion over the next 15 years have been identified. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

Additional Information

The introduction of the SBMP provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

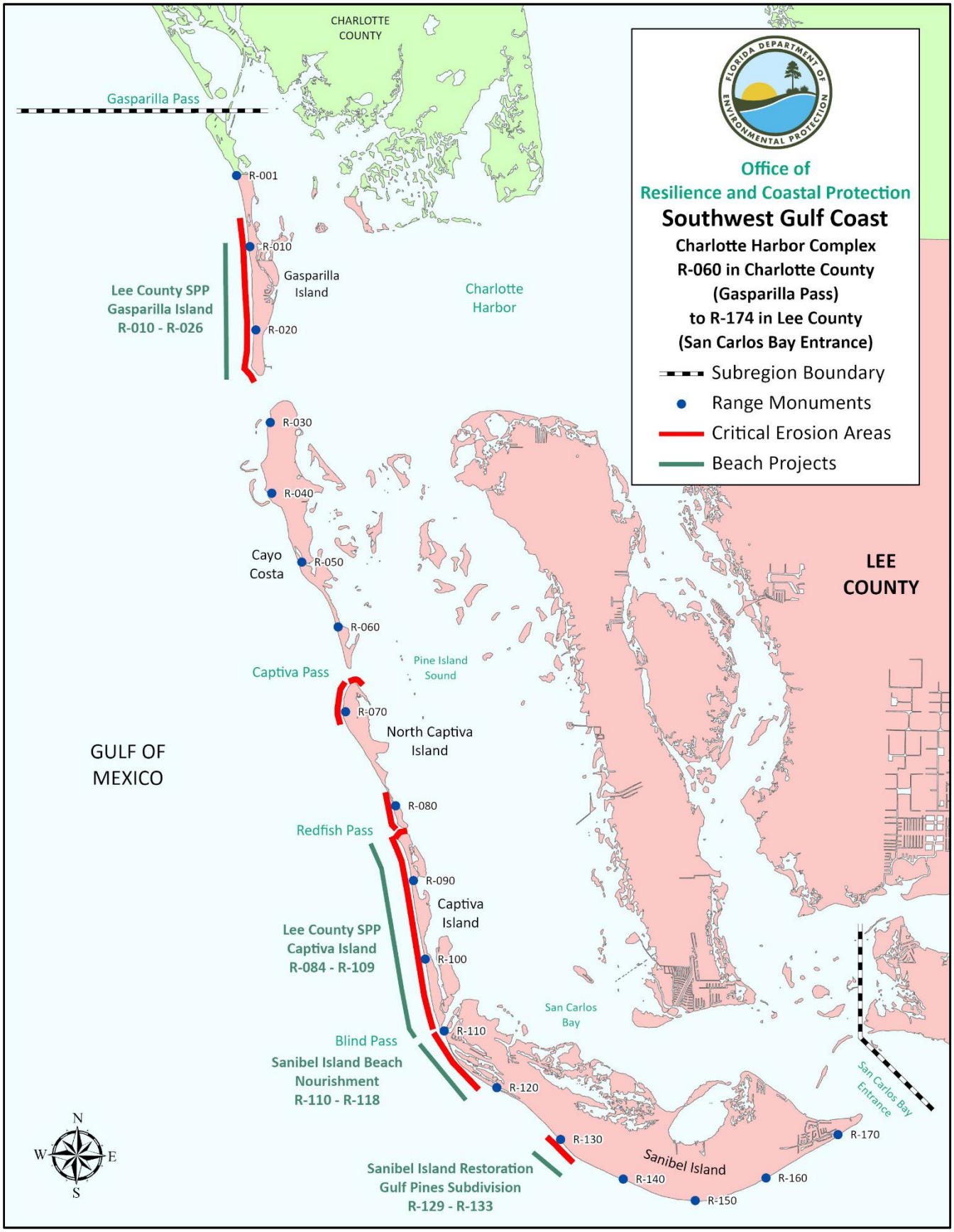

Figure 5. Map of Charlotte Harbor Complex subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Estero Barriers

There are 20.6 miles of beaches in the **Estero Barriers** subregion, which extends from the San Carlos Bay Entrance in Lee County to the Lee-Collier County boundary line, as shown on Figure 6. There are 9.6 miles of critically eroded beaches in this subregion, of which 4.0 miles have been restored. Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of inlets including Matanzas Pass, Big Carlos Pass, New Pass, and Big Hickory Pass. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1974, the Subtropical Storm of June 1982, Tropical Storm Bob (1985), Tropical Storm Keith (1988), Tropical Storm Gabrielle (2001), Hurricane Charley (2004), Tropical Storm Debby (2012), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Matanzas Pass, Lee County, R174-R175

The navigation channel through Matanzas Pass was completed in 1961 and extended in 1973 as the federal **Ft. Myers Beach Navigation Project**. The local sponsor is Lee County. Periodic maintenance dredging of the pass has been conducted with placement of the dredged material along the northern Gulf shoreline of Estero Island occurring in 1980, 1983, 1986, 1996, 2001, and 2009. The USACE performed maintenance dredging of the pass and interior navigation channels in 2013 and 2016. Dredge material was placed in the nearshore between R182 and R187 for the 2009, 2013, 2016, and 2020 events. The next maintenance event by the USACE is anticipated in 2023.

Strategy: Continue placement of beach compatible sand from the maintenance dredging of Matanzas Pass on or in the nearshore of Estero Island between R182 and R187.

Estero Island, Lee County, R174.6-R200 and R203-R207

These segments total 5.8 miles of critically eroded beach on Estero Island, more commonly known as Ft. Myers Beach. Sand from the maintenance dredging of Matanzas Pass has been placed along the northern portion of this area on the beach and nearshore between R178 and R187 since 1961.

The federal **Lee County Shore Protection Project** authorizes beach restoration and associated shore protection structures, as needed, for eroding beaches on Estero Island. The USACE completed a General Reevaluation Report for Gasparilla and Estero Islands, dated January 2000. The federal

project's design consists of a beach berm at elevation +4 ft. NAVD 88 and three years of advance nourishment to protect the existing dune and upland development. The recommended project for the two islands was modified. The modified project provides for restoration of 4.7 miles of shoreline on Estero Island (R175-R199), including the addition of a terminal groin at the north end of the island adjacent to Matanzas Pass. The local sponsor is the Town of Ft. Myers Beach, and the Estero Island segment was authorized until 2016. The **Estero Island Beach Nourishment Project** (R174.6–R181.5) is currently being cost shared between the town, county and state.

Engineering design and permitting were initiated by Lee County in 2000 to construct the project on a federal reimbursement basis. The design goal was to modify the recommended project by using an offshore borrow area located closer to the project shoreline, increasing the interval between nourishment events. Additional non-federal project features included were construction options for restoration on southern Estero Island (R208-R210) in conjunction with restoration of Lovers Key (R214-R222). A terminal groin was constructed and the first 1.2 miles of shoreline was restored for the Estero Island Beach Nourishment Project with placement of 402,805 cy of sand between R174.6 and R181.5 from an offshore borrow site in 2011. The balance of the federal project limit (R181.5-R199) was not constructed because of the unwillingness of property owners to grant federal easements. The southern segment of Estero Island (R208-R210) was eliminated from the construction template due to natural accretion occurring prior to project construction. In 2014, a 0.8-mile southern segment of Estero Island (R203-R207) was also designated critically eroded along the Little Estero Island Critical Wildlife Area. The three areas of the Big Carlos navigational channel were dredged in July 2017 and a total amount of 55,465 cy of inlet material was placed between R203.5 and R205.2 on the southern end of Estero Island beaches. The next beach nourishment has been designed and permitted and is scheduled for construction in fall 2023.

Strategy: Maintain the restored project through monitoring and nourishment using sand from offshore sources and Matanzas Pass; construct the remainder of the project from R181-R200 and R203-R207.

Big Carlos Pass, Lee County, R210-R211

Big Carlos Pass is located between Estero Island and Lovers Key and connects the Gulf of Mexico with Estero Bay. Sand has been excavated in the vicinity of the Big Carlos Pass ebb shoal as a sand source for the Bonita Beach and Lovers Key Nourishment Projects. In 2014 the West Coast Inland Navigation District (WCIND) began planning to dredge the inlet channel through the Big Carlos Pass

ebb shoal complex from Estero Bay to the Gulf. Also, in 2014 Lee County completed the nourishment of Lovers Key and Bonita Beach from the ebb shoal of Big Carlos Pass. A regional inlet feasibility study is ongoing and consists of evaluating the potential for the construction of sand traps as renewable sand resources within the flood shoal region of inlets located within the WCIND in Manatee, Sarasota, Charlotte, and Lee Counties. The WCIND conducted hydrographic surveys, vibracoring, sediment data collection/analysis, morphology modeling, and design/permitting tasks for Big Carlos Pass from 2014 through 2016. A state joint coastal permit was issued in October 2015 by the Department to selectively dredge the inlet channel to align with the borrow areas previously dredged in the ebb shoal, and to place the dredge material on the south end of Estero Island within the influence of the inlet. Plans call for maintenance dredging of the pass and placement in areas of greatest need on adjacent beaches of inlet. The connector channel project will place dredged material on the eroded southern end of Estero Island and a secondary placement option on Lovers Key Beach. The filled beach berm will have a crest elevation of +2.9 ft. NAVD and seaward slope of 1:15 to assist in restoring the eroded Critical Wildlife Area north of the inlet. A preliminary sediment budget was developed with the 2015 study of Big Carlos Pass. Dredging of the channel began in June 2017 and was completed in September 2017 to a design depth of -11 feet NAVD (including a 1-foot over depth) with a bottom width of 100 ft. The three areas of the navigational channel that were dredged in July 2017 placed a total amount of 55,465 cy inlet material between R203.5 and R205.2 on the southern end of Estero Island beaches. The Year 1 post construction monitoring report submitted to the Department in 2019 included an interim sediment budget update for the time period of 2015 to 2018. A regional inlet feasibility study has been initiated by Lee County in 2019 to study Big Carlos Pass, New Pass, and Big Hickory Pass. The study was completed and submitted to the Department in April 2023.

Strategy: Monitor and complete inlet management study; develop a sediment budget for the adoption of an inlet management plan to guide the future dredging and beach placement of inlet material.

Lovers Key, Lee County, R214-R222

This is a 1.5-mile segment of critically eroded beach within Lovers Key State Park. In October 2004, a 1.1-mile beach and the dune restoration project were completed on Lovers Key, which consisted of placing approximately 570,240 cy between R214.5 and R220.5. This material was taken from a borrow site in Big Carlos Pass ebb shoal complex. Lee County is the local sponsor working in cooperation with Division of Recreation and Parks. Nourishment was completed again in

December 2014 in conjunction with the Bonita Beach project to the south. The project placed approximately 333,494 cy of material on Lovers Key. Construction was completed in December 2020 on Lovers Key again with placement of 21,270 cy between R216.5 and R219.5 from the New Pass navigational channel. The department issued a JCP permit for Lovers Key in 2022 and the next nourishment is between R215 and R220 and scheduled for construction in 2023, due to the severe impacts from Hurricane Ian (2022).

Strategy: Maintain the project through monitoring and nourishment.

New Pass, Lee County, R221-R223

New Pass is located between Lovers Key and Big Hickory Island and provides a tidal connection between the Gulf and Estero Bay. An inlet management study of New Pass and Big Hickory Pass was completed in 1994 but was never formally adopted by the Department. Based in part on the study, the ebb shoal of New Pass was dredged as a sand source for the 1995 beach restoration at Bonita Beach.

Approximately 112,870 cy of sand was dredged from the New Pass ebb shoal in 2013 for a beach restoration project on Big Hickory Island. The Department issued a joint coastal permit in September 2015 for maintenance dredging of the pass channel to place beach compatible material on Lovers Key and/ or Big Hickory Island. Channel dredging was completed in 2017, resulting in placement of 68,320 cy of sand on Big Hickory Island between R223.4 and R224.6. The New Pass navigational channel was dredged in 2020 with placement of 21,270 cy on Lover's Key. A regional inlet feasibility study has been initiated by Lee County in 2019 to study Big Carlos Pass, New Pass, and Big Hickory Pass. The study was completed and submitted to the Department in April 2023.

Strategy: Monitor and develop a sediment budget sufficient for the adoption of an inlet management plan in conjunction with further dredging of New Pass channel and shoals.

Big Hickory Island, Lee County, R222.7-R225.9

This is a 0.8-mile segment of critically eroded beach on Big Hickory Island. The Pelican Landing Community Association received a permit in 2012 to construct a beach restoration project and erosion control structures. The beach restoration project was completed in October of 2013 using approximately 112,871 cy of beach compatible sand from the New Pass ebb shoal placed between R222.5 and R224. Channel dredging was completed in 2017, resulting in placement of 68,320 cy of sand on Big Hickory Island between R223.4 and R224.6.

Seven concrete, adjustable king-pile groins were installed to retain the placed sediment. Extensive monitoring including the adjacent shoreline is required to detect and manage shoreline changes. Overwash, erosion and a breach occurred at Big Hickory Island due to Hurricane Ian. The breach was closed with 71,000 tons of upland sand pumped onto entire beach in May 2023.

Strategy: Maintain the project through monitoring and nourishment; address or prevent reopening of the reoccurring breach on the island.

Big Hickory Pass, Lee County, R225-R226

Big Hickory Pass is located between Big and Little Hickory Islands and provides a tidal connection between the Gulf and Estero Bay. Big Hickory Pass has closed repeatedly and been reopened by storms and mechanical excavation. The inlet has remained open without dredging since November 1988. An inlet management study of New Pass and Big Hickory Pass was completed in 1994, but never formally adopted by the Department. Based in part on this study, two terminal groins were constructed adjacent to Big Hickory Pass at the north end of the Bonita Beach Restoration Project shoreline. A regional inlet feasibility study has been initiated by Lee County in 2019 to study Big Carlos Pass, New Pass, and Big Hickory Pass. The study was completed and submitted to the Department in April 2023. The Department issued a new permit in 2022 for the dredging of the southern interior inlet shoreline near private boat docks for nearshore placement on the ebb shoal.

Strategy: Monitor and develop a sediment budget sufficient for the adoption of an inlet management plan in conjunction with New Pass.

Little Hickory Island, Lee County, R226-R230.4

This is a 0.9-mile segment of critically eroded beach on Little Hickory Island at Bonita Beach. The project history for this segment of shoreline is described in Table 13. Beach restoration was completed in December 1995. The non-federal **Bonita Beach Nourishment Project** (R226-R230) was constructed along the northern Gulf shoreline of Little Hickory Island using sand from the ebb shoal of New Pass. Lee County is the local sponsor. The 0.78-mile project placed approximately 217,000 cy of sand between R225.5 and R230. The project included two terminal groins constructed at the north limits of the beach fill adjacent to Big Hickory Pass. The southern groin was damaged during the passage of Tropical Storm Gabrielle and was rehabilitated during the summer of 2003. In June 2004, nourishment was completed along Bonita Beach (R226-R230) using approximately 150,000 cy of sand from the Big Carlo Pass ebb shoal. The project design consisted of a beach berm

at elevation +5.5 ft NGVD and a dune feature at elevation +6.5 ft NGVD to protect the existing dune and upland development. Lee County continues as the local sponsor, now working at the request of the City of Bonita Springs under the terms of an interlocal agreement. Nourishment was completed in September 2014 in conjunction with the Lovers Key project to the north and placed approximately 134,484 cy of material using sand from the Big Carlos Pass ebb shoal complex. The department issued a JCP permit in December 2022 to nourish the beach in 2023/2024 from an offshore sand source with approximately 200,000 cy of material, due to the impacts from Hurricane Ian (2022).

Table 13. Bonita Beach Nourishment Project history.

Date Completed	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
December 1995	217,000	New Pass ebb shoal	R225.5-R230	0.78
June 2004	150,000	Big Carlos Pass ebb shoal	R226-R230	0.74
September 2014	134,484	Big Carlos Pass ebb shoal	R226-R230	0.74
2023/2024	200,000*	Offshore	R226-R230	0.74

*Approximate projected volume.

Strategy: Maintain the project through monitoring and nourishment.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Lee County, Fort Myers Beach, Bonita Springs, West Coast Inland Navigation District, and the USACE. Lovers Key is a state park managed by the Division of Recreation and Parks. Participants with the Department as sponsors of beach management projects include Lee County, the Town of Fort Myers Beach, the West Coast Inland Navigation District, and the USACE. Project cost estimates and schedules may be found in the Beach Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of two or more projects proposed by two or more local sponsors that are entering the same phase and can demonstrate significant anticipated cost savings through joint contracting. Opportunities in this subregion include:

1. Construction of non-federal beach nourishment projects in this subregion should be combined under a single contract when technically feasible.

2. Beach compatible maintenance dredged material should be used to supplement sand sources for nourishment of adjacent critically eroded beaches.

Environmental Protection

The protection of marine turtles, shorebirds, manatees, and seagrass beds are environmental concerns within this subregion. Sensitive areas for shorebirds include Estero Island/Ft. Myers Beach, Lover's Key, Big Hickory Island, and Bonita Beach. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has not been restricted during the marine turtle nesting season of May 1 through October 31. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. The Critical Wildlife Area at the south end of Estero Island is important to nesting habitat for beach nesting birds and sea turtles. The designation of critically eroded beach on Lovers Key is due in part to the threatened erosion of wetland habitat. Pen shell (Atrina rigida) beds were mapped with the locations verified by scuba divers during the design of the Estero borrow area offshore of Carlos Point. The pen shell beds were not incorporated into the footprint of the borrow area and were avoided during construction.

Sand Sources

Sand sources to meet the needs of future projects in this subregion over the next 15 years have been identified. Lee County is working on a regional sand search inventory to locate and characterize beach compatible sand from a new offshore borrow area and is expecting to finalize the BOEM lease in 2023. A regional sediment management strategy that uses beach quality sand from upland sand mines and the maintenance dredging of the navigation projects should be incorporated into the maintenance of the beach restoration projects. The frequent maintenance dredging of Matanzas Pass, excavation of the Big Carlos Pass ebb shoal (2004 & 2014) for Bonita Beach and Lovers Key nourishment, navigational dredging of Big Carlos Pass with sand placement on the south end of Estero Island (2016), dredging of the New Pass ebb shoal (1995 and 2013) for Bonita Beach and Big Hickory Island restoration, and the dynamic nature of Big Hickory Pass calls for continued

monitoring of recovery and assessment for the usage as borrow areas for future projects. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

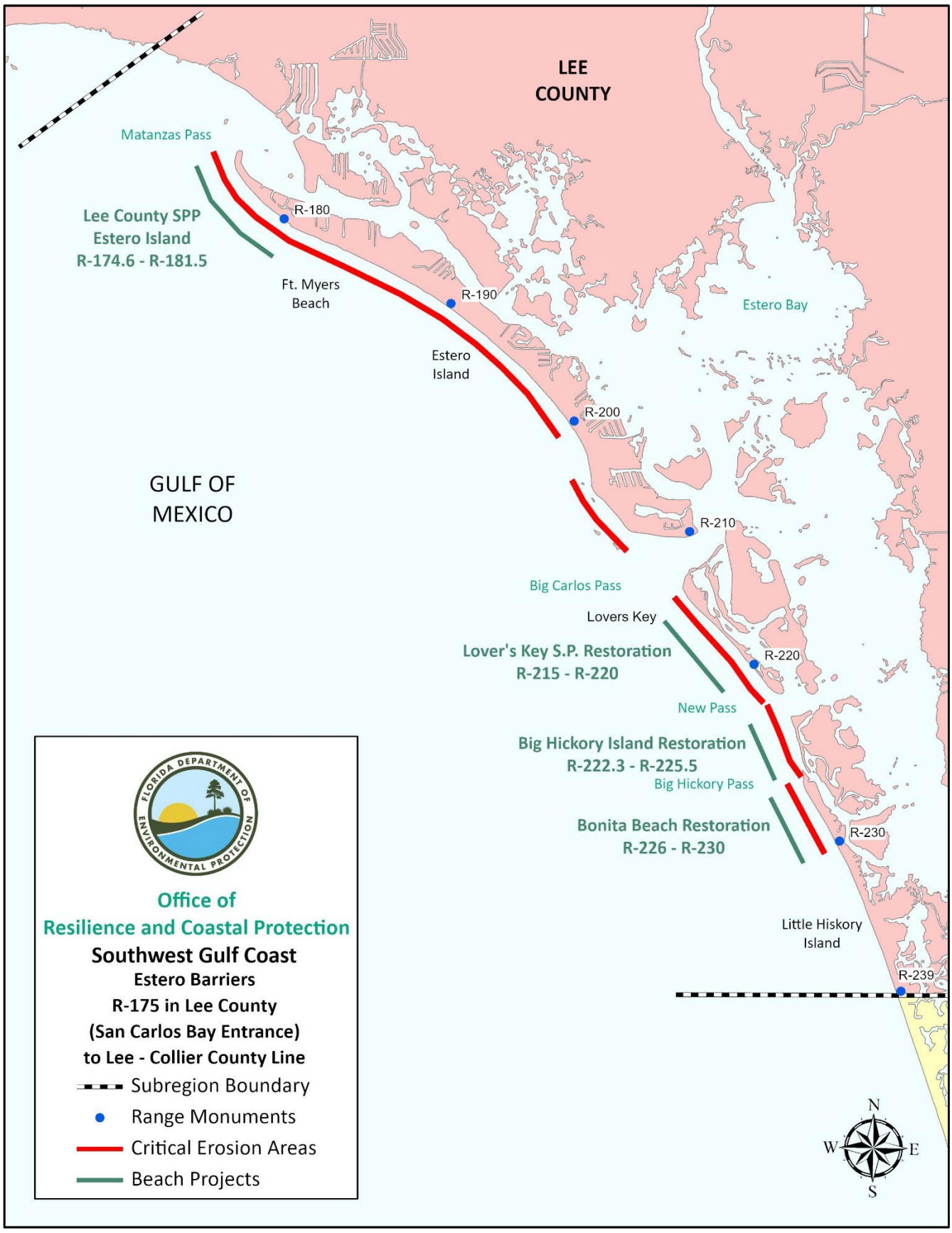

Figure 6. Map of Estero Barriers subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Naples Coast

There are 20.6 miles of beaches in the **Naples Coast** subregion, which extends from the Lee/Collier County line to the midpoint of Keewaydin Island (R111) in Collier County, as shown on Figure 7. There are 10.7 miles of critically eroded beaches in this subregion, of which 5.9 miles have been restored. Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of inlets including Wiggins Pass, Doctors Pass, and Gordon Pass. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1974, the Subtropical Storm of June 1982, Tropical Storm Keith (1988), Tropical Storm Gordon (1996), Tropical Storm Gabrielle (2001), Hurricane Charley (2004), Hurricane Wilma (2005), Tropical Storm Fay (2008), Tropical Storm Debby (2012), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Barefoot Beach, Collier County, R14-R16.3

This is a 0.4-mile segment of critically eroded beach. The erosion threatens sea turtle and gopher tortoise habitat. It is state land officially known as the Barefoot Beach State Preserve but is actively managed by Collier County as a county park. Barefoot Beach was restored and nourished with sand from Wiggins Pass in 2011 and 2013. In 2011, 52,500 cy of material was placed between R12 and R14. In 2013, 66,065 cy of material was placed between R12 and R16 to build the beach berm, nearshore beach, and repair dune scarps. An additional 34,635 cy was placed in the channel meander. A quantity of 88,993 cy (pay quantity) total of material was dredged from Wiggins Pass in the summer of 2018. Of that material, 53,396 cy of the material was placed north (R12-R14) of the pass at Barefoot Beach in the nearshore -below the mean high-water line. Wiggins Pass was dredged again in 2020 that placed a total of 48,041 cy of material in the nearshore zone between R12 and R14 at Barefoot Beach. Of the 48,041 cy, a portion of the material (26,653 cy) came from the Water Turkey Bay Channel and the rest of the material (21,388 cy) came from the main channel of Wiggins Pass.

Strategy: Maintain the eroded shoreline with sediment obtained from Wiggins Pass channel maintenance dredging.

Wiggins Pass, Collier County, R16-R17

Wiggins Pass is a natural inlet and has been open since at least 1885. Prior to 1952, the inlet was subject to periodic closures. In 1952, a south channel was dredged connecting Wiggins Pass through

Water Turkey Bay to Vanderbilt Lagoon. From 1984 to 2000, Collier County has conducted periodic maintenance dredging to maintain the Wiggins Pass entrance channel at a depth of -8 ft MLW in an area 1,050 ft long and 200 ft wide. The dredged sand was placed on the beaches north and south of the inlet. However, the channel fills rapidly, creating unreliable navigable depths. A study of inlet management alternatives in 1995 was used to support the county's application for environmental permits to construct navigation and sediment management improvements.

Widening and deepening of Wiggins Pass was completed in July 2000. The navigation improvements included deepening the channel through the ebb shoal to a depth of -12 ft MLW (plus 1 ft allowable over dredge). Wiggins Pass was dredged in 2003 with placement of 41,000 cy at Barefoot Beach between R11 to R14 and again in 2005 with placement 68,500 cy between R11 to R14. The pass was then dredged in 2007 with placement of 6,800 cy at R12 and additional 48,400 cy placed between R17 to R19. The pass was dredged again in 2009 with placement of 38,927 cy of material placed between R12 to R14 and 12,374 cy was placed at the Wiggins Pass State Park shoreline between R18 to R20. The dredging that occurred in February 2011 removed 49,900 cy and placed the material on Barefoot Beach between R12 and R14. Wiggins Pass was dredged again in 2013 with removal of approximately 107,300 cy. Of that amount, 66,064 cy of material was placed on Barefoot Beach between R12 and R16 to build the beach berm beach, nearshore and repair dune scarps. An additional amount of 34,635 cy was placed on the channel meander from the 2013 dredging event and 6,700 of non-beach compatible sand was placed offshore. A new local inlet management plan was completed in January 2012, which was the basis for permitting, dredging, and distribution of the sand dredged for the 2013 project and included a new sediment budget. The pass was dredged in 2015 with placement of 9,400 cy at Barefoot Beach near R16. The Department adopted a new Wiggins Pass - Inlet Management Plan in April 2018. Approximately 96,000 cy of material was dredged from Wiggins Pass between April and July 2018, with 53,396 cy of the material placed in the nearshore disposal area to the north (R12-R14) of the pass and 35,597 cy of material placed in the southern (R18 to R20) nearshore disposal area. Wiggins Pass was dredged in 2020 that placed a total of 48,041 cy of material in the nearshore zone between R12 and R14 at Barefoot Beach. Of the 48,041 cy, a portion of the material (26,653 cy) came from the Water Turkey Bay Channel and the rest of the material (21,388 cy) came from the main channel of Wiggins Pass. Dredging at the pass occurred again in March 2022. A total placement of 66,033 cy of inlet material was placed between R12.3 and R19.8 in 2022, with approximately 39,517 cy being placed at Barefoot Beach and 26,516 cy was placed within

Wiggins State Park. To see additional sand bypassing volumes for Wiggins Pass since 2018, see the department's Annual Inlet Report.

Strategy: 1) Conduct a comprehensive beach and inlet hydrographic monitoring program; 2) sand bypassing shall be performed from the Wiggins Pass navigation channel to the adjacent gulf-fronting beaches both to the north and to the south of the inlet between DEP Reference Monuments R12 and R20; 3) on an average annual basis, the initial target inlet sand bypassing quantity shall be 20,600 cubic yards per year, with approximately one-third placed to the south of the inlet and approximately two-thirds placed to the north; 4) the source of sediment for meeting the target sand bypassing quantity shall be the Wiggins Pass navigation channel.

Delnor-Wiggins Pass State Park, Collier County, R16.8 – R17.3

This is a 0.1-mile segment of critically eroded beach in the Delnor-Wiggins Pass State Park. This area has been impacted by inlet processes and recent storms. Due to impacts from Hurricane Ian (2022), beach nourishment is scheduled to occur in 2023. Siting of state park structures and parking area is being reexamined as well.

Strategy: Conduct inlet bypassing consistent with the Wiggins Pass - Inlet Management Plan.

Vanderbilt Beach, Collier County, R22.3-R30.5

This is a 1.6-mile segment of critically eroded beach in Collier County that is one of three segments of shoreline that is part of the Collier County Beach Restoration Project. The project history for this segment of shoreline is described in Table 14. The non-federal **Collier County Beach Restoration Project** was completed at Vanderbilt Beach (R23-R30) in January 1996 using 322,800 cy of sand from offshore borrow areas. The project design consisted of a beach berm at elevation +5 ft NGVD. Nourishment of the project was completed again in May 2006 that included the placement of 121,492 cy from R23 to R31 in the Vanderbilt Beach segment. The project design consists of a beach berm at elevation +5 ft NGVD to protect the existing dune and upland development. Both physical and environmental monitoring program are conducted in the project areas. Approximately 11,200 cy of upland sand was placed at Vanderbilt Beach in November 2012. A beach nourishment project was completed in 2014 by placing 38,362 cy of material at Vanderbilt Beach between R25 to R31 from an upland sand source. Pelican Bay received 24,759 cy of material between R33 to R37 in 2014, as a local option that is not eligible for state cost sharing. Additionally, Pelican Bay received 12,747 cy of material in 2016 and Vanderbilt Beach received 53,207 cy of material with the completed truck hauls

in December 2016. The next beach nourishment project was completed in January 2022 with placement of 77,340 cy of material between R22 to R32 and an additional 20,000 cy at Pelican Bay between R33 to R36. Due to Hurricane Ian in 2022, the county is planning to build a county-wide (north of Gordon Pass) FEMA dune of approximately 400,000 cy in 2023 and an additional volume of approximately 400,000 cy for the next full beach nourishment project in 2023/2024.

Table 14. Collier County Beach Nourishment Project (Vanderbilt Beach) history.

Year	Volume (cy)	Sand Source	Project Location (by R monuments)	Length (mi.)
1996	322,800	Offshore	R23-R30	1.5
1996	3,000	Upland	R29-R30	0.2
1999/2000	2,000*	Inlet	R40-R41	0.2
2002	22,138	Upland	R24-R30	1.1
2002	5,100*	Upland	R37-R39	0.4
May 2006	121,492	Offshore	R23-R37	1.5
May 2006	56,950*	Offshore	R30.8-R37	1.2
November 2012	11,200	Upland	R26-R30	0.8
2013/2014	38,362	Upland	R25-R31	1.1
2014	24,759*	Upland	R33-R37	0.8
December 2016	53,207	Upland	R24-R30	1.1
December 2016	12,747*	Upland	R34 - R37	0.6
January 2022	77,340	Upland	R22-R32	1.9
January 2022	20,000*	Upland	R33-R36	0.6

*Pelican Bay project area between R30.5 to R41 (in years 2000, 2006, 2014 & 2016) are not eligible for state cost share, it is outside the state designated critically eroded segment.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore and upland sources.

Clam Pass, Collier County, R41-R42

Clam Pass is a small wave-dominated inlet with tidal connection between the Gulf of Mexico and Outer Clam Bay. The initial dredging of the flood shoals in 1999 and maintenance of the flood shoal channel in 2002 and 2007 has resulted in significant improvement to the stability of Clam Pass. A

local inlet management plan was completed in 1998 and updated in 2014. Dredging has occurred in 1999, 2002, and 2007.

The project consisted of enhancing the hydrology of the system by periodically dredging sediments (up to 22,000 cy) constricting the pass and interior water bodies, placing the beach quality material on the beaches adjacent to Clam Pass (R35-R50), and disposing of the fine material on the uplands. Project activities continue with a permit in effect to 2022, including restoring the alignment of Clam Pass to the previously approved location as well as filling the meandered channel location with beach compatible sand. A project was completed to restore approximately 568 acres of mangrove estuarine ecosystem (known as the Clam Bay Natural Resource Protection Area). The pass closed following the active tropical season of 2012, which included tropical storms Debby and Isaac. The pass was reopened in the spring of 2013. The local inlet management plan of 2014 provides maintenance dredging criteria based on hydraulic and physical monitoring programs. Maintenance dredging in 2016 included dredging and grading of approximately 20,000 cy, with beach disposal south of the inlet along Clam Pass County Park (R42-R43.5). Maintenance dredging was completed again in February 2022with approximately 18,047 cy of material placed on the north (15,150 cy) and south side (2,897 cy) of the pass between R40 to R43.

Strategy: Place beach quality maintenance dredged material on beaches north and south of Clam Pass.

Park Shore, Collier County, R42-R57.5

This is a 3.0-mile segment of critically eroded beach in Collier County that is one of three segments of shoreline of the Collier County Beach Restoration Project. The project history for this segment of shoreline is described in Table 15. The non-federal **Collier County Beach Restoration Project** was completed in April 1996 at Park Shore (R50-R54) using 90,700 cy of sand from offshore borrow areas. The project design consisted of a beach berm at elevation +5 ft NGVD. The County initiated a program of nourishment using sand from upland borrow areas and inlet bypassing. This program placed approximately 94,335 cy of truck-hauled sand at Park Shore and approximately 41,725 cy of inlet-bypassed sand between 1996 and 2003.

Nourishment of the Collier County Beach Nourishment Project was completed in May 2006 and included the placement of 141,739 cy from an offshore borrow site between R45 to R54 in the Park Shore segment. The project design consists of a beach berm at elevation +5 ft NGVD to protect the

existing dune and upland development. In 2014, a 1.1-mile peripheral segment (R45-R50.65) was added to the existing critical erosion area (R50.65- R57.5) for the design integrity of the existing beach restoration project. A beach nourishment project was completed in 2014 by placing 66,100 cy of material at Park Shore between R44 to R55 from an upland sand source. Park Shore received additional sand in December 2016 in the amount of 33,092 cy between R44 and R48. The next beach nourishment project was constructed in November 2019 that placed approximately 122,222 cy of sand along 2.4 miles of beach extending from Clam Pass southward into Park Shore. Due to Hurricane Ian in 2022, the county is planning to build a county-wide (north of Gordon Pass) FEMA dune of approximately 400,000 cy in 2023 and an additional volume of approximately 400,000 cy for the next full beach nourishment project in 2023/2024.

Table 15. Collier County Beach Nourishment Project (Park Shore) history.

Year	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
1996	90,700	Offshore	R50-R54	0.72
1997	6,000	Upland	R42	0.2
1997	8,000	Upland	R48 – R50	0.4
1998	8,000	Upland	R42 – R45	0.6
1999/2000	30,000	Inlet	R42 – R44	0.4
1999/2000	35,000	Upland	R51 – R53	0.4
2001	28,268	Upland	R51 – R54	0.6
2002	9,067	Upland	R50 – R54	0.8
2002	11,725	Inlet	R42 – R43	0.2
2005	45,070	Inlet	R60 - R62	0.4
2006	141,739	Offshore	R45 - R54	1.7
2007	20,600	Inlet	R42 – R44	0.4
2011	7,842	Upland	R45 – R46	0.2
2013	10,430	Inlet	R42 – R44	0.4
2013/2014	33,632	Upland	R44 – R47	0.6

Year	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
2013/2014	32,468	Upland	R50 – R55	0.9
2014	81,690	Upland	R43-R54	2.1
December 2016	33,092	Upland	R44-R48	0.8
2016	14,644	Upland	R51-R53	0.4
2019	122,222	Upland	R42-R55	2.4

Strategy: Maintain the project through monitoring and nourishment using sand from offshore and upland sources.

Doctors Pass, Collier County, R57-R58

The City of Naples improved Doctors Pass for navigation by channel dredging and jetty construction in 1960. The pass was again dredged, and the jetties were augmented with rock and sand from the dredging in 1966. Maintenance dredging has been conducted about every four years, with dredged sand being placed on the beach or inshore zone south of the inlet. A sediment impoundment basin was dredged in 1996 within the ebb shoal and the north jetty was extended by 75 ft, which was recommended from the inlet management study in 1994. The Department adopted the Doctors Pass Inlet Management Study Implementation Plan in 1997 that specified all dredged material be placed on the beaches or inshore zone south of the inlet, meeting a minimum bypassing goal of 10,000 cy on an average annual basis. The City of Naples conducted maintenance dredging of Doctor's Pass in the winter of 2005, when approximately 44,000 cy of dredged sand was placed in the nearshore area south of the inlet between R60 and R62.

Maintenance dredging was conducted in early 2009, when approximately 33,000 cy of sand was placed in the nearshore between R60 and R62. Early in 2011, reconstruction and rehabilitation of the north jetty was completed by adding a new armor layer using approximately 3,850 tons of stone. In 2011, the beach immediately south of the pass from R58 north to the south jetty was nourished with over 22,000 cy of sand trucked from an upland source. Also, an updated sediment budget was developed in 2011, which was the basis for the improved disposal operations implemented in the 2013 dredging event that placed approximately 43,400 cy of material from south of the pass to R58.5. The Department issued a joint coastal permit in May 2016 to construct a spur groin off the south jetty

of Doctors Pass and an emergent breakwater with a detached groin and rehabilitate an existing rock groin for erosion control purposes. Doctor's Pass was dredged in summer 2018, with dredging of 37,626 cy of sand from the inlet template with placement between the south jetty and R58.5. Construction of the erosion control structures was completed in September 2018, which included nearshore placement of 30,800 cy of sand from the pass on the south side of the south jetty between R58 to R58.5 and R60 to R61. Doctor's Pass was dredged in the spring of 2022 with approximately 14,092 cy placed between R60 to R62 and construction was completed in April 2022.

Strategy: 1) Place all beach compatible dredged material on the beach south of the inlet meeting a minimum bypassing goal of 10,000 cy on an average annual basis; 2) monitor in conjunction with adjacent beach nourishment project; 3) update sediment budget and the inlet management plan.

Naples, Collier County, R57.8-R89

This is a 5.6-mile segment of critically eroded beach in Collier County that is one of three segments of shoreline of the Collier County Beach Restoration Project. The project history for this segment of shoreline is described in Table 16. The non-federal **Collier County Beach Restoration Project** was completed in May 1996 along the northern 3.8 miles of shoreline Naples (R58-R78), using 759,120 cy of sand from offshore borrow areas. The project design consisted of a beach berm at elevation +5 ft NGVD. The project also included removal of numerous derelict groins and the reconstruction of six rock groins and a timber pile groin. In 2000, the City of Naples constructed T-head groins and reconstructed wood plank groins along the Gulf shoreline near Gordon Pass (R88-R89). The County initiated a program of nourishment using sand from upland borrow areas and inlet bypassing. This program placed approximately 64,000 cy of inlet bypassed sand from Doctor's Pass and approximately 164,667 cy of truck-hauled sand on the beach at Naples between 1996 and 2003.

Nourishment of the Collier County Project Beach Nourishment Project was completed in May 2006 and included the placement of 355,000 cy from R58 to R79 in the Naples segment. The project design consisted of a beach berm at elevation +5 ft NGVD to protect the existing dune and upland development. The project included construction of 1.09 acres of artificial reef to mitigate for adverse impacts to nearshore hardbottom. Approximately 11,200 cy of upland sand was placed at Naples Beach in November 2012. Inlet dredging (Doctors Pass) occurred in October 2013 with placement of 44,000 cy onto the beach between the south jetty and R58.5. A beach nourishment project was completed in early 2014 by using 65,844 cy of material at Naples Beach between R58 to R72 from an upland sand source. Nourishment was completed again in December 2014 with a truck haul placement

of approximately 52,360 cy of material at Naples Beach between R58A (Doctors Pass) and R78.4 from an upland source. Nourishment occurred again in September 2018 using material from Doctor's Pass with total placement of 39,001 cy south of the pass. Beach nourishment occurred again and was completed in 2022 with the placement of 57,330 cy between R62 to R74. Due to Hurricane Ian in 2022, the county is planning to build a county-wide (north of Gordon Pass) FEMA dune of approximately 400,000 cy in 2023 and an additional volume of approximately 400,000 cy for the next full beach nourishment project in 2023/2024.

Table 16. Collier County Beach Nourishment Project (Naples) history.

Year	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
1996	759,120	Offshore	R58-R78	3.4
1996	55,000	Inlet	R58 – R60	0.4
1996	55,000	Upland	R70 - R72	0.4
1998	8,820	Upland	R70 – R72	0.4
1998	6,696	Upland	R75 – R76	0.2
2000	20,836	Upland	R59 – R89	5.7
2001	28,268	Upland	R51 – R54	0.6
2001	9,000	Inlet	R58- R59	0.2
2002	45,047	Upland	R58 – R68	1.9
2006	347,381	Offshore	R58-R79	4.0
2010	2,650	Upland	R58	0.1
November 2012	11,200	Upland	R62-R64	0.5
October 2013	44,000	Inlet	S. Jetty to R59	0.2
March 2014	65,844	Upland	R58-R72	2.7
December 2014	52,360	Upland	R58-R78.4	3.9
September 2018*	16,266	Inlet	S. Jetty to R58.5	0.2
September 2018*	22,735	Inlet	R60-R61.8	0.2

Year	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
January 2022	57,330	Upland	R62-R74	2.3

*Material placed in the nearshore.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore, upland, and bypassed from Doctor's Pass; evaluate alternatives to restore the remaining critically eroded shoreline.

Gordon Pass, Collier County, R89-R90

The navigation channel through Gordon Pass is part of a federal navigation project that includes an interior channel from Naples to Big Marco Pass. The USACE dredged the channel in 1962 with disposal of 230,000 cy of sandy material on Keewaydin Island. The project history for this segment of shoreline can be seen in Table 17. Groins and armoring have been constructed to protect Gulf front development north of the inlet. Maintenance dredging has been conducted by the USACE about every seven years, with beach quality dredged material placed on the beach 300 ft south of Gordon Pass, extending approximately 4,000 ft south on Keewaydin Island.

After the 2003 maintenance dredging event, construction of the south jetty sand tightening project was completed. The project consisted of the following elements: (1) installing approximately 520 linear ft of steel sheet piling along the southern side of the existing jetty, (2) adding additional foundation materials consisting of bedding stone and geotextile composites, and (3) placing additional armor stone consisting of individual units weighing between approximately one and four tons each as necessary to achieve design elevations. Top elevations of the tightened structure range between approximately –2 ft NGVD and +5 ft NGVD. Approximately 800 ft of the jetty was sand tightened. The jetty sustained minor damage during the passage of Hurricane Wilma in October 2005 and was repaired during the summer of 2006. Maintenance dredging of approximately 48,000 cy of sand was conducted in early 2010. The sand was placed onto the northern end of Keewaydin Island. Maintenance dredging of Gordon Pass in 2016 included dredging the navigation channel across the ebb shoal and 2 additional cuts within the flood shoal and placing approximately 73,000 cy of sand south of the inlet along the north Keewaydin Island shoreline. Maintenance dredging in 2020 placed approximately 87,000 cy of sand south of the inlet.

Due to the ongoing erosion impacts to the beach downdrift of Gordon Pass between R-90 and R-94, in 2012 two additional segmented breakwaters with detached low profile rock groins were constructed south of the three T-groins. These structures were built in a transition zone between the T-groins to the north and the sand bypassing attachment region to the south between R-93 and R-94. The dredging of the Gordon Pass Federal Navigation Channel between 1962 and 2016 has placed over 1.1 million cy of sandy material along the northern end of Keewaydin Island. The next anticipated dredging event of Gordon Pass is in 2023. The USACE initiated an inlet study in 2020 to determine the best strategies for bypassing sand to the adjacent beaches.

Table 17. Gordon Pass and Keewaydin Island Project history.

Year	Volume (cy)	Sand Source	Project Location (by R monument)	Length (mi.)
1962	230,000	Inlet	R90-R94	0.8
1970	181,400	Inlet	R90-R94	0.8
1980	235,000	Inlet	R90-R94	0.8
1985	120,000	Inlet	R90-R94	0.8
1993	95,000	Inlet	R90-R94	0.8
2003	175,000	Inlet	R90-R94	0.8
2010	48,000	Inlet	R90-R94	0.8
2016	73,000	Inlet	R90-R94	0.8

Strategy: Place beach quality maintenance dredged material on downdrift beaches south of the inlet. Conduct a study to determine the inlet's sediment budget that includes an inlet sink analysis and evaluation of inlet effects on the adjacent beaches.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Collier County, the City of Naples and the USACE, all of which participate with the Department as sponsors of beach management projects.

Project cost estimates and schedules may be found in Beach Management Funding Assistance Program – Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple beach nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks. Opportunities in this subregion include maintenance of the Collier County Beach Nourishment Project and the Marco Island Beach Nourishment Project using offshore sand sources under a single contract to reduce equipment mobilization costs.

Environmental Protection

The protection of marine turtles, gopher tortoise, shorebirds, including solitary nesting plovers, manatees, mangroves, and both hardbottom/reef habitat and seagrass beds are primary environmental concerns within this subregion. Sensitive areas for shorebirds include Keewaydin Island. Additionally, emergent shoals are utilized by resident and migrating birds. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. Side-scan sonar investigations in February 2003 identified approximately 500 acres of hardbottom formations within 1,000 ft offshore of the Collier County shoreline between R17 and R89. The authorized project requires monitoring of nearshore hardbottom to determine any unanticipated project related impacts. The timing of construction activities in this area has been restricted during the marine turtle nesting season of May 1 through October 31. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat.

Sand Sources

A regional sediment management strategy that uses beach quality sand from the maintenance dredging of the navigation projects should be incorporated into the maintenance of the beach restoration projects. Three upland sand sources and Doctors Pass have been identified and permitted in support of the Collier County beach and inlet management program. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI).

The Bureau of Ocean Energy Management (BOEM), through the Minerals Management Program (MMP), is responsible for the use of offshore sand resources located outside of state waters and

within federal waters on the Outer Continental Shelf. The MMP has initiated regional management of sand sources, where feasible, to manage the growing need for these sand sources. Projects in Collier County has obtained sand sources through the MMP leasing program. The Department is working with the BOEM to encourage coordination of sand sources within each region of the state to protect the shoreline of Florida.

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Statewide monitoring programs
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

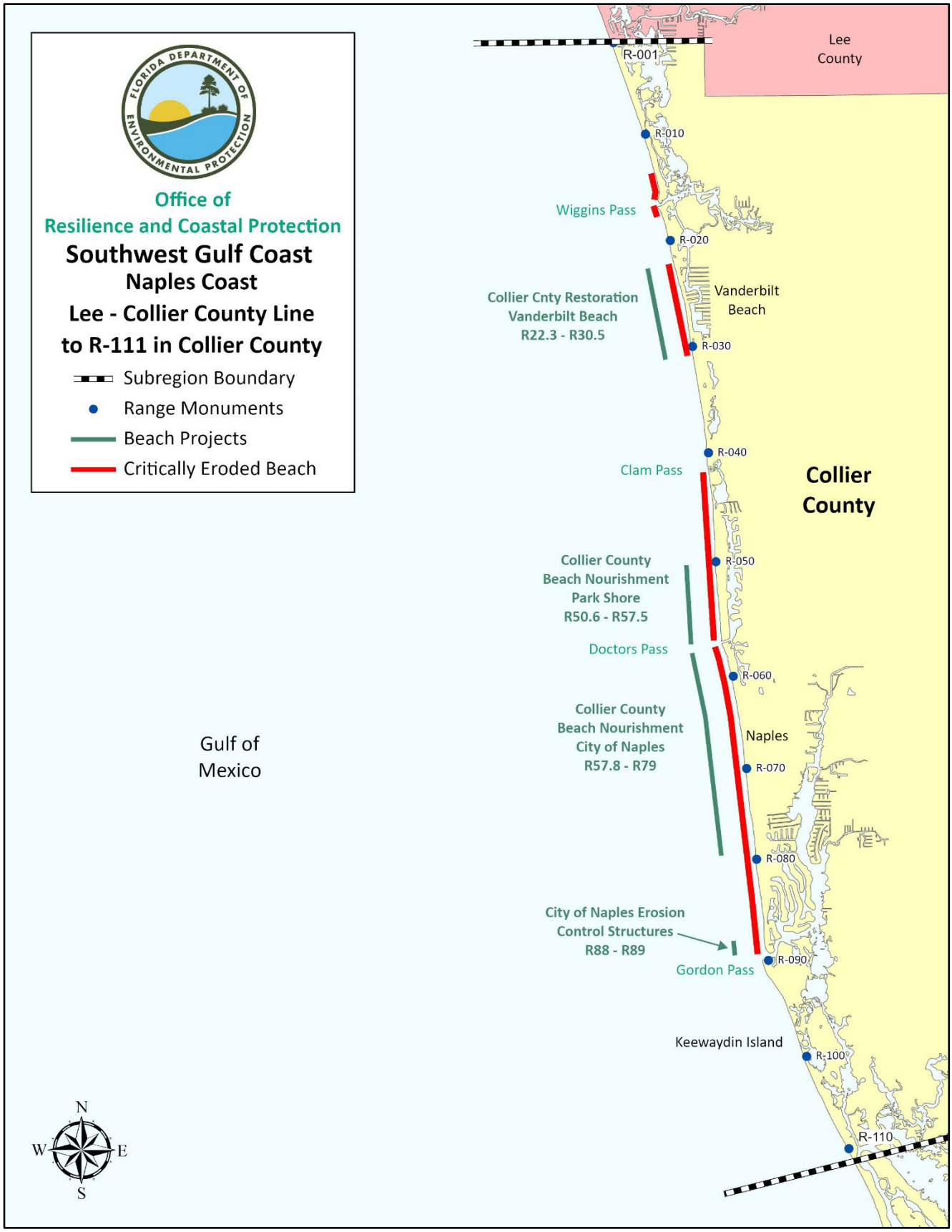

Figure 7. Map of Naples Coast subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Southern Barriers

There are 10 miles of beaches in the **Southern Barriers** subregion, which extend from about the midpoint of Keewaydin Island (R111) to Cape Romano in Collier County, as seen on Figure 8. There are 4.8 miles of critically eroded beaches in this subregion, of which 1.7 miles have been restored.

Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of inlets including Little Marco Pass, the Big Marco and Capri Pass inlet system, Caxambas Pass, and Blind Pass. The most erosive storms in recent years were Hurricane Agnes (1972), the Subtropical Storm of June 1982, Hurricane Andrew (1992), Tropical Storm Gordon (1995), Tropical Storm Harvey (1999), Hurricane Wilma (2005), Tropical Storm Fay (2008), Tropical Storm Debby (2012), Hurricane Irma (2017) and Hurricane Ian (2022).

Strategies for Inlets and Critically Eroded Beaches

Big Marco and Capri Pass Complex, Collier County, R127a-R128

Big Marco Pass is a part of a federal navigation project that includes an interior channel from Naples, although the pass has not been dredged for navigation purposes. It was the sole connection with the Gulf of Mexico between Sea Oat Island and Marco Island until 1967 when Capri Pass opened as an inlet through Sea Oat Island. Capri Pass has become the larger inlet and the severed end of Sea Oat Island, named Coconut Island, has migrated and eroded completely. As Big Marco Pass has diminished, sand from its ebb shoal has migrated toward Marco Island creating an emergent spit called Sand Dollar Island. The management strategy for Big Marco / Capri Pass Complex is based in part on an inlet management study that was completed in 1997. The department issued a permit to dredge the channel and lagoon near Sand Dollar Island in 2022.

Strategy: Monitor.

Hideaway Beach, Collier County, H3-H11

This is a 0.8-mile segment of critically eroded inlet shoreline at Hideaway Beach on the north coast of Marco Island adjacent to Big Marco Pass. The project history for this segment of shoreline is described in Table 18. Changes in the Big Marco and Capri Pass inlet system have coincided with erosion of Hideaway Beach (east of R128) on the north end of Marco Island. In 1990 and 1991, the

area was included in the non-federal **Marco Island Beach Restoration Project** using 70,000 cy of sand from borrow areas within the Big Marco/Capri Pass and Caxambas Pass ebb shoals.

Five temporary sand-filled geotextile groins were constructed at two locations by private interests in 1997. Two additional temporary sand-filled geotextile groins were installed in 2001. Periodic nourishment using sand from upland borrow sites and disposal in the nearshore from the dredging of Collier Creek has been conducted. The effectiveness of the temporary groins in controlling beach erosion was monitored. Monitoring concluded that the groins were effective in extending the longevity of the beach fill and reducing the frequency of nourishment at Hideaway Beach. The temporary groins were removed and replaced with ten permanent T-groins in conjunction with the 2005 **Hideaway Beach Nourishment Project**. In December 2005, construction of the Hideaway Beach Nourishment Project was completed with the placement of approximately 341,000 cy of sand dredged from the ebb shoal of Big Marco Pass/Capri Pass. The project design consists of a beach berm at elevation +5 ft NGVD to protect the existing dune and upland development. The project included enhancement and restoration within the Rookery Bay National Estuarine Research Reserve by removal of 3 acres of exotic species to mitigate for adverse impacts to mangroves at the site. In November 2010, Hideaway Beach was nourished with placement of 129,705 cy of sandy material and six additional T-groins. In 2013, three additional T-groins installed at North Beach, the terminal groin was modified, and 25,000 cy of sandy material was added to the beach. An additional 50,000 cy of material was placed at the Central Beach segment in 2013. There is a total of 19 T-groins located at Hideaway Beach. An additional 9,760 cy of beach material was placed at Hideaway Beach in July 2016. Beach nourishment occurred again in April 2019 with placement of 55,450 cy of material from the nearshore borrow area that was placed between H1 and H14.5.

Table 18. Hideaway Beach Nourishment Project history.

Year	Volume (cy)	Sand Source	Project Location (by H monuments) *	Length (mi.)
November 2010	129,705	Ebb Shoals	H3-H11	0.8
2013	25,000	Ebb Shoals	H12-H14, North Beach	0.2
2013	50,000	Ebb Shoals	H6-H8, Central Beach	0.2
July 2016	9,760	Hideaway Nearshore Borrow Area	H1-R128	0.2

Year	Volume (cy)	Sand Source	Project Location (by H monuments) *	Length (mi.)
April 2019	55,450	Hideaway Nearshore Borrow Area	H1-H14.5	1.3

*DEP's interactive maps have virtual (V) monuments for reference points along Hideaway Beach's shoreline. The H monuments are physical monuments that were set by the coastal engineering firm for this project area.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore and bypassing sources.

Central Coast of Marco Island, Collier County, R134.5-R139

This is a 0.8-mile segment of critically eroded beach on the central Gulf coast of Marco Island. In 1990 and 1991, the area was included in the non-federal **Marco Island Beach Restoration Project**, using sand from borrow areas within the Big Marco, Capri Pass and Caxambas Pass ebb shoals. Completed in February 1991, the project placed 1,260,000 cy of sand along the 2.64 mile segment, including the North Marco Island shoreline adjacent to Big Marco Pass from R135 to R139 and from R143 to R148. See Table 19 below for the history of the Marco Island Beach Restoration Project. The Department issued a permit modification in June 2016 to allow for beach regrading at Central Marco Island, which will establish an intermediate berm with a progressive slope to reduce ponding.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore and bypassing sources, and through sand transfer of fill material from adjacent areas within the project.

Southern Coast of Marco Island, Collier County, R143-R148

This is a 0.9-mile segment of critically eroded beach on the southern Gulf coast of Marco Island. Beach restoration and terminal shore protection structures have been completed. The project history for this segment of shoreline is described in Table 19. In 1990 and 1991, the area was included in the non-federal **Marco Island Beach Restoration Project** using sand from borrow areas within the Big Marco/Capri Pass and Caxambas Pass ebb shoals. Completed in February 1991, the project placed 1,260,000 cy of sand along the 2.64 miles including the North Marco Island shoreline adjacent to Big Marco Pass, from R135 to R139 and from R143 to R148. The project also included terminal groins constructed at the southwest end of Marco Island (R149). Breakwaters were constructed in 1997 offshore of the terminal groins and additional sand from the Caxambas Pass borrow area was placed within the south beach segment of the Marco Island Beach Restoration Project. During the winter of 2006, approximately 180,000 cy of beach quality sand was excavated from the Caxambas Pass borrow

area and placed on the beach of South Marco Island between R144 and R148, as part of the Marco Island Beach Nourishment project. During the spring of 2013, approximately 77,800 cy of beach quality sand was excavated from the Caxambas Pass borrow area and placed on the beach of South Marco Island between R146.4 and G4, as part of the Marco Island Beach Nourishment project. Three breakwaters and two groins were repaired as a component of this nourishment event. It is expected that the sand placement will provide upland protection, natural habitat and recreational beach areas with the widened beach. Beach nourishment occurred at central beach on Marco Island in July 2016 and storm repair work due to Tropical Storm Debby (2012) occurred at South Marco Island in November 2016. The Central Marco Beach Regrading project was completed in April 2019 using 180,000 cy of sandy dredge material. The next beach nourishment project was completed for the South Marco Island in April 2020, with placement of approximately 79,100 cy of sandy material from Caxambas Pass. An additional 4,000 cy was placed in the vicinity of R141 near the Madeira Condominium in 2020. The next nourishment is planned for 2024/2025.

Table 19. Marco Island Beach Nourishment Project history.

Year	Volume (cy)	Sand Source	Project Location (by R monuments)	Length (mi.)
February 1991	1,260,000	Ebb Shoals	R135-R139 and R143-R148	2.64
December 2006	180,000	Ebb Shoals	R144-R148	0.8
April 2013	77,800	Ebb Shoals	R146.4-G4	0.44
July 2016	23,680	Hideaway Nearshore Borrow Area	R135.5-R138	0.47
November 2016	13,147*	Caxambas Pass	R144-R148-G4	0.8
April 2019	180,000*	Nearshore	R135-R141.5	1.2
April 2020	79,100*	Caxambas Pass	R146-G4	0.44

* Storm repair in 2016, approximate volume and regrading beach project in 2019.

Strategy: Maintain the project through monitoring and nourishment using sand from offshore and bypassing sources.

Caxambas Pass, Collier County, R148

Caxambas Pass is a natural inlet that has not been altered or maintained for navigation but was dredged as a borrow area for beach restoration of Marco Island in 1991 and 1997. The entire north

shoreline of Marco Island has been armored by private interests. An inlet management study was completed in 1996. In 1997 and 2006, sand from the Caxambas Pass borrow area was placed within the south beach segment of the Marco Island Beach Nourishment Project.

Strategy: Develop a sediment budget sufficient for the adoption of an inlet management plan, in conjunction with further dredging in Caxambas Pass channel or shoals.

Kice Island, Collier County, V323-V331.4

This is a 1.6-mile segment of critically eroded beach on Kice Island. Kice Island is a southern barrier island in Collier County where erosion has progressed into backshore mangrove forest resulting in the loss of beach and wildlife habitat.

Morgan Island, Collier County, V333.8-V341.8

This is a 1.5-mile segment of critically eroded beach on Morgan Island. Morgan Island is a southern barrier island in Collier County where erosion has progressed into backshore mangrove forest resulting in the loss of beach and wildlife habitat.

Regional Strategies for Beach and Inlet Management

Sponsors and Funding

This subregion contains the governmental entities of Collier County, Marco Island and the USACE. The County has participated with the Department as the local sponsor of beach management projects. The Hideaway Beach Project was not cost-shared with the Department due to the project not meeting the funding eligibility criteria. Project cost estimates and schedules may be found in the Beaches Management Funding Assistance Program - Long Range Budget Plan.

Project Coordination

Regionalization is the funding and coordination of multiple beach nourishment and inlet management activities to take advantage of identifiable cost savings through economies of scale, reduced equipment mobilization and demobilization costs, and elimination of duplicative administrative tasks. At this time, no opportunities for coordinating projects in this subregion have been identified.

Environmental Protection

The protection of marine turtles, colonial shorebirds and seabirds, manatees, mangroves, and seagrass beds are primary environmental concerns within this subregion. Sensitive areas for shorebirds include Big Marco Pass Critical Wildlife Area, emergent shoals at Caxambas Pass, Caxambas Pass Critical Wildlife Area, portions of Kice Island, Cape Romano, and emergent shoals off Cape Romano now known as Second Chance Critical Wildlife Area. Additionally, emergent shoals are utilized by resident and migrating birds. These areas are subject to change as conditions change, and coordination with FWC shorebird staff is encouraged during project development. The timing of construction activities has been restricted during the marine turtle nesting season of May 1 through October 31 and the shorebird nesting season of February 15 through August 31. Project design and method of construction are restricted to avoid or minimize adverse impacts to the listed species and their habitat. Nourishment activities must avoid potential impacts to the emergent shoals at the northwest end of Marco Island and within Caxambas Pass, which are considered by the Florida Fish and Wildlife Conservation Commission (FWC) as Critical Wildlife Areas for shorebirds and seabirds. Large numbers of shorebirds and seabirds' nest and roost on the numerous sandbars near the area of North and South Marco Island. Wildlife and protected species surveys for the project area have documented nesting by least terns (state threatened), snowy plovers (state threatened), American oystercatcher (state threatened), black skimmers (state threatened), and Wilson's plovers on the beaches of Collier County. These beaches are also used as resting/foraging habitat for other species of shorebirds including the piping plover (federally threatened), and red knot (federally threatened). The Rookery Bay National Estuarine Research Reserve (which encompasses Rookery Bay and Cape Romano-Ten Thousand Islands Aquatic Preserves), includes Kice and Morgan Islands and surrounds, but does not include Marco Island. Marco Island waters, aquatic preserve areas, and the Ten Thousand Islands National Wildlife Refuge are prime habitat for the federally endangered smalltooth sawfish. Projects located within and near the Aquatic Preserve boundaries require additional protection, including more stringent water quality standards than in non-Aquatic Preserve waters, during permitting and construction to ensure preservation of the existing conditions.

Sand Sources

A regional sediment management strategy that uses beach quality sand should be incorporated into the maintenance of the beach restoration projects. For additional information on sand sources, the Department manages a database named the Regional Offshore Sand Source Inventory (ROSSI). The

Bureau of Ocean Energy Management (BOEM) through the Minerals Management Program (MMP) is responsible for the use of offshore sand resources located outside of state waters and within federal waters on the Outer Continental Shelf. The MMP has initiated regional management of sand sources, where feasible, to manage the growing need for these sand sources. Projects in Collier County have obtained sand sources through the MMP leasing program. The Department is working with the BOEM to encourage coordination of sand sources within each region of the state to protect the shoreline of Florida.

Additional Information

The introduction of the state's Strategic Beach Management Plan provides additional background information on the Department's Beach Management Programs and includes overviews of:

- The principles and statutes followed to help guide the state's management strategies
- Comprehensive list of Florida's inlets
- The miles of critically eroded beaches under active management
- Statewide sand source studies
- Innovative technologies examined
- Basic suggestions for emergency response plans
- Beaches, Economics and Tourism

Additional Links

There are many ground sites, beach sites (Cape Sable), and elevated camping platforms ("chickees") available in various locations in the Everglades National Park. Most sites are accessible by canoe, kayak, or motorboat, though a few may be reached by hiking.

- Everglades National Park
- Ten Thousand Islands

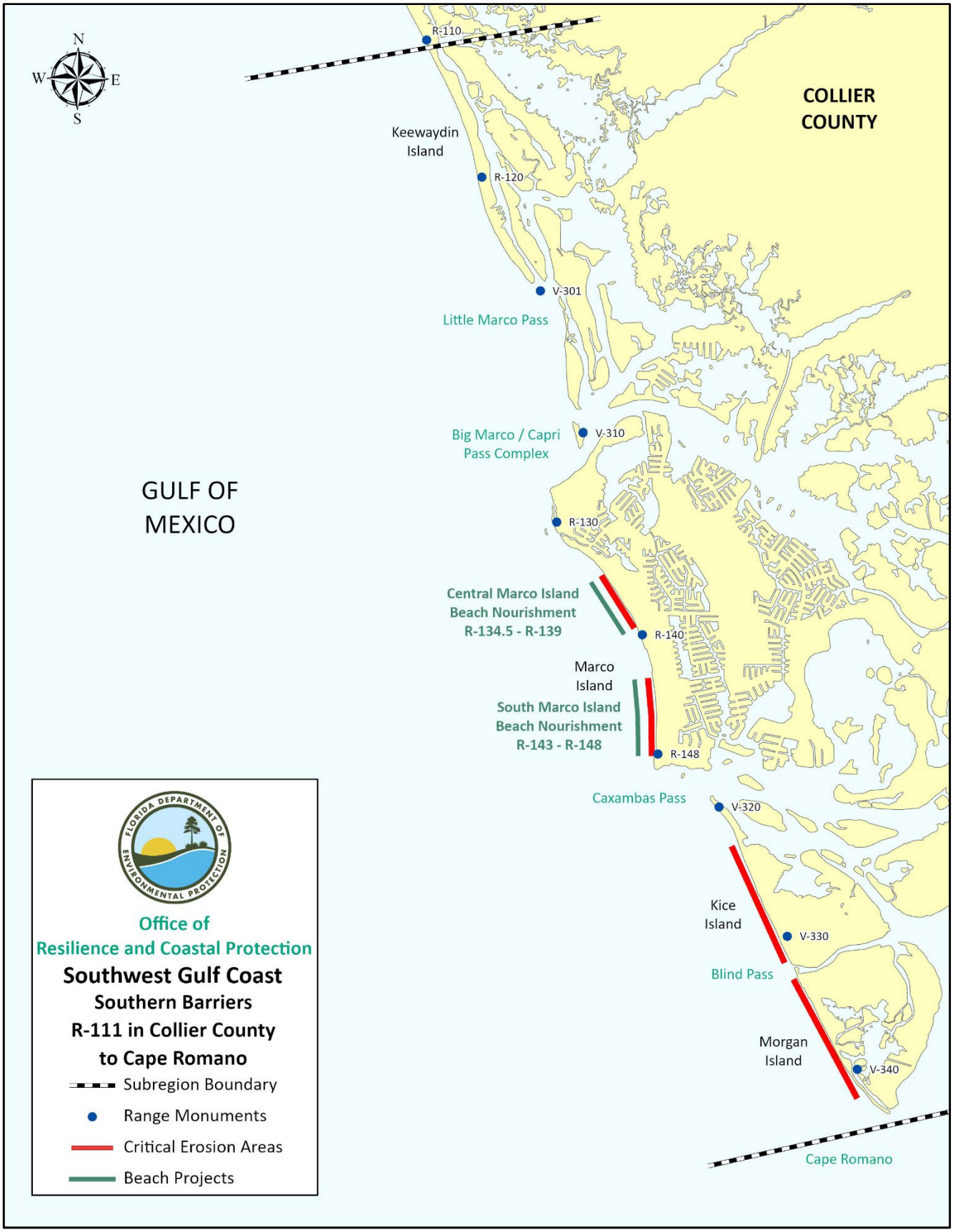

Figure 8. Map of Southern Barriers subregion of the Southwest region of Florida. View an interactive map or COASTS imagery.

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Appendix - Acronyms

Acronyms associated with the Florida Department of Environmental Protection's Strategic Beach Management Plan:

Coastal Associations Acronyms:

- ASBPA – American Shore & Beach Preservation Association
- FSBPA – Florida Shore & Beach Preservation Association
- DCA – Dredging Contractors of America

Federal Agencies Acronyms:

- BOEM – Bureau of Ocean Energy Management
- CBRA – Coastal Barrier Resources Act
- CHL – Coastal and Hydraulics Laboratory
- CIRP – Coastal Inlets Research Program
- CMS – Coastal Modeling System
- CSRM – Coastal Storm Risk Management
- CZMA – Coastal Zone Management Act
- EA – Environmental Assessment
- EIS – Environmental Impact Statement
- ERDC - Engineer Research and Development Center
- FCCE – Flood Control and Coastal Emergency
- FEMA – Federal Emergency Management Agency
- FRF – Field Research Facility
- GRR – General Reevaluation Report
- HSDR – Hurricane and Storm Damage Reduction
- LPP – Locally Preferred Plan
- LRR – Limited Reevaluation Report
- MMP – Marine Minerals Program
- NGVD 29 – National Geodetic Vertical Datum of 1929
- NAVD 88 – National American Vertical Datum of 1988
- NPS – National Park Service
- NWF – National Wildlife Refuge

- NEPA – National Environmental Policy Act
- NOAA – National Oceanic and Atmospheric Administration
- NHC – National Hurricane Center
- NWF – National Wildlife Refuge
- ODMDS - Ocean Dredge Material Disposal Site
- OCS – Outer Continental Shelf
- RSM – Regional Sediment Management
- SAJ – South Atlantic District, Jacksonville
- SPP – Shore Protection Project
- SLC – Sea Level Change
- SLR – Sea Level Rise
- TSP – Tentatively Selected Plan
- USACE – United States Army Corps of Engineers
- USFWS – United States Fish and Wildlife Service
- WRDA – Water Resources Development Act

State Agencies Acronyms:

- AIWW - Atlantic Intracoastal Waterway
- BCS – Beaches and Coastal Systems
- BIP – Beaches, Inlets and Ports Program
- BMA – Beach Management Agreement
- BMFA – Beaches and Mines Funding Assistance Program
- BMP – Best Management Practices
- BSM – Bureau of Survey and Mapping
- CCCL – Coastal Construction Control Line
- COASTS – Collection of Aerials and Shoreline Trends Systems
- DEP – Department of Environmental Protection
- DMMA – Dredge Material Management Area
- DSL – Division of State Lands
- DWRM – Division of Water Resource Management
- ECL – Erosion Control Line
- EOC – Emergency Operation Center

- FAC – Florida Administrative Code
- FAR – Florida Administrative Register
- FDEM – Florida Department of Emergency Management
- FDFS – Florida Department of Financial Services
- FDOT – Florida Department of Transportation
- FHCF - Florida Hurricane Catastrophe Fund
- FIND – Florida Inland Navigation District
- FPS – Florida Park Service
- FS – Florida Statutes
- FWC – Florida Wildlife Commission
- IMP – Inlet Management Plan
- IWW – Intracoastal Waterway
- JCP – Joint Coastal Permit
- LABINS – Land Boundary Information System
- LGFR – Local Government Funding Request
- LRBP – Long Range Budget Plans
- MHWL – Mean High Water Line
- MLLW – Mean Lower Low Water
- MLW – Mean Low Water
- MOA – Memorandum of Agreements
- MOU – Memorandum of Understandings
- OCULUS – DEP's Electronic Document Management System
- OGC – Office of General Counsel
- R – Range or Reference Survey Monument/ Survey Marker
- RCP – Resilience and Coastal Protection
- ROSSI – Regional Offshore Sand Source Inventory
- SAND – Sediment Assessment and Needs Determination Study
- SBMP – Strategic Beach Management Plan
- SOP – Standard Operating Procedures
- SOW – Scope of Work
- TAC – Technical Advisory Committee
- TIITF – Trustees of the Internal Improvement Trust Fund
- WCIND – West Coast Inland Navigation District