

Strategic Beach Management Plan
Florida Keys Region

Division of Water Resource Management
Florida Department of Environmental Protection

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Smathers Beach in Florida Keys, FDEP photo 2007.

2600 Blair Stone Rd., MS 3590
Tallahassee, FL 32399-3000
www.dep.state.fl.us



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FLORIDA KEYS REGION

There are 36.3 miles of beaches in the **Florida Keys** region, which extends from Soldier Key, just south of Key Biscayne in Dade County, to the Dry Tortugas in Monroe County as shown on Figure 1. There are a total of 10.2 miles of critically eroded beaches in this region, of which 1.4 miles have been restored and maintained.

The **Upper Keys** subregion extends from Soldier Key to Tavernier Creek. No natural beaches exist in the Upper Keys subregion.

The **Middle Keys** subregion extends from Tavernier Creek to Pigeon Key. There are 3.5 miles of critically eroded beaches in this subregion.

The **Lower Keys** subregion extends from Pigeon Key to Key West. There are 6.7 miles of critically eroded beaches in this subregion.

The **Distal Sand Keys** subregion extends west of Key West and includes Woman Key, Boca Grande Key, the Marquesas Keys, and the Tortuga Keys. This subregion has beach erosion conditions that have not been adequately studied for inclusion in this plan.

Erosion in the **Florida Keys Region** is attributed to tropical storms and hurricanes, and to natural geomorphic changes caused by the pattern of littoral transport of sediments in this area. However, natural shoreline fluctuations are exaggerated by interaction with coastal protection structures, such as seawalls and revetments, which are located at the ends of many small pocket beaches in this region. The most erosive storms in recent years were Hurricane Andrew (1992; Upper Keys), Hurricane Georges (1998), which caused extensive property damage throughout the Keys and significant beach erosion at many locations, Hurricane Irene (1999; Middle and Lower Keys), Hurricanes Rita (2005), Wilma (2005), Tropical Storm Fay (2008) and Isaac (2012).

Monitoring of the beaches along the Florida Keys is accomplished through vertically controlled aerial photography. There are no range or reference (R) survey monuments along the beaches of Monroe County.

STRATEGIES FOR INLETS AND CRITICALLY ERODED BEACHES

MIDDLE KEYS SUBREGION

SEA OATS BEACH, LOWER MATECUMBE KEY, MONROE COUNTY

This is a 0.7 mile segment of critically eroded beach along Lower Matecumbe Key in the City of Islamorada. Erosion threatens recreational interests and U.S. Highway 1 along Sea Oats Beach. Hurricanes Rita and Wilma (2005) caused moderate beach and dune erosion and flooding in this segment. The Florida Department of Transportation constructed a road shoulder stabilization project in 2008 that included a sloping mattress, sand fill and sea oats.

Strategy: Initiate a feasibility study to determine environmentally acceptable erosion control alternatives and monitor.

LONG KEY STATE PARK, MONROE COUNTY

This is a 1.0 mile segment of critically eroded beach at Long Key State Park. Park officials have estimated shoreline recession to be as much as three feet per year since the park was opened in 1970. A rock revetment was constructed along a limited segment of shoreline in 1976; however, erosion end effects are most apparent adjacent to the structure. The park was severely impacted by Hurricanes Georges and Irene in 1998 and 1999. Beach and dune restoration was considered necessary after these storms, and a feasibility study was initiated by the Florida Department of Environmental Protection (FDEP). In 2005, Hurricanes Rita and Wilma combined to severely impact the park and destroyed all the waterfront campsites and infrastructure. A beach restoration project has been designed to restore the beach width and to protect campsites. To be consistent with the carbonate sand composition of the native beach, the project is proposing to use calcium carbonate sand imported from the Bahamas and permitting efforts are ongoing.

Strategy: Construct a beach restoration project that provides acceptable mitigation for sea grass beds and monitor.

CURRY HAMMOCK STATE PARK, LITTLE CRAWL KEY, MONROE COUNTY

This is a 0.1 mile segment of critically eroded beach at Curry Hammock State Park, where recreational interests are threatened. In 2005, Hurricanes Rita and Wilma combined to severely impact the park. In

2005, a feasibility study was completed to investigate sand sources for state parks in the Keys, including Curry Hammock State Park. The **Curry Hammock State Park Beach Nourishment Project** was constructed via truck haul with removal of inappropriate fill and the placement of 14,450 cubic yards (cy) of sand in April 2008. An additional 600 cy of sand were added to the dune in 2011 to repair the dune system from subsequent storm damages.

Strategy: Maintain the project through nourishment and monitor.

WEST COCO PLUM BEACH, MARATHON, MONROE COUNTY

This is a 0.3 mile segment of beach created by dredge and fill development in the 1950’s. Located outside of the critically eroded beach, most of the eastern end of Coco Plum Beach is a City of Marathon public park. The beach sustained moderate erosion during Hurricane Georges in 1998. Following Hurricane Irene in 1999, this segment of beach was designated critically eroded where upland private development is threatened. This segment has two rock groins on the western end. Net sediment transport along this segment is to the southwest. During Hurricane Rita (2005), minor beach and dune erosion prevailed with significant overwash observed landward of the beach, and rock revetments were destroyed. Hurricane Wilma (2005) inflicted moderate beach and dune erosion and additional overwash, and also damaged major structures. In 2006, a dune restoration project was completed using approximately 4,100 cy of sand (Table 1). A beach management plan was developed in 2008 using hurricane recovery funds to assist in documenting future storm damage. To repair damages sustained during Tropical Storm Isaac, a FEMA dune nourishment using 1,117 cy of sand was completed in April, 2013 (Table 1). Dunes were re-vegetated at that time.

Table 1. Project history of West Coco Plum Beach.

| DATE | VOLUME (CY) | SOURCE | LOCATION | LENGTH (Mi.) |
|-------------|--------------------|---------------|-----------------|---------------------|
| 2006 | 4,100 | Upland | V364.4-V365.4 | 0.3 |
| 2013 | 1,117 | Upland | V364.4-V365.4 | 0.3 |

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

KEY COLONY BEACH, MONROE COUNTY

This is a 0.9 mile segment of critically eroded beach fronting on the Straits of Florida in the City of Key Colony Beach, west of Coco Plum Beach. Key Colony Beach is the western of two dredge and fill developments east of Marathon and is stabilized by 15 limerock groins, which were constructed in 1958. The 4,550-foot long private beach sustained minor to moderate beach erosion during Hurricane Georges (1998) and additional erosion during Hurricane Irene (1999). The upland development sustained substantial flooding and structural damage; however, little post-storm recovery was undertaken except some minor groin repair and the return of overwash sediments. Hurricanes Rita and Wilma combined to cause minor to moderate beach and dune erosion in 2005.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

WEST KEY COLONY BEACH, MONROE COUNTY

This is a 0.2 mile segment of critically eroded beach along the western shoreline of the City of Key Colony Beach, northwest of Sandy Point and includes the city's public beach, Sunset Beach. Hurricane Rita (2005) inflicted minor beach and dune erosion and destroyed the rock revetment at Sunset Beach. Hurricane Wilma (2005) caused major beach and dune erosion of this segment and greater structural damages. This segment was designated as critically eroded in April 2006, where public recreational interests at Sunset Beach are threatened.

Strategy: Maintain dune project with truck haul beach nourishment and dune vegetation; monitor.

SOMBRERO BEACH, VACA KEY, MONROE COUNTY

This is a 0.3 mile segment of critically eroded beach at the southwestern tip of Vaca Key. Sombrero Beach is a City of Marathon public park. The beach is sheltered from east and southeast wave activity. This results in the net sediment transport along the beach to be easterly into an adjacent canal on Tingler Island. The park facilities sustained major damage from storm tide flooding and landward sediment transport during Hurricane Georges (1998). Hurricanes Rita and Wilma combined to cause minor to moderate beach and dune erosion in 2005. Hurricane Wilma also damaged much of the park's infrastructure. Significant sand losses have occurred as a result of overwash and sediment transport into

canals on Tingler Island. Private interests on Tingler Island have constructed impermeable docks and groins, which should partially mitigate the loss of material into adjacent canals from Sombrero Beach. A beach management plan was developed in 2008 using hurricane recovery funds. A feasibility study was also initiated but was never completed. To repair damages sustained during Tropical Storm Isaac, a FEMA dune nourishment using 1,064 cy of sand was completed in March, 2014. Dunes were also re-vegetated at that time.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

LOWER KEYS SUBREGION

LITTLE DUCK KEY, MONROE COUNTY

This is a 0.2 mile segment of critically eroded beach and is the site of Veteran’s Memorial Park, a Monroe County park. Hurricane Wilma (2005) caused moderate beach and dune erosion and destroyed all the park facilities. In April 2006, this segment was designated as critically eroded threatening recreational interests at the county park.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

BAHIA HONDA STATE PARK, MONROE COUNTY

Bahia Honda Key has three erosional areas. Within Bahia Honda State Park, Calusa Beach (between the bridges), Loggerhead Beach (a western segment) fronting on the Straits of Florida, and a stretch of Sandspur Beach at the east end have 2.0 miles of critically eroded beaches. The most significant carbonate beaches and dunes of the Lower Keys are on Bahia Honda Key, which is part of Bahia Honda State Park. The island has 11,900 feet of beach, south of U.S. Highway 1, fronting on the Straits of Florida and another 800 feet of beach north of the highway fronting on the Gulf of Mexico. Coastal Tech (1987) estimated a southwesterly longshore sediment transport rate of 2,050 cy/yr; however, observations over time suggest that the actual rate along the beach and nearshore is minimal. Sediment

transport has been observed to occur primarily during storm events, with most of the material either being transported onshore or offshore.

Several attempts have been made to armor, build groins, and fill the eroding areas since the early 1970's. In 1989, a 100-foot long groin and restoration was constructed at Caloosa Beach, the 600 ft long recreation beach between the Flagler Bridge and the U.S. Highway 1 Bridge. The western 3,500 feet of Loggerhead Beach fronting the Straits of Florida, also designated critically eroded, receded about five feet between 1971 and 1986. Erosion control efforts have included the placement of concrete bridge piles near the west end, riprap along the 400 to 500 feet of threatened roadway in the early 1970's, the 1988/89 construction of a 1,200-foot long limerock revetment, and substantial sea oats planting during the 1980's and 1990's.

Hurricane Georges (1998) caused major beach and dune erosion and severely damaged the park facilities, roadway and bridge. Hurricane Rita (2005) inflicted minor beach and dune erosion at Calusa Beach and Sandspur Beach, and minor to moderate beach and dune erosion at Loggerhead Beach. Hurricane Wilma (2005) caused moderate to major beach and dune erosion at Calusa Beach and Loggerhead Beach, and minor dune erosion with beach accretion within the critically eroded portion of Sandspur Beach. Wilma also caused severe damage to the park's recreation facilities at the public beaches. A project was designed in April 2005 for Calusa Beach, but was never constructed. During post-storm recovery operations though, overwash sediments were returned to the beaches. In 2005, a feasibility study was completed to investigate sand sources for State Parks in the Florida Keys, including Bahia Honda State Park.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

BOCA CHICA KEY, MONROE COUNTY

This is a 1.3 mile segment of critically eroded beach and a Monroe County park. Hurricanes Georges (1998) and Irene (1999) caused moderate to major beach and dune erosion and road damage in this area. In 2005, Hurricane Rita caused minor beach and dune erosion and Hurricane Wilma caused moderate to major beach and dune erosion. Rita caused overwash deposits onto Boca Chica Beach Road and Wilma destroyed much of the road. The county has abandoned much of the road and beach destroyed by the 2005 hurricanes.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

SMATHERS BEACH, REST BEACH, HIGGS BEACH, AND SOUTH BEACH, KEY WEST, MONROE COUNTY

This is a 2.8 mile segment of critically eroded beach fronting on the Straits of Florida. The U.S. Army Corps of Engineers and others have studied this segment of shoreline since 1951. The net annual longshore sediment transport is to the west; however, the eastern end of the shoreline along South Roosevelt Boulevard is hardened with a seawall providing little material for transport.

In 1998, Hurricane Georges damaged the South Roosevelt seawall and private property to the west of Smathers Beach. Rest Beach and South Beach sustained substantial damage. Hurricane Irene damaged the seawall again and caused additional erosion in 1999. Hurricane Rita caused minor beach erosion to Smathers Beach, Higgs Beach, South Beach and the private beaches, and minor beach and dune erosion to Rest Beach in 2005. Hurricane Wilma caused minor beach and dune erosion to Smathers Beach, moderate to major beach and dune erosion to Berg and Kitsos Beaches, major beach and dune erosion to Rest Beach, and minor beach erosion to Higgs Beach, South Beach, and Truman Annex beaches. Wilma substantially destroyed the entire park infrastructure at Rest Beach as well as many major structures along the southeastern shoreline of Key West.

Smathers Beach, an approximately 3,300-foot long beach, has been nourished since the 1960’s with sand screened from crushed limerock and also with oolitic aragonite imported from the Bahamas (Table 2). A total of 0.6 miles of shoreline at Smathers Beach was nourished in 2000 using 23,600 cy of quartz sand from an upland sand source. In 2001, an additional 4,600 cy of quartz sand were added and four groins were constructed to retain sand within the beach limits. Two-thirds of Smathers was nourished via truck haul again in 2011 with 12,800 cy of material from an upland sand source. The nourishment of the remaining one-third of Smathers was constructed in 2013 using 5,000 cy of material from the same source.

Table 2. Smathers Beach Nourishment Project History.

| DATE | VOLUME (CY) | SOURCE | LOCATION | LENGTH (Mi.) |
|-------------|--------------------|---------------|-----------------|---------------------|
| 2000 | 23,600 | Upland | V412-V412.5 | 0.6 |

| DATE | VOLUME (CY) | SOURCE | LOCATION | LENGTH (Mi.) |
|------|-------------|--------|-------------|--------------|
| 2001 | 4,600 | Upland | V412-V412.5 | 0.6 |
| 2011 | 12,800 | Upland | V412-V412.5 | 0.6 |
| 2013 | 5,000 | Upland | V412-V412.5 | 0.6 |

Rest Beach was restored in 1995 with 7,800cy of sand from an upland mine, removal of invasive exotic plants, construction of a protective berm planted with desired dune vegetation, and public access improvements. Due to storm activity in 1995, Hurricane Georges (1998), Hurricane Irene (1999) and the 2005 hurricane season, Rest Beach was nourished with upland sand (Table 3). To repair storm damage, the City of Key West conducted emergency nourishment of the berm at Rest Beach in 2009 using 455 cy of upland sand (Table 3). Storm damage again prompted the City to conducted emergency nourishment of the dune system using 200 cy of upland sand in early 2012 (Table 3). A full nourishment using 3,800 cy of material from the same source is planned for 2015.

Table 3. Rest Beach Nourishment Project History.

| DATE | VOLUME (CY) | SOURCE | LOCATION | LENGTH (Mi.) |
|--------------------|-------------|--------|----------|--------------|
| 1995 | 2,600 | Upland | V413 | 0.12 |
| 1995 (post H Opal) | 699 | Upland | V413 | 0.12 |
| 1998 | 1,188 | Upland | V413 | 0.12 |
| 1999 | 646 | Upland | V413 | 0.12 |
| 2006 | 484 | Upland | V413 | 0.12 |
| 2009 | 505 | Upland | V413 | 0.12 |
| 2012 | 200 | Upland | V413 | 0.12 |

Strategy: Maintain the projects at Smathers and Rest Beaches through nourishment using sand from approved sources; assisted recovery of storm erosion impacts to city and county public beaches above mean high water consisting of sand trucked from approved upland borrow sites; monitor.

SIMONTON BEACH, MONROE COUNTY

This is a 0.1 mile segment of critically eroded beach located on the south shoreline of Key West fronting the Gulf of Mexico. The City of Key West’s sole public beach on the Gulf of Mexico was eroded by Hurricane Wilma (2005), threatening recreational interests. FDEP designated this segment as critically eroded in April 2006.

Strategy: Maintain beach project consisting of sand trucked from approved upland borrow sites, placed in an alongshore berm configuration above mean high water, and stabilized with plantings of native vegetation; monitor.

FORT ZACHARY TAYLOR HISTORIC STATE PARK, KEY WEST, MONROE COUNTY

This is a 0.3 mile segment of critically eroded beach on the southwest tip of Key West. The site includes the 150-year old fort. Erosion undermined a revetment built by the U.S. Navy in 1964. A terminal groin and breakwater project was constructed including approximately 10,000 cy of sand in 1989. In 1998, Hurricane Georges caused major beach and dune erosion along this area leaving an eight to nine-foot vertical escarpment along the dune line between the west breakwater and the terminal groin. Hurricane Irene caused additional erosion and damaged the west shore revetment in 1999. Hurricane Rita caused minor to moderate beach and dune erosion along the park's beach, and Hurricane Wilma caused additional minor beach and dune erosion along the beach, and moderate upland bank erosion behind the west shore revetment in 2005. Also during Wilma, one of the four detached breakwaters sustained major damage, and the west shore revetment sustained minor damage.

A sand source investigation was concluded in October 2005, recommending the use of silicate sands from an upland sand source rather than the carbonate sands originally proposed. The restoration, via truck haul, was completed in December 2008 using 3,600 cy of sand from an upland mine. Rehabilitation of the offshore breakwaters and terminal groin were permitted in 2011. Rehabilitation is planned to be coupled with a moderate truck haul to restore the beach to the 2008 design template.

Strategy: Maintain project above mean high water line; repair the west shore revetment to prevent breaching of the terminal groin and rehabilitate the breakwaters; monitor.

REGIONAL STRATEGIES FOR BEACH AND INLET MANAGEMENT

SPONSORS AND FUNDING

The Middle Keys subregion includes the communities of Plantation, Islamorada, the [City of Key Colony Beach](#), Marathon Shores, and the [City of Marathon](#). The Lower Keys subregion includes the [City of Key West](#). These communities as well as Monroe County and the [U.S. Army Corps of Engineers](#) (USACE) are eligible governmental entities under the beach erosion control assistance program. Monroe County and the City of Key West have participated with the FDEP as the local sponsors of beach management projects. In addition, the [FDEP's Division of Recreation and Parks](#) manages state parks on Long Key, Little Crawl Key, Indian Key, Lignumvitae Key, Bahia Honda, and Key West. This area is located within the Florida Keys National Marine Sanctuary program. Project cost estimates and schedules may be found in [FDEP's 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:

1. Regional opportunities for beach management activities have not been studied at the critically eroded beaches, but would include combining management activities at several sites to reduce costs through economies of scale. A coordination of efforts between local, county, state and Division of Recreation and Parks could prove beneficial.
2. Placing beach quality sand from navigational dredging on beaches in critical need.

ENVIRONMENTAL PROTECTION

The protection of marine turtles, shorebirds, mangrove wetlands, seagrass beds and hardbottom and coral reef communities and their habitats are primary environmental concerns within this sub-region. 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 environmental impacts to natural resources, listed species and their habitat. The Keys are located within the limits of the [Florida Keys National Marine Sanctuary](#) and include the [Lignumvitae Key Aquatic Preserve](#) and [Coupon Bight Aquatic Preserve](#). Offshore of Monroe County is prime habitat for the endangered small-tooth 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

Adequate sand sources have not been identified for this region. Sufficient upland sand supplies for Curry Hammock State Park and Fort Zachary Taylor State Historic Park have been identified. Sand has been trucked in from upland sites in Dade County for small nourishments. Maintenance dredging of navigation channels in this region is conducted infrequently. Oolitic aragonite sand from the western Bahamas Islands has been used to nourish Smathers Beach in Key West. Although foreign sand sources

have not been permitted since the 1990's, the FDEP's Division of Recreation and Parks continues its permitting efforts to use oolitic aragonite sand from the Bahamas for restoration of Long Key State Park, which still maintains its native carbonate composition. The Northwest Channel at Key West has been identified by the USACE as a sand source for beach nourishment. A comprehensive investigation of upland sand sources has been performed to locate and characterize all beach compatible sand within economic distance of the critically eroded beaches. For additional information on sand sources, FDEP manages a database named the [Regional Offshore Sand Source Inventory \(ROSSI\)](#).

ADDITIONAL INFORMATION

The introduction at the beginning of the state's Strategic Beach Management Plan provides additional information including overviews of:

- The principals followed to help guide the state's management strategies
- 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

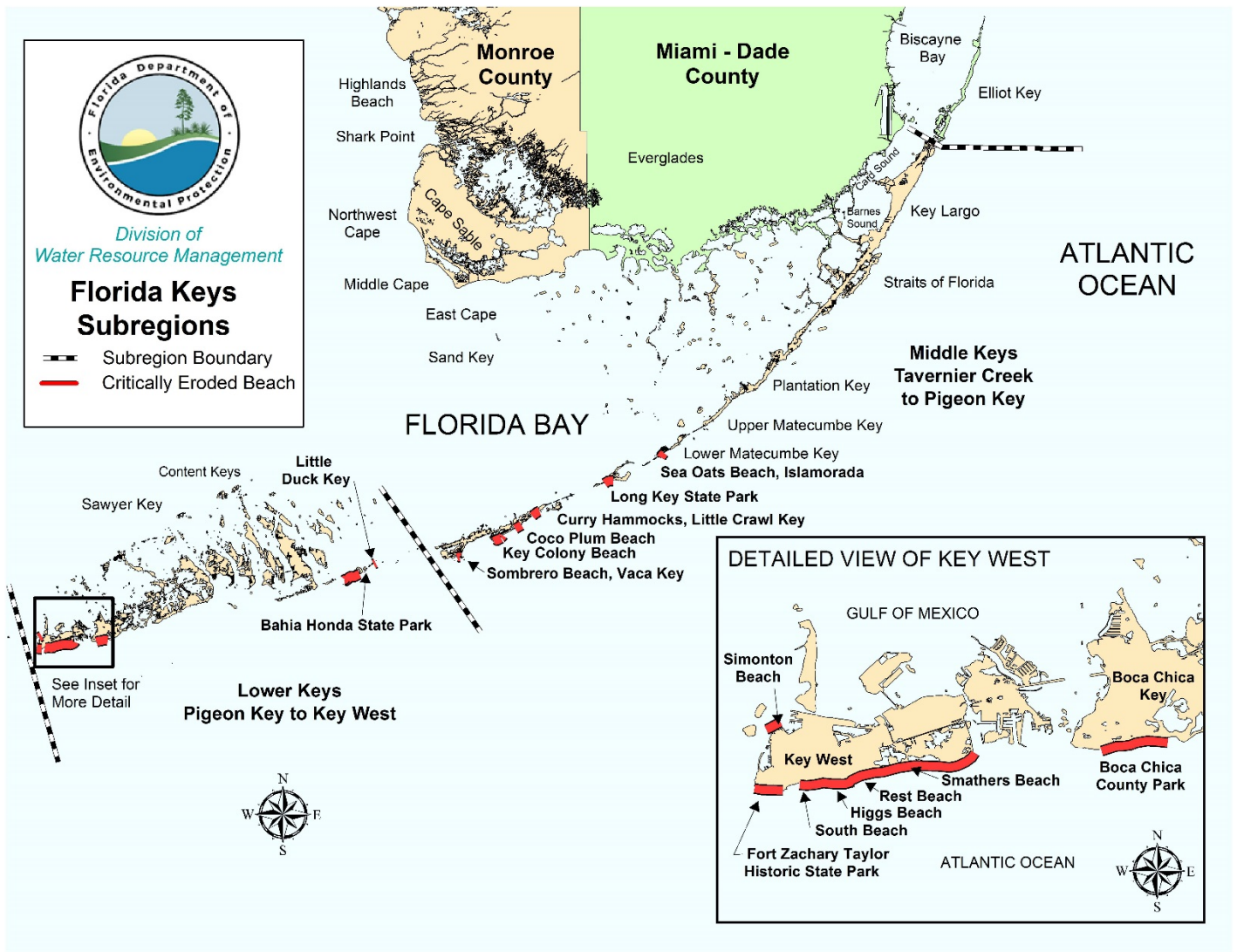


Figure 1. Map of the Florida Keys subregions.

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