

2 *Beaches and Dunes*

OVERVIEW

Beaches and dunes in Pinellas County are some of the County's most valuable natural resources, providing habitat for several different coastal species, storm protection for the upland communities, and public open space for recreation. The beaches are also the foundation for the County's thriving tourism industry.

The earliest permanent settlement in Pinellas County avoided the string of barrier islands along the Gulf Coast. Inaccessible and mosquito-ridden, the barriers were bypassed for more suitable home sites on the mainland. A look at these barrier islands today, however, demonstrates that these earlier inconveniences have been overcome, and with dramatic results. Intensively developed and enlarged by creating "new land" dredged from bay bottoms, the County's barrier islands have in most cases been transformed into linear cities and towns with very little undeveloped land remaining.



Clearwater Beach Island

Geology

In northern Pinellas County most of the barrier islands rest on a limestone surface and the unconsolidated sediment comprising these islands is five to eight meters thick, overlying the Tampa Formation, a limestone bedrock of Miocene age. The Miocene strata dip to the south; consequently, in southern Pinellas County the barrier islands are underlain by the Hawthorne Formation, which overlies the Tampa Formation. Unconsolidated sediments atop the Hawthorne Formation in southern Pinellas County are much thicker relative to northern parts of the County.

Barrier Island Origins

The barrier islands located along the Gulf coast of Pinellas County form a string of long, narrow strips of sand separated from the mainland by bays and estuaries varying from less than 30 meters to more than 600 meters in width. These islands are descriptively termed as barriers because they protect the mainland from the direct effects of major storms. Barrier islands are one of the most dynamic landscapes on earth. In fact, until approximately 4,000 to 5,000 years ago the shoreline of Pinellas County was tens to hundreds of kilometers to the west. As the sea level has gradually risen due to the continued retreat of the glaciers, the shoreline has retreated to its current location. One hypothesis advanced by the scientific community is that the barrier islands form. Another explanation of current barrier island formation off Pinellas County is that submarine sand bars become subaerial barriers by upward accretion of sand and other deposits. An example of the later process is the recent formation of Shell Key.

A third hypothesis to explain barrier island development in northern Pinellas County suggests that the barriers were initially located seaward of their present location and migrated landward as the sea level rose. Eventually the rate of sea level rise decreased and the landward migration of the barriers intercepted a source of Pleistocene sediment associated with an old marine terrace and/or the headland at Indian Rocks. As sea level rise decreased and sediment availability increased, the landward migration of the barriers slowed and stopped when they reached a preexisting topographic high. Once this happened, vertical accumulation of sediments and longshore progradation took part in barrier island development. This model indicates that the barrier islands in northern Pinellas County migrated to their present position 2,000 - 4,000 years ago.

All three hypotheses may account for the formation of Pinellas County's barrier islands, and the coast is comprised of a variety of barrier island and inlet morphologies, which may have had multiple origins.

Coastal Processes

This discussion will briefly explain the various natural processes that influence Pinellas County's barrier islands today, especially the beach and dune system. The coast of West Central Florida is considered a low energy coast. Hurricanes are infrequent and the winter frontal systems are rarely intense; however, most of the wave energy generated here is associated with winter frontal systems.

Microtidal conditions prevail, with spring tidal ranges in Pinellas County of 70-80 centimeters. Tides become significant during the few hurricanes that make landfall in or near the Pinellas coast. For example, the September 1848 hurricane produced tides that were 3.7 meters above normal, forming John's Pass by breaching a barrier island. In October 1921, a hurricane produced tides nearly nine feet above normal and created Hurricane Pass by breaching Hog Island thereby forming Caladesi and Honeymoon Islands.

The low energy waves drive littoral drift and longshore transport of sand. These transport mechanisms steadily move sand parallel to the barrier islands. South of Indian Rocks Beach the transport is generally from north to south, while north of Indian Rocks Beach the sand movement is from south to north. Estimates of the amount of sand transported along the Pinellas County coast range from 15,000 to 100,000 cubic yards of sand per year. It is important to understand this sand transport mechanism because if this sand supply is interrupted for any reason (e.g., inlet, groin, jetty) then the downdrift beach may be starved of sand. There is also sand movement offshore and onshore, perpendicular to the shore. Gentle waves tend to push sand up on the beach. Stronger waves, more typical in the winter and when a hurricane passes nearby, carry sand offshore from the beach.

It is important to understand how the beach and dune systems function, particularly in Pinellas County where the natural system has been so heavily altered. The beach zone includes the following areas:

- The area from the shoreline to the dunes, and
- The area offshore of the shoreline where active sand movement occurs.

The offshore portion can extend hundreds to thousands of yards seaward of the surf zone; thus, most of the beach zone is actually underwater. On an undisturbed barrier island, dunes are located immediately inland from the beach zone. Dunes, when present in Pinellas County, are usually less than three to four meters in height. Primary dunes, those closest to the beach, are the most important and should be protected for the storm protection they provide.

Behind the primary dunes are the secondary dunes. Often not as high as the primary dunes, the secondary dunes are usually more extensively colonized by vegetation, whose root systems help to stabilize this environment. Important functions performed by dunes include the following:

- Blocking or reducing the impact of storm waves,
- Increasing the elevation of homesites, and
- Furnishing a reservoir of sand that naturally replenishes the beach as the dunes erode.

The beach zone and dunes function as an interactive system under natural conditions with sand passing between the parts of the system based on the prevailing meteorological conditions. In Pinellas County this flow of sand is crucial since the supply of sand for the barrier islands must be primarily derived from the barriers themselves⁴. The sand contained in the County's barrier islands is a closed system because there is little contribution of sand from outside the system. Contribution from rivers to the open coast is negligible because most rivers drain into lagoons or estuaries where the sand is deposited. With no new sand entering the system, the County's barrier islands are dependent upon the existing sand supply along its coast. Offshore areas contain few large reserves of sand, which is the conclusion of a geophysical study done by the Army Corps of Engineers in 1979. In that study the Corps concluded that there is limited sediment for beach renourishment offshore and that the largest deposits are associated with tidal inlets. This conclusion is consistent with sedimentologic studies of the offshore areas of Pinellas County in which the thickness of the quartz sand is generally less than three feet and the underlying limestones are often exposed. Therefore, the sand reserves are held in these different storage elements: dunes, berms, nearshore bars, and inlets.

The beach zone is dependent upon the availability of sand from all of these sources. The beach responds to energy changes to produce a three-dimensional profile that is in equilibrium with that specific energy regime. Storms remove beach sand that under natural conditions is replaced from the berm or dunes. For example, during the high-energy winter months, the increased wave heights require a broad offshore sand apron and an offshore bar system to break the wave energy prior to reaching the swash zone. In order to adjust to this change in energy regime, the profile of the sandy beach changes. In summer, when there is less energy and wave heights are lower, the opposite occurs and the berm and dunes are replenished from the nearshore areas. Loss of dunes or berms, as has so often been the case in Pinellas County, reduces the reserve sand held in storage. Consequently, the system is no longer as capable of replacing sand losses from severe storms.

The barrier island chain along Pinellas County's Gulf coast consists of a number of islands separated by inlets, referred to as passes. Inlets serve an essential role for four sets of hydraulic processes:

- (1) an outlet for freshwater discharged from the land,
- (2) an outlet for storm tides developed within the estuaries,
- (3) a buffer for storm tides generated on the Gulf side, and
- (4) as a channel for water exchange in response to astronomical tides.

Inlets have ebb and flood tide deltas or sand bars which are major sediment storage areas for the coastal system. Major storms such as hurricanes flush out the inlet and the sand is transported laterally where it is used to absorb the storm energy in the beach zone.



Clearwater Pass

Trends in Erosion and Accretion

Trends in erosion and accretion have been measured in terms of mean high water shoreline changes and volumetric accretion and erosion. According to the Florida Department of Environmental Protection (FDEP) (formerly Florida Department of Natural Resources) Beach Restoration Plan, for the period from 1873 to 1950, the shoreline along most segments of Pinellas County's barrier islands receded. Since 1950, the shoreline has responded less uniformly, with some stretches continuing to recede and others exhibiting accretion, or an advance in the shoreline. In many instances, accretion since 1950 has been primarily attributed to corrective action (e.g., construction of shoreline protection structures and beach renourishment projects). Over this time period from 1873 to the latter 1970's, erosion on Honeymoon Island, the beaches on the central and southern portions of Clearwater Beach Island, and on the beaches on Sand Key, Treasure Island, Long Key and Mullet Key has been severe.

CONDITIONS OF PINELLAS COUNTY COASTAL BEACHES

Pinellas County has over 35 miles of sandy beaches. There are a few sandy beaches on the mainland, but most of the sandy beaches are located on the string of barrier islands. Following are brief descriptions of the barrier island and mainland beaches. Please see **Figure 7** for a location of the sandy beaches in Pinellas County.

Anclote Key's southern reaches fall within Pinellas County, but most of this island is located in Pasco County. The majority of the island is a State Park Preserve and it is accessible only by boat. The beaches consist of coarse grained sand.

FIGURE 7
SANDY BEACHES IN PINELLAS COUNTY

Three Rooker Bar was a sand shoal that has built up over the last couple decades and formed an island. The area is very popular with boaters and birds. It is only reachable by boat and is constantly shifting in size and shape. It is managed by the State of Florida as part of the Anclote Island State Park Preserve.

Honeymoon Island contains 2.6 miles of Gulf of Mexico frontage and is accessible to the mainland by a causeway. It is largely undeveloped, with only a few acres of residential development on its southern tip. The majority of the island falls within the Honeymoon Island State Recreation Area and is accessible to the mainland by a causeway. While some portions of the shoreline have receded more than 30 feet overall, some portions of the shoreline have advanced. In the northern portion of the island a sand spit and beach ridge have been growing and extending northward. However, erosion has occurred in the central and south central areas. The beach contains limestone cobbles which were dredged up by previous owners of the island in the early 1960s. The island was to be developed as a commercial and single-family development. The permits, however, were not renewed and the dredging ceased. The beach is a remnant of this development activity and consists of a thin veneer of sand that has accreted naturally over the cobbles.

Caladesi Island is a State Park accessible only by boat or by land from the northern tip of Clearwater Island. It has 2.1 miles of undeveloped Gulf frontage. The beaches are of fine grained sand. While some portions of the shoreline have receded an average of 27 feet overall, some reaches have advanced or have not changed in position. In 1985, Hurricane Elena created a new pass through the northern tip of the island. The northern portion of the island continues to be the most dynamic section of shoreline. Hurricanes from 2000 to 2005 have reorganized the sediment by removing the north end and by creating another new pass in the same location as in 1985.



Clearwater Beach Island is 3.1 miles long and averages 1,200 feet in width and is accessible from the mainland by a causeway. Highly developed as a resort and residential area, its bayside had been extended into Clearwater Bay by extensive dredge, fill and finger canal construction. Most of the beaches consist of fine grained sand. From 1873 to 1950, the shoreline receded an average of 121 feet overall, and from 1950 to 1979 it advanced an average of 175 feet overall. Some reaches have not changed positions or have receded. Some of the shoreline advance is due to local corrective action. Over the past century, there has been a relatively wide and stable beach on the south of the island; considerable erosion and a minimal beach in the central portion; and a wide and accreting beach on the northern end.

Sand Key is 14.2 miles long and its width varies from 200 feet near its middle to 2,000 feet, and is under the jurisdiction of nine municipalities. Sand Key has been highly developed as a resort and residential area, and its bayside has also been extended into Clearwater Bay and Boca Ciega Bay by extensive dredge, fill and canal construction. Indian Rocks Beach, which is in the middle of Sand Key, is a headland. In the past, wave energy has eroded Indian Rocks

Beach, which served as a sand source for other islands to the north and south. Most of the beach on Sand Key is of fine grained sand with a shell hash. From 1873 to 1950, the shoreline receded almost over the island's entire length, with extreme recession on the northern tip. From 1950 to 1979, the northern tip receded only slightly and the center portion of Sand Key advanced slightly due to the construction of numerous seawalls and bulkheads. The southern shoreline on Sand Key advanced an average of 85 feet. However, the beach on this exposed headland has continued to experience erosion problems.

Treasure Island is 3.5 miles long and averages 1,500 feet in width. It is accessible to the mainland, Sand Key and Long Key by bridges and causeways. It has been highly developed as a resort and residential area. Its bay side has been extended into Boca Ciega Bay by extensive dredge, fill and canal construction. Most of the beaches are fine grained sand beaches. Between 1873 to 1950, the shoreline receded, with the exception of the island's northern end. Since then, the shoreline has generally advanced over the entire island. This advance is primarily due to a federal beach erosion control project, dredging at John's Pass, and two jetties.

Long Key is 4.1 miles long and contains the City of St. Pete Beach. It is accessible by two bridges from the mainland and one from Treasure Island. It has also been heavily developed as a resort and residential area. Its bayside has been extended into Boca Ciega Bay by extensive dredge, fill and canal construction. The Gulf side beach is composed of predominantly fine grained sand with a shell hash. The bayside of Long Key has some fine grained sand beaches, mixed sand, and fill. Since 1950 the shoreline has advanced. The advance primarily reflects the effects of the terminal groin at the south end of the island and the fill placed on the south end of the island by local interests.

Shell Key began as two separate sand shoals that have built up and merged since the 1950's. The island is now maintained by Pinellas County's Department of Environmental Management as a County Preserve. A significant update to the specific management plan for Shell Key should be completed in late 2007.

Mullet Key is a V-shaped island about 1,000 to 2,000 feet wide that has a 2.5 mile north-south segment and a 3 mile east-west segment extending into Tampa Bay. The key contains Fort DeSoto Park. The beaches are of predominantly fine grained sand with a shell hash. In the early 1970s, severe erosion occurred in the central portion of the north shoreline.



Mullet Key

Artificial Beaches

There are a few mainland beaches which have been artificially created. These include: Fred Howard County Park, located in the City of Tarpon Springs, Gulfport Beach on Boca Ciega Bay, North Shore Beach and Spa Beach in the City of St. Petersburg. In addition, the Courtney Campbell Causeway and the causeway leading to the Gandy Bridge also have artificial sandy beach areas associated with them.

DUNES

Natural dune systems used to extend throughout the length of Pinellas County's barrier islands. However, the primary dunes, which under natural conditions provide sand to the beaches, have been covered or destroyed along much of Pinellas County's barrier islands, and natural primary dunes of significance are found only on Caladesi Island, north Clearwater Beach Island, and portions of Treasure Island, Long Key and Mullet Key. Secondary dune systems can be found only on Caladesi Island and northern Clearwater Beach Island. Artificial dunes have been created on Clearwater Beach Island, on the northern portion of Sand Key, throughout Treasure Island, on the southern tip of Long Key, and in the Madeira Beach portion of Sand Key. The creation of additional artificial dunes on the barrier islands is planned in the near future.



Dunes on Treasure Island

Please see **Figure 7** for the location of Pinellas County's sandy beaches and **Figure 8** for dunes in Pinellas County.

Intensive development of the Pinellas County barrier islands began at the beginning of the twentieth century. In 1958, the Pinellas County Water and Navigation Control Authority established bulkhead lines to protect and preserve waterways from dredging, pumping or other alterations of the shoreline. Upon the urging of the Pinellas County Board of County Commissioners, the Florida Legislature established an aquatic preserve for Boca Ciega Bay. All remaining sovereign submerged lands in Pinellas County were subsequently added to the aquatic preserve system. These actions limited horizontal dredge and fill development on the barrier islands.

During the 1960s and 1970s, vertical construction on the barrier islands took off, with development characterized by large multi-story, multi-family and commercial buildings. In the late 1970s and the 1980s, local governments made further attempts to control coastal development and redevelopment through height restrictions, greater setbacks, realistic parking requirements, environmental regulations, and land use and environmental planning.

Shoreline development from the 1890s through the 1930s occurred as multi-story luxury resort hotels. In the 1950s and the 1960s, national-chain hotels and small motels were built. From the 1960s through the 1980s, multi-story apartments and condominiums were the primary development activity along the shoreline, as were large commercial strip centers that are almost entirely dependent upon tourism.

As shoreline development continued to encroach on the natural beach and dune system, the landward migration of the shoreline in certain areas and the occurrence of major storms posed a threat to these structures. An effort was made to stabilize the

FIGURE 8
DUNES IN PINELLAS COUNTY

unstable beaches through shoreline engineering. The strategies normally used to stabilize the shoreline include: beach renourishment, groins, jetties, and seawalls.

As residential and commercial development continued, so did the practice of shoreline engineering, altering the natural shoreline system with the goal of stabilization. Some examples of early shoreline engineering are the closing of Indian Pass on Sand Key in the 1930s. Forty-one thousand linear feet of seawalls were also constructed prior to 1950 by municipalities and private property owners as a means to control erosion and protect property against storms.



Seawall along an altered shoreline

Other more recent engineering projects have included the construction of structures on John's Pass, Clearwater Pass, Pass-A-Grille Channel and Blind Pass as well as dredging of those passes for navigation or beach fill. Much of the erosion and loss of beach in Pinellas County was the result of building upon the dunes and in the active beach zone. This interferes with the natural coastal processes causing the beach in many areas to recede. As the coastline advances, seawalls have been constructed in the active beach zone to protect threatened structures. Exposed seawalls accelerate beach erosion and often result in a steepened offshore beach profile. The steep profile increases storm-wave energy striking the shoreline, exacerbating erosion, and often resulting in the need to reinforce the coastal protection structure.

Two eroded beach profiles were compared following Hurricane Elena. One profile had a vertical bulkhead and one did not. Both reflected a volumetric balance of sand over the entire profile. The profile with a bulkhead showed volume loss concentrated at a location seaward of the wall resulting in the complete loss of the beach. The profile without the bulkhead showed even erosion over the entire profile with upland or dune erosion reducing the volume of beach erosion.

With the natural beach and dune system, the profile adjusts to the storm beach profile and usually recovers completely under normal post-storm conditions; whereas the bulkhead isolated the beach from dune material and interfered with its transfer to the beach.

PROTECTION AND STABILIZATION OF BEACHES AND DUNES

A History of Coastal Engineering

Coastal development in Pinellas County began in earnest in the mid 1920s. Since that time major stretches of the County's beaches have required restoration or maintenance work. Beach erosion has resulted from coastal development upon or seaward of the dune line (interfering with the natural beach and dune system) and significant coastal storms. Early attempts at beach erosion control included approximately 41,000 linear feet of seawalls and bulkheads and 15,000 linear feet of groins constructed prior to 1950 by several municipalities and private property owners. This occurred primarily along Clearwater Beach, the north end of Sand Key, Indian Rocks Beach, Madeira Beach, Treasure Island, and Long Key. Some of the municipal shoreline protection and beach renourishment projects undertaken since 1950 include:

Honeymoon and Caladesi Islands – In the early 1960s the southern half of the island was filled, and three concrete-filled bag groins were constructed; no renourishment programs have been undertaken on Caladesi Island. Pinellas County and the FDEP partnered on a restoration project for the island that includes dredging Hurricane Pass, sand placement on the central portion of the island, and construction of a rock T-head groin. Construction of this interim project is scheduled for 2007.

Clearwater Beach Island – In 1949, approximately 150,000 cubic yards of beach fill were placed by the city of Clearwater on the island's southern end. Two groins were constructed by the City on the southern end of the public beach in 1950. In 1952, a 500-foot concrete pier groin was constructed. Between 1961 and 1963, eight groins were built by the city of Clearwater. They also placed rubble and fill at the southern end of the public beach. In 1981 and 1982, the City constructed an 800-foot long attached breakwater at the southern end of the public beach and they placed approximately 180,000 cubic yards of fill material near the breakwater. The purpose was to stabilize the shores and channel at Clearwater Pass. Since construction of this structure, beach maintenance on Clearwater Beach Island has been minimal.

Sand Key – Most shore protection structures on Sand Key have been constructed by private property owners.

In 1957, the city of Madeira Beach built 37 timber and concrete groins over its entire frontage. In 1961, the City built a terminal structure on the north side of John's Pass and placed approximately 30,000 cubic yards of fill north of the jetty. In 1975, the city of Clearwater completed a curved jetty on the south side of Clearwater Pass. In 1977, 186,000 cubic yards of fill was dredged from Clearwater Pass and placed south of the curved jetty. From 1981 to 1982, 600,000 cubic yards of fill were placed along the beach south of Clearwater Pass by the city of Clearwater. In 1969, 143,000 cubic yards of sand fill were placed at the south shore of Indian Rocks Beach in response to damage done by Hurricane Gladys in 1968. From late 1972 through 1973, 400,000 cubic yards of sand fill was placed on five miles of beach at Indian Rocks Beach to repair damages caused by Hurricane Agnes. From 1985 to 1986, an offshore breakwater was constructed by the U.S. Army Corps of Engineers and Pinellas County at the public access near the northern municipal boundary of the town of Redington

Shores. Sediment was placed in the structure's lee during construction. In 1987, the terminal groin at John's Pass was reconstructed.

The U.S. Army Corps Beach Erosion Control Study for Pinellas County established a plan for nourishing the beaches of Sand Key in 1986. To initiate the nourishment, coordination between the federal sponsor: the U.S. Army Corps of Engineers, the state sponsor: the Florida DEP Bureau of Beaches and Wetland Resources, and the local sponsor: Pinellas County, was necessary. In addition, the nine coastal municipalities of the island of Sand Key expressed their objectives.

The initial nourishment of this project was accomplished in phases. In 1988, Sand Key Phase I placed 380,000 cubic yards of sand along 1.5 miles of shoreline at North Redington Beach and Redington Shores. In 1990, Sand Key Phase II nourished approximately three miles of the Indian Rocks Beach shoreline with 1.3 million cubic yards of sediment. In 1992, Sand Key Phase III nourished 2.9 miles of Indian Shores with the placement of 850,000 cubic yards of beach sand.

The 1998/1999 Sand Key Phase IV Project included the initial nourishment of the southern part of the Clearwater section of the island and Belleair Beach, as well as renourishment of Indian Rocks Beach, Indian Shores, Redington Shores, and North Redington Beach. This project provided 2.6 million cubic yards of sediment to 8.7 miles of beach.

The 2005/2006 Sand Key Beach Renourishment project placed 1.8 million cubic yards of sand along the same 8.7 miles of beach.



Sand Key before and after beach nourishment in the early 1990s

Treasure Island – In 1960, the city of Treasure Island built 56 groins. In 1962, a terminal structure was built on the north side of Blind Pass. In December 1964, 10,000 cubic yards of fill were dredged from Blind Pass and placed on a nearby public beach. Because of damage done by Hurricane Gladys in 1968, 790,000 cubic yards of fill from Blind Pass and an offshore borrow area were placed on the Treasure Island shoreline. This was the first federal nourishment project constructed in the state of Florida. In addition, two groins were built on the shoreline in 1976, and the jetty at the north end of Blind Pass was raised two and-a-half feet in 1978.

Since the inception of the federal project on Treasure Island, the southern half of the island (Sunset Beach) has been renourished through federal periodic renourishment efforts eight times, in 1971, 1972, 1976, 1983, 1996, 2000, 2004, and 2006. An emergency fill project placed 550,000 cubic yards of fill in 1986 due to damage done by Hurricane Elena. Fill was also placed on the northern end of the island (Sunshine Beach) in 1980, 1982, and 1991 as maintenance dredging disposal areas. An ECL (erosion control line) was established along the northern end of the island, and this segment is now a part of the periodic federal renourishment program. It was renourished in 2000 and 2006. A terminal structure (jetty) was constructed on the north end of Treasure Island, adjacent to John's Pass, in 2000.



John's Pass

Long Key – Groins and a seawall were constructed by the city of St. Petersburg Beach at the south end of Long Key. In 1943, a terminal structure was built at Pass-a-Grille Channel. In 1962, that structure was extended and a concrete fishing platform was added. In 1968, the City dredged 30,000 cubic yards of sand from Blind Pass and placed the fill just south of the pass. An attached breakwater on the south side of Blind Pass was extended by the City to 261 feet in 1974. In 1975, the City constructed two kingpile groins and a beach fill of 75,000 cubic yards on Upham Beach, but within two years the shoreline where the fill was placed eroded back to the 1975 position.

The U.S. Army Corps of Engineers initiated a federal nourishment project on Long Key in March 1980, by constructing a beach fill project of 143,000 cubic yards of fill on 2,800 feet of shoreline at the north end of Long Key. This area is called Upham Beach. As an experiment, 100,000 cubic yards of advance nourishment was placed offshore to act as a partial breakwater and as a source of sediment to the beach. In 1986, an attached breakwater was constructed on the south side of Blind Pass. The breakwater anchored 175,000 cubic yards of sand placed there after the structure was completed. Since that time, nourishment projects have been constructed on Upham Beach in 1986, 1991, 1996, 2000, 2004, and 2006. Nourished sand typically erodes from Upham Beach within two years of placement.

An experimental project called the Upham Beach Geotextile T-head Groin project was constructed in 2005. This project aimed to retain nourished sand on Upham Beach longer than the present holding time of about two years. Geotextile T-groins are essentially 200-foot-long sand filled polyester bags stacked in a T configuration. Due to the lack of sediment supply to Upham Beach, renourishment into perpetuity is likely. If the structures prove successful, they will be replaced with rock T-groins in the future.

Mullet Key – In 1973, a 60-foot wide protective beach along a 6,700 foot reach and a 1,150 foot long revetment at the southern point of the island was constructed. In 2006, the County partnered with the U.S. Army Corps of Engineers on a “beneficial use of dredged material” project. Sand dredged from the entrance to Tampa Bay was placed on Egmont Key and on Ft. DeSoto Park. Approximately 200,000 cubic yards of sand was placed along the southern 2,500

feet of the gulf shoreline of Mullet Key. The terminal structure at the south end of the gulf shoreline was also rehabilitated in 2007.

Beach Protection and Restoration

In the unincorporated area, development does not threaten beaches and dunes. This is because the barrier islands in the unincorporated area of Pinellas County are already either parkland, or they are small undeveloped islands accessible only by boat. In addition, these coastal areas are designated on the Future Land Use Map as either Recreation/Open Space or Preservation.

As already discussed, most of the beaches and dunes in Pinellas County are found on the barrier islands within municipal limits, along with most of the coastal and shore protection structures. Other major concentrations of seawalls and bulkheads can be found on the shoreline areas of Tampa Bay in the City of St. Petersburg and on the mainland bordering Clearwater Harbor and St. Joseph Sound; however, the amount of wave action in these areas is small compared to that on the gulf side of the barrier islands.



Groins on Clearwater Beach Island

Pinellas County's barrier island coastline has been subjected to severe erosion in several locations. As was described earlier, both hard and soft shore protection (structures and nourishment) have been implemented to protect the shoreline. Groins have been constructed on Clearwater Beach Island, Sand Key, Treasure Island, Long Key and Mullet Key. Groins are built on straight stretches of beach away from channels and inlets, and are intended to trap sand in the longshore current. Terminal structures are found at the end of islands near channels or inlets. These structures trap sand on

the beach and prevent sand from flowing into channels. Terminal structures are found on the

southern tip of Sand Key, Treasure Island, and Long Key. There is one significant jetty in Pinellas County found on the south side of Clearwater Pass. Jetties are long structures that are intended to keep sand from flowing into a channel, and they trap sand in the same manner as a groin or terminal structure. This interruption of the flow of sand may direct sediment offshore and out of the beach zone. These structures keep sand from flowing to the next beach, causing erosion at downdrift locations. Areas in Pinellas County with groins and jetties have also been the sites of beach renourishment programs, in which sand is dredged from channels or offshore sites and placed on the beaches.

Three breakwaters are found on Pinellas County's Gulf Coast. Attached breakwaters, which anchor sand for use in beach nourishment programs, are found on the southern tip of Clearwater Beach Island and on the south side of Blind Pass. An offshore breakwater which is not attached to land is found near the northern city limit of Redington Shores. The offshore breakwater is meant to provide wave protection and to provide a recreational beach causing sand deposition in its lee.

Seawalls are another type of coastal protection structure. They can be large, massive structures designed to withstand storm wave impact loads, generally designed for a 20- to 50-year frequency storm event or greater. Many of the seawalls in Pinellas County have been placed seaward of buildings that were built upon the first, or primary, dune. Bulkheads are another type of coastal protection wall and were built primarily to protect exposed structures or to retain upland fill. They are generally designed for moderate to heavy wave activity. Seawalls and bulkheads deflect wave energy; however, they may accelerate beach erosion and steepen the offshore profile.

Placing seawalls and bulkheads in front of exposed structures constructed upon the primary dunes prevents the exchange of sand between dunes and beach. This results in the inability of the beach to supply new sand to the dunes and prohibits the dunes from nourishing the beach with sand during storms. Wave and current energy concentrates at the ends of coastal protection structures and causes erosion at these points.

In most cases, the most effective and efficient coastal protection is provided by a natural or artificial beach and dune system. During Hurricanes Elena and Juan, damage to structures where beaches existed was the least; whereas, in areas where beaches were narrow or nonexistent, the damage to bulkheads and buildings was often extreme. In areas where man-made dunes have been created, such as on Treasure Island, adequate storm protection was provided to properties behind those dunes during the referenced storms.



Dunes helped protect this home during the 2004 hurricane season

In more recent times, methods to stabilize the shoreline in Pinellas County have predominately utilized the “soft” engineering approach of beach renourishment. Pinellas County is the local sponsoring agency for managing coastal beach renourishment projects throughout the County. Close coordination continues between Pinellas County, the beach municipalities, the Florida Department of Environmental Protection (FDEP), and the U.S. Army Corp of Engineers in the implementation of beach and dune renourishment projects. This close intergovernmental coordination assures that the renourishment of the beaches of Pinellas County is managed in the most efficient and beneficial manner possible.

Pinellas County has a 50-year Project Cooperation Agreement (PCA) contract with the U. S. Army Corps of Engineers. This contract provides for shoreline maintenance and monitoring and also stipulates that, in the event of an emergency, the Federal government will provide financial assistance to restore the Pinellas County shoreline to conditions before the emergency.

Pinellas County’s beaches and barrier islands are an important component of the local tourist industry and the local tax base. Due to this importance, the County supports and implements its Beach Management Program. Beach renourishment projects include dune restoration and monitoring for erosion. Projects are also assessed for their suitability for sea turtles to nest (including such things as an analysis of the physical characteristics of the sand, slope of the beach face, timing of the project, etc). Since 1989, renourishment projects have been

completed for North Redington Beach/Redington Shores, Indian Rocks Beach, and Indian Shores Beach, Treasure Island, Long Key, and Mullet Key.

Pinellas County has constructed in excess of 50 beach walkovers in the communities of Madeira Beach, Indian Shores, and Indian Rocks Beach, four dune walkovers in Treasure Island, and 20 dune walkovers and vehicle access structures along St. Pete Beach. The Coastal Management Program is updated annually through the County's Capital Improvement Program. Ongoing and future projects are listed in **Table 11**.

It is clear that as a result of past development activities and building practices on the municipal barrier islands, there will be a continual need for beach renourishment. Beach renourishment is expensive and the economic investment needed to maintain the beaches will continue into perpetuity. However, the beaches are one of the County's most valuable natural assets and the foundation for a significant sector of the economy - tourism. The beaches of Pinellas County are also a valuable social asset, providing extensive recreational benefits, as well as a valuable environmental habitat. Therefore, resource protection and restoration, and beach renourishment activities continue to be the best available option to protect this valuable natural, social and economic asset.



Pass-a-Grille Beach before and after nourishment in 2004 following Hurricane Jeanne

Funding for Beach Nourishment Projects

Funding for beach renourishment projects can be both an opportunity and a challenge. This is especially true since funding for beach renourishment projects is derived from several different sources. In Pinellas County, the Sand Key, Treasure Island, and Long Key projects are administered by the U.S. Army Corps of Engineers (Corps). The Corps typically handles the engineering design, construction, and monitoring of the projects. Recently, the Corps has requested that Pinellas County take over the permitting responsibility for these projects. The Federal government generally pays up to 60 percent of the cost of the beach renourishment project. The non-Federal share of the project (40%) is funded by the local sponsor, Pinellas County. The State of Florida typically reimburses the local sponsor for half of the non-federal share, or 20 percent of the total project costs. Federally administered nourishment programs, like Pinellas County's, are largely beneficial to the local area because a large portion of the cost is shared by the federal and state governments.

Federally administered projects can also be a challenge, particularly when federal and state funding is not adequate to meet the needs of projects statewide. The source of the state funds is the Erosion Control Trust Fund. This fund now provides \$40 million of dedicated annual funding for shore protection projects in Florida. A lack of state funds for nourishment projects has not been a problem in recent years. Federal funding, on the other hand, is tenuous. The President's budget does not include funding for US Army Corps nourishment projects. Funding for these projects are provided via "congressional ads". These earmarked funds are added to the budget by local congressmen. Earmarking has recently come under scrutiny and the future of federal funding for beach projects is unknown. Continued and consistent cooperation with state and federal agencies, and local state and federal representatives/congressmen is important to maintain these funding sources.

Pinellas County's source of local funds for beach projects comes from the Tourist Development Tax (bed tax). The Pinellas County Board of County Commissioners has designated one-half of one cent of the Tourist Development Tax for beach renourishment and dune construction projects. This local commitment of resources to beach renourishment has facilitated the success of Pinellas County's beach management program. **Table 12** lists the capital improvement projects relating to beach nourishment and dune restoration. Please see the *Capital Improvements Element* of this Comprehensive Plan for more information on capital projects.



Dune walkovers help protect fragile vegetation from foot traffic.

TABLE 12
PINELLAS COUNTY BEACH NOURISHMENT AND DUNE RESTORATION
PROJECT SUMMARY, 2007 – 2020

PROJECT ID	PROJECT TITLE	FUNDING SOURCE	LOCATION	PROJECT STATUS¹
957	Coastal Research and Improvements	Tourist Development Fund, State Grant	Countywide	Scheduled
7002	Dune Construction and Walkovers	State Grant, Tourist Development Fund	Countywide	Scheduled
1513	Fort DeSoto Beach Improvements	Tourist Development Fund, State Grant	Ft. DeSoto Park	Scheduled
922279	Honeymoon Island Improvements	State Grant, Tourist Development Fund	Honeymoon Island	Scheduled
166	Long Key Beach Nourishment	Tourist Development Fund; State Grant	Long Key	Scheduled
1229	Madeira Beach Groin Replacement	Tourist Development Fund	Madeira Beach	Scheduled
N/A	Pass-A-Grille Beach Nourishment	Tourist Development Fund; State Grant	Long Key	Planned
921055	Sand Key Beach Enhancement	Tourist Development Fund, State Grant	Sand Key	Scheduled
167	Treasure Island Beach Nourishment	Tourist Development Fund, State Grant	Treasure Island	Scheduled

Source: Pinellas County Capital Improvements Program (CIP) and Department of Environmental Management, 2007.

N/A = Not Assigned

¹ 'Scheduled' indicates the project is included in the six-year (2008-2013) CIP list; 'Planned' indicates the project is anticipated to be implemented beyond 2013, up to the year 2020.