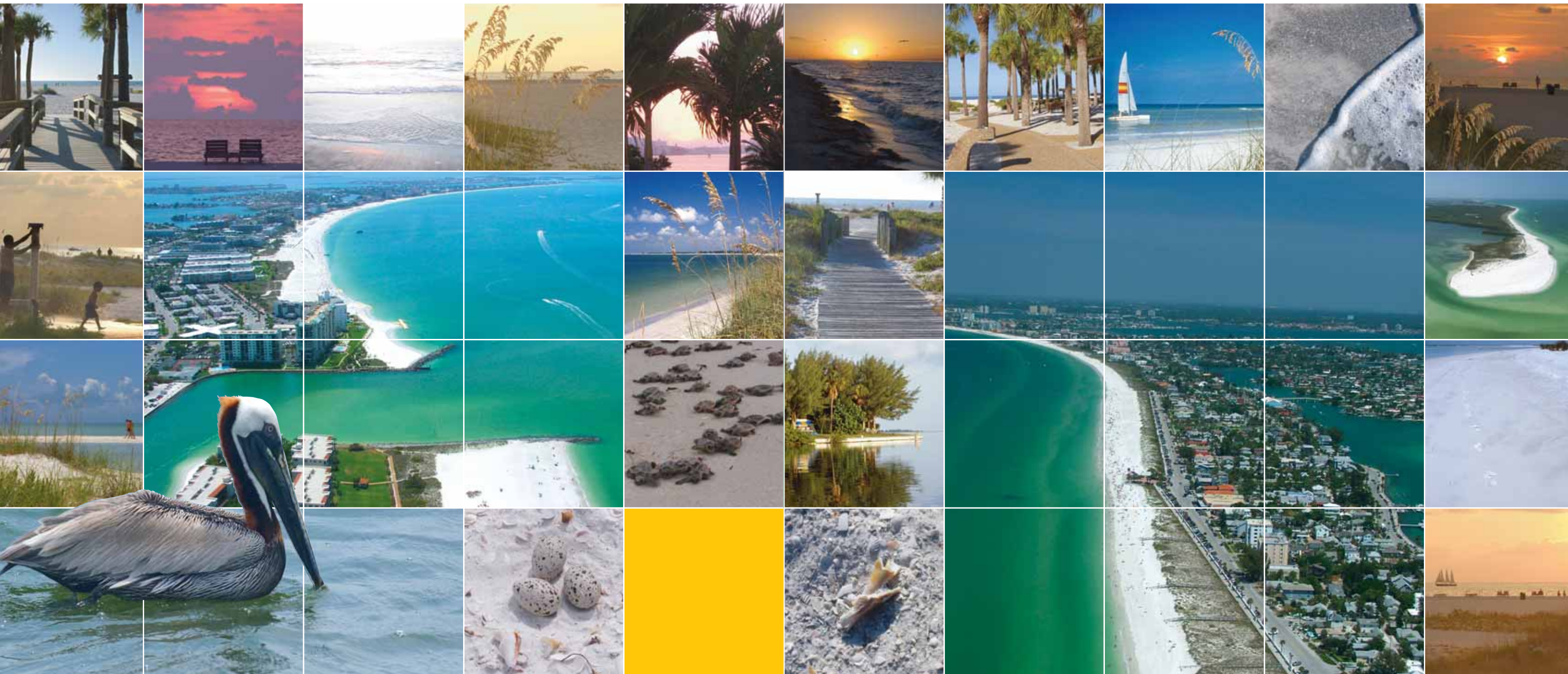


# The History of PINELLAS COUNTY'S FEDERAL SHORE PROTECTION PROJECT



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Produced in cooperation with the Pinellas County Communications Department

## Field Trip Guidebook for the American Shore and Beach Preservation Association (ASBPA) 2009 National Coastal Conference

ST. PETE BEACH, FL | OCTOBER 16, 2009





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www.VisitStPeteClearwater.com



www.pinellascounty.org/Environment



www.asbpa.org



# Introduction

The spectacular barrier-island beaches of Pinellas County are located on Florida's west-central coast to the north of the mouth of Tampa Bay. The Pinellas County coastline boasts 35 miles of white sand beaches that include four developed islands and five parks/preserved islands. Eleven coastal municipalities exist along the four developed islands. Thirteen of the 35 miles are restored beaches. In addition to providing storm protection, these restored beaches offer beautiful Gulf sunsets, picture-perfect weather and a unique cultural heritage that attract over 5 million overnight visitors every year. These tourists spend over \$3 billion in Pinellas County annually, boosting the economy of the region (Klages, 2009). The Appendix of this guidebook provides an overview of all the barriers and inlets along the Pinellas County coastline.

Barrier islands are naturally dynamic coastal landforms. They are constantly in motion and changing as they are acted upon by daily waves, seasonal storms and long-term coastal processes. Once humans developed the islands, the shoreline position was no longer allowed to fluctuate naturally; rather, the buildings and roads drew a line in the sand beyond which the sea was not to intrude. Thus, the dynamic nature of barrier islands was realized as a beach erosion problem.

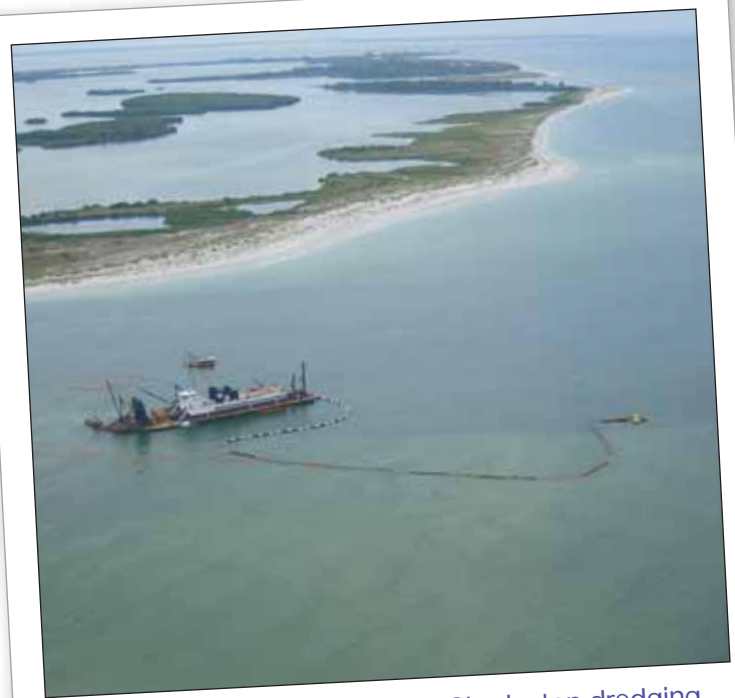
Coastal managers are tasked with managing this beach erosion and restoring the beach ecosystem in areas where it has been negatively impacted by development and erosion. When faced with coastal erosion problems, communities essentially have two options: shore protection or retreat (i.e., do something or do nothing). Like many beach communities in Florida, Pinellas County decided decades ago to protect its eroding shorelines through a federal shore protection project. The history of beach erosion that led to the federal project and the story of the segments of coastline that have been restored by the project are highlighted in this book.

Caladesi Island in northern Pinellas County, the #1 beach in America in 2008.

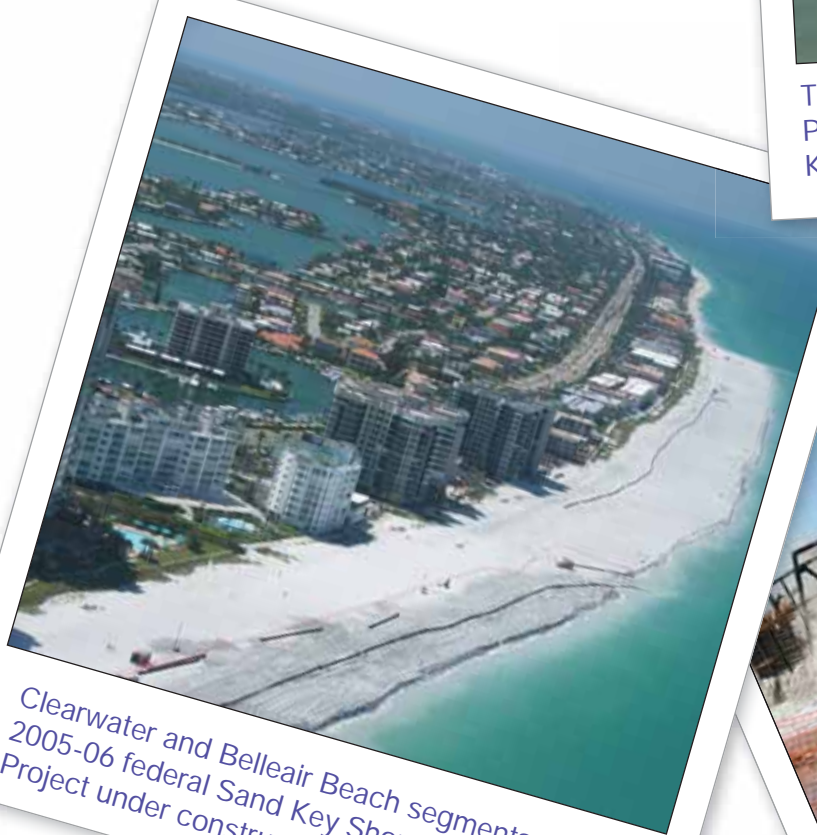


# Sponsorship

This guidebook and the ASBPA field trip were sponsored by Norfolk Dredging Company of Chesapeake, Virginia. Norfolk Dredging Company has recently constructed several federal renourishment projects in Pinellas County: Treasure Island/Long Key in 2004 and 2006, and Sand Key in 2005-06. Photos of their equipment constructing beaches in Pinellas County are featured prominently throughout this guide.



The 24-inch cutterhead dredge Charleston dredging Pass-a-Grille Channel for the Treasure Island/Long Key project in 2004 with Shell Key in the background.



Clearwater and Belleair Beach segments of the 2005-06 federal Sand Key Shore Protection Project under construction.



The 2005-06 federal Sand Key Shore Protection Project under construction with the unloader Vicksburg in the background.





# Regional Coastal Processes

Pinellas County is situated at the north end of the west-central Florida barrier-inlet complex, which is bounded to the north and south by marshes and mangrove mangals, respectively. This low-energy region is subjected to mean wave heights of about 0.3 m (Elko and Wang, 2007) and an average tidal range that is less than 1 m (NOAA, 2004). Dunes are also small on the natural portion of this coast, generally less than 3 m, due to low average wind speeds and low sediment supply. Along most of this region, the original dunes were removed in the process of urbanization.

The low wave height and tidal range values result in a mixed-energy coast that displays a great diversity of barrier island morphologies (Davis, 1994). Some regions exhibit classic wave-dominated barriers, with long, narrow islands and few tidal inlets, whereas other areas have short and wide, drumstick barriers with closely spaced tidal inlets. The varied morphology is a product of the relative influence of waves and tides (Davis and Hayes, 1984; Davis, 1989a) in which small changes in the influence of either parameter can result in significant changes in barrier island morphology.

Sediment along the west coast of Florida has a bimodal distribution of predominantly fine quartz sand and gravel-sized carbonate that is mostly bivalves (Davis, 1994). The siliciclastic sediment originated in the southern Appalachians and the carbonate shells are produced in situ. Presently, this is a sediment-starved system in terms of terrigenous material (Davis, 1997).

The typical weather conditions along this coast consist of prevailing breezes from the south during the summer. These summer conditions cause moderate longshore sediment transport from south to north. During the winter, cold fronts approach from the northwest about every seven to ten days. The passage of cold fronts generates relatively high-energy wind and wave conditions, with breaking wave heights of about 1 m and strong longshore sediment transport to the south. It is not uncommon for these weather conditions to persist for 48 hours or more.

The continental shelf off the west-central coast of Florida is broad and flat with a slope of about 1:1,000. The combination of this wide shelf and the fetch-limiting Gulf of Mexico results in depth-limited waves at the coast. The general northwest approach of wave energy drives regional net longshore sediment transport to the south. Several local reversals in sediment transport (Davis, 1994; 1999), as well as significant longshore transport gradients, result from variations in nearshore bathymetry and shoreline orientation.

Occasionally, tropical storms impact the west coast of Florida. It is rare for a hurricane that entered the Gulf of Mexico from the southeast to turn abruptly to the east/northeast and impact the west coast of Florida. In fact, the last time a hurricane made direct landfall in Pinellas County was 1921. During the hurricane season of 2004, four strong hurricanes made landfall in Florida. This tied the 1886 record with Texas for the most hurricanes to hit one state in a single season (Bell et al., 2005). The 2004 hurricanes made landfall at some distance from, but with significant effects to, Pinellas County beaches.



Google Earth satellite image of Florida showing the coastal provinces of Florida

## Pinellas County's Federal Beach Erosion Control Program (Shore Protection Project: SPP)

### Background

Railroads brought northerners to Florida's coastal towns in the late 19th century and the beaches were developed shortly thereafter. Modern development of Pinellas County's barrier islands began in the 1920s when causeways were built to connect the barriers to the mainland. Early beachfront development was unregulated and often resulted in destruction of the natural dune system and construction too close to the beach. This development essentially stabilized the naturally dynamic barrier islands, resulting in a beach erosion "problem" as described in the introduction.

Even the natural barrier islands along the Pinellas County coastline often contain historical or recreational structures. Parking lots and bathhouses on Honeymoon Island and the historic Fort De Soto on Mullet Key are fixed structures that have given way to beach erosion issues.

Throughout the 19th and 20th centuries, both natural and human-induced changes occurred along the barrier islands. The hurricanes of 1848 and 1921 breached new tidal inlets at John's Pass and Hurricane Pass. In the 20th century, many inlets experienced significant changes in tidal prism due to dredge-and-fill and causeway construction in back-barrier bays. Both the natural and human changes contributed to destabilization of certain inlets and migration in the direction of longshore sediment transport.

The combination of unregulated coastal development and the destabilization of many tidal inlets led to significant beach erosion issues in the mid-20th century. Beachfront homeowners attempted private shore protection by building seawalls and short groins. Regional sediment transport patterns were not considered in these efforts and many of the private structures were not successful. By the 1960s, much of Pinellas County's coastline had eroded to the seawalls. No sandy beach remained along the majority of the developed shoreline.



Looking north along the southern portion of the Pinellas County coastline at the short, wide drumstick barriers with closely spaced tidal inlets. The barriers shown are from south to north: Mullet Key (Fort De Soto Park, shown here with a small breach), Shell Key, and Long Key (distant background).





Southern Pinellas County's 1960s-era dredge-and-fill construction in Boca Ciega Bay

A federal shore protection project was initiated along 100 percent of Pinellas County's developed shoreline in 1966 (see map, page 7). The project includes the developed barrier islands of Clearwater Beach, Sand Key, Treasure Island and Long Key (the latter three are the active projects). No structures were approved for inclusion in this project.

By the 1970s, beach nourishment had become the preferred method of shore protection because unlike structures, it addressed the problem of a lack of sand in the nearshore system. Beach nourishment is the process of adding sand to an eroding beach to advance the shoreline seaward. Typically, dredged sand is pumped onto an eroding beach through a pipeline and the sand is distributed by bulldozers. Beach nourishment is intended to occur at regular intervals in order to provide enough sand to curtail erosion for a certain number of years.

The subsequent nourishment projects are referred to as renourishment.

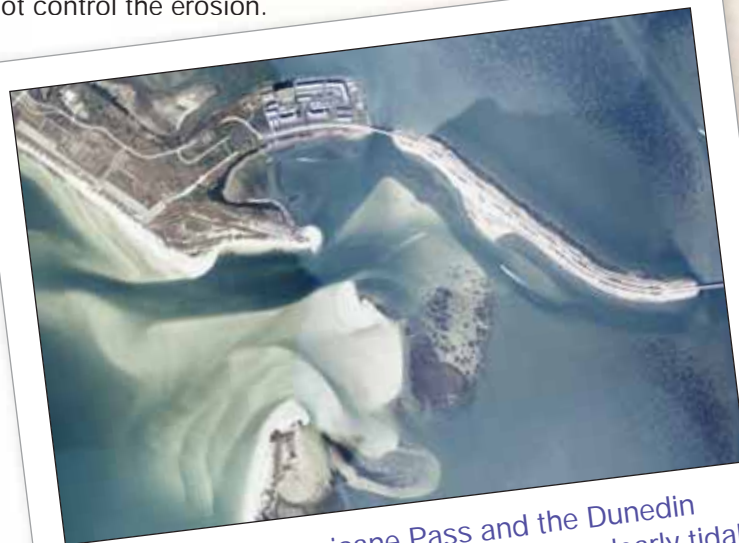
Most projects involve more than simple sand placement, including rebuilding the physical dune, planting dune vegetation to stabilize the newly constructed dune and other environmental enhancements. The projects then go beyond simple beach nourishment and consist of beach restoration. The goal of beach restoration projects, like any environmental restoration project, is to approximate the natural ecosystem. Pinellas County beaches were awarded ASBPA's Best Restored Beach in America award in 2006 for achieving this goal (Elko, 2005).

The three main benefits of beach nourishment include storm protection, recreational/tourism benefits and environmental enhancement. In terms of shore protection, the beach protects valuable infrastructure (i.e., roads and electric, cable, water and sewage service, etc.) by absorbing wave energy during storms to prevent waves from damaging upland structures. Many studies have demonstrated that wide beaches, nourished or natural, provide protection from scouring storm waves and punishing storm surge (e.g., Barker and Bodge, 2005). Tourism economics of a beach community are described in detail on page 13. Finally, restored beaches provide habitat for nesting sea turtles and shorebirds. In many locations, the beach and habitat would be totally lost without restoration.

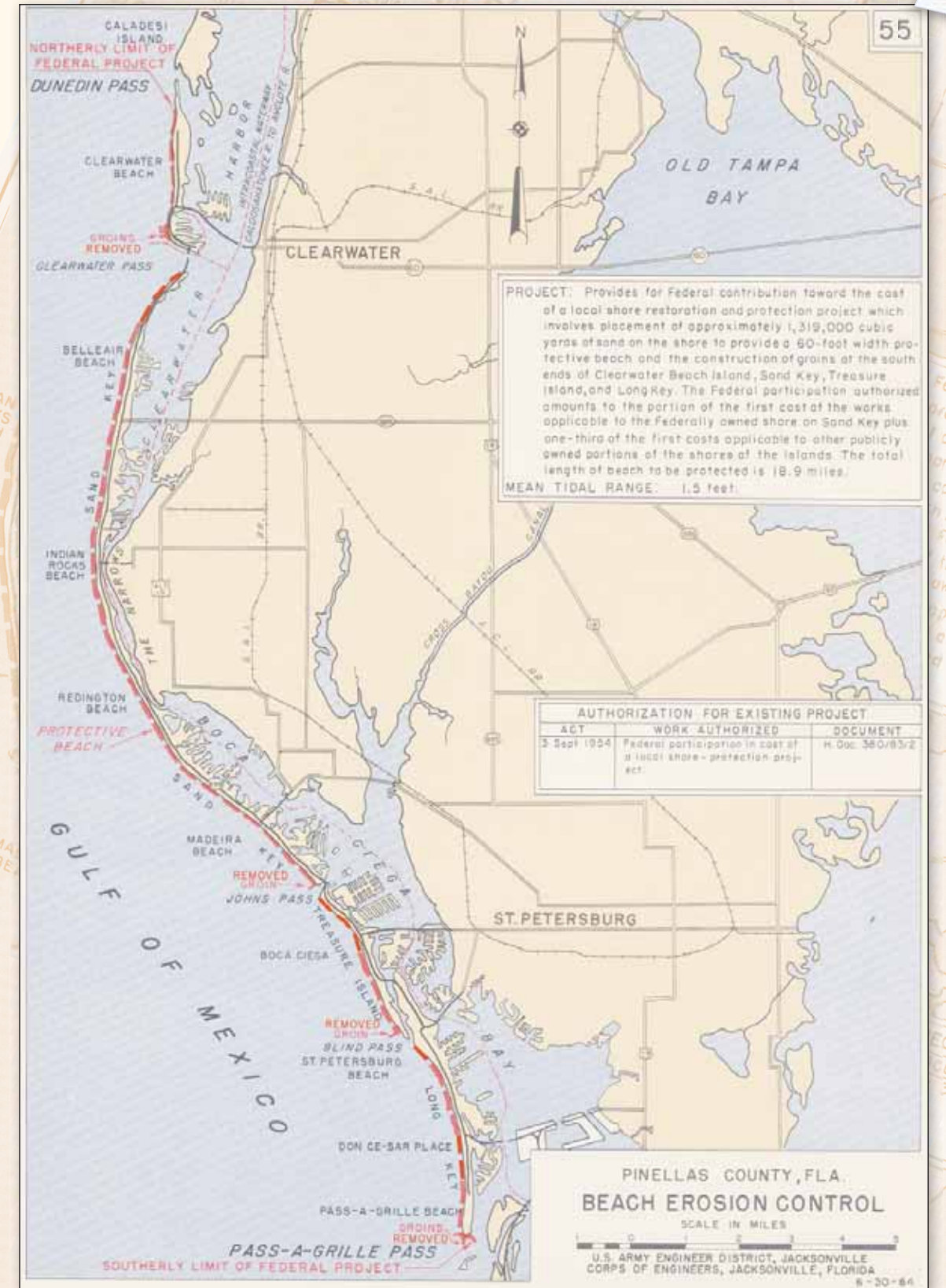
During the last several decades, structures have developed a bad reputation due to their one-size-fits-all application in the mid-1900s. More recently, the case-by-case application of structures to erosional hot spots has proven to be a successful management technique. Nourishment remains the core of the Florida program and structures are installed sparingly, only after much study and only when nourishment alone does not control the erosion.



Indian Rocks Beach in 1965 when erosion had left much of the developed Pinellas County shoreline without beaches

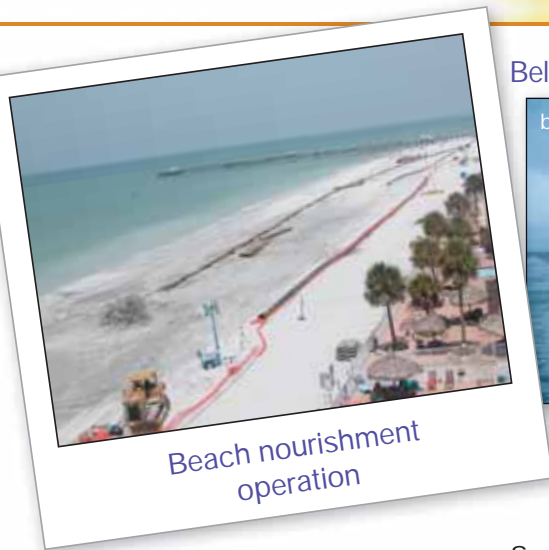


2002 aerial of Hurricane Pass and the Dunedin Causeway, constructed in the 1960s—clearly tidal flow was given little regard in causeway design



Pinellas County's federally authorized project area, 1966





Beach nourishment operation

Belleair Beach (Sand Key segment, Pinellas County SPP) before and after nourishment



before



after

## History

The beaches of Sand Key (from the Clearwater segment of Sand Key to North Redington Beach), Treasure Island and Long Key (St. Pete Beach) are nourished through a federal program administered by the Jacksonville District of the U.S. Army Corps of Engineers. Pinellas County acts as the local sponsor for the program. Participation in the Shore Protection Program (SPP) ensures that our beaches are maintained at least 40 feet wide for recreation, habitat and storm protection benefits.

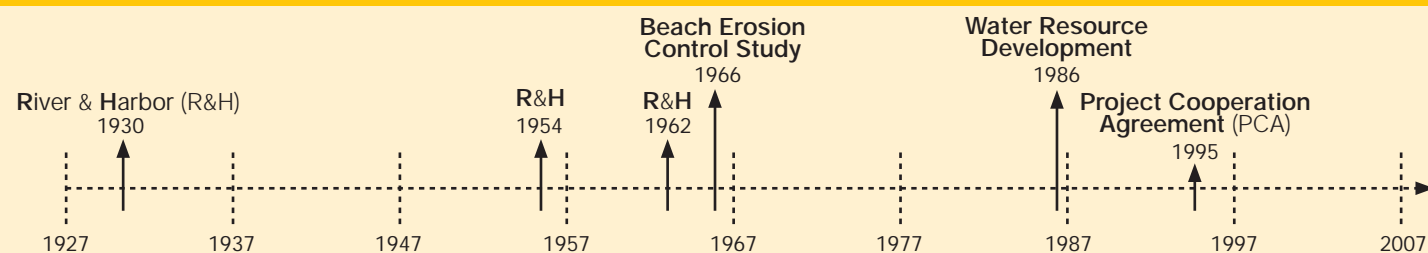
Pinellas County's original federal beach erosion control study was published in 1953 under authority of the River & Harbor Act of 1930. This Act authorized the U.S. Army Corps of Engineers to conduct shoreline erosion control studies (not construction) in cooperation with local governments. The River & Harbor Act of 1954 authorized the plan recommended in the '53 study. Because 80 percent of the beaches were privately owned at the time, the recommended federal cost share was only 5 percent. The plan allowed for federal participation for the 10-year life of the project, and then the county was required to cover 100 percent of maintenance costs into perpetuity. The county allowed this authorization to expire.

The original 1954 Beach Erosion Control Study recommended federal participation in beach nourishment along portions of the four developed islands: Clearwater, Sand Key, Treasure Island and Long Key and terminal groin construction at the south end of each island. Because Pinellas County did not adopt this project but beach erosion continued, the local municipalities constructed the recommended terminal groins on their own.

The 1962 River & Harbor Act increased the potential federal cost share to 50 percent for publicly owned shores. In response, a new Beach Erosion Control study was published in 1966. There was no change to the 10-year project life; however, the potential for 50 percent federal cost share enticed the county into the federal program. The 1966 study recommended nourishment along the same portions of the four developed islands, but it also included periodic renourishment as needed along the entire shoreline of all four islands. The groins, having been constructed by local interests, were removed from the federally authorized project.

A revised study was published in 1984. The Water Resource Development Act of 1986 increased federal participation in the Pinellas County SPP to 50 years. A Limited Reevaluation Report updated the project economics in 1995 and supported a Project Cooperation Agreement that formalized the project in 1995.

## PINELLAS COUNTY BEACH EROSION CONTROL PROGRAM



## Funding

The Pinellas County SPP is administered by the Jacksonville District U.S. Army Corps of Engineers. The typical construction cost sharing for the project is 60 percent federal (Army Corps), 20 percent state (Florida Department of Environmental Protection) and 20 percent local (Pinellas County tourist development funds). The Army Corps administers construction of the project, while Pinellas County assists with permitting, providing easements and staging areas, funding, monitoring and local management for the project.

The Pinellas County portion of the funding comes from the local tourist development tax. In Pinellas County, 0.5 percent of the 5 percent tax is dedicated to beach projects and generates nearly \$2 million per year. This tourist tax dedication guarantees that no local tax dollars are spent on beach nourishment.

## Most Valuable People

Three Pinellas County residents have been instrumental in the success of the Shore Protection Program. They have championed funding and much more.

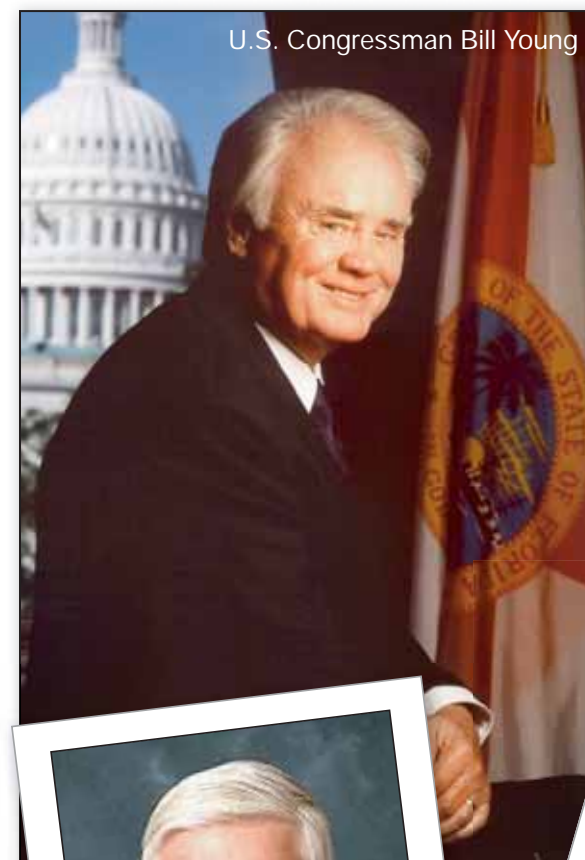
Congressman C.W. "Bill" Young was sworn into the U.S. Congress in 1970. In 1999, Congressman Young began a six-year tenure as Chairman of the House Appropriations Committee. As of fiscal year 2010, Congressman Young has obtained over \$100 million federal dollars for Pinellas County's beach program.

1970 was a good year for Pinellas County beaches. That same year, a recent graduate of the University of South Florida Geology program, Jim Terry, was hired by Pinellas County as a rodman at \$1.98/hr. When Jim received the Florida Shore and Beach Preservation Association's 2003 Bill Carlton award, Stan Tait was quoted as saying,

"He ran the Pinellas County beach program for 99 years. I can recall in the late 70s and early 80s, the beaches in Pinellas County were in pretty bad shape."

Jim Terry was the architect of a common-sense beach preservation and enhancement program for Pinellas County."

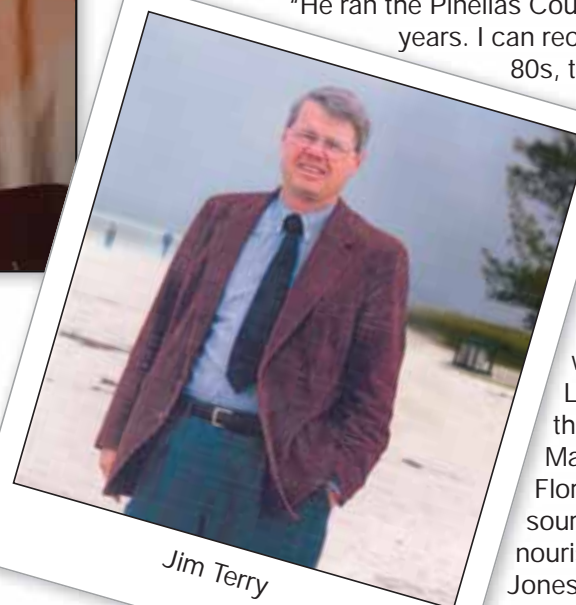
Senator Dennis Jones was elected to the Florida Legislature in 1978. In 2000, the Dennis L. Jones Beach Management Act established Florida's first dedicated funding source for the state's beach nourishment program. Senator Jones certainly lives up to his reputation as Florida's "Sandman."



U.S. Congressman Bill Young



Florida Senator Dennis Jones



Jim Terry

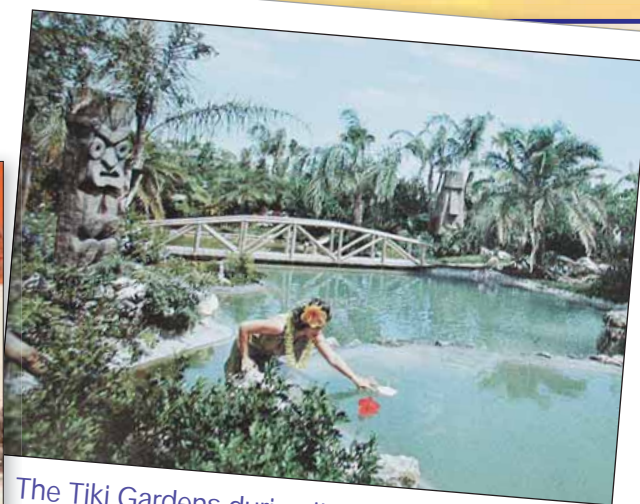




## Public Access

Public beach access has been important in Pinellas County for many years. One of the more notable property acquisitions was the Tiki Gardens in what is now Indian Shores. The Tiki Gardens was a popular tourist attraction during its heyday in the 1960s and 70s. After purchasing the property in 1990, Pinellas County created one of nine public beach access parks.

With two state parks, a barrier-island preserve, nine county parks and many municipal parking areas like Pass-a-Grille, Pinellas County has well over 12,000 beach parking spaces for the general public. The parks also ensure that all of Pinellas County's beach restoration projects are eligible for the maximum state and federal cost share.



The Tiki Gardens during its heyday in the 1970s



Pinellas County's Tiki Gardens Beach Access Park today

## Beach Nourishment Construction

Pinellas County utilizes several borrow sites, the area from which sand is dredged, such as portions of the navigable channels and ebb shoals of Hurricane Pass, John's Pass, Blind Pass and Pass-a-Grille Channel. Sediment is typically dredged from the inlets using a cutterhead suction dredge. A submerged pipeline "connects" the dredge to the nearby beach project area. Sediment is pumped through the submerged pipeline, often with the assistance of a booster pump, to the beach. The most recent cutterhead dredging project for the Pinellas County SPP was Pass-a-Grille Channel, which was dredged during the 2004 Treasure Island/Long Key beach nourishment project.

The largest borrow area in Pinellas County is the Egmont Channel Shoal. Due to its distance from the beach project areas and the shallow nearshore waters of Pinellas County, the Egmont Shoal is dredged with either a bucket or cutterhead dredge. The dredges load scows, or sand barges, which are pushed to the beach project area with tugboats. Once offshore of the beach, the scows are hooked up to an unloader that pumps the sand through a submerged pipeline to the beach. This operation was most recently conducted in 2005-06.



The bucket dredge Atlantic loading a scow in the Egmont Shoal in 2005.



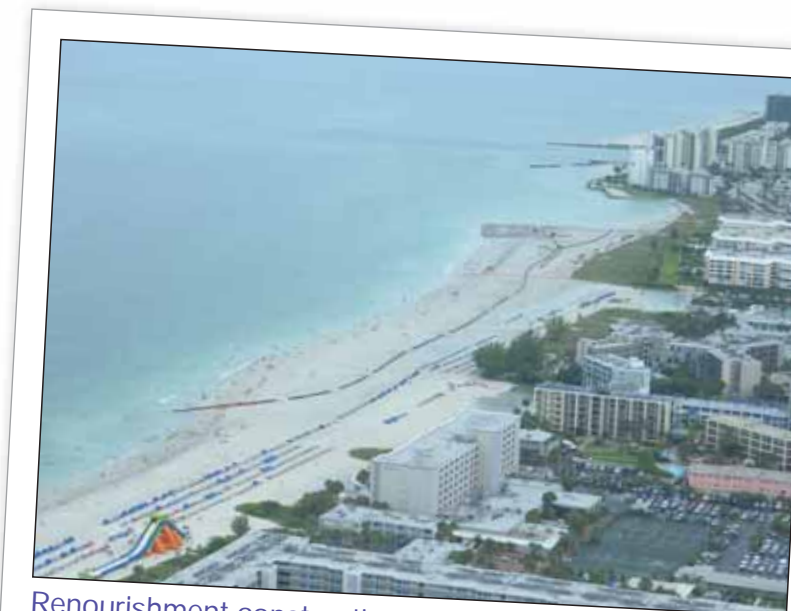
The unloader Vicksburg unloading a scow offshore of Sand Key in 2005.



2006 aerial view looking east at the Virginian and the Atlantic dredging sand from the Egmont Shoal. Fort De Soto Park is in the background, left, and the north tip of Egmont Key is to the right. The darker water indicates the dredged portion of the borrow area.

The Egmont Shoal is located about 3 miles due west of Fort De Soto Park (see map, page 1). This sand shoal has been dredged numerous times in the past to place high-quality beach sand on the beaches of Pinellas County. The sand meets stringent state environmental criteria. This borrow area is located far enough offshore that dredging of the shoal does not affect waves that reach the shore and does not cause beach erosion (Wang et. al, 1996). There are no reef or hardbottom communities in or near this borrow area that are impacted by dredging activity.

During construction, a submerged pipeline runs from the unloader or cutterhead dredge to a landing point on the beach. Sand is pumped in a slurry of sand and water to the beach. Once the entire beach section has been nourished, the landing point and pipeline are demobilized and relocated to construct the next section. During construction, temporary sand ramps are maintained over the pipeline at regular intervals to provide safe public access to the Gulf and newly widened beach. Bulldozers redistribute the sand that is pumped to the beach to create a smooth, wide beach.



Renourishment construction at Upham Beach, July 2004

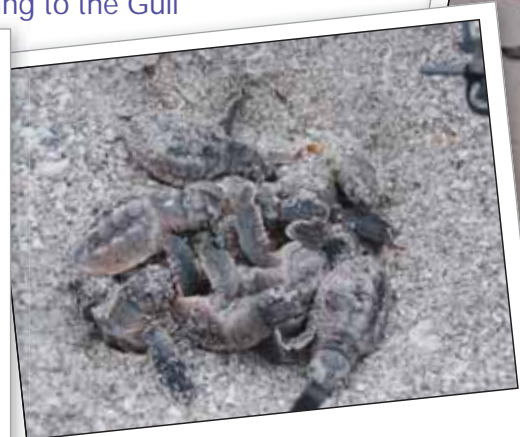
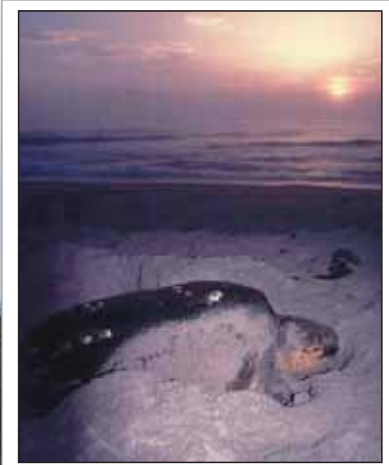




# Environmental Monitoring

The Pinellas County Shore Protection Projects are permitted by the Florida Department of Environmental Protection. The FDEP completes a rigorous analysis of the environmental effects of each project. Adverse impacts to the surrounding islands, seagrasses, sea turtles, nearshore hardbottom or other environmental habitats, are a concern during beach nourishment projects. Pinellas County is required to prevent and/or mitigate for these potential adverse impacts. Turbidity created by the operation is monitored daily during construction. If water quality degrades, the operation is shut down. If construction occurs during nesting season, sea turtle and shorebird nesting areas are also monitored daily. The contractor must wait until getting the "All Clear!" from the monitors before beginning work each morning. Finally, nearshore mitigation reefs have been constructed during past projects to mitigate for adverse impacts to the nearshore hardbottom.

A nesting female sea turtle and hatchlings emerging from their nest and heading to the Gulf



## Sea Turtle Monitoring

Marine turtle nesting and hatching occurs each year from May 1st through October 31st. Female turtles come ashore in the dark and lay 100 to 150 eggs at a time. During the course of a season, a single female lays eggs in three to eight nests. After a 45- to 70-day gestation period, hatchlings emerge from the nest at night and follow the moonlight reflecting off the Gulf. Pinellas County contracts with the Clearwater Marine Aquarium to monitor sea turtle nesting along all the nourished beaches.

Clearwater Marine Aquarium staff conducting an early-morning nesting survey on a new sea turtle nest. Note the female's track in the foreground.

Over the last couple decades, turtle-nesting habitat has been restored along the developed beaches of Pinellas County. Prior to the federal project, portions of Pinellas County had no beach and thus no nesting habitat.



# Tourism Economics

Visitors come to Pinellas County to enjoy the beach. Ninety-five percent of visitors consider the beach their #1 influential factor for choosing the area. Tourism employs more than 84,000 residents and has a \$7 billion impact in direct and indirect visitor expenditures. The following example illustrates the economic value of beaches to a community by comparing the economics of Pinellas County, Fla., to that of the two neighboring counties to the north, Hernando and Pasco.

The average household is on about the same economic footing in all three counties. Thus, the main difference between the counties is their coastal geomorphology (see satellite image, page 4). Hernando and Pasco are located along the south end of Florida's Big Bend coastline. These coastlines lack beaches and are dominated by open marine salt marsh. On the other hand, Pinellas County is located at the north end of Florida's west coast barrier island chain. Here, the beaches are the main tourist attraction. The main difference is that Pinellas County has beaches and Hernando and Pasco counties do not.

Household Economic Comparison of Pinellas (beaches), Pasco and Hernando (no beaches) counties in Florida (USCB, 2007)			
County	Avg. Household Income	Median Value of Owner-Occupied Housing Units	% Households w/Income \$100,000 or more
Pinellas	\$59,236	\$205,200	14%
Pasco	\$55,126	\$173,200	13%
Hernando	\$53,494	\$179,100	11%

The tourism economics of these three counties exhibit a striking difference. Pinellas has far more hotel units and charges a 5 percent tourist development (bed) tax as opposed to 2 percent & 3 percent in Hernando and Pasco. As a result, Pinellas County collects nearly \$25 million in tourist development taxes during a typical 1-year period. Pasco County collects less than \$1 million and Hernando County collects less than \$0.5 million. The estimated direct expenditures by guests staying in Pinellas County hotels, motels and condos are nearly \$2 billion. Compare that to about \$150 million and \$50 million in Pasco and Hernando counties. These tourism expenditures illustrate the importance of beaches to Pinellas County.

Economic Comparison of Tourism Revenues in Pinellas (beaches), Pasco and Hernando (no beaches) counties from July 2006 to July 2007 (FDBPR, 2009; FDOR, 2009)				
County	# Hotel Units	Tourist Development Tax	Tourist Development Tax Collections	Estimated Direct H/M/C Expenditures
Pinellas	18,817	5%	\$24,618,173	\$1,934,101,777
Pasco	2,113	2%	\$755,174	\$151,035,000
Hernando	792	3%	\$423,463	\$56,462,000

Pinellas County spends \$1 million annually, on average, on shore protection. This table illustrates that the annual tourism economy (~\$2 billion) far exceeds the annual cost of shore protection.

For more tourism statistics visit [www.pinellascvb.com](http://www.pinellascvb.com)





## Treasure Island & Long Key

The remainder of this guidebook focuses on Treasure Island and Long Key, the two most southerly developed barrier islands on the Pinellas County coastline. Both islands formed according to Miles Hayes' drumstick barrier island model with wide updrift ends and narrow downdrift ends. Treasure Island provides an example of a modern drumstick barrier in action, whereas

drumstick barrier processes have ceased at Long Key. Drumstick barriers develop when wave energy is refracted around the updrift ebb delta causing a local sediment transport reversal. Sediment is transported onshore in the form of swash bars that eventually weld to the beach. A prograding-beach-ridge complex forms near the updrift end of the island, creating the bulbous shape

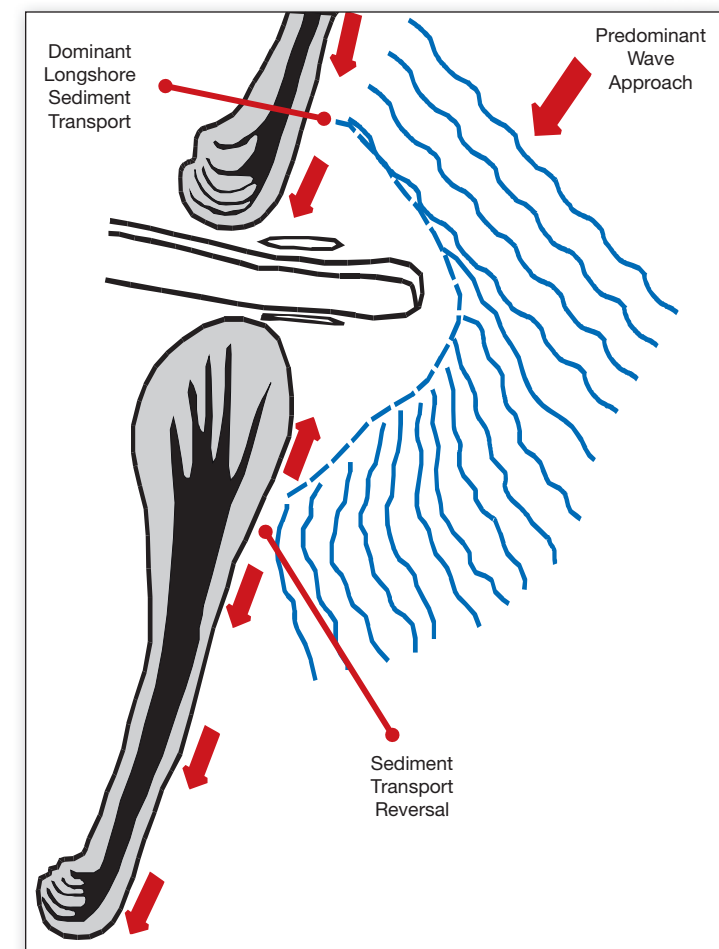
The geomorphology of the barriers has been modified due to natural and human intervention over the last century. The formation of John's Pass during the hurricane of 1848 forever altered the two islands. It resulted in a significant reduction in the size and stability of Blind Pass, located 3 miles to the south and formerly called Boca Ciega Pass. John's Pass captured a portion of the tidal prism of Boca Ciega Bay.

During the 20th century in Pinellas County, dredged sediment from the back-barrier environment was mounded to create subaerial land upon which causeways and homes were built. Causeway construction began in Boca Ciega Bay in 1926 and directed an even larger percentage of the tidal prism to John's Pass. The causeways, which connected the barrier islands to the mainland, compartmentalized the back-barrier bays and limited open circulation of tidal flow.

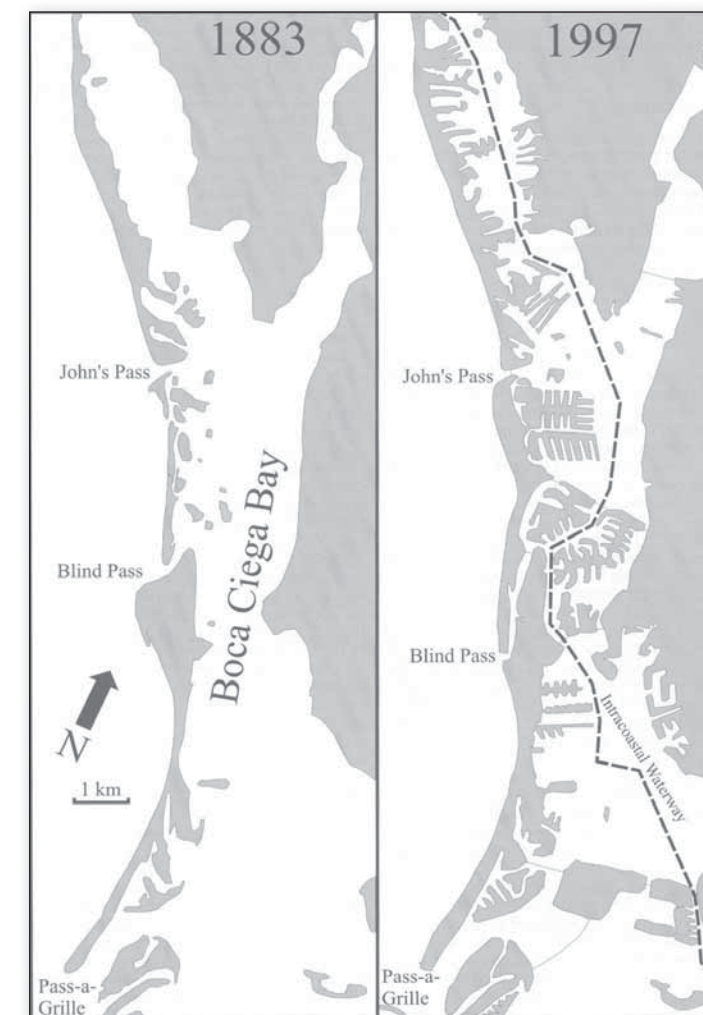
Dredge-and-fill construction during the construction boom that began in the mid-1950s reduced the surface area of the back-barrier bays. This reduced the tidal prisms of the inlets. As a result of both causeway and dredge-and-fill construction prior to the 1975 Fill Act, the surface area of Boca Ciega Bay decreased by nearly 30 percent (Mehta et. al, 1976). During the late 19th century, both John's Pass and Blind Pass had similar cross-sectional areas, but by the mid-20th century, they had diverged significantly due to both natural and human intervention.



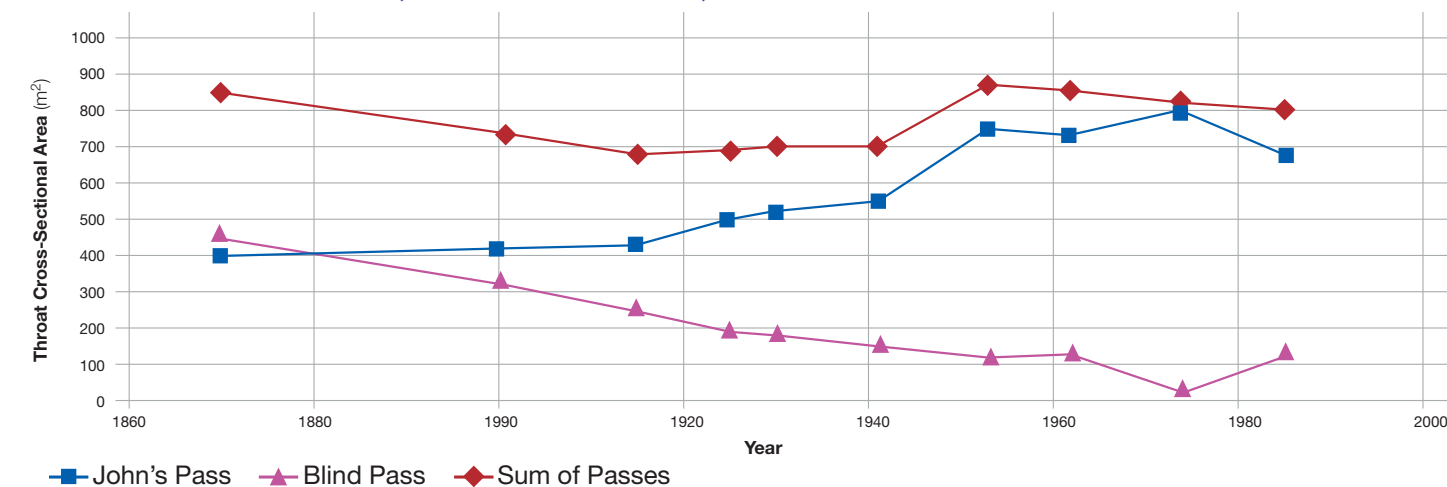
The drumstick barrier island model illustrates wave refraction around an ebb tidal delta and sediment attachment on the downdrift shoreline (Hayes and Kana, 1976).



Reduction of the surface area of Boca Ciega Bay from 1883 to 1997 (Davis and Barnard, 2000).



Time series of the changes in cross-sectional area of John's Pass and Blind Pass (Davis and Zarillo, 2003).

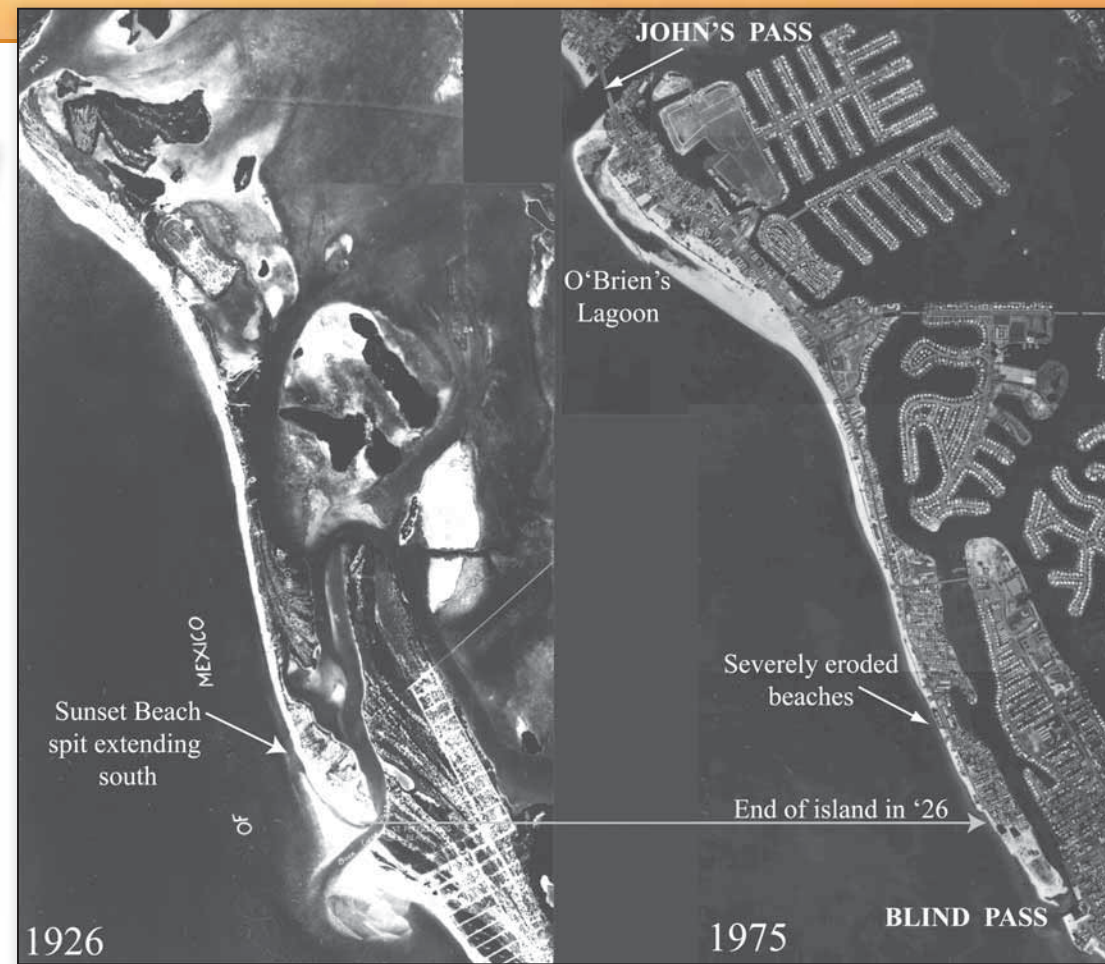




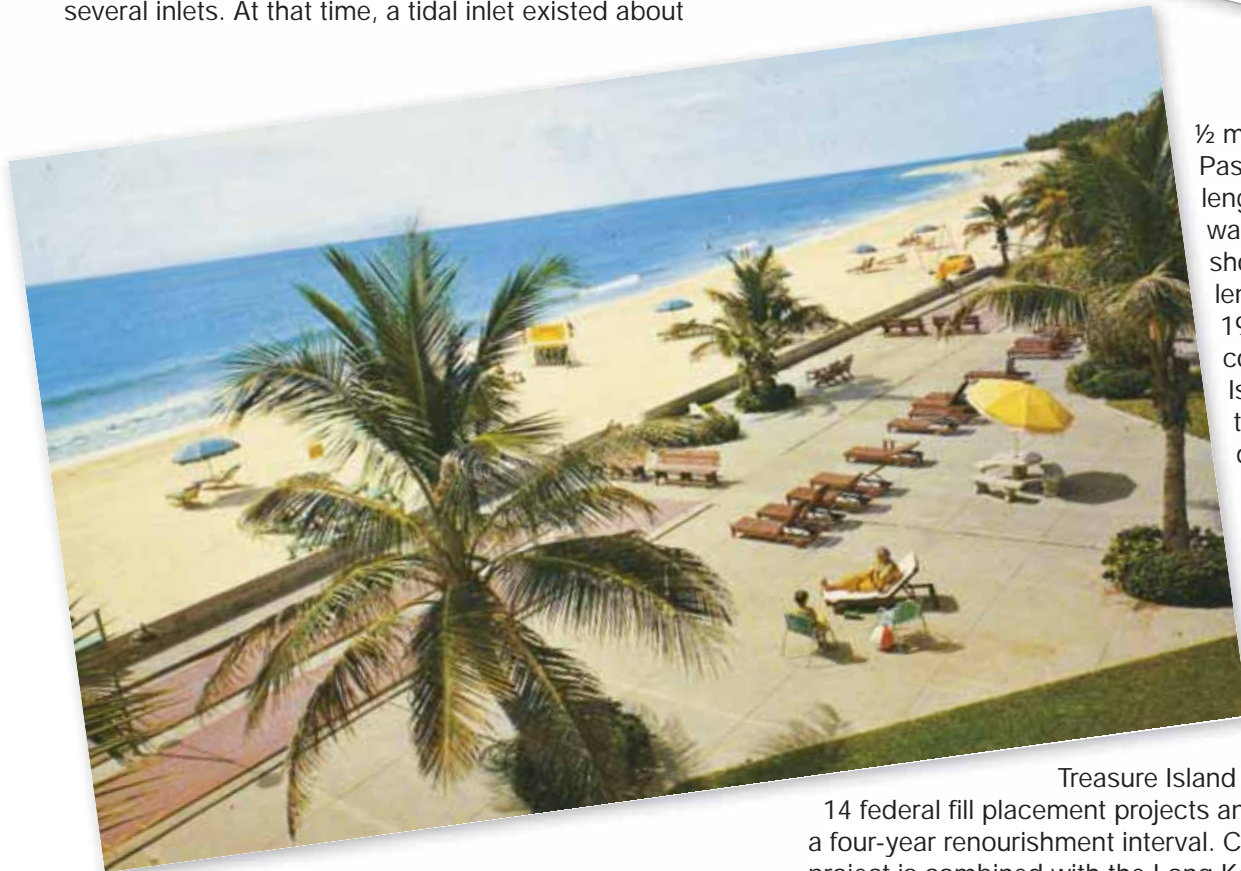
# Treasure Island

This 840-acre barrier island has a population of less than 10,000, which doubles in the winter. Prior to causeway construction in the late 1920s, the only access to Treasure Island was by boat or a ferry that ran from the mainland. The first homesteader on the island purchased land from the state at a cost of \$1.25/acre in 1908. The island got its name in 1918 when a shrewd real estate agent hatched a scheme to generate interest in his property. He buried two treasure chests reportedly filled with sand and a 100 lb. lead pig head split in half, which were then "discovered" by guests staying at an early hotel (Williams, 2003). The buccaneer icon has infused the island over the years. In 1985, the "World's Largest Sand Castle," Bluebeard's Castle, was erected on Treasure Island's beach.

During the latter half of the 19th century, Treasure Island evolved from a series of small islands separated by several inlets. At that time, a tidal inlet existed about



Historical aerial photos of Treasure Island in 1926 and 1975 illustrating the morphologic evolution of the island, including the migration of Blind Pass and the formation of O'Brien's Lagoon.



½ mile south of John's Pass. The combined length of the islands was more than a mile shorter than the present length of the barrier. By 1926, the islands had coalesced and Treasure Island was elongating to the south due to the destabilization and southerly migration of Blind Pass.

The Treasure Island segment of the Pinellas County SPP was initially nourished in 1969. Over the years,

Treasure Island has been involved in 14 federal fill placement projects and it is presently on a four-year renourishment interval. Construction of the project is combined with the Long Key segment of the SPP on the barrier to the south.



History of the Treasure Island segment of the Pinellas County Shore Protection Project				
Date	Volume (cubic yards)	Sand Source	Location	Length
1969	790,000	Offshore borrow area	R132-R141	1.8 mi
1971	75,000	O'Brien's Lagoon	R131-R132	0.2 mi
1972	155,000	Blind Pass	R140-R141	0.2 mi
1976	380,000	Offshore borrow area	R135-R142	1.4 mi
1978	50,000	Blind Pass	Southern Treasure Island	
1981	70,000	John's Pass	R127-R130	0.6 mi
1983	220,000	Blind Pass	R138-R142	0.8 mi
1986	550,000	Blind Pass & Pass-a-Grille Channel	R129-R141	2.4 mi
1991	56,000	John's Pass	R127-R129	0.4 mi
1996	51,300	Egmont Channel Shoal	R138-R141	0.4 mi
2000	350,000	John's Pass	R127-R129 and R136-R141	1.6 mi
2004	225,000	Pass-a-Grille Channel	R136-R141	1 mi
2006	110,000	Egmont Channel Shoal	R127-R129 and R136-R141	1.6 mi
2009	225,000	John's Pass	R127-R129 and R136-R141	1.6 mi





Field Trip, Stop 1

# Sunshine Beach

Sunshine Beach, on northern Treasure Island, is one of the island's original neighborhoods with multi-story condominiums juxtaposed by quaint beach cottages. The wide, mid-island beach contains most of Treasure Island's Gulf-front motels, hotels and condo-hotels. It is a commercial area with many restaurants and shops.

The geomorphology of these beaches is influenced by the John's Pass ebb tidal delta. The ebb delta attaches to the downdrift shoreline approximately 4,000 feet south of the inlet along the wide, central portion of Treasure Island. Sunshine Beach, the downdrift beach adjacent to the inlet, receives little bypassed sand and is subsequently sediment starved. Fitzgerald refers to this version of a drumstick barrier as a humpbacked barrier (Fitzgerald, 1988).

When federally authorized dredging of John's Pass began in 1966, over 77,000 cubic yards of dredge spoil was placed nearly four miles offshore of Sunshine Beach in a spoil site that was used to dispose of nearly 100,000 cubic yards in 1960. The material amalgamated into a huge, concave-shoreward sand bar (more than ½ mile long) and attached to the north shore of the barrier in 1968. Over the next few years, the bar consolidated and became impervious to tidal flux or overtopping by regular wave energy. Thus, a small-scale lagoon formed and was named O'Brien's Lagoon after the Dean of the University of Florida's coastal engineering program, M.P. O'Brien. Many of the 1971 through 1983 federal projects involved either excavating sand from or attempting to fill the lagoon.

Most recently, in August 2006, Sunshine Beach was renourished through an emergency rehabilitation nourishment to repair damages from the 2005 hurricane season at 100 percent federal cost. Sunshine Beach will be restored as part of the Treasure Island/Long Key segment of the Pinellas County SPP in the fall of 2009.

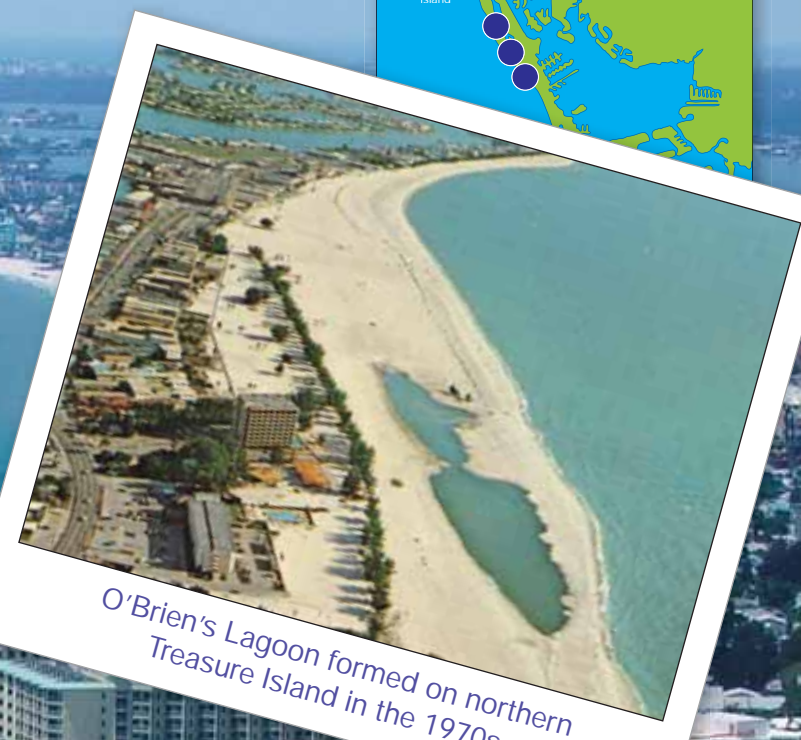


Beach access at Sunshine Beach



Treasure Island, John's Pass bridge construction and the John's Pass south terminal groin

Northern Treasure Island: the wide central beach, the ebb-shoal attachment point and the narrow Sunshine Beach. The naturally deep and narrow John's Pass channel is also visible as dark water.



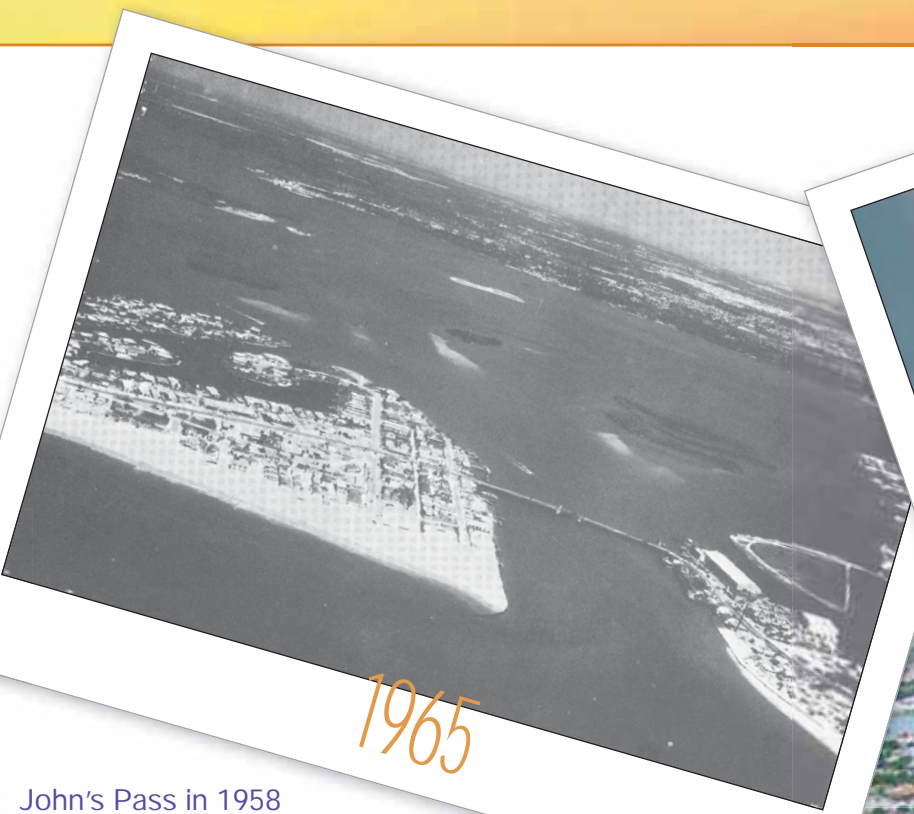
O'Brien's Lagoon formed on northern Treasure Island in the 1970s.

**Focus on a structure**  
JOHN'S PASS SOUTH TERMINAL GROIN  
Date of original construction: 2000  
Initial Cost: \$1.4 million  
Constructed by: Pinellas County  
Present length: 760 feet



Field Trip, Stop 2  
**John's Pass**

John's Pass, one of two inlets that connects Boca Ciega Bay to the Gulf of Mexico, was created by a hurricane in 1848. John's Pass carries the larger tidal prism and is a tide-dominated inlet with a large, asymmetrical ebb tidal delta, as well as a mature flood tidal delta that is covered with mangroves and seagrass beds. The federal navigation channel is maintained every eight years with the dredge spoil used for beach nourishment. Terminal groins have been constructed on both sides of the pass addressing the adjacent beach erosion issues.

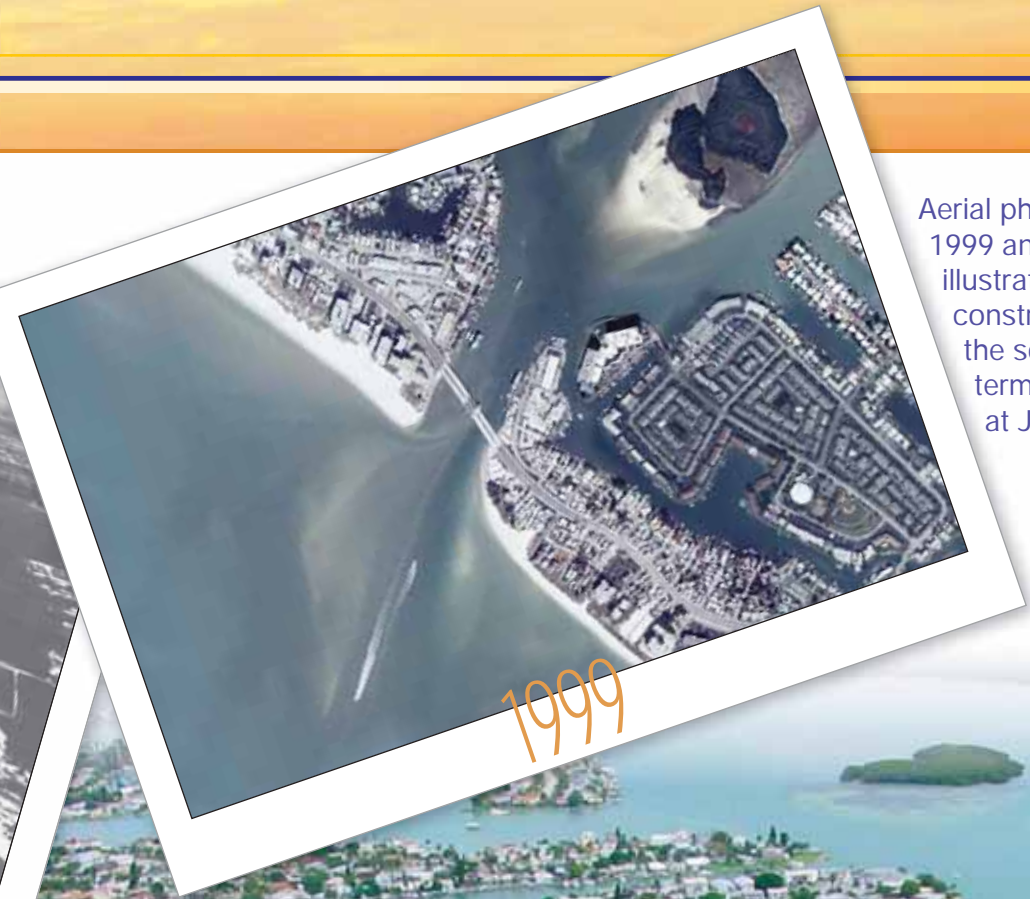


John's Pass in 1958 with eroded beach on the north side of the inlet, and in 1965, after construction of the north terminal groin.

The original John's Pass bridge, built in 1875, was a fixed-span bridge. Prior to the 1970s, the John's Pass bridge was located approximately 700 feet to the east of its present location. Due to limited access, the fishing village on the south end of Sand Key in Madeira Beach was spawned on the west side of the bridge. This area is now the home of John's Pass Village, a popular tourist area with shops and restaurants. The latest two-span bascule bridge is presently under construction and is scheduled for completion in 2010.

The 1958 photo looks north at John's Pass prior to construction of the northern terminal groin. Note the narrow beach on the south end of Sand Key. In 1961 prior to implementation of the SPP, the City of Madeira Beach constructed the 460-foot curved terminal groin on the north side of John's Pass, which nourished the beach.

In 2000, Pinellas County constructed another terminal groin on the south side of John's Pass. John's Pass will be dredged as one of the borrow areas for the Treasure Island/Long Key segment of the Pinellas County SPP in the fall of 2009.



Aerial photos from 1999 and 2002 illustrating the construction of the southern terminal groin at John's Pass



**Focus on a structure**  
**JOHN'S PASS NORTH TERMINAL GROIN**  
Date of original construction: 1961  
Initial cost: unknown (less than \$300,000)  
Constructed by: City of Madeira Beach  
Date of modification: 1988  
Present length: 460 feet

History of federal dredging at John's Pass	
Date	Volume (cubic yards)
1966	77,650
1979	80,000
1981	70,000
1983	80,000
1991	56,000
2000	390,000
2009	375,000

2002



Field Trip, Stop 3

## Sunset Beach

Sunset Beach is an eclectic beach neighborhood with a blend of classic Florida beach cottages and modern beachfront homes and condominiums. This beach community is nestled in Australian pines. Most of Sunset Beach, which makes up the southern third of the island, did not exist in the 1800s. After the formation of John's Pass in 1848, Blind Pass destabilized and migrated to the south. Concurrently, a spit on the southern end of Treasure Island extended at a rapid rate of 92 feet/year (Mehta et. al, 1976) and Sunset Beach was created. The southern mile of Sunset Beach originated in this manner.

Unregulated coastal development, which included dredge-and-fill construction in the back-barrier bays, led to significant beach erosion in the mid-20th century. In an effort to curb erosion, the City of Treasure Island constructed 56 ineffective groins in 1960 along the "severely eroded beaches." The complete lack of a beach was in direct contrast to the large volumes of sand that supplied the island during the early 1900s.

As explained earlier, the federal government authorized the Pinellas County SPP in 1966. The U.S. Army Corps of Engineers first addressed Treasure Island by publishing a General Design Memorandum in 1968. The GDM recommended the use of a shore-parallel borrow pit as the sand source for nourishment of the southern beaches. This was a common practice in the 1960s. The shore-parallel pit was a cheap and efficient way to build a beach, and it was an improvement over dredging the productive mangrove and tidal flat ecosystems in the back barrier bays. Constructed in 1969, Treasure Island was the first federal nourishment project on the west coast of Florida.

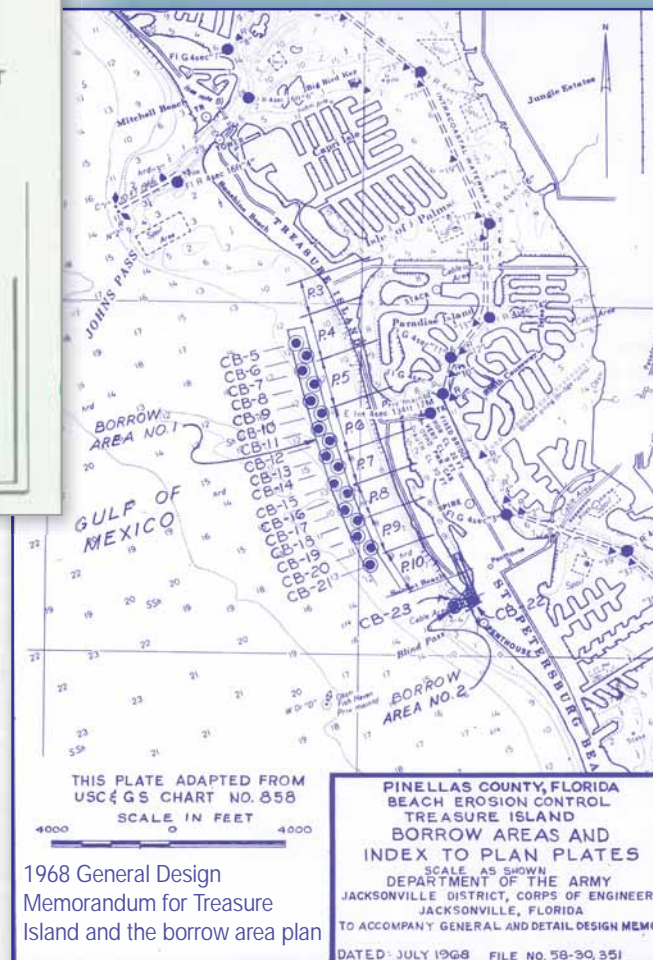
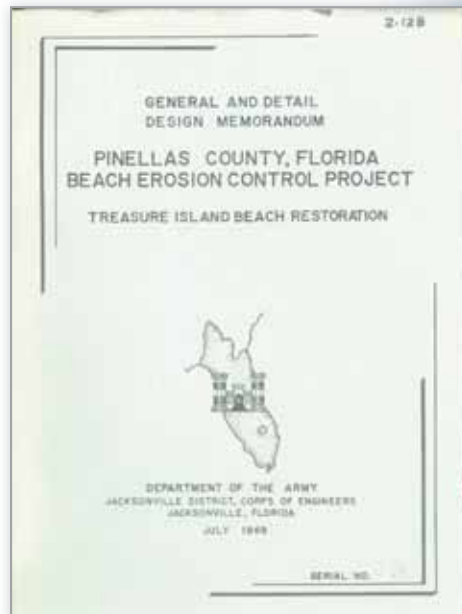
Most recently, in August 2006, Sunset Beach was renourished through an emergency rehabilitation nourishment to repair damages from the 2005 hurricane season, at 100 percent federal cost. Sunset Beach will be restored as part of the Treasure Island/Long Key segment of the Pinellas County SPP in the fall of 2009.



Sunset Beach with its Australian pines



Completely eroded beach along central Treasure Island in 1965



1968 General Design Memorandum for Treasure Island and the borrow area plan

PINELLAS COUNTY, FLORIDA BEACH EROSION CONTROL TREASURE ISLAND BORROW AREAS AND INDEX TO PLAN PLATES DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA TO ACCOMPANY GENERAL AND DETAIL DESIGN MEMO DATED: JULY 1968 FILE NO. 58-30,351

## Stop 3



### Focus on structures

#### BLIND PASS NORTH TERMINAL GROIN

Date of original construction: 1962  
Initial cost: \$18,000  
Constructed by: City of Treasure Island  
Date of modifications: 1976, 1978, 1983  
Present length: 490 feet

#### SUNSET BEACH GROIN 2300 feet north of Blind Pass

Date of original construction: 1976  
Initial cost: unknown  
Constructed by: U.S. Army Corps of Engineers  
Present length: 285 feet

Sunset Beach following completion of the 2006 federal rehabilitation project





# Long Key (St. Pete Beach)

The City of St. Pete Beach has a population of just over 10,000 with less than 30 percent of the residential units owned as second homes. The city is a popular tourist destination with more than 3,000 lodging units. The Don CeSar, Florida's legendary "Pink Palace," is located on central Long Key. The hotel, which opened in 1928 during the Great Gatsby era, was built to resemble the Royal Hawaiian in Waikiki Beach. On opening night, the Don CeSar hosted over 1,500 guests who paid \$2.50 each to enjoy dinner and dancing. Today, it is one of only eight hotels in Florida that is listed on the National Register of Historic Places.

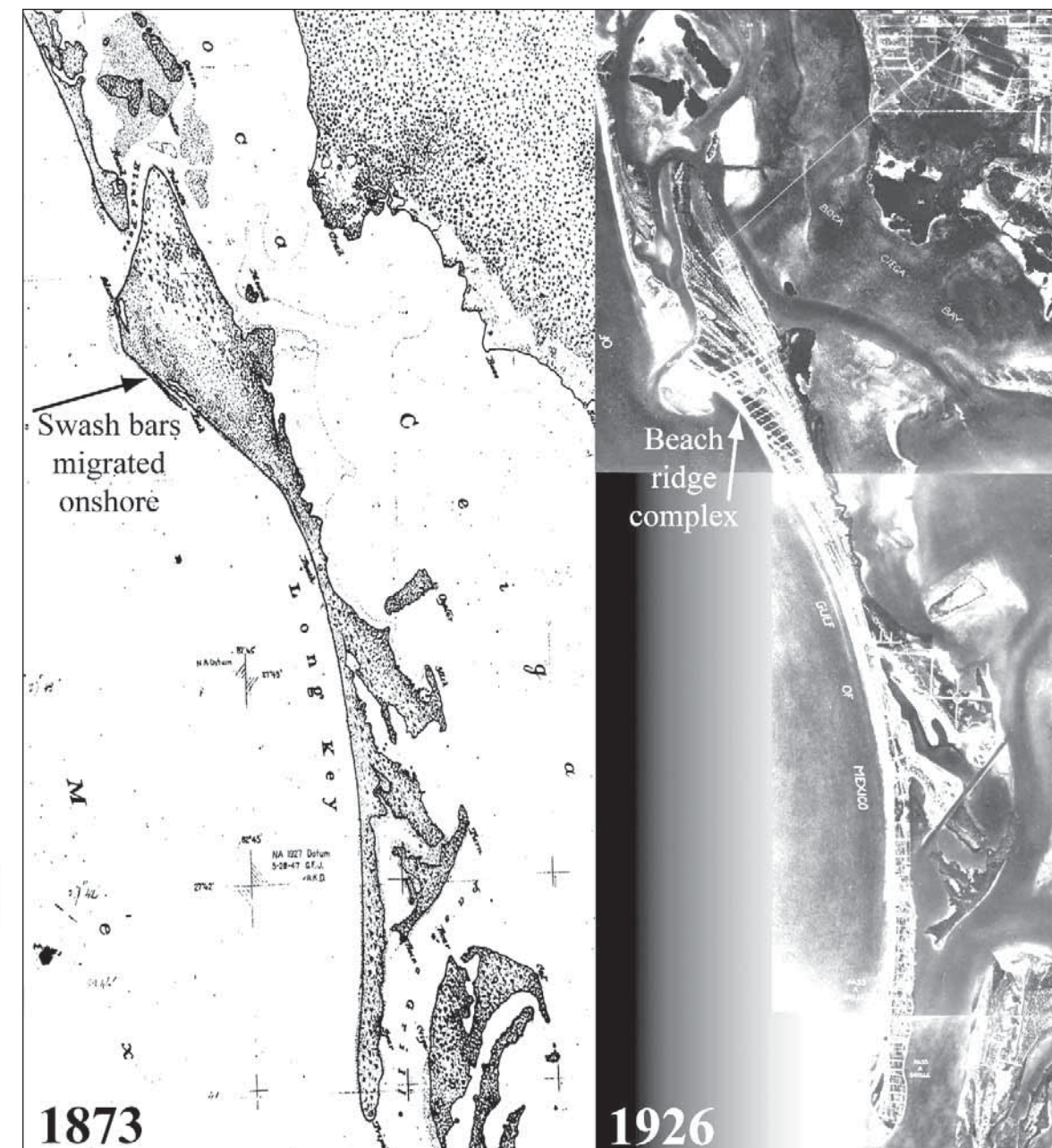
Long Key developed as a drumstick barrier island with a wide updrift end and a narrow downdrift end. A prograding beach ridge complex formed on the updrift end of the island. The National Ocean Service (NOS) Historic Topographic Survey Sheets (T-sheets) that were published in 1873 depict Long Key with a prograding, triangular-shaped northern end in the classic drumstick configuration. Blind Pass had a prominent ebb tidal delta that refracted wave energy resulting in onshore sediment transport illustrated by attached bars visible along the northern shoreline of Long Key.

Morphologic changes to Long Key over the last two centuries were initiated by natural events that altered the

tidal regime of Blind Pass (Elko and Davis, 2006). The deterioration of Blind Pass was initiated by the hurricane of 1848 and then accelerated by anthropogenic influences. The large ebb tidal delta eroded, removing the sediment sink that caused the updrift end of the barrier to prograde (Davis, 1989). The shoreline now appears to be tending toward a straight configuration, as the island transforms from a drumstick barrier with a prograding updrift end and eroding downdrift end into a wave-dominated barrier with the opposite erosion/accretion pattern. The combined effect of terminal groins at Blind Pass, a minimal ebb shoal and periodic dredging of the inlet largely eliminated natural

sand bypassing around Blind Pass. This pattern has prevented an adequate sediment supply from reaching northern Long Key.

The Long Key segment of the Pinellas County SPP was initially nourished in 1980. Upham Beach, on northern Long Key, is presently on a four-year renourishment interval. Pass-a-Grille Beach is on an eight-year renourishment interval. Construction of the project is combined with the Treasure Island segment of the SPP on the barrier to the north.



1873 Historic T-sheet and 1926 aerial photo illustrating the morphologic evolution of Long Key







## Field Trip, Stop 4 Blind Pass

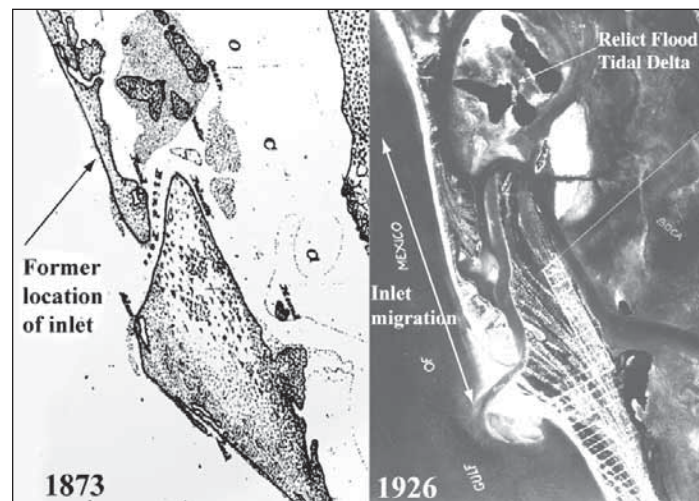
In the 1800s, Blind Pass (formerly called Boca Ciega Pass) was a well-established tidal inlet with prominent ebb and flood tidal deltas. Blind Pass began to destabilize in 1848 when John's Pass formed three miles to the north and captured a portion of the tidal prism of Blind Pass (Mehta et al., 1976). In response to longshore sediment transport to the south, the inlet began to migrate to the south and erode the wide north end of Long Key. By 1926, the inlet had migrated over 1 kilometer. The ebb delta of Blind Pass had been forced onshore by wave energy as a result of reduced tidal flows (Elko and Davis, 2006).

Records indicate that the cities of St. Pete Beach and Treasure Island began dredging Blind Pass in 1936 when the first jetty (90 feet long) was built on the south side of the inlet. Federal dredging began in 1969 and jetty construction on both sides of the inlet continued. Despite these efforts, Blind Pass shoaled and nearly closed in 1978 due to low-energy tidal flows in the inlet and relatively high longshore transport rates from the north. Although spring tidal velocities exceed 0.8 m/s, Blind Pass is an unstable inlet evidenced by rapid shoaling that follows each dredging event (Tidwell, 2005). Presently, the inlet carries only about 5 percent of the tidal prism of Boca Ciega Bay (Becker and Ross, 1999).

After this shoaling, the jetties were raised, lengthened, and sand tightened. A detached breakwater was added to the south jetty in 1986. During this time, Blind Pass was dredged nearly every 2 ½ years. By the 1990s, the downdrift erosion at Upham Beach was seemingly unstoppable. Due to the large volumes of sand trapped by Blind Pass, the only sediment source for the downdrift beach was nourishment (Elko, 1999).

Since 1990, Blind Pass has only been dredged every nine years. As a result, Blind Pass shoals considerably between dredging events, but remains navigable. Hydrographic surveys conducted by the University of South Florida's Coastal Research Laboratory indicate that the ebb shoal has started to reform (Wang et. al, 2007). The ebb shoal protects the downdrift beach from wave energy and should eventually allow for sediment bypassing around Blind Pass. This ebb shoal come-back suggests that reducing the dredging interval improved the morphology and functionality of Blind Pass (Elko, 2006).

Blind Pass will be dredged as one of the borrow areas for the Treasure Island/Long Key segment of the Pinellas County SPP in the fall of 2009.



1873 Historic T-sheet and 1926 aerial photo illustrating the morphologic evolution of the inlet and adjacent barriers

History of federal dredging at Blind Pass	
Date	Volume (cubic yards)
1969	108,000
1972	<155,000
1975	75,000
1976	<550,000
1978	50,000
1980	143,000
1983	220,000
1986	75,000
1991	325,000
2000	250,000
2009	200,000

**Focus on a structure**  
**BLIND PASS SOUTH TERMINAL GROIN**  
Date of original construction: 1937  
Initial cost: unknown  
Constructed by: City of St. Pete Beach  
Date of modifications: 1974, 1986, 2006  
Present length: 520 feet



Looking south along Long Key at Blind Pass shoaling in December 1978

Blind Pass and Upham Beach in October 2003 depicting the stabilization of Blind Pass, the southern migration of the inlet and the development of the back-barrier bay. Photo taken prior to closure of the gap between the southern terminal groin and the detached breakwater.



Blind Pass ebb shoal, August 2008

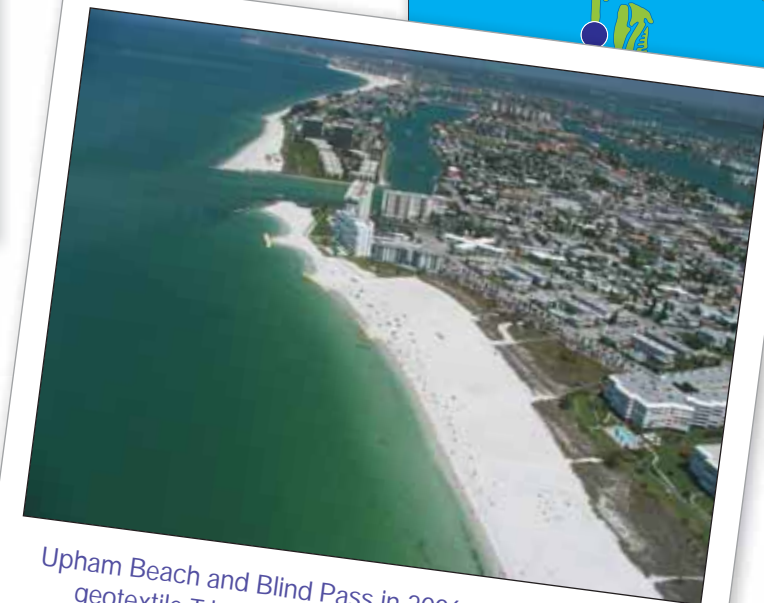


## Field Trip, Stop 5 Upham Beach

Upham Beach has the unfortunate distinction of being located downdrift of a structured inlet. Overdredging of Blind Pass in the 20th century resulted in minimal natural sediment bypassing, which combined with pre-control line development, led to severe erosion problems on Upham Beach. Upham Beach is one of the most rapidly eroding beaches on the west coast of Florida with 83 percent of nourished sand eroding within two years of placement (Elko et. al, 2005).

Upham Beach has been considered a "feeder beach" by the U.S. Army Corps of Engineers. When nourished sand erodes from Upham Beach, it is transported to the south, thereby feeding the beaches along the rest of the island. In an effort to slow the erosion at Upham Beach, the Geotextile T-Head Groin Project was constructed in 2006. The project design included nourishment with over 320,000 cubic yards of sand, five geotextile T-head groins, and the closing of the jetty/breakwater gap on the south side of Blind Pass. The goal of the project was to maintain a 40-foot-wide beach while avoiding downdrift erosion of the pre-construction beach (Elko and Mann, 2005). The groins were intended to maintain the beach, increase the interval between nourishment projects and allow for the use of Blind Pass as the lone sediment source for future nourishment projects.

Upham Beach will be restored as part of the Treasure Island/Long Key segment of the Pinellas County SPP in the fall of 2009.



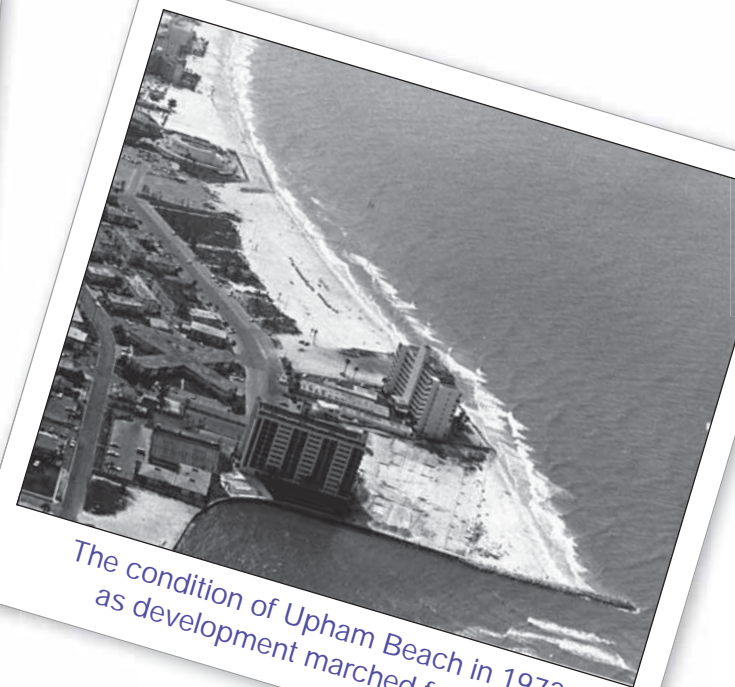
Blind Pass in 1951 and 1967 illustrating the collapse of the ebb shoal and the unregulated coastal development south of the inlet

This beach was privately owned by William W. Upham but was donated to local government in a possible act of foresight in 1954 and is now called Upham Beach. During the 1950s, Upham Beach was wide and stable due to onshore sediment transport as the ebb delta collapsed and migrated onshore. No coastal construction control line building regulations existed at the time and condos were built on the beach. Due to this poorly located construction, erosion problems were imminent. Once the sediment source from the collapsing ebb shoal disappeared, erosion began to plague this region.

The University of South Florida Geology Department has monitored the performance of the T-head groins since the 2006 renourishment project. From 2006 to 2008, Upham Beach lost nearly 40 percent less sand than during the same period of time following nourishment from 2000 to 2002 (Wang and Roberts, 2009). Based on 31 months of monthly monitoring, no negative impact from the T-head groin field to the downdrift beach has been identified. Thanks to the T-head groins, only 200,000 cubic yards of sand will be required for renourishment in 2009 thereby saving significant public funds.

1960s era postcard of Upham Beach with the former St. Pete Beach Aquatorium in the background and the Don Cesar on the horizon

Upham Beach and Blind Pass in 2006 with newly installed geotextile T-head groins (erosion control structures)



The condition of Upham Beach in 1972 as development marched forward

History of the Upham Beach (north Long Key) segment of the Pinellas County Shore Protection Project

Date	Volume (cubic yards)	Sand Source	Location	Length
1980	254,000	Blind Pass	R144-146	0.4 mi
1986	98,000	Pass-a-Grille Channel	R144-146	0.4 mi
1991	230,000	Blind Pass	R144-146	0.4 mi
1996	253,000	Egmont Channel Shoal	R144-146	0.4 mi
2000	281,000	Blind Pass	R144-146	0.4 mi
2004	408,000	Pass-a-Grille Channel	R144-148	0.7 mi
2006	90,000	Egmont Channel Shoal	R144-146	0.4 mi
2009	200,000	Blind Pass	R144-148	0.7 mi

### Focus on structures

#### UPHAM BEACH GEOTEXTILE T-HEAD GROINS

Date of original construction: 2006

Initial cost: \$1.5 million

Constructed by: Pinellas County

Present length: five structures ranging from 100 to 310 feet long with 100- to 170-foot-long T-head groins



## Field Trip, Stop 6 Pass-a-Grille Beach

Pass-a-Grille, on southern Long Key, was one of the first established towns along Florida's west coast barrier islands and it retains its historical charm. Pass-a-Grille contains a one-mile-long public beach with no development on the west side of Gulf Way. The community was named for the Cuban fishermen, known as "Grillers," who would smoke their catch along the water's edge. When boating through the pass, their fires were visible on the beaches, hence Pass-A-Grille. In 1911, State Legislation declared Pass-A-Grille a town and twenty-one residents voted in the first election.

Astonishing erosion occurred on Pass-a-Grille Beach in the 1940s and 50s. Historical postcards illustrate the total loss of a 500-foot-wide beach. In an effort to curb this erosion, the city constructed groins, a seawall and a terminal groin in 1965.



The terminal groin constructed at the south end of Long Key in 1965

The wide beach that accreted due to the structure was stabilized with sea oats in the late 1980s. Today, the beach has been restored to nearly the same width as the early 20th century beach. Pass-a-Grille Beach has received emergency nourishment twice. The beach was restored in October 1986 following the passage of Hurricane Elena in 1985. Another post-storm fill placement occurred in 2004 following that hurricane season (Elko, 2005).

Pass-a-Grille Beach will be restored as part of the Treasure Island/Long Key segment of the Pinellas County SPP in 2013.

History of the Pass-a-Grille Beach (south Long Key) segment of the Pinellas County SPP				
Date	Volume (cubic yards)	Sand Source	Location	Length
1986	73,000	Pass-a-Grille Channel	R160-R165	1 mi
1991	100,000	Blind Pass	R160-R165	1 mi
2004	95,000	Pass-a-Grille Channel	R160-R165	1 mi



Same building



Postcards of Pass-a-Grille Beach on southern Long Key in 1936 and 1959



Postcard of Pass-a-Grille Beach in the early 1990s, illustrating the dune revegetation project

Pass-a-Grille Beach in 2006

**Focus on a structure**  
PASS-A-GRILLE CHANNEL NORTH TERMINAL GROIN  
Date of original construction: 1959  
Initial cost: unknown  
Constructed by: City of St. Pete Beach  
Date of modifications: 1962, 1984  
Present length: 430 feet







# Acknowledgements

Although Congressman Bill Young, Senator Dennis Jones and the late Jim Terry have already been mentioned in the History section, it is worth noting their contributions to the Pinellas County Shore Protection Project again. In addition, the following people have made significant contributions to the success of the Pinellas County program: U.S. Army Corps of Engineers staff who have managed the project over the years, such as Richard Bonner, Rick McMillen, Jackie Keiser, Rene Perez and Tom Martin; Florida Department of Environmental Protection staff, such as Phil Flood, Paden Woodruff, Catherine Florko and Ralph Clark; the academics who initiated many of the studies for projects that were ultimately constructed,

such as Per Brunn, Robert Dean, Richard A. Davis Jr. and Ping Wang; the FSBPA's Stan Tait and Debbie Flack; the Pinellas County Board of County Commissioners and the Pinellas County Convention & Visitors Bureau; the elected officials from local municipalities from Clearwater to St. Pete Beach, such as George Cretekos; the Clearwater Marine Aquarium and the Pinellas County residents and business owners who have contributed to the success of the project, such as Nick Fritsch and Carl Hall. The 2009 ASBPA field trip was sponsored by Norfolk Dredging Company, who has professionally constructed several federal beach renourishment projects throughout Pinellas County in the last several years.

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## Appendix: Pinellas County's barrier islands & tidal inlets

Pinellas County is located on the low-energy west-central Florida coast, at the north end of a barrier island chain that is bounded to the north and south by marshes. The county's coastline offers over 35 miles of fine, white sandy beaches on eleven barrier islands along the Gulf of Mexico. The barriers and tidal inlets in the county are listed below from north to south. For more details see [www.pinellascounty.org/beach](http://www.pinellascounty.org/beach).



### Anclote Key

This barrier contains the Anclote Key State Preserve and the Anclote National Wildlife Refuge. Pinellas County does not manage the beaches of Anclote Key. Geologic studies indicate that Anclote Key is approximately 2,000 years old. This November 2005 photo looks north at the south end of Anclote Key.



### Howard Park

The man-made beach at Howard Park, dedicated in 1966, was most recently renourished in 2002 with nearly 7,000 cubic yards of truck-hauled sand. Beach vegetation and two new sidewalks were also installed during this project. This October 2002 photo looks north with the Anclote River in the background.



### Three Rooker Bar

This island started as a sand shoal, building up over the last couple decades. The area is very popular with boaters and birds. This photo looks north along the bar in November 2005.



### Honeymoon Island

Shoreline restoration projects on this state park are conducted through a partnership between Pinellas County and the Florida Department of Environmental Protection. The most recent restoration project, which included nourishment and a T-head erosion control structure, was completed in early 2008. This photo looks north in April 2008.



### Hurricane Pass

This inlet separates Honeymoon Island and Caladesi Island, providing boating access between St. Joseph Sound and the Gulf of Mexico. Created by the Hurricane of 1921, the inlet is dredged periodically by Pinellas County, and the dredge spoil is placed as nourished sand on Honeymoon Island or Dunedin Causeway.



### Caladesi Island

One of the few pristine barrier islands in Pinellas County, this island is accessible by boat or by foot from the south where it is connected to Clearwater Beach Island.



### Dunedin Pass

Dunedin Pass shoaled and closed in the late 1980s. Studies have shown that reopening the pass through dredging would be costly and detrimental to the physical and biological ecosystems that have developed over the last couple decades.



### Clearwater Beach Island

Clearwater Beach is a popular vacation destination with beautiful sugary sand. After an interesting history of coastal management, the island's beaches do not presently require nourishment.



### Clearwater Pass

Clearwater Pass is an important inlet for recreational boaters in northern Pinellas County. Two long jetties prevent the inlet from shoaling.





## Sand Key

At about 14 miles, Sand Key is the longest barrier island in Pinellas County. Nine coastal municipalities occupy this island. After suffering from decades of erosion, the federal segment of the Pinellas County Beach Erosion Control program began in 1985. The most recent federal renourishment was constructed in 2005-06 and the next project is scheduled for 2010-11.



## John's Pass

John's Pass is a federally maintained inlet that is dredged periodically by the U.S. Army Corps of Engineers. The most recent project was conducted in 2000 when dredge spoil was pumped onto Treasure Island as beach nourishment. The ongoing Florida Department of Transportation John's Pass bridge replacement is scheduled for completion in 2009.



## Treasure Island

Treasure Island has two erosional hot spots, Sunshine and Sunset beaches, on the north and south ends of the island, respectively. The Pinellas County Beach Erosion Control program has maintained these beaches since 1969. In contrast, the wide, central beach on Treasure Island accretes slowly due to sediment bypassing around the large ebb delta of John's Pass. The City of Treasure Island's emergency plan allows for "sand sharing" from the wide beach to the erosional areas after a major storm, if necessary.



## Blind Pass

Blind Pass has more structural modifications than any inlet on the west-coast of Florida. The inlet is dredged periodically to nourish the downdrift beach (Upham Beach), most recently in 2000. The gap in the south breakwater was closed in 2005. The next dredging of Blind Pass is scheduled for 2009.



## Long Key

Long Key is the technical name for the island that contains the City of St. Pete Beach. The major erosional hot spot on Long Key is Upham Beach, on the north end of the island. Pass-a-Grille Beach, on southern Long Key, also requires periodic renourishment. The Pinellas County Beach Erosion Control program has maintained these beaches since 1980. Five geotextile T-head groins were installed on Upham Beach in 2005 as an experimental project intended to slow the rapid erosion.



## Pass-a-Grille Channel

This inlet forms part of the Egmont Channel tidal delta complex. Modifications in the early 1960s to Pass-a-Grille Channel included dredging and the construction of the terminal groin and seawall at the south end of Long Key. Dredged material from Pass-a-Grille Channel was placed on Long Key in 1986 and 2004.



## Shell Key

Shell Key began as two separate sand shoals that have built up and merged since the 1950s. The island is now managed by Pinellas County's Department of Environmental Management. This photo looks north in November 2005.



## Bunces Pass

This beautiful natural tidal inlet between Shell Key and Mullet Key has limited boating access due to two fixed (16-foot) bridges. This tide-dominated inlet forms part of the Egmont Channel tidal delta complex. The ebb tidal delta contains distinct channel-margin linear bars as shown on the right side of the photo.



## Mullet Key

The barrier island containing Pinellas County's Fort De Soto Park has a right-angle formation with one shoreline exposed to the Gulf of Mexico and the other shoreline exposed to Egmont Channel. A restoration project was constructed in 2006 that involved placement of beneficial-use material from the dredging of the Tampa Bay shipping channel. The L-shaped terminal groin, originally built in the 1960s, was also rehabilitated. This photo looks north along the Gulf of Mexico of Mullet Key shoreline in April 2006.



## Egmont Key

Egmont Key, located at the mouth of Tampa Bay, is actually located in Hillsborough County. The beaches of Egmont Key are not managed by Pinellas County. Much of this island, which is managed by the Florida Park Service, is a wildlife refuge.