

**A GEOLOGIC GUIDE TO THE STATE PARKS
OF THE FLORIDA PANHANDLE COAST**

**ST. GEORGE ISLAND, ST. JOESPH PENINSULA,
ST. ANDREWS AND GRAYTON BEACH PARKS
AND RECREATION AREAS**



FLORIDA DEPARTMENT OF NATURAL RESOURCES

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On the front cover: St. Joseph Peninsula State Park. View of the scarp cut in the foredune ridge by Hurricane Eloise in 1975. Overlook is opposite main picnic and concession area.

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by Kenneth M. Campbell

INTRODUCTION

St. George Island, St. Joseph Peninsula, St. Andrews and Grayton Beach State Parks and Recreation Areas are part of the barrier island chain which extends, with some breaks, from Alligator Point, Florida, westward past the Florida-Alabama state line. Barrier islands, along with associated spits and lagoons, are common coastal features, not only in Florida, but also along much of the Atlantic and Gulf of Mexico coastlines of the United States.

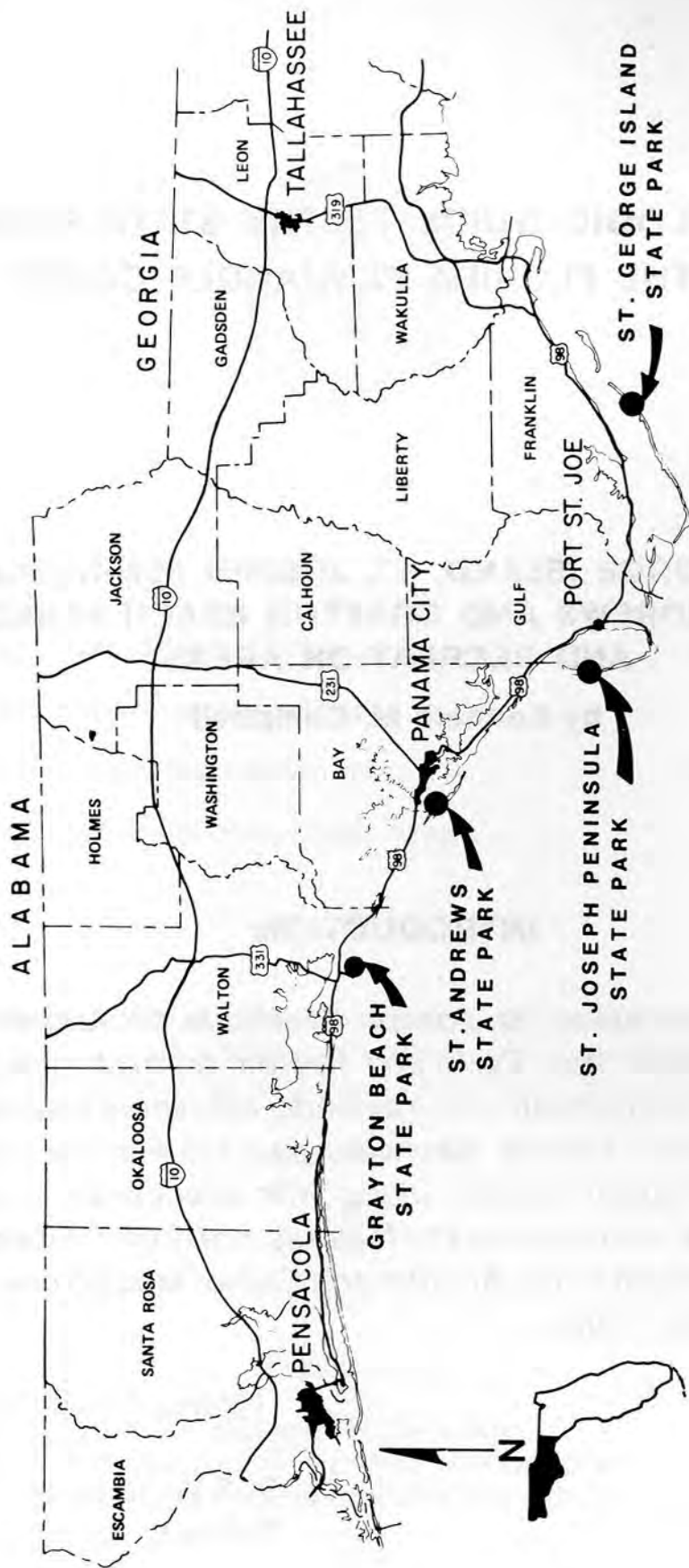


Figure 1. General location

BARRIER ISLANDS

How do barrier islands form? Barrier islands originate in a variety of ways, two of which are most likely for the barrier islands in the Florida panhandle. In the first type, wave activity sweeps sand shoreward as a rising sea level transgresses across the land in response to climatic or geologic conditions. When the sea level stabilizes, the sand remains as a barrier island. This is probably the way St. George Island was formed. In the second type, submerged shoals may build above sea level and become stabilized. The Cape San Blas area may have formed in this way.

Barrier islands now present along the Gulf Coast were formed during the last 4000 to 5000 years, since sea level became reasonably stable. The barrier islands seen today represent the latest adjustment to changing conditions during this period of time. Barrier islands change size, shape and position in response to both short-term and long-term conditions. Barrier islands can be "welded" together, split into segments, become attached to the mainland as spits or peninsulas, migrate ashore and be "welded" to the mainland or even disappear completely. The method of formation and the original location may be obscured.

Barrier islands require an abundant sand supply. Since present sea level has stabilized there has been very little new sand being added to the barrier islands in this area. The result is that portions of these barrier islands are being eroded. Most of the sand lost to erosion is being redeposited as spits at the ends of the barrier islands, in the lagoons or offshore.

The barrier island system encompasses a wide variety of energy conditions. The Gulf side is exposed to the most intense wave activity, which results in clean sandy beaches. Dunes are formed landward of the beaches, and old wave-formed beach ridges may be preserved in the interior of the

island. The landward side of the island faces a relatively protected sound (body of water between the island and the mainland) and is generally fringed by tidal salt marshes or shallow grass flats.

DUNES

The dunes found behind the beach are the first line of defense against severe wave activity and high water levels. The dunes are physical barriers and provide a large



Figure 2.

St. Joseph Peninsula. View of a large vegetation-stabilized dune. Wave erosion has exhumed old, buried tree roots on the dune face. Note the high-tide, wave-cut scarp in the foreground.

supply of sand which can be eroded, dissipating wave energy in the process. The eroded sand is, in some cases, returned to the beach during periods of normal weather and wave activity.

The dune ridge may eventually become stabilized by vegetation, such as sea oats. This is important as it decreases the mobility of both the dune and its individual sand grains. It is for this reason that vehicle and foot traffic are so destructive to dunes. The vegetation is disrupted by the traffic, and the sand in that particular area becomes more susceptible to erosion by the wind. The concentrated erosion lowers the dune elevation and leaves a breach in the dune ridge through which storm waters gain access to the area behind the dune ridge. Driving on the dunes is prohibited, and walkways have been constructed in order to protect and preserve the dune system as much as possible.

Unstabilized dunes may migrate, as individual sand grains are transported by the wind. Migrating dunes may become stabilized when they encroach upon a vegetated area; however, they may cover large amounts of vegetation before being stabilized. In severe cases, the vegetation may only slow the rate of migration.

BEACH RIDGES

Beach ridges are linear sand ridges which were deposited along the beach face in areas with a gentle offshore slope, low wave energy and an abundant sand supply. Beach ridges form only on accreting (growing seaward) beaches. Because they form on the beach face, they indicate the location and orientation of the coastline at the time they were formed.

The ridges are constructed, layer by layer, over an extended period of time, by sediment deposited by swash



*Figure 3.
St. Joseph Peninsula. View from the top of a low beach
ridge, across adjacent ridges in the set. Straight lines
indicate the crests of three ridges.*

(run-up) on the beach face. Several beach ridges constructed adjacent to one another, separated by a gentle intervening swale (linear depression) comprise a beach ridge set. The swale has an elevation near the mean low water level at the time the ridge was formed. The height of most beach ridges in the Florida panhandle is only a few feet; however, some are as high as 15 feet.

Conditions along Florida's coasts are not conducive to the formation of beach ridges at this time. This is evident from the widespread beach erosion observed today.

THE SOUND

The sound behind a barrier island is subject to tidal fluctuations but is a relatively protected water body. The salinity of the water depends on the amount of fresh water introduced by rivers, the amount of mixing and the amount of water exchanged by tidal activity.

The protected waters of the sound behave as a holding basin for fine-grained sediments introduced by river waters or by rainfall runoff from the land. Large quantities of these organic-rich materials may settle to the sound bottom and provide organic matter and nutrients for high biologic productivity. Tidal salt marshes or shallow grass flats generally border the sound side of a barrier island. In addition, the sound side often has a highly irregular outline. For these reasons the waters of the sound are extremely important as breeding and nursery areas for many marine organisms. Also, their high productivity makes them important to the seafood industry with oysters, scallops, shrimp and fish all being harvested there.

ST. GEORGE ISLAND STATE PARK

St. George Island State Park is located on the eastern end of St. George Island in Franklin County and consists of essentially undeveloped beaches and dunes. St. George Island was formed primarily by three geologic processes: beach ridge development, dune and dune flat formation and washover formation. The bulk of the island consists of low coastal dunes backed by a dune flat complex composed of small hummocky dunes. The dune/dune flat complex has been disrupted in many areas by washover

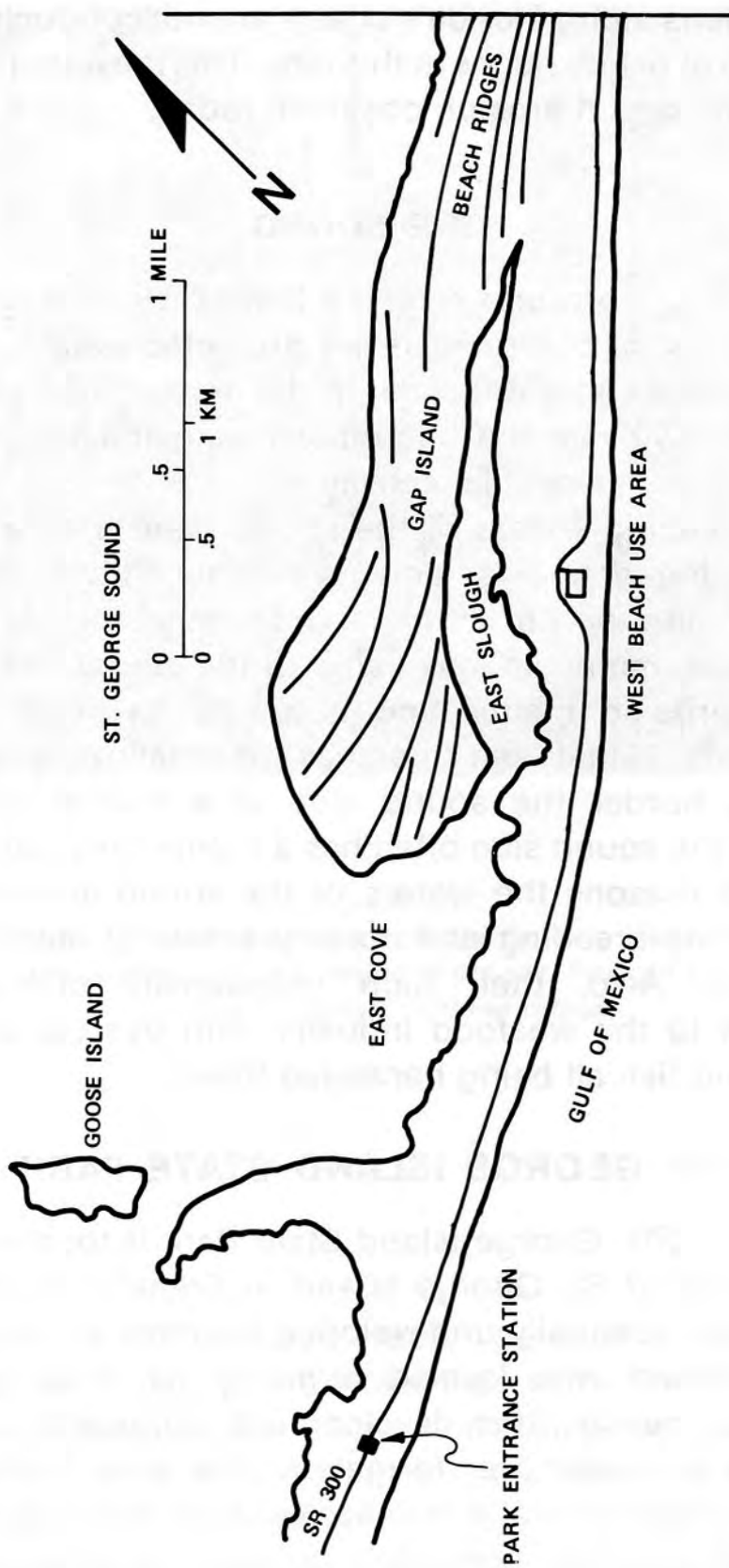


Figure. 4 A.
St. George Island State Park. West end.

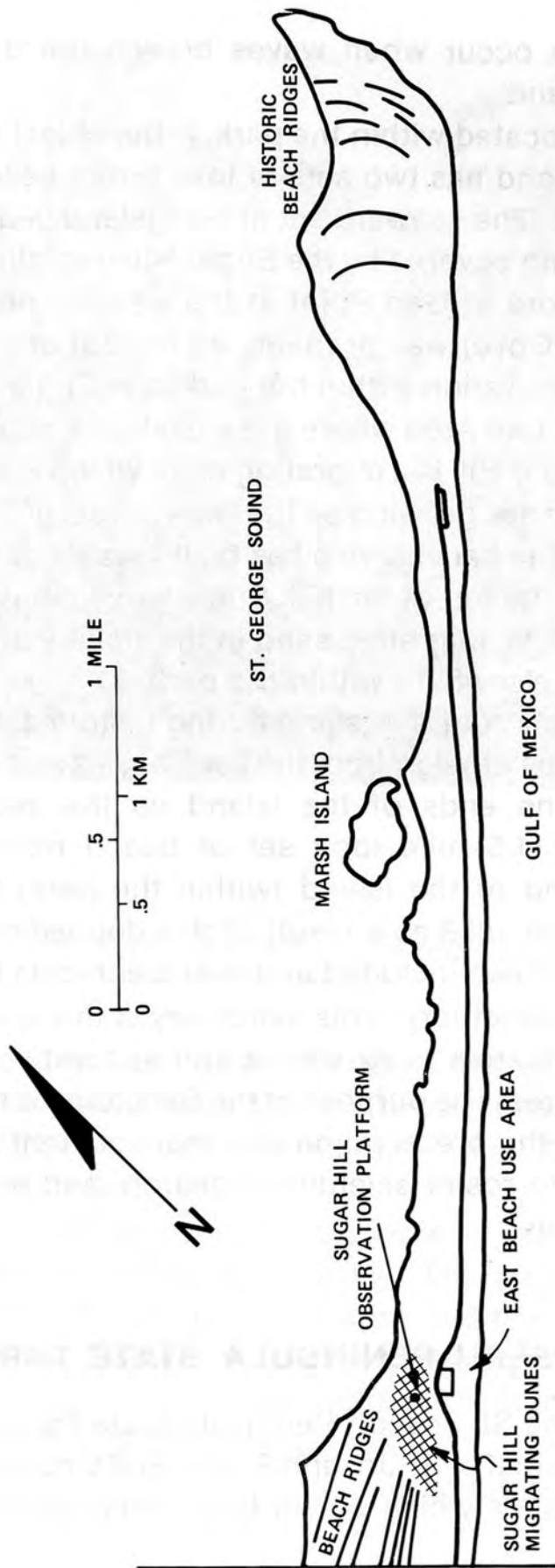


Figure 4 B.
St. George Island State Park. East end.

deposits which occur when waves breach the dunes and overtop the island.

Gap Island, located within the park, is the oldest part of St. George Island and has two sets of low, broad beach ridges developed on it. The seaward set of Gap Island beach ridges is currently being covered by the Sugar Hill migrating dunes. The area offshore of Gap Point at the western end of Gap Island (at East Cove) was probably an inlet at one time.

The highest elevation within the park is at Sugar Hill, near the East Beach Use Area where the elevation is slightly more than 30 feet. Sugar Hill is a migrating dune which is encroaching on mature pines growing on the seaward set of Gap Island beach ridges. The park service has built a walkway to a viewing platform at the top of the hill. Snow fencing has been utilized to control the migrating sand in the vicinity of the walkway as well as elsewhere within the park.

Natural alteration of the island during historical times has primarily been by erosion from the central part and spit-type extension of the ends of the island as the sediment is redeposited. A 1.5-mile long set of beach ridges at the easternmost end of the island (within the park) has been developing since 1858 as a result of this deposition.

The park has been included in the Apalachicola Bay River and Estuarine Sanctuary. This sanctuary is the largest of 12 national sanctuaries in existence and encompasses more than 190,000 acres. The purpose of the Sanctuary is three-fold: To provide for the preservation and management of critical habitat areas; to foster scientific research; and to enhance public education.

ST. JOSEPH PENINSULA STATE PARK

The St. Joseph Peninsula State Park is located on the northern half of St. Joseph Spit in Gulf County, Florida. The barrier islands which would later comprise St. Joseph



Figure 5.
St. Joseph Peninsula State Park. View along a flooded beach
ridge swale.

Spit were formed approximately 5000 years ago. Approximately 1000 years ago, the two islands were joined at Eagle Harbor and to the mainland, forming Cape San Blas and St. Joseph Spit.

The sediment-transport processes which formed the cape and the spit are still at work today. The area is constantly being modified by erosion and sediment deposition. Comparison of bathymetric surveys indicates that the shoreline at Cape San Blas eroded slightly less than one-half mile between 1875 and 1942 an average rate of approximately 36 feet per year. Much of St. Joseph Spit is also eroding but at a progressively slower rate, going northward.

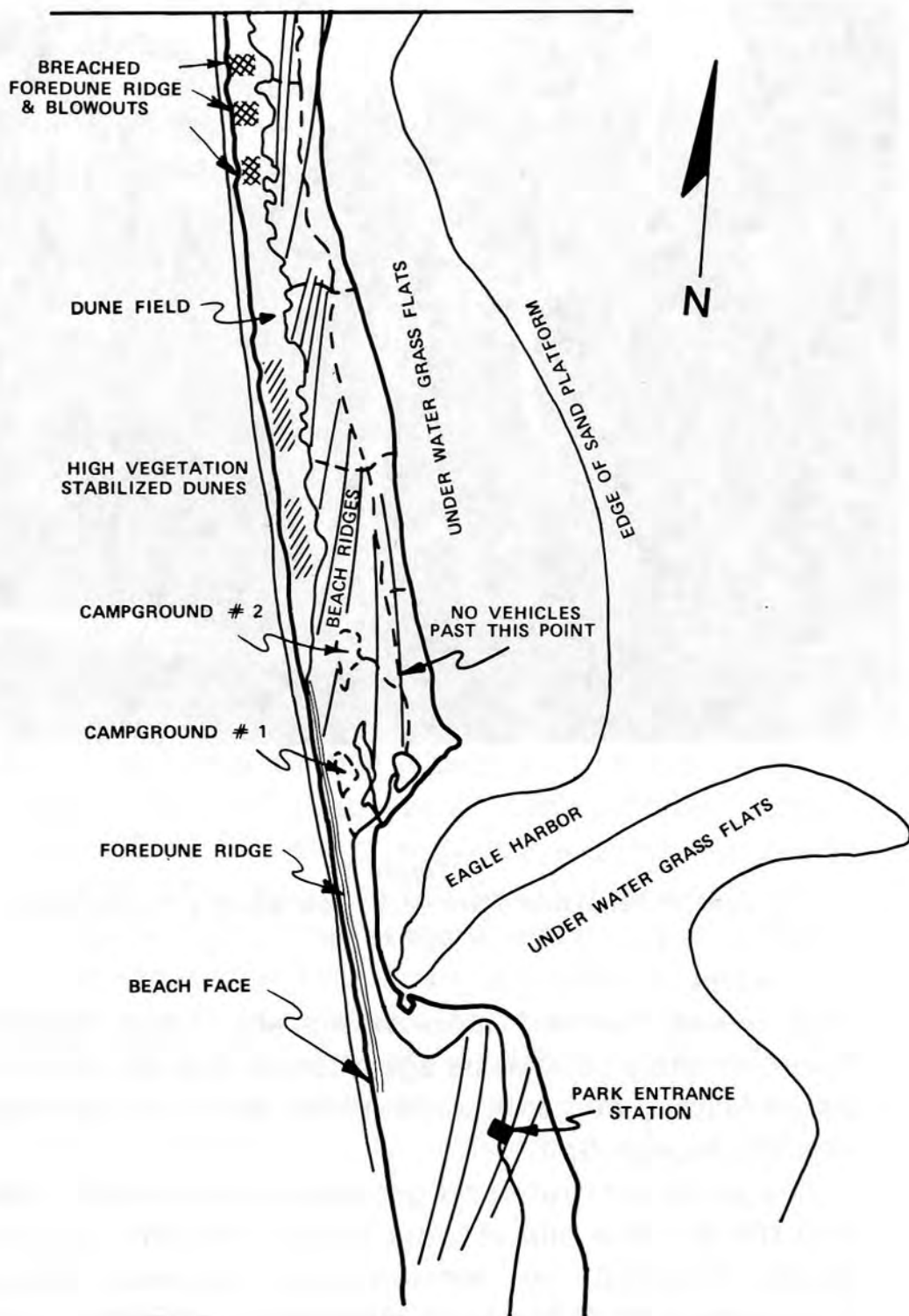


Figure 6 A.
St. Joseph Peninsula State Park. Southern part.

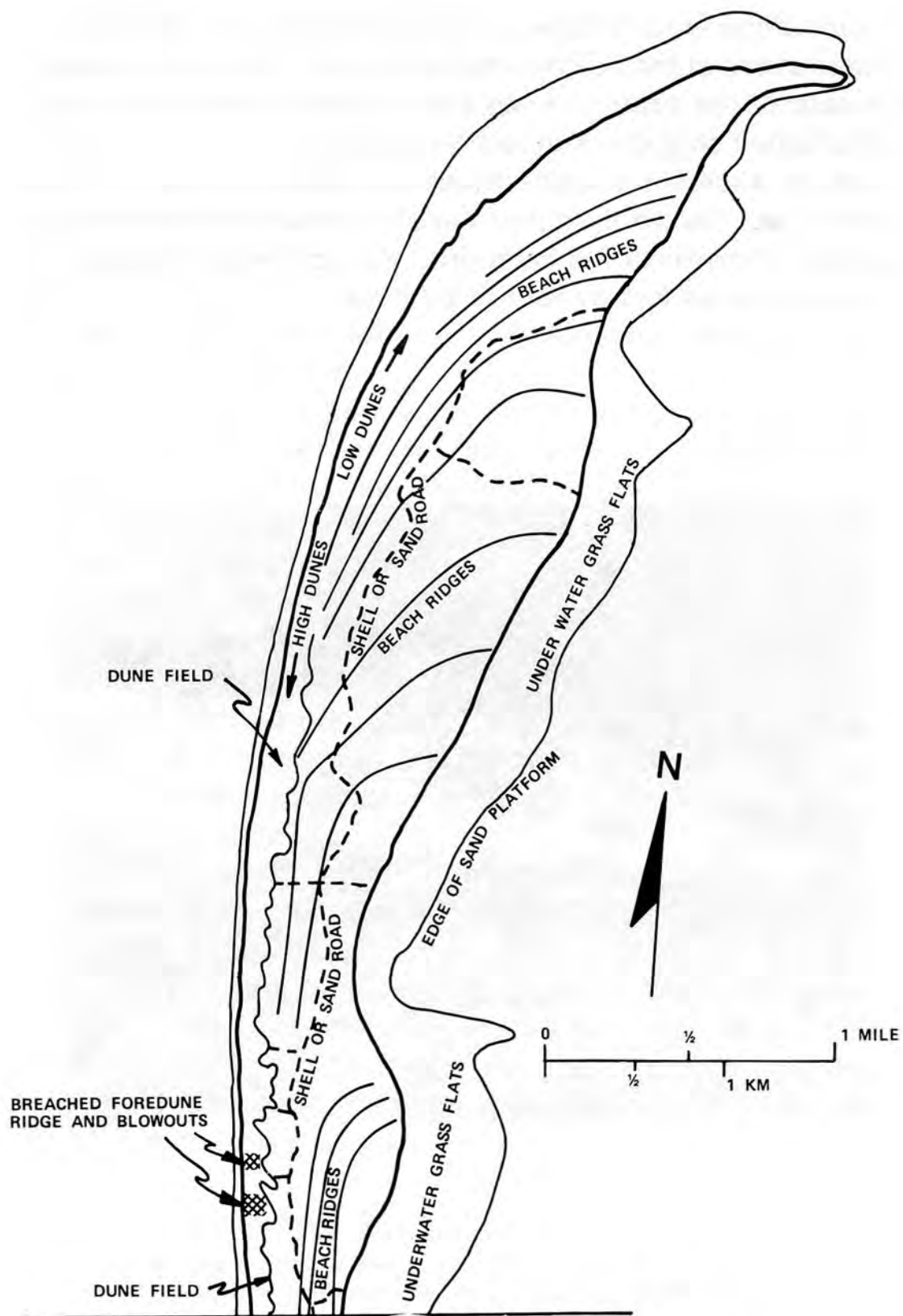


Figure 6 B.
St. Joseph Peninsula State Park. Northern part.

Much of the eroded material is transported northward and is redeposited at the northern tip of the spit. Further northward growth of the peninsula has been halted by the continually maintained ship channel to Port St. Joe.

Many interesting sights await the person willing to hike northward toward the tip of the peninsula. Vehicles are not permitted north of the campgrounds, so the only access to most of the park is by foot or by boat.



*Figure 7.
St. Joseph Peninsula State Park. Trees which were covered
by this migrating dune and have now been exhumed.*

A well-developed foredune ridge is present in the vicinity of Eagle Harbor and the campgrounds. This dune ridge was severely eroded by storm waves generated by Hurricane Eloise in 1975 (see cover photo). The dune ridge was breached by this storm in several places. These breaches allow a large area behind the dune ridge to be flooded and scoured by storm waters. The shallow basin which storm waters flooded generally contains large quantities of driftwood and other debris which was stranded when the storm waters receded.

Also of note as you walk north along the coast are spectacular dunes which have become stabilized by vegetation. Dunes may become stabilized when grasses grow upon them or may become anchored when they migrate into an area vegetated by trees or shrubs. If a dune does not completely cover the vegetation, the trees or shrubs may survive and continue to grow as they have in this area.

Beach ridges are present in parts of the interior of the peninsula, behind the dunes. The ridges are separated by swales which often hold water, resulting in long fingers of high ground separated by long, narrow ponds, swampy areas or grassy meadows.

The bay side of the peninsula is generally bordered with a thin band of coastal salt marsh vegetation, beyond which extends a shallow underwater grass flat up to one-half mile wide. These grass flats provide excellent habitat for many marine species. At the edge of this flat, the water depth increases rapidly to 18 feet or more. The edge of the grass flat is in reality the shoreward edge of the sand body on which the original barrier islands were built.

ST. ANDREWS STATE RECREATION AREA

St. Andrews State Recreation Area is located on Shell Island peninsula near Panama City in Bay County. Shell Island is a barrier island which has migrated ashore at the western end,

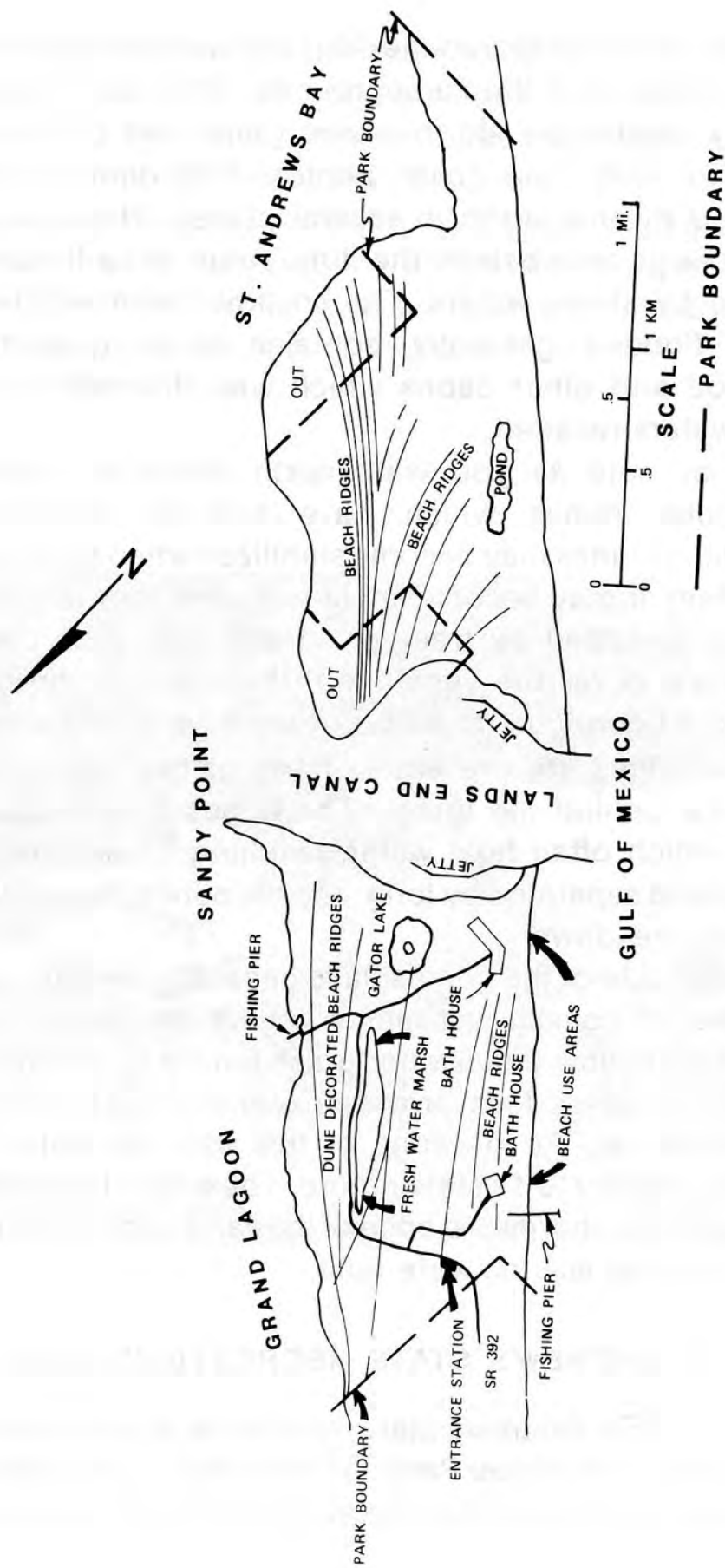
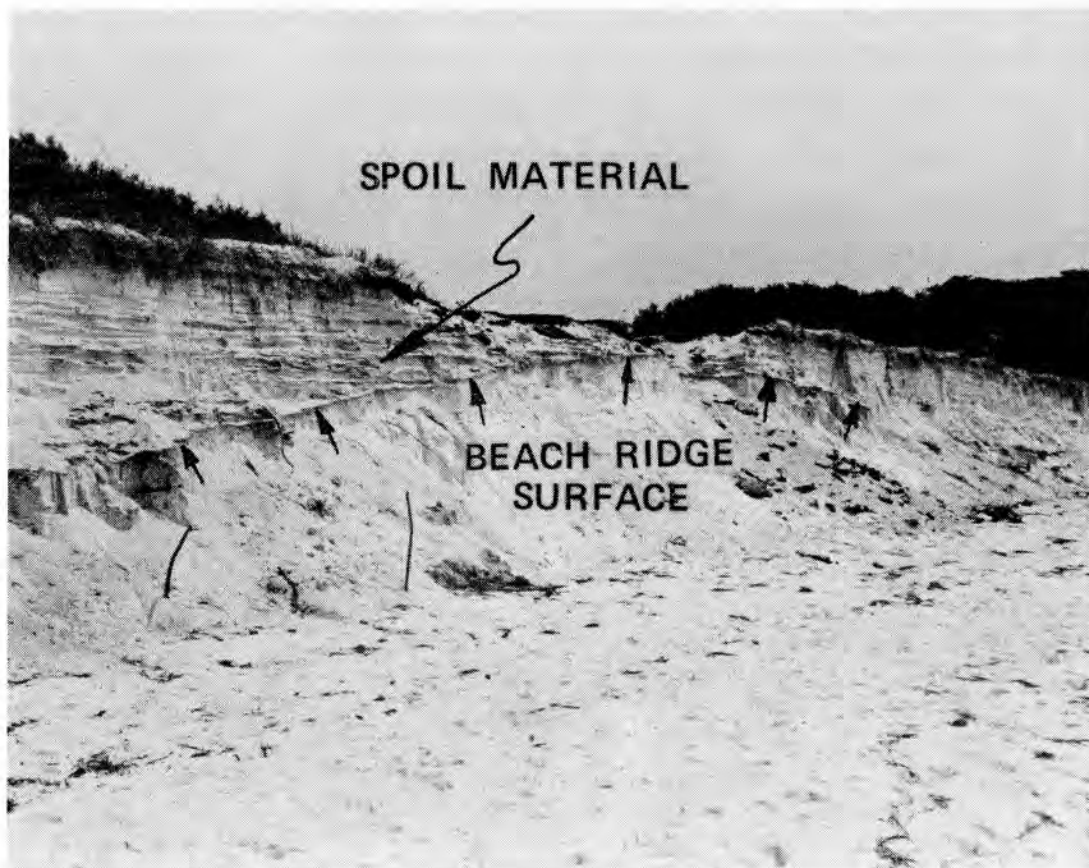


Figure 8. St. Andrews State Recreation Area



*Figure 9.
St. Andrews State Recreation Area. View of spoil materials
from the Land's End Canal cut covering the pre-existing
topography, a broad beach ridge.*

thus forming a peninsula. Grand Lagoon and St. Andrews Bay lie behind the island. In the early 1930's the Land's End Canal was constructed, cutting off the eastern 5.5 miles of the peninsula. The park encompasses 1063 acres located on both sides of the Land's End Canal.

Two sets of beach ridges were developed during the formation of Shell Island. The older ridges are broad and were formed from sediment which was probably being transported



*Figure 10.
St. Andrews State Recreation Area. View north along the west
side of the Land's End Canal. The tree stumps in the water
and the step scarp are signs of active erosion.*

westward by longshore drift. The campground and park store are located among these ridges. These ridges are difficult to see from the ground because of the wind-blown dunes which have been developed in the area since the beach ridge formation. The fresh water marsh on the south side of the main road lies in a swale adjacent to one of these ridges. The younger beach ridges which lie directly behind the present beach are narrow and indicate that the sediment was transported directly on shore. High coastal dunes are migrating over both sets of beach ridges.

The presence of the Land's End Canal has altered the area, and the spoil materials deposited along its banks have buried the original topography. Under certain conditions, the

original topography and swale deposits of peat (a compact black deposit of partially decomposed plant material) can be seen in the eroded scarp along the west side of the canal.

GRAYTON BEACH STATE RECREATION AREA

Grayton Beach is a small (356 acre) Recreation Area located in Walton Conty. The previously discussed park areas were all constructed predominantly by beach ridge formation during late Holocene time (the last half of last 10,000 years.)

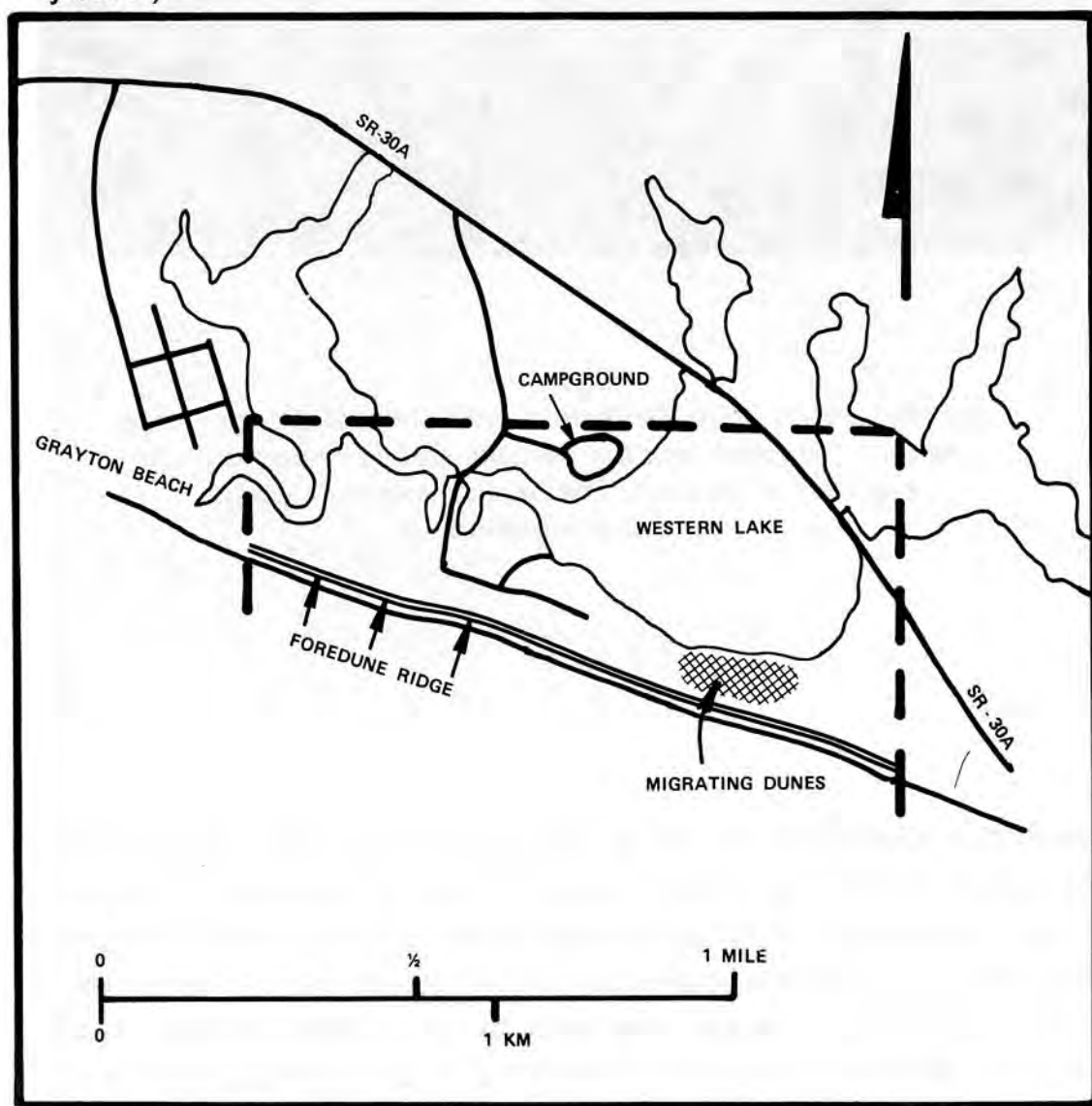


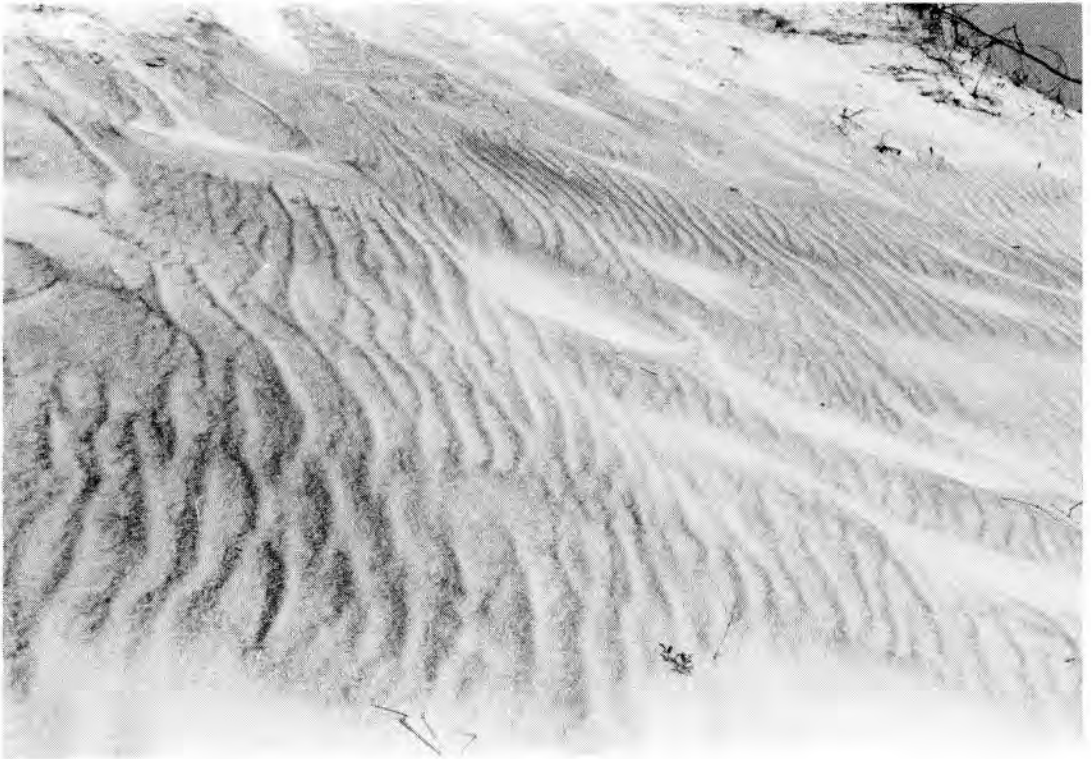
Figure 11.
Grayton Beach State Recreation Area.



*Figure 12.
Grayton Beach State Recreation Area. View of Western Lake,
the pine flatwoods and the partially stabilized dunes at the
east end of the park. The bare areas indicate active
sand migration.*

With the exception of the dunes and the modern beach, the Grayton Beach sediments were deposited earlier. Western Lake occupies a flooded stream valley which is cut off from the Gulf by a dune-covered, bay-mouth bar (a sand bar which extends across the mouth of a bay) which was deposited during late Holocene time. Thus, the recent history of Grayton Beach is one of modification, rather than growth or formation.

Although Western Lake is cut off from the Gulf on the surface, there is still an effective hydraulic connection with the Gulf through the bar. This explains the brackish nature of the water.



*Figure 13.
Grayton Beach State Recreation Area. These ripple marks
are an indication that sand is being moved by the
wind. The dark, areas are "heavy minerals" which are
concentrated in swales by the wind, since the lighter
quartz grains are moved more easily.*

Sand dunes are in motion at Grayton Beach. Some dunes are migrating so quickly that vegetation cannot grow on their surface. Others have been partially stabilized by vegetation which is growing on them or by the trees and shrubs they have buried. The nature trail points out several areas where dunes are migrating.

SUMMARY

*T*he coastal parks of Florida we have discussed provide a peaceful and beautiful setting for recreational activities of many kinds. We hope that your enjoyment is enhanced by an increased understanding and awareness of the vital part the barrier island plays in the coastal barrier/lagoon environment and in the geologic forces which have shaped, and are still shaping, these parks.

This publication was produced at a cost of \$890.00 or a cost of \$.89 per copy to disseminate geologic data.