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**GEOLOGY OF THE STATE PARKS
IN THE
FLORIDA KEYS**

by

Ed Lane

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GEOLOGY OF THE STATE PARKS IN THE FLORIDA KEYS

by

Ed Lane

The chain of sun-drenched islands of the Florida Keys and associated coral reefs are unique in the continental United States. There are five state parks in the Keys, each with its own special features that will enhance a visit to this subtropical realm. The state parks are: John Pennekamp Coral Reef, Lignumvitae Key, Indian Key, Long Key, and Bahia Honda (Figure 1). The geological history of the Florida Keys is an interesting story that will add to one's enjoyment of these parks.

The Florida Keys lie along an arc from Miami to Key West, a distance of about 135 miles. The islands have been divided into Upper and Lower Keys, based on their orientations and on the differences between the two types of limestone that compose them. The Upper Keys, composed of the Key Largo Limestone, extend from Biscayne Bay southwest to Big Pine Key. The Lower Keys, made of the Miami Limestone, encompass Big Pine Key to Key West (Figure 1). Figure 1 also shows the distinctive orientations which characterize the Upper and Lower Keys. The Upper Keys are oriented in a linear northeast-southwest direction, while the Lower Keys are oriented perpendicular to them, in a northwest-southeast direction. The reasons for their orientations are discussed below.

GEOLOGICAL HISTORY

The Florida peninsula is the emergent portion of a wide, relatively flat geologic feature called the Floridan Plateau, which forms a rampart between the deep waters of the Gulf of Mexico and the Atlantic Ocean (Figure 2). The Florida peninsula is located on the eastern side of the plateau. The edge of the plateau lies over 100 miles west of Tampa, while on the east it lies only three or four miles off the coast from Miami to Palm Beach.

Near the southern rim of the plateau's escarpment lies a fringeline of living and dead coral reefs. The dead coral reefs form the islands of the Florida Keys. The edge of the Floridan Plateau, marked by the 300-foot depth contour line, lies four to eight miles south of the Keys. Today, living coral reefs grow in the shallow waters seaward of the Keys. This environ-

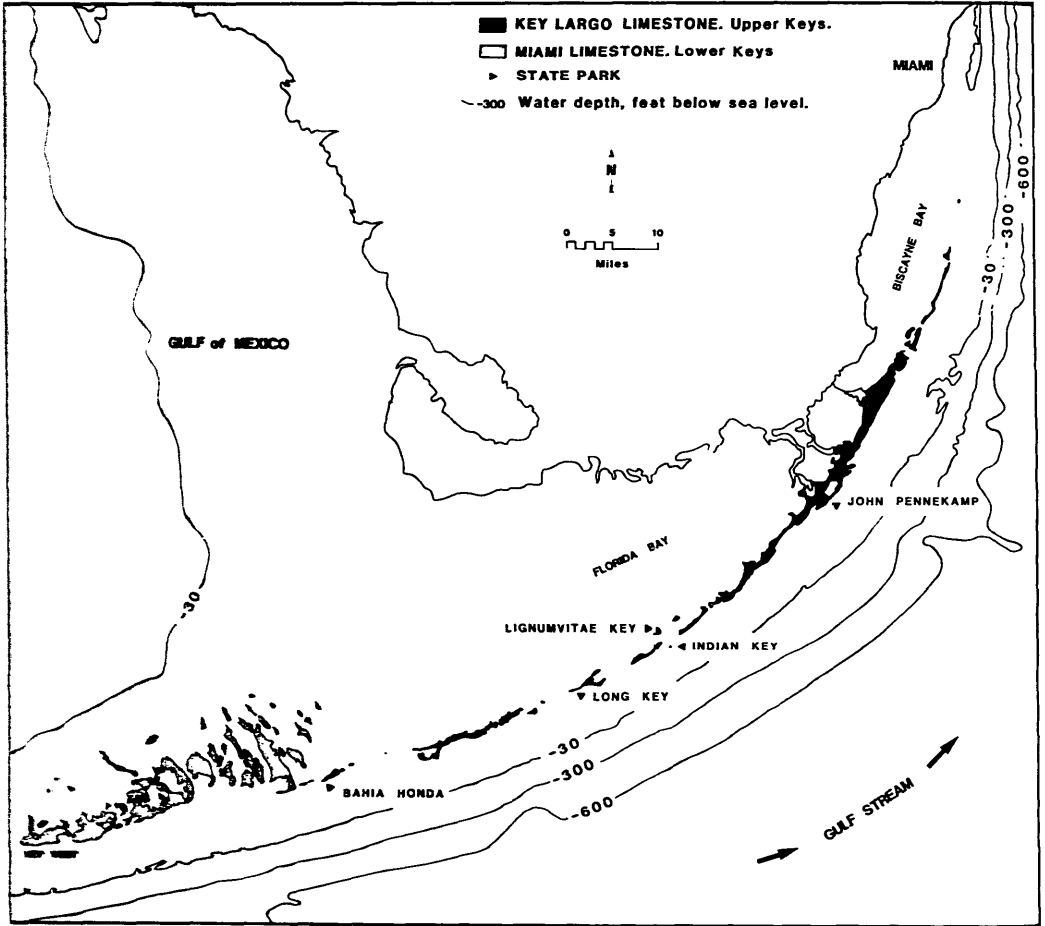


Figure 1. The Florida Keys, showing locations of the State parks, and the extent of the Key Largo Limestone and the Miami Limestone geological formations.

ment is ideal for the growth of coral: a shallow-water shelf, subtropical latitude, and the warm Gulf Stream nearby.

The geological history of the Florida Keys began about three million years ago, when a shallow sea covered what is now south Florida. During the next 2.8 million years, often called the Pleistocene Ice Ages, world sea levels underwent many fluctuations of several hundred feet, both above and below present sea level, in response to the waxing and waning of the great glaciers. Colonies of coral became established in the shallow sea along the rim of the broad, flat Floridan Plateau. The subtropical climate allowed the corals to proliferate, forming reefs. As sea levels fluctuated the corals maintained footholds along the edge of the plateau: their reefs grew upward when sea levels rose, and their colonies retreated to lower depths along the plateau's rim when sea levels fell. During times of rising sea levels, dead reefs provided good substrates for new coral growth. In this manner, during successive phases of growth, the Key Largo Limestone accumulated up to 200-feet thick in places. The Key Largo Limestone is a white to tan limestone that is primarily the skeletal remains of corals, with invertebrate shells, marine plant and algal debris, and lime-sand. The Key Largo Limestone varies irregularly in thickness from about 75 feet to over 200 feet. In the Lower Keys the Key Largo Limestone is covered by the Miami Limestone. The last major drop in sea level exposed the ancient reefs, which are the present Keys.

During reef growth, carbonate sand banks periodically accumulated behind the reef in environments similar to the Bahamas today. One such lime-sand bank covered the southwestern end of the coral reefs and, when sea level last dropped, the exposed lime-sand or ooid bank formed the Lower Keys. This white to light tan granular rock, the Miami Limestone, is composed of tiny ooliths, lime-sand and shells. Ooliths may be up to 2.0 mm in diameter and are made of concentric layers of calcium carbonate deposited around a nucleus of sand, shell, or other foreign matter. Throughout the Lower Keys the Miami Limestone lies on top of the coralline Key Largo Limestone, and varies from a few feet up to 35 feet in thickness. The northwest-southeast aligned channels between islands of the Lower Keys were cut in the broad, soft, oolite bank by tidal currents. Then, as today, the currents flowed rapidly into and out of the shallow bay behind the reefs, keeping the channels scoured clean.

Exposures of the Key Largo Limestone and Miami Limestone can be seen in many places along the Keys: in canal cuts, at shorelines, and in construction spoil piles.

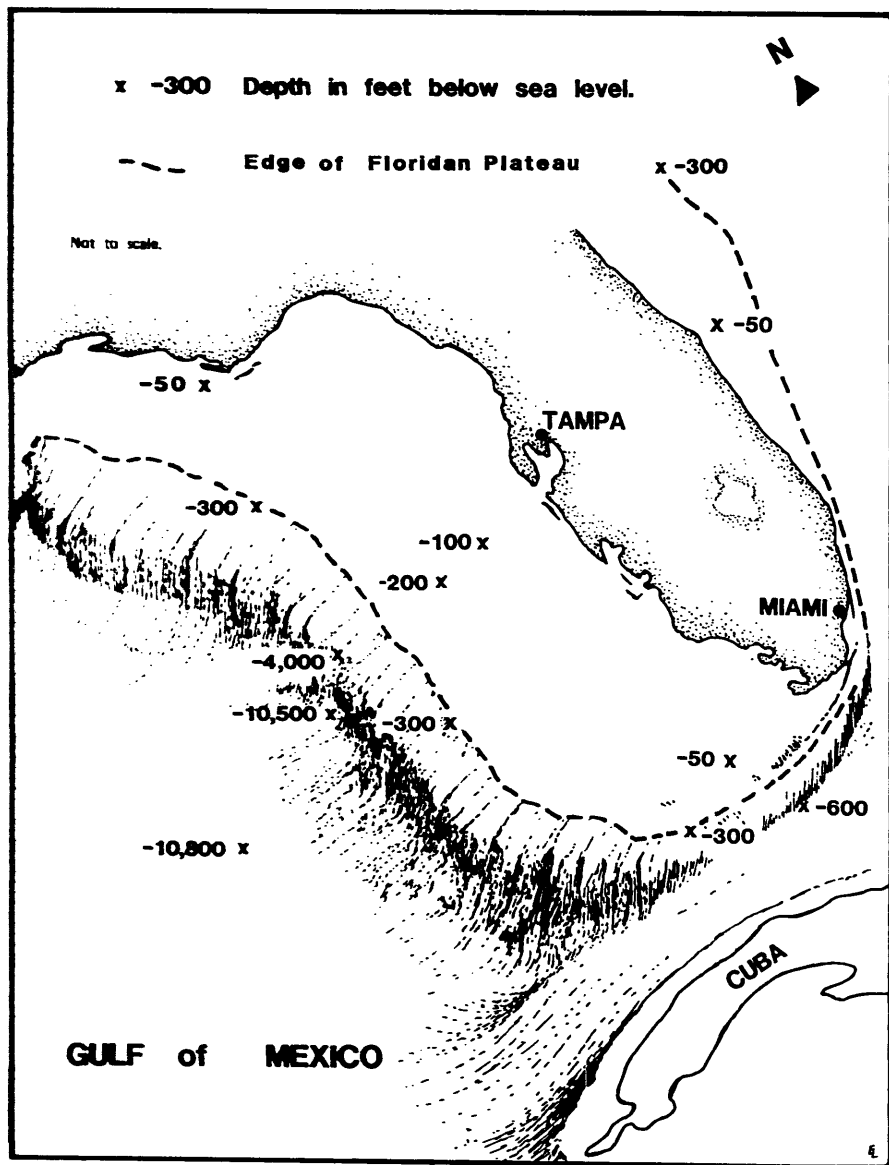


Figure 2. Oblique view of the Floridan Plateau, showing the islands of the Florida Keys fringing its southern rim.

ENVIRONMENT

The climate of the Florida Keys is subtropical to tropical, with rare, brief, below-freezing temperatures. The plants, animals, and ecosystems are a blend of temperate and tropical species.

Because the Keys receive some of the lowest amounts of rainfall in Florida, because they are surrounded by salt water, and because the rocks of the Keys are permeable, obtaining adequate supplies of fresh water has always been a problem. There are no reliable natural sources of potable groundwater, although some small, unpredictable and fluctuating lenses of fresh-to-brackish water occur at shallow depths. Fresh water must be obtained by the pioneers' technique of capturing rain runoff in cisterns, by importation via the pipeline along US 1, or by desalinization.

Elevations over most of the Keys are less than 10 feet above mean sea level, although Key Largo and Key West have small areas that rise slightly over 15 feet. The islands slope very gradually up from the sea to flattened, gently rounded tops. Relief is slight on the bedrock surfaces, seldom exceeding one or two feet. Irregularities of the rock surfaces are a result of the heterogeneous topography of the coral reefs that created the islands, and also the result of erosion and solution of the limestone rocks after exposure above the sea. Solution features, such as pitted and pinnacled surfaces, occur everywhere on the Keys. Sinkholes, up to several feet in diameter and several feet deep, are abundant but many are filled with peat or carbonate sediments, which masks them from casual detection. Vegetation preferentially takes root in them, providing clues to their location.

Compared to the rest of Florida, there is very little quartz sand on the Keys. Most of the sand is of carbonate origin, not quartz sand. Carbonate sand is derived from the erosion of limestone, from particles precipitated in water, or as by-products in the life processes of some marine plants and animals. A few islands, notably Long Key and Bahia Honda, have beaches of loose carbonate sand that veneers the bedrock; most other beaches are exposed, pitted and pinnacled limestone. Extensive commercial development and construction has resulted in large quantities of crushed limestone "fill" covering many areas of the Keys.

The subtropical Florida Keys present somewhat of a paradox with respect to vegetation. In contrast to the usual picture of tropical, verdant rainforests and luxuriant plant cover, large areas of the islands present

bare, rocky surfaces or sparse grass cover. Several factors combine to create a stressful environment for many types of plants. Top soil, in the usual sense, is almost non-existent on the islands. The "soil" consists of weathering byproducts of limestone or carbonate debris, which provides few nutrients and limited rooting material. The mean annual rainfall for the Keys is the lowest of any part of Florida, averaging as much as 50 percent less than the wettest areas of the State. Rainfall on the Keys decreases from about 50 inches per year at Key Largo to as little as 25 inches per year at Key West. In addition, the rainfall is rapidly lost through high evaporation or it readily percolates downward through the few feet of porous rock to the underlying brackish water table. Any plant attempting to colonize the islands must also be salt-tolerant, since the atmosphere is laden with salt spray. These conditions restrict the types of plants that can grow on the islands, and they curtail the growth of the plants that do gain footholds.

The foundations of the islands are ancient, dead coral reefs. However, more recent changes in the Keys are the result of natural and biological forces acting as geological agents, which are constantly at odds in adding to or eroding the islands. Perhaps the most important constructional biological agents are mangrove trees, which are ubiquitous in the Keys. Mangroves are salt-tolerant trees that thrive in the tidal zones along subtropical and tropical coastlines (Figure 3). In south Florida and the Keys mangroves are one of the most important components in the coastal marsh ecosystems. Figures 3, 4 and 5 illustrate the effects of mangroves along the islands' shorelines. A mangrove's thick tangle of aerial prop roots act as a baffle that catches and holds sediments, from both landward and seaward directions. Figure 4 shows a carbonate mud bank forming around a stand of mangroves. The lime mud accumulating in shallow water (lighter toned) is an ideal substrate for young mangrove seedlings, seen here in progressively younger generations offshore, reaching to join the main island to the small mangrove island in the right background. In this typical fashion, mangroves stabilize shorelines and add new land to the Keys. The labyrinthine mangrove islands and tidal channels shown in Figure 5 are the result of such mangrove growth and sediment accumulation. Conversely, mangrove roots also provide convenient supports for new colonies of oysters, which may provide rock foundations for future generations of mangroves.

Some marine animals are intensively destructive to the limestone islands, and a significant portion of modern erosion on the rock coasts of the Keys has been attributed to the direct action of organisms that bore and burrow into the rocks. Marine animals whose growth and feeding requirements are destructive include certain sponges, worms, barnacles, clams, echinoids, and chitons. Many of these animals can be seen by exploring along the rocky shorelines of the islands. The pinnacles and pits of the limestone should be examined closely, however, because some of the animals' camouflage blends with the rocks.

Hurricanes and tropical storms are agents of destruction, altering exposed shorelines by erosion, salting the land by storm-surge flooding, and damaging the coastal marshes that act as buffer zones between high land and sea. While rains associated with them bring large amounts of fresh water to the region, from man's viewpoint they tend to be more destructive than useful.

STATE PARKS

The Florida Keys are geologically and botanically unique in North America. The vegetation of the Keys is of West Indian, or Caribbean, origin. Extensive mangrove swamps fringe the Keys, while tropical hardwood hammocks cover upland areas. A great variety of trees and shrubs are found in the hammocks, including species with exotic sounding names, such as gumbolimbo, Florida poisontree, mahogany, mastic, Jamaica dogwood, pigeon plum, strangler fig, and lignumvitae (Figures 6 to 13). During Florida's colonial period, many stands of these tropical trees were felled to supply commercial and shipbuilding demands of various countries. In order to preserve and protect the remaining populations of plants and animals, Florida's state park lands are managed to appear as they did when the first Europeans arrived. Consumptive uses, including hunting, livestock grazing and timber removal, are not permitted. Florida's state parks fulfill an important purpose as representative examples of "Original Natural Florida."



Figure 3. Mangrove trees, showing thickly tangled prop roots. Note the many mangrove seedlings sprouting in the shallow water. Photo by Dr. Renate Skinner.

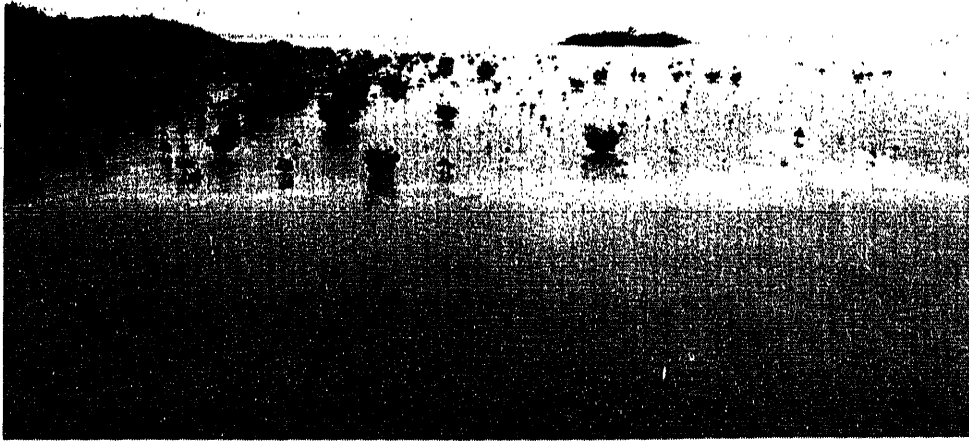


Figure 4. Mangrove seedlings in the process of colonizing a shallow lime-mud bank (the light-toned band across middle of picture). In time the small mangrove island in the background will be joined to the main island, on the left. Photo by the author.

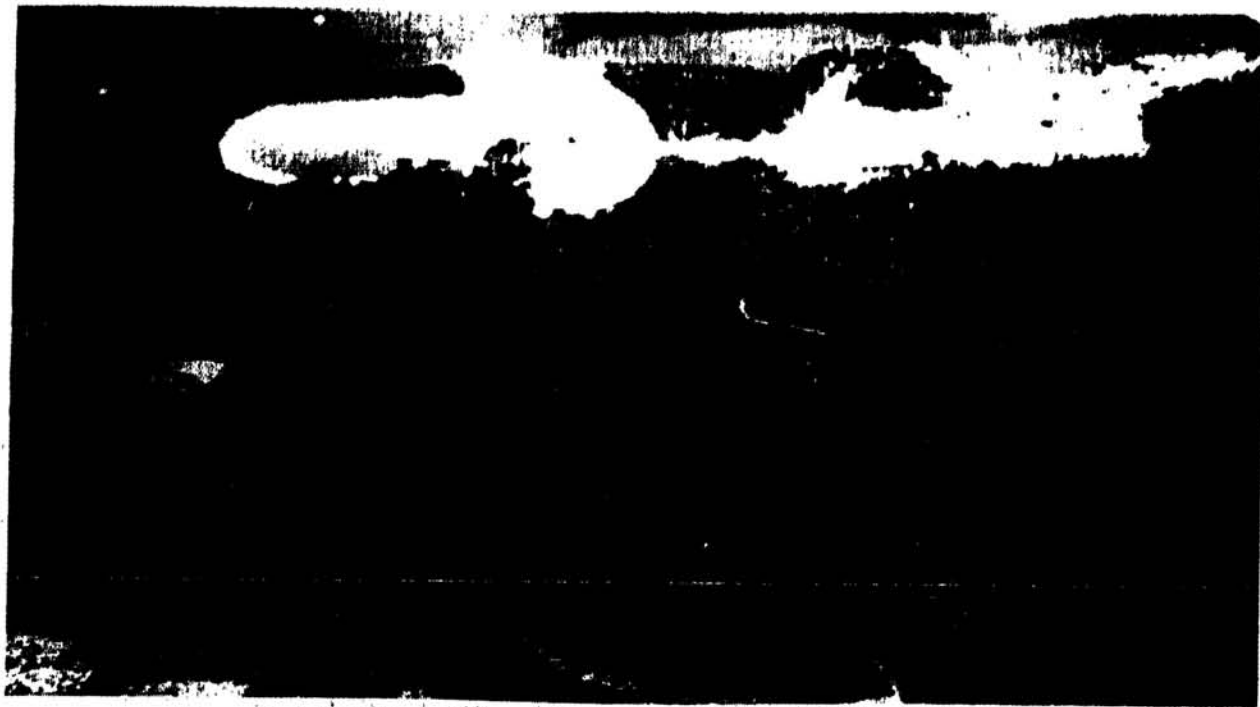


Figure 5. Aerial view of part of John Pennekamp park. The labyrinth of tidal channels through the mangroves serve an important function as a nursery in the ecosystem of the Keys, providing food and shelter to many marine animals. Another important function of such mangrove jungles that fringe coastlines is to protect the shorelines from erosion. Photo by Dr. Renate Skinner.



Figure 6. The gumbolimbo tree (West Indian Birch) (*Bursera simaruba*) has smooth bark, is up to 60 feet high, with a trunk up to three feet in diameter. The fruit is rounded, triangular, in clusters, with a thick, dark red covering (from Fla. Div. of Forestry, 1980).

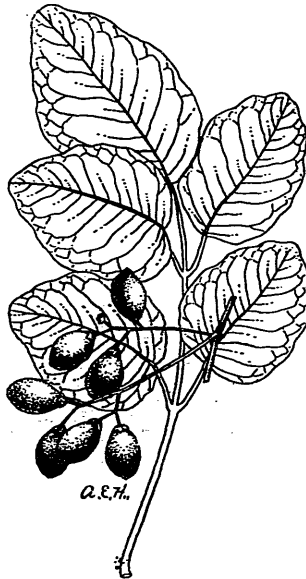


Figure 7. The Florida Poison tree (Hog Gum) (*Metopium toxiferum*) has thin, reddish or orange-brown bark, often spotted from exuded dried gum which has caustic properties. It grows up to 40 feet high and resembles the non-poisonous gumbolimbo. **WARNING:** Precautions should be taken in identifying this tree, as it is as poisonous as poison ivy. All parts of this tree act as a contact skin-poison to many people (from Fla. Div. of Forestry, 1980).

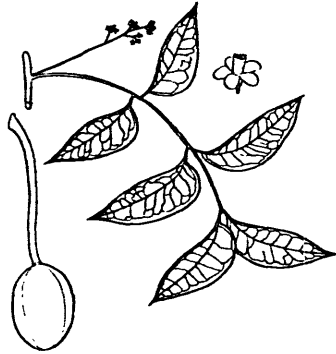


Figure 8. The West Indies Mahogany (*Meliaceae* = *Chinaberry Family*) grows to 50 feet high, up to two feet in diameter, with thick, reddish-brown, scaly bark. Fruits are dark reddish-brown, ovate, up to five inches long (from West and Arnold, 1946).

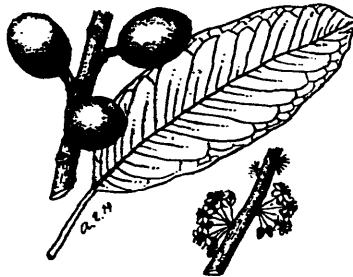


Figure 9. The Mastic tree (Jungleplum or Wild Olive) (*Sideroxylon foetidissimum*) grows up to 70 feet high with a trunk up to four feet in diameter. Fruits are olive-shaped, with firm yellow skin (from Fla. Div. of Forestry, 1980).

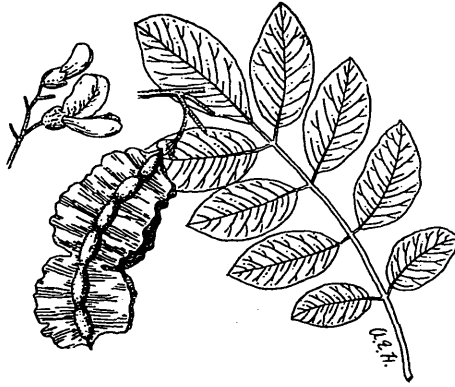


Figure 10. The Jamaica dogwood (Florida Fishfuddle tree) (*Piscidia communis*) grows up to 50 feet high and up to three feet in diameter. The fruit is a four-winged pod, three or four inches long. Natives of the Caribbean made a poison from the bark of the roots, leaves, and young branches, which stupified fish so they could be picked out of the water (from Fla. Div. of Forestry, 1980).

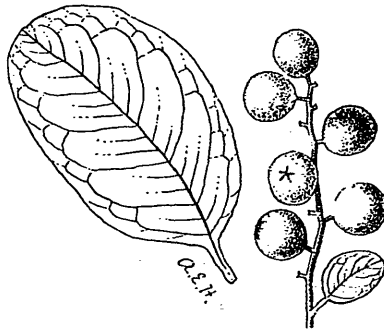


Figure 11. The Pigeon Plum (Pigeon Seagrape) (*Coccolobis floridana*) grows to heights of 70 feet, with trunks up to two feet in diameter. The fruit is a dark red to black berry about one-third inch long (from Fla. Div. of Forestry, 1980).

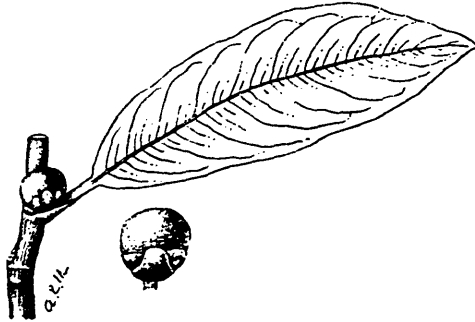


Figure 12. The Florida Strangler Fig (Golden Fig) (*Ficus aurea*) seedlings develop on the upper branches and trunks of other trees. As the roots grow down the host's trunk, a dense crown of foliage shades out the host's crown. In time the fig is firmly rooted in the ground and the host is nearly or totally dead. Aerial roots drop from branches to the ground, forming additional trunks. It grows to 50 feet high, with trunks up to three feet in diameter. Fruits are red, round to ovate, 3/4-inch long, and stalkless (from Fla. Div. of Forestry, 1980).



Figure 13. The Lignumvitae tree ("Tree of Life") (*Zygophyllaceae* = *Bean-caper Family*) grows up to 25 feet high, with trunks up to two feet in diameter. Fruits are bright orange, ovate, five-angled, about 3/4-inch long (from West and Arnold, 1946).

VISITORS' INFORMATION

All plant and animal life is protected in state parks, as are non-living materials, such as rock and mineral specimens or artifacts. Parks open at 8 a.m. and close at sunset year-round. For visitors' safety, regulations prohibiting the feeding of animals are enforced. Pets must be on a six-foot, hand-held leash at all times. They are not permitted in campgrounds, swimming areas, or any park buildings. Intoxicants are not permitted in any area of state parks. Some activities and facilities are accessible to the handicapped. Inquire at the respective park.

Snorkeling and diving are the best ways to observe the coral reefs and associated marine life. The *DIVERS DOWN* flag must be displayed while in the water. NEVER swim alone. Do not touch anything you are unsure of and treat all underwater life with respect. Do not touch, grasp, or stand on coral, for it will die. Anchors are very destructive when dropped into coral; therefore, anchor only in sandy bottom areas. Spearfishing is prohibited in state parks.

JOHN PENNEKAMP CORAL REEF STATE PARK

John Pennekamp Coral Reef State Park is the first underwater state park in the United States. Pennekamp and the adjacent Key Largo Coral Reef National Marine Sanctuary extend 8.5 nautical miles into the Atlantic and are 21 nautical miles long (approximately 10 by 25 miles), covering about 178 square nautical miles. These areas were established to protect and preserve a portion of the only living coral reef in the continental United States. The park is named for the late John Pennekamp, a Miami newspaper editor who contributed to the establishment of the Everglades National Park and to the perpetuation of Florida's park system.

Tropical vegetation, shore birds and marine life may be seen within the park. The mangrove swamp, with a boardwalk through it, allows visitors to explore the swamp's ecosystem. On the upland areas the tropical hardwood hammock's nature trail provides views of numerous exotic trees. Boulders around the swimming areas are Key Largo Limestone, showing examples of the coral reef lithology of this geological formation. The park's living reef is a modern counterpart of the ancient reef that produced these rocks. The present reef is made of the same plant and animal communities

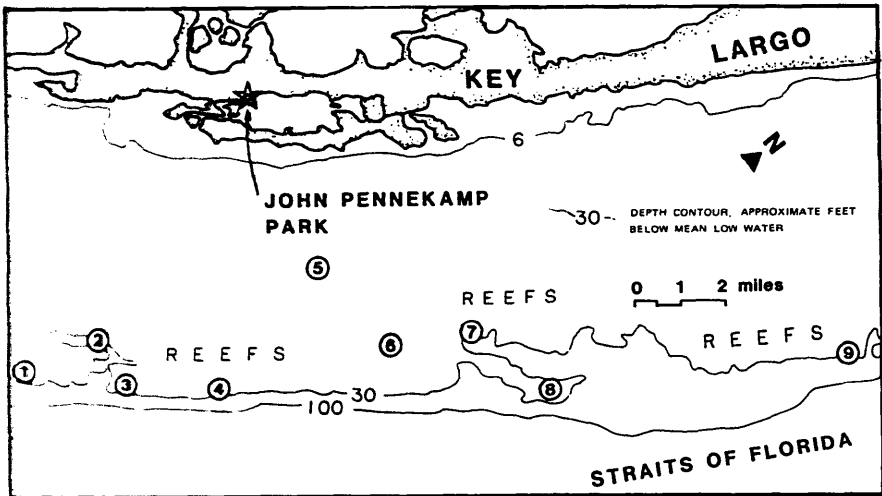


Figure 14. John Pennekamp Coral Reef State Park, showing points of interest on the reef tract: 1) Molasses Reef is toured by the Park's glass-bottomed boat; 2) White Banks Dry Rocks, with 5 to 15 feet of water, is a good reef to snorkel; 3) French Reef has underwater caves, cliffs, and canyons; 4) the Benwood Wreck, the hull of a World War II freighter that was torpedoed by a German sub; 5) Garret's Reef and the Cannon Patch, less than 10 feet under water, has several coral encrusted cannon; 6) Grecian Rocks, an easy reef to snorkel, averaging about six-feet deep; 7) Key Largo Dry Rocks has a nine-foot tall bronze statue, "Christ of the Deep," in water less than 20-feet deep; 8) The Elbow has several ship wrecks and shallow water for diving; 9) Carysfort Reef, with depths from five to 40 feet, and Carysfort Reef Light Station, built in 1882, provides some of the best diving conditions in the Keys. Map compiled from NOAA Nautical Chart 11451, U.S. Geological Survey topographic maps, and park information guides.

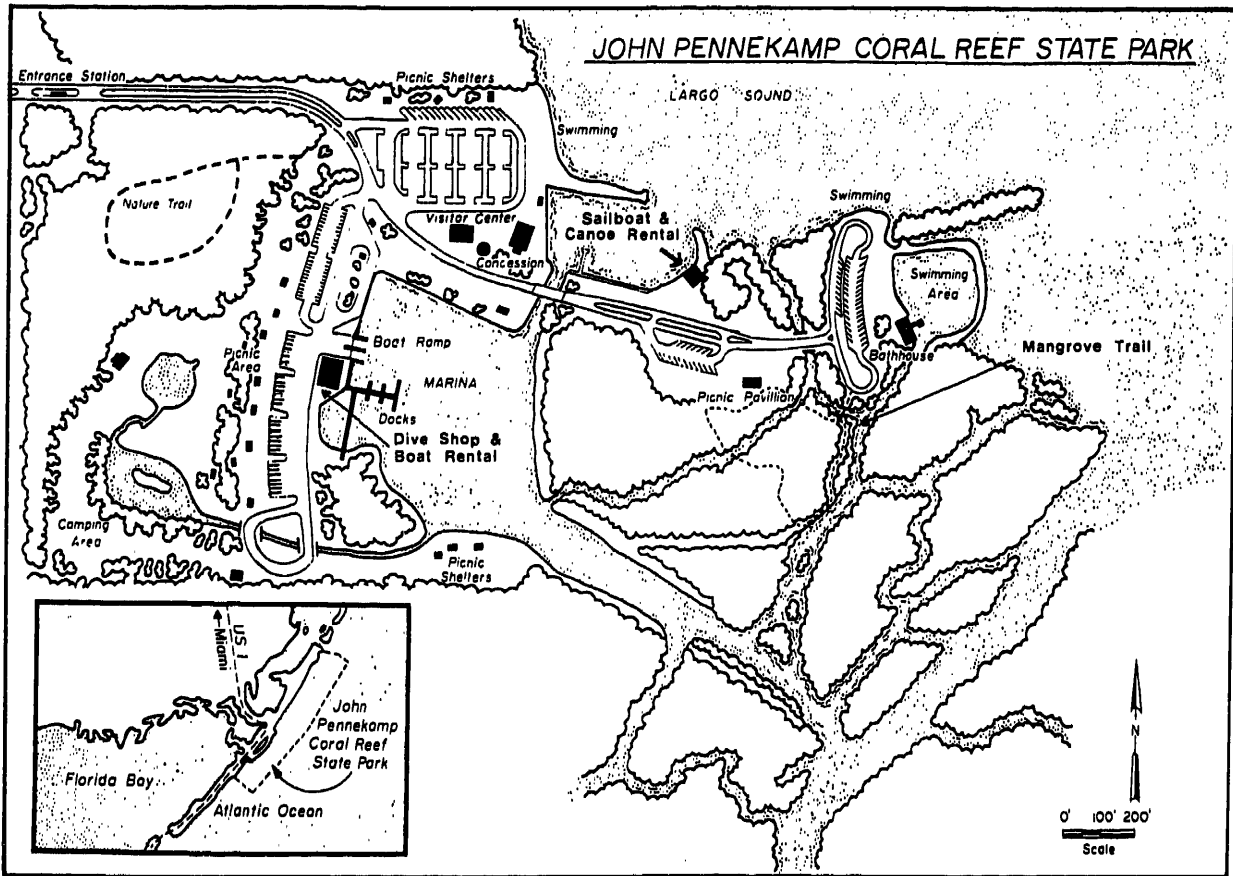


Figure 15. John Pennekamp Coral Reef State Park.

that created the emergent islands of the Keys.

Although the park and marine sanctuary encompass hardwood hammocks, mangrove swamps, seagrass beds, and coral reefs, the coral formations and associated marine life attracts the most visitors. Coral reefs are among the most beautiful and interesting of all living communities. They represent a colorful, very complex and prolific ecosystem. Daily, glassbottom boat tours are available for visitors who do not wish to dive onto the reef. Figure 14 shows the locations of points of special interest on the reef tract.

The park offers a variety of recreational facilities, including a visitor center with nautical history exhibits and slide programs, concessions, a dive shop, sailboat and canoe rentals, boat launching ramp, picnic and camping areas, and swimming areas with bathhouses (Figure 15).

Park Rangers provide special snorkeling programs to familiarize visitors with the most desirable method of observing the coral reefs. Maps and instructions are available for the most interesting sites on the reef. Campfire programs are provided during the winter season. Guided walks and canoe trips are provided year-round. For further information, write or phone John Pennekamp Coral Reef State Park, P. O. Box 487, Key Largo, FL 33037. Telephone (305) 451-1202.

LIGNUMVITAE KEY STATE BOTANICAL SITE

The serenity and isolation of remote islands have always captured man's imagination. Lignumvitae Key is no exception. To step ashore here is to take a step back into the past (see Figure 16).

The Matheson House, built in 1919, has changed little over the years. A windmill provides power, and fresh water is supplied from a cistern which is filled by rain falling on the roof. This is how island people lived during pioneer times when most of their needs were met by the land and sea around them.

This island is an ancient counterpart of a modern patch reef. Patch reefs are smaller reef complexes that grow in relative isolation, often behind the main reef line. The patch reef that became Lignumvitae Key grew behind its main reef, now the Florida Keys. Numerous modern patch reefs can be seen in the shallow water between the Keys and the main reef line that fringes the Florida Straits.

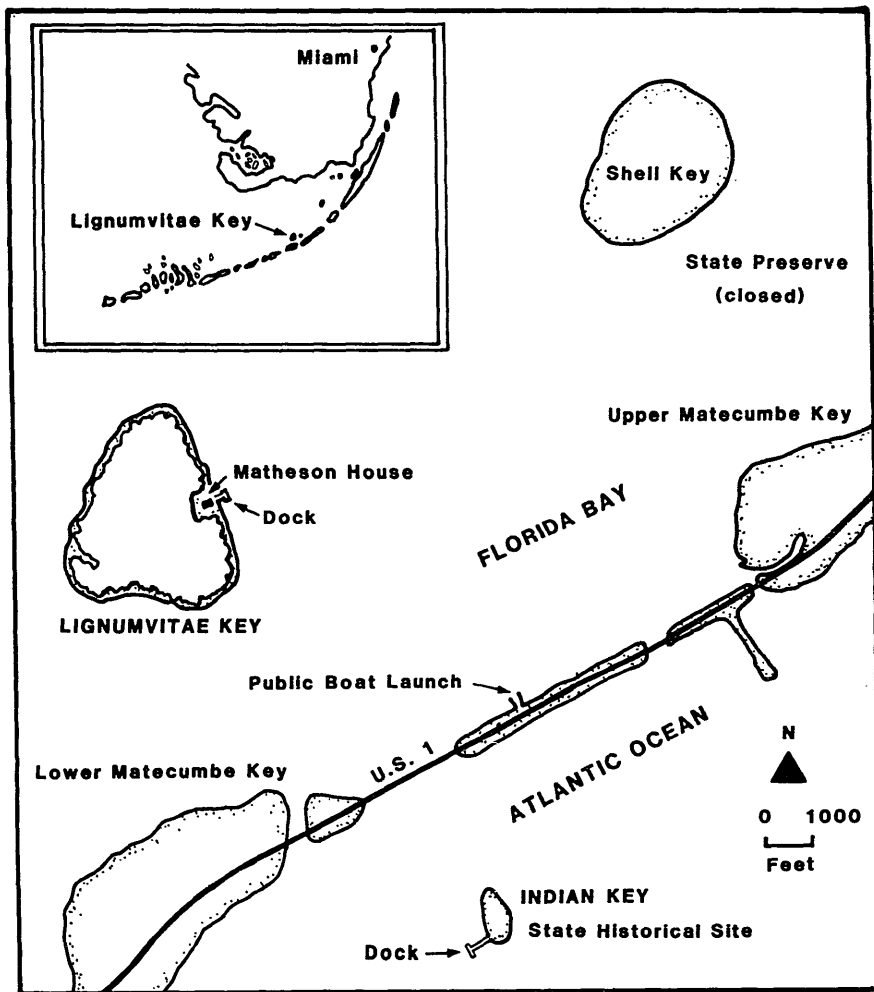


Figure 16. Lignumvitae Key State Botanical Site, showing the location of Indian Key State Historical Site southeast of Lower Matecumbe Key.

Thousands of years ago, the island began as a living coral reef jutting up from the sea floor. As great quantities of water began to freeze into glaciers at the earth's poles, the sea level dropped, exposing the top of the reef and forming an island composed of fossilized coral rock.

As time passed, storm tides and waves left seaweed, driftwood, and other organic debris stranded on the bare rock. This material began decaying and forming small pockets of soil in depressions in the coral rocks. Then a few seeds arrived from other tropical islands — some floating on the sea or carried by the winds, while others came in the digestive tracts of migrating birds. The seeds sprouted and began to grow, drop leaves, produce flowers and seeds, mature, die, and decay. With the passing of each generation, a complex and diverse tropical hammock colonized the remains of this ancient coral reef.

The virgin tropical forest that thrives here is typical of the kind of scenery that was once enjoyed on most of Florida's Upper Keys. As the Keys were developed to accommodate an increasing number of people, most of the unique vegetation was scraped away — making the tropical forest of Lignumvitae Key a very rare and special place. Here, a visitor can walk in the shade of trees with strange names like strangler fig, poisonwood, lignumvitae, and gumbolimbo.

Access to the Key is limited to privately owned boats or charter boats available at nearby marinas. A two-hour guided tour of the island and the Matheson House is given at 9 AM and a one-hour tour at 1 PM and 3 PM from Wednesday through Sunday. The visitor should wear walking shoes and bring mosquito repellent. To protect the fragile vegetation and environment of the Key, visitors must stay within the clearing except in the company of the interpretive guide or ranger. For further information, write or phone Lignumvitae Key State Botanical Site, c/o Long Key State Recreation Area, P. O. Box 776, Long Key, FL 33001. Telephone: (305) 664-4815.

INDIAN KEY STATE HISTORICAL SITE

Indian Key is located about three-quarters of a mile to the southeast of the north end of Lower Matecumbe Key (Figures 16, 17 and 18). Even though it is in front of the main reef tract the geological history of Indian Key is similar to Lignumvitae Key, discussed above. A small patch reef, exposed by falling sea level, formed the limestone foundation for Indian Key.

This small coral island, little more than 10 acres in area, figures prominently in Florida's early history, from pre-historic Indians to the 1830's. Archeological excavations have shown that Calusa Indians lived in the Keys for several thousand years prior to the arrival of the first Spanish explorers, who discovered Florida in 1513. The eastward-flowing Gulf Stream provided a quick route home for the treasure-laden Spanish fleets. The shoals and reefs south of the Keys proved to be extremely dangerous when tropical storms or hurricanes blew up unexpectedly. Many treasure-fleets were sunk on the reefs along the Keys, to the profit of the Indians. Later, in the mid-1700s, salvaging shipwrecks, or "wrecking," as it was called, became so profitable for local fishermen that the practice attracted pirates. American occupation of Florida in 1821 put an end to pirating. Key West became the wealthy center of the salvage-wrecking industry.

A newcomer, Jacob Housman, challenged the monopoly of Key West in 1831, when he bought Indian Key and built his own wrecking colony there. A few years of prosperity followed, during which Housman's political activities established the new Dade County, with Indian Key as the county seat. His fortunes declined rapidly, forcing him to mortgage the island. In 1840, during the Second Seminole War, a large band of Indians attacked the community, killing several people and destroying buildings. No one has lived on Indian Key since the late-1800s. The archeological excavations, the foundations of buildings, cisterns, and partially restored buildings provide the visitor with a sense of the colorful, adventurous lives of these "wreckers."

An observation tower, boat dock, shelter, and trails are provided. There are no rest rooms. Most facilities and activities are *not* accessible to the handicapped. For further information, write or phone the Park Manager, Long Key State Recreation Area, P. O. Box 776, Long Key, FL 33001. Telephone: (305) 664-4815.

LONG KEY STATE RECREATION AREA

The bedrock of Long Key is Key Largo Limestone, although much of it is thinly covered by carbonate sand, Figures 19 and 20. The park beach in Figure 19 shows the vulnerability of the key's shoreline to wave erosion; the shoreline has been cut back to a point where trees are being undermined. Comparing this exposed, eroding beach with the shoreline in Figure 4, which is accreting seaward due to mangrove growth, illustrates the importance of mangroves as a geological agent and as a buffer against storm damage.

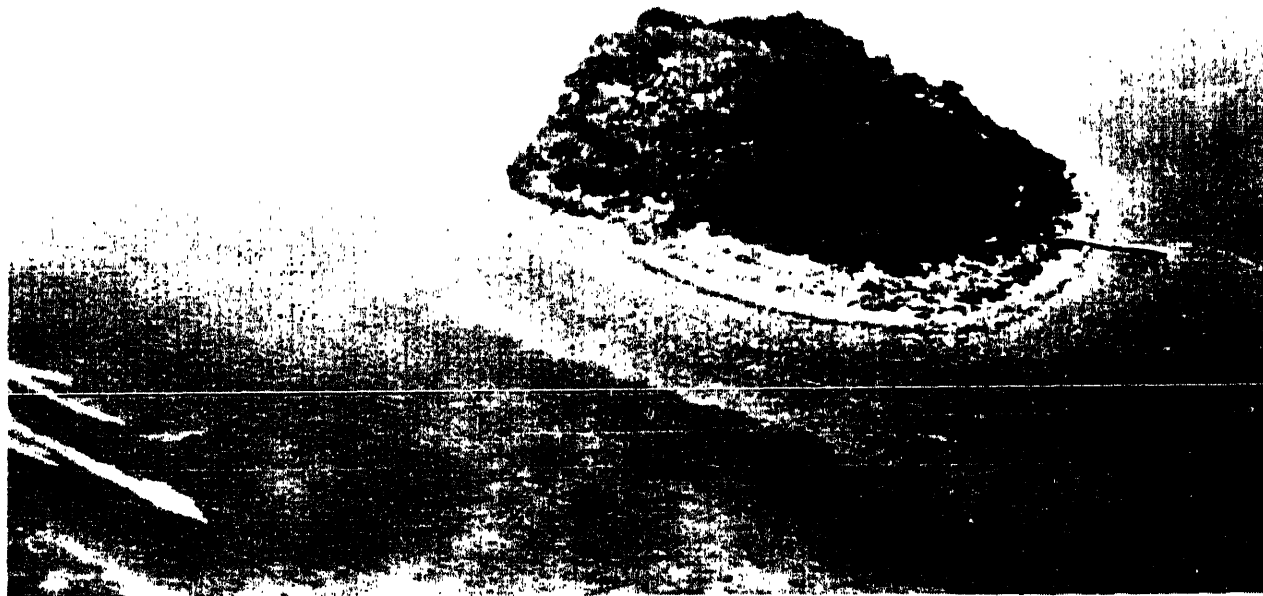


Figure 17. Indian Key State Historical Site, a Pleistocene age patch reef, now exposed above sea level. The darker tones in the water locate deeper channels that are scoured by strong tidal currents between the islands of the Keys. Photo by Dr. Renate Skinner.

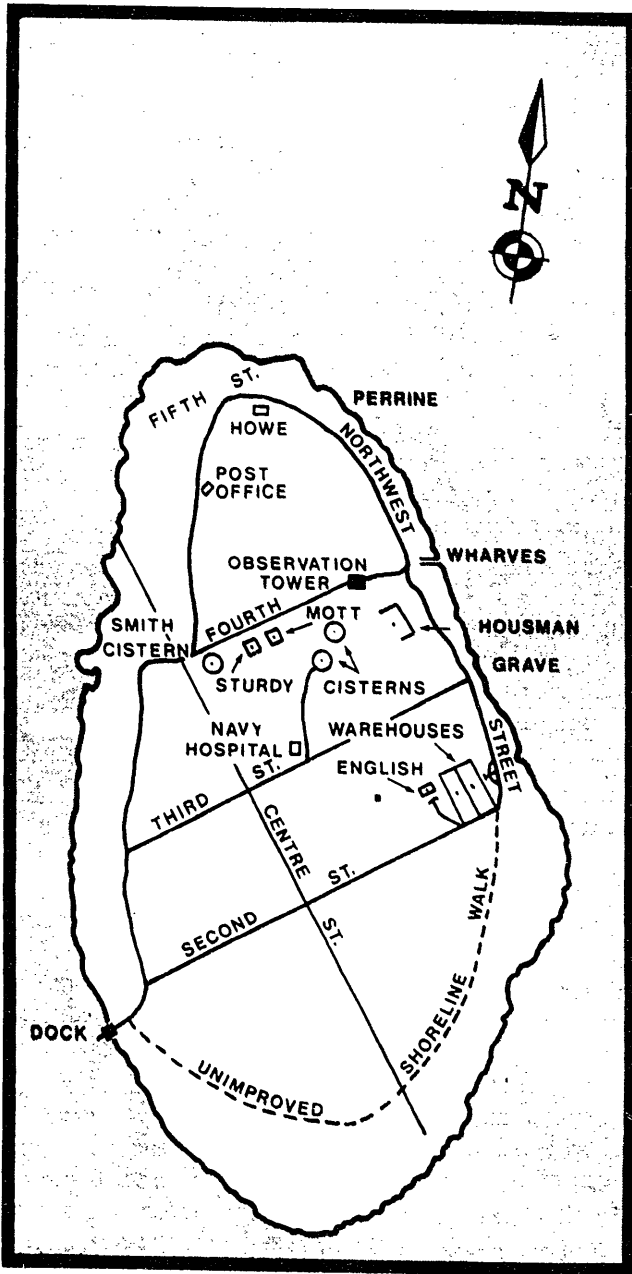


Figure 18. Map of Indian Key showing archeological sites.

The shallow flats seaward of Long Key and the mangrove-lined lagoons support an abundance of marine life. Wading-bird populations can be readily observed in these areas, particularly during the winter months. A trail winds through natural areas of the key, along the beach, and over a mangrove-lined lagoon.

Long Key State Recreation Area provides an opportunity to enjoy the natural values of a typical Florida Key. The subtropical climate, clear waters and abundance of marine life associated with the Florida Keys have attracted man since early times. The Calusa Indians lived off the abundant plant and animal life long before the first Spanish explorers arrived. After the Spanish occupation, the keys attracted settlers from other islands, such as the Bahamas, who made their living from the sea.

These remote keys were no longer isolated when, in 1912, the Key West Extension of the Florida East Coast Railroad was completed. The viaduct west of Long Key was the first bridge built by the railroad crews, and was the trademark of the Henry Flagler railroad.

Long Key was an important depot during the days of the railroad. Flagler established the Long Key Fishing Club as a mecca for the world's greatest saltwater fishermen. The era came to an end on September 2, 1935, when a hurricane destroyed the fishing club and the railroad.

Park Rangers present campfire programs and lead guided walks year-round. They also offer informative programs on snorkeling, fishing, canoeing, and the marine ecology of the area. For further information, write or phone Long Key State Recreation Area, P. O. Box 776, Long Key, FL 33001. Telephone: (305) 664-4815.

BAHIA HONDA STATE RECREATION AREA

In Spanish, Bahia Honda means "deep bay." This southernmost state recreation area's boney skeleton is an ancient coral reef thinly covered by beaches and dunes of carbonate sand, and mangroves (Figure 21). Bedrock is Key Largo Limestone.

The very shallow, clear water around the island provides an opportunity to observe marine plants and animals that inhabit the carbonate-sand sea bed. Bahia Honda has a number of tropical plants that are not often found on the other islands. Among the rarer species are the satinwood tree, spiny catesbaea and dwarf morning glory. The birdlife of Bahia Honda includes beautiful and rare species such as the white-crowned pigeon, great white heron, roseate spoonbill, reddish egret, osprey, brown pelican, and least tern.

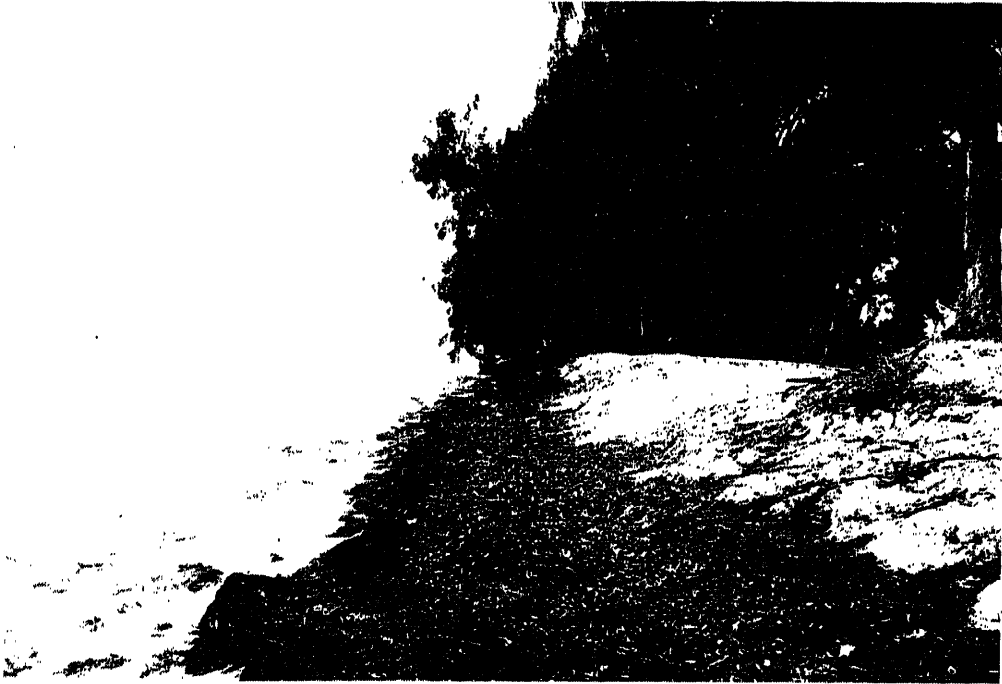


Figure 19. Ocean-facing beach at Long Key showing erosion. The trees are rooted in thin carbonate sand that covers bedrock. Photo by the author.

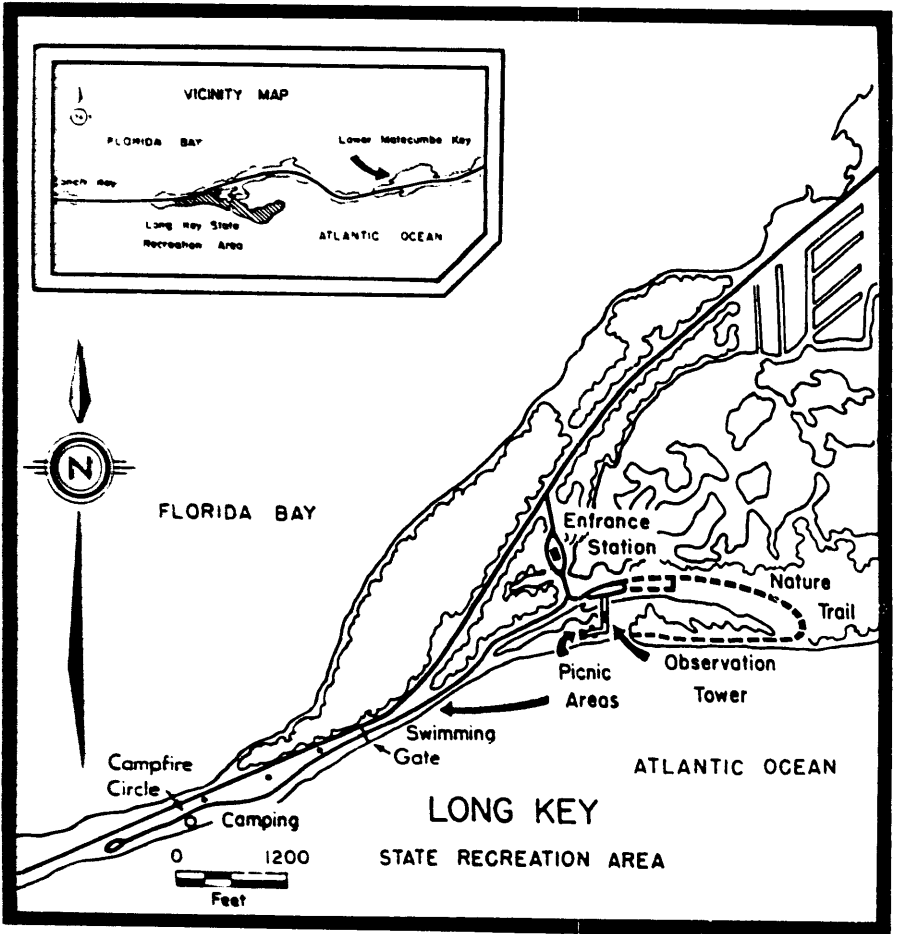


Figure 20. Map of Long Key State Recreation Area.

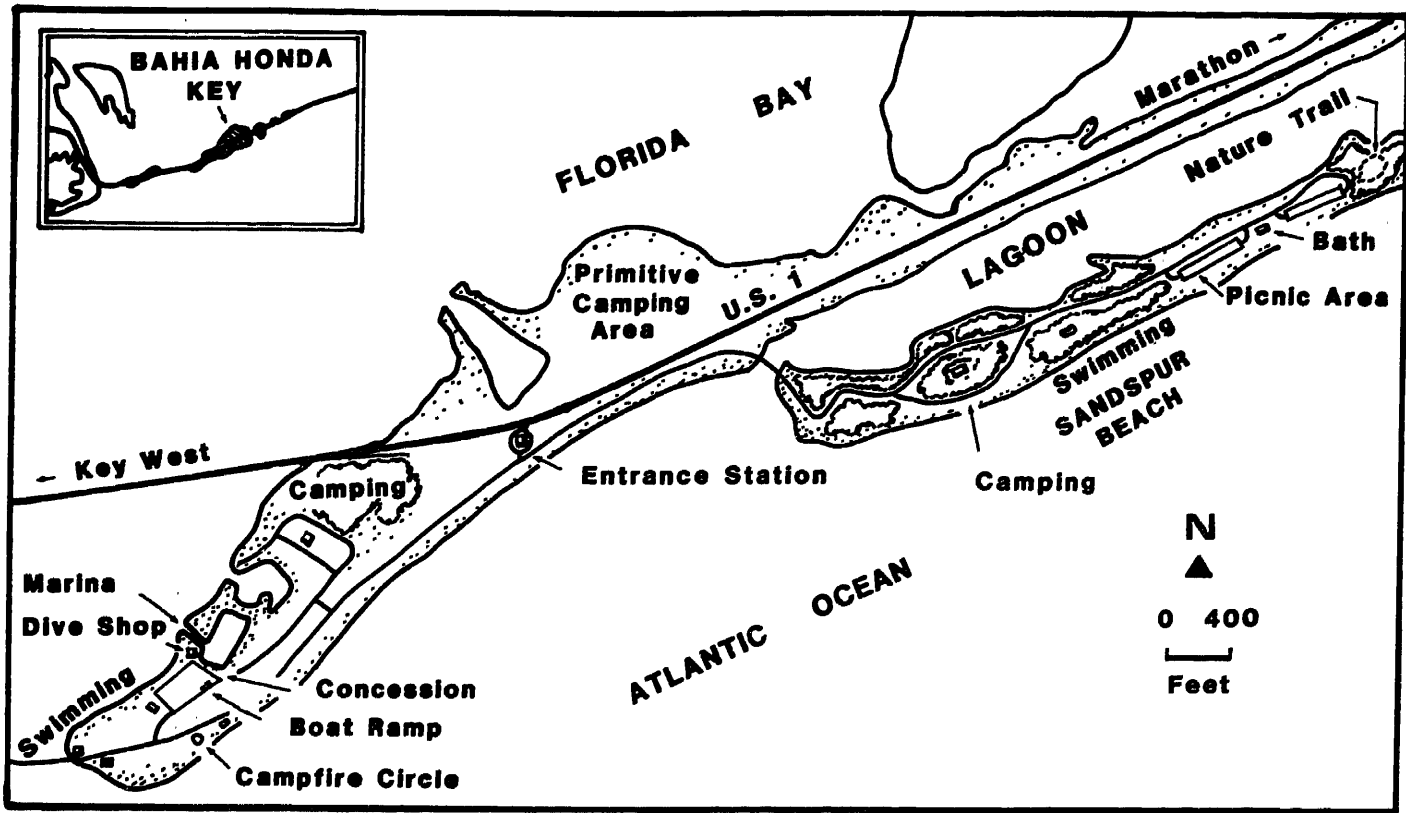


Figure 21. Bahia Honda State Recreation Area.

The island remained fairly isolated and remote until the railroad spanned the channels with bridges of steel and concrete to link Key West with the mainland. The island became part of land holdings of the Florida East Coast Railroad until the company abandoned the line after the 1935 hurricane destroyed the railroad. The original train trestle is still visible as part of the old Bahia Honda Bridge.

Regular campfire programs and guided walks are provided during the winter season, with special interpretive programs provided to groups by reservation. At the northeast end of Sandspur Beach, a nature trail follows the shore of a tidal lagoon, goes through a coastal strand hammock and returns along the beach. For further information, write or phone Bahia Honda State Recreation Area, Route 1, Box 782, Big Pine Key, FL 33043. Telephone: (305) 872-2353.

SELECTED BIBLIOGRAPHY

Florida State Park leaflets, available at the respective parks.

Florida Division of Forestry, 1980, *Forest Trees of Florida*: 102 pp.

Multer H. Gray, 1971, *Field Guide to Some Carbonate Rock Environments, Florida Keys and Western Bahamas*: Miami Geological Society, Miami, FL. 158 pp.

West. Erdman and Lillian E. Arnold, 1946, *The Native Trees of Florida*: Univ. of Florida Press, 212 pp.

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