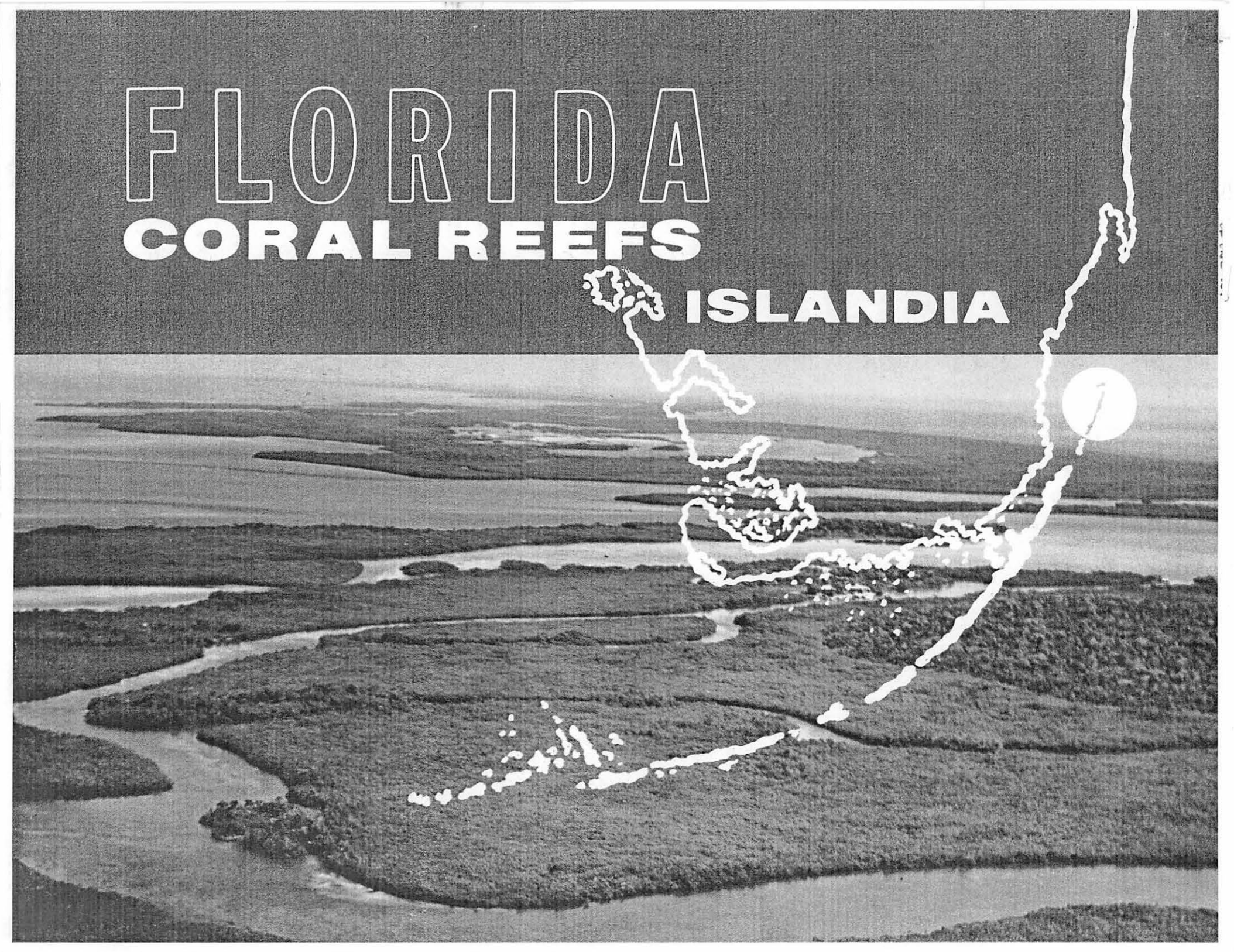


FLORIDA

CORAL REEFS

ISLANDIA



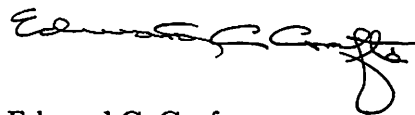
FOREWORD

In their present relatively undeveloped state, the upper Florida Keys and the adjoining waters and submerged lands of Biscayne Bay and the Atlantic Ocean are an environmental element highly important to Florida and a valuable recreation resource for the nation.

Fully aware that intensive private development would greatly alter these values, the Secretary of the Interior directed the National Park Service and the Bureau of Outdoor Recreation, assisted by the Fish and Wildlife Service, to conduct studies of the area.

This interim professional report is the result of these studies. It is being distributed now to solicit the comments and suggestions of interested parties. The additional information obtained in this manner will be utilized by the National Park Service and the Bureau of Outdoor Recreation to complete the study and formulate recommendations to the Secretary of the Interior.

It is requested that comments and suggestions on this interim professional report be sent to the Regional Director, Southeast Region, National Park Service, P. O. Box 10008, Richmond, Virginia 23240. Material should be submitted in time to reach the Regional Director on or before August 15, 1965.



Edward C. Crafts
Director
Bureau of Outdoor Recreation



George B. Hartzog, Jr.
Director
National Park Service

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THE STUDY

In response to interest expressed by the Dade County Board of Commissioners and conservation-minded individuals and organizations, the Secretary of the Interior directed the National Park Service and the Bureau of Outdoor Recreation to conduct studies of the upper Florida Keys. Such studies would be directed toward an evaluation of the natural resources and, if indicated, recommendations for their preservation and development for public use and enjoyment.

Currently the area is used principally for outdoor recreation. Boating, sports fishing, skin and scuba diving, picnicing, camping,

weekending, and vacationing are engaged in extensively.

Dade County's 90-acre Elliott Key Park, maintained primarily as a "primitive area," offers limited swimming, camping, picnicing, and harbor facilities, as well as fishing and hiking. Homestead Bayfront Park offers a fine marina facility on the mainland. This area is also in the Dade County Park System. John Pennekamp Coral Reef State Park provides an unusual underwater experience for the experienced diver. Glass-bottom boats open up the underwater scene to those who prefer to remain on the surface.

THE CORAL REEFS

THE RESOURCE

The study area is located south of Miami and is accessible only by boat. It includes a portion of the upper Florida Keys, together with portions of the adjoining waters and bottoms of the Atlantic Ocean and Biscayne Bay.

The upper Florida Keys are a chain of narrow islands separating Biscayne Bay from the Atlantic Ocean and lying three to seven miles off the Florida mainland south of Miami. A bulkhead line has been established along these Keys. This is a line fixed by local authorities and trustees of the In-

ternal Improvement Fund, an instrumentality of the State of Florida. Shoreward of this line, filling is permitted; seaward, it is not. Dredging and filling within the present established limits would enable the upper Florida Keys to about double their present land area.

The upper Florida Keys are essentially marine in character. The waters surrounding them have high clarity, and it is these waters and the biota inhabiting them that have directed our attention to the study area.



THE CLIMATE

"Subtropical" aptly describes the warm, mild climate of this part of the United States. The major influences on the climate are the Gulf Stream, which lies only a few miles off shore, and the Trade Winds, which warm the air in winter and cool it in summer.

In Dade County, mean maximum temperatures range from about 77 degrees in January to about 90 degrees in August, and mean minimum temperatures range from about 54 degrees in February to about 72 degrees in July and August. Killing frosts are infrequent. Temperatures of 32 degrees or less occur about every other year at Homestead and much less frequently near the ocean. From June through October, the relatively high humidity averages from 60 to almost 90 percent, and in the dry season is five to ten percent lower.

Average annual rainfall runs between 50 and 60 inches. The rainy season occurs in summer and early fall (September and October are the months of most rain-

fall), while the winter months, November through March, are usually quite dry. Over 60 percent of the days are classified either as clear or partly cloudy, with most of the clear days occurring during the winter months.

The lunar tides along the coastline of the upper Florida Keys are semidiurnal. Mean tide ranges vary from about 2 feet at Sands Key to about .2-foot in lower Barnes Sound, and mean high tide in the same area varies from about 1 foot to about .1-foot. Maximum hurricane tide of 16 feet may occur. Surf and heavy wave action are almost entirely absent along the oceanfront of the study area.

This section of the country is occasionally struck by hurricanes, some of which cause heavy damage. Especially severe hurricanes occurred in September 1926, November 1935, September 1945, October 1950, and September 1960. Hurricanes occur most frequently in September and October.

*Mangroves and Shallows between
Totten Key and Old Rhodes Key;
Caesar Creek and Elliott Key in the Horizon*

THE ECOLOGY

Generally, the upper Florida Keys consist of an outer barrier of coral limestone on the ocean side sheltering mangrove swamps on the inner side. The seaward side of the Keys is a nearly flat sheet of limestone that passes beneath the sea without appreciable change of slope and with little trace of wave-cut scarp. At most places shoal water extends several miles and then slopes abruptly to greater depths. These shoals are partly covered by living coral reefs.

The emerged coral reef forming the seaward shore is composed of Key Largo limestone containing coral heads in their original position. Although quite hard, the limestone contains so many cavities that crushed stone may occupy less space than the original rock.

At the beginning of the Sangamon inter-glacial stage (Wicomico time), when the Floridian Plateau lay beneath water 100 feet deeper than the present sea level, a coral reef began to grow on the southeastern edge of the Plateau. By Talbot time, the sea had dropped to about 40 feet above its present level, a depth favorable for the growth of coral reefs, and the Key Largo limestone reef grew upward until it was within 20 or 25 feet of the surface, perhaps less. Meanwhile, the Miami oolite was accumulating in the shallow water behind the reef. When the sea fell during the Wisconsin glacial stage, the coral reef died. It was submerged again briefly during the mid-Wisconsin recession (Pamlico time), but soon emerged and has since remained above water except in the low passes between the present Keys.

Coral-bearing Key Largo limestone is used as building stone. Because the surface rocks of the mainland contain almost no quartz, they have yielded little sand for the seashore. Very little sand has drifted southward along the coast beyond the entrance to

Biscayne Bay. As a result, the ocean shores of Elliott and Rhodes Keys are mostly rough coral rock with very little sandy beach. Only on Sands Key are there good beaches of any size.

The flora of the Florida Keys includes a number of species not found on the mainland. These species were supposedly carried in from the West Indies by the Gulf Stream which flows northward just off the coast.

These Keys are almost completely covered with woody vegetation. The western side and all land subject to tidal overflow are covered with red, white, and black mangroves, which occupy from one-fourth to one-third of the total area. Tropical hardwoods are predominant on the higher central portion of these keys and come down to the ocean shore except in the lower places where the shoreline is bordered with mangroves. Most of the tropical hardwood growth is 20-40 year old second growth that followed cultivation or fire. Only very small areas of the original forest remain here and there, but even so these Keys are reported to have the best remaining remnants of the once splendid tropical forests of South Florida. Some few large mahoganies, vestiges of the fine stands cut for ship building over the past 200 years, still exist on these islands, especially on Sands Key. Rhodes Key has the largest proportion of undisturbed hammock while the woody vegetation on Totten Key is principally mangroves, as is the case with the other smaller Keys.

Among the plants of interest is the Hog Palm or Sargent Palm (*Psuedophoenix vinifera*). This close relative of the Royal Palm, once abundant on Elliott Key, was for some years thought to be exterminated but has recently been seen again on Elliott Key.

Other trees of interest are Red-Berried *Eugenia* (*Eugenia confusa*), Torchwood (*Amyris elemifera*), Joewood (*Jacquinia keyensis*), Seven-year Apple (*Casasia clusiifolia*), and Jamaica Dogwood (*Ichthyomethia piscipula*).

The Australian Pine also occurs on the islands, having been introduced by winds and birds. If indigenous vegetation is to be preserved, this exotic weed must be completely eradicated.

Raccoon, opossum, and mink have been observed as well as that interesting creature, the manatee, which frequents the creeks of the Keys and feeds on the grass flats of Biscayne Bay.

Elliott Key may be the northern breeding outpost for such West Indian species as the White-Crowned Pigeon and Cuban Golden Warbler, and some rare species much in need of protection wherever they occur, such as the Reddish Egret, Swallow-tailed Kite, and Short-tailed Hawk, may have small breeding populations in the area.

In general, the ecology of the Keys does not favor an abundance of water birds because, other than dense mangrove swamps, the wetlands are limited. The one exception is the wide tidal mud flat between Old Rhodes Key and Totten Key which seems to be a productive feeding ground. The nesting place of most of the colonial water birds that feed on these flats appears to be the northeastern island of Arsenicker Keys. The Arsenicker Keys—Old Rhodes Bight area apparently is an ecological unit as far as water birds are concerned.

Of most interest in conservation of rare reptilian species is the probable occurrence of the American

Crocodile and several species of sea turtles. In addition to three Atlantic species of sea turtle (Loggerhead, Ridley and Leatherback), it is almost certain that the Atlantic Hawksbill and, more rarely, the Atlantic Green Turtle, occur in Islandia waters. The scarcity of broad sand beaches makes it unlikely that the study area is an important sea turtle nesting area. In the past, the range of the American Crocodile included Biscayne Bay and as recently as two years ago this beast was still to be found on northern Key Largo at a point some seven miles below the southern boundary of Dade County. Definite records are wanting, but scientists consider it likely that the crocodile occurs in the maze of islands and waterways around Caesar Creek and Broad Creek.

The numerous keys present a varied series of habitats for marine life. The bay side of the keys is typically marl mud with marine grasses forming dense meadows which are the principal nursery grounds for shrimp, spiny lobsters and many marine game and food fishes. There are also numerous outcroppings of the limestone which afford a settlement for numbers of sponges, many of them of commercial value although now largely unexploited.

On the seaward side of the Keys the shore is low, usually rocky with the bottom shoal and covered with corallines, small cluster corals, algae and marine grasses, but more rapidly deepening than the bay shore and exposed to moderate wave action. A few yards offshore there are usually coralline rock outcrops covered with low coral growth and sea-feathers, sea whips and sponges and frequented by numerous fishes and spiny lobsters.

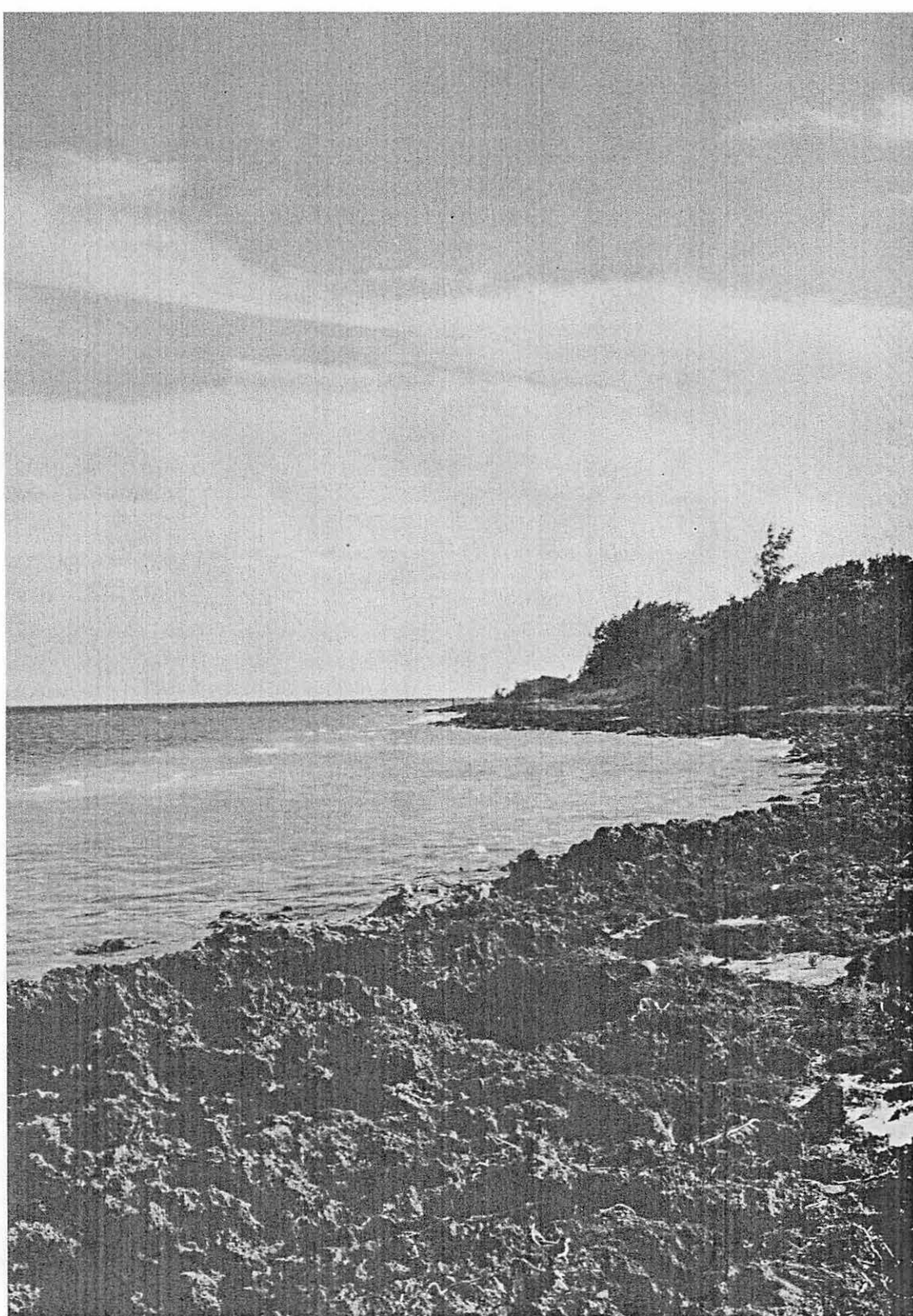
The corals are formed by millions of tiny soft-bodied colonial animals, laying down lime secreted from the sea. Except for brain corals, which are massive, the

stony skeletons are fragile even when alive. They are torn up and overturned by hurricane seas, and they live perilously in this, the northernmost range of corals along the Atlantic Coast.

From an underwater naturalist's point of view, these marine gardens display four separate ecologies: (1) Pastures of turtlegrass where one can find thirty-two different kinds of starfish alone and six species of sea anemones. Here also are curiosities like the sea cucumber and the sea hare. (2) "Hard pan" bottoms where forests of sea fans, sea whips and giant sponges grow. (3) Miniature reefs and coral heads which include a number of delicate, shallow water forms. (4) The dark, still water under the mangrove labyrinth—a fantastic marine nursery. On the west side of Elliott Key, near the County Park, these four ecologies can be found in miniature in two or three feet of water, each one only a few yards from the other. This shallow water is a fairyland for children to look at in safety. They thrill to the sight of shark and barracuda that look big under water but are actually only eight inches long. From beneath the surface, a ten inch limestone cliff, complete with caverns full of snapper, lobster, and parrotfish, looms as large and mysterious as Captain Nemo's caves. Adults are no less thrilled than children at these amazing underwater sights.

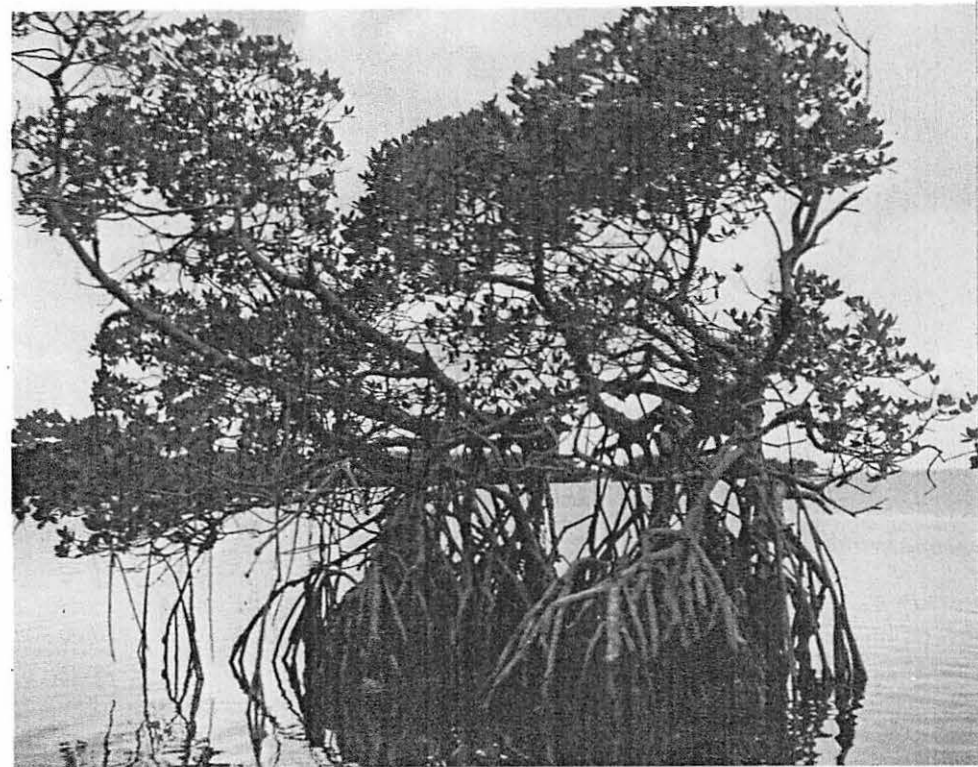
Between the Keys are various passes or creeks, as they are locally termed, some of which are fairly wide and shallow, and some narrow, only a few hundred feet wide, twisting, but deep, down to 25-30 feet, with crystal clear water. These creeks are the haunts of teeming thousands of fishes which live among the corals, sponges and seafeathers on the bottom. There are such fishes as groupers, snappers, jewfish, Spanish hog fish, barracuda, yellowtails and many others. Over 250 species of marine fishes occur along the shore.

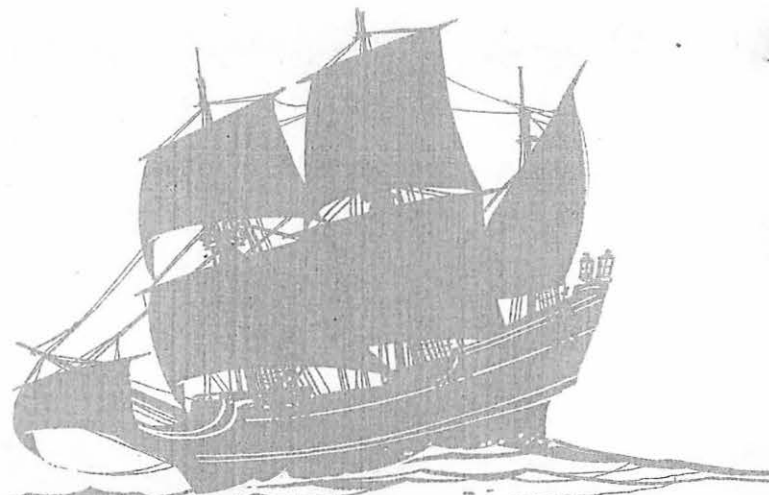
Wild Shore of Elliott Key





Mangroves on Sands Key





MAN AND THE CORAL REEFS

No archeological sites were observed during the field investigations, but such sites are not infrequent from Key Largo south, so may occur within the study area.

The Florida Keys were known to Europeans from about 1500 onward. Ponce de Leon named them Los Martires in 1513. A young Spanish boy, Escalante de Fontenada, taken prisoner from one of the frequent shipwrecks that occurred on the uncharted reefs, was held captive by the Indians for 17 years before making his escape. His *Memoirs* give us the first written account of the South Florida natives.

Pirates made these keys their base of operations and an inlet between Elliott and Old Rhodes Key was a refuge for such notorious pirates as the Black Caesars. Black Caesar the Second is said to have kept both loot and prisoners on Elliott Key.

Under different flags (Spanish, English, United States), the Keys of Islandia and surrounding waters have borne differing names. Biscayne Bay, for example, was once known as Sandwich Gulf.

Following the emancipation of slaves in the Bahamas in 1834, and the failure of many plantations, pioneer families who had originally emigrated from Georgia and the Carolinas to the Bahamas, Green Turtle Cay and Governor's Island again crossed the Gulf Stream and homesteaded on the Florida Keys.

Colonel Robert E. Lee visited Biscayne Bay in 1849, under instructions from General Joseph Totten (Totten Key), Chief of Engineers, Washington, and the War Department, to consider the advisability of local military installations. Captain M. C. Meigs (Meigs Key) was later Captain of Engineers based at Key West during the Civil War. Key West was the largest salvage center in the United States.

Dr. A. J. Hanna writes in his *Flight to Oblivion* that General John Breckinridge, Confederate Secretary of War, sailed down Biscayne Bay to Elliott Key and escaped through Caesar's Creek, taking what was left of the Confederate treasury to safety. One diary of that era recorded that "scores of Flamingoes, vermillion scarlet" were on Elliott Key.



Sponge fishermen on Sands Key

In 1886, Jeremiah Saunders from Green Turtle Cay in the Bahamas was granted land on Elliott and Adams Keys by the United States. He was a planter and lived on the ocean side of Elliott Key, a mile north of Caesar's Creek, with his family. In those days, according to one of his daughters-in-law, the land grew large trees some "two feet in diameter and 100 feet tall." After these trees were cut, the planters then burned the cleared land and "the rock went to lime and pineapple slips were planted in the powder." Almost all the high land was eventually burned.

Among the other early inhabitants of Islandia were William D. Albury and his family who lived at the south end of Elliott Key, his parents who lived on neighboring land along the ocean front, and the Henry Filers who lived at the northern end of Elliott Key. Of all the early settlers' homes, only that built by Arthur and Edgar Higgs still stands.

Although relatively undeveloped, the keys within the area studied are by no means undisturbed by the hand of man. Much of the higher land was farmed

until the early 1900's. The largest of the keys, Elliott, was rather extensively cleared and planted to pineapples and cane. Hogs were raised on it in considerable numbers.

Bridging the gap from past to present we find that commercial harvesting of natural resources is confined largely to the waters of Islandia. Neither agriculture nor harvesting of forest products is now carried on within the study area. The relatively young even-aged forest which has replaced the valuable original tropical hardwood forest has little commercial value.

Currently, the area is used principally for outdoor recreation. Boating, sports fishing, skin and scuba diving (made most rewarding in these waters by the underwater wonders), picnicking, camping, week-ending and vacationing are engaged in extensively. Dade County's 90-acre Elliott Key Park, maintained primarily as a "primitive area," offers limited swimming, camping, picnicking and harbor facilities as well as fishing and hiking.

THE SITUATION

DEVELOPMENT POSSIBILITIES

In December 1960, the upper Florida Keys in Dade County were incorporated as the City of Islandia. Included in the new city are 385 tracts of land owned by 346 individuals as well as Elliott Key Park and some other publicly owned property. The City of Islandia has requested the State of Florida to build a causeway to Islandia and the private property owners there are said to be planning a high class development of attractive homes and plush motels.

Although no industrial development appears to be planned for the Keys in the study area, the construction of industry on the mainland, such as an oil refinery, would probably cause water and air pollution that would damage the natural values of the area, especially marine life. The construction and use of ship channels or causeways would certainly alter natural conditions and the scene, and would materially change the marine ecology.

SIGNIFICANCE FOR PRESERVATION

The study area is a combination of land, water and terrestrial, marine and amphibious life that is rare in continental United States.

The best vestiges of South Florida's tropical forest are within the boundaries of the proposed area, and these vestiges contain species not found on the mainland. The land, water and vegetation of the area shelter many species of animals, some of which are rare species sorely in need of protection.

John Pennekamp Coral Reef State Park is 21 miles long and about 3½ miles wide, lying in the Atlantic Ocean off Key Largo. It contains spectacular underwater formations, including both lagoon and barrier reefs and scores of colorful and unusual fish. Forty of the fifty-two species of coral known for the Atlantic Reef System are found in this State Park.

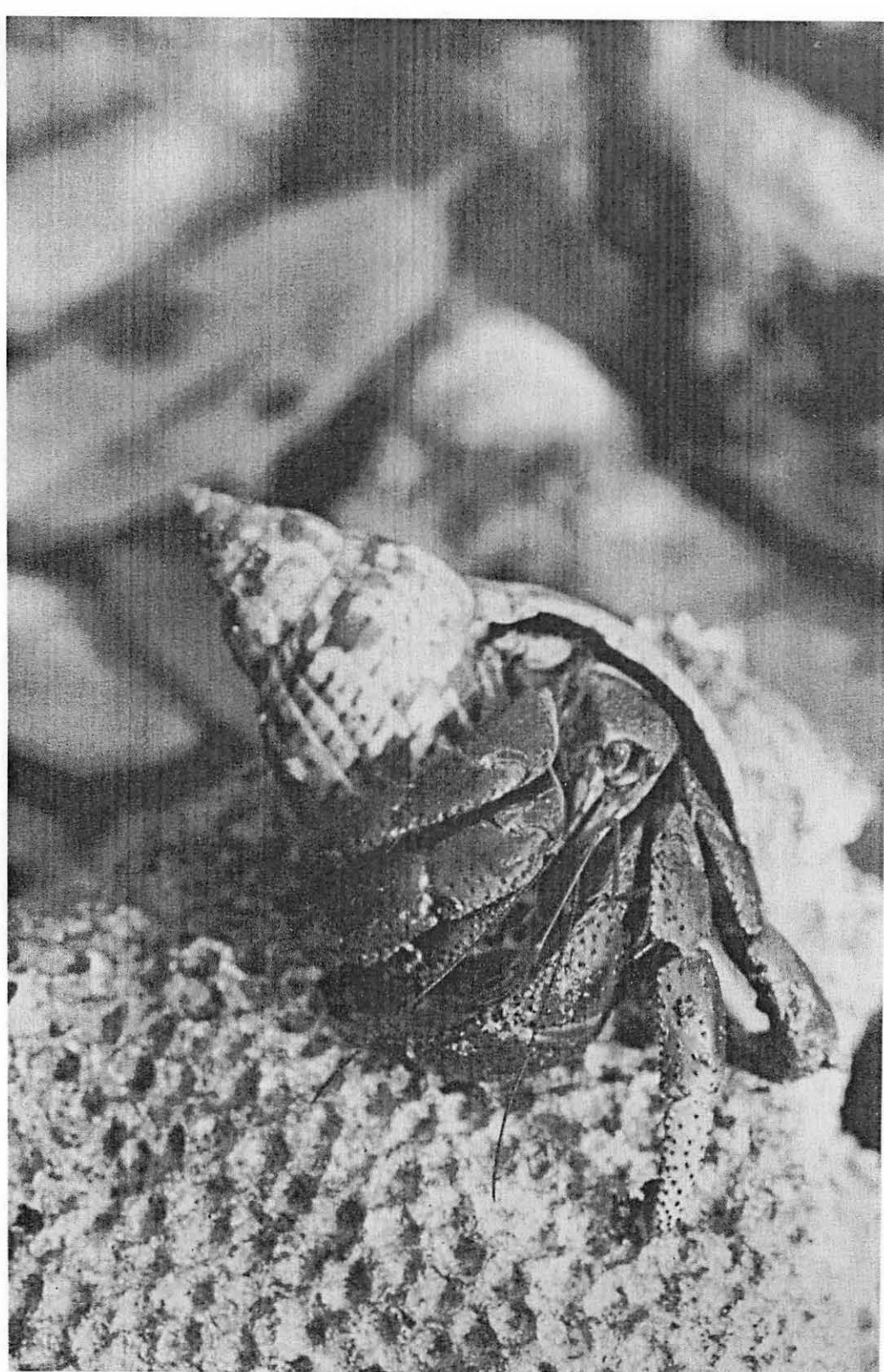
Most significant of all the area's attributes are the clear, sparkling waters, marine life, and the sub-

merged lands of Biscayne Bay and the Atlantic Ocean. Here in shallow water is a veritable wonderland. Corals, sponges, grasses, crabs, shellfish, starfish, and reef fishes are but a few of the life forms inhabiting this colorful underwater kingdom. The whole area is an enormous underwater nursery where reef and pelagic fish hatch and grow before daring the ocean.

Intimately associated with the natural features are significant outdoor recreation values. Those pre-eminent for their own sake, such as boating and fishing, are enhanced by both the natural beauty and the climate of the area. Those engaged in primarily as a means of viewing and enjoying underwater life, such as skin and scuba diving, are still rewarding activities. Type and volume of public use must be compatible with preservation of natural conditions and should be governed accordingly.

Current causeway, real estate and industrial proposals are immediate threats to natural features within the study area.

Hermit Crab and Fossil Coral on Elliott Key



THE OPPORTUNITIES

The area provides highly significant water-related outdoor recreation opportunities. There are unusually fine opportunities for skin diving, underwater nature study, and enjoyment of the beauty of the underwater world. Large stretches of water only two to three feet deep offer rare opportunities for children to fish-watch and observe other subsurface life.

The area is essentially marine in character. It is the marine life made possible by the clear sparkling waters of Biscayne Bay and the Atlantic Ocean that make the proposal outstanding.

The higher ground within the study area is now covered with a 20-40 year old second-growth tropical hardwood forest, said to be the best remaining remnant of the once splendid tropical forests of South Florida. If it is preserved undisturbed, this second-growth forest will eventually approximate the size and composition of the original forest.

Only by bringing these resources into public ownership will they be adequately and permanently protected and preserved for public use and enjoyment.

If this rare combination of land, water and terrestrial, marine and amphibious life is to be preserved for the use and enjoyment of this and future generations, there must be immediate action to set aside the resource in its present condition.

ALTERNATIVE PLANS

The boundaries suggested in the three alternative plans presented in this report encompass an area which can be preserved, administered, developed, maintained, and operated for public use and enjoyment.

Within the boundaries are land and water which harbor terrestrial, marine and amphibian life of exceptional significance.



PLAN 1

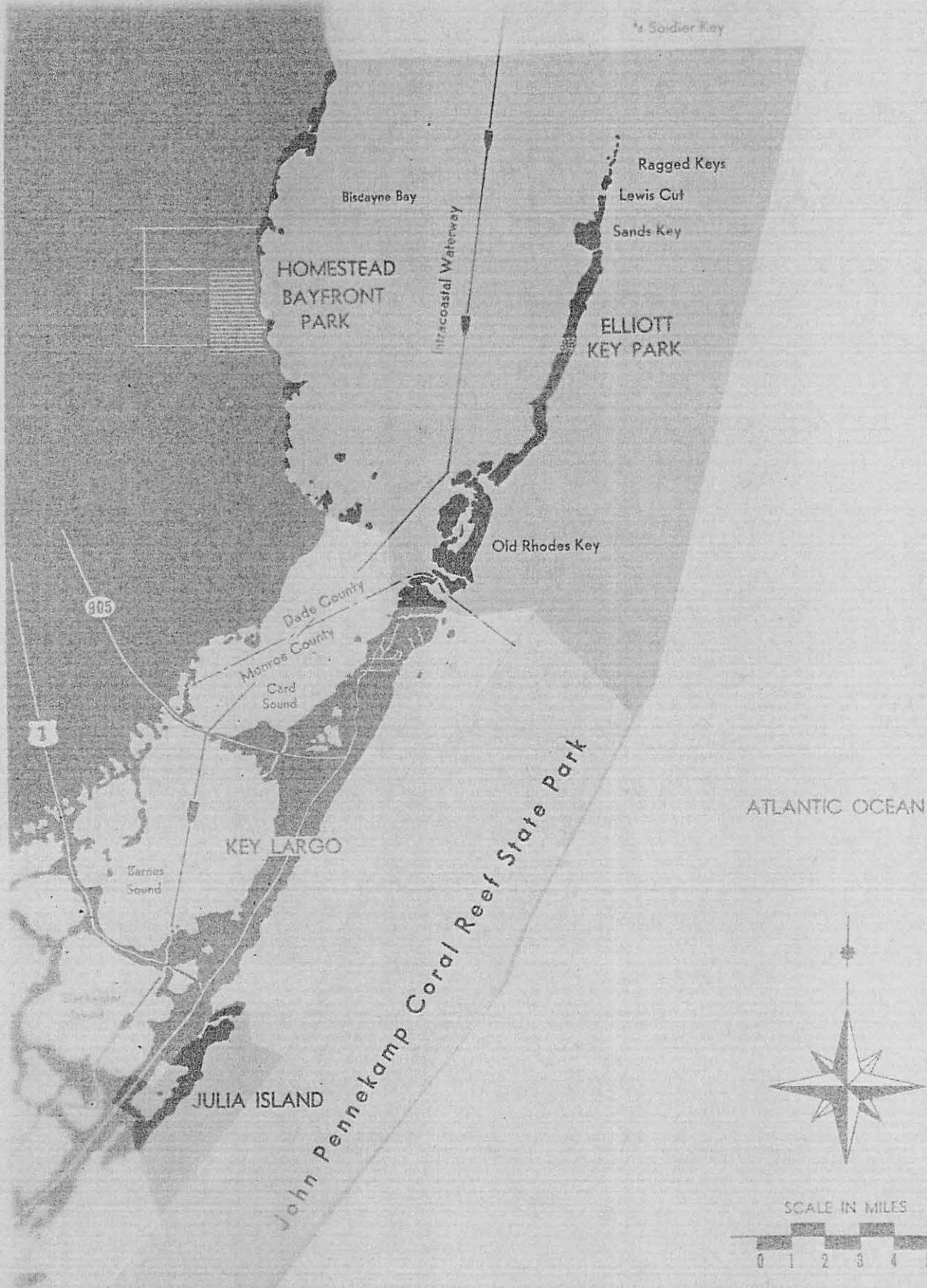
Under this plan, a combination of conservation agencies would cooperate to provide resources, facilities, interpretation and protection for visitor use in both Dade and Monroe Counties. Dade County administers Homestead Bayfront Park on the mainland and Elliott Key Park on Elliott Key. The State of Florida administers John Pennekamp Coral Reef State Park and is in the process of acquiring land on Julia Island for a wilderness-type addition to Pennekamp.

John Pennekamp Coral Reef State Park would be included within the National Monument boundary; however, it would be acquired by the Federal Government only with the consent of the State of Florida. Implementation of this plan would preserve in public ownership about 220,000 acres; 5,500 of land and 214,500 of water. The boundaries would extend to the 60-foot line in the Atlantic Ocean to the east; between Soldier and Ragged Keys in the north; to

the mainland in the west; through Anglefish Creek and down to include John Pennekamp Coral Reef State Park and Julia Island in the south.

The underwater resource is fragile. Its preservation must, of necessity, include limitations on its use. The area preserved in this plan will provide sufficient bay and ocean bottom to permit visitor use over a large area, thereby reducing the potential wear. By extending the boundaries to the mainland the opportunity will be afforded to control pollutants which may enter the bay from the mainland. Pollution can upset the underwater ecology.

The additional land areas will provide more area for future expansion of day use recreational facilities and additional opportunities for nature study. These land areas are relatively undeveloped and are an integral part of the resource.



PLAN 1

PLAN 2

Implementation of this plan would preserve in public ownership about 79,000 acres; 4,000 acres of land and 75,000 of water. The boundary would extend to the 60-foot line in the Atlantic Ocean to the east; Lewis Cut in the north; the Intracoastal Waterway in the west, and the Dade-Monroe County line in the south.

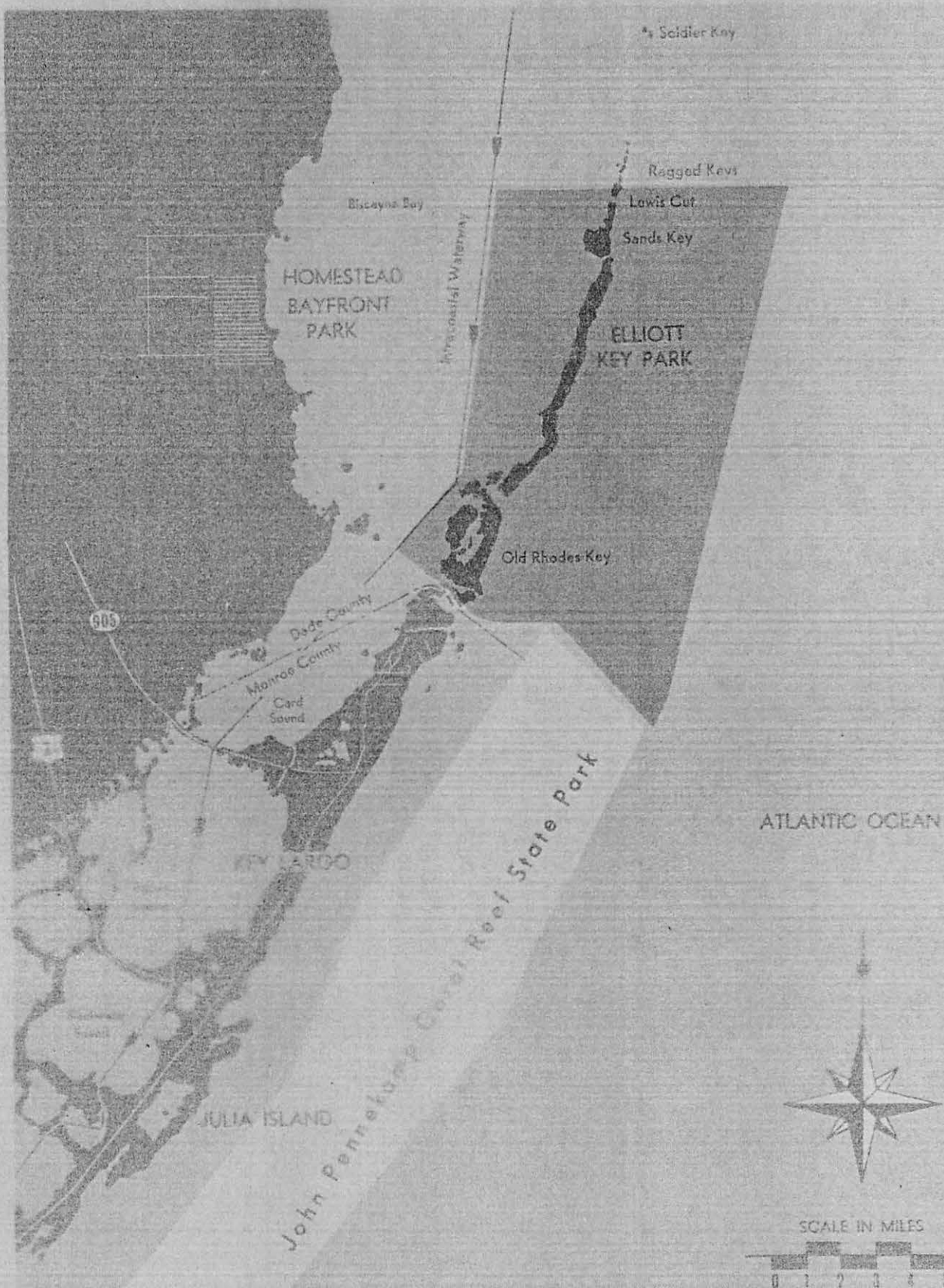
John Pennkamp Coral Reef State Park; Julia Island; Arsenicker, Ragged, and Palo Alto Keys; and the Biscayne Bay area from the Intracoastal Waterway to the mainland are excluded from this boundary.

The land, water, and bay and ocean bottom included offer the opportunity to preserve in a National Monument sufficient of the resources for public use and enjoyment.

It will be necessary from time to time to close to the public certain of the underwater areas to permit them to recover from visitor use. This can be accomplished by directing visitor use to the other areas within the boundary, and this plan provides sufficient of the resources to permit use of this management technique.

The reduction in land area will limit future expansion; however, sufficient area is provided to adequately meet present demands for day use facilities.

This plan has the advantage of meeting the present needs, yet acquiring less area than Plan 1 and thereby reducing cost.



ATLANTIC OCEAN



SCALE IN MILES



PLAN 2

PLAN 3

Implementation of this plan would preserve in public ownership about 67,000 acres; 2,500 acres of land and 64,500 acres of water. The boundary would extend to the 60-foot line in the Atlantic Ocean to the east; Lewis Cut in the north; the Intra-coastal Waterway in the west; and Caesar Creek in the south. Old Rhodes and Totten are the major keys included in Plan 2 and not included in this plan.

While this is the minimum which should be considered for preservation as a National Monument, it will provide a representative sample of the resources for public use and enjoyment.

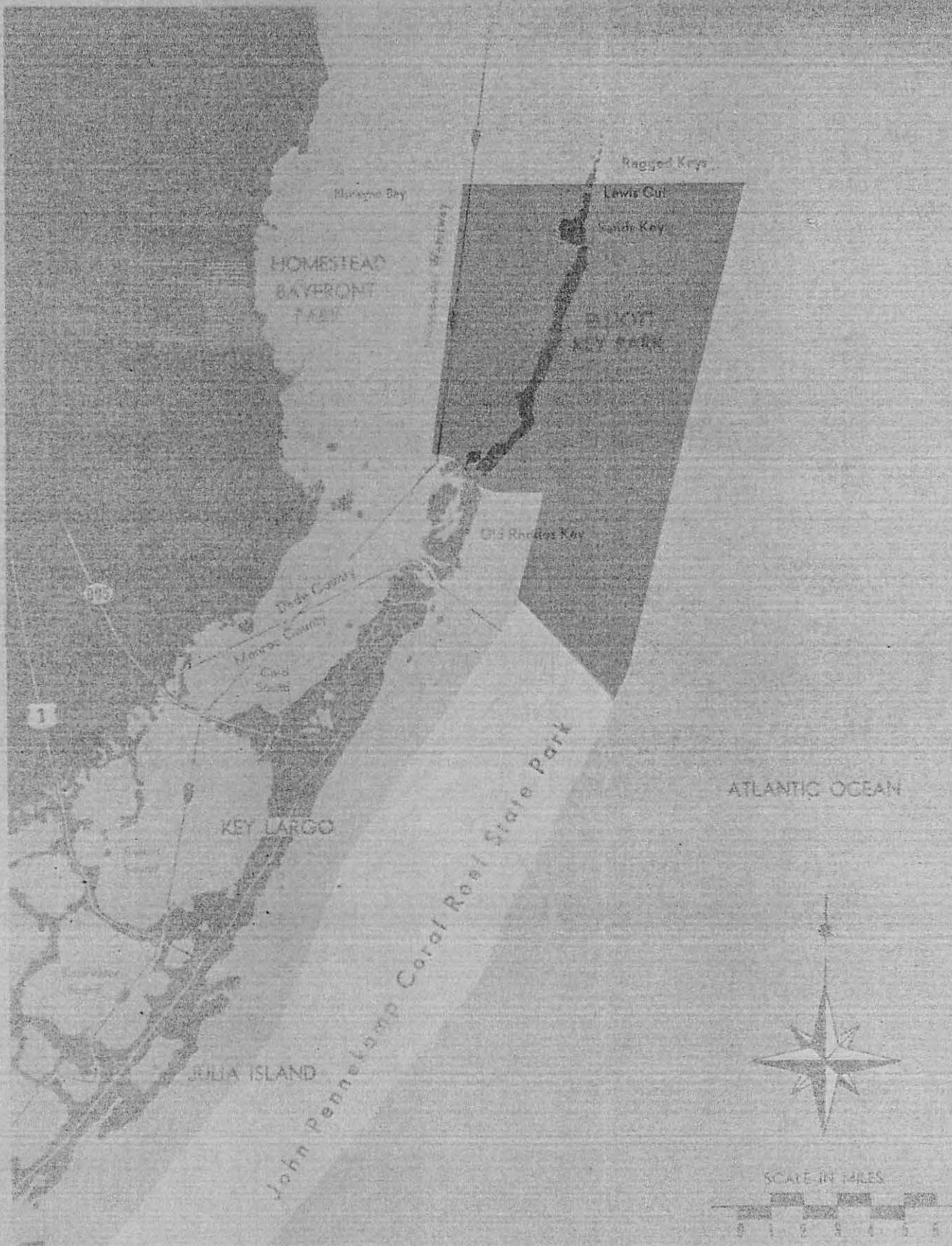
It will be necessary from time to time to close to the public certain of the under-

water areas to permit them to recover from visitor use. This can be accomplished by directing visitor use to the other areas within the boundary, and this plan provides sufficient of the resources to permit use of this management technique.

The reduction in land area in this plan provides for a minimum area to meet demands for day use facilities.

The water and bottom areas provided appear sufficient to meet minimum public demand.

The further reduction in area provides for minimum land and water resources in public ownership. It has the advantage of being the least costly of the three plans.



PLAN 3