

draft general management plan /
development concept plan
and environmental assessment
november 1981

PADRE ISLAND

NATIONAL SEASHORE / TEXAS





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PADRE ISLAND NATIONAL SEASHORE TEXAS

DRAFT GENERAL MANAGEMENT PLAN /
DEVELOPMENT CONCEPT PLAN AND
ENVIRONMENTAL ASSESSMENT

DENVER SERVICE CENTER
NATIONAL PARK SERVICE
U. S. DEPARTMENT OF THE INTERIOR

CONTENTS

INTRODUCTION	1
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PART ONE: DRAFT GENERAL MANAGEMENT PLAN/DEVELOPMENT CONCEPT PLAN

OVERVIEW OF THE NATIONAL SEASHORE	5
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DRAFT PLAN PROPOSALS	9
Natural Resource Management	9
Cultural Resource Management	11
Visitor Use	13
Interpretation	14
Park Operations and Management	15
Development Concept	16
Proposed Management Zoning	23

PART TWO: ENVIRONMENTAL ASSESSMENT

PURPOSE OF AND NEED FOR ACTION	31
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ALTERNATIVES	33
Alternative 1: Remove Major Facilities (Proposed Draft Plan)	33
Alternative 2: Continuation of Current Situation (No Action)	33
Natural Resource Management	33
Visitor Use and Interpretation	34
Park Operations and Management	34
Development Concept	35
Alternative 3: Management to Accommodate Major Visitor Use Facilities	36
Natural Resource Management	36
Visitor Use and Interpretation	37
Park Operations and Management	38
Development Concept	38

AFFECTED ENVIRONMENT	47
Natural Processes and Features	47
Climate and Storms	47
Coastal Floodplain	51
Water Quality	51
Topography and Soils	52
Plants	52
Animals	53
Visual Resources	54
Cultural Resources	55
Park Development and Use	57
Existing Facilities	57
Visitor Profiles and Patterns of Use	58

Visitation Trends	63
Regional Trends that May Affect Visitation	64
Oil and Gas Operations	68
ENVIRONMENTAL CONSEQUENCES	70
CONSULTATION AND COORDINATION	80
APPENDIXES	
A: Legislation	83
B: Management Objectives	84
C: Characteristic Plants and Animals	85
BIBLIOGRAPHY	93
LIST OF PREPARERS	96

ILLUSTRATIONS

Region	4
Development Concept Plan	17
Proposed Management Zoning	25
Typical Cross Sections	46
Dynamics of Hurricanes	49
Existing Park Development	59
Visitor Activity and Use Zones	62
Visitation Trends	65

TABLES

1. Facility Capacity and Cost Summary, Draft Plan	20
2. Summary of Alternatives	40
3. Facility Capacity and Cost Comparisons	42
4. Staffing Comparison	45
5. Padre Island Visitation	64
6. Recreation Facilities in a Six-County Area Surrounding the National Seashore	66
7. Summary of Environmental Consequences	70
8. Adversely Affected Natural Environments	71
9. Environmental Consequences	72

STORM DAMAGE /
HURRICANE ALLEN



INTRODUCTION

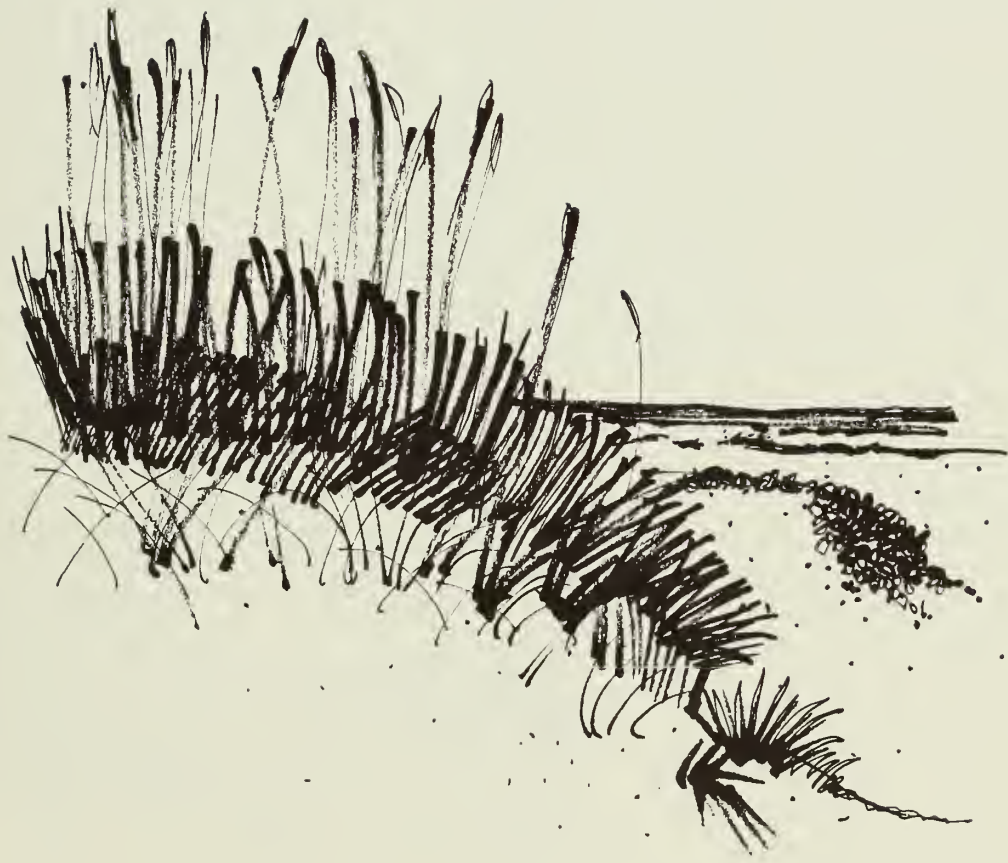
In August 1980 Hurricane Allen swept the Texas Gulf Coast and caused millions of dollars worth of damage. The full fury of the storm demonstrated the vulnerability of man-made structures placed in coastal high-hazard zones and prompted the National Park Service to reevaluate a 1974 plan to provide extensive facilities for visitor use at Padre Island National Seashore. The costs of repairing the storm damage to the limited facilities that were already in place on the island was estimated to be \$562,000. Furthermore, these facilities have sustained additional significant damage attributable to the corrosive salt-air atmosphere of the gulf shore, which causes a constant, ongoing maintenance problem.

Since 1974 the park staff has had the opportunity to observe and document visitor use and travel trends and has determined that the level of use projected in the 1974 plan was approximately two times greater than present use, which has now stabilized at about one million visitors a year. This determination, coupled with an improved understanding of barrier islands and their implications for development, provided the incentive for considering new, less development-oriented management strategies for Padre Island.

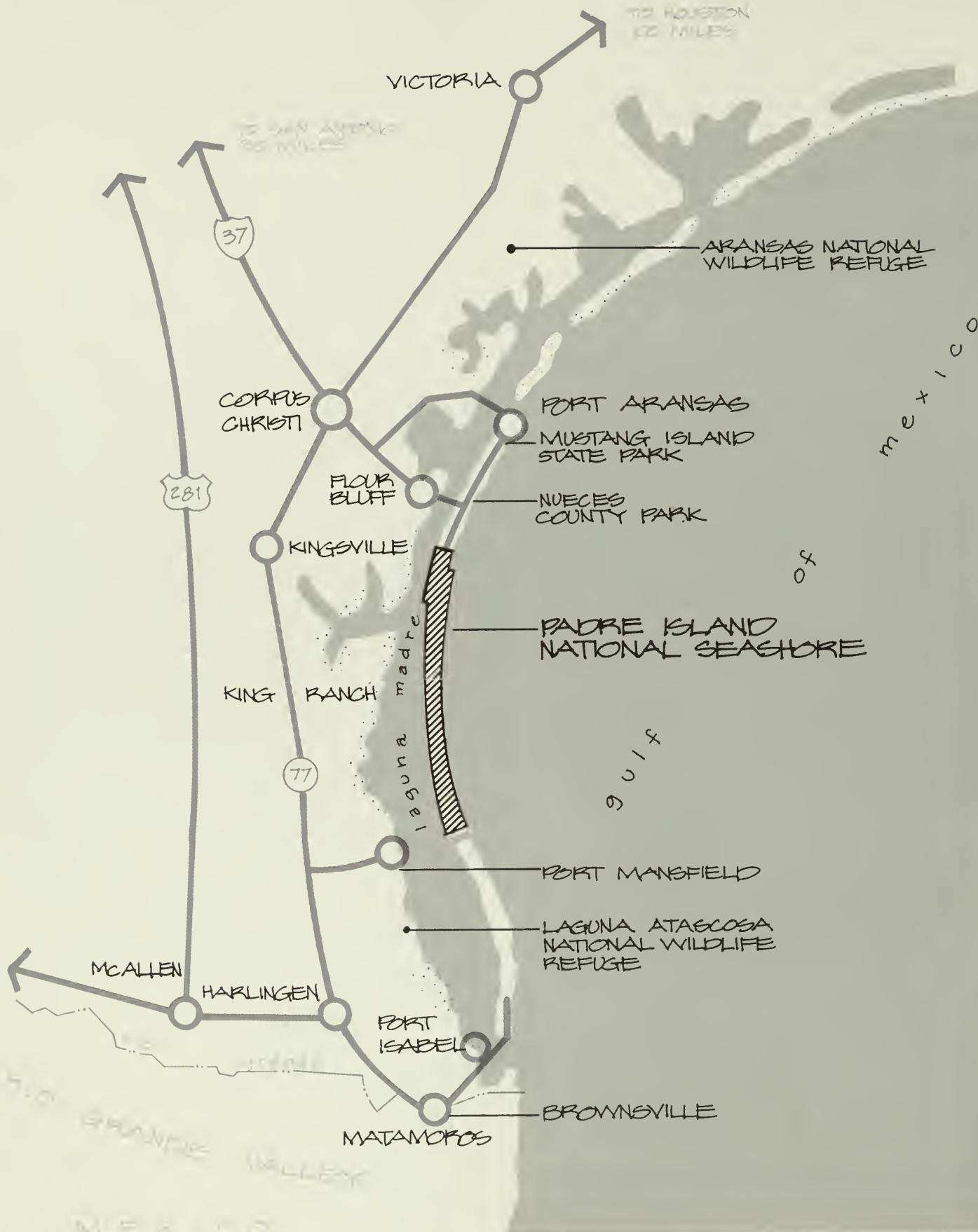
As part of the reevaluation of the management direction for Padre Island, the National Park Service initiated a program of public involvement to help identify current issues and concerns. Public comments indicated that the following issues warranted consideration: 24-hour ranger patrol to reduce law enforcement and resource management problems, improvements to the boat launching facilities at Bird Island Basin to reduce congestion and waiting time, provision of visitor use facilities at Mansfield Channel to serve down-island visitors, and management action to reduce the potential for resource damage and conflicts among visitors associated with ORV driving along the beach. Different ways of resolving these issues were explored in the context of alternative management and development schemes for the national seashore.

The National Park Service's preferred alternative for a new plan is presented in part one of this document. The "Draft General Management Plan/Development Concept Plan" includes an integrated set of proposals for resource management, visitor use, operations, and development, intended to guide activity at the national seashore for approximately the next 10 years. Part two of this document, the "Environmental Assessment," presents all the alternatives considered in developing the draft plan, describes the affected environment, and analyzes the environmental impacts of each alternative.

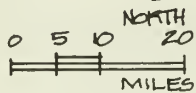
The draft plan is not approved. The purpose of this document is to present a preliminary proposal and other alternatives for public and agency review and comment. At the end of the review period the plan will be reevaluated and reissued in final form.



part 1 draft general management plan /
development concept plan



↑ REGION



PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE

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DEC/SEPT 81

OVERVIEW OF THE NATIONAL SEASHORE

Padre Island National Seashore was established by Congress in 1962 "to save and preserve, for the purposes of public recreation, benefit, and inspiration, a portion of the diminishing seashore of the United States that remains undeveloped." In the enabling legislation (reprinted in appendix A), Congress specifically directed that the national seashore be administered under the provisions of the 1916 act that established the National Park Service, indicating that it would be subject to the same mandates, policies, and regulations that apply to all units of the National Park System. The management objectives for the seashore (appendix B) reflect the National Park Service's intention to provide for recreational and interpretive uses that are compatible with the preservation of the natural environment, consistent with the legislated purpose of the park.

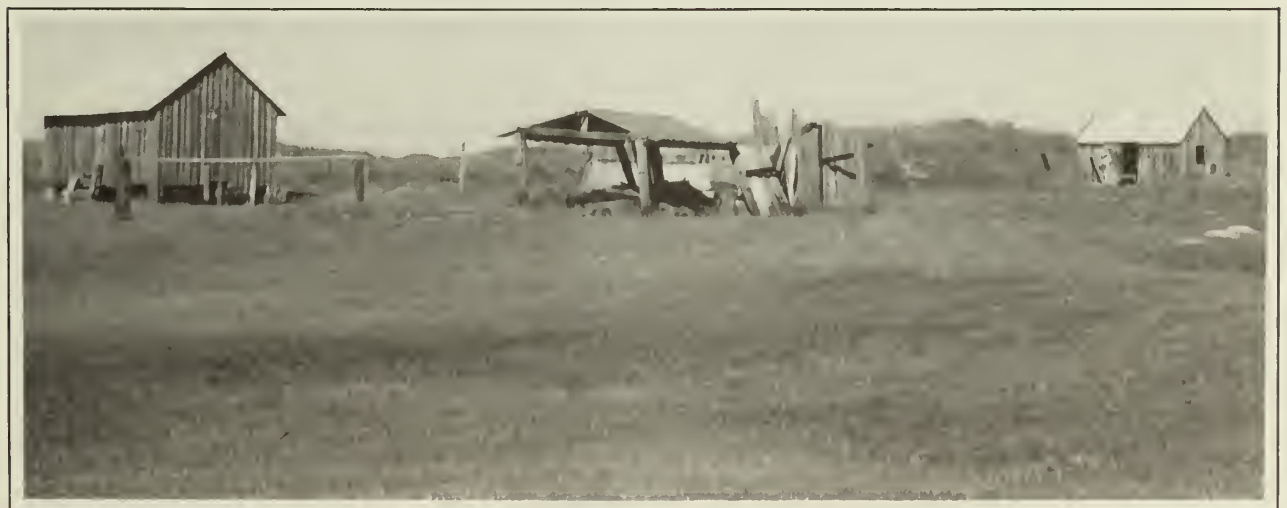
The area so designated by Congress stretches along approximately 80 miles of the longest barrier island in the country. The southernmost link in the chain of Texas barrier islands in the Gulf of Mexico, Padre Island extends for 113 miles from Corpus Christi Bay southward to Brazos Santiago Pass, just north of the U.S./Mexico border. It is separated from the mainland by Laguna Madre, a shallow body of water that is navigable through the Gulf Intracoastal Waterway maintained by the U.S. Army Corps of Engineers. The lagoon, which is 10 miles wide at its widest point, is connected to the gulf by the Mansfield Channel, which cuts through the southern portion of Padre Island. The national seashore lies entirely on the north side of the channel.

From the gulf to the lagoon--a width that varies along the island from 1,000 feet to 2½ miles--the island's landscape changes from broad sandy beaches, or in places beaches comprised almost entirely of shells, to ridges of fore-island dunes, then to grassy flats broken here and there by smaller dunes and ponds, and finally to vaguely defined back-island dunes and mudflats that merge with the waters of the lagoon. These land-and-water environments provide rich habitat for marine and terrestrial plants and animals, including seven threatened or endangered species of birds and sea turtles.

The barrier island is continuously being reshaped by the day-to-day action of winds, currents, waves, and tides. During storms, change is dramatic. The barrier island takes the full force of a hurricane's high-energy assault. As observed after Hurricane Allen, beaches are eroded, dunes are breached, overwash passes are cut, and human property is damaged or destroyed. Where the fore-island dune ridge is well developed, the barrier island blocks the storm tidal surge and dissipates wave energy, providing a major defense for the mainland.

With the longest stretch of undeveloped ocean beaches in the country, the national seashore provides a rare opportunity for primitive beach recreation. Nearly a million visitors come to enjoy the national seashore each year, mostly during the spring and summer. The majority of visitors are from Texas and come to spend the day, returning home at night. Visitor use is concentrated on the broad gulf beaches, where





beachcombing, swimming, wading, sunbathing, fishing, picnicking, and strolling are popular activities. Beach use is densest near the pavilion and campground at Malaquite Beach, the only one of the three major developed areas proposed in the 1974 plan where some of the facilities have been built. The pavilion provides a visitor contact station, showers and restrooms, and limited food service, making Malaquite an attractive beach destination. Many other visitors, however, seek a more solitary experience by driving down the beach, relying on their own vehicles for support. The lagoon is another destination for visitors. At Bird Island Basin and Yarborough Pass there are minor facilities near the lagoon to support boating, fishing, wading, and camping.

Visitor use at the national seashore has remained relatively stable, increasing only 13 percent between 1969 and 1980. Use has never exceeded one million visits in any given year. A regional growth in tourism and the subsequent development of coastal recreation facilities closer to the urban centers may contribute to a dispersal of public use away from the more remote national seashore.

DRAFT PLAN PROPOSALS

The draft plan reflects several basic concepts about the nature of Padre Island, the purpose of the national seashore, and the character of appropriate uses. First, it recognizes that left alone the natural barrier-island processes will perpetuate the unique resource values recognized by Congress and enjoyed by the public. Stated conversely, experience here and in other barrier-island environments has proved that wherever man disturbs the natural features or interferes with natural forces on a barrier island, he eventually destroys or seriously impairs the island's natural ability to renew itself. Consequently, the island will be managed to sustain natural processes, accepting natural change as part of its evolution through time and space. Resource management problems will be reduced in the future by avoiding facilities and activities that go counter to the island's natural energy systems.

The plan also recognizes that the high-energy forebeach is both the most desirable setting for recreation and the most resilient natural zone, capable of withstanding high-density use without sustaining damage. Visitors' use of the beach does not depend upon extensive facilities. Therefore, the national seashore will be managed to retain its primitive qualities, providing for an experience that complements, rather than duplicates, the experiences available at other regional shoreline recreation sites. The plan proposes that the seashore be operated to support a moderately high level of use--around one million visitors a year. It proposes facilities that will allow for the possibility of future growth, but it does not commit the National Park Service to the long-term economic and environmental costs of maintaining large-scale permanent facilities on Padre Island.

Finally, the draft plan recognizes that hurricanes will continue to hit the Texas Gulf Coast and that natural and man-made features are vulnerable to storm damage. The perpetuation of the fore-island dune ridge is paramount to the island's storm defenses and thus to the overall preservation of the island.

The following specific proposals for resource management, visitor use, operations, and development are closely interrelated around these basic concepts, creating an integral plan for the future preservation and enjoyment of the national seashore.

NATURAL RESOURCE MANAGEMENT

Natural processes will be allowed to continue shaping the barrier island with as little interference as possible. The environment will not be manipulated except to correct man-caused degradation. The potential for such degradation will be greatly reduced by removing imposing facilities and placing restrictions on potentially destructive visitor activities. At Malaquite, for example, where the natural dune-building processes have been interrupted by development, the facilities will be removed and replaced behind the fore-island dune ridge with new nonpermanent

structures designed to reduce that impact. Other preventive measures will be taken throughout the seashore, such as restricting use on the back-island road during the peregrine falcon migrations.

Natural changes in the barrier island will be recognized as stages in its inevitable evolution. As the island is modified by future storms, there will be no management effort to restore prestorm conditions. The recovery of the environment will depend on natural processes.

Research will be conducted to improve understanding of the natural processes at Padre Island and to suggest ways of adapting man's use accordingly. The research program and management actions will be detailed in a separate resource management plan. Some of the actions that closely relate to this general management plan are introduced below.

Dune Management

The dunes will be reestablished at Malaquite by planting native grass sprigs in beds along the length of the sites where the pavilion and campground will be removed. After this initial management effort, dunes throughout the national seashore will be protected without rebuilding or restoring in most instances. Only man-caused damage will be corrected; for example, dunes will be reestablished where visitor foot traffic has caused a blowout. Where storms damage the dunes, the site will be protected to allow natural recovery with little interference from man.

Wildlife Habitat Protection

Cooperative efforts of the National Park Service, National Marine Fisheries Service, Fish and Wildlife Service, and the Republic of Mexico to establish a second nesting population of the endangered Kemp's ridley sea turtle at Padre Island will continue. The species has only one nesting site along approximately 12 miles of beach in the Mexican state of Tamaulipas. Only incidental nesting occurs in the United States, all on Padre Island. Viable Kemp's ridley eggs (2,000-3,000) are collected annually in Mexico by the Fish and Wildlife Service and brought to Padre Island for incubation and hatching on the assumption that they will be "imprinted" to Padre Island and return to nest here. The hatchlings are released on the beach and allowed to enter the sea where they are then recaptured and captively raised by the Marine Fisheries Service for up to a year, before release into the gulf. If the imprinting is effective, the female turtles, upon reaching sexual maturity, will come ashore and lay their eggs at Padre Island. Whether this cooperative international project will succeed or not will not be known for a number of years. On the assumption that they will return, the nesting habitat of Padre Island will have to be closely protected through appropriate restrictions on visitor use.

Use will also be restricted within the habitat of the endangered peregrine falcon during its spring and fall migrations. The habitat to be protected extends across the entire width of the island and along its length from Yarborough Pass to Mansfield Channel. In addition to existing limitations on oil and gas operations during migrations, the back-island road will be closed to all but maintenance or emergency repair vehicles (which will require a special use permit). Controls on beach use will be enforced. These controls may range from restricting use to a narrow corridor, to limiting the numbers of vehicles allowed, to closing some sections of the beach. Additional regulations will be developed to satisfy the requirements of the Endangered Species Act if this area is designated as critical habitat for peregrine falcons by the U.S. Fish and Wildlife Service.

The programs for managing these and other endangered or threatened species will be implemented in cooperation with the U.S. Fish and Wildlife Service to ensure compliance with the Endangered Species Act. Informal or formal consultation will be required for the initiation of greater restrictions on visitor use to protect the turtle nesting habitat or the critical habitat of the peregrine falcon. A separate public involvement program will be conducted for these efforts.

The waterbird rookeries on the spoil and natural islands along the Gulf Intracoastal Waterway will be protected as nesting habitat. Some manipulation of the environment will be necessary to maintain suitable habitat for the large population of birds that utilize the area. In addition the islands will be closed to visitor use during the nesting season.

Beach Vehicle Use

Vehicle use will be allowed on the beach in a corridor below the vegetation line. The intent of the corridor is to reduce damage to the dunes and dune-building vegetation by restricting use to the area of beach most tolerant of vehicle use. The beach will be closed to vehicle traffic whenever high water is predicted to reach the embryonic dune line, so that this sensitive dune area is not damaged. Vehicle use will also be subject to seasonal restrictions, possibly including closure of some sections, for protection of the habitat of Kemp's ridley and loggerhead sea turtles and peregrine falcons.

CULTURAL RESOURCE MANAGEMENT

General Procedures

Management of cultural resources will be in accordance with NPS policies, numerous legislative enactments, regulations, and other mandates (see chapter 5 of the NPS Management Policies and the NPS Cultural Resources Management Guideline).

Operations for the removal of oil and gas constitute a potential for impacts upon cultural resources within the seashore. All plans of operation will be reviewed for compliance with regulations; all will contain provisions for the protection of cultural resources. An archeological survey will be required, and if resources eligible for the National Register are present within the project impact area, compliance with section 106 of the National Historic Preservation Act will be completed prior to approval of the plan of operation. Onsite inspections and monitoring of operations will be carried out by NPS personnel to ensure compliance.

Terrestrial Archeological Resources

Management of terrestrial archeological resources from both the prehistoric and historic periods will reflect NPS policy. Prior to ground disturbance the area to be affected will be examined by professional archeologists to locate and evaluate archeological sites. Sites judged eligible for the National Register will be nominated. All archeological resources will be preserved, if possible, but if adverse effects upon them cannot be avoided or otherwise mitigated, professional retrieval of data through controlled excavations or other acceptable means will be conducted.

Because the water-related movement of sand during major storms is both rapid and potentially highly destructive of archeological data, NPS personnel will conduct archeological surveys immediately following hurricanes (see "Hurricane Plan" 1981). Sites thus located will be recorded, marked, and evaluated.

Regulations prohibiting the use of metal detectors and the removal or disturbance of artifacts will continue to be enforced. Public education and notification regarding these regulations will be intensified.

Submerged Archeological Resources

There is no question that nationally significant submerged cultural resources exist within the national seashore, but only a small portion of the submerged lands have been archeologically surveyed. Hence, when funds are available a systematic survey to locate, record, and evaluate submerged archeological sites will be conducted.

In the meantime, post-hurricane beach surveys will be conducted--thus providing some data regarding offshore shipwrecks--and existing regulations prohibiting artifact removal will be enforced. The seashore staff will receive training so as to better recognize illicit salvage activities.

Historic Structures

The Dunn Ranch, Novillo line camp complex--the only historic structures in the seashore--will be allowed to deteriorate naturally, although the complex will be protected from human activities, including fire. The site will be managed as an archeological site.

Collections

Acquisition of objects, documents, and collections will be guided by the current "Scope of Collections Statement". Collections will be managed in accordance with the NPS Museum Handbook and the Manual for Museums. Beneficial but nonconsumptive uses, such as scholarly study or interpretation, will be encouraged. Additional donations will not be actively sought. Rather, the many private collections acquired by individuals prior to the national seashore designation will be studied, recorded, and evaluated, as possible. The park will retain collection copies of records that are significant in the administrative history of the national seashore.

Boundary Changes

Cultural resources will be identified, evaluated, and considered prior to the disposal of any park lands. If resources eligible for the National Register are present on lands to be disposed, separate compliance with section 106 of the National Historic Preservation Act will be required.

VISITOR USE

The natural seashore environment is an outstanding recreational resource. The entire gulf shoreline is accessible by road or by two-wheel-drive or four-wheel-drive routes along the beach, and with only minimal support facilities, such as primary access points, informational signs, and restrooms, visitors in increasing numbers can continue to enjoy a variety of recreational activities. The level of use occurring now at Padre Island--with the exception of a few peak days on popular stretches of the gulf beach--is still well below the level that would strain the resiliency of the beach environment or result in feelings of crowding. The few basic services required by visitors can be expanded gradually if the demand for them increases.

Malaquite Beach will continue to serve as the hub of gulf beach day use. Information, interpretive programs, showers and restrooms, limited food service, and a paved campground suitable for recreation vehicles will all

be available at this point. The beach will remain closed to vehicles for a distance of about $4\frac{1}{2}$ miles extending north from the parking area. A high-density walk-in beach for sunbathing, swimming, fishing, picnicking, and general recreation will be maintained at Malaquite. The pavilion and the dune-ridge campground will be replaced with new facilities behind the dune ridge providing similar services to visitors but designed to be more compatible with the dynamic barrier island environment. Visitors will walk to the beach from these facilities over short trails with raised wooden boardwalk dune-crossings designed to protect the foredune.

The $5\frac{1}{2}$ -mile stretch of hard beach south of Malaquite (from the end of the paved road to the four-wheel-drive sign) will be maintained as a two-wheel-drive beach, where visitors will continue to enjoy the same kinds of activities that occur at Malaquite plus primitive camping.

The soft beach from the four-wheel-drive sign south to Mansfield Channel will remain open to four-wheel-drive vehicles, providing access to the gulf for visitors desiring a more isolated location for fishing, swimming, beachcombing, camping, and recreational vehicle driving. The back-island road around Big Shell Beach will be minimally maintained for public use except during the spring and fall migrations of peregrine falcons or whenever high-water or muddy conditions occur. If a nesting population of Kemp's ridley turtles becomes established at Padre Island in the next five to ten years, beach use will be restricted during their nesting and hatching periods. Year-round closure will not be considered because without this means of access the recreational opportunities at the national seashore would be extremely limited.

Access to Laguna Madre for boat launching, sail-fishing, wading, picnicking, camping, and other activities will be maintained at Bird Island Basin and Yarbrough Pass.

INTERPRETATION

Information and interpretation services will be expanded and redesigned to relate to both local and nonlocal visitors, who often have quite different needs and expectations. Nonlocal visitors need information and orientation and often anticipate traditional National Park Service interpretive programs. Local visitors, who account for about 85 percent of all visitors to the national seashore, are interested primarily in recreation--fishing, beachcombing, and four-wheel driving. They are often repeat visitors who do not need basic information but they do need to become familiar with the regulations affecting their activities, and they need to understand the fragile, dynamic barrier-island system and become actively interested in its use and protection.

The park staff will continue to provide information at the park headquarters in Flour Bluff and the Malaquite visitor contact station, principally to help first-time visitors become familiar with the seashore. In addition, a number of wayside exhibits will be placed at various

locations throughout the national seashore. A new wayside at the north entrance will supplement the services provided at Flour Bluff and Malaquite by providing basic orientation and information about where to go and what to see and do. Other waysides will carry safety and interpretive messages.

The interpretive program will be structured around four basic themes:

barrier island processes--how wind and wave energy sustain the barrier island in a state of dynamic equilibrium and how man-caused modifications disrupt these processes

barrier island ecology--how the biological and mineral resources on the island represent integrated systems and how people can benefit from and enjoy these systems

seashore recreation--how visitors can enjoy the seashore without degrading the environment

energy--how solar energy converts to wind, wave, storm, and hurricane to transport water and sand; how visitors perceive their energy needs relative to this dynamic system and what applications can be made back home

The park staff will continue to conduct interpretive programs suited to the changing seasons and interests of visitors. These interpretive programs will be supplemented by two self-guiding nature trails. The existing grasslands nature trail, which introduces visitors to the stabilized blowout dune environment with its characteristic plants and animals, will be improved and made accessible to handicapped visitors. A second, similar trail will be constructed near Malaquite to interpret the ponds and marshes occupying the wind-deflation troughs.

PARK OPERATIONS AND MANAGEMENT

A major shift in operations will be possible once major visitor facilities are removed and replaced by less permanent ones, allowing the additional removal of most support facilities from the island. With the Malaquite area no longer requiring extensive facility-maintenance and resource-protection projects, the major support facilities for all park operations will be consolidated at, or in the vicinity of, the leased headquarters building in Flour Bluff.

The superintendent, division chiefs, and administrative personnel will maintain permanent offices at the Flour Bluff headquarters, which is convenient for conducting business in the Corpus Christi region and providing a mainland visitor contact station. Permanent supervisors and seasonal employees will commute daily to the island from residences on the mainland, a distance of 26 miles (40 minutes). Rangers will no longer reside on the island to provide on-call overnight emergency protection.

Instead, 24-hour resource protection and law enforcement will be provided by on-duty rangers.

This type of operation will require only minimal support facilities on the island. A ranger office with sleeping quarters will be built into the view tower at Malaquite. The only other essential facility will be a storage building for heavy equipment.

DEVELOPMENT CONCEPT

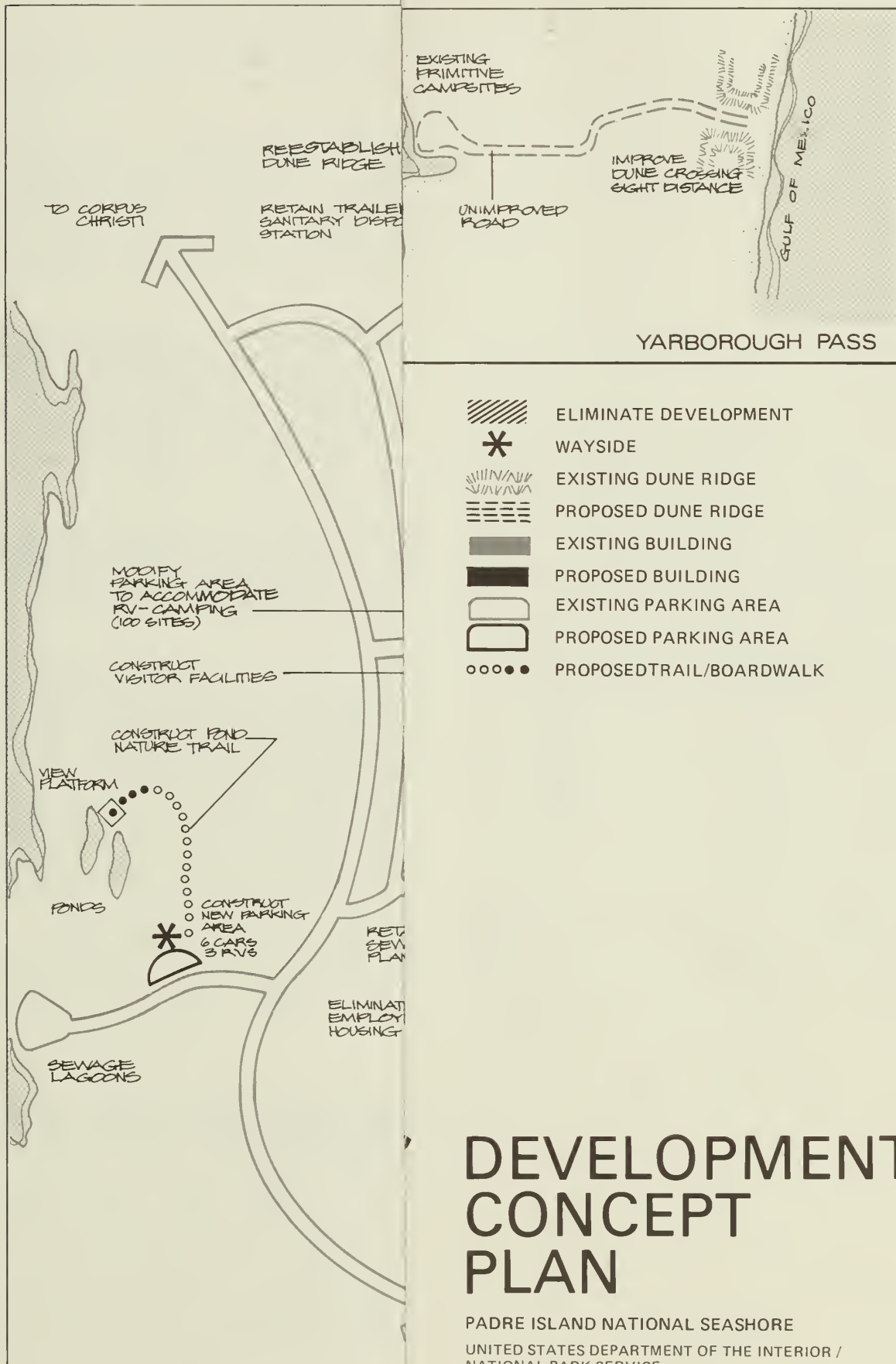
The draft plan proposes a level of development that will meet the proven (past) needs for visitor services and a corresponding support (management and operations) capability. The proposed changes include relocating some existing visitor facilities and modifying others, and reducing support facilities on the island to include only those essential to visitor safety and resource protection. The basis for these proposed changes is the high cyclic maintenance and replacement costs associated with facility vulnerability to storm damage and corrosion, and the resource degradation caused by existing facilities.

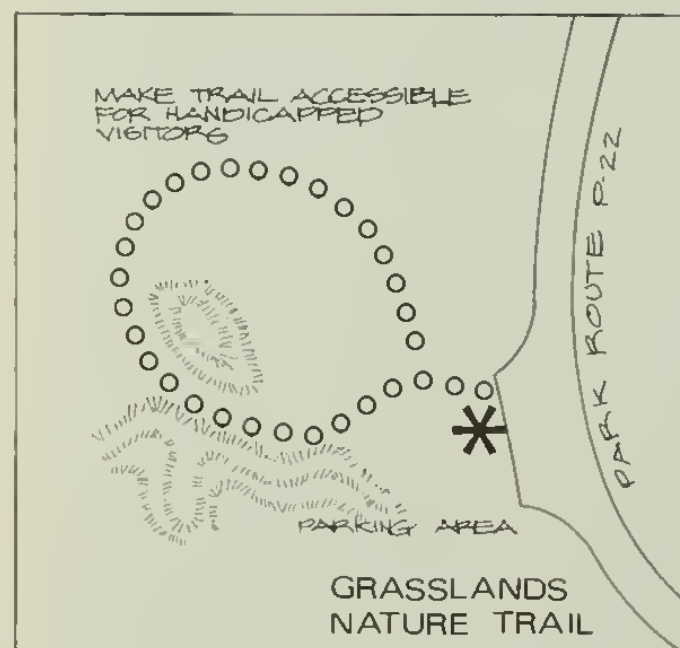
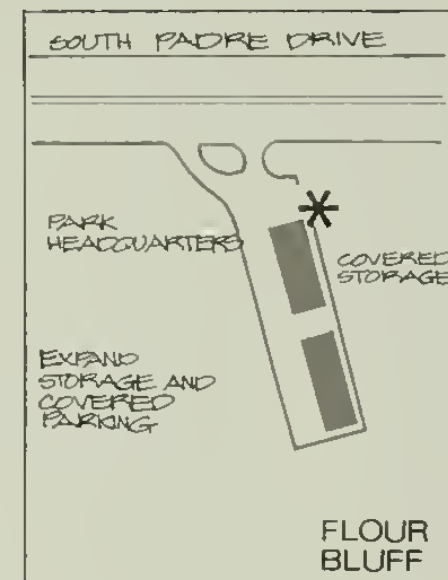
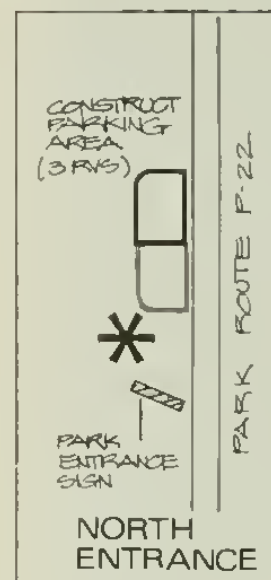
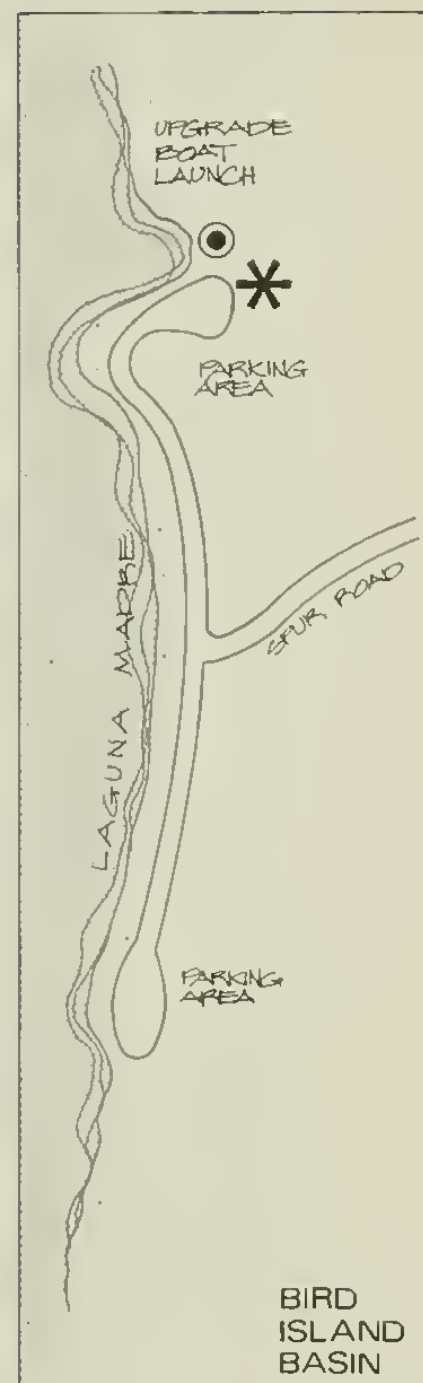
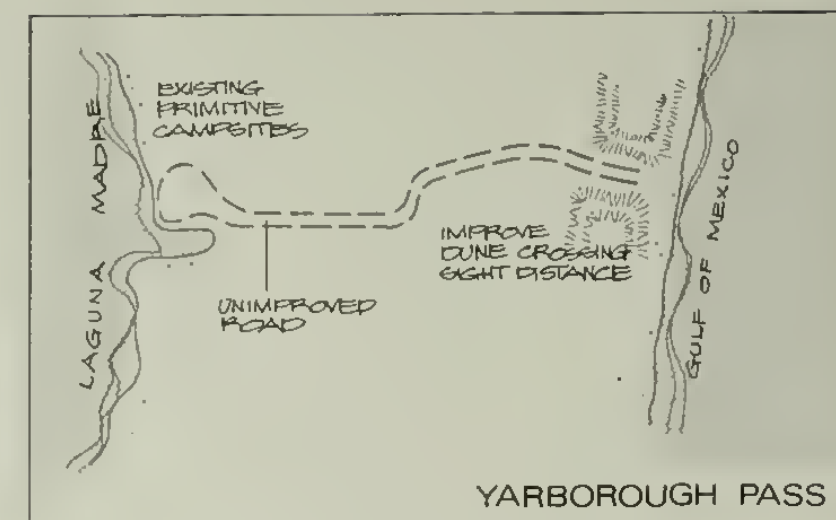
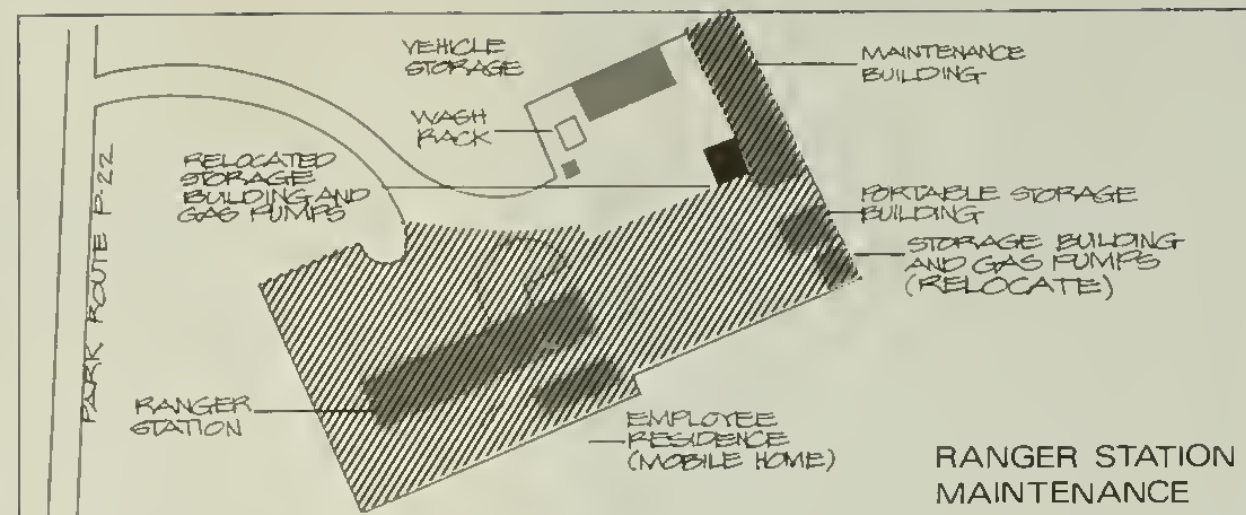
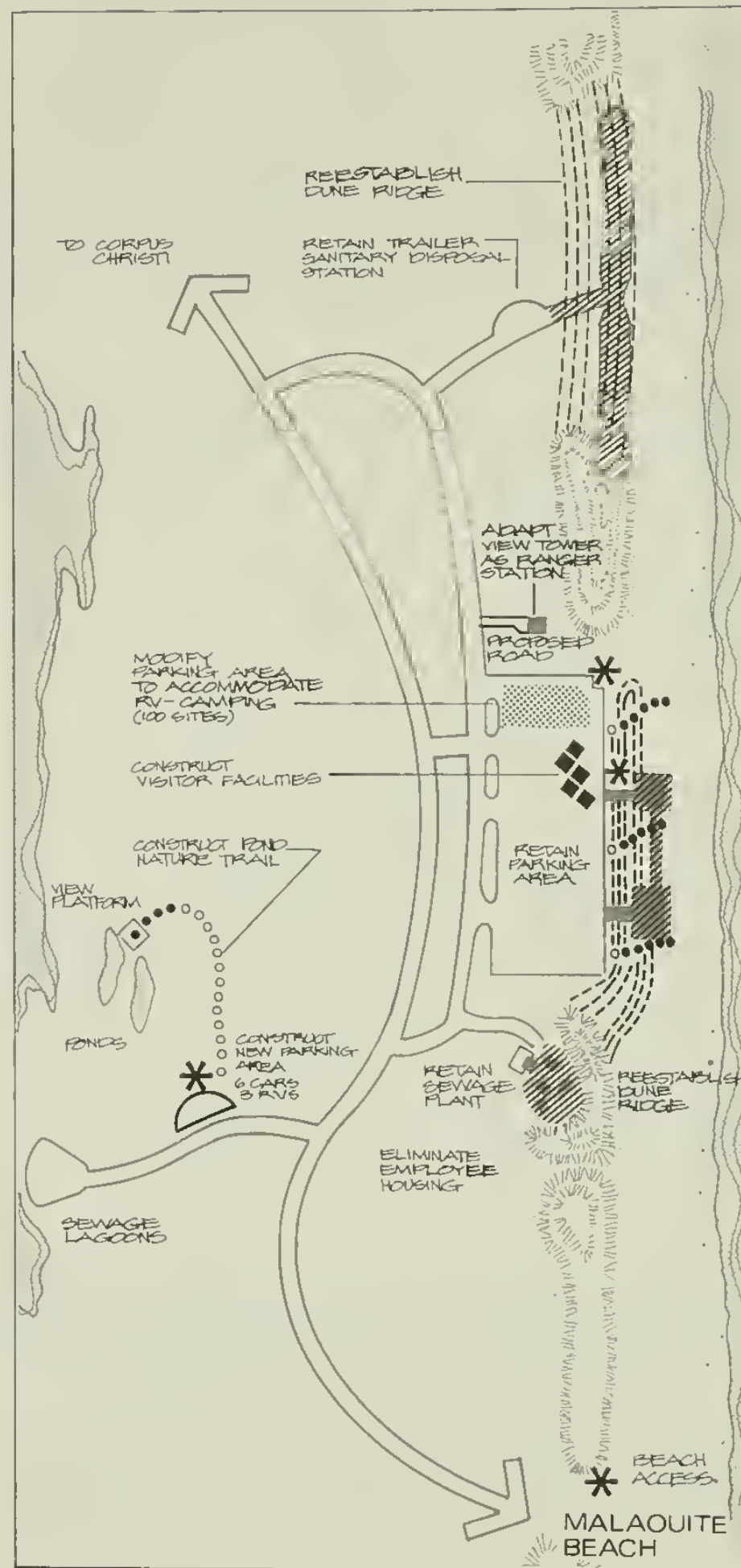
Proposed Facilities

Proposed changes in development are described below. The specific sizes, capacities, and costs of each facility are listed in table 1 at the end of this section.

Malaquite Beach. Because of structural deterioration and the associated major maintenance costs, the beach pavilion will be replaced within five years (from the date of the final plan) with modular, less permanent (expendable), or possibly transportable structures. Functions will include visitor information/orientation, showers, restrooms, and food concession. All but one of the structures will be sited on the existing paved parking area and connect with underground utilities (water, sanitary sewer, electricity, and telephone) now servicing the beach pavilion. A portable lifeguard/first-aid station will be located on the beach during the spring and summer visitor season.

A portion of the existing 1,200-car parking area will be redesigned to accommodate year-round camping by providing 100 sites for tents and recreation vehicles. This will eliminate 200 parking spaces leaving the parking area with a capacity of 1,000 spaces. The 100 sites provided at the parking area will equal the number of sites that existed at the campground before the hurricane. Once this area is operational, the existing 40-site campground, which is situated on the fore-island dune ridge, will be removed. Facilities to be removed include a portion of the entrance road, dune-ridge spur-road sites, and three comfort stations. The associated trailer sanitary disposal station will be retained. Walk-in





- ELIMINATE DEVELOPMENT
- WAYSIDE
- EXISTING DUNE RIDGE
- PROPOSED DUNE RIDGE
- EXISTING BUILDING
- PROPOSED BUILDING
- EXISTING PARKING AREA
- PROPOSED PARKING AREA
- PROPOSED TRAIL/BOARDWALK



DEVELOPMENT CONCEPT PLAN

PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

tent camping will also continue to be allowed in this area with vehicle parking provided in the existing pavilion parking area, but separate from day use parking.

The fore-island dune ridge in both the pavilion and existing campground locations will be reestablished. However, it will take a period of years for reestablishment to occur. Therefore movement of gulf breezes inland across the sites will continue to minimize the effects of heat and mosquitoes for some time. Raised wooden boardwalks will be used where appropriate to minimize erosion of dunes from pedestrian traffic.

Bird Island Basin. A hard-surfaced boat launch ramp, designed to be accessible to handicapped persons, will be constructed in the area of the existing sand-bottomed launch site. No dredging will be required to upgrade the boat launch site, but infrequent dredging (every 20 years) will be necessary to maintain the boat channel. Overnight camping and day uses including sail-fishing, wading, and picnicking will continue.

Yarborough Pass. No improvements will be made to the primitive campsites at Yarborough Pass. However, the dune crossing that allows vehicle access from the beach to these facilities will be improved so that oncoming vehicles can more easily be seen.

Interpretive Facilities. Interpretation, information, and orientation waysides will be placed at various locations from the north entrance to the beginning of the four-wheel-drive beach. At the north entrance wayside, immediately inside the park boundary along route P-22, pulloff parking for an additional three vehicles will be provided alongside the southbound lane. Other waysides will be placed at the Flour Bluff headquarters building, Bird Island Basin, the north beach barricade, the two self-guiding nature trails, Malaquite Beach, the campground, the south beach entrance, and the start of the four-wheel-drive beach.

A new barrier-free parking area and 1-mile self-guiding loop trail and raised wooden boardwalk will be constructed to interpret the ponds and wetlands across from Malaquite Beach. The existing grasslands nature trail and its parking area will be modified to make them accessible to handicapped visitors.

Operations and Management Facilities. The facilities at the island ranger station/maintenance area will be removed with the exception of a building that will provide minimal storage for essential vehicles, fire cache, etc., and the fuel tanks and gas pumps. On-island ranger functions will be relocated to the view tower, which will be modified on the observation level for office space, storage, a communications center, and restrooms. The tower will remain inaccessible to handicapped persons. The equipment, materials, and maintenance shops removed from the island will be accommodated on the mainland by leasing additional facilities in the Flour Bluff area. The four existing employee residences (two wood-frame and two mobile homes) will be removed.

Table 1: Facility Capacity and Cost Summary, Draft Plan

Location/Action		Facility Capacity*	Development Cost**	Location/Action		Facility Capacity*	Development Cost**
8	Flour Bluff Headquarters expand storage and covered parking (15,000 sq ft)	--	--	4	Bird Island Basin retain facilities	200	--
9	Island Ranger Station/ Maintenance Area demolish ranger station and maintenance buildings	--	\$57,000		upgrade boat launching ramp (1,200 sq ft)	--	\$11,700
	relocate fuel storage tanks and gas pumps	--	15,000	7	Malaquite Campground modify existing parking area to accommodate RV camping (100 sites)	320	201,500
	restore building sites (1,200 sq yd)	--	1,500		obliterate existing fore-island dune-ridge campground (40 sites)	--	112,400
	obliterate parking area and restore site (1,000 sq yd)	--	12,700		reestablish fore-island dune ridge (150,000 sq ft)	--	21,900
	pave road and parking area (asphalt, 16,000 sq ft)	--	17,500	11	Malaquite Beach demolish pavilion	--	321,200
10	Island Employee Housing remove 2 houses, garage, and storage buildings	--	19,000		construct modular visitor facilities (5 units) and retain parking area (1,000 spaces)	3,200	100,000
	remove mobile home	--	1,500		reestablish fore-island dune ridge (50,000 sq ft)	--	7,300
	restore building sites (400 sq yd)	--	1,500		construct trails and boardwalks (600 lin ft)	60	5,800
6	North Entrance provide park entrance wayside	10	11,700	3	Malaquite View Tower adapt for ranger station (1,000 sq ft)	--	60,000
	enlarge parking area (3 RV spaces)	--	13,000	2	Yarborough Pass upgrade vehicle dune crossing (300 sq yd)	--	1,500
5	Grasslands Nature Trail modify parking area and trail for handicapped visitors (3/4 mi)	65	35,000	1	Wayside Exhibits provide waysides (10 units)	100	29,200
12	Pond Nature Trail construct trail and boardwalk (1 mi)	50	89,000		Totals	4,595	\$1,186,200
	construct parking area (6 car, 3 RV spaces)	--	26,300		Annual Operations and Maintenance Cost (includes salaries, materials, equipment, and leasing costs)		\$1,500,000
	construct viewing platform	10	13,000				

NOTE: Circled numbers denote the priorities and sequencing for accomplishing the development projects.

*Capacity is defined as the number of visitors that a facility will accommodate at any one time. Capacity shown for Malaquite Beach facilities was determined by the number of available parking spaces.

**Gross development costs include construction, project planning, construction supervision, and administrative services.

Site Planning and Development Considerations

New buildings will be mobile or of flood-proof construction, energy efficient, and accessible to handicapped persons, all in conformance with the following applicable regulations: Executive Order 11988, Floodplain Management; Executive Order 11990, Protection of Wetlands; Executive Order 12003, Energy Policy and Conservation; Public Law 90-480, Design and Construction of Public Buildings to Accommodate the Physically Handicapped; and Public Law 93-112, the Rehabilitation Act of 1973.

At proposed building sites within the 100-year floodplain, buildings will either be elevated on open works--walls, columns, piers, piles--or will be portable and removable from the island. The finished floor elevations of the more permanent buildings will be above the combined storm surge and wave height as calculated for the specific site, so that the 100-year floodwaters will be accommodated.

The buildings will be oriented approximately 5 degrees east of south to minimize east and west solar exposure. This orientation will reduce both hot summer afternoon sun and cool winter winds. Wherever possible, indoor and outdoor activity spaces will also be oriented to the south and shaded with architectural features. Supplemental planting of vegetation may be needed to modify the microclimate for improved southwest summer wind movement in summer, and also to provide protection from cool northwest winds in winter. Facilities will be arranged in patterns that allow summer winds to facilitate cooling and reduce humidity. Solar accessibility is excellent, and passive or active solar systems will be considered for space heating and cooling and for water heating.

Accessibility for handicapped persons will be provided by designing barrier-free structures and removing barriers from existing structures. Elevated structures will be accessible via ramps with landings. Curb cuts or ramps will be installed in parking areas. Picnic areas and campgrounds will have some barrier-free tables and level sites located close to comfort stations. Except in areas where barrier-free design would cause serious environmental impacts, trails and boardwalks will be barrier-free with respect to trail width, grade (not to exceed 5%), and surfacing.

Site development will reflect the existing landscape character. Only plant materials indigenous to the barrier island will be used in landscaping. Indigenous plants will be used for vegetative screens and low foundation plantings to minimize both onsite and offsite visual intrusions. Vegetation disturbance and earth work will be minimized by taking advantage of previous building sites and existing or abandoned roads and trails in siting new facilities. Where possible new buildings will also be sited to utilize existing utilities. All new utilities will be placed underground and be concentrated where possible in a corridor along the roadway. Soil erosion resulting from construction will be reduced by controlling stormwater runoff.

Trails across the dune ridge will be sited to conform with natural site conditions. Boardwalks will be used where appropriate to minimize erosion of dunes and disturbance of wetlands.

Professional surveys will be conducted early in the project planning and design stages to locate and evaluate cultural resources within project impact areas. Such impacts will be avoided or mitigated by professional data recovery or other means.

Capacities

While visitor capacities at other parks are often dictated by the number of facilities and their sizes, this is not the case for most of Padre Island, where visitors can drive their vehicles the length of the national seashore, carrying their own recreational gear, food, and shade to almost any point along the beach. In two places--the walk-in beach at Malaquite and the lagoon access point at Bird Island Basin--capacities will continue to be controlled by the size of the parking areas. Throughout the rest of the national seashore, however, use will be limited more by management policies, heat, insects, availability of drinking water, and whether or not the visitor's vehicle can navigate the soft sand south of the hard two-wheel-drive beach.

The capacities of the facilities proposed in the draft plan reflect the current demand for these facilities at the national seashore. Based on visitor use trends over the past 12 years, the current level of use is anticipated to remain relatively constant for the life of this plan, so these capacities are expected to be adequate and appropriate for the visitor experience.

The overall recreation carrying capacity of the national seashore is unknown. It would be exceeded if visitors began causing an unacceptable change in the natural environment or if people began feeling overcrowded. These two parameters of capacity are known as the "physical capacity" and "social capacity." The physical capacity of the fore-island dune ridge is extremely low. Even a small amount of vehicle or foot traffic destroys the dune-binding vegetation and erodes the dunes, creating an unacceptable change. Consequently, visitors will be prohibited from climbing or driving on the dunes. The physical capacities of certain wildlife habitats are also low. Visitor use will be seasonally restricted to avoid disturbing the peregrine falcon, and the same protection will be afforded the Kemp's ridley sea turtle nesting and hatching habitat if a nesting population becomes established on the island. The physical capacity of the gulf beach, where the impacts of use are washed away daily by forces stronger than man's, is quite high. So long as visitor use is confined generally to this resilient environment, the physical capacity of the national seashore will probably not be reached as quickly as the social capacity. Social capacity depends on individual visitors' perceptions and expectations, which in turn depend upon their aesthetic, emotional, and educational experiences, their socioeconomic and ethnic backgrounds, and a number of other variables. The current level of use at the national seashore is well below either the physical or the overall social capacity of the beach; however, in two locations where conflicting activities are occurring--the two-wheel-drive beach and Bird Island Basin--the social capacity is exceeded during peak use periods. These conflicts will be reduced by management actions, such as separating activities through zoning.

PROPOSED MANAGEMENT ZONING

Management zones are designated for park lands and waters to indicate what park operations and management functions, visitor uses, and development are appropriate in different locations, based on the park's authorizing legislation, NPS policies, the nature of the park's resources, desired visitor experiences, and established uses. Padre Island National Seashore has a current management zoning system utilizing four major zones: natural, historic, development, and special use. Each of these zones is divided into several subzones to further specify particular use and management strategies. The current zoning system will change very little with the implementation of the proposed draft plan. At the scale of the Proposed Management Zoning map included in this document, the changes are imperceptible. However, there will be a slight decrease in the amount of land included in the development zone at Malaquite and a corresponding increase in the natural zone. The current and proposed acreages for each zone and subzone are listed on the Proposed Management Zoning map. The kinds of lands and waters included in each zone and the management strategies are described below.

Natural Zone

This zone includes the natural environments that comprise the bulk of the national seashore. The lands and waters in this zone give Padre Island its character and value as a natural and visual resource.

Natural Environment Subzone. Lands and waters in this subzone are managed for resource-oriented recreation. Developments are confined to those essential for supporting visitor use--the beach vehicle corridor, unsurfaced back-island road, chemical toilets, and signs. The primary management strategy is noninterference with natural processes, but limited manipulation can occur to mitigate man-caused changes. Allowable activities include hiking, fishing, birding, swimming, beachcombing, primitive camping, and regulated vehicle use. Most of the natural zone falls into this subzone. It includes all of the beaches except Big Shell and Little Shell; the back-island grasslands, dune fields, and mudflats; all of Laguna Madre except the protected bird rookeries; and the gulf waters out to the 2-fathom line.

Outstanding Natural Feature Subzone. Resources in this subzone are managed for public appreciation and interpretation with a minimum of impact on the environment. In recognition of their value as unique natural resources, Big Shell Beach and Little Shell Beach are included in this subzone. The result of a convergence of longshore currents that deposit large amounts of shells at the heart of the barrier island sand and shell accretion system, these beaches provide an interesting visual contrast to the sand beaches and a focus for interpretation of the island's geology. Also included in this subzone is the small stand of live oaks

near the Bird Island Basin road. The trees are the only representation of maritime forest vegetation in the national seashore and provide the sole opportunity for interpretation of this barrier island environment type.

Protected Natural Area Subzone. Management in this subzone is intended to perpetuate ecologically significant and fragile environments. Minimal human intrusion is allowed and development is limited to boardwalks, signs, and wayside exhibits. The fore-island dune ridge, Laguna Madre bird rookeries, and marsh wetlands are included in this subzone. Other fragile wildlife habitats, including the habitats of threatened or endangered species, will be managed as part of this subzone on a seasonal basis.

Research Natural Area Subzone. Management in this subzone promotes research in undisturbed environments. A mile-long corridor of beach and fore-island dune ridge in the northern portion of the national seashore is included in this subzone. The area is closed to vehicle use, and no visitor facilities are provided. Researchers are recording the naturally occurring changes along the gulf side of the island.

Historic Zone

This zone and its associated subzones include archeological and historic resources and their settings. The overall management emphasis is on protection of cultural resources. Allowable uses include interpretation and necessary support development, including trails, boardwalks, signs, and waysides.

Historic Site Subzone. The Dunn Ranch's Novillo line camp is included in this subzone. The management strategy for this site is limited maintenance to slow deterioration.

Archeological Sites Subzone. Management emphasis in this subzone is upon preservation and protection of cultural resources, with limited interpretation permitted. Twenty sites located along the length of the seashore, including the sites in the Mansfield Cut underwater archeological district, are included in this subzone. Development of facilities is not proposed where construction would impact the sites.

Development Zone

This zone includes areas where park development or intensive use substantially alters the natural environment.

		EXISTING		PROPOSED	
		ACREAGE	% OF TOTAL	ACREAGE	% OF TOTAL
NATURAL ZONE					
	NATURAL ENVIRONMENT SUBZONE	130197	97	111349	83
	OUTSTANDING NATURAL FEATURE SUBZONE	637	.5	21855	16
	PROTECTED NATURAL AREA SUBZONE	2830	2	514	.4
	RESEARCH NATURAL AREA SUBZONE	75	.05	0	0

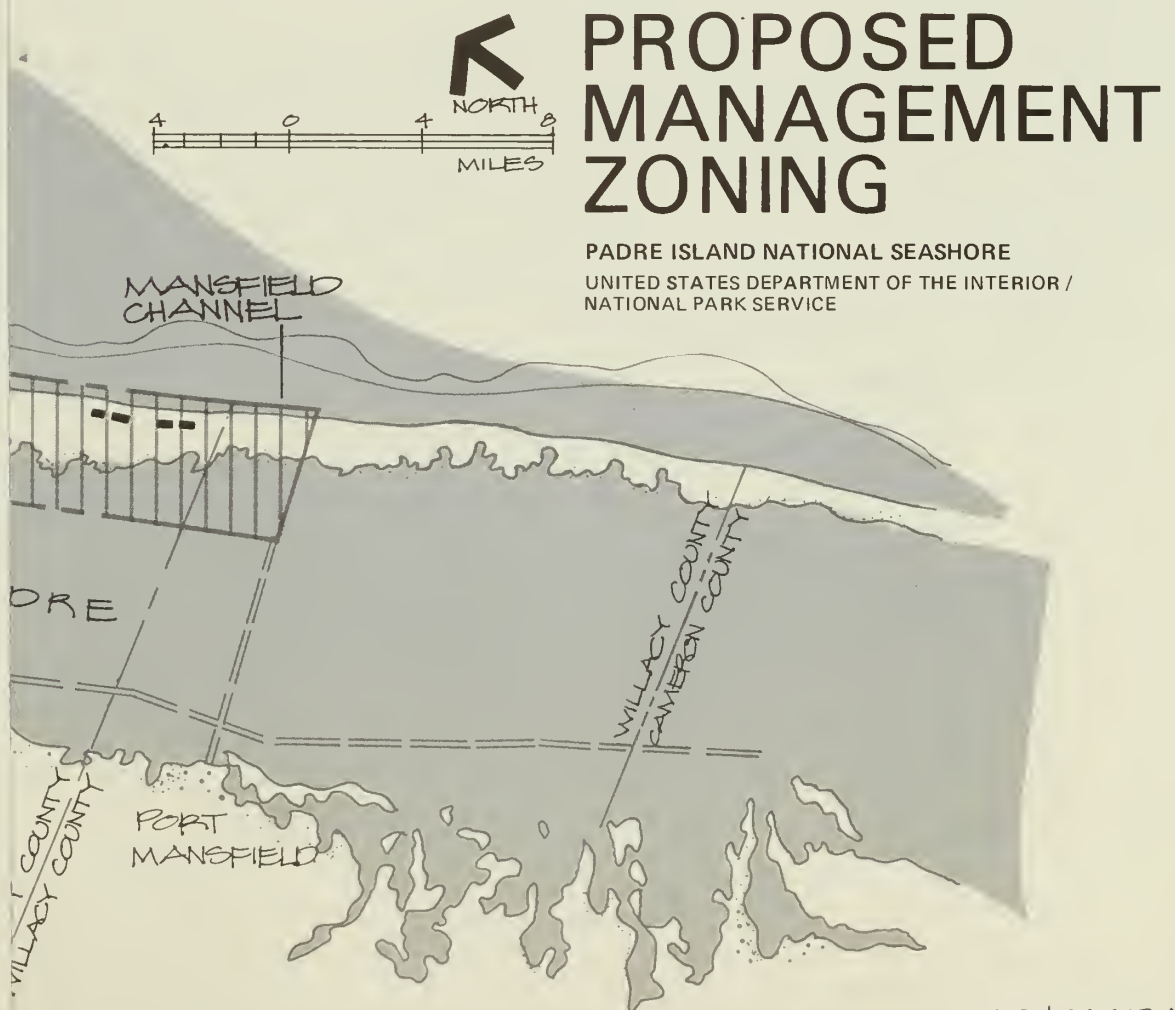
HISTORIC ZONE					
	HISTORIC SITE SUBZONE	25	.02	25	.02
	ARCHEOLOGICAL SITES SUBZONE	—	—	—	—

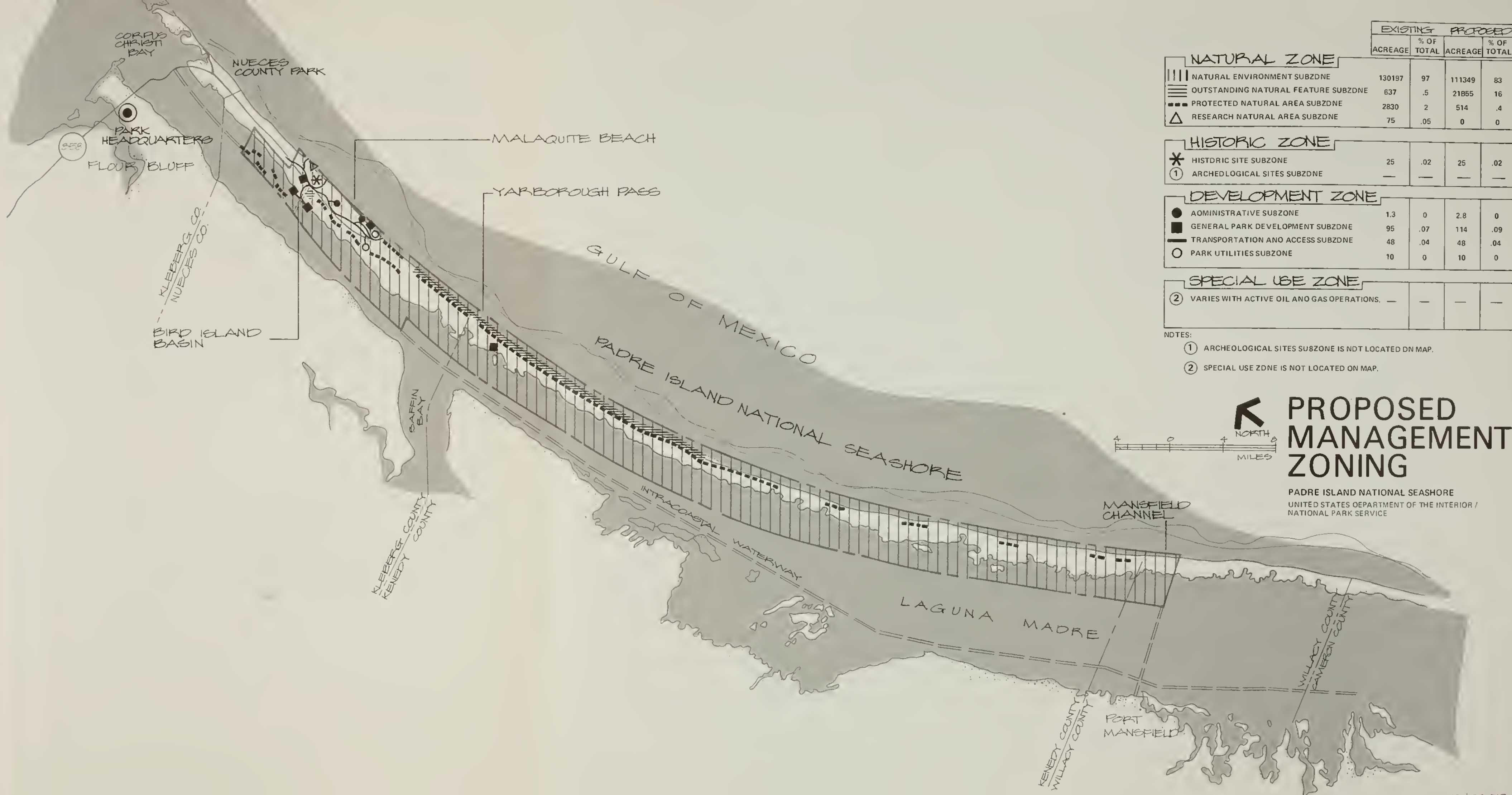
DEVELOPMENT ZONE					
	ADMINISTRATIVE SUBZONE	1.3	0	2.8	0
	GENERAL PARK DEVELOPMENT SUBZONE	95	.07	114	.09
	TRANSPORTATION AND ACCESS SUBZONE	48	.04	48	.04
	PARK UTILITIES SUBZONE	10	0	10	0

SPECIAL USE ZONE					
	VARIES WITH ACTIVE OIL AND GAS OPERATIONS.	—	—	—	—

NOTES:

- ① ARCHEOLOGICAL SITES SUBZONE IS NOT LOCATED ON MAP.
- ② SPECIAL USE ZONE IS NOT LOCATED ON MAP.





	EXISTING		PROPOSED	
	ACREAGE	% OF TOTAL	ACREAGE	% OF TOTAL
NATURAL ZONE				
NATURAL ENVIRONMENT SUBZONE	130197	97	111349	83
==== OUTSTANDING NATURAL FEATURE SUBZONE	637	.5	21855	16
----- PROTECTED NATURAL AREA SUBZONE	2830	2	514	.4
△ RESEARCH NATURAL AREA SUBZONE	75	.05	0	0

HISTORIC ZONE				
* HISTORIC SITE SUBZONE	25	.02	25	.02
① ARCHEOLOGICAL SITES SUBZONE	—	—	—	—

DEVELOPMENT ZONE				
● ADMINISTRATIVE SUBZONE	1.3	0	2.8	0
■ GENERAL PARK DEVELOPMENT SUBZONE	95	.07	114	.09
— TRANSPORTATION AND ACCESS SUBZONE	48	.04	48	.04
○ PARK UTILITIES SUBZONE	10	0	10	0

SPECIAL USE ZONE				
② VARIES WITH ACTIVE OIL AND GAS OPERATIONS.	—	—	—	—

NOTES:
① ARCHEOLOGICAL SITES SUBZONE IS NOT LOCATED ON MAP.
② SPECIAL USE ZONE IS NOT LOCATED ON MAP.

PROPOSED MANAGEMENT ZONING
PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

Administrative Subzone. Management emphasis is on provision of services for administering the park and maintaining park resources. The proposed ranger office in the view tower at Malaquite and the vehicle storage facility on the island are included in this subzone.

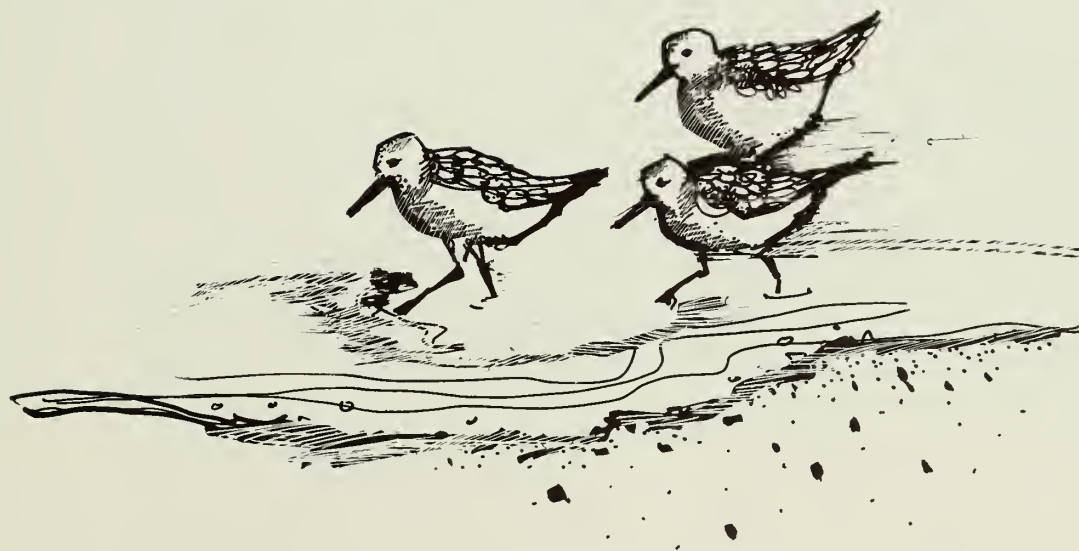
General Park Development Subzone. Management emphasis is on providing facilities to support recreation and interpretation. Developed areas at Malaquite, Bird Island Basin, the grasslands and pond nature trails, and Yarborough Pass are included in this subzone.

Transportation and Access Subzone. Public roads and designated road corridors are included in this subzone. The two-lane surfaced route P-22 and surfaced and unsurfaced spur roads comprise this subzone. (The beach vehicle corridor and the back-island road are included in the natural environment subzone.)

Park Utilities Subzone. The sites of the water pumping station, Malaquite campground sanitary disposal station, and Malaquite treatment plant and sewage lagoons are included in this subzone. It does not include the utilities at Malaquite or in the road corridors (since these are part of the general park development and transportation subzones), the minor facilities such as the chemical toilets at Bird Island Basin, Yarborough Pass, etc., or buried utilities where substantial modification of the landscape is not present.

Special Use Zone

Lands designated in this subzone include the Chevron compressor station, the Sun Oil complex at Yarborough Pass, and the Corps of Engineers spoil easements at Mansfield Channel. Actually, most of the island could fall under this zone, since the federal government does not control the mineral rights to the island or to Laguna Madre. These rights are either owned by the state of Texas or are privately owned. The National Park Service controls exploration and extraction activities through enforcement of federal regulations; agreements with the School Land Board, oil companies, and private owners; and issuance of special use permits which prevent drilling on the beach, in the dunes, or in ecologically sensitive areas.



part 2 environmental assessment

PURPOSE OF AND NEED FOR ACTION

The 1974 plan for Padre Island National Seashore is no longer considered a feasible guide for management and use. The plan was prepared at a time when the demand for recreational space and facilities was great nationwide and the Recreation Advisory Council directed that all national recreation areas (including seashores) be managed to accommodate high-density use. The plan responded to this policy by proposing major development to support an anticipated 2 million visitors a year by 1980. Large-scale facilities to accommodate National Park Service programs and concession services were proposed for Malaquite Beach, Yarbrough Pass, and Mansfield Channel. The plan balanced these proposals for major development with complementary proposals for intensive manipulation of the natural environment and an extensive management and operations presence on the island. To date, only some of the proposals for visitor facilities at Malaquite have been implemented.

A new National Park Service policy, adopted in 1979, discourages the kind of large-scale development of barrier islands proposed in the 1974 plan, stating that

New developments will not be placed in areas subject to flooding or wave erosion or active shoreline processes unless it can be demonstrated that they are essential to meet the park's purpose . . . , that no practicable alternative locations are available; and that the development will be reasonably assured of surviving during its planned life span without the need of shoreline control measures.

This policy reflects a growing understanding of barrier islands and the dynamic processes that sustain them. Because man-made structures are vulnerable to these processes, the environment must be altered and constantly manipulated to accommodate them--a management strategy that threatens the perpetuation of the island's natural resources and should be avoided if possible.

Based on visitor use trends over the past 12 years, which indicate that use of the national seashore has stabilized at about a million visits a year, major development is not essential to support visitor use. Comments from the public received during the early public involvement phase of this planning project reinforce the determination that there is little public need for, or interest in, the large-scale facilities proposed in the 1974 plan. Furthermore, although flood-proof structures might be maintained without shoreline control measures, the corrosive atmosphere of the island has proved to be such a destructive force that maintenance would require an excessive and long-term commitment of federal funds. In short, it would be hard to justify the environmental and economic costs of implementing the 1974 plan.

With the abandonment of the plan the question remains whether the facilities already built at Malaquite should be retained or removed. The park is currently operating under a less-than-desirable funding situation. Major visitor use facilities are in place at Malaquite, but although resource management programs and operational capability have been increased, they have not been increased to the point that they can adequately support the Malaquite development. There are two alternative solutions to this problem: to remove the Malaquite facilities and reduce resource management programs and operational capability on the island, or to retain the Malaquite facilities and increase resource management and island operations. These two solutions, and also the current situation, are the three general alternatives analyzed in this Environmental Assessment.

The three alternatives are arrayed in order of increasing development, resource manipulation, and management capability on the island. The current situation is described in alternative 2 (the "no-action" alternative). Alternative 1 represents a decrease in management and development from the current situation, and alternative 3 represents an increase. The three alternatives are summarized and compared in table 2 (following the text describing each alternative), and the operational and development costs of each alternative are compared in table 3.

Included in the alternatives are specific actions to resolve several issues identified through public involvement. One is the lack of 24-hour ranger patrols, which encourages a greater incidence of law enforcement and resource management problems. Currently, after-hours emergencies are handled by on-call rangers living on the island. The alternatives explore the possibilities of providing 24-hour protection by on-duty rangers (alt. 1) and increasing the number of rangers residing on the island (alt. 3). Another issue is the major demand for boat launching at Bird Island Basin, which creates parking and circulation problems while visitors wait to launch their boats. Both of the action alternatives (alt. 1 and alt. 3) include the provision of improved launch facilities to reduce this problem. A third issue is the provision of visitor use facilities at Mansfield Channel to serve down-island visitors. Primitive campsites, similar to those already existing at Bird Island Basin, and a new boat launch ramp are included in alternative 3. The last issue is the potential for resource damage and conflicts among visitors associated with ORV driving along the beach south of Malaquite. Both of the action alternatives include provisions for restricting vehicle use to a corridor below the embryonic dune line.

ALTERNATIVES

ALTERNATIVE 1: REMOVE MAJOR FACILITIES (PROPOSED DRAFT PLAN)

This alternative has been selected as the proposed draft plan, and it is described in detail in part one of this document. Of the three alternatives, it represents the smallest scale visitor facilities, the least amount of resource manipulation, and the fewest operational facilities on the island.

ALTERNATIVE 2: CONTINUATION OF THE CURRENT SITUATION (NO ACTION)

This alternative represents the current situation at the national seashore. With no major change in strategy, the island would continue to be managed and developed as described below.

Natural Resource Management

Natural processes would be allowed to continue shaping the barrier island, but they would be hampered by ongoing interference caused by the remaining major development at Malaquite Beach and by some visitor activities. Only minor corrective measures would be taken to decrease the potential for damage in heavily used areas. Whenever storms damaged the island, efforts to restore prestorm conditions would only be undertaken where park development was damaged or threatened.

The dunes would be protected by posting signs prohibiting climbing and by other restrictions, but only minimal rebuilding or restoring would be undertaken. The changes in the dune system would be monitored.

Efforts to introduce a nesting population of the Kemp's ridley sea turtle would continue. If the program was successful, the returning turtles would have to nest amidst conditions similar to those created by existing use patterns. Existing limitations on oil and gas operations in the mid-island and back-island environments would remain in effect during peregrine falcon migration seasons. There would be no additional restrictions on use in the peregrine falcon habitat unless it was designated as critical by the U.S. Fish and Wildlife Service. Cooperative efforts with the U.S. Fish and Wildlife Service would continue. Ongoing programs would comply with the Endangered Species Act.

The waterbird rookeries at Bird Island Basin would continue to be maintained for suitable nesting habitat. Some manipulation of the environment would occur on selected islands. Visitor use would continue to be prohibited on islands utilized during the nesting season.

Vehicle use would be allowed across the width of the beach, from the forebeach to the oceanside toe of the dunes. Vehicles would be prohibited from driving in the fore-island dunes. There would be no closure of the beach until after it became impassable due to storm conditions.

Visitor Use and Interpretation

The pattern and level of visitor use would not differ substantially between alternative 2 and the proposed draft plan. However, there would be a difference in the amenities provided for visitors. Malaquite Beach would continue to serve as the major access point for the gulf beach. The pavilion would be maintained for information, showers and restrooms, and food service, providing a place adjacent to the beach where visitors could cool off, eat, and enjoy expansive views of the shoreline from the elevated boardwalk. The 40-site dune-ridge campground would also be retained, with overflow RV camping accommodated in the parking lot.

The current designation of walk-in, two-wheel-drive, and four-wheel-drive beaches would be retained, with no regulations imposed on use other than the current prohibition against driving on the dunes. The beach and the back-island road would not be closed to protect sensitive wildlife habitat, but the back-island road would not be maintained and would continue to be closed whenever flooded.

Visitors would continue to have access to the lagoon at Bird Island Basin and Yarbrough Pass for day and overnight use and boat launching. There would be no activity zoning at Bird Island Basin, and visitors would continue to select recreation sites along the shore and on the lagoon based on their own criteria for safety, congestion, and compatibility with other activities.

The themes for interpretation would continue to be taken from the current Interpretive Prospectus (approved in 1975), which places equal emphasis on themes of cultural history and natural processes. The 1975 plan also calls for considerable expansion of interpretive facilities; however, no new interpretive facilities would be constructed. As a continuation of the existing situation, the staff would provide information at the Flour Bluff headquarters and at Malaquite, and they would conduct evening programs at the Malaquite campground and on the public viewing deck over the water reservoir. These programs would be supplemented by the self-guiding grasslands nature trail and by informational and interpretive waysides to be placed at various locations throughout the national seashore.

Park Operations and Management

Operations would continue as at present. The headquarters would remain in Flour Bluff, where the superintendent and administrative staff would

have permanent offices. The division chiefs for maintenance, interpretation, resource management, and visitor protection would operate from island offices in both summer and winter. Maintenance facilities would remain on the island. After-hour emergencies would be handled by on-call rangers residing on the island in the existing employee housing. Other employees would continue to commute to the national seashore.

Development Concept

The development focus of this alternative would be to more efficiently utilize existing park operation and visitor use facilities. This would be accomplished by modifying and upgrading facilities so that they better serve actual park operation needs and visitor use patterns and reduce resource degradation.

Visitor Facilities. At Malaquite Beach the pavilion would be maintained at its existing size and continue to serve its present functions. For at least the life of the plan (10 years) the remaining upper level (40 sites) of the hurricane-damaged campground would continue to be used for RV camping and parking for walk-in tent campers. The associated trailer sanitary disposal station would be retained. The north end of the 1,200-car parking area at Malaquite would be used to accommodate overflow RV camping.

Facilities would be retained at Bird Island Basin. A project is underway to pave the Bird Island Basin entrance road, shoreline roads, and two parking areas and to delimit vehicle use areas with wooden posts. These improvements are considered part of the existing development in all the alternatives.

The dune crossing and primitive campsites at Yarborough Pass would be retained.

Operations and Management Facilities. The existing offices and maintenance buildings at Flour Bluff and on the island would be retained in their present locations. A project is underway to construct a covered vehicle storage building in the island maintenance area. This facility is considered part of the existing development in all the alternatives. Existing employee residences would be retained.

Site Planning and Development Considerations. The proposed vehicle storage structure would be designed to comply with the applicable regulations governing construction in the floodplain and energy efficiency (listed in the proposed draft plan).

Capacities. Visitor use would be expected to remain fairly constant. The capacity of the pavilion would be greater than the current demand,

allowing for future increases in use without additional facility expansion. Other facility capacities would be consistent with demand. If in the future the physical capacity of a sensitive environment was exceeded, use would be restricted as necessary to protect the natural resources.

ALTERNATIVE 3: MANAGEMENT TO UPGRADE AND RETAIN MAJOR VISITOR USE FACILITIES

This alternative accommodates the maintenance and resource management requirements of the Malaquite Beach pavilion and campground, recognizing that for many visitors the amenities provided by these facilities in their existing locations contribute substantially to their enjoyment of the national seashore. Acknowledging that these major facilities cannot be maintained without continuing to disrupt the fore-island dune ridge at Malaquite, the National Park Service would carry out an intensive resource management program to confine this impact to the smallest possible area and to ensure that visitor use on the remainder of the island did not result in resource degradation. Maintenance of facilities and protection of resources would require maximum operational capability on the island supported by offices, maintenance shops, and housing.

Natural Resource Management

Natural processes would be allowed to continue shaping the barrier island, except in the areas altered by major development. Whenever storms damaged the island, localized efforts would be made to restore prestorm conditions wherever park development was damaged or threatened. In other areas the recovery of the natural environments would be left to natural processes. Additional restrictions would be placed on visitor activities to avoid degradation of sensitive environments, and corrective measures would be taken to restore areas that were disturbed by visitor use.

The dunes would be protected and rebuilt to correct man-caused damage. A dune maintenance program would be undertaken to repeatedly restore or rebuild the dunes where development and associated heavy use interfered with the dune ridge.

Efforts to introduce a nesting population of the Kemp's ridley sea turtle would continue. Appropriate restrictions on visitor use would be developed to protect the turtles nesting and hatching habitat if the introduction was successful. Visitor use would also be restricted to protect the peregrine falcon habitat during spring and fall migrations. The back-island road would be seasonally closed and use of the beach would be controlled as necessary. The programs for managing these and other endangered or threatened species would be implemented in cooperation with the U.S. Fish and Wildlife Service to ensure compliance with the Endangered Species Act. A separate public involvement program would be conducted for these efforts.

The waterbird rookeries at Bird Island Basin would be managed to maintain suitable nesting habitat. Visitor use would be prohibited on the islands during the nesting season.

Vehicle use on the beach would be restricted to a corridor below the vegetation line. The beach would be closed to vehicle traffic whenever high water was predicted to reach the embryonic dune line. Vehicle use would also be subject to seasonal restrictions, including closure if required, to protect the habitats of Kemp's ridley sea turtles and peregrine falcons.

Visitor Use and Interpretation

The pattern and level of visitor use would not differ substantially between alternative 3 and the proposed draft plan. However, there would be a difference in the amenities provided for visitors.

Malaquite Beach would continue to serve as the major access point for the gulf beach. The pavilion would be maintained for information, showers, restrooms, and food service, providing a place adjacent to the beach where visitors could cool off, eat, and enjoy expansive views of the shoreline from the elevated boardwalk. The campground would be rebuilt to its previous 104-site capacity by reconstructing the 64 beach-level campsites, providing opportunities for RV and tent camping in what many visitors would perceive as a more natural and pleasant setting than the pavilion parking lot.

The current designation of walk-in, two-wheel-drive, and four-wheel-drive beaches would be retained, with use of the beach and the back-island road seasonally restricted to protect sensitive wildlife habitat. The addition of a boat dock and primitive campsites at Mansfield Channel would encourage greater use of the south end of the island by boaters and visitors with four-wheel-drive vehicles.

Visitors would have access to the lagoon at Bird Island Basin, Yarborough Pass, and Mansfield Channel for day and overnight use and boat launching. Activities at Bird Island Basin would be zoned to minimize conflicts among visitors.

With the park headquarters moved to the island, the park staff would no longer provide information to visitors on the mainland. The National Park Service would explore the possibility of cooperating with other agencies to provide information about the national seashore at a regional information center. The visitor contact station at Malaquite would be expanded, and a number of informational and interpretive waysides would be placed at various locations throughout the seashore. The interpretive program would be structured around the themes of barrier island processes and ecology, seashore recreation, and energy. Interpretive programs conducted by the park staff would be supplemented by two self-guiding nature trails interpreting the grassland and pond ecosystems.

Park Operations and Management

The facility maintenance, resource management, and visitor protection commitments involved in this alternative would require additional support facilities on the island and a full-time management presence by the superintendent, division chiefs, and administrative staff. This would require that all offices and maintenance facilities be consolidated on the island, even though they would be subject to severe corrosion and hurricane damage.

The Flour Bluff headquarters would be permanently closed. The superintendent and the administrative and clerical personnel would be relocated to the ranger station. All maintenance operations would remain in this area. The law enforcement rangers would work out of a new office provided in the view tower at Malaquite, the major visitor use area. Additional employee housing would be provided at Malaquite to provide adequate on-call emergency protection. Most employees would continue to commute to the island from private residences on the mainland.

Development Concept

Development in this alternative would involve maintenance and modification of existing facilities and construction of some new facilities to enhance the visitor experience and provide an adequate operational and maintenance capability on the island. Major facilities would be replaced in kind when they deteriorated or were destroyed by storms.

Visitor Facilities. The Malaquite Beach pavilion would be retained through a continuing maintenance and rehabilitation program designed to minimize the effects of the corrosive environment and to extend the life of the facility. The NPS visitor contact station located in the pavilion would be expanded by enclosing a larger portion of the deck. Both levels of the campground would be rehabilitated or reconstructed to restore the prehurricane capacity of 104 sites. This would involve reconstruction of bituminous roadway, installation of picnic tables, placement of wooden posts to restrict vehicle use on the beach, and rehabilitation of three comfort stations to make them accessible to handicapped persons.

A boat launch ramp would be constructed at Bird Island Basin. No dredging would be required to construct this facility, but infrequent dredging (every 20 years) would be necessary to maintain the boat channel.

The dune crossing at Yarborough Pass would be upgraded to improve sight distances.

A small boat dock and 15 primitive campsites would be constructed on the north side of Mansfield Channel.

Interpretive waysides would be placed at various locations (as described in the proposed draft plan). The grasslands nature trail would be made accessible to handicapped persons, and a barrier-free pond nature trail and associated parking area would be constructed.

Operations and Management Facilities. The leases on the Flour Bluff headquarters and storage buildings would be terminated. The ranger station and view tower would be adaptively used to provide some additional office space on the island. Maintenance facilities on the island would be expanded to provide more covered parking for vehicles and storage for supplies.

Employee housing adjacent to Malaquite Beach would be expanded with construction of two new single-family units. The two existing residences would be upgraded. No residences would be constructed at the ranger station.

Site Planning and Development Considerations. All new structures would be designed to comply with the applicable regulations governing construction in the floodplain, energy efficiency, and barrier-free accessibility (listed in the proposed draft plan). The same development considerations described in the draft plan would also apply to facilities proposed in this alternative.

Capacities. Visitor use would be expected to remain fairly constant. The capacity of the pavilion would be greater than the current demand, allowing for future increases in use without additional facility expansion. Other facility capacities would be consistent with demand. Visitor use would be restricted to avoid exceeding the physical capacity of sensitive environments.

Table 2: Summary of Alternatives

	1 Remove Major Facilities (Proposed Draft Plan)	2 Current Situation (No Action)	3 Retain Major Facilities
<u>NATURAL RESOURCE MANAGEMENT</u>			
General strategy	Reduce facilities and activities that interfere with natural processes, manipulate the environment to correct man-caused degradation	Retain facilities and activities that interfere with natural processes, slightly manipulate the environment to correct man-caused degradation and to protect facilities	Reduce activities that interfere with natural processes, retain facilities, manipulate the environment to correct man-caused degradation and to protect facilities
Specific strategies			
Kemp's ridley turtles	Continue efforts to introduce a nesting population, restrict visitor use of beach during nesting/hatching period if introduction is successful	Continue efforts to introduce a nesting population	Same as alternative 1
Peregrine falcons	Restrict use in habitat (back-island road) during migration	No restriction of use in habitat*	Same as alternative 1
Spoil islands (rookeries)	Manipulate environment to maintain suitable nesting habitat on selected islands, restrict use during nesting period	Same as alternative 1	Same as alternative 1
Beach vehicle use	Allow vehicle traffic in a corridor below the vegetation line, close the beach to traffic whenever high water is predicted to reach the embryonic dune line	Allow vehicle traffic the width of the beach, close the beach to traffic only when high water reaches the dune line	Same as alternative 1
Dune management	Protect and rebuild to correct man-caused damage	Protect without major rebuilding or restoring, monitor change	Same as alternative 1
<u>VISITOR USE</u>			
Information/orientation	Flour Bluff office (with exhibits), Malaquite contact station, waysides at various locations	Flour Bluff office, Malaquite contact station, waysides at various locations	Enlarged Malaquite contact station, waysides at various locations
Beach-oriented recreation	4½-mile walk-in beach north of Malaquite	Same as alternative 1	Same as alternative 1
	5½-mile 2-wheel-drive beach south of Malaquite (current end of route P-22 to 4-wheel-drive sign)	Same as alternative 1	Same as alternative 1
	4-wheel-drive beach from Malaquite to Mansfield Channel	Same as alternative 1	Same as alternative 1
	Beach access point at Malaquite for day and overnight use	Major beach access point at Malaquite for day and overnight use	Same as alternative 2
Lagoon-oriented recreation	Vehicle access to Bird Island Basin for day and overnight use and boat launching	Same as alternative 1	Same as alternative 1
	Vehicle access to Yarrowborough Pass for day and overnight use, boat launching	Same as alternative 1	Same as alternative 1, plus primitive camping and boat launching at Mansfield channel

*If habitat is determined to be critical, this will no longer be a feasible alternative.

	1	2	3
	<u>Remove Major Facilities (Proposed Draft Plan)</u>	<u>Current Situation (No Action)</u>	<u>Retain Major Facilities</u>
Back-island road	Road minimally maintained, access restricted during periods of peregrine falcon migration and predicted highwater or muddy conditions	Road open but not maintained, closed only when flooded	Same as alternative 1
<u>PARK OPERATIONS AND MANAGEMENT</u>			
Office locations	Superintendent, division chiefs, administrative support, maintenance, and visitor information in Flour Bluff; permanent supervisors and seasonals on island	Superintendent, administrative support, and visitor information in Flour Bluff; division chiefs, maintenance, permanent supervisors, and seasonals on island	All offices on island
Employee housing	No residences on island; 24-hour patrol required	Minimal ranger residences on island	Adequate ranger residences on island to provide on-call emergency services
<u>GENERAL DEVELOPMENT</u>			
Flour Bluff headquarters	Retain headquarters office building, expand storage and covered parking	Retain existing facilities	Terminate lease on headquarters facilities
Island ranger station/maintenance area	Remove ranger station, adapt view tower for staff offices, eliminate all maintenance facilities except essential covered vehicle storage	Retain ranger station and maintenance facilities	Adaptively use ranger station and view tower for staff offices, expand maintenance facilities
Island employee housing	Phase out residences	Retain residences	Upgrade 2 residences, build 2 additional residences
North entrance	New wayside and additional pull-off	No additional development	Same as alternative 1
Grasslands nature trail	Make accessible to disabled visitors	Same as alternative 1	Same as alternative 1
Pond nature trail	Construct barrier-free trail and parking area	No development	Same as alternative 1
Bird Island Basin	Retain roads and parking areas, upgrade boat launch	Retain roads and parking areas	Same as alternative 1
Malaquite campground	Modify north portion of Malaquite parking area to accommodate RV camping; when complete, phase out 40-site dune-ridge campground	Retain 40-site dune-ridge campground, allow overflow RV camping at parking area	Retain 40-site dune-ridge campground, reconstruct lower beach level 64-site campground
Malaquite Beach	Remove pavilion in 5 years, replace with small contact station/restrooms	Maintain pavilion for the life of the plan (10 years)	Maintain pavilion, expand NPS visitor contact station (replace in kind when required)
Yarborough Pass	Retain facilities, improve sight distance at dune crossing	Retain facilities	Same as alternative 1
Mansfield Channel	No facilities	Same as alternative 1	Construct boat dock and primitive campsites with chemical toilets
Wayside exhibits at various locations	10	9	9

Table 3: Facility Capacity and Cost Comparisons

Location	Alternative 1 (Draft Plan)	Facility Capacity*	Development Cost**
Flour Bluff Headquarters	Expand storage and covered parking (15,000 sq ft)	---	---
Island Ranger Station/ Maintenance Area	Demolish ranger and maintenance buildings	---	\$ 57,000
	Relocate fuel storage tanks and gas pumps	---	15,000
	Restore building sites (1,200 sq yd)	---	1,500
	Obliterate parking area and restore site (1,000 sq yd)	---	12,700
	Pave road and parking area (asphalt, 16,000 sq ft)	---	17,500
Island Employee Housing	Demolish 2 houses, garage, and storage buildings	---	19,000
	Remove mobile home	---	1,500
	Restore building sites (400 sq yd)	---	1,500
North Entrance	Install park entrance wayside	10	11,700
	Construct parking area (3 RV spaces)	---	13,000
Grasslands Nature Trail	Modify parking area and trail for handicapped visitors (3/4 mi)	65	35,000
Pond Nature Trail	Construct trail and boardwalk (1 mi)	50	89,000
	Construct parking area (6 car, 3 RV spaces)	---	26,300
	Construct viewing platform	10	13,000
Bird Island Basin	Retain facilities	200	---
	Upgrade boat launching ramp (1,200 sq ft)	---	11,700
Malaquite Campground	Modify existing parking area to accommodate RV camping (100 sites)	320	201,500
	Obliterate existing fore-island dune ridge campground (40 sites)	---	112,400
	Reestablish fore-island dune ridge (150,000 sq ft)	---	21,900

Alternative 2	Facility Capacity	Development Cost	Alternative 3	Facility Capacity	Development Cost
Retain facilities	---	---	Terminate lease on facilities	---	---
Retain Facilities	---	---	Adapt ranger station (2,000 sq ft)	---	\$ 43,800
			Expand maintenance storage and covered parking (4,000 sq ft)	---	87,600
Retain facilities	---	---	Reorient residences (2)	---	8,800
			Relocate garages and storage units (2)	---	2,900
			Construct residences with garages (2)	---	350,400
No development	---	---	Same as alternative 1	10	11,700
			Same as alternative 1	---	13,000
Same as alternative 1	65	\$ 35,000	Same as alternative 1	65	35,000
No development	---	---	Same as alternative 1	50	89,000
			Same as alternative 1	---	26,300
			Same as alternative 1	10	13,000
Retain facilities	200	---	Same as alternative 1	200	---
			Same as alternative 1	---	11,700
Retain campsites (40 sites)	128	---	Retain campsites (40 sites)	128	---
Provide for overflow camping at parking area (100 sites)	320	---	Reconstruct campground (64 sites)	205	93,400

Table 3: Facility Capacity and Cost Comparisons (Cont'd)

	Alternative 1 (Draft Plan)	Facility Capacity	Development Cost
Malaquite Beach	Demolish pavilion	---	\$ 321,200
	Construct modular visitor facilities (5 units) and retain parking area (1,000 spaces)	3,200	100,000
	Reestablish fore-island dune ridge (50,000 sq ft)	---	7,300
	Construct trails and boardwalks (600 lin ft)	60	5,800
Malaquite View Tower	Adapt for ranger station (1,000 sq ft)	---	60,000
Yarborough Pass	Upgrade vehicle dune crossing (300 sq yd)	---	1,500
Mansfield channel	No development	---	---
Wayside Exhibits	Provide waysides (10)	<u>100</u>	<u>29,200</u>
Totals		4,595	\$1,186,200
Annual operation and maintenance cost (includes salaries, materials, and equipment)			\$1,500,000

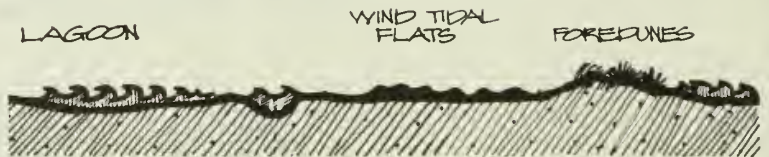
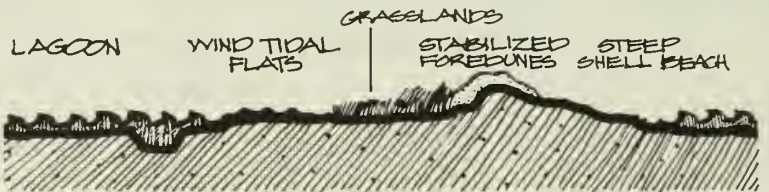
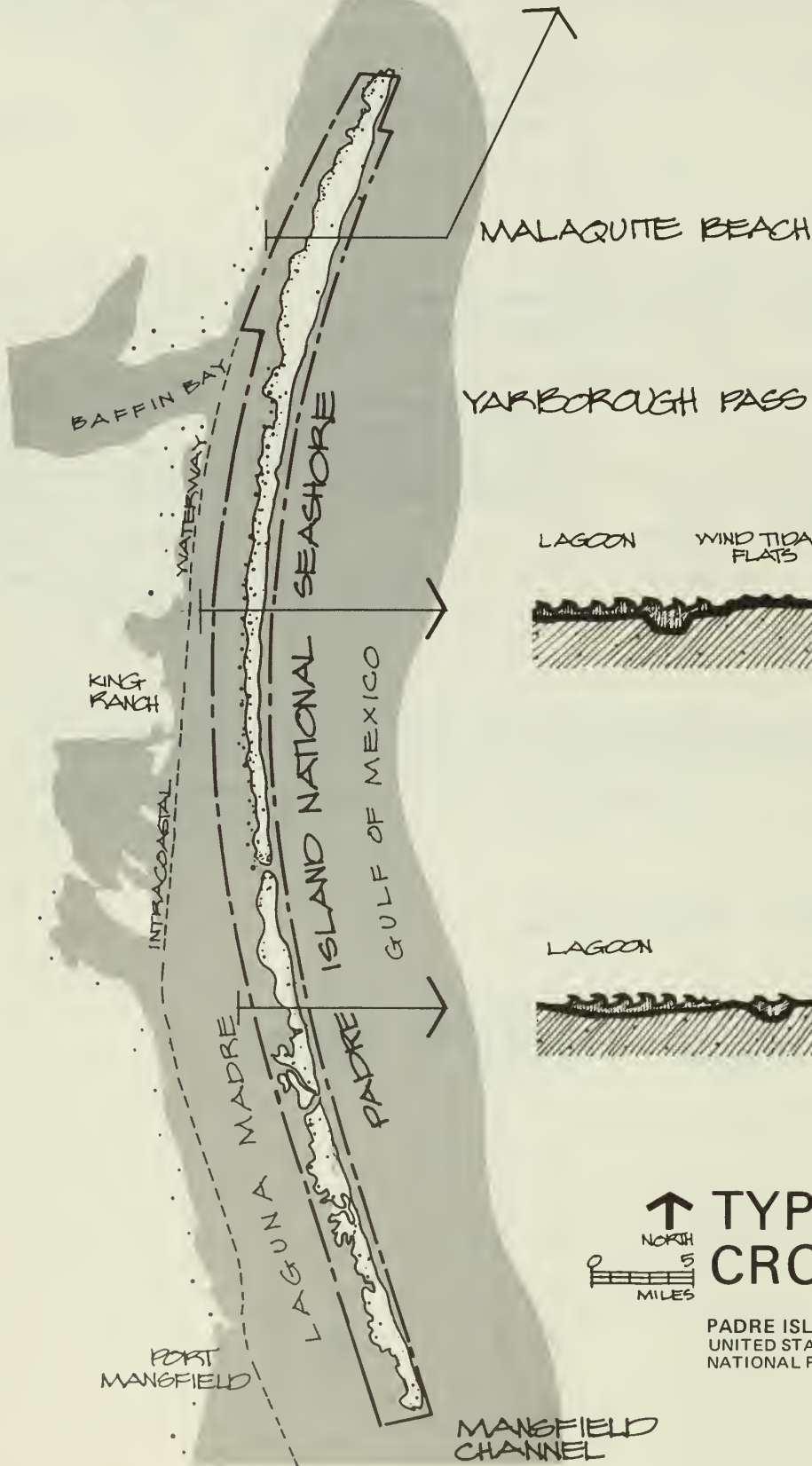
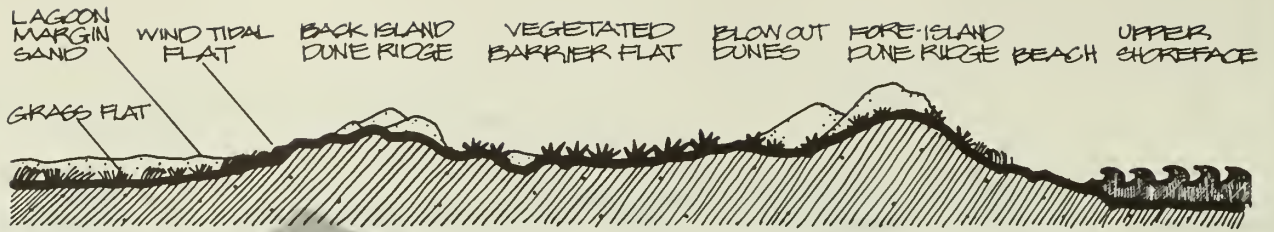
* Capacity is defined as the number of visitors that a facility would accommodate at any one time. Capacities shown for Malaquite Beach were determined by the number of available parking spaces.

** Gross development costs include construction, project planning, construction supervision, and administrative services.

Alternative 2	Facility Capacity	Development Cost	Alternative 3	Facility Capacity	Development Cost
Retain facilities	(3,200)	---	Retain pavilion and parking area (1,200 parking spaces)	(3,840)	---
			Enclose area for NPS visitor contact station (600 sq ft)	---	\$ 109,500
Retain facility	(25)	---	Same as alternative 1	---	29,200
Retain facility	(32)	---	Same as alternative 1	---	1,500
No development	---	---	Construct small boat dock (450 sq ft), chemical toilets (2), primitive campsites (16)	---	20,400
				32	10,200
					23,400
No development	---	---	Provide waysides (9)	90	26,300
	4,610	\$ 35,000		4,630	\$1,007,100
		\$1,300,000			\$1,600,000

Table 4: Staffing Comparison

	Alternative 1 (Draft Plan) Perm/Seas		Alternative 2 (Current Situation) Perm/Seas		Alternative 3 Perm/Seas	
Superintendent	1	--	1	--	1	--
Administration	5	1	5	1	6	1
Visitor & Park Protection	15	9	9	9	10	9
Resource management	3	2	2	2	2	2
Interpretation	5	1	5	1	5	1
Maintenance	16	3	14	3	18	3
Total	45	16	36	16	42	16



↑ NORTH
0 5
MILES
TYPICAL CROSS SECTIONS

PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR/
NATIONAL PARK SERVICE

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DEC | SEPT. 01

AFFECTED ENVIRONMENT

NATURAL PROCESSES AND FEATURES

Padre Island, composed of sand and shell, was created and is continuously being reshaped by the forces of waves, currents, and winds. Waves and currents move tons of sand and shell along the gulf shore in shifting patterns that determine the individual characters of different beaches. Winds pick up the sand from the beaches and carry it landward, constantly moving the island toward the mainland. Where vegetation is successful, it produces a stabilizing effect, binding the blowing sand and building the elevations of the dunes. This stabilizing force is constantly interrupted, however, by the large storms that sweep across the island, destroying the vegetation, leveling the dunes, and eroding deposits of sand and shell.

The environments of this dynamic island change rapidly, but in a predictable pattern that reflects their positions on the island and the processes affecting these sites. A generalized cross section includes the open gulf beach, fore-island dune ridge, vegetated barrier flat, back-island dune field, and wind tidal flat. The north portion of the island is most stable and best represents the range of barrier-island environments, while the south portion is in a state of erosion that denies most vegetative and fore-island dune development (see Typical Cross Sections illustration).

The colored Geology and Natural Environments map provided in the back pocket of this document illustrates the current environments of Padre Island and Laguna Madre. The mapping is based on the origin, landforms, vegetation, and active processes in each area. This work was compiled and printed by the Bureau of Economic Geology, University of Texas at Austin, for their Padre Island guidebook (1980).

Climate and Storms

The climate of Padre Island, as reported at Corpus Christi, is intermediate between humid subtropical and semiarid conditions. Because of the gulf influence, relative humidity is high throughout the year. Normal rainfall is 28.5 inches. Most rain is associated with tropical storms which occur from June to November.

Except for occasional showers and storms there is little change in the day-to-day weather during the summer months. Maximum temperatures range from the high 80s to the low 90s. The highest temperatures occur at noon, then are moderated by afternoon and evening sea breezes. Minimum summer temperatures are usually in the low 70s. The winter months are relatively mild with temperatures seldom falling below freezing and with prevailing northerly winds.

Although no baseline air quality data has been collected on the island, it is assumed that air quality is acceptable because of the frequent wind, which would disperse pollutants. The maritime climate, coupled with the salt spray, creates a very corrosive atmosphere that requires extra effort in maintaining facilities and equipment.

Hurricane season begins in late spring, but hurricanes are most common from August through October. According to Henry and McCormack (1975) during any given year the probability of tropical storms or hurricanes affecting north Padre Island is 34%; for all hurricanes (wind speeds of 74 mph or greater) it is 23%; and for extreme hurricanes (wind speeds of 136 mph or greater) it is 5%. There is an average of five years between hurricanes along this stretch of coastline. In recognition of the storm hazard at Padre Island, the National Park Service maintains a hurricane preparedness plan to help ensure the safety of visitors and employees.

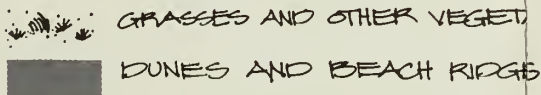
The destructive forces of hurricanes are intense wind, heavy rainfall, and storm tides. The storm tidal surge pushes ashore on the island, erodes the beach, and cuts into the foredunes, dissipating its energy. The surge may be blocked by the dune ridge, or it may open channels across the island, through which sediments eroded from the beach and dunes are carried landward and deposited as washover fans on the barrier flats and in the lagoon. In the storm's aftermath, water drains from the mainland and the lagoon back across the island to the gulf through these same channels.

The most recent hurricane to hit Padre Island was Hurricane Allen. Born August 3, 1980, off Saint Lucia in the Lesser Antilles, it carved a destructive path northwestward towards the Texas Gulf Coast, where it made landfall August 10 near Port Isabel, approximately 95 miles south of the Malaquite Beach development on Padre Island. While offshore, the hurricane registered winds of 185 miles per hour. Two-day rainfall totals at sites in the region measured from 11 inches to 16 inches. Storm tides rose to 10-20 feet in elevation. Coupled with this tidal surge were treacherous wave crests, which combined with the surge brought the flood level up to 20-30 feet.

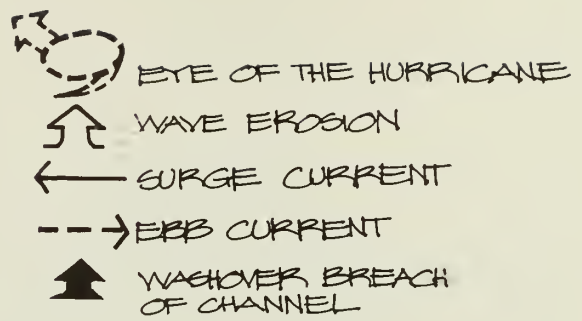
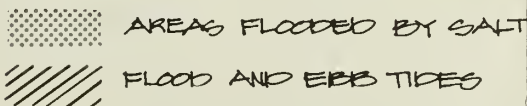
The Padre Island beach and foredunes were severely eroded during the storm. On the south portion of the island, up to 1100 feet of small scattered dunes were washed away and the vegetation was devastated (Gundlach et al. 1981). The sand was transported to the backside of the island through numerous washover channels. The fore-island dune ridge eroded an average 150 feet on the central portion of the island and an average 115 feet to the north. Vertical escarpments cut into these dunes measured some 13 to 19 feet high. Along these sections, the shoreline accreted immediately after the storm and then retreated back to near its prestorm location and configuration. These changes in the island suggest that any construction should be several hundred yards behind the active beach and away from overwash channels.



A Physical Framework



C Hurricane



- ① BARRIER ISLAND
- ② TIDAL INLET OR PASS
- ③ LAGOON
- ④ BAY
- ⑤ RIVER AND DELTA

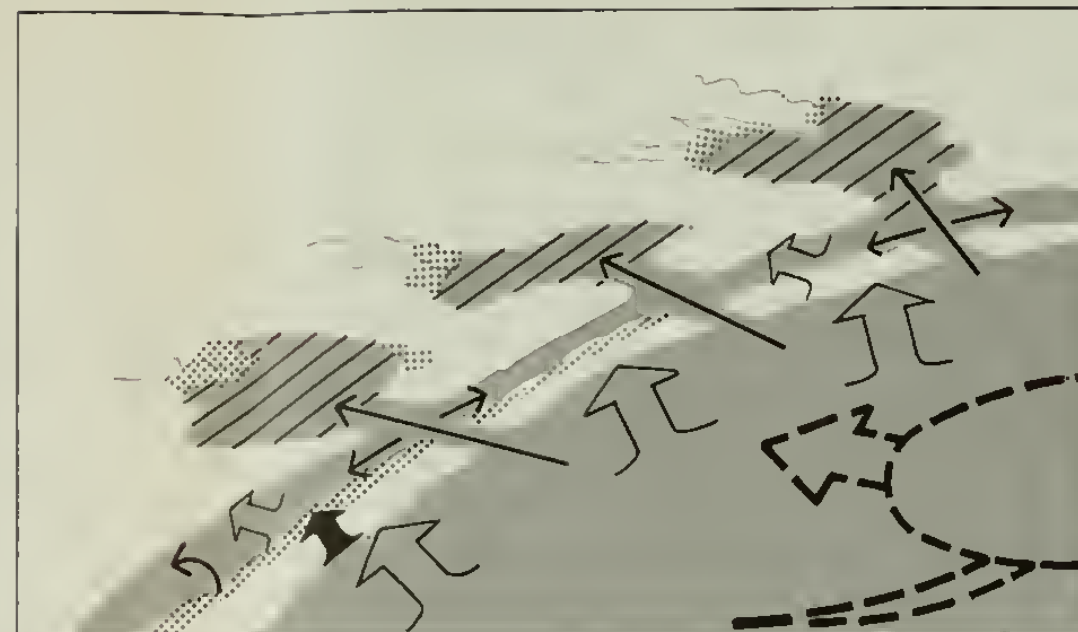
DYNAMICS OF HURRICANES

PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE



A Physical Framework, Texas Coast

- GRASSES AND OTHER VEGETATION ON BARRIER ISLANDS
- DUNES AND BEACH RIDGES

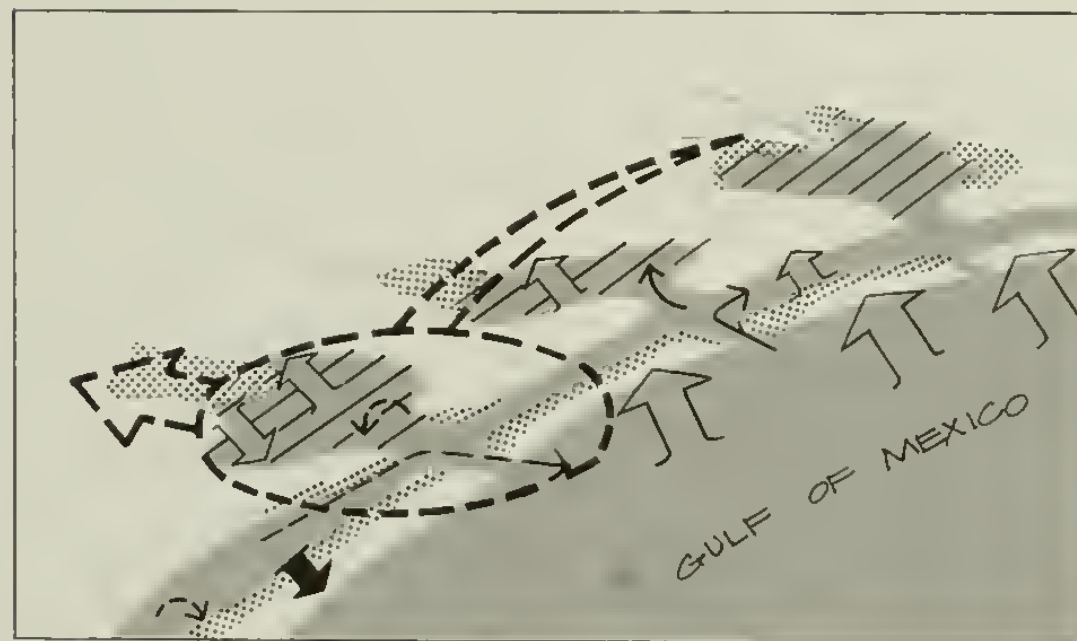


B Hurricane Approach

- SALTWATER FLOODING OF LOW LYING AREAS
- FLOOD TIDES AND STACKING OF WATER FROM SURGE IN BAYS

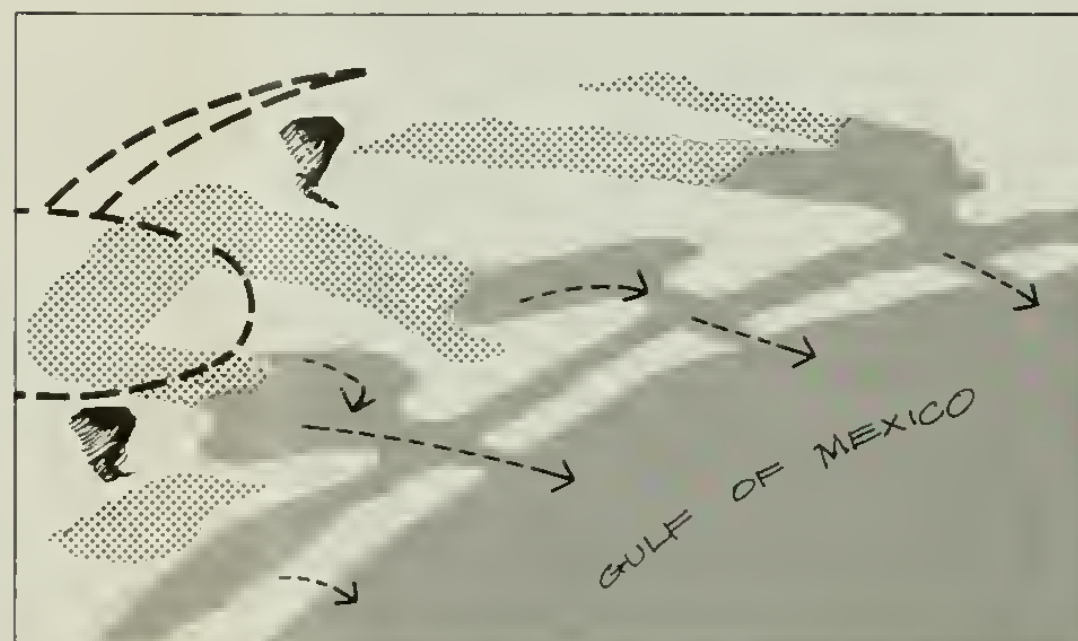
- EYE OF THE HURRICANE
- WAVE EROSION
- SURGE CURRENT
- EBB CURRENT
- WASHOVER BREACH OF CHANNEL

- ① BARRIER ISLAND
- ② TIDAL INLET OR PASS
- ③ LAGOON
- ④ BAY
- ⑤ RIVER AND DELTA



C Hurricane Landfall

- AREAS FLOODED BY SALTWATER
- FLOOD AND EBB TIDES



D Hurricane Aftermath

- TORNADOES AND INTENSIVE TURBULENCE
- FLOODING FROM RUNOFF

DYNAMICS OF HURRICANES

PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE

Coastal Floodplain

Normally, there is little tidal fluctuation on the Padre Island shore. The mean diurnal range is less than 2 feet. Wave heights are normally 2 to 3 feet but exceed 6 feet several days per year during storms.

Most of Padre Island, except for a few high dune ridges, is within the 100-year coastal floodplain. (A 100-year flood is of a magnitude that has a one percent chance of occurrence each year). The stillwater (tidal surge) flood elevation of the 100-year flood on the gulf side is estimated in the range of 6.8 to 7.3 feet above mean sea level (U.S. Flood Insurance Administration 1981b) to 10.5 to 11.0 feet (U.S. Army Corps of Engineers 1980). The maximum 100-year flood estimates for the lagoon side range from 6.5 feet on the south to 12.0 feet on the north (U.S. Army Corps of Engineers 1980). (If the dunes are breached during a storm, the higher gulf side flood elevation occurs on both sides of the breach.) On top of the stillwater, breaking waves create an additional flood height. Depending on the land elevation (feet above sea level) of a particular site, a maximum 11-foot wave height might occur in combination with the stillwater flood height. This total is calculated by multiplying the depth of the floodwater at the site by 1.55 then adding the stillwater elevation (U.S. Flood Insurance Administration 1981a). Any area where the stillwater flood height causes a floodwater depth of 3 feet would be subjected to wave crest action and therefore is considered as the coastal high hazard zone (U.S. Army Corps of Engineers 1981a). The 500-year flood elevations are estimated to be 1-1.5 feet higher than the 100-year flood elevations.

The National Park Service administrative site in Flour Bluff is just above the 100-year floodplain. The flood elevation for the 100-year storm at that location is estimated at 13 feet above mean sea level (U.S. Army Corps of Engineers 1981b), and the facility is 16 feet above mean sea level. This site off Padre Island is also less exposed to the full forces of a hurricane, especially the breaking waves.

In accordance with Executive Order 11988, Floodplain Management, the National Park Service is to "avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of the floodplain, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative."

The National Park Service and the state of Texas share the mutual concern of coastline management. Texas has chosen not to participate in the federal Coastal Zone Management Program; therefore, a consistency determination is not required for this project.

Water Quality

The water quality of the gulf is periodically degraded by oil spills. The oil and other debris frequently wash ashore on Padre Island, creating an unattractive littered beach and safety hazards.

The water quality of Laguna Madre is generally very good. Almost all measurements of temperature, pH, oxygen concentration, and total coliform count are within water quality standards (Texas Water Quality Board 1975).

Any further dredging required by the National Park Service in developing or maintaining its access channels would require a dredge and fill permit from the Corps of Engineers, a provision of section 404 of the Clean Water Act.

Topography and Soils

Most of the sediment of Padre Island is fine sand, but near the center of the island, where the two regional longshore currents converge, up to 80 percent of the sediment is shell. The highest dune elevations occur at Little Shell Beach. The majority of the dune ridges are about 20 feet high, but a few reach as high as 50 feet.

The soils on the island are mapped as the Galveston-Mustang-Active Sand Dunes association (USDA, Soil Conservation Service 1977). These soils are rated as presenting severe limitations for development of buildings, roads, sanitary facilities, and recreational areas. The limitations are caused by wetness, flooding, sandiness, and seepage. The severe rating means that the limitations are difficult and costly to modify or overcome.

Plants

Vegetation types interact with the landforms across Padre Island because of plant tolerance to varying conditions of water, blown sand, and salinity (see the Geology and Natural Environments map). Water promotes plant growth, unless the salinity is high. Where growth is promoted, plants trap the blowing sand and the sand, in turn, builds up the elevation. At higher elevations, water and salinity are reduced. Therefore different environmental conditions are presented and the plant species that are dominant will change in response to the new conditions (Baccus and Horton 1979).

Distinctive plants correspond with the environment types (see appendix C). Where there is no vehicular traffic, the beach supports some highly adapted salt-tolerant plants. Other plants typical of the foredunes and barrier flats may also invade an undisturbed back beach. Sea oats is the dominant builder of the foredunes, but other common foredune species vary along the island. Camphorweed is found on the stable shell-laden central island. Beach evening primrose grows on the bare, moving sands in the south. A diversity of species is represented on the slowly accreting northern beach. The barrier flats are heavily vegetated in a mosaic of species that change with elevation. Sea coast bluestem dominates the highest level. This same bluestem, marshhay

cordgrass, and gulf dune paspalum occur at lower levels. Eleocharis interstincta, spadeleaf, and American bulrush are found at the lowest elevation. Similar to the foredunes, the back-island dunes are built primarily by sea oats. Depending on the local environmental conditions, the vegetation of the spoil islands resembles that of the barrier flats, beach, or foredunes. On the tidal flats salinity controls the species; the lowest and saltiest areas are covered by a thick mat of shoregrass. Extensive algae mats occur on some of the otherwise barren tidal flats. Seagrasses are prevalent throughout Laguna Madre. These plants are highly productive and support a wide variety of associated fauna.

The wetland areas include the tidal flats and shores of Laguna Madre and the freshwater ponds (both ephemeral and permanent). By definition, wetland areas are inundated by surface waters with a frequency to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Executive Order 11990 (Protection of Wetlands) and NPS guidelines direct the agency "to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

The only remnant of a maritime forest in the national seashore is a small stand of four mature live oak trees and 50 saplings near the Bird Island Basin road.

No plant species that are on the federal list of threatened and endangered species are known to occur at Padre Island National Seashore. One plant on the proposed list, Sesuvium trianthimoides, may occur within the national seashore but also may be extinct.

Animals

Characteristic animals and the environments they inhabit are listed in appendix C. Finfish are found in the gulf and lagoon waters. The nearshore and beach, environments of harsh tide and wave action, are inhabited by animals that burrow in the bottom sand. These animals, the most visible of which are ghost crabs, are supported in greatest numbers on the forebeach, where they serve as food for a number and variety of shorebirds. On the foredunes, the diversity of wildlife increases with the vegetative cover. Rodents, other mammals, and reptiles, especially snakes, inhabit the dunes. Similar wildlife is found on the barrier flats and back-island dunes. Amphibians abound in the low-lying ponds. Migratory birds, most notably the sandhill crane, are also attracted to these ponds. The endangered peregrine falcon rests and feeds on the tidal flats during migration, especially in the southern portion of the national seashore. Ducks feed on the seagrasses in Laguna Madre. The grasses also serve as nursery areas for commercial fish species. Colonial seabirds and wading birds nest on the Bird Islands and some of the spoil islands in the Laguna Madre. The Army Corps of Engineers cooperates in protecting this habitat by not depositing spoil material in the rookery

areas, particularly during the nesting season. South Bird Island is administered to perpetuate its rookeries through a memorandum of understanding between the Department of the Interior and the National Audubon Society. This island supports the only breeding colony of white pelicans on the western gulf.

Several animals found at Padre Island National Seashore are included on the federal list of endangered (E) or threatened (T) species: peregrine falcons (E) (Falco peregrinus anatum and Falco peregrinus tundrius); southern bald eagle (E) (Haliaeetus leucocephalus); eastern brown pelican (E) (Pelecanus occidentalis); green sea turtle (E) (Chelonia mydas); Kemp's ridley sea turtle (E) (Lepidochelys kempii); and loggerhead sea turtle (T) (Caretta caretta). The leatherback sea turtle (E) (Dermochelys coriacea), the hawksbill sea turtle (E) (Eretmochelys imbricata), and the american alligator (T) (Alligator mississippiensis) occur within the counties where Padre Island is located, but none have been reported at the national seashore.

Migrating individuals or small groups of brown pelicans are observed flying over and actively feeding in the gulf waters and Laguna Madre during the spring, late summer, and fall. Bald eagles have been sighted in the winter in Laguna Madre. Three eagles were noted in the 1980 annual Audubon bird count. The loggerhead, green, and Kemp's ridley sea turtles are found in the adjacent marine waters. Kemp's ridley and loggerhead turtles nest sporadically on Padre Island. There is a program to establish a nesting population of Kemp's ridley sea turtles at the national seashore.

Peregrine falcons actively use Padre Island for feeding, staging, and resting during their spring and fall migrations. The national seashore is probably their most important habitat on the Gulf Coast (Burnham and Riddle 1979). During the fall of 1979, 378 peregrines were sighted here, and 473 were sighted in spring 1980. Almost all peregrines are seen in the area between Big Shell Beach and a site 20 miles south of Port Mansfield Channel. They are seen primarily on the tidal flats or migrating sand dunes on the west side of the island, but they are also observed in the beach corridor, particularly in the morning. They avoid areas of intense recreational use and vehicular traffic. The National Park Service has recommended the designation of Padre Island from Yarbrough Pass to Port Mansfield Channel as critical habitat for the peregrine falcon.

In accordance with the Endangered Species Act, the National Park Service is consulting with the U.S. Fish and Wildlife Service to ensure protection of all threatened and endangered species present at the national seashore.

Visual Resources

Landform, water, vegetation, animals, and other visible features stimulate visitors' perceptions of the visual quality of the landscape. The national seashore's landform is predominantly flat to rolling, with elevation

changes from sea level to 30 feet above sea level. The gently sloping sand and steep shell beaches, the foredune ridge, and the grassy flatlands stretch along the length of the island in horizontal bands more or less parallel to one another. The vegetation generally assumes a low profile, emphasizing the flat, horizontal lines of the landform. The gulf and sky provide a dramatic backdrop for views from most locations. Dominant colors on the island are the browns and grays of soils, the greens and browns of vegetation, and the blues, greens, and browns of water. The landscape is enriched by its ephemeral quality--the changing moods of clouds, patterns of waves and sand, movement of waterfowl, blowing grasses, and rise and descent of the sun.

The island's visual resources serve as an amenity for the residents and the many visitors who come to the region. Extensive panoramas and vistas may be viewed from higher elevations, such as ridges, foredunes, and especially the view tower at Malaquite Beach. The details of the landscape--a shell, a remnant from a shipwreck, a pattern in the sand--require a pedestrian pace to be appreciated.

Both the far and the near views are vulnerable to visual change. The far view's potential vulnerability is measured by the visible landscape's ability to absorb development: the more diverse the landforms and vegetation, the greater the landscape's potential for absorbing changes introduced into it. Because far views encompass a panorama, where all features are regarded generally, specific changes may not be immediately obvious, and a perceived change in visual quality tends to occur slowly over time. The near view's potential vulnerability is also measured by its diversity. However, because near views are perceived in greater detail they can be dramatically changed through the introduction of a single element.

Padre Island remains a relatively natural landscape. However, its natural character is somewhat tempered by the presence of oil and gas development, park facilities, and the road surface of route P-22. Because of the low, horizontal character of the landscape, vertical features are extremely conspicuous and tend to focus an observer's view. The landscape character of the island is most vulnerable to elements that oppose its horizontality.

CULTURAL RESOURCES

Cultural resource surveys between 1964 and 1974 recorded 32 sites on Padre Island, 20 of which are within the boundaries of the national seashore. The 32 sites include 10 neo-American, 14 archaic/neo-American, 1 neo-American/historic, and 7 historic sites. Because the shifting sands of Padre Island constantly cover and reveal archeological sites--and because survey coverage is not yet complete--the presence of additional sites is likely.

Artifactual evidence from the neo-American sites is attributed to the late prehistoric and historic Karankawa and/or Coahuiltecan tribes. Both

tribes had essentially the same material culture and nomadic subsistence lifestyle, including hunting and gathering. Contact with Euro-Americans so totally uprooted and physically reduced these two tribes that by 1840 very few members remained.

Three historic archeological sites within the park boundary are associated with at least three mid-16th century Spanish Colonial shipwrecks, including one that occurred in 1554. These sites comprise the Mansfield Cut underwater archeological district, which is listed on the National Register of Historic Places. Artifacts were recovered from this area in 1967 by a privately owned salvage company. Additional salvage archeology was conducted by the state of Texas during 1971 and 1972. One associated site is located onshore and could be the survivors' and/or salvagers' camp related to the 1554 wreck.

Other historic sites include the Zachary Taylor campsite (Mexican-American War); and three sites known as Black Hill, Green Hill, and Novillo line camps, built for the cattle operations of the Dunn Ranch. The Novillo line camp, the only remaining structural expression of open-range ranching, is included on the National Register of Historic Places. This site is located on the east side of the main park road, immediately west of the Chevron cracking plant and approximately 3/4 mile north of the ranger station. The site consists of two bunkhouses that are still standing, a kitchen building that is leaning, a hand pump well, concrete and ground stock tanks, corrals that are partially standing, and a windmill that has fallen to the ground.

Following earlier consultation with the Texas state historic preservation officer and the Advisory Council on Historic Preservation, it was determined that the proper management strategy for the Novillo site is one of "acceptable loss," wherein structures will be allowed to deteriorate. Limited annual maintenance will be performed to minimize rapid wood decay, to renail or resecure structural components, and to perform regular grounds maintenance. This determination was reached because of the severe effects of the environment upon the structures, the present poor physical condition of the structures, and limited preservation and maintenance funds. A 1979 historic structures report serves as a detailed recordation of the site. The above management action is in compliance with section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR 800).

All actions detailed in the final general management plan will be in compliance with section 106 of the National Historic Preservation Act and with the programmatic memorandum of agreement among the National Park Service, the National Conference of State Historic Preservation Officers, and the Advisory Council on Historic Preservation.

PARK DEVELOPMENT AND USE

Existing Facilities

Administrative Facilities. The headquarters offices and limited storage facilities are situated on the mainland in leased buildings adjacent to South Padre Island Drive in Flour Bluff. The north entrance of the national seashore is 17 miles from headquarters.

Visitor protection and maintenance facilities are situated on the island, 4 miles south of the north entrance. A rehabilitated barracks is being used as the ranger station. Minimal maintenance shops, storage facilities, and a temporary residence (mobile home) are located in the same area, and a project is underway to construct a vehicle storage building. Additional staff residences (two mobile homes and two wood-frame houses) are located 2 miles south of the ranger station, at Malaquite. A three-stall garage and two wood-frame sheds are adjacent to these residences. The maintenance area is scheduled for resurfacing in fiscal year 1983.

Visitor Facilities. The north entrance area, extending 10 miles from the boundary south to the four-wheel-drive sign, is the most heavily used section of the national seashore. From the entrance, it is 1½ miles along route P-22, a two-lane paved road, to the north beach access spur road. Route P-22 continues for 3½ miles and then terminates just south of Malaquite Beach. From the road terminus to a point 5½ miles south, the beach is hard and accessible by both two- and four-wheel-drive vehicles; beyond that point it is only accessible by four-wheel-drive vehicles. Route P-22, the north beach access road, and the service road at Malaquite are scheduled for resurfacing in fiscal year 1983.

A 3/4-mile self-guiding (stake and leaflet) nature trail and parking area are situated off route P-22 north of Malaquite. The facilities are currently not accessible to handicapped persons.

Another spur road off route P-22 terminates at Bird Island Basin. This area is improved with shoreline roads and two unpaved parking areas, comfort stations, picnic tables, and a sand-bottomed boat launch. A project is underway to pave and delimit the roads and parking areas.

The Malaquite Beach pavilion includes an NPS visitor contact station, concessioner gift and food sales, restrooms, showers, locker rooms, and a covered boardwalk. NPS interpretive staff offices and storage are also located in this facility. The beach is closed to vehicles for 4½ miles in this area, and a supervised swimming beach is provided in front of the pavilion. The Malaquite facility is accessed off route P-22, and parking for 1,200 cars is provided. An overlook tower combining water storage with a viewing area is located north of the parking lot.

A 40-paved-site campground is situated on the foredune north of the Malaquite facility. A 64-site beach-level loop of this campground was obliterated by Hurricane Allen.

An unpaved four-wheel-drive route connects the Malaquite area with Yarborough Pass, where primitive campsites are available.

Accessibility for Disabled Persons. Approximately 5% of all visitors are handicapped persons who require barrier-free access. The beach, lagoon, and grasslands environments are visually and physically accessible to handicapped visitors via existing roads. The campground and the Malaquite pavilion are accessible by paved roads, ramps, and walks. The view tower is inaccessible to handicapped visitors. The grasslands nature trail is also inaccessible because of uneven grades and soft sand.

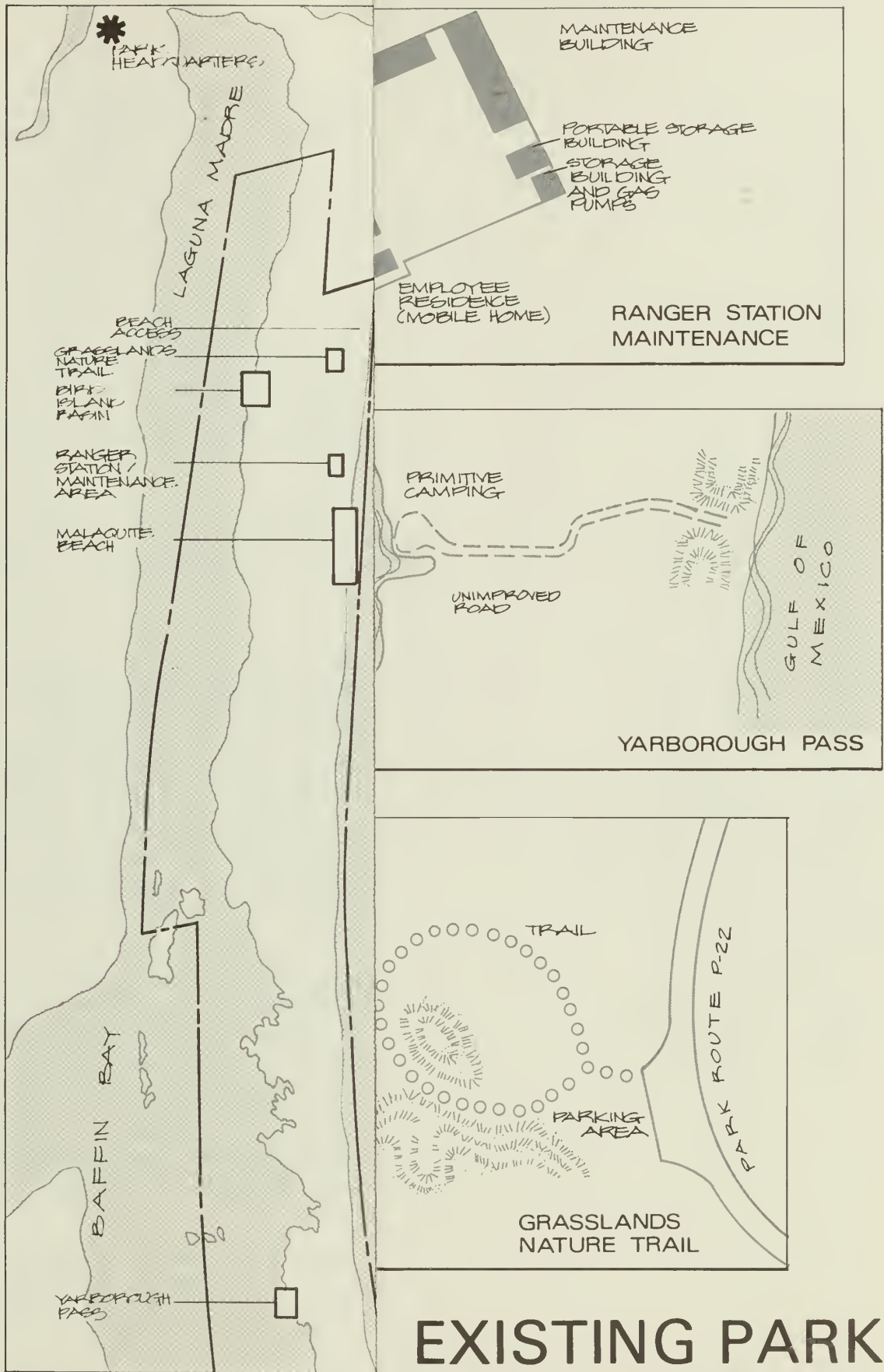
Utilities. Water is obtained from the city of Corpus Christi and stored in a 300,000-gallon aboveground storage reservoir at Malaquite. The water line, electric power cable, and telephone cable are all located underground in the road shoulder.

The Malaquite Beach area and ranger station/maintenance area are serviced by a sewage plant (45,000 gallons per day capacity). The sewage lagoon covers 2.35 acres. A sewage disposal station for self-contained vehicles is located in the vicinity of the campground.

Facility Vulnerability to Storm Damage. The most extensive damage from Hurricane Allen occurred at the 104-site campground at Malaquite, where bituminous roads and walkways, picnic tables, and wooden bumper posts from about 70% of the sites were broken and scattered along the beach. At the pavilion, the high waters removed beach sand and undermined beach structures, cabanas, walkways, ramps, and stairways, but no apparent damage occurred to the basic structure. Two mobile homes were totally destroyed at the park housing area south of Malaquite. Additional housing damage consisted of broken windows, wet carpets, water and sand in electrical equipment, roof shingles blown away, and foundation settlement. Damage at the ranger station/maintenance area was confined to removal of one shed roof, collapsed storage sheds, broken radio tower supports, removal of paint from structures, and damage to enclosure fences. In other areas of the park, bituminous and caliche road surfaces were undermined; signs, guide posts, and fencing were broken and blown away; and water and sand damaged chemical toilets, vehicles, and utility systems. For comparison, the projected costs of repairing the storm damage were \$562,000, which was nearly as high as the original cost, \$700,000, of facility development.

Visitor Profiles and Patterns of Use

The national seashore is visited mainly by local and regional residents. Only 15% of all visitors come from outside the Gulf Coast Texas counties. Most people come to spend the day fishing, beachcombing, swimming, or pursuing other recreational activities, then return home at night.

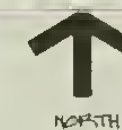
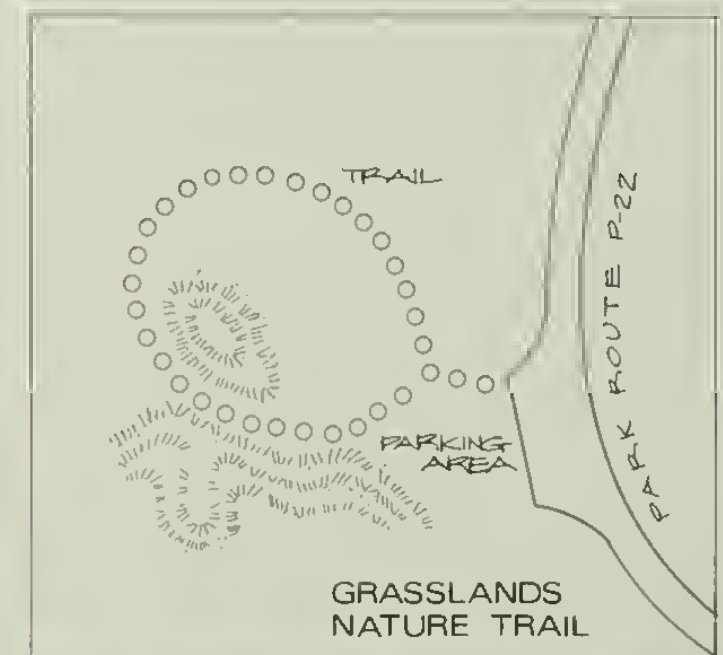
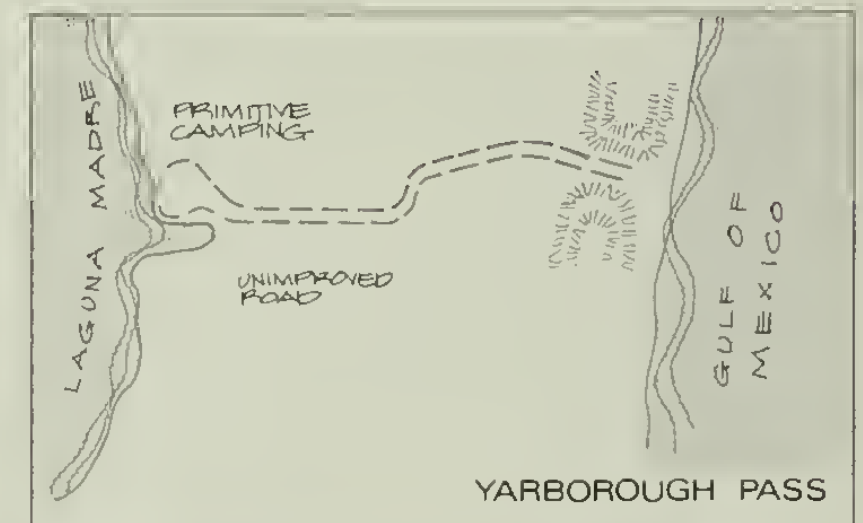
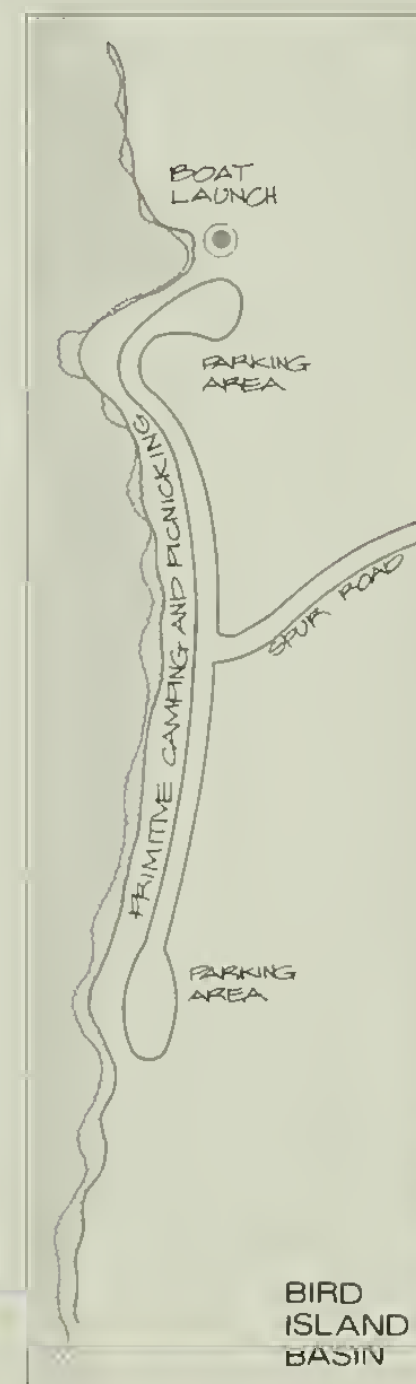
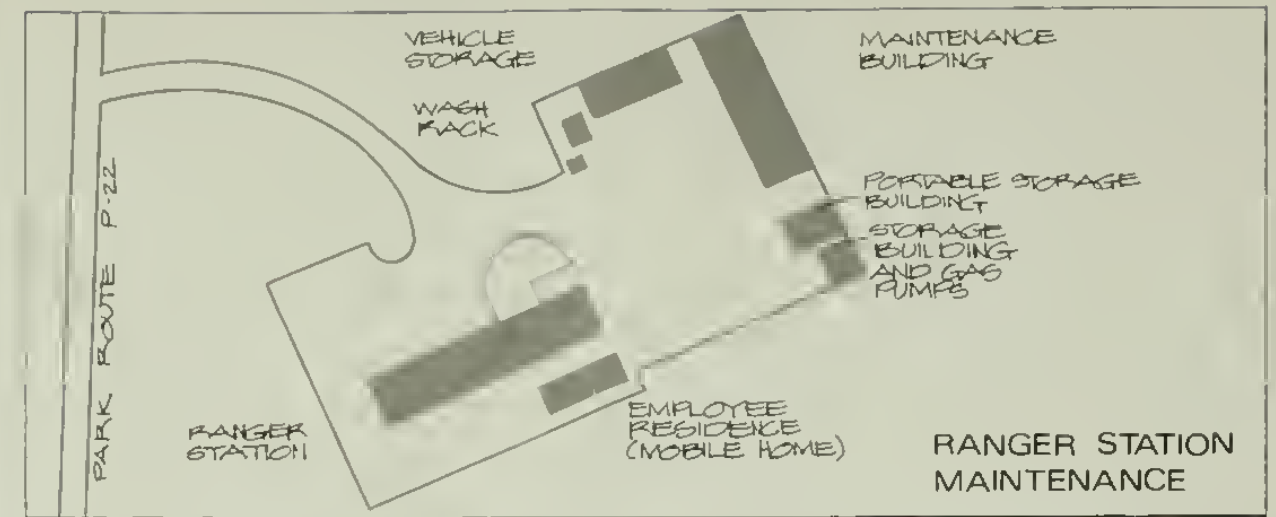
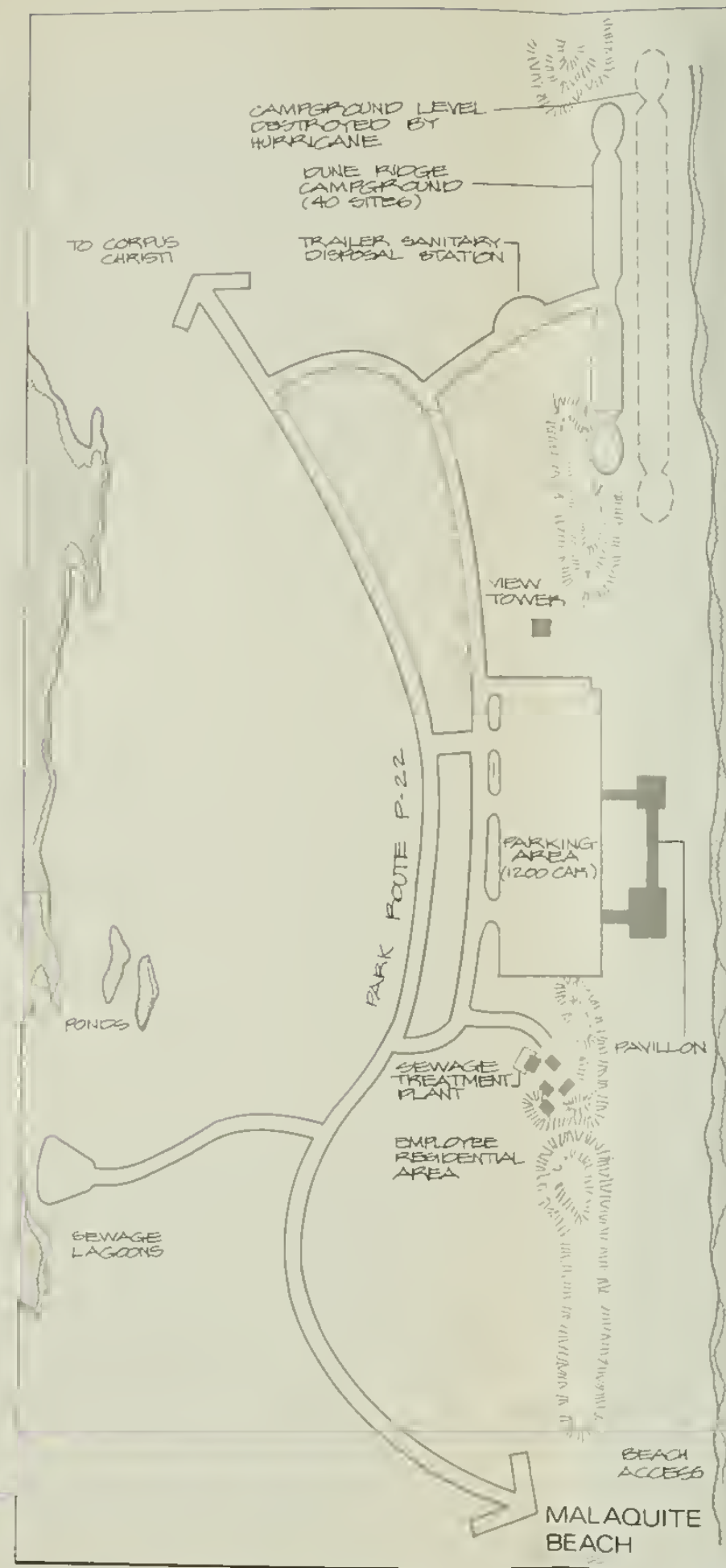
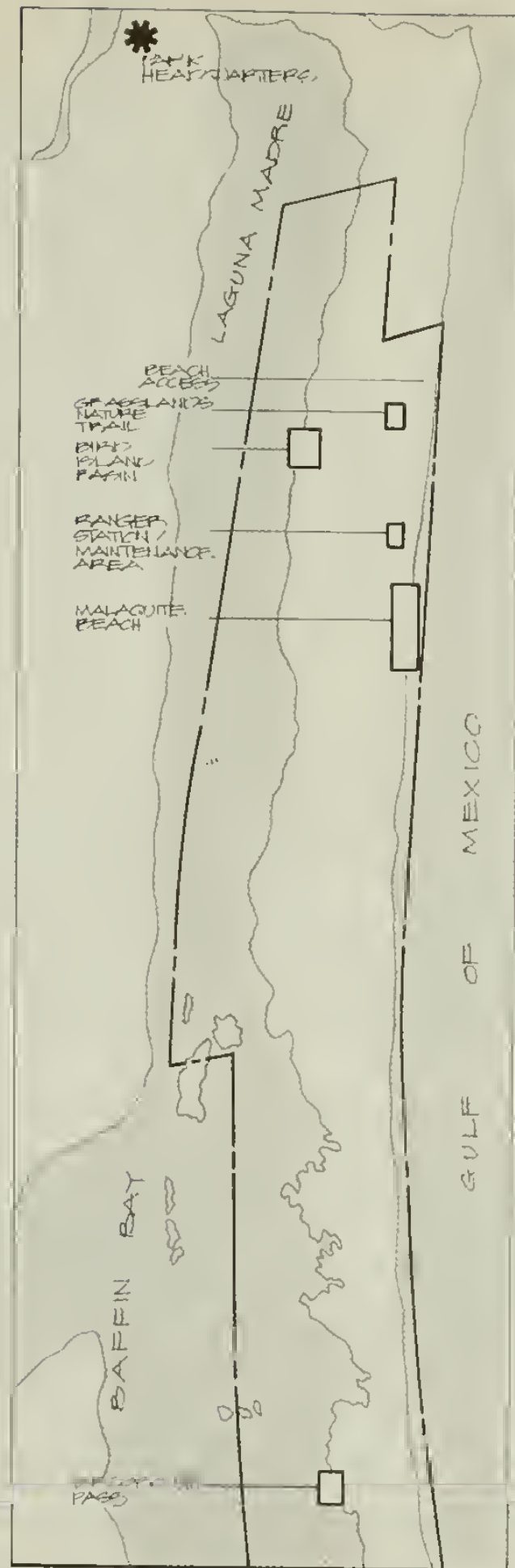


EXISTING PARK DEVELOPMENT

PADRE ISLAND NATIONAL SEASHORE

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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EXISTING PARK DEVELOPMENT

PADRE ISLAND NATIONAL SEASHORE

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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Although camping opportunities are available, fewer than 10% of all visitors stay overnight. The many recreational activities pursued by visitors are largely determined by the features of the various barrier island environments. Major activities are listed on the Visitor Activities and Use Zones chart. Most activities occur on the beach, including vehicle driving, which is regulated in accordance with Executive Orders 11644 and 11989 regarding use of off-road vehicles on public lands. Use is concentrated in the northern third of the national seashore, where access is easiest and support facilities are available. South of the four-wheel-drive sign, the seashore retains a primitive character affording opportunities for a more isolated experience. Most visitors are interested solely in recreation, and only 10% participate in interpretive programs. More emphasis is placed on demonstrations of practical techniques related to fishing and other activities than on natural history; however, the opportunity is provided at several locations for those who wish to learn more about the barrier island ecosystem.

Visitor profiles and use patterns vary greatly with the seasons, as described below. Use is greatest during spring and summer. Percentages of total annual use by season are spring 31%, summer 43%, autumn 17%, and winter 10%.

Spring. During the months of March, April, and May, the weather becomes pleasant and the gulf waters begin to warm, attracting higher weekend traffic and holiday crowds. Most visitors come with their families or college or high school peer groups. They come mostly from Texas except during Easter vacation, when heavy concentrations of college people from all over the country camp on the beaches for their "spring fling." Another upsurge in visitation takes place over Memorial Day, when family groups predominate. Many high school groups from throughout the state come on chartered buses during Buccaneer Days, April 26 through May 8. Beachcombing and surf-fishing are popular activities with local families and individuals driving out for the day.

Summer. The warm, sunny days of June, July, and August bring crowds of visitors to the beach for swimming and sunbathing. Schoolchildren are on vacation, and family groups make up the largest percentage of visitors. Most visitors are local residents or state residents who make Padre Island a vacation destination. Use remains heaviest on weekends, indicative of heavy day use by residents of nearby communities. Various environmental factors encourage evening migrations back to air-conditioned homes and familiar amenities. Summer evenings are hot and humid, and when the gulf breeze periodically dies away, the humidity can become stifling and hordes of mosquitoes and flies appear.

People congregate at Malaquite Beach, where day use becomes extremely heavy. In spite of the heat, many families also use the campground, which is filled by the Fourth of July. In all campsite settings, activities concentrate around that "home base" and do not radiate out much farther.

Beach camping is also popular--campsites may become so dense immediately south of Malaquite that they fill the beach from the high tide zone to the

LAGUNA MADRE

BACK-ISLAND
DUNE FIELD

VEGETATED
BARRIER FLATS

FORE-ISLAND
DUNE RIDGE

BEACH

GULF



GRASSLANDS NATURE TRAIL

BIRD ISLAND BASIN

MALAUQUITE CAMPGROUND

YARBOROUGH PASS

MALAUQUITE PAVILION

EIGHTSEEING

FISHING

WADING

SAIL-FISHING

PICNICKING

BOATING

WATER-SKIING

SWIMMING

CAMPING

DUCK
HUNTING

NATURE STUDY

BACKPACKING

BIRDING

NATURE STUDY

BACKPACKING

HIKING

BIRDING

BICYCLING

RESEARCH

FISHING

WADING

SUNBATHING

BEACHCOMBING

PICNICKING

CAMPING

WALKING

JOGGING

FOUR-WHEEL
DRIVING

SWIMMING

SCUBA DIVING

SURFING

VISITOR ACTIVITIES BY USE ZONE

PADRE ISLAND NATIONAL SEASHORE

UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE

dune line. Interpretive programs offered in this high-density campsite setting are attended, but programs away from this area do not draw visitors.

Down-island activities also reach their peak for the year. Four-wheel-drive vehicle camps are set up at Little Shell, Big Shell, and near Mansfield Channel, where fishing and beachcombing are popular activities. Shark fishing is popular at Big Shell.

Autumn. About the middle of August park attendance drops off. Although September, October, and November are pleasant for camping and enjoying the coastal environment, visitors seem to be diverted to other places and priorities outside the seashore. Most use occurs in the zone between Little Shell and Big Shell beaches, where fishing is more productive. The annual redfish run occurs off the coast in October. With fishing interest high in late October and November, weekend visits by local and state residents pick up and camping on the beach increases. In the Malaquite campground use is limited mainly to weekends.

Winter. In December, January, and February, the seashore attracts out-of-state visitors who travel from the northern states to camp for extended periods. This group is made up generally of older, retired people who frequent the seashore each winter. Unlike spring and summer visitors, the "snowbirds" are very supportive of park interpretive programs and have a greater interest in nature walks, handicrafts, birding, photography, and hiking. Many of these people live in national parks for much of the year, taking advantage of the low-cost campsites, emergency medical treatment, property protection, entertainment, and a sense of community with other retired people living the same way of life.

Visitation Trends

Annual visitation has remained relatively stable over the 12-year reporting period shown in table 5. The total increase between 1969 and 1980 was only 13%, or an average of 1% per year. This was very close to the 13.8% growth rate of the Corpus Christi metropolitan area during the same period.

A closer look at table 5, however, shows two distinct visitation trends for Padre Island. In the five years following 1969, visitation increased steadily, then it fell off during the recession and gasoline shortages of 1974 and 1975, then it jumped to an all-time high in 1976, which was a big travel year for Bicentennial vacationers. Since then, visitation has steadily declined. The maximum growth between 1969 and 1976 represented a 30% increase in visitation. Since 1976, visitation has decreased 20% to a level approximated last in 1974. It is unknown if this trend will continue downward, stabilize, or increase in the next five years.

Table 5: Padre Island Visitation

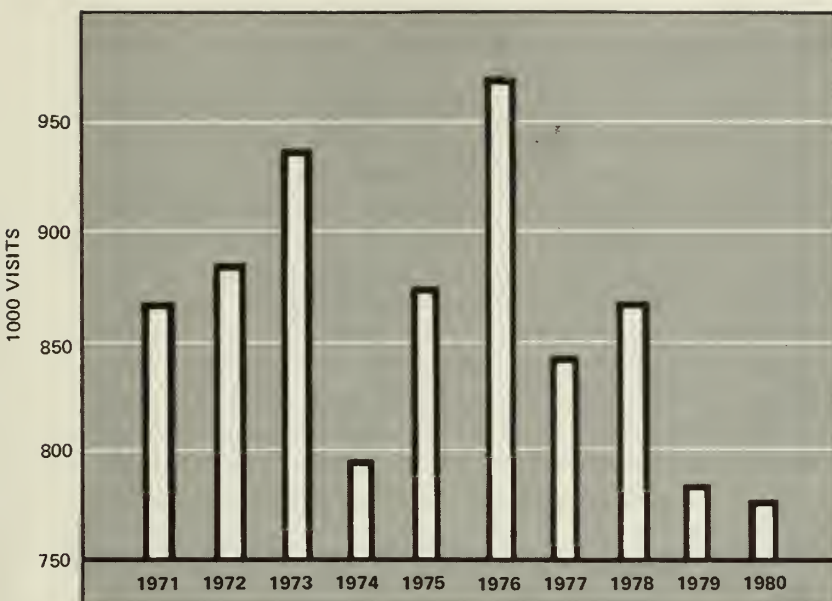
<u>Year</u>	<u>Total Visits</u>	<u>Overnight Stays</u>
1969	675,139	
1970	694,249	
1971	860,513	
1972	883,800	119,000
1973	937,400	132,700
1974	796,300	117,600
1975	872,200	131,000
1976 [*]	968,100	126,500
1977	842,200	106,700
1978	867,000	102,400
1979	783,500	81,684
1980 ^{**}	776,200	75,268

* Bicentennial year.

** Campground closed by hurricane damage on August 10. Parking lot was used as alternate.

Regional Trends That May Affect Visitation

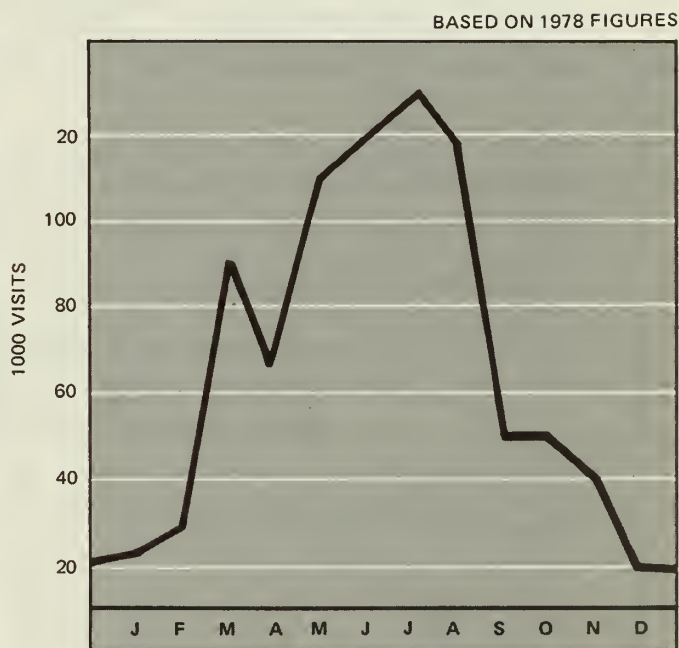
The rising cost of gasoline and the economic instability caused by inflation, together with any number of related economic conditions, will affect the visitation patterns at the national seashore. One future trend according to the economic outlook of the Corpus Christi Chamber of Commerce will be an increased use of tour bus transportation throughout the state.



ANNUAL
VISITATION



OVERNIGHT CAMPING



MONTHLY VISITATION

VISITATION TRENDS

PADRE ISLAND NATIONAL SEASHORE
UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE

Table 6: Recreation Facilities in a Six-County Area
Surrounding the National Seashore

<u>Urban Areas</u>		<u>Rural Areas</u>	
<u>Activities/ Facilities</u>	<u>Number</u>	<u>Activities/ Facilities</u>	<u>Number</u>
Boating		Boating	
Parks	2	Parks	27
Ramp lanes	6	Ramps	28
		Lanes	40
		Slips and stalls	445
Fishing		Fishing	
Parks	2	Parks	22
Pier/barges/marinas		Piers/barges/marinas	20
Total linear yards	60	Total linear yards	1,138
Camping		Camping	
Parks	1	Parks	21
Campsites	10	Campsites	960

Source: Texas Parks and Wildlife Department 1975.

Note: The region includes Aransas, Kennedy, Kleberg, Nueces, Refugio, and San Patricio counties.

Given the trend of visitation in recent years, it does not appear realistic to plan for greatly increased demands for services, especially at a time when more facilities are being developed at similar sites closer to urban centers. A Texas barrier-island-ecosystem study conducted by the U.S. Department of the Interior (1980) inventoried the recreation resources in the 24-county coastal region from Galveston Bay on the north to Brownsville on the south. Approximately 2.7% of this region is recreation park lands. This is more than the state as a whole and suggests the relative concentration of recreation/tourism resources within the coastal region. Included in these park lands are Padre Island National Seashore, six national wildlife refuges, and 18 state parks and recreation areas. Recreational facilities in the 24-county region include 1,613 boat slips and 63 camping parks with 2,914 campsites. A more specific breakdown of facilities for the six-county area surrounding the national seashore is given in table 6.

Like Padre Island visitation, Texas regional tourism has decreased over the past few years. Nevertheless, recreational seashore facilities in the area surrounding the national seashore have been increased by 7% since 1979, indicating that developers expect demand to rise. It is possible that development of coastal recreational facilities closer to Corpus Christi and South Padre Island may contribute to dispersal of public use away from the national seashore.

The Corpus Christi metropolitan area, to the north of Padre Island, had a 1980 population of approximately 324,000, while the population of the four-county area of San Patricio, Nueces, Kleberg, and Kennedy counties totaled approximately 358,000. The Rio Grande Valley region is a major population center south of the island. The combined population in 1980 of Cameron, Willacy, and Hidalgo counties in the valley was approximately 472,000. The next closest major population centers to Padre Island are San Antonio, approximately 160 miles to the northwest, and Houston, approximately 230 miles to the northeast.

The Corpus Christi metropolitan area experienced a 13.8% population growth from 1970 to 1980. This represented a slowdown in growth, which was attributed to declining birth rates in the Anglo, Hispanic, and black populations and substantial net out-migration by the blacks and Anglos. Although birth rates are declining for the Hispanic and black populations, their rates are still above the local Anglo rate and the national trend. This means that there are higher concentrations of young people in the Hispanic and black populations and that their proportion of the total population will be increasing. Since different ethnic and age groups have different recreational needs, park programs will have to accommodate the changing needs of local visitors as population and age shifts occur (Demographic Study, Corpus Christi Department of Planning and Urban Development).

Growth in the age groups between 15 and 24 years of age, 40% of the population of the Corpus Christi metropolitan area in 1975, suggests a strong increase in vehicle ownership and use. This could affect park resource management if increased vehicle use occurred within the national seashore.

A substantial increase in the residential population has occurred in the southeast Corpus Christi area adjacent to South Padre Island Drive. A significant portion of the new residents are Anglo immigrants from outside Corpus Christi. There is also a trend in the movement of retail establishments away from the center city and into the southeast area, which further contributes to the increase in population in this area as employees seek to reside close to their work (Economic Study, Corpus Christi Department of Planning and Urban Development). As this trend continues, increased demand for recreation could affect use of the national seashore and increase visitor contact at the Flour Bluff building.

The metropolitan area's overall employment experienced a net gain of 10.7% between 1970 and 1977. This reflects a slowdown from the previous decade when employment realized a 17% net gain. The growth of the metropolitan tourist industry, however, increased 15%, as compared to a 9% increase for the state, from 1974 to 1978. It appears from the growth in the tourist industry and related employment that the local demand for recreation is increasing.

Oil and Gas Operations

For the past 20 to 30 years, oil and gas exploration and extraction have been actively pursued on Padre Island. All mineral rights have been reserved to the grantors, and provision for the recovery of minerals is made in the establishing act for the national seashore. Mineral exploration and recovery leases in the gulf and Laguna Madre are administered by the state of Texas. The leases are sold by the state to individual companies for a specified period of time, after which they revert to the state and can be resold.

Oil and gas operations within the boundaries of the national seashore are subject to NPS regulations governing nonfederal oil and gas rights (Code of Federal Regulations, title 36, part 9, subpart B) promulgated to ensure that oil and gas activities are carried out in a manner that is consistent with the purpose of the unit of the National Park System where they occur. The park staff enforces these regulations through the approval of plans of operations. Drilling is not permitted on the beach, in the dunes, or in ecologically sensitive areas on the island.

Complementing these regulations, the School Land Board, with NPS concurrence, has adopted a policy prohibiting the placement of offshore structures within 2 miles of the gulf shoreline.

Nine oil companies and four pipeline companies currently operate facilities within the national seashore. Oil and gas activity has increased in the past few years, and the National Park Service anticipates that a number of new plans of operations will be submitted in the near future. To date, no major development has extended south of Yarbrough Pass. Active wells total 40. Offshore oil and gas are piped to the island and transported by pipeline or barge to the mainland. Most facilities on the island are for storage, drying, and compressing. The total acreage of

surface leases in connection with oil company activities within the national seashore is 136 acres. This does not include pipeline rights-of-way.

An additional area of approximately 28 acres of lagoon bottom in Laguna Madre has been lost, in terms of ecological productivity, through dredging of channels and basins incident to oil and gas recovery operations. Although much of the drilling activity has resulted in dry holes and abandonment of operations, the bottom land has been permanently altered. The number of channels and basins dredged under any particular lease is not limited by law, thus making it possible that fish and waterfowl habitats of Laguna Madre could be severely affected. However, the School Land Board has the authority to place restrictions on each state tract that may prohibit new dredging.

On Padre Island itself, oil companies have shown genuine interest in preserving the environment through efforts to restore affected sites to their original condition, even to the point of revegetation of denuded areas.

ENVIRONMENTAL CONSEQUENCES

The environmental consequences of each alternative are arrayed in tables 7, 8, and 9. The consequences are tabulated to facilitate comparison of the alternatives.

Table 7 presents a brief summary of the magnitudes of overall effect. Table 8 identifies the types of environments and the acreages that would be impacted at each development site. These sites can be identified on the Development Concept map. The important implications of development and management actions are further discussed in table 9.

Table 7: Summary of Environmental Consequences

	<u>Alternative 1</u> <u>(Draft Plan)</u>	<u>Alternative 2</u> <u>(Current Situation)</u>	<u>Alternative 3</u>
Alteration of barrier island dynamics	Low	Moderate	Moderate
Construction in coastal floodplain	Low	Moderate	High
Dredging of bottom sediments	Low	Low	Low
Damage to plants and animals	Low	Moderate	Moderate
Disturbance of threatened or endangered species	Low	Moderate	Low
Threat to cultural resources	None	None	None
Visual intrusions on landscape	Low	Moderate	Moderate

Table 8: Adversely Affected Natural Environments

<u>Location and Environment Type</u>	<u>Alternative 1 (Draft Plan)</u>	<u>Alternative 2 (Current Situation)</u>	<u>Alternative 3</u>
Flour Bluff Office man-modified land	acres 1.4	acres 1.0	acres --
North Entrance barrier flat	acres .1	acres .1	acres .1
Bird Island Basin sandflat/coppice dune field	acres .9	acres .9	acres .9
barrier flat	1.2	1.2	1.2
back-island dune field	.6	.6	.6
wind tidal flat	1.5	1.5	1.5
lagoon margin sands	18.9	18.9	18.9
spoil	.6	.6	.6
man-modified land	.9	.9	.9
Ranger Station barrier flat	acres .8	acres .8	acres .8
ephemeral ponds and marshes	--	--	--
man-modified land	.5	2.0	2.1
Malaquite Campground sandflat/coppice dune field	acres --	acres --	acres 9.0
fore-island dune ridge	--	1.1	1.1
man-modified land	--	2.4	4.8
Malaquite Beach sandflat/coppice dune field	acres 3.9	acres 3.9	acres 3.9
fore-island dune ridge	20.4	32.1	32.2
stabilized blowout dunes	8.0	8.0	8.0
man-modified land	14.5	18.5	18.6
ORV Beach Route beach	miles 66.5	miles 66.5	miles 66.5
sandflat/coppice dune field	--	66.5	--
Back-Island Road barrier flat	miles 9.0	miles 9.0	miles 9.0
fore-island blowout dunes	1.0	1.0	1.0
wind-tidal flat	3.0	3.0	3.0
Yarborough Pass fore-island dune ridge	acres .2	acres .1	acres .2
barrier flat	.1	.1	.1
stabilized blowout dunes	1.1	1.1	1.1
spoil	1.5	1.5	1.5
man-modified land	1.0	1.0	1.0
Mansfield Channel spoil	acres --	acres --	acres 4.4

Table 9: Environmental Consequences

Geology and Processes - Barrier Island Dynamics	Alternative 1 (Draft Plan)	Alternative 2 (Current Situation)	Alternative 3
	Assistance to natural processes in overcoming man-caused changes in areas where facilities are eliminated will allow natural conditions to recover more quickly. Then as <u>resources are managed</u> so that natural processes operate alone, the barrier island will respond freely to natural day-to-day and storm-related conditions. Any storm destruction, such as eroding of dunes or scouring of wash-over channels, will be visible on the island until a natural recovery occurs. Blowouts in fore-island dunes will remain as gaps for future storm surge. Active dunes migrating toward Laguna Madre will eventually infill the lagoon edge. In the long term, natural barrier island processes and a natural environment will be best preserved.	Similar to alternative 1, except human activities would have more influence on the natural processes. Human interference such as damage caused by foot traffic would weaken the condition of the barrier island, and this could result in more severe storm damage to the natural environments. In the long term, barrier island processes would be preserved, but barrier island environments would be altered from their truly natural state.	Environmental processes would be manipulated to manage site conditions as required for protection of facilities. For example, a natural plant cover would be facilitated by planting grasses over footpaths that had cut across the fore-island dunes, decreasing the potential for dune blowouts during storms. In developed areas, some human actions would weaken the condition of the barrier island, and this could result in more severe storm damage to the natural environments. In the long term, barrier island processes would be preserved, but some barrier island environments would be altered from their truly natural state.

Vehicle use on 67 miles of beach will continue to induce sand movement. Vehicles destroy the vegetation in the narrow corridor, and the lack of vegetation allows sand to blow freely out of the corridor. This sand movement is lowering the beach, a condition that represents long-term environmental degradation (Weise and White 1980 and Baccus and Horton 1979). Beach closure in anticipation of high water will avoid damage when the beach is most vulnerable to impacts from vehicle use. Because damage from vehicle use is less in the dynamic and resilient beach environment than in other environments on Padre Island, use of the beach corridor meets the requirements of executive orders 11644 and 11989, regarding use of off-road vehicles on private lands.

Same as alternative 1.

Vehicle use on 67 miles of beach would continue to induce major sand movement across the entire width of the beach and berm. Vehicles would destroy the vegetation, and the sand from this extensive area would blow freely. This sand movement would not only lower the beach but would also increase the potential for dune blowouts where damage was incurred at the base of dunes. Also, storm tides could force vehicles onto the embryonic dunes until the beach could be vacated and closed. This could result in more severe long-term environmental degradation. This alternative would comply, but not to the maximum extent possible, with executive orders 11644 and 11989.

Alternative 1
(Draft Plan)

Traffic on the back-island road will have less impact than at present. Because the road will be closed during wet conditions and periods of peregrine falcon migration, rutting and ponding will be less severe. Therefore, the possibility of resource damage spreading away from the road will be reduced.

Alternative 2
(Current Situation)

The back-island road would be closed only when flooded. However, traffic during wet but not flooded periods would continue to deepen the ruts, thus increasing the potential for ponding. These conditions encourage drivers to detour off the road and cause more extensive resource damage. The barrier island processes are less active where the road is routed, behind the fore-island dunes, than on the beach. Therefore, the damage, including vegetation destruction and soil compaction, are more permanent effects, but interference with long-term natural processes is less.

Alternative 3

Same as alternative 1.

A return to more natural conditions will occur with the phase-out of existing development at Malaquite Beach (including removal of the campground, the pavilion, and employee housing) and at the ranger station (including removal of ranger station and all but one of the maintenance facilities). At these sites, human influence on natural barrier island processes will be reduced. Without development and heavy foot and vehicle traffic at the Malaquite and ranger station sites, plants will have a chance to grow and entrap the blowing sand. This process will eventually reestablish the damaged fore-island dune field that serves as a natural defense against storm overwash.

Natural conditions would not recover at any of the presently developed areas except in the lower loop of the Malaquite campground. A recovery of coppice dunes at this one site would be incomplete because of the ongoing intense use across this site between the campground and the beach.

Natural conditions would not recover at any of the presently developed areas.

Alternative 1 (Draft Plan)

Natural processes will continue to be somewhat altered from the remaining development and use at Bird Island Basin, the ranger station, Malaquite Beach, and Yarrowough Pass (refer to the Affected Natural Environments table for the acreages affected at each site). Development of the pond nature trail will impact natural conditions through development and subsequent visitor use.

Expanded facilities (maintenance) will be located above the 100-year floodplain at the Flour Bluff site, which is a less hazardous site than sites on Padre Island. This site provides a practicable alternative that is outside the floodplain. Therefore this alternative is consistent with objectives of E.O. 11988, Floodplain Management. The values of the barrier island floodplain will be preserved. The recovery to more natural conditions will possibly increase the natural moderation of storm surge at localized sites. The reduction of development (ranger station and Malaquite) on the island will also decrease the potential harm to life and property.

Alternative 2 (Current Situation)

Natural processes would continue to be altered from the present level of development and use at Bird Island Basin, the ranger station, Malaquite campground, Malaquite Beach, Malaquite employee housing area, and Yarrowough Pass (refer to the Affected Natural Environments table).

Existing facilities, except the administrative offices in Flour Bluff, would remain in the more exposed and hazardous 100-year floodplain on Padre Island. The development and associated use at Malaquite Beach, in particular, would continue to alter the adjacent fore-island dunes, thereby adversely affecting the coastal floodplain. Storm waters might penetrate farther towards the middle of the island. This condition would be contrary to the intent of E.O. 11988, Floodplain Management. However, the values of the barrier island floodplain would be enhanced by opportunities for recreational use.

Alternative 3

Natural processes would continue to be altered to a greater extent than in alternatives 1 and 2 (refer to the Affected Natural Environments table). This would be caused by re-maining and expanded development at Bird Island Basin, the ranger station, Malaquite campground, Malaquite Beach, Yarrowough Pass, and Mansfield Channel. Natural conditions at a currently undisturbed site would be impacted by construction of the pond trail. The greatest alteration would be at the Malaquite campground, where the coppice dunes and the face of the fore-island dunes are leveled and some of the site would be covered with pavement. As shown in damage from Hurricane Allen, this site exposure without a natural buffer accelerates the natural storm forces.

All development, including new and expanded facilities would be located in the exposed and hazardous 100-year floodplain on Padre Island. New recreational development at Malaquite Beach and Mansfield Channel would be excepted actions according to NPS guidelines for E.O. 11988, Floodplain Management. The values of the barrier island floodplain would be enhanced by the greater opportunities for recreational and educational use. New headquarters, maintenance, and housing development would not be excepted. The guidelines call for avoiding new construction in floodplains whenever there is a practicable alternative. This alternative would be contrary to this objective.

be required for this alternative.

Alternative 3

Water Quality

Alternative 2
(Current Situation)

Bottom sediments will be displaced and water quality will be temporarily degraded with turbidity during maintenance dredging at Bird Island Basin. This action will require a dredge and fill permit from the Army Corps of Engineers (section 404, Clean Water Act).

Bottom sediments would be stirred, causing some temporary turbidity and degradation of water quality, with repeated kicking-out action of boat propellers in passing through the boat channel.

Same as alternative 1.

If facilities malfunction or are damaged by storms, there will be a possibility of groundwater pollution from EPA-approved sewage disposal facilities at Bird Island Basin, Malaquite Beach,, and Yarbrough Pass.

Same as alternative 1.

Similar to alternative 1, except there would be the additional possibility of water pollution from primitive facilities at Mansfield Channel.

Soils will be uncovered where development is removed (the ranger station and Malaquite). Soils will be further compacted and covered from new construction at Flour Bluff. The limitations of these soils associated with their sandy texture will have to be overcome.

Soils would remain compacted and covered at developed sites on Padre Island and at Flour Bluff.

Additional soils on Padre Island would be compacted and covered for new construction. Limitations of these soils, including wetness and sandy texture, would have to be overcome.

Vegetation

A natural cover of vegetation will possibly be reestablished where resource management corrects man-caused damage. This will occur only as plant growth can stabilize more barrier island terrain than what is damaged by periodic storms or further human activity.

Similar to alternative 1, except human activities would have a greater influence in retarding the natural reestablishment of plant cover.

Similar to alternative 1, except the possibility of successful vegetation reestablishment would be lower because a great area would have to be manipulated.

Vehicle use will destroy salt-spray tolerant plants that otherwise would grow on the beach and berm. This destruction will be confined to a narrow corridor where natural plant growth is low; the more densely vegetated back beach and foot of the dunes will be protected.

Continued unconfined vehicle use would destroy the plants in the embryonic or coppice dune fields. Therefore, a broad and flat beach devoid of plant life would be perpetuated.

Same as alternative 1.

Alternative 1
(Draft Plan)

Recovery of the native plant cover will be a critical aspect of the return to natural site conditions (refer to the Affected Natural Environments table). The areas at the ranger station and Malaquite where development will be eliminated will be stabilized by invading plant species.

Alternative 2
(Current Situation)

The native plant cover would not regenerate where development remained. The heavily used areas at Bird Island Basin, the ranger station, Malaquite campground, Malaquite Beach, and Yarrowbrough Pass would be devoid of vegetation that helps stabilize the sandy terrain. At the lagoon-side sites, this adverse effect on the wetlands would be confined locally. It would not affect the overall survival and quality of wetlands in conformance with the objectives of E.O. 11990.

Alternative 3

Similar to alternative 2, except a greater area at Malaquite campground, Malaquite Beach, and Mansfield Channel would be devoid of vegetation.

Animals

Animal life, especially mammals and ghost crabs, will remain less abundant on the beach even with confined vehicle traffic. Vehicles crush ghost crabs and compact the sand they burrow in, thus detrimentally affecting their populations (Baccus and Harton 1979). However, the nesting Kemp's ridley sea turtle will not be affected because measures that properly restrict visitor use will be taken through cooperative efforts with the U.S. Fish and Wildlife Service in compliance with the Endangered Species Act.

Similar to alternative 1, except disturbance of animals would be greater as vehicle use would continue across the width of the beach.

Same as alternative 1.

Alternative 1
(Draft Plan)

The endangered peregrine falcon will not be affected by vehicle use on the back-island road, which will be closed on a seasonal basis, or by visitor use on the beach, which will be appropriately restricted. There will be no vehicles present on the back-island road during the spring and fall when the peregrines migrate through Padre Island. This will be accomplished through cooperative efforts with the U.S. Fish and Wildlife Service in compliance with the endangered species act.

Animals will reinhabit the previously developed sites that return to natural conditions. The animal populations are likely to increase in the restored natural environments.

Visual Quality

The elimination of some facilities and uses at the island ranger station/maintenance area and Malaquite will improve the visual quality of these areas. As these areas reestablish themselves, their more natural character will return. Both near and distant views of these areas will be improved.

Alternative 2
(Current Situation)

The endangered peregrine falcon would be disturbed by vehicular traffic on the back-island road and perhaps on the beach. In spring and fall, the migrating peregrine might be forced out of its optimum habitat if traffic and associated disturbances increased. The peregrines actively avoid areas of recreational use for their staging, resting, and feeding. Vehicular use of this road would require consultation with the U.S. Fish and Wildlife Service.

Animals would continue to avoid the areas of existing development.

The visual intrusiveness of existing development would continue.

Alternative 3

Same as alternative 1.

Animals would be lost from sites of new development and would continue to avoid the sites of remaining development.

Proposed development would generally not affect the horizon by introducing vertical elements. However, the perceived naturalness of the lands to be developed would be diminished. More of the island's viewshed (area of island seen by observers) would be intruded upon by man-made features. The contrast in form and color between structures and the background would tend to direct the observer's view away from the natural setting and focus it on the man-made.

Alternative 1 (Draft Plan)	Alternative 2 (Current Situation)	Alternative 3
Cultural Resources Although relocation and removal of some existing facilities may affect previously unknown archeological resources, the likelihood of such impact is extremely slight considering that (1) the affected areas have largely been previously disturbed, (2) new facilities will involve little subsurface disturbance, and (3) all new ground disturbance will be preceded by archeological survey. Increased enforcement coverage will decrease the likelihood of vandalism to cultural resources. The Novillo line camp will be allowed to deteriorate, thus causing the loss of the historic architecture, but many of the significant qualities of the site will be preserved in the resulting archeological site.	The increased potential for illegal ORV use of the dunes might result in some destruction of exposed archeological resources. Increased enforcement coverage would decrease the likelihood of vandalism to cultural resources. Novillo line camp, same as alternative 1.	Expansion of existing facilities or construction of new facilities might impact archeological resources, although preconstruction archeological fieldwork would promote the avoidance or mitigation of adverse effects upon archeological resources. Novillo line camp, same as alternative 1.

Visitor Use		
Some visitors who drive their vehicles on the beach will be upset by the restriction of vehicle use to a designated corridor and with seasonal closures.	Visitors who drive their vehicles on the beach would not be restricted to a corridor and would continue to drive where they pleased on the beach.	Same as alternative 1.
Visitors will continue to use the back-island road to bypass Big Shell Beach except in the season when the road is closed. The problem of getting stuck in the soft sand on this stretch of beach will continue.	Visitors would continue to bypass Big Shell Beach on the back-island road. The problem of difficult driving along the rutted and ponded road would remain.	Same as alternative 1.
Visitors will be protected with 24-hour law enforcement services during the major use season, with onsite patrols and on-call service at the view tower.	Visitors would be protected with law enforcement that only includes after-hour services by rangers who reside on the island.	Similar to alternative 2, except visitors would have greater protection with the two additional ranger residences provided on the island.
Amenities enjoyed by visitors will be reduced with the relocation of beach services and campsites to an area behind the dune ridge. This location will not afford the views, the cooling breezes, or the protection from mosquitoes afforded by the existing facility locations.	Visitors would continue to enjoy the amenities--views, cooling breezes, and freedom from mosquitoes--associated with the existing facility sites.	Same as alternative 2.

Visitors will lose the opportunity to stay in a developed NPS campground located on the beach; however they can tent camp on the beach and RV camp behind the dune ridge.

The level of use in the coastal floodplain will decrease with the elimination of some visitor and administrative facilities and employee residences. Therefore, the magnitude of effort required for evacuation will be reduced.

Visitors will continue to launch their boats at Bird Island Basin and at Yarrowborough Pass. Launching conditions will improve at Bird Island Basin with the upgraded boat launch.

Park Operations and Maintenance

The NPS will be in the best location (Flour Bluff headquarters site) for maintaining a close relationship with other organizations, government agencies, and the public in the region.

NPS employees will socially and economically be part of the greater Corpus Christi community rather than being isolated at the national seashore.

The potential for facility damage and personal property damage will be decreased with removal of major visitor facilities and operations/maintenance facilities from the island.

Annual maintenance costs will be decreased with elimination of the Malaquite pavilion.

Staffing costs for law enforcement will be increased to provide 24-hour protection.

Visitors could continue to camp at one developed NPS campground and three primitive camping areas that are concentrated primarily at the northern end of the seashore.

The present level of use would continue in the coastal floodplain. The existing potential harm from storms and the magnitude of effort necessary to evacuate visitors off the island would remain.

Visitors would continue to use the unimproved boat launch at Bird Island Basin, and the primitive and remote boat launch at Yarrowborough Pass. Congested conditions would remain at Bird Island Basin.

Same as alternative 1.

Employees residing on the island would continue to be socially and economically isolated from the Corpus Christi community.

The existing potential for facility damage and personal property damage would continue with retention of major visitor use facilities and operations/maintenance facilities on the island.

Major maintenance costs for the Malaquite pavilion would continue.

Existing staffing costs would continue.

Visitors could camp at one developed NPS campground on the beach and at four primitive camping areas dispersed throughout the seashore.

The use by visitors and management would increase in the coastal floodplain. There would be a corresponding increase in the potential for harm from storms and in the magnitude of effort necessary to evacuate visitors off the island.

Same as alternative 1.

With the elimination of the Flour Bluff headquarters, the proximity and convenience of relating to organizations, government agencies, and the public would be compromised.

Same as alternative 2.

The potential for facility damage and personal property damage would increase with expansion of visitor facilities and operations/maintenance facilities on the island.

Maintenance costs would be increased with expansion of visitor facilities and operations/maintenance.

Staffing costs for administration, law enforcement, interpretation, and maintenance would be increased to support expanded visitor facilities and services.

CONSULTATION AND COORDINATION

Public involvement in preparing this document began during July 1981 when the National Park Service issued a preplanning worksheet to federal, state, and local governments and interested individuals for the purpose of gathering comments about current issues. These comments were reviewed and analyzed by the planning team and were considered in formulating the alternatives.

Copies of this and future documents regarding the park will be circulated to local, state, and federal agencies and to individuals who have expressed interest. The agencies receiving review copies are listed below.

Federal Agencies

Advisory Council on Historic Preservation

Department of Agriculture
Forest Service

Department of the Army
Corps of Engineers

Department of Commerce
National Marine Fisheries Service
Office of Coastal Zone Management

Department of Energy

Department of Health and Human Services

Department of Housing and Urban Development

Department of the Interior
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Mines
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey

Department of Transportation
Coast Guard
Federal Aviation Administration
Federal Highway Administration

Environmental Protection Agency

State Agencies

Office of the Governor, Division of Planning Coordination

Soil Conservation Service

Texas Coastal Management Program

Texas Historical Commission

Texas A-95 Clearinghouse

Local Agencies

City of Corpus Christi

Department of Planning and Urban Development

The following U.S. congressional delegations will receive review copies:

Senator Lloyd M. Bentsen

Senator John G. Tower

Congressman Eligio de la Garza

Congressman William N. Patman

APPENDIX A: LEGISLATIVE DATA



Public Law 87-712
87th Congress, S. 4
September 28, 1962

An Act

To provide for the establishment of the Padre Island National Seashore.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to save and preserve, for purposes of public recreation, benefit, and inspiration, a portion of the diminishing seashore of the United States that remains undeveloped, the Secretary of the Interior shall take appropriate action in the public interest toward the establishment of the following described lands and waters as the Padre Island National Seashore: Beginning at a point one statute mile northerly of North Bird Island on the easterly line of the Intracoastal Waterway; thence due east to a point on Padre Island one statute mile west of the mean high water line of the Gulf of Mexico; thence southwesterly paralleling the said mean high water line of the Gulf of Mexico a distance of about three and five-tenths statute miles; thence due east to the two-fathom line on the east side of Padre Island as depicted on United States Coast and Geodetic Survey chart numbered 1286; thence along the said two-fathom line on the east side of Padre Island as depicted on United States Coast and Geodetic Survey charts numbered 1286, 1287, and 1288 to the Willacy-Cameron County line extended; thence westerly along said county line to a point 1,500 feet west of the mean high water line of the Gulf of Mexico as that line was determined by the survey of J. S. Boyles and is depicted on sections 9 and 10 of the map entitled "Survey of Padre Island made for the office of the Attorney General of the State of Texas", dated August 7 to 11, 1941, and August 11, 13, and 14, 1941, respectively; thence northerly along a line parallel to said survey line of J. S. Boyles and distant therefrom 1,500 feet west to a point on the centerline of the Port Mansfield Channel; thence westerly along said centerline to a point three statute miles west of the said two-fathom line; thence northerly parallel with said two-fathom line to 27 degrees 20 minutes north latitude; thence westerly along said latitude to the easterly line of the Intracoastal Waterway; thence northerly following the easterly line of the Intracoastal Waterway as indicated by channel markers in the Laguna Madre to the point of beginning.

Padre Island
National Sea-
shore, Tex.
Establishment.

SEC. 2. (a) The Secretary of the Interior (hereinafter referred to as the "Secretary") is authorized to acquire by donation, purchase with donated or appropriated funds, condemnation, transfer from any Federal agency, exchange, or otherwise, the land, waters, and other property, and improvements thereon and any interest therein, within the areas described in the first section of this Act or which lie within the boundaries of the seashore as established under section 3 of this Act (hereinafter referred to as "such area"). Any property, or interest therein, owned by the State of Texas or political subdivision thereof may be acquired only with the concurrence of such owner. Notwithstanding any other provision of law, any Federal property located within such area may, with the concurrence of the agency having custody thereof, be transferred without consideration to the administrative jurisdiction of the Secretary for use by him in carrying out the provisions of this Act.

Acquisition of
land, etc.

76 STAT. 850.

76 STAT. 651.

(b) The Secretary is authorized to pay for any acquisitions which he makes by purchase under this Act their fair market value, as determined by the Secretary, who may in his discretion have his determination on an independent appraisal obtained by him.

(c) In exercising his authority to acquire property by exchange, the Secretary may accept title to any non-Federal property located within such area and convey to the grantor of such property any

federally owned property under the jurisdiction of the Secretary within such area. The properties so exchanged shall be approximately equal in fair market value; *Provided*, That the Secretary may accept cash from or pay cash to the grantor in such an exchange in order to equalize the values of the properties exchanged.

Publication in
P. R.

SEC. 3. (a) As soon as practicable after the date of enactment of this Act and following the acquisition by the Secretary of an acreage in the area described in section 1 of this Act, that is in the opinion of the Secretary efficiently administrable to carry out the purposes of this Act, the Secretary shall establish the area as a national seashore by the publication of notice thereof in the Federal Register.

Notice.

(b) Such notice referred to in subsection (a) of this section shall contain a detailed description of the boundaries of the seashore which shall encompass an area as nearly as practicable identical to the area described in section 1 of this Act. The Secretary shall forthwith after the date of publication of such notice in the Federal Register (1) send a copy of such notice, together with a map showing such boundaries, by registered or certified mail to the Governor of the State and to the governing body of each of the political subdivisions involved; (2) cause a copy of such notice and map to be published in one or more newspapers which circulate in each of the localities; and (3) cause a certified copy of such notice, a copy of such map, and a copy of this Act to be recorded at the registry of deeds for the county involved.

Mineral reser-
vation.

SEC. 4. (a) When acquiring land, waters, or interests therein, the Secretary shall permit a reservation by the grantor of all or any part of the oil and gas minerals in such land or waters and of other minerals therein which can be removed by similar means, with the right of occupation and use of so much of the surface of the land or waters as may be required for all purposes reasonably incident to the mining or removal of such from beneath the surface of these lands and waters and the lands and waters adjacent thereto, under such regulations as may be prescribed by the Secretary with respect to such mining or removal.

76 STAT. 651.
76 STAT. 652.

(b) Any acquisition hereunder shall exclude and shall not diminish any right of occupation or use of the surface under grants, leases, or easements existing on April 11, 1961, which are reasonably necessary for the exploration, development, production, storing, processing, or transporting of oil and gas minerals that are removed from outside the boundaries of the national seashore and the Secretary may grant additional rights of occupation or use of the surface for the purposes aforesaid upon the terms and under such regulations as may be prescribed by him.

Administra-
tion.

16 USC 1.

SEC. 5. Except as otherwise provided in this Act, the property acquired by the Secretary under this Act shall be administered by the Secretary, subject to the provisions of the Act entitled "An Act to establish a National Park Service and for other purposes", approved August 25, 1916 (39 Stat. 535), as amended and supplemented, and in accordance with other laws of general application relating to the areas administered and supervised by the Secretary through the National Park Service; except that authority otherwise available to the Secretary for the conservation and management of natural resources may be utilized to the extent he finds such authority will further the purposes of this Act.

Roadways.

SEC. 6. The Secretary may provide for roadways from the north and south boundaries of such public recreation area to the access highways from the mainland to Padre Island.

Gunnery or
bombing ranges.

SEC. 7. The Secretary of the Interior shall enter into such administrative agreements with the Secretary of the Navy as the Secretary of the Navy may deem necessary to assure that the Secretary of the Interior will not exercise any authority granted by this Act so as to interfere with the use by the Department of the Navy of any aerial gunnery or bombing range located in the vicinity of Padre Island.

Appropriation.

SEC. 8. There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act; except that no more than \$5,000,000 shall be appropriated for the acquisition of land and waters and improvements thereon, and interests therein, and incidental costs relating thereto, in accordance with the provisions of this Act.

APPENDIX A: LEGISLATION

An Act to authorize the appropriation of funds for Padre Island National Seashore in the State of Texas, and for other purposes. (82 Stat. 1155)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, notwithstanding any other provision of law, there are hereby authorized to be appropriated such sums as may be necessary to satisfy the final judgment of \$6,810,380, (that is, \$9,212,730 minus \$2,402,350 deposited in court; all figures exclusive of amounts for tract No. 7) rendered against the United States in civil action numbered 65-C-54 in the United States District Court for the Southern District of Texas, for the acquisition of land and interests in land for the Padre Island National Seashore. The sums herein authorized to be appropriated shall be sufficient to pay the amount of said judgment, together with interest and costs as provided by law.

Approved October 17, 1968.

Legislative History

House Report No. 1856 (Committee on Interior and Insular Affairs).

Senate Report No. 1598 (Committee on Interior and Insular Affairs).

Congressional Record, Vol. 114 (1968):

Sept. 16: Considered and passed House.

Oct. 4: Considered and passed Senate.

An Act to authorize the appropriation of funds for Padre Island National Seashore in the State of Texas, and for other purposes. (83 Stat. 45)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, notwithstanding any other provision of law, there are hereby authorized to be appropriated such sums as may be necessary to satisfy the final net judgments rendered against the United States in civil action numbered 66-B-1 in the United States District Court for the Southern District of Texas, for the acquisition of lands and interests in land for the Padre Island National Seashore, totaling \$4,129,829.00, plus interest as provided by law.

Approved July 11, 1969.

Legislative History

House Report No. 91-305 (Committee on Interior and Insular Affairs).

Senate Report No. 91-261 (Committee on Interior and Insular Affairs).

Congressional Record, Vol. 115 (1969):

June 16: Considered and passed House.

June 30: Considered and passed Senate.

APPENDIX B: MANAGEMENT OBJECTIVES

To provide for recreational opportunities and development of the national seashore in such a manner as to be compatible with the protection of the natural and cultural resources of the area.

To encourage a continuing research program which will provide management with guidance needed for accurate and informative interpretation of the natural and cultural aspects of the seashore.

To maintain and foster close liaison and cooperation with governmental and nongovernmental entities and individuals who have an interest in the national seashore and its surroundings.

To provide visitors with a varied and balanced interpretive program that offers insights into the natural and cultural values of the seashore.

To fulfill the commitment to previous property owners by ensuring their ability to recover the reserved oil and gas mineral resources with a minimum of environmental consequences.

APPENDIX C: CHARACTERISTIC PLANTS AND ANIMALS

Table C-1: Characteristic Plants

	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
Gregg amaranth (<u>Amaranthus greggi</u>)	X					
American searocket (<u>Cakile fusiformis</u>)	X					
goat-foot morning glory (<u>Ipomoea pes-capre</u>)	X	X				
wooly tidestromia (<u>Tidestromia lanuginosa</u>)	X					
sea purslane (<u>Sesuvium portulacastrum</u>)	X				X	
sea oat (<u>Uniola paniculata</u>)	X	X	X	X		
fiddleleaf morning glory (<u>Ipomoea stolonifera</u>)		X				
beach evening primrose (<u>Oenothera drummondii</u>)		X	X	X	X	
bitter panicum (<u>Panicum amarum</u>)		X				
gulf croton (<u>Croton punctatus</u>)		X		X		
partridge pea (<u>Cassia fasciculata</u>)		X	X	X		
sea coast bluestem (<u>Andropogon littoralis</u>)		X	X			
camphorweed (<u>Heterotheca subaxillaris</u>)		X				
marsh hay cordgrass (<u>Spartina patens</u>)			X			
gulfdune paspalum (<u>Paspalum monostachyum</u>)			X		X	
sumpweed (<u>Iva angustifolia</u>)			X			
betonyleaf eupatorium (<u>Eupatorium betonicifolium</u>)			X			
(<u>Panicum angustifolium</u>)			X			

<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
(<u>Eragrostis oxylepis</u>)		X			
(<u>Eleocharis interstincta</u>)		X			
spadeleaf (<u>Centella erecta</u>)		X			
water hyssop (<u>Bacopa monnieri</u>)		X			
turkeytangle (<u>Phyla nediflora</u>)		X			
American bulrush (<u>Scripus americanus</u>)		X			
blue-green algae (<u>Lyngbya confervoides</u>)				X	
seaside gerardia (<u>Gerardia maritima</u>)				X	
(<u>Fimbristylis caroliniana</u>)				X	
(<u>Machaeranthera phyllocephala</u>)				X	
(<u>Salicornia</u> sp.)				X	
shoregrass (<u>Monanthochloe littoralis</u>)				X	
silverhead (<u>Phloxerus vermicularis</u>)				X	
(<u>Distichlis spicata</u>)				X	
shoalgrass (<u>Halodule beaudettei</u>)					X
manateeegrass (<u>Syringodium filiforme</u>)					X
widgeongrass (<u>Ruppia maritima</u>)					X
Halophila (<u>Halophila engelmanni</u>)					X

Table C-2: Characteristic Animals

	<u>Off-Shore</u>	<u>Near-Shore</u>	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
<u>Invertebrates</u>								
haustoriid amphipods								
bivalve (<u>Donax variabilis</u>)		X	X					
polychaete worm (<u>Lumbrineris</u> sp.)		X	X					
ghost shrimp (<u>Callinassa isLagrande</u>)		X	X					
sand dollar (<u>Mellita quinquesperforata</u>)		X						
lettered olive (<u>Oliva sayana</u>)		X	X					
ghost crab (<u>Ocypode quadrata</u>)			X					
polychaete worm (<u>Scolepis aquamata</u>)			X					
grass shrimp (<u>Palaemonetes intermezus</u>)								X
pink shrimp (<u>Penaeus Zuorarum</u>)								X
brown shrimp (<u>Penaeus aztecus</u>)								X
blue crab (<u>Callinectes sapidus</u>)								X
<u>Fish</u>								
striped mullet (<u>Mugil cephalus</u>)	X							
gulf whiting (<u>Menticirrhus littoralis</u>)	X							X
speckled trout (<u>Cynoscion nebulosus</u>)	X							X
redfish (<u>Sciaenops ocellata</u>)	X							

	<u>Off-Shore</u>	<u>Near-Shore</u>	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
sea catfish (<u>Arius felis</u>)	X							
Atlantic stingray (<u>Dasyatis sabina</u>)	X							
sheepshead (<u>Archosargus probatocephalus</u>)	X							X
Atlantic croaker (<u>Micropogon undulatus</u>)	X							
black drum (<u>Pogonias cromis</u>)								X
pinfish (<u>Lagodon rhomboides</u>)								X
<u>Reptiles</u>								
keeled earless lizard (<u>Holbrookia propinqua</u>)				X	X	X		
six-lined racerunner (<u>Cnemidophorus sexlineatus</u>)				X	X	X		
western diamondback rattlesnake (<u>Crotaxus atrox</u>)				X	X	X		
western massasauga (<u>Sistrurus catenatus</u>)				X	X	X		
western coachwhip (<u>Masticophis flagellum</u>)				X	X	X		
eastern hognose snake (<u>Heterodon platyrhinos</u>)				X	X	X		
Mexican glossy snake (<u>Arizona elegans</u>)				X	X	X		
Mexican milk snake (<u>Lampropeltis triangulum</u>)				X	X	X		
Gulf Coast ribbon snake (<u>Thamnophis proximus</u>)				X	X	X		
Rio Grande racer (<u>Coluber constrictor</u>)				X	X	X		
Rio Grande leopard frog (<u>Rana pipiens</u>)					X			
green tree frog (<u>Hyla cinerea</u>)					X			

<u>Birds</u>	<u>Off-Shore</u>	<u>Near-Shore</u>	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
cattle egret (<u>Bubuleus ibis</u>)			X					
great blue heron (<u>Ardea herodias</u>)			X					
Louisiana heron (<u>Hydranassa tricolor</u>)			X					
green heron (<u>Butorides virescens</u>)			X					
black bellied plover (<u>Squatarola seuatarola</u>)			X					
piping plover (<u>Charadrius melodus</u>)			X					
snowy plover (<u>Charadrius alexandrinus</u>)			X					
Wilson's plover (<u>Charadrius wilsonia</u>)			X					
killdeer (<u>Charadrius vociferus</u>)			X					
long-billed curlew (<u>Numerius americanus</u>)			X					
willet (<u>Catoptrophorus semipalmatus</u>)			X					
ruddy turnstone (<u>Arenaria interpres</u>)			X					
knot (<u>Calidris canutus</u>)			X					
sanderling (<u>Crocethis alba</u>)			X					
least sandpiper (<u>Erolia minutilla</u>)			X					
herring gull (<u>Larus argentatus</u>)			X					

<u>Birds (cont.)</u>	<u>Off-Shore</u>	<u>Near-Shore</u>	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island Dunes</u>	<u>Tidal Flat</u>	<u>Laguna Madre</u>
ring-billed Gull (<u>Larus delawarensis</u>)			X					
laughing gull (<u>Larus atricilla</u>)			X					
least tern (<u>Sterna albifrons</u>)			X					
Forster's tern (<u>Sterna forsteri</u>)			X					
Sandwich tern (<u>Thalasseus sandvicensis</u>)			X					
gull-billed tern (<u>Gelochelidon nilotica</u>)			X					
royal tern (<u>Thalasseus maximus</u>)			X					
caspian tern (<u>Hydroprogne caspia</u>)			X					
black tern (<u>Chilodrias niger</u>)			X					
black skimmer (<u>Rynchops nigra</u>)			X					
horned lark (<u>Eremophila alpestris</u>)				X	X	X		
marsh hawk (<u>Circus cyaneus</u>)				X	X	X		
bobwhite quail (<u>Colinus virginianus</u>)				X	X	X		
western meadowlark (<u>Sturnella neglecta</u>)				X	X	X		
eastern meadowlark (<u>Sturnella magna</u>)				X	X	X		
longbilled curlew (<u>Numenius americanus</u>)				X	X	X		
killdeer (<u>Charadrius vociferus</u>)				X	X	X		

<u>Off-Shore</u>	<u>Near-Shore</u>	<u>Beach</u>	<u>Foredunes</u>	<u>Barrier Flats</u>	<u>Back Island</u>	<u>Dunes</u>	<u>Tidal Flat</u>	<u>Laguna</u>	<u>Madre</u>
<u>Birds (cont.)</u>									
common snipe (<u>Capella gallinago</u>)			X	X					
savanna sparrow (<u>Passerculus sandwichenus</u>)			X	X					
sandhill crane (<u>Grus canadensis</u>)			X	X					
peregrine falcon (<u>Falco peregrinus tundrius</u>)							X		
peregrine falcon (<u>Falco peregrinus anatum</u>)							X		
redhead duck (<u>Aythya americana</u>)									X
pintail duck (<u>Anas acuta</u>)									X
lesser scaup duck (<u>Aythya affinis</u>)									X
<u>Mammals</u>									
kangaroo rat (<u>Dipodomys compactus</u>)			X	X					
spotted ground squirrel (<u>Spermophilus spilosoma</u>)			X	X					
cotton rat (<u>Sigmodon hispidus</u>)			X	X					
pygmy mouse (<u>Baiomys taylori</u>)			X	X					
South Texas pocket gopher (<u>Geomys personatus</u>)			X	X					
California jackrabbit (<u>Lepus californicus</u>)			X	X					
Coyote (<u>Canis latrans</u>)			X	X					

REFERENCES

- BACCUS, J.T., and HORTON, J.K.
1979 "An Ecological and Sedimentary Study of Padre Island National Seashore. Prepared for the National Park Service. On file at Padre Island National Seashore, Flour Bluff.
- BULLARD, F.M.
1942 "Source of Beach and River Sands on Gulf Coast of Texas." Bull. Geol. Soc. Amer. 53:1021-1044.
- BURNHAM, W., and RIDDLE K.E.
1979 "The National Parks System and Peregrine Falcons." Paper presented at the Second Conference on Scientific Research in the National Parks, San Francisco.
- CORPUS CHRISTI, DEPARTMENT OF PLANNING AND URBAN DEVELOPMENT
n.d. Demography Study. Corpus Christi.
n.d. Economic Study. Corpus Christi.
- FRANK, N.
1981 Personal communication. National Hurricane Center, Fla.
- GUNDLACH, E.R.; DOMERACKI, D.D.; THEBEAU, L.C.; AND MUTHIG, M.
1981 "The Effects of Hurricane Allen on Padre Island National Seashore." Prepared for the National Park Service by Research Planning Institute, Inc.
- HAYES, M.O.
1965 "Sedimentation on a Semiarid, Wave-Dominated Coast (South Texas) with Emphasis on Hurricane Effects." Ph.D. dissertation, University of Texas at Austin.
- HENRY, W.K., and MCCORMACK, J.P.
1975 Hurricanes of the Texas Coast: Description and Climatology. College Station: Texas A & M University.
- LEATHERMAN, S.P.
1979 Barrier Island Handbook. Amherst: University of Massachusetts, the Environmental Institute, National Park Service Cooperative Research Unit.
- MCGOWEN, J.H., GARNER, L.E., and WILKINSON, B.H.
1977 The Gulf Shoreline of Texas: Processes, Characteristics, and Factors in Use. Bureau of Economic Geology Geological Circular 77-3. Austin: University of Texas.

MCGOWEN, J.H.; GROAT, C.G.; BROWN, L.F. JR.; FISHER, W.L.; and SCOTT, A.J.

- 1970 Effects of Hurricane Celia: A Focus on Environmental Geologic Problems of the Texas Coastal Zone. Bureau of Economic Geology Geological Circular 70-3. Austin: University of Texas.

TEXAS HISTORICAL COMMISSION, OFFICE OF STATE ARCHEOLOGIST

- 1974 An Assessment of the Archeological Resources of Padre Island National Seashore, Texas. Special Report No. 11. Austin.

TEXAS WATER QUALITY BOARD

- 1975 "Water Quality Segment Report for Segment No. 2491, Laguna Madre." Report No. WQS-14.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

- 1977 General Soil Map of Kleberg County, Texas.

U.S. DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS, GALVESTON DISTRICT

- 1980 Floodplain Map of 100-Year and 500-Year Floodplains for Padre Island National Seashore. Galveston.

- 1981a Personal communication on coastal high hazard zone. Galveston.

- 1981b "Floodplain Information on Padre Island National Seashore Administrative Office, Flour Bluff." Galveston.

U.S. DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS

- 1977 City and County Data Book. Washington: U.S. Government Printing Office.

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, OFFICE OF COASTAL ZONE MANAGEMENT

- 1976 National Hazard Management in Coastal Areas. Washington, D.C.

U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ENVIRONMENTAL DATA AND INFORMATION SERVICE

- 1979 Local Climatological Data: Annual Summary With Comparative Data. Corpus Christi, Texas.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT AND FISH AND WILDLIFE SERVICE

- 1980 Texas Barrier Islands Region Ecological Characterization: A Socioeconomic Study. Vols. 1 and 2. Slidell, La: Office of Biological Services.

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE

- 1971 "Historic Resource Study, Padre Island National Seashore." Washington, D.C.

1973- "Public Use of the National Park System." Washington,
1975 D.C.

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE,
DENVER SERVICE CENTER

1974 Master Plan, Padre Island National Seashore. Denver.

1975 "Interpretive Prospectus, Padre Island National Seashore."
Denver.

1976 "National Park Statistical Abstracts." Denver.
1980

UNITED STATES DEPARTMENT OF THE INTERIOR, NATIONAL PARK
SERVICE, PADRE ISLAND NATIONAL SEASHORE

n.d. "Hurricane Plan--Padre Island National Seashore." Flour
Bluff.

1978 "Statement for Interpretation and Visitor Services," by Robert
G. Whistler. Flour Bluff.

1980a "Report on the Effects of Hurricane Allen on Padre Island
National Seashore, August 8-11, 1980." Flour Bluff.

1980b "Endangered Species: Determination of Critical Habitat."
Flour Bluff.

1980c "Determination of Critical Habitat, Class 3 Species." Flour
Bluff.

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE,
SOUTHWEST REGIONAL OFFICE

1979 "Novillo Line Camp Historic Structures Report, Padre Island
National Seashore." Santa Fe, N.M.

U.S. FEDERAL EMERGENCY MANAGEMENT ADMINISTRATION, FEDERAL
INSURANCE ADMINISTRATION

1981a Personal Communication with Gene Zeizel, Washington, D.C.

1981b "100-Year Stillwater Elevations for Padre Island National
Seashore, Texas." Prepared by Bernard Johnson, Inc.

WARSHAW, S.

1975 "Water Quality Segment Report for Segment No. 2491 Laguna
Madre." Report No. WQS-14. Prepared for Texas Water
Quality Board.

WEISE, B.R., and WHITE, W.A.

1980 Padre Island National Seashore: A Guide to the Geology,
Natural Environments, and History of a Texas Barrier Island.
Bureau of Economic Geology Guidebook 17. Austin:
University of Texas.

LIST OF PREPARERS

Planning Team Members

Donald S. Follows, Project Manager, Park Ranger (Senior Planner-Geologist), Denver Service Center

B.S. and post-graduate work in geology. Employed 18 years by the National Park Service as park ranger, park naturalist, interpretive planner, and principal planner in field assignments, central offices, and Denver Service Center.

Gary W. Johnson, Team Captain, Landscape Architect/Sociologist, Denver Service Center

B.S. in sociology and Bachelors of Landscape Architecture. Employed 5 years, with diversified experience in design, construction, and planning, in field assignments and in Denver Service Center.

Janet Bergquist Dixon, Environmental Specialist, Denver Service Center

B.S. in environmental sciences and planning and M.A. in geography (land use). Employed 6 years by Denver Service Center, mostly in coastal area assessments.

William M. Lukens, Park Superintendent, Padre Island National Seashore

B.A. in geology. Employed 22 years by the National Park Service as park ranger and superintendent in field assignments in southwest and northwest regions.

James Woods, Biologist, Padre Island National Seashore

B.S. in marine biology and post-graduate work in marine biology and marine geology. Employed three years by the National Park Service as biologist in field assignments.

Consultants

Robert G. Whistler, Chief Naturalist, Padre Island National Seashore

Thomas Lucke, Environmental Compliance Coordinator, Southwest Regional Office

M. R. Fletcher, Division of Natural Resources, Southwest Regional Office

Jane Harvey, Division of Wayside Exhibits, Harpers Ferry Center

Terry Wong, Structural Engineer, Denver Service Center

Dave Stuart, Cultural Resource Specialist, Denver Service Center

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