DRAFT D-64

OIL AND GAS MANAGEMENT PLAN ENVIRONMENTAL IMPACT STATEMENT

February 1999

PADRE ISLAND NATIONAL SEASHORE TEXAS

In 1916, Congress created the NATIONAL PARK SERVICE in the Department of the Interior to

> ...promote and regulate the use of the Federal areas known as national parks, monuments, and reservations...by such means and measure as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. (NPS Organic Act, 16 USC 1)

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Draft

OIL AND GAS MANAGEMENT PLAN
ENVIRONMENTAL IMPACT STATEMENT

February 1999

PADRE ISLAND
National Seashore
Kleberg, Kenedy, and Willacy Counties
Texas

Prepared by
United States Department of the Interior • National Park Service

Dear Reader:

Enclosed for your review and comment is the Draft Oil and Gas Management Plan/Environmental Impact Statement for Padre Island National Seashore. This document describes and analyzes three alternatives for managing access and surface uses associated with the exploration, development, and transportation of nonfederal oil and gas underlying Padre Island National Seashore, Texas. The purpose of this review is to improve the impact analysis and the decision-making process. We welcome your comments.

The public review and comment period for this draft document will be a minimum of 60 days. The availability of this draft document has been advertised in the *Federal Register*. Comments on this document should be addressed to:

> Superintendent
> Padre Island National Seashore
> Attention: Linda Dansby, EIS Team Leader
> Intermountain Support Office - Santa Fe
> P. O. Box 728
> Santa Fe, New Mexico 87504-0728

Written comments must be received no later than ***May 12, 1999***, in order to be considered in the Oil and Gas Management Plan/Final Environmental Impact Statement. In submitting written comments, please cite page number, page number, paragraph number, and line number. Written comments will be fully considered and evaluated in preparing the Oil and Gas Management Plan/Final Environmental Impact Statement.

If changes to this draft document in response to comments are minor, the final document will include only those changes and will not be a reprint. Reviewers are urged to retain this copy of the Draft Oil and Gas Management Plan/Environmental Impact Statement to be used with the final document.

Sincerely,

John E. Miller

for Superintendent,
Padre Island National Seashore

Department of the Interior
National Park Service
Draft
Oil and Gas Management Plan/
Environmental Impact Statement
for
Padre Island National Seashore
Kleberg, Kenedy, and Willacy Counties, Texas

Abstract: This Draft Oil and Gas Management Plan and Environmental Impact Statement (EIS) describes and analyzes three alternatives for managing access and surface uses associated with the exploration, development, and transportation of nonfederal oil and gas underlying Padre Island National Seashore:

- Proposed Action (Preferred Alternative)
- No-Action Alternative/Current Management
- Maximum Resource Protection Alternative

Managed Access Provisions consisting of the NPS's Nonfederal Oil and Gas Rights Regulations and a variety of natural, cultural, and recreational use protection measures based primarily on laws, regulations, policies, and existing land use plans would apply to any selected alternative. "Managed Access Provisions" are described in Chapter 2.

Lead Agency: National Park Service

Type of Action: (X) Administrative ( ) Legislative

For further information contact:

Superintendent, Padre Island National Seashore
Attention: Linda Dansby, EIS Team Leader
Intermountain Support Office - Santa Fe
P. O. Box 728
Santa Fe, New Mexico 87504-0728
EIS Team Leader Telephone: (505) 988-6095

Comments have been requested from individuals, groups, and agencies shown on the partial distribution list in Chapter 5. We welcome comments from others.

Comments on the Draft must be received no later than: ***May 12, 1999***.

Recommended:

Jock F. Whitworth 1/15/99
Date
Jock F. Whitworth
Superintendent
Padre Island National Seashore

Approved:

John H King for 1/19/99
Date
John E. Cook
Regional Director
Intermountain Region

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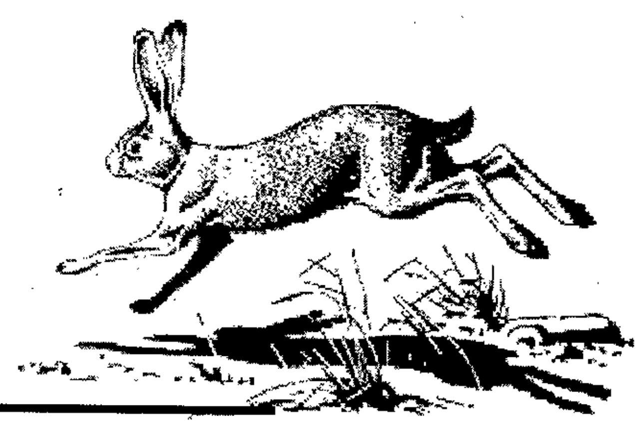
SUMMARY



SUMMARY

PURPOSE OF THIS PLAN

This Draft Oil and Gas Management Plan/EIS identifies significant issues and concerns facing park managers. The plan presents a reasonable range of alternatives for managing surface uses associated with the exploration, development, and transportation of the nonfederal oil and gas underlying Padre Island National Seashore, while protecting natural and cultural resources and allowing for public use and enjoyment of those resources, and it analyzes the effects of implementing each alternative.

When completed, the Oil and Gas Management Plan/EIS will provide a comprehensive framework for managing access and surface uses for the exploration, development, and transportation of nonfederal oil and gas at the park. The plan covers the next 15-20 years, and possibly longer, if there are no major changes in technology and impacts do not significantly change from those described.

The combined plan and environmental impact statement meets the requirements of the National Environmental Policy Act of 1969 and the Council on Environmental Quality regulations. It is also consistent with the direction established in the lead planning document for the park, the General Management Plan/Development Concept Plan (1983). A team of NPS resource specialists, in consultation with other experts, has prepared this document.

This Draft Oil and Gas Management Plan/EIS does not address rights-of-ways for oil and gas pipelines. Rights-of-way are permitted under the NPS regulations at 36 CFR Part 14. Pipeline rights-of-way in any park unit may be granted only under specific legislative authority granted by Congress. Such pipelines are for the purpose of transporting oil and gas products through an NPS unit and may or may not be associated with nonfederal oil and gas rights within the park. At present, no statutory authority exists for granting transpark oil and gas pipelines at Padre Island National Seashore. The circumstances for granting such rights-of-way under language in the Padre Island enabling statute at 16 U.S.C. §459d-3(b) no longer exist.

PADRE ISLAND NATIONAL SEASHORE ENABLING ACT

Padre Island National Seashore (hereafter referred to as "the park") was established by Congress on September 28, 1962 (16 U.S.C. §459d, *et seq.*),

> "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...".

At the time of the park's establishment, surface ownership was held by the State of Texas or by private landowners. In 1973, the surface estate owned by the State of Texas was conveyed to the U.S. Government, while those surface rights held by private landowners were acquired by the federal government through condemnation. All subsurface mineral interests underlying the park were retained by private owners. Those underlying the submerged lands under the Laguna Madre and Gulf of Mexico were retained by the State of Texas and are administered by the Texas General Land Office. Thus, the federal government does not own any of the subsurface oil and gas rights in the park. However, Congress directed that nonfederal oil and gas development be regulated in the park's enabling act.

Nonfederal oil and gas development has occurred at Padre Island National Seashore since the early 1950's, prior to the establishment of the park. Out of 52 wells drilled, 23 (44 percent) were placed in production. Currently, there are 6 oil and gas wells, 1 salt water disposal well, and 7 pipelines in the park.

NONFEDERAL OIL AND GAS RIGHTS REGULATIONS, 36 CFR 9B

Under the NPS Organic Act (16 U.S.C. §3) and Section 4(a) of the Padre Island National Seashore enabling legislation (16 U.S.C. §459d-3(a)), Congress authorized the Secretary of the Interior to promulgate regulations to control access and surface uses associated with nonfederal oil and gas development in the park. These regulations, the NPS's Nonfederal Oil and Gas Rights Regulations, are published at Title 36 of the Code of Federal Regulations, Part 9, Subpart B (36 CFR 9B).

> "These regulations control all activities within any unit of the National Park System in the exercise of rights to oil and gas not owned by the United States where access is on, across or through federally owned or controlled lands or waters....These regulations are designed to insure that activities undertaken pursuant to these rights are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations. These regulations are not intended to result in the taking of a property interest, but rather to impose reasonable regulations on activities which involve and affect federally-owned lands (36 CFR §9.30(a))."

The final rulemaking on the regulations was published in the *Federal Register*, Volume 43, Number 237, page 57822 (43 FR 578822) on December 8, 1978, with an effective date of January 8, 1979.

OIL AND GAS MANAGEMENT PLANNING OBJECTIVES

The NPS's Planning Objectives in this document are to:

- Identify which park resources and values are most sensitive to oil and gas exploration and development disturbance, and define impact mitigation requirements to protect such resources and values.

- Establish reasonable oil and gas exploration and development performance standards to protect park resources and values.

- Provide pertinent information to oil and gas owners and operators that will facilitate operations planning and compliance with all applicable regulations.

OVERVIEW OF PADRE ISLAND NATIONAL SEASHORE'S NATURAL AND CULTURAL ENVIRONMENT

Padre Island National Seashore preserves the longest undeveloped barrier island in the United States. It encompasses 69 miles of the 113-mile-long barrier island.

The cultural environment of Padre Island National Seashore includes numerous identified archeological sites, and several cultural landscapes and historic structures.

The natural environment of Padre Island National Seashore has changed dramatically since the park was established in 1962. In place of vast expanses of sand dunes, the park today is a mixture of upland grasslands, extensive wetlands environments, and vegetated dunes. More than 60 percent of the park consists of wetlands comprising marshes, inland waters, wind-tidal flats, and seagrass beds. Figure S.1, is a Region/Vicinity Map.

Factors contributing to a tremendous increase in vegetated areas include the phasing out of livestock grazing by 1974, and increasing rain levels since the Texas droughts of the 1930's. The increased vegetative cover is providing for a higher diversity and abundance of wildlife. Eighteen

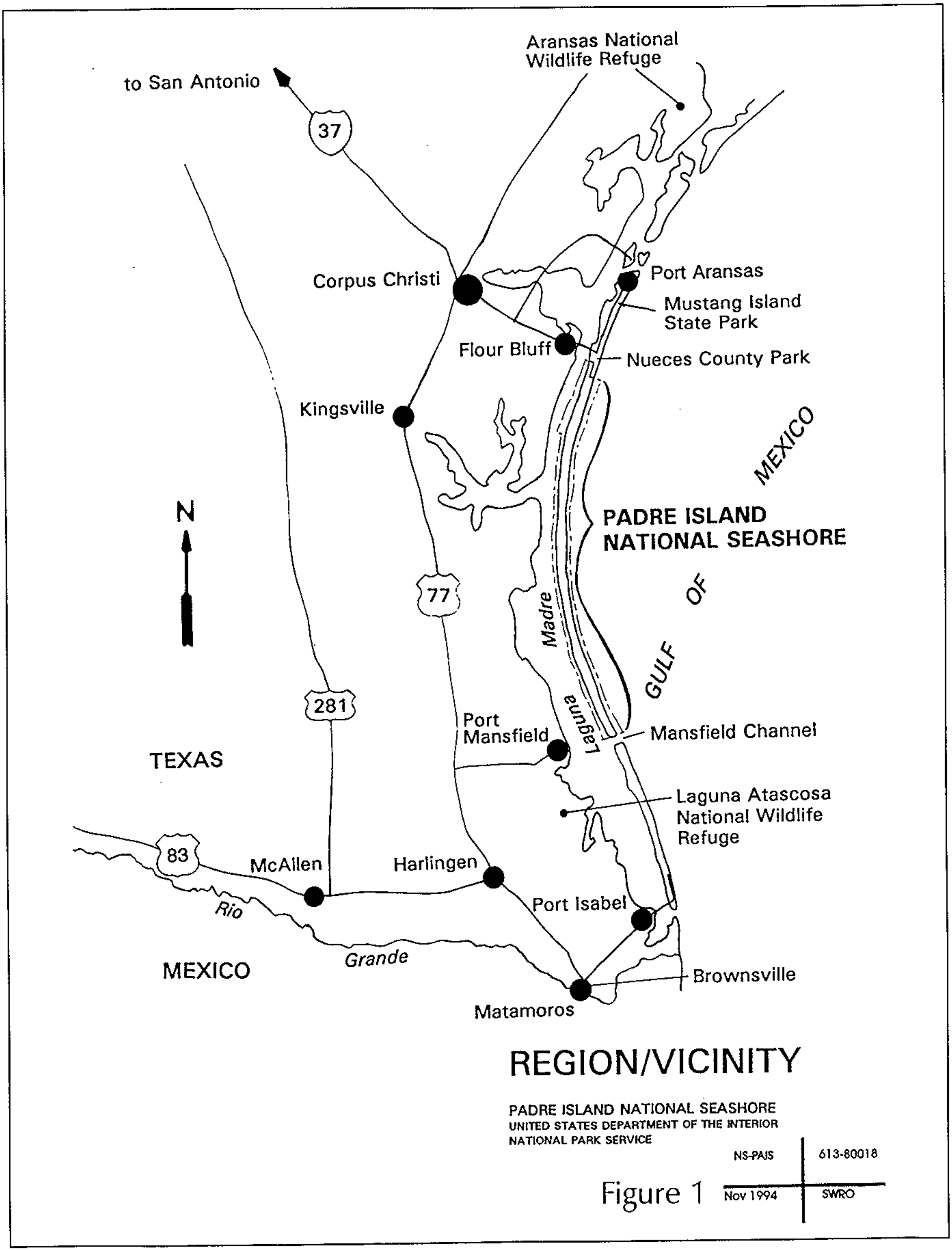


Figure S.1. Region/Vicinity Map

ON MICROFILM

(18) species of state and federally-listed threatened and endangered birds, sea turtles, and marine mammals are known to occur at the park.

Padre Island National Seashore is a dynamic system. It was formed and is continually being re-shaped by the action of wind, current, wave, and tide. Waves and currents move sand and shell along the Gulf shore in shifting patterns that shape the character of different beaches. Where vegetation is successful, it produces a stabilizing effect, binding the blowing sand and building the elevations of the dunes. However, this stabilizing force is constantly interrupted by the large storms that sweep across the island, destroying vegetation, leveling the dunes, and eroding deposits of sand and shell.

The most recent hurricane to hit the park was Hurricane Allen in August 1980. 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 above mean sea level. Tidal surges pushed ashore on the island, eroded the beach, and cut into the foredunes. The foredune ridge served to block the tidal surges, thereby dissipating tidal surge energy and providing a major defense for the mainland. Where foredunes were not well-developed, the tidal surges opened washover channels across the island. In the storm's aftermath, water drained from the mainland and the laguna back across the island to the Gulf through the same channels.

The park's relatively natural setting provides a rare opportunity for beach driving and walking, camping, boating, sailboarding, fishing, nature study and viewing, swimming, shelling, bird watching, and contemplation of past and present uses of the coastline. The park draws an estimated 600,000 to 800,000 visitors annually.

ISSUES CONSIDERED

Through the public scoping process, the following sensitive resources and values were identified that could potentially be affected by surface uses associated with nonfederal oil and gas operations:

1. Air Quality
2. Cultural Resources
3. Foredunes
4. Freshwater Ponds
5. Local and Regional Economies
6. Natural Quiet
7. Night Sky
8. Oil and Gas Exploration and Development
9. Park Operations
10. Relict Live Oaks
11. Rookery Islands
12. Seagrass Beds
13. Soils
14. Threatened and Endangered Wildlife Species and their Habitat
15. Vegetation
16. Visitor Experience, Health and Safety
17. Visitor Use Areas
18. Visual Quality
19. Washover Channels
20. Water Resources
21. Wetlands
22. Wildlife

These topics were analyzed, and criteria were developed to identify certain sites as Sensitive Resource Areas (SRAs) (see below). The SRAs and five of the remaining topics were identified by the EIS team as being significant issues and/or potentially having significant impacts, based on the team's initial evaluation and input from the public scoping process. The remaining topics were found to be relatively insignificant issues for the park and the proposed development, or were expected to have only negligible or minor impacts, assuming the application of mitigation required under the Managed Access Provisions.

SENSITIVE RESOURCE AREAS

SRAs identified through the scoping and initial evaluation process were plotted on park maps and were used in developing alternatives. Under the Proposed Action (Alternative A) and Maximum Resource Protection Alternative (Alternative C), zones were identified for each SRA necessary to reasonably protect each SRA from the various types of oil and gas activities. How each SRA is protected under each of the three alternative management strategies is described on Table S.1.

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

Reasonably foreseeable development (RFD) scenarios for oil and gas development at Padre Island National Seashore have been developed by the NPS for use in analyzing the Proposed Action (Alternative A) and reasonable alternatives (Alternatives B and C), so that cumulative impacts on the environment could be evaluated. The scenarios are based on estimates of remaining hydrocarbon resource potential and the likely level of development needed to produce those resources. A U.S. Geological Survey (USGS) Assessment of "Remaining Oil and Gas Resources beneath Padre Island National Seashore" identified the geology, target formations, and remaining hydrocarbon potential within Padre Island National Seashore. From the USGS assessment, the NPS formulated a hypothetical Reasonably Foreseeable Development (RFD) scenario. The RFD scenario provides a means for estimating potential acres of surface disturbance and analyzing site specific impacts for the various environments.

The Reasonably Foreseeable Development Scenario is:

Following a 3-D seismic survey over the entire park, 6 exploratory wells would be drilled inside Padre Island National Seashore at separate sites. Of these 6 wells, 2 would be dry-holes and would be immediately plugged and the sites reclaimed. Each of the remaining 4 wells would produce a given field. Of the 4 wells, 3 would be further developed by adding 2 more wells to each exploratory well in order to fully develop each of 3 fields. The remaining 4th well would be the only well to develop the 4th field. Therefore, of the 12 wells drilled, 10 would be placed in production to produce an estimated 80 billion cubic feet of gas (BCF) and condensates over the next 30 years.

To simplify describing potential impacts associated with each of the alternatives, the interdisciplinary team decided to evaluate full field development for each of the hypothetical 6 development fields. While this would increase the number of wells proposed to be drilled as described in the RFD scenario from 12 to 18 (3 wells per 6 development fields = 18), the slight increase in number of wells was thought to not appreciably change the scope of potential impacts.

Hypothetical locations for the exploration wells, with associated access roads, drill pads, and pipeline corridors, were estimated to result in 250 acres of direct surface impacts. Operations were assumed to occur in all land classification types.

MANAGED ACCESS PROVISIONS

The NPS permits access and surface uses associated with nonfederal oil and gas exploration and development through application of its Nonfederal Oil and Gas Rights Regulations at 36 CFR 9B. Via these regulations, a prospective operator must submit a proposed plan of operations to the NPS for review and approval. Other management provisions are applied to the 36 CFR 9B permitting process. These "Managed Access Provisions" include laws, regulations, policies, land use management planning decisions, and other basic policy applicable to the various resource management programs for which the National Park Service is responsible.

PLAN ALTERNATIVES

Three alternatives have been developed to describe a reasonable range of management options available to the NPS for managing surface uses associated with the exploration, development, and transportation of nonfederal oil and gas underlying the park. These alternatives were developed based on sensitivity of park resources, especially those resources identified as Sensitive Resource Areas. Each alternative presents a different level of application of oil and gas management constraints. Together with the limitations and mitigation provided by Managed Access Provisions, each of the alternatives forms a separate land-use plan. The three alternatives developed for the Padre Island National Seashore Oil and Gas Management Plan/EIS are summarized below.

Alternative A, Proposed Action (Preferred Alternative):
- No Surface Occupancy in Some Sensitive Resources Areas
- Restricted Access in Other Sensitive Resource Areas
- Seismic Operations Could be Permitted under Managed Access
- and Managed Access in All Other Areas of the Park

This alternative provides specific up-front protection for Sensitive Resource Areas that have important natural, cultural, and visitor use values. Existing oil and gas operations located within Sensitive Resource Areas include five gathering lines and one pipeline within 500 feet of Novillo Line Camp, and one shut-in gas well located in the Laguna Madre, surrounded by seagrass beds. These existing operations would continue; however, the restrictions under this alternative would apply to requests for additional surface disturbances and uses associated with these existing operations, as much as reasonably possible, and to requests for new oil and gas operations proposed after implementation of this plan.

The Proposed Action, Alternative A, would provide specific protection for 49 percent of the surface acreage of the park, or approximately 65,183 acres.

The features of Alternative A include:

- All of Padre Island could be accessed for geophysical (seismic) exploration under Managed Access Provisions.

- Specific provisions, including No Surface Access, No Surface Occupancy, No Ground Disturbance, and Seasonal/Timing Restrictions, would limit drilling, production, or pipeline operations in some Sensitive Resource Areas, while restricted surface access may be permitted in other Sensitive Resource Areas. Where surface access and uses are restricted in a Sensitive Resource Area, a surface location outside the Sensitive Resource Area to directionally drill to a bottom hole location underlying the Sensitive Resource Area would be permitted. Placement of pipelines via directional drilling techniques would also be permitted so as to avoid surface impacts to Sensitive Resource Areas.

Alternative B, No Action (Current Management):
- All Areas of Padre Island Could be Developed under Managed Access

This alternative provides for continuing the existing management strategy, by continuing to evaluate and permit operations on a case-by-case basis. The NPS would continue to require nonfederal oil and gas operators to conduct operations in a manner that would minimize adverse impacts to park resources and values, and avoiding conflicts with visitor use, enjoyment, and safety. Development of existing operations would continue in accordance with terms and conditions of the approved permit, with supplementation to approved plans of operations as needs arise to correct the potential for resource and visitor use impacts. New plans of operations would continue to be approved under this alternative by applying Managed Access Provisions on a case-by-case basis.

This alternative would allow for 100 percent of the surface acreage of the park, or 133,918 acres, to be open to nonfederal oil and gas operations under Managed Access Provisions.

The features of Alternative B include:

- All of Padre Island could be accessed for seismic exploration under Managed Access Provisions.

- All of Padre Island could be accessed for drilling, production, or pipeline operations, under managed Access Provisions.

Alternative C, Maximum Resource Protection:
- No Surface Access in Any Sensitive Resource Area
- While All Other Areas of Padre Island Could be Developed under Managed Access

This alternative would provide the maximum protection of park resources and values and visitor use, enjoyment, and safety, by not permitting surface access or uses for any type of nonfederal oil and gas activity within Sensitive Resource Areas. Managed Access Provisions would apply to all other areas.

Under this alternative, a total of 65,183 acres, or 49 percent of the park, would be excluded from surface access and uses associated with nonfederal oil and gas activities, while the remaining 68,735 acres, or 51 percent of the park would be open under Managed Access Provisions. Directional drilling from a surface location outside Sensitive Resource Areas to access a bottomhole location underlying a Sensitive Resource Area would be permitted. Placement of pipelines via directional drilling techniques so as to avoid surface impacts to a Sensitive Resource Area would also be permitted.

The features of Alternative C include:

- No surface access for seismic exploration; drilling, production, or pipeline operations would be allowed in Sensitive Resource Areas.

- All other areas of Padre Island could be accessed for seismic exploration; drilling, production, or pipeline operations under Managed Access Provisions.

Table S.1 provides a comparison of how Sensitive Resource Areas would be protected under the three alternatives.

Table S.1, Sensitive Resource Area Acreages and Operating Restrictions that would be Applied under the Proposed Action (Alternative A), and Alternatives B and C

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Sensitive Resource Areas would be provided specific protection by applying No Surface Occupancy, No Ground Disturbance, No Surface Access, and/or Seasonal/Time Restrictions to specific types of oil and gas activity within designated buffer areas; In all other areas of Padre Island National Seashore, oil and gas activities may be permitted under Managed Access Provisions.	65,183 acres or 49% of National Seashore 68,735 acres or 51% of National Seashore	No specific protection would be provided to Sensitive Resource Areas. All areas of Padre Island National Seashore, including Sensitive Resource Areas, may be protected from adverse impacts of oil and gas activities by applying Managed Access Provisions on a case-by-case basis.	133,918 acres or 100% of National Seashore	Sensitive Resource Areas would be provided the most protection by applying "No Surface Access" to all types of oil and gas activity within the maximum buffer areas of all SRAs. Directional drilling from surface locations outside SRAs to access bottomhole locations under SRAs, and for placement of pipelines, would be permitted. In all other areas of Padre Island National Seashore, oil and gas activities may be permitted under Managed Access.	65,183 acres or 49% of National Seashore 68,735 acres or 51% of National Seashore
Cultural Sites - To protect the integrity of physical remains and the context therein of significant cultural sites: -No surface occupancy for drilling or production within 1,500 feet of Novillo Line Camp, Green Hill Line Camp, and Black Hill Line Camp; -No ground disturbance for pipeline operations within 500 feet of Novillo Line Camp, Green Hill Line Camp, or Black Hill Line Camp; -No ground disturbance within the Mansfield Archeological District; -Geophysical exploration may be permitted within Novillo Line Camp, Green Hill Line Camp, and Black Hill Line Camps under Managed Access Provisions.	 377 acres 311 acres 313 acres 115 acres 70 acres 77 acres 2,702 acres 32 acres 20 acres 18 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions. Novillo Line Camp Green Hill Line Camp Black Hill Line Camp Mansfield Archeological District	 377 acres 311 acres 313 acres 2,702 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations in: Novillo Line Camp Green Hill Line Camp Black Hill Line Camp Mansfield Archeological District	 377 acres 311 acres 313 acres 2,702 acres
Freshwater Ponds - To preserve water sources for invertebrates, fish, birds, and wildlife; to preserve groundwater discharge areas; and to protect wildlife viewing areas: -No vehicular access and no surface disturbance within 500 feet of Pond A, Pond B, and Pond C.	 33 acres 33 acres 42 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions. Pond A Pond B Pond C	 33 acres 33 acres 42 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations. Pond A Pond B Pond C	 33 acres 33 acres 42 acres

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Seagrass Beds - To preserve habitat for marine turtles and dolphins; and nursery habitat for fin-fish, the biotic foundation for the Laguna Madre's productive U.S. fin fishery: -Managed Access so that no dredging of access channels, except dredging new channels may be permitted if they meet the least damaging method of access.	25,240 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	25,240 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operation.	25,240 acres
Wind Tidal Flats - To protect hydrogeologic conditions that allow for inundation by wind-driven Laguna Madre waters, the Gulf of Mexico waters through washovers, or rain events that support algal growth and macroinvertebrates, and provide important feeding, resting, and loafing areas for shorebirds and threatened/endangered species, including Piping and Snowy Plovers, and Peregrine Falcons: -Managed access so that there would be no placement of fill, or compaction and rutting more than 1 inch deep, except roads, drilling and production pads, and pipelines may be permitted if they meet the least damaging method.	29,127 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	29,127 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operation.	29,127 acres
Visitor Use Areas - To protect the visitor experience by preserving natural darkness, ambient noise levels and visual quality; and protecting human health and safety: -No surface occupancy for access roads, drilling, production , and pipeline operations within 1,500 feet of: Malaquite Visitor Center/RV Campground; Bird Island Basin; and Grasslands Nature Trail. -Geophysical exploration may be permitted under Managed Access Provisions within Malaquite Visitor Center/RV Campground; Bird Island Basin; and Grasslands Nature Trail. -No surface occupancy for drilling, production, or pipeline operations within 500 feet of the U.S. Army Corps of Engineers Disposal Area at Mansfield Channel. -Geophysical exploration may be permitted in the U.S. Army Corps of Engineers Disposal Area at Mansfield Channel.	470 acres 380 acres 318 acres 470 acres 380 acres 318 acres 875 acres 875 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions: Malaquite Visitor Center and Malaquite RV Campground; Bird Island Basin; Grasslands Nature Trail; and U.S. Army Corps of Engineers Disposal Area at Mansfield Channel	470 acres 380 acres 318 acres 875 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations: Malaquite Visitor Center and Campground; Bird Island Basin; Grasslands Nature Trail; and U.S. Army Corps of Engineers Disposal Area at Mansfield Channel	470 acres 380 acres 318 acres 875 acres

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Foredunes - To preserve dune integrity for protection of back-island environment and provide a major defense for the mainland to block storm tidal surge and dissipate wave energy: -No surface disturbance, except roads may be permitted if they meet the least damaging method of access.	3,200 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	3,200 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	3,200 acres
Washover Channels - To preserve resting, loafing, feeding, and nesting habitat for raptors, shorebirds, and wading birds, including threatened and endangered species; and to recognize these areas as being highly dynamic in that washover channels provide intermittent hydrologic connections between the Laguna Madre and Gulf of Mexico during hurricanes: -No surface occupancy for drilling, production, or pipeline operations, except roads may be permitted if they meet the least damaging method of access. -Geophysical exploration may be permitted under Managed Access Provisions.	1,192 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	1,192 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	1,192 acres
Rookery Islands - To preserve islands for waterbird nesting and reproduction: -No surface access within 1,000 feet of island edge from February 15 through September 30. -No surface occupancy for drilling, production, or pipeline operations within 1,000 feet of island edge year-round. -Geophysical exploration may be permitted between October 1 through February 14, under Managed Access Provisions.	530 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	530 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	530 acres
Relict Live Oak Mottes - To preserve two unique vegetative communities of live oak mottes: -No surface disturbance within 500 feet around Live Oak Motte A, and Live Oak Motte B	22 acres 18 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions: Live Oak Motte A Live Oak Motte B	22 acres 18 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations: Live Oak Motte A Live Oak Motte B	22 acres 18 acres
Totals:	**65,183 acre**	**Total Acres:**	**65,183 acres**	**Total Acres:**	**65,183 acres**

SUMMARY OF IMPACTS

As previously described, six resources or values were identified by the EIS interdisciplinary team, using input from scoping, as being significant or having potentially significant impacts. These topics, which were analyzed in depth in the EIS, include:

- Oil and Gas Exploration and Development
- Soil and Water Resources
- Wetlands
- Cultural Resources
- Visitor Experience
- Sensitive Resource Areas (SRAs)

The impacts anticipated from the proposed action and alternatives for these six topics are summarized in Table S.2.

The remaining topics from the original list of potentially affected resources or values were eliminated from further detailed study.

Table S.2. Summary of Impacts, Padre Island National Seashore Oil and Gas Management Plan/EIS

Resource/Issue	Alternative A Proposed Action -No Surface Occupancy in Some Sensitive Resource Areas	Alternative B No-Action/Current Management -Managed Access Provisions Applied on a Case-by-Case Basis	Alternative C Maximum Resource Protection -No Surface Access in Sensitive Resource Areas
IMPACTS TO OIL AND GAS EXPLORATION AND DEVELOPMENT	1) Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least-damaging methods). NPS anticipates that costs and time associated with preparing and approving Plans of Operations would be less than Alternative B, because the plan would allow operators to know in advance specific locations in the park where access would likely be denied or severely restricted. 2) Costs to explore and develop oil and gas would be higher than for areas outside the park. 3) Managed Access Provisions would allow for full geophysical characterization of the oil and gas reserves of the park. 4) All oil and gas reserves beneath the park would be accessible for extraction.	1) Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least-damaging methods). NPS anticipates that time requirements would be greater than Alternatives A and C because the lack of a plan would not allow operators to know in advance the specific locations in the park where access would likely be denied or severely restricted. Inconsistencies are possible without a plan, and this could cause frustration, longer negotiations, and unanticipated denials. 2) Costs to explore and develop oil and gas would be higher than for areas outside the park. 3) Full geophysical characterization of the oil and gas reserves of the park would be allowed. 4) All and gas reserves beneath the park would be accessible for extraction.	1) Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least-damaging methods). The NPS anticipates that time requirements would be similar to Alternative A, and less than Alternative B because the plan would allow operators to know in advance specific locations in the park where surface access would be denied or severely restricted. 2) Costs to explore and develop oil and gas would be higher than for areas outside the park. 3) No surface access to SRAs (65,183 acres) would preclude these areas from geophysical exploration. While operators could use existing well and geophysical data available at the time this plan is implemented, the inability to conduct newer 3-D geophysical exploration is likely to interfere with full characterization of oil and gas reserves underlying these areas of the park. 4) Some oil and gas reserves may not be accessible for extraction because a small portion of the seagrass beds and wind-tidal flats may not be accessible by directional drilling. If commercial quantities of oil or gas occur within this area, these oil and gas reserves beneath the park would not be accessible for extraction.

Resource/Issue	Alternative A Proposed Action -No Surface Occupancy in Some Sensitive Resource Areas	Alternative B No-Action/Current Management -Managed Access Provisions Applied on a Case-by-Case Basis	Alternative C Maximum Resource Protection -No Surface Access in Sensitive Resource Areas
IMPACTS TO SOIL AND WATER RESOURCES	1) Soil compaction is expected to occur on approximately 250 acres (0.2%) of the park. Most impacts are expected to be minor and short-term because as some operations are developed, others would be reclaimed; therefore, only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. SRAs would experience little or no short-term impacts as a result of specific protection provided. 2) Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide NPS with adequate documentation to require cleanup. 3) Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.	1) Soil compaction is expected to occur on approximately 250 acres (0.2%) of the park. Most impacts are expected to be minor and short-term because as some operations are developed, others would be reclaimed; therefore, only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. SRAs could experience negligible short-term impacts. 2) Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide NPS with adequate documentation to require cleanup. 3) Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.	1) Soil compaction is expected to occur on approximately 250 acres (0.2%) of the park. Most impacts are expected to be minor and short-term because as some operations are developed, others would be reclaimed; therefore, only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. SRAs could experience short-term, indirect impacts but impacts would be negligible. 2) Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide NPS with adequate documentation to require cleanup. 3) Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.

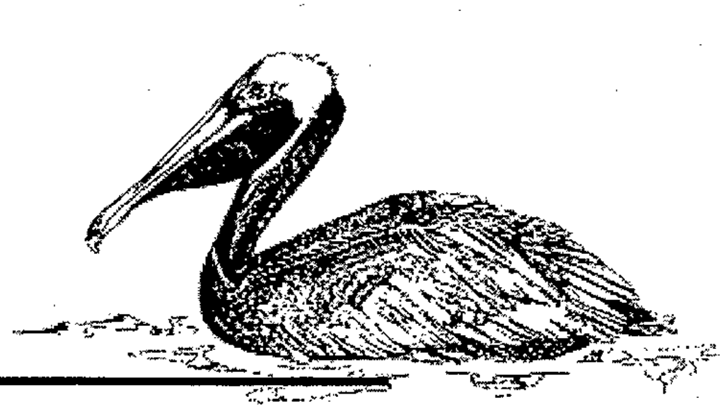
Resource/Issue	Alternative A Proposed Action -No Surface Occupancy in Some Sensitive Resource Areas	Alternative B No-Action/Current Management -Managed Access Provisions Applied on a Case-by-Case Basis	Alternative C Maximum Resource Protection -No Surface Access in Sensitive Resource Areas
IMPACTS TO WETLANDS	1) Direct wetlands impacts would occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts could occur. Only a small portion of the estimated 142.5 acres would result in long-term impacts because as some oil and gas operations are being undertaken others would be reclaimed. Because wetlands impacts are avoided or minimized in the process of permitting under Managed Access Provisions, it is unlikely that SRA restrictions applied in Alternative A would result in fewer direct wetland impacts. 2) Geophysical exploration would have minor and short-term impacts. 3) Specific wetlands communities, including the 3 freshwater ponds, seagrass beds, and wind tidal flats, receive increased protection by being identified as SRAs, which heightens awareness that they are sensitive to disturbances and are important for providing habitat for wildlife, particularly for threatened and endangered shorebirds. 4) The NPS's no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impact. In addition, the requirement to restore wetlands communities to their natural condition at the completion of oil and gas operations results in no significant impact to wetlands.	1) Direct wetlands impacts would occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts would occur. Only a small portion of the estimated 142.5 acres would result in long-term impacts because as some oil and gas operations are being undertaken others would be reclaimed. All types of wetlands communities would be affected, in proportion to the Acreages each is found in the park. 2) Geophysical exploration would have minor and short-term impacts. 3) Identification of wetlands communities and Managed Access Provisions would be applied on a case-by-case basis. This could result in greater variation and the potential for greater impacts to all types of wetlands communities. 4) The NPS's no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impact. In addition, the requirement to restore wetlands communities to their natural conditions at the completion of oil and gas operations results in no significant impact to wetlands.	1) Direct wetlands impacts would occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts would occur. Only a small portion of the estimated 142.5 acres would result in long-term impacts because as some oil and gas operations are being undertaken others would be reclaimed. 2) Geophysical exploration would have minor and short-term impacts. 3) Specific wetlands communities, including the 3 freshwater ponds, seagrass beds, and wind tidal flats, receive maximum protection by being identified as SRAs and by applying a No Surface Access restriction to all oil and gas operations, including seismic. This results, however, in other wetlands communities, such as inland freshwater wetlands and salt fringe wetlands, becoming the focus of wetlands impacts. 4) The NPS's no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impact. In addition, the requirement to restore wetlands communities to their natural condition at the completion of oil and gas operations results in no significant impact to wetlands.

Resource/Issue	Alternative A Proposed Action -No Surface Occupancy in Some Sensitive Resource Areas	Alternative B No-Action/Current Management -Managed Access Provisions Applied on a Case-by-Case Basis	Alternative C Maximum Resource Protection -No Surface Access in Sensitive Resource Areas
IMPACTS TO CULTURAL RESOURCES	1) Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park. 2) Contamination at a nearby abandoned oil and gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.	1) Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park. 2) Contamination at a nearby abandoned oil and gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.	1) Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park. Known cultural sites are identified as Sensitive Resource Areas and no surface access for any oil and gas activities would prevent any future impacts to these areas from implementing the RFD scenario. 2) Contamination at a nearby abandoned oil an gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.
IMPACTS TO VISITOR EXPERIENCE	1) There are no significant impacts expected from the RFD scenario to Visitor Experience under Alternative A due to the specific distance restrictions provided with the SRA buffers; the Managed Access Provisions which provide avoidance, mitigation and health and safety measures; and the indications that visitors do not have significant issues with oil and gas operations in the park, as evidenced by the surveys and complaint record at the park. 2) Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience to Novillo Line Camp due to the introduction of hydrocarbon odor that is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing,	1) Managed Access Provisions, especially the lesser buffer restrictions provided for SRA Visitor Use Areas (500-foot vs. 1,500-foot), may not provide enough mitigation so that there is the possibility that significant impacts to visitor experience could occur near the SRA Visitor Use Areas and other remote locations used by visitors to experience the natural environment and view wildlife. Noise, in particular, may affect visitors if buffer distances are not sufficient and background levels are exceeded, causing disruption to wildlife use and visitor enjoyment in these areas. Although there has been little indication to date that noise is causing significant disruption to park visitors, the possibility exists, if oil and gas facilities are sited too close to sensitive use areas.	1) With the buffer zones provided for the SRAs, the "No Surface Access" restriction in these areas, in addition to the standard protective measures provided by the Managed Access Provisions for other areas of the park, there would be no significant impacts to visitor experience under Alternative C. 2) Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience to Novillo Line Camp due to the introduction of hydrocarbon odor that is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, adverse impacts to visitor experience at Novillo Line Camp may continue.

Resource/Issue	Alternative A Proposed Action -No Surface Occupancy in Some Sensitive Resource Areas	Alternative B No-Action/Current Management -Managed Access Provisions Applied on a Case-by-Case Basis	Alternative C Maximum Resource Protection -No Surface Access in Sensitive Resource Areas
IMPACTS TO VISITOR EXPERIENCE (continued)	adverse impacts to visitor experience at Novillo Line Camp may continue.	2) Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience at Novillo Line Camp due to the introduction of hydrocarbon odor that is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, adverse impacts to visitor experience at Novillo Line Camp may continue.	
IMPACTS TO SENSITIVE RESOURCE AREAS	SRAs, comprising 65,183 acres, or 49% of Padre Island National Seashore, receive specific protection by applying various surface use restrictions, including No-Surface Occupancy, No Ground Disturbance, and Seasonal Restrictions to specific types of oil and gas activities. As a result, SRAs experience little or no impacts.	SRAs are identified and specific mitigation measures are applied on a case-by-case basis. By using this approach, there is higher variability in identifying SRAs and mitigation techniques so that more impacts to SRAs could occur; however, no significant impacts are expected.	SRAs receive maximum protection by applying a No-Surface Access restriction to any oil and gas activity; therefore, SRAs experience no direct impacts from oil and gas operations.

CHAPTER 1

INTRODUCTION



CHAPTER 1
INTRODUCTION

PURPOSE AND NEED FOR THIS PLAN

The purpose of this Draft Oil and Gas Management Plan/Environmental Impact Statement for Padre Island National Seashore is to set forth the overall approaches necessary to protect natural, cultural, and visitor use values that would be implemented over the next 15-20 years. Once finalized, the plan will serve as a guide for directing access for geophysical exploration, exploratory drilling, and production and transportation of nonfederal oil and gas resources in the park. It will also provide a greater degree of certainty to operators since it provides up-front information on the location of sensitive resources and suggests needed mitigation.

Oil and gas development could potentially impact natural and cultural resources, and visitor experience. The NPS must ensure that only appropriately planned and designed operations are approved in the future, and that cumulative impacts are fully analyzed so that resources are not impaired to the degree that the ecological integrity of the park is compromised. Identifying potential resource impacts and applying appropriate operating standards, including no-surface occupancy restrictions, time/seasonal restrictions, and other mitigation techniques, would avoid or mitigate adverse impacts. The current management constraints or "Managed Access Provisions" applied to nonfederal oil and gas operations are updated and modified (if necessary) in this document. Areas of the park are identified where (1) operating standards, (2) impact mitigating measures, or (3) operating requirements may be included in plans of operations or attached as conditions of approval.

SPECIAL MANDATES AND DIRECTION

General Management Plan Direction

The General Management Plan (GMP) is the major planning document for all National Park System units. The GMP sets forth the basic philosophy of the unit, and provides strategies for resolving issues and achieving identified management objectives required for resource management and visitor use. The GMP includes environmental analysis and other required compliance documentation.

In August 1980, Hurricane Allen swept across Padre Island National Seashore. The full fury of the storm demonstrated the vulnerability of man-made structures placed in coastal high-hazard zones. Furthermore, the corrosive salt-air atmosphere of the Gulf shore, which causes a constant, ongoing maintenance problem for any man-made developments, led to the new General Management Plan/Development Concept Plan (GMP/DCP), to recognize "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 Draft GMP/DCP for Padre Island National Seashore was completed in April 1983, and contained an integrated set of proposals to be carried out over a 10-15 year period to:

1. ensure the continued protection of the island's natural and cultural resources,

2. support the established level and pattern of visitor use, and

3. facilitate efficient park operations.

The following strategies were identified in the GMP/DCP to achieve the identified management objectives:

1. Natural processes will be allowed to shape the barrier island with as little interference as possible.

2. Natural resource manipulation will be limited to localized efforts to correct man-caused impacts.

3. The vestiges of historic and prehistoric occupants of the island will be protected from man-caused damage, but not from the effects of natural forces. (NPS policy requires preservation maintenance to protect resources from the effects of natural erosion and deterioration.)

4. Facilities that are sited in the coastal high-hazard area (the Malaquite pavilion and campground) will be retained until their maintenance is no longer cost-effective or they are damaged by a storm; at that time they will be removed, and the same service will be provided in a more environmentally sensitive manner.

5. Recreational use will be supported by all ongoing services and by increased on-island information and interpretation. Activity zoning will be established around Bird Island Basin to minimize visitor conflicts and disturbance of nesting birds, and driving corridors will be delimited to reduce the potential for resource damage and conflicts among visitors associated with ORV driving along the beach.

6. Required island operations and maintenance facilities, including housing for necessary law enforcement personnel, will be consolidated at Malaquite.

The following management objectives were identified in the GMP/DCP:

1. Provide for recreational opportunities. and development of the national seashore in a manner that is compatible with the protection of the natural and cultural resources of the area.

2. Avoid, to the extent possible, the long- and short-term impacts associated with the occupancy and modification of barrier island floodplains and the destruction or modification of wetlands.

3. Encourage a continuing research program, which will provide staff with information needed for interpretation and management of the natural and cultural aspects of the seashore.

4. 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.

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

6. 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.

The GMP/DCP recognized . . ."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. 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."

The GMP/DCP specifically identified that: "A minerals management plan will be prepared that will identify and map existing leases and existing operations; identify and map critical resources to be protected (beach, dunes, ponds, archeological sites, endangered species, views, etc.); list minerals management policies; assess cumulative impacts of oil and gas operations; and describe procedures for managing oil and gas operations, including the time frames and content of required documentation." These identified tasks will be addressed in this Oil and Gas Management Plan/Environmental Impact Statement. The NPS has chosen to retitle this document from that of "minerals management plan" to the more specific title of "Oil and Gas Management Plan."

The GMP/DCP provided direction in identifying that: "The NPS controls exploration and extraction activities through enforcement of federal regulations; agreements with the state School Land Board (now the Texas State General Land Office), oil companies, and private owners; and the requirement for an approved plan of operations, which effectively prevents drilling on the beach, in the dunes, or in ecologically sensitive areas."

The Oil and Gas Management Plan will identify areas closed to access and surface uses, and areas open to access and surface uses with a range of managed access provisions. Managed access provisions would include operating standards and specific resource protection measures intended to protect natural and cultural resources, and visitor use values.

Padre Island National Seashore Enabling Legislation

The park was established by Congress on September 28, 1962 (see 16 U.S.C. §459d *et seq.*). The enabling legislation is provided in Appendix A. The relevant sections of the park's enabling legislation that provide guidance regarding the management of nonfederal oil and gas are provided in two sections:

> 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 water and the lands and waters adjacent thereto, under such regulations as may be prescribed by the Secretary with respect to such mining or removal. (See 16 U.S.C. §459d-3(a).)

Under Section 4(a) of the park's enabling legislation and the NPS Organic Act (16 U.S.C. §3), Congress authorized the Secretary of the Interior to promulgate the NPS's Nonfederal Oil and Gas Rights Regulations, 36 CFR 9B. A copy of the 36 CFR 9B regulations is provided in Appendix B.

Section 4(b) of the park's enabling legislation exempted a specific class of nonfederal oil and gas operations from any NPS regulations. This exemption applied to operations existing within Padre Island National Seashore, operating under grants, leases, or easements existing on April 11, 1961. This class of operator was also to be granted additional surface uses and occupancy, pursuant to the 36 CFR Part 9B regulations, which were necessary for the development of oil and gas from outside the boundaries of the park.. The last operator at the park to qualify under this exemption ceased production of 4 wells in the Gulf of Mexico, outside the boundaries of the park, and removed all above-ground production facilities located on the island and within the boundaries of the park in 1985.

> Sec. 4.(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. (See 16 U.S.C. §459d-3(b).)

THE PLANNING PROCESS

The oil and gas management planning process consists of the following steps: establishing a planning team, developing planning objectives, identifying issues and collecting data, scoping with the public and governmental agencies, generating alternatives, and identifying significant issues and evaluating alternatives.

Establishing a Planning Team

The first step in the planning process was establishing an NPS planning team to coordinate and plan the Oil and Gas Management Plan/Environmental Impact Statement. The planning team consists of approximately 30 NPS staff. Fifteen form a core team, who are chiefly responsible for developing the plan. Three have significant industry background, while seven others have extensive experience working with the oil and gas industry on regulatory and operational issues. Other NPS staff who are contributing to the production of the plan bring expertise in the areas of geographic information systems; environmental regulations such as the National Environmental Policy Act, Endangered Species Act, and National Historic Preservation Act; and a range of resource issues including wetlands, hydrology, wildlife including threatened and endangered species, and cultural resources. Four private consultants were contracted, and one graduate student working in an NPS-New Mexico Highlands University partnership project participated in preparing impact analyses.

The interdisciplinary core team determined there were no cooperating agencies participating in the development of this document. Through internal and public scoping, the team did identify the following federal and state agencies that would be involved in the permitting process for nonfederal oil and gas operations within Padre Island National Seashore. These agencies and affiliated groups include:

- **U.S. Fish and Wildlife Service**. Pursuant to Section 7 of the Endangered Species Act, the NPS consults with the F&WS on a project-by-project basis to evaluate the adequacy of resource survey information and associated mitigation measures being employed to avoid or mitigate potential impacts to threatened/endangered species or their habitat.

- Also pursuant to Section 7 of the Endangered Species Act, the NPS consults with the **Texas Parks and Wildlife Department** on a project-by-project basis to request an updated list of state-listed special status species; and with the **National Marine Fisheries Service** for a list of special status marine species.

- The **Texas Parks and Wildlife Department, Texas State General Land Office, and Texas Natural Resource Conservation Commission** share natural resource trusteeship of the biota, submerged lands, and groundwater, respectively, at Padre Island National Seashore.

- **Texas State Historic Preservation Officer**. Pursuant to Section 106 of the National Historic Preservation Act, the NPS would consult with the SHPO on a project-by-project basis to evaluate the adequacy of cultural resources survey information and mitigation measures to avoid impacting significant cultural resources.

- **Texas State General Land Office.** This state agency performs several important roles pertaining to the nonfederal oil and gas program at Padre Island National Seashore. The GLO administers the leasing program for state-owned oil and gas that are located under the submerged waters within the boundaries of the park. It also administers the federally-approved Coastal Zone Management Program, for which the NPS would consult on a voluntary basis to ensure consistency with the intent of the program.

- **Tonkawa Tribe.** Pursuant to Section 106 of the National Historic Preservation Act, the NPS is responsible for determining whether or not historic properties to which American Indian tribes may ascribe cultural or religious significance may be affected by its undertakings. The Tonkawa Tribe of Oklahoma was consulted because their customary homeland before 1859 was the south Texas area just north of Padre Island and because of their past relationship with the Karankawa people, Padre Island's native inhabitants. At a July 1995 meeting in Oklahoma City between the NPS and representatives of the Oklahoma tribes to discuss tribal affiliations with national parks in Texas and Oklahoma, none of the 16 federally recognized tribes present (the Tonkawa Tribe was not present) asserted any association with Padre Island. Further, at an October 28, 1996, meeting of the Working Group on Historic Preservation of the Seven Tribes of the Anadarko Agency, Oklahoma, members present unanimously recommended to NPS that the Tonkawa Tribe be consulted for any activities affecting national park lands in south and southwest Texas. The NPS consulted with the Tonkawa Tribe through correspondence and telephone calls beginning in July 1997 and during a visit to the park by an officially designated tribal representative in May 1998. The tribal representative's preliminary conclusion was that Padre Island is too far south of Tonkawa customary lands for the tribe to identify historic properties of cultural or religious significance or to have specific concerns about the potential impacts of the oil and gas operations. The Tonkawa Tribe, however, is concerned about the health of the Padre Island ecosystem in general and wishes to be kept informed about the oil and gas management plan and about NPS management plans for the Island in general.

- **Railroad Commission of Texas.** This state agency regulates oil and gas production under its Statewide Oil and Gas Rules.

- The **U.S. Army Corps of Engineers** administers Section 404 permitting for dredge and fill into waters of the United States. Operators whose operations require Section 404 permitting would consult with the Corps for such permits. The COE would also provide certification of wetlands delineations performed by operators of prospective sites and adjacent lands needed to identify resource issues that may be affected by a proposed operation and to evaluate potential direct and indirect impacts on wetlands.

The Corps also administers Section 10 of the Rivers and Harbors Act of 1899. A Department of Army authorization is required for work in, on, or below navigable waters of the United States. Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. (33 CFR 329.4)

Developing Planning Objectives

The planning objectives are to:

- Identify which park resources and values are most sensitive to oil and gas exploration and development disturbance, and define impact mitigation requirements to protect such resources and values.
- Establish reasonable oil and gas exploration and development performance standards to protect park resources and values.
- Provide pertinent information to oil and gas owners and operators that will facilitate operations planning and compliance with all applicable regulations.

Identifying Issues and Collecting Data

The planning team identified the following resources and values that could be affected by surface uses associated with nonfederal oil and gas operations:

1. Air Quality
2. Cultural Resources
3. Foredunes
4. Freshwater Ponds
5. Local and Regional Economies
6. Natural Quiet
7. Night Sky
8. Oil and Gas Exploration and Development
9. Park Operations
10. Relict Live Oaks
11. Rookery Islands
12. Seagrass Beds
13. Soils
14. Threatened and Endangered Wildlife Species and their Habitat
15. Vegetation
16. Visitor Experience, Health, and Safety
17. Visitor Use Areas
18. Visual Quality
19. Washover Channels
20. Water Resources
21. Wetlands
22. Wildlife

During 1996 and early 1997, additional information was collected about these resource issues. A vegetation classification map was completed for use as a base map, and additional information was collected to map and describe the resources and values. All of the issues or topics listed above were analyzed by the team and presented and discussed during the public scoping process described below. Criteria were developed to evaluate relative significance of these resources and values in relation to the park and the proposed oil and gas development. Of the 22 resources and values initially listed, nine were identified as Sensitive Resource Areas, and were used to generate and evaluate alternatives (see Section 5, below). Five others were considered as major or significant issues and carried through the EIS for detailed analysis. The remainder were studied and analyzed, but were not considered significant issues, or were expected to have minimal impacts, assuming implementation of mitigation under Managed Access Provisions. These issues or resources were dropped from detailed analysis in the EIS. Details are provided at the end of this chapter.

Scoping with the Public and Governmental Agencies

The public scoping process is required under the National Environmental Policy Act (NEPA). Scoping under NEPA involves the solicitation of comments and concerns from the public regarding projects that are proposed on federal land. Issues and concerns raised by the public during the scoping period are used by the NPS to establish which issues need to be addressed in the EIS.

Early in the planning process, the planning team consulted with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department about threatened and endangered species that could occur in the park; with the State Historic Preservation office about cultural resources; and with the Tonkawa Tribe to inform them of the planning process and issues that could affect lands that may be significant to them, and to determine if there were any resource issues with which the Tonkawa Tribe had ethnographic affiliation.

In June 1997, the NPS mailed a public scoping newsletter to over 300 individuals, organizations, and government agencies. The newsletter announced the beginning of the EIS scoping period and the location, date, and time of the scoping open house. A notice of intent was published in the *Federal Register* on June 10, 1997. The NPS also published the notice of intent and announced the scoping open house by placing newspaper advertisements in the Austin *American-Statesman*, Houston *Chronicle*, and Corpus Christi *Caller Times*. The notices of intent and newsletter provided the public opportunities for scheduling additional scoping open houses; however, the NPS received no requests for additional scoping meetings.

The scoping newsletter also provided information on the planning process and schedule, and described how agencies and the public could be involved. The newsletter identified oil and gas management plan goals and planning objectives, sensitive resources and values, and preliminary management strategies. The NPS developed the preliminary planning framework to inform agencies and the public of what the NPS was considering, but more important, to provide agencies and the public with enough information with which they could bring other ideas, comments, suggestions, and management strategies to the decision-making process.

The formal public scoping period for the proposed Oil and Gas Management Plan/Environmental Impact Statement for Padre Island National Seashore concluded on January 6, 1998. During this period, one scoping open house was held in Corpus Christi, Texas. All issues, concerns, and alternatives identified during scoping have been considered by the NPS for inclusion in the Draft EIS.

Although the formal scoping period ended on January 6, 1998, the NPS continued to consider public comments throughout the EIS process, as allowed by the overall EIS schedule.

A second newsletter was released on March 6, 1998, to over 280 individuals, organizations, and government agencies. The newsletter summarized the results of the scoping open house and the written comments received by the NPS. The newsletter categorized and summarized issues, concerns, and alternatives raised. All issues, concerns, and alternatives identified during scoping were considered by the NPS for inclusion in this Draft EIS.

What We Heard From You: In response to publishing the notice of intent, hosting the scoping open house, and distributing the Public Scoping Newsletter, nine comment letters were received by the NPS during the scoping period, and 13 individuals asked to be added to the mailing list for receiving the Draft EIS.

To encourage early and open public participation, the NPS hosted an open house in Corpus Christi, Texas, on July 9, 1997, at the Omni Bayfront. Ten members of the public attended. Four participants represented three different oil and gas companies; one participant represented a consulting firm; three participants represented private mineral owners at the national seashore; one participant represented an environmental organization; and one participant represented the state university system.

With this review of the Draft Oil and Gas Management Plan/EIS, you have the opportunity to review the analysis and inform the NPS whether the issues you raised during scoping have been adequately addressed in the document. The Draft EIS will be followed by the Final EIS, in which errors and omissions will be corrected.

Scoping Comments: The following issues and questions raised in the comment letters received by the NPS and recorded at the scoping open house have been incorporated into this Draft Plan/EIS.

Compliance with State and Federal Regulations

> An approved Plan of Operations will serve as a permit for exploration and development of nonfederal minerals on the seashore's federal lands, such a plan must be consistent with the State of Texas' federally approved coastal management program if there is any potential for impacts to coastal resources outside those federal lands. I therefore encourage you to consider consistency with the Texas Coastal Management Program (CMP) during development of the management plan and the environmental impact statement.
>
> Will endangered species permits be necessary? What other permits will this project need? Who will pay the costs of obtaining these permits?

Planning Goals and Objectives

> The stated goals and planning objectives in the Public Scoping Newsletter are very good and adequately outline the given task.

Planning Process

> How will the plan be updated?
>
> Will the plan address 3D seismic operations?

Identification of Resource Issues

I agree with the sensitive resources and values that have been initially identified. The national seashore is a spot famous for its bird-watching and other wildlife watching opportunities. Your identified resources and values seem to cover these areas and the other important features of the area.

Maintaining pristine water quality should also be a defining criteria. Beaches along many of the coastal areas are full of tar balls resulting from past oil spills and accidents. How can we be sure that this will not happen to Padre Island National Seashore?

Protecting the aquifer should be a major consideration.

What effect will oil and gas development have on sport fishing and recreation?

Will these activities be restricted so as not to harm or interfere with fish spawning patterns, marine mammal migrations, aquatic food chains, reptiles and nesting birds?

What effects will siltation and drilling have upon marine organisms?

What impacts and effects will the proposed action have upon threatened and endangered species? The endangered Green Sea Turtle, Hawksbill Sea Turtle, Kemp's Ridley Sea Turtle, and Leatherback Sea Turtle, plus the threatened Loggerhead Sea Turtle are all found within the area. These species use the Padre Island National Seashore for nesting and the proposed action may disturb their habitat thereby constituting a taking.

[Information that should be included in the plan to facilitate oil and gas operations planning is] any information which would impact either the timing, or method of implementation of any oil and gas operation.." More specifically, pertinent information should include any and all geographic "off limits" areas (visitor, environmental, historical), seasonal nuances, and guidelines for mobilization and de-mobilization of equipment and personnel.

The bullets as expressed in the newsletter that deal with specific items, species, etc., appear to be consistent with that usually encountered by oil and gas operators in other sensitive areas, however, I do get concerned with hard to define or very general criteria. For instance, "scenic integrity, a sense of history, sounds of nature" if vigorously applied, or construed to the extreme, by certain groups or individuals, then these could very possibly preclude <u>any</u> oil and gas operations. As long as the criteria, resources and values are ranked consistent with, what I assume from the titling of this project, is permitting oil and gas operations with minimal impact, then the identified criteria is workable.

How much oil and gas is present? Do the environmental costs outweigh the monetary benefits?

Alternatives

If there are certain (hopefully, very limited) geographic areas, seasons, situations or conditions that need to be held sacrosanct then, they should be clearly set forth from the beginning.

Taking "management strategy" to a different connotation, I would offer the following framework. Institute a panel of industry and environmental experts to oversee the permitting process. Permitting would originate under the auspices of this panel by the requesting party. The initial meeting could be patterned after the Louisiana Department of Natural Resources' "Geologic Review Meeting," which is the "informal" process that this agency has utilized to pull together various state and federal agencies into one room for initial comment. I would recommend that the "informal" be removed and that the panel be "independent," rather than a subset of commenting agencies. Further, the panel should remain in a position of authority throughout the permitting process.

...develop a plan that is in the best interest of the natural environment of the National Seashore as well as allowing the mineral owners to exercise their rights to oil and gas exploration on their lands.

...almost all Oil and Gas Operations that I am familiar with are usually more than happy to comply with reasonable regulations on environmentally sensitive lands.

I would like to see the National Park Service adopt a policy that allows exploration and development and protects the environment. To me, this can most easily be accomplished by developing a general plan that allows the mineral owners their rights and is not so restrictive as to prohibit economic exploration.

I believe that clear mapping of the area with some type of an impact sensitivity rating that would establish the concerns for the area and risk that would be acceptable would allow project planning to proceed without the full structure of the management plan being available.

It should be possible to develop some minimum impact requirements for these operations and the[n] allow the companies to establish a quality control program to ensure that they perform as indicated. I believe that ISO 14000 could be used as the basis for having independent 3rd party verification of performance at these sites.

What about drilling outside the Padre Island National Seashore area on an angle to reach the oil and gas reserves?

How can one be certain that the proposed developers have a good record of environmental stewardship and compliance? How will the developers be held accountable for their activities? Who will remediate operations that are not conducted properly?

Should environmental problems occur, how will the problem (such as a spill) be cleaned up? Will the cleanup equipment be located nearby or on site? If not, how long will it take to arrive and who will pay for cleanup operations? How soon will the cleanup occur? Who will be responsible for fish, mammal and reptile kills? What about the litter and general havoc upon the area caused by oil and gas developers?

Who will pay for future environmental degradation such as pipeline ruptures brought about by these activities? What if problems occur several years down the road? Who will pay to cleanup future spills?

Kemp's ridleys are nesting at the Seashore in an incredible breakthrough for sea turtle conservation. The entire area of beach and coastal waters should be declared a sanctuary in order to give the turtles an opportunity to nest without fishing vessels, oil field traffic or any type of commercial traffic.

The beach should remain the peaceful, quiet, untouched place that it is. All of us need places that provide the solitude, space and scenery which we need to offset the frantic pace of our daily lives.

Specific guidelines should be provided for operations, such as for drilling a well, or dealing with contaminants.

Generating Alternatives

The Oil and Gas Management Plan/Environmental Impact Statement for Padre Island National Seashore identifies and analyzes a reasonable range of alternative strategies for managing access and surface uses associated with the exploration, development, and transportation of the nonfederal oil and gas mineral estate underlying Padre Island National Seashore necessary to protect natural, cultural, and visitor use values.

As a result of public scoping and the resource analysis conducted by the EIS team, the NPS developed three Oil and Gas Management Plan/EIS alternatives to describe the different management options available to the NPS for managing surface uses associated with nonfederal oil and gas exploration and development in the park. These alternatives were developed to respond to the issues mentioned above, especially the identification of specific Sensitive Resource Areas. Each alternative presents a different level of application of oil and gas management constraints. Together with the Managed Access Provisions, each of the alternatives forms a separate land-use plan.

The term "managed access" as used in the description of alternatives means application of all pertinent federal and state laws, regulations, and policies governing oil and gas operations conducted in the seashore. These include NPS regulations at 36 CFR 9B, which require operators to use technology and methods least damaging to seashore resources while ensuring the protection of public health and safety. Managed Access Provisions are based primarily on laws, regulations, manuals, and existing land use plans.

The plan alternatives are described in Chapter 2, along with Managed Access Provisions. A brief summary of the alternatives follows below:

Alternative A, Proposed Action (Preferred Alternative), No Surface Occupancy in Some Sensitive Resource Areas: Sensitive Resource Areas are provided specific protection by applying "No Surface Occupancy," "No Ground Disturbance," No Surface Access," and "Seasonal Restrictions" within designated buffer areas to specific types of oil and gas activities. Geophysical (seismic) exploration could be allowed in SRAs under Managed Access Provisions.

In Sensitive Resource Areas where surface access is restricted, directional drilling from a surface location outside an SRA to access a bottomhole location underlying the SRA would be permitted. Directional drilling technology for placement of pipelines under SRAs to avoid surface impacts would also be permitted.

Sensitive Resource Areas are shown on Table 2.2, with the maximum acreage for protective buffers. Sensitive Resource Areas, with their maximum protective buffers, comprise 65,183 acres, or 49 percent of the park.

In all other areas of Padre Island National Seashore, oil and gas activities may be permitted under Managed Access Provisions.

Alternative B, No-Action (Current Management): All areas, or 100 percent of the park, including Sensitive Resource Areas, are open to nonfederal oil and gas exploration, development, production, and transportation under Managed Access Provisions.

Alternative C, Maximum Resource Protection: A "No Surface Access" restriction would be applied to all types of oil and gas activities in any Sensitive Resource Areas, comprising 65,183 acres or 49 percent of the park. In all other areas of the park, oil and gas activities would be permitted under Managed Access Provisions. Directional drilling from a surface location outside SRAs to access bottomhole locations underlying SRAs would be permitted. Directional drilling technology for placement of pipelines under SRAs to avoid surface impacts would also be permitted.

Identifying Significant Issues and Evaluating Alternatives

The Council on Environmental Quality Regulations, at 40 CFR 1501.7(a)(2) requires the NPS to "Determine the scope and the significant issues to be analyzed in depth in the environmental impact statement," and (3) "Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review, narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere."

Significant Issues to be Analyzed in Depth: As previously mentioned, the EIS team conducted an evaluation of the initial issues identified, and narrowed down the list to those issues considered significant in relation to the park and the decision to be made regarding the different plan alternatives:

1. Oil and Gas Exploration and Development is considered a significant issue because the oil and gas mineral rights are a nonfederal property interest; and there is the potential for controversy.

2. Soil and Water Resources is considered a significant issue because the highly porous sand at Padre Island National Seashore allows for rapid transport of any leaked or spilled contaminating or hazardous substances into the shallow perched freshwater aquifer that supports the park's substantial wetlands environment and important biotic communities.

   Several incidents of hydrocarbon and heavy metal contamination resulting from oil and gas operations in the past have resulted in remediation that has been costly and controversial.

3. Wetlands are considered a significant issue because over 60 percent of the park is wetlands; therefore, oil and gas activities cannot avoid impacting wetlands. Wetlands are a major contributor to the high biological values of the park.

4. Cultural Resources is considered a significant issue because hydrocarbon contamination from an abandoned natural gas processing facility is spreading via surface water into Novillo Line Camp, a historic site listed on the National Register of Historic Places. The contamination is resulting in visible sheening on surface water and strong hydrocarbon odor, which degrades the character and setting of the historic property.

5. Visitor Experience is considered a significant issue because oil and gas operations introduce an industrial element in a natural environment, with potential conflicts with visitor uses, enjoyment, and safety.

6. SRAs include nine different topics from the original list: certain cultural sites included under the overall Cultural Resources topic; washover channels; foredunes; rookery islands; seagrass beds; wind-tidal flats; freshwater ponds; relict live oak mottes; and visitor use areas. SRAs were selected and considered a significant issue because they met one or more of the following criteria:

   - cannot be successfully reclaimed using state-of-the-art methods;
   - are important historic, cultural, and archeological sites;
   - are developed areas that support visitor use and enjoyment;
   - are threatened and endangered species habitat; and
   - provide a natural defense for the island and mainland against major storm surges associated with tropical storms.

The impacts anticipated from the alternatives for these issues are described in detail in Chapter 4, and the issues or resources themselves are described under Affected Environment, Chapter 3. A comparative summary of impacts is included in Table S.2.

Issues or Resources Evaluated and Dropped from Detailed Analysis: For the remaining resources or values, a resource analysis or evaluation was conducted, but the team concluded that these issues or resources were not significant, because (1) they were not major issues or values for the parks; or (2) even if they could be major issues, the impacts expected (assuming application of all required mitigation under the required Managed Access Provisions) would be negligible or minor. Since these topics would not be major factors in the EIS decision-making process, they were dropped from further detailed evaluation. These topics include:

- Air Quality
- Local and Regional Economics
- Natural Quiet
- Night Sky
- Park Operations
- Threatened and Endangered Species and Their Habitat
- Vegetation
- Visual Quality
- Wildlife
- Floodplains

In addition to the topics discussed above, there are several topics that must be considered in an EIS (mandatory EIS topics, NPS DO-12). Several of these were not evaluated because of the reasons listed below:

- Possible Conflicts Between the Proposed Action and Land Use Plans, Policies, or Controls

- Sustainability and Long-term Management, and Energy Requirements and Conservation Potential

- Socially or Economically Disadvantaged Populations

- Prime and Unique Agricultural Lands

The following discussion provides a brief summary of these issues and includes the specific reasons why these were eliminated from detailed evaluation. The impact evaluations are available in the project file.

Air Quality: Padre Island National Seashore is a Class II air quality area. According to the Texas Natural Resources Conservation Commission (TNRCC), all of Kleberg and Kenedy Counties are attainment areas for regulated pollutants. No violations of ambient air standards have been recorded. Although air quality and visibility in the region are threatened by increases in the number and extent of petrochemical industries and related increases of emissions in the Houston and Corpus Christi areas, the prevailing winds are likely to dissipate any pollutants quickly from the park. From October through February, north-northeasterly winds occur, and from March through September, prevailing southeasterly winds are from the Gulf of Mexico.

Typical sources of particulate and gaseous emissions from oil and gas operations include site construction activities, traffic on unpaved roads, combustion engines, and the oil/gas itself, including routine emission of noxious vapors from storage tanks.

Impacts to air quality could be considered significant if:

- the accidental emission of H_2S, hydrogen sulfide, or other harmful compounds occurred in sufficient concentrations and duration to affect the health and safety of workers at the site, or visitors in the vicinity; or

- the emission of pollutants from any activities associated with the construction and operations from the proposed project exceeded any applicable significance emissions or ambient concentration threshold values set by the EPA PSD permitting rules, the Texas Natural Resources Conservation Commission Nonattainment rules or volatile organic compound (VOC) emissions, or any Ambient Air Quality Standard established by the TNRCC.

Impacts to air quality from these emissions under all three alternatives are expected to be similar and negligible. This is because all operations must comply with state and federal regulations, and because of the prevailing wind conditions on the island. The oil and gas facilities must be designed to comply with the State Implementation Plan (SIP) under the Clean Air Act (CAA) provisions, in order to receive approval for their Plan of Operations. In addition, the operators would be required to follow operating procedures to minimize emissions. These include use of blowout preventers; a prohibition on burning of vegetation, construction debris, or site-produced wastes; road watering; proper maintenance of engines; use of pollution control devices on exhaust gas (e.g., catalytic converters); and inspection and maintenance of flares and treater facilities. Also, Padre Island has good natural wind dispersion. The prevailing southeasterly winds would carry contaminants away from the park, minimizing the potential for developing concentrations in excess of any applicable standards (Ambient and PSD standards and increments). For all these reasons, it is not expected that this Class II area would be significantly affected. Therefore, air quality was eliminated from further detailed analysis.

Local and Regional Economies: There were approximately 1,000 new wells drilled in the Corpus Christi area during 1997 alone. This compares to a historical average of about one well per year drilled inside the present boundary of Padre Island National Seashore. Natural gas production in the District was 1,350 BCF in 1997. The USGS estimates 80 BCF of natural gas would be discovered underneath Padre Island over the next 30 years. That is equivalent to less than 3 BCF/year on average, or about 0.2 percent of District 4 natural gas daily production.

In the rare event that a serious spill event would occur, the public could perceive that the park is not a desirable place to visit. Tourism could fall, resulting in reduced revenues to the local economy. The likelihood of this happening is very small, considering the precautions and mitigation required of the operators.

Impacts to local and regional economics could be significant if there were discernible changes in revenue flow, salaries, unemployment rates, and/or utilization of local goods and services, or conflicts with exiting ways of life with the local and regional areas. However, given the above information, especially considering the minimal amount of oil and gas production historically present and also expected in the park, the local or regional economies would not be measurably affected under any of the alternatives. Therefore, this topic was eliminated from further detailed analysis.

Natural Quiet: The natural quiet found in many of the National Park Service areas is of value, not only because visitors enjoy it, but also because it is a resource in and of itself. At most locations on Padre Island, sounds of wildlife, wind gusts, and human activity are heard over and above fairly constant background sounds. These background sounds are usually due to surf, although at some times of the year (in sheltered areas such as the Grasslands Nature Trail), they may be due to insects.

A useful measure of these background sounds is the sound level exceeded 90 percent of the time, abbreviated L90. Specific measurements of sound levels and L90 calculations were obtained from many of the areas heavily used by visitors at Padre Island. These levels and associated impacts are discussed in greater detail in Chapters 3 and 4 under "Visitor Experience" and "SRAs-Visitor Use Areas".

Noise from oil and gas activities and equipment (e.g., compressors) would be audible in some areas of Padre Island National Seashore. For some visitors in some areas, the mere audibility of noise would interfere with their recreation and enjoyment. However, for some other visitors in some areas, even relatively high noise levels would not interfere with their recreation and enjoyment. Thus, noise impact analysis is very subjective, and depends on the visitors' perceptions and the size and location of the areas affected.

Wildlife would also be affected by noise from oil and gas operations, but there is uncertainty as to the extent and severity of the impacts. According to Echols (pers. comm.), at Padre Island, the Fish and Wildlife Service is generally not overly concerned with noise impacts to wildlife. The impacts are usually temporary, with wildlife avoiding or moving away from the source of noise, but returning after noise is reduced, or even becoming acclimated to some noise disturbance. Also, the Section 7 review process considers noise impacts to endangered and threatened species.

Significant impacts from noise would occur if visitor experience was negatively affected by the noise, or if wildlife were disturbed to the point of having permanent adverse effects at the population level.

Other than the potential for adverse effects around certain visitor use areas, which is discussed in Chapter 4, under SRAs/Visitor Experience, noise related to oil and gas development was not considered to be a significant issue for the park. This is because noise from the existing oil and gas operations has not been perceived by past users as a major problem, and there are no expected significant impacts to wildlife. According to Padre Island records, there have been no formal written complaints and only one verbal complaint about noise from oil and gas operations. There have been a few complaints regarding offshore seismic operations done during turtle release (Echols, pers. comm.). In addition, noise impacts to wildlife are also not considered significant. There are temporary impacts (avoidance and some acclimations), but no permanent effects have been noted. In addition, the approval of oil and gas operations must meet the Managed Access Provisions and receive an approved Plan of Operations, which will require mitigation measures such as setbacks (especially near SRAs; again, refer to Chapter 4).

Other mitigation measures are included under Managed Access Provisions. It is conceivable that noise from seismic blasting could be reduced through design, involving depth and size of explosives, which would direct more of the force of the explosives downward. Noise from internal combustion engines could be reduced through the use of high-performance exhaust mufflers and massive blankets over engine compartments. Noise from transportation could be reduced through careful use of gears and/or speed controls. The noise impact of production facilities could be reduced by exploiting such modest natural barriers as the seashore terrain affords, by locating the facilities down wind from sensitive resource areas, and by orienting facilities to exploit directional advantages inherent in necessary equipment.

With these mitigation measures, and for the other reasons listed above, natural quiet was not carried through for detailed analysis (other than the noise-related components of visitor experience/visitor use areas).

Night Sky: Padre Island National Seashore is located approximately 20 miles from Corpus Christi, Texas, and the influence of artificial light intrusion. The only development with night lighting at the national seashore is the Malaquite Beach Visitor Center area and the Gulf Operations Area. This lighting has been reduced to provide basic safety, and is shielded where possible. Natural darkness is part of the visitor experience at Padre Island National Seashore. When atmospheric conditions exist that permit viewing of the constellations, this can be accomplished without intrusions from artificial lighting. Under a starlit summer sky, it is not uncommon to see phosphorescent phytoplankton in the waves illuminated by starlight.

If a major oil or gas find was discovered near shore or on Padre Island, the increased activity could result in several exploratory wells being drilled at the same time or consecutively. Drilling activity occurs around the clock. A drilling location is well lit with artificial light to illuminate the work area. Drilling derricks on shore often exceed 90 feet in height and can be seen for over 15 miles at night. Likewise, marine drilling rigs are much larger than shore-based ones, and they have more artificial lighting. Light that is emitted by a lighting installation that falls outside the boundaries of that structure would be an intrusion to the night sky.

These impacts would be significant if the exploration and drilling occurred at a more frequent interval. However, during the past 10 years, there have been only two wells drilled. If the frequency increased to multiple wells each year, every year, then the incidence of artificial light intrusion would be a significant resource issue. Also, the offset siting of the drilling operation would mitigate impacts to the night sky. Operators would be encouraged to shield, aim, and direct rig lighting to the work site, rather than have lighting that shines at high angles to the vertical and upward to the sky.

Because there is no anticipated increase in frequency of well drilling and mitigation is available, this topic was eliminated from further detailed analysis.

Park Operations: Padre Island National Seashore has been assigned different management zoning categories that reflect different park operations and resources. These include the natural zone, historic zone, development zone, and special use zone. Many of the park's sensitive cultural and natural features (including many SRAs identified and used in the EIS analysis) can be found within the natural or historic zones. The development zone includes areas where development or intensive use substantially alters the natural environment. These areas include the ranger station, maintenance facility, visitor use areas, surface roads, and utilities.

Oil and gas operations affect different park operations in different ways and to a different extent, depending on the nature of the operation. Many of these operational areas are covered and discussed under other resource or value topic areas, especially the sensitive natural and cultural resource and visitor experience categories.

Management of private oil and gas operations in Padre Island requires dedication of park and support office staff time. NPS personnel spend time meeting with operators to discuss regulatory requirements, procedures, and resource issues. They evaluate submitted plans, prepare environmental assessments, and set performance bond amounts. Then when approved work is underway, personnel spend time monitoring operations and reclamation to ensure compliance with the plan of operations. Management costs are partially offset by having better operations in the park. Improved operating standards reduce the likelihood of spills and other accidents. For those spills that do occur, contingency planning (required in a Plan of Operations) works to minimize the associated impacts. This translates to a decreased burden on the NPS in terms of responding to oil- and gas-related emergencies.

In general, park operations are not expected to be significantly affected by the proposed oil and gas development under any of the alternatives. Any operations that might be significantly affected are addressed in other topics that include the specific operation or area in question. For all operations in the natural zones, appropriate mitigation measures under Managed Access Provisions would require such things as remediation of any contamination and reclamation to natural contours, with native vegetation cover to 70 percent of preimpact conditions, or even more stringent mitigation for certain resources and natural areas. Also, the 36 CFR 9B regulations §9.41(a) provide an operating standard indicating that "surface operations shall at no time be conducted within 500 feet of any structure or facility (excluding roads) used for unit interpretation, public recreation or for the administration of the unit, unless specifically authorized by an approved plan of operations." Application of this managed access provision is expected to minimize impacts on most park operations.

Park management would actually benefit under Alternative A. Although the overall NPS expense of managing private oil and gas operations is not expected to change significantly, park and support office time necessary to handle individual permit applications would be reduced, and park staff time could be shifted to other aspects of oil and gas management other park purposes.

In conclusion, it was determined that, in general, oil and gas development would have no significant impacts on park operations that would not be covered under other resource area discussions, and this topic was eliminated from further detailed analysis.

Threatened and Endangered Species and Their Habitat: Because Threatened and Endangered Species and Their Habitat is a significant topic in and of itself, the following provides more detail than is found under other topics that have been eliminated from further detailed analysis.

However, as noted in the final paragraphs of this discussion, impacts to this important resource are not expected to be significant for any of the alternatives; therefore, no additional analysis was warranted.

Although no federally listed threatened or endangered plant species are known to occur at Padre Island National Seashore (Drawe, 1992), several animals known to occur at the park are included on federal and state lists of threatened and endangered species. Table 1.1, lists Federal and State Listed Endangered (E), Threatened (T), or Candidate (C) Species Known to Occur Within Padre Island National Seashore. For a complete listing of federal and state threatened and endangered species that may possibly occur at Padre Island National Seashore, see Appendices C, D, and E.

	Federally Protected			**State Protected**	
SPECIES	**E**	**T**	**C**	**E**	**T**
BIRDS Peregrine falcon *Falco peregrinus anatum*	X				
Peregrine falcon *Falco peregrinus tundris*		X			
Eastern brown pelican *Pelecanus occidentalis*	X			X	
Interior least tern *Sterna antillarum athalassos*	X			X	
Reddish egret *Egretta rufescens*					X
Piping plover *Charadrius melodus*		X			X
Snowy plover *Charadrius alexandrinus*			X		
White-tailed hawk *Buteo albicaudatus*					X
Ferruginous hawk *Glaucidium brasilianum*					X
Black-capped vireo *Vireo atricapillus*	X			X	
Cerulean warbler *Dendroica cerulea*			X		
White-faced ibis *Plegadis chihi*					X
REPTILES Loggerhead sea turtle *Caretta caretta*		X		X	
Green sea turtle *Chelonia mydas*					X
Atlantic hawksbill sea turtle *Eretmochelys imbricata*	X				
Kemp's ridley sea turtle *Lepidochelys kempii*	X			X	
Leatherback sea turtle *Dermochelys coriacea*	X			X	
American alligator *Alligator mississippiensis*		X			

Table 1.1. Listed Species Known to Occur within the Park

Avifauna: Protected shorebird species including piping plover, reddish egret, and snowy plover are present in the park during all seasons of the year (Chaney, et al., 1995). They utilize the wind-tidal flats, the washover channels, and the Gulf beaches for feeding, foraging, and resting. Reddish egret, white-faced ibis, and interior least tern are seen feeding, foraging, and resting along the Gulf and Laguna Madre shoreline throughout the park. All of these species nest on park spoil islands. The white-faced ibis and least tern appear during the summer months, while the reddish egret is a resident species and can be seen during all months. The Laguna Madre provides the wintering habitat for approximately 90 percent of the Redhead duck population of North America.

Brown pelicans are year-round inhabitants, and utilize the Gulf of Mexico and the Laguna Madre shores for feeding, resting, and foraging. They do not nest within the park, but research indicates that they are expanding their southern nesting grounds northward toward the park.

The peregrine falcon stages on Padre Island National Seashore during the spring and fall migration, with falcon numbers totaling more than 2,000. Larger numbers of falcons occur on the southern end of the park, making this particular park area the most important peregrine falcon habitat on the Gulf coast, and it is considered critical habitat by the Peregrine Fund. These birds primarily utilize the wind-tidal flats from Yarborough Pass to Port Mansfield, but can be observed anywhere within the park. Peregrine falcons are observed on the wind-tidal flats and sand dunes on the western side of the seashore. The falcons tend to avoid areas of intense recreational use and vehicular traffic. Padre Island is the only known locality in the western hemisphere where peregrine falcons are found in large concentrations during their spring migration.

The ferruginous hawk and white-tailed hawk, occurring as single individuals, are seen along the Laguna Madre and Gulf of Mexico throughout the park. Higher numbers are generally seen during the migration periods of spring and fall.

At least two species of protected songbirds occur during the spring and fall migration periods. The black-capped vireo and cerulean warbler inhabit areas of the park that offer vegetative structure for protection and sources of food. These areas include areas of the park that have live oaks, black willows, and other species of woody vegetation.

Sea Turtles: All five species of sea turtles inhabiting the Gulf of Mexico can nest, hatch, or strand along the Gulf beaches of the park and forage or rest in the waters of the Gulf of Mexico, Laguna Madre, and Port Mansfield Channel.

Nesting starts in April and continues until September. Nests can occur from the high tide line to the coppice dunes at the base of the primary dune line. The Texas coast averages one sea turtle nest per year, with the majority documented on Padre Island. Twenty-one nests were documented during the nesting season of 1998. All nests found within the park are removed from the beach and incubated in an incubation facility. However, some nests are not located and therefore incubate on the beach. Additionally, park staff locates and cares for an average of 10 stranded hatchlings washed in on the tide yearly. Sea turtles strand throughout the Gulf beach portion of the park. The stranding peaks are seen in winter months if cold stunnings occur, and in the late spring and summer months due to shrimping activities in the Gulf (Shaver, 1997). The following table lists the times of sea turtle activity in the South Texas coast.

Events	Dates	Locations
Kemp's ridley Nesting/tracks	April-mid-July	Padre Island National Seashore to Mustang Island
Loggerhead Nesting/tracks	June-mid July	Padre Island National Seashore to Mustang Island
Green Nesting/tracks	June-July	Padre Island National Seashore
Kemp's Hatchling stranding	June-mid Sept	Padre Island National Seashore to Mustang Island
Loggerhead Hatchling stranding	late July-Sept	Padre Island National Seashore to Mustang Island
Hawksbill Hatchling stranding	August-Sept	Padre Island National Seashore to Mustang Island

Table 1.2. General Dates and Locations of Turtle Nesting, Tracks, and Hatchling Strandings

Marine Mammals: All species of marine mammals are protected under the Marine Mammal Protection Act. The majority of listed marine mammals (Appendix E) may occur in the park but generally only appear when they wash ashore after being injured or dying. The majority of marine mammals in the Gulf of Mexico are typically found in deep waters (continental shelf and beyond) with the exception of the rough-nosed dolphin (*Steno bredanensis*) and Atlantic spotted dolphin (*Stenella frontalis*) (both Texas State Threatened), which commonly inhabit nearshore waters. Park habitats including wind-tidal flats, seagrass beds, and nearshore waters provide essential food sources for these dolphin species.

An action that is likely to jeopardize the continued existence of a federally protected species would include an action that subjects a wildlife population to a change in numbers of individuals, age class structure, migration routes, habitat usage, etc., thereby threatening the survivability of the population. Therefore an action would be significant if:

- it disrupted the habitat, nests, or breeding grounds of special status wildlife species;
- it permanently interfered with the routine movements of special status wildlife within the park or surrounding areas; or
- it removed individuals from the population.

There are several reasons why Threatened and Endangered Species/Habitat was not carried through as a significant issue. Nonfederal oil and gas development as described in the RFD scenario in Chapter 2 would directly impact a small area of the park, representing an estimated 250 acres or 0.2 percent of the park. Also, by performing biological surveys and consulting with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department on a project-by-project basis, as mandated by federal law, adverse impacts on special status species would be avoided.

The NPS manages federally listed threatened and endangered species within the park and their habitats as mandated under Section 7 of the Endangered Species Act of 1973 (ESA). The ESA, as amended, prohibits the NPS and other federal agencies from implementing any action that is likely to jeopardize the continued existence of a federally protected species. Furthermore, the act requires that the NPS consult with the FWS and/or the NMFS on any action it authorizes, funds, or executes that could potentially affect a protected species or its designated critical habitat. Species of Special Concern not only includes federal threatened and endangered candidate species, but state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to the park and their critical habitats. These species will be afforded the same status as federally listed species under section 7 (Management Policies (USDI, NPS 1988, 4:11). All marine mammals are protected under the Marine Mammal Protection Act, and many are listed as threatened or endangered under the ESA.

Through the consultation mechanism required under section 7 of the ESA, when the NPS identifies that a proposed nonfederal oil and gas operation is in or near an area where listed species are known to occur, and the proposed oil and gas operation may have an effect or adverse effect on a listed species, Managed Access Provisions including operating standards, seasonal/time limitations, or no surface occupancy restrictions could be applied, which would result in avoiding potential impacts to the listed species. By applying the Managed Access Provisions, no adverse impacts to listed species or their habitat are expected under any alternative. Therefore, this topic was eliminated from more detailed analysis.

Vegetation: Park vegetation is dominated by species and forms that are adapted to rapid colonization and extremes of salinity and sun. Dominants are largely grasses and forbs. There are few woody species on the island, and trees are rare. Many plants are adapted to high salinity and harsh temperatures. A large part of the island is vegetated by wetlands plants adapted to growing in saturated soils.

Vegetation communities within the park are divided into three major plant communities (dunes, low coastal sands, and marsh) and two minor plant communities (salty sands and shoregrass flats), listed below. These communities contain some particularly sensitive plant species or sensitive ecological areas, such as wetlands. These more sensitive vegetation communities or species are covered under separate topics in Chapters 3 and 4.

- Dunes - include foredunes covered under SRAs
- Low Coastal Sands - grasslands, live oaks, and willows; includes live oak motties covered under SRAs
- Marsh - ephemeral ponds and wetlands; includes marshy areas around freshwater ponds covered under SRAs and wetland topics
- Salty sands and algal mats - some areas may be part of park's wetlands
- Shoregrass flats

Vegetation is important to the overall health of the park, and provides habitat for wildlife. It also holds and traps blowing sands, thereby preventing erosion, and is a primary factor in the park's visual quality and diversity.

Potential impacts to vegetation from oil and gas exploration and development include loss of vegetation and habitat acreage as a result of clearing and construction of well-pads, roads, pipelines, and ancillary facilities. All surface-disturbing activities have the potential to have adverse impacts to vegetation resources. Oil and gas exploration usually creates varying amounts of surface disturbance, depending on the size of the project and the length of time involved. Construction of drilling pads and roads would be the leading cause of disturbance to vegetation, followed by seismic activities and pipeline construction.

Impacts to vegetation resources associated with implementation of the proposed action or alternatives would be considered significant if:

- reclamation of disturbed areas would not attain an adequate cover of vegetation to stabilize the disturbed site to pre-disturbance conditions; or attain a species composition to support pre-existing land uses, including wildlife habitat, within 18-24 months following revegetation;
- when operations could spread or encourage the growth of exotic species; or
- contamination from blowouts, spills, or other accidents necessitated long-term remedial efforts to achieve revegetation standards.

The team's analysis of vegetation and potential impacts (except for specific sensitive vegetation communities or species covered under wetlands and/or SRAs) indicated that this is not a significant issue. This is because of the limited extent of disturbance expected and the mitigation required under the Managed Access Provisions, especially the reclamation and revegetation standards. The scale of direct occupancy according to the RFD scenarios in Chapter 2 would be small, representing a direct impact to less than 250 acres, or 0.2 percent of the park. This represents the estimated acreage of surface disturbance anticipated from development of 18 wells, assuming only uplands vegetation were impacted, which would be a worst case scenario for uplands vegetation. Managed Access Provisions in Chapter 2 require areas impacted by nonfederal oil and gas operations to be reclaimed and revegetated within 6 months of the abandonment of operations. Loss of vegetation would be minimized by limiting the operations to the minimum practical size, using low-impact off-road vehicles and equipment and other mitigation techniques described in Chapter 2. Impacts to vegetation are anticipated to be corrected through reclamation by recontouring to natural grade and reseeding with native vegetation, using reserved seed source material taken from the site. Attainment of 70 percent native vegetative cover is expected within 1 to 3 years with normal precipitation.

Implementation of the required mitigation and reclamation under Managed Access would result in an overall negligible impact to vegetation over the long term. Therefore, this topic was eliminated from further detailed analysis.

Visual Quality: The park remains a relatively natural landscape, tempered somewhat by the presence of park facilities, the entrance road, vehicular use of the beach, and oil and gas development. The terrain is predominantly flat to rolling, with the elevations rising from sea level to 30 feet. The vegetation generally has a low profile, emphasizing the flat, horizontal lines of the landform. The majority of visitor use areas have water--either the Gulf or the Laguna--as the focus. Visual intrusions are noticed primarily from the park road or inland use areas (for example, the Grasslands Nature Trail).

The Gulf and sky provide a dramatic backdrop for views from most locations. Both near and distant views are vulnerable to visual change, especially vertical elements, with near views probably more vulnerable because they are perceived in greater detail. 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.

Loss of natural character and visual quality would be the primary visual impacts associated with oil and gas development activities. Loss of visual quality would occur during all phases of development (road and pad construction, drilling, production, pipeline construction, reclamation). This loss would be particularly important where roads, drill pads, production facilities, and other surface-disturbing activities are located in areas of low visual absorption capabilities or where facilities are not compatible with the surrounding landscape features. The intrusion of oil and gas facilities on the largely natural, undeveloped appearance of Padre Island National Seashore would lessen its attractiveness to the many visitors who would be able to see the facilities. The extent of loss would depend upon the ability of the landscape to withstand loss or change of natural character; the nature and extent of the proposed oil and gas operations; the existing scenic qualities (including existing non-natural intrusions, such as RVs and vehicles on the beach); and the success of reclamation. The low topographic profile of the national seashore is susceptible to stark visual contrasts from introduction of any vertical element.

A visual impact would be considered significant if it:

- would result in contrast visible to potentially large numbers of viewers, or
- would appreciably diminish the aesthetic experience of these viewers.

Visual quality could affect visitor experience differently under different alternatives, and this is considered and evaluated under "Visitor Experience" in Chapters 3 and 4. In general, however, visual quality was not considered to be a significant issue. This is because of the limited amount of oil and gas development present and expected in the park (see discussion under Local and Regional Economies), as well as the mitigation required to limit visual exposure to park users.

Along the Gulf beach, the NPS would request the General Land Office to continue applying a sensitive resource protection stipulation associated with state-issued leases for oil and gas under submerged lands in the Gulf of Mexico. Padre Island National Seashore's boundary extends to the two-fathom line in the Gulf. To drill and produce oil and gas from submerged lands located within the boundaries of the park, the NPS would continue to request the General Land Office to require operators to drill a minimum 2 miles offshore during September 15-March 15; while a 3-mile offset would be applied from March 15-September 15. While drilling and production operations would still be visible and visual quality degraded, this sensitive resource protection stipulation would minimize the visual intrusion and protect the visual quality of Gulf beach recreational users. During occasional periods when storm fronts approach the Gulf beach and fog impairs visibility, the drilling and production operations would not be visible to recreationists from the Gulf beach. When the 2- or 3-mile offset is not feasible, the NPS's alternative would be to place drilling and production operations behind the foredunes.

In addition, other measures included in the Managed Access Provisions would reduce visual impacts to minor levels. These include siting restrictions and set-back provisions, use of low-profile structures for all permanent production facilities within 3 miles of the Gulf shoreline, reclamation requirements including recontouring and revegetation, and use of noncontrasting colors. For all of the above reasons, this topic was eliminated from further detailed analysis.

Wildlife: The native animal population found at Padre Island National Seashore includes an extensive diversity of both marine and terrestrial species. Wildlife known to occur in the national seashore include: 266 species of neo-tropical migrants, migratory, coastal, and marine birds; 47 species of terrestrial and marine mammals; 100 species of fish; 56 species of reptiles and amphibians; 36 species of marine crabs; and numerous species of plankton and benthic organisms. Wildlife that are listed as federal and state threatened and endangered species are discussed in the section, Threatened and Endangered Species and their Habitat. Common wildlife species known to occur in and around the park include:

Mammals: There are 47 species of terrestrial mammals listed on the park checklist, which include: white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), striped skunks (*Mephitis mephitis*), badgers (*Taxidea taxus berlandieri*), raccoons (*Procyon lotor*), jackrabbits (*Lepus californicus merriami*), mice, rats, and bats.

Fish: The Laguna Madre ecosystem ranks first in finfish production in Texas, and contains over 85 percent of the seagrass cover in the state. The Laguna Madre provides essential habitat for many species of vertebrates and invertebrates, including two species of sea turtles; at least 31 species of fish such as the striped mullet (*Mugil cephalus*), redfish (*Sciaenops ocellata*), pinfish (*Lagodon rhomboides*), and black drum (*Pogonias cromis*); and numerous invertebrates such as shrimp, crabs, bivalves, and others.

Finfish in the Laguna Madre inhabit all areas of the lagoon, which include seagrass beds, bare substrate, and Intracoastal Waterway. Over 23 species of finfish occur in the Laguna Madre, and at least 67 species of finfish occur in the Gulf of Mexico portions of the park. Fish species also occur in large shallow bodies of freshwater within the park. They include mosquito fish (*Gambusia affinis*), sheepshead minnow (*Cyprinodon veriegatus*), and gulf killifish (*Fundulus grandis*).

Avifauna: Padre Island has 322 bird species, including migratory and resident waterfowl, shorebirds, neo-tropical songbirds, and raptors. During the fall and winter, sandhill cranes (*Grus canadensis*) frequent the west side of Padre Island, near Bird Island Basin. The cranes can be observed feeding in the wetlands, uplands, and shallow water of the Laguna Madre. Many bird species utilize the ephemeral and freshwater ponds. They include bobwhite quail (*Colinus virginianus*), northern harrier (*Circus cyaneus*), sandhill crane (*Grus canadensis*), American egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), long-billed curlew (*Numenius americanus*), sanderling (*Crocetheia alba*), killdeer (*Charadrius vociferus*), terns, ducks, and grebes. Rookery islands (see SRAs-Rookery Islands-in Chapters 3 and 4) are also important to avifauna.

Reptiles and Amphibians: Many species of snakes, turtles, and frogs are known to occur at Padre Island National Seashore. Reptiles and amphibians are considered as indicators of aquatic health, because they are sensitive to pollution and loss of habitat (Hall, 1980). They are also important in the food chain, and make up a large portion of the vertebrate population in certain ecotypes. Many species of snakes, turtles, and frogs find ephemeral ponds important sources of water habitat (see SRAs-Freshwater Ponds-in Chapters 3 and 4.)

The predominant impact-producing factors related to oil and gas development are: pipeline construction and maintenance activities, drilling and facility construction, facility operations, service vessel operations, inshore operational discharges, water quality degradation, seismic activities, vehicular traffic, oil spills from pipeline ruptures, facility failures or offsite spills, and associated oil-spill response activities. Impacts to wildlife could include direct disturbance from people, equipment, and operations (including noise and lights); physical and chemical hazards; removal of habitat; fragmentation of habitat; road kills; and disturbance of nesting areas.

Impacts to wildlife would be significant if:

- they disrupt nests or breeding grounds of native wildlife species to the extent that there is a measurable negative effect to the population of that species;

- they permanently interfere with the routine movements of wildlife within the park or surrounding areas; or

- they remove sufficient numbers of individuals to endanger the population.

Impacts to wildlife dependent on or present in Sensitive Resource Areas are covered and discussed under SRAs in Chapters 3 and 4. Chapters 3 and 4 also address impacts to wetlands in great detail, and these areas are also prime wildlife habitat. Impacts to any threatened and endangered species are discussed previously in this chapter, and are expected to be insignificant, given the level of protection and required mitigation for these species. Other wildlife inhabiting the less sensitive areas are also not expected to be significantly impacted by any of the proposed alternatives. This is because of the limited extent of oil and gas development expected under the RFDs, plus the protective measures provided in the Managed Access Provisions. Required mitigation includes fencing around facilities, revegetation and reclamation of disturbed areas, netting of open water, and requirements to minimize potential for spills and to clean up releases. With these provisions and the protection afforded wildlife in SRAs and wetlands separately discussed and evaluated, no significant impacts would be expected, and this topic was eliminated from further detailed analysis.

Floodplains: Most of the park, except for high dune ridges along the Gulf beach, where major structural development is confined, lies within the 100-year coastal floodplain. A formal designation of the floodplain status of Padre Island National Seashore was initially conducted by the Federal Emergency Management Agency's National Flood Insurance Program, August 17, 1971; and the latest revision was done on March 1, 1984.

With the exception of the dunes, almost all of Padre Island National Seashore is subject to periodic flooding as a result of hurricanes or prolonged rain events. Because of the very shallow perched freshwater lens, which is located from 1 to 4 feet below ground level, heavy or sustained rains quickly inundate the sand and begin ponding on the surface. Only evaporation lowers flood waters. It can be assumed that all developed areas are subject to some flooding every 10-20 years. All areas, including camping areas at Bird Island Basin and the Malaquite campground, are covered by the park's emergency contingency plan.

Impacts from oil and gas development on floodplains are reflected in several of the other topics discussed, because the floodplain designation covers nearly all of the island. Specific functions and impacts associated with foredunes and washover channels are discussed under SRAs in Chapters 3 and 4. In general, oil and gas operations would significantly affect floodplains (outside of the SRAs) only if their presence increased flood damage to the park.

Floodplains were not considered as a significant issue for the purpose of this EIS, because the operating standards under the Managed Access Provisions and the Director's Order for Floodplain Management would avoid or minimize the potential impacts. The Managed Access Provisions found in Chapter 2 require park and operator compliance with the Director's Orders for Protection of Floodplains Values. The intent of the guidelines is to recognize and protect floodplain values and to avoid long-term surface occupancy in floodplains, and to minimize impacts when there is no practicable alternative to locating facilities in a floodplain. The guidelines require operators to avoid or minimize developments and storage of hazardous or contaminating substances in high-hazard areas that could result in increasing hurricane or flood hazards. The approach of hurricanes and flooding events provide the park and operators sufficient time to take the reasonable actions at oil and gas facilities necessary to avoid or reduce the potential impacts of flooding or hurricanes, such as securing storage tanks. Therefore, no significant impact to floodplain values is anticipated from implementing any of the alternatives, and this topic was eliminated from further detailed analyses.

Possible Conflicts Between the Proposed Action and Land Use Plans, Policies, or Controls: This EIS is consistent with the NPS Organic Act, park enabling legislation, the General Management Plan for Padre Island National Seashore, and all applicable policies and controls.

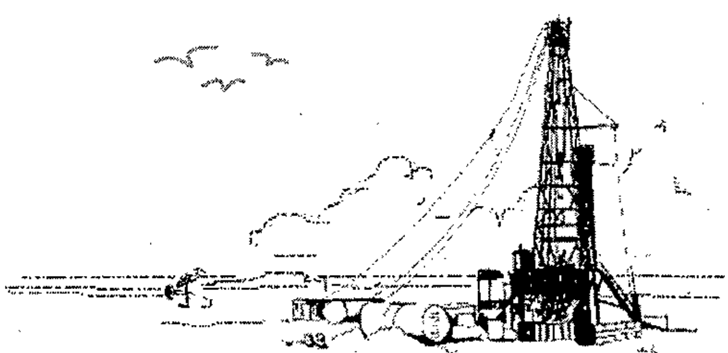
Sustainability and Long-term Management, and Energy Requirements and Conservation Potential: This EIS is not concerned with construction and maintenance of dwellings or structures for public use; therefore, this topic is not evaluated.

Socially or Economically Disadvantaged Populations: This EIS does not address or affect socially or economically disadvantaged populations; therefore, this topic is not evaluated.

Prime and Unique Agricultural Lands: There are no prime or unique agricultural lands within or adjacent to Padre Island National Seashore.

CHAPTER 2
PART I

PLAN ALTERNATIVES



CHAPTER 2
PART I, PLAN ALTERNATIVES

INTRODUCTION

This chapter contains two sections, the first of which discusses plan alternatives, and the second, Managed Access Provisions that would be applied regardless of which alternative is selected.

The first section outlines three proposed plan alternatives that represent different levels of resource protection for future management of surface access and uses associated with nonfederal oil and gas development. The difference between the plan alternatives is the allocation of surface acreage in the park that is proposed for either No Surface Occupancy or No Surface Access. These areas represent significant natural and cultural resources, park development zones, and visitor use areas, and are designated as Sensitive Resource Areas. No long-term occupancy and surface disturbances associated with nonfederal oil and gas exploration and development will be permitted in areas designated as No Surface Occupancy. Surface access and uses associated with nonfederal oil and gas exploration and development within all remaining acreage not proposed as No Surface Occupancy or No Surface Access zones under each Plan Alternative will be categorized as Managed Access Areas, for which a variety of resource and visitor use protection measures under Managed Access Provisions will be applicable.

The second section of the chapter summarizes the Managed Access Provisions (resource protection measures) that will be applied regardless of which alternative is selected. It contains the basic requirements under the NPS's Nonfederal Oil and Gas Rights Regulations (36 CFR Part 9B), and policies applicable to the various resource management programs for which the NPS is responsible.

FUTURE MODIFICATIONS TO THE OIL AND GAS MANAGEMENT PLAN

The Managed Access Provisions presented in this chapter are anticipated to be supplemented in the future as technology improves and as we learn more about the most effective methods to protect park resources and values and avoiding conflicts with visitor use, enjoyment, and safety. Also, as new or revised regulations, policies, and land use planning direction are implemented, the Managed Access Provisions described in this chapter will be updated and supplemented.

APPLICABILITY OF THE PLAN TO NEW LANDS AND WATERS THAT MAY BE ADDED TO THE PARK IN THE FUTURE, OR IN RESPONSE TO DYNAMIC CHANGES TO THE ENVIRONMENT

If new lands and waters are added to Padre Island National Seashore in the future, the land classification system used in this EIS would guide the management restrictions on the added lands and waters.

Padre Island is a coastal barrier island subject to dynamic change, particularly in the event of a hurricane. Future storm events are likely to change the land classification currently shown in the EIS. When such environmental changes occur, the maps will be revised and the restrictions based upon environmental factors will continue to serve as a guide. For example, if a storm eliminated an existing permanent freshwater pond and the site became an emergent wetland, that site would no longer be managed as a Sensitive Resource Area. Conversely, if a storm created a new washover channel, that site would automatically be treated as a Sensitive Resource Area.

EXEMPTIONS FROM THE PLAN

This plan takes into consideration future technological innovations. Given technological changes and improvements, and in the event that best available technologies are applied, specific elements of the selected plan or Managed Access Provisions may be exempted. All requests for an exemption shall be presented in a Plan of Operations with sufficient discussion how the potentially impacted resource or value would be protected by replacing the plan restriction or Managed Access Provision with a technological innovation. Approval of exemptions shall be documented with full discussion and evaluation of potential impacts in the accompanying Environmental Assessment for a proposed Plan of Operations.

TYPES OF OIL AND GAS OPERATIONS

The petroleum industry is a continuous cycle of searching for new oil and gas reservoirs, developing and producing them, and finally abandoning the property once the hydrocarbons are depleted.

There are four general phases of petroleum development: (1) exploration, (2) drilling, (3) production, and (4) abandonment and reclamation. Surface uses vary for each phase in terms of intensity and duration. Also, operations related to one or all of the phases may be occurring in the same area at any given time.

To be of interest to the petroleum industry, petroleum deposits must be commercially valuable. There must be a reasonable chance of making a profit on the eventual sale of the oil and gas. Factors such as the market price of oil and gas, the amount of recoverable petroleum, the expected production rates, and the cost of drilling wells, and producing and transporting the product to market all determine the economic viability of developing a deposit once it is discovered.

Appendix F, Types of Oil and Gas Operations, is provided to give the reader a general understanding of common activities associated with each phase of oil and gas development.

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO: EXPLORATORY AND DEVELOPMENT WELLS WITH ASSOCIATED ACCESS, PRODUCTION, AND PIPELINES

In order to analyze the environmental effects that could occur as a result of a decision to select a strategy to manage access and surface uses associated with nonfederal oil and gas exploration, development, and transportation, a projection of the kind and amount of activity that could be reasonably anticipated was made.

The National Park Service formed reasonable foreseeable development (RFD) scenarios for oil and gas exploration and production. The NPS based its RFD scenarios on remaining oil and gas resources potential derived by the U.S. Geological Survey, and the likely level of development needed to produce those resources. The USGS Assessment of Remaining Hydrocarbon Resources Beneath Padre Island National Seashore, contained in Appendix G, discusses at length the geology, target formations, and remaining hydrocarbon potential within Padre Island National Seashore.

It must be recognized that future exploration and development may not occur as predicted in the RFD scenario presented. The RFD scenario only provides a reasonable basis for analyzing potential subsequent activities and their effects.

The Reasonably Foreseeable Development Scenario is based on these assumptions:

- Approximately 80 BCF of natural gas and associated liquid hydrocarbons is discovered and produced from inside Padre Island National Seashore over the next 30 years. The volume is based on the USGS assessment of the undiscovered oil and gas resource potential of Padre Island National Seashore.

- The demand, price, and availability of domestic hydrocarbons remain relatively stable.

- Locations for projected activities (roads, wells, pipelines, etc.) are hypothetical. They provide a means for analyzing site specific impacts for the various environments described in Chapter 3, Affected Environment.

- Information obtained via 3D-Seismic will result in a success ratio of two discoveries for each three exploration wells.

- The locations for wells described in these scenarios are in addition to existing wells that are producing, shut-in, or plugged and abandoned.

- Because Padre Island National Seashore is nearly 70 miles long and only 1/2 to 3 miles in width, it is likely that discovered fields will overlap the boundary of Padre Island National Seashore.

An estimated 12 new wells inside Padre Island National Seashore are projected to produce 80 BCF over the next 30 years. A possible sequence of development would be:

- Obtain 3D-Seismic data over all areas in Padre Island National Seashore.

- Drill 6 exploration wells, 4 of which are commercially successful discoveries. Two (2) exploratory wells would be dry-holes and would be plugged immediately and the associated developments reclaimed within 6 months.

- Three (3) of the discovery wells prompt drilling of 2 additional wells inside the National Seashore, to fully develop each of the 3 fields.

- One (1) of the discovery wells remains a single well field or an extension of an existing field.

Hypothetical locations for the exploration wells are shown on Figure 2.1, and are described below. The descriptions below also provide a scenario of roads and pipelines that would be associated with development necessary to reasonably calculate acres of surface disturbance.

3-D Seismic. A 3-D seismic program for the national seashore could involve 64 shot points per square mile. This would involve drilling 100-foot shot holes loaded with 10 pounds of explosives. With mini-charges and shallower holes, the number of shot points could increase three to nine-fold The park is approximately 200 square miles. With 64 shot points per square mile, the total number of shot points could be minimally 12,800. Shot points and receiver points would be separated by 1,980 feet. Shot points would be 220 feet apart. Surface damage from equipment would visually be extensive, but have short-term duration. Vegetation recovery would occur within 12 months with normal precipitation.

RFD #1 is located in the Laguna Madre near the north boundary of the park. Access for a drilling barge is via existing channels or dredging new channels from the intracoastal waterway. The development wells may be drilled in the Laguna Madre from barges or directionally drilled from a surface location on the western side of the national seashore. Production facilities could be located on a terrestrial site on Padre Island (not on North Bird Island). Flowlines from the wells would transport production to the production facility. Product could then be transported by a flowline to an existing pipeline at a point north of Bird Island Basin to carry product to the mainland.

Activity	Dimensions	Surface Disturbance in Acres
dredge channel in Laguna Madre for access by drill rig barge	50' x 2,000'	= 2.30 acres
dredge to place flowline from well in Laguna Madre to west edge of Padre Island	50' x 3,000'	= 3.44 acres
continue placement of flowline cross-island to production facility site just west of park road	50' x 2 miles	= 12.12 acres
production facility	300' x 300'	= 2.07 acres
access road from Park Road 22	20' x 1 mile	= 2.42 acres
flowline to tie-in with existing pipeline north of Bird Island Basin to transport product to mainland	50' x 1 mile	= 6.06 acres
Total Surface Disturbance:		28.41 acres

RFD #2 is located near milepost 10. Access to the drilling site is via the beach, with entry to the back-island gained through an existing road cut through the dune line near milepost 6. Existing oil and gas roads are improved and used to the extent possible. Approximately 1 mile of new access road (20' width) and a new 2-acre pad are put in to drill the exploration well. One development well would be drilled directionally from the existing pad, while a second development well would require an additional 1/2 mile of access road and a 2-acre drilling pad. One of the bottomhole targets is in the Gulf of Mexico on a State of Texas lease tract. New production facilities are installed with gas tied into the Murdock Pass lateral pipeline, while liquids are stored on location and transported via tank trucks.

Padre Island National Seashore
Reasonably Foreseeable Development Scenarios

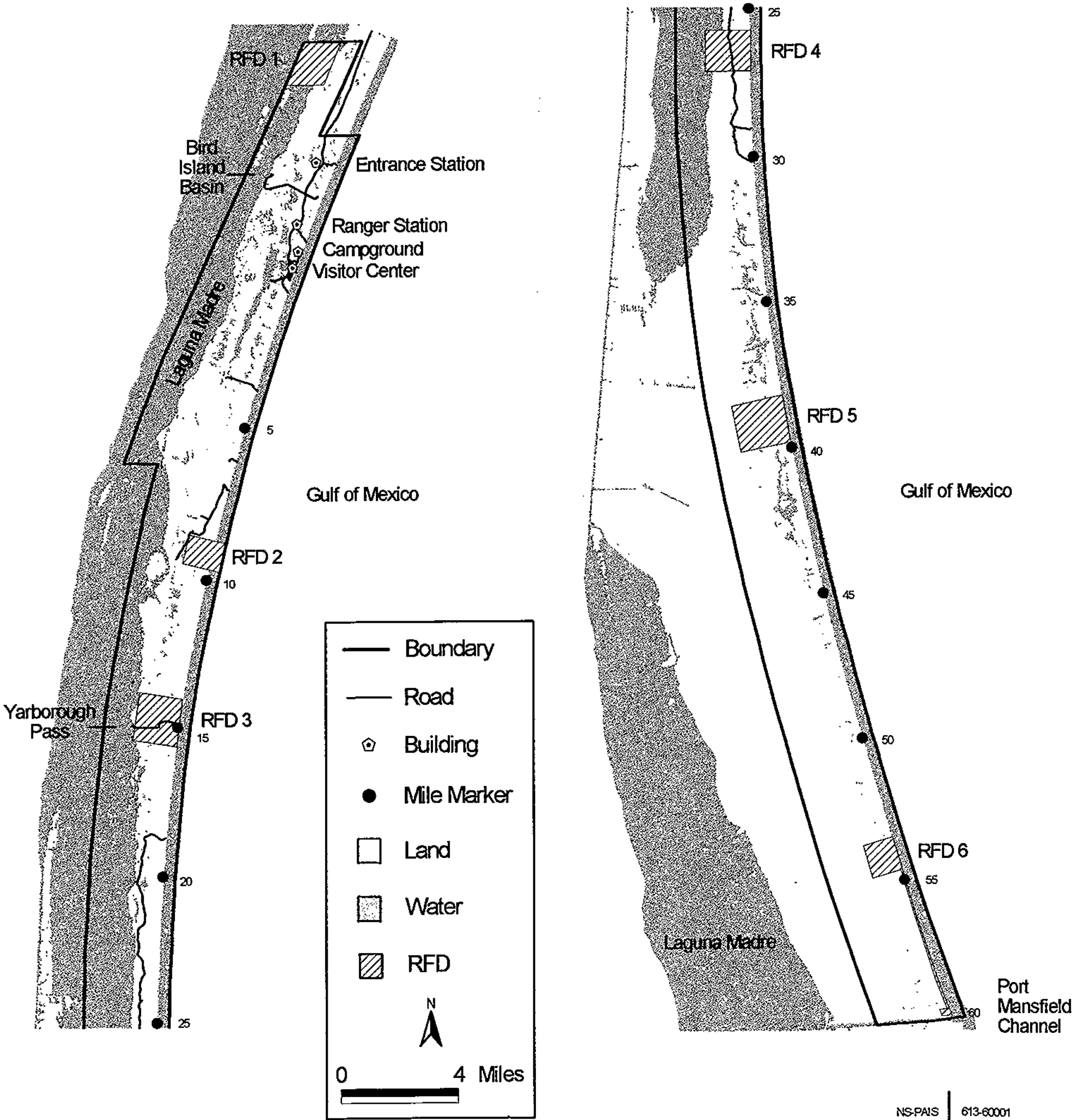


Figure 2.1

ON MICROFILM

Activity	Dimensions	Surface Disturbance in Acres
road extension	20' x 1 mile	= 2.42 acres
exploratory well pad	300' x 300'	= 2.07 acres
development well #1		= 0.00 acres
development well #2 road extension	20' x 1/2 miles	= 1.21 acre
drill pad	300' x 300'	= 2.07 acres
flowline to Murdock Pass	50' x 6 miles	= 36.36 acres
Total surface disturbance:		44.13 acres

RFD #3 is located near milepost 15. Access to a drilling site north of Yarborough Pass is via improvement of existing oil and gas roads and construction of new road and well pad. Approximately 1/2 mile of new access road is constructed to a well pad built on a wind tidal flat. One development well needs an additional 1/2 mile of access road and a well pad on a wind tidal flat. A second development well is drilled directionally from one of the two new well locations. Production is transported via pipeline to new production facilities located at Yarborough Pass. Gas production is tied into the Murdock Pass lateral pipeline, and liquids are stored on location until transported by tank trucks.

Activity	Dimensions	Surface Disturbance in Acres
access road	20' x 1/2 mile	= 1.00 acre
exploratory well pad	300' x 300'	= 2.07 acres
development well #1 access road	20' x 1/2 miles	= 1.21 acres
pad #2	300' x 300'	= 2.07 acres
production facility at Yarborough Pass	300' x 300'	= 2.07 acres
flowline to Yarborough Pass	50' x 7,000'	= 8.03 acres
Total surface disturbance:		16.45 acres

RFD #4 is located near milepost 25. Access to the drilling site is via the beach, with entry to the back-island gained with a cut through the dune line (using the existing road cut to the cultural site, Green Hill Line Camp). The exploration well is a straight hole and is located south of Green Hill. One development well requires construction of 1 mile of new access road and a 2-acre drilling pad. A second development well is reached using directional drilling from one of the new well locations. Production is transported via pipeline to new facilities located at Yarborough Pass. Gas production is tied into the Murdock Pass lateral pipeline, and liquids are stored on location until transported by tank trucks.

Activity	Dimensions	Surface Disturbance in Acres
widen and stabilize existing dune cut and entry road to Green Hill		= 0.50 acre
road extension south immediately upon entry behind dune	20' x 1/2 mile	= 1.21 acres
Development well #1 road extension	20' x 1 mile	= 2.42 acres
Development Well Pad #1	300' x 300'	= 2.07 acres
pipeline corridor to Yarborough Pass	20' x 13 miles	= 78.79 acres
Total surface disturbance:		84.99 acres

RFD #5 is located near milepost 33 in a wind-tidal flat. Access to the drilling site is via the beach, with a road constructed to the back-island through the edge of a washover channel. Approximately 1 mile of new road is constructed from the beach. One 2-acre pad is built to support the exploration well. Directionally drilled development wells and production facilities are located at the same site, expanding the pad to 3 acres. Production is transported via pipeline to new facilities located at Yarborough Pass. Gas production is tied into the Murdock Pass lateral pipeline, and liquids are stored on location until transported by tank trucks.

Activity	Dimensions	Surface Disturbance in Acres
road through edge of washover channel	20' x 1 mile	= 0.50 acre
road	20' x 1 mile	= 2.42 acres
exploratory well pad	300' x 300'	= 2.07 acres
extended pad for 2 development wells		= 1.00 acre
pipeline corridor to tie-in to RFD #4 pipeline to carry product to Yarborough Pass	20' x 7 miles	= 42.42 acres
Total surface disturbance:		48.41 acres

RFD #6 is located near milepost 53. Access is provided by barge at Mansfield Channel. From there, equipment is transported north on the beach, where access to the back-island is gained with a cut through the dune line. The exploration well requires 1/2 mile of new road and a well pad. One development well requires construction of 1/2 mile of new access road and a drilling pad. A second development well is reached using directional drilling from one of the new well locations. One of the well pads is expanded to 3 acres to locate separation, storage, and pumping/compression facilities. Production is moved to the mainland via new pipeline.

Activity	Dimensions	Surface Disturbance in Acres
improve loading area at Mansfield Channel near the Gulf beach		= 0.50 acre
stabilize cut through dune		= 0.50 acre
access road	20' x 1/2 mile	= 1.21 acres
exploratory well pad	300' x 300'	= 2.07 acres
Development Well #1 access road	20' x 1/2 mile	= 1.21 acres
Development Well #1 pad	300' x 300'	= 2.07 acres
pad expansion for Development Well #2 onto exploratory well pad or development well pad #1		= 1.00 acre
flowline to existing pipeline tie-in 3 miles offshore in Gulf of Mexico	50' x 3 statute miles	=18.18 acres
Total surface disturbance:		26.74 acres

Rather than try to choose which of the six RFD exploratory wells would be dry holes and which would be the single producer of a field, the interdisciplinary team assumed that all six RFD exploratory wells would be fully developed and evaluated the potential for environmental impacts, based on 18 wells.

Table 2.1. Approximate Acreages Associated with Each Reasonably Foreseeable Development Scenario

RFD Number	Wells Projected	Surface Disturbance in Acres
RFD #1	3 wells projected	28.41 acres
RFD #2	3 wells projected	44.13 acres
RFD #3	3 wells projected	16.45 acres
RFD #4	3 wells projected	84.99 acres
RFD #5	3 wells projected	48.41 acres
RFD #6	3 wells projected	26.74 acres
Total	18 wells projected	249.13 acres represents 0.2 percent of the 133,918 acres of Padre Island National Seashore

The RFD scenario predicts the number of wells, the extent of roads and pipelines, and other appurtenant facilities and activities associated with surface disturbance for the next 15 to 20 years. The RFD scenario provides a method to test the site-specific effectiveness of mitigation measures, and to provide a basis to measure and compare the three alternatives and address cumulative effects.

To ensure that there is no misunderstanding, the NPS wants to underscore that the presented RFD scenario is solely hypothetical. The formulation of actual development plans rests with companies and private individuals. The NPS responds to proposed plans of operations submitted by operators who have secured the right to explore for and/or develop nonfederal oil and gas underlying the national seashore, and identifies needed surface use stipulations.

MAPPING AND DEFINING SENSITIVE RESOURCE AREAS

Alternative scenarios for oil and gas operations were developed based on the sensitivity of park resources and values. During the interdisciplinary team's evaluation and analyses of all potentially affected resources and values, criteria were developed to identify those resources considered particularly sensitive to development of oil and gas operations. Of all the initial resources and value topics considered by the interdisciplinary team and the public during scoping, nine (9) were eventually identified and delineated as Sensitive Resource Areas that would be used in generating plan alternatives.

Table 2.2 (below) provides a listing of the SRAs and information on their extent in the park. More detailed information about these SRAs and maps showing their location within Padre Island are provided in Chapter 3.

Table 2.2. Sensitive Resource Areas in Acres and Percent of Park

Sensitive Resource Area	Acres	% of Park
Cultural Sites		
-Novillo Line Camp	377 acres	0.28%
-Green Hill Camp	311 acres	0.23%
-Black Hill Camp	313 acres	0.23%
-Mansfield Cut Archeological District	2,702 acres	2.02%
Freshwater Ponds		
-Pond A	33 acres	0.02%
-Pond B	33 acres	0.02%
-Pond C	42 acres	0.03%
Seagrass Beds	25,240 acres	18.85%
Wind Tidal Flats	29,127 acres	21.75%
Visitor Use Areas		
-Malaquite Visitor Center and Malaquite RV Campground	470 acres	0.35%
-Bird Island Basin	380 acres	0.28%
-Grasslands Nature Trail	318 acres	0.24%
-Mansfield Channel COE Disposal Area	875 acres	0.65%
Foredunes	3,200 acres	2.39%
Washover Channels	1,192 acres	0.89%
Rookery Islands	530 acres	0.40%
Relict Live Oak Mottes		
-Live Oak Motte 1	22 acres	0.02%
-Live Oak Motte 2	18 acres	0.02%
Totals:	65,183 acres	48.67%

Sensitive Resource Areas were plotted on park maps and were used in developing alternatives. Zones around each SRA were developed and specific restrictions applied to protect the areas from various types of oil and gas activities. The following section describes the three alternatives developed by using the SRAs and varying the degree of surface occupancy or access allowed.

PLAN ALTERNATIVES

By using the SRAs, three (3) alternatives have been developed to address the issue of managing surface access and uses associated with the exploration and development of nonfederal oil and gas underlying Padre Island National Seashore. The No-Action/Current Management alternative, Alternative B, evaluates the continued implementation of existing management strategies, policies, and decisions, while the other two alternatives evaluate changes to the existing management strategy. Alternative A, No Surface Occupancy in some Sensitive Resource Areas, the Proposed Action, was developed to give specific protection for resource values and uses. Alternative C was developed to focus on maximum protection and preservation of resource values, and assigns the most acreage under No Surface Access restrictions to provide maximum resource protection. These alternatives provide a reasonable range of options to guide oil and gas management in Padre Island National Seashore.

All the alternatives are subject to Managed Access Provisions, including Operations Performance Standards required pursuant to 36 CFR §9.41. Operations in the park must employ a variety of impact mitigation techniques and fulfill operations requirements pursuant to the NPS's Nonfederal Oil and Gas Rights Regulations. These requirements are included in Plans of Operations or attached as Conditions of Approval during the review/plan of operations approval process. The NPS will apply Managed Access Provisions only where the NPS manages the surface, or to avoid or mitigate adverse impacts from directional drilling operations proposed from a surface location outside the park to mineral estate underlying the park. Many of these protective measures are applied to oil and gas development in consultation with other federal and state agencies under applicable rules and regulations. These Managed Access Provisions are provided at the end of this chapter.

The following provides a more detailed description of the three alternatives. Table 2.3 shows Sensitive Resource Area Acreages and Operating Restrictions that would be Applied under Alternative A (Proposed Action), and Alternatives B and C.

Alternative A, Proposed Action (Preferred Alternative):
- No Surface Occupancy in Some Sensitive Resource Areas
- Restricted Access in Other Sensitive Resource Areas
- Seismic Operations Could be Permitted Under Managed Access
- and Managed Access in All Other Areas of the Park

The primary emphasis of this alternative is to provide specific protection to Sensitive Resource Areas from potential impacts of nonfederal oil and gas exploration and development.

Under this alternative, the most Sensitive Resource Areas are protected by applying a No Surface Occupancy exclusion to potentially long-term surface disturbances, including road construction, well drilling and production operations. However, seismic operations could be permitted in these

Sensitive Resource Areas, as in all other areas of the park, under Managed Access Provisions. Depending on the specific use(s) of a given Sensitive Resource Area, a No Surface Access restriction is applied to some areas during certain times of the year, necessary to protect specific uses of the area. Directional drilling from a surface location outside the Sensitive Resource Area to access a bottomhole location underlying a Sensitive Resource Area would be permitted. Directional drilling techniques for placing pipelines under Sensitive Resource Areas without disturbing the surface of SRAs would also be permitted.

All other areas of the park could be developed under Managed Access Provisions.

Under this alternative, approximately 65,183 acres, or 49 percent, of the park would be closed to surface occupancy, but all 133,918 acres of the park could be open to seismic operations under Managed Access Provisions. Under this alternative, 68,735 acres, or 51 percent, of the park would be available for road development, drilling, and production operations under the NPS's Managed Access Provisions.

Surface disturbance associated with developing the RFD wells could occur on the estimated 250 acres, to construct access roads, well pads, production facilities, and pipeline corridors necessary to produce 80 BCF over the next 30 years; however, the surface locations for some of the 18 RFD wells might be moved away from Sensitive Resource Areas, but bottomhole locations could still be reached via directional drilling. Successful rehabilitation of well pads and pipeline corridors would reduce the amount of long-term surface disturbance.

Alternative B, No-Action (Current Management): - All Areas of Padre Island Could be Developed under Managed Access Provisions

A total of 133,918 acres exist within the administered boundaries of Padre Island National Seashore. Under this alternative, all 133,918 acres of the surface of Padre Island National Seashore could be available for development under Managed Access Provisions.

The RFD scenario projects the development of up to 18 wells to produce 80 BCF over the next 30 years. Surface disturbance associated with developing these wells would occur on approximately 250 acres for access roads, well pads, production facilities, and pipeline corridors. Successful rehabilitation of well pads and pipeline corridors would reduce the amount of long-term surface disturbance.

Alternative C, Maximum Resource Protection: - No Surface Access in Sensitive Resource Areas - While All Other Areas of Padre Island Could be Developed Under Managed Access

The primary emphasis of this alternative is to focus on the maximum protection of Sensitive Resource Areas. All Sensitive Resource Areas shown on Figures 3.8, 3.9, and 3.10, the map showing Sensitive Resources Areas, and Table 2.3, which gives SRA Acreages and Operating Restrictions under the three alternatives, would be closed to surface access associated with nonfederal oil and gas operations. However, areas closed to surface occupancy may be reached via directional drilling technology.

Under this scenario, approximately 65,183 acres identified as Sensitive Resource Areas would be off limits to any oil and gas surface uses. Where the Sensitive Resource Areas are small (such as cultural sites) or linear (such as foredunes), operators could plan geophysical operations around them, and directionally drill underneath them, if desired. However, the seagrass beds and wind-tidal flats cover an extensive 54,367 acres, which would be unavailable for geophysical exploration. Lack of current or site-specific 3-D seismic data may deter operators from drilling extended-reach directional wells underneath the seagrass beds and wind-tidal flats. In this scenario, a portion of this acreage may be effectively unavailable for oil and gas development.

Table 2.3. Sensitive Resource Area Acreages and Operating Restrictions that would be Applied under the Proposed Action (Alternative A), and Alternatives B and C

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Sensitive Resource Areas would be provided specific protection by applying No Surface Occupancy, No Ground Disturbance, No Surface Access, and/or Seasonal/Time Restrictions to specific types of oil and gas activity within designated buffer areas; In all other areas of Padre Island National Seashore, oil and gas activities may be permitted under Managed Access Provisions.	65,183 acres or 49% of national seashore 68,735 acres or 51% of national seashore	No specific protection would be provided to Sensitive Resource Areas. All areas of Padre Island National Seashore, including Sensitive Resource Areas, may be protected from adverse impacts of oil and gas activities by applying Managed Access Provisions on a case-by-case basis.	133,918 acres or 100% of national seashore	Sensitive Resource Areas would be provided the most protection by applying "No Surface Access" to all types of oil and gas activity within the maximum buffer areas of all SRAs. Directional drilling from surface locations outside SRAs to access bottomhole locations under SRAs, and for placement of pipelines, would be permitted. In all other areas of Padre Island National Seashore, oil and gas activities may be permitted under Managed Access.	65,183 acres or 49% of national seashore 68,735 acres or 51% of national seashore
<u>Cultural Sites</u> - To protect the integrity of physical remains and the context therein of significant cultural sites: -No surface occupancy for drilling or production within 1,500 feet of Novillo Line Camp, Green Hill Line Camp, and Black Hill Line Camp; -No ground disturbance for pipeline operations within 500 feet of Novillo Line Camp, Green Hill Line Camp, or Black Hill Line Camp; -No ground disturbance within the Mansfield Archeological District; -Geophysical exploration may be permitted within Novillo Line Camp, Green Hill Line Camp, and Black Hill Line Camps under Managed Access Provisions.	 377 acres 311 acres 313 acres 115 acres 70 acres 77 acres 2,702 acres 32 acres 20 acres 18 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions. Novillo Line Camp Green Hill Line Camp Black Hill Line Camp Mansfield Archeological District	 377 acres 311 acres 313 acres 2,702 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations in: Novillo Line Camp Green Hill Line Camp Black Hill Line Camp Mansfield Archeological District	 377 acres 311 acres 313 acres 2,702 acres
<u>Freshwater Ponds</u> - To preserve water sources for invertebrates, fish, birds, and wildlife; to preserve groundwater discharge areas; and to protect wildlife viewing areas: -No vehicular access and no surface disturbance within 500 feet of Pond A, Pond B, and Pond C.	 33 acres 33 acres 42 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions. Pond A Pond B Pond C	 33 acres 33 acres 42 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations. Pond A Pond B Pond C	 33 acres 33 acres 42 acres

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Seagrass Beds - To preserve habitat for marine turtles and dolphins; and nursery habitat for fin-fish, the biotic foundation for the Laguna Madre's productive U.S. fin fishery: -Managed Access so that no dredging of access channels, except that dredging new channels may be permitted if they meet the least damaging method of access.	25,240 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	25,240 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operation.	25,240 acres
Wind-Tidal Flats - To protect hydrogeologic conditions that allow for inundation by wind-driven Laguna Madre waters, the Gulf of Mexico waters through washovers, or rain events that support algal growth and macroinvertebrates, and provide important feeding, resting, and loafing areas for shorebirds and threatened/endangered species, including piping and snowy plovers, and peregrine falcons: -Managed access so that there would be no placement of fill, or compaction and rutting more than 1 inch deep, except roads, drilling, and production pads, and pipelines may be permitted if they meet the least damaging method.	29,127 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	29,127 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operation.	29,127 acres
Visitor Use Areas - To protect the visitor experience by preserving natural darkness, ambient noise levels, and visual quality; and protecting human health and safety: -No surface occupancy for access roads, drilling, production, and pipeline operations within 1,500 feet of Malaquite Visitor Center/RV Campground; Bird Island Basin; and Grasslands Nature Trail. -Geophysical exploration may be permitted under Managed Access Provisions within Malaquite Visitor Center/RV Campground; Bird Island Basin; and Grasslands Nature Trail. -No surface occupancy for drilling, production, or pipeline operations within 500 feet of the U.S. Army Corps of Engineers Disposal Area at Mansfield Channel. -Geophysical exploration may be permitted in the U.S. Army Corps of Engineers Disposal Area at Mansfield Channel.	470 acres 380 acres 318 acres 470 acres 380 acres 318 acres 875 acres 875 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions: Malaquite Visitor Center and Malaquite RV Campground; Bird Island Basin; Grasslands Nature Trail; and U.S. Army Corps of Engineers Disposal Area at Mansfield Channel.	470 acres 380 acres 318 acres 875 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations: Malaquite Visitor Center and Campground; Bird Island Basin; Grasslands Nature Trail; and U.S. Army Corps of Engineers Disposal Area at Mansfield Channel.	470 acres 380 acres 318 acres 875 acres

Alternative A Proposed Action (Preferred Alternative)	Acres	Alternative B No-Action/Current Management	Acres	Alternative C Maximum Resource Protection	Acres
Foredunes - To preserve dune integrity for protection of back-island environment and provide a major defense for the mainland to block storm tidal surge and dissipate wave energy: -No surface disturbance, except roads may be permitted if they meet the least damaging method of access.	3,200 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	3,200 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	3,200 acres
Washover Channels - To preserve resting, loafing, feeding, and nesting habitat for raptors, shorebirds, and wading birds, including threatened and endangered species; and to recognize these areas as being highly dynamic in that washover channels provide intermittent hydrologic connections between the Laguna Madre and Gulf of Mexico during hurricanes: -No surface occupancy for drilling, production, or pipeline operations, except that roads may be permitted if they meet the least damaging method of access. -Geophysical exploration may be permitted under Managed Access Provisions.	1,192 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	1,192 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	1,192 acres
Rookery Islands - To preserve islands for waterbird nesting and reproduction: -No surface access within 1,000 feet of island edge from February 15 through September 30. -No surface occupancy for drilling, production, or pipeline operations within 1,000 feet of island edge year-round. -Geophysical exploration may be permitted between October 1 through February 14 under Managed Access Provisions.	530 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions.	530 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations.	530 acres
Relict Live Oak Mottes - To preserve two unique vegetative communities of live oak mottes: -No surface disturbance within 500 feet around Live Oak Motte A, and Live Oak Motte B.	 22 acres 18 acres	Geophysical exploration, drilling, production, and pipeline operations may be permitted under Managed Access Provisions: Live Oak Motte A Live Oak Motte B	 22 acres 18 acres	No Surface Access would be permitted for geophysical exploration, drilling, production, or pipeline operations: Live Oak Motte A Live Oak Motte B	 22 acres 18 acres
Totals:	**65,183 acres**	**Total Acres:**	**65,183 acres**	**Total Acres:**	**65,183 acres**

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

In developing alternatives, there were some alternatives that were considered, but, after further investigation, were eliminated from detailed evaluation. Those alternatives, and the reasons for their elimination follow.

1. ***No nonfederal oil and gas development.*** The option of eliminating all oil and gas development at Padre Island National Seashore was considered. Alternatives need to meet all planning objectives, and, although this alternative would protect, preserve, and interpret resources and values and avoid conflicts with visitor use, enjoyment, and safety, it does not meet the third goal of permitting access for geophysical exploration, exploratory drilling, and production and transportation of nonfederal oil and gas resources. Padre Island's enabling legislation contains provisions related to nonfederal oil and gas operations, and NPS regulations provide for reasonable access for nonfederal oil and gas exploration, development, and transportation. Totally eliminating those activities is inconsistent with law and regulation.

2. ***No Surface Occupancy.*** The option to allow nonfederal oil and gas operations, but restricting operators to a No Surface Occupancy constraint was considered. This alternative meets the same two of three goals as above, but for the same reasons as described above, does not meet the third goal of permitting access for geophyiscal exploration, exploratory drilling, and production and transportation of nonfederal oil and gas resources.

CHAPTER 2
PART II

MANAGED ACCESS PROVISIONS

CHAPTER 2
PART II, MANAGED ACCESS PROVISIONS

INTRODUCTION

This section describes the Managed Access Provisions that will continue to guide decisions in Padre Island National Seashore, regardless of which alternative is selected. This direction is fundamental; its associated guidance is based on laws, regulations, manuals, policy, executive orders, memoranda, and applicable planning documents. The result of this management direction is a variety of resource and visitor use protection measures, including Operating Standards, Surface Use Restrictions, Time/Seasonal Limitations, and other resource impact mitigation techniques. Before approving a Plan of Operations, the NPS must decide whether Managed Access Provisions are needed to avoid or mitigate adverse impacts. If managed access provisions are determined to be needed in order to avoid or mitigate potential impacts, and are not included in a Plan of Operations, the NPS may attach them as conditions of approval.

This second part of Chapter 2 containing Managed Access Provisions, is organized in two sections. The first section is a description of the NPS's Nonfederal Oil and Gas Rights Regulations, while the second half provides resource and oil-and-gas operations-specific operating standards, including time/seasonal limitations and other mitigation techniques.

NONFEDERAL OIL AND GAS RIGHTS REGULATIONS

The NPS has the primary responsibility for managing mineral activity in National Park System units in conjunction with nonfederally owned oil and gas and ensuring that nonfederal oil and gas activity does not impair unit resources or values. NPS regulations governing nonfederal oil and gas rights are published at Title 36 of the Code of Federal Regulations, Part 9, Subpart B (CFR Part 9B). The regulations have been promulgated under the authority of the NPS Organic Act (16 U.S.C. §3) and several individual park enabling acts, including that of Padre Island National Seashore. The final rulemaking on the regulations was published in the *Federal Register*, Volume 43, Number 237, page 57822 (43 FR 57822) on December 8, 1978, with an effective date of January 8, 1979. A reference copy of the 36 CFR Part 9B regulations is presented in Appendix B.

The NPS discharges its protective responsibilities under its general authorities (e.g., National Park Service Organic Act, General Authorities Act of 1970, etc.) and the regulations at 36 CFR Part 9B, by:

- evaluating proposed Plans of Operations and approving such plans if they meet standards that protect park resources and values,
- enforcing the regulations, and
- considering acquisition of the nonfederal oil and gas interest.

If the National Park Service determines that the proposed oil and gas development would conflict with the protection or management of other resources or visitor uses, the regulations and NEPA process identify measures to mitigate impacts. Such mitigation measures may be applied as conditions of approval. However, if derogation of park values and purposes cannot be sufficiently modified to meet this standard, then the Service has a final recourse to seek to extinguish the associated mineral right through acquisition, unless otherwise directed by Congress.

In applying the NPS's Nonfederal Oil and Gas Rights Regulations, the NPS respects the constitutionally guaranteed property rights of mineral owners. As set forth in the Fifth Amendment to the constitution, "...no person shall be deprived of property without due process of law; nor shall private property be taken for public use without just compensation." The NPS's position to not contravene this amendment is underscored by Executive Order 12630, "Governmental Actions and Interference With Constitutionally Protected Property Rights." The alternatives presented and evaluated in this document observe this executive order.

Overview of 36 CFR 9B Process

Under existing NPS regulations, each operator requiring access across or through NPS lands or water may conduct activities only under a Plan of Operations approved by the NPS. The Plan of Operations provides the means for the NPS to approve private oil and gas activities in the park. Once approved, it serves as the operator's permit. Through the plan, the NPS and the operators aim to use methods and equipment that (1) are least damaging to the natural, cultural, and recreational resources of the park, (2) protect the public, and (3) do not seriously interfere with park management.

A key component of preparing the Plan of Operations is a detailed description of the environment that will be affected by the proposed activities. Operators first conduct plant, animal, cultural, hydrological, or topographic surveys as needed to adequately describe the environment in the areas in which they plan to work. Once the environmental conditions are known, operators must plan the use of methods and equipment that are least damaging to resources. The surveys also provide a basis for designing reclamation.

Based on the scale of operations, the Plan of Operations preparation can range from $1,000 up to and exceeding $45,000. The wide range demonstrates the differences in a plan's scope and content, variations in the number and types of environmental surveys needed, and the company's approach to planning (in-house or contracted).

Next, operators often need to modify operations from their standard methods to minimize the environmental impacts. For example, to avoid impacting certain resources, an operator may need to construct a longer access road or use directional drilling. Sometimes avoidance of areas (e.g., storm washover channels) is often both an environmental and logistical concern, so it can be difficult to separate the environmental expenses. Another example is costs incurred for waste and contaminant disposal outside the park, whereas onsite disposal of certain wastes may be negotiable in other areas. These and other modifications can add to project cost.

Some upfront expenditures may result in future savings for operators. For example, the NPS requires dikes around and impermeable barriers underneath new storage tanks to provide secondary containment. An uncontained spill or unnoticed leaks from a tank can cover large areas, flow into nearby surface waters, and seep into ground waters. Clean up and restoration of the damaged area to meet State of Texas and other federal requirements can cost hundreds of thousands of dollars. A typical $5,000 investment for secondary containment at a small tank battery might save the operator 50 times that amount.

Next, the NPS commonly requires operators to take a more active role in reclamation of the site compared with other areas outside the park. Clean up of contaminated soil or water, removal of non-native materials used in operations, returning natural contours, establishing native vegetation, and monitoring are common reclamation activities inside the park, but less common outside. On more remote locations down-island, removal of caliche road and pad building material can be a substantial cost at Padre Island.

Finally, maintaining a performance bond to guarantee compliance with the plan is an annual cost to the operator. Regulations limit the maximum bond amount to $200,000 for all operations under a given operator in a single park. Annual costs to maintain bonds through a surety company range from 1 percent to 3 percent face value, which translates to a maximum cost of $2,000 to $6,000 per year. Operators may also elect to deposit other types of securities such as cash, certificates of deposit, or government bonds in lieu of a surety bond to lower their out-of-pocket expenses.

Taken all together, these additional costs are usually a small percentage of an operator's total expenses, perhaps less than 10 percent. Even though these costs are a small percentage of operating costs, they become more important for marginal projects, such as producing wells late in their economic life.

Another issue facing operators in NPS units is the length of time it takes to obtain a permit. Under the best of circumstances, the permitting process can take 5 to 6 months, including 3 to 4 months of NPS review and approval. Table 2.4 provides an explanation of the process and associated time periods. Under current management practices, the NPS looks at oil and gas proposals individually under the 36 CFR 9B regulations. There is no written guidance to help operators interpret the regulations and apply them specifically to Padre Island. At times, this has caused confusion and added to permitting delays.

Table 2.4. NPS Processing Time for a Plan of Operations

Action	NPS Response Time	Reference
Operator contacts park regarding interest in oil and gas activities.	Same Day	Subject to Park Staff Availability
Park provides Operator copies of 36 CFR 9B regulations, Standards, and Requirements for a Plan of Operations, and other information, as necessary.	Same Day	Subject to Park Staff Availability
Operator submits written request for temporary access to gather basic information needed to complete a Plan. Request includes documentation of the right to conduct operations associated with the private mineral right.	Variable - NPS Provides Assistance as Needed	Subject to Operator Response
Park issues 60-day data collection permit with park resource/visitor protection stipulations.	1 - 2 days	
Operator conducts surveys, including biological, and cultural, as applicable.	Variable - NPS Provides Assistance as Needed	Subject to Operator Response or Timing Restrictions
Operator submits draft Plan of Operations to park.	Variable - NPS Provides Assistance as Needed	Subject to Operator Response
NPS performs a completeness and technical review. Park accepts Plan of Operations as complete *OR* returns it to the operator with specific directions on how to complete the plan.	30 days	NPS Policy from NPS Procedures Governing Nonfederal Oil and Gas Rights, 1992, and 36 CFR §9.36(c).
Plan of Operations Decision	**60 days**	**See Below**
Park writes an environmental assessment or adopts operator's consultant-prepared EA, incorporates other environmental compliance (NHPA, Wetlands, ESA), and initiates mandated consultations, completes public review, finalizes decision documents, and notifies the Operator if the plan has been approved, conditionally approved, or rejected.	60 days (includes 30-day public review of EA)	36 CFR §9.37, 36 CFR §9.52(b), NPS DO-77.1 for Wetlands Compliance, and DO-12 for NEPA Compliance. Operator notified if additional time is needed per 36 CFR §9.37(b)(6).
Operator agrees to any conditions of approval, shows applicable state and federal permits, and files suitable performance bond.	Variable	Subject to Operator Response
Total NPS Response Time	3 to 4 months	Dependent on Compliance Requirements

Persons Who May Conduct Nonfederal Oil and Gas Operations in National Park System Units

Persons who may have rights to explore and develop nonfederally owned oil and gas in National Park System units include:

- **owners** - individuals, corporations, local and state governments, Indian tribes (when the tribe owns the oil and gas in fee), etc.;
- **lessees** - individuals or corporations that lease oil and gas from the owner; and
- **contractors** - individuals or corporations under contract with the owner, lessee, or operator.

Only persons who own, lease, or have been authorized by the owner or lessees of a nonfederal oil and gas right may be permitted to conduct activities in connection with such a right in National Park System units. Persons who do not possess a right to nonfederal oil and gas are not permitted to conduct operations, including exploration and transportation in connection with nonfederal oil and gas, in a unit.

To establish a right to conduct operations, the regulations at 36 CFR §9.36(a)(1) and (2) require that a Plan of Operations include:

- names and legal addresses of owners, lessee, and operator if not the owner or lessee; and
- a copy of the lease, deed, designation of the operator, or evidence of authorization upon which the operator's right to conduct operations is based.

Applicability of the 36 CFR 9B Regulations

The 36 CFR Part 9B regulations apply to all operations in connection with nonfederally owned oil and gas in all National Park System units where ***access*** is on, across, or through federally owned or controlled lands or waters (36 CFR §9.30(a)). ***Access*** is any way, means, or method of entering or traversing lands or waters including, but not limited to:

- vehicle
- watercraft
- fixed-wing aircraft
- helicopter
- off-road vehicle
- mobile heavy equipment
- pack animal
- foot

Access can also pertain to transportation systems associated with nonfederal oil and gas. Examples include pipelines, electrical powerlines, and similar transportation systems. Access also includes travel of the drill bit while directionally drilling wells or installing underground pipelines.

Access granted under 36 CFR 9B for landing aircraft within a park must also be in compliance with regulations found at 36 CFR 2.17, pertaining to Aircraft and Air Delivery.

- **federally owned or controlled lands** means all land that the United states possesses fee title through purchase, donation, public domain, or condemnation. It also includes land in which the United states holds any interest, such as a lease, easement, rights-of-way, or cooperative agreement.

- **federally owned or controlled waters** includes all surface waters in the boundaries of a National Park System unit without regard to whether the title to the submerged lands lies within the United States or another party.

- **Oil** means "any viscous combustible liquid hydrocarbon, or solid hydrocarbon substance easily liquefiable on warming which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas without resort to manufacturing process" (36 CFR §9.31(1)).

- **Gas** is defined as "any fluid, either combustible or nocombustible, which is produced in a natural state from the earth and which maintains a gaseous or rarefied state at ordinary temperatures and pressures" (36 CFR §9.31(m)). Therefore, "oil and gas" is a generic term for petroleum, natural gas, methane, carbon dioxide, tar sands, and other related substances.

- **Operations** is defined as "all functions, work and activities within a unit in connection with exploration for and development of oil and gas resources." (36 CFR §9.31(c)). Operations include, but are not limited to:

  - reconnaissance to gather natural and cultural resources information;
  - line-of-sight surveying and staking;
  - geophysical exploration;
  - exploratory drilling;
  - production, gathering, storage, processing, and transport of petroleum products;
  - inspection, monitoring, and maintenance of equipment;
  - well "work-over" activity;
  - construction, maintenance, and use of pipelines;
  - well plugging and abandonment;
  - reclamation of the surface; and
  - construction or use of roads, or other means of access or transportation, on, across, or through federally owned or controlled lands or waters.

If an operator desires to conduct nonfederal oil and gas operations in a National Park System unit, and operations require access on, across, or through federally owned or controlled lands or waters, the 36 CFR Part 9B regulations require that the operator:

- possess a right to the nonfederal oil and gas in the unit (36 CFR §9.36(a)(2)),
- file a Plan of Operations with the NPS and receive approval from the regional director prior to commencing operations (36 CFR §9.32(a)), and
- submit a performance bond or security deposit to the NPS (36 CFR §9.48(a)).

Exemptions from the 36 CFR 9B Regulations

Operators who gain access to nonfederal oil and gas in a National Park System unit without traveling on, across, or through federally owned or controlled lands or waters ***are not*** subject to the 36 CFR Part 9B regulations. This situation may occur where an operator exercises a nonfederal oil and gas right beneath nonfederally owned surface estate located in a unit (most likely in and adjacent to a unit boundary), and access to such property is across nonfederally owned lands or waters.

This exemption to the 36 CFR Part 9B regulations does not apply to ***directional drilling operations*** from a surface location outside unit boundaries to intersect and develop nonfederal oil and gas beneath federally owned lands or waters in a unit. Such directional drilling operations are subject to all provisions of the 36 CFR Part 9B regulations even though access is not on, across, or through federally owned or controlled lands or waters. (See further discussion to directional drilling operations under the heading "Exemption from Plan of Operations Requirement" below.)

In Padre Island National Seashore, persons conducting operations in connection with nonfederal oil and gas rights existing on April 11, 1961, may also be exempt from 36 CFR Part 9B regulations; however, this exemption was exhausted when the last operator for which this provision applied plugged and abandoned its offshore oil and gas wells and reclaimed the production facilities location on the island in 1985.

Exemption for Existing Operations (36 CFR §9.33)

The 36 CFR 9B regulations allow "existing operations" to continue as is without submitting a Plan of Operations or filing a performance bond. They are essentially "grandfathered."

An "existing operation" uses federal access, but meets one of the following conditions:

- The operation was ongoing under a valid state or federal permit as of January 8, 1979 (effective date of the regulations).
- The operation was ongoing under a valid state or federal permit when the area became a new park unit.
- The operation was ongoing under a valid state or federal permit when the area came into the park system by expansion of an existing unit.

An "existing operation" can lose its exempt status. If this happens, the operator must then follow all 36 CFR 9B regulations. This includes filing a Plan of Operations, obtaining NPS approval of the plan, and submitting a performance bond. Two events that cause an "existing operation" to lose its exempt status are:

- the state or federal permit expires, and
- there is a change in operations that requires a new state or federal permit.

All current operations in Padre Island that were once grandfathered have lost their exempt status due to one of the events described above, but most commonly because of a change in operators requiring a new State of Texas permit.

Access Across Units to Nonfederal Oil and Gas Outside Units (36 CFR §9.32(d))

Operators requiring access across units of the National Park System to reach nonfederal oil and gas rights located outside units are subject to the 36 CFR Part 9B regulations, including filing a Plan of Operations and submitting a performance bond.

The regulations at 36 CFR §9.32(d) strictly limit access across units for such a purpose. The NPS may not permit operators to gain access across a unit to reach nonfederal oil and gas outside unit boundaries unless such access is by foot, pack animal, or designated road. ***Designated road*** is defined as an existing road that is open for use by the general public, or for the exclusive use of an operator, as determined by the superintendent in accordance with the regulations at 36 CFR §1.5 and §4.19 (36 CFR §9.31(k)).

Plan of Operations (36 CFR §9.36)

Operators subject to the 36 CFR Part 9B regulations may conduct operations in National Park System units only under an approved Plan of Operations unless they qualify for an exemption as provided in the regulations.

The approved Plan of Operations requirement also applies to operators who seek to directionally drill a well from outside a unit into nonfederal oil and gas under federally owned or controlled lands or waters in a unit. However, the regional director may exercise discretion in terms of requiring an approved Plan of Operations for the conduct of such directionally drilling operations (see discussion below under "Exemption from Plan of Operations Requirement"). Operators are responsible for preparing a Plan of Operations that addresses all information requirements applicable to proposed operations. Information requirements for a Plan of Operations are specified at 36 CFR §9.36(a)(1)-(18). The information requirements include:

- name and address of the operator;
- a copy of the deed, lease, designation of operator, or evidence of authorization upon which the operator's right to conduct operations is based;
- maps showing the location of the nonfederal oil and gas right, proposed surface disturbance, and all surface facilities (***Datum is requested in NAD 83 UTM***);

- geologic information pertaining to the deposit;
- a description of equipment, methods, and materials necessary to conduct the operations;
- an estimated timetable for the operations;
- a description of proposed actions to comply with applicable operating standards;
- anticipated hazards and mitigation actions;
- waste disposal techniques;
- reclamation procedures and anticipated costs;
- a description of the natural, cultural, social, and economic environments to be affected by the operations;
- environmental consequences of the operations;
- alternative methods of operation and associated environmental impacts and costs;
- evidence that operations are in compliance with applicable federal, state, and local laws and regulations; and
- a discussion of the proposed operations in relation to the unit's planning documents.

Operators must provide information in sufficient detail to enable the NPS to effectively analyze the impacts of the proposed operations on unit resources and values, and to determine whether to approve the proposed plan.

The information presented in a Plan of Operations should be tailored to the type of proposed operations (e.g., geophysical exploration, well drilling, oil well production, gas well production, pipeline construction and use, etc.).

The regulations at 36 CFR §9.36(a)(18) require operators to include any additional information in a Plan of Operations that the superintendent deems necessary to:

- establish whether the operator has the right to conduct a proposed operations;
- effectively analyze the effects that operations will have on resources, management and public use of the unit;
- determine the amount of the performance bond or security deposit to be posted; and
- make a recommendation to the regional director regarding approval, conditional approval, or rejection of a Plan of Operations.

Operators are allowed flexibility to design and submit Plans of Operations for a specific phase of operations contemplated at a particular time (36 CFR §9.30(c)). Although a phased approach for nonfederal oil and gas exploration and development is allowable under the regulations, use of such an approach should be limited to distinctly different and logically unconnected types of operations. For example, it is often difficult for operators to precisely define the location, operational methods, equipment requirements, environmental impacts, reclamation strategies, and mitigation actions for an exploratory drilling operation when planning a geophysical operation. Therefore, geophyiscal operations and drilling operations should be addressed in separate Plans of Operations.

However, a proposed Plan of Operations for an exploratory well drilling operation should include all necessary information pertaining to a well production operation, including potential field development (e.g., total number of wells, well spacing, access roads, pipelines, etc.). Exploratory drilling to well production to field development is a logical sequence progression of closely related and connected operational phases. Therefore, all three phases should be addressed and evaluated simultaneously in a single Plan of Operations, particularly in terms of cumulative impacts to unit resources and values.

Exemption from Plan of Operations Requirement (36 CFR §9.32)

The 36 CFR 9B regulations permit certain operators to conduct nonfederal oil and gas operations in National Park System units without an approved Plan of Operations. Operators who are specifically granted an exemption from the requirement to have an approved Plan of Operations prior to conducting operations in a unit include those that:

- gain access to nonfederal oil and gas in a unit without traveling on, across, or through federally owned or controlled lands or waters; or
- are conducting existing operations pursuant to a valid state or federal permit.

The regulations at 36 CFR §9.32(e) grant the regional director discretion in terms of requiring a Plan of Operations from operators proposing to drill a directional well from a surface location outside unit boundaries into nonfederal oil and gas under federally owned or controlled lands or waters in a unit. In order for the regional director to waive the requirement for a Plan of Operations, the regional director must determine that the proposed directional drilling operation poses no significant threat of damage to unit resources and values.

A proposed directional drilling operation would pose a ***significant threat of damage to unit resources and values*** if the operation would:

- adversely impact habitat critical to a listed threatened or endangered species;
- drastically reduce or alter faunal species number or composition, or substantially change wildlife migration patterns;
- impair surface water quality to a point where quality standards are not met;
- contaminate a freshwater aquifer or allow for the exchange of water between distinct subsurface water lenses;
- permanently change water flow quantity or patterns;
- cause an exceedance of an air quality increment under the "Prevention of Significant Deterioration" section of the Clean Air Act;
- contaminate soils or surface waters with brine, drilling fluids, oil, or hazardous chemical;

- drastically change vegetative community structure or composition, including influx of exotic species;

- violate a national ambient air quality standard;

- emit hydrogen sulfide or other toxic noxious gas;

- present an obvious fire hazard;

- alter topography due to erosion, subsidence, or slumping; or

- damage cultural resources in the unit.

Under certain conditions, the regional director may grant an exemption from the Plan of Operations requirement to operators proposing to access a unit for the purpose of obtaining basic information necessary to prepare a plan. The regional director may also grant this exemption, under very limited circumstances, to operators proposing to conduct new operations that *are subject* to the Plan of Operations requirement. The regulations at 36 CFR §9.38 (Temporary approval) provide for these exemptions to the Plan of Operations requirement. (See "Temporary Approval of Operations" discussion below.)

Temporary Approval of Operations (36 CFR §9.38) without an Approved Plan of Operations

The regional director may grant an operator temporary approval to access a unit, for the purpose of conducting certain operations, in the absence of an approved Plan of Operations. Operations for which temporary approval may be granted are limited to:

- collection of information necessary to prepare a Plan of Operations,

- continuance of existing operations following expiration of a state or federal permit, and

- new operations under limited circumstances.

Temporary approval granted by the regional director to an operator is issued in a *letter.* A temporary approval letter includes stipulations as necessary to protect unit resources, values, and park visitors.

The regional director may grant an operator access on, across, or through federally owned or controlled lands or waters for the purpose of obtaining basic information necessary to prepare a Plan of Operations (36 CFR §9.38(a)(1)). Information-gathering activities that are often necessary for development of a complete Plan of Operations include:

- surveying, flagging, staking, or marking the proposed operation location and access route(s) to prepare required maps and plats;

- natural resource surveys to document existing features and conditions in the area of operations; and

- cultural resource surveys to document the existence and significance of any archeological, cultural, or historical resource that might be affected by operations.

Approval to conduct preliminary information-gathering activities has been delegated from the regional director to the superintendent, Padre Island National Seashore. This temporary data-collection permit is limited to a period of 60 days (36 CFR §9.38(a)(1)). Approval is conditioned upon a finding by the superintendent that the operator has a legal right to the nonfederal oil and gas interest, and the collection of information will not result in significant resource disturbance.

The issuance of temporary approval for the purpose of collecting basic information is not contingent on preparation of an Environmental Assessment if the proposed action meets one of more of the following agency categorical exclusions under the National Environmental Policy Act, as published in the Department of the Interior *Departmental Manual* (DM), Part 516:

- land and boundary surveys (516 DM 6, Appendix 7.4(A)(2));
- archeological surveys and permits, involving only surface collection or small-scale test excavations (516 DM 6, Appendix 7.4(E)(1)); or
- non-destructive data collection or inventory (516 DM 2, Appendix 1.6).

Under the regulations at 36 CFR §9.38(a)(2), the regional director has the authority to grant an operator temporary approval to continue an existing operation, following expiration of a state or federal permits, pending approval of a Plan of Operations. The regional director may issue temporary approval for the continuation of an existing operation following expiration of a state or federal permit only if:

- suspension of the operation would result in a unreasonable economic burden to the operator (e.g., cause the operator's business to fail; render the operator unable to meet debt payments, payrolls, contractual obligations; etc.);
- the operation is being conducted in accordance with all applicable federal, state, and local laws;
- the operator conducts the operation in a manner prescribed by the regional director to prevent adverse environmental impact (e.g., operating standards, stipulations, etc.); and
- the operator submits a complete Plan of Operations within 60 days of receiving such approval.

If temporary approval is granted and the operator fails to comply with the above regulatory provisions, the regional director may suspend operations until such time as the operator either complies with the provisions or receives approval on a proposed Plan of Operations.

The regulations do not specify that temporary approval for the continuation of an existing operation must be limited to a 60-day period. The regional director may grant an operator such temporary approval for any period of time deemed appropriate considering that the operator must file a proposed plan within 60 days, and NPS review of such plan will likely require at least an additional 60 days. Therefore, temporary approval for continuation of an existing operation should be issued for a minimum of 120 days. Temporary approval may be suspended if the operator fails to submit a substantially complete proposed Plan of Operations within 60 days of receiving such approval.

The issuance of temporary approval for the continuation of an existing operation following expiration of a state or federal permit is not contingent on preparation of an Environmental Assessment because the action meets the NEPA categorical exclusion of 516 DM 6, Appendix 7.4(A)(4): reissuance/renewal of permits not involving new environmental impacts. However, NPS action on a submitted Plan of Operations is subject to NEPA compliance and the regulatory approval standards at 36 CFR §9.37.

The regional director may also issue temporary approval for the continuation of operations conducted under an approved Plan of Operations when such operations are transferred to a new owner/operator (see Transfer of Interest discussion below).

The regional director may grant an operator temporary approval for the conduct of new operations subject to the regulations under very limited circumstances. The regulations at 36 CFR §9.38(b) specify that the regional director may issue temporary approval for a new operation only when the operation will not cause significant environmental damage, or result in significant new or additional surface disturbance to the unit. The regulations further require that the operator demonstrate:

- that a compelling reason exists for failure to have had timely approval of a proposed Plan of Operations (an unforeseeable emergency would qualify as a "compelling reason"), or

- that failure to grant temporary approval will result in an unreasonable economic burden or injury (e.g., cause the operator's business to fail; render the operator unable to meet debt payments, payrolls, contractual obligations; etc.).

The issuance of temporary approval for the conduct of new operations is strictly limited to emergencies involving a threat of significant injury to federally owned or controlled lands or waters, or resources, or for reasons involving public health and safety (e.g., pipeline rupture, explosion, fire, etc.).

Operator Compliance (36 CFR §9.36(a)(15))

Operators conducting nonfederal oil and gas operations in National Park System units must comply with all applicable federal, state, and local laws and regulations, in addition to all relevant provisions of the 36 CFR Part 9B regulations. To ensure awareness of this responsibility, the regulations require operators to include in all proposed Plans of Operations an ***affidavit*** stating that the operations as planned are in compliance with all applicable federal, state, and local laws and regulations (36 CFR §9.36(a)(15)).

Operators are subject to all permitting requirements under other applicable federal, state, and local laws and regulations, over and above such requirements imposed by the 36 CFR Part 9B regulations. Therefore, operators are required to include copies of applicable permits, or proof of applications for such permits, in a proposed Plan of Operations.

Other federal statutes applicable to nonfederal oil and gas operators include, but are not limited to:

- Clean Air Act (42 U.S.C. §7401, et seq.),
- Clean Water Act (33 U.S.C. §1151, et seq.),
- Safe Drinking Water Act (42 U.S.C. §300f, et seq.),
- Coastal Zone Management Act (16 U.S.C. §1451, et seq.), and
- Resource Conservation and Recovery Act (42 U.S.C. §6901, et seq.).

Determinations under these and other similar statutes are the responsibility of the NPS, other federal agencies, or state agencies if the state has a federally-approved program under the specific law.

Nonfederal oil and gas owners, just as any private property owner, are bound to obey the laws and regulations of state and local authorities. The NPS does not supplant the authority of state and local governments over the activities of nonfederal oil and gas operators under state and local jurisdiction. The NPS thus requires that operators conform to all applicable state and local laws as a condition of plan approval.

The NPS will generally not prescribe standards in a Plan of Operations that are any less stringent than those required under state or local law. The NPS may, and often does, impose more stringent requirements upon nonfederal oil and gas operators than are required under state and local law. Operators must comply with the NPS requirements. If there is a conflict between federal, state, or local requirements, the operator must obey the federal requirements.

Operators conducting nonfederal oil and gas operations in National Park System units are subject to:

- state and local laws that Congress explicitly directed shall apply to all entities, including federal agencies and lands. For example, state and local air and water pollution control requirements and permits apply even in NPS units under exclusive U.S. jurisdiction;
- state well-spacing rules and regulations, if not in conflict with NPS requirements under 36 CFR Part 9B (except in areas of exclusive U.S. jurisdiction);
- state and local laws that establish permit and other requirements such as zoning, over and above those imposed by the NPS under 36 CFR Part 9B regulations, even if the requirements prevent the conduct of operations (except in areas of exclusive U.S. jurisdiction); and
- all other state and local laws not in conflict with federal law or regulation (except in areas of exclusive U.S. jurisdiction).

Plan of Operations Adequacy Determination (36 CFR §9.36(c))

The regulations at 36 CFR §9.36(c) state:

"Information and materials submitted in compliance with this section (Plan of Operations requirements) *will not* constitute a Plan of Operations until information...which the superintendent determines as pertinent to the type of operations proposed, has been submitted to and determined adequate by the regional director."

The regulation specifies that a proposed Plan of Operations submitted by an operator *will not be officially accepted* for formal review by the NPS until the regional director determines that such Plan of Operations:

- contains all information required by the superintendent, and
- is sufficiently detailed for the NPS to effectively analyze the impacts of the proposed operations on unit resources and values.

The regional director's adequacy determinations are based on a concurrent review of the proposed Plan of Operations by the regional director's staff, superintendent's staff, and the Washington Office's Geologic Resources Division staff.

Each superintendent may require an operator to provide any additional information needed to effectively analyze the impact that proposed operations may have on resources, management, and public use of the unit (36 CFR §9.36(18)). Because a plan should be specifically tailored to the proposed operations, the content requirements for a Plan of Operations will vary accordingly. Operators are encouraged to work with park staff to ensure that Plan of Operations information requirements are identified early in the development of the plan.

The regulations do not specify a time period in which the regional director must make an adequacy determination on a proposed Plan of Operations. However, a determination is normally completed within 30-60 days following receipt of a proposed Plan of Operations from an operator.

Proposed Plans of Operations determined to be adequate by the regional director are officially "accepted" by the NPS for further analysis and action. Proposed plans that are found to be inadequate by the regional director are not officially accepted by the NPS for further review. Operator's aggrieved by a regional director's decision to not officially accept a proposed Plan of Operations due to inadequacy may file an appeal. (See Operator's Appeal Rights discussion below.)

NPS Compliance (36 CFR §9.37)

The authority to approve a Plan of Operations rests with the regional director. Before approving a plan, the regional director must comply with all federal statutes and executive orders requiring that federal agency actions be reviewed and assessed for their impact, including cumulative impacts, on the environment.

These statutes and executive orders include, but are not limited to:

- National Environmental Policy Act,
- Resource Conservation and Recovery Act,
- Coastal Zone Management Act,
- Endangered Species Act,
- National Historic Preservation Act,
- Clean Air Act,
- Executive Order 11988 (Floodplain Management),
- Executive Order 11990 (Protection of Wetlands)
- Executive Order 12630 (Takings).

Determinations and finding under these and other similar statutes are the responsibility of the NPS and other federal or state agencies.

The operator is required to submit in a Plan of Operations the information upon which the NPS can make a determination on the plan. This information may include providing copies of applicable permits issued by other regulatory agencies, or proof of application for such permits. The NPS is responsible for verifying the accuracy of the information presented in the proposed Plan of Operations, and evaluating the overall effect of the operation on the resources, values, and management of the unit.

The regional director applies the National Environmental Policy Act to each proposed Plan of Operations determined to be adequate and officially accepted by the NPS for analysis and approval consideration (36 CFR §9.37(b)). The regulatory requirement firmly integrates National Environmental Policy Act (NEPA) compliance with the Plan of Operations approval process. This typically requires preparation of an Environmental Assessment (EA); however, in some cases, proposed operations qualify under a "categorical exclusion" (CX), while other proposals that have the potential for "significant" impacts require preparation of an Environmental Impact Statement (EIS).

The CX, EA, or publication of a notice of intent to prepare an EIS, must be prepared with 60 days of official acceptance of the proposed plan. While the burden of meeting environmental responsibilities under NEPA falls on federal agencies responsible for permitting actions, and not on the mineral owner or operator, *staffing limitations and other park workload may preclude park staffs from preparing an EA within 60 days of the official acceptance of the proposed plan. Also, preparation of an EIS requires agency allocation of funds which may take 2 or more years to receive. Operators are therefore encouraged to contract a consulting firm, subject to approval by the NPS, to prepare EAs and EISs; and the NPS can adopt the final EA or EIS product that meets the content requirements under the NPS's NEPA Compliance Guidelines, DO-12.*

Detailed NPS guidance on preparing EAs and Environmental Impact Statements (EISs) is provided in the *NPS's NEPA Compliance Guidelines (DO-12)* and in Council on Environmental Quality regulations at 40 CFR Part 1500. DO-12 requires that the following sections be included in an EA:

- purpose and need for the proposal,
- alternatives,
- environmental impacts of the alternatives, and
- list of persons or agencies consulted.

The regulations at 36 CFR §9.37(d) specify additional content requirements for EAs prepared on proposed nonfederal oil and gas Plans of Operations. The additional EA content requirements consist of:

- an analysis of all information submitted by the operator (e.g., does the plan adequately address the required information?);

- an evaluation of measures and timing required to comply with reclamation requirements (See Reclamation Requirements, discussed later in the chapter);

- an evaluation of necessary conditions and amount of the performance bond or security deposit (See Bond Requirement, discussed below);

an evaluation of the need for any additional requirements in the plan or stipulations; and

- a determination regarding the impact, including cumulative impacts, of the proposed operations and all other proposed and existing operations on the resources, values, and management of the unit.

Although DO-12 (NPS NEPA Compliance Guidelines) and the 36 CFR Part 9B regulations do not require that EAs evaluate specific alternatives, EAs prepared on proposed Plans of Operations typically include the following range of reasonable alternatives:

- "No Action,"
- "Reject the Proposed Plan,"
- "Approve the Proposed Plan Subject to NPS Stipulations," and
- "Approve the Proposed Plan, as submitted."

The "No Action" alternative evaluates the continuation of existing conditions in the absence of the proposed operations. This information provides the regional director with a benchmark with which to compare the impacts associated with other alternatives. According to the regulations at 36 CFR §9.37(c), no action by the regional director within 60 days following official acceptance of a plan constitutes a rejection on the plan, and the operator has a right to appeal such rejection.

The NPS does not develop alternative proposals in the EA to make the operation acceptable, except for possibly adding a few stipulations to the proposed plan. In addition, an EA prepared on a proposed Plan of Operations does not always identify a "proposed alternative." A proposed alternative will be selected by the regional director following public review of the EA, and after evaluating the proposed plan against the regulatory approval standards at 36 CFR §9.37(a).

The primary purpose of the EA is to describe environmental effects associated with the proposed operation and alternatives, assist the regional director in determining if the operation meets the applicable approval standards at 36 CFR §9.37, and aid the regional director in determining if an EIS is required. (See Plan of Operations Approval or Rejection, below, for a review of the regulatory approval standards.)

If, based upon the EA and public comments (See Public Involvement discussion below), the regional director determines that approval of the proposed Plan of Operations is not a major federal action significantly affecting the quality of the human environment, the regional director prepares a ***Finding of No Significant Impact (FONSI).***

A FONSI is also prepared if the regional director determines that rejection of the proposed plan is the proper action. A FONSI is the decision document that completes the NEPA process.

A FONSI is a separate document from the EA and is generally less than two pages in length. A FONSI prepared on an EA for a Plan of Operations typically contains the following information as required by DO-12 and the regulations at 40 CFR §1508.13:

- a brief description of the proposed Plan of Operations;

- a brief summary of the EA results (incorporated by reference) justifying approval (or rejection) of the proposed Plan of Operations.

- a statement(s) that compliance with other applicable laws, regulations, and executive orders, if necessary, has been completed and documented (e.g., Endangered Species Act, National Historic Preservation Act, Clean Water Act);

- a statement that the proposed Plan of Operations meets (or does not meet) the NPS approval standards at 36 CFR §9.37;

- a concluding statement that "approval (or rejection) of the proposed Plan of Operations does not constitute a major federal action significantly affecting the quality of the human environment, and therefore and EIS will not be prepared;" and

- the regional director's signature and date executed.

The regional director prepares a separate ***"Statement of Findings"*** pursuant to NPS Floodplain Management Guidelines (Special Directive 93-4, August 11, 1993) and Director's Order 77.1 for Wetlands Protection in addition to a FONSI if:

- the proposed Plan of Operations will be approved; and

- the proposed operations will be located in, or may adversely impact, a floodplain or wetland.

In the Statement of Findings, the regional director must document that there is no practical alternative to locating in or impacting a floodplain or wetland.

If the regional director determines that a proposed Plan of Operations meets the regulatory approval standards at 36 CFR §9.37, but approval of such plan may constitute a major federal action significantly affecting the quality of the human environment or will be highly controversial, an EIS pursuant to Section 101(2)(c) of NEPA is required.

A proposal initiated by an operator or the regional director to supplement or revise a previously approved Plan of Operations is also subject to NEPA compliance. (See Supplementing or Revising Approved Plans discussion below.)

Public Involvement (36 CFR §9.52)

The NPS is required to seek public review and comment on all proposed Plans of Operations determined to be adequate and officially accepted by the regional director. The regulations in 36 CFR §9.52(b) require the NPS, upon official acceptance of a proposed Plan of Operations, to publish a notice in the *Federal Register* of the availability of the plan for public review and comment.

The superintendent, upon official acceptance of a proposed Plan of Operations, also publishes a notice in a newspaper of general circulation in the county(s) in which the unit is located (36 CFR §9,52(a)). Such notice or new release is issued to advise the local public of the availability of the proposed plan for review and comment.

Although the regulations require publication of a *Federal Register* notice and a news release in a local newspaper upon official acceptance of a proposed Plan of Operations, the NPS has chosen to delay publishing such notices until such time as the EA on a plan is completed. The NPS has determined that announcing the availability of an accepted plan and the corresponding EA simultaneously best serves the public interest. The public is thereby afforded an opportunity to examine the proposed plan and the Service's environmental analysis at the same time.

Identified proprietary or confidential information and records submitted by an operator to the NPS is not to be made available for public inspection (CFR §9.52(c)). Such information most often consists of technical geologic data and records gathered during the drilling of wells in the area. The availability of proprietary or confidential information and records for public inspections is governed by the regulations at 43 CFR Part 2.

Public review and comment period on a proposed Plan of Operations is set at 30 days (36 CFR §9.52(b)). However, the NPS may provide additional time for public review and comment on a proposed plan if:

- additional review time is required under an applicable regulation,
- public comments received during the initial 30-day review period reveal that more time is necessary, or
- the superintendent otherwise determines that additional time for public participation is appropriate.

The 36 CFR Part 9B regulations do not specifically require that EAs prepared on proposed plans be made available for public inspection. However, the NPS has customarily issued public notice of EA availability in the *Federal Register* and a local area newspaper. The public review and comment period for EAs prepared on nonfederal oil and gas Plans of Operations customarily runs concurrent with the 30 days for the submitted proposed plan.

Notices published in the *Federal Register* and local newspapers announcing the availability of a Plan of Operations and/or EA for public review and comment typically include the following information:

- the subject of the proposed Plan of Operations and/or EA (e.g., a proposed Plan of Operations for the conduct of an exploratory well drilling operation);
- the operator or company name proposing the operation;
- the general location of the proposed operations;
- the location and address where a copy of the proposed Plan of Operations and/or EA may be obtained;
- the location(s) where a copy of the proposed Plan of Operations may be inspected (e.g., Padre Island National Seashore Headquarters);
- the closing date of the public review and comment period (30 days from the date of notice publication);
- a summary statement of potential impacts as determined through the Environmental Assessment; and
- a statement that all comments are to be written and submitted to the unit superintendent; and the name(s), address(es), and telephone number(s) of the individual(s) from whom further information may be obtained.

Public comments received on a proposed Plan of Operations and EA become part of the official record and are considered by the regional director in determining whether to approve the plan.

Bond Requirement (36 CFR §9.48)

Prior to approving a proposed Plan of Operations, the regional director must require the operator to submit a performance bond with satisfactory surety to the NPS (36 CFR §9.48(a)). The purpose of the bond is to ensure operator compliance with terms and stipulations of an approved Plan of Operations (e.g., reclamation requirements, handling of wastes). The bond in effect acts as the NPS's insurance policy against there being a lack of clean-up funds. In the event that the operator fails to properly reclaim park resources damaged during the conduct of operations in violation of an approved plan, the bond will serve as a source of funding to rectify the operator's shortfall. If the bond amount proves inadequate to rectify such a shortfall, the NPS can seek damages and clean up response costs under the Park System Resource Protection Act (16 U.S.C. §19jj, as amended). A corporate surety bond is the type of security instrument most often filed to satisfy this regulatory requirement. Other types of acceptable securities include, but are not limited to: cash, certified check, irrevocable letter of credit, and U.S. Treasury bonds (36 CFR §9.48(b)). Operators may use an SF-25 (Performance Bond) for filing a corporate surety bond, or they may use any other form that includes the same information. However, each type of acceptable security must satisfy specific criteria in order to be accepted by the NPS.

Bonding for a particular phase of an operations is permitted under the regulations at 36 CFR Part 9B. Most nonfederal oil and gas operations are bonded initially for the exploration phase of the operation. If exploration is successful and production is to occur, the bond or security deposit may be transferred to cover the production phase of the operation, provided the operator adequately reclaims the area not necessary for production operations. The amount of a bond or security deposit should be adjusted to reflect the cost of reclamation for a particular phase of an operations. The amount of a performance bond or security deposit on file with the NPS is evaluated annually, and adjusted accordingly, to reflect any increase in the cost of site reclamation resulting from inflation.

The regional director is responsible for determining the proper amount of the performance bond or security deposit to be filed by an operator. This determination is based on a written evaluation contained in the EA on a proposed Plan of Operations. The bond or deposit must be in an amount equal to:

- the ***estimated cost of reclaiming the site*** (as defined and itemized by the operator in the proposed Plan of Operations, and determined to be accurate by the regional director), *plus*

- the ***"liability amount"*** determined by the superintendent to cover anticipated cost for: rapid and effective clean up of contaminating substances or waste spills; minimizing resource damage resulting from an oil, waste, or contaminating substance spill; minimizing resource damage from the escape of gas; and minimizing resource damage from fire resulting from the operations (36 CFR §9.48(d)).

The operator's estimated cost of reclaiming the site must address plugging of the well(s), removal of all equipment and debris, restoration of topographic grade, topsoil replacement, vegetation planting/seeding, exotic species control, reclamation monitoring, etc. The NPS uses the following handbooks, guidelines and publications in evaluating the accuracy of the operator's estimate:

Handbook for Calculation of Reclamation Bond Amounts published by the Office of Surface Mining and Reclamation Enforcement, *Caterpillar Performance Handbook,* and *Dataquest Cost Reference Guide for Construction Equipment.* Labor rates, material and certain reclamation activity costs can be obtained from other sources, such as the Davis-Bacon wage rates, supplier estimates, standard material guidebooks, and construction cost guides.

Factors that can be used to calculate the liability amount portion of the bond or security deposit include, but are not limited to:

- the potential amount of oil that may be spilled, in a worst case scenario, and the estimated cost to contain and clean up such a spill and restore damaged resources;

- the potential amount of hazardous substances and waste that may be spilled, in a worst case scenario, and the estimated cost to contain and clean up such a spill and restore damaged resources.

- the potential extent of damage to park resources resulting from a fire, and the cost to contain and extinguish a fire and restore damaged resources; and

- the potential for release of harmful or toxic gas, and the cost to secure the area and restore damaged resources.

Superintendents and their staffs typically contact several oil and/or hazardous substance spill clean up contractors in the local area to obtain cost estimates for worst case spill scenarios. The containment and clean up cost estimate are added to the anticipated cost of restoring damaged resources to determine the liability portion of performance bond or security deposit.

The regulations at 36 CFR §9.48(d)(2) establish maximum limits on the liability amount that can be imposed by the NPS. The ***liability amount*** calculated and recommended by the superintendent may not exceed:

- $5,000 for a single-party geophysical operation;

- $25,000 for a multiple-party geophysical operation, or

- $50,000 for each exploratory well, production, or pipeline operation.

A ***"single party geophysical operation"*** consists of one supervisor (party manager), and usually includes two shothole drillers, two drillers' helpers, two personnel responsible for explosives (powdermen), and six to eight laborers. A ***"multiple party geophysical operation"*** consists of two or more supervisors, several drillers, helpers, and powdermen, and usually includes more than eight laborers.

A operator's total bond or security deposit amount for a single operation, or multiple operations, in a given unit of the National Park System may not exceed $200,000 at any given time (36 CFR §9.48(d)(3)). It is certainly possible that the total performance bond or security deposit amount calculated for a single exploratory drilling operation could equal $200,000, the maximum bonding limit established by the regulation (e.g., estimated cost of reclaiming the site at $150,000, *plus* the liability amount calculated to be the maximum of $50,000).

Operators conducting nonfederal oil and gas operations under Plans of Operations in more than one unit of the National Park System are required to file separate performance bonds or security deposits for such operations in each unit (36 CFR §9.48(d)(3)).

Within 30 days following successful completion of all reclamation requirements specified in an approved Plan of Operations, the regional director must release the operator of liability under the bond or security deposit (36 CFR §9.48(f)). A determination of successful reclamation may not be possible for a period of 1 to 3 years, or longer, following initiation of reclamation actions. Successful re-establishment of vegetation communities is perhaps the key criterion in terms of defining when reclamation is complete.

According to the regulations at 36 CFR §9.48(e), the operator's surety company is required to perform all reclamation specified in the approved Plan of Operations if the operator fails to fully comply with pertinent provisions of the plan. The NPS is responsible for notifying the operator's surety company of its responsibility, and monitoring reclamation to ensure compliance with the pertinent provisions of the plan.

The regional director also has the option of demanding that the surety company forfeit the performance bond to the unit if the operator fails to fully comply with pertinent provisions of the approved plan. The forfeited bond can then be used by the unit superintendent to fund a contract to complete the reclamation work specified in the approved Plan of Operations. If this option is exercised, the NPS must comply with the requirement for documenting of the transaction as set forth in the U.S. General Accounting Office Policy and Procedures Manual for Guidance to Federal Agencies.

Plan of Operations Approval or Rejection (36 CFR §9.37)

The authority to approve or reject a proposed Plan of Operations rests with the regional director. The regulations at 36 CFR §9.37 detail the requirements for approving a Plan of Operations, including: "approval standards" that vary depending on the ownership status of the surface estate (e.g., federally or nonfederally owned); a time limit in which the regional director must notify the operator of a determination on the proposed plan; and decision options available to the regional director.

The regional director is required to prepare an EA on a proposed Plan of Operations and notify the operator of a determination on the plan within 60 days of the plan's receipt (36 CFR §9.37(b)). The time period ("60-day clock") begins on the day the regional director determines the proposed plan to be adequate and officially accepts the plan for NPS analysis and action.

Certain circumstances may arise during the Plan of Operations review process that warrant the need to temporarily suspend the 60-day clock. The number of days accrued under the following circumstances are not considered in determining the 60-day period termination date:

- days during which NPS personnel cannot access the area of operations for such reasons as inclement weather, natural catastrophe, acts of God, etc.;
- days required for mandatory consultation with other federal, state, or local agencies or advisory councils pursuant to other applicable laws or regulations (e.g., Endangered Species Act, National Historic Preservation Act); and

- days necessary to complete public and/or agency review of document prepared pursuant to the National Environmental Policy Act.

The 60-day clock remains suspended until such time access to the site is possible, mandatory consultation is completed, or public review and comment on EPA documents is included, respectively. The regional director should notify the operator that the 60-day clock is temporarily suspended if any of the above circumstances arise during the process of reviewing the Plan of Operations.

The regulations at 36 CFR §9.37(b)(4) provide for a 30-day extension to the 60-day period in order for the regional director to complete the review and analysis of a proposed Plan of Operations. Use of this 30-day extension provision is limited to cases where more than 60 days are necessary to complete the EA on a proposed Plan of Operations.

The regional director must inform an operator in writing of a decision on a proposed Plan of Operations within 60 days of officially accepting the plan. The regulations at 36 CFR §9.37(b) list the decision options available to the regional director as follows:

- Approve the Plan of Operations (36 CFR §9.37(b)(1)).

- Reject the Plan of Operations and specify the reasons for the rejection (36 CFR §9.37(b)(1)).

- Conditionally approve the Plan of Operations subject to the operator's acceptance of specific provisions or stipulations (36 CFR §9.37(b)(2)).

- Require the operator to modify the Plan of Operations before it can be approved (36 CFR §9.37(b)(3)).

- Request additional information from the operator for evaluating the environmental effects of the operation or to determine the appropriate amount of the performance bond (36 CFR §9.37(b)(3)).

- Extend the review and analysis (e.g., EA) on the plan an additional 30 days, and specify the reasons why additional time is required (36 CFR §9.37(b)(4)).

- Notify the operator that the Plan of Operations has been reviewed and evaluated, but cannot be considered for approval until 45 days after a final EIS has been prepared and filed with the Environmental Protection Agency (36 CFR §9.37(b)(5)).

- Notify the operator that additional time (specify amount) is necessary for public review and comment (including mandatory consultation with other federal, state, or local agencies as required by applicable laws and regulations) on the proposed Plan of Operations and/or NEPA documents, including sufficient time to analyze public comments (36 CFR §9.37(b)(6)).

A proposed Plan of Operations is automatically rejected if the regional director fails to notify an operator within the prescribed 60-day period that one of the above decisions has been reached (36 CFR §9.37(c)). The operator has the right to appeal rejection of a proposed plan due to a regional director's failure to provide such notification within the 60-day period (see Operator's Appeal Rights discussion below).

Prior to approving a proposed Plan of Operations, the regional director must determine if any properties listed, or properties eligible for inclusion, in the National Register of Historic Places or National Registry of Natural Landmarks may be affected by the proposed operations (36 CFR §9.37(d)). This approval provision is based on the requirements under Section 106 of the National Historic Preservation Act governing federal agency actions. Such a determination is required for operations proposed on federally-owned and nonfederally-owned lands.

Note that approval of a proposed Plan of Operations is expressly conditioned upon the superintendent having reasonable access to the site of operations to properly monitor operations and to ensure compliance with the approved plan (36 CFR §9.37(f)).

The regional director may approve a Plan of Operations only if it is determined that the proposed operations satisfy the pertinent "approval standards" listed at 36 CFR §9.37.

Approval Standards: Federally-Owned or Controlled Surface Estate

The regulations at 36 CFR §9.37(a) stipulate that the regional director shall not approve a proposed plan for the conduct of operations on surface estate owned or controlled by the federal government until:

- The Plan of Operations satisfactorily addresses all information requirements of 36 CFR §9.36 applicable to the proposed operations (36 CFR §9.37(a)(4)). (See Plan of Operations discussion above.)

- The plan shows that the proposed operations will utilize technologically feasible methods that are least damaging to federally owned or controlled lands, waters, and resources of the unit (36 CFR §9.37(a)(1)).

- The plan shows that the proposed operations will be conducted in a manner that ensures the protection of public health and safety (36 CFR §9.37(a)(1)).

- The regional director determines that the conduct of proposed operations will not significantly injure federally-owned or controlled lands or waters, or will not substantially interfere with the management of the unit to ensure the preservation of the natural and ecological integrity in perpetuity (36 CFR §9.37(a)(3)).

If the regional director determines that an operation proposed on federally-owned or controlled surface estate fails to meet the last approval standard above, and rejection of the proposed Plan of Operations would constitute a taking of property interest under applicable law rather than an appropriate exercise of regulatory authority, the plan may be approved provided it satisfies all other approval standards (36 CFR §9.37(b)(3)).

This provision should not be interpreted to mean that the regional director cannot reject a proposed Plan of Operations. Rejection of a plan does not by itself constitute a taking of property. (See Taking of a Property Right discussion below.)

While the NPS may reject a proposed Plan of Operations, the NPS may be able to approve an alternative plan. The NPS may also be able to exercise the option of extinguishing a nonfederal oil and gas mineral interest through acquisition. (See Acquisition of Nonfederal Oil and Gas Property Rights discussion below.)

The approval standard regarding use of ***"technologically feasible methods least damaging to federally owned or controlled lands, waters and resources of the unit"*** requires further explanation. The standard requires that an operator use "state-of-the-art" equipment, techniques, and methods that will have the least impact on federally owned or controlled resources in the unit.

The operational methods or techniques must also be "technologically feasible"; that is, the operator must be capable of implementing the methods or techniques under the present level of knowledge and know-how. If use of a theoretical technique will result in the absolute least impact on the NPS resources, but such a technique is impossible to attain because the technology does not exist, the NPS does not require the operator to employ such a technique.

Examples of exploration and production methods or techniques that are state-of-the-art in terms of environmental protection include, but are not limited to:

- use of portable, or small, low-impact shothole drilling equipment for geophysical exploration,
- elimination of geophysical shothole drilling in sensitive or important resource areas,
- directional drilling to avoid direct adverse impact to a sensitive or important resource area,
- containerized mud systems versus use of earthen pits during drilling operations,
- zero discharge of effluents,
- lumber drilling pads and access roads for exploratory wells versus use of fill,
- heavy-duty plastic liner installed below lumber drilling pads,
- reinjection or hauling out brine water,
- reinjecting or piping gas off-site rather than flaring on-site, and
- installation of an automated monitoring system and alarm for H_2S discharge.

The approval standard specifying that the conduct of proposed operations must *not* ***"significantly injure federally-owned or controlled lands or waters"*** also warrants further explanation. A proposed operation will not meet this approval standard if it is determined that one of the following adverse impacts, or impact of similar magnitude, will occur:

- habitat critical to a federally-listed threatened or endangered species will be destroyed and such destruction can not be adequately mitigated (jeopardy opinion issued by U.S. Fish and Wildlife Service);
- a population of a federally-listed threatened or endangered species will be at risk and such risk can not be adequately mitigated (jeopardy opinion issued by U.S. Fish and Wildlife Service);
- a wildlife population will be subject to change in terms of numbers of individuals, age class structure, migration routes, habitat usage, etc., thereby threatening survivability of the population;

- surface water and/or groundwater quality will be impaired to the point that such water will not meet established water quality standards or historic uses;

- surface water flow patterns or volume will be permanently altered;

- national ambient air quality standards will be violated;

- maximum pollution level under the Prevention of Significant Deterioration section of the Clean Air Act will be exceeded;

- the numbers or composition of species comprising a vegetation community will be permanently altered, reduced, or adversely effected to the point that a population, community type, or ecological relationship between community types cannot be restored;

- soils will be unavoidably contaminated with brines, hazardous substances, drilling muds, or oil;

- an operator proposes to use or occupy federal surface estate beyond the boundaries of the operator's nonfederal oil and gas tract, and such use or occupancy affords no protection to unit resources and values; or

- an operator fails to submit a satisfactory performance bond or security deposit to the NPS.

Operator's Access Permit Format (36 CFR §9.32(a))

The regulations at 36 CFR §9.32(a) declare that an approved Plan of Operations serves as the operator's access permit. Therefore, the regional director approves a Plan of Operations, including provisions or stipulations, in a ***letter*** to the operator.

Temporary approvals granted by the regional director, delegated to park superintendents, to operators for the purpose of either accessing a unit to collect information necessary to prepare a proposed Plan of Operations, or for the continuation of an existing operation pending approval of a proposed pending approval of a proposed plan, are also issued via a letter.

Operator Use of NPS Roads (36 CFR §9.50)

Operators required to conduct operations under an approved Plan of Operations are subject to the regulations in 36 CFR §9.50 governing the use of commercial vehicles on roads administered by the NPS. The regulations specify that operators using commercial vehicles on NPS-administered roads must:

- register all commercial vehicles with the superintendent (36 CFR §9.50(a)),

- pay a road use fee based upon a posted fee schedule, or enter into a cooperative road maintenance agreement with the superintendent (36 CFR §9.50(a)(1) and (2)),

- not exceed weight or load limits established by the superintendent (36 CFR §9.50(b)), and

- use such roads in accordance with procedures outlined in an approved Plan of Operations (36 CFR §9.50(a)).

Commercial vehicle is defined at 36 CFR §9.31(g) as "any motorized equipment used in direct or indirect support of operations." This definition includes, but is not limited to: offroad geophysical ATVs, geophysical recording trucks, vehicles transporting equipment and supplies, earth-moving equipment, tandem trucks pulling flatbed or lowboy trailers, acid trucks, vacuum trucks, fuel trucks, and other service vehicles. An ***NPS-administered road*** is a road or route maintained by employees or contractors of the NPS.

The unit superintendent is responsible for ensuring that operators register all commercial vehicles with the park prior to use on NPS-administered roads. The superintendent must also ensure the collection of road use fees. The NPS generally does not levy a fee for passenger motor vehicles. The superintendent is responsible for developing a road use fee schedule for commercial vehicles if nonfederal oil and gas operators under approved Plans of Operations will use such vehicles on NPS- administered roads. A fee schedule should be calculated by weighing such factors as:

- NPS cost of constructing or maintaining the road and bridges leading to the nonfederal oil and gas site,

- total volume of traffic on such roads,

- operator's percentage of road use in relation to total traffic volume, and

- adjustments necessary to compensate for the operator's use of heavily-weighted commercial vehicles.

The fee schedule should be posted in the office where commercial vehicle registration takes place. The superintendent may choose to collect the fee prior to each commercial vehicle trip, or establish a log to record successive trips and submit a bill of collection at a prescribed frequency. The superintendent may adjust the fee schedule, but must notify operators 60 days in advance of the effective date of the change.

In lieu of collecting road use fees, the superintendent may elect to enter into a cooperative road maintenance agreement with the operator, under which the operator will agree to certain road maintenance responsibilities. Such an agreement must be in writing and signed by both parties.

Operators using commercial vehicles on NPS-administered roads are subject to applicable provisions or stipulations associated with an approved Plan of Operations. Operators' contractors and subcontractors are equally responsible for complying with vehicle usage stipulations. Provisions or stipulations that should be considered include, but are not limited to:

- vehicle weight restrictions based upon type of road surface,
- speed limits,
- seasonal restrictions to reduce visitor use conflicts,
- time of day use is permitted,
- days of the week use is permitted, and
- stipulations necessary to protect wildlife.

Supplementing or Revising an Approved Plan (36 CFR §9.40)

The regulations at 36 CFR §9.40 govern proposals to supplement or revise approved Plans of Operations. The regulations address who may initiate a proposal to supplement or revise an approved plan, review and approval requirements, notification requirements, and operations suspension provisions.

A proposal to supplement or revise an approved Plan of Operations may be made by either the operator or the regional director. The party initiating the plan supplement or revision must notify the other party in writing of the proposed alteration and justification (36 CFR §9.40(a)).

The regulations at 36 CFR §9.40(b) specify that any proposal to supplement or revise an approved Plan of Operations, whether initiated by the operator or the regional director, must be reviewed and acted on by the regional director in accordance with the Plan of Operations approval regulations at 36 CFR §9.37 (See Plan of Operations Approval or Rejection discussion above). The regional director must adjust the amount of the operator's performance bond or security deposit to conform to the modified plan (36 CFR §9.48(c)). (See Bond Requirement discussion above.)

If implementation of a proposed revision or modification is immediately necessary to prevent significant injury to federally-owned or controlled lands or waters, the regulations at 36 CFR §9.40(b) specify that the superintendent may verbally direct the operator to suspend operations at once under the provisions of 36 CFR §9.33(c)). Within 5 days following the issuance of a verbal suspension order, the superintendent must notify the operator in writing of the reasons for the suspension and the right to appeal the suspension under the regulations at 36 CFR §9.49 (Appeals). Operations are to remain suspended until the operator completes the necessary modification or revision (36 CFR §9.33(c)). The superintendent may then issue the operator written permission to resume operations pending the regional director's final decision on the supplemented or revised Plan of Operations.

If implementation of a proposed revision or modification to an approved Plan of Operations is not immediately critical in terms of preventing significant injury to federally owned or controlled lands or waters, the operations may continue pending the regional director's final decision on the supplemented or revised plan. If the regional director initiates the proposed supplementation or revision, the regional director must notify the operator in writing 60 days prior to the effective date of such changes (36 CFR §9.40(b)).

Transfer of Interest (36 CFR §9.34)

The regulations at 36 CFR §9.34 pertain explicitly to the transfer of nonfederal oil and gas rights being exercised under an approved Plan of Operations. The application of these regulations most often occurs when an interest in an approved production operation (e.g., producing well, pipeline) is sold or otherwise conveyed to another party.

An owner/operator who conveys a right to nonfederal oil and gas operation covered under an approved plan must notify the superintendent of the transfer within 60 days from the date the transfer of interest was executed (36 CFR §9.34(a)). The notification from the transferring owner must include:

- identification of the site(s) involved in the transfer,
- name and address of the party to whom the interest has been conveyed, and

- a description of the interest transferred.

The transferring owner/operator continues to be responsible for compliance with the approved Plan of Operations, and remains liable under the performance bond or security deposit until released from liability by the regional director. The regional director must release the transferring owner/operator from liability upon the superintendent's receipt of a transfer of interest notice *provided* operations have been conducted in accordance with applicable provisions of the approved Plan of Operations up to that date (36 CFR §9.34(b)) *and* the new owner/operator has secured a sufficient performance bond/security deposit to cover reclamation.

In situations where a non-active or non-producing operation under an approved Plan of Operations is transferred to a new owner/operator, and the operation site has not been properly reclaimed according to the approved plan, the transferring owner/operator remains liable under the performance bond or security deposit until the new owner/operator files a satisfactory substitute bond or deposit. The regulatory provisions at 36 CFR §9.48(e), in addition to the provisions of 36 CFR §9.34, govern this type of unique situation.

Upon receipt of the transfer notice, the superintendent must provide the new owner/operator with a written notice stating that the conduct of operations is prohibited (e.g., suspended) pursuant to the regulations at 36 CFR §9.34(b) until the new owner/operator submits:

- a suitable substitute performance bond or security deposit, *and either*
- a statement ratifying the previously approved Plan of Operations and intent to be bound by the terms, conditions, and stipulations of such plan, *or*
- a new proposed Plan of Operations.

The regional director may issue temporary approval to continue operations if a new owner/operator submits a new proposed Plan of Operations and a suitable substitute performance bond or security deposit. However, the issuance of such approval is governed by the regulations at 36 CFR §9.38(a)(2). (See Temporary Approval of Operations discussion above.)

If a new owner/operator elects to ratify the previously approved Plan of Operations, the regional director may subsequently exercise the authority to revise such plan if necessary. (See Supplementing or Revising an Approved Plan discussion above.) The regional director may also adjust the amount of the performance bond or security deposit if a ratified approved plan requires revision or supplementation. (See Bond Requirement discussion above.)

If a new owner/operator submits a new plan, the regional director must review and evaluate the plan for approval in accordance with all regulatory provisions applicable to a proposed Plan of Operations.

Penalty Provisions (36 CFR §9.51)

Operators that violate a provision of the 36 CFR 9B regulations are subject to ***civil penalties***. Any violation of the 36 CFR 9B regulations is deemed a trespass against the United States, and the operator may be subject to a court-imposed injunction (36 CFR §9.51(c)). All operators subject to the 36 CFR 9B regulations are civilly liable for any damages to federally-owned or controlled lands, waters, or property caused by failure to comply with the terms and conditions of either:

- a valid state or federal permit (e.g., existing operations), or

- temporary approval issued by the regional director, or
- an approved Plan of Operations (36 CFR §9.51(a)).

The superintendent is authorized to issue either a verbal or written ***suspension order*** to operators under a variety of circumstances, including, but not limited to:

- an existing operation being conducted pursuant to a valid state or federal permit poses an immediate threat of significant injury to federally-owned or controlled lands or waters (see Exemption for Existing Operations discussion above);

- an operator conducting operations under temporary approval issued by the regional director violates a condition, term, or stipulation of that approval, and such violation poses an immediate threat of significant injury to federally-owned or controlled lands or waters (see Temporary Approval of Operations discussion above);

- an operator fails to implement a revision to an approved Plan of Operations, and such failure poses an immediate threat of significant injury to federally-owned or controlled lands or waters (see Supplementing or Revising an Approved Plan discussion above); or

- an operator violates a provision of an approved Plan of Operations, and such violation poses an immediate threat of significant injury to federally-owned or controlled lands or waters.

If a violation of an approved Plan of Operations poses an immediate threat of significant injury to federally-owned or controlled lands or waters, the superintendent may notify the operator verbally that approval of the plan is immediately suspended. The superintendent must notify the operator in writing within 5 days, following a verbal suspension order, explaining the reason for the suspension and the right of the operator to appeal under the regulations. The suspension of operations remains in effect until the operator corrects the violation (36 CFR §9.51(c)(2)).

If a violation of an approved Plan of Operations does not pose an immediate threat of significant injury to federally-owned or controlled lands or waters, the superintendent must notify the operator in writing that the violation must be corrected within 10 days. The regional director may suspend approval of a plan if an operator fails to correct such a violation within the 10-day period. The suspension of operations remains in effect until the operator corrects the violation (36 CFR §9.51(c)(1)).

The NPS must seek an ***injunction***, or temporary restraining order, from a judge to halt an operation if an operator fails to comply with a verbal or written suspension order. An injunction is obtained through the U.S. Attorney's Office for the area in which the unit is located, in consultation with the regional director and regional departmental solicitor.

If an injunction is issued by a court judge, it will usually result in an immediate order to cease all activity in question. A hearing is held before a judge at which both the NPS and the operator are given an opportunity to present their respective cases. The court can order the operator to fully comply with all applicable regulations, and to pay for and carry out necessary reclamation or clean up prescribed by the superintendent. Note: Under special and particularly grave circumstances, a temporary restraining order (TRO) may be granted by the judge prior to a hearing.

The regional director may ***revoke approval*** of a Plan of Operations if an operator fails to:

- correct a violation of applicable law, regulation, or provision of an approved Plan of Operations; or

- repair damage to federally-owned or controlled lands, waters, or resources caused by a violation (36 CFR §9.51(c)(3)).

Revocation is permanent withdrawal of NPS approval to conduct operations under a Plan of Operations. If the regional director revokes approval of a Plan of Operations, the operator may resume operations only if a new proposed plan is submitted and approved.

The ***criminal penalty*** provisions at 36 CFR §1.3 (e.g., fines not exceeding $500 or imprisonment not exceeding 6 months, or both) apply if an operator fails to receive proper approval prior to using aircraft to gain access to federally owned or controlled lands or waters for the purpose of conducting nonfederal oil and gas operations. Proper approval for such access may be obtained only under an approved Plan of Operations, temporary approval, or in the case of an existing operation, such access is authorized in a valid state or federal permit. Failure of an operator to receive such approval is a violation of the regulations at 36 CFR §2.17 (36 CFR §9.32(c)). Therefore, operators that violate the aircraft provisions at 36 CFR §9.32(c) are subject to suspension of operations, an injunction, revocation of plan approval, and the criminal penalties applicable to the regulations at 36 CFR §2.17.

Operators are also subject to the criminal penalty provisions at 36 CFR §1.3, *where the United states has criminal jurisdiction*, if they:

- engage in operations without possessing an approved Plan of Operations, if such approval is required;

- engage in nonmineral-related activity that is prohibited by law or regulation for all persons (e.g., illegal taking of wildlife, destruction of property); or

- engage in mineral-related activity beyond the area where operations are authorized either through an approved Plan of Operations, temporary approval, or a valid state or federal permit governing an existing operation.

The operator may be cited for violating any applicable provision of the regulations at 35 CFR Parts 1-5, 7, and 13 in the above situations. A violation notice issued must cite the specific provision violated under 36 CFR Parts 1-5, 7 or 13, and *not cite* a provision under the 36 CFR Part 9B regulations. Operators may also be subject to additional civil and/or criminal penalties for violating other applicable federal, state, or local laws and regulations.

Operator's Appeal Rights (36 CFR §9.49)

Any decision that a superintendent or regional director makes under the 36 CFR Part 9B regulations may be appealed by an aggrieved operator in accordance with the procedural provisions in 36 CFR §9.49. An aggrieved operator must submit a written statement to the NPS official who issued the disputed decision (e.g., superintendent or regional director) within 30 days following the date such decision is conveyed to the operator. The operator's written statement must detail how the decision conflicts with applicable law or regulation. Failure of an aggrieved operator to submit a written statement to the responsible NPS official within the 30-day period renders an appeal null and void (36 CFR §9.49(a) and (f)).

Upon receipt of a written statement from an aggrieved operator, the responsible NPS official must either reverse the original decision, or write a statement explaining that the decision is upheld, and the reasons for the decision. If the original decision is reversed, the appeal process is completed. However, if the responsible NPS official issues a written statement to the operator that upholds the decision, the statement and all pertinent documentation must be submitted to the appropriate supervisor (e.g., the regional director or director, depending on who issued the original statement regarding the appeal). The aggrieved operator has 30 days from the receipt of the original statement to file exceptions to that decision (36 CFR §9.49(a)).

The NPS official who receives an aggrieved operator's exceptions (e.g., regional director or Director) must render a decision in writing within 45 days of receiving such exceptions. Provided there is cause, the 45-day period may be extended in writing (36 CFR §9.49(d) and (f)). The decision by the appropriate NPS official is the final administrative decision of the agency.

The Department of the Interior has the discretion to initiate a hearing, if requested by an operator, pursuant to the regulations at 43 CFR §4.700 (36 CFR §9.49(a)).

Acquisition of Nonfederal Oil and Gas Property Rights

The regional director has the option, in lieu of approving a proposed Plan of Operations, to initiate acquisition proceedings to preclude nonfederal oil and gas exploration and development, where the NPS determines that the conduct of operations will not meet the approval standards of 36 CFR 9B.

OPERATING STANDARDS, TIME/SEASONAL LIMITATIONS, AND OTHER MITIGATION TECHNIQUES

Operating Standards (36 CFR §9.41)

The regulations at 36 CFR §9.41 list several operating standards applicable to nonfederal oil and gas operations conducted under Plans of Operations in National Park System units. These are listed below under the applicable resource or oil and gas operations headings, along with other operating requirements and impact mitigation techniques. All proposed Plans of Operations submitted by operators to the NPS must adequately explain specific actions that will be taken to achieve compliance with applicable operating standards (36 CFR §9.36(a)(11)). If operations are approved, operators must ensure compliance with all applicable operating standards during the conduct of operations.

- If drilling or well production operation is suspended for more than 24 hours, but less than 30 days, the well must be shut in by either activating blow-out prevention equipment, or closing well-head valves, respectively (36 CFR §9.41(c)).
- If a well production operation is suspended for more than 30 days, the well must be either shut in by closing well-head valves or properly plugged as acceptable to the superintendent (36 CFR §9.41(c)).

- A legible sign showing the operator or owner name, operation name, and unique operation number must be displayed and properly maintained at each drilling operation, producing well, pipeline, storage tank(s), or processing facility (36 CFR §9.41(d)).

  Signs should include:

  - The Company Name,
  - Operation Name and Railroad Commission of Texas Number (if a well), and
  - Name and Phone Number of Contact in Case of Emergency.

Administrative Operating Standards

- The operator will be held fully accountable for their contractors' or subcontractors' compliance with the requirements of the approved Plan of Operations. (36 CFR 9.41(g))

- A copy of the temporary operating permit or approved Plan of Operations, whichever is applicable, and any additional operating standards or conditions for plan approval, must be kept by each seismic crew, or subcontractor performing work as part of the approved operations.

- The NPS does not warrant title or the accuracy of the descriptions provided in the operator's lease agreements with the mineral owner or other mineral lessees.

Third-party Monitoring of 3-D Seismic Exploration

The NPS has the authority to require an operator to hire a third-party monitor to ensure that the operator complies with the terms of their Plan of Operations, and to ensure the protection of park resources. A stipulation requiring a 3-D (three-dimensional seismic) operator to hire a third-party monitor is not a universal rule to be applied to every 3-D seismic proposal. As with all other proposals exercising nonfederal oil and gas rights in park units, the NPS evaluates each 3-D seismic proposal on a case-by-case basis. Given the nature and scope of 3-D seismic proposals and the nationally significant park resources at stake, the NPS will alert 3-D operators early in the regulatory process of the likelihood adequate monitoring will be a critical element of their operation in order to meet the 36 CFR 9B standards. If the operator's monitoring plans appear to be inadequate, given the scope of the operation, and that without those capabilities the operation will put the park's nationally significant resources at risk, the NPS will inform the operator that monitoring is likely to be an essential element of their plan.

Three-dimensional (3-D) seismic surveys provide high-resolution images of the subsurface, enabling oil and gas developers to more accurately locate geologic structures favorable to oil and gas deposits. Although data gathered from a 3-D seismic survey will benefit park resources by minimizing surface disturbance (fewer dry holes drilled and a reduction of multiple 2-D surveys), the 3-D seismic operation itself presents unique challenges to NPS resource managers, especially the need to adequately monitor these operations.

Summary of 3-D Seismic Operations

The technology used to acquire the data (vibroseis, shot hole explosives, or Poulter (above-ground explosives)) is the same as conventional 2-D seismic, but the seismic lines are run in a dense grid pattern that can cover many square miles. Typically, the 3-D operation will run 7 days a week, 12 hours a day, and for up to 9 months. An average crew is 50 people, but can be as high as 75. Because of the multiple seismic lines, surface resources potentially impacted at any one time are greatly increased. Along with the increase in seismic lines there is an increase in the number of vehicles impacting surface resources. Shots per mile vary. The average is about 80, but for deeper imaging, this number climbs quickly to as many as 260. A 3-D operation is extremely complex logistically. Operations are phased, with specific tasks continually leapfrogging others. In short, 3-D seismic operations will likely increase the immediate potential threats to NPS resources at least ten-fold.

Under NPS regulations in 36 CFR 9B, an operator proposing to exercise nonfederal oil and gas rights in a park unit must demonstrate to the NPS through a Plan of Operations how they will meet all pertinent 36 CFR 9B provisions, including 36 CFR 9B operating standards and approval standards. The language contained in the following operating standard and approval standard gives the NPS the authority to ensure that operations will protect park resources:

- 36 CFR §9.41(f): "Operator shall carry on all operations and maintain the site at all times in a safe and workmanlike manner, having due regard for preservation of the environment of the unit."

- 36 CFR §9.37(a)(3): "[The regional director shall not approve a Plan of Operations] for operations at a site the surface of which is owned or controlled by the federal government, where operations would substantially interfere with the management of the unit to ensure the preservation of its natural and ecological integrity in perpetuity or would significantly injure the federally-owned or controlled lands or waters."

If the NPS determines that a third-party monitor is necessary for the 3-D operator's plan to meet the above operating and approval standards, the NPS has the authority to stipulate that the plan contain such a requirement under the following regulatory provision:

- CFR §9.37(b)(2), Conditional Approval of a Plan of Operations:

- "Within sixty (60) days of the receipt of a Plan of Operations, the regional director shall make an environmental analysis of such plan, and:...notify the operator that the Plan of Operations has been conditionally approved, subject to the operator's acceptance of specific provisions and stipulations."

Under 36 CFR §9.37(f), all approved Plans of Operations are conditioned upon the superintendent's right to access an operation to monitor and ensure compliance with a Plan of Operations. Because under this scenario a third party will handle monitoring, the superintendent can exercise his/her right to access and monitor the operation through the third party via specific stipulations. Under 36 CFR §9.37(b)(2) and 9.37(f), the NPS may fashion additional stipulations designed to ensure that the operator complies with its plan and that the third-party monitor fulfills the NPSs goal of protecting the unit's resources. Examples of additional stipulations include, but are not limited to:

1. the NPS must approve the selection of the monitor and the terms of the operator's contract with the third-party monitor;

2. the contract must include a provision requiring the monitor to report directly to the NPS, and not to the company, and identify the frequency of reports (daily, weekly, monthly); and

3. the NPS may suspend the Plan of Operations if the quality of the monitoring performed is unsatisfactory to the NPS.

Protection of Air Quality

The NPS has a responsibility to protect air quality under both the 1916 Organic Act and the 1990 Clean Air Act (42 U.S.C. 7401, et seq.). According to the NPS Management Policies, the NPS will seek to perpetuate the best possible air quality in parks because of its critical importance to visitor enjoyment, human health, scenic vistas, and the preservation of natural systems and cultural resources (Management Policies, Chapter 4:17).

Consideration of air quality impacts and associated mitigation measures will be evaluated on a project-by-project basis. It is anticipated, however, that because of prevailing winds, Class II air quality values in the park are not expected to be impacted by proposed nonfederal oil and gas operations. The NPS consults with the Texas Natural Resources Conservation Commission, which is the state-designated agency that the U.S. Environmental Protection Agency has delegated, permitting authority under the Clean Air Act, and with the U.S. Environmental Protection Agency, when adverse impacts to air quality values are anticipated.

Performance Standard: To protect the Class II air quality at Padre Island National Seashore.

Operating Standards:

- Operators shall be required to comply with the Clean Air Act and incorporate appropriate discussion of anticipated air quality impacts, mitigation measures, and any permitting requirements in proposed Plans of Operations.

- Operations will be designed to protect Class II air quality values and comply with the State Implementation Plan under the Clean Air Act.

Consistency with the Texas Coastal Zone Management Program

The Coastal Zone Management Act (CZMA) (16 U.S.C. 1451, et seq.) was enacted by Congress in 1972 to improve the nation's management of coastal resources, which were being irretrievably damaged or lost due to poorly planned development. Specific concerns were the loss of living marine resources and wildlife habitat, decreasing open space for public use, and shoreline erosion. Congress also recognized the need to resolve conflicts between various uses that were competing for coastal lands and waters (USDOC, NOAA, 1988a). The NPS will comply with provisions of state coastal zone management plans prepared under the Coastal Zone Management Act when such provisions are more environmentally restrictive than NPS management zoning (Management Policies, Chapter 4:20).

The basic goal of the CZMA is to encourage and assist coastal states to voluntarily develop comprehensive management programs. The CZMA establishes a state-federal partnership in which the states take the lead in managing their coastal resources, while the federal government provides financial and technical assistance and agrees to act in a manner consistent with the federally-approved state management programs. The CZMA is implemented by the Office of Ocean and Coastal Resource Management (OCRM), within NOAA's National Oceanic Service. The Texas General Land Office is the Lead State Coastal Agency.

The Coastal Zone Reauthorization Amendments of 1990 amended the federal consistency provisions to counter the Supreme Court's 1984 decision in *Secretary of the Interior v. California.* This clarified that all federal agency activities, whether in or outside of the coastal zone, are subject to the consistency requirements of Section 307(c)(a) of the CZMA if the activities affect natural resources, land uses, or water uses in the coastal zone.

The new provisions encourage each state, under a Coastal Zone Enhancement Grants Program in Section 309, to improve continually its CZM program in one or more of eight identified national priority areas: coastal wetlands management and protection; natural hazards management (including potential sea and Great Lakes level rise); public access improvements; reduction in marine debris; assessment of cumulative and secondary impacts of coastal growth and development; special area management planning; ocean resource planning; and siting of coastal energy and government facilities. Three new program approval requirements were also added in Section 306(d)(14), (15), and (16), dealing with public participation in permitting processes; consistency determinations, providing a mechanism to ensure that all state agencies will adhere to the program; and requiring enforceable policies and mechanisms to implement the applicable requirements of the new Coastal Nonpoint Pollution Control Programs, respectively.

Oil and gas exploration and production, including geophysical operations, waste management, pipeline placement, and activities associated with access to the exploration or production site are to be managed subject to the Texas Coastal Zone Management Program policies.

Federal lands such as Padre Island National Seashore are excluded from the coastal zone. According to the August 1996 Texas Coastal Management Program/Final Environmental Impact Statement, prepared by the National Oceanic and Atmospheric Administration of the Office of Ocean and Coastal Resource Management and the State of Texas Coastal Coordination Council, "While activities on excluded federal lands are not required to comply with the TCMP goals and policies, an activity that has spillover effects on CNRAs is subject to the federal consistency requirement (Part II, 2-5).

In the event that the NPS is considering issuing an access or surface use permit through the approval of a Plan of Operations, and the proposed nonfederal oil and gas operation may have a spillover effect on CNRAs, the NPS will consult with the Texas General Land Office for a consistency determination. In these cases, a consistency certification must be referred by the Coastal Coordination Council within 45 days of receipt by the Council Secretary of an administratively complete consistency certification, or the action is conclusively presumed to be consistent.

Control of Contaminating and Hazardous Substances

Performance Standards: To prevent the release of contaminating and hazardous substances into the environment; and to respond quickly and effectively to contain and clean up spills that do occur.

Contaminating substances is defined at 36 CFR §9.31(o) as "those substances, including but not limited to, salt water or any other injurious or toxic chemical, waste oil or waste emulsified oil, basic sediment, mud (drilling fluid) with injurious or toxic additives, or injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas."

Operating Standard:

Operators conducting oil and gas drilling and production operations will often use or generate substances that meet this definition, and are therefore required to fully comply with the provisions of 36 CFR §9.45 during the conduct of operations. Operators must include a "Contaminating or Toxic Substance Spill Control Plan" in their Plan of Operations. The Spill Control Plan will:

- list the types and amounts of contaminating substances proposed for use in operations;
- describe potential hazards to humans and the environment and respective mitigation techniques;
- describe actions to be taken to handle, store, clean up, and dispose of such substances;
- describe the equipment and methods for containment and clean up of contaminating substances, including a description of the equipment available on-site versus those available from local contractors; and
- include an emergency spill response plan in the event of accidents, fires, or spills, prepared by a qualified spill specialist.

If determined to be adequate by the superintendent, a Spill Prevention Control and Countermeasure Plan, approved under 40 CFR part 112, may be used to satisfy the oil spill contingency plan requirements.

- Confine brine water and all other waste and contaminating substances to the smallest practicable area, and prevent escape of such substances due to percolation, rain, high water, or other causes. Properly store and promptly remove all wastes and contaminating substances to prevent contamination, pollution, damage, and injury to unit resources and values. (36 CFR 9.45)
- The operator will immediately stop work if contamination is found in the operating area and notify the park superintendent or his/her designated representative.
- The operator will be liable for pollution or other damages, as a result of their operations, to government-owned lands and property.
- Operators shall make efforts to use the least hazardous and/or contaminating substances necessary in the conduct of operations if those choices are available; and to store the minimum quantity on site needed to maintain operations.
- Hazardous and contaminating substances shall be properly stored in secondary containment systems.
- The operator shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under an approved Plan of Operations. This shall include liability arising from the occupancy or use of public lands under an approved Plan of Operations. This shall include liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq., or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, et seq.) on this approved surface use (unless the release or threatened release is wholly

unrelated to operator's activity in this approved surface use), or resulting from the activity of operator on this approved surface use. This applies without regard to whether a release is caused by the operator, their agent, or unrelated third parties.

- Any collection and laboratory analyses of soil and/or ground water samples conducted before well drilling, or after well drilling, production, or a change of ownership or leasing rights, shall follow the NPS's "Guideline for the Detection and Quantification of Contamination at Oil and Gas Operations," contained in Appendix H.

Protection of Cultural Resources

Federal laws providing for protection and management of the cultural resources at Padre Island National Seashore include the National Historic Preservation Act of 1966 (NHPA), as amended; the Archeological and Historic Preservation Act of 1974; the Archeological Resources Protection Act of 1979 (ARPA); the American Indian Religious Freedom Act of 1978; the Native American Graves Protection and Repatriation Act; Executive Order 13007; Mining in the National Parks Act of 1976; and the National Park Service's Organic Act. The term "cultural resources" includes various components of archeological, ethnographic, historic architectural, and historic landscape resources.

Regulations included in 36 CFR §9.47 specifically address operator responsibilities of protecting significant cultural resources as related to nonfederal oil and gas operations in National Park System units. Historic properties are those cultural resources that meet criteria for inclusion in the National Register of Historic Places. Historic properties known to exist within the park are the Novillo Line Camp and the Mansfield Cut Underwater Archeological District. In addition, the NPS evaluation of the Green Hill Line Camp and the Black Hill Line Camp (including their cultural landscapes) indicates that they are significant.

Section 106 of NHPA: Identification, evaluation, and protection of historic properties within NPS lands must be considered at the Plan of Operations preparation and review/approval stages. In exercising the Plan of Operations approval provisions under 36 CFR 9.37, the NPS regional director must comply with the provisions of Section 106 of the NHPA. In part, this act authorizes the establishment of a National Register of Historic Places (NRHP) and allows for the inventory, assessment, and nomination of cultural properties to the register. Additionally, any effects of a proposed operation on properties eligible for, or listed on, the NRHP must be assessed, in conjunction with the State Historic Preservation Officer (SHPO), prior to Plan of Operations approval. Section 106 of the Act provides the Advisory Council on Historic Preservation (ACHP) with an opportunity to comment on the effect of an agency's undertakings in historic properties.

Adverse effects on NRHP properties are those that result from undertakings, such as oil and gas operations, which will diminish the integrity of the characteristics that qualify the property for inclusion on the NRHP. These can be direct or indirect impacts, such as destruction of original fabric or context, or visual intrusions into the historic scene.

Adverse effects on historic properties are avoided whenever possible. When adverse impacts caused by NPS projects or authorized actions cannot be avoided, mitigation measures will be taken. The nature of mitigation measures will depend on the adverse impact and the scientific and socio-cultural values of the resource involved. As required, recommended mitigation is coordinated with the SHPO and the ACHP. This review process takes at least 30 days. Consultation can be facilitated by procedures outlined in the NPS Servicewide Programmatic Agreement (PA), which contains an agreement between the NPS, the SHPO, and the ACHP. Under this Servicewide PA, a streamlined consultation process allows the NPS to approve actions that have no impact or no adverse impact on historic properties before formal consultation with the SHPO. The PA also speeds mitigation of impacts in cases where the SHPO and the NPS concur on a course of action, because this concurrence can eliminate consultations with the ACHP.

Antiquities Act and ARPA: An operator's conduct of operations must conform to the provisions of the Antiquities Act of 1906 (16 U.S.C. §431-433) and the Archaeological Resources Protection Act (16 U.S.C. §470aa); that is, operators conducting nonfederal oil and gas operations on surface estate owned by the United States may not injure, alter, destroy, or collect any object, structure, or site of historical, archaeological, or cultural value without written authorization issued by the NPS (36 CFR §9.47(a)).

Nonfederal oil and gas operators conducting operations under an approved Plan of Operations on federally-owned surface estate are excepted from the permit requirements of ARPA. This exception is based on the fact that such operations are exclusively for purposes other than excavation or removal of archeological resources. General earth-moving excavations conducted under an approved Plan of Operations are not construed to be "excavation or removal" of archeological resources (43 CFR §7.5(b)(1)). However, operators on federal lands engaged in operations without, or contrary to, an approved Plan of Operations, who remove, alter, or deface archeological resources, are in violation of ARPA and are subject to the criminal and civil penalties.

Note that operator's contractors performing cultural resource surveys must obtain an ARPA permit if such surveys involve collection of archeological resources. An operator must also obtain an ARPA permit prior to salvaging any previously unknown archeological resources discovered during operations. The NPS regional director will advise an operator how to obtain an ARPA permit.

Archeological Surveys for 3-D Seismic Operations: Due to the size of 3-D seismic operations, the NPS has developed the following approach for archeological survey that can identify, evaluate, and protect historic properties in compliance with the NHPA and other statutes and NPS policy and yet be feasible for the operators of large-scale seismic operations:

- Any activities that do not qualify as ground-disturbing (i.e., hand-held drilling of shot holes of 3-inch diameter or less, and non-rutting vehicles) will not require archeological survey.

- Wells and related facilities will not be allowed on any historic properties or within a distance that directly or indirectly impacts the integrity of such resources.

- Archeological survey (including shovel-testing) will be conducted ahead of any ground-disturbing activities. Ground-disturbance is defined as earth-moving (be it blading, rutting, etc.) below 2 inches of the present ground surface. Areas of ground disturbance typically include access roads, storage areas, heavy equipment parking areas, and other related use areas including disturbance resulting from removal of fill brought in to create roads or drill pads. Areas of disturbance should be restricted to an absolute minimum required for safe operation and construction of facilities.

  Particular care should be taken in areas where there is a high probability of archeological sites occurring. Based on current information, such areas would include: (1) the banks of natural channel cuts through the island; (2) between the west shore of the island (along the Laguna Madre) to the mid-island lakes/ponds; (3) within, and immediately behind, the foredunes along the eastern side of the island; and (4) within the vicinity of the former ranching complexes at Novillo, Green Hill, and Black Hill line camps, and the Mansfield Cut Archeological District. Most of the known prehistoric archeological sites occur within the foredunes and immediately behind them, while the late prehistoric sites occur between the ponds and Laguna Madre. The other two areas are where the known historic sites tend to occur.

When a cultural resource survey is required, the operator shall provide to the NPS the necessary cultural resources survey of the project area or area of effect. Such cultural resource surveys may include identification and evaluation of archeological sites, historic structures, cultural landscapes, and traditional cultural properties, and must be conducted by professionally qualified cultural resource experts who have knowledge of the specific resource type in question. The NPS will provide operators with available existing cultural resource information.

Operator surveys will result in a final report that allows the NPS to determine National Register eligibility and effect. All newly discovered archeological sites will be recorded both on State of Texas computerized site forms and NPS Archeological Sites Management Information System (ASMIS) forms. GPS locations (requested in NAD 83) and site location maps will also be required.

– Operators shall employ a qualified archeologist to monitor all ground-disturbing activities. Qualified archeologists are those who meet the Secretary of Interior Standards and Guidelines for Archeology and Historic Preservation.

Unanticipated Discovery: The NPS is responsible, under 36 CFR 800.11, for providing a plan of action to address properties discovered during implementation of an undertaking.

If any unknown cultural resource is discovered during the conduct of approved operations, and such resource might be altered or destroyed by the operations, the operator must immediately cease operations in the immediate area and notify the superintendent. The operator must leave the discovery intact until the superintendent grants permission to proceed with the operations (36 CFR §9.47(b)). Before any further activities occur, a qualified cultural resource expert will assess the cultural resources, evaluate their National Register eligibility, and consult with the state Historic Preservation Officer. Minor recordation, stabilization, or data recovery may be necessary during this action and will be conducted at the operator's expense. Until eligibility of the discovered historic properties can be determined, no further disturbance to the cultural resources may occur. Any plans for mitigating the negative impacts to historic properties will be subject to approval of the NPS, and it is the responsibility of the operator to provide for any necessary mitigation efforts.

Damage to Previously Identified Sites: This stipulation applies to situations where operations have damaged a previously identified cultural resource that was visible on the ground surface. If, in its operations, a nonfederal oil and gas operator damages, or is found to have damaged, any historic or prehistoric ruin, monument, or site, or any object of antiquity subject to the Antiquities Act of 1906 or the Archeological Resources Protection Act of 1979 (16 U.S.C. 470) and the National Historic Preservation Act, as amended, the operator will prepare and implement a data recovery plan at his/her expense. The operator will obtain at his/her expense, a qualified permitted archeologist to carry out the specific instruction of the NPS.

A qualified cultural resource monitor may be required during operations or reclamation activities if the work is in a particularly sensitive area and/or reclamation was not done immediately following operations. Additionally, the NPS may require an archeologist to inspect reroutes to determine if cultural sites were successfully avoided. If required, this information shall be included in a monitoring report submitted to the NPS, along with an assessment of the damage, if any, to the cultural resources that were to be avoided.

Employees of the operator and subcontractors shall be made aware that any collection of artifacts is punishable by law and that the company is liable under trespass regulations, the Antiquities Act, and the Archeological Resources Protection Act for fines and possible costs for any cultural resources damaged by vehicular traffic or collection.

Fire Management

Performance Standard: Fire is a powerful phenomenon, with the potential to drastically alter the vegetative cover of any park. All fires are classified as either prescribed fires or wildfires. Wildfires will be suppressed. (Management Policies, Chapter 4:14)

Operating Standards:

- The operator shall include in its Plan of Operations a Fire Management Plan, which the NPS will review.
- Accumulations of oil and other materials deemed to be fire hazards in the vicinity of well locations and storage tanks will be prevented and removed (36 CFR §9.41(f)).

Protection of Floodplain Values/Hurricane Preparedness

The occupancy and modification of floodplains will be avoided wherever possible. Where no practicable alternatives exist, mitigating measures will be implemented to minimize potential harm to life, property, and the natural values of floodplains. Management of floodplains is subject to the provisions of Executive Order 11988, "Floodplain Management" (42 U.S.C. 4321). (Management Policies, Chapter 4:16) The NPS Special Directive 93-4 (August 11, 1993), "Floodplain Management Guideline," provides requirements for implementing the floodplain protection and management actions under the executive order.

Performance Standard: Protect floodplain values; minimize potential harm to life, property, and the natural values of floodplains.

Operating Standards:

- Avoid siting oil and gas developments requiring surface occupancy in 100-year coastal flood areas, which includes washover channels.
- Confine brine water and all other waste and contaminating substances to the smallest practicable area, and prevent escape of such substances due to percolation, rain, high water, or other causes. Properly store and promptly remove all wastes and contaminating substances to prevent contamination, pollution, damage, and injury to unit resources and values. (36 CFR 9.45)
- Storage tanks shall be firmly secured to reduce risk of tank failure during high wind and water.

- Storage tanks shall be emptied and filled with water in preparation for hurricanes.

Emergency Preparedness Plan for Hurricanes: The primary objectives of the Emergency Preparedness Plan for Padre Island National Seashore are to protect and save human lives, and to protect property and keep physical losses at a minimum. The hurricane season begins June 1 and ends November 30 each year. The Emergency Preparedness Plan comprises a warning system consisting of three color alerts:

- *Green Alert* - When a storm builds to hurricane force (74 miles per hour) within 500 miles or 36 hours of Padre Island National Seashore or when a hurricane watch is issued for the coastal bend.

- *Yellow Alert* - When a storm is hurricane force within 300 miles or 24 hours of Padre Island National Seashore and the storm tract and speed indicates it will strike the coastal bend. A Red Alert will be set when a Hurricane Warning is established by the National Weather Service.

- *Red Alert* - When a storm is hurricane force within 300 miles or 24 hours of Padre Island National Seashore and the storm track and speed indicates it will strike the coastal bend. A Red Alert will be set when a Hurricane Warning is established by the National Weather Service.

Oil and gas operators will be bound by the Padre Island National Seashore Emergency Preparedness Plan. When a Yellow Alert is established, the operator will be contacted and advised as to the possibility of a shut-down of their operations and evaluation of all park staff and visitors.

Under Red Alert, the operator will be required to shut down its operation and prepare for hurricane conditions. The operator will be required to empty all above-ground tanks of products and fill the tanks with water in advance of the hurricane approaching, and remove or secure all loose equipment and/or supplies. As much as reasonably possible, the operator should remove contaminating and hazardous substances from the park.

High Pressure Precautions (36 CFR §9.43)

Operators conducting drilling operations subject to an approved Plan of Operations must take all necessary precautions to maintain control of wells at all times. This requirement is particularly important when exploratory drilling operations are conducted in areas where minimal or no data on subsurface formation pressures are available.

A proposed Plan of Operations for the drilling of an oil and gas well must specify that all equipment, methods, and materials to be used to ensure proper control of the well. Information that should be adequately addressed in a Plan of Operations for the conduct of a drilling operation include, but are not limited to:

- anticipated pressures to be encountered;

- manufacturer and type of blow-out preventers to be used (e.g., annular, blind ram, and pipe ram preventers);

- blow-out preventer activation system;

- pressure rating on each blow-out preventer;
- blow-out preventer inspection procedures;
- type of casing anchors to be used and method of securing anchors;
- casing cementing methods and materials, particularly surface casing (surface casing must be cemented through the entire length); and
- drilling fluid (mud) program, properties, constituents, and weights.

Protection of Human Health and Safety

The saving of human life will take precedence over all other management actions. The NPS and its concessionaires, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees. The NPS will work cooperatively with other federal, state, and local agencies, organizations, and individuals to carry out this responsibility. However, park visitors assume a certain degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments. (Management Policies, Chapter 8:5)

Proper siting of new operations and the application of Managed Access Provisions will aid nonfederal oil and gas operations in avoiding visitor use conflicts, protecting the health and safety of visitors, and protecting visitor use and enjoyment of park resources.

Performance Standard: Provide for maximum protection of human life.

Operating Standards:

- The operation site must be maintained in a safe and orderly condition (36 CFR §9.41(f)).
- Minimize conflicts with visitor use.
- Operations shall be restricted to specified times during a day, or during certain days in a week to minimize conflicts with visitor uses.
- For drilling operations that routinely operate continuously, operators may be required to hire qualified security personnel to monitor egress and ingress to the drill site.
- Noise mitigation is required for developments to avoid or minimize impacting nearby visitor use areas. Mitigation could include siting of equipment, and use of alternative equipment such as quiet design mufflers, acoustic covers, acoustically insulated buildings, and specifications for muffler discharge direction (See Natural Quiet).
- Acceptable fences for the protection of visitors and wildlife shall be constructed around, but not limited to, exploratory drilling locations, production wells, high pressure equipment, hazardous equipment, and storage tanks, unless otherwise authorized by the superintendent (36 CFR §9.41(e)).

- Design for fencing, and requirements for locks and other security measures shall be approved by the NPS prior to construction or implementation (see 36 CFR 9.41(e)).

- All hazardous areas in or near visitor use must be clearly marked with acceptable warning signs (36 CFR §9.41(e))

- Minimum altitude requirements for aircraft over the National Seashore, particularly over visitor use developments, will protect human heath and safety.

Surface operations may not be conducted within 500 feet of any structure or facility, excluding roads, used for unit interpretation, public recreation, or administration, unless specifically authorized by the regional director (see 36 CFR 9.41(a)).

Integrated Pest Management

Performance Standard: The choice to use a chemical pesticide will be based on a review by Regional and Washington Office coordinators of all other available options and a determination that these options are either not acceptable or not feasible. Chemical pesticides that are not specifically exempt from reporting (regardless of who the applicator is) will be used only with prior approval by the director on an annual basis. The application of such pesticides is subject to the federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), Department of the Interior policies and procedures (DM 517), the NPS Pesticide Use Guideline (draft), Environmental Protection Agency regulations in 40 CFR and Occupational Safety and Health Administration regulations (Management Policies, Chapter 4:14).

Operating Standard:

Selection and use of pesticide or herbicide shall be approved by the NPS prior to application.

Protection of Natural Quiet

The NPS will strive to preserve the natural quiet and the natural sounds associated with the physical and biological resources of the parks (for example, the sounds of waves breaking on the shore or the call of shore birds). Activities causing excessive or unnecessary unnatural sounds in and adjacent to parks, including low-elevation aircraft overflights, will be monitored, and action will be taken to prevent or minimize unnatural sounds that adversely affect park resources or values or visitors' enjoyment of them. In accordance with 36 CFR 2.12, the operation or motorized equipment or sound devices that create unreasonable audio disturbances will be prohibited. (Management Policies, Chapter 4:18).

Performance Standard: Preserve the natural quiet and the natural sounds associated with the physical and biological resources of Padre Island National Seashore.

Operating Standard: Oil and gas operations shall be planned to prevent or minimize unnatural sounds that adversely affect park resources or values or visitors' enjoyment of them.

Protection of Night Sky

Performance Standard: To minimize the intrusion of artificial light into the night scene in areas of the park with natural dark, in recognition that darkness and the night sky contribute in the overall visitor experience.

Operations Standard:

In natural areas, artificial outdoor lighting will be limited to basic safety requirements and will be shielded when possible. (Management Policies, Chapter 4:19).

Protection of Park Developments and Survey Monuments

Performance Standard: To avoid impacts to existing or future park structures, development, and survey markers.

Operating Standards:

- Surface operations may not be conducted within 500 feet of any structure or facility, excluding roads, used for unit interpretation, public recreation, or administration, unless specifically authorized by the regional director (36 CFR §9.41(a)).
- All NPS survey monuments, witness corners, reference monuments, and bearing trees shall be protected against damage, destruction, or obliteration (36 CFR §9.41(b)).

Plugging and Abandonment Operations Requirements

Performance Standard: To protect groundwater quality, and return operations sites to natural conditions.

Operating Standard:

- When plugging wells in National Park System units, operators must comply with both state and NPS regulations. The NPS uses the standards of the Department of the Interior's Onshore Oil and Gas Order Number 2, Section III. G., Drilling Abandonment Requirements, when prescribing plugging requirements. A copy is in Appendix I.

Reclamation and Revegetation Performance Standards

The regulations in 36 CFR §9.39 specify reclamation standards applicable to all nonfederal oil and gas operations conducted under a Plan of Operations in National Park System units.

All operators subject to the Plan of Operations requirement must initiate reclamation actions within the time specified in an approved Plan of Operations, regardless of surface ownership. Reclamation actions must begin as soon as possible, and no later than 6 months following completion of operations, unless a longer period of time is authorized by the regional director (36 CFR §9.39(a)).

All proposed Plans of Operations submitted by operators must adequately describe specific actions that will be taken to achieve compliance with the applicable reclamation requirements (36 CFR §9.39(a)(12)).

A proposed Plan of Operations must state when reclamation of the disturbed area will begin, and anticipated time required to complete reclamation. Although a specific date may be difficult to predict, the Plan of Operations must state that reclamation actions will be initiated within a specified amount of time following completion of the proposed operation.

The reclamation section of a proposed Plan of Operations must also present a detailed breakdown of the estimated costs that the operator will incur to properly reclaim all disturbed lands or waters (36 CFR §9.36(a)(13)). Itemized cost estimates must be provided for all materials, equipment, supplies, and personnel necessary to complete all specified reclamation actions. The projected cost to complete all reclamation tasks is the basis for the regional director's determination of the appropriate performance bond amount.

Reclamation Standards: Federally Owned or Controlled Surface Estate

Operators must take the following actions, at a minimum, to reclaim all federally-owned or controlled surface estate disturbed during the conduct of nonfederal oil and gas operations (36 CFR §9.39(a)(2)):

- All aboveground structures, equipment, and roads used for operations must be removed from the unit (unless such structures, equipment, or roads are the subject of another approved Plan of Operations of a plan submitted for approval, or unless otherwise authorized by the regional director consistent with unit purposes and management objectives as defined in the unit's General Management Plan or Development Concept Plan).

- Man-made debris must be removed from the unit.

- All contaminating substances must be removed from the unit (or neutralized if technologically possible).

- All nonproductive wells must be properly plugged.

- Topographic contour of the operations area must be restored to reasonably conform to the contour that existed prior to the operations.

- Natural topsoil must be replaced to promote the restoration of vegetation.

- Native vegetation communities must be reestablished on all sites disturbed by the operations.

These actions are based upon the requirement that natural conditions and processes be restored on federally-owned or controlled surface estate (36 CFR §9.39(a)(2)). ***Restoration of natural conditions and processes*** means that the reclaimed area must be returned to conditions and processes representing the ecological zone in which the operation lies.

Natural processes for a given area are dynamic, representing a series of successional stages over time. Therefore, restoration of natural conditions and processes may not always demand that a disturbed area be reclaimed to the exact vegetation conditions that existed prior to disturbance.

However, reclamation must stabilize a disturbed site through re-establishment of a specific vegetative successional stage that will promote development of conditions that existed prior to disturbance.

Reclamation could thus provide for natural invasion of woody species through successional stages following establishment of natural herbaceous species. Reclamation that converts the disturbed area to some other use, or establishes an ecological zone that did not previously exist, or would not exist, is unsuccessful reclamation under the regulations precisely because the reclamation has not restored natural conditions and processes.

The regulations at 36 CFR §9.39(b) stipulate that reclamation of federally-owned or controlled surface estate must also provide for:

- safe movement of native wildlife,

- re-establishment of native vegetative communities (Refer to 1988 NPS Management Policies, Chapter 4:8, for detailed guidance on vegetation management),

- re-establishment of normal surface water flows,

- re-establishment of reasonable subsurface water flow, and

- public health and safety.

- The operator must notify the superintendent, Padre Island National Seashore, or his/her designated representative, the date that reclamation operations commence and are completed.

- All surface areas disturbed during drilling activities and not needed for production activities will be recontoured to natural grade and reseeded with natural seed material. For optimum results, seeding should be conducted prior to the first spring or fall rainfall periods after the location is abandoned. For producing locations, imported fill material will be removed from all surface areas disturbed during production activities; the area will be contoured and reseeded after the surface is reclaimed, which should take place within the first 6 months after drilling is completed.

- If, upon abandonment of wells, the retention of access road is not considered necessary for the management of Padre Island National Seashore, fill material will be removed (99.9 percent) and replaced with native Mustang/Galveston sand for contouring to its previous natural contours. The area will be mulched with native seed material.

- Native seed mix for use in revegetating operations sites at Padre Island are not generally available from commercial sources. The operator is encouraged to work with Padre Island National Seashore to locate suitable road corridors to mow and bale seed and mulch for subsequent reclamation/revegetation requirements. With proper timing of proposed operations, before clearing or developing the site, mowing and baling should be done to collect native seed.

- Revegetation shall be deemed successful when 70 percent of the pre-impact plant cover density and diversity is attained.

- If, in the opinion of the NPS, the seeding is unsuccessful, the operator may be required to make subsequent seedings.

Protection of Soil Resources

The NPS will actively seek to understand and preserve the soil resources of parks and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. (Management Policies, Chapter 4:20).

Performance Standard: Preserve soil resources to minimize unnatural erosion, physical removal, or contamination.

Operating Standards:

- Control erosion.

- Use of herbicides and pesticides requires NPS approval (see Integrated Pest Management).

- Ground-disturbing activities will be timed and type of equipment selected to prevent or minimize rutting of soils.

- All ground disturbance, such as rutting caused by offroad equipment, greater than 1 inch, will be repaired to prior elevation and contours, and revegetated according to NPS reclamation recommendations.

- Compaction of wind-tidal flat soils will be avoided, and where avoidance is unavoidable, will be minimized and reclaimed.

- Proper siting of oil and gas operations will avoid impacting dune elevations and wetlands.

- Imported material will be used to construct drilling pads, access roads, and berms around production operations. Therefore, no surface soil material will be stripped and stockpiled for future reclamation. Imported material will be removed when the operations site is reclaimed, to return the surface to grade.

- Restrict sources for sand fill material to areas outside the park, preferably Padre Island and Mustang Island.

- The operator shall avoid any operations requiring offroad vehicle access when the ground is muddy and/or wet in order to minimize rutting. The superintendent may prohibit exploration, drilling, or other activities during periods of precipitation.

- A berm, to contain 1.5 times largest tank capacity, will be constructed around the perimeter of the production tank battery with imported suitable fill material. The berm/liner shall provide temporary containment of spills and fires and prevent the downward movement of fluids through the soil to the groundwater.

- Drilling operations shall provide for protection of soils by utilizing a liner system beneath the drilling rig and associated equipment that will direct spilled materials, including fuels and lubricants, rig wash, and contaminated rainwater, to a collection point for recycling or disposal.

- For exploratory drilling operations and workovers, drilling muds will be circulated within a closed-loop containment system.

- Secondary containment systems will be utilized to prevent the introduction of hazardous and contaminating substances to soils.

Secondary containment systems shall be used. These include drip pans, 55-gallon drum "coffin" containment systems, etc.

Protection of Threatened and Endangered Wildlife

Consistent with the purposes of the Endangered Species Act (16 U.S.C. 1531 et seq.), the National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats. . . . Active management programs will be conducted as necessary to perpetuate the natural distribution and abundance of threatened or endangered species and the ecosystems on which they depend. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service are the lead agencies in matters pertaining to federally listed threatened and endangered species. The National Park Service will cooperate with those agencies in activities such as the delineation of critical habitat and recovery zones on park lands, and will participate on recovery teams. The National Park Service also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats. These species and their critical habitats will be considered in NPS planning activities. The National Park Service will cooperate with the agencies responsible for state or locally listed species. (Management Policies, Chapter 4:11).

Performance Standard: Ensure the continued existence of federal- and state-listed threatened and endangered species.

The Endangered Species Act of 1973 and National Park Service Organic Act direct the National Park Service to protect and preserve wildlife habitat. Section 7 of the ESA and regulations in 50 CFR Parts 17 and 402 specifically require all federal agencies to use their authorities in furtherance of ESA to carry out programs for the conservation of listed species, and to ensure that any agency action will not jeopardize the continued existence of a listed species or adversely modify critical habitat.

The NPS cooperates with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, the lead agencies in matters pertaining to federally listed threatened and endangered animals. The NPS also cooperates with the Texas Parks and Wildlife Department, responsible for state-listed species, on a project-specific basis, to evaluate potential impacts to state-listed species and determine appropriate mitigation measures.

The NPS shall identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats. These species and their critical habitats will be considered in NPS permitting of nonfederal oil and gas operations. Based on an analysis of the status of state and locally listed species throughout their native ranges and through the National Park System, the NPS may choose to control access to critical habitats or to conduct active management programs similar to activities conducted to perpetuate the natural distribution and abundance of federally listed species.

Operating Standards:

- Operators shall include in proposed Plans of Operations a biological survey of the proposed project area, performed by a qualified biologist.

- All proposed Plans of Operations will be evaluated for potential impacts to special-status species. If the evaluation indicates a "may affect" situation (includes both beneficial and adverse impacts) on a federally listed or proposed species, and the adverse impacts cannot be eliminated, a Section 7 consultation or conference with the U.S. Fish and Wildlife Service (FWS) and/or National Marine Fisheries Service must be conducted. The NPS does not have the authority to make a "no affect" finding if a "may affect" situation exists.

- In the event that formal consultation is initiated with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service on a federally listed species in accordance with Section 7(d) of the ESA, the NPS cannot make any irreversible or irretrievable commitment of resources that would preclude the formulation and execution of reasonable alternatives to resolve the conflict. The NPS will consult with the Texas Parks and Wildlife Department when adverse impacts to state-listed species are anticipated.

- The results of NPS consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department will be integrated into the NPS decisionmaking process at the conclusion of public and agency review of a proposed Plan of Operations and Environmental Assessment.

- After initiation of formal consultation on a federally listed species, the NPS cannot, in accordance with Section 7(d) of the ESA, make any irreversible or irretrievable commitment of resources that would preclude the formulation and execution of reasonable alternatives to resolve the conflict. In general, it is the NPS's responsibility to manage all programs for the conservation of endangered species to the extent that a jeopardy opinion need never be issued by the FWS. The NPS consults with the Texas Parks and Wildlife Department when adverse impacts to state-listed species are anticipated.

- All open-vent exhaust stacks on production vessels designed to heat the product using an open flame (as opposed to electrically heated) shall be constructed, modified, and/or otherwise equipped and maintained to prevent birds and bats from entering, and to discourage perching and nesting. Such production vessels include, but may not be limited to, heater-treaters, separators, dehydrators, and in-line units. This requirement does not apply to compression-type equipment.

- All open topped (non-earthen) tanks will be effectively netted or otherwise covered and maintained so as to minimize the likelihood of accidental deaths of migratory birds. This netting or cover shall be installed no later than four (4) days after the setting of the production casing string or completion of plugging as a dry hole. All tanks installed for production purposes will be immediately netted or covered. All tanks shall remain netted or covered until such time as they are removed from the location. The granting of a four (4) day interim period for completion of covering or netting tanks associated with the drilling process in no way limits the operator's responsibility should migratory birds be found dead in the tanks within the interim period or during the actual drilling phase.

A list of federal- and state-listed species that are known to occur in the park is shown on Table 1.1. The seasons in which these species use specified habitats are described in the accompanying text, and Table 1.2 provides General Dates and Locations of Turtle Nesting, Tracks, and Hatchling Strandings. The NPS will comply with the Endangered Species Act to avoid adverse impacts to these species and their habitats. Where adverse impacts from proposed oil and gas operations cannot be eliminated, the NPS will undertake consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service pursuant to Section 7 of the ESA. Depending on consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department, proposed Plans of Operations requesting approval for access or surface uses associated with nonfederal oil and gas operations may be modified to avoid impacts to species or their habitats.

Protection of Vegetation

The National Park Service will strive to restore native species to parks. To the maximum extent possible, plantings in all zones will consist of species that are native to the park. Only native species will be allowed in natural zones. (Management Policies, Chapter 4:8).

Performance Standard: Preserve natural vegetative communities.

Operating Standards:

- Use existing access roads and the use of construction equipment and/or techniques designed to minimize vegetative disturbance.
- Shotholes shall not be drilled within 500 feet of the two relict oak mottes.
- Surface soil shall be used to re-plug the hole.
- Any rutting caused by the offroad equipment, greater than 1 inch, shall be contoured, filled, and revegetated according to NPS reclamation recommendations.
- Drill cuttings matching soil surrounding the shothole may be used to replug the hole and fill in any rutting.
- Minimize loss of vegetation by proper road and drilling pad design/siting.
- Avoid uprooting of vegetation during seismic operations.
- Driving off established routes is prohibited.
- Cut and store vegetation prior to ground-disturbing activities for use in later mulching and collection of native seed for reclamation/revegetation.
- Minimize vegetative clearing.
- Control the introduction of exotic species.

- Seismic operations shall employ a one-way method allowing multiple passes along the same route in order to minimize cumulative impacts.

Protection of Visual Quality

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 (GMP, p. 5).

Performance Standard: Protect the visual quality of the park.

Operating Standards:

- Protect the visual quality of the park by avoiding permanent structures that can be seen from locations that are commonly utilized by the public. Where this is not practicable, utilize technically feasible methods to minimize the visual impact on the natural and historic scene.

- Exploratory wells and production operations proposed to bottomhole locations in the Gulf of Mexico will be offset 2 statute miles from the shoreline, during September 15 through March 15; and 3 miles offshore from the 2-fathom line during March 15 through September 15, or directionally drilled from behind the high dune line, so as to minimize visual impacts to Gulf beach visitors.

- Production facilities located on the island will be designed to minimize the visual intrusion on the natural scenery, utilizing equipment that will conform compatibly with the island topography and painted to blend with the surrounding environment.

- Paint permanent oil and gas facilities a color that blends with the surrounding environment. Selection of paint color shall be approved by the NPS before being used.

- Utilize low-profile structures for all permanent production facilities located within 3 miles of the Gulf shoreline.

Protection of Water Resources

The National Park Service will seek to perpetuate surface and ground waters as integral components of park aquatic and terrestrial ecosystems. Park waters, either surface waters or ground waters, will be withdrawn for consumptive use only where such withdrawal is absolutely necessary for the use and management of the park, and when studies shown that it will not significantly alter natural processes and ecosystems. The National Park Service will seek to restore, maintain, or enhance the quality of all surface and ground waters within the parks consistent with the Clean Water Act (33 U.S.C. 1251, et seq.) and other applicable federal, state, and local laws and regulations. (Management Policies, Chapter 4:16).

The Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977, is the basic authority for in-stream water quality standards and maximum permissible pollutant discharges. The Safe Drinking Water Act of 1974 authorizes domestic water quality standards.

Performance Standard:

Maintain existing conditions for surface and ground water resources (includes quality, quantity, and circulation).

Operating Standards to avoid or minimize impacts to water quality:

- Surface operations may not be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses, unless specifically authorized by the regional director (36 CFR §9.41(a)).
- Surface operations may not be conducted within 500 feet of the high-pool shoreline of any natural or man-made impoundment, unless specifically authorized by the regional director (36 CFR §9.41(a)).
- Surface operations may not be conducted within 500 feet of the mean high tide-line, unless specifically authorized by the regional director (36 CFR §9.41(a)).
- No earthen pits will be permitted.
- Ensure proper hydrologic circulation of surface waters by installing bridges, culverts, low-water crossings, reducing rutting, etc.
- Use of herbicides and pesticides will require NPS approval (see Integrated Pest Management).
- Use secondary containment such as drip pans, impermeable liners, berms, etc.
- Ensure rapid spill response and removal.
- Properly site and design operations.
- Use approved wastewater systems.
- Dispose of stormwater in accordance with federal and state law.
- Ensure proper saltwater injection and disposal.
- For drilling operations, drilling pad shall be sloped towards the drilling cellar to capture any spilled hazardous or contaminating substances.
- Vacuum accumulations of any spilled hazardous and contaminating substances from the well cellar and drilling area for disposal in a state-approved disposal facility.
- Monitor surface water if sub-surface water is removed.
- Collection and laboratory analyses of soil and/or ground water samples before and after well drilling or production (or a change of ownership or leasing rights) shall follow the NPS's "Guideline for the Detection and Quantification of Contamination at Oil and Gas Operations" contained in Appendix H.

Operating Standards to protect water quantity:

- Use of water from a point of diversion in any National Park System unit for the conduct of nonfederal oil and gas operations subject to the Plan of Operations requirement is not allowed, except as authorized by the regional director in an approved Plan of Operations (36 CFR §9.35). A ***point of diversion*** is a partial or total alteration of a surface water course or subsurface aquifer away from the natural course.

The regional director can authorize the use of water from a point of diversion in a unit for the conduct of nonfederal oil and gas operations only if the operator:

- holds a superior claim to the water than held by the United States; or

- holds a subordinate claim to the water than held by the United states, and the operator can conclusively show that removal of the requested water will not damage unit resources and values.

In either case, operators proposing to use water from a point of diversion must comply with appropriate state water laws. An operator's proposed Plan of Operations must adequately address all legal and environmental issues associated with water diversion and use if the conduct of operations will require diverting water in a unit.

Optional water supply sources may include drilling of water wells and tanking.

Protection of Wetlands

Performance Standard: The occupancy and modification of wetlands will be avoided wherever possible. Where no practicable alternatives exist, mitigating measures will be implemented to minimize potential harm to natural values of wetlands.

Management of wetlands is subject to the provisions of Executive Order 11990, "Protection of Wetlands" (42 U.S.C. 4321); the Rivers and Harbors Act (33 U.S.C. 401,et seq.); and Section 404 of the Clean Water Act (33 U.S.C. 1344). (Management Policies, Chapter 4:16).

Director's Order 77.1 and Procedural Manual 77.1 (Wetlands Protection) establish policies, requirements, and standards for protection of NPS wetlands.

Operating Standards:

- Where wetlands resources may potentially be directly or indirectly impacted, oil and gas operators are required to perform and submit wetlands delineation surveys in the Plan of Operations. The wetlands delineation should cover the project area if wetlands are present, and adjacent lands if wetlands are adjacent to the proposed operations site for the purpose of identifying potential direct and indirect wetlands impacts. The wetlands delineation shall be approved by the U.S. Army Corps of Engineers and by the Water Resources Division of the NPS in conjunction with the statement of Findings.

- NPS mitigation requirements for direct and indirect adverse impacts to wetlands requires a minimum compensation 1:1. In some situations, a higher ratio for compensation may be required. Final compensation ratios may need to be greater than 1:1 in cases where:

(1) the functional values of the site being impacted are determined to be high and the restored wetlands will be of lower functional value; (2) it will take a number of years for the restored site to become fully functional; (3) the likelihood of full restoration success is unclear. If the adverse impact on wetlands (direct plus indirect impacts) from the entire project totals less than 0.1 acres, then wetlands compensation is strongly encouraged, but may be waived if the loss of wetlands functions is considered to be minimal.

– The compensation site shall be located in the park. Compensation shall be performed prior to or at the time impacts associated with proposed nonfederal oil and gas operations are anticipated to occur. On completion of operations that have impacted wetlands (directly and/or indirectly), restoration of the site shall be conducted to return the impacted wetlands to their pre-impact condition.

– Areas within Padre Island National Seashore that will be restored in connection with compensation for potential impacts associated with new surface uses, in priority order, are:

1. poorly restored abandoned oil access roads and drilling locations near Yarborough Pass;

2. wetland restoration in areas that were adversely affected from past actions, such as vehicular impacts in the mud flats and surface water circulation at Bird Island Basin;

3. in situations when potential wetlands impacts from proposed nonfederal oil and gas operations would result in wetlands compensation ratios greater than 1:1, operators would be required to perform the initial 1:1 compensation by restoring disturbed wetlands areas described in items 1 and 2 above; however, operators would then have two options to perform the remaining wetlands compensation ratio:

   a. perform the remaining compensation ratio by restoring the disturbed wetlands areas described in items 1 and 2 above; or,

   b. perform a commensurate portion of an "in-lieu" project by constructing segments of educational and interpretive elevated boardwalks to be located across from the Malaquite Visitor Center, at Novillo Line Camp, or other sites designated by the superintendent. These wetlands projects shall be planned and designed by Padre Island National Seashore, and all environmental compliance performed by the NPS. A commensurate portion would be based on the costs for the initial 1:1 compensation described above.

4. When the minimum 1:1 wetlands compensation ratio can not be performed in Padre Island because no remaining impacted wetlands areas remain to be restored, operators shall be required by the NPS to perform the minimum 1:1 wetlands compensation ratio in another NPS unit.

Protection of Wildlife Biodiversity

Performance Standard: Minimize human impacts on wildlife populations.

-Protection of Native Animals Performance Standard: To perpetuate the native animal life as part of the natural ecosystems of parks. Emphasis will be on minimizing human impacts on natural animal population dynamics. The native animal life is defined as all animal species that as a result of natural processes occur or occurred on lands now designated as a park. Native animal populations will be protected against harvest, removal, destruction, harassment, or harm through human action. (Management Policies, Chapter 4:5).

-Management of Migratory Animals Performance Standard: Padre Island National Seashore has several native migratory species (marine turtles, geese, peregrine falcons, piping plover, to name a few). The NPS will ensure the preservation of their populations and their habitats inside the park and will cooperate wherever possible with others to ensure the preservation of their populations and habitats outside the park. (Management Policies, Chapter 4:7).

Many species of vertebrates and invertebrates regularly travel from one location to another at yearly or other intervals. Such species have at least two significant habitat areas, and those that spend time enroute may have three or more. Where those species occur in a park, park habitats provide only one of the major habitat needs, and the survival of the species in the park is also dependent on the existence and quality of habitats outside the park.

Operating Standards:

- Operators shall include in proposed Plans of Operations a biological survey of the proposed project area, performed by a qualified biologist.

- Operations shall abide by speed limits on access routes, particularly at night, to reduce the potential for collisions with wildlife.

- Worker shift changes could occur during daylight hours to the maximum extent possible to reduce traffic during night hours.

- Nets shall be placed over open water tanks and secondary containment where stormwater could collect.

- Acceptable fences for the protection of visitors and wildlife shall be constructed around, but not limited to, exploratory drilling locations, production wells, high pressure equipment, hazardous equipment, and storage tanks, unless otherwise authorized by the superintendent (36 CFR §9.41(e)).

- Restricted access to rookery islands will protect wildlife using the islands.

- Operators are not allowed to carry firearms.

- No hunting is permitted.

- Utilize proper waste disposal.

- Minimum altitude requirements for aircraft flight over the National Seashore, particularly over the rookery islands, the Gulf of Mexico shoreline, and over wind-tidal flats, during specified times of the year when shorebirds, including T/E species, are using these areas for nesting, feeding and resting, will protect wildlife

Liability for Damage to Park Resources

Under the Park System Resource Protection Act (16 U.S.C. §19jj as amended), "any person who destroys, causes the loss of, or injures any park system resource is liable to the United States for response costs and damages resulting from such destruction, loss, or injury." Park system resource means "any living or non-living resource that is located within the boundaries of a unit of the National Park System, except for resources owned by a non-federal entity." At Padre Island, with the exception of non-federal oil and gas rights, the federal government owns all the resources in the park. This includes both surface and subsurface resources.

The noted Act provides comprehensive definitions for both response costs and damages.

Response costs "means the costs of actions taken by the Secretary of the Interior to prevent or minimize destruction or loss of or injury to park system resources; or to abate or minimize the imminent risk of such destruction, loss, or injury; or to monitor ongoing effects of incidents causing such destruction, loss or injury."

Damages "includes the following:

1. Compensation for -

   A(i). the cost of replacing, restoring, or acquiring the equivalent of a park system resource; and

   A(ii). the value of any significant loss of use of a park system resource pending its restoration or replacement or the acquisition of an equivalent resource; or

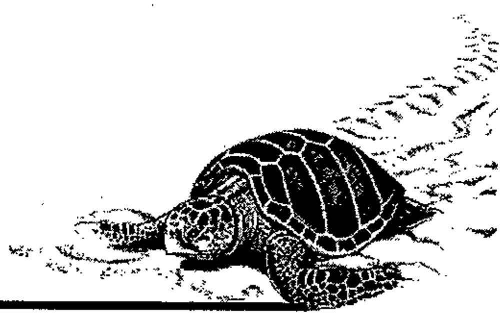
   B. the value of the park system resource in the event the resource cannot be replaced or restored.

2. The cost of damage assessments under" the Act.

The above provisions embody a very broad articulation of the scope of liability that attaches to private activities in parks. In addition, under §19jj-1(d), Congress makes clear that the provisions of the Act are "in addition to any other liability which may arise under federal or state law." With respect to nonfederal oil and gas activities in parks in general and Padre Island in particular, an operator's liability for damages to park resources may easily exceed the amount of the bonds set under 36 CFR §9.48(d) [see discussion earlier in this chapter on "Bond Requirement"]. Under 16 U.S.C. §19jj, the NPS can recover the costs associated with such damages.

CHAPTER 3

AFFECTED ENVIRONMENT



CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

The purpose of this chapter is to describe the existing condition of the environment that may be affected by the implementation of any of the alternatives. The information presented in this chapter serves as the "baseline" by which to measure the potential effects of the alternatives discussed in Chapter 4 (Environmental Consequences) identified through the scoping process and interdisciplinary field analysis. The resources and issues in this chapter and Chapter 4 are those that were considered significant to the park or as possibly having significant impacts. These topics are:

- Oil and Gas Exploration and Development
- Soil and Water Resources
- Wetlands
- Cultural Resources
- Visitor Experience
- Sensitive Resource Areas (SRAs)

The other resources or issues that were considered and evaluated, but not carried forward for more detailed analysis, are described in the last portion of Chapter 1.

Description of resources in this chapter also provides a basis for the mitigation measures described in the proposed action and alternatives, and Managed Access Provisions, which are common to all alternatives described in Chapter 2.

OVERVIEW OF PADRE ISLAND NATIONAL SEASHORE

Padre Island National Seashore was established by Congress on September 28, 1962 (16 U.S.C. §459d *et seq.*):

> "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. . . ."

Padre Island National Seashore encompasses 68 miles of the 113-mile long barrier island located in the Coastal Bend region of South Texas, within Kleberg, Kenedy, and Willacy Counties. It contains 133,918 acres.

Padre Island is separated from the mainland by Laguna Madre, a shallow body of hyper-saline 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 forms the southern boundary of the park.

Padre Island National Seashore preserves the longest undeveloped barrier island in the United States. It is a dynamic ecosystem with significant resources. From the Gulf to the lagoon, a width that varies along the island from 1/2 to 3 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 18 federal and state-listed threatened and endangered species of birds, sea turtles, and marine mammals.

Figure 3.1 is a cross-sectional diagram that depicts the varying topography of Padre Island. The majority of the park is less than 20 feet above mean sea level, and the highest points are approximately 50 feet above sea level. Table 3.1 summarizes the landcover classification types on Padre Island, while Figures 3.2, 3.3, and 3.4, provide a Landcover Classes map of the island.

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, in August 1980, beaches were eroded, dunes were breached, overwash passes were cut, and property was 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.

Padre Island remains a relatively natural landscape. The island's visual resources serve as an amenity for the region's residents and many visitors. Extensive panoramas and vistas may be viewed from higher elevations, such as ridges, foredunes, and especially the view tower at Malaquite Beach. 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 horizontal nature.

Cultural resource surveys have recorded 42 sites on Padre Island, 20 of which are within the boundaries of the national seashore. 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. Three historic archeological sites within the park boundary are associated with at least three Spanish colonial shipwrecks that occurred in 1554. These sites comprise the Mansfield Cut underwater archeological district, which is listed on the National Register of Historic Places. One associated site is located onshore and could be the survivors' and/or salvagers' camp related to the 1554 wrecks. 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 most intact remaining structural expression of open-range ranching on the island, is listed in the National Register of Historic Places.

Figure 3.1. Cross-Section of Environments of North Padre Island. (After Weise and White, 1980.)

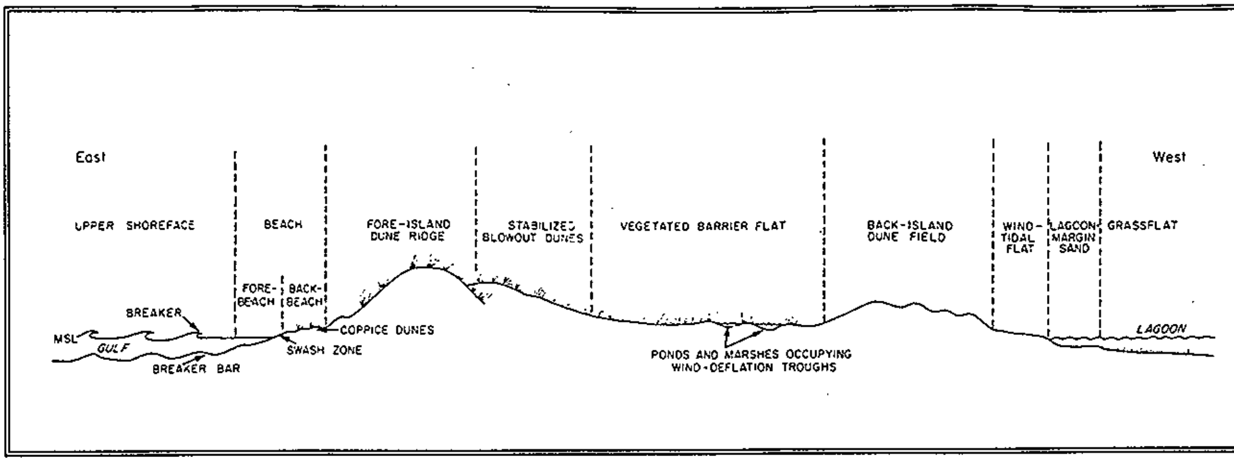
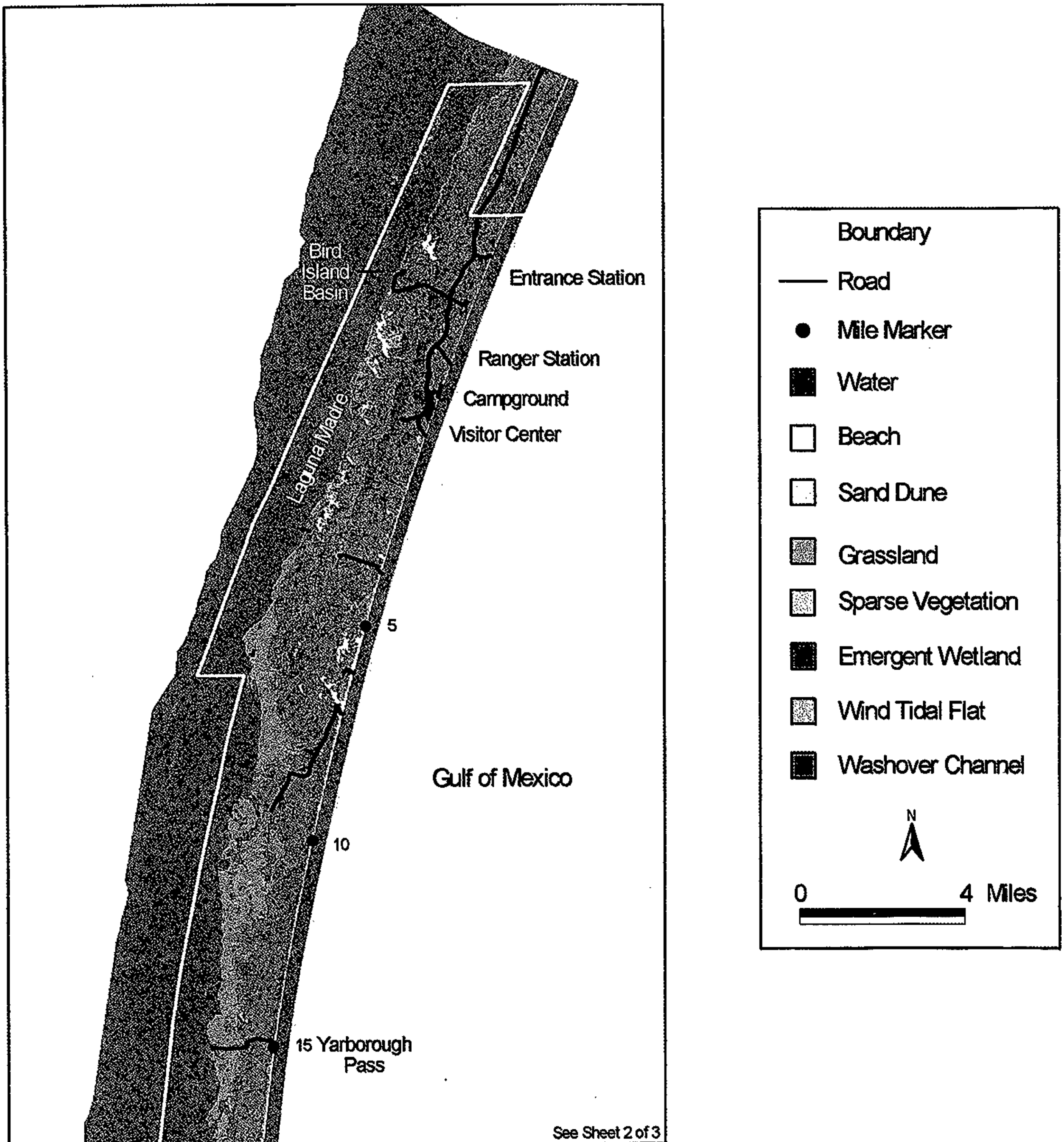


Table 3.1. Landcover Classification Type in Acres and Percent of Park

LAND CLASSIFICATION TYPE	ACRES	% PARK
Inland Waters (ephemeral and permanent freshwater ponds)	2,437	1.8%
Laguna Madre	31,310	23.4%
Gulf of Mexico	13,178	9.8%
Wind-Tidal Flats	29,127	21.7%
Sparse Vegetation	6,093	4.6%
Emergent Vegetation	19,806	14.8%
Grassland	13,807	10.3%
Beach/Sand	3,335	2.5%
Urban (park development)	442	0.3%
Dunes (foredunes and back island dunes)	6,241	4.7%
Unconsolidated Shore	6,736	5.0%
Washover Channels	1,192	0.9%
Rookery Islands	214	0.2%
Total	133,918	100.00%

Padre Island National Seashore
Landcover Classes

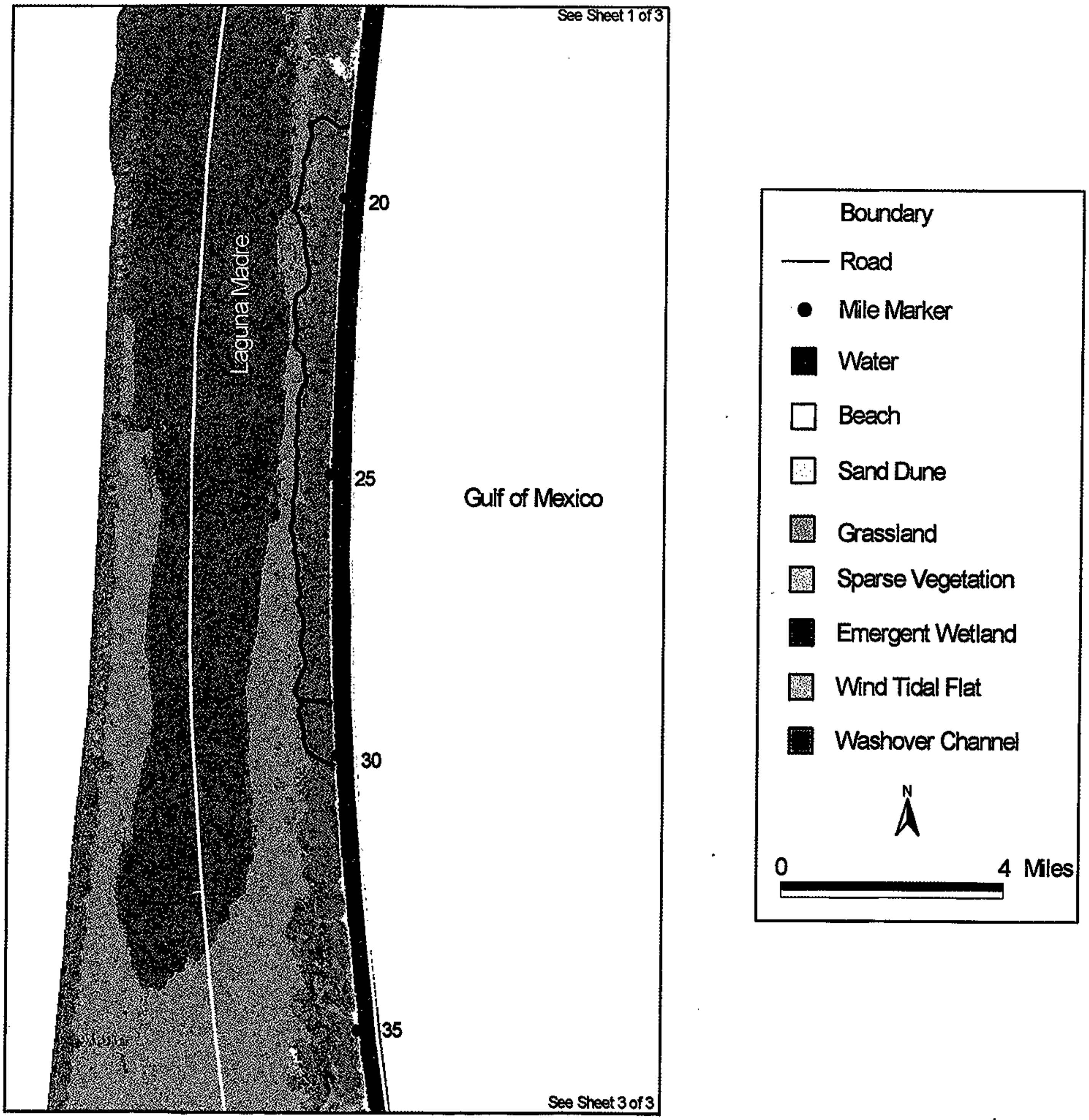


NS-PAIS	613-60006
Jan 1999	PAIS

Figure 3.2
Sheet 1 of 3

ON MICROFILM

Padre Island National Seashore
Landcover Classes



NS-PAIS	613-60007
Jan 1999	PAIS

Figure 3.3
Sheet 2 of 3

ON MICROFILM

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283

Padre Island National Seashore
Landcover Classes

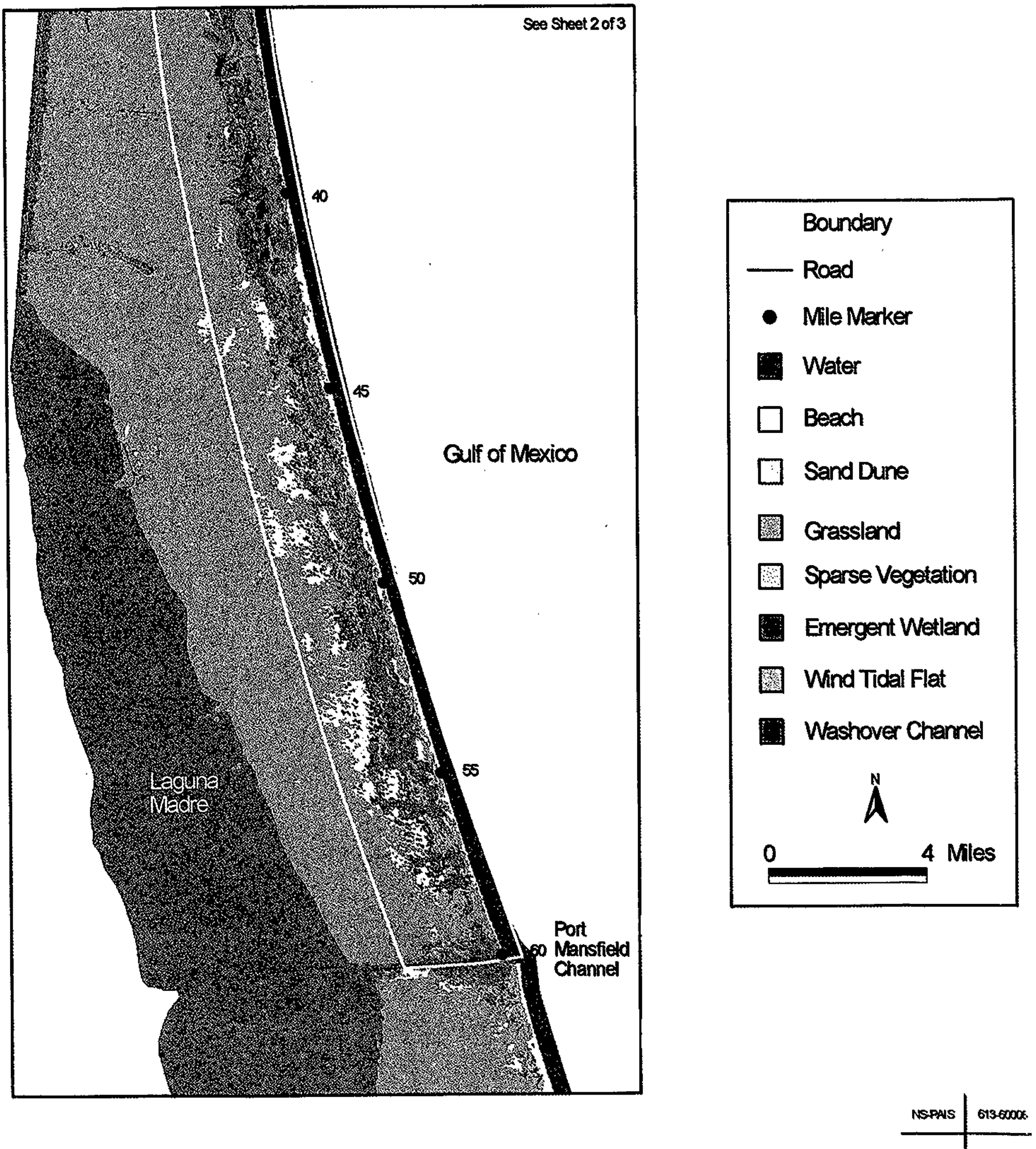

Figure 3.4
Sheet 3 of 3

ON MICROFILM

With the longest stretch of undeveloped ocean beaches in the United States, Padre Island is a major regional recreation destination. It offers visitor developments within 5 miles of the entrance, and 56 miles of undeveloped beach stretching to the south. The national seashore provides a rare opportunity for primitive beach recreation, natural history study, and contemplation of past and present uses of the coastline. Visitor use is concentrated on the broad Gulf beaches, where beach driving and beachcombing, shelling, birdwatching, swimming, wading, sunbathing, fishing, camping, picnicking, and strolling are popular activities. Beach use is densest near the Malaquite Visitor Center and campground. The visitor center provides a visitor interpretive center, showers, restrooms, and limited food services, making Malaquite an attractive beach destination. Many other visitors, however, seek a more solitary experience by driving down the beach, relying on their own 4WD vehicles for support. The lagoon is another destination for visitors. At Bird Island Basin and Yarborough Pass, there are minor facilities to support boating, sailboarding, fishing, wading, bird-watching and nature study, and camping.

NONFEDERAL OIL AND GAS EXPLORATION AND DEVELOPMENT

All subsurface mineral interests underlying the park are retained by private owners and comprise approximately 89,430 acres; and those underlying the submerged lands under the Laguna Madre and Gulf of Mexico are retained by the State of Texas and comprise approximately 44,488 acres. Lease of state-owned oil and gas is administered by the General Land Office.

Oil and gas exploration and production have been actively pursued on Padre Island since the early 1950's. A total of 71 operations have occurred within the current boundaries of the park since Sun Oil drilled the first well on March 23, 1951. It was a dry hole. Since that time, 58 additional oil and gas wells were drilled, six 2-D seismic operations conducted, and 6 pipelines constructed. The majority of operations took place during the period 1951 through 1981. Currently, there are five natural gas wells and one saltwater disposal well occurring in the park. A sixth natural gas well is located in the Gulf of Mexico, outside the park, and ties into a production facility in the park. Four of the natural gas wells are shut in, pending workover or plugging and abandonment. Direct surface disturbances associated with oil and gas operations affect approximately 411 acres.

Figure 3.5 is a map of Oil and Gas Development. Table 3.2 lists the oil and gas wells that have been drilled within or adjacent to the boundary of Padre Island National Seashore.

Padre Island National Seashore
Oil and Gas Development

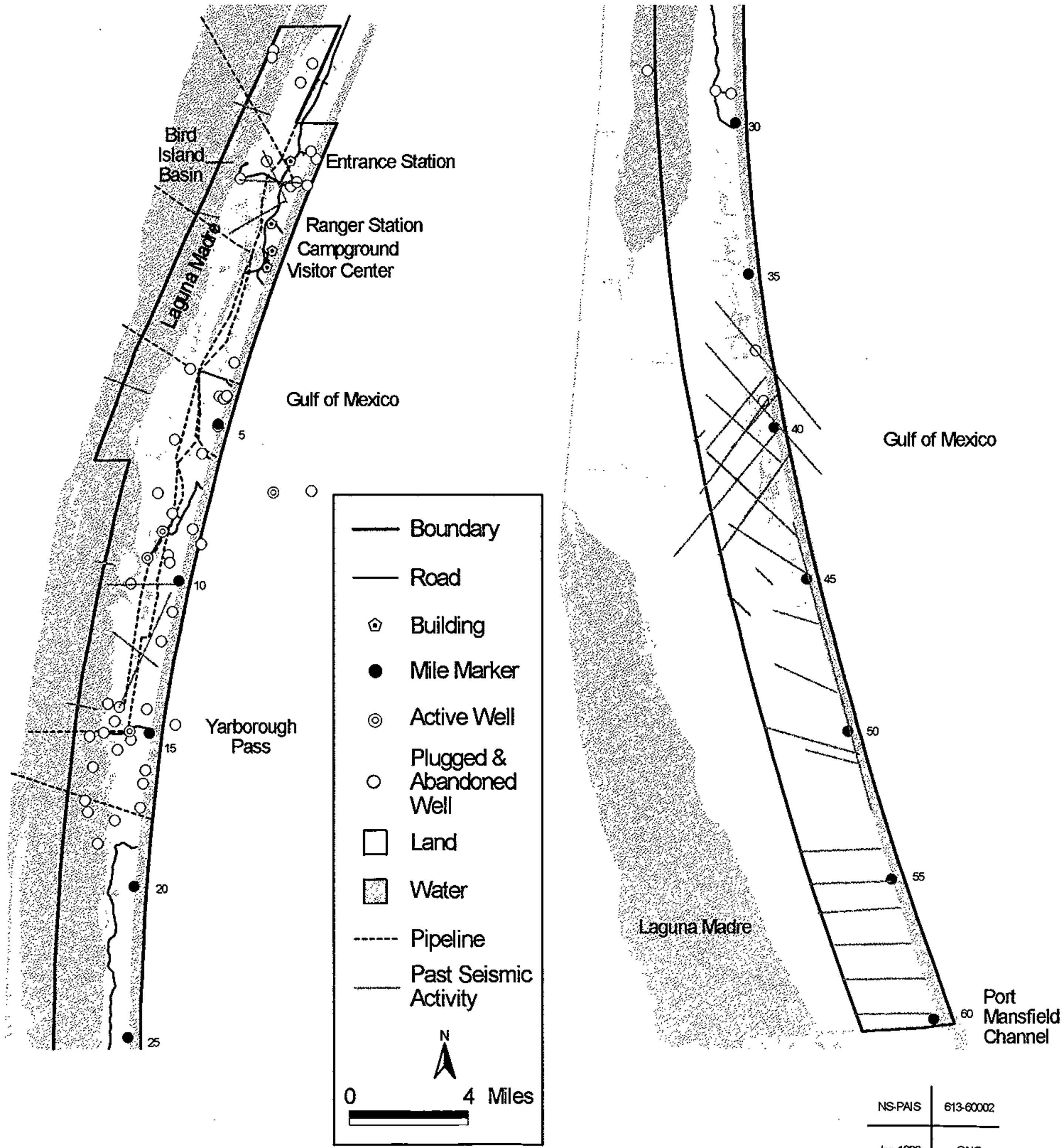

Figure 3.5

ON MICROFILM

Table 3.2. Nonfederal Oil and Gas Wells Drilled within Padre Island National Seashore

Operator/Well Name	Completion Date	Status Active/P&A	36 CFR 9B	Surface Disturbance	Remarks
Sun 4-B	03/27/62	P&A	No	No	Surface location outside of park, bottomhole location within the park. Dry hole.
Colorado Henderson	08/26/58	P&A	Yes	Yes	Oil well. Subsequent operators: Lamb, Zgen, Vantage Point Energy, Convest Energy. Reclamation in progress. Laguna Madre spoil island location.
Sun 5B	12/25/63	P&A	Yes	No	Surface location outside of park, bottomhole location within the park. Dry hole.
Sun No. 1	06/23/54	P&A	No	No	Dry hole.
Standard Oil of Texas State Tract 945 No.7	Unknown	P&A	No	No	Directional well from beach location.
Sunmark No. 2	Unknown	P&A	Yes	Yes	Some scattered debris and remnants of caliche pad remain. Dry Hole.
Standard Oil of Texas No. 1	01/13/65	P&A	No	No	Dry hole.
Standard Oil of Texas State Tract 949 Nos. 42 and 63	Unknown	P&A	No	No	Well 42 natural gas well, Well 63 an oil well, both wells drilled from same location.
McMoran Exploration Co.	Unknown	P&A	No	No	Records for the location of this well contradict each other. Exact surface location is unknown.
ENSERCH Dunn-McCampbell 17	11/30/94	P&A	Yes	No	Reclamation complete. Dry hole.

Operator/Well Name	Completion Date	Status Active/P&A	36 CFR 9B	Surface Disturbance	Remarks
Chevron Oil of Calif.	Unknown	P&A	No	Yes	Soil contamination at pit - may be at saltwater disposal well. NPS released Chevron in 1986 based on initial but temporary vegetative cover.
Standard Oil of Texas State Tract 949, No. 87 & State Tract 951, No. 22	Unknown	P&A	No	No	Two directional wells from same location.
Sun Oil State Tract 975 Well No. 1	Unknown	P&A	No	No	Dry hole.
Coral No. 1	Unknown	P&A	No	No	Some oyster shell remnants of pad.
Sun A-2	09/24/54	P&A	No	No	Dry hole.
Sun Oil State Tract 976 No. 1	Unknown	P&A	No	No	Dry hole.
Sun Oil State Tract 976 No. 2	Unknown	P&A	No	No	Gas well thought to have been drilled from same location as Sun Oil ST 976-1.
Sun A-1	06/12/54	P&A	No	No	Dry hole plugged back and permitted as a water well. P&A as water well 12/15/91.
Bright & Company Dunn-Campbell No. 1	08/10/95	P&A	Yes	No	Dry hole. Reclamation complete.
Enron Oil and Gas South Sprint No. 1	08/23/68	Active	Yes	Yes	Well drilled and developed by Amoco Production Company.
McMoran Exploration State Tract 985 No. 10	07/17/75	P&A	No	No	Dry hole.

Operator/Well Name	Completion Date	Status Active/P&A	36 CFR 9B	Surface Disturbance	Remarks
Sun A-6	Unknown	P&A	No	No	Northwest of A-3, A-5 on margin of Laguna Madre shoreline.
Sun Oil Dunn-McCampbell A-6	12/16/68	Active	Yes	Yes	Saltwater disposal well utilized for disposal of produced water from A-3, A-4 and A-8. Texas Energy & Env. (transferred from Sun and American Exp.)
Sun A-5	Unknown	P&A	No	No	Gas well.
Sun Oil Dunn-McCampbell 2-CT	07/06/59	P&A	No	No	
Sun Oil Dunn-McCampbell A-3	10/21/68	Active	Yes	Yes	Gas well currently operated by Texas Energy & Environmental. Transferred from Sun Oil and American Exploration.
Sun Oil Dunn-McCampbell A-8	05/15/85	Active	Yes	Yes	Gas well currently operated by Texas Energy & Environmental. Located on same pad as A-3.
Pelto State Tract 986 No. 1	06/18/82	P&A	No	No	Dry hole.
Sun Oil Dunn-McCampbell A-7	07/12/71	P&A	No	Yes	Remnants of pad and possible old pit.
Sun Oil Dunn-McCampbell A-4	11/13/68	Active	Yes	Yes	Gas well operated by Tex. Energy & Env.
Sun Oil Dunn-McCampbell 3-CT	08/13/61	P&A	No	Yes	Gas well. Remnants of shell pad.
Sun Oil Dunn-McCampbell CT-1	06/27/59	P&A	No	No	Dry hole.

Operator/Well Name	Completion Date	Status Active/P&A	36 CFR 9B	Surface Disturbance	Remarks
Sun Oil Dunn-McCampbell 5-A	12/15/68	P&A	No	No	Gas well location was removed when Texaco reclaimed location of Tana well in 1990.
Samedan Oil, et al., State Tract 1000 (1)	Unknown	P&A	No	No	Dry hole.
Samedan Oil Dunn No. 1	07/13/75	P&A	No	No	Dry hole.
Carrl Oil Dunn, et al., No. 3	05/14/65	P&A	No	No	Dry hole.
Carrl Oil Dunn, et al., No. 1	11/26/64	P&A	No	No	Gas well.
Carrl Oil Dunn, et al., No. 4	07/14/65	P&A	No	No	Dry hole.
McCormick Oil and Gas State Tract 1009, No. 1	Unknown	P&A	No	No	Gas well.
Carrl Oil Dunn, et al., No. 2	05/02/65	P&A	No	No	Gas well.
Union Oil Co. of CA No. 1	1985	P&A	Yes	No	Gas well.
Sun Oil Compound	Unknown	P&A	Yes	Yes	Production location for Sun Wells that were located in Laguna Madre. Currently associated with Laguna State 233-1. Contamination
Sun Oil well No. 8	Unknown	P&A	No	No	Gas well.
Sun Oil well No. 1	03/23/51	P&A	No	No	Dry hole.
Sun Oil well No. 9	Unknown	P&A	No	No	Dry hole.
Sun Oil State Gulf No. 1	Unknown	P&A	No	No	Unknown.
Sun Oil Dunn-McCampbell No. 6	12/24/55	P&A	No	No	Dry hole.

Operator/Well Name	Completion Date	Status Active/P&A	36 CFR 9B	Surface Disturbance	Remarks
Sun Oil Dunn-McCampbell No. 10	11/18/68	P&A	No	No	Dry hole.
Sun Oil Dunn-McCampbell No. 7	07/08/58	P&A	No	No	Dry hole.
Sun Oil well No. 2	12/10/52	P&A	No	No	Oil well.
Sun Oil well No. 5	02/04/54	P&A	No	No	Dry hole.
Sun Oil well No. 3	05/10/53	P&A	No	No	Unknown whether oil or gas well.
Sun Oil well No. 12	Unknown	P&A	No	No	Dry hole.
Sun Oil State Tract 1048 (10E)	Unknown	P&A	No	No	Dry hole.
Sun Oil Dunn-McCampbell No. 11	12/17/77	P&A	No	No	Dry hole.
Union Oil of CA, W.V. Jones, et al., 30036	06/08/75	P&A	No	No	Dry hole.
McMoran Exploration	07/15/75	P&A	No	No	Dry hole.

In 1995, Padre Island National Seashore contracted a survey to identify the abandoned oil and gas sites occurring within the park. The investigators were able to positively identify 31 sites, but were unable to identify the remaining 26 sites that had been identified in an earlier survey. Current surface disturbance is evident in 10 of the 31 sites, and is quantified in the following table. The remaining sites were determined to have insignificant surface disturbance, since they showed little or no evidence.

Existing Well Operations

Table 3.3. Surface Disturbance in Acres Associated with Existing Well Operations

Operator/Well Name	Production or Drilling Location	Access Road
Texas Energy and Environmental (4 wells: A-3, A-4, A-6 (salt water disposal well), and A-8)	2.67 acres	5.85 acres
Enron Oil and Gas (2 wells: South Sprint #1 and #2 gas wells)	1.61 acres	0 acre
Louis Dreyfus Natural Gas (1 well: ST 233-1)	6.21 acres	0 acre
Fina Oil and Chemical (1 oil well: ST 181-1)	0.25 acre	0 acre
Chevron U.S.A. (hydrocarbon contamination remains at the abandoned shorebase production facility)	0.50 acre	0 acre
Sunmark No. 2 (plugged and abandoned well; debris and remnants of a caliche pad remain)	0.25 acre	0 acre
Total	11.49 acres	5.85 acres

1. **Texas Energy and Environmental, Inc.**, acquired wells A-3, A-4, A-6, and A-8 on March 27, 1997, from American Exploration Company. These wells are located on the Dunn-McCampbell "A" Lease located along the Pan Am road. These wells were originally drilled by Sun Exploration Company.

   Dunn-McCampbell A-3 was completed on October 21, 1968. The well was drilled to a total depth of 10,827 feet in the Oligocene Frio Formation. A cement plug was set at 7,927 feet. The well was perforated at 7,266 feet. It is currently shut in.

   Dunn-McCampbell A-4 is currently the only producing well being operated by Texas Energy and Environmental, Inc. The well was drilled to a total depth of 7,620 feet and completed November 13, 1968. The well is producing from perforations at 7,276-7,280 feet; at 7,288-7,298 feet; and at 7,295-7,303 feet.

   Dunn-McCampbell A-6 is a saltwater disposal well plugged back to a total depth of 2,298 feet and permitted as a saltwater disposal well September 25, 1981. The perforations are located at 2,090- 2,150 feet. The well was originally drilled to a total depth of 7,588 feet and completed December 16, 1968.

   Dunn-McCampbell A-8 is currently shut in. The well was directionally drilled to a total depth of 11,593 (10,503 feet Total Vertical Depth), March 1985, from the A-3 surface location.

2. **ENRON Oil and Gas Company** is operating a natural gas facility for the gathering of natural gas from state tracts in the Gulf of Mexico. Access to the South Sprint facility is

through the primary dune line, approximately 6 miles south of the end of the paved road (Park Road 22). The facility is currently being used to produce two wells.

South Sprint Well #1 is a directional natural gas well drilled from a location on Padre Island National Seashore. The bottomhole location is in State Tract 980S in the Gulf of Mexico and was completed on September 1, 1968. The well was drilled to a depth of 10,978 feet (8,684 feet true vertical depth). The well is currently perforated in the Frio "A" sand at 9,915 feet to 9,930 feet.

South Sprint Well #2 is a straight hole natural gas well producing from a marine location in State Tract 981S. The well was completed on January 10, 1969. The wellhead is located on an unmanned platform approximately 9,000 feet offshore from Padre Island, in the Gulf of Mexico. The was drilled to a total depth of 10,825 feet and is currently perforated in the Frio "A" sand at 7,880 feet to 7,886 feet. The production from the well is delivered to the surface facilities at the South Sprint natural gas facility through a 3-1/2-inch OD flowline.

3. **Louis Dreyfus Natural Gas Corporation** acquired a shut-in gas well, ST-233-1, located in the Laguna Madre from Oryx Energy Company in December 1989. Louis Dreyfus also acquired the Murdock Pass gas production facility located at Yarborough Pass, and an associated water well.

4. **Fina Oil and Chemical Company** operates the only oil well in the park. The well (ST 181-1) is located in State Tract 181, in the Laguna Madre. The well was drilled February 1985 to a Total Vertical Depth of 8,000 feet. Equipment at the well location consists of a well with a production Christmas tree and a metal platform with cage protecting the wellhead. Production of liquid hydrocarbons is by means of gas lift. The produced hydrocarbons are transferred by a 2-1/2 inch O.D. flowline to a location beyond the boundary of the park, in State Tract 155.

5. **Chevron U.S.A.** plugged all of its wells located in the Gulf of Mexico, outside the boundaries of the park by the mid-1980's. The shorebase production facility, which was located in the park, was abandoned in 1986. Despite initial reclamation efforts, hydrocarbon contamination persists at the site, as discussed below under the heading "Contamination."

6. **Sunmark No. 2.** This well was a dry hole and was plugged and abandoned; however, some scattered debris and remnants of a caliche pad remain as surface disturbances.

Past 2-D Seismic Operations

Six two-dimensional seismic exploration operations have been performed under approved Plans of Operations at Padre Island National Seashore. There have been few measurable impacts from these seismic explorations activities. There is some rutting on the wind-tidal flats and mud flats on the west side of the island. Some, but not all, can be attributed to seismic exploration. Rutting impacts would be mitigated in future seismic activities.

Table 3.4. Past 2-D Seismic Exploration Operations

Operator	Year	Length in Miles	Location	Surface Impacts
Cities Service Company	1982	63.0 miles	Between Mile Markers 35 and 50	None
GEO Seismic Service Inc.	1982	16.0 miles	Near Mansfield Channel	None
Amoco Production Company	1984	2.5 miles	Near 10-mile marker	None
CGG Land Seismic	1985	19.4 miles	Laguna Madre throughout park	None
Trafalgar House Oil and Gas	1988	10.3 miles	Near Novillo Line Camp and Yarborough Pass	None
LeMarco, Ltd.	1992	2.5 miles	Near Novillo Line Camp	None
Total:		**113.7 miles**		**None**

Pipelines

There are six pipelines currently in operation within the park. These are located in the northern half of the park. Each pipeline has a 50-foot maintenance corridor that allows for pipeline placement and maintenance. A list of existing pipelines is in Table 3.5.

Table 3.5. Existing Pipelines

Operator	Pipeline Size in Inches	Length in Miles	Location
Petrotex Engineering Company (Chartex Petroleum Company)	20	1.50 miles	Near Six-Pigs facility
Duke Energy (Texas Eastern Transmission)	12	3.25 miles	From near Novillo Line Camp to Laguna Madre
Duke Energy (PanEnergy Services, Inc.)	10	26.00 miles	Along center of island from Malaquite to Yarborough Pass
Houston Pipeline Company (Valley Pipeline)	24	8.50 miles	From Laguna Madre west of Six-Pigs to 6.5 mile marker
Houston Pipeline Company	12	12.00 miles	Along center of island from Yarborough Pass to Six-Pigs facility
Williams Field Services (Transco Pipeline Company)	24	3.00 miles	Across the island near the 18-mile marker
Total:	**6 pipelines**	**66.25 miles**	

The total surface permitted for nonfederal oil and gas pipeline corridor maintenance for a 50-foot-wide corridor for 66.25 miles is 400 acres. In the event of a pipeline rupture or spill, operators would be permitted to temporarily use up to a 100-foot-wide corridor for rapid response and cleanup activities.

1. **Petrotex Engineering Company (Chartex Petroleum Company)** operates a 20-inch pipeline and a pig receiver in the park. The pipeline gathers natural gas from Gulf of Mexico State Tract 818. The segment of the pipeline located in the park is approximately 8,052 feet in length.

2. **Duke Energy (Texas Eastern Transmission)** operates a 12-inch pipeline that extends from a location near Novillo Line Camp northwest to a location on King Ranch located on the mainland. The segment of pipeline in the park is 16,463 feet long. Currently there is no gas gathered from the portion of the line located in the park.

3. **Duke Energy (PanEnergy Services, Inc.)** acquired the Florida Gas Pipeline on August 1, 1996, from ENRON Operating Corporation. The pipeline enters the park at Yarborough Pass and extends north for approximately 26 miles. The pipeline exits the park north of Malaquite Visitor Center to the King Ranch, located on the mainland.

4. **Houston Pipeline Company**, a company of Enron Operations Corporation, operates 10-inch, 12-inch, and 24-inch pipelines in the park, along with a pigging facility known as "Six-Pigs." The 10-inch pipeline extends north from 6-pigs to prior gas leases approximately 3 miles north of the park. The 10-inch line has been purged and filled with nitrogen. The 12-inch pipeline extends from Yarborough Pass to the 6-pigs location, gathering natural gas from Enron Oil and Gas Company facilities and the Texas Energy and Environmental, Inc., facilities. The 24-inch pipeline gathers natural gas from operations in the Gulf of Mexico approximately 77 miles south in state waters. The pigging facility occupies an area of less than 1 acre.

5. **Williams Field Services (Transco Pipeline)** operates a pipeline that crosses the park from a point on the Gulf of Mexico approximately 17 miles below the end of Park Road 22, to the Laguna Madre, entering the Kenedy Ranch on the south side of Baffin Bay. The length of the pipeline inside the park is 16,050 feet.

Contamination

The National Park Service discovered hydrocarbon contamination at three nonfederal oil and gas operations sites within a short time span in 1993. The locations where contamination was discovered were the Amoco South Sprint production facility (now owned by ENRON), the American Exploration Company Yarborough Pass Natural Gas production facility (Louis Dreyfus Natural Gas Corporation), and the Chevron U.S.A. former shorebase production location.

During environmental quality control monitoring, the Amoco Production Company discovered free phase hydrocarbon upon a perched shallow freshwater aquifer around the production unit. Amoco performed a site characterization to determine the type and extent of contamination. A vacuum extraction technology was employed to remove the free-phase hydrocarbon without removing ground water. Early results indicate that removal of the free-phase hydrocarbon is successful. Amoco sold the South Sprint facility to Enron Oil and Gas Company in 1996. Enron Oil and Gas is continuing the free-phase removal of the hydrocarbon.

Free-floating oil was recently documented (March and May 1998) on flood-level ponding at the former Chevron U.S.A. location. Also, strong hydrocarbon odor was documented nearby at Novillo Line Camp, a National Register site. Hydrocarbon matting and oil staining remains visible in areas where a pit and tank battery had been located at the Chevron site. Contamination had been discovered when Chevron was closing out and removing the facility in 1986. Chevron had utilized the latest technology for the time related to soil washing for hydrocarbon removal. After testing and presentation of the results, the NPS released Chevron from its obligation.

In 1993, the NPS requested Chevron to return and remediate the site. Chevron responded by performing total petroleum hydrocarbon sampling, which indicated that hydrocarbons were present in the pit and tank battery areas. Based on the initial confirmation of hydrocarbon contamination, the NPS asked Chevron to perform sampling and analysis beyond the total petroleum hydrocarbon analysis to determine the specific types and extent of specific polycyclic aromatic hydrocarbons. Chevron has committed to perform remediation to meet NPS objectives.

In December 1989, American Exploration Company acquired nonfederal oil and gas operations from Oryx Energy Company. Included in the acquisition was the Murdock Pass gas production facility at Yarborough Pass. The well that had produced gas through the plant was shut in. The well was worked over and never brought into production by American Exploration. In 1993, the NPS documented visible oil staining of surface soils near a bulkhead at the Murdock facility. At the request of the NPS, American Exploration performed a Site Characterization. The Site Characterization confirmed the presence of petroleum hydrocarbon contamination in excess of 10,000 milligrams per Kilograms (mg/Kg) in a small area near the compressor bulkhead. Groundwater results indicated low levels of total petroleum hydrocarbons and individual components of oil, including volatile compounds and semi-volatile compounds. Additionally, mercury was discovered in two areas of meter runs in concentrations from nondetect up to 504 mg/Kg. American Exploration Company merged with Louis Dreyfus Natural Gas Corporation on October 14, 1997. Late in 1998, Louis Dreyfus appealed to the NPS to reconsider the NPS's decision to approve Louis Dreyfus' plan of operations to reclaim the site and remediate contamination, subject to NPS conditions of approval. The NPS's conditions of approval included holding Louis Dreyfus Natural Gas Corporation wholly responsible for reclamation and remediation of the operations site, including the requirement to remove approximately 600 cubic yards of mercury-contaminated soils for disposal in a state-approved facility, as necessary to reach the clean-up attainment level of 0.2 mg/Kg (toxicity concentration to restore the site to a state in which native vegetation will flourish). On December 11, 1998, the NPS upheld its decision to hold the company wholly responsible for reclamation and remediation of contaminants, but reduced the mercury attainment level from 0.2 mg/Kg to 0.3 mg/Kg. Louis Dreyfus Natural Gas Corporation has committed to perform remediation to meet NPS objectives.

In 1995, the NPS located abandoned oil and gas locations and conducted an electromagnetic survey to determine if contamination exists at these sites (Hay, 1995). Twenty-three (23) locations were positively identified, and eight suspected locations were identified. There was documentation that 57 oil and gas operations had occurred at Padre Island National Seashore. Those locations that were not found were due to poor records, or were located in areas that have experienced dune movement. Of the locations that were identified as having some measure of contamination by the electromagnetic survey, 10 were selected to have soil sampled and tested for Total Petroleum Hydrocarbons (TPH) and a metal scan. Five of the 10 that were the most contaminated were selected to have a monitoring well installed. A water sample was taken and sampled. All contamination that was identified was in such small quantities that cleanup is not economically feasible.

SOIL AND WATER RESOURCES

Soils

Padre Island consists of Pleistocene and Holocene sands, silts, clays, and shell fragments, which were transported by water and wind.

The soils of the Padre Island belong to the Galveston-Mustang-Tidal Flats Association. The park also contains important sediment groups that have not developed into soils. They include coastal beach, sand dune, and wind-tidal flat sediments. The soil-sediment groups are described below, and are taken from the United States Department of Agriculture's *Soil Survey of Nueces County, Texas*. The large amount of well-rounded sand in these unconsolidated soil-sediment groups makes them both porous and permeable. Any contaminants that are spilled or released onto these soil-sediment sands are therefore infiltrated quickly to the shallow, perched aquifer underlying the northern region of Padre Island.

The Galveston soil series consists of deep, hummocky, light-colored, loose sands. The taxonomic class is mixed, hyperthermic Typic Udipsamments. The soils are more than 5 feet above mean sea level. The nearly white to grayish-brown surface layer, normally less than 1 foot thick, contains little humus. It is underlain by fine, light gray sand that is 3 or 4 feet thick and is moist most of the time. The parent material is fine white sand, which is found at a depth of 4 to 10 feet. It is usually saturated with subsurface waters. Rain moves through these soils rapidly. The soil remains moist in its lower layers most of the time.

The Mustang soil series consists of nearly level, deep, sandy soils that are wet and, in some places, salty. The taxonomic class is mixed, hyperthermic Typic Psammaquents. They are generally less than 5 feet above sea level. The light-gray surface layer is about 6 inches thick and contains little humus. Below this is a 2-foot thick layer of moist, white sandy soil. The parent material is similar to the 2-foot layer. The water table lies 3 to 4 feet or less below the surface. Mustang soils are mainly in shallow depressions between coastal dunes and on nearly level to gently sloping coastal flats. They are periodically flooded with salt water, and poorly drained.

The coastal beach sediment group consists of shores that have been washed and rewashed by waves. It is partly or completely covered by water at high tides during storms. The soil material is predominantly fine sand that is almost white. In some areas like Little and Big Shell Beaches, there is a large percentage of shell material incorporated into the coastal sand.

The coastal dunes sediment group is made up of sand dunes that are partly stable and partly active. The dunes are a series of steep-sided ridges consisting of fine sand that has been deposited on the beach by wave action and moved into the dune field by the wind. The surface layer is light-gray, loose, fine sand about 4 feet thick. It is underlain by a white, loose, fine sand about 1 to several feet thick. The top of the dunes are 5 to 50 feet above sea level. The coastal dune sediments are steeper, more choppy, and less stable than the Galveston soils. They are not subject to flooding at high tide as the Mustang soils are.

The wind-tidal flats sediment group is made up of mainly barren, nearly level areas that are predominantly above water. They are made up of layers of sand, shells, and clay which are not consistent in texture, thickness, or stratigraphic position. A sparse growth of grasses and weeds tolerant of salt water borders the edges of these flats that are above water most often. They are overlain in places by clusters of algal mats of varying densities.

Stratigraphy

Little information is available to describe the subsurface stratigraphy of Padre Island National Seashore. Boylan (1986) describes the sedimentary formations of North Padre Island as having 60 feet of holocene silt and sand (unnamed) overlying 700 feet of the Pleistocene Beaumont Clay (Formation) which in turn overlies 400 feet of the Lissie Sand (Formation). It should be noted that the 400-foot thickness that Boylan ascribes to the Beaumont Unit is derived from measurements made on the mainland. Its true thickness in the subsurface of the park is not known. It is possible that the Beaumont Clay appreciably thins as it approaches the Gulf. Boylan describes the Beaumont Unit as being consolidated, and reflecting a depositional environment of coalescing stream levees and stream deltas. It is composed of 60 percent clay, 20 percent silt, and 20 percent sand. The Lissie Sand, an aquifer in the interior of Texas, is composed of 60 percent sand, 20 percent sandy clay, 10 percent gravel, and 10 percent clay.

Boylan believes that the Beaumont Unit underlies the entire length of Padre Island (modern transgressive barrier). However, Morton and Price (1987) disagree with this interpretation and suggest that the Holocene Rio Grande Delta complex underlies the modern transgressive barrier in South Padre Island, measured south of the Mansfield Cut. The Rio Grande Delta complex was deposited because the Rio Grande River had, during the Late Wisconsinan sea-level lowstand, eroded its valley below the coastal plain. This valley was then aggraded (filled up) with delta plain mud and fluvial sand. The sand content is much higher than it is in the Beaumont Unit. The Holocene Rio Grande Delta complex may, according to Morton and Price's cross-section, pinch out after it crosses into the southern boundary of Padre Island. The actual distance that it can be traced in the subsurface in the park is unknown. The unit is very close to sea level in southern Padre Island and the modern transgressive barrier island is built on it. Its maximum thickness is about 50 feet in Morton's cross-section, and it is underlain by Late Pleistocene Rio Grande Delta distributary channel and delta front sand, which is about 40 feet thick.

The thin, modern transgressive barrier sands, the Holocene Rio Grande Delta complex mixed muds, sands, and caliche layers, and the Upper Pleistocene Rio Grande Delta complex sands could serve as the shallow unconfined aquifer of southern Padre Island, similar to the Beaumont Clay serving as the supporting aquitard underlying the northern portion of Padre Island. The lower portion of the Late Pleistocene Rio Grande Delta complex is muddy and could serve as a supporting aquitard. It is possible that the mixture of lithologies (mud, sand, and caliche) of the shallow stratigraphy of southern Padre Island makes it a less effective aquifer than its northern counterpart, and lessens its capacity to support a heavily vegetative cover, which both creates and stabilizes the northern Padre Island foredune and barrier flat environments. The lack of information about subsurface stratigraphy at Padre Island National Seashore requires the application and interpretation of available information collected outside the park.

Surface Waters

Laguna Madre: The Laguna Madre formed nearly 6,000 years ago as the sea began to retreat and Padre Island began to develop (Amdurer and Land, 1982). As the barrier island grew, the water became isolated, forming a shallow lagoon.

The Laguna Madre is a narrow, hypersaline lagoon that extends from Corpus Christi Bay south to the Rio Grande, covering approximately 320 km^2. Approximately 31,310.03 acres of the Laguna Madre is located in the park. This comprises 23.4 percent of the park.

The Laguna Madre is one of the few hypersaline bodies of water in the world, and one of the most productive estuarine systems in the United States. High salinity content is typically higher than Gulf waters, and is attributed to high evaporation, low freshwater infusion (due to limited runoff and scarcity of freshwater systems emptying into the Laguna Madre), and to the damming of waterways and rivers. Salinity values can vary annually between 22 and 54 parts per thousand (ppt), and rarely exceed 75 ppt, usually during a drought condition.

The Saltillo Flats subdivide the Laguna Madre into the upper and lower Laguna. The upper Laguna Madre is bordered on the west by the King Ranch and the City of Corpus Christi, and on the east by Padre Island. The Gulf Intracoastal Waterway extends from Texas to Florida and passing through the Laguna Madre. The Laguna Madre contains numerous manmade and natural islands, which have become productive colonial waterbird rookery islands. It averages 3 feet in depth, and ranges from 1/2 to 10 miles in width, depending on wind-generated tides. The Laguna Madre contains several species of seagrasses, which create extensive nursery habitat for finfish and shellfish. Seagrasses include shoalgrass (*Halodule wrightii*), widgeongrass (*Ruppia maritima)*, and manatee grass (*Syringodium testudium)*.

Daily water-level fluctuations in the Laguna Madre are primarily wind-driven. There is no observable astronomical tide in the Laguna Madre and water circulation is primarily wind driven (Rusnak, 1960). Wind tides may produce a rise or fall of water levels by as much as 1 or 2 feet, if water is pushed onto low-lying marginal areas. Maximum water fluctuations typically occur in October, April, and May, during times of strong onshore winds (Weise and White, 1980). Water level variations, present for several weeks, are caused by regional atmospheric differences, and precipitate water exchange between the shelf and Intracoastal Waterway areas. Seasonal runoff, combined with the expansion and contraction of shelf waters as they warm and cool, cause a semi-annual tide in the Laguna Madre.

Water temperatures may range between 44° and 81°F in open areas, with more extremes in shallow near-shore waters. Sediments of the upper Laguna Madre consist of predominately quartzose sand, with some small areas of clayey sand (Chaney, 1988).

Numerous federal and state agencies gather water quality data throughout the upper Laguna Madre. Monitored parameters include salinity, chlorophyll-a, volatile solids, total suspended solids, total dissolved solids, total organic carbon, and total zinc. Many additional parameters have been sampled including turbidity, temperature, alkalinity, pH, phosphate, copper, arsenic, and mercury. Dissolved metal values do not exceed the marine chronic or acute criteria, and no spatial or temporal trends have been detected.

Permanent Freshwater and Ephemeral Ponds: Permanent freshwater ponds only occur within three locations in the park. They are located along the south side of the Bird Island Basin road, adjacent to the main road behind the ranger station, and near the sewage lagoon road. The three permanent freshwater ponds are Sensitive Resource Areas shown on Figures 3.8, 3.9, and 3.10. Including a 500-foot protective buffer, the three permanent freshwater ponds comprise 108 acres or 0.08 percent of the park. They were formed by excavation of fill to build the park road and are therefore deeper than naturally occurring ephemeral ponds. Because they have greater water-holding capacity, they tend to hold water longer and provide a valuable freshwater source for wildlife during drought periods.

Ephemeral ponds are large, shallow bodies of water that are created when water is deposited from rain events or tidal inundations. Ephemeral ponds occur throughout the park, but tend to evaporate quickly. These inland waters comprise 2,437 acres, or 1.8 percent of the park. They are variable in size and occurrence depending on rain levels. They are shown on the Landcover Classes Map, Figures 3.2, 3.3, and 3.4.

Numerous water quality parameters have been analyzed for the three permanent freshwater ponds (Sissom, 1990; Serota, 1971; Perez, 1971). These parameters include: (1) general parameters, which include temperature, turbidity, salinity, dissolved oxygen, pH, and alkalinity; (2) inorganic nutrients, such as nitrate, total nitrogen, and phosphates; and (3) heavy metals, including arsenic, cadmium, chromium, copper, zinc, lead, strontium, iron, and mercury.

Chemical parameters of pond water change with a change in seasons. During the spring and summer months, high temperatures, high nitrates, low turbidity, low oxygen, high pH, and alkalinity occur. In general, the opposite occurs during the winter and fall months. These seasonal changes correspond to changes in rainfall, air temperatures, and wind. No pesticides or PCB contaminants are found in these ponds, and levels of heavy metals are well below the standards set by the Texas Department of Health (Sissom, et al., 1990). Hydrocarbons in the form of grease and oil occur in all three ponds; however, the amounts are considered to not be significant to the health of the ponds. This occurrence may be due to the ponds' close proximity to well-traveled roads.

Water quality in ephemeral ponds is highly influenced by evaporation, ocean spray, and waterfowl. Considerable quantities of sodium, chlorine, and potassium are deposited in ephemeral ponds (Hannan et al., 1978). Due to evaporation and continual input of the aforementioned elements, ephemeral ponds tend to have higher conductivity. Despite a high conductivity, ephemeral ponds have less than 30 percent of the conductivity of seawater. Ephemeral ponds tend to have high organic nitrogen and high pH due to increased photosynthesis and input from animals. These ponds have an abundance of blue-green algae and therefore high particulate organic matter. Generally, no manmade pollutants are found in the ephemeral ponds.

Permanent and ephemeral ponds provide essential habitat, sources of water, food, and protection to many wildlife species. Many forms of wildlife including mammals, reptiles, fish, invertebrates, and birds have become dependent on these ponds. Mammal species include deer (*Odocoileus virginianus*), badgers (*Taxidea taxus berlandieri*), coyotes (*Canis latrans*), raccoons (*Procyon lotor*), jackrabbits (*Lepus californicus merriami*), and bobcats (*Felis rufus*). Fish species include mosquito fish (*Gambusia affinis*), sheepshead minnow (*Cyprinodon veriegatus*), and gulf killifish (*Fundulus grandis*). Many bird species utilize the ponds and include bobwhite quail (*Colinus virginianus*), northern harrier (*Circus cyaneus*), sandhill crane (*Grus canadensis*), American egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), long-billed curlew (*Numenius americanus*), sanderling

(*Crocetheia alba*), killdeer (*Charadrius vociferus*), terns, ducks, and grebes. Several species of snakes, turtles, and frogs also find ephemeral ponds important sources of water.

In addition to wildlife, over 50 species of plants, 28 species of fungi, and approximately 66 species of plankton can be found in ephemeral and permanent ponds (Sissom, 1990). Vascular plant species occurring within and adjacent to ponds include pennywort (*Hydrocotyle bonariensis*), frog fruit (*Phyla nodiflora*), fleabane (*Erigeron procumbens*), spike sedge (*Eleocharis montevidensis*), and narrow-leaf cattail (*Typha domingensis*), American bulrush (*Scirpus americanus)*, marsh hay cordgrass (*Spartina patens)*, fleabane (*Erigeron procumbens)*, and little bluestem (*Schizachyrium littoralis)* (Drawe, 1992). Plankton genera included *Spirogyra*, *Polycystis*, *Gonium*, *Ostracoda*, *Diatoma*, *Copepoda*, and others. Some of the fungi species include *Aspergillus*, *Cladosporium*, *Penicillium*, *Nigrospora*, and *Alternaria*.

Gulf of Mexico: The Gulf of Mexico occupies 13,178 acres, or 9.8 percent of the park. Water quality parameters are typical for large bodies of ocean water. Salinity ranges from 28 ppt to 35 ppt, and temperatures near shore occur between the low 50's to mid 80's. Turbidity varies with the amount of wave activity.

Groundwater

The groundwater at Padre Island is not used as a drinking water source for the park. The nature of the shallow groundwater system of northern Padre Island National Seashore is better understood than that of the southern section. Boylan (1986) states that the depth to the water table in northern PAIS ranges between a low of 4 feet and a high of 1 foot (excluding dune systems). He describes a lens of freshwater (approximately 30 feet thick, near the Gulf of Mexico) overlying the saltwater.

The total thickness of the freshwater-saltwater unconfined aquifer is 50 feet. It is underlain by the Beaumont Formation, which is believed to be the aquitard that supports the freshwater-saltwater aquifer. Berkebile and Hay (1997) constructed a subsurface cross section from the mainland to the Gulf of Mexico and through northern Padre Island in order to illustrate their interpretation of the relationships existing among the various water types in the shallow unconfined aquifer. Their illustration emphasizes their uncertainty as to the subsurface boundary conditions existing amongst the hypersaline, fresh, and seawaters. They show continental water (presumably fresh) underlying and in contact with the saltwater. Berkebile and Hay state that they are uncertain as to the thickness of the freshwater lens under northern Padre Island despite the fact that they had 12 monitoring wells across the Island between June 12, 1993, and December 16, 1993. Little is known about the subsurface water of southern Padre Island. There is evidence to indicate that the Beaumont Formation and the Holocene sand complex that support the modern transgressive barrier are not present in southern Padre Island where they are replaced by the Holocene Rio Grande Delta complex and the Late Pleistocene Rio Grande Delta complex. It is possible that the mixture of lithologies of the shallow stratigraphy of southern Padre Island, makes it a less effective aquifer than its northern counterpart and reduces its capacity to support a heavy vegetative cover, which both creates and stabilizes the northern Padre Island fore-dune and barrier flat environments.

The aquifer is composed of Holocene eolian/marine sands deposited over the Pleistocene age Beaumont Formation, and appears to run the length of the park. The water table aquifer contains three distinct zones of water quality: the hypersaline zone, the freshwater zone, and the seawater zone. The freshwater zone rests above the seawater zone to the east, where it abuts the Gulf of Mexico, then thickens rapidly toward the center of the island, and finally tapers to a thin layer resting on the hypersaline zone to the west (Berkebile and Hay, 1994).

The freshwater zone in the aquifer is recharged from precipitation over the island and is not directly connected to the mainland aquifer system. The groundwater is discharged through evapo-transpiration, biologic activities, and through springs and seeps into the Gulf of Mexico and the Laguna Madre. Water quality data for park groundwater includes temperature, total hardness, salinity, pH, and sulfides. Water chemistry values vary significantly due to dissolved solids.

Salinity measurements range from 1 ppt to 95 ppt. The groundwater adjacent to the Gulf of Mexico is consistently below 3 ppt, while the groundwater along the center of the island rarely exceeds 5 ppt. However, salinity of the groundwater along the Laguna Madre is highly concentrated and many times exceeds the salinity in the Laguna Madre.

Sulfides range from 20.00 mg/L to less than 0.20 mg/L. The average sulfide level found in groundwater is 5.75 mg/L. Sulfide levels vary in average between the Gulf of Mexico beach is consistently less than 0.20 mg/L, and the Laguna Madre averages 13.74 mg/L.

Total hardness varies from 100 mg/L to 19,670 mg/L. The average total hardness found in park ground water is 4,260 mg/L. The Gulf beach groundwater tends to average 381 mg/L, while the center of the island averages 1,552 mg/L. The Laguna Madre groundwater produces high readings between 5,000 mg/L to near 20,000 mg/L, due to the high concentration of dissolved solids.

The hydrogen ion concentration, or pH, for groundwater within the park averages 7.48. It ranges between 6.50 and 8.10, remaining fairly stable with only minor variations. The freshwater zone generally contains water with salinity less than 2 ppt, pH of 7.5; hardness less than 500 mg/L; and total dissolved solids of roughly 700 mg/L. Because total dissolved solids are less than the 1,000 mg/L, this zone has been classified as being suitable for most domestic, agricultural, and industrial applications.

WETLANDS

Wetland categories occurring in the park include marine, estuarine, and palustrine wetlands. Marine wetlands include beaches and the splash zone of the open Gulf of Mexico. Estuarine wetlands include subtidal aquatic beds such as seagrasses and unconsolidated shores such as wind-tidal flats. Palustrine wetlands include emergent wetlands and freshwater and ephemeral ponds. Wetlands are significant in that they produce a large amount of primary production and provide important habitat for the rich wildlife resources of the park. Approximately 60 percent of the park is comprised of a rich variety of wetlands. These wetland communities are located behind the Gulf foredunes and extend west toward the Laguna Madre.

> "Wetlands are lands transitional between terrestrial and aquatic system where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at

some time during the growing season of each year." (Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al., 1979))

Emergent Wetlands

Emergent wetlands occur throughout the park between the Laguna Madre and the foredune ridge. Halophytic succulents in the lower areas and shoregrass in the upper elevation areas dominate them. Palustrine wetland vegetation includes Seacoast Bluestem (*Schizachyrium littoralis*), fleabane (*Erigeron procumbens*), roundstem (*Paspalum monostachyum*), narrowleaf sumpweed (*Iva angustifolia*), and marsh hay cordgrass (*Spartina patens*). The dominant species is swordgrass (*Scirpus americanus*). Estuarine wetland vegetation species include shoregrass (*Monanthochloe littoralis*), blue-green algae, (*Plantain plantago sp.*), whorled dropseed (*Sporobolus pyramidatus*), and sea ox-eye daisy (*Borrichia frutescens*). The dominant marsh species is glasswort (*Salicornia bigelovii*).

Emergent wetlands comprise approximately 19,806 acres, or 14.8 percent of the park, as depicted on the Landcover Classes Map, Figures 3.2, 3.3, and 3.4.

Seagrass Beds

In shallow, quiet areas of the Laguna Madre are broad underwater flats vegetated with marine grasses. Seagrass beds are among the most productive of marine plant communities. These seagrasses create extensive nursery habitat for finfish and shellfish. Chambers (1992) estimated that 98 percent of the commercial landings in the Gulf of Mexico were estuarine-dependent. The seagrasses are generally covered by less than 4 feet of water, and the shallowest parts are exposed at low tidal levels. The water depth, as well as the salinity and turbidity, determines the types of seagrasses that grow in these areas. Shoalgrass (*Halodule wrightii*) is the dominant seagrass in Laguna Madre. It tolerates the highest salinity and turbidity and prefers the shallowest depths. Other seagrasses include widgeongrass (*Ruppia maritima*), turtlegrass (*Thalassia testudium*), clovergrass (*Halophila engelmanni*), and manatee grass (*Syringodium testudium*).

The seagrass beds support a large invertebrate population, predominantly a variety of snails and clams. The seagrass beds are spawning grounds or nurseries for many fish and crustaceans. This environment of high biological productivity, which is important in the coastal ecosystem and to the Gulf fishing industry, is maintained by a delicate balance of salinity, turbidity, and water depth (Brown, et. al., 1977). In addition to providing habitat for invertebrate fauna and fishes, seagrasses also provide habitat for other wildlife. These include migratory waterfowl, two species of federally protected sea turtles, the Kemp's ridley (*Lepidochelys kempii*) and green turtle (*Chelonia mydas*), and a variety of wading and diving birds (mergansers, loons, cormorants, pelicans). Some of these animals consume seagrasses directly: redhead ducks feed on seagrass rhizomes; sea turtles eat seagrass leaves.

Seagrass cover in the upper Laguna Madre has decreased in the early 1990's as a consequence of the persistent brown tide algal bloom (Onuf, 1996). Light levels were reduced as much as 50 percent in response to the high, water column chlorophyll concentrations (Dunton, 1994). This loss has been partially attributed to increased turbidity caused by maintenance dredging. Light limitation, either as a consequence of increased levels of suspended solids or chlorophyll concentrations, is therefore a serious problem facing seagrass communities along the Texas coast. Dredging disrupts benthic communities during the removal, deposition, and re-distribution of fine materials; these activities ultimately result in higher turbidity. Furthermore, dredged material disposal areas are not always suitable for the colonization and growth of seagrasses (Zieman, 1975). The direct and immediate effect of dredging on submerged aquatic vegetation is seagrass mortality due to burial.

The main effects of industry are related to vessel operations, marine construction, and small localized oil spills. Vessel operations can have an impact on shallow seagrass beds through propeller scarring (Phillips, 1960; Zieman, 1976; Eleuterius, 1987). Vessel traffic causes direct damage to seagrasses through the physical destruction of seagrass leaves and below-ground tissues (roots and rhizomes) by propellers. Prop scars tend to occur in areas less than 3.28 feet (1 meter) deep at low tide (Zieman, 1976). Eleuterius (1987) indicated that once a propeller scar is created, wave action leads to erosion within the channel, resulting in scouring and deepening of the disturbed area. Similarly, Zieman (1976) reported a reduced proportion of fine sediments in areas with propeller scars.

Seagrass beds are Sensitive Resource Areas, as shown on Figures 3.8, 3.9, and 3.10. They comprise 25,240 acres, or 2.7 percent of the park. While seagrass beds do not currently occupy the entire submerged bay bottoms of the Laguna Madre, the potential exists for all bay bottoms of the Laguna Madre to provide suitable habitat, with the exception of the deeper dredged channels. Therefore, the entire portion of the Laguna Madre located within the park has been identified as a Sensitive Resource Area.

Wind-Tidal Flats

Wind-tidal flats are low areas inundated when high-water conditions are created by northerly winds, and left uncovered when low-water conditions are created by southerly winds (hence the term "wind-tidal flats"). These mudflats form an almost continuous band along the Laguna Madre side of the park.

Tidal flats begin at mean sea level and extend upward to at least mean high tide. In the southern areas of the park, wind-tidal flats may extend to the high wind-tide levels. They are generally covered with a blue-green algal mat that ranges between a thin layer to 0.4 inches (2 cm) thick.

Frequently inundated by Laguna Madre waters driven by wind, some parts of the flats support extensive mats of blue-green algae, and are essential habitat for the piping plover (Withers, 1993). Wind-tidal flats play a crucial role in the life history of some of Texas' most important commercial fish and shellfish industries, and offer significant feeding areas for aquatic bird life (Withers, 1993). They provide abundant amounts of blue-green microalgae, which contribute to the primary productivity of estuarine systems (Peterson, 1981). Their productivity is comparable to seagrass beds and to 20-40 percent of a typical marshhay cordgrass (Spartina patens) marsh. The mats of blue-green algae are also essential habitat for the piping plover (Withers, 1993).

Macrobenthic invertebrates inhabit the wind-tidal flats in the Laguna Madre and create an abundant and diverse benthic community that exists throughout most of the year (Withers 1994). Detritus from other estuarine habitats such as seagrass beds is deposited in large quantities on the flats, and, combined with the large algal biomass, contribute to the high productivity found in this area. As a result of the high productivity, the wind-tidal flats are inhabited by a large number of benthic invertebrates, which are then preyed upon by demersal fish and crabs. These invertebrates include polychaetes (*Arenicola* sp., *Capitella* sp., *and Sabella* sp.), fly larvae (*Canaceidae*), springtail nymphs (*Entomobryidae*) and stonefly nymphs (*Leuctridae*), amphipods (*Corophium lousianum*), tanaids (*Leptochelia rapax*), and mollusks (*Mulinia lateralis*). In addition, shorebirds utilize these areas making them significant feeding areas during the winter and migration seasons along the Texas Gulf Coast (Withers and Chapman, 1993, Withers, 1994), particularly the endangered and/or threatened piping and snowy plovers. Additionally, tidal flats are also important foraging habitat for Piping plovers (*Charadrius melodus*), reddish egrets (*Egretta rufescens*), and peregrine falcons (*Falco peregrinus ssp.*), and at least 19 other species of shorebirds, including western sandpiper (*Calidris mauri*), dunlin (*Calidris alpina*), killdeer (*Charadrius vociferus*), and willet (*Catoptrophorus semipalmatus*).

The addition of fill materials and soil compaction are anthropogenic disturbances that adversely affect blue-green algal mat production. Extensive blue-green algal mat production is dependent on flats that are alternately emergent and submerged in regular cycles. The use of fill in wind-tidal flat areas not only converts the flats to an elevated landform, it also disrupts the hydrological cycle. The filled area may act as a barrier to inundation or allow water to be retained behind the filled area. Irregular inundation and excessive water retention both adversely affect blue-green algal mat production. Soil compaction by vehicular traffic in wind-tidal flats disturbs the hydrological regime by allowing compacted areas to remain submerged. Wind-tidal flats that are submerged too frequently do not have extensive algal mats (Weise and White, 1980).

Wind-tidal flats border the eastern shores of the park. Tidal flats occupy 29,127 acres, or approximately 22 percent of the park, as shown on the Landcover Classes Map, Figures 3.2, 3.3, and 3.4.

CULTURAL RESOURCES

Archeological Resources

Archeological resources consist of "any material remains or physical evidence of past human life or activities which are of archeological interest, including the record of the effects of human activities on the environment. They are capable of revealing scientific or humanistic information through archeological research" (NPS 1994:187).

A complete inventory of archeological resources within Padre Island has not yet been conducted, and a formal assessment of known archeological sites within the park has not been done since 1974. A few small surveys have added information to the inventory base since that time and more substantial work on the underwater components has also been completed. Of the at least 27 sites, only two are listed on the National Register of Historic Places (the Mansfield Cut Underwater Archeological District and the Novillo Line Camp). Two others are recommended as eligible to the National Register (Black Hill Line Camp and Green Hill Line Camp). These four sites have been identified as Sensitive Resource Areas. None of the remaining archeological sites have been evaluated for National Register significance.

Overview: The archeological resources of Padre Island can be divided into two primary categories, based on temporal periods: (1) prehistoric, and (2) historical. The first period includes all evidence related to the aboriginal use of the island prior to the arrival of Europeans (pre-1500); while the latter includes all remains related to both American Indian and Euroamerican activities on the island since 1500. Prehistoric sites are not known to be numerous but do occur over the length of the island. They represent the remains of human activity on the island from at least the late Archaic period (ca. 3000 BC) through the Neo-American period (A.D. 1400). Evidence from prehistoric sites within the park indicates that the island was used seasonally by people who lived primarily on the mainland, and had more permanent sites along the rivers and bays of the Texas coast. But use of the island for hunting, gathering, fishing, and shell fishing occurred throughout the centuries before the arrival of Europeans and continued as a lifeway into the late-1700's.

At least 15 prehistoric archeological sites are known within the boundaries of the park and almost all possess evidence of having been occupied during both the Archaic and Neo-American periods listed above. These archeological sites are composed mostly of scatters of stone tools and chipping debris, with limited evidence of ceramic sherds and animal bone, exposed in dune blowouts. Although not reported on sites within the park, evidence of hearths may occur in some instances. Other material culturally associated with these groups was perishable in nature and would not be preserved except under very extraordinary conditions. Site patterning suggests four areas of primary prehistoric occupation/use: (1) along the banks of channel cuts through the island; (2) along the west shore of the island between the Laguna Madre and the mid-island lakes; (3) the east-central portion of the island between the foredunes and the mid-island lakes; and (4) behind the large foredunes. Archaic sites tend to occur in locations 2 and 3 above, while Neo-American sites occur in all four locations.

Research in the mid-1980s located seven additional sites containing cultural material, including four of suspected prehistoric origin, but these were all determined to be minimal or suspect in nature and recommended as not significant. This information does point to the existence of "scatters" of archeological materials across the island. Although not recorded as archeological sites at the time, human remains of two individuals, assumed to be prehistoric in age, were exhumed from the foredune area about midway down island in the 1970s. Additionally, evidence of human burials was recorded at a prehistoric site about 2 miles southwest of the visitor center.

Historical sites are fewer in number across the island (a total of 8) and consist of two categories of sites: (1) those related to land-based activities on the island, and (2) those related to maritime activities. The first category includes four sites, three of which are line camps related to ranching activities by the Dunn family, while the fourth is the remnant of a Mexican-American War military campsite. Along with being historic structures and part of the cultural landscape of the island, the three line camps of Novillo, Black Hill, and Green Hill also are listed in the state archeological site files. No other features of the ranching aspects on the island have been recorded, although some of the more minor features probably still occur. Although ephemeral in nature, the campsite of American soldiers traveling down island during the Mexican-American War represents the only known site of this period within the park.

Maritime activities associated with Padre Island began early in European history in the area. Three of the 1554 Spanish plate fleet vessels sank in or just outside the park boundary near the Mansfield Cut. A smaller vessel was also lost during attempts to salvage the cargo of the vessels. Remains of two of these wrecks have been confirmed within the park, as are the remains of the survivors'/salvors' camp established on shore during these events. Due to years of destruction by "treasure hunters," sites of this era have become extremely rare in U.S. waters and any remains in National Park Service areas make them extremely significant.

Additionally, magnetometer surveys along the southern portion of the island have resulted in a number of shipwreck possibilities yet to be confirmed. Research into the historical records indicates that the remnants of as many as 20 shipwrecks may occur within the park boundaries. In addition to the Spanish wrecks noted above, the remains of the *Colonel Cross, Gladiator, Nicaragua, Winthrop,* five unidentified ships, and possibly the *Palas* lay within the waters and sands of the park. Remains of a late nineteenth-century wreck were recorded in the foredune area of the island in 1994. Due to the currents and shipping routes along the coast, the majority of these wrecks occur along the southern half of the island.

Contrary to the general pattern of shipwrecks located at the southern end of the island, ranching remains and prehistoric sites occur primarily in the northern half of the island. This may be due, in part, to the fact that logistics make archeological survey difficult in the southern half of the island and, thus, fewer sites have been found there, but any proposed ground-disturbing activities in the northern half of the island may stand an increased chance of encountering prehistoric archeological deposits. This situation is complicated by the fact that vegetation has increased over the last 30 years and has stabilized many dunes that cover the known archeological sites. While this affords a certain amount of protection for the buried archeological resources, it also increases the chances of encountering unseen cultural deposits during development activities. Thus, any ground-disturbance activities should be preceded by appropriate compliance requirements.

Cultural Landscapes

Cultural landscapes are geographic areas where people have modified, interacted with, or given meaning to the land. They reveal fundamental ties between people and the land -- ties based on needs such as gathering or growing food, developing settlements, and developing recreational opportunities. The National Park Service is concerned with preserving and interpreting those cultural landscapes determined to be significant on a national, state, or local level. Individual cultural resources (e.g., archeological sites, structures) are located within cultural landscapes. Visible evidence of human manipulation does not need to be present for an area to be considered a significant cultural landscape. Cultural landscapes are systems where both natural elements (e.g., landform, flora, fauna) and cultural elements (e.g., patterns of circulation and spatial relationships between built elements, uses, and cultural traditions) interact. Cultural landscape resources include both physical elements present on site (e.g., vegetation, structures, roads, and trails) and characteristic uses and functions.

Padre Island National Seashore as a whole can be thought of as a cultural landscape, with special natural areas, vegetation, visual resources, ethnographic resources, night sky visibility, relative quiet, and lack of unnatural odors all being part of the cultural landscape. These landscape elements are addressed in other sections of this document. This section focuses on the areas that have been identified thus far as significant (National Register listed or eligible) historic landscapes, namely, the three line camp areas associated with cattle ranching on the Island. Following a preliminary outline of landscape changes at Padre Island NS, the line camp areas are discussed specifically, as landscape resources.

A Cultural Landscape Inventory (CLI) is the NPS tool used to determine character-defining (significant) cultural landscape resources, and is used to provide the information that can be used in a Determination of Eligibility. A CLI has not been completed at Padre Island National Seashore. Thus, the following descriptions and evaluations are preliminary, based on limited research, site visits, and discussions with park staff. Completion of the inventory may identify additional cultural landscape resources.

Overview of Landscape Changes over Time on Padre Island: Detailed descriptions of the history of human interactions with the island have been completed (e.g., Sheire, 1971) and are not repeated here. What follows is a broad overview of landscape changes within the seashore associated with different historic events and periods. While use of the seashore has varied, and while land ownership has been complex, there has been very little settlement on the seashore compared with surrounding areas outside the NPS boundary.

Pre-1519 use and seasonal occupation by the Coahuiltecans and Karankawas:
Seasonal, short-term hunting camps present (see archeology and ethnography sections). No references to large-scale landscape/vegetation modification (e.g., burning) have been found in the literature to date. The island environment was likely very similar to today's conditions, with dune, inland grasslands, wetlands, and tidal-flat areas.

1519 - 1805 - Spanish exploration and use:
Numerous shipwrecks result in ship and cargo remains washing on shore, and debris from Spanish settlements in other locations washed up on shore. Various exploring and shipwreck parties came through but no settlements were developed. The island environment was likely similar to the pre-1519 period.

1805 - 1846; Padre Nicolas Balli cattle operation:
Introduction of cattle onto the island would have resulted in some impact on and changes to island vegetation. Balli's Santa Cruz de Buena Vista Ranch was located outside the present-day seashore boundary. Other activities during this period included the 1828 Survey, and the continuation of material being washed up on shore from the Gulf.

1846 - 1879 - Mexican-American War; Americans take over the island; various cattle operations:
War-related activity had minimal impact on the landscape (e.g., Zachary-Taylor campsite). The cattle operations, now under American control, have similar types of impacts as the Balli operation.

1879 - 1920s; Dunn family cattle operation:
With larger numbers of cattle, and horses, on the island, changes to island vegetation were likely larger in scale than during the earlier period. To run the cattle operation, line camps (Novillo, Green Hill, and Black Hill) were developed, and various other modifications, such as cross-island fences and a fresh water seep tank, were developed between the line camps (see Historical Architecture section). With the continuation of cattle grazing, the overall amount of vegetation on the island was reduced, resulting in more exposed sand, more active dunes, and more sand movement, and thus a greater degree of "migration" of the island's shores. Some non-native plant species (e.g., tamarisk) were introduced during this period.

When large trucks were used to transport the cattle, roads to/from line camps were developed, which required breaks to be established in the foredune area. The Dunn family residence/headquarters was located north of the present-day Seashore boundary.

1920s - 1962; Cattle operation continues; mineral exploration and extraction starts; growing interest in island as place for outdoor recreation/tourism:
Grazing-related changes to the island environment continued. Mineral activity resulted in the introduction of developments (e.g., structures, roads), the introduction of foreign materials such as oyster shells for construction, and the introduction of potential pollutant sources. Documents reviewed so far, that discuss early recreational/tourism development (e.g., that associated with Colonel Sam Robertson) do not indicate that this development occurred with the present seashore boundary.

1962 - present: Padre Island National Seashore established in 1962.
Establishment of the national seashore formalized the preservation/recreation/education emphasis for the area. The Dunn cattle operations ran until 1971. Since then, vegetation has generally increased and dunes have stabilized to large extent, resulting in less overall dune migration and sand movement. Recreational use has resulted in some social trails, dune blowouts, and the subsequent need for dune restoration projects. NPS developments have been introduced at Bird Island Basin, Malaquite, North and South Beaches, and the area of the Gulf campground. NPS educational programs have resulted in more exposure to and experience of the seashore area by the general public than in previous times.

Identified Significant Cultural Landscape Resources: Cattle ranching activity on Padre Island National Seashore -- a relatively rare example of cattle ranching on a barrier island extending into recent times,, which includes the Dunn family operation -- has been determined to be a historically significant activity (see also Historic Structures section for discussion of significance). While the cattle operation used the whole island, and so the historic vernacular landscape associated with the cattle operation can be thought of as including the whole island, the three line camps (Novillo, Green Hill, and Black Hill) are areas of relatively limited extent that represent key concentrated activity associated with the cattle operation, and have extant related resources. Novillo is the remaining Dunn operation line camp with the greatest degree of structural integrity and the one closest to the visitor use area at Padre Island. Green Hill and Black Hill sites are in more remote areas of the seashore, where the structural remains of the line camps are located within areas more representative of conditions during the early days of the Dunn operation (i.e., no mineral exploration activity evident, no NPS development visible). Without the active cattle operation, vegetation (mostly grasses) grow higher today than they would have when the cattle were present.

Sensitive resources in the three line camp areas consist of more than the visible structures alone. Vegetation, areas within corrals, in addition to the actual corral fencing, planted trees, roads and trails, cross-island fences, freshwater seep tanks, small-scale features such as hand pumps and hitching posts, views to and from the line camps, and the spatial arrangement of all line camp elements (characteristic of Dunn's camp configuration), are also important character-defining elements of the line camp landscapes. While the National Register form for Novillo identifies the boundary for the site as the area within the trap fences, the area to be preserved as a significant historic landscape is more accurately identified as the area within the 1,500-foot distances (see

Table S.1 or 2.3). Evaluation of the Green Hill and Black Hill Line Camp landscapes has identified the areas within 2,000 feet of the outer-most corral fences north and south, and the area extending east and west to the Gulf and Laguna, as the boundaries of the historic landscapes. Evaluation has also determined that these landscapes have sufficient integrity to support the significance determination. It should be noted that the areas defined by the 1,500- and 2,000-foot distances are not "buffer" areas around the historic resources, but instead define the significant historic landscapes.

Historic Structures

The historic structures on Padre Island are the remnants of the Dunn Ranch operations. These include the Novillo, Green Hill, and Black Hill Line Camps. While the Novillo Line Camp may be the best candidate for interpretation of ranching history, the other components are integral to a whole system. The park proposes to develop a vehicle pullout and elevated boardwalk at the Novillo Line Camp to interpret the cattle ranching history in the park. Also to be included as historic structures are any extant features located in between the three line camps. These may include traces of cattle trails, freshwater seep tanks, traps, and cross-island fences that divided the island into distinct pasture areas.

The Novillo Line Camp was listed in the National Register in 1974 as an individual site. The NPS evaluated the Green and Black Hill Line Camps and recommended them as eligible for listing in the National Register in May 1998. The three sites are listed as Sensitive Resource Areas and shown on the Sensitive Resource Areas Map, Figures 3.8, 3.9, and 3.10.

The Dunn Ranch line camps are significant in the history of 19th- and 20th-century ranching in the state, and are the only remnants of ranching activity on the island. While the Novillo Line Camp was only one part of the whole Dunn ranching operation, it has the most integrity; it is the only one that still has a contained complex of buildings and corrals generally intact.

The ranching period on Padre Island extended from the turn of the century to 1971. The historic features representing this era of history include post and wire fencing, wood corrals and chutes, a bunk house, a cook house, and small features such as the water pump and hitching post installed for the last roundup. Although Patrick Dunn began the ranching operation in the 1880's, a hurricane in 1919 may have prompted the construction of the current line camp features in about 1920. Patrick's son, Burton Dunn, had the loading chutes, concrete water tanks, and a windmill added in 1948 when trucks began to be used to transport the cattle.

The extant features at Green Hill and Black Hill line camps include cross-island post and wire fences, traps, corrals, loading chutes, and remnants indicating the locations of line camp buildings. The extant features at the line camps represent the development of ranching on the island as the Dunn family adapted to technological changes. Together the three camps also illustrate the particular patterns of ranching adapted to the configuration of the barrier island.

Ethnographic Resources

National Park Service guidelines define an "ethnographic resource" as "a tangible or intangible aspect of a cultural system, past or present, that is identified as significant by a recognized ethnic group. Tangible resources include cultural resources that should be preserved primarily for their historic, technical, aesthetic, or scientific values, and other natural and material entities that should be specifically managed with awareness of their ideological, religious, or utilitarian associations with ongoing cultural practices. Intangible resources consist of cultural practices and their associated knowledge and beliefs" (NPS-28 Cultural Resources Management Guidelines, Appendix A).

The National Historic Preservation Act specifically recognizes that tangible "properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for the National Register" (NHPA 1966 as amended, Section 101(d)(6)(A). Most discussions of Padre Island's cultural history stress the ephemeral nature of human occupation and use from the times of pre-Spanish contact to its designation as a unit of the National Park Service (cf. National Park Service, 1971, 1974, 1996). Shier (National Park Service 1971) and others identify successive periods of occupation and use of the island from a pre-Spanish contact period American Indian presence to Spanish occupants and Americans, including cattle ranchers, settlers, fishermen, vacationers, and finally, the National Park Service (see Cultural Landscape section for chronology). Many of these occupants are described as using the island only occasionally or seasonally, or as having permanent settlements that lasted only a few years. Other associations, however, lasted for several generations, such as those of the Bali and Dunn families -- or even centuries, such as those of the Coahuiltecans and Karankawas.

While the majority of these former occupants, users, and owners are gone, descendants of many of them retain interests in park lands in one way or another and may place particular cultural value on park resources. The importance of particular places in the perpetuation of a group's identity and cultural practices may be retained through oral tradition, even if the group has been physically separated from the place for a long time.

The federal government has specially mandated responsibilities toward American Indian interests, including but not limited to those required by the National Historic Preservation Act. For the purposes of this EIS, it was most crucial to determine if there are American Indian tribes that retain customary associations with park lands, and if so, if there are places on the island to which they may ascribe cultural significance and which require special management considerations.

American Indian Tribes: Among the cultural groups that might retain an association with park lands, the federal government has specially mandated responsibilities to the interests of American Indian tribes. The American Indian Religious Freedom Act, the National Historic Preservation Act, the Archeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007 on American Indian Sacred Sites, and other mandates, require the National Park Service to identify places of cultural significance to Indian tribes on park lands and to consult with tribal governments about management actions that may affect culturally significant resources.

Further, American Indian tribal identities are often rooted in the landscapes from which their origins derived and are intricately linked with tribal traditional history. These histories are common to the cultural group as a whole and are passed from generation to generation, making the physical places themselves an integral component of cultural continuity.

It is commonly held that the Coahuiltecan and Karankawa people whose ancestors once inhabited the island were long ago decimated by disease, conflict with other Indian tribes and non-Indians, migration, and other factors, and were absorbed into Mexican or other American Indian populations until, by the middle of the 19th-century, they became culturally extinct (cf. Campbell, 1979; Newcomb, 1979; Ricklis, 1996; National Park Service, 1971).

The Tonkawa Tribe of Oklahoma is a federally recognized tribe whose customary homeland before forced removal to Oklahoma in the mid-19th-century was the south Texas area just north of Corpus Christi to Waco, and between Austin and San Antonio. According to some accounts, the tribe retains among its membership people of Tonkawa, Lipan Apache, and Karankawa descent (Schilz, 194:640). Further, the Tonkawa Tribe was recommended to the NPS by other southern plains tribes as the tribe with whom to consult regarding national park lands in south and southwest Texas (see Chapter 1). A visit to Padre Island on May 5 and 6, 1998, by an officially designated representative of the Tonkawa tribe revealed that Padre Island is considered to be too far south of Tonkawa customary territory for the tribe to have specific concerns about potential impacts to culturally significant resources. Further, while tribal oral tradition includes references to relationships with the Karankawa people and stories about Padre Island, they, too, are too general to point to specific concerns about specific management actions. However, the tribe is concerned about the health of the island's ecosystem as a whole, and wishes to be kept informed about the oil and gas management plan as well as future park management plans in general.

Non-Indian-associated Groups: In addition to the American Indian traditional cultural values that may be placed on park lands and resources are those that may be placed on park resources by other park-associated families or communities. Descendants of the family of Padre Nicolas Balli, cattle rancher and owner of a Spanish grant to the island from 1805 to the 1846, are still living and maintain periodic correspondence with the park. Similarly, many members of the Dunn family -- cattle ranchers on the island from 1879 through the 1970's, and ongoing owners of mineral rights -- remain in the area and may attach cultural values to particular park lands and resources. consultation with members of the Dunn family in Corpus Christi on May 6, 1998, indicated that Dunn family members retain significant family records and oral traditions about the island, and would be interested in participating in an oral history project to preserve their family history on the island in conjunction with the National Park Service.

Park User Groups: It is also possible that there are ongoing recreational uses of park lands or resources that have given significance or value to certain places by local residents and long-time park users. It is important to understand, for example, how local families have traditionally used the Malaquite area for family outings, and the values that are attached to this area for specific purposes as opposed to areas "down island." Similarly, the wind surfing community has attached a kind of "ownership" to the Bird Island Basin area, while shark fishers place similar values on areas of importance to them. Although these various park uses and the potential for areas of special significance to contemporary users have not been documented, overall, preliminary consultations with park-associated groups reveal no known ethnographic resources and no associated impacts from oil and gas activities.

VISITOR EXPERIENCE

Padre Island is known nationally and internationally for its recreation opportunities. The park provides excellent opportunities for a wide range of seashore recreation, with its stretches of undeveloped beaches, high-quality visual resources, and other significant resources. The north end of the park, from the north boundary south approximately 10 miles to the four-wheel-drive sign on the Gulf beach, is the most heavily used section.

The park is managed to retain its natural qualities and processes as a coastal barrier island. Development has followed a conservative approach. As a coastal high-hazard area, the park's management direction is to not commit the NPS to long-term economic and environmental costs of maintaining large-scale permanent facilities. Such facilities are not needed to support visitor uses, and the NPS is not required to duplicate opportunities provided elsewhere, or to accommodate all regional demand for public recreation.

Park developments occupy approximately 442 acres, or 0.33 percent, of the park's land base, as shown on Table 3.1, Landcover Classification Type in Acres and Percent of Park. Following are descriptions of visitor use areas and park developments. Figure 3.6 is a Map of Park Development. Visitor use areas including the Malaquite Visitor Center, Malaquite RV Campground, Bird Island Basin, and Grasslands Nature Trail, in addition to the Mansfield Channel disposal area, are recognized as Sensitive Resource Areas and shown on the Sensitive Resource Areas map, Figures 3.8, 3.9, and 3.10.

Malaquite Visitor Center

The current visitor center and concession facility was built in 1988 to replace the older pavilion structure damaged by Hurricane Allen. The visitor center serves as the focus of operations for park interpretive programs, which include roving interpretation programs during the summer months; formal programs, arranged in advance; orientation tours for new visitors; and interpretive displays. In addition to NPS interpretive facilities, a bookstore, gift shop, restrooms, auditorium, and first aid station are also available. A concessionaire, located adjacent to the visitor center, provides food, drinks, gifts, beach rentals, and other items. Near the parking lot, which has the capacity for 1,150 vehicles, are cold-water rinse-off showers. The visitor center complex also contains a boardwalk, which is handicapped-accessible, which connects the visitor center to a supervised swimming beach.

Recreational Use Areas

Malaquite RV Campground: This campground is a paved 40-site campground located along the primary dune ridge situated north of the Malaquite Visitor Center complex. This campground has restroom, shower facilities, and a dump station nearby, but there are no RV hook-ups available. A campfire circle, with bench seats, is located on the north end of the campground to provide evening and weekend interpretive programs.

Bird Island Basin: This area is one of the primary recreational use areas within the park. Approximately one-third of the park's visitors go to Bird Island Basin, on Laguna Madre, for boating,

Padre Island National Seashore
Park Development

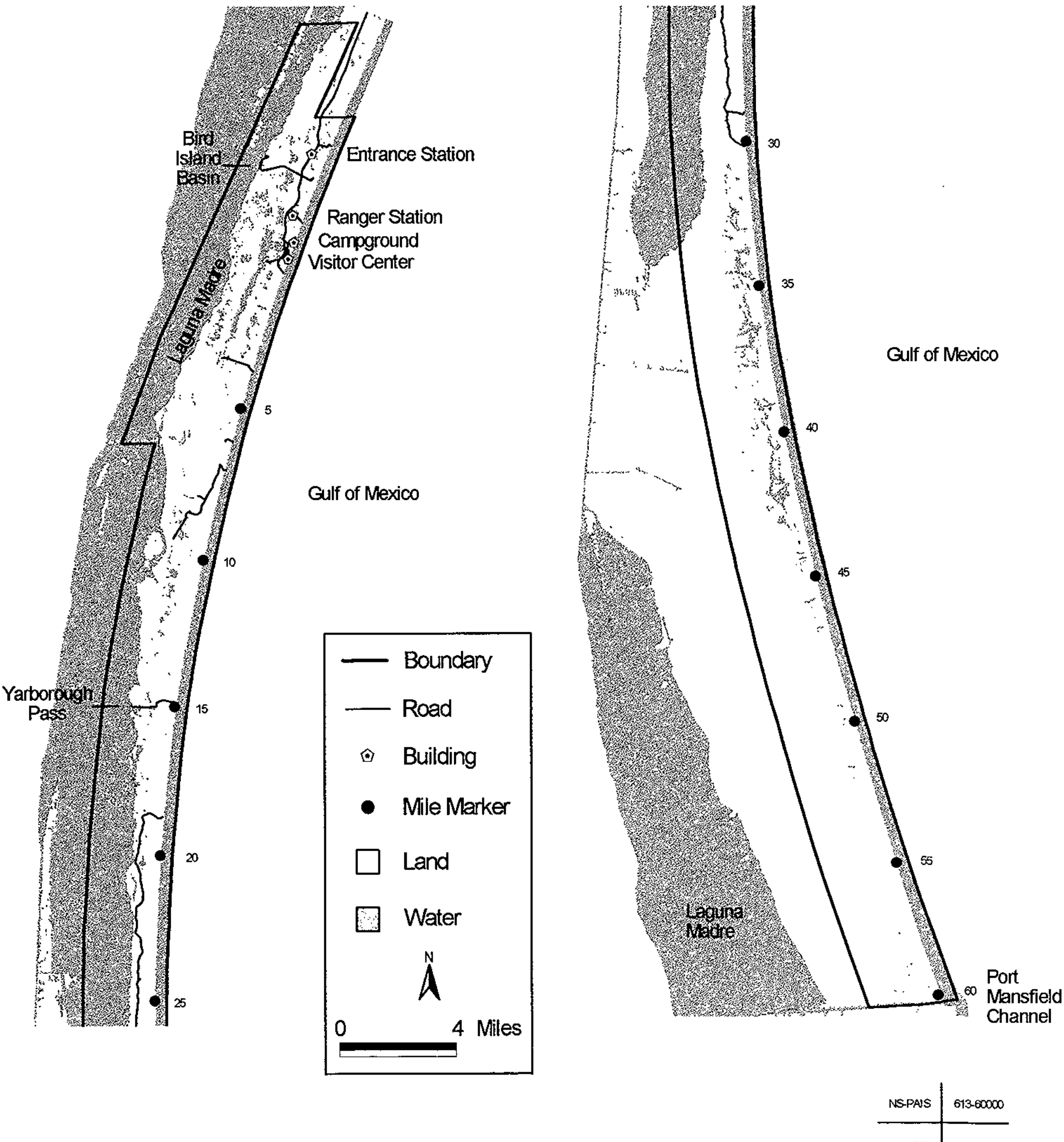

Figure 3.6

fishing, windsurfing, and camping. It is the only easily accessible developed recreation area within the park located on the Laguna Madre shore. (Yarborough Pass is accessible by boat or four-wheel-drive vehicle only.) The Bird Island Basin use area is a geographically small area, extending 2,000 feet along the shoreline and extending 40-125 feet in width, and bordered by wind-tidal flats and other valuable natural features. About 10 percent of Bird Island Basin visitors camp overnight along the shoreline, and the remaining visitors are either visitors wanting to windsurf for the day or boaters launching at the boat ramp. Of the Bird Island Basin campers, approximately 45 percent are tent campers, and 55 percent are recreational vehicle campers. During heavy use periods, Bird Island Basin receives more visitation than other areas of the park.

Boat Dock/Fish Cleaning Station and Channel at Bird Island Basin: Bird Island Basin provides an area that includes a boat ramp, parking area, fish cleaning station, and dredged channel for access to the Laguna Madre. The dredged channel was originally established to transport cattle to and from the island, and later used by the oil and gas industry for exploration and production operations on the island. Currently, this boat ramp is the southernmost launching facility available to area visitors, thereby minimizing travel times to popular Laguna Madre fishing sites.

Grasslands Nature Trail: The park has one interpretive trail, the Grasslands Nature Trail. This 3/4-mile self-guiding, unpaved nature trail and paved parking area are situated off the park road just south of, and in view of, the entrance station. This is the only designated trail for public use within the park, providing the only developed access to the interior grasslands. Signs are located at various locations along the trail to interpret the natural resources present in the dune and grassland habitats.

Mansfield Channel: The Mansfield Channel is a popular down-island destination during the summer. Visitors set up four-wheel-drive vehicle camps and enjoy fishing and beachcombing activities.

Yarborough Pass Boat Dock/Channel: Yarborough Pass was the result of three failed attempts to establish an open pass to the Gulf of Mexico in the 1950's. There is a boat dock that was built for boat access to oil and gas wells in the Laguna Madre. This is an unimproved dirt ramp for launching small boats. Yarborough Pass was not established with jetties, and therefore silted in, due to the longshore currents transporting sand up and down the Texas coast. It is located 15 miles south of the Malaquite Visitor Center on South Beach. A four-wheel-drive road inland from the Gulf beach leads to Yarborough Pass, where primitive campsites are available. A boat ramp is available for launching small boats.

Gulf Beach: The beach provides the only means of getting down island and is defined as a road in the state of Texas with all applicable road laws applying. The Gulf beach is generally 32 to 250 feet (10 to 75 meters) in width. During the summer months, sand is deposited on the beach by gentle waves and tides and the beach is characterized as depositional. Inversely, during the winter months, strong waves and high tides erode the sand, creating a narrower or erosional beach.

Visitor use is typically concentrated on the Gulf beaches, where beachcombing, swimming, wading, sunbathing, fishing, and picnicking are popular activities. Beach use is highest near the park's visitor center and campground at Malaquite Beach. However, many visitors seek a more solitary experience by utilizing less populated areas of the national seashore. This requires relying on their own vehicles to drive down the beach. In general, use is concentrated in the northern third of the park, where driving is easiest and support facilities are available.

The park's Gulf beach is broken into three sections: North Beach, Closed Beach, and South Beach. North Beach is 1 mile in length and extends from the park's north boundary to a set of bollards marking the northern extent of Closed Beach. Driving and camping are permitted on this section of beach. Closed Beach is only a pedestrian beach and no motorized vehicles are allowed. Closed Beach extends south of North Beach for 4.5 miles to a set of bollards marking the beginning of South Beach. The campground and Malaquite Visitor Center beaches are included in the Closed Beach section. The last section, South Beach, is the longest of the beach sections. It extends for 60 miles south and can be accessed by two-wheel-drive vehicles for the first 5 miles. For the remaining 55 miles, soft sand requires that vehicles be four-wheel-drive in order to drive down island. South Beach contains two areas referred to as Little Shell and Big Shell, which are formed by currents that converge off the coast of Padre Island. As these currents converge, shells are broken into smaller and smaller fragments that become deposited on the beach. Little Shell is characterized by shell fragments about 1/2 inch wide from the four-wheel-drive sign to the 15-mile marker on South Beach and is located between the 6- and 8-mile marker on South Beach.

In contrast, Big Shell is composed of shell fragments between 1/2 and 2 inches wide and is located between the 18- and 30-mile markers. The beach profile of Big Shell changes between the summer and winter months. During the winter, the beach extends westward from the Gulf of Mexico to a berm approximately 3-5 feet in height. The summer months, with weaker wave intensity, create a berm that is 1-1/2 to 6 feet high. From the berm, the beach extends relatively flat until it reaches the foot of the primary dunes. Driving in Big Shell is slow and deliberate.

All beach sections contain various types of manmade garbage as well as natural debris such as the marine algae *Sargassum* and tropical woods. This debris can make driving hazardous.

Roads: The park road system provides a means of access for visitors and prime wildlife-viewing points. The road system includes several two-lane asphalt roads, with no improved shoulders, and unpaved roads, which are single-lane, caliche roads. The paved roads include the main road, North Beach Access road, Bird Island Basin road, campground road, and visitor center loop road. The unpaved roads include Novillo Line Camp road, a portion of the Bird Island Basin road going to the boat ramp, the ranger road, sewage lagoon roads, Yarborough Pass, and the Back Island road. Several oil and gas access roads are present and include the Pan Am road, Amoco road, and six pig facility roads. For safety reasons, all roads are accessible by visitors except the oil and gas roads, the sewage lagoon road, and the Novillo Line Camp road.

The Back Island road was created prior to the establishment of the park, and was utilized to avoid the deep ruts, bumps, and soft dry sand that is characteristic of the Big Shell area of the beach during the hot, dry months of summer. Beach conditions generally prevent a two-wheel-drive vehicle from reaching the Back Island road. Despite having a four-wheel-drive vehicle, this road is impassable if it has rained or during the times that the tides in the Laguna Madre are high.

The park road terminates just south of Malaquite Beach. From the road terminus to a point 5-1/2 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.

Seasonal Visitor Use Patterns

Visitor profiles and use patterns vary greatly with the seasons, with the greatest use occurring in the spring and summer.

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.

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. Use remains heaviest on weekends, indicative of heavy day use by residents of nearby communities. Summer evenings are hot and humid and when the Gulf breeze periodically dies away, the humidity can become stifling, and mosquitoes and flies appear. Few visitors remain overnight.

People congregate at Malaquite Beach, where day use becomes extremely heavy. In spite of the heat, many families also use the campground. 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 dense immediately south of Malaquite, and have been known in previous years to fill the beach from the high-tide zone to the dune line. Interpretive programs offered in this high-density campsite setting are well attended, while programs away from this area do not draw as many visitors.

Down-island activities also reach their peak for the year during the summer. Four-wheel drive vehicles camps are set up at Little Shell and Big Shell Beaches, and near the Mansfield Channel, where fishing and beach combing are popular activities. There is a very limited inland backcountry use.

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Fall: About the middle of August, park attendance drops off, even though September, October, and November are pleasant for camping and enjoying the coastal environment. Most Gulf-side use during this season occurs at Little Shell and Big Shell beaches, where fishing is more productive. With fishing interest high in late October and November, weekend visits by locals pick up, and camping on the beach increases. In the Malaquite campground, use is limited mainly to weekends during the fall. At Bird Island Basin, the most popular destination, sailboarding continues through november.

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

Visitor Use Statistics

Currently, the park records approximately 600,000 visitors annually (Table 3.6), with July being the busiest visitation month. It appears that Padre Island is becoming more of a regional destination. Although the 1983 Draft GMP/DCP/EA reports that only 15 percent of all visitors come from outside the Laguna Madre counties, a recent study reports that 61 percent of all visitation comes from outside the State. Even so, the great majority of use is day use. Although camping opportunities are available, less than 10 percent of all visitors stay overnight. Since 1981, tent camping has generally decreased, while recreational vehicle camping has increased; in 1990, about four times as many campers were using RVs than were camping in tents.

The total amount of visitor use at Bird Island Basin has increased more rapidly than the total visitation for the park as a whole. Over the last few years, the average increase in use at Bird Island Basin has been 35 percent, with a rate of 24-percent increase during 1992. This overall increase is due in large part to the rapidly increasing popularity of sailboarding.

Table 3.6. Yearly Visitation

Year	Annual Visitation
1991	973,825
1992	849,873
1993	768,191
1994	917,396
1995	757,617
1996	724,403
1997	657,703

Noise as a Component of Visitor Experience

Visitors come to Padre Island National Seashore for many different reasons. Surveys have been completed of down-island visitors (Ditton and Gramann, 1987) and visitors at Bird Island Basin (Gramann, 1989). Both surveys examined visitor motive for coming to Padre Island National Seashore, and the top motives included "to be outdoors," "to get away," "for relaxation and rest," "to be with friends," "to feel alive, alert, and active," "for excitement," and "to experience peace and quiet," (1989 survey). The 1987 survey found similar motives, with "to be outdoors" and "for relaxation and rest" as the top two reasons for visiting Padre Island.

The natural quiet of Padre Island National Seashore contributes heavily to a positive visitor experience and is a direct or indirect component of many of the top motives reported for park visitors. Therefore, noise was evaluated as an important component of visitor experience purposes.

Background noise measurements were taken at various locations on Padre Island National Seashore. A useful measure of background sounds is when the sound level exceeded 90 percent of the time, abbreviated L90. A standard measurement for sound is dBA, which stands for A-weighted decibels. Table 3.7 contains L90s obtained in January and March 1998. Comparisons of park sound levels to other natural and manmade sounds, including certain oil and gas operations are shown in Figure 3.7.

Table 3.7. Ambient L90 Sound Levels

Location	L90, dBA
Bird Island Basin boat ramp	30
Bird Island Basin wind surfing area	45
Grasslands Nature Trail	38
Malaquite Beach	59
North Beach	61-62
Pan Am Road (back-island)	44
South Beach	62-63
Malaquite Visitor Center	48-51

The potential effects of noise on visitor experience in the highly-used SRA visitor use areas (Malaquite Beach and campground, Bird Island Basin, Grasslands Nature Trail) was one of the main reasons for establishing 1,500-foot buffers as part of the SRAs under the various alternatives. The buffer widths were derived partly by using information about drilling rig noise levels from the Sound Level Comparison Chart in Figure 3.7, and assuming that the noise at sensitive areas should be kept as close as possible to ambient sound levels.

Visitor Perception of Oil and Gas Operations

There has been relatively little input received from visitors to Padre Island National Seashore on the existing oil and gas operations and their effect on visitor experience at the park. The 1987 survey of down-island users (Ditton and Gramann, 1987) included questions about perceived sources of beach debris. The survey results showed that the offshore oil platforms and rigs were perceived by many visitors to be the greatest source of beach litter. This is actually not the case, according to a 10-year marine debris project recently conducted by the park (Miller, Baker, and Echols, 1995). However, the 1987 survey did conclude that the public perceives oil and debris on the beach as a pervasive problem that adversely affects their visitor experience. Regarding noise impacts, there have been a few complaints about oil and gas operations registered (one written, one verbal, and several during seismic operations) over the years. Noise from oil and gas operations is an important consideration near high visitor use areas, as previously discussed.

No other specific survey information is available regarding visitor expectations about the oil and gas operations, but the reasons reported by visitors for coming to the park are primarily focused on the "outdoor, natural, rest and relaxation" motives. The extent to which the presence of oil and gas operations could limit visitor experience of the outdoors and relaxation is dependent on the visitor, the location of the operations in the park, and operational conditions. In general, however, it is recognized that viewing or experiencing oil and gas operations is not one of the primary reasons visitors come to Padre Island National Seashore, so that potential impacts should be mitigated whenever possible.

Figure 3.7. Sound Level Comparison Chart[1]

How it Feels	Equivalent Sounds	Decibels	Sound Levels at Various Locations in Padre Island National Seashore
Very loud	Air compressor @ 20 ft. Garbage trucks and city buses	100	
Conversation stops	power lawnmower		
	diesel truck @ 25 ft.		
Intolerable for phone use		90	
	steady flow of freeway traffic 10 HP outboard motor garbage disposal		
	near drilling rig automatic dishwasher muffled jet ski @ 50 ft. vacuum cleaner	80	
	Drilling rig @ 200 ft.	70	
	window air conditioner outside @ 2 ft.		South Beach North Beach
	window air conditioner in room	60	Malaquite Beach
	normal conversation		
			Malaquite Visitor Center
		50	
	quiet home in evening drilling rig @ 800 ft.		Bird Island Basin - wind-surfing area
	bird calls		PanAm Road (back-island)
	drilling rig @ 1500 ft. library	40	Grasslands Nature Trail
	soft whisper		
		30	Bird Island Basin boat ramp
	in a quiet house at midnight		
	leaves rustling	20	

[1]Modified from Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida (U.S. Department of the Interior).

SENSITIVE RESOURCE AREAS

The planning process for this Oil and Gas Management Plan/EIS included identifying issues, collecting data, and scoping with the public and governmental agencies. During this process, numerous resources and values were identified that could be affected by the proposed oil and gas development (see Chapter 1 - Identifying Issues and Collecting Data). Criteria were developed by the EIS team to define particularly sensitive resources or areas, and these criteria were applied to the initial list of resources and values. From this came the identification of the Sensitive Resource Areas (SRAs) listed in Tables 2.2 and 3.8, below. The acreages for each SRA shown in the tables includes the largest protective buffer. Figures 3.8, 3.9, and 3.10 present a Sensitive Resource Areas map that shows the locations of the SRAs.

The SRAs overlap with some of the broader resource categories already discussed as significant issues or resources in this chapter; for example, seagrass beds and wind-tidal flats are types of wetlands. Therefore, the discussions pertaining to SRAs already included under previous topics are not repeated here; rather, the reader is referred to the relevant sections. The SRAs that have already been addressed under previous topics are:

Cultural Sites (4) - see "Cultural Resources" for discussions of Novillo, Green Hill, and Black Hill Line Camps and the Mansfield Archeological District

Freshwater Ponds (3 permanent) - see "Soil and Water Resources" - Permanent Freshwater and Ephemeral Ponds

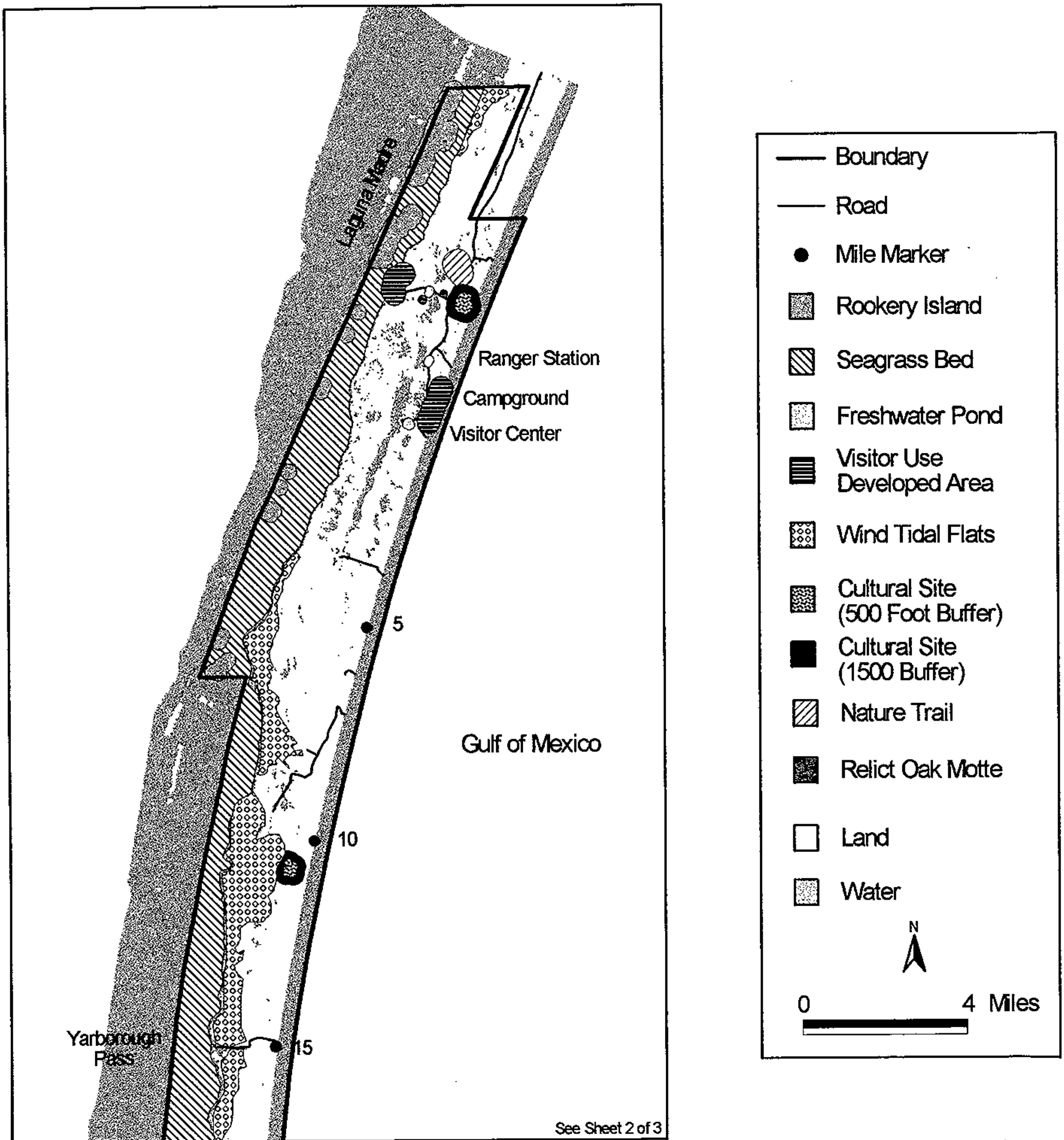
Seagrass Beds - see "Wetlands - Seagrass Beds"

Wind-Tidal Flats - see "Wetlands - Wind-Tidal Flats"

Visitor Use Areas (5) - see "Visitor Experience" discussion of Malaquite Visitor Center, Grassland Nature Trail, Bird Island Basin, Malaquite RV Campground, and Mansfield Channel Archeological District.

The remaining SRAs not included in other topics are described below.

Padre Island National Seashore
Sensitive Resource Areas



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Jan 1999	PAIS

Figure 3.8
Sheet 1 of 3

Padre Island National Seashore
Sensitive Resource Areas

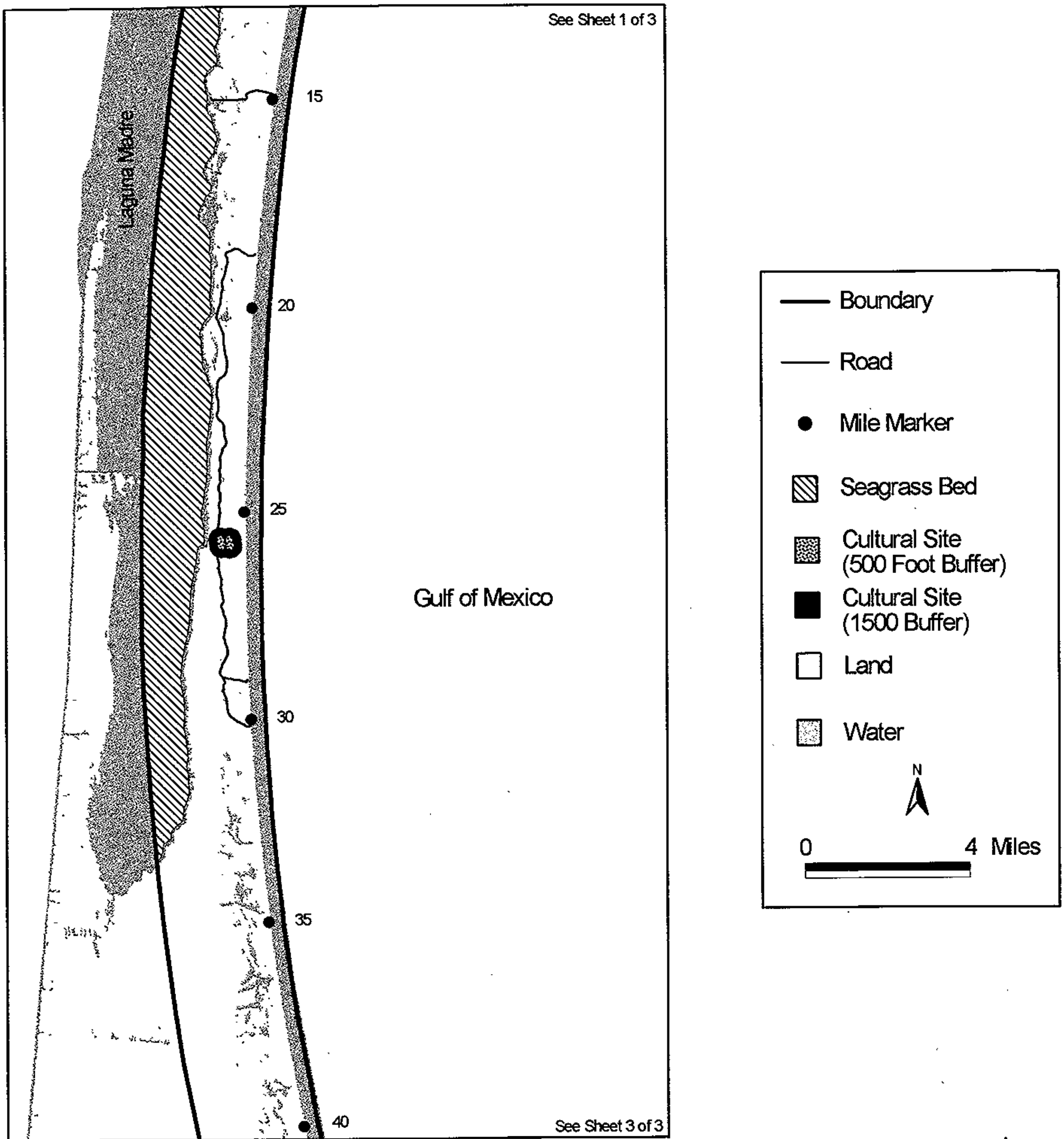

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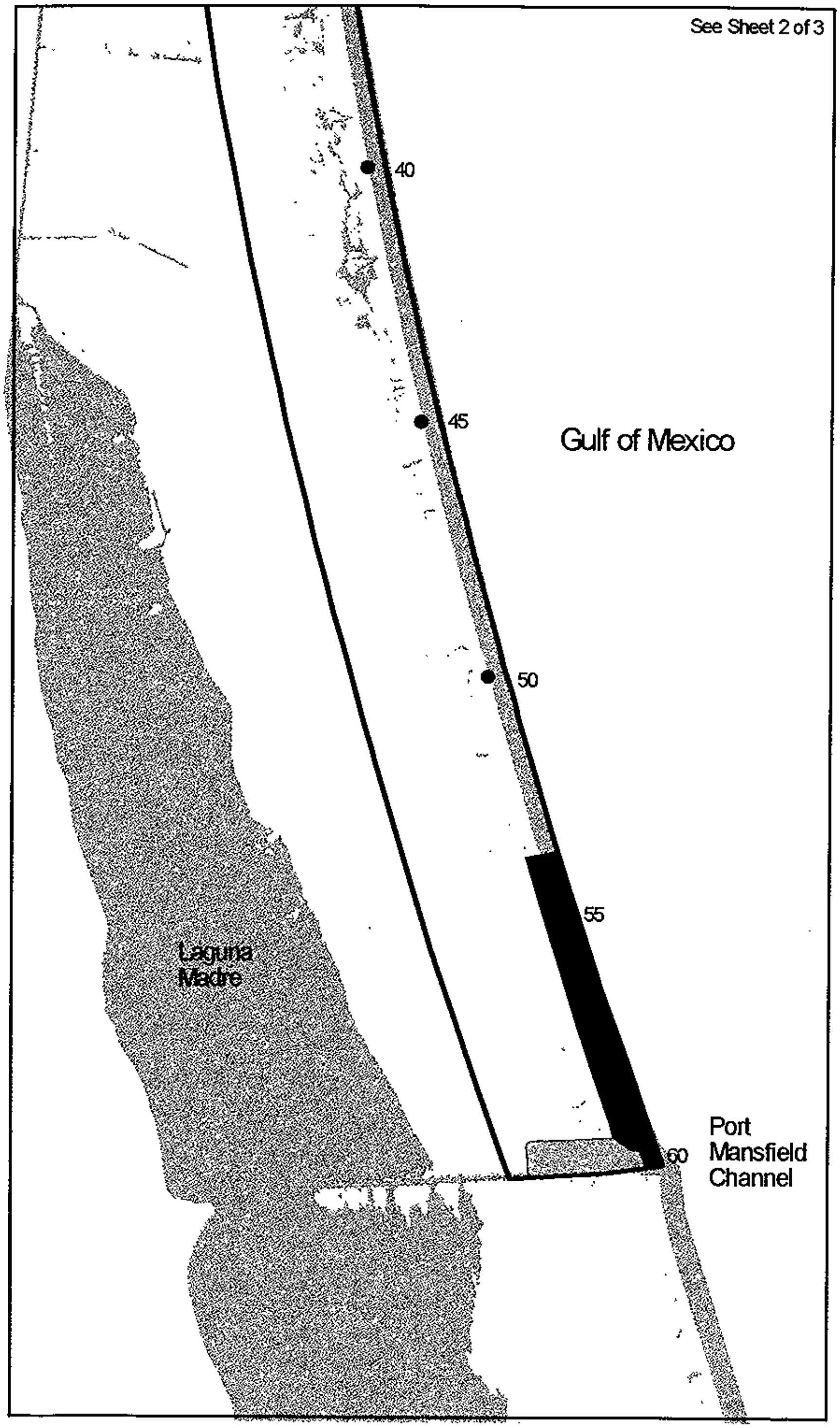
Figure 3.9
Sheet 2 of 3

ON MICROFILM

Padre Island National Seashore
Sensitive Resource Areas



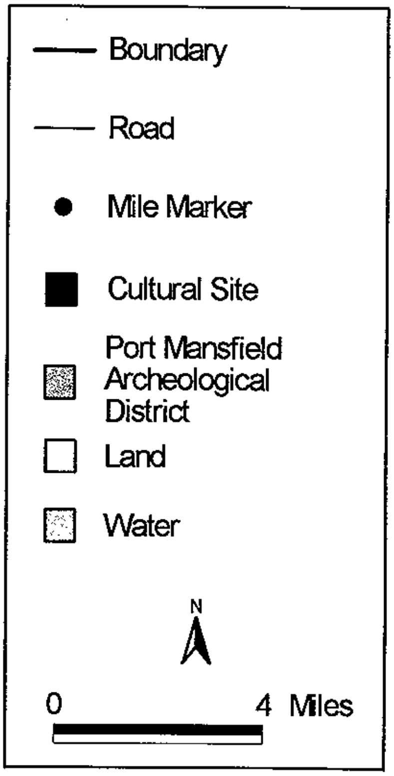


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Figure 3.10
Sheet 3 of 3

Table 3.8. Sensitive Resource Areas in Acres and Percent of Park

Sensitive Resource Area	Acres	% of Park
Cultural Sites		
-Novillo Line Camp	377 acres	0.28%
-Green Hill Camp	311 acres	0.23%
-Black Hill Camp	313 acres	0.23%
-Mansfield Cut Archeological District	2,702 acres	2.02%
Freshwater Ponds		
-Pond A	33 acres	0.02%
-Pond B	33 acres	0.02%
-Pond C	42 acres	0.03%
Seagrass Beds	25,240 acres	18.85%
Wind-Tidal Flats	29,127 acres	21.75%
Visitor Use Areas		
-Malaquite Visitor Center and Malaquite RV Campground	470 acres	0.35%
-Bird Island Basin	380 acres	0.28%
-Grasslands Nature Trail	318 acres	0.24%
-Mansfield Channel COE Disposal Area	875 acres	0.65%
Foredunes	3,200 acres	2.39%
Washover Channels	1,192 acres	0.89%
Rookery Islands	530 acres	0.40%
Relict Live Oak Mottes		
-Live Oak Motte 1	22 acres	0.02%
-Live Oak Motte 2	18 acres	0.02%
Totals:	65,183 acres	48.67%

Foredunes

The foredunes of Padre Island National Seashore provide protection from hurricanes and tropical storms for the Island's backcountry and the Texas mainland. The dunes are extremely fragile and, once impacted, can easily be destroyed through erosion and wind action. Dunes are created when vegetation stabilizes blowing sands that are moved across the beach. Small coppice dunes form first and become primary dunes as vegetation stabilizes more sand. A line of dunes form parallel to the beach and vary in height from less than 7 feet to over 30 feet (2 m to over 10 m) above mean sea level. The primary dune line extends the entire length of Padre Island National Seashore, broken only in a few places where hurricane washover channels have occurred.

The presence of dunes is dependent on the presence and amount of vegetation. Dune vegetation includes a variety of halophytic plant species such as railroad vine (*Ipomoea precaprae*), sea purslane (*Sesuvium portulacastrum*), beach croton (*Croton punctatus*), sea oats (*Uniola paniculata*), beach evening primrose (*Oenothera drummondii*), and beach and partridge pea (*Cassia fasciculata*).

The wildlife composition of the foredunes is fairly diverse. Two rodent species, the kangaroo rat (*Dipodomus compactus*) and the spotted ground squirrel (*Spermophilus spilosoma*), are quite prevalent. This habitat supports a moderate number of reptilian species. The keeled earless lizard (*Holboddkia propinqua*) is indigenous to Padre Island and the insular dunes at Sarita, Texas.

Washover Channels

When hurricanes and tropical storm tides break through the foredune ridge, washover channels are created. Washover channels provide a conduit for Gulf of Mexico waters to freshen the hypersaline waters of the Laguna Madre. After storm events or extremely high tides that reopen these washover channels, they will normally close up to the Gulf of Mexico and Laguna Madre through the natural deposition of sand on the beaches. These washover channels are utilized by numerous shorebirds for resting, foraging and nesting. The piping plover (*Charadrius melodus*), snowy plover (*Charadrius aleandrinus*), and other flat nesting guild species utilize the washover channels, wind-tidal flats, and Gulf beaches.

Rookery Islands

The Laguna Madre portion of the park contains two natural islands, North Bird Island and South Bird Island. Additionally, 27 manmade islands, referred to as spoil islands, were created by the U.S. Army Corps of Engineers (COE) during the establishment of the Gulf Intracoastal Water Way (GIWW). In order to maintain a proper depth, the COE must dredge the GIWW, and the "spoil" generated from these dredging activities is placed in areas adjacent to the channel. Over the years, continued deposition has created small islands that have become vegetated and occupied by waterbirds who use them as nesting area. Large rookeries for numerous species of waterbirds are established on these islands. Species include great blue heron (*Ardea herodias*), reddish egret (*Egretta rufescens*), caspian tern (*Sterna caspia*), royal tern (*Sterna maxima*), white pelican (*Pelicanus erthrorhynchos*), laughing gull (*Larus atricilla*), and white-faced ibis (*Plegadis chihi*). Any activity on these islands during nesting season will harm nesting birds, eggs, or hatchlings; therefore, rookery islands are closed between February 15 and September 30. The U.S. Fish and Wildlife Service recommends a 1,000-foot buffer around these islands during nesting season.

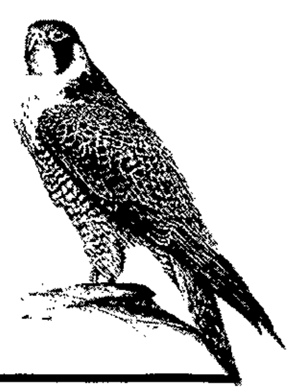
These islands are located along the Intracoastal waterway from the north boundary of the park to a point west of Point of Rocks along the north shore of Baffin Bay. They range in size from 2 to 40 acres and have a flat topography. Vegetation consists of yucca (*Yucca constricta*), sea ox-eye daisy (*Borrichia frutescens*), glasswort (*Salicornia bigelovii*), and salt-flat grass (*Monanthochloe littoralis*). No structures or developments are currently present on the islands. In addition, these islands provide some protection for the northern area of Bird Island Basin from wind waves, but the southern area is more exposed.

Relict Live Oak Mottes

The Virginia live oak (*Quercus virginiana*) is the species of remnant tree that is reported by Spanish explorers to have covered most of North Padre Island. There are few remaining stands of the live oak in the park. These oat mottes provide cover, forage, and shelter for neo-tropical migrant songbirds; shelter and forage for the white tailed deer (*Odocoileus virginianus*); and a seed source for the continuation of the species at Padre Island National Seashore. They also add to the visual quality of the island, providing a different landscape element.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES



CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the effects, or potential impacts, on the physical, biological, and cultural environment from implementation of the proposed action and alternatives considered in this EIS. The topics discussed are the same significant resources and issues addressed in Chapter 3:

- Oil and Gas Exploration and Development
- Soil and Water Resources
- Wetlands
- Cultural Resources
- Visitor Experience
- Sensitive Resource Areas (SRAs)

The other resources or issues that were considered and evaluated, but not carried forward for more detailed analysis, are described in the last portion of Chapter 1. Reasons are provided as to why those topics were not considered significant, given the nature of the park, the proposed development, and/or the mitigation required under Managed Access Provisions.

Use of the Reasonably Foreseeable Development (RFD) Concept

It is important to understand the purpose for which the Reasonably Foreseeable Development Scenario (RFD) was developed. The purpose of the RFD is to test the site-specific effectiveness of mitigation measures (including operating standards, no-surface occupancy restrictions, and seasonal/time restrictions), and to provide the basis to compare alternatives and address cumulative effects.

The RFD theorizes that initially six exploratory wells would be drilled, of which two would be dry-holes and immediately plugged and abandoned. Of the remaining four wells, one exploratory well would produce one field, while the remaining three exploratory wells would be augmented with two additional wells each, to produce three other fields. Therefore, out of a total of 12 wells, 10 would be placed in production to produce 80 BCF over the next 30 years. Rather than try to choose which of the six RFD exploratory wells would be dry holes and which would be the single producer of a field, the interdisciplinary team assumed that all six RFD wells would be fully developed, and evaluated the potential for environmental impacts based on 18 producing wells.

The projected surface disturbance of the theoretical RFD for 18 wells, with associated access roads, drilling and production pads, and pipelines is approximately 250 acres or 0.2 percent of the park. It should be noted that no ground-disturbing activities would result directly from the management decisions made from this document. Any future nonfederal oil and gas operations causing ground disturbance would require further environmental analysis, in accordance with NEPA, prior to their authorization. Therefore, no approval of any access and surface use is being made through this analysis.

Under Alternatives A and C, restrictions that would be applied to Sensitive Resource Areas could potentially result in not all the wells identified in the RFD being drilled. Some locations would be precluded from occupancy by the application of a No Surface Occupancy Stipulation (Alternative A), or the area would be precluded from surface access (Alternative C). In using this analytical approach, it is assumed that if a particular location cannot be occupied, the operator would make exploration investments at locations outside the SRA but still within the park, or at locations adjacent to the SRA but outside the park to access subsurface locations under the SRA. Where the SRA is large, however, such as seagrass beds and wind-tidal flats, the RFD scenario could be reduced.

Impact Significance Criteria

Impact Significance Criteria are defined as the criteria used to establish the threshold or magnitude at which an impact could be considered significant, thus warranting special attention such as mitigation. These criteria are derived from government regulatory standards, available scientific documentation, previously prepared environmental documents, and the professional judgment of resource specialists.

Organization of Impact Discussions

This chapter is organized by resource, the same as Chapter 3. Discussions may vary in format from resource to resource, but most (except the SRA discussion) proceed as follows: For each resource, data analysis methods used in evaluating effects are described. Impact Significance Criteria are identified. A discussion of general effects that could be attributed to nonfederal oil and gas activities follows. Potential consequences associated with oil and gas development are discussed without reference to any particular location. The projected amount of acreage disturbed per well is presented in Chapter 2. These numbers have been used for impact analysis. This is in recognition that activity could take place at any location, unless under Managed Access Provisions (for all alternatives) or under Sensitive Resource Area restrictions (for Alternatives A and C), that activity is controlled or precluded. The following analysis takes into consideration the Managed Access Provisions that could avoid or reduce impacts as discussed in Chapter 2, and the added protection for Sensitive Resource Areas included in Plan Alternatives A and C, also discussed in Chapter 2.

The impacts are discussed in terms of standard types/phases of nonfederal oil and gas operations such as access roads, exploratory drilling, production, and abandonment and reclamation. Long-term impacts are projected to occur for 20 to 30 years. Short-term impacts generally range from 1 to 3 years in duration.

This chapter also includes a comparative analysis of the proposed action and alternatives and analysis pertaining to the following topics:

- Cumulative Impacts;
- Relationship Between Local Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity;
- Irreversible or Irretrievable Commitments of Resources; and,

– Unavoidable Adverse Impacts That Cannot be Avoided Should the Action be Implemented.

IMPACTS TO OIL AND GAS EXPLORATION AND DEVELOPMENT

Introduction

Impacts to oil and gas exploration and development are addressed as a significant impact topic, because the oil and gas mineral rights are a nonfederal property interest, and there is the potential for controversy.

The effects for each of the alternatives on oil and gas exploration and development are expected to be primarily economic and limited to oil and gas operations in the park and persons or entities owning minerals underneath the park.

Impact Significance Criteria

Impacts to oil and gas exploration and development would be considered significant if they substantially impaired an owner's or lessee's right of access to the mineral estate, such that the owner or lessee would be effectively and economically precluded from developing the resource.

Impacts to Oil and Gas Exploration and Development Common to All Alternatives

Operating costs would be higher inside the park than in other areas because Congress mandated the park to be managed to minimize adverse environmental impacts.

Increased costs to operators would be incurred to prepare Plans of Operations, implement extra resource protection measures for operations utilizing methods least damaging to park resources and values, reclaim sites to higher standards, and secure performance bonds.

Operators would need to incorporate into their planning schedule NPS processing time to approve a Plan of a Operations. The standard processing period for the NPS to approve a plan is 3 to 4 months. The NPS processing time could be integrated and run concurrently with other federal and state regulatory and permitting requirements; therefore the NPS processing time is not expected to result in unusual delays for operators.

Geological potential, logistical issues, and royalty rates are a few primary factors that determine whether a mineral tract will be explored and developed. Environmental constraints can affect oil and gas exploration and development decisions when comparing like properties. Where properties are subject to additional operating costs, they may be more difficult to lease (or may receive a lower bid price). Regulatory requirements are only one in a myriad of factors influencing decisions to explore for and develop oil and gas.

Impacts to Oil and Gas Exploration and Development under Alternative A, Proposed Action

Under the Proposed Action, Alternative A, there could be increased costs for operators to design operations to avoid or reduce impacts to SRAs. In particular, directional drilling of exploratory wells or installing pipelines under SRAs may need to be used where No Surface Occupancy or No Ground Disturbance is specified. However, these areas are few in number, and geographically small, so that the maximum offset for directionally drilling exploratory wells is not expected to exceed 2,500 feet, and is not expected to preclude drilling or pipeline construction.

Cost savings are expected to be derived by operators in their preparation of a Plan of Operations as a result of having a planning framework available to them that identifies SRAs and operating standards. With an understanding of the regulatory framework, and through adequate planning, environmental impacts may be identified early so that project design provides for avoiding impacts or appropriate mitigation, thereby avoiding costly revision of Plans of Operations.

Under Alternative A, Proposed Action, implementation of this oil and gas management plan is expected to benefit operators by providing clearer direction and reducing confusion. The result would be fewer occurrences of unnecessary expenditures or time delays during the permitting process.

Efficiencies are expected to be gained in the timeliness of Plan of Operations preparation and approval. Operators would be able to more efficiently prepare Plans of Operations because surface resources and values especially sensitive to potential disturbance from oil and gas activities are identified as SRAs; and a defined regulatory framework and operating standards are provided to facilitate operators in their planning efforts to design operations and prepare Plans of Operations. For the NPS, the identification of SRAs and operating standards are expected to guide the NPSs management of oil and gas activities in a comprehensive and consistent manner so that it meets its primary objective to ensure that oil and gas activities are uniformly conducted to minimize damage to park resources and values.

Under Alternative A, geophysical exploration may occur under Managed Access Provisions, in all areas of the park.

Under Alternative A, all oil and gas would be accessible, and the Reasonably Foreseeable Development scenario is expected to be attainable.

Cumulative Impacts to Oil and Gas Exploration and Development under Alternative A, Proposed Action

Under Alternative A, all oil and gas reserves would be accessible for exploration and development; the level of oil and gas activity is not expected to change appreciably from past and current levels. As new discoveries are made and developed, older operations will move from production to reclamation. Thus, there are no anticipated cumulative impacts on oil and gas exploration and development under Alternative A, the Proposed Action.

Conclusion

1. Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least-damaging methods). NPS anticipates that costs and time associated with preparing and approving Plans of Operations would be less than Alternative B, No-Action/Current Management, because the plan would allow operators to know in advance specific locations in the park where access would likely be denied or severely restricted.

2. Costs to explore and develop oil and gas would be higher than for areas outside the park.

3. Managed Access Provisions would allow for full geophysical characterization of the oil and gas reserves of the park.

4. All oil and gas reserves beneath the park would be accessible for extraction.

Impacts to Oil and Gas Exploration and Development under Alternative B, No-Action (Current Management)

Under Alternative B, No-Action/Current Management, all areas of the park would be accessible for oil and gas exploration and development under Managed Access Provisions.

Identification of sensitive resource areas and development of appropriate operating standards would be made on a case-by-case basis, necessitating more consultations with park and other NPS resource specialists. This process would increase the time for operators to prepare a Plan of Operations. Interpretation and application of Managed Access Provisions on a case-by-case basis could result in a higher frequency of inconsistent interpretations; time delays as a result of consulting with resource specialists in other NPS offices outside the park, when technical specialists are not available in the park; and confusion, which would likely translate into increased costs in time and effort by the operator to prepare a Plan of Operations, increased operating costs, and delay in obtaining NPS approval of a Plan of Operations.

In some situations, directional drilling of exploratory wells or pipelines under an identified sensitive area may need to be used where the project-specific decision is to not allow surface occupancy or ground disturbances. Directional drilling offsets could exceed 2,000 feet.

Under Alternative B, No-Action/Current Management, lack of a clear regulatory framework, which would include identification of Sensitive Resource Areas and applicable operating standards, reduces the ability for the operator or the NPS to prepare and process Plans of Operations efficiently. The result would be increased occurrences of unnecessary expenditures, frustration, and time delays during the permitting process. There would be a higher potential for the NPS to reject plans.

Under Alternative B, No-Action/Current Management, all oil and gas reserves beneath the park would be accessible for full geophysical characterization and development. All areas of the park could be explored using existing geophysical surveying technology. Operators would need to design surveys to minimize or avoid surface disturbance in any sensitive resource area identified during project planning. Drilling could occur in any area of the park, although directional drilling may be necessary to reach some bottomhole targets.

Cumulative Impacts to Oil and Gas Exploration and Development under Alternative B, No-Action/Current Management

Under Alternative B, all oil and gas reserves would be accessible for exploration and development; the level of oil and gas activity would not be expected to change appreciably from past and current levels. As new discoveries are made and developed, older operations will move from production to reclamation. Thus, there are no anticipated cumulative impacts on oil and gas exploration and development under Alternative B.

Conclusion

1. Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least damaging methods). The NPS anticipates that time requirements would be greatest because the lack of a plan would not allow operators to know in advance the specific locations in the park where access would likely be denied or severely restricted. Inconsistencies are possible without a plan and this could cause frustration, longer negotiations, and unanticipated denials.

2. Costs to explore and develop oil and gas would be higher than for areas outside the park.

3. Full geophysical characterization of the oil and gas reserves of the park would be allowed.

4. All oil and gas reserves beneath the park would be accessible for extraction.

Impacts to Oil and Gas Exploration and Development under Alternative C, Maximum Resource Protection

Under Alternative C, all Sensitive Resource Areas would be closed to surface activity associated with the conduct of oil and gas operations. The impact of such a closure on the costs associated with exploration and development of oil and gas would largely depend on the geographical extent of a particular Sensitive Resource Area.

No Surface Access in Sensitive Resource Areas that have a relatively small geographical extent, such as relict live oak mottes and freshwater ponds, would result in minimal increased costs to explore for and develop oil and gas. Operators could likely meet exploration and development goals by designing operations to avoid these areas so that no additional costs are incurred.

Prohibiting oil and gas surface activity in larger Sensitive Resource Areas, particularly seagrass beds in the Laguna Madre and wind-tidal flats on the leeward margin of the island, would likely preclude an operator's use of exploration tools, such as seismic data acquisition, to develop drilling prospects beneath these areas. Operators could still use well and geophysical data existing at the time this Oil and Gas Management Plan/EIS is implemented for defining potential drilling prospects located beneath Sensitive Resource Areas.

In terms of exploratory drilling and production, operators could use directional-drilling techniques from surface locations outside Sensitive Resource Areas to reach most bottomhole targets beneath Sensitive Resource Areas. The costs associated with directional drilling are appreciably higher than a vertical well, particularly as the offset extends beyond 2,500 feet. The NPS recognizes that some potential bottomhole targets may be technologically inaccessible, and therefore a portion of acreage beneath larger Sensitive Resource Areas may be effectively unavailable for oil and gas development.

Under Alternative C, Maximum Resource Protection, implementation of this Oil and Gas Management Plan/EIS is expected to benefit operators by providing clearer direction and reducing confusion. The result would be fewer occurrences of unnecessary expenditures or time delays during the permitting process.

Efficiencies are expected to be gained in timeliness of Plan of Operations preparation and approval. Operators would be able to prepare Plans of Operations more efficiently because surface resources and values especially sensitive to potential disturbance from oil and gas activities are identified as SRAs; and a defined regulatory framework and general operating standards are provided to help operators in their planning efforts to design operations and prepare Plans of Operations. For the NPS, the identification of SRAs and specific operating standards are expected to facilitate the NPS's management of oil and gas activities in a comprehensive and consistent manner so that it meets its primary objective to ensure that oil and gas activities are uniformly conducted to minimize damage to park resources and values.

Under Alternative C, Maximum Resource Protection, operators would need to design operations to avoid surface access in SRAs. As discussed under "costs," above, prohibiting oil and gas surface activity in larger Sensitive Resource Areas, particularly seagrass beds in the Laguna Madre and wind-tidal flats on the leeward margin of the island, would likely preclude an operator's use of exploration tools, such as seismic data acquisition, to develop drilling prospects beneath these areas. Operators could still use well and geophysical data existing at the time this Oil and Gas Management Plan/EIS is implemented for defining potential drilling prospects located beneath Sensitive Resource Areas.

In terms of exploratory drilling and production, operators could use directional-drilling techniques from surface locations outside Sensitive Resource Areas to reach most bottomhole targets beneath Sensitive Resource Areas. However, the NPS recognizes that some potential bottomhole targets may be technologically inaccessible, and therefore a portion of acreage beneath larger Sensitive Resource Areas may be effectively unavailable for oil and gas development.

Therefore, under Alternative C, a portion of acreage beneath larger Sensitive Resources Areas may be effectively unavailable for oil and gas development, and the potential exists for a portion of the Reasonably Foreseeable Development scenario to not be attainable.

Cumulative Impacts to Oil and Gas Exploration and Development under Alternative C, Maximum Resource Protection

Under Alternative C, there would be a potential reduction in the acreage available for oil and gas exploration and development, primarily in seagrass beds and wind-tidal algal flats. A potential reduction in available acreage for exploration and production may lower the estimate of recoverable oil and gas reserves in the park. Because the presence or absence of commercial quantities of oil or gas in any specific area is highly speculative, any estimates of final impact to the oil and gas owners and operators would be largely conjectural.

Conclusion

1. Compared to operations outside the park, oil and gas proposals would require more time for approval and more stringent environmental protection technology (utilization of least damaging methods). The NPS anticipates that time requirements would be similar to Alternative A, and less than Alternative B (No-Action/Current Management) because the plan would allow operators to know in advance specific locations in the park where surface access would be denied or severely restricted.

2. Costs to explore and develop oil and gas would be higher than for areas outside the park.

3. No access to the 65,183 acres of Sensitive Resource Areas would preclude these areas from geophysical exploration. While operators could use existing well and geophysical data available at the time this plan is implemented, the inability to conduct newer 3-D geophysical exploration is likely to interfere with full characterization of the oil and gas reserves underlying these areas of the park.

4. Some oil and gas reserves beneath the park may not be accessible for extraction because a small portion of the seagrass beds and wind-tidal flats that may not be accessible by directional drilling. If commercial quantities of oil or gas occur within this area, these oil and gas reserves beneath the park would not be accessible for extraction.

IMPACTS TO SOILS AND WATER RESOURCES

Introduction

The soils and water resources at Padre Island National Seashore are highly susceptible to impacts from oil and gas activities. Several incidents of hydrocarbon and heavy metals contamination resulting from oil and gas operations in the past have resulted in remediation that has been costly and controversial. Therefore, soils and water resources was selected as a significant impact topic.

Impact Significance Criteria

The following criteria were used to determine the significance of impacts to soils and water resources that could result from project implementation. Impacts to soils and water resources could be considered significant if:

- the introduction of toxic contaminants into the soils and/or sediment groups would, in any way, endanger the biota of the park and contaminate its subsurface aquifers;

- the artificial manipulation of soils would result in their long-term removal, compaction, and erosion, so as to lessen their ability to support biota and alter their capacity to foster effective drainage; and,

- exploration, drilling, production, and abandonment actions would contaminate either surface or subsurface waters.

Impacts to Soils and Water Resources Common to All Alternatives

The impacts of hydrocarbon exploration, drilling, production, and abandonment operations on soils and surface and subsurface waters that are common to all alternatives are summarized here, and discussed under specific topics below.

Impacts to soils and water resources could directly impact up to 250 acres or 0.2 percent of the park for construction of access roads, exploratory drilling and production pads, and pipelines. Careful siting and culverting will minimize impacts to soils and water resources. Most impacts would be minor and short-term because, as some operations are developed, other surface disturbances would be reclaimed; therefore, only a portion of the estimated 250 acres are expected to impact soil and water resources over the long term. Long-term impacts associated with production pads and pipelines could last for the life of operations -- for 20 years or more.

Leaks and spills of contaminating and hazardous substances are the most serious impact identified; however, spills are expected to be localized to access routes and operations areas. Prompt identification of the type and extent of contamination, and timely removal and disposal to a state-approved facility is expected to result in no significant impact on soils and water resources. Any contaminated soils removed would be required to be replaced with compatible soils from outside the park.

Over the long term, reclamation of oil and gas operations are expected to result in no significant impact to soils and water resources.

Seismic: The primary impacts from seismic operations on soil resources would result from vehicles. Vehicles are used in seismic operations to transport survey crews, to transport water for drilling shot holes, for carrying vehicle-mounted equipment for drilling shot holes, and transporting geophones and cables. Vehicles could compact and kill plants, resulting in increased soil exposure, which would allow for increased soil erosion. Vehicles could cause soil compaction, and thereby reduce the soil's water-holding and infiltration capacities. Soil compaction would reduce vegetation's root-penetration capabilities and therefore hinder plant growth and subsequent soil formation. Compacted soils increase runoff of surface waters. Increased runoff could then accelerate soil erosion.

Vehicles could also cause deep rutting of soils if operations are conducted when soils are wet, which would also contribute to erosion and increased runoff through vehicle-made channels.

The use of smaller, light-weight, or other low-impact vehicles would minimize these vehicular-caused impacts by reducing and distributing weight. A one-pass method, in which all vehicles travel in one direction, could also reduce vehicular impacts to soils.

Seismic crews' access to inland areas from the coast can either be over the foredunes, by creating trails over them, or by using existing roads. New road cuts through the foredunes could increase the erosion rate of the foredunes, particularly if steep unstable slopes are cut. Cuts through the foredunes would cause a loss of subsurface water from the dune area by providing a continuous depression (perpendicular to the coast) from which dune subsurface water can seep. Increased soil erosion could increase total dissolved solids in surface waters, reducing water quality.

Seismic operations are anticipated to have minor effects on subsurface water quantity or quality. Seismic shot holes drilled to as deep as 100 feet in which 2 to 10-pound explosive charges are detonated could introduce small quantities of drilling fluids, most likely water. Any contamination of groundwater would be localized to very near the shot hole. Because the shot holes are small, 3 to 4 inches in diameter, and spaced approximately 660 feet apart, contamination of groundwater from shot hole drilling fluids is not expected to appreciably change water chemistry.

The NPS does not anticipate adverse impacts from seismic blasting on the Beaumont Clay Unit that underlies sea water upon which the shallow unconfined aquifer of northern Padre Island is perched; therefore, seismic operations are not expected to impact the quantity or quality of the shallow perched freshwater aquifer.

Construction Activities: Under all alternatives, construction of roads, pipelines, exploratory drilling, and production pads would disturb soils and impact surface water quality and circulation.

Primary impacts to soils from oil and gas construction operations would be clearing of vegetation, exposing soils to erosion, and then compacting and introducing nonnative fill materials to construct elevated access roads and exploratory drilling or production pads. These impacts would be localized to areas where access roads, wells, and production facilities are proposed, up to 250 acres or 0.2 percent of the park. Elevated pads for exploratory and production operations may disturb as much as 2 to 5 acres of soil and associated vegetation per site. Compaction of back-island wind-tidal flats would require careful re-engineering to reclaim the soil horizon at the right elevation to ensure inundation by waters necessary to support algal growth.

If there are no existing roads into the area, they would have to be constructed. If access to a drilling site is from the Gulf beach, a road cut through the foredunes could accelerate erosion of the foredunes and provide an avenue for the seepage of subsurface waters. A 20-foot-wide road constructed of caliche or shell material, 1 mile in length, would disturb 2.42 acres of soil and vegetation. This would increase to 5.71 acres if it includes shoulders and turnouts.

Improperly constructed roads could adversely affect the direction of flow of both surface and subsurface waters (including surface water flow generated by hurricane and tropical storm-related activities). This could result in either directing water toward or away from wetland areas, and may be responsible for drying up some of them; however, impacts would not be significant if roads are carefully sited and culverted.

Negligible, short-term impacts to surface water quality are expected, resulting from increased total suspended solids during construction activities.

Exploratory Drilling: In addition to construction activities, another primary impact to soils and water resources from well drilling is the potential for releases of contaminating and hazardous substances used in the drilling process and diesel fuel used to support drilling operations.

The composition of the mud system depends on the types of formations being drilled, economics, water availability, pressure, temperature, and many other significant factors. Mud can be as simple as freshwater, or a complex emulsion of water, oil, chemicals, clays, and weighting material. Chemical additives such as alkalies, bactericides, soluble chromates, and corrosion inhibitors are often used to adapt mud properties to conditions encountered while drilling. Weighting material is often added to prevent formation fluids from flowing into the well as it is being drilled. Mud systems can be highly toxic or relatively benign.

Drilling muds and diesel fuel could be spilled during drilling operations, contaminating soil and groundwater in the vicinity of the spill. Contamination of groundwater by drilling operations would be localized because the potential sources of pollution are short-lived. Primary and secondary containment systems on a drill pad should avoid the release of drilling muds and other hazardous and contaminating substances into the environment. The drilling mud circulating system would be completely containerized in tanks. A totally containerized system stores the cuttings and waste fluids in tanks. Use of blow-out preventers should prevent blow-outs from occurring.

It is not expected that drilling operations would encounter formations with high pressures and associated strong fluid flows of oil, gas, brine, or fresh water. There is also very little possibility for encountering hydrogen-sulfide-gas-bearing zones during exploratory drilling operations. However, in the event that these zones or high pressures are encountered, the drilling mud system and standard safety procedures are expected to prevent release or blow-outs.

Production: A successful exploratory well would lead to the drilling of additional wells to develop the field. The development of the field may involve building storage tanks, separation and treatment facilities (to separate gas and water from oil), burying pipelines, and drilling injection wells. Directional drilling from existing pads may decrease the necessity of developing a large number of new well sites.

The most serious impact to soil and water resources from production operations would be from leaks and spills of hazardous and contaminating substances. Because longevity of production operations could last for 20 years or longer, the potential for leaks and spills from production operations is greater than for any other type of oil and gas operations. Even small leaks and spills, over an extended time, could become a significant and costly issue to remediate. Windblown saltwater from the Gulf contributes to a highly corrosive environment that corrodes oil and gas facilities and equipment, which could result in leaks and spills. Routine monitoring by operators and the NPS, to promptly identify and correct potential problems that could lead to leaks and spills, is expected to avoid or minimize such incidents.

Leaks and spills of contaminating substances are the singular most important impact that persists over time and can increase in toxicity or spread over distance through various pathways if left untreated. At three existing or abandoned oil and gas operations sites at Padre Island, contamination by heavy metals, produced water, and/or hydrocarbons has occurred, and persists. Impacts at these sites are to soil, surface waters, and the perched aquifer. In all three cases, the NPS is working with responsible operators who are diligent to characterize and remediate the contaminants, and the operators are committed to remediate the contaminants to meet NPS objectives. The NPS will require prompt and appropriate remediation of all hazardous and contaminating substances that are leaked or spilled as a result of oil and gas operations.

Padre Island has 18 threatened and endangered species, including birds and sea turtles, and has important habitat for many other waterfowl and fishery resources that could be recipients of these contaminants through soil and surface and groundwater pathways.

Casing failure due to faulty installation or corrosion of the casing by strong brine solutions could result in impacts to groundwater as a result of leakage of hydrocarbons and/or brine from one formation into a freshwater aquifer. This could result in the contamination of the aquifer. Threats to groundwater from casing leaks are more likely to occur during the long-term production life of the well. Underground casing leaks may go undetected for years.

Fresh and salt waters are produced during production activities, sometimes in large quantities. They can contain solids and oil particles. Their release through leaks and spills from corroded flowlines and storage tanks, and through transfer to a tank truck could contaminate soils and water resources.

Pipelines from production facilities can rupture due to corrosion of the pipe or failure of a flange, valve, or seal. The escaping fluids could contaminate soils and surface and subsurface waters. Rupturing can be responsible for igniting fires. In addition to oil and gas, other substances like brine, treating chemicals, and acidizing or fracturing fluids could leak from production equipment and flow lines.

An alternative to the pipeline transportation of fluids from wells sites to storage tanks or the refinery is to transport them by tanker trucks. This method has a greater potential for leaks and spills during transfer of fluids to the tanker, in addition to the potential for vehicular accidents in which the tank contents could be spilled.

In the event of leaks and spills, primary and secondary containment systems required under the Managed Access Provisions, in Chapter 2, are expected to prevent contaminating and hazardous substances to escape into the environment and contact soil or water. In these events, operators are required to promptly remove and dispose of contaminants and hazardous substances at a state-approved facility. Depending on the type of contaminant and size of the spill, the NPS may require the operator to perform site characterization and to design appropriate remediation techniques pursuant to NPS Guideline for the Detection and Quantification of Contamination for Oil and Gas Operations (Appendix H). By using mitigation techniques and response actions described in Chapter 2, Plan Alternatives, no significant impact to soil and water resources is expected to occur from future oil and gas operations.

The potential for subsidence as a result of withdrawing large quantities of fluids from the pore spaces of the productive formations was considered; however, the NPS does not anticipate that the potential withdrawal of 80 BCF from an estimated 18 wells over a 30-year period would result in the subsidence of areas of Padre Island.

The potential for encountering hydrogen sulfide during production operations was also considered. As discussed under exploratory drilling, Padre Island is not known as a hydrogen sulfide area.

Abandonment: There are various stages involved in the abandonment of a well. They involve plugging, removing equipment and supplies, and removing road and pad fill materials. Each of these activities can impact soils and surface and subsurface waters.

The abandonment of a well could result in its being improperly plugged. This could lead to the contamination of the unconfined aquifer. Improper removal of contaminated equipment, toxic supplies, and toxic materials produced during production activities could result in the contamination of soils and subsurface waters. Incorrectly removing road and pad fill could result in the erosion of soils and disruption of surface drainage patterns.

Under the Managed Access Provisions, in Chapter 2, an operator is required to provide a description, schedule, and estimation of reclamation for the type of operations proposed. NPS review and approval of the plan and subsequent monitoring of abandonment operations is expected to ensure that soil and water resources at the operations site are returned to their pre-impact condition. In the event that an operator does not comply with the conditions of the permit and approved Plan of Operations, the NPS has the option of attaching the operator's performance bond and overseeing plug and abandonment operations under a contract with private contractors. Therefore, future oil and gas operations are not expected to result in significant impacts to soils or water resources.

Impacts to Soils and Water Resources under Alternative A, Proposed Action

Under Alternative A, seismic operations would be allowed in all areas of Padre Island under Managed Access Provisions, except that specific restrictions would be prescribed for Sensitive Resource Areas; e.g., no ground disturbance would be permitted in foredunes (except roads would be permitted if they meet the least impacting method of access), and no surface disturbance would be permitted within 500 feet of three permanent freshwater ponds or the two relict live oak mottes. Impacts from seismic operations on soils and water resources are anticipated to be short-term and negligible due to use of Managed Access Provisions (Chapter 2) and specific protection provided to SRAs.

Sensitive Resource Areas would experience little or no impacts to soils and water resources as a result of drilling, production, or pipeline operations, because specific protection provided by the No Surface Occupancy restriction precludes access roads, on-site drilling, or production, except that some oil and gas activities may be permitted if they meet the least damaging method. Where No-Surface Occupancy is applied to SRAs, targeted drilling sites under SRAs could be reached by directional drilling techniques from outside SRAs, which is expected to have no impact on soils or water resources within the SRAs. Seven existing pipelines cross under three SRAs (Novillo and Black Hill Line Camps, and seagrass beds). The continuing operation of these pipelines is not expected to have impacts to soil or water resources, unless there is a leak or spill. Over the long-term, these pipelines would be purged and filled with nitrogen and left in place; therefore, there should be no, or only negligible, long-term impacts to soil and water resources in these SRAs.

Cumulative Impacts to Soils and Water Resources under Alternative A, Proposed Action

The designation of Sensitive Resource Areas, and establishment of special restrictions and operating standards prescribed under this Alternative would provide consistent protection of soils and water resources in Sensitive Resource Areas from future nonfederal oil and gas operations.

Short-term impacts are expected from construction of access roads and exploratory drilling pads in some SRAs where such activities meet the least damaging method, and in other areas of the park. Long-term impacts are expected from construction of production pads and pipelines over the life of operations. While leaks and spills of contaminating and hazardous substances are expected, it is anticipated that they would be localized on or near roads and oil and gas operations, and prevented from escape into the environment by primary and secondary containment systems, followed by prompt identification and removal of any spilled materials for disposal in accordance with state and federal requirements. Impacted soils would be replaced with suitable soils brought in from outside the park.

Approximately 250 acres or 0.2 percent of the park's soils and water resources are expected to be impacted from future nonfederal oil and gas operations; however, impacts are not expected to be significant because at the completion of operations, reclamation activities would return soils and water resources at the disturbed operations areas to their original condition. These impacts would occur primarily outside of SRAs.

Existing heavy metals and hydrocarbon contamination at several abandoned and existing oil and gas operations have impacted soils and water resources. While contaminated areas are localized in small geographic areas, these contaminants can spread via various pathways, including surface and groundwater, or biologic pathways such as foodchains. Therefore, the cumulative impact to soils and water resources under Alternative A is considered a significant impact until the contaminants are removed.

Conclusion

1. Soil compaction is expected to occur on approximately 250 acres (0.2 percent) of the park. Most impacts are expected to be minor and short-term because as some operations are developed, others would be reclaimed; therefore, only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. SRAs would experience little or no short-term impacts as a result of specific protection provided.

2. Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide NPS with adequate documentation to require cleanup.

3. Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.

Impacts to Soils and Water Resources under Alternative B, No-Action/Current Management

Under Alternative B, basic minimum protection to soils and water resources would be provided by applying Managed Access Provisions to oil and gas operations proposed in all areas of the park. No special protection would be prescribed for any Sensitive Resource Areas in advance. Under this alternative, SRAs could experience impacts to soil and water resources if appropriate identification of a sensitive resource area and avoidance or mitigation techniques are not applied.

More time would be needed for park staff to identify concerns about impacts to soils and water resources, and additional time would be required to review and consult with resource specialists and to develop project-specific mitigation techniques. Additional time and identification of project-specific mitigation measures, particularly related to protecting sensitive resources, would increase the time to process plans and could possibly incur increased costs for operators if modifications to the plan based on redesign of proposed operations are necessary.

Cumulative Impacts to Soils and Water Resources under Alternative B, No-Action/Current Management

Alternative B, No-Action/Current Management, would provide the minimum protection to soils and water resources by applying basic federal laws and regulations and NPS policies on a project-by-project basis, through which project-specific mitigation measures would be applied. This management strategy could be time-consuming. Impacts to soils and water resources could affect up to 250 acres or 0.2 percent of the park, and could include impacts to soil and water resources in SRAs; however, no significant impacts are anticipated. Only short-term and negligible impacts to soil or water resources would occur.

Similar to Alternative A, Proposed Action, existing heavy metals and hydrocarbon contamination at several existing or abandoned oil and gas operations have resulted in significant impacts to soils and water resources. Therefore, the cumulative impact to soils and water resources under Alternative B is a significant impact.

Conclusion

1. Soil compaction is expected to occur on approximately 250 acres (0.2 percent) of the park. Most impacts are expected to be minor and short-term because as some operations are developed, others would be reclaimed; therefore, only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. Sensitive Resource Areas could experience negligible short-term impacts.

2. Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide the NPS with adequate documentation to require cleanup.

3. Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.

Impacts to Soils and Water Resources under Alternative C, Maximum Resource Protection

Under Alternative C, no surface access would be permitted in any Sensitive Resource Area for oil and gas operations, including the stipulation that no surface access would be permitted for seismic operations in any Sensitive Resource Area. In all other areas of the park, oil and gas operations may be permitted under Managed Access Provisions.

Sensitive Resource Areas are afforded maximum resource protection under this alternative. As a result, environmental quality of Sensitive Resource Areas would be maintained, and there would be no adverse impacts to soils and water resources in any Sensitive Resource Area as a result of permitting future oil and gas operations under the RFD scenario.

Impacts to soils and water resources could affect up to 250 acres or 0.2 percent of the park, but no soil or water resources in Sensitive Resource Areas would be affected.

Cumulative Impacts to Soils and Water Resources under Alternative C, Maximum Resource Protection

Under Alternative C, all Sensitive Resource Areas receive maximum resource protection by applying a No Surface Access restriction on all oil and gas operations, including seismic. Therefore, under this alternative, impacts to soils and water resources could affect up to 250 acres or 0.2 percent of the park, but not within SRAs. These impacts in other areas of the park are expected to not be significant. Most would be short-term, because, as some operations are being reclaimed, new disturbances could occur, so that cumulative impacts to soils and water resources are likely to adversely impact only a portion of the estimated 250 acres at any time.

While no significant impacts to soils and water resources are anticipated from the RFD scenario under this alternative, and no impacts to soils and water resources in any Sensitive Resource Area would occur because of the special "No Surface Access" stipulation that would be applied under this alternative, existing hydrocarbon contamination at several existing or abandoned oil and gas operations results in a cumulative significant impact on soils and water resources.

Conclusion

1. Soil compaction is expected to occur on approximately 250 acres (0.2 percent) of the park. Most impacts are expected to be minor and short-term because, as some operations are developed, others would be reclaimed; therefore only a portion of the estimated 250 acres is expected to impact soil and water resources over the long-term. SRAs would experience short-term indirect impacts, but impacts would be negligible.

2. Measures would be required to reduce potential for contamination of soil and water from leaks and spills, but some contamination is inevitable. Monitoring would identify contamination and provide the NPS with adequate documentation to require cleanup.

3. Contamination at three sites in the park from previous oil and gas activity persists. Until cleanup is successfully completed, these impacts to soil and water will persist.

IMPACTS TO WETLANDS

Introduction

Wetlands habitats dominate PAIS. Over 60 percent of the park is comprised of these waters, including marshes, inland waters, wind-tidal flats, and seagrass beds (Laguna Madre). The most abundant wetland types are seagrass beds and wind-tidal flats. These two wetlands cover types comprise over 45 percent of the park. Given the extensive cover of wetlands in the park, it is inevitable that there would be impacts on wetlands as a result of oil and gas exploration and development.

As discussed in Chapter 2, Executive Order 1190 (Protection of Wetlands) and Director's Order 77.1 (NPS Guidelines for Protection of Wetlands) require that all wetland impacts be avoided, minimized, and mitigated, and set "no net loss of wetlands" as the goal of the NPS and other federal agencies. Mitigation, the compensation for affected wetlands, often at a greater than 1:1 ratio, is often ineffective in Texas coastal areas (Cobb, 1987). Cobb (1987) found that over 50 percent of wetland mitigation projects fail to achieve their goal. Other studies in Texas coastal ecosystems have shown that poorly executed wetland compensation fails to provide vital wetland functions, such as nursery grounds for fish (Nicolau and Adams, 1993; and Nicolau, 1993). Recently, park staff have had some success in restoring wetland functions to wind-tidal flats, emergent wetlands (D. Echols, pers. comm., 1998), and seagrass beds. Careful attention to restoring pre-disturbance elevation, soils, and hydrology has aided in these successes.

Direct and indirect impacts to wetlands are anticipated from alteration of wetland hydrology and increased siltation or turbidity from well site preparation pipelines or well operation. Accidental oil spills from pipelines or storage facilities also have the potential for adverse impacts to wetlands. The duration of impacts to wetlands would extend through the construction and operation of drilling activities, drilling pad removal and site preparation activities, and the time required for wetland vegetation to recolonize disturbed areas. If exploration leads to development and production, direct and indirect wetland impacts would be long-term.

In the scenarios described below, it was assumed that roughly 50 percent of the total area of each RFD would fall into wetlands. Where the well pad was placed in a wetland, for example a wind-tidal flat, it is assumed that a greater proportion (>50 percent) of roads, pipelines, and production well pads would also be in wetlands. Pipelines, due to their linear nature, would likely impact wetlands in the proportion in which they occur (estimated 50 percent). Where exploration facilities are located on the back-island (e.g., seagrass beds or wind-tidal flats), there are more wetlands to encounter in extending roads and pipelines. A well pad placed in seagrass beds would have extensive pipelines and roads in wind-tidal flats due to the relationship of tidal flats to seagrass beds (Laguna Madre). At the high side of wind-tidal flats is a fringe of emergent wetlands (e.g., Salicornia sp.), which grade into uplands. These acreage estimates do not include indirect effects, which are expected to be much greater in area than direct effects.

Impact Significance Criteria

Impacts to wetland resources associated with implementation of the proposed action, or action alternatives, would be considered significant if:

- Wetland vegetation, algal mats (wind-tidal flats or SRAs (e.g., seagrass beds), would be directly or indirectly affected.

- Soils or hydrology are significantly modified to prevent or reduce the potential for restoration of the natural communities present prior to disturbance.

- Reclamation of disturbed areas fails to achieve prescribed cover or survival levels within a year after the site reclamation.

Impacts to Wetlands Common to All Alternatives

A grid pattern of explosive charge holes and sensor lines is necessary for 3-D seismic surveys. The extensive wetlands in the park make it impossible to avoid wetlands while conducting 3-D seismic exploration. Operating standards (36 CFR 9.41), such as restricting operations within 500 feet of natural impoundments (freshwater ponds) or mean high tide-line (e.g., wind-tidal flats, gulf shore), could be excepted to permit 3-D seismic surveys in these areas of the park. The NPS could restrict equipment utilized in, and access to, wetlands as conditions of approval of a 3-D seismic survey Plan of Operations.

Because the 3-D seismic survey operations would be subject to equipment requirements, access restrictions, and monitoring of compliance with the Plan of Operations, there would be minor and temporary wetland impacts. Access controls and equipment limitations on 3-D seismic surveys are designed to minimize wetland vegetation disturbance by requiring wide tires on light-weight vehicles (e.g., 4-wheel-drive, off-road vehicles) used in wetland areas. Wide-tired or tracked vehicles would rut wet soils less, minimizing disturbance to the root zone of wetland vegetation. Flotation-type tires (wide) would not compress wetland soils to any great extent, avoiding the creation of depressed linear channels, or ruts, which may alter wetland hydrology. If significant rutting (over 1 inch) is observed in wetlands, the activity would be halted by park staff until the operator can prepare and demonstrate adequate preventive measures. By applying these operating standards, there would be minor disturbance to wetlands vegetation. There would be no fill placed in wetlands as a result of 3-D seismic surveys.

Impacts to Wetlands under Alternative A, Proposed Action

Direct Effects: The direct effect to wetlands of the Proposed Action is estimated to be 142.5 acres. The kinds of wetlands affected are listed in Table 4.1. Because wetland impacts are avoided or minimized in the process of permitting, regardless of scenario, it is unlikely that the SRA restrictions applied in Alternative A would result in fewer direct wetland impacts. The extent of wetlands in the park and the limits of offset available to exploration wells with existing directional drilling technology suggest that wetlands would be encountered by all exploration activities. The specific protection provided under Alternative A to specific wetlands communities increases awareness about the sensitive nature and high value of these wetlands communities.

Specific control of surface access to the three freshwater ponds would prevent wetland losses at these select ponds; however, it is likely that exploration facilities displaced by these access restrictions would affect wetlands elsewhere in the park. Access restrictions on wind-tidal flats allow use only if it is the least damaging alternative. Restrictions on seagrass beds prohibit dredging of new channels; however, maintenance dredging of existing channels, and dredging of new channels may be permitted if they meet the least damaging method of access.

Table 4.1. Estimated Direct Wetland Impacts, by Wetland Type, for Each RFD under Alternatives A, B, and C.

RFD Well No.	Wetland Dredge or Fill Area (acres)	Wetland Type Alternatives A and B	Wetland Type Alternative C	Types of Wetland Impacts
1.	13.6	seagrass beds, wind-tidal flats, emergent, inland waters	seagrass beds, wind-tidal flats, emergent, inland waters	dredging, fill roads and pads, pipelines, siltation, erosion
2.	20.8	emergent	freshwater emergent	fill roads and pads, pipelines
3.	11.5	wind-tidal flats, emergent	fringe salt marsh, freshwater emergent	fill roads and pads, pipelines
4.	44.3	emergent, inland waters	freshwater emergent, inland waters	fill roads and pads, pipelines
5.	26.7	wind-tidal flats, emergent	fringe salt marsh, freshwater emergent	fill roads and pads, pipelines, siltation, erosion
6.	25.6	wind-tidal flats	fringe salt marsh	dredging, pilings, fill roads and pads, pipelines
Total Direct Effects	142.5	Various	Various	Various

Table 4.1 includes anticipated direct impacts to wetlands from oil and gas operations, including pipelines, storage facilities (e.g., tanks), and gas compression facilities associated with production activities.

Indirect Effects: Indirect effects on wetlands may be reduced by the SRA restrictions provided by Alternative A, the Proposed Action. For example, careful access through foredunes may prevent a washover during a hurricane. An intact foredune provides protection to wetlands, and other habitats behind the dunes. Careful conservation of the foredune as an intact hurricane barrier would prevent indirect effects to wetlands, including wind-tidal flats and seagrasses. As discussed above, sand moved inland by storm surge and hurricane winds could fill emergent wetlands, raise wind-tidal flat elevations, and cover seagrass beds. Though a natural process, creation of hurricane washover channels can be exacerbated by manmade breaches of the foredunes (e.g., access roads) (Scott, et al., 1969).

Another potential effect of access limitations may be to force exploration activities (e.g., roads, well pads) onto habitats adjacent to the access-limited habitats. For example, avoidance of cultural sites on uplands may force access roads or drilling pads onto emergent wetlands or wind-tidal flats. Similarly, access limitations may cause exploration activities or access to be located on adjacent lands under Texas General Land Office (GLO) or other ownership (e.g., Laguna Madre). The potential exists for access limitations to encourage exploration access to portions in the park from adjacent lands under GLO ownership. While wetland avoidance, minimization, and mitigation requirements apply to state lands as well, oil and gas exploration activity in the park may affect adjacent lands in this way.

Indirect wetland effects may include siltation of wetlands adjacent to fill or dredge activities or modifications of local wetland hydrology, with consequences for surrounding wetlands. For example, a fill road or channel spoil across a wind-tidal flat may alter tidal flat hydrology, affecting wetland flora and fauna (Elliott and Zonick, 1996). Interception of wind-driven tides by even a low elevation fill barrier (e.g., road fill) can cause the flat to become drier on the downwind side, affecting the algal community and associated invertebrate fauna, reducing these wetlands' productivity. Changes in wind-tidal flooding can affect the algal mat communities that dominate the wind-tidal flats (see Elliott and Zonick, 1996). Examples of extensive wind-tidal flat alteration by fill placement can be found in the Laguna Madre (e.g., Laguna Atascosa National Wildlife Refuge) (Farmer, 1991; Zonick, 1994). Fill placed perpendicular to the prevailing wind direction is especially disruptive to wind tide hydrology (Elliott and Zonick ,1996).

Culverts placed in fill to transmit wind tides are poor substitutes for the sheet-flow typical across undisturbed wind-tidal flats. Culverts increase tidal velocities through the culvert, causing erosion of the wind-tidal flat. Culverts also change the duration and extent of wind-tidal flat inundation through restriction of tidal flow, affecting the nature of tidal flat vegetation communities. Erosion contributes both to loss of wind-tidal flats and to siltation of seagrass beds. As discussed previously, protection of the barrier dune would protect interior wetlands, wind-tidal flats, and seagrasses from filling as a result of hurricane washovers. Thus, this alternative may decrease indirect effects of hurricane washovers, exacerbated by new breaches in the foredunes.

Indirect effects may affect larger areas than direct effects, especially in wetlands with complex hydrology. Alteration of wind-tidal flat sheet flow by even minor elevation changes may change inundation frequency and duration with consequences for wetland plants and animals (Farmer, 1991).

Siltation during dredging operations in the Laguna Madre has been suggested as the cause of seagrass (e.g., Halodule wrightii) decline (Onuf, 1994). Erosion of fill structures (e.g., service roads, well pads) may contribute to siltation of adjacent wetlands. Elliott and Zonick (1996) discuss the effects of erosion of old oil and gas exploration channels and spoil on wind-tidal flats in the Laguna Madre. See Weise and White (1980) for a discussion of erosion of spoil areas as it affects nearby seagrass beds.

Cumulative Impacts to Wetlands under Alternative A, Proposed Action

Cumulative effects of the proposed action on wetlands would include unmitigated wetland losses, the result of failed or inadequate mitigation. Where tidal hydrology is altered, there may be long-term effects for the Laguna Madre ecosystem as a result of diminished primary productivity and dominant plant community changes. The process of ecosystem change in the Laguna Madre as a result of the Gulf Intracoastal Waterway (GIWW) and related past dredging and wetland fills would continue. Wetland losses and fragmentation as a result of this action will contribute to that process. Protection of the barrier dune from breaches will have beneficial cumulative effects for all communities behind the dunes, including wetlands, by protecting them from the effects of severe blowouts.

Conclusion

1. Direct wetlands impacts would occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts could occur. Only a small portion of the estimated 142.5 acres would result in long term impacts, because as some oil and gas operations are being undertaken others are being reclaimed. Because wetlands impacts are avoided or minimized in the process of permitting under Managed Access Provisions, it is unlikely that SRA restrictions applied in Alternative A would result in fewer direct wetland impacts.

2. Geophysical exploration would have minor and short-term impacts.

3. Specific wetlands communities, including the three freshwater ponds, seagrass beds, and wind-tidal flats, receive increased protection by being identified as SRAs, which heightens awareness that they are sensitive to disturbances and are important for providing habitat for wildlife, particularly for threatened and endangered shorebirds.

4. The NPS's no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impacts. In addition, the requirement to restore disturbances and reclaim wetlands communities to their natural condition at the completion of oil and gas operations result in no significant impact to wetlands.

Impacts to Wetlands under Alternative B, No-Action/Current Management

Direct Effects: Under Alternative B, no special protection would be provided for SRAs. Access restrictions, if any, would be negotiated for each well, within the applicable law or regulation. Under this alternative, all federal laws, NPS policy, and park regulations (managed access provisions) would apply.

Impacts to all types of wetlands communities are likely to be greatest under the No Action Alternative, because identification of some wetlands communities, such as seagrass beds, wind-tidal flats, and the three permanent freshwater ponds, are not identified in advance as SRAs. Therefore, variation in the application of access restrictions, equipment requirements, and SRA valuation through time is likely to result in impacts to wetlands proportional to their acreages in the park. Variations in identifying some wetlands communities as being more sensitive than others, and development of mitigation measures may occur under different park administrations, resulting in different interpretations and applications of policy. Additionally, as information accumulates on resource values and functions, policies and procedures are modified. New technologies, for example directional drilling, vastly change what were once considered standard practice.

Estimated direct wetland impacts under the RFD scenarios for this alternative total about 142.5 acres (Table 4.1), with a proportionate acreage of surface disturbance to wind-tidal flats, seagrass beds, and the permanent freshwater ponds, to other wetlands communities according to their total acreages in the park. Wetland impacts would be avoided, minimized and mitigated by applying Managed Access Provisions, through Section 404 permitting with the U.S. Army Corps of Engineers, and NPS wetlands guidelines, DO 77.1.

Indirect Effects: Under alternative B, indirect effects to wetlands may include the loss of wetlands as a result of hurricane washover, created by a road cut in a foredune. Sand transported from the foredunes may be deposited on wetlands in the island interior, filling them or altering hydrology (Scott, et al., 1969). Washover fans on the Laguna Madre side of the island raise the elevation of wind-tidal flats, altering their hydrology and making them drier (see figure 62, Weise and White, 1980). While hurricanes are a natural force affecting barrier island geography, the potential exists to exacerbate their effects through alteration of natural island formations (e.g., barrier dunes) during oil and gas exploration.

Oil spills may be an indirect effect of oil and gas exploration that impacts wetlands. Oil could kill wetland plants and benthic fauna. Remediation of oil spills in coastal wetlands is a difficult task.

Cumulative Impacts to Wetlands under Alternative B, No-Action/Current Management

Each incremental loss of wetland productivity (e.g., nutrients supporting biological processes) affects the Laguna Madre ecosystem. Mitigation actions may take years to replace the habitat values lost; and some mitigation may fail. Long-term impacts of this and other wetland loss in the Laguna may eventually begin to affect overall productivity. The Laguna Madre has been substantially altered by the GIWW, and past oil exploration. The combined effects of wetland losses include increased siltation, reduced primary productivity, changes in dominant communities of seagrasses, and ultimately changes in the fauna. Temporal loss of habitat values and functions, incomplete mitigation, fragmentation of habitats, and similar effects are changing the nature of the Laguna Madre, including major components of Padre Island National Seashore. These processes will continue, and will continue to be a focus of management concern for the NPS.

Conclusion

1. Direct wetlands impacts are expected to occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts would occur. Only a small portion of the estimated 142.5 acres would result in long-term impacts, because as some oil and gas operations are being undertaken others are being reclaimed. All types of wetlands communities would be affected, proportionately to the total acreages in which each is found in the park.

2. Geophysical exploration would have minor and short-term impacts.

3. No identification of wetlands communities that are known to be highly sensitive to oil and gas activities would be provided to oil and gas operators. Therefore, identification of wetlands communities and Managed Access Provisions would be applied in on a case-by-case basis. This could result in greater variation and the potential for greater impacts to all types of wetlands communities.

4. The NPSs no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impacts. In addition, the requirement to restore disturbances and reclaim wetlands communities to their natural conditions at the completion of oil and gas operations results in no significant impact to wetlands.

Impacts to Wetlands under Alternative C, Maximum Resource Protection

Direct Effects: Under alternative C, SRAs receive maximum protection by applying a No Surface Access restriction to all types of oil and gas activities. As a result, the park's most extensive wetland types --seagrass beds and wind-tidal flats, in addition to three permanent freshwater ponds -- would have no direct impacts from oil and gas activities. The No Surface

Access restriction in these wetlands communities, however, would force wetland impacts onto fringe salt marshes adjacent to the wind-tidal flat and on freshwater wetlands on the island interior. Because many of the SRAs are uplands (i.e., cultural sites, foredunes, visitor use areas, live oak mottes, and washover channels), the No Surface Access restriction in these areas would force more impacts onto island interior uplands and wetlands. Under Alternative C, freshwater wetlands and fringe salt marsh wetlands would be disproportionately affected.

The effect of shifting impacts away from certain upland sites, the foredune, seagrass beds, and wind-tidal flat is to focus impacts toward the island interior. Wetland types common on the interior are emergent freshwater and fringe salt marsh, which would receive the brunt of the exploration impacts (Table 4.1: Note that acres do not change, but the wetland-type impacted changes). Operators seeking to locate wells on areas dominated by seagrass beds or wind-tidal flats may move to adjacent fringe salt marsh, uplands, or freshwater wetlands to employ directional drilling. Under this alternative, potential direct impacts to fringe salt marsh and freshwater wetlands may be greater than 140 acres. Interior island wetlands (freshwater emergent) are relatively small compared to the extensive wind-tidal flats and seagrass beds. Thus, impacts to these wetlands would be more localized.

Indirect Effects: Indirect effects of alternative C may include effects on wind-tidal flats or seagrass beds. For example, fills in fringe salt marsh may cause siltation of adjacent wind-tidal flat. Erosion of fills may also increase siltation of seagrass beds and contribute to turbidity. By avoiding wind-tidal flats, indirect effects such as altered hydrology on tidal flats and siltation of seagrass beds are substantially avoided. Protection of the barrier dune reduces the potential for blowouts, as discussed above, also reducing indirect impacts to wetlands.

Cumulative Impacts to Wetlands under Alternative C, Maximum Resource Protection

The cumulative effect of alternative C will be relatively small. Mitigation actions and natural recovery processes will restore interior and fringe wetland functions after removal of oil and gas exploration and production equipment. Because this alternative avoids seagrass beds and wind-tidal flats, the cumulative effects on the Laguna Madre are limited. Temporal losses of interior wetland area will have some negative effect on waterfowl, migratory birds, and wading birds as a result of lost habitat. Mitigation for wetlands will be at the expense of island upland habitats. Alternative C may reduce the amount of NPS staff time spent in monitoring and enforcement activities, because substantially large areas of wetlands are avoided.

Conclusion

1. Direct wetlands impacts are expected to occur on approximately 142.5 acres. At least an equal acreage of indirect wetlands impacts would occur. Only a small portion of the estimated 142.5 acres would result in long-term impacts, because as some oil and gas operations are being undertaken others are being reclaimed.

2. Geophysical exploration would have minor and short-term impacts.

3. Specific wetlands communities, including the three freshwater ponds, seagrass beds, and wind-tidal flats, receive maximum protection by being identified as SRAs and

applying a No Surface Access restriction to all oil and gas operations, including seismic. This results, however, in other wetlands communities, such as inland freshwater wetlands and salt fringe wetlands, becoming the focus of wetlands impacts.

4. The NPS's no-net loss policy and DO 77.1 require a minimum 1:1 compensation ratio for direct and indirect impacts to wetlands, to be performed prior to or at the time of impacts. In addition, the requirement to restore disturbances and reclaim wetlands communities to their natural condition at the completion of oil and gas operations results in no significant impact to wetlands.

IMPACTS TO CULTURAL RESOURCES

Introduction

Cultural resources was selected as a significant impact topic because hydrocarbon contamination from an abandoned natural gas processing facility has spread via surface water into Novillo Line Camp, a historic site listed on the National Register of Historic Places. The contamination is resulting in a visible hydrocarbon sheening on surface water and strong hydrocarbon odor, which are significantly degrading the character and setting of the historic property.

Except for the persisting contaminants issue at Novillo Line Camp, the NPS anticipates that federal laws and regulations and NPS policies provide management tools for protection and management of cultural resources. These are described in Chapter 2, under Managed Access Provisions.

Only about 0.5 percent of the park has been surveyed for archeological resources; therefore, it is likely that the majority of below-surface resources on Padre Island National Seashore have not been discovered. Visible, aboveground cultural resources have been identified: Novillo Line Camp, Green Hill Line Camp, and Black Hill Line Camp. The Mansfield Cut Archeological District and Novillo Line Camp are listed on the National Register of Historic Places. The Black Hill Line Camp and the Green Hill Line Camp (including their cultural landscapes) are recommended as eligible for the National Register.

Actions on or near historic properties are assessed for their potential to adversely affect the qualities that make the property eligible for the National Register of Historic Places. To be eligible for the National Register, a property must be not only historically significant but it must also have integrity. The National Register defines "integrity" as the property's ability to convey its historic significance. Further, the National Register identifies seven qualities that comprise integrity: location, design, setting, materials, workmanship, feeling, and association. A property does not have to retain all seven aspects to retain its integrity. The reason for the property being historically significant determines which integrity qualities are most important for that particular property.

Impact Significance Criteria

The following are considered significant impacts to cultural resources:

- destruction or alteration of part or all of a prehistoric or historic property;

- isolation from or alteration to its surrounding environment;

- introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

Impacts to Cultural Resources Common to All Alternatives

Because only a very small percentage of the park has been surveyed for archeological resources, it is possible that cultural resource surveys to be performed in and adjacent to the proposed operations area could lead to the discovery of previously unknown archeological sites and other cultural resources. When the park was established, access and surface uses were permitted under Special Use Permits. Then in 1979, permits were authorized under the NPS's Nonfederal Oil and Gas Rights Regulations, 36 CFR 9B. Since that time, all new surface uses permitted under Plans of Operations, pursuant to the 36 CFR 9B regulations, have required cultural resource surveys. See the Nonfederal Oil and Gas Exploration and Development section in the Affected Environment Chapter for a description of existing and abandoned nonfederal oil and gas operations. To date, archeological surveys related to nonfederal oil and gas operations have resulted in no new archeological discoveries.

A parkwide 3-D seismic operation could have both beneficial and adverse impacts concerning unknown archeological sites. Because the seismic lines would run in a dense grid pattern over the entire park, with a minimum of 12,800 shot holes drilled along lines in one direction while geophone lines are placed perpendicular to the shot lines, there is potential for discovering previously unknown archeological sites, thereby increasing the NPS's knowledge of the park. However, there is also the possibility that archeological evidence could be destroyed in the process of conducting seismic operations. Each shot hole would be approximately 3 to 4 inches in diameter, which is smaller than the area typically disrupted by a professional archeologist performing a shovel test.

Known archeological sites are relatively small, so avoidance of sites by road construction, seismic operations, and well drilling and production could be easily achieved. When significant sites cannot be avoided, impacts would be mitigated under Managed Access Provisions.

Any surface-disturbing activity could potentially damage site integrity. Surface-disturbing activities take place during seismic exploration, exploratory drilling, well production, pipeline construction, and abandonment and reclamation. Specific actions could include: vegetative clearing, dredging, survey marking, foot traffic, construction and maintenance of roads, drill and production pad construction, disposal of dredge material, drilling, spill response, reclamation, fire management, pipeline construction, and construction of fencing.

Under all alternatives, cultural resources would be protected from nonfederal oil and gas operations by applying basic cultural resource protection laws, regulations, and NPS policies which are described in the Managed Access Provisions section of Chapter 2.

Strong hydrocarbon odor was documented at Novillo Line Camp during a period of high water (March and May 1998) and is thought to have been carried by the prevailing wind from the nearby Chevron abandoned shorebase production facility. Refer to the section titled "Contamination" under the heading "Nonfederal Oil and Gas Exploration and Development" in Chapter 3, Affected Environment, for a description of the abandoned oil and gas site, and the section "Historic Structures" in the Cultural Resources section of Chapter 3 for a description of significance of Novillo Line Camp. Hydrocarbon odor introduces an atmospheric element that is out of character with the historic property and alter its setting.

Chevron has committed to remediate the hydrocarbon contamination at the abandoned shorebase production facility to meet NPS objectives. The NPS anticipates that when Chevron has successfully completed cleanup at the abandoned shorebase production facility, the hydrocarbon odor at Novillo Line Camp will be removed.

Impacts to Cultural Resources under Alternative A, Proposed Action

Four listed or potentially eligible historic properties are identified as Sensitive Resource Areas, and protective zones are established in which a No-Surface Occupancy stipulation would be applied to drilling and production operations. The No-Surface Occupancy stipulation would result in avoidance of surface disturbances, and would also minimize visual, audible, and atmospheric elements from nonfederal oil and gas operations that could be permitted adjacent to the cultural sites but outside the protective buffer, which would be out of character with the cultural properties or alter their settings.

Seismic operations may be permitted within four significant cultural zones under Managed Access Provisions requiring no surface disturbance, except that 3- to 4-inch diameter shot holes may be drilled but shall be reclaimed to grade after seismic operations are completed. With the application of avoidance and mitigation measures described in Chapter 2, under Managed Access Provisions, impacts from seismic operations on significant cultural sites are expected to be negligible.

This alternative provides for consistent application of mitigation techniques to protect the four sites, and would allow for more efficient processing of Plans of Operations, saving time and costs for the operator, NPS, and Texas State Historic Preservation Office staff.

The four listed or potentially eligible historic properties and their protective buffers comprise 3,703 acres, or 2.8 percent of the park.

Cumulative Impacts to Cultural Resources under Alternative A, Proposed Action

The designation of four listed or potentially eligible historic properties as Sensitive Resource Areas and establishment of protective zones and operating stipulations would provide consistent protection of the integrity of physical remains and the context of these sites from future nonfederal oil and gas operations.

The prescribed buffers and operating restrictions would also provide for more efficient processing of Plans of Operations, reducing time and costs for the operator, NPS, and State Historic Preservation Office staff. Negligible cumulative impacts to cultural resources are expected under the RFD scenario under Alternative A.

Hydrocarbon contamination at an abandoned production facility is contributing to hydrocarbon odor at the nearby Novillo Line Camp. While cleanup of the hydrocarbon contamination is ongoing at the abandoned production facility, until such time as cleanup is successfully completed, the integrity of the National Register site may be adversely affected.

Conclusion

1. Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park.

2. Contamination at a nearby abandoned oil and gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.

Impacts to Cultural Resources under Alternative B, No-Action/Current Management

Under Alternative B, No-Action/Current Management, nonfederal oil and gas Plans of Operations would continue to be evaluated on a project-by-project basis, and the integrity of physical remains and the context therein of four listed or potentially eligible historic properties would be protected under federal laws and regulations and NPS policies as described in the Managed Access Provisions - Protection of Cultural Resources, contained in Chapter 2. Park staffs would coordinate with cultural resource specialists in the Intermountain Support Office-Santa Fe, and with the Texas State Historic Preservation Office, to identify potential impacts and develop mitigation techniques. Through this process, project-specific mitigation techniques would be identified and applied. Additional time would be required to review and process Plans of Operations for approval in order to incorporate consultation and coordinate between the park, support office, cultural resource specialists, and SHPO staff. This would incur additional time and possibly increase costs for operators in cases where operators would need to modify or redesign operations. The potential could exist for the loss of integrity or context of these sites as a result of applying inadequate mitigation measures and/or inconsistently applying mitigation techniques due to changes in administration in the park and the Texas State Historic Preservation Office.

Cumulative Impacts to Cultural Resources under Alternative B, No-Action/Current Management

Alternative B, No-Action/Current Management, would provide the minimum protection to significant cultural resources by applying basic federal laws and regulations and NPS policies on a project-by-project basis, through which project-specific mitigation measures could be applied. This management strategy would be the most time-consuming of the three alternatives. Negligible impacts to cultural resources are anticipated from the RFD scenario under this alternative.

Similar to Alternative A, hydrocarbon contamination at an abandoned production facility is contributing to hydrocarbon odor at the nearby Novillo Line Camp. While cleanup of the hydrocarbon contamination is ongoing at the abandoned production facility, until such time as cleanup is successfully completed, the integrity of the National Register site may be adversely affected.

Conclusion

1. Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park.

2. Contamination at a nearby abandoned oil and gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.

Impacts to Cultural Resources under Alternative C, Maximum Resource Protection

Under Alternative C, Maximum Resource Protection, the four listed or potentially eligible historic properties are identified as Sensitive Resource Areas, and establishment of protective zones, within which No Surface Access for any type of nonfederal oil and gas operation would be permitted. This alternative would consistently provide maximum protection for the integrity of physical remains and the context therein of these sites as nonfederal oil and gas Plans of Operations are evaluated on a project-by-project basis by not allowing any access and therefore no potential for impacts.

Similar to Alternative A, the prescribed buffers and operating restrictions would provide for more efficient processing of Plans of Operations, reducing time and costs for the operator, NPS, and State Historic Preservation Office staff. Negligible impacts to cultural resources are anticipated under Alternative C.

The four listed or potentially eligible historic properties and their protective buffers, within which no access for any type of nonfederal oil and gas operation would be permitted, comprise 3,703 acres or 2.8 percent of the park.

Cumulative Impacts to Cultural Resources under Alternative C, Maximum Resource Protection

Under Alternative C, four listed or potentially eligible historic properties are identified as Sensitive Resource Areas, and protective zones are established in which a No Surface Access stipulation would apply to all nonfederal oil and gas operations. This alternative provides maximum protection to the significant cultural sites by precluding surface access to nonfederal oil and gas operations and therefore avoiding impacts. Therefore, only negligible impacts to cultural resources are anticipated from the RFD scenario under Alternative C.

More efficient processing of Plans of Operations and consultation with the State Historic Preservation Office are anticipated with the development of protective buffers and operating restrictions.

As with Alternatives A and B, hydrocarbon contamination at an abandoned production facility is contributing to hydrocarbon odor at the nearby Novillo Line Camp. While cleanup of the hydrocarbon contamination is ongoing at the abandoned production facility, until such time as cleanup is successfully completed, the integrity of the National Register site may be adversely affected.

Conclusion

1. Surveys required in advance of surface disturbance are expected to avoid adverse impacts to cultural resources. The information from these surveys is also expected to add to the information about the cultural resources of the park. Known cultural sites are identified as Sensitive Resource Areas and no surface access for any oil and gas activities would prevent any future impacts to these areas from implementing the RFD scenario.

2. Contamination at a nearby abandoned oil and gas production facility may be adversely affecting the Novillo Line Camp, listed on the National Register, by introducing an atmospheric element, hydrocarbon odor, which is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, this resource may be adversely affected.

IMPACTS TO VISITOR EXPERIENCE

Introduction

Visitor experience was selected as a significant impact topic because oil and gas operations introduce an industrial element into a natural environment, with potential conflicts with visitor uses, enjoyment, and safety.

An estimated 800,000 people visit Padre Island National Seashore every year to fish, swim, hike, wind surf, beachcomb, camp, view wildlife, and observe a relatively undeveloped barrier island environment. Oil and gas operations could cause direct and indirect impacts to the visitor experience. Access restrictions, surface disturbances, noise, odors, noxious fumes, and release of oil or hazardous chemicals all would affect recreation activities, because the opportunities for certain types of recreation would be lost or the quality of the recreation experience would be lowered.

As described in Chapter 3, Padre Island National Seashore offers the visitor many different options, from developed visitor use areas, trails, and campgrounds to beaches and water-related recreational experiences. Of particular interest are those visitor areas designated as Sensitive Resource Areas, such as Malaquite Visitor Center and Bird Island Basin. To date, visitor use surveys have concentrated on Bird Island Basin and the down-island beaches, and the visitor comments concerning impacts of oil and gas operations were limited to oil and debris on beaches. In general, existing oil and gas operations have been sited and operated with a minimal number of visitor complaints. There are few other direct reports of visitors' negative perceptions of oil and gas operations, although a few noise-related complaints have been received by the park staff, especially during seismic operations (Echols, pers. comm., 1998).

The following discussion includes an analysis of potential impacts to visitor experience from direct and indirect impacts, especially visual intrusion and noise.

Impact Significance Criteria

Impacts to visitor experience could be considered significant if:

- the release of a contaminating or hazardous substance endangers visitor health and safety;
- oil and gas operations interfere with traditional visitor uses at established visitor use areas during peak times (holidays, weekends) ; which includes any closure to visitor access for more than 4 hours;
- oil and gas development alters the physical setting by introducing unwanted visual contrast to the landscape, intrusive noise, smells, or lighting that is noticeable to the casual viewer and interferes with the visitor experience; or
- oil and gas operations are not operated in a clean and workmanlike manner, resulting in leaks and spills of oil and gas products, and/or litter.

Impacts to Visitor Experience Common to All Alternatives

Recreation Experience: Direct impacts would occur in areas where oil and gas activities would temporarily displace a recreation activity, create the loss of land available for recreation, or cause the loss of recreational settings. The land use for oil and gas development sites and access roads would be closed to visitor access. This could restrict recreation use on up to 250 acres or 0.2 percent of the national seashore. Direct impacts to developed visitor use areas from disturbance caused by oil and gas activity should be negligible with the application of the 1,500-foot offsets requiring "no-surface occupancy" for drilling, producing, and pipeline activities. Indirect impacts would result if disturbance is visible or audible from recreation areas. Indirect impacts such as noise, dust, odors, night lighting, and increased human activity would not necessarily preclude recreational use, but would decrease the quality of the recreation experience.

Past oil and gas activities have resulted in the transport of hydrocarbon contamination from an abandoned production facility into the nearby Novillo Line Camp. The line camp is probably the most significant of the line camps, because it is already listed in the National Register of Historic Places and is very accessible from a primary road. Although this condition can be corrected, the visible sheening on the surface of the water and strong hydrocarbon odor degrades the visitor experience. Therefore, because of this, the cumulative impact to visitor experience under any alternative is significant, and will persist until the contamination issue is corrected.

Visual Impacts: Park visitors could have a high sensitivity to any changes (modifications in form, line, color, and texture) to the visual environment. Oil and gas activity visible from adjacent roads in the foreground (0 to 1/2 miles), would result in high impacts to recreation resources in the form of strong visual contrasts visible from sensitive viewpoints. Moderate impacts would result from strong contrasts visible in the middleground view (1/2 to 3 miles) and moderate contrasts in the foreground view. In primitive areas of the park requiring four-wheel-drive access, such as along the Gulf beach south of the four-wheel-drive sign, an indirect impact would be expected due to the reduction or loss of the recreation experience where users anticipating a nature experience would pass a developed field or view a related disturbance. The visual or audible presence of oil and gas activities could impact these primitive areas of the national seashore by potentially lessening the experience for those resource users of primitive areas, and possibly displace these users to other more remote areas of the national seashore where the potential for this experience exists, if the users are significantly affected by the presence of the oil and gas operations. Based on the minimum 3-mile distance from roads with motorized use, the potential affected acreage from one exploratory well and associated road development would potentially change 1,200 acres. If field development were to occur in primitive areas, 7,500 acres per field would potentially be affected. However, the actual impact would depend greatly on visitors' perceptions of the oil and gas presence, and few complaints have been registered to date regarding this.

Exploration and most development activities would have relatively insignificant and short-term impacts on recreationists. The exception would be in fields where more intensive oil and gas development occurs. Field development is anticipated to occupy a small percentage of the land within the national seashore. In developed oil and gas fields, permanent support facilities such as roads, powerlines, compressors, and storage facilities would cause alteration of the landscape.

When facilities and activities cause extensive alteration of the landscape, the recreation setting shifts from undeveloped to developed. Recreation settings would shift from primitive, semiprimitive non-motorized, or semiprimitive motorized to modern urban or rural settings. Activities would change from resource-dependent (primitive) to facility-dependent (modern urban). Once these changes occurred, the areas would probably never be returned to their original class, even with rehabilitation. The effect would be a decline in the area available to users who prefer undeveloped settings and an increase in the area available to users who prefer more developed settings. However, once exploration and development have ceased, rehabilitation would resolve many of the adverse impacts to recreation. The remaining production facilities could have a long-term adverse impact on outdoor recreation.

Recreational settings, opportunities, and recreational developments would be maintained through the application of Managed Access Provisions. These would prevent desired recreational settings and opportunities from being significantly impaired or destroyed. Under Managed Access Provisions, production facilities are to be located where they will not be seen by the visiting public using the Gulf beach or campground areas, including Bird Island Basin, Malaquite Visitor Center, Malaquite campground, and significant cultural sites, or else technically feasible methods to minimize the visual impact are to be used. Exploratory wells and production operations in the Gulf are to be offset 2 miles offshore from the 2-fathom line (from September 15 to March 15), and 3 miles from March 15 to September 15, or directionally drilled from behind the high dune line, to minimize visual impacts to gulf beach visitors. Production equipment is to be designed to minimize visual intrusion and painted to blend with the surrounding environment. In addition, the provisions state that surface operations shall not be conducted within 500 feet of any structure or facility (excluding roads) used for unit interpretation, public recreation, or administration, unless specifically authorized. All of these provisions, applied under any of the alternatives, serve to reduce indirect visual (and other) impacts from oil and gas operations.

Other Indirect Impacts, Including Noise: Oil and gas development would increase the number of vehicles in the park, and introduce large-scale drilling equipment on park roads and the Gulf beach. Increased traffic and operational activity could lower the quality of the recreational experience due to the increased noise associated with vehicles and operations. The noise could especially affect opportunities for users to enjoy semiprimitive, nonmotorized, and semiprimitive motorized recreation experiences.

Significant noise impacts would occur if the oil and gas activity occurs close enough to a visitor use area to cause interference with the enjoyment of the park. Drilling and production operations would increase noise levels where ambient noise levels are substantially lower. Drilling and production operations would also introduce light into areas of natural darkness, which could reduce the recreation experience for some visitors. Drilling and production activities would intrude on the natural setting for potentially 30 years or more.

Creating the buffers for the SRAs was done partly in response to concern about noise impacts, because these can carry farther from the source than visual, odor, or some lighting impacts. Also, noise can drive wildlife away from visitor use areas, thus diminishing the visitor experience related to wildlife viewing in these areas. The 1,500-foot buffer provided for the Malaquite Visitor Center and campground, Grasslands Nature Trail, and Bird Island Basin would help to reduce many indirect impacts from oil and gas operations, including visual, odor, lighting, and especially noise impacts. This size of buffer is needed so that noise levels remain at or near the background levels in these visitor use areas (see Figure 3.7). With the buffers included under Alternatives A and C, the oil and gas operations would be sited farther away from popular visitor use areas, so that effects on visitors using these areas would be minimized.

Geophysical exploration could alter recreation experiences and fishing success within a few miles of the exploration activity with the unanticipated noise from seismic blasting. This might result in temporary displacement of recreation activities. Geophysical activities generally last only a short time in a given area, and timing of operations could reduce the potential impact on visitor use and enjoyment.

Health and Safety: All oil and gas development activities could increase the potential for hydrocarbon and hazardous substances to be released into the environment, jeopardizing park visitors' health, safety, and recreation experiences. Geophysical exploration could subject park visitors to hazards associated with coming into contact with explosives. The possibility of a hurricane damaging drilling and production sites and pipelines and spreading materials and substances could cause environmental contamination. Also, increased traffic associated with all oil and gas development could increase the potential for conflicts and motor vehicle accidents involving recreationists, particularly visitors on the Gulf beach.

Several of the Managed Access Provisions address protection of human health or safety and, if applied, would serve to minimize impacts to visitors. These include requirements to site and operate production facilities so as to minimize conflicts with visitor use; clean up contamination; hire security; provide fencing around facilities and hazardous equipment; clearly mark hazardous areas; and not conduct surface operations within 500 feet of any structure or facility used for interpretation, public recreation, or administration, unless specifically authorized. There may also be restrictions to minimize visitor conflicts during certain holidays or other days and times where additional visitors are expected.

Although geologic conditions make it unlikely, a remote possibility exists of an accidental release of hydrogen sulfide during drilling operations due to equipment failure or accident.

A well blowout could cause unpredictable, and possibly severe, damage near the proposed well sites. The extent of damage could depend on the volume and characteristics of the materials released; environmental conditions at the time of the blowout; and the length of time required to bring the well back under control. A blowout could release liquid materials (drilling fluids, formation waters, oil, or natural gas condensate) under pressure. These liquids could be spread some distance from the well site. A well blowout could also release methane, carbon dioxide, H_2S, and other gases into the atmosphere. If fires accidentally occurred, or if the well was intentionally set on fire for safety reasons, sulfur dioxide could be produced.

Preventing well blowouts is an important concern during drilling, and is accomplished by use of experienced drilling personnel and measures required by Managed Access Provisions that address High Pressure Precautions. These include proper casing and cementing; proper design and use of drilling muds, and constant monitoring of the characteristics and volume of drilling mud to determine conditions in the wellbore; and equipping the well with blowout preventers, which can be used to shutin the well if needed. Proposed Plans of Operations for drilling would be required to prepare and submit an H_2S Contingency Plan in the event that H_2S is encountered.

Impacts to Visitor Experience under Alternative A, Proposed Action

Under this alternative, specific protection measures would be applied to protect visitor use areas, including those identified as SRAs (Malaquite Visitor Center and Campground, Bird Island Basin, and Grasslands Nature Trail). These would have a 1,500-foot buffer in which no surface occupancy for road construction, well drilling, production, or pipelines would be permitted. No surface occupancy would be permitted within 500 feet of the Mansfield Channel COE Disposal Area. Short-term seismic operations may be permitted under Managed Access Provisions.

The effects of oil and gas development on visitor use areas and the general visitor experience at Padre Island National Seashore are not expected to be significant under Alternative A, because of the buffers established for the sensitive visitor use areas and other operating stipulations regarding lighting, location, health and safety precautions, security, and spill prevention and cleanup. Also, there is little evidence to indicate that the visitor experience has been significantly affected by existing operations. Therefore, with the additional protective measure built into the SRA buffers, impacts to visitor experience would not be significant under Alternative A.

Cumulative Impacts to Visitor Experience under Alternative A, Proposed Action

With the application of the SRA buffers, plus the avoidance, mitigation, and health and safety measures provided in the Managed Access Provisions, there should not be significant impacts to visitor experience under Alternative A.

However, hydrocarbon contamination at the Novillo Line Camp degrades visitor experience; therefore, until corrected, there is a significant adverse effect on the visitor experience.

Conclusion

1. There are no significant impacts expected from the RFD scenario to Visitor Experience under Alternative A due to the specific distance restrictions provided with the SRA buffers; the Managed Access Provisions, which provide avoidance, mitigation and health and safety measures; and the indications that visitors do not have significant issues with oil and gas operations in the park, as evidenced by surveys and the complaint record at the park.

2. Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience to Novillo Line Camp due to the introduction of hydrocarbon odor which is out of character with the historic setting. Until such time as the operator successfully

completes cleanup, which is ongoing, adverse impacts to visitor experience at Novillo Line Camp may continue.

Impacts to Visitor Experience under Alternative B, No-Action/Current Management

Under this alternative, continued implementation of current management policy and objectives would result in protecting visitor use developments and visitor enjoyment on a case-by-case basis. No specific protection would exist to ensure that visitor uses or developments would be protected from oil and gas development in the form of designated sensitive areas and buffers.

Developed recreation sites may not receive adequate protection if an oil and gas activity is proposed immediately adjacent to or on these sites. Noise, dust, odors, increased traffic, and visual impact from well sites could significantly reduce the quality of the visitor experience when well sites are very close to sensitive visitor use areas. It is expected that the measures provided for in the Managed Access Provisions would lessen impacts considerably; however, there is the potential for significant impacts, especially from noise, since the buffers needed to substantially reduce this impact (1,500-foot) would not apply in SRAs. Only a 500-foot buffer is required under Managed Access.

Cumulative Impacts to Visitor Experience under Alternative B, No-Action/Current Management

If the buffers and other provisions provided for by the Managed Access Provisions are not sufficient to mitigate impacts that can affect the visitor experience, then there could be significant impacts (e.g., from noise).

Similar to Alternative A, hydrocarbon contamination at an abandoned production facility near Novillo Line Camp is resulting in hydrocarbon odors which may be degrading the visitor experience; therefore, until corrected, there is a significant adverse effect on visitor experience.

Conclusion

1. Managed Access Provisions, especially the lesser locational restriction provided for near SRA Visitor Use Areas (500-foot vs. 1,500-foot), may not provide enough mitigation, so that there is the possibility that significant impacts to visitor experience could occur near the SRA Visitor Use Areas and other remote locations used by visitors to experience the natural environment and view wildlife. Noise, in particular, may affect the visitor, if buffer distances are not sufficient and background levels are exceeded, causing disruption to wildlife use and/or visitor enjoyment in these areas. Although there has been little indication to date that noise is causing significant disruption to the Padre Island National Seashore visitor, the possibility exists, if oil and gas facilities are sited too close to sensitive use areas.

2. Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience to Novillo Line Camp due to the introduction of hydrocarbon odor that is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, adverse impacts to visitor experience at Novillo Line Camp may continue.

Impacts to Visitor Experience under Alternative C, Maximum Resource Protection

Under this alternative, the same protective measures applied under Alternative B would be used to protect visitor uses and developments from oil and gas operations; however, under this scenario, all visitor use areas (including the Malaquite Visitor Center and Campground, in addition to the segment of Gulf beach along these areas, Bird Island Basin, Grasslands Nature Trail, and the Mansfield Channel COE Disposal Area) would have a 1,500-foot buffer in which no oil and gas activities would be permitted.

Under this alternative, there would be no significant impacts expected to visitor experience, either direct or indirect, from visual, noise, or other intrusions, because of the limited access in SRAs and associated larger buffer areas, and the limitation on exploratory (seismic) activities in all SRAs.

Cumulative Impacts to Visitor Experience under Alternative C, Maximum Resource Protection

There are no expected significant impacts under Alternative C, given the level of specific protection provided by the "No Surface Access" restriction to all types of oil and gas activity in any SRA.

Similar to Alternatives A and B, hydrocarbon contamination at an abandoned production facility near Novillo Line Camp is resulting in hydrocarbon odors which may be degrading the visitor experience; therefore, until corrected, there is a significant adverse affect on visitor experience.

Conclusion

1. With the buffer zones provided for the SRAs, the "No Surface Access" restriction in these areas, and the additional protective measures included in the Managed Access Provisions for other areas of the park, there would be no significant impacts to visitor experience under Alternative C.

2. Hydrocarbon contamination at a nearby abandoned oil and gas production facility may be degrading visitor experience to Novillo Line Camp due to the introduction of hydrocarbon odor that is out of character with the historic setting. Until such time as the operator successfully completes cleanup, which is ongoing, adverse impacts to visitor experience at Novillo Line Camp may continue.

IMPACTS TO SENSITIVE RESOURCE AREAS (SRAs)

Introduction

As noted in Chapter 3, Sensitive Resource Areas, several of the SRAs overlap (or are parts of) some of the broader resource categories already identified and analyzed as significant resources or issues. Therefore, the impact assessments pertaining to SRAs already included under the broader topics are not repeated here; rather, the reader is referred to the relevant sections of Chapter 4. The SRAs that have already been addressed under previous topics are:

- **Cultural Sites** - see "Impacts to Cultural Resources" for discussion of impacts to the Novillo, Green Hill, and Black Hill Line Camps and the Mansfield Archeological District.
- **Freshwater Ponds** - see "Impacts to Soil and Water Resources" and relevant sections of "Impacts to Wetlands."
- **Seagrass Beds** - see "Impacts to Wetlands."
- **Wind-Tidal Flats** - see "Impacts to Wetlands."
- **Visitor Use Areas** - see "Impacts to Visitor Experience" for discussion of impacts to the Malaquite Visitor Center and Campground, Bird Island Basin, Grassland Nature Trail, and Mansfield Channel COE Disposal Area.

The remaining SRAs are discussed below. A summary of impacts (by acres) and protective measures/buffers associated with each alternative for all SRAs can be found in Table S.1.

Foredunes

These are discussed briefly under the "Impacts to Soil and Water Resources" section, because they are part of the soil impact assessment. Impacts to foredunes could occur under Alternatives A or B if roads are permitted (if they meet the least damaging method of access). If proper engineering and stabilization techniques are used, impacts would be minimized. No surface access (and therefore no impacts) would occur under Alternative C.

Washover Channels

Impacts could be similar to those described for foredunes, above. Geophysical exploration would be allowed under Alternatives A or B. Managed Access Provisions call for avoidance of washover channels. However, they may be affected by road-building under Alternatives A or B, if constructing a road in a washover channel is the least-damaging method of access. No surface access (and therefore no impacts) would occur under Alternative C.

Rookery Islands

The SRA buffers under Alternative A include (1) no surface access within 1000 feet from February 15 to September 30; (2) no surface occupancy within 1000 feet year-round; and (3) geophysical exploration permitted only between October 1 to February 14 (Managed Access Provisions). With these restrictions in place under Alternative A, and the "no surface access" provisions under Alternative C, no significant impacts would be expected. Under Alternative B, there is a possibility of disturbance to waterbirds if the provisions under Managed Access do not provide sufficient protection, especially during the more sensitive nesting season (February 15-September 30). The Managed Access Provisions require certain measures to protect threatened and endangered species and to minimize human impacts on wildlife populations in general. However, there are no provisions that specifically limit disturbance to the rookery islands at specific times, only a requirement that "restricted access to rookery islands will protect wildlife using the island." If this is applied during critical times, the impacts to the Rookery Island SRA should be less than significant, even under Alternative B.

Relict Live Oak Mottes

No significant impacts to this SRA would occur under any of the alternatives. Alternatives A and C provide buffers and specific protections, and Alternative B includes the Managed Access Provision that states "shotholes shall not be drilled within 500 feet of the two relict oak mottes." The mottes could experience some surface disturbances if seismic operations are permitted nearby, but if the shothole buffer (above) is enforced, significant disturbance should not occur.

SRA Impacts in General

The SRAs with their associated buffers, as listed in Table S.1, were identified and delineated as part of the generation of alternatives for this EIS. Therefore, they are inherently important, and impacts to any SRA should be reduced to insignificant levels through enforcement of the restricted surface occupancy and/or access provided for under Alternatives A or C. Under Alternative C, there is assurance of maximum protection, since all access (including geophysical exploration) is restricted within SRAs. Alternative A provides specific activity-driven protection, allowing geophysical exploration in many SRAs, and possibly some additional surface disturbance (e.g., roads across foredunes and in washover channels, if they are the least damaging methods of access; no surface occupancy in certain SRAs, but surface access allowed for certain purposes).

Under Alternative B, protection is provided, but in a form that is less certain then for Alternatives A or C. Under Alternative B, the Managed Access Provisions are applied to all areas of the park, including SRAs. Although the Managed Access Provisions are quite extensive and include many mitigation measures, their implementation would be decided on a case-by-case basis. Therefore, there would be the potential for adverse (even possibly significant) impacts, if the provisions were not strictly enforced or uniformly applied during the site-specific permitting process. Also, in some areas, the Managed Access Provisions are not as stringent or protective as the buffers and/or the surface occupancy or access restrictions required for SRAs under Alternatives A or C.

Cumulative Impacts to Sensitive Resource Areas Common to All Alternatives

Under any of the alternatives, the cumulative impacts to SRAs would be significant, because of the existing disturbance (contamination) in the Novillo Line Camp, a designated SRA. No additional significant impacts would be expected under the restrictions outlined for Alternatives A or C; or under the Managed Access Provisions for Alternative B, assuming they are enforced or applied consistently.

Conclusion

If the Managed Access Provisions are strictly and uniformly applied and enforced, there would be no significant impacts to SRAs under any of the alternatives. However, in general, Alternative B provides protection for SRAs in a form that is less certain than the specific restrictions and buffers included under Alternatives A or C. Alternative A provides activity-driven protection with many surface area restrictions, and Alternative C provides the assurance of maximum protection to SRAs.

COMPARATIVE ANALYSIS OF THE PROPOSED ACTION AND ALTERNATIVES

Enhancement of Long-term Relationship between Local Short-term Uses of the Environment and Maintenance and Productivity

For all alternatives, most impacts would be relatively short-term and would be mitigated so that they do not persist beyond the life of the well fields. Land disturbed would be reclaimed, all equipment and contamination or wastes removed, and the ground restored to its natural contours. However, some soil and land surface disturbances for well field development may cause long-term effects, if disturbed land is not totally restored or restored only after a very long period of time. For example, access roads may be used for more then one well pad or for other multiple uses. In such cases, long-term productivity would likely decrease and possibly be lost in the areas used for access roads. Also, for wetlands, if the mitigation required is not successful in recreating the original productivity of areas lost, there could be a loss in long-term productivity in certain areas. This would be the case if certain out-of-kind wetland mitigation would be approved for replacement of productive wetland acreage.

Irreversible or Irretrievable Commitments of Resources

The term "irreversible commitment of resources" refers to the loss of production or use of a resource that cannot be changed. Nonrenewable minerals are an irreversible commitment, if used. An "irretrievable commitment of resources" refers to losses of production, harvest, or use of renewable natural resources.

For all the alternatives, there would be an irreversible commitment of oil and gas resources of up to 80 BCF. Any cultural resources destroyed due to surface exploration would be irreversible; however, given the size of the exploration borings, this would be relatively insignificant. For all alternatives, there would be an irretrievable loss of production and a loss of undeveloped areas for visitor experience where the ground is cleared and disturbed for oil and gas exploration, including roads, well pads, and nearby areas. This involves approximately 250 acres or 0.2 percent of the park. The potential for these lands to produce vegetation or be viewed in an undisturbed state would be irretrievably committed for the duration of the oil and gas development activities.

Unavoidable Adverse Impacts that Cannot be Avoided Should the Action be Implemented

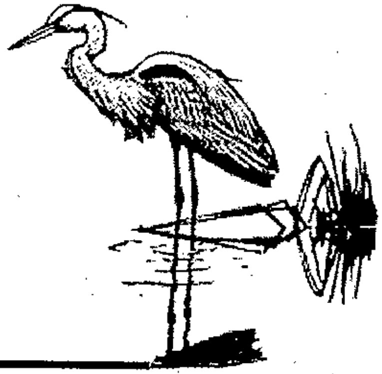
Unavoidable adverse impacts are significant impacts that cannot be avoided and cannot be mitigated, and, therefore, would remain throughout the duration of the project to some point beyond. For Alternatives A or B, there may be unavoidable adverse impacts if roads are constructed through foredunes. This impact is difficult to mitigate, because it is very difficult to rebuild and reclaim foredune areas affected by road-building.

For all alternatives, there may be unavoidable adverse impacts if the mitigation proposed for affected wetlands is not successful and/or does not replace the original wetland functions and values. It is difficult to ensure that mitigation of wetlands will have the necessary water regime and other environmental conditions to succeed. Although Alternative C avoids impacts to sensitive seagrass beds, it is likely that other wetlands could be impacted.

Finally, under Alternative B, there may be unavoidable adverse impacts to visitor experience and some SRAs (visitor use areas) if the buffer (500-foot) and other measures under Managed Access do not provide enough of a restricted area between oil and gas operations and sensitive visitor use areas, such as Malaquite Visitor Center, Bird Island Basin, Grasslands Nature Trail, and other more primitive areas. If only a 500-foot buffer is used, there is a distinct possibility that noise from drilling rigs could affect the visitor experience at these areas. This would depend on the specific location, intervening topography and vegetation, and the existing background noise levels.

CHAPTER 5

CONSULTATION AND COORDINATION



CHAPTER 5
CONSULTATION AND COORDINATION

INTRODUCTION

During consultation and coordination for this Draft Oil and Gas Management Plan/Environmental Impact Statement, formal and informal efforts have both been made to involve the public and local, state, and federal agencies. This involvement occurred through an open house, telephone calls, and letters. All applicable public participation has been documented and analyzed and is on file.

The planning process for this document was officially initiated through a public notice in the *Federal Register* on June 10, 1997. This notice invited the general public, as well as federal, state, and local government agencies, to identify issues and submit comments regarding the proposed planning effort to the NPS.

In June 1997, the NPS mailed a public scoping newsletter to over 300 individuals, organizations, and government agencies. The newsletter announced the beginning of the EIS scoping process and the location, date, and time of the scoping open house. The NPS also published the notice of intent and announced the scoping open house by placing newspaper advertisements in the Austin *American-Statesmen*, Houston *Chronicle*, and the Corpus Christi *Caller Times.* The notices provided the public with opportunities to schedule additional scoping open houses; however, the NPS received no requests for additional scoping meetings. The notices requested public participation. The scoping open house was held in Corpus Christi, Texas, on July 9, 1997. At this meeting, the NPS received comments directly pertaining to the issues identified with oil and gas development. A second newsletter was sent to the public on March 6, 1998, to over 280 individuals, summarizing the results of the scoping open house and the written comments received by the NPS. This newsletter is on file at the NPS Intermountain Support Office - Santa Fe, and Padre Island National Seashore.

The U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department have been consulted concerning listed threatened or endangered wildlife and plant species. Also, the Texas State Historic Preservation Officer and the Tonkawa Tribe have been consulted concerning cultural resource and ethnographic concerns. Documentation of these consultations is on file at the NPS Intermountain Support Office - Santa Fe, and Padre Island National Seashore.

Coordination and consultation with these federal and state agencies and the Tonkawa Tribe will be continued during the life of the plan.

TABLE 5.1. LISTING OF DOCUMENT RECIPIENTS

FEDERAL GOVERNMENT

Congressional Delegation

Senator Kay Bailey Hutchison
Senator Phil Gramm
Honorable Solomon P. Ortiz

Agencies

Federal Emergency Management Agency
Department of Energy
U.S. Environmental Protection Agency
Department of Agriculture
    Natural Resources Conservation Service
Department of the Army
    U.S. Army Corps of Engineers
Department of Commerce
    National Oceanic and Atmospheric Administration
Department of Interior
    Bureau of Land Management, Santa Fe, New Mexico
    Bureau of Reclamation, Billings, Montana
    U.S. Fish & Wildlife Service, Albuquerque
        Corpus Christi Field Office
        Aransas National Refuge, Austwell, Texas
        Laguna Atascosa Wildlife Refuge, Rio Hondo, Texas
        National Wildlife Refuge Complex, Alamo, Texas
    U.S. Geological Survey, Denver, Colorado
    National Park Service
        Superintendent, Aztec Ruins National Monument
        Superintendent, Big Cypress National Preserve
        Superintendent, Big South Fork National River and Recreation Area
        Superintendent, Big Thicket National Preserve
        Superintendent, Buffalo National River
        Superintendent, Cuyahoga Valley National Recreation Area
        Superintendent, El Morro National Monument
        Superintendent, Jean Lafitte National Historical Park and Preserve
        Superintendent, Lake Meredith National Recreation Area
        Superintendent, Lyndon B. Johnson National Historical Park
        Superintendent, New River Gorge National River
        Superintendent, Obed Wild & Scenic River
        Superintendent, San Antonio Missions National Historical Park
Department of Transportation
    Federal Aviation Administration
    Federal Highway Administration
    U.S. Coast Guard

TRIBAL GOVERNMENT

Tonkawa Tribe

STATE GOVERNMENT

Senator Carlos Truan, Corpus Christi
Congressman Gene Seaman, Texas
Texas State Department of Highways and Public Transportation, Austin, Texas
Texas State Highway Department, Corpus Christi, Texas
Texas General Land Office, Corpus Christi
Texas General Land Office, Austin, Texas
Texas Historical Commission, Austin, Texas
Texas Natural Resources Conservation Commission, Austin Texas
Texas Parks and Wildlife Department, Austin, Texas
Texas Parks and Wildlife Department, Edinburg, Texas
Texas Parks and Wildlife Department, Corpus Christi
Texas Railroad Commission, Austin, Texas
Texas Railroad Commission, Corpus Christi, Texas
Texas State Aquarium, Corpus Christi
Director, Corpus Christi Museum
Director of Parks, South Padre Island, Texas
Mustang Island State Park, Port Aransas, Texas

CITY AND COUNTY COMMISSIONS/PLANNING COMMISSIONS

Honorable Lloyd Neal, Mayor, Corpus Christi, Texas
Alice Chamber of Commerce
Aransas Pass Chamber of Commerce
Assistant City Manager, Corpus Christi, Texas
Bee County Chamber of Commerce
Brownsville Convention & Visitor Bureau
City Council, Corpus Christi, Texas
City Council, District 1, Corpus Christi, Texas
City Council, District 2, Corpus Christi, Texas
City Council, District 3, Corpus Christi, Texas
City Council, District 4, Corpus Christi, Texas
City Council, District 5, Corpus Christi, Texas
City of Corpus Christi
County Commissioner, Precinct 1, Corpus Christi, Texas
County Commissioner, Precinct 2, Corpus Christi, Texas
County Commissioner, Precinct 3, Corpus Christi, Texas
County Commissioner, Precinct 4, Corpus Christi, Texas
Corpus Christi City Manager, Corpus Christi, Texas
Corpus Christ Hispanic Chamber of Commerce
County Judge, Corpus Christi, Texas
Corpus Christi Parks and Recreation
Ships of Discovery, Corpus Christi

Visitor Information Centers, Corpus Christi, Texas
City Manager, South Padre Island
Director of Parks, Nueces, Texas
Falfurrias Chamber of Commerce
Gregory Chamber of Commerce
Greater Corpus Christi Business Alliance
George West Chamber of Commerce
Ingleside Chamber of Commerce
Kenedy County Courthouse
Kingsville Chamber of Commerce
Kingsville Visitor Center
Parks and Recreation, Kingsville, Texas
Kleberg County Courthouse
Lake Mathis Chamber of Commerce, Mathis, Texas
Mayor of Refugio
Port Aransas Chamber of Commerce
Refugio County Chamber of Commerce
Rockport/Fulton Chamber of Commerce
Sinton Chamber of Commerce
Taft Chamber of Commerce
Texas Center for Policy Studies, Austin, Texas
Victoria Convention/Visitor
Willacy County Courthouse
Woodsboro Chamber of Commerce

OIL AND GAS INDUSTRY

American Association of Geophysical Contractor
American Association of Professional Landmen
Amoco Production Company
American Petroleum Institute
Carrizo Oil & Gas
Corpus Christi Geological Society
Department of Geography and Planning
Duke Energy
Dunn-McCampbell Royalty Interest Group, Inc.
ENRON Oil & Gas Co.
ENRON Pipeline Group
ENSERCH Exploration
ENTRIX, Inc.
Exxon Company, USA
Fina Oil and Chemical Company
Forcenergy, Inc.
Houston Geological Society
Louis Dreyfus Natural Gas Corporation
Marconi Exploration, Inc.
Petrotex Engineering Company
Polaris Exploration Corporation
Royal Production Company, Inc.
Samedan Oil Corporation

Texas Energy & Environmental, Inc., Houston, Texas
Texas Independent Producers & Royality Owners Association
Valero Energy Corporation

ORGANIZATIONS AND BUSINESSES

Adopt-a-Beach Program
Applied Earth Sciences
Aransas Pass Progress
Audubon Outdoor Club
Austin ISD
Belaire Consulting, Inc.
Bob Conwell & Associates
Carter - Burgess
Coastal Bend Audobon Society
Coastal Bend Sierra Club
Corpus Christi Sailboard Association
CCISD
Elich & Associates
Endangered Species & Wetlands Rpt.
Fishermans Wharf
First State Bank
George Wright Society, Hancock, Michigan
Garth Henro Realty
Goldston Engineering
Gulf Coast Conservation Association
HEART - Help Endangered Animals - Ridley Turtles
Institute for Policy Research Sierra Club
King Ranch
Lower Laguna Madre Foundation
M.D. Surf and Skate
National Parks and Conservation Association
Olivarri & Associates
OPUS
Padre Island Park Company
Padre Isles Property Owners
Padre Island Realtors
Pelican Cove
Peterson Maritime Services, Inc.
Resort Marina
Robstown Economic Development Council
Sabal Palm Grove Sanctuary
Shiner, Moseley and Associates
South Texas Water Authority
Texas Audubon
Texas Excursions
Texas Organization of Endangered Species Trust for Public Lands, Austin, Texas
Texas Shrimp Association
The Gulfstream
Turner Collie & Braden Inc.

Welder Wildlife Foundation
Wetland Habitat Alliance of Texas, Nacogdoches, Texas
Wind and Wave Watersports

UNIVERSITIES

Del Mar College, Corpus Christi, Texas
Texas A&M University, Corpus Christi Texas
Texas A&M University, C CBN E Program, Corpus Christi, Texas
Texas A&M University, Department of Biology, Kingsville, Texas
Texas A&M University, Sea Grant College Program, Galveston, Texas
Texas A&M University, Sea Grant College Program, College Station, Texas
Texas A&M University, College Services & Technology, Corpus Christi, Texas
University of Texas, Marine Science Institute, Port Aransas, Texas

NEWSPAPERS AND MAGAZINES

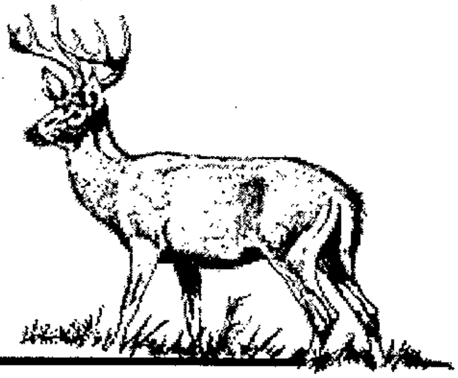
Corpus Christi Caller Times
Flour Bluff Sun
Navy Flightline
Sun Publishing
University News

RADIO AND TELEVISION

KBSO/KCCT
KCTA
KDF-TV
KEDT-TV
KEYS/KZFM
KFGG
KILL-TV
KLUX
K-LITE/KDAE/KLTG
KLTG
KOUL/KCTA
KNCN
KRIS-TV
KRYS
KZTV/K-SIX
WFAA-TV

CHAPTER 6

PREPARERS AND CONSULTANTS



CHAPTER 6
PREPARERS AND CONSULTANTS

PREPARERS

Name	Responsibility	Education	Years Related Experience
Linda Dansby	EIS Team Leader Summary, Introduction -Air Quality -Visual Quality -Floodplains Environmental Consequences -Cultural Resources -Soil and Water Resources -Visitor Experience	BS-Biology	NPS-20 yrs Environmental Protection Specialist
Darrell Echols	Affected Environment -Natural Resources ArcView Maps	BS-Biology	NPS-10 yrs Natural Resource Management Specialist
Pat O'Dell	RFD Scenario, Introduction -Local and Regional Economies -Park Operations Environmental Consequences -Oil and Gas Exploration and Development Appendix F, Types of Oil and Gas Operations	BS-Petroleum Engineering	NPS-6 yrs Petroleum Engineer Industry-10 yrs Petroleum Engineer
Paul Eubank	Introduction -Night Sky Affected Environment -Oil and Gas Exploration and Development	BS-Biology	NPS-24 yrs Environmental Protection Specialist
Jim Bradford	Affected Environment -Archeology	BS-Archeology/ Anthropology	NPS-20 yrs Cultural Resource Mgt. Private Sector-6 yrs
Alexa Roberts	Affected Environment -Ethnography	PhD- Anthropology	NPS-4 yrs Ethnographer Navajo Nation-8 yrs Private Sector-4 yrs
Catherine Colby	Affected Environment -Historic Structures	MA Architecture	NPS-15 yrs Historical Architect
Jill Cowley	Affected Environment -Cultural Landscapes	Masters in Landscape Architecture	NPS-10 yrs Landscape Architect

Name	Responsibility	Education	Years Related Experience
Lysa Wegman-French	Environmental Consequences -Cultural Resources	MA-History/ MLS Library Science	NPS-7 yrs Historian
Bob DuBey	Introduction -Wildlife -T&E Species	MS-Life Science	NPS-9 mos. Natural Resource Spec. Industry-10 yrs
Loreen Lithgow	Introduction -Vegetation	MS-Environ. Science & Mgt.	NPS/NMHU Student Partner-8 mos
Jane Harvey	Editing	BA-Anthropology	NPS-25 years Exhibit Planner Private-8 years Writer-Editor
Ben Espinoza	Copy-Editing/Formatting		NPS-10 years Program Assistant
Victoria Barela	Copy-Editing/Formatting		NPS-11 years Program Assistant
Linda Lutz-Ryan	Graphics and Publication Support	MFA - Fine Arts	NPS-10 years Visual Info. Specialist/Park Ranger

The following individuals provided contracted products and services:

Elijah W. Ramsey Stephen C. Laine	Landcover Classes Map		USGS, National Wetlands Research Center, Lafayette, LA
Chris Schenk R. Charpentier R. Corvelli and J.W. Schmoker	Appendix G, Remaining Oil and Gas Resources Beneath Padre Island National Seashore		USGS, Denver, CO
Nancy Van Dyke	Technical EIS Support, Environmental Consequences -Visitor Experience -SRAs	BA-Biology/Geog. MS-Env. Sciences	Environmental Consulting - 19 yrs President, Van Dyke Environmental, LLC
Jim Foch	Introduction -Natural Quiet	PhD	Livermore Laboratory
Bob Lessard	Environmental Consequences -Soil and Water	MS-Geology PhD-Hydrology PhD-Paleontology	New Mexico Highlands Univ., Professor of Geology
Rex Wahl	Environmental Consequences -Wetlands	MS-Biology	Sr. Environmental Planner, Entranco

CONSULTANTS

Padre Island National Seashore
Jock Whitworth, Superintendent
Dave McGinnis, Acting Superintendent (May-September 1998)
Pat McCrary, Superintendent (1996 - 1998)
Butch Farabee, Superintendent (1991 - 1996)
John Miller, Chief, Resources Management, Science and Interpretation

Big Thicket National Preserve
Pete Peterson, Superintendent
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Doug Hutter, Resources Management Specialist
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Roy Zipp, Resources Management Specialist

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Washington Office
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APPENDIXES

A THROUGH I

REFERENCES

ACRONYMS

AND ABBREVIATIONS

GLOSSARY

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APPENDIX A

PUBLIC LAW 87-712
ENABLING LEGISLATION FOR
PADRE ISLAND NATIONAL SEASHORE

Establishment authorized by Act of September 28, 1962

An Act To provide for the establishment of the Padre Island National Seashore, approved September 28, 1962 (76 Stat. 650)

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 a "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.

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.
(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 base 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.

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.

(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.

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.

(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.

Sec. 5. Except as otherwise provided in this Act. the property acquired 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.

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.

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.

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 B

NATIONAL PARK SERVICE
NONFEDERAL OIL AND GAS RIGHTS REGULATIONS
36 CFR 9B

Subpart--B--Non-Federal Oil and Gas Rights

AUTHORITY: Act of August 25, 1916, 39 Stat. 535 (16 U.S.C. 1, et seq.); and the acts establishing the units of the National Park System, including but not limited to: Act of April 25, 1947, 61 Stat. 54 (16 U.S.C. 241, et seq.); Act of July 2, 1958, 72 Stat. 285 (16 U.S.C. 410, et seq.); Act of October 27, 1972, 86 Stat. 1312 (16 U.S.C. 460dd, et seq.); Act of October 11,1974, 88 Stat. 1256 (16 U.S.C. 698-698e); Act of October 11, 1974, 88 Stat. 1258 (16 U.S.C. 698f-698m); Act of December 27,1974, 88 Stat. 1787 (16 U.S.C. 460ff et seq.).

SOURCE: 43 FR 57825, Dec. 8, 1978, unless otherwise noted.

§ 9.30 Purpose and scope.

(a) These regulations control all activities within any unit of the National Park System in the exercise of rights to oil and gas not owned by the United States where access is on, across or through federally owned or controlled lands or waters. Such rights arise most frequently in one of two situations: (1) When the land is owned in fee, including the right to the oil and gas, or (2) When in a transfer of the surface estate to the United States, the grantor reserved the rights to the oil and gas. These regulations are designed to insure that activities undertaken pursuant to these rights are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations.

These regulations are not intended to result in the taking of a property interest, but rather to impose reasonable regulations on activities which involve and affect federally-owned lands.

(b) Regulations controlling the exercise of minerals rights obtained under the Mining Law of 1872 in units of the National Park System can be found at 36 CFR Part 9, Subpart A. In area where oil and gas are owned by the United States, and leasing is authorized, the applicable regulations can be found at 43 CFR, Group 3100.

(c) These regulations allow operators the flexibility to design plans of operations only for that phase of operations contemplated. Each plan need only describe those functions for which the operator wants immediate approval. For instance, it is impossible to define, at the beginning of exploratory activity, the design that production facilities might take. For this reason, an operator may submit a plan which applies only to the exploratory phase, allowing careful preparation of a plan for the production phase after exploration is completed. This allows for phased reclamation and bonding at a level commensurate with the level of operations approved. However, it must be noted that because of potential cumulative impacts, and because of qualitative differences in the nature of the operations, approval of a plan of operations covering one phase of operations does not guarantee later approval of a plan of operations covering a subsequent phase.

[43 FR 57825, Dec. 8, 1978, as amended at 44 FR 37914, June 29, 1979]

§9.31 Definitions.

The terms used in this Subpart shall have the following meanings:

(a) *Secretary.* The Secretary of the Interior.

(b) *Director.* The Director of the National Park Service or his designee.

(c) *Operations* All functions, work and activities within a unit in connection with exploration for and development of oil and gas resources, the right to which is not owned by the United States, including: gathering basic information required to comply with this Subpart, prospecting, exploration, surveying, preproduction development and production; gathering, onsite storage, transport or processing of petroleum products; surveillance, inspection, monitoring, or maintenance of equipment; reclamation of the surface disturbed by such activities; and all activities and uses reasonably incident thereto performed within a unit, including construction or use of roads, pipelines, or other means of access or transportation on, across, or through federally owned or controlled lands and waters, regardless of whether such activities and uses take place on Federal, State or private lands.

(d) *Operator.* A person conducting or proposing to conduct operations.

(e) *Person.* Any individual, firm, partnership, corporation, association, or other entity.

(f) *Superintendent.* The Superintendent, or his designee, of the unit of the National Park System containing lands subject to the rights covered by these regulations.

(g) *Commercial Vehicle.* Any motorized equipment used in direct or indirect support of operations.

(h) *Unit.* Any National Park System area.

(i) *Owner.* The owner, or his legal representative, of the rights to oil and gas being exercised.

(j) *Regional Director.* The Regional Director, or his designee, for the National Park Service region in which the given unit is located.

(k) *Designated Roads.* Those existing roads determined by the Superintendent in accordance with 36 CFR 1.5 and § 4.19 to be open for the use of the general public or for the exclusive use of an operator.

(1) *Oil.* Any viscous combustible liquid hydrocarbon or solid hydrocarbon substance easily liquifiable on warming which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas without resort to manufacturing process.

(m) *Gas.* Any fluid, either combustible or noncombustible, which is produced in a natural state from the earth and which maintains a gaseous or rarefied state at ordinary temperature and pressure conditions.

(n) *Site.* Those lands or waters on which operations are to be carried out.

(o) *Contaminating substances.* Those substances, including but not limited to, salt water or any other injurious or toxic chemical, waste oil or waste emulsified oil, basic sediment, mud with injurious or toxic additives, or injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas.

(p) *Statement for Management.* A National Park Service planning document used to guide short- and long-term management of a unit; to determine the nature and extent of planning required to meet the unit's management objectives; and, in the absence of more specific planning documents, to provide a general framework for directing park operations and communicating park objectives to the public.

[43 F R 57825, Dec. 8, 1978: 44 FR 37914, June 29, 1979]

§ 9.32 Access.

(a) No access on, across or through lands or waters owned or controlled by the United States to a site for operations will be granted except for operations covered by § 9.33 and, except as provided by § 9.38, until the operator has filed a plan of operations pursuant to § 9.36 and has had the plan of operations approved in accordance with § 9.37. An approved plan of operations serves as the operator's access permit.

(b) No operations shall be conducted on a site within a unit, access to which is on, across or through federally owned or controlled lands or waters except in accordance with an approved plan of operations, the terms of § 9.33 or approval under § 9.38.

(c) Any operator intending to use aircraft of any kind for access to a federally-owned or controlled site must comply with these regulations. Failure of an operator to receive the proper approval under these regulations prior to using aircraft in this manner is a violation of both these regulations and 36 CFR 2.17.

(d) No access to a site outside a unit will be permitted across unit lands unless such access is by foot, pack animal, or designated road. Persons using designated roads for access to such a site must comply with the terms of § 9.50 where applicable.

(e) Any operator on a site outside the boundaries of a unit must comply with these regulations if he is using directional drilling techniques which result in the drill hole crossing into the unit and passing under any land or water the surface of which is owned by the United States. Except, that the operator need not comply in those areas where, upon application of the operator or upon his own action, the Regional Director is able to determine from available data, that such operations pose no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence fracture of geological formations with resultant fresh water aquifer contamination, or natural gas escape, or the like.

§ 9.33 Existing operations.

(a) Any person conducting operations on January 8, 1979 in accordance with a Federal or State issued permit may continue to do so as provided by this section. After expiration of such existing permits no operations shall be conducted except under an approved plan of operations, unless access is granted by the Regional Director under § 9.38.

(1) All Federal special use permits dealing with access on, across or through lands or waters owned or controlled by the United States to a site for the conduct of operations within any unit issued prior to January 8, 1979 shall expire according to their terms and shall not be renewed, unless by the terms of the existing permit it must be renewed.

(2) All operations on a site in a unit access to which is on, across, or through federally owned or controlled lands or waters conducted pursuant to a valid State access permit may be continued for the term of that permit, exclusive of any renewal period whether mandatory or discretionary, if conducted in accordance with the permit.

(b) Any person conducting operations on January 8, 1979 in a unit where Federal or State permits were not required prior to January 8, 1979 may continue those operations pending a final decision on his plan of operations; *Provided,* That:

(1) The operator (within thirty (30) days of January 8, 1979), notifies the Superintendent in writing of the nature and location of the operations; and

(2) Within sixty (60) days after such notification, the operator submits, in accordance with these regulations, a substantially complete proposed plan of operations for those operations;

(3) Failure to comply with § 9.33(b) (1) and (2) shall constitute grounds for the suspension of operations.

(c) At any time when operations which are allowed to continue under § 9.33 (a) and (b) pose an immediate threat of significant injury to federally owned or controlled lands or waters, the Superintendent shall require the operator to suspend operations immediately until the threat is removed or remedied. The Superintendent must, within five (5) days of this suspension notify the operator in writing of the reasons for the suspension and of his right to appeal the suspension under § 9.49.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.34 Transfers of interest.

(a) Whenever an owner of rights being exercised under an approved plan of operations sells, assigns, bequeaths, or otherwise conveys all or any part of those rights, he, his agent, executor, or representative must notify the Superintendent within sixty (60) days of the transfer of: the site(s) involved; the name and address of the person to whom an interest has been conveyed; and a description of the interest transferred. Failure to so notify the Superintendent shall render the approval of any previously approved plan of operations void.

(b) The transferring owner shall remain responsible for compliance with the plan of operations and shall remain liable under his bond until such time as the Superintendent is notified of the transfer in accordance with paragraph (a). At that time the Superintendent will prohibit the new owner from operating until such time as the new owner has filed with the Superintendent: (1) A statement ratifying the existing plan of operations and stating his intent to be bound thereby, or a new plan of operations, and (2) a suitable substitute performance bond which complies with the requirements of § 9.48.

§ 9.35 Use of water.

No operator may use for operations any water from a point of diversion which is within the boundaries of any unit unless authorized in writing by the Regional Director. The Regional Director shall not approve a plan of operations requiring the use of water from such source unless the operator shows either that his right to the use of the water is superior to any claim of the United States to the water, or where the operator's claim to the water is subordinate to that of the United

States that the removal of the water from the water system will not damage the unit's resources. In either situation, the operator's use of water must comply with appropriate State water laws.

§ 9.36 Plan of operations.

(a) The proposed plan of operations shall include, as appropriate to the proposed operations, the following:

(1) The names and legal addresses of the following persons: The operator and the owner(s) or lessee(s) (if rights are State-owned) other than the operator;

(2) Copy of the lease, deed, designation of operator, or assignment of rights upon which the operator's right to conduct operations is based;

(3) A map or maps showing the location of the perimeter of the area where the operator has the right to conduct operations, as described in § 9.36(a)(2), referenced to the State plane coordinate system or other public land survey as acceptable to the Superintendent;

(4) A map or maps showing the location, as determined by a registered land surveyor or civil engineer, of a point within a site of operations showing its relationship to the perimeter of the area described in § 9.36(a)(2) and to the perimeter of the site of operations; the location of existing and proposed access roads or routes to the site; the boundaries of proposed surface disturbance; the location of proposed drilling; location and description of all surface facilities including sumps, reserve pits and ponds; location of tank batteries, production facilities and gathering, service and transmission lines; wellsite layout; sources of construction materials such as fill; and the location of ancillary facilities such as camps, sanitary facilities, water supply and disposal facilities, and airstrips. The point within the site of operations identified by registered land surveyor or civil engineer shall be marked with a permanent ground monument acceptable to the Superintendent, shall contain the point's State plane coordinate values, and shall be placed at least to an accuracy of third order, class I, unless otherwise authorized by the Superintendent;

(5) A description of the major equipment to be used in the operations, including a description of equipment and methods to be used for the transport of all waters used in or produced by operations, and of the proposed method of transporting such equipment to and from the site;

(6) An estimated timetable for any phase of operations for which approval is sought and the anticipated date of operation completion;

(7) The geologic name of the surface formation;

(8) The proposed drilling depth, and the estimated tops of important geologic markers;

(9) The estimated depths at which anticipated water, brines, oil, gas, or other mineral bearing formations are expected to be encountered;

(10) The nature and extent of the known deposit or reservoir to be produced and a description of the proposed operations, including:

(i) The proposed casing program, including the size, grade, and weight of each string, and whether it is new or used;

(ii) The proposed setting depth of each casing string, and the amount of type of cement, including additives, to be used;

(iii) The operator's minimum specifications for pressure control equipment which is to be used, a schematic diagram thereof showing sizes, pressure ratings, and the testing procedures and testing frequency;

(iv) The type and characteristics of the proposed circulating medium or mediums to be employed for rotary drilling and the quantities and types of mud and weighting material to be maintained;

(v) The testing, logging, and coring programs to be followed;

(vi) Anticipated abnormal pressures or temperatures expected to be encountered; or potential hazards to persons and the environment such as hydrogen sulfide gas or oil spills, along with plans for mitigation of such hazards;

(11) A description of the steps to be taken to comply with the applicable operating standards of § 9.41 of this subpart;

(12) Provisions for reclamation which will result in compliance with the requirements of § 9.39:

(13) A breakdown of the estimated costs to be incurred during the implementation of the reclamation plan;

(14) Methods for disposal of all rubbish and other solid and liquid wastes, and contaminating substances;

(15) An affidavit stating that the operations planned are in compliance with all applicable Federal, State and local laws and regulations

(16) Background information, including:

(i) A description of the natural, cultural, social and economic environments to be affected by operations, including a description and/or map(s) of the location of all water, abandoned, temporarily abandoned, disposal, production, and drilling wells of public record within a two-mile radius of the proposed site. Where such information is available from documents identified in § 9.36(d), specific reference to the document and the location within the document where such information can be found will be sufficient to satisfy this requirement

(ii) The anticipated direct and indirect effects of the operations on the unit's natural, cultural, social, and economic environment;

(iii) Steps to be taken to insure minimum surface disturbance and to mitigate any adverse environmental effects, and a discussion of the impacts which cannot be mitigated

(iv) Measures to protect surface and subsurface waters by means of casing and cement, etc.

(v) All reasonable technologically feasible alternative methods of operations their costs, and their environmental effects, and

(vi) The effects of the steps to be taken to achieve reclamation

(17) Any other facets of the proposed operations which the operator wishes to point out for consideration; and

(18) Any additional information that is required to enable the Superintendent to establish whether the operator has the right to conduct operations as specified in the plan of operations; to effectively analyze the effects that the operations will have on the preservation, management and public use of the unit, and to make a recommendation to the Regional Director regarding approval or disapproval of the plan of operations and the amount of the performance bond to be posted.

(b) Where any information required to be submitted as part of a proposed plan of operations has been submitted to the Superintendent in substantially the same form in a prior approved plan of operations, a specific cross-reference to that information contained in the prior approved plan of operations will be sufficient to incorporate it into the proposed plan and will satisfy the applicable requirement of this section.

(c) Information and materials submitted in compliance with this section will not constitute a plan of operations until information required by § 9.36(a) (1) through (18), which the Superintendent determines as pertinent to the type of operations proposed, has been submitted to and determined adequate by the Regional Director.

(d) In all cases the plan of operations must consider and discuss the unit's Statement for Management and other planning documents as furnished by the Superintendent, and activities to control, minimize or prevent damage to the recreational, biological physical, scientific, cultural, and scenic resources of the unit, and any reclamation procedures suggested by the Superintendent.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.37 Plan of operations approval.

(a) The Regional Director shall not approve a plan of operations:

(1) Until the operator shows that the operations will be conducted in a manner which utilizes technologically feasible methods least damaging to the federally-owned or controlled lands, waters and resources of the unit while assuring the protection of public health and safety.

(2) For operations at a site the surface estate of which is not owned by the federal government, where operations would constitute a nuisance to federal lands or waters in the vicinity of the operations, would significantly injure federally-owned or controlled lands and waters; or

(3) For operations at a site the surface estate of which is owned or controlled by the federal government, where operations would substantially interfere with management of the unit to ensure the preservation of its natural and ecological integrity in perpetuity, or would significantly injure the federally-owned or controlled lands or waters; *Provided, however,* That if the application of this standard would under applicable law, constitute a taking of a property interest rather than an appropriate exercise of regulatory authority, the plan of operations may be approved if the operations would be conducted in accordance with paragraph (a)(1) of this section, unless a decision is made to acquire the mineral interest.

(4) Where the plan of operations does not satisfy each of the requirements of § 9.36 applicable to the operations proposed.

(b) Within sixty (60) days of the receipt of a plan of operations, the Regional Director shall make an environmental analysis of such plan, and:

(1) Notify the operator that the plan of operations has been approved or rejected, and, if rejected, the reasons for the rejection; or

(2) Notify the operator that the plan of operations has been conditionally approved, subject to the operator's acceptance of specific provisions and stipulations; or

(3) Notify the operator of any modification of the plan of operations which is necessary before such plan will be approved or of additional information needed to effectively analyze the effects that the operations will have on the preservation, management and use of the unit, and to make a decision regarding approval or disapproval of the plan of operations and the amount of the performance bond to be posted; or

(4) Notify the operator that the plan of operations is being reviewed, but that more time, not to exceed an additional thirty days, is necessary to complete such review, and setting forth the reasons why additional time is required. *Provided, however,* That days during which the area of operations is inaccessible for such reasons as inclement weather, natural catastrophe acts of God, etc., for inspection shall not be included when computing either this time period, or that in subsection (b) above; or

(5) Notify the operator that the plan of operations has been reviewed, but cannot be considered for approval until forty-five (45) days after a final environmental statement has been prepared and filed with the Environmental Protection Agency; or

(6) Notify the operator that the plan of operations is being reviewed, but that more time to provide opportunities for public participation in the plan of operations review and to provide sufficient time to analyze public comments received is necessary. Within thirty (30) days after closure of the public comment period specified by the Regional Director, he shall comply with § 9.37(b) (1) through (5).

(c) The Regional Director shall act as expeditiously as possible upon a proposed plan of operations consistent with the nature and scope of the operations proposed. Failure to act within the time limits specified in this section shall constitute a rejection of the plan of operations from which the operator shall have a right to appeal under § 9.49.

(d) The Regional Director's analysis shall include:

(1) An examination of all information submitted by the operator;

(2) An evaluation of measures and timing required to comply with reclamation requirements;

(3) An evaluation of necessary conditions and amount of the bond or security deposit (See § 9.48);

(4) An evaluation of the need for any additional requirements in the plan;

(5) A determination regarding the impact of this operation and cumulative impacts of all proposed and existing operations on the management of the unit; and

(6) A determination whether implementation by the operator of an approved plan of operations would be a major Federal action significantly affecting the quality of the human environment or would be sufficiently controversial to warrant preparation of an environmental statement pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969.

(e) Prior to approval of a plan of operations, the Regional Director shall determine whether any properties included in, or eligible for inclusion in the National Register of Historic Places or National Registry of Natural Landmarks may be affected by the proposed operations. This determination will require the acquisition of adequate information, such as that resulting from field surveys, in order to properly determine the presence and significance of cultural resources within the areas to be affected by operations. Whenever National Register properties or properties eligible for inclusion in the National Register would be affected by operations, the Regional Director shall comply with Section 106 of the Historic Preservations Act of 1966 as implemented by 36 CFR Part 800.

(f) Approval of each plan of operations is expressly conditioned upon the Superintendent having such reasonable access to the site as is necessary to properly monitor and insure compliance with the plan of operations.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.38 Temporary approval.

(a) The Regional Director may approve on a temporary basis:

(1) Access on, across or through federally-owned or controlled lands or waters for the purpose of collecting basic information necessary to enable timely compliance with these regulations. Such temporary approval shall be for a period not in excess of sixty (60) days.

(2) The continuance of existing operations, if their suspension would result in an unreasonable economic burden or injury to the operator; provided that such operations must be conducted in accordance with all applicable laws, and in a manner prescribed by the Regional Director designed to minimize or prevent significant environmental damage; and provided that within sixty (60) days of the granting of such temporary approval the operator either:

(i) Submits an initial substantially complete plan of operations; or

(ii) If a proposed plan of operations has been submitted, responds to any outstanding requests for additional information.

(b) The Regional Director may approve new operations on a temporary basis only when:

(1) The Regional Director finds that the operations will not cause significant environmental damage or result in significant new or additional surface disturbance to the unit; and either

(2) The operator can demonstrate a compelling reason for the failure to have had timely approval of a proposed plan of operations; or

(3) The operator can demonstrate that failure to grant such approval will result in an unreasonable economic burden or injury to the operator.

[43 FR 57825, Dec. 8, 1978, as amended at 44 FR 37914, June 29, 1979]

§ 9.39 Reclamation requirements.

(a) Within the time specified by the reclamation provisions of the plan of operations, which shall be as soon as possible after completion of approved operations and shall not be later than six (6) months thereafter unless a longer period of time is authorized in writing by the Regional Director, each operator shall initiate reclamation as follows:

(1) Where the Federal government does not own the surface estate. the operator shall at a minimum:

(i) Remove or neutralize any contaminating substances; and

(ii) Rehabilitate the area of operations to a condition which would not constitute a nuisance or would not adversely affect, injure, or damage federally-owned lands or waters, including removal of above ground structures and equipment used for operations, except that such structures and equipment may remain where they are to be used for continuing operations which are the subject of another approved plan of operations or of a plan which has been submitted for approval.

(2) On any site where the surface estate is owned or controlled by the Federal government, each operator must take steps to restore natural conditions and processes. These steps shall include but are not limited to:

(i) Removing all above ground structures, equipment and roads used for operations, except that such structures, equipment and roads may remain where they are to be used for continuing operations which are the subject of another approved plan of operations or of a plan which has been submitted for approval, or unless otherwise authorized by the Regional Director consistent with the unit purpose and management objectives;

(ii) Removing all other man-made debris resulting from operations;

(iii) Removing or neutralizing any contaminating substances;

(iv) Plugging and capping all nonproductive wells and filling dump holes, ditches, reserve pits and other excavations;

(v) Grading to reasonably conform the contour of the area of operations to a contour similar to that which existed prior to the initiation of operations, where such grading will not jeopardize reclamation;

(vi) Replacing the natural topsoil necessary for vegetative restoration; and

(vii) Reestablishing native vegetative communities.

(b) Reclamation under paragraph (a)(2) of this section is unacceptable unless it provides for the safe movement of native wildlife, the reestablishment of native vegetative communities, the normal flow of surface and reasonable flow of subsurface waters, and the return of the area to a condition which does not jeopardize visitor safety or public use of the unit.

§ 9.40 Supplementation or revision of plan of operations.

(a) A proposal to supplement or revise an approved plan of operations may be made by either the operator or the Regional Director to adjust the plan to changed conditions or to address conditions not previously contemplated by notifying the appropriate party in writing of the proposed alteration and the justification therefore.

(b) Any proposed supplementation or revision of a plan of operations initiated under paragraph (a) of this section by either party shall be reviewed and acted on by the Regional Director in accordance with § 9.37. If failure to implement proposed changes would not pose an immediate threat of significant injury to federally-owned or controlled lands or waters, the operator will be notified in writing sixty (60) days prior to the date such changes become effective, during which time the operator may submit comments on proposed changes. If failure to implement proposed changes would pose immediate threat of significant injury to federally-owned or controlled lands or waters, the provisions of § 9.33(c) apply.

§ 9.41 Operating Standards.

The following standards shall apply to operations within a unit:

(a) Surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent or ephemeral watercourses; or within 500 feet of the high pool shoreline of natural or man-made impoundments; or within 500 feet of the mean high tide line; or within 500 feet of any structure or facility (excluding roads) used for unit interpretation, public recreation or for administration of the unit unless specifically authorized by an approved plan of operations.

(b) The operator shall protect all survey monuments, witness corners, reference monuments and bearing trees against destruction, obliteration, or damage from operations and shall be responsible for the reestablishment, restoration, or referencing of any monuments, corners and bearing trees which are destroyed, obliterated, or damaged by such operations.

(c) Whenever drilling or producing operations are suspended for 24 hours or more, but less than 30 days, the wells shall be shut in by closing wellhead valves or blowout prevention equipment. When producing operations are suspended for 30 days or more, a suitable plug or other fittings acceptable to the Superintendent shall be used to close the wells.

(d) The operator shall mark each and every operating derrick or well in a conspicuous place with his name or the name of the owner, and the number and location of the well, and shall take all necessary means and precautions to preserve these markings.

(e) Around existing or future installations, e.g., well, storage tanks, all high pressure facilities, fences shall be built for protection of unit visitors and wildlife, and protection of said facilities unless otherwise authorized by the Superintendent. Fences erected for protection of unit visitors and wildlife shall be of a design and material acceptable to the Superintendent, and where appropriate, shall have at least one gate which is of sufficient width to allow access by fire trucks. Hazards within visitor use areas will be clearly marked with warning signs acceptable to the Superintendent.

(f) The operator shall carry on all operations and maintain the site at all times in a safe and workmanlike manner, having due regard for the preservation of the environment of the unit. The operator shall take reasonable steps to prevent and shall remove accumulations of oil or other materials deemed to be fire hazards from the vicinity of well locations and lease tanks, and shall remove from the property or store in an orderly manner all scrap or other materials not in use.

(g) Operators will be held fully accountable for their contractor's or subcontractor's compliance with the requirements of the approved plan of operations.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.42 Well records and reports, plots and maps, samples, tests and surveys.

Any technical data gathered during the drilling of any well, including daily drilling reports and geological reports, which are submitted to the State pursuant to State regulations, or to any other bureau or agency of the Federal government shall be available for inspection by the Superintendent upon his request.

§ 9.43 Precautions necessary in areas where high pressures are likely to exist.

When drilling in "wildcat" territory, or in any field where high pressures are likely to exist, the operator shall take all necessary precautions for keeping the well under control at all times and shall install and maintain the proper high-pressure fittings and equipment to assure proper well control. Under such conditions the surface string must be cemented through its length, unless another procedure is authorized or prescribed by the Superintendent, and all strings of casing must be securely anchored.

§ 9.44 Open flows and control of "wild" wells.

The operator shall take all technologically feasible precautions to prevent any oil, gas, or water well from blowing open or becoming "wild," and shall take immediate steps and exercise due diligence to bring under control any "wild" well, or burning oil or gas well.

§ 9.45 Handling of wastes.

Oilfield brine, and all other waste and contaminating substances must be kept in the smallest practicable area, must be confined so as to prevent escape as a result of percolation, rain high water or other causes, and such wastes must be stored and disposed of or removed from the area as quickly as practicable in such a manner as to prevent contamination, pollution, damage or injury to the lands, water (surface and subsurface), facilities, cultural resources, wildlife, and vegetation of or visitors of the unit.

§ 9.46 Accidents and fires.

The operator shall take technologically feasible precautions to prevent accidents and fires, shall notify the Superintendent within 24 hours of all accidents involving serious personal injury or death, or fires on the site, and shall submit a full written report thereon within ninety (90) days. This report supersedes the requirement outlined in 36 CFR 2.17, but does not relieve persons from the responsibility of making any other accident reports which may be required under State or local laws.

§ 9.47 Cultural resource protection.

(a) Where the surface estate of the site is owned by the United States, the operator shall not, without written authorization of the Superintendent, injure, alter, destroy, or collect any site, structure, object, or other value of historical, archeological, or other cultural scientific importance in violation of the Antiquities Act (16 U.S.C. 431-433 (See 43 CFR Part 3).

(b) Once approved operations have commenced, the operator shall immediately bring to the attention of the Superintendent any cultural or scientific resource encountered that might be altered or destroyed by his operation and shall leave such discovery intact until told to proceed by the Superintendent. The Superintendent will evaluate the discoveries brought to his attention, and will determine within ten (10) working days what action will be taken with respect to such discoveries.

§ 9.48 Performance bond.

(a) Prior to approval of a plan of operations, the operator shall be required to file a suitable performance bond with satisfactory surety, payable to the Secretary or his designee. The bond shall be conditioned upon faithful compliance with applicable regulations, and the plan of operations as approved, revised or supplemented. This performance bond is in addition to and not in lieu of any bond or security deposit required by other regulatory authorities.

(b) In lieu of a performance bond, an operator may elect to deposit with the Secretary or his designee, cash or negotiable bonds of the U.S. Government. The cash deposit or the market value of such securities shall be at least equal to the required sum of the bond. When bonds are to serve as security, there must be provided to the Secretary a power of attorney.

(c) In the event that an approved plan of operations is revised or supplemented in accordance with § 9.40, the Regional Director may adjust the amount of the bond or security deposit to conform to the modified plan of operations.

(d) The bond or security deposit shall be in an amount:

(1) Equal to the estimated cost of reclaiming the site, either in its entirety or in phases, that has been damaged or destroyed as a result of operations conducted in accordance with an approved, supplemented, plan of operations; plus

(2) An amount set by the Superintendent consistent with the type of operations proposed, to bond against the liability imposed by § 9.51(a); to provide the means for rapid and effective cleanup; and to minimize damages resulting from an oil spill, the escape of gas, wastes, contaminating substances, or fire caused by operations. This amount shall not exceed twenty-five thousand dollars ($25,000) for geophysical surveys when using more than one field party or five thousand dollars ($5,000) when operating with only one field party, and shall not exceed fifty thousand dollars ($50,000) for each wellsite or other operation.

(3) When an operator's total bond or security deposit with the National Park Service amounts to two hundred thousand dollars ($200,000) for activities conducted within a given unit, no further bond requirements shall be collected for additional activities conducted within that unit, and the operator may substitute a blanket bond of two hundred thousand dollars ($200,000) for all operations conducted within the unit.

(e) The operator's and his surety's responsibility and liability under the bond or security deposit shall continue until such time as the Superintendent determines that successful reclamation of the area of operations has occurred and, where a well has been drilled, the well has been properly plugged and abandoned. If all efforts to secure the operator's compliance with pertinent provisions of the approved plan of operations are unsuccessful, the operator's surety company will be required to perform reclamation in accordance with the approved plan of operations.

(f) Within thirty (30) days after determining that all reclamation requirements of an approved plan of operations are completed, including proper abandonment of the well, the Regional Director shall notify the operator that the period of liability under the bond or security deposit has been terminated.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915 June 29, 1979]

§ 9.49 Appeals.

(a) Any operator aggrieved by a decision of the Regional Director in connection with the regulations in this Subpart may file with the Regional Director a written statement setting forth in detail the respects in which the decision is contrary to, or is in conflict with the facts, the law, or these regulations, or is otherwise in error. No such appeal will be considered unless it is filed with the Regional Director within thirty (30) days after the date of notification to the operator of the action or decision complained of. Upon receipt of such written statement from the aggrieved operator, the Regional Director shall promptly review the action or decision and either reverse his original decision or prepare his own statement, explaining that decision and the reasons therefor, and forward the statement and record on appeal to the Director for review and decision. Copies of the Regional Director's statement shall be furnished to the aggrieved operator, who shall have thirty (30) days within which to file exceptions to the Regional Director's decision. The Department has the discretion to initiate a hearing before the Office of Hearing and Appeals in a particular case (See 43 CFR 4.700).

(b) The official files of the National Park Service on the proposed plan of operations and any testimony and documents submitted by the parties on which the decision of the Regional Director was based shall constitute the record on appeal. The Regional Director shall maintain the record under separate cover and shall certify that it was the record on which his decision was based at the time it was forwarded to the Director of the National Park Service. The National Park Service shall make the record available to the operator upon request.

(c) If the Director considers the record inadequate to support the decision on appeal, he may provide for the production of such additional evidence or information as may be appropriate, or may remand the case to the Regional Director, with appropriate instructions for further action.

(d) On or before the expiration of forty-five (45) days after his receipt of the exceptions to the Regional Director's decision, the Director shall make his decision in writing: provided however, that if more than forty-five (45) days are required for a decision after the exceptions are received, the Director shall notify the parties to the appeal and specify the reason(s) for delay. The decision of the Director shall include: (1) A statement of facts; (2) conclusions; and (3) reasons upon which the conclusions are based. The decision of the Director shall be the final administrative action of the agency on a proposed plan of operations.

(e) A decision of the Regional Director from which an appeal is taken shall not be automatically stayed by the filing of a statement of appeal. A request for a stay may accompany the statement of appeal or may be directed to the Director. The Director shall promptly rule on requests for stays. A decision of the Director on request for a stay shall constitute a final administrative decision.

(f) Where, under this Subpart, the Superintendent has the authority to make the original decision, appeals may be taken in the manner provided by this section, as if the decision had been made by the Regional Director, except that the original statement of appeal shall be filed with the Superintendent, and if he decides not to reverse his original decision, the Regional Director shall have, except as noted below, the final review authority. The only decision of a Regional Director under this paragraph which shall be appealable by the Director is an appeal from a suspension under § 9.51(b). Such an appeal shall follow the procedure of paragraphs (a)-(3) of this section.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.50 Use of roads by commercial vehicles.

(a) After January 8, 1978, no commercial vehicle shall use roads administered by the National Park Service without being registered with the Superintendent. Roads must be used in accordance with procedures outlined in an approved plan of operations.

(1) A fee shall be charged for such registration and use based upon a posted fee schedule. The fee schedule posted shall be subject to change upon sixty (60) days of notice.

(2) An adjustment of the fee may be made at the discretion of the Superintendent where a cooperative maintenance agreement is entered into with the operator.

(b) No commercial vehicle which exceeds roadway load limits specified by the Superintendent shall be used on roads administered by the National Park Service unless authorized in writing by the Superintendent, or unless authorized by an approved plan of operations.

(c) Should a commercial vehicle used in operations cause damage to roads, resources or other facilities of the National Park Service, the operator shall be liable for all damages so caused.

§ 9.51 Damages and penalties.

(a) The operator shall be held liable for any damages to federally-owned or controlled lands, waters, or resources resulting from his failure to comply with either his plan of operations, or where operations are continued pursuant to § 9.33, failure to comply with the applicable permit or, where operations are temporarily approved under § 9.38, failure to comply with the terms of that approval.

(b) The operator agrees, as a condition for receiving an approved plan of operations, that he will hold harmless the United States and its employees from any damages or claims for injury or death of persons and damage or loss of property by any person or persons arising out of any acts or omissions by the operator, his agents, employees or subcontractors done in the course of operations.

(c) Undertaking any operations within the boundaries of any unit in violation of this Subpart shall be deemed a trespass against the United States and shall be cause for revocation of approval of the plan of operations.

(1) When a violation by an operator under an approved plan of operations is discovered, and if it does not pose an immediate threat of significant injury to federally-owned or controlled lands or waters, the operator will be notified in writing by the Superintendent and will be given ten (10) days to correct the violation; if the violation is not corrected within ten (10) days approval of the plan of operations will be suspended until such time as the violation is corrected.

(2) If the violation poses an immediate threat of significant injury to federally-owned or controlled lands or waters, approval of the plan of operations will be immediately suspended until such time as the violation is corrected. The operator will be notified in writing within five (5) days of any suspension and shall have the right to appeal that decision under § 9.48.

(3) Failure to correct any violation or damage to federally owned or controlled lands, waters or resources caused by such violations will result in revocation of plan of operations approval.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.52 Public inspection of documents.

(a) When a Superintendent receives a request for permission for access on, across or through federally-owned or controlled lands or waters for the purpose of conducting operations, the Superintendent shall publish a notice of this request in a newspaper of general circulation in the county(s) in which the lands are situated, or in such publications as deemed appropriate by the Superintendent.

(b) Upon receipt of the plan of operations in accordance with § 9.35(c), the Superintendent shall publish a notice in the FEDERAL REGISTER advising the availability of the plan for public review and comment. Written comments received within thirty (30) days will become a part of the official record. As a result of comments received or if otherwise deemed appropriate by the Superintendent, he may provide additional opportunity for public participation to review the plan of operations.

(c) Any document required to be submitted pursuant to the regulations in this Subpart shall be made available for public inspection at the office of the Superintendent during normal business hours, unless otherwise available pursuant to § 9.51(b). This does not include those records only made available for the Superintendent's inspection under § 9.41 of this Subpart or those records determined by the Superintendent to contain proprietary or confidential information. The availability of such records for inspection shall be governed by the rules and regulations found at 43 CFR Part 2.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

APPENDIX C

U.S. Fish and Wildlife Service Letter Providing a List of Threatened and Endangered Species that Occur or Might Occur at Padre Island National Seashore

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive
Corpus Christi, Texas 78412

August 8, 1997

Mr. Patrick C. McCrary - Superintendent
NATIONAL PARK SERVICE
Padre Island National Seashore
9405 South Padre Island Drive
Corpus Christi, Texas 78418

Consultation No. 2-11-97-I-226

Dear Mr. McCrary:

This responds to your letter dated July 23, 1997, requesting a formal list of the threatened and endangered species that occur or might occur at Padre Island National Seashore, within Kleberg, Kenedy, and Willacy Counties, Texas. The list has been prepared to assist you in the preparation of an Oil and Gas Management Plan/Environmental Impact Statement. Be advised that animals and plants are listed on a county by county basis for reference purposes only, therefore these species may occur in other counties if the appropriate habitat is present.

The list has been expanded to include candidate species as well. Candidate species have no protection under the Endangered Species Act; however, the U.S. Fish and Wildlife Service has substantial information on candidate species to support their listing as threatened or endangered. Therefore, actions that might contribute to the listing of candidate species should be avoided. A letter designation following the species name represents the current Federal status of that species. Within the following list, the letters E, T and C represent the status of Endangered, Threatened and Candidate, respectively. Our data indicate that the following species may occur in Kleberg, Kenedy, and Willacy Counties:

Kenedy County

American peregrine falcon (Falco peregrinus anatum) - E
brown pelican (Pelecanus occidentalis) - E
hawksbill sea turtle (Eretmochelys imbricata) - E
jaguarundi (Felis yagouaroundi) - E
Kemp's ridley sea turtle (Lepidochelys kempii) - E
leatherback sea turtle (Dermochelys coriacea) - E
northern aplomado falcon (Falco femoralis septentrionalis) - E
ocelot (Felis pardalis) - E
Arctic peregrine falcon (Falco peregrinus tundrius) - T
green sea turtle (Chelonia mydas) - T
loggerhead sea turtle (Caretta caretta) - T
piping plover (Charadrius melodus) - T
cactus ferruginous pygmy owl (Glaucidium brasilianum cactorum) - C (Proposed Threatened)

Kleberg County

American peregrine falcon (Falco peregrinus anatum) - E
black lace cactus (Echinocereus reichenbachii var. albertii) - E
brown pelican (Pelecanus occidentalis) - E
hawksbill sea turtle (Eretmochelys imbricata) - E
jaguarundi (Felis yagouaroundi) - E
Kemp's ridley sea turtle (Lepidochelys kempii) - E
leatherback sea turtle (Dermochelys coriacea) - E
northern aplomado falcon (Falco femoralis septentrionalis) - E
ocelot (Felis pardalis) - E
slender rush-pea (Hoffmannseggia tenella) - E
South Texas ambrosia (Ambrosia cheiranthifolia) - E
Arctic peregrine falcon (Falco peregrinus tundrius) - T
bald eagle (Haliaeetus leucocephalus) - T
green sea turtle (Chelonia mydas) - T
loggerhead sea turtle (Caretta caretta) - T
piping plover (Charadrius melodus) - T
mountain plover (Charadrius montanus) - C

Willacy County

American peregrine falcon (Falco peregrinus anatum) - E
brown pelican (Pelecanus occidentalis) - E
hawksbill sea turtle (Eretmochelys imbricata) - E
jaguarundi (Felis yagouaroundi) - E
Kemp's ridley sea turtle (Lepidochelys kempii) - E
leatherback sea turtle (Dermochelys coriacea) - E
northern aplomado falcon (Falco femoralis septentrionalis) - E
ocelot (Felis pardalis) - E
Arctic peregrine falcon (Falco peregrinus tundrius) - T
green sea turtle (Chelonia mydas) - T
loggerhead sea turtle (Caretta caretta) - T
piping plover (Charadrius melodus) - T
cactus ferruginous pygmy owl (Glaucidium brasilianum cactorum) - C (Proposed Threatened)
mountain plover (Charadrius montanus) - C

The Service appreciates the opportunity to provide you with this information. For updates of the species list or if we can be of further assistance, please contact our office at (512) 994-9005.

Sincerely,

William Seawell
WILLIAM M. SEAWELL
Field Supervisor

APPENDIX D

Texas Parks and Wildlife Department List of Special Status Species that Might Occur at Padre Island National Seashore

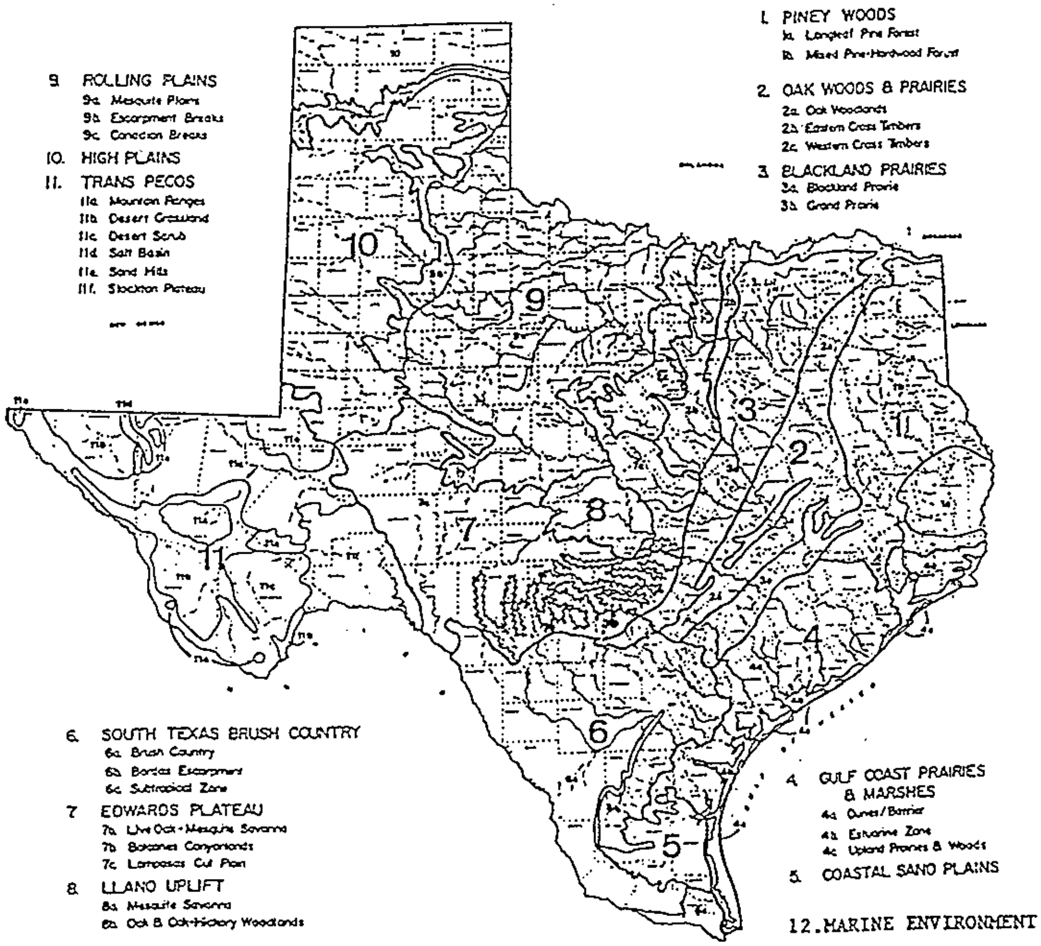
TEXAS THREATENED AND ENDANGERED SPECIES
November 1997

ANIMALS
In 1973 the Texas legislature authorized the Texas Parks and Wildlife Department to establish a list of endangered animals in the state. Endangered species are those species which the Executive Director of the Texas Parks and Wildlife Department has named as being "threatened with statewide extinction." Threatened species are those species which the TPW Commission has determined are likely to become endangered in the future. Laws and regulations pertaining to endangered or threatened animal species are contained in Chapters 67 and 68 of the Texas Parks and Wildlife (TPW) Code and Sections 65.171 - 65.184 of Title 31 of the Texas Administrative Code (T.A.C.).

PLANTS
In 1988 the Texas legislature authorized the Department to establish a list of threatened and endangered plant species for the state. An endangered plant is one that is "in danger of extinction throughout all or a significant portion of its range." A threatened plant is one which is likely to become endangered within the foreseeable future. Laws and regulations pertaining to endangered or threatened plant species are contained in Chapter 88 of the TPW Code and Sections 69.01 - 69.14 of the T.A.C.

REGULATIONS
TPWD regulations prohibit the taking, possession, transportation, or sale of any of the animal species designated by state law as endangered or threatened without the issuance of a permit. State laws and regulations prohibit commerce in threatened and endangered plants and the collection of listed plant species from public land without a permit issued by TPWD. In addition, some species listed as threatened or endangered under state law are also listed under federal regulations. These animals are provided additional protection by the U.S. Fish and Wildlife Service.

LISTING AND RECOVERY
Listing and recovery of endangered species in Texas is coordinated by the Endangered Resources Branch. The Department's Permitting Section is responsible for the issuance of permits for the handling of listed species. The following pages list those species which have been designated as threatened or endangered in Texas. The range of the species within the state can be referenced by the map of Texas natural regions below:



1. PINEY WOODS
1a. Longleaf Pine Forest
1b. Mixed Pine-Hardwood Forest
2. OAK WOODS & PRAIRIES
2a. Oak Woodlands
2b. Eastern Cross Timbers
2c. Western Cross Timbers
3. BLACKLAND PRAIRIES
3a. Blackland Prairie
3b. Grand Prairie
9. ROLLING PLAINS
9a. Mesquite Plains
9b. Escarpment Breaks
9c. Canadian Breaks
10. HIGH PLAINS
11. TRANS PECOS
11a. Mountain Ranges
11b. Desert Grassland
11c. Desert Scrub
11d. Salt Basin
11e. Sand Hills
11f. Stockton Plateau
10
9
3
2
1
8
7
11
6
5
6. SOUTH TEXAS BRUSH COUNTRY
6a. Brush Country
6b. Bordas Escarpment
6c. Subtropical Zone
7. EDWARDS PLATEAU
7a. Live Oak-Mesquite Savanna
7b. Balcones Canyonlands
7c. Lampasas Cut Plain
8. LLANO UPLIFT
8a. Mesquite Savanna
8b. Oak & Oak-Hickory Woodlands
4. GULF COAST PRAIRIES & MARSHES
4a. Dunes/Barrier
4b. Estuarine Zone
4c. Upland Prairies & Woods
5. COASTAL SAND PLAINS
12.MARINE ENVIRONMENT

TEXAS PARKS AND WILDLIFE DEPARTMENT
TEXAS BIOLOGICAL AND CONSERVATION DATA SYSTEM
SPECIAL ANIMAL LIST
06 OCT 1997

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
*** AMPHIBIANS					
BUFO HOUSTONENSIS	HOUSTON TOAD	G1	S1	LE	E
EURYCEA LATITANS	CASCADE CAVERNS SALAMANDER	G3	S3		T
EURYCEA NANA	SAN MARCOS SALAMANDER	G1	S1	LT	T
EURYCEA NEOTENES	TEXAS SALAMANDER	G1	S1		
EURYCEA PTEROPHILA	BLANCO RIVER SPRINGS SALAMANDER	G2	S2		
EURYCEA RATHBUNI	TEXAS BLIND SALAMANDER	G1	S1	LE	E
EURYCEA ROBUSTA	BLANCO BLIND SALAMANDER	G1	S1		T
EURYCEA SOSORUM	BARTON SPRINGS SALAMANDER	G1	S1	LE	
EURYCEA SP 1	JOLLYVILLE PLATEAU SALAMANDER	G1	S1		
EURYCEA SP 2	SALADO SPRINGS SALAMANDER	G1	S1		
EURYCEA SP 5	GEORGETOWN SALAMANDER	G1	S1		
EURYCEA SP 6	PEDERNALES RIVER SPRINGS SALAMANDER	G1	S1		
EURYCEA SP 7	EDWARDS PLATEAU SPRING SALAMANDERS	G1G3Q	S1S3		
EURYCEA SP 8	COMAL SPRINGS SALAMANDER	G1Q	S1		
EURYCEA TRIDENTIFERA	COMAL BLIND SALAMANDER	G1	S1		T
EURYCEA TROGLODYTES	VALDINA FARMS SINKHOLE SALAMANDER	GH	SH		
HYPOPACHUS VARIOLOSUS	SHEEP FROG	G5	S2		T
LEPTODACTYLUS LABIALIS	WHITE-LIPPED FROG	G5	S1		T
NOTOPHTHALMUS MERIDIONALIS	BLACK-SPOTTED NEWT	G1	S1		T
PLETHODON SERRATUS	SOUTHERN REDBACK SALAMANDER	G5	S1		
RANA GRYLIO	PIG FROG	G5	S2		
RANA PIPIENS	NORTHERN LEOPARD FROG	G5	S1		
RHINOPHRYNUS DORSALIS	MEXICAN BURROWING TOAD	G5	S2		T
SIREN SP 1	SOUTH TEXAS SIREN (LARGE FORM)	G?Q	S?		T
SMILISCA BAUDINII	MEXICAN TREEFROG	G5	S3		T
*** ARACHNIDS					
ARCHEOLARCA GUADALUPENSIS	GUADALUPE CAVE PSEUDOSCORPION	G1	S1		
CICURINA BANDIDA	BANDIT CAVE SPIDER	G1	S1		
CICURINA BARONI	ROBBER BARON CAVE SPIDER	G1	S1		
CICURINA CUEVA	A CAVE SPIDER	G1	S1		
CICURINA MADLA	MADLA'S CAVE SPIDER	G1	S1		
CICURINA VENII	VENI'S CAVE SPIDER	G1	S1		
CICURINA VESPERA	VESPER CAVE SPIDER	G1	S1		
CICURINA WARTONI	WARTON'S CAVE SPIDER	G1	S1	C1	
NEOLEPTONETA MICROPS	GOVERNMENT CANYON CAVE SPIDER	G1	S1		
NEOLEPTONETA MYOPICA	TOOTH CAVE SPIDER	G1	S1	LE	
TARTAROCREAGRIS TEXANA	TOOTH CAVE PSEUDOSCORPION	G1	S1	LE	
TEXELLA COKENDOLPHERI	ROBBER BARON CAVE HARVESTMAN	G1	S1		
TEXELLA REDDELLI	BEE CREEK CAVE HARVESTMAN	G1	S1	LE	
TEXELLA REYESI	BONE CAVE HARVESTMAN	G1Q	S1	LE	
*** BIRDS					
AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW	G3	S3B		T
AIMOPHILA BOTTERII ARIZONAE	ARIZONA BOTTERI'S SPARROW	G4T3?	S1		T
AIMOPHILA BOTTERII TEXANA	TEXAS BOTTERI'S SPARROW	G4T4	S3B		T
AMMODRAMUS BAIRDII	BAIRD'S SPARROW	G3G4	S2		
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW	G3G4	S2S3N,SXB		
ATHENE CUNICULARIA HYPUGAEA	WESTERN BURROWING OWL	G4TU	S2B		
BUTEO ALBICAUDATUS	WHITE-TAILED HAWK	G4G5	S4B		T
BUTEO ALBONOTATUS	ZONE-TAILED HAWK	G4	S3B		T
BUTEO NITIDUS	GRAY HAWK	G4G5	S2B		T
BUTEO REGALIS	FERRUGINOUS HAWK	G4	S2B,S4N		
BUTEOGALLUS ANTHRACINUS	COMMON BLACK-HAWK	G4G5	S2B		T
CAMPEPHILUS PRINCIPALIS	IVORY-BILLED WOODPECKER	G1	SX	LE	E
CAMPTOSTOMA IMBERBE	NORTHERN BEARDLESS-TYRANNULET	G5	S3B		T
CHARADRIUS ALEXANDRINUS	SNOWY PLOVER	G4	S3B		
CHARADRIUS ALEXANDRINUS NIVOSUS	WESTERN SNOWY PLOVER	G4T3	S2B		
CHARADRIUS ALEXANDRINUS TENUIROSTRIS	SOUTHEASTERN SNOWY PLOVER	G4T3	S2B		
CHARADRIUS MELODUS	PIPING PLOVER	G3	S2	LT	T
CHARADRIUS MONTANUS	MOUNTAIN PLOVER	G2	S2	C1	
CHLIDONIAS NIGER	BLACK TERN	G4	S3		
CHONDROHIERAX UNCINATUS	HOOK-BILLED KITE	G4	S2		
CYANOCORAX MORIO	BROWN JAY	G5	S2B		
CYRTONYX MONTEZUMAE	MONTEZUMA QUAIL	G4G5	S3B		
DENDROICA CERULEA	CERULEAN WARBLER	G4	SHB,S3N		
DENDROICA CHRYSOPARIA	GOLDEN-CHEEKED WARBLER	G2	S2B	LE	E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
EGRETTA RUFESCENS	REDDISH EGRET	G4	S3B		T
ELANOIDES FORFICATUS	SWALLOW-TAILED KITE	G5	S2B		T
EMPIDONAX TRAILLII EXTIMUS	SOUTHWESTERN WILLOW FLYCATCHER	G5T2	S1B	LE	E
FALCO FEMORALIS SEPTENTRIONALIS	NORTHERN APLOMADO FALCON	G4T2	S1	LE	E
FALCO MEXICANUS	PRAIRIE FALCON	G4G5	S3B		
FALCO PEREGRINUS	PEREGRINE FALCON	G4	S3	E/SA	E,T
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	G4T3	S2B	LE	E
FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON	G4T4	S3N	E/SA	T
GEOTHLYPIS TRICHAS INSPERATA	BROWNSVILLE COMMON YELLOWTHROAT	G5T2	S1B		
GLAUCIDIUM BRASILIANUM CACTORUM	CACTUS FERRUGINOUS PYGMY-OWL	G5T3	S3B		T
GRUS AMERICANA	WHOOPING CRANE	G1	S1	LE	E
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S3B,S3N	LT	T
ICTERUS CUCULLATUS CUCULLATUS	MEXICAN HOODED ORIOLE	G5TU	S4B		
ICTERUS CUCULLATUS SENNETTI	SENNETT'S HOODED ORIOLE	G5TU	S3B		
ICTERUS GRADUACAUDA AUDUBONII	AUDUBON'S ORIOLE	G5T4	S3B		
LANIUS LUDOVICIANUS MIGRANS	MIGRANT LOGGERHEAD SHRIKE	G4G5T3	S2B		
LATERALLUS JAMAICENSIS	BLACK RAIL	G4?	S2B		
MYCTERIA AMERICANA	WOOD STORK	G4	SHB,S2N		T
NUMENIUS BOREALIS	ESKIMO CURLEW	G1	SH	LE	E
PACHYRAMPHUS AGLAIAE	ROSE-THROATED BECARD	G4G5	SA		T
PARULA PITIAYUMI	TROPICAL PARULA	G5	S3B		T
PELECANUS OCCIDENTALIS	BROWN PELICAN	G4	S3B	LE	E
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G3	S2B	LE	E
PLEGADIS CHIHI	WHITE-FACED IBIS	G5	S4B		T
SETOPHAGA RUTICILLA	AMERICAN REDSTART	G5	S2B		
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	G4T2Q	S1B	LE	E
STERNA FUSCATA	SOOTY TERN	G5	S2B		T
STRIX OCCIDENTALIS LUCIDA	MEXICAN SPOTTED OWL	G3T3	S1B	LT	T
TYMPANUCHUS CUPIDO ATTWATERI	ATTWATER'S GREATER PRAIRIE-CHICKEN	G4T1	S1B	LE	E
TYMPANUCHUS PALLIDICINCTUS	LESSER PRAIRIE-CHICKEN	G3	S2B		
VERMIVORA BACHMANII	BACHMAN'S WARBLER	GH	SR	LE	E
VIREO ATRICAPILLUS	BLACK-CAPPED VIREO	G2	S2B	LE	E
*** CRUSTACEANS					
ASELLUS SMITHII	TEXAS TROGLOBITIC WATER SLATER	G1	S1		
CAMBARELLUS TEXANUS	A CRAYFISH	G3?	S3?		
FALLICAMBARUS DEVASTATOR	TEXAS PRAIRIE CRAYFISH	G2?	S2?		
GAMMARUS HYALLELOIDES	DIMINUTIVE AMPHIPOD	G1	S1		
GAMMARUS PECOS	PECOS AMPHIPOD	G1	S1		
HYALELLA TEXANA	CLEAR CREEK AMPHIPOD	G1	S1		
MONODELLA TEXANA		G1	S1		
ORCONECTES MALETAE	A CRAYFISH	G2	S1?		
PALAEMONETES ANTRORUM	TEXAS CAVE SHRIMP	G1	S1		
PROCAMBARUS NECHESAE		G1G2	S1S2		
PROCAMBARUS TEXANUS	A CRAYFISH	G1	S?		
STYGOBROMUS BALCONIUS	BALCONES CAVE AMPHIPOD	G1	S1		
STYGOBROMUS BIFURCATUS	BIFURCATED CAVE AMPHIPOD	G1	S1		
STYGOBROMUS DEJECTUS	CASCADE CAVE AMPHIPOD	G1	S1		
STYGOBROMUS FLAGELLATUS	EZELL'S CAVE AMPHIPOD	G1	S1		
STYGOBROMUS HADENOECUS	DEVIL'S SINKHOLE AMPHIPOD	G1	S1		
STYGOBROMUS LONGIPES	LONG-LEGGED CAVE AMPHIPOD	G1	S1		
STYGOBROMUS PECKI	PECK'S CAVE AMPHIPOD	G1	S1	PE	
STYGOBROMUS REDDELLI	REDDELL'S CAVE AMPHIPOD	G1	S1		
STYGOBROMUS RUSSELLI	AN AMPHIPOD	G3	S3		
*** FISHES					
AWAOUS TAJASICA	RIVER GOBY	G5	S1		T
CAMPOSTOMA ORNATUM	MEXICAN STONEROLLER	G3	S1		T
CYCLEPTUS ELONGATUS	BLUE SUCKER	G3	S3		T
CYPRINELLA PROSERPINA	PROSERPINE SHINER	G3	S2		T
CYPRINODON BOVINUS	LEON SPRINGS PUPFISH	G1	S1	LE	E
CYPRINODON ELEGANS	COMANCHE SPRINGS PUPFISH	G1	S1	LE	E
CYPRINODON EXIMIUS	CONCHOS PUPFISH	G4	S1		T
CYPRINODON PECOSENSIS	PECOS PUPFISH	G1	S1	C1	T
DIONDA ARGENTOSA	MANANTIAL ROUNDNOSE MINNOW	G2	S2		
DIONDA DIABOLI	DEVILS RIVER MINNOW	G1	S1	C1	T
DIONDA SERENA	NUECES ROUNDNOSE MINNOW	G2	S2		
ERIMYZON OBLONGUS	CREEK CHUBSUCKER	G5	S2S3		T

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATU
ETHEOSTOMA CLARUM	WESTERN SAND DARTER	G3	S3		
ETHEOSTOMA FONTICOLA	FOUNTAIN DARTER	G1	S1	LE	E
ETHEOSTOMA GRAHAMI	RIO GRANDE DARTER	G3	S2		T
GAMBUSIA GAIGEI	BIG BEND GAMBUSIA	G1	S1	LE	E
GAMBUSIA GEORGEI	SAN MARCOS GAMBUSIA	GX	SX	LE	E
GAMBUSIA HETEROCHIR	CLEAR CREEK GAMBUSIA	G1	S1	LE	E
GAMBUSIA NOBILIS	PECOS GAMBUSIA	G2	S2	LE	E
GAMBUSIA SENILIS	BLOTCHED GAMBUSIA	G4	SX		T
GILA PANDORA	RIO GRANDE CHUB	G3	S1		T
GOBIONELLUS ATRIPINNIS	BLACKFIN GOBY	G3	S1		T
HYBOGNATHUS AMARUS	RIO GRANDE SILVERY MINNOW	G1G2	SX	LE	E
HYBOGNATHUS PLACITUS	PLAINS MINNOW	G5	S4		
ICTALURUS LUPUS	HEADWATER CATFISH	G3	S2		
ICTALURUS SP 1	CHIHUAHUA CATFISH	G1G2	S1S2		
MACRHYBOPSIS AESTIVALIS TETRANEMUS	ARKANSAS RIVER SPECKLED CHUB	G5T5	S5		
MICROPHIS BRACHYURUS	OPOSSUM PIPEFISH	G5	S1		T
MICROPTERUS TRECULI	GUADALUPE BASS	G3	S3		
MOXOSTOMA AUSTRINUM	WEST MEXICAN REDHORSE	G3	S1		
NOTROPIS BUCCULA	SMALLEYE SHINER	G2Q	S2		
NOTROPIS CHIHUAHUA	CHIHUAHUA SHINER	G3	S2		T
NOTROPIS GIRARDI	ARKANSAS RIVER SHINER	G2	S2	PE	
NOTROPIS HUBBSI	BLUEHEAD SHINER	G3	S1		T
NOTROPIS JEMEZANUS	RIO GRANDE SHINER	G3	S3		
NOTROPIS OXYRHYNCHUS	SHARPNOSE SHINER	G3	S3		
NOTROPIS SIMUS	BLUNTNOSE SHINER	G2	SX		T
PERCINA MACULATA	BLACKSIDE DARTER	G5	S1		T
POLYODON SPATHULA	PADDLEFISH	G4	S3		T
SATAN EURYSTOMUS	WIDEMOUTH BLINDCAT	G1	S1		T
SCAPHIRHYNCHUS PLATORYNCHUS	SHOVELNOSE STURGEON	G4	S2		T
SYNGNATHUS AFFINIS	TEXAS PIPEFISH	G1	S1		
TROGLOGLANIS PATTERSONI	TOOTHLESS BLINDCAT	G1	S1		T
*** INSECTS					
AESHNA DUGESI	ARROYO DARNER	G3	S?		
AGATHYMUS CHISOSENSIS		G2?	S2?		
AGATHYMUS GILBERTI		G2?	S?		
AGATHYMUS VALVERDIENSIS		G2?	S?		
AMBLYCHILA PICOLOMINII	A TIGER BEETLE	G3	S?		
AMBRYSUS HUNGERFORDI HUNGERFORDI	HUNGERFORD'S NAUCORID	G5T3	S1		
AMPLYPTERUS BLANCHARDI	BLANCHARDS' SPHINX MOTH	G1	S1		
ANOMALA TIBIALIS	TIBIAL SCARAB	GH	SH		
APODEMIA CHISOSENSIS	CHISOS METALMARK	G1G3	S?		
ARGIA LEONORAE	BALMORHEA DAMSELFLY	G2G3	S2		
ASAPHOMYIA TEXANUS	TEXAS ASAPHOMYIAN TABANID FLY	GH	SH		
ATRYTONOPSIS CESTUS		G1G3	S?		
AUSTROTINODES TEXENSIS	TEXAS AUSTROTINODES CADDISFLY	G2	S2		
BATRISODES TEXANUS	COFFIN CAVE MOLD BEETLE	G1	S1	LE	
BATRISODES VENYIVI	HELOTES MOLD BEETLE	G1	S1		
CALEPHELIS FREEMANI	FREEMAN'S METALMARK	GH	SH		
CALEPHELIS RAWSONI	RAWSON'S METALMARK	G3?	S?		
CHEUMATOPSYCHE FLINTI	FLINT'S NET-SPINNING CADDISFLY	G3	S3		
CHEUMATOPSYCHE MORSEI	MORSE'S NET-SPINNING CADDISFLY	G1	S1		
CHIMARRA HOLZENTHALI	HOLZENTHAL'S PHILOPOTAMID CADDISFLY	G1	S1		
CICINDELA CAZIERI	CAZIER'S TIGER BEETLE	G1	S1		
CICINDELA CHLOROCEPHALA SMYTHI	SMYTH'S TIGER BEETLE	GHTH	SH		
CICINDELA HORNII	A TIGER BEETLE	G3	S?		
CICINDELA NEVADICA OLMOSA	LOS OLMOS TIGER BEETLE	G5T3	S1S2		
CICINDELA NIGROCOERULEA SUBTROPICA	SUBTROPICAL BLUE-BLACK TIGER BEETLE	G5T2	SH		
CICINDELA OBSOLETA NEOJUVENILIS	NEOJUVENILE TIGER BEETLE	G5T1	SH		
CICINDELA POLITULA BARBARANNAE	BARBARA ANN'S TIGER BEETLE	G5T1	S1		
CICINDELA POLITULA PETROPHILA	GUADALUPE MOUNTAINS TIGER BEETLE	G5T2	S1		
CYLINDROPSIS SP 1	TOOTH CAVE BLIND ROVE BEETLE	G1	S1		
DERONECTES NEOMEXICANA	BONITA DIVING BEETLE	G1	S1		
EUPROSERPINUS WIESTI	WIEST'S SPHINX MOTH	G3G4	S1		
EXIMACRIS SUPERBUM	SUPERB GRASSHOPPER	GH	SH		
FIXSENIA POLINGI	POLING'S HAIRSTREAK	G1	S1		
GOMPHUS MODESTUS	GULF COAST CLUBTAIL	G3	S?		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STAT STAT
HAIDEOPORUS TEXANUS	EDWARDS AQUIFER DIVING BEETLE	G1	S1		
HALIPLUS NITENS	DISJUNCT CRAWLING WATER BEETLE	GH	SH		
HETERELMIS COMALENSIS	COMAL SPRINGS RIFFLE BEETLE	G1	S1	PE	
HYDROPTILA OUACHITA	A PURSE CASEMAKER CADDISFLY	G1	S1		
LIBELLULA COMPOSITA	BLEACHED SKIMMER	G3	S?		
LIMNEBIUS TEXANUS	TEXAS MINUTE MOSS BEETLE	GH	SH		
LORDITHON NIGER	BLACK LORDITHON ROVE BEETLE	G1	SH		
MEGACEPHALA AFFINIS ANGUSTATA	A TIGER BEETLE	G5T3	S?		
MINISTRYMON CLYTIE	CLYTIE HAIRSTREAK	G3?	S?		
NEUROCORDULIA MOLESTA	SMOKY SHADOWFLY	G3	S?		
NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	G1	SR	LE	
PHYLOCENTROPUS HARRISI		G1	S1		
PIRUNA HAFERNIKI		G1?	S1?		
PROTOPTILA ARCA	SAN MARCOS SADDLE-CASE CADDISFLY	G1	S1		
PROTOPTILA BALMORHEA	BALMORHEA SADDLE-CASE CADDISFLY	G2	S1		
RHADINE EXILIS	A GROUND BEETLE	G1	S1		
RHADINE INFERNALIS	A GROUND BEETLE	G1	S1		
RHADINE PERSEPHONE	TOOTH CAVE GROUND BEETLE	G1	S1	LE	
SCHINIA INDIANA	PHLOX MOTH	GU	SH		
SOMATOCHLORA MARGARITA	BIG THICKET EMERALD DRAGONFLY	G2	S2		
STALLINGSIA MACULOSUS	MACULATED MANFREDA SKIPPER	G2	S2		
STYGOPARNUS COMALENSIS	COMAL SPRINGS DRYOPID BEETLE	G1	S1	PE	
TAENIOPTERYX STARKI	LEON RIVER WINTER STONEFLY	G1	S1		
TEXAMAUROPS REDDELLI	KRETSCHMARR CAVE MOLD BEETLE	G1	S1	LE	
ZIZULA CYNA	CYNA BLUE	G3	S?		
*** MAMMALS					
BALAENOPTERA MUSCULUS	BLUE WHALE	G2	S1	LE	E
BALAENOPTERA PHYSALUS	FINBACK WHALE	G3	S1	LE	E
BLARINA HYLOPHAGA HYLOPHAGA	ELLIOT'S SHORT-TAILED SHREW	G5T1Q	S1		
BLARINA HYLOPHAGA PLUMBEA	ARANSAS SHORT-TAILED SHREW	G5T1Q	S1		
CANIS LUPUS	GRAY WOLF	G4	SX	LE	E
CANIS RUFUS	RED WOLF	G1	SX	LE	E
CHOERONYCTERIS MEXICANA	MEXICAN LONG-TONGUED BAT	G3G4	S1		
CORYNORHINUS RAFINESQUII	RAFINESQUE'S BIG-EARED BAT	G3G4	S3		T
CORYNORHINUS TOWNSENDII PALLESCENS	PALE TOWNSEND'S BIG EARED BAT	G4T4	S3?		
CYNOMYS LUDOVICIANUS ARIZONENSIS	ARIZONA BLACK-TAILED PRAIRIE DOG	G5T3	S3		
DIPODOMYS ELATOR	TEXAS KANGAROO RAT	G2	S2		T
EUBALAENA GLACIALIS	BLACK RIGHT WHALE	G1	S1	LE	E
EUDERMA MACULATUM	SPOTTED BAT	G4	S2		T
EUMOPS PEROTIS CALIFORNICUS	GREATER WESTERN MASTIFF BAT	G5T?	S3		
FELIS PARDALIS	OCELOT	G3	S1	LE	E
FELIS WIEDII	MARGAY	G3	SX		T
FELIS YAGUARONDI	JAGUARUNDI	G4	S1	LE	E
FERESA ATTENUATA	PYGMY KILLER WHALE	G4	S1		T
GEOMYS ARENARIUS	DESERT POCKET GOPHER	G3	S2		
GEOMYS KNOXJONESI	JONES' POCKET GOPHER	G3	S2		
GEOMYS PERSONATUS DAVISI	DAVIS POCKET GOPHER	G4T2	S2		
GEOMYS PERSONATUS FUSCUS	TEXAS POCKET GOPHER	G4T2	S2		
GEOMYS PERSONATUS MARITIMUS	MARITIME POCKET GOPHER	G4T2	S2		
GEOMYS PERSONATUS STRECKERI	CARRIZO SPRINGS POCKET GOPHER	G4T1	S1		
GEOMYS TEXENSIS BAKERI	FRIO POCKET GOPHER	G3T2	S2		
GEOMYS TEXENSIS TEXENSIS	LLANO POCKET GOPHER	G3T2	S2		
GLOBICEPHALA MACRORHYNCHUS	SHORT-FINNED PILOT WHALE	G5	S1		T
KOGIA BREVICEPS	PYGMY SPERM WHALE	G5	S1		T
KOGIA SIMUS	DWARF SPERM WHALE	G4	S1		T
LASIURUS EGA	SOUTHERN YELLOW BAT	G5	S1		T
LEPTONYCTERIS NIVALIS	GREATER LONG-NOSED BAT	G3	S1	LE	E
MESOPLODON DENSIROSTRIS	TROPICAL BEAKED WHALE	G4	S1		
MESOPLODON EUROPAEUS	GERVAIS' BEAKED WHALE	G3	S1		T
MICROTUS OCHROGASTER TAYLORI	PRAIRIE VOLE	G5T?	S1		
MUSTELA NIGRIPES	BLACK-FOOTED FERRET	G1	SH	LE	E
MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS BAT	G4	S3		
MYOTIS CILIOLABRUM	WESTERN SMALL-FOOTED BAT	G5	S3		
MYOTIS THYSANODES	FRINGED BAT	G5	S3		
MYOTIS VELIFER	CAVE BAT	G5	S4		
MYOTIS VOLANS	LONG-LEGGED BAT	G5	S4		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATU
MYOTIS YUMANENSIS	YUMA MYOTIS BAT	G5	S4		
NASUA NARICA	WHITE-NOSED COATI	G5	S2?		T
ONDATRA ZIBETHICUS RIPENSIS	PECOS RIVER MUSKRAT	G5T?	S2S3		
ORCINUS ORCA	KILLER WHALE	G4G5	S1		T
ORYZOMYS COUESI	COUES' RICE RAT	G5	S2		T
OVIS CANADENSIS MEXICANA	DESERT BIGHORN SHEEP	G5T3	S2		
PANTHERA ONCA	JAGUAR	G3	SH	LE	T
PEROMYSCUS TRUEI COMANCHE	PALO DURO MOUSE	G5T2	S2		T
PHYSETER MACROCEPHALUS	SPERM WHALE	G2	S1	LE	E
PSEUDORCA CRASSIDENS	FALSE KILLER WHALE	G5	S1		T
SCALOPUS AQUATICUS TEXANUS	PRESIDIO MOLE	G5T1Q	S1		
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	G5	S3		
SPILOGALE PUTORIUS INTERRUPTA	PLAINS SPOTTED SKUNK	G5T3T4	S3		
STENELLA CLYMENE	SHORT-SNOUTED SPINNER DOLPHIN	G4	S1		
STENELLA FRONTALIS	ATLANTIC SPOTTED DOLPHIN	G5	S1		T
STENELLA LONGIROSTRIS	LONG-SNOUTED SPINNER DOLPHIN	G5	S1		
STENO BREDANENSIS	ROUGH-TOOTHED DOLPHIN	G4	S1		T
SYLVILAGUS FLORIDANUS ROBUSTUS	DAVIS MOUNTAINS COTTONTAIL	G5T3	S3		
TAMIAS CANIPES	GRAY-FOOTED CHIPMUNK	G3	S2S3		
THOMOMYS BOTTAE GUADALUPENSIS	GUADALUPE SOUTHERN POCKET GOPHER	G5T2	S2		
THOMOMYS BOTTAE LIMPIAE	LIMPIA SOUTHERN POCKET GOPHER	G5T2	S2		
THOMOMYS BOTTAE TEXENSIS	LIMPIA CREEK POCKET GOPHER	G5T2	S2		
TRICHECHUS MANATUS	WEST INDIAN MANATEE	G2?	S1	LE	E
URSUS AMERICANUS	BLACK BEAR	G5	S3	T/SA	T
URSUS AMERICANUS LUTEOLUS	LOUISIANA BLACK BEAR	G5T3?	SR	LT	T
URSUS ARCTOS	GRIZZLY BEAR	G4	SX	LT	
VULPES VELOX	SWIFT FOX	G3	S3?	C1	
ZIPHIUS CAVIROSTRIS	GOOSE-BEAKED WHALE	G4	S1		T
*** MOLLUSKS					
ARCIDENS CONFRAGOSUS	ROCK-POCKETBOOK	G3	S?		
ARKANSIA WHEELERI	OUACHITA ROCK-POCKETBOOK MUSSEL	G1	S1	LE	E
ASHMUNELLA PASONIS	FRANKLIN MOUNTAIN WOOD SNAIL	G1	S1		
ASSIMINEA PECOS	PECOS ASSIMINEA SNAIL	G2	S1	C1	
COCHLIOPA TEXANA	PHANTOM CAVE SNAIL	G1	S1		
DISCONAIAS SALINASENSIS	SALINA MUCKET	G1Q	S1		
EUCHEMOTREMA CHEATUMI	PALMETTO PILL SNAIL	G1	S1		
FONTELICELLA DAVISI	DAVIS SPRING SNAIL	G1	S1		
FONTELICELLA METCALFI	PRESIDIO COUNTY SPRING SNAIL	G1	S1		
FUSCONAIA ASKEWI	TEXAS PIGTOE	G3	S1S2		
FUSCONAIA LANANENSIS	TRIANGLE PIGTOE	G2	S1		
HUMBOLDTIANA CHEATUMI	DAVIS MOUNTAINS THREEBAND	G2	S2		
HUMBOLDTIANA CHISOSENSIS	CHISOS MOUNTAINS THREEBAND	G1	S1		
HUMBOLDTIANA FERRISSIANA	MITRE PEAK THREEBAND	G2	S2		
HUMBOLDTIANA HOEGIANA PRAESIDII	SAN CARLOS THREEBAND	G3T3	S3		
HUMBOLDTIANA PALMERI	MOUNT LIVERMORE THREEBAND	G2	S2		
HUMBOLDTIANA TEXANA	STOCKTON PLATEAU THREEBAND	G2	S2		
HUMBOLDTIANA ULTIMA	NORTHERN THREEBAND	G2	S2		
LAMPSILIS BRACTEATA	TEXAS FATMUCKET	G2	S?		
LAMPSILIS SATURA	SANDBANK POCKETBOOK	G3	S1		
OBOVARIA JACKSONIANA	SOUTHERN HICKORYNUT	G1G2	S?		
PHREATODROBIA IMITATA	MIMIC CAVESNAIL	G1	S1		
PLEUROBEMA RIDDELLI	LOUISIANA PIGTOE	G1	S1		
POLYGYRA HIPPOCREPIS	HORSESHOE LIPTOOTH	G1	S1		
POPENAIAS POPEI	TEXAS HORNSHELL	G2	S2		
POTAMILUS AMPHICHAENUS	TEXAS HEELSPLITTER	G1	S1		
QUADRULA AUREA	GOLDEN ORB	G2G3	S?		
QUADRULA COUCHIANA	RIO GRANDE MONKEYFACE	GH	SH		
QUADRULA HOUSTONENSIS	SMOOTH PIMPLEBACK	G2	S?		
QUADRULA PETRINA	TEXAS PIMPLEBACK	G2G3	S?		
QUADRULA PUSTULOSA MORTONI	WESTERN PIMPLEBACK	G5T2T3	S?		
QUINCUNCINA MITCHELLI	FALSE SPIKE MUSSEL	G1	SH		
SONORELLA METCALFI	FRANKLIN MOUNTAIN TALUS SNAIL	G1	S1		
TRUNCILLA COGNATA	MEXICAN FAWNSFOOT MUSSEL	G1	S1		
TRUNCILLA MACRODON	TEXAS FAWNSFOOT	G1G2	S?		
TRYONIA ADAMANTINA	DIAMOND Y SPRING SNAIL	G1	S1	C1	
TRYONIA BRUNEI	BRUNE'S TRYONIA	G1	S1		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	ST/ ST/
TRYONIA CHEATUMI	PHANTOM CAVE SPRING TRYONIA	G1	S1		
TRYONIA STOCKTONENSIS	GONZALES SPRING SNAIL	G1	S1	C1	
*** REPTILES					
CARETTA CARETTA	LOGGERHEAD SEA TURTLE	G3	S2	LT	T
CEMOPHORA COCCINEA COPEI	NORTHERN SCARLET SNAKE	G5T5	S3		T
CEMOPHORA COCCINEA LINERI	TEXAS SCARLET SNAKE	G5T2	S2		T
CHELONIA MYDAS	GREEN SEA TURTLE	G3	S1	LT	T
COLEONYX RETICULATUS	RETICULATED GECKO	G3	S3		T
CONIOPHANES IMPERIALIS	BLACK-STRIPED SNAKE	G3	S2		T
CROTALUS HORRIDUS	TIMBER (CANEBRAKE) RATTLESNAKE	G5	S4		T
CROTAPHYTUS RETICULATUS	RETICULATE COLLARED LIZARD	G3	S2		T
DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	G3	S1	LE	E
DRYMARCHON CORAIS	INDIGO SNAKE	G5	S3		T
DRYMOBIUS MARGARITIFERUS	SPECKLED RACER	G5	S1		T
ERETMOCHELYS IMBRICATA	ATLANTIC HAWKSBILL SEA TURTLE	G3	S1	LE	E
GOPHERUS BERLANDIERI	TEXAS TORTOISE	G4	S3		T
GRAPTEMYS CAGLEI	CAGLE'S MAP TURTLE	G3	S3	C1	
GRAPTEMYS OUACHITENSIS SABINENSIS	SABINE MAP TURTLE	G5T3	S3		
HOLBROOKIA LACERATA	SPOT-TAILED EARLESS LIZARD	G3G4	S3?		
HOLBROOKIA PROPINQUA	KEELED EARLESS LIZARD	G3?	S3?		
KINOSTERNON HIRTIPES MURRAYI	CHIHUAHUAN MUD TURTLE	G3T3	S1		T
LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	G1	S1	LE	E
LEPTODEIRA SEPTENTRIONALIS SEPTENTRIONALIS	NORTHERN CAT-EYED SNAKE	G5T5	S2		T
LIOCHLOROPHIS VERNALIS	SMOOTH GREEN SNAKE	G5	S1		T
MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3G4	S3		T
MALACLEMYS TERRAPIN LITTORALIS	TEXAS DIAMONDBACK TERRAPIN	G5T3	S3		
NERODIA CLARKII	GULF SALTMARSH SNAKE	G4Q	S4		
NERODIA HARTERI	BRAZOS WATER SNAKE	G2	S2		T
NERODIA PAUCIMACULATA	CONCHO WATER SNAKE	G2	S2	LT	T
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD	G5	S4		T
PHRYNOSOMA HERNANDESI	MOUNTAIN SHORT-HORNED LIZARD	G5	S3		T
PITUOPHIS MELANOLEUCUS RUTHVENI	LOUISIANA PINE SNAKE	G5T3	S2		T
SCELOPORUS ARENICOLUS	DUNES SAGEBRUSH LIZARD	G5T2	S2		
TANTILLA ATRICEPS	MEXICAN BLACKHEAD SNAKE	G3	S1		
TANTILLA RUBRA	BIG BEND BLACKHEAD SNAKE	G4	S2		T
THAMNOPHIS SIRTALIS ANNECTENS	TEXAS GARTER SNAKE	G5T3	S3		
THAMNOPHIS SIRTALIS DORSALIS	NEW MEXICO GARTER SNAKE	G5T3	S1		
TRACHEMYS GAIGEAE	BIG BEND SLIDER	G3	S2		
TRIMORPHODON BISCUTATUS	TEXAS LYRE SNAKE	G5	S3		T

360 Records Processed

BASIC CODE KEY

FEDERAL STATUS (USESA)

LE - Listed Endangered
LT - Listed Threatened
LELT - Listed Endangered in part of range, Threatened in a different part
PE - Proposed to be listed Endangered
PT - Proposed to be listed Threatened
PDL - Proposed to be Delisted
E(S/A) or T(S/A) - Listed Endangered or Threatened on basis of Similarity of Appearance.
DL - Delisted Endangered/Threatened
C1 - Candidate, Category 1. USFWS has substantial information on biological vulnerability and threats to support proposing t as endangered or threatened. Data are being gathered on habitat needs and/or critical habitat designations.
C1* - C1, but lacking known occurrences
C1** - C1, but lacking known occurrences, except in captivity/cultivation
XE - Essential Experimental Population.
XN - Non-essential Experimental Population.

STATE STATUS

E - Listed as Endangered in the State of Texas
T - Listed as Threatened in the State of Texas
blank - Not currently listed

GLOBAL RANK (GRANK)

G1 - Critically imperiled globally, extremely rare, 5 or fewer occurrences. [Critically endangered throughout range.]
G2 - Imperiled globally, very rare, 6 to 20 occurrences. [Endangered throughout range.]
G3 - Very rare and local throughout range or found locally in restricted range, 21 to 100 occurrences. [Threatened throughou range.]
G4 - Apparently secure globally.
G5 - Demonstrably secure globally.
GH - Of historical occurrence through its range.
G#T# - "G"= species rank; "T"= rank of variety or subspecies taxa.
GU - Possibly in peril range-wide, but status uncertain.
G#G# - Ranked within a range as status uncertain.
GX - Believed to be extinct throughout range.
Q - Qualifier denoting questionable taxonomic assignment.
? - Not ranked to date; or, Qualifier denoting uncertain rank.
C - Captive population exists.

STATE RANK (SRANK)

S1 - Critically imperiled in state, extremely rare, very vulnerable to extirpation, 5 or fewer occurrences.
S2 - Imperiled in state, very rare, vulnerable to extirpation, 6 to 20 occurrences.
S3 - Rare or uncommon in state, 21 to 100 occurrences.
S4 - Apparently secure in state.
S5 - Demonstrably secure in state.
SA - Accidental in state.
SE - An exotic species established in state.
SH - Of historical occurrence in state. May be rediscovered.
SP - Potential occurrence in state.
SR - Reported, but without persuasive documentation.
SRF - Reported in error, but error persists in literature.
SU - Possibly in peril in state, but status uncertain.
SX - Apparently extirpated from State.
SZ - Migratory/transient in state to irregular/dispersed locations.
B - Basic rank refers to the breeding population in the state.
N - Basic rank refers to the non-breeding population in the state.
? - Not ranked to date; or, Qualifier denoting uncertain rank.
C - Captive population exists.

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	ECOREGIONS OF OCCURRENCE
***MAMMALS				
	Bats			
GREATER LONG-NOSED BAT	LEPTONYCTERIS NIVALIS	E	LE	11
SOUTHERN YELLOW BAT	LASIURUS EGA	T		6
SPOTTED BAT	EUDERMA MACULATUM	T		11
RAFINESQUE'S BIG-EARED BAT	CORYNORHINUS RAFINESQUII	T		1
	Rodents			
TEXAS KANGAROO RAT	DIPODOMYS ELATOR	T		9
COUES' RICE RAT	ORYZOMYS COUESI	T		6
PALO DURO MOUSE	PEROMYSCUS TRUEI COMANCHE	T		10
	Marine Mammals			
GERVAIS' BEAKED WHALE	MESOPLODON EUROPAEUS	T		12
GOOSE-BEAKED WHALE	ZIPHIUS CAVIROSTRIS	T		12
PYGMY SPERM WHALE	KOGIA BREVICEPS	T		12
DWARF SPERM WHALE	KOGIA SIMUS	T		12
SPERM WHALE	PHYSETER MACROCEPHALUS	E	LE	12
ATLANTIC SPOTTED DOLPHIN	STENELLA FRONTALIS	T		12
ROUGH-TOOTHED DOLPHIN	STENO BREDANENSIS	T		12
KILLER WHALE	ORCINUS ORCA	T		12
FALSE KILLER WHALE	PSEUDORCA CRASSIDENS	T		12
SHORT-FINNED PILOT WHALE	GLOBICEPHALA MACRORHYNCHUS	T		12
PYGMY KILLER WHALE	FERESA ATTENUATA	T		12
FINBACK WHALE	BALAENOPTERA PHYSALUS	E	LE	12
BLUE WHALE	BALAENOPTERA MUSCULUS	E	LE	12
BLACK RIGHT WHALE	EUBALAENA GLACIALIS	E	LE	12
WEST INDIAN MANATEE	TRICHECHUS MANATUS	E	LE	(4,12)
	Carnivores			
RED WOLF	CANIS RUFUS	E	LE	(1-4,7)**
GRAY WOLF	CANIS LUPUS	E	LE	(6-11)
BLACK BEAR	URSUS AMERICANUS	T	T/SA	(1,2,4,6-8),11
LOUISIANA BLACK BEAR	URSUS AMERICANUS LUTEOLUS	T	LT	(1)
GRIZZLY BEAR	URSUS ARCTOS		LT	(10,11)
WHITE-NOSED COATI	NASUA NARICA	T		4,6,7,11
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	E	LE	(9-11)**
OCELOT	FELIS PARDALIS	E	LE	(4),6
MARGAY	FELIS WIEDII	T		(6)
JAGUARUNDI	FELIS YAGUARONDI	E	LE	(4),6
JAGUAR	PANTHERA ONCA	T	LE	(6,11)
***BIRDS				
	Waterbirds			
BROWN PELICAN	PELECANUS OCCIDENTALIS	E	LE	4
REDDISH EGRET	EGRETTA RUFESCENS	T		4
WHITE-FACED IBIS	PLEGADIS CHIHI	T		2-11
WOOD STORK	MYCTERIA AMERICANA	T		1,2,4,6
WHOOPING CRANE	GRUS AMERICANA	E	LE	4
	Raptors			
SWALLOW-TAILED KITE	ELANOIDES FORFICATUS	T		1,4
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	T	LT	1-4,7-11
COMMON BLACK-HAWK	BUTEOGALLUS ANTHRACINUS	T		6,11
GRAY HAWK	BUTEO NITIDUS	T		6
WHITE-TAILED HAWK	BUTEO ALBICAUDATUS	T		4-6
ZONE-TAILED HAWK	BUTEO ALBONOTATUS	T		6,7
NORTHERN APLOMADO FALCON	FALCO FEMORALIS SEPTENTRIONALIS	E	LE	6
PEREGRINE FALCON	FALCO PEREGRINUS	E,T	E/SA	4,7-11
AMERICAN PEREGRINE FALCON	FALCO PEREGRINUS ANATUM	E	LE	7-11
ARCTIC PEREGRINE FALCON	FALCO PEREGRINUS TUNDRIUS	T	E/SA	4
CACTUS FERRUGINOUS PYGMY-OWL	GLAUCIDIUM BRASILIANUM CACTORUM	T		5,6
MEXICAN SPOTTED OWL	STRIX OCCIDENTALIS LUCIDA	T	LT	11
	Upland Birds			
ATTWATER'S GREATER PRAIRIE-CHICKEN	TYMPANUCHUS CUPIDO ATTWATERI	E	LE	4
	Shorebirds			
PIPING PLOVER	CHARADRIUS MELODUS	T	LT	4
ESKIMO CURLEW	NUMENIUS BOREALIS	E	LE	4
INTERIOR LEAST TERN	STERNA ANTILLARUM ATHALASSOS	E	LE	6,9
SOOTY TERN	STERNA FUSCATA	T		4
	Woodpeckers			
RED-COCKADED WOODPECKER	PICOIDES BOREALIS	E	LE	1
IVORY-BILLED WOODPECKER	CAMPEPHILUS PRINCIPALIS	E	LE	(1)
	Songbirds			
NORTHERN BEARDLESS-TYRANNULET	CAMPTOSTOMA IMBERBE	T		6
SOUTHWESTERN WILLOW FLYCATCHER	EMPIDONAX TRAILLII EXTIMUS	E	LE	11
ROSE-THROATED BECARD	PACHYRAMPHUS AGLAIAE	T		6
BLACK-CAPPED VIREO	VIREO ATRICAPILLUS	E	LE	7,11
BACHMAN'S WARBLER	VERMIVORA BACHMANII	E	LE	(1)
TROPICAL PARULA	PARULA PITIAYUMI	T		6
GOLDEN-CHEEKED WARBLER	DENDROICA CHRYSOPARIA	E	LE	7
BACHMAN'S SPARROW	AIMOPHILA AESTIVALIS	T		1
BOTTERI'S SPARROW	AIMOPHILA BOTTERII	T		4

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	ECOREGIONS OF OCCURRENCE
***REPTILES				
	Turtles			
LOGGERHEAD SEA TURTLE	CARETTA CARETTA	T	LT	12
GREEN SEA TURTLE	CHELONIA MYDAS	T	LT	12
ATLANTIC HAWKSBILL SEA TURTLE	ERETMOCHELYS IMBRICATA	E	LE	12
KEMP'S RIDLEY SEA TURTLE	LEPIDOCHELYS KEMPII	E	LE	12
ALLIGATOR SNAPPING TURTLE	MACROCLEMYS TEMMINCKII	T		1-4
LEATHERBACK SEA TURTLE	DERMOCHELYS CORIACEA	E	LE	12
CHIHUAHUAN MUD TURTLE	KINOSTERNON HIRTIPES	T		11
TEXAS TORTOISE	GOPHERUS BERLANDIERI	T		4-6
	Lizards			
RETICULATED GECKO	COLEONYX RETICULATUS	T		11
RETICULATE COLLARED LIZARD	CROTAPHYTUS RETICULATUS	T		6
TEXAS HORNED LIZARD	PHRYNOSOMA CORNUTUM	T		2-11
MOUNTAIN SHORT-HORNED LIZARD	PHRYNOSOMA HERNANDESI	T		11
	Snakes			
SCARLET SNAKE	CEMOPHORA COCCINEA	T		1,4-6
BLACK-STRIPED SNAKE	CONIOPHANES IMPERIALIS	T		6
INDIGO SNAKE	DRYMARCHON CORAIS	T		4-7
SPECKLED RACER	DRYMOBIUS MARGARITIFERUS	T		6
NORTHERN CAT-EYED SNAKE	LEPTODEIRA SEPTENTRIONALIS	T		4
BRAZOS WATER SNAKE	NERODIA HARTERI	T		2,9
CONCHO WATER SNAKE	NERODIA PAUCIMACULATA	T	LT	8,9
SMOOTH GREEN SNAKE	LIOCHLOROPHIS VERNALIS	T		4
LOUISIANA PINE SNAKE	PITUOPHIS MELANOLEUCUS RUTHVENI	T		1
BIG BEND BLACKHEAD SNAKE	TANTILLA RUBRA	T		7,11
TEXAS LYRE SNAKE	TRIMORPHODON BISCUTATUS	T		11
TIMBER (CANEBRAKE) RATTLESNAKE	CROTALUS HORRIDUS	T		1-4
***AMPHIBIANS				
	Salamanders			
CASCADE CAVERNS SALAMANDER	EURYCEA LATITANS	T		7
SAN MARCOS SALAMANDER	EURYCEA NANA	T	LT	7
COMAL BLIND SALAMANDER	EURYCEA TRIDENTIFERA	T		7
BARTON SPRINGS SALAMANDER	EURYCEA SOSORUM		LE	7
TEXAS BLIND SALAMANDER	EURYCEA RATHBUNI	E	LE	7
BLANCO BLIND SALAMANDER	EURYCEA ROBUSTA	T		7
BLACK-SPOTTED NEWT	NOTOPHTHALMUS MERIDIONALIS	T		4-6
SOUTH TEXAS SIREN (LARGE FORM)	SIREN SP 1	T		4-6
	Frogs and Toads			
HOUSTON TOAD	BUFO HOUSTONENSIS	E	LE	2,4
MEXICAN TREEFROG	SMILISCA BAUDINII	T		6
WHITE-LIPPED FROG	LEPTODACTYLUS LABIALIS	T		6
SHEEP FROG	HYPOPACHUS VARIOLOSUS	T		5,6
MEXICAN BURROWING TOAD	RHINOPHRYNUS DORSALIS	T		6
***FISHES				
	Large River Fish			
SHOVELNOSE STURGEON	SCAPHIRHYNCHUS PLATORYNCHUS	T		1
PADDLEFISH	POLYODON SPATHULA	T		1
	Minnows			
MEXICAN STONEROLLER	CAMPOSTOMA ORNATUM	T		11
DEVILS RIVER MINNOW	DIONDA DIABOLI	T	C1	7
RIO GRANDE CHUB	GILA PANDORA	T		11
RIO GRANDE SILVERY MINNOW	HYBOGNATHUS AMARUS	E	LE	(11)
CHIHUAHUA SHINER	NOTROPIS CHIHUAHUA	T		11
ARKANSAS RIVER SHINER	NOTROPIS GIRARDI		PE	9
BLUEHEAD SHINER	NOTROPIS HUBBSI	T		1
BLUNTNOSE SHINER	NOTROPIS SIMUS	T		(11)*
PROSERPINE SHINER	CYPRINELLA PROSERPINA	T		7,11
	Suckers			
BLUE SUCKER	CYCLEPTUS ELONGATUS	T		1-4,6,7
CREEK CHUBSUCKER	ERIMYZON OBLONGUS	T		1
	Catfish			
WIDEMOUTH BLINDCAT	SATAN EURYSTOMUS	T		7
TOOTHLESS BLINDCAT	TROGLOGLANIS PATTERSONI	T		7
	Killifishes			
LEON SPRINGS PUPFISH	CYPRINODON BOVINUS	E	LE	11
COMANCHE SPRINGS PUPFISH	CYPRINODON ELEGANS	E	LE	11
CONCHOS PUPFISH	CYPRINODON EXIMIUS	T		11
PECOS PUPFISH	CYPRINODON PECOSENSIS	T	C1	11
	Livebearers			
BIG BEND GAMBUSIA	GAMBUSIA GAIGEI	E	LE	11
SAN MARCOS GAMBUSIA	GAMBUSIA GEORGEI	E	LE	(7)*
CLEAR CREEK GAMBUSIA	GAMBUSIA HETEROCHIR	E	LE	8
PECOS GAMBUSIA	GAMBUSIA NOBILIS	E	LE	11
BLOTCHED GAMBUSIA	GAMBUSIA SENILIS	T		(7,11)**

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	ECOREGIONS OF OCCURRENCE
	Perches			
FOUNTAIN DARTER	ETHEOSTOMA FONTICOLA	E	LE	7
RIO GRANDE DARTER	ETHEOSTOMA GRAHAMI	T		7,11
BLACKSIDE DARTER	PERCINA MACULATA	T		1
	Coastal Fishes			
OPOSSUM PIPEFISH	MICROPHIS BRACHYURUS	T		12
RIVER GOBY	AWAOUS TAJASICA	T		4,6,12
BLACKFIN GOBY	GOBIONELLUS ATRIPINNIS	T		6,12
***INVERTEBRATES				
	Crustaceans			
PECK'S CAVE AMPHIPOD	STYGOBROMUS PECKI		PE	7
	Insects			
AMERICAN BURYING BEETLE	NICROPHORUS AMERICANUS		LE	1
COMAL SPRINGS RIFFLE BEETLE	HETERELMIS COMALENSIS		PE	7
TOOTH CAVE GROUND BEETLE	RHADINE PERSEPHONE		LE	7
KRETSCHMARR CAVE MOLD BEETLE	TEXAMAUROPS REDDELLI		LE	7
COFFIN CAVE MOLD BEETLE	BATRISODES TEXANUS		LE	7
COMAL SPRINGS DRYOPID BEETLE	STYGOPARNUS COMALENSIS		PE	7
	Spiders			
TOOTH CAVE SPIDER	NEOLEPTONETA MYOPICA		LE	7
BEE CREEK CAVE HARVESTMAN	TEXELLA REDDELLI		LE	7
BONE CAVE HARVESTMAN	TEXELLA REYESI		LE	7
TOOTH CAVE PSEUDOSCORPION	TARTAROCREAGRIS TEXANA		LE	7
	Mollusks			
OUACHITA ROCK-POCKETBOOK MUSSEL	ARKANSIA WHEELERI	E	LE	2
***PLANTS				
	Cacti			
TOBUSCH FISHHOOK CACTUS	ANCISTROCACTUS TOBUSCHII	E	LE	7
BUNCHED CORY CACTUS	CORYPHANTHA RAMILLOSA	T	LT	11
LLOYD'S HEDGEHOG CACTUS	ECHINOCEREUS LLOYDII	E	PDL	11
BLACK LACE CACTUS	ECHINOCEREUS REICHENBACHII VAR ALBERTII	E	LE	4,6
DAVIS' GREEN PITAYA	ECHINOCEREUS VIRIDIFLORUS VAR DAVISII	E	LE	11
CHISOS MOUNTAINS HEDGEHOG CACTUS	ECHINOCEREUS CHISOENSIS, VAR CHISOENSIS	T	LT	11
LLOYD'S MARIPOSA CACTUS	NEOLLOYDIA MARIPOSENSIS	T	LT	11
NELLIE CORY CACTUS	CORYPHANTHA MINIMA	E	LE	11
SNEED PINCUSHION CACTUS	CORYPHANTHA SNEEDII VAR SNEEDII	E	LE	11
STAR CACTUS	ASTROPHYTUM ASTERIAS	E	LE	6
	Trees, Shrubs, and Sub-shrubs			
WALKER'S MANIOC	MANIHOT WALKERAE	E	LE	6
HINCKLEY'S OAK	QUERCUS HINCKLEYI	T	LT	11
JOHNSTON'S FRANKENIA	FRANKENIA JOHNSTONII	E	LE	6
TEXAS AYENIA	AYENIA LIMITARIS	E	LE	6
TEXAS SNOWBELLS	STYRAX TEXANUS	E	LE	7
	Wildflowers			
SOUTH TEXAS AMBROSIA	AMBROSIA CHEIRANTHIFOLIA	E	LE	4,6
TEXAS PRAIRIE DAWN	HYMENOXYS TEXANA	E	LE	4
ASHY DOGWEED	THYMOPHYLLA TEPHROLEUCA	E	LE	6
TERLINGUA CREEK CAT'S-EYE	CRYPTANTHA CRASSIPES	E	LE	11
WHITE BLADDERPOD	LESQUERELLA PALLIDA	E	LE	1
SLENDER RUSH-PEA	HOFFMANNSEGGIA TENELLA	E	LE	4,6
MCKITTRICK PENNYROYAL	HEDEOMA APICULATUM	T	DL	11
TEXAS POPPY-MALLOW	CALLIRHOE SCABRIUSCULA	E	LE	9
LARGE-FRUITED SAND-VERBENA	ABRONIA MACROCARPA	E	LE	2
TEXAS TRAILING PHLOX	PHLOX NIVALIS SSP TEXENSIS	E	LE	1
CHAFFSEED	SCHWALBEA AMERICANA		LE	?
	Orchids			
NAVASOTA LADIES'-TRESSES	SPIRANTHES PARKSII	E	LE	1,2
	Grasses and Grass-like Plants			
TEXAS WILD-RICE	ZIZANIA TEXANA	E	LE	7
LITTLE AGUJA PONDWEED	POTAMOGETON CLYSTOCARPUS	E	LE	11

KEY: *State Status - E=Endangered, T=Threatened*
Federal Status - LE=Listed Endangered, LT=Listed Threatened,
PE=Proposed Endangered, PT=Proposed Threatened,
DL=Delisted, PDL=Proposed Delisted,
E/SA,T/SA=Endangered/Threatened by Similarity of Appearance,
CI=Candidate Species (category 1 - awaiting listing)
Ecoregion - ( )=Species extirpated from ecoregion within Texas
**=Species extinct*
***=Species extinct in the wild (except some experimental populations)*
If a species is listed, all its subspecies have same listing status, by default

In 1983, the Texas Legislature created the Special Nongame and Endangered Species Conservation Fund. This fund may be used for nongame wildlife and endangered species research and conservation, habitat acquisition and development, and dissemination of information pertaining to these species. Money for the fund is obtained through private donations and sale of nongame wildlife art prints, decals and stamps. For more information on the fund or endangered species call 1-800-792-1112 or 512-912-7011.

PWD-LF-W3000-017 (11/97) (previous revisions obsolete)

APPENDIX E

National Marine Fisheries Service Letter Providing a List of Threatened and Endangered Marine Mammals that Might Occur at Padre Island National Seashore

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702

JUL 1 1998 F/SER3:CCC:jbm

Mr. David E. McGinnis, Superintendent
Padre Island National Seashore
9405 South Padre Island Drive
Corpus Christi, Texas 78418

Dear Mr. McGinnis:

This responds to your letter, dated May 26, 1998, requesting a list of threatened and endangered species within National Marine Fisheries Service (NMFS) jurisdiction occurring within the boundaries of the Padre Island National Seashore. Specifically, you are concerned with the species that may be affected by the Seashore's Oil and Gas Management Plan. The only listed species under our jurisdiction likely to occur within the Seashore boundaries are sea turtles, including green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*) turtles.

For information on the distribution, abundance, diet, and habitat use of the turtles within the Padre Island National Seashore, we recommend that you confer with Donna Shaver, within your own offices on Padre Island. Donna's outstanding work with nesting and stranded turtles, as well as her in-water sampling, has resulted in a wealth of area-specific natural and life history information of sea turtles within the Seashore. The NMFS relies extensively on these data whenever we develop management measures for fisheries, dredging projects, and other Federal activities in Texas.

Please contact Colleen Coogan (727 570-5312) if you have any questions or need further information regarding Endangered Species Act coordination.

Sincerely,

Andrew J. Kemmerer
Regional Administrator

cc: F/PR3
F/SEC5, Galveston

APPENDIX F

TYPES OF OIL AND GAS DEVELOPMENT

Prepared by
Pat O'Dell, Petroleum Engineer
Geologic Resources Division
National Park Service
Denver, Colorado

The petroleum industry is a continuous cycle of searching for new oil and gas reservoirs, developing and producing them, and finally abandoning the property once the hydrocarbons are depleted.

There are four general phases of petroleum development. The phases are (1) exploration, (2) drilling, (3) production, and (4) abandonment/reclamation. Surface uses vary for each phase in terms of intensity and duration. Also, operations related to one or all of the phases may be occurring in the same area at any given time.

To be of interest to the petroleum industry, petroleum deposits must be commercially valuable. There must be a reasonable chance of making a profit on the eventual sale of the oil and gas. Factors such as the market price of oil and gas, the amount of recoverable petroleum, the expected production rates, and the cost of drilling wells, producing, and transporting the product to market all determine the economic viability of developing a deposit once it is discovered.

The following sections are meant to provide the reader with a general understanding of common activities associated with each phase of oil and gas development.

EXPLORATION OPERATIONS

Occurrence of Petroleum

Petroleum deposits are not large underground caverns filled with oil and gas as the term reservoir might suggest. Rather, petroleum accumulates in tiny spaces within the buried rock layers. Most scientists today agree that petroleum was formed from large amounts of very small plant and animal life. These organic materials accumulated in ancient seas, which, over great periods of time, have covered much of the present land area. As time passed, sediments rich in organic matter were buried deeper and deeper. The increased pressure and temperature caused these organic remains to change into oil and natural gas. Once formed, the oil and gas migrated upward until certain forms and shapes of underground rocks halted the upward movement, trapping the hydrocarbons in large quantities. The search for these traps is the focus of the first phase of oil and gas development and exploration.

Geological Exploration

The search for oil and gas often begins with geological exploration. The exploration geologist is looking for clues on the surface that would suggest the possibility of petroleum deposits below. Surface studies comprise the first stage of exploratory fieldwork. Geological surveys of the land surface are made using aerial photographs, satellite photographs, maps of surface outcrops of specific formations or rock types, and geochemical analyses. Field crews map surface attributes and collect surface samples of rock for analysis.

Creating maps of surface outcrops and geochemical analyses requires fieldwork. Little equipment is needed other than surveying gear and rock and soil sampling supplies. These activities require a small field party of two to four persons who can work out of a single vehicle or on foot. Access to remote areas can be gained by a four-wheel-drive vehicle, small all-terrain vehicles, helicopter, pack animals, or by walking. A small boat may access shallow estuarial and near-shore areas. Constructing road or digging channels for boats in shallow water areas is not required at this early stage.

Geochemical analysis often requires subsurface samples to be taken from a ditch or a shallow corehole. The coreholes are not usually big, but may generate some cuttings.

Geophysical Exploration

Geological exploration can narrow the area being searched, but subsurface geology may or may not be accurately indicated by surface outcrops. Geophysical prospecting extends the search beneath the earth's surface. The surveys identify and map characteristics favorable to oil and gas accumulation deep underground. Geophysical operations include gravitational, magnetic, and seismic surveys. Of these, the seismic survey is most common.

Gravitational and Magnetic Surveys

Gravitational and magnetic field studies yield regional or reconnaissance-type data. These surveys detect variation in gravitational attractions and magnetic fields of the various types of rock below the surface.

Gravity surveys are generally done with small, portable instruments called gravity meters or gravimeters. The number and placement of measurement points in a gravity survey depend on the site's characteristics. These include feasibility of access and the spacing pattern necessary to detail the features selected for mapping. The field party required is not large, usually 3 to 6 people. Travel on foot is possible with the smaller portable gravimeters. Progress, however, is slow, so most surveys use four-wheel-drive vehicles. In marshy areas, the use of special swamp or marsh buggies is quite common with gravity survey crews. Airborne survey operations are not yet practical due to present instrument limitations and the relatively large and rapid changes in altitude and acceleration characteristic to aircraft.

The objective of most surveys can be achieved when gravity stations are confined to existing roads or waterways. Where roads or waterways do not exist, a large level of latitude in positioning stations is possible to account for logistical or environmental constraints. Disturbance of the land surface is minimal when established access is already available. Methods of access to roadless areas are similar to those required for geological explorations described above. The surveying technique itself does not require any physical disturbance of the surface.

Magnetic surveys are often used in place of or to supplement gravity surveys. These surveys are done with relatively small airborne or portable ground instruments called magnetometers. Flight patterns usually consist of a series of parallel lines at 1- to 2-mile intervals.

Airborne surveys require geodetic and ground control points. These must be installed on the ground before the survey can take place, if not already present. A majority of the lower 48 states have been surveyed, so these points are already in place. If not, however, the area must be accessed by overland vehicles or helicopters. The size of the field party required is not large. The access to roadless areas is similar to that required for geological exploration described above. The surveying technique itself does not require any physical disturbance of the surface.

Seismic Surveys

Whereas gravity and magnetic surveys provide regional information, seismic survey can provide enough subsurface detail to locate potential oil and gas traps.

A seismic survey gathers subsurface geological information by recording impulses from an artificially generated shock wave. The energy waves travel downward toward underground formations. A series of sensitive instruments, called geophones, set out at surveyed points on the ground, record the energy waves as they are reflected off the subsurface formations and back to the surface. Cables or radio transmitters transfer information from the geophones to a recorder truck that receives and records the reflected seismic energy. Sophisticated computers analyze the data and generate a "picture" of the rocks underground. Each survey line provides a cross-section of the rock formations beneath it, and many lines may be run to create a complete picture.

In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the attitude of the subsurface formations. After this, the pattern of seismic lines or grids is designed to make the final data more accurate and valuable. Although alignment is fairly critical, some source and recording stations may be moved or skipped for environmental or logistical reasons without seriously affecting the results of the investigation.

A more recent technique called 3-D Seismic works on the same principle as conventional seismic, but energy and recording stations are placed at a much denser spaced grid. There may be up to 150 energy source locations and 200 recording stations per square mile on a 3-D seismic project. Surveys commonly exceed a 25-square-mile-area. The 3D-Seismic surveys can provide enough detail to locate traps that have been "missed" by conventional geophysical methods and exploratory drilling. Even in areas that have been heavily explored and developed, 3D-Seismic is helping to optimize new field development and find new targets within producing fields. New life is being brought to areas thought to have been played out.

Seismic methods are usually referred to by the various methods of generating the shock wave. These include weight drop, vibrators, dinoseis, and explosives. No matter what method of generating energy is used, the procedures for preparing the line and recording the data are relatively similar. The procedure for "shooting" a line consists of first surveying and flagging the locations for the geophones and the positions of the energy sources. Second, the geophones and the connecting cable are laid down. The cable is either connected with more cable to the recording truck or to a radio transmitter to send the data to the recording truck. Normally the recording truck will be within a short distance of the transmitter or within line of sight. Once the geophones and ground cable are in place, the energy source is put in place. The detonation of the energy source, whether by truck or by explosive, is controlled by the recording truck. The shock wave is set off, and the seismic signal recorded. Once the signal is recorded, the cable is picked up and the entire process is repeated on the next segment of the line.

The most common energy source in seismic work is explosives placed in holes drilled to depths of up to 200 feet. Explosives may range from ½- to 50-pound charges. Drills can be mounted on trucks, boats, or specially designed airboats or ATVs, depending on the type of access required. In rugged topography, or to reduce surface disturbance associated with access, portable drills are sometimes carried by helicopter or by hand. Other field equipment can include vehicles to carry water for drilling operations, personnel, surveying equipment, recording equipment, and computers.

Existing roads are used if possible, but reaching some lines may require clearing vegetation and loose rock to improve access for the crews and the trucks. Each mile of seismic line cleared to a width of 8 to 15 feet represents disturbance of about an acre of land. A network of low-standard temporary roads and trails can result from these operations. The alignment of these trails usually consists of straight lines dictated by the grid, often with little regard for steep slopes or rough terrain. Level topography with few trees and shrubs would require little or no trail construction. An area with rugged topography or larger vegetative types such as trees and large shrubs would require more trail preparations. Temporary roads and trails are usually constructed with bulldozers.

Seismic crews consist of several surveying people, people for laying and retrieving the cable and geophones, the truck drivers and drillers for the energy source, personnel in the recording truck and miscellaneous water truck drivers, cleanup people, and field crew managers. The size of the seismic crews vary from 15 to 80 people. On most seismic jobs, the people and equipment are transported in trucks or four-wheel-drive vehicles. However, the surveying, cable laying, and sometimes the drilling can be done on foot in some situations.

Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive methods. Crews may be in the field for 1 to 4 weeks for an average conventional survey. An average 3-D survey may take several months to complete.

DRILLING OPERATIONS

Stratigraphic Test

Sometimes operators need underground rock samples to further define and confirm data from a geophysical exploration program. A stratigraphic test, commonly called a "strat" test, involves drilling a hole primarily to obtain geological information. Small-diameter holes are drilled to 100 feet or several thousand feet with small, truck-mounted drilling equipment. A space of ½ acre or less may be cleared of vegetation and leveled for the average strat test drill site. A road may be needed to get equipment to the site. As the rock is drilled, the resulting rock chips are brought to the surface by a high-pressure airflow or circulating drilling mud. The geologist analyzes the cuttings in order to correlate this geological and geophysical data to other known subsurface structure in order to prepare a subsurface geological map.

A space of about ½ acre or less is leveled and cleared of vegetation for the average strat test drill site. If air drilling is employed, drill cuttings are blown into a reserve pit next to the drill truck through what is known as a blooey line. If mud is used as a drilling fluid, mud pits may be dug. More commonly, portable mud tanks are used. Usually 1 to 3 days are required to drill the strat test holes, depending on the well depth and the hardness of the bedrock. In areas with shallow, high-pressure, water-bearing zones, casing may be required to keep water out of the hole.

Once the surface and subsurface geological and geophysical information is interpreted and a potential oil or gas trap is located, exploratory wells are drilled to test for the actual presence of oil or natural gas.

Oil and Gas Well Drilling

Classification of Wells: Wells drilled for oil and gas are classified as either exploratory or development wells. An exploratory well is drilled either in search of an as-yet-undiscovered pool of oil or gas (a wildcat well) or to extend greatly the limits of a known pool. Exploratory wells may be classified as (1) wildcat, drilled in an unproven area; (2) field extension or step-out, drilled in an unproven area to extend the proved limits of a field; or (3) deep test, drilled within a field area but to unproven deeper zones. Development wells are wells drilled in proven territory in a field to complete a pattern of production.

Exploration, or wildcat, well drilling, and the equipment involved are well beyond that of strat test drilling. At a common height of 180 feet, the rig stands as tall as a 12-story building. An average drilling rig needs a level location of about 3 acres. The drilling pad and access road must be capable of supporting thousands of tons of equipment. The access road may need to be widened and upgraded to accommodate heavy loads.

Choosing the Site: Once exploration activities have narrowed the search to specific drilling targets, the operator must select an exact spot on the surface to drill the well. The industry prefers to drill vertically, and usually chooses a drill site directly above the desiredbottom hole location. When topographical, geological, or environmental constraints prevent a drill site from being located directly above the bottomhole location, the use of direction drilling can achieve the objective. Reaches of over a mile are common for 10,000-foot-deep wells, and extended reach wells have been drilled with over 2 miles of horizontal departure.

Direction drilling involves directing a wellbore from the vertical below the surface along a predetermined course to a target zone located a given distance away. It is a common practice in the industry today, with a number of uses. Directional drilling techniques can be applied if the target zone lies underneath an inaccessible location such as a heavily urbanized area, mountain, or water body, and the drill rig must be located elsewhere. The technique is most often used in offshore applications to allow many wells to be drilled from one location. It can be used to drill around or through fault planes, salt domes, or obstructions in the hole, and to provide relief to a nearby well that has blown out. More recently, the technique has been used to move surface locations as an environmental protection measure.

While directional drilling allows flexibility in the selection of the drill site, there are numerous technical, physical, and economic constraints on its use. Sophisticated equipment and specialized personnel are needed to monitor and guide the direction of the well as it is being drilled. Geological factors such as formation stability, type, and dip angle physically complicate and restrict the opportunities for using directional drilling. The cost of using this technique typically ranges from 10 percent to 50 percent higher than the cost of a vertical well.

Accessing the Site: Wildcat drilling often takes place in remote areas. Preliminary exploration work will not have contributed any new roads to an area, although there may be some cross-country trails. Temporary access roads will have to be constructed. Existing roads may need upgrading to accommodate the heavier loads associated with truck traffic. One lane is usually adequate. Installation of culverts or other engineering structures will be needed in steep terrain or when crossing stream channels. Soil texture, topography, and moisture conditions might dictate that roads be surfaced with material such as gravel, oyster shells, caliche, or ground limestone. Heavy equipment such as graders, bulldozers, front-end loaders, and dump trucks are commonly used in constructing roads. In marshy areas, a roadbed may be laid with heavy boards.

Preparing the Drill Site: To accommodate the rig and equipment, the drill site must be prepared. Site preparation may include extensive clearing, grading, cutting, filling, and leveling of the drill pad using heavy construction equipment. Soil material suitable for plant growth is often removed first and stockpiled for later use in reclamation. The operator may also dig reserve pits to hold large volumes of drilling mud and drill cuttings. In environmentally sensitive areas, such as Alaska and California, a large effort is made not to alter the surface area comprising the drill site more than is necessary. For example, reserve pits may not be dug. Instead, large steel bins are placed on the site to receive the cuttings and other materials that are normally dumped into the reserve pits. These bins can then be trucked away from the site and the material inside them disposed of properly. Also, even in areas where reserve pits are excavated, they are often lined with thick plastic sheeting to prevent any contaminated water or other materials from seeping into the ground. The drill pad typically occupies about 3 to 5 acres.

Directional drilling may require a larger-sized rig for additional facilities that increase the pad size. For inland water sites, drilling barges that sit on the bottom may be used as a foundation for the drill rig. Some dredging may be done on these sites to create a slip, and protective skirts or pilings may be installed around the barge to prevent erosion by currents and tidal flow. In deeper water, jack-up, submersible and semi-submersible, rigs and drill ships may be used to drill wildcat wells. An offshore platform is required to drill development wells in deep water.

Since a source of freshwater is required for the drilling mud and for other purposes, a water well is sometimes drilled prior to moving the rig onto the location. If other sources are available, the water may be piped or trucked to the site.

At the exact spot on the surface where the hole is to be drilled, a rectangular pit called a cellar is dug, or culvert-like pipe is driven into the ground. If the cellar is dug, it may be lined with boards, or forms may be built and concrete poured to make walls for the cellar. The cellar is needed to accommodate drilling accessories that will be installed under the rig later.

In the middle of the cellar, the top of the well is started, sometimes with a small truck-mounted rig. The conductor hole is large in diameter, perhaps as large as 36 inches or more; is about 20 to 100 feet deep; and is lined with conductor casing, which is also called conductor pipe. If the topsoil is soft, the conductor pipe may be driven into the ground with a pile driver. In either case, the conductor casing keeps the ground near the surface from caving in. Also, it conducts drilling mud back to the surface from the bottom when drilling begins, thus the name conductor pipe.

Usually, another hole considerably smaller in diameter than the conductor hole is dug beside the cellar and also lined with pipe. Called the rathole, it is used as a place to store the kelly when it is temporarily out of the borehole during certain operations. Sometimes on small rigs, a third hole, called the mousehole, is dug. On large rigs, it is not necessary to dig a mousehole because of the rig floor's height above the ground. In either case, the mousehole is lined with pipe and extends upward through the rig floor and is used to hold a joint of pipe ready for makeup.

Rigging Up: With the site prepared, the contractor moves in the rig and related equipment. The process, known as rigging up, begins by centering the base of the rig, called the substructure, over the conductor pipe in the cellar. The substructure supports the derrick or mast, pipe, drawworks, and sometimes the engines. If a mast is used, it is placed into the substructure in a horizontal position and hoisted upright. A standard derrick is assembled piece by piece on the substructure. Meanwhile, other drilling equipment such as the mud pumps are moved into place and readied for drilling.

Other rigging-up operations include erecting stairways, handrails, and guardrails; installing auxiliary equipment to supply electricity, compressed air, and water; and setting up storage facilities and living quarters for the toolpusher and company man. Further, drill pipe, drill collars bits, mud supplies, and many other pieces of equipment and supplies must be brought to the site before the rig can make hole.

Mobilizing the drill rig to the location requires moving 10 to 25 large truckloads of equipment over public highways and smaller roads. In very remote locations, entire drilling crews and service personnel may be temporarily housed onsite. A typical drilling crew consists of five people. Drilling operations are continuous, 24 hours a day and 7 days a week. The crews usually work two 12-hour shifts. With the drilling crew, geologists, engineers, supervisors, and specialized service providers, there may be anywhere from 5 to over 20 people on a drilling location at any given time. An irregular stream of traffic to and from the rig occurs day and night.

Drilling the Surface Hole: Rotary drilling is used almost universally in modern-day drilling. Drilling is accomplished by rotating special bits under pressure. Starting to drill is called "spudding in" the well. To spud in, a large bit, say 17 ½ inches in diameter as an example, is attached to the first drill collar and is lowered into the conductor pipe by adding drill collars and drill pipe one joint at a time until the bit reaches the bottom. While drilling, the rig derrick and associated hoisting equipment support the drill string's weight. The combination of rotary motion and weight on the bit causes rock to be chipped away at the bottom of the hole.

The rotary motion is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the hole advances, the kelly slides down through it. With the kelly attached to the top joint of pipe, the pump is started to circulate mud, the rotary table is engaged to rotate the drill stem and bit, and weight is set down on the bit to begin making hole. When the kelly has gone as deep as it can, it is raised, and a joint of drill pipe about 30 feet long is attached in its place. The drill pipe is then lowered, the kelly is attached to the top of it, and drilling recommences. By adding more and more drill pipe, the hole can steadily penetrate deeper.

Large volumes of fluid, generically called drilling mud, circulate down the drill pipe to the drill bit and back to the surface. The mud lubricates and cools the bit and carries drill cuttings to the surface. The composition of the mud system depends on the types of formations being drilled, economics, water availability, pressure, temperature, and many other significant factors. Mud can be as simple as freshwater, or a complex emulsion of water, oil, chemicals, clays, and weighting material. Chemicals added to the mud help drill and protect the hole's integrity. Weighting material is often added to prevent formation fluids from flowing into the well as it is being drilled. Mud systems can be highly toxic or relatively benign. The drilling mud along with cuttings from the well account for the largest volume of waste generated at the wellsite.

The first part of the hole is known as the surface hole. Even though the formation that contains the hydrocarbons may lie many thousands of feet below this point, drilling ceases temporarily because steps must now be taken to protect and seal off the formations that occur close to the surface. For example, freshwater zones must be protected from contamination by drilling mud. To protect them, special pipe called casing is run into the hole and cemented.

Tripping Out: The first step in running casing is to pull the drill stem and bit out of the hole. Pulling the drill stem and bit out of the hole in order to run casing, change bits, or perform some other operation in the borehole is called tripping out. To trip out, the drilling crew uses the rig's hoisting system, or drawworks, to raise the drill stem out of the hole.

Attached to the traveling block is a set of drill pipe lifting devices called elevators. Elevators are gripping devices that can be latched and unlatched around the tool joints of the drill pipe. The crew latches the elevators around the drill pipe, and the driller raises the traveling block to pull the pipe upward. When the third joint of pipe clears the rotary table, the rotary helpers set the slips and use the tongs to break out the pipe. The pipe is usually removed in stands of three joints. Removing pipe in three-joint stands, rather than in single joints, speeds the tripping out process. With the stand of pipe broken out, the crew guides it into position on the rig floor to the side of the mast or derrick.

The derrickman unlatches the elevators from the top of the pipe and stands the pipe back in the derrick. Working as a close-knit team, the driller, rotary helpers, and derrickman continue tripping out until all the drill pipe, the drill collars, and the bit are out of the hole. At this point, the only thing in the hole is drilling mud, because mud was pumped into the hole while pipe was tripped out.

Running Surface Casing: Once the drill stem is out, often a special casing crew moves in to run the surface casing. Casing is large-diameter steel pipe, and is run into the hole with the use of special heavy-duty casing slips, tongs, and elevators. Casing accessories include centralizers, scratchers, a guide shoe, a float collar, and plugs.

Centralizers keep the casing in the center of the hole so that when the casing is cemented, the cement can be evenly distributed around the outside of the casing. Scratchers help remove mud cake from the side of the hole so that the cement can form a better bond. The guide shoe guides the casing past debris in the hole, and has an opening in its center out of which cement can exit the casing. The float collar serves as a receptacle for special cementing plugs, and allows drilling mud to enter the casing at a controlled rate. The plugs begin and end the cementing job, and serve to keep cement separated from the mud so that the mud cannot contaminate the cement. The casing crew, with the drilling crew available to help as needed, runs the surface casing into the hole one joint at a time. Casing is available in joints of about 40 feet. Once the hole is lined from bottom to top with casing, the casing is cemented in place.

Cementing: The cementing of oil well casing annuli is a universal practice done for a number of reasons, depending on casing type. Conductor casings can be cemented to prevent the drilling fluid from circulating outside the casing, causing the very surface erosion the casing was intended to prevent. Surface casings must be cemented to seal off and protect freshwater formations, provide an anchor for blowout preventer equipment, and give support at the surface for deeper strings of casing. Intermediate strings of casing are cemented in order to seal off abnormal pressure formations, effectively isolate incompetent formations that might cause drilling problems unless supported by casing and cement, and shut off zones of lost circulation. Production casing is cemented to prevent the migration of fluids to thief zones, to prevent sloughing of formations that could result in reduced production, and to isolate productive zones for future development.

An oilwell cementing service company usually performs the job of cementing the casing in place. The cement used to cement oilwells is not too different from the cement used as a component in ordinary concrete. Basically, oilwell cement is Portland cement with special additives to make it suitable for various conditions of pumping, pressure, and temperature.

Cementing service companies stock various types of cement and use special trucks to transport the cement in bulk to the well site. Bulk cement storage and handling at the rig location make it possible to mix the large quantities needed in a short time. The cementing crew mixes the dry cement with water, often using a recirculating mixer (RCM). This device thoroughly mixes the water and cement by recirculating part of the already-mixed components through a mixing compartment. Powerful cementing pumps move the liquid cement (slurry) through a pipe to a special valve made up on the topmost joint of casing. This valve is called a cementing head, or plug container. As the cement slurry arrives, the bottom plug is released from the cementing head and precedes the slurry down the inside of the casing. The bottom plug keeps any mud that is inside the casing from contaminating the cement slurry where the two liquids interface. Also, the plug wipes off mud that adheres to the inside wall of the casing and prevents it from contaminating the cement.

The plug travels ahead of the cement until it reaches the float collar. At the collar the plug stops, but continued pump pressure breaks a seal in the top of the plug and allows the slurry to pass through a passageway in it. The slurry flows out through the guide shoe, and starts up the annulus between the outside of the casing and the wall of the hole until the annulus is filled.

A top plug is released from the cementing head and follows the slurry down the casing. The top plug keeps the displacement fluid, usually drilling mud, from contaminating the cement slurry. When the top plug comes to rest on the bottom plug in the float collar, the pumps are shut down and the slurry is allowed to harden. Allowing time for the cement to set is known as waiting on cement (WOC) and varies in length. In some cases, it may be only a matter of a few hours; in other cases, it may be 24 hours or even more, depending on well conditions. Adequate WOC time must be given to allow the cement to set properly and bond the casing firmly to the wall of the hole. After the cement hardens and tests indicate that the job is good -- that is, that the cement has made a good bond and no voids exist between the casing and the hole -- drilling can be resumed.

Tripping In: To resume drilling, the drill stem and a new, smaller bit that fits inside the surface casing must be tripped back into the hole. The bit is made up on the bottommost drill collar. Then, working together, the driller, floormen, and derrickman make up the stands of drill collars and drill pipe and trip them back into the hole.

When the drill bit reaches bottom, circulation and rotation are begun and the bit drills through the small amount of cement left in the casing, the plugs, the guide shoe, and into the new formation below the cemented casing. As drilling progresses and hole depth increases, formations tend to get harder; as a result, several round trips (trips in and out of the hole) are necessary to replace worn bits.

Controlling Formation Pressure: During all phases of drilling, an important consideration is well control. Well control is preventing the well from blowing out by using proper procedures and equipment. A blowout is the uncontrolled flow of fluids -- oil, gas, water, or all three -- from a formation that the hole has penetrated.

Blowouts threaten lives, property, and pollution of the environment. Rig crews receive extensive training in how to recognize and react to impending blowouts, making them relatively rare events.

The key to well control is understanding pressure and its effects. Pressure exists in the borehole because it contains drilling mud and in some formations because they contain fluids. All fluids -- drilling mud, water, oil, gas, and so forth -- exert pressure. The denser the fluid (the more the fluid weighs), the more pressure the fluid exerts. A heavy mud exerts more pressure than a light mud. For effective control of the well, the pressure exerted by the mud in the hole should be higher than the pressure exerted by the fluids in the formation.

Pressure exerted by mud in the hole is called hydrostatic pressure. Pressure exerted by fluids in a formation is called formation pressure. The amount of hydrostatic pressure and formation pressure depends on the depth at which these pressures are measured and the density, or weight, of each fluid. Regardless of the depth, hydrostatic pressure must be equal to or slightly greater than formation pressure, or the well kicks. The well kicks, formation fluids enter the hole, if hydrostatic pressure falls below formation pressure. Thus, one of the crew's main concerns during all phases of the drilling operation is to keep the hole full of mud whose weight is sufficiently high to overcome formation pressure.

However, unexpectedly high formation pressures can be encountered. Formation fluids can be swabbed, or pulled, into the hole by the piston-like action of the bit as pipe is tripped out of the hole. Also, the mud level in the hole can fall so that the hole is no longer full of mud. Whatever the reason, when hydrostatic pressure falls below formation pressure, crew members have a kick on their hands, and they must take quick and proper action to prevent the kick from becoming a blowout.

Helping the crew keep an eye on the rig's operation are various control instruments located on the driller's console. Some rigs have data processing systems that utilize slave computer display terminals, or CRTs (short for cathode ray tubes), on the rig floor, in the mud logging trailer, in the toolpusher's trailer, and in the company man's trailer. When limits that have been programmed into the system are exceeded, the system goes into an alarm condition.

Whether the kick warning signs come from electronic monitors, a computer printout, or the behavior of the mud returning from the hole, an alert drilling crew detects the signs and takes proper action to shut the well in. To shut a well in, large valves called blowout preventers, which are installed on top of the cemented casing, are closed to prevent further entry of formation fluids into the hole. Once the well is shut in, procedures are begun to circulate the intruded kick fluids out of the hole. Also, weighting material is added to the mud to increase its density to the proper amount to prevent further kicks, and the weighted up mud is circulated into the hole. If the mud has been weighted the proper amount, then normal operations can be resumed.

Running and Cementing Intermediate Casing: At a predetermined depth, drilling stops again in order to run another string of casing. Depending on the depth of the hydrocarbon reservoir, this string of casing may be the final one, or it may be an intermediate one. Intermediate casing is smaller than surface casing because it must be run inside the surface string and to the bottom of the intermediate hole. In general, it is run and cemented in much the same way as surface casing.

Final Depth and Well Evaluation: Using a still smaller bit that fits inside the intermediate casing, the next part of the hole is drilled. Often, the next part of the hole is the final part of the hole unless more than one intermediate string is required. After cementing the intermediate casing, drilling resumes by tripping the new bit and drill stem back in the hole. The intermediate casing shoe is drilled out, and drilling the new hole resumes.

While drilling and once reaching the total depth (TD) of the well, the operator collects information to determine if hydrocarbons have been encountered. To help the operator decide whether to abandon the well or to set a final, or production, string of casing, several techniques can be used. A thorough examination of the cuttings made indicates whether the formation contains sufficient hydrocarbons. A geologist catches cuttings at the shale shaker and analyzes them in a portable laboratory at the well site. He often works closely with a mud logger logger -- a technician who monitors and records information brought to the surface by the drilling mud as the hole penetrates formations of interest.

Well logging is another valuable method of analyzing downhole formations. Using a mobile laboratory, well loggers lower sensitive tools to the bottom of the well on wireline and then pull them back up the hole. As they pass back up the hole, the tools measure and record certain properties of the formations and the fluids (oil, gas, and water) that may reside in the formations. Logging tools can also be run as part of the drill string to measure hole conditions and formation properties as the well is being drilled. This is called "measurement while drilling" or MWD.

If logging results indicate commercial quantities, a drill stem test (DST) may be run. Tools are positioned on the drill pipe to isolate the zone to be flow tested. Downhole formation pressure and fluids enter the tool and activate a recorder. Test may be designed to allow formation fluids to flow to the surface during the test or just to allow a certain volume to enter into the wellbore. In either case, provisions must be made at the surface to separate formation fluids from the mud, and to store and dispose of formation liquids. Natural gas produced during drill stem test is vented or flared. A properly designed and run DST can give excellent indication of the types and volumes of fluid the zone is capable of producing.

In addition to well logging and drill stem testing, formation core samples can be taken from the hole and examined in a laboratory.

Setting Production Casing: After the drilling contractor has drilled the hole to final depth and the operating company has evaluated the formations, the company decides whether to set production casing or plug and abandon the well. If the well is judged to be a dry hole --that is, not capable of producing oil or gas in commercial quantities -- the well will be plugged and abandoned.

Several cement plugs will be put in the well to seal it permanently. Cement plugs will be designed and placed to protect the zones of usable water from pollution and to prevent escape of oil, gas, or other fluids to the surface or other zones. Plugging and abandoning a well are considerably less expensive than completing it.

On the other hand, if evaluation reveals that commercial amounts of hydrocarbons exist, the company may decide to set casing and complete the well. The services of a casing crew and cementing company will once more be arranged for; and the production casing will be run and cemented in the well.

The drilling contractor nears the end of his job when the hole has been drilled to total depth and production casing has been set and cemented. In some cases, the rig and crew remain on the location to "complete" the well, or make it ready for production. In other cases, the drilling contractor moves his rig, and the operator brings in a smaller, less expensive completion rig and crew to finish up the job.

Well Completion: Completion equipment and methods employed are quite varied. The perforated completion is by far the most popular method of completing a well. Perforating is the process of piercing the casing wall, cement, and rock to provide openings through which formation fluids may enter the wellbore. Perforating is accomplished by placing guns holding special explosive charges opposite the zone to be produced. The charges are shaped so that an intense, directional explosion is formed. The well must have a good cement job and well-designed and well-executed perforation methods to get effective formation flow.

Explosives used in perforating guns are very stable. Accidents are rare as long as the people involved use proper procedures. Perforating guns may be run in the well on tubing or by wireline. Firing is accomplised by applying electric current, pressure, or mechanical force to a firing head located on the perforating gun.

The final string of pipe usually run in a producing well is the tubing. Tubing is a string of relatively small diameter pipe through which the hydrocarbons are produced. Tubing sizes vary from less than 2 inches in diameter up to 4½ inches for large volume producers. In a flowing well, its smaller diameter produces more efficient flow than casing. Also, since it is not cemented in the hole, tubing may be removed when it becomes plugged or damaged. Tubing, when used with a packer, keeps well fluids and formation pressures away from the casing. Well fluids and high pressures can damage casing, necessitating costly repairs.

The packer consists of a pipelike device through which well fluids can flow. Rubber sealing elements form a fluid tight seal around the inside of the casing. Gripping elements, called slips, hold the packer in place. Because the packer seals off the space between the tubing and the casing, produced fluids are forced into and up the tubing.

Another device often installed in the tubing string near the surface is a "subsurface safety valve." The valve remains opened, as long a flow is normal. When the valve senses a loss in pressure or significantly increased flow (such as would occur with a flowline break), the valve closes automatically. Subsurface safety valves can prevent uncontrolled well flow in the event of massive surface equipment failure.

Finally, a tubing head is installed at the top of the well to support the tubing. Valves, gauges, and flow control devices are installed on top of the tubing head. Together, they make up what is commonly called a Christmas tree.

When reservoir pressures are not sufficient for the well to flow on its own, operators employ artificial lift methods. The most common by far is rod pumping. A plunger pump is installed deep in the well and connected by rods to a pumping unit on the surface. The pump jack moves the rods up and down to work the downhole pump. Pump jacks are often driven with electric motors or natural gas engines. The gas lift method works by injecting high-pressure gas into the fluid column of a swell to lighten and raise the fluid by expansion of the gas. Instead of pump jacks, there will be a source of high-pressure gas in the field, usually from a gas compressor. The hydraulic pumping method uses a fluid to drive a downhole motor, which in turns drives a pump that pumps the oil to the surface. Surface equipment for hydraulic pumping includes a high-pressure pump and vessels to separate the hydraulic fluid from produced fluid. Yet another type of artificial lift is electric submersible pumping, usually only used on very high-volume wells. An electric motor attached to a pump is installed downhole. Electric current is supplied to the motor through special heavy-duty armored cable. Surface facilities may just be a small transformer/control box.

The well may be stimulated to enhance flow. Stimulation may be performed before or after the completion equipment is installed. Two common types of stimulation are formation acidization and hydraulic fracturing. Stimulation treatments can improve flow to the point where commercial production is achieved in an otherwise uneconomical well.

Formation acidizing is treating the hydrocarbon-bearing rock with large volumes of acid. The most common types of acid used are hydrochloric (HCl) and hydrofluoric (HF). Oilfield acids contain additives to prevent of delay corrosion of the well's tubulars, inhibit sludging and emulsion reactions with oil in the formation, and make the acid easier to pump. The aim in acidizing is to enlarge the pore spaces and passages by dissolving rock, thus enlarging existing flow channels and opening new ones to the wellbore.

Acid is brought to the well location in tanker trucks and pumped using one or more truck-mounted pumps. Spent acid that is flowed back from the well is often kept separate from field production. The spent acid may be put into temporary tanks until it is trucked off to disposal.

In hydraulic fracturing, fluid is pumped into the formation at high enough pressures and rates to split the rock. Proppants are pumped with the fluid to hold the crack open once pumping stops. Sand and sintered bauxite beads are two common propping agents. Fracturing fluid must not only break down the formation, but also extend and transport the proppant into the fracture. The industry has developed a multitude of complex fluid and proppant systems to achieve the best results in the many varied types of reservoirs.

Many truck-mounted pumps and temporary storage tanks are needed on location to fracture-treat wells. Larger well locations may be needed if hydraulic fracturing is part of a completion procedure.

Field Development: If the wildcat well produces oil or gas in commercial quantities, one or more additional wells are normally drilled to confirm the initial finding and further test and define the extent of the oil or gas reserves. Location of the confirmation wells is dependent upon analysis of discovery well data and any existing seismic surveys. Confirmation progresses by drilling one well after another, each dependent on the results of the previous wells.

With more information in hand, facilities can be designed to handle production from the field. Next, development wells are drilled as needed to efficiently drain the reservoir. The procedures for drilling development wells are about the same as for wildcats, except that there may be a variation in the amount and type of subsurface sampling, testing, and evaluation. More detailed seismic work may be performed to aid in the location of development wells.

A state Oil & Gas Commission usually establishes the field well spacing pattern. Typical well spacing may be one well every 640, 320, 160, 80, or 40 acres. Completely filled spacing patterns would translate to 1, 2, 4, 8, or 16 wells per square mile, respectively. In general, oil well spacing is denser than for gas wells, and shallow well spacing is denser than for deeper wells.

Access roads to development wells are usually better planned and constructed than those for wildcat wells because these wells tend to have a longer life. Typically a lease area will have one main route, with side roads to each well or multiwell pad location. Change from temporary to permanent roads does not take place until a well has been established as being capable of production. The amount of roadway required per square mile of field is 4 miles, based upon a spacing pattern of 40 acres and a separate pad for each well.

Directional drilling is sometimes used to concentrate the surface locations of two or more wells in one area. This technique minimizes the amount of surface area (roads and well pads) needed to develop a field. Multiple well pads may be used when developing a field inside the limits of a city or in environmentally sensitive areas.

Other surface equipment and support facilities are brought in or constructed during field development. For example, a battery of storage tanks or a pipeline may be required to handle produced oil or gas. Separation and treatment facilities are required to separate gas and water from oil. Storage tanks are required to hold brines produced during oil extraction, and a proper disposal capability, most typically reinjection, must be developed. Natural gas must be properly disposed of (usually flared) or treated to remove impurities if it is to used or sold.

Well Servicing and Workover Operations: Sometimes it is necessary to repair downhole mechanical problems. Workover rigs are often used to repair downhole equipment or assist in large stimulation jobs. The most common well servicing operation is related to artificial lift installation, tubing string repairs, and work on other downhole completion equipment that may be malfunctioning. More involved workover operations might include cleanout of sand, scale, or paraffin deposits that accumulate in the well, casing repair, cementing, perforating new or existing zones of production, or even some limited drilling operations.

Workover rigs are scaled-down drilling rigs. They are usually equipped to stand the pipe in the derrick, rotate pipe while it is in the hole, and circulate workover fluids down and back up the well. Workover rigs are usually self-contained on a truck. They are highly mobile and can be rigged up and rigged down quickly. A well servicing jog to replace a rod pump may last only 1 or 2 days. A major workover operation to change or "recomplete" to another productive zone may last more than a month.

Well Abandonment and Reclamation: Workover rigs are also used to plug and abandon wells once they are depleted. Plugging operations consist of removing the tubing, packer, and other completion equipment; pumping cement across producing zones; and placing cement plugs at various depths to protect freshwater zones. Finally, a cement plug is set at the surface to cap the well, and wellhead equipment is cut off. A permanent abandonment marker is often placed to identify the well's location.

The surface owner and regulatory agencies often dictate surface reclamation. Reclamation can range from just removing equipment to reclaiming the area to conditions that existed before drilling the well.

Full-scale reclamation can include the following:

- Removal of structures, equipment, and debris used or generated during operations;
- Removal or remediation of contaminated soils;
- Recontouring of disturbed areas to near original grade;
- Spreading and preparation of topsoil;
- Planting of native vegetation, usually grasses, but sometimes also tree saplings;
- Erosion protection measures such as mulching; and
- Monitoring of revegetation and erosion control efforts.

Reclamation may last a few days or a few years, depending on the degree of contamination on the site and the ability of native species to grow.

APPENDIX G

REMAINING OIL AND GAS RESOURCES BENEATH PADRE ISLAND NATIONAL SEASHORE USGS ASSESSMENT METHODOLOGY

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Introduction

The Energy Team of the USGS was retained by the National Park Service to assess the undiscovered oil and gas resource potential of Padre Island National Seashore. The oil and gas plays of the entire Gulf Coast region were most recently assessed in 1995 (Schenk and Viger, 1996). Padre Island National Seashore lies along the southeastern margin of the Texas Gulf Coast and is within the Western Gulf Province. The oil and gas plays developed in 1995 for the Western Gulf Province formed the basis for this more localized assessment of Padre Island National Seashore.

The first step in the assessment process was to define geologically based plays that were then assessed for undiscovered oil and gas resources. A play is defined as a set of known or postulated oil and (or) gas accumulations sharing similar geologic, geographic, and temporal properties, such as source rock, migration pathway, timing, trapping mechanism, and hydrocarbon type. The geologic formations that may be productive in the future on Padre Island National Seashore include the Oligocene Vicksburg, the Oligocene Frio, the Lower Miocene, and the Middle Miocene. The four plays developed for this assessment reflect this stratigraphy.

Following the geologic development of the plays, the second step involved data allocation and evaluation, which formed the basis of this geologically based field size assessment. Third, the input data from the geologist was entered into each of the quantitative models to calculate undiscovered oil and gas resources for each of the four plays. Finally, in Step 4, the allocations of undiscovered resources to Padre Island National Seashore were made using an analysis of richness factor.

Step 1. Geologic Play Definition

The oil and gas plays of the 1995 Assessment were developed to assess much larger areas of the Gulf Coast (Schenk and Viger, 1996) than we are interested in for this study. Here, we defined plays with smaller areal size so that the allocation of resources to Padre Island National Seashore was more geologically realistic. For example, in the 1995 Assessment, Padre Island National Seashore was included in a play called the Frio Downdip Gas Play that extended across much of coastal Texas. For this study, only that portion of this larger play south of a geologic feature called the Rio Grande Embayment was assessed, a play we herein called the Frio Rio Grande Embayment Gas Play.

The four plays developed for this study are the Vicksburg Rio Grande Embayment Play, Frio Rio Grande Embayment Gas Play, Lower Miocene Gas Play, and the Middle Miocene Rio Grande Embayment Gas Play. Each of these plays was defined geologically.

Vicksburg Rio Grande Embayment Downdip Gas

General Description

The Vicksburg Rio Grande Embayment Downdip Gas Play is bounded to the west by the Vicksburg fault zone, to the north by the San Marcos Arch, to the south by the Mexican border, and to the east by the extension of the play to depths of 25,000 feet. The play is part of a larger one defined as a downdip Vicksburg gas play (4731) for the U.S. National Oil and Gas Assessment (Schenk and Viger, 1996). Padre Island National Seashore is entirely confined within this play. The area of the play is 34,307 square kilometers, and Padre Island represents 1.5% of the play, or 524 square kilometers.

The Vicksburg is a clastic wedge that prograded across southern Texas in Early Oligocene time, and is generally bounded by the benthic foram zones *Cibicides mississippiensis* and *Textularina warreni.* The Vicksburg fault zone is a major zone of shelf edge growth faulting that developed during Vicksburg time, and had a significant impact on the distribution of reservoir and non-reservoir facies of the Vicksburg.

The Vicksburg Formation is a prolific oil and gas producer in the state of Texas, with more than 250 fields discovered to date (Coleman and Galloway, 1990). The potential for additional discoveries in the Vicksburg depends upon the area of interest or play. For example, the deep gas trends are the most likely plays for additional discoveries in the future compared to the updip fluvial and deltaic Vicksburg reservoirs (Schenk and Viger, 1996).

Reservoirs and Reservoir Quality

Most of the published information on reservoirs in the Vicksburg Formation is from the producing areas updip from the area of concern in this play. Most updip reservoirs in this play are in shelf-edge deltas, strand-plain, or barrier sandstones (Coleman and Galloway, 1990). Reservoirs of the Vicksburg Formation that are considered to be most likely for the undiscovered resources in this play and in the area of Padre Island National Seashore are slope-channel and fan sandstones, rather than deltaic, nearshore marine or shelf sandstones that are productive in updip Vicksburg fields, as the Vicksburg paleoshelf edge was located west of present-day Padre Island. Potential reservoirs may include slope-channel sandstones, levee sandstones, and fan sandstones.

Sandstones of the Vicksburg Formation have undergone a complex diagenetic history that has a significant impact on sandstone reservoir quality (Richmann and others, 1980; Taylor and Al-Shaieb, 1986; Humphrey, 1986). Vicksburg sandstones are predominantly lithic arenites, with the lithic fraction composed mainly of volcanic rock fragments. These grains are chemically and mechanically labile, and are an important aspect of diagenesis. Early diagenesis began with pervasive calcite cementation, clay rims around detrital grains, and quartz and feldspar overgrowths. At depth, dissolution of volcanic rock fragments, calcite cement, and feldspars led to the formation of secondary porosity, possible due to fluids preceding hydrocarbon migration. Secondary porosity in proximal Vicksburg sandstones ranges up to 15%. Porosity in sandstones of the undiscovered fields may be lower, as the sandstones may be finer grained in general, and may not have the good development of secondary porosity. The deeper Vicksburg reservoirs in this play may be overpressured.

Source Rocks

Source rocks for the hydrocarbons in the Vicksburg are not know for certain, but analyses of the underlying Jackson Group shales indicate that these shales may have sourced some of the oil and gas in the Vicksburg (Tanner and Fuex, 1990). For the area of Padre Island National Seashore, the predominant hydrocarbon is gas rather than oil, given the depths involved in the play, the thermal history, and the production to date.

Traps and Seals

The Vicksburg section is cut by several major growth faults, leading to complex structures throughout the Vicksburg and overlying sections. The growth faults range from the Vicksburg fault zone eastward through the Frio and Miocene growth fault zones. The structures associated with growth faults and salt movement form the structures that are the traps in this play. Structures include faulted rollover anticlines, anticlines, and complexly faulted growth structures. The seals for this play are the marine mudstones that encase the fan sandstones, or encase the slope channel sandstones, or may be from the juxtaposition of mudstones against sandstones along faults.

Exploration

Exploration in the Vicksburg has focused on the updip area of this play, and few wells have been drilled to test the downdip portion of the play that is of most interest in this study. The potential for hydrocarbons in the downdip area is considered good, as significant gas discoveries in the Vicksburg are being made today just to the north of this play in the vicinity of Galveston Bay (Petlet, 1997).

Frio Rio Grande Embayment Downdip Gas

General Description

The Frio Rio Grande Embayment Downdip Gas Play is bounded to the west by the Frio fault zone, to the north by the San Marcos Arch, to the south by the Mexican border, and to the east by depths to 25 to 30,000 feet. The Frio Formation comprises at least three depositional sequences, and are called the lower, middle and upper Frio sequences (Theis and others, 1993). For this assessment, the Anahuac depositional sequence is included with the Frio. Thus, this assessment covers the section between *Texularia warreni* and *Discorbis restricted*. The area of the Frio play is 28,960 square kilometers, and Padre Island represents 1.8% of the play, or 524 square kilometers.

The Frio Formation is one of the most prolific hydrocarbon producing stratigraphic intervals in Texas. Renewed interest in the Frio is evident in significant exploration in this play in the area of Galveston Bay, where deep gas discoveries are being made in the Frio and Vicksburg (Petlet, 1997). This play forms part of Play 4732 of Schenk and Viger (1996), and Play 1 of Galloway, Hobday, and Magara (1982).

Reservoirs and Reservoir Quality

The Frio Formation in the play area represents the distal portion of the Frio, which includes shelf sandstones, slope-channel sandstones, and fan sandstones with all associated subenvironments. The paleoshelf edge for the upper Frio is located just off the present-day shoreline (Galloway and others, 1982). The types of reservoirs hold significant potential, as this downdip area has not been explored as heavily as the updip area of the Frio.

Reservoir quality is similar to the deep Vicksburg (Loucks, Bebout, and Galloway, 1977; Bebout, Loucks, and Gregory, 1978). Frio sandstones are lithic and feldspathic arenites, with early cementation by calcite, followed by cementation by clays, quartz, feldspar, and sparry calcite.

Important to the evolution of porosity was the dissolution of calcite, feldspars, and volcanic rock fragments at depth, which led to secondary porosity. This type of porosity is best developed in coarser grained facies, which would be channel sands in the deeper water deposits. Finer grained turbidites may have significantly less secondary porosity due to the finer grain size. Following secondary porosity development, cementation by kaolinite and iron-bearing carbonates was locally important. Porosity of deeper Frio sandstones may range to 18 percent (Bebout, Loucks, and Gregory, 1978). The deeper Frio and Anahuac reservoirs in this play may be overpressured.

Source Rocks

The source rocks for the Frio hydrocarbons, like those for all Tertiary rocks in the Gulf Coast, are not known for certain. Frio mudstones have reached the stage of generative maturity for hydrocarbons, but the low organic carbon contents, around 0.3 weight percent, indicate that Frio mudstones may not have been a significant source. Most studies of the Frio suggest that hydrocarbons were generated in mudstones at some depth below the Frio section and migrated up or along faults to Frio reservoirs (Galloway and other, 1982).

Traps and Seals

The Frio Formation has undergone the same types of structural deformation as the Vicksburg, mainly in the development of extensive listric fault zones. Associated with these fault zones are structures such as anticlines, faulted anticlines, roll-over structures, and complexly faulted structures along the growth faults. Seals are mainly mudstones of the Frio and Anahuac that enclose sandstones, or seals are mudstones juxtaposed with sandstones along the faults.

Exploration

The Frio play is the most likely for additional gas discoveries in the Padre Island area. If the current trend of 3-D seismic based exploration continues south along the coast, then additional Frio discoveries are likely.

Lower Miocene Rio Grande Embayment Gas Play

General Description

The Lower Miocene Rio Grande Embayment Gas Play is bounded to the north by the San Marcos Arch, to the south by the Mexican border, to the west by the Vicksburg Fault Zone, and to the east by the boundary with the Lower Miocene Slope-Fan Gas Play. The Lower Miocene interval for this study in bounded by the forams *Crisellaria R* and *Discorbis B* zones. This interval corresponds in general to the Oakville and Lagarto formations in coastal Texas. This play approximates play MC-1 in the Texas Gas Atlas (Kosters and others, 1989). The area of the Lower Miocene play is 26,717 square kilometers, and Padre Island National Seashore represents 1.96%, or 524 square kilometers of the play.

The Lower Miocene is a significant oil and gas producer in this play, with several large gas reservoirs discovered to date. The remaining fields, however, may be small.

Reservoirs and Reservoir Quality

Sandstone reservoirs in this play range from deltaic, strandplain and shelf sandstones, with depths to undiscovered reservoirs in the Padre Island area in the range of 5000 to 8000 feet.

Reservoir quality in Lower Miocene sandstones generally is good, with porosity ranging up to 30%, and permeability ranging up to 5000 md. The diagenetic history of Miocene sandstones is similar to that of the Oligocene Vicksburg and Frio sandstones (Flournoy and Ferrell, 1980). The sands began as lithic arenites and lithic arkoses, with the lithic fraction dominated by feldspar and volcanic rock fragments. Early cementation by calcite, and quartz decreased primary porosity, but compaction was not as important as in the Oligocene sandstones. At depth, dissolution of lithic grains, feldspars, and calcite cement led to the formation of secondary porosity, which gives the reservoirs the present quality. Secondary porosity can range up to 30%, and permeabilities can range to 2500 md. Late cementation by kaolinite and iron-bearing carbonates led to a decrease in secondary porosity. As in the Oligocene sandstones, coarser grained sandstones will exhibit better development of secondary porosity than finer grained sandstones.

Source Rocks

The source rocks for the Lower Miocene hydrocarbons are not known for certain, but, like the source for the Frio, is generally thought to be from organic-bearing mudstones beneath the Miocene section, and migration has occurred up and along faults to source the Lower Miocene sandstone reservoirs. Galloway and others (1986) considered the Frio and /or the Anahuac mudstones as potential source rocks for this play.

Traps and Seals

Traps in the Lower Miocene Play include growth-fault-related structures, such as anticlines, faulted anticlines, and rollovers. Other structural traps include salt structures and shale ridges. Seals in this play are provided by mudstones of the Lower Miocene, by the juxtaposition of mudstones and sandstones along faults, and by the margins of salt structures. The traps are associated with the Vicksburg-Frio growth fault zones and deep-seated salt structures. The main limitation to the effectiveness of this play is seal quality (Galloway and others, 1986), although the *Amphistegina B* transgressive mudstones form a seal for several reservoirs in this play.

Exploration

The potential for additional Lower Miocene gas reservoirs to be discovered in the Padre area is good, but not as good as the Frio. The potential exists for Lower Miocene reservoirs to be located on the same structures as Frio reservoirs.

Middle Miocene Rio Grande Embayment Gas Play

General Description

The Middle Miocene Rio Grande Embayment Gas Play is bounded to the west by the Vicksburg Fault Zone, to the north by the San Marcos Arch, to the south by the Mexican border, and to the east by the Middle Miocene Shelf-Slope Gas Play. The Middle Miocene interval for this report is bounded by the *Robulus L* and *Textularia W* zones. This interval corresponds in general to the Goliad Formation of coastal Texas. The area of the play is 39,680 square kilometers, and Padre Island National Seashore represents 1.3%, or 524 square kilometers of the play.

Reservoirs and Reservoir Quality

Sandstone reservoirs in this play include fluvial, coastal plain, deltaic, strandplain and shelf reservoirs. In the area of Padre Island, the reservoirs are mainly of strandplain and shelf origin.

Reservoir quality in Middle Miocene reservoirs generally is good, with porosity ranging up to 32%, with permeability ranging to 5000 md. The diagenetic history of Miocene sandstones is similar to that of the Oligocene Vicksburg and Frio sandstones (Flournoy and Ferrell, 1980). The sands began as lithic arenites, with the lithic fraction dominated by feldspar and volcanic rock fragments. Early cementation by calcite, and quartz decreased primary porosity, but compaction was not as important as in the Oligocene sandstones. At depth, dissolution of lithic grains, feldspars, and calcite cement led to the formation of secondary porosity, which gives the reservoirs the present quality. Late cementation by kaolinite and iron-bearing carbonates led to a decrease in secondary porosity. As in the Oligocene sandstones, coarser grained sandstones will exhibit better development of secondary porosity than finer grained sandstones.

Source Rocks

The source rocks for the Middle Miocene hydrocarbons are not known for certain, but, like the source for the Frio and Lower Miocene is generally thought to be from organic-bearing mudstones beneath the Miocene section, and migration has occurred up and along faults to source the Middle Miocene sandstone reservoirs.

Traps and Seals

Traps in the Middle Miocene play are similar to those of the Lower Miocene, and are largely related to growth faults, shale ridges, and salt structures. Traps include anticlines, faulted anticlines, complexly faulted sections above shale ridges, and salt structures. Seals include mudstones of the Middle Miocene, as the mudstones may enclose the sandstones, be juxtaposed along faults with sandstones, and also can be the margins of shale or salt structures, although seals may be a problem given the low number of accumulations discovered in this play to date.

Exploration

The potential for additional Middle Miocene reservoirs to be found in the Padre Island area is considered to be low, given the level of exploration and the problems with potential seals.

Step 2. Oil and Gas Data Allocation and Evaluation

Once the plays were defined geologically, the next step was to organize and allocate all of the pertinent oil and gas information to each play using digital techniques.

Data Retrieval, Play Allocations, and Field size

The oil and gas field data for both the onshore and offshore areas of the Western Gulf were initially retrieved from the Nehring Significant Oil and Gas Field File, a commercially available database. Oil and gas wells were retrieved from the Petroleum Information Well History Control One-Line File, another commercially available database. The oil and gas fields and wells within the play boundaries were allocated digitally to each play by producing formation, which were the Vicksburg, Frio, Lower Miocene, and Middle Miocene. This digital allocation of fields and wells was done using Arc/Info.

One of the basic tenets of assessments such as this that used a geologically based field size analysis approach is that estimates must be available for discovered field sizes. Field size is the sum of 1) oil and gas production, 2) calculated reserves, and 3) an estimate of field growth. The production and reserves data are provided in the Nehring Significant Oil and Gas Field database, but we must estimate the amount of field growth that may occur in each field over the next 30 years.

Field growth is a long-acknowledged phenomenon within oil and gas fields. Basically, the size of a field grows with time, compared with a field's first reported size, for several reasons. We must estimate, for the fields in each play, the grown size of each field before we construct and begin to examine historical data plots for each play. For the fields in the four Padre Island plays, we used a growth function that was developed for onshore Gulf Coast gas fields by Root (1996) for the 1995 National Assessment. All of the historical data plots were constructed using grown field sizes.

Historical Data Plots

Once the grown fields were assigned to each play, then a series of historical data plots were constructed that were used as guides to develop the distributions of sizes and numbers of undiscovered accumulations. The data plots included numbers of accumulations discovered vs time, numbers of fields vs field size, field size vs time, field size vs numbers of exploration wells, numbers of fields vs exploration wells, and a series of plots with such parameters as API gravity, gas/oil ratio, and reservoir depth. These plots are used in conjunction with the play geology and predictions as to future trends, technologies, and new exploration concepts to estimate a distribution of undiscovered field size and number for each play. Ancillary data, such as gas-oil ratios and natural gas liquid to gas ratios, were included so we could calculate co-products such as natural-gas liquids.

Field Size and Numbers Analysis

Determining the distributions of sizes and numbers of undiscovered gas accumulations for each play forms the core of the assessment. Given all the historical exploration and production data, and predictions as to future exploration and development and applications of new technology, estimates are made of the minimum, median, and maximum numbers of gas accumulations remaining to be discovered in each play. Likewise, estimates were made of the minimum, median, and maximum sizes of gas accumulations remaining in each play.

Following the estimates made by the assessor, a review meeting was held where the estimates of undiscovered sizes and numbers were defended on a geologic basis. Changes suggested during this review process were incorporated into the final distributions that were sent forward to the modelers.

Data Form

The data form used in this assessment is similar to the one used for the U.S. National Assessment. Key input parameters include minimum size of field to be assessed, the risk structure for charge, reservoir, and timing, distributions of sizes and numbers of undiscovered accumulations, and input for co-product calculations. The form was completed for each play, and the same input data was provided to each model.

Step 3. Quantitative Methods for Resource Calculations

The input data was entered into two models, an Adaptive Fractile model and a Monte Carlo model. Each model produced an estimate for undiscovered gas and condensate resource in each play using identical input data. The initial estimates of undiscovered resources are for the entire play area, not just for the area of Padre Island National Seashore.

Adaptive Fractile Method

The Adaptive Fractile Distribution is an adaptive probability distribution in terms of seven fractiles (F100, F95, F75, F50, F25, F5, and F0) for a random variable of interest, for example, the number of undiscovered fields. Typically, the fractile F95 denotes the value of the random variable such that the probability of at least F95 is 0.95. The seven fractiles sufficiently describe the probability distribution for modeling purposes. Suppose we are given the estimates for the following three fractiles; the median (F50), a center parameter; the minimum (F100) and maximum (F0), which are spread parameters. The Adaptive Fractile Distribution consists of a mathematical algorithm involving proportions for calculating the four intermediate fractiles (F95, F75, F25, and F5) which are shape parameters. The Adaptive Fractile Distribution can be adapted to have any shape. Two important scenarios of the Adaptive Fractile Distribution are 1) specified shape when no data are available, and 2) same shape as empirical distributions from data.

Monte Carlo Method

Calculations of undiscovered resources were made using a USGS program based on Microsoft Excel and Crystal Ball, a commercial Monte Carlo simulation program that works within Excel. On each iteration of the simulation, a sample from the field size distribution gave the number of undiscovered fields in the play. That many independent samples from the field size distribution were taken and summed. Amounts of natural gas liquids and geographic allocations were calculated by multiplication of appropriate factors. This was then redone for a total of ten thousand iterations, giving relatively smooth output distributions.

For each of the four plays two Monte Carlo simulations of ten thousand iterations each were conducted. The first simulation used lognormal or (for symmetrical distributions) normal distributions fit to the input parameters. The second simulation used adaptive fractile distributions fit to the input parameters.

Step 4. Allocation of Undiscovered Resources to PAIS

To allocate undiscovered resources to Padre Island National Seashore, we used a method called richness factor analysis (Crovelli, 1983). The essence of this approach is to determine the degree to which undiscovered resources can be reasonably assigned to a parcel of land such as Padre Island, given the percentage of land Padre Island occupies within the play, the position of Padre within the play area, and the petroleum geology of the play. For example, Padre Island occupies 1.8% of the Frio Rio Grande Embayment Play area, thus if undiscovered resources were evenly distributed, Padre would contain 1.8% of the resources of the Frio Play. However, with respect to the Frio play, Padre Island is nicely situated for additional Frio gas discoveries, greater than the 1.8% land area would suggest. This type of analysis was completed for each play, resulting in the allocation of undiscovered resources, including conventional gas and condensate, to Padre Island National Seashore.

Assessment Results

Results of the allocation of conventional gas resources and condensate by richness factor are given in Table 1. The results of each method are shown; the Adaptive Fractile method, the Monte Carlo method using adaptive fractile distributions, and the Monte Carlo method using log-normal distributions. The results illustrate the similarities when the adaptive fractile distributions are used, but also the differences where log-normal distributions are used. The Monte Carlo method with log-normal model produced slightly less undiscovered resource for each play. The results show that approximately 65-80 bcf (10-13 mmboe) of conventional gas and 1.5 to 1.7 mmb of condensate are expected to be discovered on Padre Island National Seashore.

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Table 1. Padre Island National Seashore Assessment Results

	Adaptive Fractile Mean (bcfg)	Monte Carlo AF Mean (bcfg)	Monte Carlo LN Mean (bcfg)
Vicksburg	11	11	9.3
Frio	38	38	32
Lower Miocene	25	25	20
Middle Miocene	4	4	4
MEAN GAS TOTAL	78	78	65.3

	Adaptive Fractile Mean (mmbngl)	Monte Carlo AF Mean (mmbngl)	Monte Carlo LN Mean (mmbngl)
Vicksburg	.3	.3	.3
Frio	1.05	1.06	.9
Lower Miocene	.3	.3	.25
Middle Miocene	.04	.04	.04
MEAN NGL TOTAL	1.7	1.7	1.5

APPENDIX H

January 1999

GUIDELINE FOR THE DETECTION AND QUANTIFICATION OF CONTAMINATION AT OIL AND GAS OPERATIONS

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I. WHAT IS THE PURPOSE OF THIS DOCUMENT?

This document is to be used as a guideline for collecting samples at sites within National Park Service (NPS) units where there are oil or gas operations. Samples will indicate whether or not contamination has occurred at the site as a result of an operation.

It is important that specific contaminants be tested for and that specific methodology be used so that contamination is accurately defined and so that results taken at different times by different people at a site can be reliably compared. This guideline presents methodology for analyzing soil, sediment, groundwater, and surface water.

Specifically, guidelines are presented for: (1) when in the operation owner/operators must collect samples, (2) the contaminants that must be tested for, (3) how samples must be collected, (4) quality assurance/quality control, (5) how samples must be analyzed in the laboratory, (6) required detection limits and choosing environmental benchmarks, (7) sample plan and reporting requirements, and (8) what to do in case of a spill.

Note that in this guideline "superintendent" refers to the superintendent or his/her designee(s) who will represent him/her on these issues. In many cases, the superintendent's actual involvement may be only that of approving the recommendations of the designee(s).

II. WHEN MUST SAMPLES BE COLLECTED?

Sampling at oil and gas sites is not automatically required. However, the Superintendent can require sampling if the site has recently experienced a release or, has a history of releases, or the facility is operated in a manner that poses a risk of releasing crude oil, condensates, or any other "contaminating substance" associated with an oil or gas operation.

Sampling can occur at any time during or after an operation. ("After" refers to when an owner/operator sells the operation, transfers its leasing rights, or closes the operation and abandons the site.)

Sampling will be biased (not random), focusing on areas where contamination is obvious or most likely (for example, near well heads, pump jacks, storage tanks, old meter houses, or flowline or pipeline valves or connections). The exact sample locations and number of samples collected are site-specific and will be determined by the Superintendent.

If sampling shows contamination at or above levels of concern, baseline data may be needed to measure natural background concentrations for the contaminants of concern. This will indicate whether or not the on-site contamination was caused by the oil and gas operation or if it was a natural, pre-existing condition.

If contaminant concentrations are indeed higher than natural background levels for that area, additional sampling will be necessary to further define contamination (that is, identify more contaminants that may be involved and define their distribution throughout the site). How to proceed after that will depend, of course, on the data and on the Superintendent's restoration and management objectives for the site.

Note that incoming owners/operators at new or existing oil or gas operations may wish to conduct their own environmental audit of the site. If they do choose to do so, it is strongly suggested they test for the contaminants and use the methodology given in this guideline so that if samples are later required during or after the operation, all data can be reliably compared.

In summary:

If samples show the unnatural presence of contaminating substances that are associated with the oil or gas operations, past or present, at a site, then the owner/operator at the site at the time the samples were collected will be held responsible for causing the contamination and will be liable for conducting and paying for any mitigation, including any further sampling. The burden of proving non-liability for contamination at a site rests squarely on the operator, not on the NPS.

III. FOR WHAT CONTAMINANTS MUST SAMPLES BE TESTED?

Contaminating substances that can be found at oil and gas sites are primarily crude oil, condensate, produced water, drilling mud, lube (motor) oil, and solvents. The more important individual contaminants found in these substances are listed in Table 1. Though there are other contaminants associated with these substances, those in Table 1 were chosen because they are not only good indicators of the contaminating substance, but also are generally considered to be the most toxic. When contamination of a site by one of the above contaminating substances is being investigated, sampling and analyses for these individual contaminants should occur.

A two-tiered sampling approach is recommended where Tier I sampling is conducted for the minimum number of contaminants needed to detect the presence of a contaminating substance. These contaminants are indicated in Table 1 by "xx". Testing for additional contaminants could occur if the Superintendent so desires.

If contamination is found, Tier II sampling will be necessary to further define the contamination spatially (how får it extends into the area), qualitatively (a more complete list of contaminants involved), and quantitatively (how much there is). These additional contaminants are indicated in Table 1 by "x". Tier II sampling , then, should be for all of the contaminants listed ("x" and "xx") under the contaminating substance(s) of interest in Table 1.

Table 1: Contaminants to test for when investigating various types of contamination at oil and gas sites. Contaminants that should be tested for in Tier I sampling are indicated by "xx", while those with either an "x" or "xx" should be tested for during Tier II sampling.

contaminant	where found: soil/sediment = S groundwater/ surfacewater = W	|------------ Contaminating substances individual contaminants are associated with: ---------| crude oil	condensate	produced water	drilling mud	lube (motor) oil	solvents [i]
PAHs [a]	S, W	x	x	x	x	x	x
TPH [b]	S, W	xx	xx	x	x	xx	xx
BTEX [c]	S, W	x	xx	x	x	x	xx
metals [d]							
arsenic	S, W	x		x	x	x	
barium	S, W	x		x	xx	x	
cadmium	S, W	x		x	x		
chromium	S, W	x		x	xx	x	
copper	S, W	x		x		x	
lead	S, W	x		x	x	xx	
magnesium	S, W	x		x	x	x	
mercury [e]	S, W	x		x	x		
nickel	S, W	xx		x		x	
selenium	S, W	x			x		
strontium	S, W	x		xx			
vanadium	S, W	xx		x	x		
zinc	S, W	x		x	x	xx	
radioactivity [f]	S, W			x			
ammonia [g]	W	x					
calcium	W			x	x	x	
potassium	W			x			
sodium	W			xx	x	x	
sulfates	W			x			
conductivity	W			xx	x		
salinity	S, W			xx	x		
TDS	W			x	x		
Surfactants	S, W				x		
Pentachlorophenol	S, W				x		
pH	S, W				x		
temperature	W	xx	xx	xx	xx	xx	xx
grain size	S	xx	xx	xx	xx	xx	xx
percent moisture	S	xx	xx	xx	xx	xx	xx
total organic carbon	S	xx	xx	xx	xx	xx	xx
static water level [h]	W	xx	xx	xx	xx	xx	xx

a = Polycyclic Aromatic Hydrocarbons. The lab analysis required in this guideline detects approximately 38 individual compounds including the priority pollutant "parent" compounds and their alkylated homologs. See Table 2 for a full list of these. Note that these 38 compounds are measured with a single analytical test (i.e., there is not a separate test for each compound). When testing water for PAHs, do so for groundwater only unless ongoing surface water contamination from adjacent contaminated soil, sediment, or aquifer is suspected.

b = Total Petroleum Hydrocarbons. Certain "ranges" of hydrocarbons should be analyzed for, depending on the possible contaminating substance. For crude oil, a "full range" or "wide range" TPH scan should be conducted; for natural gas condensate a "lighter end" TPH scan, like for "gasoline range organics" (GRO), should be conducted; and for diesel fuel a TPH scan for "diesel range organics" (DRO) should be conducted. See section VI.A for details.

c = Benzene, Toluene, Ethylbenzene, Xylene. Neither sediment nor surface water typically not tested for unless ongoing contamination of these from adjacent contaminated media (soil, sediment, or aquifer) is suspected.

d = analyze all metals for Total Recoverable

e = soil (or sediment) should be tested for if mercury manometers are suspected to have been used onsite in the past (natural gas operations only)

f = analyze for alpha gross emissions (include only if this is a known component of crude oil or produced water in region where site is located)

g = analyze for both Total and Unionized fractions

h = for groundwater only

i = various solvents can be used onsite (e.g. benzene, toluene, ethylbenzene, xylene, various petroleum products, etc.). Analyte tested for depends on the particular solvent(s) used on-site.

Table 2: Polycyclic aromatic hydrocarbons (PAHs) detected by the recommended "expanded scan" analysis for PAHs (see section VI.A). These compounds include the so-called priority pollutant "parent" compounds and their alkylated homologs. Note that the 38 compounds below are measured with a single analytical test (that is, there is not a separate analytical test for each compound).

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(e)pyrene
Benzo(a)pyrene
Biphenyl
Chrysene
Chrysene, C1-
Chrysene, C2-
Chrysene, C3-

Chrysene, C4-
Dibenzo(a,h)anthracene
Dibenzothiophene
Dibenzothiophene, C1-
Dibenzothiophene, C2-
Dibenzothiophene, C3-
Fluoranthene
Fluoranthenes/Pyrenes, C1-
Fluorene
Fluorene, C1-
Fluorene, C2-
Fluorene, C3-
Ideno(1,2,3,c,d)pyrene
Naphthalene
Naphthalene, C1-
Naphthalene, C2-
Naphthalene, C3-
Naphthalene, C4-
Perylene
Phenanthrene
Phenanthrenes/Anthracenes, C1-
Phenanthrenes/Anthracenes, C2-
Phenanthrenes/Anthracenes, C3-
Phenanthrenes/Anthracenes, C4-

Note that Table 1 does not include all possible contaminants associated with oil and gas operations. Other contaminating substances involved are: caustic solutions used in natural gas sweetening (these can contain sodium, pH, amines, and EDTA contaminants); glycols used in natural gas dehydration; and surfactants, acidizing agents, corrosion inhibitors, solvents, biocides, etc. used in oil or gas well workover and completion. The Superintendent may require that contaminants associated with these substances be tested for if they are suspected of having been released on-site. See Table 1 and 2.

IV. HOW SHOULD THE SAMPLES BE COLLECTED?

A. Sample Locations

1. Soil: Baseline samples, if needed, should be collected from an area as close to the site as possible, where it is certain that no contaminating substances from the site could have reached (for example, from off-site dumping, migration from wind, surface runoff, etc.).

For soils that are known or suspected to be contaminated, samples should be collected from the spot and depth where contamination is visible or most likely. For the latter, seek out areas near machinery, tanks, valves, etc., and adjacent topographical depressions of any sort where contaminated runoff may have "puddled up" and concentrated. Where contamination is obvious, sample from the most visibly contaminated spot. Where contamination is likely but not obvious, collect samples from the top 2 inches of soil. Be sure not to collect any plant matter or surface detritus with the sample. If in sandy soil, you may need to dig down through the soil profile in search of contamination that may have moved down to deeper soil layers that have more organic matter and structure.

All samples will be grab samples (not composite). Where contamination is not obvious, sampling devices should be some type of tube or auger in order to capture equal amounts of soil over the depth of the profile, although depending on the heterogeneity of the soil matrix, a trowel may need to be used. The core of soil actually containerized should be about 2 inches long and approximately 1/2 - 2 inches in diameter. Sample collectors may have to communicate with the laboratory to ensure that enough soil is collected for the various analyses.

When sampling soil for BTEX (or other volatiles), use a coring device such as the EnCore sampler or plastic syringe to collect samples. Insert the device into the ground to the appropriate depth. Once the sample is collected, it should immediately be placed in either a headspace vial (for low-level [<0.2ppm] analyses) or a 40 mL VOA vial containing methanol (for high-level analyses) and monitoring compounds (such as surrogates). Both types of vials with appropriate Teflon-lined, silicone-backed septa should be hermetically sealed immediately. Note: Deionized water should be added to the headspace vial prior to crimp-top sealing. For detailed guidance on sampling equipment, collection, preservation, and handling for BTEX in soil, see Method 5035 in EPA's SW-846, Update III (full reference below).

The total number of samples to be collected will be site-specific and must be approved by the Superintendent. Enough samples should be collected and analyzed to adequately and reliably define contamination.

2. Sediment: Baseline samples, if needed, should be collected from areas immediately adjacent to the site, where it is reasonably certain no contaminating substances from the site (or other sites in the area) could have reached (for example, from off-site dumping, sediment transport, etc.).

As with soils, sediments known or suspected to be contaminated should be sampled from the spot and depth where contamination is visible or most likely. For the latter, seek out areas near machinery, tanks, valves, etc., and adjacent areas where potentially contaminated suspended sediments in runoff could have settled out. Collect samples from the top 2 inches of sediment (or deeper if contaminant concentrations are thought to be higher there). Sediment high in organic matter (usually darker in color) is better to collect since most oil and gas contaminants preferentially bind to this organic matter.

As with soils, all samples will be grab samples (not composite). The sampling device used should be suitable for the site-specific conditions. Sample collectors may have to communicate with the laboratory to ensure that enough sediment is collected for the various analyses.

The total number of samples to be collected will be site-specific and must be approved by the Superintendent. Enough samples should be collected and analyzed to adequately and reliably define contamination.

3. Groundwater: Groundwater samples will be required only if one of the conditions in section II exists and the Superintendent determines that hydrogeological conditions at the site are such that the groundwater under or near the site is reasonably at risk. Samples can be collected either via established monitoring wells or with "push" technology (such as Geoprobe). "Low-flow" sample collection methods should be used.

It is critical that (1) sampling occurs in the right areas (for example, one location must be upgradient of the contaminated area and two locations must be downgradient of the contaminated area toward the potential point of impact), and (2) wells are finished at the appropriate depths to intercept any contaminant plume(s) (this will require knowing the contaminants involved and their environmental fate characteristics). If "push" technology is used and samples are collected on two or more occasions, care must be taken to collect samples from exactly the same locations (or as close as possible) and from the same points in the vertical profile of the aquifer.

Use low-flow sample collection methods as per the EPA guidance document in IV.B.3 below. Note that groundwater samples should not be filtered.

If sampling groundwater for BTEX, note that these are highly volatile. Therefore, sample equipment, collection, preservation, and handling are all extremely important. For detailed guidance on these, see Method 5030 in EPA's SW-846, Update III (full reference below).

The total number of samples to be collected will be site-specific and must be approved by the Superintendent. Enough samples should be collected and analyzed to adequately and reliably define contamination.

4. Surface Water: Samples should be collected at or just downstream from operation facilities such as well heads, pump jacks, storage tanks, flowlines, pipelines, valves, connections, etc. Baseline samples, if needed, should be collected upstream from any possible influence from these facilities. All samples will be grab samples.

If contamination is obvious in a surface sheen, collect samples right at the surface, avoiding any scum, algae, or other detritus on the water surface if possible (and note in fieldbook if present). Its possible contamination could be visible or strongly suspected at the bottom of the water column (depending on the contaminating substance involved). Collect samples just off the bottom if that is the case. Note any visible contamination in the fieldbook and include in the final report.

Where contamination is not visible or strongly suspected, collect surface water samples at a depth of 3-12 inches.

If sampling water for BTEX, note that these are highly volatile. Therefore, sample equipment, collection, preservation, and handling are all extremely important. For detailed guidance on these, see Method 5030 in EPA's SW-846, Update III (full reference below).

The total number of samples to be collected will be site-specific and must be approved by the Superintendent. Factors such as flow, depth, and surface area covered will be important. Enough samples should be collected and analyzed to adequately and reliably define contamination.

B. Specific Sample Collection Protocol Documents

Once the exact sample locations have been determined, the next step is to collect the actual samples. There are a wide variety of sampling devices and techniques available and site-specific conditions will usually dictate which of these to use. Protocols for sample collection can be taken from the documents listed below. For soil, sediment, and surface water, acceptable sample collection protocols other than those listed below are available. The collection methodology and/or guidance documents to be used must be briefly described or cited in the sample plan (section VIII).

1. Soil: Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

2. Sediment: Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

3. Groundwater: Environmental Protection Agency. 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. EPA/530/R-93-001. Office of Solid Waste, EPA, Washington, D.C.
For guidance on low-flow sampling, see: Puls, R.W. and M.J. Barcelona. 1996. Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA/540/S-95/504. Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

4. Surface Water: Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

Stednick, J.D. and D.M. Gilbert. 1998. Water quality inventory protocol: Riverine environments. National Park Service, Water Resources Division, Technical Report no. NPS/NRWRD/NRTR-98/177. Fort Collins, CO, 103 pp.

C. Sample Containers, Preservation, Storage

See documents listed in Section VI.A below for this information, including 40 CFR Part 136 if necessary. Note that sediment samples should not be acidified for metals and that neither groundwater nor surface water samples should be filtered. Remember special conditions when sampling for BTEX (methods 5030 and 5035 in SW-846, Update III) and for any metals requiring unusually low detection limits.

D. Chain of Custody

Proper chain-of-custody procedures must be used in sample handling (collection, shipping, storage, analysis). For guidance, see Standard Methods for the Examination of Water and Wastewater for general information, and SW-846, Update III, Chapter 9, for detailed information.

V. QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) plans ensure that the data generated are scientifically valid, defensible, and of known precision and accuracy. Some of the basic elements of QA/QC plans are data quality objectives (DQO); field operating procedures (such as sample management, decontamination, equipment calibration, etc.); field QA/QC requirements (such as data handling, collection of control samples like blanks, spikes and duplicates, etc.); lab operating procedures (such as sample management, equipment calibration, etc.); and lab QA/QC procedures (such as data handling, control samples, etc.). An acceptable QA/QC plan must be in place before either Tier I or Tier II sampling can begin. The plan or guidance document that will be used must be cited in the sample plan (see section VIII). Many guidance documents are available—several through EPA—including the following, recommended here:

Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

Adherence to the QA/QC plan must be properly documented throughout the project and demonstrated in the final report to the Superintendent.

Other quality assurance requirements that are more general are given in the sample plan discussion in section VIII.A below. These are less specific than those in SW-846, for example, but no less important in ensuring that the sampling effort is worthwhile and achieves its objectives.

VI. HOW SHOULD THE SAMPLES BE ANALYZED IN THE LABORATORY?

A. Analytical Methods

Metals analyses must use the methods in EPAs SW-846, Update III (or more recent, see full reference above). This applies to soil, sediment, groundwater, and surface water samples. Groundwater and surface water methods can also include EPAs 200 series, or the 1600 series where extremely low (state-of-the-art) detection limits are desired for metals.

PAH analyses must use a modification of EPA's SW-846, Update III method 8270, developed by the National Oceanic and Atmospheric Administration (NOAA). This method is referred to as "GC/MS method 8270 in selective ion mode (SIM)," and is informally referred to as the "expanded scan" for PAHs. Consult the following for a detailed explanation of methodology:

Lauenstein, G.G., and A.Y. Cantillo (1998). Sampling and analytical methods of the National Status and Trends Program Mussel Watch Project: 1993-1996 update. NOAA Technical Memorandum NOS ORCA 130. 233 pp.

TPH analyses will be for a certain "range" of hydrocarbons, depending on the contaminating substance that may be present. For crude oil, a "wide range" or "full range" TPH scan should be conducted (this includes the heavier fractions); for natural gas condensate a "lighter end" TPH scan, like for "gasoline range organics" (GRO), should be conducted; and for diesel fuel, a TPH scan for "diesel range organics" (DRO) should be conducted. Although many analytical methods are available for TPH scans, samples should be analyzed using only GC/FID (gas chromatograph/flame ionization detection) methodology, such as EPA's SW-846, Update III method 8015B.

BTEX analyses should use EPA's SW-846, Update III method 8260B.

Ammonia analyses should use EPA method 350.1 (or equivalent APHA method 4500-NH3 H, or USGS method 4523-85). Samples should not be filtered.

For all other contaminants in Table 1, use methods approved in 40 CFR Part 136. If the method is not there, use the latest edition of Standard Methods for the Examination of Water and Wastewater as guidance.

B. Laboratories

Samples must be sent to an EPA-certified lab for analyses. Note, however, that very few labs nationwide (perhaps a dozen) currently can perform the Tier II PAH analysis as specified above. Here is a partial list of those that can (no government endorsement implied):

Arthur D. Little, Inc.
25 Acorn Park
Cambridge, MA 02140
(617) 498-5000

Battelle Marine Science Lab
1529 West Sequim Bay Road
Sequim, WA 98382
(360) 683-4151

Battelle
397 Washington Street
Duxbury, MA 02332

Geochemical and Environmental Research Group
Texas A&M University
833 Graham Road
College Station, TX 77845
(409) 862-2323 ext. 115

Woods Hole Group, Environmental Laboratories
375 Paramount Drive., Suite B
Raynham, MA 02767-5154
(508) 822-9300

If the sample plan submitted by the owner/operator for Superintendent approval (see section VIII) reveals that the laboratory cannot achieve all of the detection limits listed in Table 3 (section VII), the owner/operator should find another lab that can.

VII. DETECTION LIMITS AND ENVIRONMENTAL BENCHMARK CONCENTRATIONS

Labs must achieve the detection limits (DLs) in Table 3 below. These DLs are below federal (and presumably state) standards and most other environmental benchmarks currently in the literature. Therefore, analytical methods that achieve these DLs will be able to indicate if even the strictest standards and criteria are being met. Note, however, that for two contaminants—PAHs and mercury—the DL is not below the strictest standard or criteria cited for these. This is because many labs cannot achieve DLs that low, and the DLs in the table were chosen so that most/all EPA-certified labs could achieve them. Lower DLs are possible for these contaminants upon special request to the appropriate lab.

For the contaminants in Table 1 that are not listed in this table, commonly reported DLs are acceptable.

Table 3: Maximum acceptable detection limits for surface water, groundwater, soil, and sediment samples. Lower detection limits are also acceptable.

contaminant	detection Limit for surface water and groundwater samples	detection Limit for soil and sediment samples (dry weight)
PAHs	10 ppt [a]	1 ppb [c]
TPH	50 ppb	0.1 ppm
benzene	1 ppb	25 ppb
toluene	5 ppb	25 ppb
ethylbenzene	5 ppb	25 ppb
xylene	5 ppb	25 ppb
arsenic	5 ppb	0.5 ppm
barium	1 ppb	1 ppm
cadmium	0.5 ppb	0.2 ppm
chromium	3 ppb	1 ppm
copper	5 ppb	1 ppm
lead	1 ppb	5 ppm
mercury	0.2 ppb [b]	0.2 ppm [d]
nickel	5 ppb	5 ppm
selenium	1 ppb	1 ppm
strontium	10 ppb	5 ppm
vanadium	10 ppb	1 ppm
zinc	10 ppb	5 ppm

water units:
ppb = parts per billion = micrograms per liter = ug/L
ppt = parts per trillion = nanograms per liter = ng/L
soil/sediment units:
ppm = parts per million = milligrams per kilogram = mg/kg = micrograms per gram = ug/g
ppb = parts per billion = micrograms per kilogram = ug/kg = nanograms per gram = ng/g

a - DLs as low as 1 ppt may be achievable
b - DLs as low as 0.1 ppb, or even 10 ppt, may be achievable
c - DLs as low as 0.25 ppb may be achievable
d - DLs as low as 25 ppb, or even 1 ppb, may be achievable

It is the superintendent's decision as to which standard or environmental benchmark to adopt as the level of protection for the site. (Not all contaminants have enforceable standards but almost all have some sort of published criteria or level of toxicity.) Since the detection limits (except for PAHs and mercury) in Table 3 that labs will be reporting are below all current standards and nearly all criteria and benchmarks, choosing the level of protection can be done after the samples have been analyzed.

For PAHs and mercury, if a site is particularly sensitive, pristine, or important to the park, the Superintendent may wish to choose the strictest available standards or benchmarks as the level of protection for PAHs and mercury. He/she would then have to request some lower DL (lower than those in Table 3) from the lab for these. Sample collectors should also be alerted since special collecting and handling techniques may be required.

For an extensive list of federal standards and other published environmental benchmarks for most of the contaminants in Table 1, consult NPS WRD's "Environmental Contaminants Encyclopedia" at the website http://www.aqd.nps.gov/toxic. There may also be state standards or other benchmarks not in this encyclopedia that the superintendent wishes to choose as the level of protection for a particular contaminant at a particular site.

VIII. SAMPLE PLAN AND REPORTING REQUIREMENTS

A. Sample Plan

Owner/operators should submit a sample plan to the superintendent for approval before sampling can begin. Since the superintendent will determine the exact sample locations by walking the site (presumably with the owner/operator and/or sample collector), submission of the sample plan will be after this occurs. The plan must include:

- sampling objectives (what question(s) will data hope to answer?)
- the contaminating substances under investigation
- list of individual contaminants that will be tested for
- analytical methods that will be used
- brief description of sample collection methodology and/or citation of specific guidance documents
- sample locations (be as specific as possible)
- type of samples to be collected (soil, sediment, groundwater, surface water)
- number of samples to be collected (be as specific as possible)
- detection limits that will be achieved for each sample type and contaminant
- citation of QA/QC guidance document(s) to be used

B. Reporting Requirements

Upon completion of the lab analyses, a report shall be submitted to the Superintendent. This report shall include:

- sample location name and/or ID number
- description of sample locations (including maps, sketches, photos, and stakes if necessary, nearby landmarks, etc.); must be detailed enough so that sampling at the same location, depth, etc. can be accurately duplicated by someone else at a later date.
- brief description of the sample area (topography, vegetation, surface water, apparent soil conditions, etc.)
- date and time of sampling
- date and time of analysis
- type of sample (soil, sediment, groundwater, surface water)
- sample depth
- name of the sample collector
- analytical results
- lab QA/QC results
- full name of contaminant tested for
- analytical method/procedure name
- sample fraction (for example, total recoverable, suspended, etc.)
- measurement units (mg/kg, µg/L, etc.)
- percent moisture (if soil or sediment samples)
- wet weight or dry weight units (if soil or sediment samples)

- method/procedure detection limits
- minimum quantification limits (a.k.a. method reporting limit) for the method/procedure
- indication of whether it was measured in the field or lab
- description of any lab sample preparation procedures
- description of sample container and preservation (for example, glass, cool to 4°C, adjust pH <2 with H_2SO_4, etc.)
- name and model number of field and/or lab equipment
- name of the chemist/lab technician that analyzed the samples
- notes related to QA/QC plan
- appropriate chain-of-custody forms

IX. IN CASE OF A SPILL

36 CFR 9B requires that each owner/operator's Plan of Operations contain a "contaminating or toxic substance spill control plan." Spill Prevention, Control, and Countermeasure (SPCC) plans required of owner/operators by OPA '90 are also acceptable. These plans discuss required clean-up equipment and procedures. Additionally, elevated concentrations of contaminants (such as from a larger spill) may trigger regulatory involvement from other federal or state agencies that have their own mitigation protocols and requirements for how to proceed.

The superintendent may want to require some form of follow-up sampling (as per the individual contaminants and methods in this guideline) if he/she believes contamination at a site has not been satisfactorily remediated. The superintendent should note that it could be to the park's advantage to consult the Environmental Response, Planning and Assessment Unit of the Environmental Quality Division (EQD) of the NPS immediately after a release, even before any samples are collected to assess damage.

APPENDIX I

ONSHORE OIL AND GAS ORDER NO. 2

Bureau of Land Management, Department of the Interior
Section III.G., Drilling Abandonment Requirements
From Federal Register, Vol. 53, No. 223,
Friday, November 18, 1988, pages 46810 and 46811

G. Drilling Abandonment Requirements

The following standards apply to the abandonment of newly drilled dry or non-productive wells in accordance with 43 CFR 3162.3-4 and section V of Onshore Oil and Gas Order No. 1. Approval shall be obtained prior to the commencement of abandonment. All formations bearing usable-quality water, oil, gas, or geothermal resources, and/or a prospectively valuable deposit of minerals shall be protected. Approval may be given orally by the authorized officer before abandonment operations are initiated. This oral request and approval shall be followed by a written notice of intent to abandon filed no later than the fifth business day following oral approval. Failure to obtain approval prior to commencement of abandonment operations shall result in immediate assessment of under 43 CFR 3163.1(b)(3). The hole shall be in static condition at the time any plugs are placed (this does not pertain to plugging lost circulation zones). Within 30 days of completion of abandonment, a subsequent report of abandonment shall be filed. Plugging design for an abandonment hole shall include the following:

1. Open Hole

   i. A cement plug shall be placed to extend at least 50 feet below the bottom (except as limited by total depth (TD) or plugged back total depth (PBTD)), to 50 feet above the top of:

      a. Any zone encountered during drilling which contains fluid or gas with a potential to migrate;

      b. Any prospectively valuable deposit of minerals.

   ii. All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of hole, plus an additional 10 percent of slurry for each 1,000 feet of depth.

   iii. No plug, except the surface plug, shall be less than 25 sacks without receiving specific approval from the authorized officer.

   iv. Extremely thick sections of a single formation may be secured by placing 100-foot plugs across the top and bottom of the formation, and in accordance with item ii hereof.

   v. In the absence of productive zones or prospectively valuable deposits of minerals which otherwise require placement of cement plugs, long sections of open hole shall be plugged at least every 3,000 feet. Such plugs shall be placed across in-gauge sections of the hole, unless otherwise approved by the authorized officer.

2. Cased Hole. A cement plug shall be placed opposite all open perforations and extend to minimum of 50 feet below (except as limited by TD or PBTD) to 50 feet above the perforated

interval. All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of hole, plus an additional 10 percent of slurry for each 1,000 feet of depth. In lieu of the cement plug, a bridge plug is acceptable, provided:

i. The bridge plug is set within 50 feet to 100 feet above the open perforations;

ii. The perforations are isolated from any open hole below; and,

iii. The bridge plug is capped with 50 feet of cement. If a bailer is used to cap this plug, 35 feet of cement shall be sufficient.

3. Casing Removed from Hole. If any casing is cut and recovered, a cement plug shall be placed to extend at least 50 feet above and below the stub. The exposed hole resulting from the casing removal shall be secured as required in items 1i and 1ii hereof.

4. An additional cement plug placed to extend a minimum of 50 feet above and below the shoe of the surface casing (or intermediate string as appropriate).

5. Annular Space. No annular space that extends to the surface shall be left open to the drilled hole below, If this condition exists, a minimum of the top 50 feet of annulus shall be plugged with cement.

6. Isolating Medium. Any cement plug which is the only isolating medium for a fresh water interval or a zone containing a prospectively valuable deposit of minerals shall be tested by tagging with the drill string. Any plugs placed where the fluid level will not remain static also shall be tested by either tagging the plug with the working pipe string, or pressuring to minimum pump (surface) pressure of 1,000 psi, with no more than a 10 percent drop during a 15-minute period (cased hole only). If the integrity of any other plug is questionable, or if the authorized officer has specific concerns for which he/she orders a plug to be tested, it shall be tested in the same manner.

7. Silica Sand or Silica Flour. Silica sand or silica flour shall be added to cement exposed to bottom hole static temperatures above 230mF to prevent heat degradation of the cement.

8. Surface Plug. A cement plug of at least 50 feet shall be placed across all annuluses. The top of this plug shall be placed as near the eventual casing cutting point as possible.

9. Mud. Each of the intervals between plugs shall be filled with mud of sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling such interval. In the absence of other information at the time plugging is approved, a minimum mud weight of 9 pounds per gallon shall be specified.

10. Surface Cap. All casing shall be cut-off at the base of the cellar or 3 feet below final restored ground level (whichever is deeper). The well bore shall then be covered with a metal plate at least ¼ inch thick and welded in place, or a 4-inch pipe, 10-feet in length, 4 feet above ground and embedded in cement as specified by the authorized officer. The well location and identity shall be permanently inscribed. A weep hole shall be left if a metal plat is welded in place.

11. The cellar shall be filled with suitable material as specified by the authorized officer and the surface restored in accordance with the instructions of the authorized officer.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ARPA	Archeological Resources Protection Act
ASMIS	NPS Archeological Sites Management Information System
BCF	billion cubic feet (of gas)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLI	Cultural Landscape Inventory
CNRAs	Coastal Natural Resource Areas
COAs	Conditions of Approval
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act of 1972
dBA	Decibels (A-weighted sound pressure level measurement)
DCP	Development Concept Plan
DEIS	Draft Environmental Impact Statement
DM	Departmental Manual
DO-2	Director's Order 2, NPS Planning Process Guidelines
DO-12	Director's Order 12, NPS NEPA Guidelines
DO-28	Director's Order 28, NPS Cultural Resources Management Guidelines
DO-66	Director's Order 66, NPS Minerals Management Guidelines
DO-77	Director's Order 77, NPS Natural Resources Management Guidelines
DO-77.1	Director's Order 77.1, Protection of Wetlands Guidelines
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act of 1973
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FWS	U.S. Fish and Wildlife Service
GIWW	Gulf Intracoastal Waterway
GLO	Texas General Land Office
GMP	General Management Plan
GPS	Global Positioning System
H_2S	Hydrogen Sulfide
IDT	Interdisciplinary Team
mg/Kg	milligram per Kilogram
Mg/L	milligram per Liter
NAD	North American Datum
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
PA	NPS Servicewide Programmatic Agreement Between NPS, SHPO, and ACHP
pers. comm.	personal communication
ppt	parts per trillion
PSD	Prevention of Significant Deterioration
RFD	Reasonably Foreseeable Development

ROD	Record of Decision
ROW	Right-of-Way
RV	Recreational Vehicle
SFM	Statement for Management
SHPO	State Historic Preservation Officer
SOF	Statement of Findings
SPCC	Spill Prevention, Control, and Countermeasure Plan
SRA	Sensitive Resource Area
TCMP	Texas Coastal
T&E	Threatened and Endangered (plants and animals)
USGS	U.S. Geological Survey

GLOSSARY

Abandonment: The termination of oil and gas production operations, removal of facilities, plugging of the well bore, and reclamation of surface disturbances.

Access: Any way, means, or method of entering or traversing on, across, or through federally owned or controlled lands or waters (36 CFR §.30(a)), including but not limited to: vehicle, watercraft, fixed-wing aircraft, helicopter, offroad vehicle, mobile heavy equipment, snowmobile, pack animal, and foot.

Affected Environment: Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by oil and gas activities. The environment of the area to be affected or created by the alternatives under consideration. (40 CFR 1502.15)

Alternative: A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision-making. An alternative need, not substitute, for another in all respects.

Alternative, No-Action: An alternative that maintains established trends or management direction.

American Petroleum Institute: Founded in 1920, this national oil trade organization is the leading standardizing organization on oil field drilling and producing equipment. It maintains departments of transportation, refining, and marketing in Washington, D.C., and a department of production in Dallas.

Aquifer: (1) A layer of material that contains water. (2) The part of a water-drive reservoir that contains the aquifer.

Barrel: A measure of volume for petroleum products. One barrel is the equivalent of 42 U.S. gallons or 0.15899 cubic meters. One cubic meters equals 6.2897 barrels.

Billion Cubic Feet (BCF): Measurement of Gas at Standard pressure and temperature, measured in billion cubic feet of gas.

Biological Diversity: The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

Blowout: An uncontrolled explosion of gas, oil, or other fluids from a drilling well. A blowout or "gusher" occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid and when blowout prevention equipment is absent or fails.

Blowout Preventer (BOP): One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling or completion operations.

Brine: Water containing relatively large concentrations of dissolved salts, particularly sodium chloride. Brine has higher salt concentrations than ordinary ocean water.

Buffer Zone: An area between two different land uses that is intended to resist, absorb, or otherwise preclude developments or intrusions between the two use areas.

Cement Casing: To fill the annulus between the casing and hole with cement to support the casing and prevent fluid migration between permeable zones.

Christmas Tree: The control valves, pressure gauges, and chokes assembled at the top of a well to control the flow of oil and gas after the well has been completed.

Completion: The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Conditions of Approval (COAs): Provisions or requirements under which a Plan of Operations is approved.

Contaminating Substance: Those substances, including but not limited to, salt water or any other injurious or toxic chemical; waste oil or waste emulsified oil; basic sediment; mud with injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effort on the environment, conducts environmental studies, and advises the President on environmental matters.

Cultural Landscape: A cultural landscape is a geographic area, including both cultural and natural resources and the wildlife and domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes.

Drilling Fluid ("Mud"): Circulating fluid, one function of which is to force cuttings out of the wellbore and to the surface. While a mixture of clay, water, and other chemical additives is the most common drilling fluid, wells can also be drilled using air, gas, or water as the drilling fluid.

Development Concept Plan (DCP): The Development Concept Plan bridges the gap between the General Management Plan and the comprehensive or preliminary design, providing guidance for the development and use of a particular geographic area within a park.

Directional Drilling: Intentional deviation of a wellbore from the vertical (90 degrees). Although wellbores are normally drilled vertically, it is sometimes necessary or advantageous to drill at an angle from the vertical.

Dry Hole: Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas, or even oil, but not enough to justify production.

Effects: see Impacts

Endangered Species: Federally listed: any species of animal or plant in danger of extinction throughout all or a significant portion of its range; state (group I): species whose prospect of survival or recruitment in the state are in jeopardy in the foreseeable future; state (group II): species whose prospect of survival or recruitment within the state may become jeopardized in the near future.

Environmental Assessment (EA): A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact. An EA includes a brief discussion of the need for a proposal, the alternatives considered, the environmental impacts of the proposed action and alternatives, and a list of agencies and individuals consulted.

Environmental Impact Statement (EIS): A document prepared to analyze the impacts on the environment of a proposed project or action and released to the public for comment and review. An EIS must meet the requirements of NEPA, CEQ, and the directives of the agency responsible for the proposed project or action.

Federally Owned and Controlled Lands: Land that the United States possesses fee title through purchase, donation, public domain, or condemnation. It also includes land in which the United States holds any interest, such as a lease, easement, rights-of-way, or cooperative agreement.

Federally Owned and Controlled Waters: All surface waters in the boundaries of a National Park System unit without regard to whether the title to the submerged lands lies within the United States or another party.

Gas: Any fluid, either combustible or noncombustible, which is produced in a natural state from the earth, and which maintains a gaseous or rarefied state at ordinary temperature and pressures (36 CFR §9.31(m)).

General Management Plan (GMP): The GMP is the major planning document for all National Park System units. The GMP sets forth the basic philosophy for managing a unit, and provides strategies for resolving issues and achieving identified management objectives over a 5 to 10-year period. The GMP includes an environmental impact assessment and other required compliance documentation.

In a GMP, the National Park Service should prescribe general strategies for managing nonfederal oil and gas exploration and development if such activity is an issue in a unit. Pertinent information that might be included in a GMP includes:

- where and when nonfederal oil and gas operations may occur under statutory or regulatory authorities;
- impacts of exploration and development on unit resources and values;
- location of nonfederal oil and gas rights in relation to areas planned for park-related development, preservation, or interpretation; and
- existing or potential impacts from nonfederal oil and gas activity conducted on lands adjacent to the unit.

The GMP also establishes "management zones" in a unit according to criteria and procedures contained in DO-2 (NPS Director's Order, Planning Process). Management zoning is prescriptive, based on surface resources and visitor-related values.

Hydrocarbons: Organic compounds of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. The smallest molecules of hydrocarbons are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

Impacts: ***Direct Impacts*** are caused by the action and occur at the same time and place. ***Indirect Impacts*** are caused by the action and are later in time or farther removed in distance, but are still anticipated. ***Cumulative Impacts*** are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Impermeable: Preventing the passage of fluid. A formation may be porous yet impermeable if there is an absence of connecting passages between the voids within it.

Lease: A legal document executed between a landowner, as lessor, and a company or individual, as lessee, that grants the right to exploit the premises for minerals or other products.

Long-term: Describes impacts that would occur over a 20-year period.

Management Policies: National Park Service Management Policies is the basic Servicewide policy document of the National Park Service and will be revised at appropriate intervals to consolidate servicewide policy decisions. The management of the National Park System and NPS programs is guided by the U.S. Constitution, public laws, proclamations, executive orders, rules and regulations, and directives of the Secretary of the Interior and the Assistant Secretary for Fish and Wildlife and Parks. Other laws, regulations, and policies related to the administration of federal programs, although not cited, may also apply.

Mitigation: Includes:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.

2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

3. Rectifying the impact of repairing, rehabilitating, or restoring the affected environment.

4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

5. Compensating for the impact by replacing or providing substitute resources or environments.

National Environmental Policy Act of 1969 (NEPA): Public Law 91-190. Establishes environmental policy for the nation. Among other items, NEPA requires federal agencies to consider environmental values in decision-making processes.

National Register of Historic Places (NRHP): A listing of architectural, historical, archeological, and cultural sites of local, state, or national significance, established by the Historic Preservation Act of 1966 and maintained by the National Park Service.

Natural Gas: A highly compressible, highly expandable mixture of hydrocarbons having a low specific gravity and occurring naturally in a gaseous form. Besides hydrocarbon gases, natural gas may contain appreciable quantities of nitrogen, helium, carbon dioxide, and contaminants.

No Ground Disturbance: In general, applies to an area where an activity is allowed, so long as it does not disturb the surface.

No Surface Occupancy (NSO): A constraint that prohibits occupancy or disturbance on all or part of the land surface to protect special values or uses. Operators may exploit the oil and gas resources under the surface restricted by this constraint through use of directional drilling from sites outside the NSO area.

Oil: Any viscous, combustible liquid hydrocarbon or solid hydrocarbon substance easily liquefiable on warming, which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas without resort to manufacturing processes.

Operations: Defined as "all functions, work and activities within a unit in connection with exploration for and development of oil and gas resources." (36 CFR §9.31(c)). Operations include, but are not limited to:

- reconnaissance to gather natural and cultural resources information;
- line-of-sight surveying and staking;
- geophysical exploration;
- exploratory drilling;
- production, gathering, storage, processing, and transport of petroleum products;
- inspection, monitoring, and maintenance of equipment;
- well "work-over" activity;
- construction, maintenance, and use of pipelines;
- well plugging and abandonment;
- reclamation of the surface; and
- construction or use of roads, or other means of access or transportation, on, across, or through federally owned or controlled lands or waters.

If an operator desires to conduct nonfederal oil and gas operations in a National Park System unit, and operations require access on, across, or through federally owned or controlled lands or waters, the 36 CFR Part 9B regulations require that the operator:

- possess a right to the nonfederal oil and gas in the unit (36 CFR §9.36(a) (2)),
- file a plan of operations with the NPS and receive approval from the Regional Director prior to commencing operations (36 CFR §9.32(a)), and
- submit a performance bond or security deposit to the NPS (36 CFR §9.48(a)).

Operator: Person(s) who may have rights to explore and develop nonfederally owned oil and gas in NPS units, including:

- Owners: individuals, corporations, local and state governments, Indian tribes (when the tribe owns the oil and gas in fee)., etc.;
- Lessees: individuals or corporations that lease oil and gas from the owner; and
- Contractors: individuals or corporations under contract with the owner, lessee, or operator.

Organic Act: Congress formally established the National Park Service by the Act of August 25, 1916, which is commonly called the National Park Service Organic Act. The Organic Act mandates the Service"...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1 *et seq.).* This unambiguous statement of purpose for the National Park System directs that preservation and public enjoyment of the natural, scenic, and cultural resources in a manner that leaves them unimpaired is the fundamental purpose of all national parks, monuments, and other reservations.

The Organic Act authorized the Secretary of the Interior to promulgate rules and regulations necessary for the management of the national parks, monuments, and other reservations under the Secretary's jurisdiction (16 U.S.C. §3). This authority, among others, provides the basis for the regulations in 36 CFR Chapter 1, including the NPS regulations in 36 CFR Part 9, governing mining claims and nonfederally owned oil and gas.

Plan of Operations: Application submitted by an operator describing how proposed oil and gas operations would be conducted in a unit of the National Park System pursuant to the NPS's Nonfederal Oil and Gas Rights Regulations, 36 CFR 9B, and containing information requirements pertinent to the type of operations being proposed (36 CFR §9.36(a) through (d)).

Reclamation: The process of returning mined land to a condition that will be approximately equivalent to the pre-mining condition terms of sustained support of functional physical processes, biological productivity, biological organisms, and land uses.

Regional Director: There are seven geographic regions under which the units of the National Park System are organized. Padre Island National Seashore is located within the Intermountain Region of the National Park Service. The Regional Director is the chief decision-maker.

Revegetation: The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance, such as seed bed preparation, reseeding, and mulching.

Scoping Process: An early and open public participation process for determining the scope of issues to be addressed in an Environmental Impact Statement, and for identifying significant issues related to a proposed action.

Shut-in well: An oil and gas well in which the inlet and outlet valves have been shut off so that it is capable of production but is temporarily not producing.

Significant: "Significant" as used in NEPA (40 CFR 1508.27), requires considerations of both context and intensity:

- **Context.** This means that the significance of an action must be analyzed in several contexts, such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

- **Intensity**. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

  1. Impacts that may be both beneficial and adverse. A significant effect may exit even if the federal agency believes that on balance the effect will be beneficial.

  2. The degree to which the proposed action affects public health or safety.

  3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, and wild and scenic rivers, or ecologically critical areas.

  4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

  5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

  6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

  7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

  8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for the listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historic resources.

  9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

  10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

Split Estate: Refers to the situation where the mineral estate is owned or controlled by a party (usually, but not always, the federal government) other than the owner of the land surface in the same area.

Statement for Management (SFM): A National Park Service planning document used to guide short- and long-term management of a unit; to determine the nature and extent of planning required to meet the unit's management objectives; and, in the absence of more specific planning documents, to provide a general framework for directing park operations and communicating park objectives to the public.

Superintendent: The Superintendent (or his/her designee) of the unit of the National Park System containing lands subject to the rights covered by the Nonfederal Oil and Gas Rights Regulations, 36 CFR 9B.

Threatened Species: Any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.

Timing Limitation (Seasonal Restriction): Constraint that prohibits surface use during specified time periods to protect identified resource values. The constraint does not apply to the operation and maintenance of production facilities unless analysis demonstrates that such constraints are needed and that less stringent, project-specific constraints would be insufficient.

Vertical Drilling: Drilling of a well vertically (90 degrees) to reach a target zone straight underneath the surface location.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people for live in island territories under U.S. Administration.