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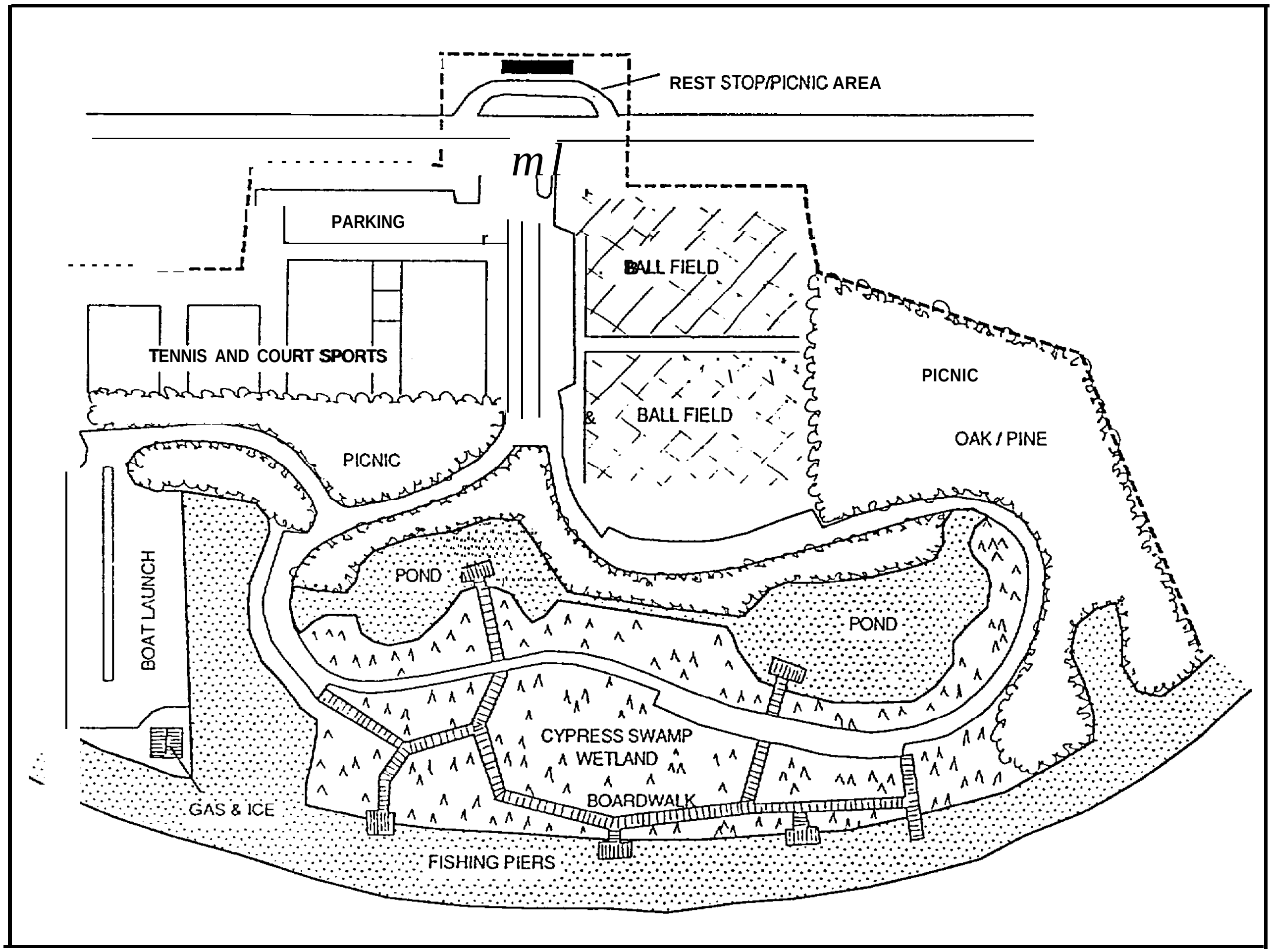
ALTERNATIVE ECONOMIC DEVELOPMENT OPPORTUNITIES
FOR OCS-RELATED FACILITIES AND INFRASTRUCTURE




June 1990

OCS Study
MMs 90-

# ALTERNATIVE ECONOMIC DEVELOPMENT OPPORTUNITIES FOR OCS-RELATED FACILITIES AND INFRASTRUCTURE

FINAL

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# L INTRODUCTION

The Gulf of Mexico is the center of offshore oil and gas exploration and production for the United States. Since the Kerr-McGee well was located out of the site of land in 1947 (Davis and Place 1983), more than 20,000 offshore oil and/or gas wells have been drilled. Offshore activities cannot exist without an extensive network of supply and support bases on the nearby land. Within the Gulf states of Texas, Louisiana, Mississippi and Alabama, hundreds of businesses have formed during the last 40 years to serve the industry (Davis and Place 1983). Population expansions of many communities that are oriented toward offshore oil and gas, such as Morgan City, Houma, and Intracoastal City, Louisiana, as well as Houston, Texas, can be traced directly to the growth in demand for oil and gas. In fact, the economies of these towns became almost completely oriented to this single business.

When the prices of oil plummeted in 1983, communities were devastated by massive layoffs. Without jobs, skilled and semi-skilled workers and professionals could not finance their debts on homes, cars, boats, and petroleum-related enterprises. Oil companies reduced their work forces; consequently, subcontractors felt the impact. Supply bases were closed; platform yards became idle; and ships, machinery, and buildings were abandoned to creditors or placed in storage in anticipation of future demands.

This onshore infrastructure and an available and intelligent work force offers a tremendous opportunity for the Gulf Coast states to diversify their economies to become less dependent on the oil and gas industry. The public and private sectors can initiate various programs and projects that will benefit the economy of the state and region in the long term and place people back to work in the short term.

The team has investigated as complete a set of alternative opportunities as possible, including, but not limited to, other mineral resources development, secondary and tertiary petrochemical opportunities, commercial fisheries, aquiculture, tourism and recreation, ports, transportation, and manufacturing. The purpose of this study is to present practical concepts applied to long-term solutions for using the available OCS-related infrastructure and taking advantage of OCS-related environmental enhancement where it occurs. Although the emphasis is placed on involving the private sector to the maximum extent, the public sector must be willing to cooperate in some of the joint ventures. Planning and design should begin as soon as possible because it takes a considerable period of time to formulate an acceptable project for the many federal, state, and local regulatory agencies. In addition to the lengthy engineering phase, the environmental process has proven to be quite time-consuming. Job training in support of these proposals should be offered in regional vocational and technical training institutions; and financial assistance must be made available through commercial lenders. Finally, government participation is essential because several of the proposals are public works projects.

The following section presents an overview of the physical, biological, and cultural systems and characterizes the setting of the study area. Section III describes OCS-related infrastructure and environmental modifications so that it is then possible to propose alternative uses and project scenarios for implementation. Section IV discusses the framework of economic development organizations and an overview of the economic development challenges confronting communities in the Gulf of Mexico region. Finally, Section V recommends alternatives for the private and public sectors to pursue.

# II. THE COASTAL SETTING

The study area includes 49 counties and parishes between Mexico and the Alabama-Florida state line. Four identifiable regions can be mapped: the Texas Barrier Island System, the Strandplain-Chenier Plain System, the Mississippi Deltaic System, and the Mississippi-Alabama System (Figure 2-1). Each region is a combination of physical forms and processes, vegetation assemblages, and cultural patterns that present distinct advantages for economic opportunities in addition to those associated with oil and gas activities. The characteristics of and the advantages in each region are discussed below.

## A. Texas Barrier Island System

The Texas Barrier Island System extends from the United States-Mexico Border on the south to Galveston Bay on the north. A system of barrier islands and beaches extends from Mexico to, and including, the Bolivar Peninsula. A series of bays and lagoons separates the beaches from the mainland, The islands and peninsulas are long, narrow bodies of land composed of sand and shell with maximum elevations of just over 20 ft. As with all shorelines, this one is dynamic, regressing in the center of the system and retreating at both extremes. Structures, such as jetties and sea walls, interfere with the natural erosional and depositional cycles so that within given segments of coast, accretion is occurring but in adjacent areas accelerated erosion may be taking place. W ashovers are also common, as the entire coast is subject to hurricanes and the accompanying storm surges.

Separating the islands and peninsulas and connecting the lagoons and bays with the Gulf are tidal passes which, in their natural condition, would be shallow and have tidal deltas. However, most of the passes have jetties and are part of the deep-draft navigation system from the Gulf through the lagoons and bays to the ports. Channel dredging requires an active and continuous maintenance program, and in some estuaries, spoil islands now serve as industrial sites and as part of a port complex.

The mainland, a flat plain dissected by wide river valleys and estuaries (Figure 2-2), gradually increases in elevation toward the interior. Storm surge is a problem because of the frequency of hurricanes and the low elevations along the shorelines. These older Pleistocene surfaces have a better suitability for buildings and roads than do the unconsolidated surface materials of the barrier islands and peninsulas.

By the late 1970s, there were approximately 413,000 ac of wetlands (e.g., fresh to saline marshes) in coastal Texas (Longley 1981). Within the Texas Barrier Island System, marshes are limited to the back side of barrier islands, or they fringe the mainland-estuary interface (Figure 2-3). These fringing marshes are saline with oystergrass and saltgrass being the dominant species. Fresh marshes contain the greatest variety of plant species. They occupy small ponds on barrier islands and interior portions of the mainland that have sufficient freshwater impact.

In the southern portion of this system where the climate is semi-arid, marshes are replaced by wind-tidal flats and washover fans sparsely covered by algal mats and very salt-tolerant species such as maritime saltgrass and glassworts. The hypersaline lagoons are relatively clear because of the limited freshwater inflow, thereby permitting development of extensive grassbeds, such as turtlegrass, shoalgrass, and Halophilia, within the lagoons. With the exception of the Brazes River floodplain, fluvial forests are very limited in extent and

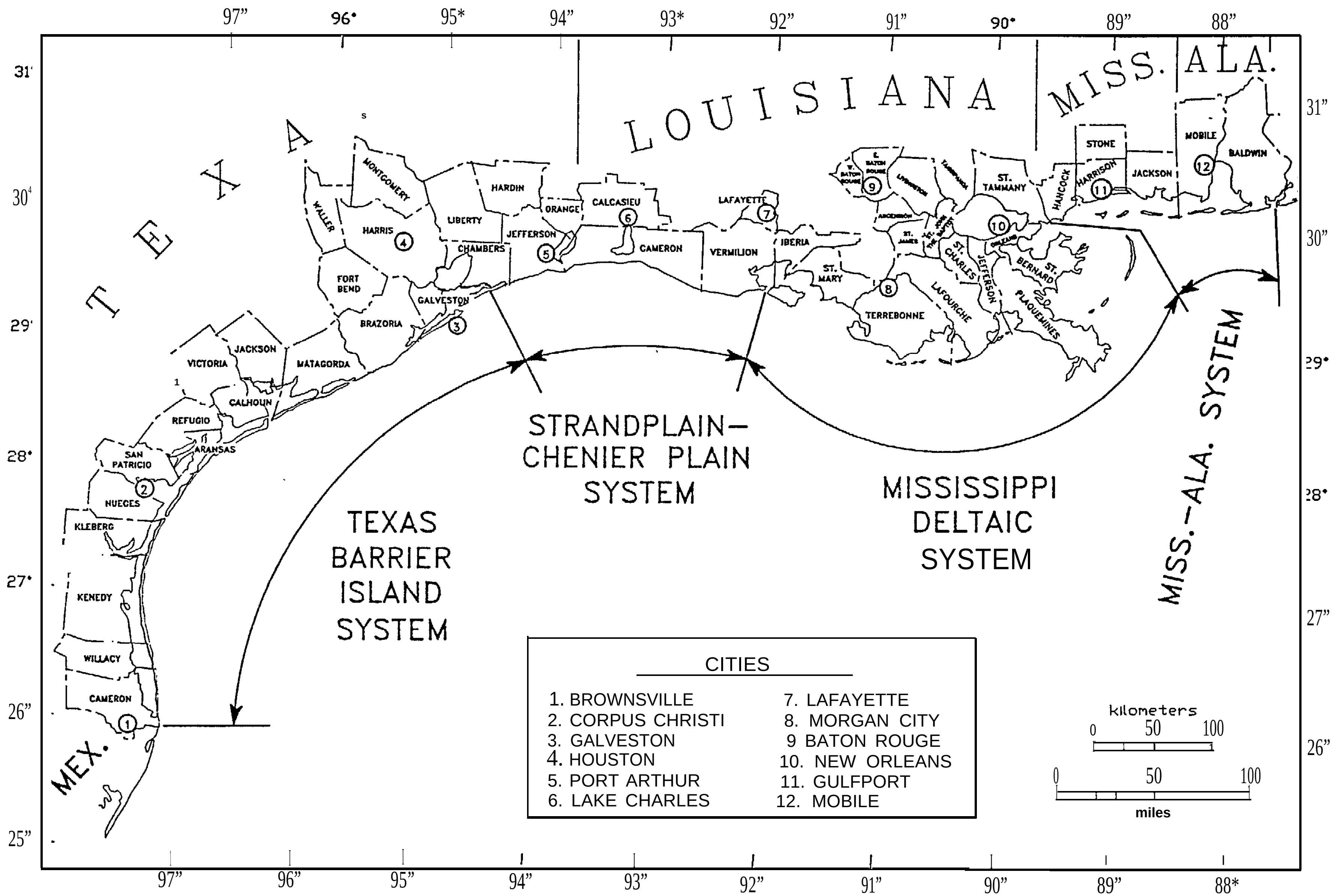



Figure 2-1. The study area.

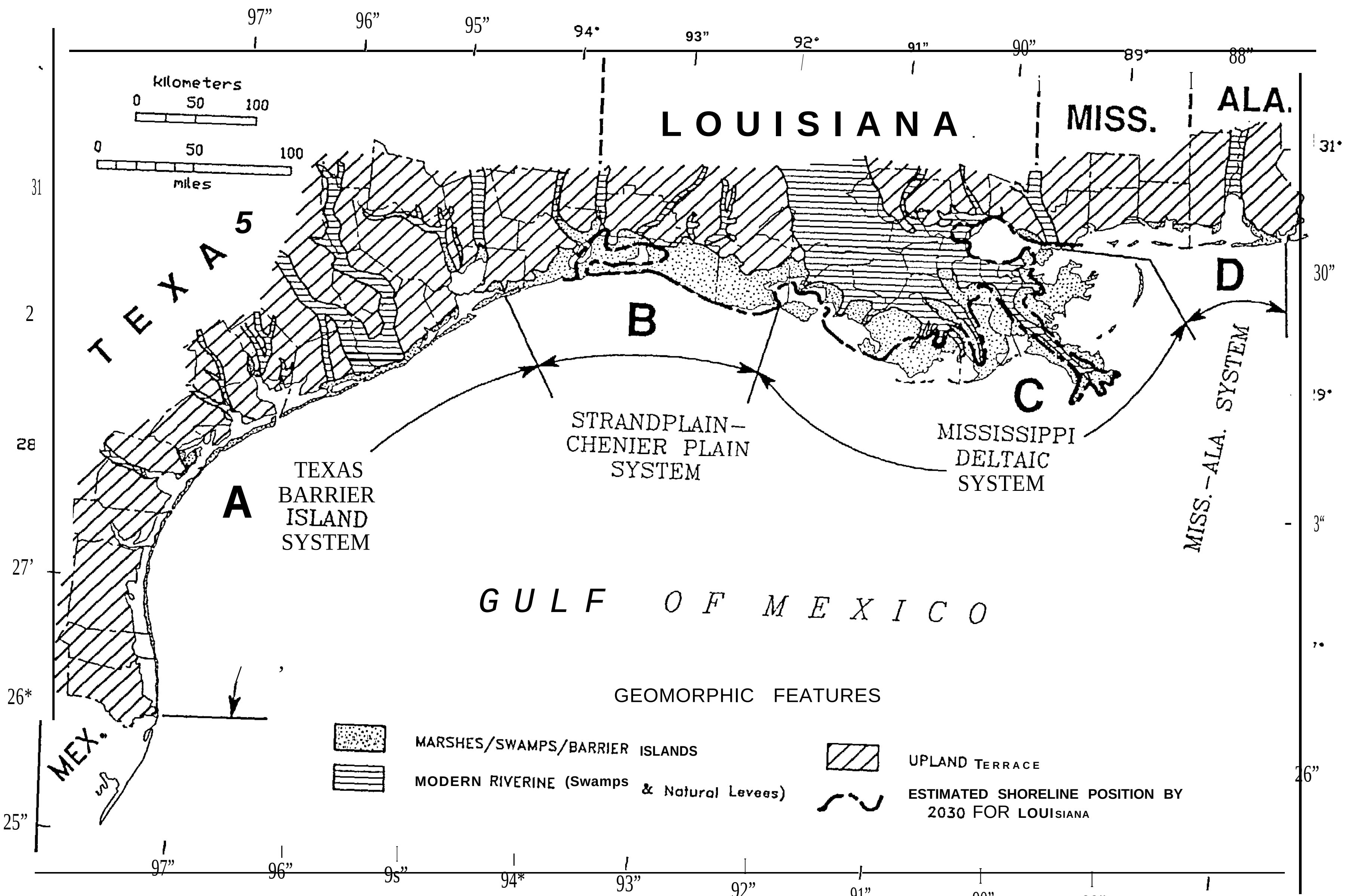



Figure 2-2. Geomorphic features along the north and central Gulf of Mexico (after USDI, MMS 1986a).

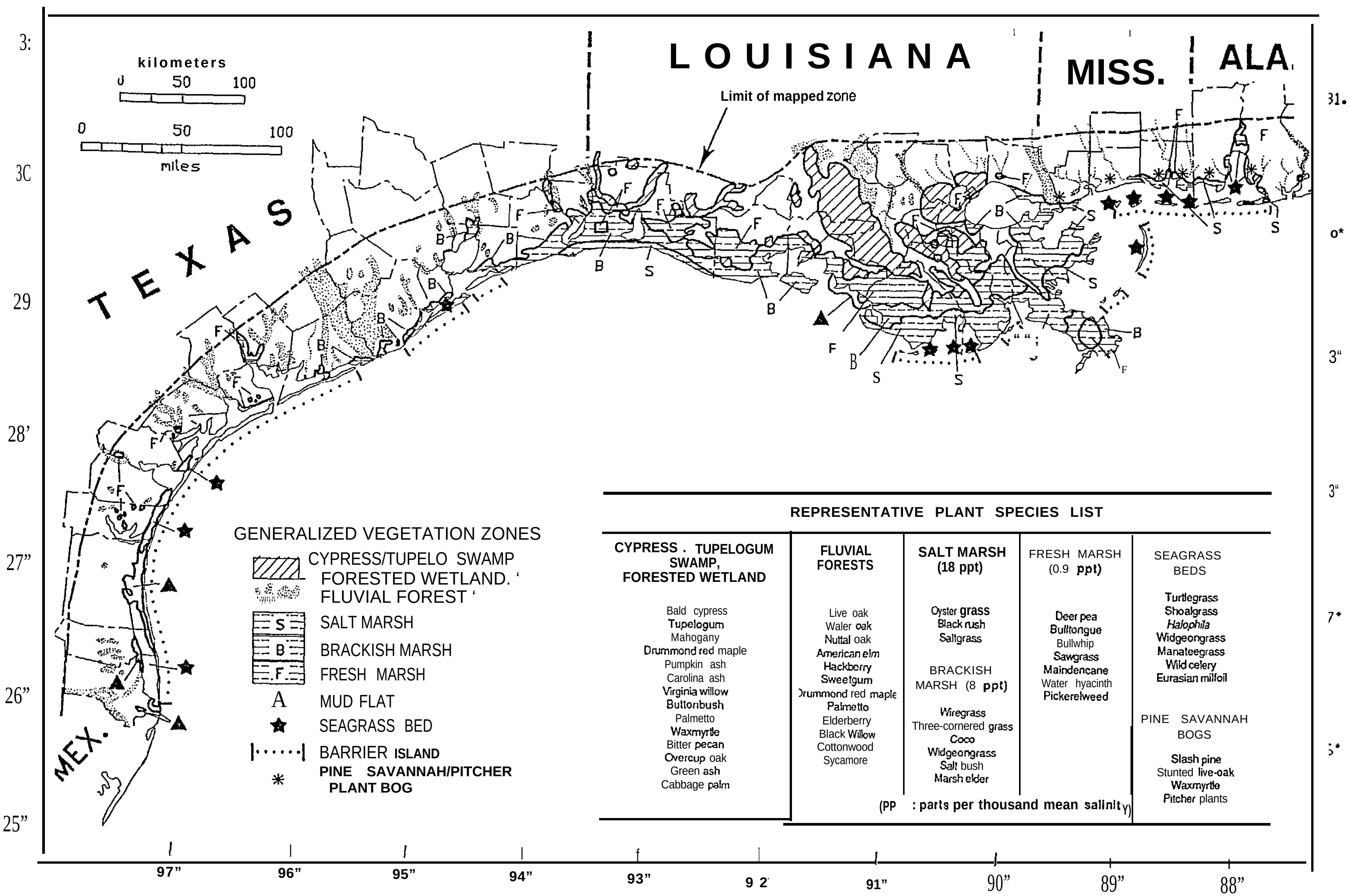



Figure 2-3. Generalized vegetation zones along the northern and central Gulf of Mexico.

contain many of the species listed in Figure 2-3, such as bald cypress, red maple, pumpkin ash, and tupelo gum.

The major fisheries resources within the Texas Barrier Island System include brown and white shrimp, speckled trout, red drum, flounder, blue crab, and various other demersal fishes such as sand trout and croakers. Outer shelf, nearshore, and estuarine open water habitats are abundant, but two of the important nursery habitats (saline and brackish marsh) are considered sparse (Table 2-1). This scarcity of marsh habitat is somewhat compensated for by the presence of abundant seagrass beds. For the most part, the important commercial fisheries activities take place in the nearshore and outer shelf portions of the gulf, and are often concentrated near the major tidal passes. Recreational fishing capitalizes on the fish production of the inshore bays and lagoons. Because of the demand for live bait, some limited trawling for brown and white shrimp in the bays is allowed. Tight regulation of sports fishing catches of speckled trout and red drum has taken place for many years to protect the relatively small populations of these target species. Viable oyster reefs are found in Galveston and Matagorda Bays, but these do not support an extensive commercial industry, although recreational tonging is practiced. Special management of oyster resources is limited to the prohibition of harvesting from reefs with high coliforrn bacteria counts.

Commercially important populations of furbearing mammals and the American alligator are limited in the region because of the scarcity of swamp, fresh marsh, and brackish marsh habitat (Table 2-1). The resource value of these species in this region relate to the nonconsumptive, recreational experiences they may provide to the public.

Because of the abundance of suitable beach habitat, the region is very important to the survival of several species of threatened or endangered sea turtles. The beaches, dunes, wind-tidal flats, and seagrass beds serve as habitat for seabirds, shorebirds, and wading birds that provide considerable nonconsumptive recreational opportunities. The last population of whooping cranes, a colony of brown pelicans, and sightings of the peregrine falcon and bald eagle attest to the importance of this region for non-game birds. Concentrations of migratory waterfowl, however, are limited by the scarcity of bottornland hardwood, swamp, fresh marsh, and brackish marsh habitat. Therefore, hunting is not of economic importance.

Within the system, all the population centers, except Galveston, which is on a barrier island, are located on uplands (Figure 2-4) with only limited expansion into coastal wetlands (USDI, MMS 1986c; Boesch and Robilliard 1985). While OCS businesses and personnel operate out of many of these cities, these areas existed prior to OCS activities and the economy is more diversified than in other sites within the study area (Davis and Place 1983; Davis 1984).

Petroleum-related facilities, such as platform and pipeline fabrication and coating yards, supply and service bases, and major ports and shipyards, are concentrated in the coastal cities along navigable waterways (Figure 2-5). The OCS infrastructure is most diverse in the Houston, Galveston, and Corpus Christi areas, with eight platform fabrication yards and four pipe-coating yards. Sites that serve as ports or supply/service bases include Houston, Texas City, Galveston, Freeport, Port O'Connor, Port Lavaca, Port Aransas, Rockport, Corpus Christi, Port Mansfield, and Port Isabel. In addition, these ports support other maritime industries, such as, fishing and international trade.

Only ten OCS pipelines make landfall within the Texas Barrier Island System as of 1986.

Table 2-1. Selected Fish and Wildlife Resources of **the** Northern Gulf Coast as Related to **the** Relative Extent of Habitat **Types.**

| COASTAL HABITATS | COASTAL REGIONS* | | | | Estuarine dependent fishes | | | Brown shrimp | | | White shrimp | | | Blue crab | | | American oyster | | | Furbearing mammals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TBI | SCP | MDP | MAS | I*** | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| Outer shelf | A** | A | A | A | 1/2 | | | 1 | | | | | | | | | | | | | | |
| Nearshore gulf | A | A | A | A | 112 | | | 1 | | | 1 | | | | b | | | | | | | |
| Estuary | A | A | A | A | 2 | | 1 | 1/2 | | | 1/2 | | | 1/2 | b | | 1/2,b | | a | | | |
| Beach/dunes | A | s | T | F | | | | | | | | | | | | | | | | | | |
| Scrub/shrub | T | s | s | s | | | | | | | | | | | | | | | | 3 | | |
| Saline marsh | S | F | A | S | 2 | | a | 1/2 | | a | 1/2 | | a | 1/2 | | a | 1,b | | a | 3 | | |
| Wind-tidal flats | F | N | N | N | 2 | | a | | | a | | | a | 1/2 | | a | | | | 3 | | |
| Seagrass beds | A | N | S | F | 2 | | a | | | a | | | a | 1,/2 | | a | | | | | | |
| Brackish marsh | S | A | A | S | 2 | | a | | | a | | | a | 1/2 | | a | | | | 1/3 | a | |
| Fresh marsh | S | A | A | S | | | | | | | | | | 1/2 | | | | | | 1/3 | a | |
| Aquatic grass beds | S | A | A | S | | | | | | | | | | 1/2 | | | | | | | | |
| Swamp | T | S | A | T | | | | | | | | | | | | | | | | 1/3 | a | |
| Bottomland hardwoods | F | T | F | S | | | | | | | | | | | | | | | | 1/3 | a | |
| Ridge/chenier forests | | | | | | | | | | | | | | | | | | | | | | |

*COASTAL REGIONS

| | |
|---|---|
| Texas Barrier Islands | TBI |
| Strand Plain/Chenier Plain | SCP |
| Mississippi Deltaic Plain | MDP |
| Mississippi Alabama System | MAS |

**RELATIVE HABITAT EXTENT

| | |
|---|---|
| Abundant | A |
| Frequent | F |
| Sparse | S |
| Trace | T |
| Non-existent | N |

***HABITAT AND RESOURCE USES

| | |
|---|---|
| Adult concentrations | A |
| Breeding, nesting, or spawning | B |
| Nursery or migration areas | C |

| | |
|---|---|
| Commercial harvest | 1 |
| Sportsfishing/hunting | 2 |
| Non-consumptive recreation | 3 |

| | |
|---|---|
| Required habitat | a |
| Special management | b |
| Threatened/endangered | c |

| COASTAL HABITATS | COASTAL REGIONS | | | | American alligator | | | Sea turtles | | | Seabirds & shorebirds | | | Wading birds | | | Migratory waterfowl | | | Other birds | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TBI | SCP | MDP | MAS | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| Outer shelf | A** | A | A | A | | | | 3,c | | a | | | | | | | | | | | | |
| Nearshore gull | A | A | A | A | | | | 3,c | | a | | | | | | | 3 | | a | | | |
| Estuary | A | A | A | A | | | | | | | 3 | | | | | | 3 | | a | | | |
| Beach/dunes | A | s | T | F | | | | 3,c | c | a | 3 | b,c | a | | | | | | | | | |
| Scrub/shrub | T | s | s | s | | | | | | | 3 | b,c | a | 3 | c | a | | | | 3 | | a |
| Saline marsh | S | F | A | s | t), c | | | | | | | | | 3 | c | a | 3 | | | | | |
| Wind-tidal flats | F | N | N | N | b,c | | | | | | 3 | | | 3 | | a | 3 | | | | | |
| Seagrass beds | A | N | s | F | b,c | | | | | | | | | 3 | | a | 213 | | a | | | |
| Brackish marsh | s | A | A | s | 1/3,b,c | | a | | | | | | | 3 | c | a | 2/3 | | a,b | 3 | | a |
| Fresh marsh | s | A | A | s | I/3, b,c | | a | | | | | | | 3 | | a | 2/3 | | a,b | 3 | | a |
| Aquatic grass beda | s | A | A | s | 1/3,b,c | | a | | | | | | | 3 | | a | 2/3 | | a,b | | | |
| Swamp | T | s | A | T | 1/3,b,c | | a | | | | | | | 3 | c | a | 2/3 | | a | 3 | | a |
| Bottomland hardwooda | F | T | F | s | | | | | | | | | | | | | 2/3 | | a | 3 | | a |
| Ridge/chenier forests | N | S | T | T | | | | | | | | | | 3 | | | | | | 3 | | a |

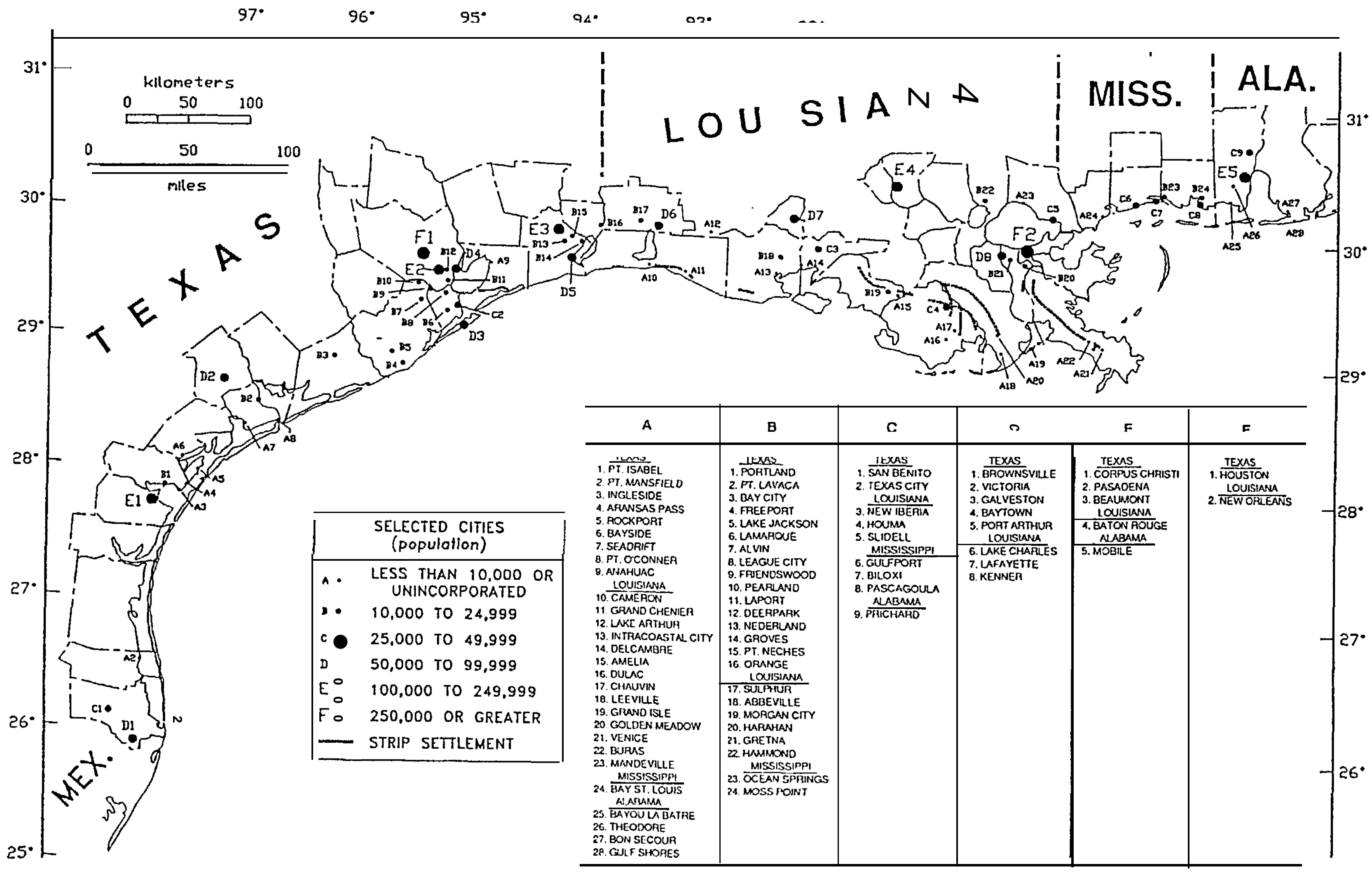



Figure 2-4. Distribution of major population centers within the study area (after USDI, MMS 1986c).

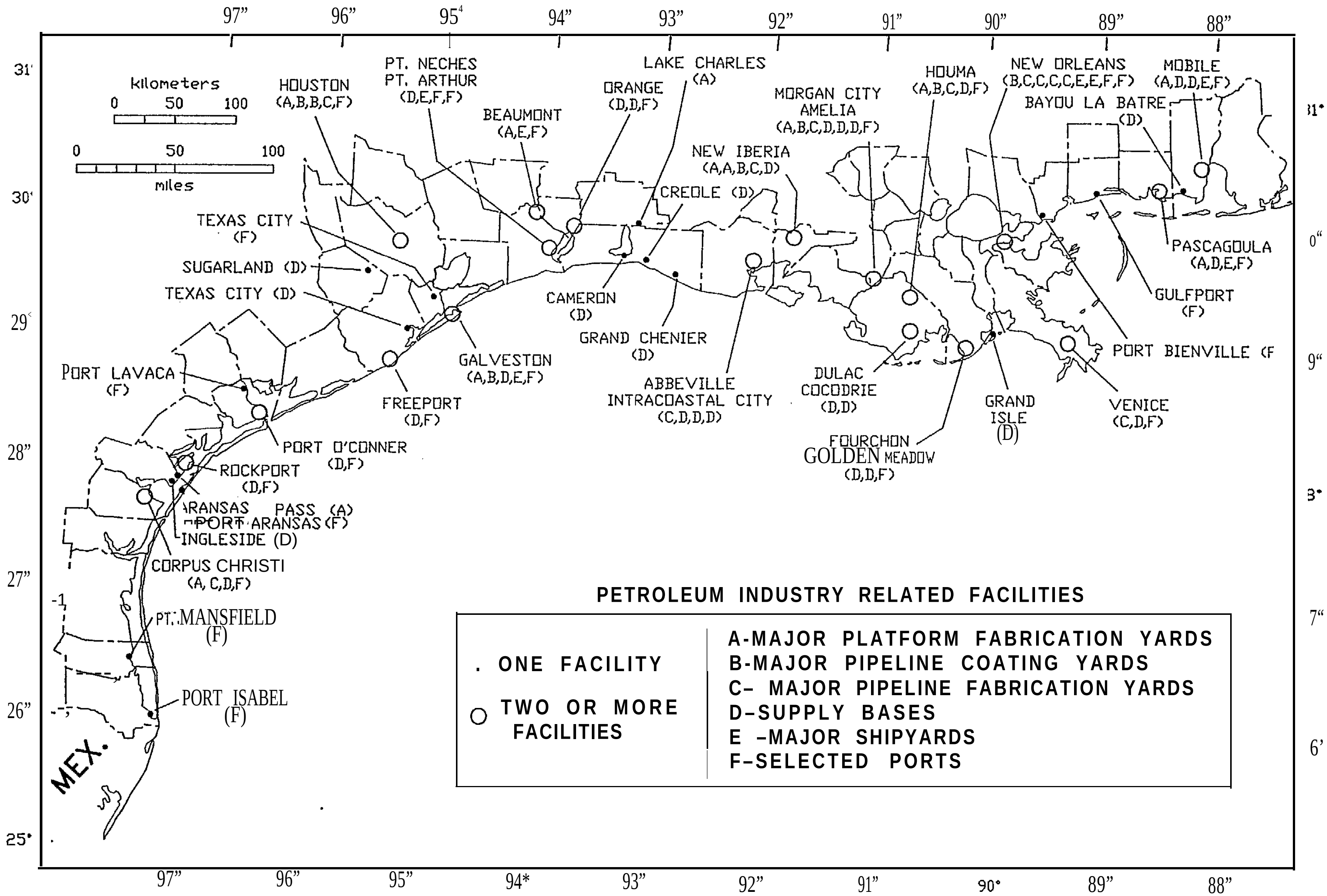



Figure 2-5. Distribution of selected petroleum-related facilities within the study area (after **USDI,** MMS **1986d).**

Recreation, conservation, and preservation areas are distributed throughout the study area (Figure 2-6). Texas has numerous barrier islands presently being used for recreation and wildlife management areas. There are also ten state and federal wildlife refuges and management areas, and ten Audubon sanctuaries.

## B. Strandplain-Chenier Plain System

The Strandplain-Chenier Plain System from Galveston Bay to Vermilion Bay is an area of low elevation and low relief. Gulf beaches of sand and shell are narrow and are rapidly eroding. Abandoned beach ridges, known locally as cheniers, lie between the active beach and the Pleistocene terrace to the north. These are narrow (100 ft to 1500 ft) topographic features that generally trend east to west and have the highest elevations of the region, approximately 10 ft. Between the cheniers are marshes and associated small lakes. Wetland soils are high in clay and organic material. Development is most suitable on the cheniers because of better foundation conditions and elevations above all flooding except that associated with hurricanes.

Several large lakes also occur within the chenier plain and are connected to the Gulf by tidal rivers. Commercial pressures during the nineteenth century resulted in the dredging of the passes, the construction of jetties, and the excavation and maintenance of channels through the lakes.

Broad expanses of marsh exist in the coastal reaches of eastern Texas and western Louisiana. In 1978, there were approximately 257,000 ac of fresh marshes and 437,600 ac of intermediate-to-saline marshes in the Louisiana portion of this system (Wicker et al. 1983). Unfortunately, comparable data on the Texas portion of this area is not available. Oystergrass and saltgrass dominate the saline marshes that border the Gulf. Most of the marsh landward of the high salt marsh is brackish-to-intermediate dominated by wiregrass and three-cornered grass. Fresh marshes lie at the base of the Pleistocene terrace and contain a very diverse association including bull tongue, bullwhip, cattail, sawgrass, maidencane and water hyacinth. Actual seagrass beds are not present, but submerged aquatics consisting primarily of widgeongrass and Eurasian watermilfoil are present in the less turbid, stillwater ponds.

Fluvial forests, containing a variety of mixed bottomland hardwoods, are almost nonexistent in this area. The wetland forests that remain are predominantly cypress-tupelo gum swamps along rivers cutting through the Pleistocene terrace (Figure 2-3).

In recent years, the problem of wetland loss has taken on a new perspective, as it became evident in the Louisiana Chenier Plain and Mississippi Deltaic System that the wetlands were being lost at an accelerating rate. Several causes of wetland loss have been identified (Coleman et al. 1984; Turner and Cahoon 1988):

1. natural cyclic shifts in deltaic depositional sites;

2. compaction and localized differential subsidence due to oil, gas, and groundwater extraction;

3. regional geosynclinal subsidence;

4. short- and long-term sea-level fluctuations;

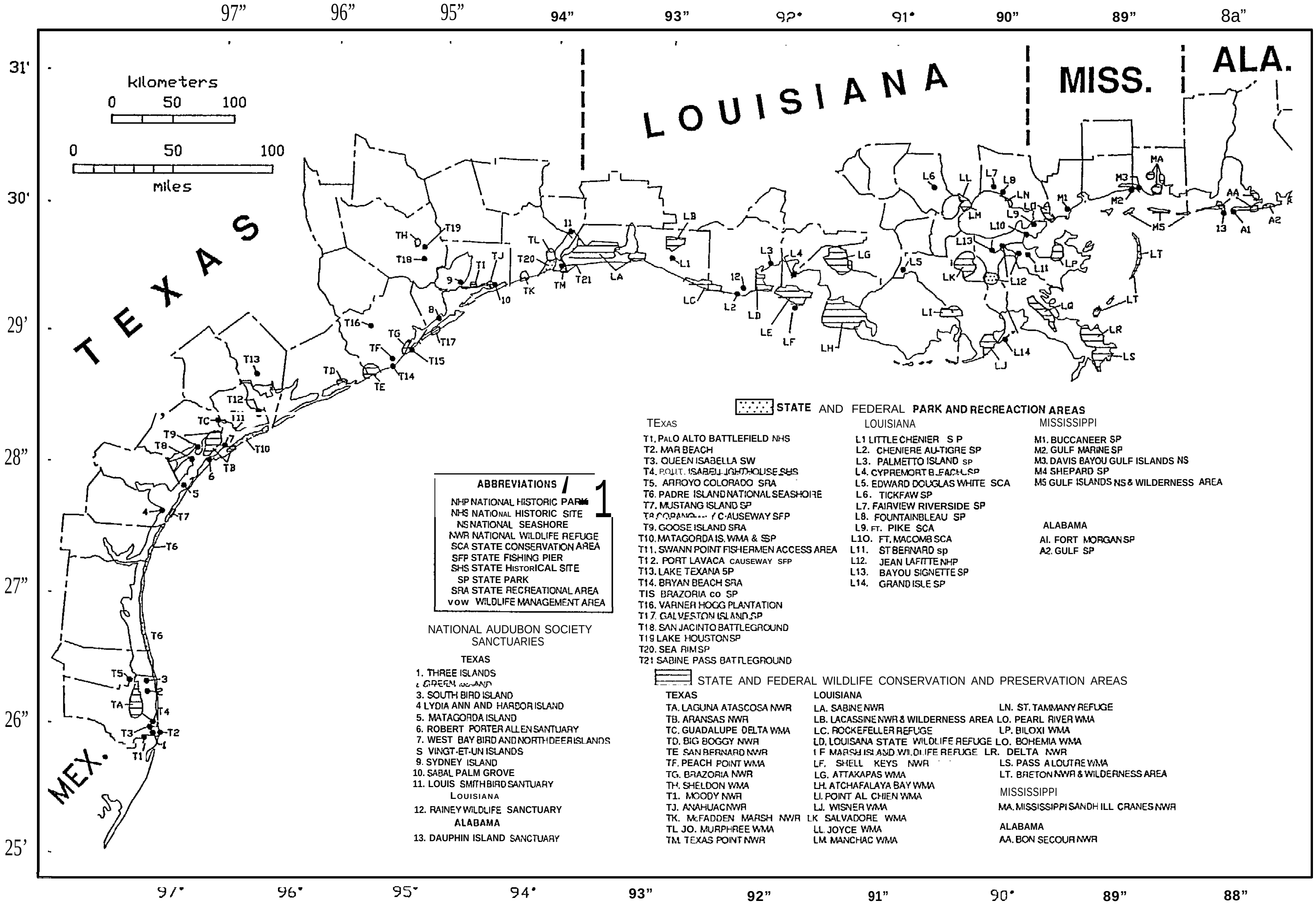



Figure 2-6. Distribution of state and federal wildlife and conservation areas, parks and recreation areas (after **USDI,** MMS **1986c).**

5. decreased sediment yield from overbank flooding because of levees and upstream dams;

6. canal dredging;

7. biological degradation; and

8. natural coastal processes such as hurricanes, waves, and currents.

Wetland loss takes on greater significance in Louisiana than in the neighboring states because of the state's unique environmental setting and the relative contribution of natural versus man-made processes to total land loss. Such forms and processes include the greater extent of wetlands to be impacted, the development of man-made canals and levees extending into the marshes, and the geomorphic characteristics of the coastal zone. The broad, wide deltaic environment susceptible to natural land loss processes, as well as environmentally detrimental manipulation by man, have contributed to the magnitude of the problem.

While habitat types have been mapped for the entire study area (Garofalo and Burk and Associates, Inc. 1982; Kimber et al. 1984; Wicker et al. 1980; Wicker et al. 1983; U.S. Fish and Wildlife Service, n.d.) land loss has only been calculated and mapped for Louisiana (Wicker et al, 1980, 1983; Gagliano et al. 1981; Gagliano 1984). Using historic land loss rates, it is possible to predict where the shore will be in Louisiana. As indicated on Figure 2-7, much of the coastal wetlands will have disappeared by 2083, and, although not shown on this figure, land will be created only in the Atchafalaya River delta region.

This rate of loss, however, does not take into account an accelerated eustatic sea-level rise, which has been calculated to the year 2025, at various rates:

| | |
|---|---|
| High estimate | 1.80 ft |
| Mid-range high | 1.29 ft |
| Mid-range low | 0.86 ft |
| Low | 0.43 ft |
| Current trends | 0.15 ft to 0.22 ft |
| | (Hoffman et al. 1983) |

Eustatic sea-level rise will exacerbate the existing land loss rate for Louisiana, as well as, flood existing marshes in Texas, Alabama, and Mississippi, which are not experiencing the same wetland loss rate as that of Louisiana. The major physical effects of this sea level rise are: shoreline retreat, increased flooding, and landward movement of saltwater (Hoffman et al. 1983). Planning efforts for new construction and management projects by individuals; businesses; and state, federal and local governmental agencies must, therefore, consider not only present land loss but also future trends associated with sea-level rise.

The Strandplain-Chenier Plain System contains considerably more saline and brackish marsh than does the Texas Barrier Island System (Table 2-1). The combination of large acreages of tidally-influenced wetlands and the sediment and nutrient supply moving westerly from the Atchafalaya River delta creates ideal nursery conditions. The region produces large commercial harvests of white shrimp in the nearshore gulf, and there is also a commercial fishery for brown shrimp, blue crab, and (until recently) speckled trout and redfish. Activity inshore is concentrated in the lower reaches of Sabine Lake, Lake

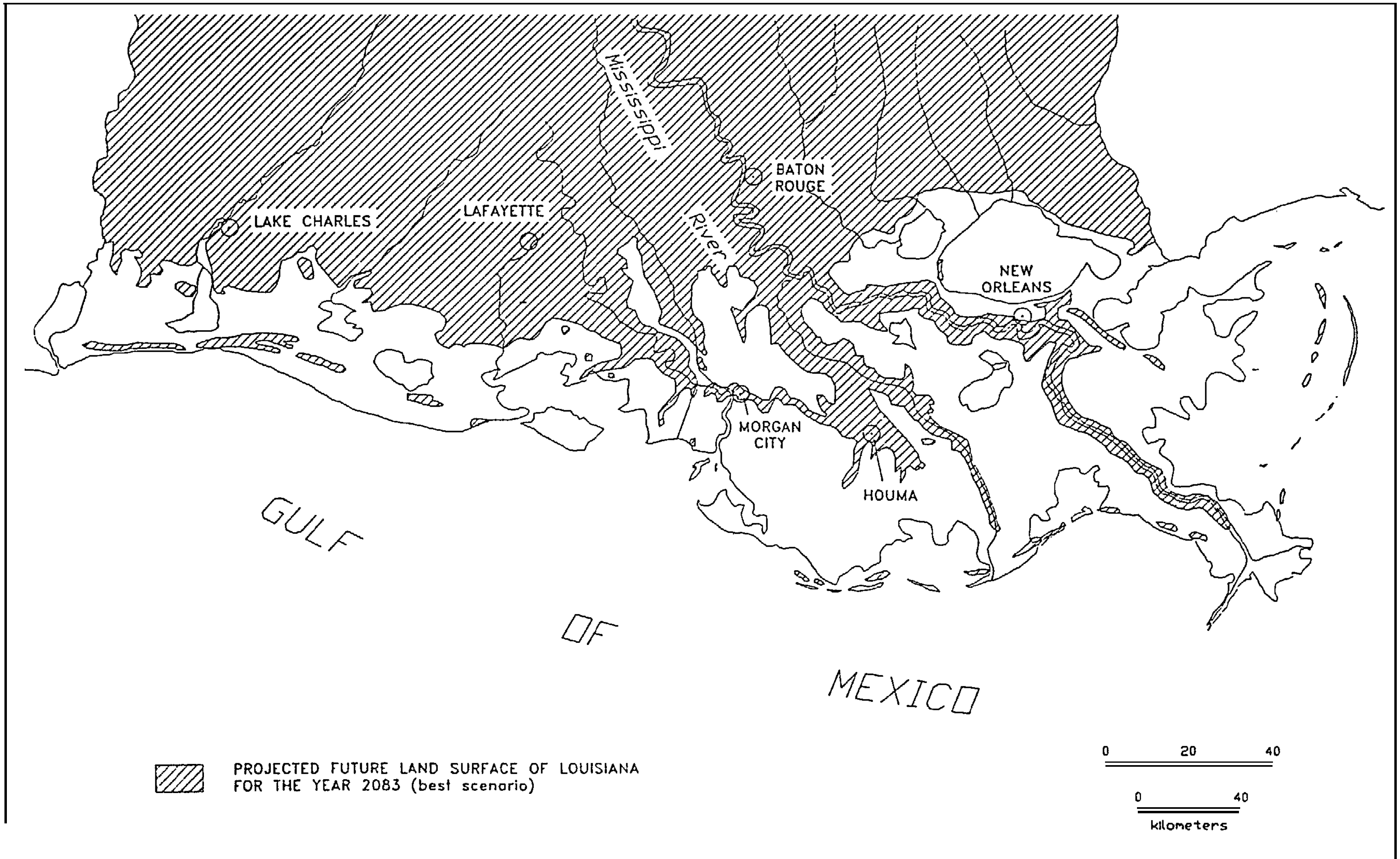



**Figure 2-7. Projected land surface (after C Restoration Technica Committee 988).**

Calcasieu, and the Mermentau River. Although access to Grand Lake and White Lake are controlled by locks to maintain freshwater for rice irrigation, there is, in some years, a major harvest of white shrimp in these systems. Perhaps equally important to commercial harvests is the production of juvenile, estuarine-dependent species that support the fish populations of the nearshore gulf. Fishing, shrimping, and crabbing are common recreational activities. Oyster production occurs in Lake Calcasieu on both public and privately leased grounds, but commercial harvesting on half of these grounds has been prohibited as a result of sewage pollution. All of Sabine Lake is closed to harvesting for the same reason.

The wildlife resources of the region are rich and diverse because of the interspersion of wooded chenier ridges among fresh, intermediate, and brackish marshes (Table 2-1). Commercial trapping for furbearing mammals has long been a source of income for landowners and local residents. Although the populations are still high, trapping has diminished in recent years because of low prices for pelts on the international market. In Louisiana, alligators are harvested under a controlled tagging program where tags are distributed to landowners based on the acreage of the different marsh types on their property. Alligator populations have steadily increased under this management program and prices are relatively high at present. Leasing of this renewable resource has increased the revenues of some landowners.

The sparsity of suitable beach, wind-tidal flats, and seagrass beds limits the importance of the region to sea turtles, seabirds, and shorebirds. However, it supports large and diverse populations of wading birds. The woody vegetation of the chenier ridges is very important as a resting station for migratory song birds. Also, the region supports very large concentrations of migratory waterfowl. The importance of this habitat to waterfowl is evidenced by the presence of the Texas Point, Sabine, Lacassine, Rockefeller, and Paul J. Rainey wildlife refuges. Hunting leases provide the bulk of the surface revenues generated by private marshlands in the region.

Major population centers are around Port Arthur in Texas and Lake Charles in Louisiana. Both cities are primarily on terrace uplands. In coastal Louisiana, smaller communities have developed along the chenier ridges (Figure 2-5). Communities near navigable waterways experienced explosive population growth from the late- 1950s to the early- 1980s (Davis and Place 1983). The Port Arthur-Beaumont-Orange triangle of Texas, and Lake Charles-to-Abbeville corridor are the location of fabrication yards, supply/service bases, shipyards and ports. Fifty-five OCS pipelines make landfall in this area as of 1986.

This system also encompasses large expanses of wetlands dedicated to wildlife conservation and preservation areas, several park and recreation areas, and two Audubon sanctuaries. In Louisiana, especially, a large number of camps (habitable structures, normally on pilings as high as 17 ft above the ground, usually only intermittently occupied during fishing, hunting, or other recreational excursions) are located along the numerous waterways. These camps are used for both recreation and as a base of operations for harvesting renewable resources (Figure 2-8) (Gary and Davis 1979).

## C. Mississippi Deltaic System

The Mississippi Deltaic System includes southeast Louisiana from Vermilion Bay to the Mississippi state line. The delta was formed by a series of prograding, shifting, and then retreating masses of sediment that have coalesced during the past 7000 years. Meander belts of sand and silt generally trend north to south. Maximum elevations and the most

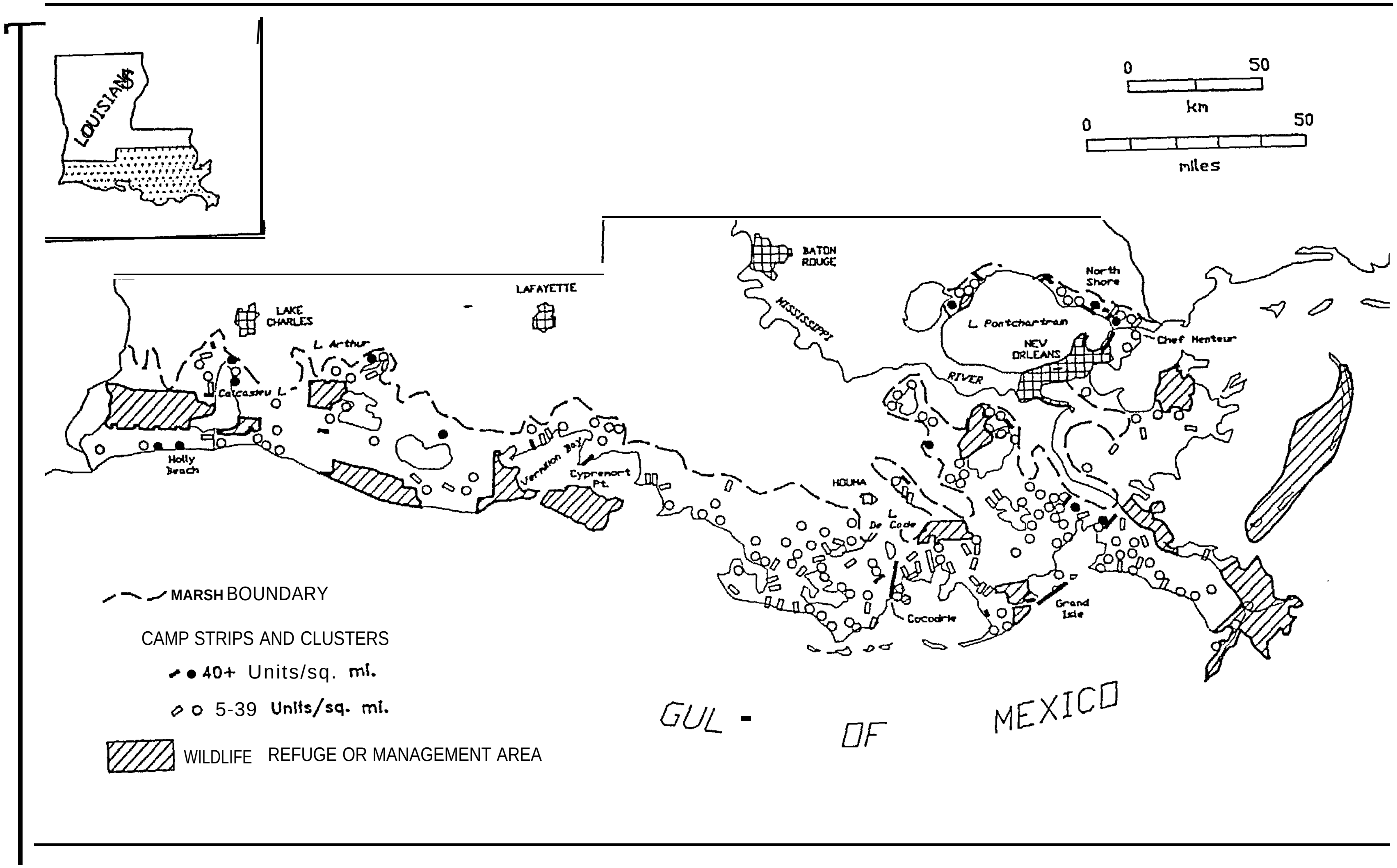



Figure 2-8. Generalized map of camp location (after Gary and Davis 1979:4).

suitable areas for development are found along the crest of the natural levees adjacent to the river channels. Natural levees decrease in elevation and width toward the Gulf. Between the levees are the interdistributary basins, the low coastal wetlands of swamps and marshes. Soils in the marshes and swamps are high in clay and organic material and are thus not very suitable for development. The deltaic plain varies in width, that is, between the Gulf of Mexico to the Pleistocene terrace, from 15 rni in the southwest to 80 mi in the southeast. Except for two locations, Port Fourchon and Grand Isle, one must travel inland before reaching levees sufficiently high and wide enough to support significant development. Several rivers in the system have been dredged and the mouths constricted by jetties in order to provide navigation access. In addition to natural waterways, artificial channels have been dredged through the wetlands to connect interior ports to the Gulf.

The broadest expanse of marshland, cypress-tupelo gum swamp, and fluvial forests (e.g., bottomland hardwood and natural levee forests) are located within the Mississippi Deltaic Plain System. In 1978, there were approximately 1,862,000 ac of marshes (freshwater and estuarine-emergent grass only), 9,000 ac of estuarine shrubs, and 423,500 ac of wetland forests (swamp and bottomland hardwood forests) within Louisiana's officially designated coastal zone (Wicker 1980). Swamps and bottomland hardwoods in the Atchafalaya Basin (the largest intact riverine swamp in the United States), and portions of the upper Barataria and western Pontchartrain Basins are not included in these figures because these areas were not in the coastal zone at the time of the mapping study sponsored by the U.S. Fish and Wildlife Service (USFWS) and Minerals Management Service (MMS), nor have they been mapped subsequently.

The fresh-to-saline marsh zones in this system contain basically the same composition as those with the Strandplain-Chenier Plain System. Seagrass beds are confined primarily to the backside of the Isles Dernieres-to-Sandy Point and Chandeleur barrier island complexes. Widgeongrass is common in interior marsh ponds, which are shallow and less turbid.

The Mississippi Deltaic System contains the majority of the estuarine open water, saline marsh, and brackish marsh habitats in the northern Gulf of Mexico and is therefore the largest producer of estuarine-dependent fisheries resources. Commercial harvests of brown and white shrimp are made, not only in the outer shelf and nearshore environments, but also in the inshore bays, lakes, bayous, and canal networks during regulated seasons. Until recently, a commercial fishery for speckled trout and redfish existed; however, now only speckled trout can be taken commercially and a quota has been imposed. The blue crab fishery is well established and provides a stable livelihood for resident fishermen. For many coastal parishes, commercial fishery resources rank second in the overall economy behind the oil and gas industry. Recreational shrimping, crabbing, and fishing, also directly tied to the fishery resources, are important to local economies.

The oyster resources in the region are extensive and are intensively managed by the Louisiana Department of Wildlife and Fisheries (LDWF) and a multitude of commercial oyster fishermen. The LDWF maintains public oyster "seed' grounds in Bay Gardene (Breton Basin), Hackberry Bay (Barataria Basin), and Caillou Lake (Terrebonne Basin) by placing shell material on the bottom to serve as substrate for oyster spat attachment. Shell material is periodically added to replace that which is lost through the harvest of oysters. Presently, many oyster leases are closed to harvest because of sewage pollution. The industry has adapted to the problem by moving oysters to non-polluted areas for deputation prior to harvest and sale. The creation and maintenance of productive oyster grounds in this region is not only the result of favorable environmental conditions, but also the product of active management.

Commercial trapping of furbearing mammals and alligators is also important. In this system, however, the combination of high productivity and low pelt prices leads to localized areas of nutria and muskrat over-population. As a result, marsh "eatouts" sometimes occur, damaging many acres of marsh and leaving the substrate subject to erosion.

Suitable beaches for the nesting of sea turtles occur only along the Chandeleur Islands. Large populations of seabirds and shorebirds are found along most of the barrier islands and beaches in the region. Wading birds are widely dispersed throughout the extensive wetland habitats. Large concentrations of migratory waterfowl are generally found in the Mississippi River delta (Delta National Wildlife Refuge and Pass a Loutre State Wildlife Management Area) and in the emerging Atchafalaya River delta (Atchafalaya Delta State Wildlife Management Area). Leasing of private lands for waterfowl hunting is an important source of surface revenue for landowners in the fresh-to-brackish marsh zones.

Population centers generally consist of linear settlements located along natural levee ridges. Many inhabitants of these sites originally farmed or fished for a living. The Morgan City-Amelia area on the Atchafalaya River, New Iberia on the New Iberia Southern Drainage Canal, the Abbeville-Intracoastal City on the Gulf Intracoastal Waterway, Houma on the Houma Navigation Canal, and the New Orleans area on the Mississippi River became major points for OCS activities. With the exception of Abbeville, the population centers are on natural levee ridges, and all but Morgan City are in areas experiencing high rates of land loss (Figure 2-9). There are at least 95 OCS pipelines making landfall in this portion of the study areas as of 1986.

Thirteen large parcels of wetlands in this area are in wildlife conservation and preservation areas. There are also 13 park and recreation areas located primarily along natural waterways. In addition to these public areas, many private camps are found in the coastal wetlands (Figure 2-8) (Gary and Davis 1979), further indicating the local population’s affinity for the commercial and recreational opportunities.

## D. Mississippi-Alabama System

To the east is the Mississippi-Alabama System of offshore barrier islands and inter-island shoals, semi-enclosed embayments, and river estuaries. The sandy islands of low elevation and low relief are an average of 10 to 12 mi south of the mainland and are subject to significant impact from hurricane storm surge. Inter-island passes are slightly deeper than the shoal near the islands. The east-to-west-oriented island chain protects a long, narrow, and shallow sound. Several large embayments are surrounded by Pleistocene terraces. Rivers empty into these embayments and are slowly building deltas onto the shallow bottoms. Deep draft access to ports is through a network of dredged channels.

Mississippi and Alabama have very little wetland area in the form of swamps or marshes. Seagrass beds can become widespread on the bayside of barrier islands and protected shore areas. Storms and pollution, which increase water turbidity, influence the distribution of these beds through time, and thereby make their distribution and extent variable.

In the late 1970s, there were approximately 3,500 ac of fresh marsh and 64,000 ac of intermediate-to-saline (non-fresh) marsh in the Mississippi coastal zone below the 15-ft

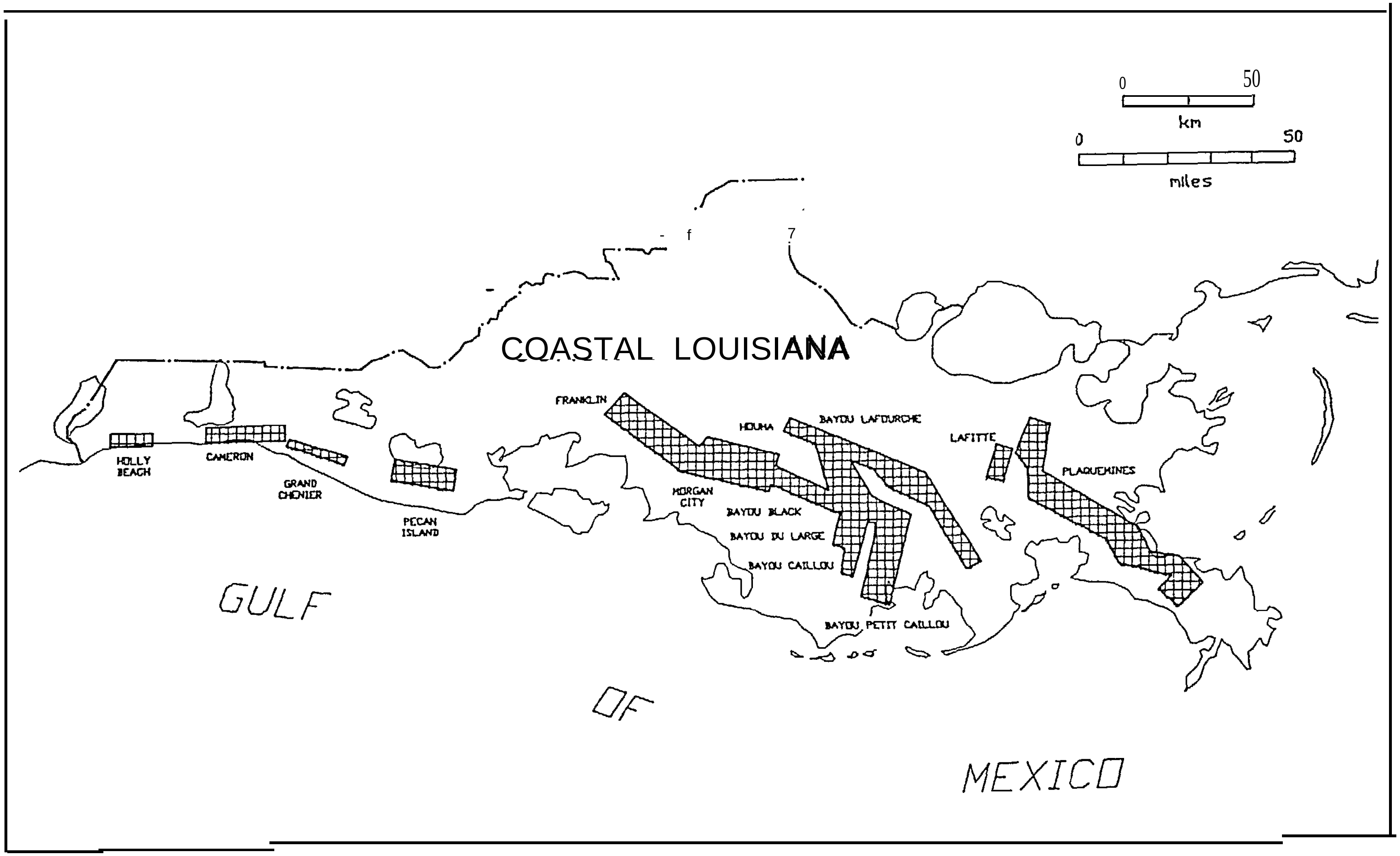



**Figure** 2-9. Fourteen settlement strips of coastal Louisiana (after Davis and Place 1983).

contour (Wicker 1980). For this same period of time, the Alabama coastal zone (below the 10-ft contour) included approximately 8,800 ac of fresh marsh and 35,500 ac of non-fresh marsh (Rathbun et al. 1987). The marshes included only habitats covered by emergent vegetation.

Aquatic vegetation, including seagrass beds in the Mississippi Sound and floating and submerged aquatics in coastal bays, lakes, ponds, and streams, add another 15,200 ac (National Coastal Ecosystems Team 1986). Combined, Mississippi and Alabama have a total of approximately 241,200 ac of forested wetlands (bottomland hardwoods and cypress-tupelo gum swamp) (National Coastal Ecosystems Team 1986).

Marsh zonation and species composition in Mississippi and Alabama are comparable in salinity to that of the Mississippi Deltaic System. However, needlerush dominates most of the marsh area in these states. In contrast, oystergrass is the dominant species in saltmarshes and wiregrass is the dominant species in brackish marshes in Louisiana and Texas.

Historically, much of the wetland loss that has occurred in these areas is a result of dredge and fill operations for development (Eleuterius 1973). Shoreline erosion has resulted in the loss of nearshore islands such as the Grand Batture Islands east of Pascagoula. Saltwater intrusion, perhaps in combination with poor water quality, is also causing marsh loss along some dredged channels, such as the Escatawpa River system.

A distinctive wetland feature of this system is the upland pine savannah bogs characterized by flat topography and poor drainage. These areas contain a variety of plants, such as pitcher plants, which are species with special status (U.S. Fish and Wildlife Service 1982).

Wetlands that are comparatively scarce in this system provide habitat for adult concentrations of estuarine-dependent fish, some of which may have migrated from the adjacent Louisiana marshes. Commercial fisheries for brown shrimp, blue crab, and oysters have been established. The Mississippi Sound is a very productive area for recreational fishing, especially in the vicinity of the barrier islands. These islands provide suitable nesting beaches for endangered sea turtles and ideal habitat for many species of seabirds, shorebirds, and wading birds. The value of these islands for nonconsumptive uses is very high.

Furbearing mammals and alligators occur in local concentrations in the wetland pockets on the mainland, but not in numbers necessary to support a significant commercial industry. Migratory waterfowl usage of the area occurs but is relatively low in comparison to the Mississippi Deltaic System nearby.

Mobile, the one large population center in Alabama, is the site of platform fabrication yards, supply bases, shipyards, and a major port (Figures 2-4 and 2-5). The population centers in coastal Mississippi are the ports of Gulfport, Biloxi and Pascagoula. The latter includes a platform fabrication yard, supply/service base, and shipyard. As of 1986, only two OCS pipelines make landfall in Mississippi; none in Alabama.

Most of the barrier islands and several mainland wetland areas along this coast are within the Gulf Islands National Seashore and Wilderness Areas or are national wildlife refuges (Figure 2-6). These areas are accessible to the general public for recreational purposes.

## E. Regulator Setting

Numerous federal laws and programs regulate activities within the nation's coastal zone (Zinn and Copeland 1982). Some of these laws and programs control land use through direct ownership of property, such as wildlife management areas or national parks, while others significantly influence the character and intensity of development through the permitting process. The latter group of legislation is a major concern for this study because each statute affects the potential rehabilitation of OCS infrastructure or use of modified environments.

Five federal agencies dominate control of renewable resources and the resource base within the coastal zone: the Office of Coastal Resource Management; the U.S. Fish and Wildlife Service; the National Marine Fisheries Service; the U.S. Army Corps of Engineers; and the Environmental Protection Agency. The Council on Environmental Quality can indirectly exert power in environmental matters through its review authority under the National Environmental Policy Act. Table 2-2 summarizes pertinent federal responsibilities.

The states within the study area also manage coastal zone activities. Louisiana, Mississippi, and Alabama have federally approved coastal zone management programs and exercise permitting authority over development activities (Table 2-3), dredge and fill in wetlands, mineral extraction, and the location of most types of facilities. Texas has chosen not to participate under the federal program, but controls coastal projects through designated agencies. Coordination of permitting actions with state game and fish departments (Table 2-3) is mandated by the Fish and Wildlife Coordination Act of 1965 (16 U.S.C. 661-668). These agencies have review responsibilities on federal permits and actions. A water quality certification must be obtained from the state (Table 2-3) before a federal permit can be issued for dredge and fill activities in wetlands.

Activities that are within the state-defined coastal zone or that affect wetlands must consider these federal and state environmental programs. A review and comment system is established and coordination is mandatory. The National Environmental Policy Act mandates multidisciplinary planning and consideration of the impacts (direct and indirect) on the physical, biological, and cultural setting of the region. Testing for toxic or hazardous materials, including radioactive substances, is an important part of all permit processing. Mitigation may become important in an effort to eliminate or reduce to an acceptable level some adverse impacts. Incorporation of environmental concerns, including regulatory obligations, early in the project planning process is essential for rational project design and efficient implementation.

## F. Environmental Advantages of Different Parts of the Studv Area

The advantages of using selected OCS-related facilities, including equipment, to enhance or revive local economies is most realistically addressed by relating the availability of the facilities to the existing and projected natural (including flora and fauna) and human (population centers) habitats. Figures 2-3 and 2-5 synthesize data on vegetation and OCS-related infrastructure by coastal region, thereby facilitating the correlation between available OCS infrastructure and environmental/economic enhancement needs. This section identifies those physical, biological, and cultural elements within the study area which provide a potential advantage to that coastal system for economic recovery.

**Table** 2-2. Selected Federal Government Programs that can Affect the Rehabilitation or Modification of OCS Facilities.

| Lead Agency | Authority | Statute | Action Required | Regulation |
|---|---|---|---|---|
| Office of Coastal Resource Management (OCRM) | Coastal Zone Management Act, as amended | 16 USC1451-1464 | Develop coastal zone plan | States and parishes develop and implement, long range management plan approved by Federal government. |
| Environmental Protection Agency (EPA) | Clean Water Act, as amended, Section 402 | 33USC1251-1376 | Permit | Effluent limitations of point sources of pollution. |
| EPA | Clean Water Act, as amended, Section 404 | 33 USC1251-1376 | Identification of Wetlands | Makes final determination on all wetland permit proposals; determines where 404 permit is applicable. |
| U. S. Army Corps of Engineers (USACE) | Clean Water Act, as amended, Section 404 | 33 USC1251-1376 | Permit | Applies to discharges or fill material placed in wetlands and waters of the U.S. |
| USACE | Rivers and Harbors Act of 1899, Section 10 | 33 USC401-406n | Permit | Prohibits obstructing by dams, dikes, bridges navigable waters or excavating or filling in any wetlands and waters of the U.S. |
| U. S. Fish and Wildlife Service and National Marine Fisheries Service (USFWS-NMFS) | Fish and Wildlife Coordination Act | 16 USC661-668 | Consultation in permit decisions | Integrates concern for fish and wildlife resources into permit process. |
| Council on Environmental Quality | National Environmental Policy Act | 42 USC4321-4347 | EIS | Preparation of environmental document identifying alternatives considered and beneficial and adverse primary and secondary impacts. |

Source: Emmer 1984.

Table 2-3. State Agencies Coordinating Activities in Respective Coastal Zones.

**Federally Approved Coastal Management Programs**

| State | Responsible Agency |
|---|---|
| Louisiana | Coastal Management Division, Department of Natural Resources |
| Mississippi | Bureau of Marine Resources, Department of Wildlife Conservation |
| Alabama | Department of Environmental Management |

Texas does not have an approved program, but manages activities through the General Land Office, School Land Board, and the Railroad Commission.

**Water Quality Certification**

| State | Resporisible Agency |
|---|---|
| Texas | Texas Water Commission |
| Louisiana | Office of Water Resources, Department of Environmental Quality |
| Mississippi | Bureau of Pollution Control, Department of Natural Resources |
| Alabama | Department of Environmental Management |

**Fish and Wildlife coordination**

| State | Responsible Agency |
|---|---|
| Texas | Parks and Wildlife Department |
| Louisiana | Department of Wildlife Conservation |
| Mississippi | Bureau of Marine Resources, Department of Wildlife Conservation |
| Alabama | Department of Conservation and Natural Resources |

Each of the four physiographic systems within the study area has characteristics that give the system particular advantages for economic recovery. Within the Texas Barrier Island System high ground with foundation conditions suitable for most types of development is inland from the Gulf of Mexico, for the most part, above the expected hurricane storm surge levels. Barrier islands and lagoons separate the uplands from the Gulf and thus protect them from offshore waves and storm surge. However, these existing zones of development are close enough to the Gulf to be efficiently reached by existing dredged channels that are maintained for commercial foreign trade. The system has sparse wetlands but abundant seagrass beds and tidal flats. Most of the infrastructure is in the established port complexes and environmental modification away from the ports is limited in extent.

The Strandplain-Chenier Plain offers two physical advantages. First, extensive port complexes at Orange and Port Arthur, Texas, and Lake Charles, Louisiana, are located inland on the older and higher Pleistocene terrace and are better protected from river and coastal floods than if they were on the shoreline of the Gulf; and the foundation conditions are suitable for intensive development. Second, deep draft navigation channels are maintained for commercial foreign trade. In addition, facilities and infrastructures are concentrated along the Sabine and Calcasieu channels, although some activities are distributed throughout the system. Marshes and interior grassbeds are evolving into open water and thus offer an opportunity for research and wetland management projects.

The Mississippi Deltaic System contains zones along navigable waterways and near wetlands that have been modified for OCS support facilities. These lands are available for development and should reduce the future pressure for modification of adjacent wetlands. Several deep-draft waterways are maintained for commercial trade and already serve OCS-related businesses. Unfortunately, many ports and sites are very close to the Gulf and are subject to storm-surge, a hazard which may result in destruction of structures and lost time for manufacturing because of wind and water damage. As with other coastal wetlands in the study area, the wetlands are deteriorating and would benefit from intensive management. Many facilities and significant infrastructures are found on the natural levees of old distributaries and at the mouth of the Mississippi River.

The Mississippi and Alabama System possesses deep draft access to established port facilities and high, well-drained ground with foundation conditions suitable for development. However, wetlands are being lost, and, unlike the other systems in the study area, this one has comparatively few facilities and infrastructures.

For the study area, several aquatic organisms have been identified as an underutilized commercial resource. These species include black drum, croaker, sheepshead, mullet, squid, eels, and clams (Roberts 1983).

# 111. OCS INFRASTRUCTURE AND ENVIRONMENTAL MODIFICATIONS

## A. Introduction

Within the Gulf of Mexico, significant extraction of hydrocarbons takes place from Federal waters on the continental margin beyond the jurisdiction of the states, an area commonly referred to as the outer continental shelf (OCS). These submerged lands are subject to Federal control as a result of the Submerged Lands Act (43 U.S.C. 1301 and 1302) (USDI, MMS 1982). However, OCS oil and gas production would be impossible without the establishment and operation of numerous support facilities on the adjacent landmass, in this case, the states of Texas, Louisiana, Mississippi, and Alabama. Onshore development is directly related to offshore activities and each could not exist in the absence of the other, a fact commonly ignored when discussing the nature and extent of the industry and its effect on the region. Establishment of support facilities results in environmental modifications, such as site preparation, dredging of navigation canals for port access, and installation of pipelines for transportation of extracted hydrocarbons. In order to further discuss and propose alternative economic uses for OCS-related facilities and environmental modifications it is first necessary to identify and characterize the types of development that occur in the study area. The purpose of this section is to describe the facilities and environmental modifications associated with the OCS industry.

The OCS oil and gas activities occur in six phases: pre-exploration, geological and geophysical exploration, exploratory drilling, field development, production, and abandonment (Clark et al. 1978). Infrastructure in support of these phases is comprised of the basic elements and facilities required for the orderly functioning of the industry. Clark et al. (1978) identify 15 activities that have an onshore component (Table 3-1 and Figure 3-1). Of the 15 activities, refineries, petrochemical industries, gas processing, and liquified natural gas processing are manufacturing activities that provide a finished product for the market place; offshore mooring and tanker operations are specialized activities that occur within navigable waterways and in the OCS. Operation of these activities for the most part can be independent of OCS production. Other sources of the basic resource are from foreign suppliers, such as Mexico, Venezuela, or Algeria. In fact, these plants are for liquid natural gas (Congressional Research Service 1980), functioning either as originally designed or modified to yield other products, even during these times of very reduced OCS activity. A report to Congress (Weinstein et al. 1985) found that:

> The U.S. refining industry is not going out of business, but it is changing to product mix and its modus operandi. In the future, emphasis will be placed on products with a higher value-added than gasoline, such as lubricating base oils and petrochemical feed-stocks.

Because these activities appear to be little affected under present circumstances, this study focuses on the ten projects that directly support OCS activities and that have declined during the past five years. Essential components of the OCS onshore activities may contribute to diversification of the economic base of the states. Many of the elements that are available could be used for establishing a stronger economic posture and will contribute to long-term solutions to many of the physical and biological problems present in the coastal zone.

Table 3-1. Onshore Support Activities (Clark et al. 1978).

| | |
|---|---|
| **Offshore Development Projects** | |
| *1. | Geophysical survey |
| *2. | Exploratory drilling |
| 3. | Production drilling |
| 4. | Pipelines |
| 5. | Offshore mooring and tanker operations |
| **Onshore Development Projects** | |
| 6. | Service bases |
| 7. | Marine repair and maintenance |
| 8. | General shore support |
| 9. | Platform fabrication yards |
| 10. | Pipe coating yards |
| 11. | Oil storage terminals |
| **Processing Projects** | |
| 12. | Refineries |
| 13. | Petrochemical industries |
| 14. | Gas processing |
| 15. | Liquified natural gas processing |

* Corresponds to MMS Prelease Geophysical and Geological Survey Phase.

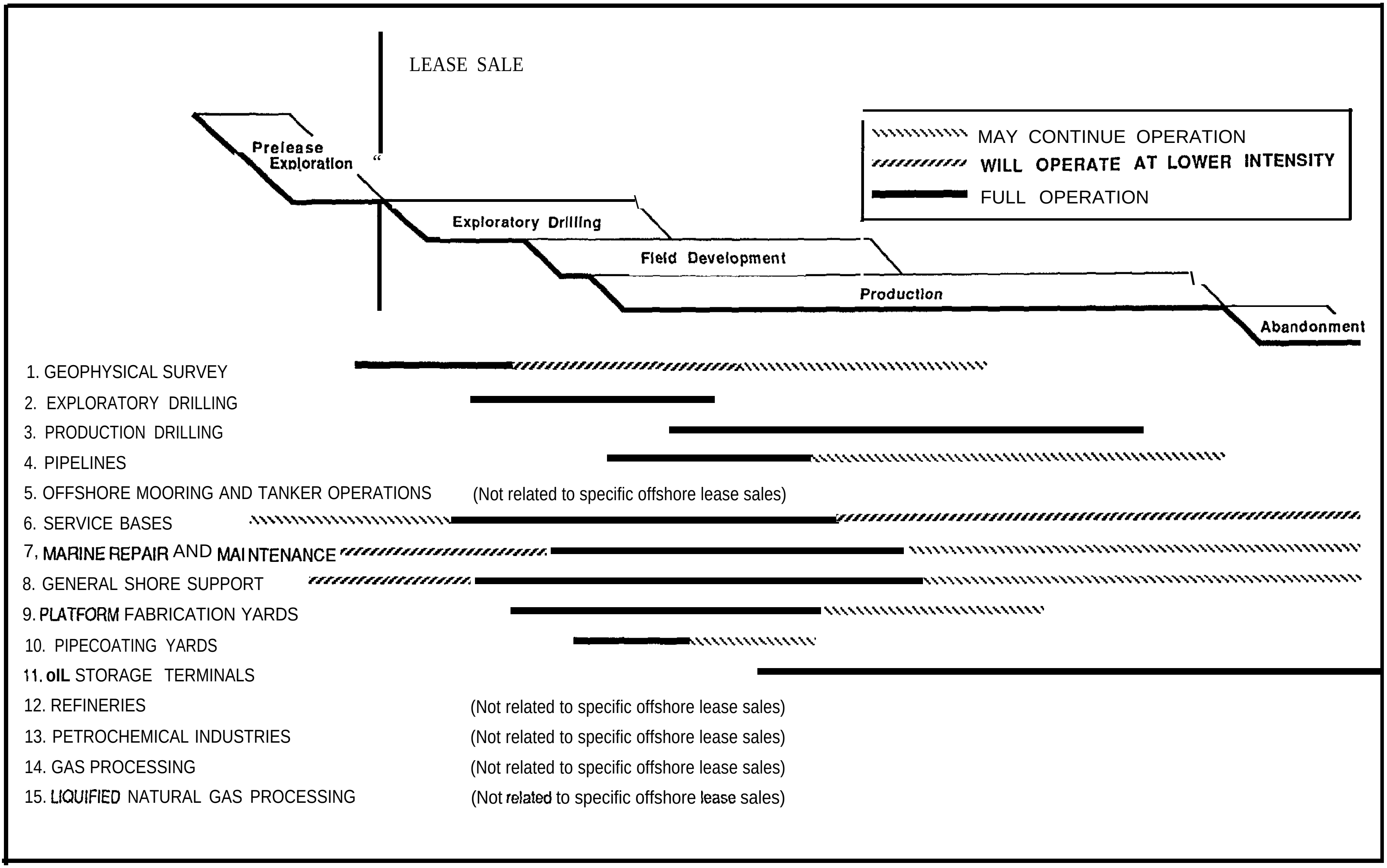



Figure 3-1. Relationships of phases of OCS field development to facility (modified from Zinn 1978; Rodi 1990).

## B. Phases of Field Development and Related Facilities

Development of the OCS resources occurs in six distinct stages, described by Clark et al. (1977) as phases. Each phase (Figure 3- 1) is characterized by different physical activities and regulations that mandate they take place in a specified order. In the case of the Gulf of Mexico with an extended history of operations, all of the phases may be happening at the same time, but for any one site the sequence is maintained. The pre-exploration, and the geological and geophysical exploration phases of OCS development, now described by MMS as the Pre-lease Geophysical and Geological Survey Phase, involve analyzing seismic information and geologic surveys to identify areas where there are the greatest potentials for hydrocarbons. Property boundaries are reconciled and survey controls are established. Existing facilities such as docks, waterways, and supply companies are used during these phases so that there are little, if any, environmental modifications (Clark et al. 1978). It is during the third phase, exploratory drilling, that the industry initiates development of significant facilities in support of OCS activities.

During the exploratory drilling phase test wells are drilled to define the characteristics of the resource while surface investigations determine the suitability of foundation conditions for supporting platforms and possibly pipeline routes (Clark et al. 1978). Temporary service bases are used as staging areas for equipment, supplies, and personnel. An all-weather site of 5 to 10 ac of land is needed on a navigable waterway that has a depth of 15 to 20 ft. Dock space is necessary for transferring men and provisions to well sites.

Maximum onshore development takes place during the fourth phase, field development. Onshore facilities--which include permanent service bases, repair and maintenance yards, ancillary industries and district offices, steel platform fabrication yards and installation service bases, pipelines, pipe-coating yards, and oil storage terminals (Figure 2-5)--are constructed during this phase. Permanent service bases replace the temporary facilities used during exploring and drilling, but continue to function as staging areas for men and equipment and storage space. Larger all-weather areas (usually 25 to 50 ac, but as much as 75 ac) are needed. Significant environmental modification of the property takes place, such as, construction of an all-weather surface for helipads, buildings, warehouses, and docks. Docks provide access to navigable waterways that have depths of 15 to 20 ft. Most heavy and bulky materials, as well as some personnel, are moved offshore by boat (Table 3-2). The size of engines on these vessels may exceed 7500 horsepower. In conjunction with the service bases are repair and maintenance yards for hulls, mechanical and electrical equipment, and personnel qualified to conduct inspections of equipment and vessels. The total land area necessary to satisfy these yards depends on the type of activity and can range from less than one acre for electronic repair shops to hundreds of acres for the larger ship repair yards.

Associated with the repair businesses are the ancillary industries and district offices of OCS-related companies. Some common enterprises include caterers who furnish provisions and cooks for the platforms; tool rental firms; specialty suppliers for items such as valves, hoses, and belts; hardware outlets; companies that provide contract laborers; welding and sheet metal shops; marine engine sales and service; log libraries; chemical distributors; engineers; and boat and helicopter lessors (Davis and Place 1983). Again, the size of the area affected depends on the particular facility. However, most of these companies must have access to an integrated transportation network that includes navigable waterways, roads, railroads, and airfields and sufficient space for storage or parking of vehicles. Davis and Place (1983) found that most of these industries were located on the higher, drier, and better drained grounds with access to a navigable watercourse. Other

Table 3-2. Typical Vessels Operating in the OCS Industry (from Clark et al. 1978).

| Type of Vessel | Description |
|---|---|
| Crew | For personnel transport; high speed boat |
| Utility/supply | General maintenance and movement of light-weight equipment and cargo |
| supply | For transport of bulk cargo |
| utility | Maintenance and general work |
| Tug | Light to heavy towing |
| Tug/supply | Moderate towing and transport of portable equipment and cargo |
| Crew/utility | For personnel transfer and general work |
| Crew/supply | For transfer of personnel and equipment |

land uses, for example agriculture, have been replaced by these commercial and industrial activities. Secondary development, particularly housing, is encroaching into the lower-lying and more floodprone wetlands now protected by levees and pumps. For example, there are developed areas within levee and pump systems in the Luling and Destrehan areas of St. Charles Parish and along Bayou Lafourche (Lafourche Parish). Terrebonne Parish has a forced drainage plan (U.S. Army Corps of Engineers 1982).

The largest user of land is the steel platform fabrication yard. These facilities need from 200 to 1000 ac of land with access to a complete transportation system, especially a navigable watercourse. Occasionally, access channels to the sea must be dredged to provide the 15-to-30-ft channels with a 2 10-to-350-ft horizontal clearance. Bulkheads transform the shoreline into an artificial edge. Most of the land area is cleared for shops, buildings, fabrication sites, and administrative offices. Associated with these yards are service areas, approximately 5 ac in size, which provide docks, warehouses, and repair businesses specifically for the platform industry. Heavy equipment, such as cranes, compressors, tracked vehicles, and a whole variety of engines are integral components of the operations.

Next, by individual size, are the pipe-coating yards. Within these facilities, 40-ft lengths of pipe are fashioned and prepared for use through the application of a mastic and concrete wrapping. Yards range in size from 30 ac, for temporary facilities, to 200 ac for the permanent developments (Clark and Terrell 1978). Long wharves (750 ft) provide access to deep (20 to 30 ft) channels connected to the Gulf. Movement of supplies and personnel to and from the yards is along established highways and railroads. Most of the tract is cleared for storage, with offices and buildings only needing a small portion of this area.

Pipelines for transporting oil and gas either from the offshore to onshore facilities or from these facilities to interior processors cross the coastal zone. Detailed studies of pipelines (Turner et al. 1988; Wicker et al. in review) through the coastal wetlands and across barrier islands describe effects of these facilities. Basically, the permanent pipeline right-of-way is up to 100 ft wide, a portion of which is cleared of vegetation before excavation for actual emplacement of the pipe. Spoil banks may block wetland flow while saltwater intrusion is reduced by structures. Pipelines are installed through wetlands by flotation canal, push-pull ditch, or trenching with heavy equipment on upland sites. Sections of pipe are welded and placed in the trench and buried. Pipeline rights-of-way cross the coastal zone in every conceivable direction. Numerous dredge barges, pipe supply barges, lay-barges, tugs, and tracked vehicles perform important functions during pipeline installation.

Oil storage terminals or tank farms collect production from the offshore and distribute it through the transportation network at a constant rate. Site requirements are a function of the predetermined handling capacity of the facility. Regardless of the size, such a facility requires land clearing, leveling, retention embankments, and access to an integrated transportation network.

## C* Summary

With the decline of OCS oil and gas activities along the Gulf Coast, many OCS-related facilities closed and a significant amount of equipment was stored, abandoned, or sold. Each of the major OCS-related infrastructure complexes and associated activities is distinguished by a number of construction and operational elements which only vary in degree and extent from one facility to another. Higher ground that is less floodprone is desired and, in most cases, needs to be on a navigable waterway. In every case transportation access (highway, railroad, canal) is essential to the location.

During site preparation vegetation will be cleared, except for perhaps a buffer strip for retarding runoff and for aesthetic value; the surface will be rough-graded and then, in most cases, covered with concrete, asphalt, shell, or sand to provide an all-weather surface and to more efficiently handle runoff. Along canals, bulkheads will be constructed to reduce erosion of the shoreline and provide for the construction of work areas for the transfer of materials to barges or boats. Utilities, such as electricity, gas, water, telephone, sewage processing, and roads, will be installed and functioning. Usually there is immediate access to some type of air service, ranging from international airports at the larger cities to small grass fields for fixed wing aircraft to helipads, each capable of handling men or material. Runoff may contain organic materials, heavy metals, oils and toxic contaminants. Construction contributes sediment from erosion of bare ground.

A schematic model of a facility no longer serving its original purpose shows a natural levee or high ground setting usually adjacent to a navigable waterway and cleared of native vegetation (Figure 3-2). Surface topography has been modified to enhance drainage and accommodate onsite activities. Roads and railroads lead to a complex of metal office and industrial buildings; all-weather parking lots and work areas; helipads; and storage yards for stockpiling pipe, muds, and other supplies. Much of the equipment once used to manufacture OCS structures, boats, and pipe remains on the site, either neglected and in disrepair or stored in anticipation of revival of the industry. An inventory of the facility would produce a list that includes engines, pumps, cranes, pipe, vehicles, tools, and ferrous and other metal scraps. In nearby canals and bayous are towboats, crewboats, and supply boats lashed together and guarded, but serviced and ready for deployment if and when contracted. Finally, barges and drilling rigs stand idle because of a decline in exploration and production.

Environmental modifications have also occurred away from the infrastructure sites. OCS pipelines cross barrier islands, beaches, and the coastal wetlands. In some cases the route is marked by open canals and spoil banks and in other instances almost invisible because of mitigation. Pump stations and processing plants are periodically located along the lines to boost pressures or separate hydrocarbons. Several dredged channels flanked by spoil banks allow for boat traffic between the Gulf of Mexico and inland ports. When necessary for navigation, jetties have been constructed and maintained. The OCS industry has become an integral element of the study area.

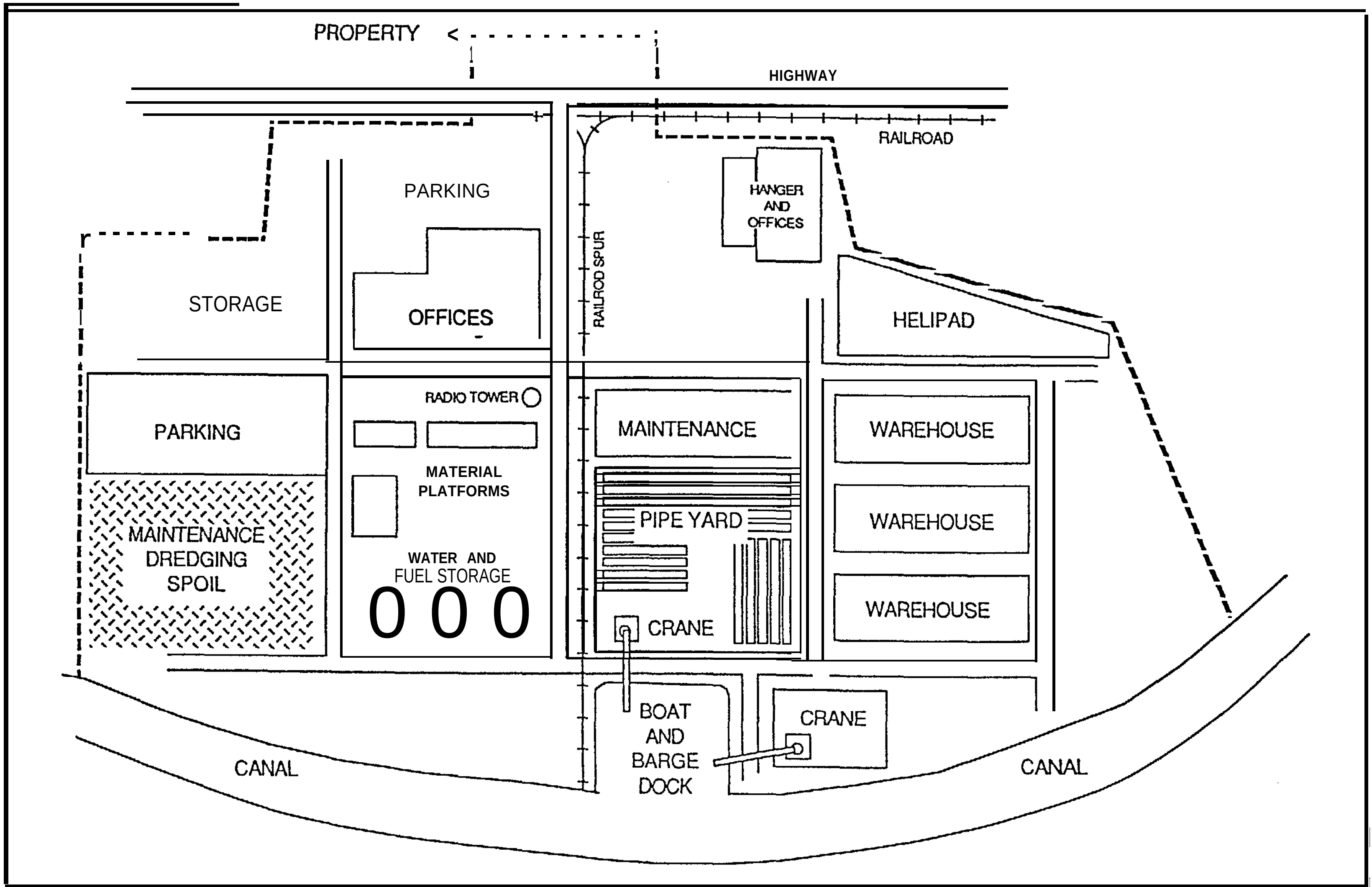



Figure 3-2. A composite of activities within an OCS facility (after Wales et al. 1976; Clark and **Terrell** 1978).

# IV. RECENT ALTERNATIVE ECONOMIC DEVELOPMENT INITIATIVES

## A. Background

The experiences associated with price-related declines in oil and gas activity in 1982 and 1985 accentuate the need for planning alternative economic development initiatives. The lessons learned from the impacts on the economies of Gulf Coast communities can be applied when considering mitigating impacts that will likely occur because of an ultimate decline resulting from resource depletion.

Price-related decline scenarios are far more unpredictable than is an eventual decline resulting from resource depletion. Communities along the Gulf of Mexico were not adequately prepared to contend with the severe, unexpected economic and demographic impacts resulting from the price-related decline, nor were they prepared to deal with the intense task of redevelopment. The prosperity attained from a viable oil and gas industry contributed to a false sense of security, which was shattered as oil and gas prices plummeted. The need to diversify the region's economic base was not apparent until it was too late.

The negative effects caused by low oil prices impacted the national economy but were largely concentrated in a few key, oil-producing states, including Texas and Louisiana (U.S. Congress, Office of Technology Assessment [OTA] 1987). The sustained level of low oil prices resulted in a drop in investments in exploration and development, loss of business to industries servicing oil producers, financial damage caused by widespread company failures and loan defaults, unemployment, and loss of tax receipts (U.S. Congress, OTA 1987).

By 1988, Texas crude oil production reached a 45-year low (Shreveport Times 1989). The United States continued to become more dependent on imported oil as domestic production dropped. The American Petroleum Institute reported oil imports of 8 million barrels per day and domestic production of 7.9 million barrels per day during January 1989 (State Times 1989).

The nine-year high in oil imports occurred during a period when demand for energy in the United States reached an all-time high (Morning Advocate 1989). During 1988 the United States consumed 18 million barrels of oil per day or about 35% of the world total. The previous record for energy consumption in the United States occurred in 1979, the year of the last oil crisis. Domestic oil production in 1988 was the lowest since 1976, the year before production began on the north slope of Alaska. Oil production in the 48 contiguous states in 1988 was the lowest since 1950.

An unprecedented economic boom was experienced among communities within the Texas-Louisiana Gulf Coast during the 1970s. Rising prices for oil and gas drove an economy characterized by rapidly growing employment and income gains associated with increased exploration, drilling, and production activity (Weinstein et al. 1985).

Conditions began to deteriorate following the price decline in 1982. A report prepared in 1985 for the Subcommittee on Economic Goals and Intergovernmental Policy of the Joint Economic Committee of the Congress of the United States revealed that ". . . every metropolitan area along the Gulf Coast has experienced large declines in manufacturing employment since 1980, with losses ranging from 4.8% in Lafayette to 33.3$% in Lake

Charles" (Weinstein et al. 1985). Unemployment rates within the area exceeded the U.S. average, a condition which continued throughout most of the decade. The last sentence of the report's Executive Summary states: "Industrial diversification has become an imperative for economic survival."

The international supply and demand relationship for crude oil exerts a major influence on domestic oil production (Weinstein et al. 1985). The international market price for crude oil--the OPEC "benchmark price" or the price for "Saudi Light''--is the greatest influence on the supply-demand relationship. The economic boom experienced along the Gulf Coast during the 1970s resulted primarily from rising oil prices. In 1982 prices dropped in response to the oil glut in the world market. A second major reduction in oil prices occurred in 1985 in response to production increases by Saudi Arabia. World oil prices were about $40 per barrel in 1981. By December 1985 the price had dropped to $28 per barrel, and during July 1986, the price dropped below $10 per barrel (U.S. Congress, OTA 1987).

The price-related decline impact on the domestic oil industry was catastrophic. Industry employment dropped from a 1982 high of 708,000 to 422,000 in September 1986. During that period oil field service employment dropped from 435,000 to 206,000. Exploration and production capital spending decreased from $50 billion in 1981 to $16 billion in 1986. The fiscal optimism evidenced by the popular early 1970s oil patch slogan "$85 by '85" (meaning oil prices of $85 per barrel by 1985) quickly faded into oblivion as Gulf Coast communities came to grips with the unexpected reality of economic recession and net population decreases.

Changes experienced in Houston, an international oil and gas industry center, were indicative of the detrimental impacts experienced by large and small communities along the Gulf Coast. As oil prices began to decline in 1982, the Houston economy experienced an immediate and devastating impact. The previous year's euphoria was replaced by despair. The shift from industry and employment growth to cutback was sudden and massive (The Houston Post 1989).

Louisiana, New Orleans in particular, has been the administrative and operational center for offshore oil and gas exploration and production in the Gulf of Mexico since 1947. Companies in Houston served a major role in the manufacture of capital goods for exploration and production and supply technology on a global basis (USDI, MMS 1987).

Optimism created by the rapid rise in the price of oil between 1979 and 1981 was dampened by the price decline experienced in 1982. Belief that the price decline would prevail for only a short term was shattered as prices plummeted in early 1986. With prices remaining at low levels for the last several years, the oil and gas industries' attitude for the future has been termed "hypercautious" by World Oil magazine (Morning Advocate 1989).

The recent (post-1982) price-related decline in oil and gas activity was unexpected. Gulf coast states and communities were not prepared to deal with the economic consequences. Unrealistic optimism and a false sense of economic security shrouded by oil and gas activity detracted from the need to pursue economic development alternatives. The wealth attained from oil and gas was not used to diversify economies; few saw the need to do so.

Recent economic development initiatives spawned as a result of the price-related decline in oil and gas activity will be identified and discussed in this chapter. Personal communiqué with individuals and groups involved with the formulation of economic development initiatives and news articles are the main sources of the information presented.

Economic diversification and revitalization within the Gulf Coast is a concern to both the public and private sectors. With the collapse of the oil and gas activity economic base, attention has been redirected toward the evaluation of undeveloped, underdeveloped, and neglected assets within the region. Tourism, alternative manufacturing opportunities, petrochemical industries, fisheries, environmental attractions, and ports are now being actively pursued to fill the economic void created by the demise of the oil and gas activity.

This chapter provides an overview of the economic and demographic changes experienced as a result of the recent price-related decline in oil and gas activity, the framework of economic development organizations, and an overview of the economic development challenges confronting communities in the Gulf of Mexico region.

## B. Population and Employment Changes

The phenomenal impacts resulting from the recent decline within the 49-county-and-parish study area are evident in population and employment changes. From 1960 to 1986, the population of the United States increased by 34.5% (McKenzie 1988). During that same period, the population within the study area increased by 72.9%. During the 1970s, the population growth rate in the study area was more than double the national average (2,79% versus 1.15%).

From 1981 to 1982, the population in the Central and Western Gulf of Mexico Coastal Analysis Areas increased by 4.01%, a rate of nearly four times the national average of 1.03% (Figure 4-1 ). The growth rate between 1982 and 1983 was still double the national average; however, by 1984 it had declined to one-half the national population growth rate (0.48% versus 0.94%).

Population change rates for select coastal areas within the study area further evidence the dramatic reversal of growth trend in counties and parishes in the Gulf of Mexico region. From 1981 to 1982, the population in southwest Louisiana (coastal area C- 1) increased at a rate three times the national average (Figure 4-2). Two years later, the area was experiencing a net loss in population. In southeast Texas (coastal area W-2), which includes the Houston metropolitan area, the percent change in population between 1981 and 1982 was approximately five times the national average but dropped to one-third the national rate between 1984 and 1985 (Figure 4-3).

Five of the 49 counties and parishes in the study area experienced negative net migration during 1981 (Figure 4-4). By 1984, 35 of the 49 counties and parishes experienced negative net migration.

Peak positive net migration occurred between 1981 and 1982 when 208,324 people moved into the study area (Figure 4-5). From 1982 to 1983, the net number of people moving into the area decreased to 63,972. The following year a net total of 60,978 people moved out of the study area.

Mining industry jobs within the study area reached a peakof231,768 in 1982. From 1982 to 1983, jobs in the mining sector decreased by 12.52%. By 1986, only 165,403 mining industry jobs existed, a 28.63% decrease from 1982.

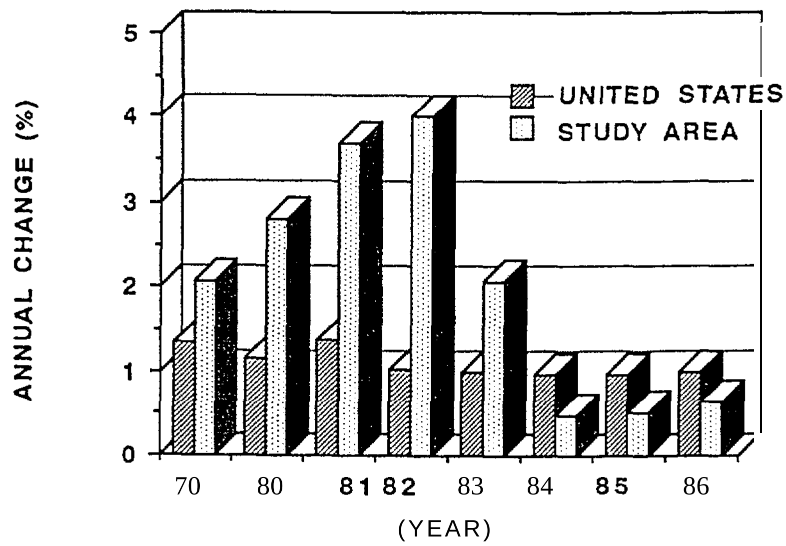



Figure 4-1. Population change, USA vs. study area.

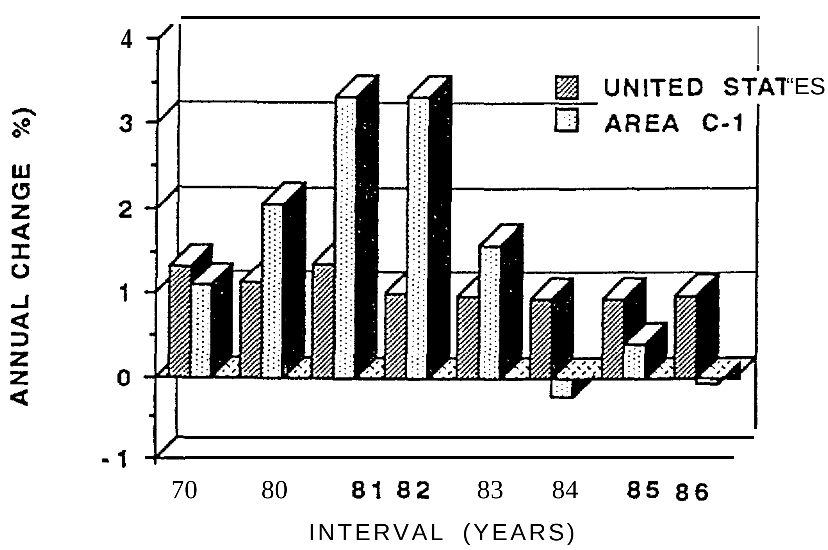



Figure 4-2. Population change, USA vs. Area C-1.

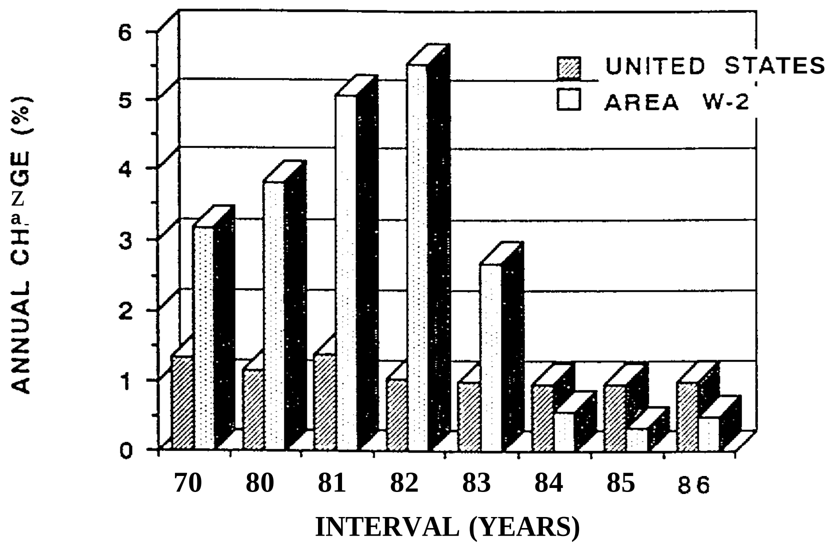



Figure 4-3. Population change, USA vs. Area W-2.

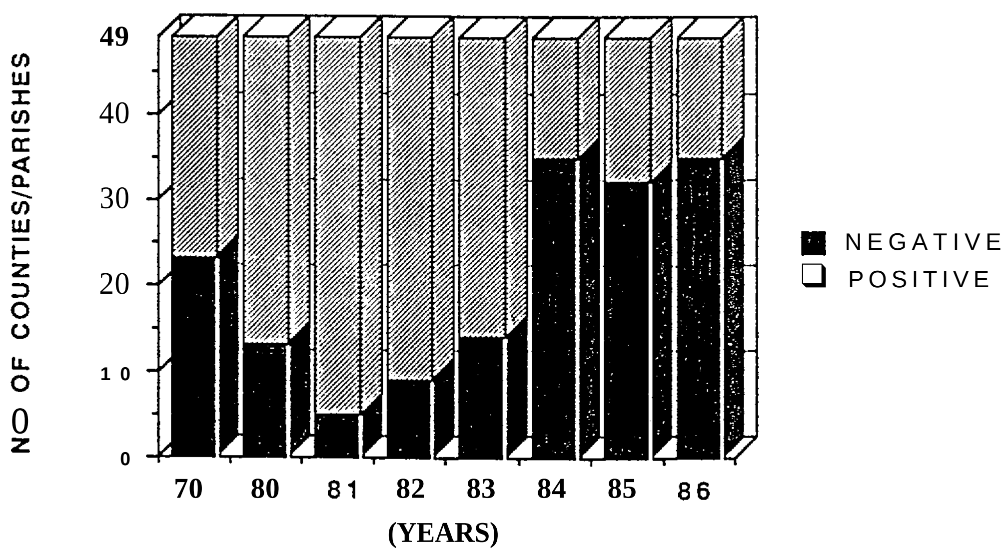



Figure 4-4. Negative and positive net migration by counties/parishes.

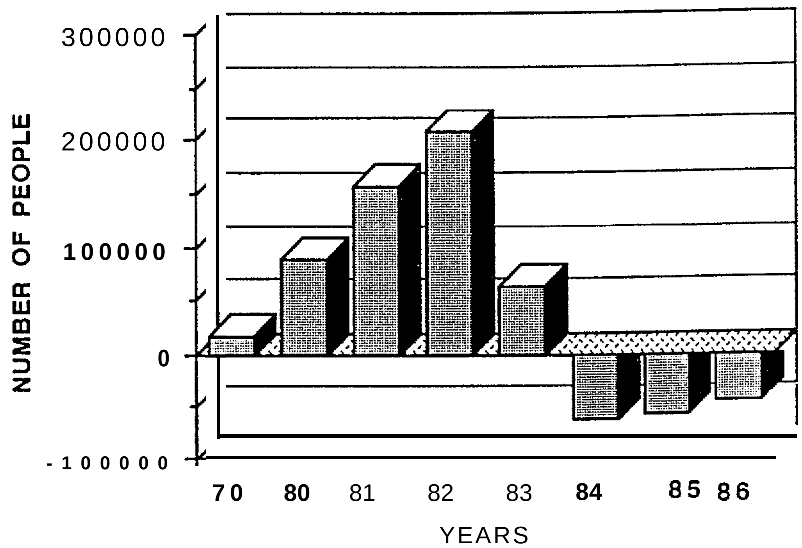



Figure 4-5. Net migration for study area.

An important baseline study entitled "Indicators of the Direct Economic Impact Due to Oil and Gas Development in the Gulf of Mexico" focused on employment and expenditures associated with offshore oil and gas activities in the Gulf of Mexico (USDI, MMS 1986e). The study was conducted with the cooperation of nine major offshore companies represented on the Offshore Operators Committee, Socioeconomic Subcommittee. These companies were responsible for over half of the total offshore Gulf of Mexico energy production in 1984.

Each of the companies represented provided key information on approximately 12,500 employees associated with offshore oil and gas exploration, development, and production in the Gulf of Mexico. Data collected from personnel records included position or job description, income, employee's home zip code, work location, and staging areas used. The sample data obtained from the nine producing companies were scaled or weighted to provide estimates on the universe of offshore Gulf of Mexico producers' employees.

The data obtained on offshore employees' income and place of residence (zip code) are of particular interest because they can be used to determine geographic areas of economic impact associated with offshore employment. Data on earnings and jobs by industry and by place of employment are available from the U.S. Department of Commerce, Bureau of Economic Analysis. The availability of place of work data from the offshore producers provides the means for segregating offshore employment impact from mining industry in general. This distinction is of particular importance to the present study since attention is being directed toward impacts associated with Gulf of Mexico outer continental shelf oil and gas activity.

Of the estimated 23,935 job positions with offshore production companies, 9,881 were located offshore and 14,054 were located primarily onshore (USDI, MMS 1986e:29). Approximately 13,500 of the onshore workers reported to job sites in Louisiana; the remainder to sites in Texas. The New Orleans area alone serves as the work site for approximately 10,000 onshore jobs; the Lafayette area for another 1,300. Approximately 60% of the 500 onshore personnel in Texas report to work sites in the greater Houston area.

More than 80% (8,075) of the offshore Gulf of Mexico workers report to work sites in Louisiana. An estimated 501 offshore personnel report to sites in Texas; the remaining 1,071 were classified as "multi-location" workers. An insignificant number of offshore workers reported to work sites in Alabama, Florida, and Mississippi.

A substantial majority (82%) of offshore Gulf of Mexico production workers (including those assigned to onshore and offshore work sites) resided in Louisiana; 8% had residential zip codes in Mississippi; 6% in Texas; 2% in Alabama; and 2% in other states or places of residence could not be identified. These data are of particular importance since the place of offshore production workers' employment may in all likelihood differ from their place of residence.

A relative measure of the financial impact of earnings by offshore production workers on their respective residential economies was obtained by data collected on wages and salaries by place of residence. Offshore production employees residing in Louisiana received the largest proportion of wages and salaries. During 1984, wages and salaries paid by offshore production companies to residents of states along the Gulf of Mexico were: Louisiana, $710 million; Mississippi, $64.7 million; Texas, $51.3 million; Alabama, $15.2 million; and Florida, $6.4 million (USDI, MMS 1986e:39).

In addition to wages and salaries to employees, offshore producers expended an estimated $8.75 billion for contract services, materials and products associated with offshore oil and gas exploration, development, and production in the Gulf of Mexico during 1984 (USDI, MMS 1986e:48). Although these expenditures were categorized by offshore activity, they could not be allocated on a geographic basis.

The combined offshore producers' expenditures to contractors and supply businesses in 1984 generated an estimated $2.59 billion in wages and salaries to contractor and supply business employees. Those wages and salaries supported approximately 97,400 full-time equivalent positions. The major employment contractor industries supporting offshore producer oil and gas activity in the Gulf of Mexico were: contract labor and engineering, 19,005 employees; oil field services and tool rentals, 13,656 employees; contract development drilling, 9,026 employees; contract exploratory drilling, 7,748 employees; platform and equipment fabrication, 7,170 employees; and boat, barge, and marine equipment, 6,074 employees (USDI, MMS 1986e:52).

Although the geographic distribution of contractor employees could not be determined from data provided by the offshore producers, it can be surmised that the distribution is similar to that for offshore production company employees. The magnitude of the socioeconomic impacts associated with the price-related decline in oil and gas activity in the Gulf of Mexico on counties and parishes is likely to be in proportion to the relative influence of offshore employees' earnings and salaries residing in those areas.

## C. Economic Development Organizations

The unexpected price-related decline in oil and gas activity focused attention on the efforts of economic development organizations. Substitute industries were needed to fill the employment void created by the drop in jobs associated with mining sector activity.

An expansive system of economic development entities operates within the project area, The intent of the discussion in this section is to provide an overview of the structure of the economic development system.

Economic development organizations share a common goal of creating employment opportunities within their geographic domain. Competition exists among the economic development organizations within the study area. The intensity of the competition becomes increasingly parochial toward the local level.

Financial incentives and public relations are the primary tools employed by public sector economic development organizations to attract new industry. Major attention is given to attracting new industry rather than to enhancing existing industry. Efforts to "buy" industry involve the provision of financial incentives, including direct monetary grants, waiver of taxes, job training assistance, and technical assistance. On the public relations side, economic development organizations espouse the virtues of their respective jurisdictions, including geographic location and siting, labor pools, cultural assets, and educational and recreational opportunities.

Economic development agencies exist within a framework that can be broadly segregated into public sector entities and private and quasi-public sector entities. Public sector development agencies supported by public funds and managed by public officials exist at the federal, state, and local (regional, county and parish, municipal, and sub-municipal district) levels. Although purely private sector economic development entities (such as units within privately owned utility companies or business associations funded by members' dues and donations) exist, many are actually quasi-public because they actively seek and receive public funds in the form of grants or contracts.

### 1. Public Sector Organizations

Federal. Federal initiatives have to a degree mitigated the detrimental economic impacts associated with the recent price-related decline in oil and gas activity in communities along the Gulf of Mexico. Assistance has been provided in the form of financial aid to displaced oil and gas industry workers and federal grants and contracts to local government and businesses.

State. State economic development agencies are competing with one another on the international and national levels. Changes in the global economy have spawned renewed efforts to attract industry and business. The price-related decline impacts on oil- and gas-producing states along the Gulf Coast further accentuated the need to diversify their economic base. States are becoming increasingly competitive to attract industries, know-how, and tourists from other states (Council of State Governments 1988). Aggressive state-financed public relations campaigns involving advertising in national publications and specialized trade publications, and sponsorship of trade-visits to foreign countries have become commonplace.

Financial incentive packages are used to entice businesses to locate in a state. The incentives can include tax exemptions, job training grants, technology research support at state-funded universities, and tax abatements for property and materials. States often become involved in "bidding" wars to attract new or expanding industry. The use of business tax and other financial incentives to stimulate growth and create jobs are controversial economic development activities (Council of State Governments 1988:17). The controversy centers around the question of whether the costs outweigh the benefits.

The Mid-South Trade Council formed in 1983 is representative of a cooperative, multi-state, regional economic development initiative. Council members include the states of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, and Tennessee, and the World Trade Center of New Orleans. Although each of the member organizations is free to pursue economic development independent of the Council, they cooperate by cost-sharing trade shows in foreign countries. The trade shows are primarily designed to identify prospects for Council-area companies to export goods and services.

Faced with increased competition from other states and a pressing need to diversify economically to replace jobs and economic losses resulting from the impact of the price-related decline in oil and gas activity, states within the study area have initiated structural and procedural changes in their economic development organizations. Alabama recently implemented the Governor's Rural Development Initiative--a cooperative effort involving state and federal employees to promote economic development in the most distressed counties. Financial assistance and investment programs administered by the Louisiana Department of Economic Development were consolidated into the Economic Development Corporation to provide a one-stop shop for businesses and communities seeking financial aid. An initiative in the State of Mississippi would involve a reorganization of county government to encourage economic development and enhance accountability. Export assistance centers in Texas assist businesses in conducting foreign trade. The Texas program is a joint venture between the Texas Department of Commerce and the U.S. Department of Commerce.

Local. Counties and parishes, metropolitan areas, municipalities, and special districts such as downtown development groups, port commissions, and industrial park authorities play an active role in economic development. A profusion of such entities exists within the study area. Economic development has in itself become a growth industry within the study area.

### 2. Private and Quasi-public Sector Organizations

Resident businesses, especially those in the service, utility, construction, real estate, and financial sectors of the economy, are active in economic development. A growing economy is essential to their expansion and viability. Although some of the larger businesses, particularly electric utility companies, maintain an economic development staff, many form associations to foster economic development. In addition to creating and promoting local economic development initiatives, chambers of commerce tend to serve as liaison or intermediary between prospective private business and local businesses and government.

Individual businesses and private economic development groups representing businesses that have suffered from the price-related decline in oil and gas activity within the Gulf Coast region have solicited increased cooperation and coordination with governmental entities to promote economic activity. This closer partnership between the public and private sectors was required in order to obtain government financial assistance to offset the cost of economic diversification necessitated by the loss of opportunities affiliated with oil and gas activity.

## D. Recent Economic Development Activities

As stated previously, the need for economic diversification was not a pressing concern during the boom period. Communities' and states' over-reliance on a single industry poised them for the unexpected and catastrophic economic bust which occurred when oil prices dropped sharply.

As activity in the oil and gas industry slowed down, employees were laid off and the demand for goods and services provided by secondary industries decreased. The resulting loss in wages and salaries and slowed economic activity impacted both the public and private sectors. State and local government revenues began to shrink at a time when demand for government assistance, primarily in the form of unemployment compensation, rose drastically. Capital, much of which had been invested in a booming real estate market and in oil-and-gas-industry -related companies and projects, became increasingly scarce.

The period when the urgency to establish economic alternatives was greatest was accompanied by a period when attraction to the region was lowest. Population expansion and economic growth had been replaced by net out-migration and a depressed economy. The attraction offered by alternative assets in the region had not been fully developed during the boom period. The economic demise was accompanied with an overshadowing sense of gloom among the population about the region's future.

## 1. Reactionary Initiative

A flurry of activity began when it became clear that the price-related decline in oil and gas activity was more than a short-term problem. These activities were intended to salvage as much of the economy as possible in the short-term until long-range strategies could be formulated and viable economic development alternatives initiated.

Although little could be done by oil and gas producing companies, businesses that serviced those companies actively sought new markets to service through the conversion of skills and expertise originally created to meet oil and gas industry demand. A number of these conversion efforts arose from businesses which had been involved with the extensive support industry associated with offshore oil and gas activities. Examples of conversion effort actions include:

a. industrial parks being designated as foreign trade zones;

b. oil field pipe galvanizing processes applied to commercial products such as boat trailers and structural steel towers;

c. exportation of drilling and workover rigs to the Soviet Union;

d. shipyards entering the excursion boat, barge construction, and small vessel repair markets;

e. shipyards redirecting marketing from the oil industry to the federal government for the construction of military vessels;

f. retrofit of oil industry vessels for seafood factory ships and transport vessels; and

g. retrofit of offshore supply vessels and offshore platforms in the Gulf of Mexico for drug traffic surveillance and interdiction.

The success of these conversions was founded on the ingenuity of local company management, available environmental modifications, a skilled work force, and production capabilities that had been previously employed to support offshore operations.

Many examples of diversification exist throughout the Gulf region, permitting companies to survive and profit. New technologies in inspection, repair, and maintenance extend the useful life of pipelines, and refurbished jackets offer an alternative to new construction. Because each jacket and topside must be reclassified or recertified before it can be used again, a growing industry has developed in the inspection and recertification of the structures. In addition, there is a demand for platform modules and decks that can be transferred to other jackets. Refurbishing requires trained personnel (welders, engineers, support and office staff,), machinery (small-to-medium-size lifting equipment, boats), and facilities (yards and shops) to accomplish the reconditioning which also adds workers to the payroll.

Pacific Crane and Engineering Co. bottomed out in 1987 from the depressed activity in the offshore oil industry and mapped out a diversification strategy. They went from strictly container-handling equipment to contract manufacturing (Supplement to Sun Herald 1988). Moss Point Marine, Inc. of Escatawpa, Mississippi became the first Mississippi company to be granted special purpose foreign trade sub zone status by the U.S. Department of Commerce. It was during the oil and gas recession that Moss Point saw the need for an increase in the production of vessels for the Navy and fishing industry. Their foreign trade subzone status designation was the result of an application prepared by the Mississippi Research and Development Center's business service bureau at the request of the Greater Gulfport-Biloxi Foreign Trade Zone.

Aztec Manufacturing Co., in Crowley, Texas does finishing work on oilfield pipe and galvanizes a variety of products. They have now expanded their successful hot dip galvanizing operations, in which molten zinc is applied to products such as boat trailers and structural steel towers (Houston Chronicle 1988).

Some equipment from Roberds-Johnson Industries rig-up yard in Galena Park, Houston, Texas is the first part of $36.6 million worth of drilling and workover rigs to be shipped to the Soviet Union (Houston Chronicle 1988).

Lincoln Big Three, Inc., a welding supply company with locations in Lafayette, Baton Rouge, and New Orleans, Louisiana and Jackson, Mississippi, has moved into a 14,870 square foot "welders supermarket." The fabrication of steel is seen as the only thing to count on making a comeback for the oil industry. They are building barges, offshore rigs, workboats and bridges because of expansions in the chemical industry (Sunday Advocate 1988).

Alabama Dry Dock and Shipbuilding Corp. (ADDSCO) shut down its union shipyard subsidiary but is now examining the feasibility of entering a smaller vessel repair market (Mobile Press Register 1988),

Trinity Marine relocated its corporate headquarters from New Orleans to Gulfport. The company moved about 90 employees into the office building at the old McDermott shipyard and has plans to double the size of the building for the rest of their New Orleans-based employees. Trinity Marine, which manufactures ships smaller than 500 feet, was able to profit from the oil boom of the 70s and early 80s by building oil platforms and supply boats. But when the decline came, Trinity, like many oil-related businesses, was forced to cut back. The company survived by turning its efforts to government contracts. But in recent years, Trinity has worked in new markets and on new products that will help the company reestablish the commercial part of its business. They see opportunities in barges, tow boats, push boats, and excursion boats, such as the one recently completed for a dinner cruise company in the San Francisco Bay Area. Trinity also is proving competitive in overseas markets by building ships for foreign governments, particularly in the Middle East (Sun Herald 1989).

McDermott is diversifying its fabrication yard to handle heavy metal and steel structures for the Navy, highway girders for Texas, Louisiana, and Tennessee, pipelines manufactured on barges (floating production) and bridge girders. They are changing the shipyard to handle: tugboats and coal hopper barges. The company went from a 100'ZO commercial market to a 90% governmental market and presently has eight Navy contracts for surveillance vessels and torpedo test craft (USDI, MMS 1989).

Conrad Industries, Inc., in St. Mary Parish, Louisiana refurbishes crewboats and utility and supply boats for some renewed work offshore. Conrad has expanded to include foreign businesses and now converts boats for these clients while providing dry docks, barges, and boats with new structural designs (Domino 1988). Ham Industries, Inc., located on the Pascagoula River in Mississippi, converted the ODECO drilling ship Ocean Tempest to a seafood factory for Alaskan waters. The newly renamed All Alaskan is the largest American seafood factory ship. The conversion allowed the company to employ approximately 150 persons and infused $5 million into the Pascagoula economy (Peck 1988).

Boat owners, who comprise another related support industry, are aggressively marketing their idle ships. Some vessels are being sold for steel scrap while others are used for fishing or coastwide cargo service in foreign areas. At least two offshore supply vessels have been modified to serve as gambling ships which cruised to international waters from ports in Mississippi and Louisiana. Other less conventional uses for OCS vessels are: transports for containerized commercial cargoes or special projects such as sail boats (Atkinson 1988); tugs for barges with containerized cargo; towing balloons as part of the United States drug interdiction program; towing of large ships such as the battleship Wisconsin (which was built by Ingalls Shipyard in Pascagoula, Mississippi), and offshore platforms such as the Shell Oil Co. Boxer and the Standard Oil Co. rig Snapper (Currence 1987); and docking services along the east coast and in foreign harbors. Bollinger Machine Shop and Shipyard of Lockport, Louisiana now constructs Coast Guard cutters to slow the flow of drugs into the U.S.A. They had the help of the Louisiana Productivity Center at the University of Southwestern Louisiana to gain the contract.

Increased unemployment was experienced during the recovery time-lag during which services and products were being converted to meet the demands of new markets. Industries and businesses pursuing market conversions were hard-pressed to obtain financial support locally because of the unavailability of capital for speculative or untried ventures. Fiscal conservatism and skepticism replaced the adventuresome, optimistic attitude prevalent among Gulf Coast financial institutions prior to the price-related bust.

## E. Summary

The unexpected price-related bust in the oil and gas industry confronted states and communities along the Gulf of Mexico with serious economic consequences. Most were not prepared to contend with the magnitude and intensity of alternative development required to maintain their economies. The experiences learned during the recent price-related decline period can be applied to an eventual resource-depletion decline scenario.

Recent economic development initiatives spawned as a result of the price-related decline in oil and gas activity include intensive efforts by state and local governments to attract new industries and the conversion of goods and services to meet new markets by businesses previously dependent on the oil and gas industry. The successes attained are attributed partially to the work-force skills, infrastructure, and production capabilities developed in the region in response to the demands of the oil and gas industry.

# V. ALTERNATE USES OF OCS INFRASTRUCTURE AND ENVIRONMENTAL MODIFICATIONS TO ENHANCE OR REVIVE LOCAL ECONOMIES

## A. Introduction

Recent declines in the price of oil and gas and the corresponding declines in oil and gas activities and employment have forced both the public and private sectors to investigate new and different ways of recycling equipment, material, and facilities. In fact, many entrepreneurs and organizations have initiated programs and formed companies that are reusing equipment and vessels to meet the needs of the offshore industry, as well as adapting presently used infrastructures to meet other diversified functions. This section builds on these examples of innovations occurring in the Gulf of Mexico region and suggests practical uses for the facilities and environmental modifications that are presently abandoned, are under-used, or might be lost through time because of neglect.

The suggested alternatives are not intended to be a restatement of the obvious or that which is being tried by either the public or private sectors. Rather, the alternatives are founded on the need for greater foresight in planning for activities in the coastal zone, a luxury not often pursued under existing conditions. Therefore, what are proposed go beyond the immediate and are in anticipation of what is important and needed in the future. The first group of suggested activities is directed at restoring or enhancing the coastal wetlands. A second set of ideas focuses on the concept of more intensively managing the renewable resources of the coastal zone. Finally, several industries that can stimulate further resource use in the coastal zones of the study area are discussed.

## B. Economic Mitigation

The Economic Adjustment Program administered by the U. S. Department of Defense is representative of a successful federal effort to mitigate detrimental economic impacts associated with the loss of jobs from the closure of military installations. The program, although not directly related to impacts created by declines in oil and gas activity, is of particular relevance to conditions being experienced by communities along the Gulf of Mexico. Alternative uses of existing infrastructure and employment opportunities for displaced workers are addressed. The comprehensive program for mitigating detrimental impacts which relies on local participation could be adapted to coastal communities.

The program operates within a methodical system which includes a rigorous advanced planning effort involving agency personnel and local representatives from the public and private sector. The success of the program is documented in a number of base closure experiences which have resulted in local economic advancements.

The Department of Defense (DoD) administers the Economic Adjustment Program for local governments and businesses to replace jobs lost to the closure of military installations (Office of Economic Adjustment 1986). The DoD program was initiated in 1961 and serves as a representative example of a comprehensive federal assistance initiative designed to mitigate local economic impacts resulting from the closure of military installations and operations.

The Economic Adjustment Program's message to local governments is "communities can recover effectively from base closures; adjustments can provide long-term opportunities--not necessarily a crisis" (President's Economic Adjustment Committee 1986). The process of economic adjustment includes extensive local involvement during the transition period and capitalization of abandoned infrastructure and displaced employees.

The closure of Brookley Air Force Base in Mobile, Alabama, provides an example of a successful conversion within the study area. In spite of strong local protest accompanied by acute apprehension, Brookley Air Force Base was closed in 1969 with a loss of 13,600 civilian jobs. The federal government sold the runways, aviation buildings, and 1,312 ac of land to Mobile for one dollar to use as a general aviation airport; 392 ac were acquired at fair market value for an industrial park; 24 ac were purchased at one-half the market price for a city park; and 289 ac on Mobile Bay and a number of buildings for use as an additional campus for the University of South Alabama were donated free of charge.

The base was subsequently converted into an industrial-aviation-educational complex. The local governing authorities together with local financial institutions and the Chamber of Commerce were able to attract several private industries to locate on the site. The success of their efforts resulted partially from economic advantages provided by the infrastructure which had been obtained at an extremely low cost from the federal government.

In 1978 the Office of Economic Adjustment provided technical assistance to local governments along the Mississippi Gulf Coast in conjunction with a planned work force reduction at Ingalls shipyard in Pascagoula. Ingalls was completing major Navy shipbuilding contracts. Employment at the shipyard served as the economic mainstay for the area. The 25,000-person work force was to be reduced to 10,000. Severe detrimental economic impacts were expected. A comprehensive study involving local public and private sector leaders was prepared. The study's goal was to help the area further develop its economic base and reduce reliance on the Ingalls shipyard. An infrastructure inventory, an estimate of Ingalls cutback impact, economic development prospects, a development strategy, and development actions were documented to assist local entities in the diversification of their economic base and thereby mitigate anticipated detrimental impacts. Ingalls did begin reducing employment between 1977 and 1978 from 24,742 to 20,602. The reduction continued until it reached a low of 10,126 in 1983.

This section does not propose alternatives for specific facilities within the study area or provide cost feasibility reports or projects; it presents considerations on the transferability of facility assets to alternative economic uses. For example, several economic development agencies have compiled inventories on site availability. These include the Harrison County Development Commission in Mississippi and the Gulf States Utilities Company based in Louisiana.

Each of these agencies has on its database an automated inventory that can provide pertinent traits of the sites. The Harrison County Development Commission data pertains only to Harrison County sites and includes data on company name, address, building size in square feet, and the price.

The Gulf States Utilities Company data encompasses a service area from southeast Texas eastward to a portion of southeastern Louisiana. Its database includes information on square footage; ceiling height in feet; address; whether it is within city limits; name of former occupant; percentage of building with air conditioning; and whether it has access to rail spur, rail dock, deep water transport, or barge transport.

Some limitations on applicability of activities to specific sites are obvious. Facilities within commercial corridors or industrial parks will attract these types of businesses. In place of an OCS facility, the new operator may decide that a central warehouse, a regional distribution center for a national chain of discount stores, or a truck terminal is a more appropriate use of the amenities provided by the location and existing infrastructure. The distance from population centers or markets may determine the profitability of a site. In addition, the acreage of the facility may not be appropriate for a new venture. The private sector is able to evaluate and judge the suitability of particular traits.

The constraints imposed by the surroundings, county (parish) or municipality zoning ordinances can also influence the type of business that can occupy a parcel. For example, if the facility is within an area zoned "Commercial" it could be difficult or impossible to obtain a reclassification to "Heavy Industrial." Local ordinances and practices will dictate how alternative uses will be accepted or encouraged. Certainly, environmental regulations will have a part in determining what can be built in an area. Selected communities are designated by the Environmental Protection Agency (EPA) as non-attainment areas for air emissions. Therefore, qualifications may be placed on the range of enterprises that are allowed because of permit conditions. The same reservations may apply to industries with a point source discharge for waters resulting from manufacturing or processing.

Each proposed alternative is presented as a concept which may be adaptable to a tract in the depressed economic area. An individual involved in rehabilitation must coordinate with federal, state, and local authorities for obtaining the necessary permits and inspections and make his own determination of feasibility given the existing and future conditions at the site. Rehabilitation of activities and initiation of efforts will result in the development of secondary businesses, who must then prepare a feasibility analysis.

## C* Restoration and Enhancement of Coastal Wetlands

### 1, Surplus Pipe and Machinery

The use of old or salvaged pipe, pumps, moth-balled equipment and skilled but unemployed workers to install freshwater pipelines in existing pipeline rights-of-way has potential for wetland enhancement. There are a number of issues to consider prior to their use which must be done on a case-by-case basis. First, there must be a dependable source of surplus freshwater. This basically eliminates the Texas Barrier Island and the Strandplain-Chenier Plain Systems from consideration because the freshwater resource is either nonexistent or is being conserved for rice irrigation. Secondly, there must be a need for additional freshwater in the wetlands. The Mississippi and Alabama System has limited wetlands, most of which are in balance with the regional freshwater inflow and salinity regimes. Therefore, of the four systems, only the Mississippi Deltaic System is a potential candidate.

A reliable source of freshwater is available from the Mississippi and Atchafalaya Rivers. There is also a critical need for supplemental freshwater to combat the loss of wetlands due to saltwater intrusion and subsidence in the fringing shoreline wetlands farthest from the Mississippi River. Selected wetlands that would benefit from freshwater discharge cannot be supplied by the proposed freshwater diversion projects. The map in Figure 5-1 shows two of these "shadow" zones where this concept would produce benefits. Finally, the pipe must not be contaminated with toxic or hazardous substances or radioactive particles.

The benefits of introduction of Mississippi River water to estuarine marshes includes lowering the salinity in estuaries and providing suspended inorganic sediments, nutrients, and dissolved minerals for plant production. The freshwater pipeline concept is very

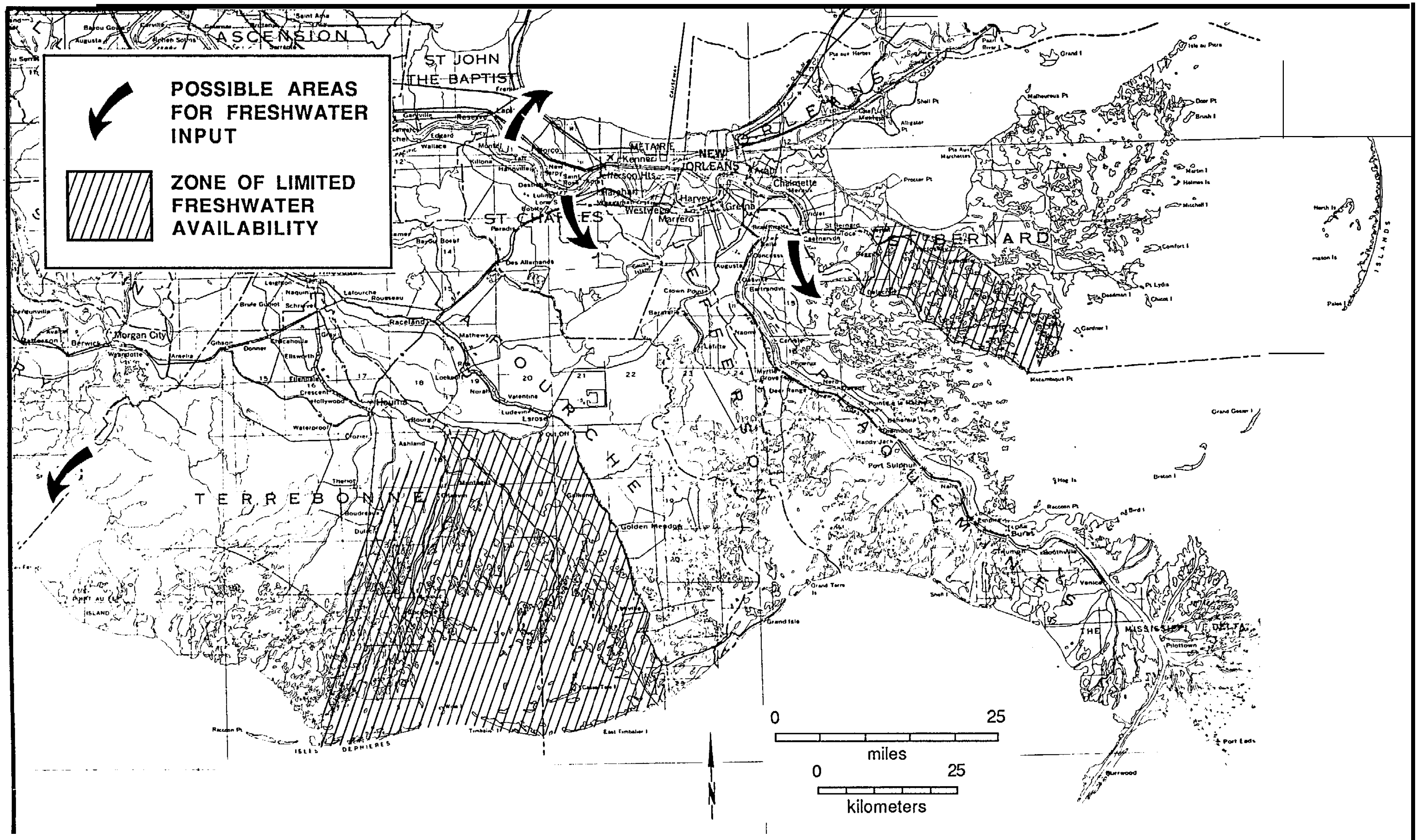



Figure 5-1. Possible areas for h input.

similar to the existing and proposed freshwater siphons in St. Bernard and Plaquemines Parishes. Van Beek et al. (1986) analyzed the benefits of siphons in Plaquemines Parish and estimated that 1 ac-ft/day of siphon discharge should be sufficient to maintain 1.5 ac of marsh against the effects of subsidence (on an annual basis). Siphons operate solely on head differential between the river and the receiving basin nearby and do not normally function during six months of the year. The freshwater pipeline, however, would employ used pumps or compressors to move river water and could therefore operate year-round.

Figure **5-2** shows the 1985-1987 national average for total pipeline costs per mile as related to pipe diameter (True 1987). Although a thorough analysis of costs is beyond the scope of this report, one example is presented. The hypothetical receiving area is the hydrologic sub-basin between Delacroix and Hopedale in St. Bernard Parish (Figure 5-1). The site is 13 mi from the Mississippi River. A preliminary study indicates that 100 ac-ft/day freshwater input would maintain optimum salinities for the commercial oyster grounds in the area under present conditions. This would result in the maintenance of 300 ac of marsh and benefits to an additional unknown acreage.

For construction of the project, pipelines would be placed within the rights-of-way of existing routes. Because the pipe only transports water, it could be installed on the surface, except where crossings of roads, railroads, or channels are necessary. Cooperation is mandatory from the oil and gas industry as well as from the affected landowners.

This is a public works project that would be managed through existing state agencies, such as the Department of Natural Resources. Plans would need to be completed, contracts signed with pipeline companies, and appropriate federal and state environmental permits acquired. As part of the program, large pumps salvaged from rigs could be refurbished at vocational-technical schools, thus providing training opportunities for the students, equipment to be used by the schools, and less expensive components for the project. Operation of the electric pumps or motors would be during the off-peak hours between 11 pm and 5:30 am. Perhaps some arrangements could be made with the utility companies for a reduced rate.

The pipeline would be installed by either unemployed skilled workers or as part of a class training project for vocational-technical students. Again, repossessed or surplus tractors and pipe-laying equipment could be repaired and rehabilitated by the vocational-technical system and then placed on the job. Excess machinery could be distributed to exceptionally poor parish governments for road maintenance or drainage projects. A fair and equitable procedure for placing equipment would need to be developed since the political process is neither.

### 2. Shell and Aggregate

Most of the facilities found in the study area have all-weather surfaces for roads, parking areas, and storage yards. The materials commonly used for construction are shell, a renewable resource, and gravel, a nonrenewable resource. The continued extraction of shell from coastal waters is under review in Louisiana and more closely restricted in the other states. Gravel is brought from sources from the interior United States. The material is available and can be used in beneficial ways. In so doing the adverse impacts resulting from the excavation procedure are eliminated or reduced because the step is no longer necessary or is decreased in response to a lower demand.

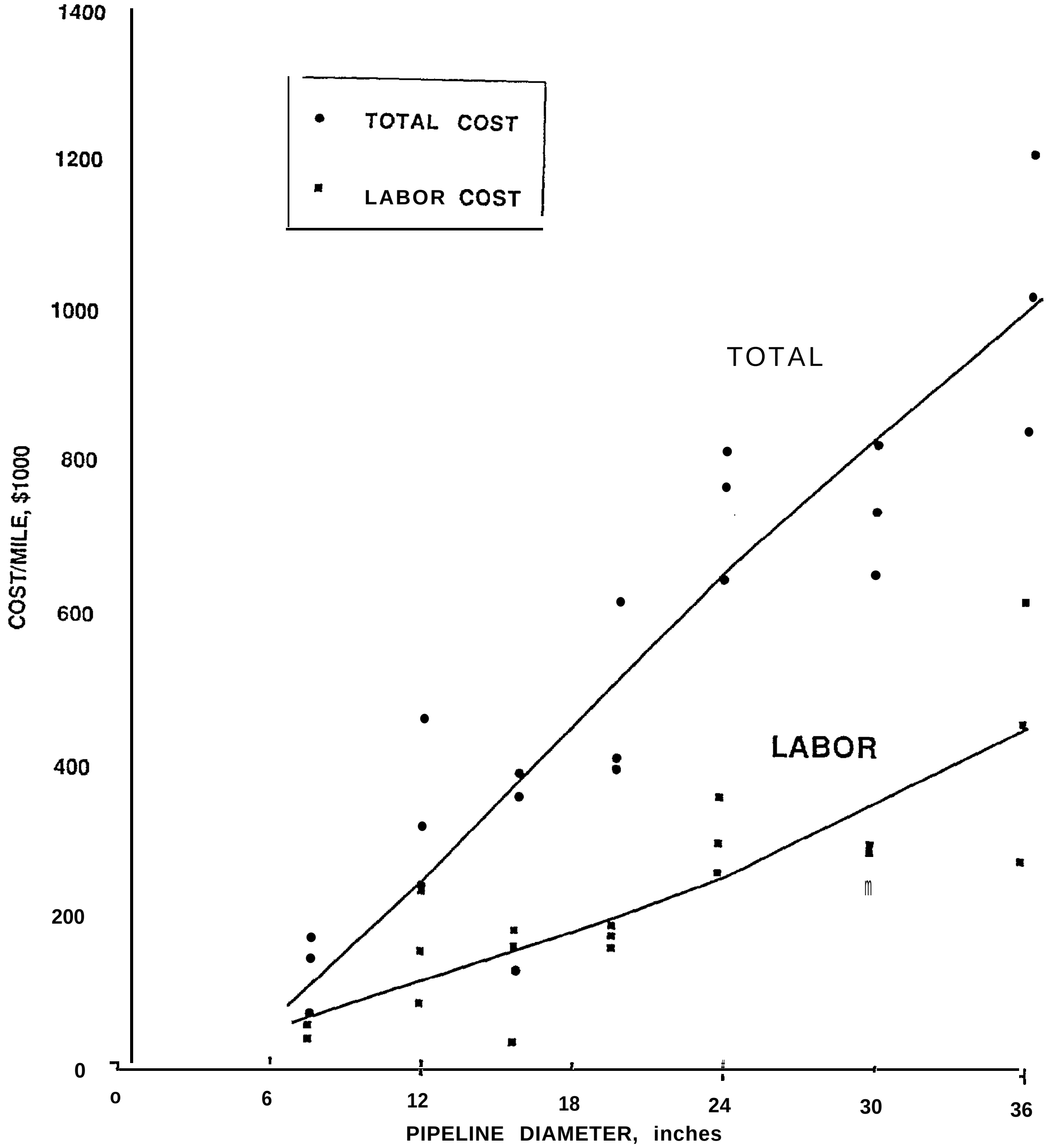



Figure 5-2. Total costs and labor costs per mile for different sizes of pipeline from the 1985-87 national average (True 1987).

Opportunities exist for beneficial application of these materials either at the site or in the region. When a plan is proposed for modification of the OCS facility, the contractor could stockpile the shell or gravel for later use as road or foundation material. The practice is similar to mounding topsoil when it is to be reapplied to an area. If the material is not needed on site, it could be placed in coastal systems to form substrate for estuarine habitat or as protection for wetlands. For example, shell and gravel could be scraped from their present locations and placed on barges for transport to selected coastal waters. In a predetermined location and as part of a federal and state permitted action, the material would be deposited to form core areas of hard bottom for eventual colonization by selected species, such as oysters. As part of the same coastal plan but in a different wetlands management unit, the salvaged shell and gravel could be strategically placed along the edge of the marsh to retard or stop shoreline erosion. Waves are one of the principal causes of wetland degradation and armoring the exposed, soft marsh soils or channel banks will help to retard the adverse effects of pounding water. Elsewhere in the wetlands, shell could be used to plug canals or rehabilitate deteriorating structures that reduce saltwater intrusion or limit boat access to these canals. These suggested actions are just three components of a comprehensive wetlands management plan.

Several pieces of equipment are necessary for implementing these actions, such as, marsh buggies, backhoes, towboats, barges, cranes, and bulldozers. Experienced and licensed personnel would be employed to refurbish and operate the equipment.

In each state, a lead agency could be designated by the Governor. All activities must comply with state bid laws and contracting procedures, but this is an established and ongoing process so no new procedures are anticipated.

For those projects involving the private sector on a specific site, the methodology for implementation will be more efficiently defined by the operator. The state could provide guidance and offer concepts for creative uses by publishing a succinct booklet to be available through the parish coastal officers or the extension agent. More definitive procedures can be outlined for those projects to be undertaken by the public sector.

A fiist step is the selection of sites that have a sufficient quantity of material for use in the wetlands. It may be that no sites are available or the sites could be converted to other higher and better uses. In both cases the process stops. However, if enough material is available to make the effort worthwhile, samples of the material must be collected and analyzed to determine the chemical constituents. Most of these areas were subject to heavy industrial activity and probably contain grease, diesel, and oil from trucks, cranes, and other motorized equipment. In addition, pesticides for weed control and heavy metals associated with welding, sanding, painting, or priming may have accumulated in pockets. In some cases, pollution may not be a problem, such as tank batteries or isolated facilities that had little regular intrusion unless spills have occurred.

The shell and gravel would be used as part of an accepted plan, Environmental permits are necessary when undertaking deposition in wetlands or waters of the United States. Therefore, coordination is essential with the U.S. Army Corps of Engineers for Section 404 and Section 10 permits; the National Marine Fisheries Service; the U.S. Fish and Wildlife Service; the Environmental Protection Agency; the state agency responsible for the protection of wildlife and fisheries; and the state agency that oversees coastal projects.

## 3* Wetlands Management

One important aspect of resource utilization and environmental management that is generally not considered is the knowledge and understanding of foremen, operators, and crewmen who work in the estuaries and wetlands of the coastal zone. Although there may be only one way to excavate a drilling slip, technique and attentiveness by the operator can be the difference between a damaging situation and a small impact. It is proposed that some unemployed workers from the energy industry be given retraining in the basics of environmental management, and that the individual can be matched with sets of used machinery and equipment that have been reconditioned specifically for wetland management work.

An all-purpose work crew with special training in wetland management operations would include a 40 x 150 ft spud barge with fuel, water, and septic tanks; tool room; and rest quarters. On it would be a dragline equipped with a clam bucket, drag bucket, and hammer and leads for pile driving. There would also be several steel pontoons, a 2-in water pump, air compressor, and a diesel generator. A similar size flat-topped barge would be needed for transporting materials only and a small tug would be required to move the unit. To complete the capability, a 20 x 40 ft barge, a marsh buggy backhoe, and a crewboat would be needed. Often there is a need to accomplish tasks beyond the reach of the dragline. A marsh buggy backhoe could also follow the dragline and do final shaping of management levees, create wave barriers, and assist in vegetation plantings. The work unit would consist of seven persons: a foreman, two operators, two pilot/workmen, and two mechanic/workmen, plus additional day-laborers, if necessary, for a particular project, such as vegetation plantings.

An example of a specialized work unit would be a transportable 6- or 8-in suction dredge, accessories, and crew. This unit would be employed for activities such as mitigation through marsh creation or maintenance of drainageways within managed areas. A 40 x 100 ft barge would be needed to carry the dredge body, dredge pontoons, pipe, pipe pontoons, turbidity curtains, fuel, and marsh buggy dragline. Two 18-ft mud boats and a small tug would provide transportation. Labor would consist of a foreman, two operators, and four to six workmen.

Candidates for foreman would receive the most training, possibly including the basics of wetland ecology, geomorphology, and coastal processes. Foremen and operators would become familiar with types and uses of water control structures, geotextiles, and other new construction materials.

The preferred procedure for administrating work crews would be through the private sector. State or federal agencies, such as the U.S. Fish and Wildlife Service, State wildlife and fisheries commissions, the Coastal Zone offices, or National Marine Fisheries Service could identify projects and cooperate on their implementation. Projects may include mitigation measures applied as special conditions on coastal use permits, new projects on state or federal lands, or operations and maintenance of facilities on public management areas.

In addition to working on wetland management plans, these crews could construct projects that use wetlands to treat secondary sewage effluent or urban storm-water runoff. It must be noted that this idea is limited in most areas by the unavailability of wetlands or lands that could be converted to wetlands. In Louisiana there are plenty of suitable wetlands, but the engineering plans of the past did not consider siting of sewerage and drainage facilities near accessible wetlands. Most of the water pollution in coastal Louisiana stems from the discharge of forced drainage storm-water effluent (pumping station outfall) directly into canals or other flowing open waters. This freshwater, highly loaded with nutrients and sediments which would enhance the productivity of the endangered marshes, usually causes eutrophication of receiving waters.

The materials, equipment, and labor could modify this situation at many pumping station sites. One scenario involves construction of interlocking sheetpile enclosures around a pump outfall. Large-diameter pipes would allow discharge into the wetlands. Depending upon other factors, primarily hydroecology, the discharge may be routed through a managed wetland drainage system to controlled outlets or allowed to sheetflow over the area. The added nutrients, sediments, and freshwater would promote growth and vertical accretion of the wetland, counteracting the effects of subsidence. Most harmful pollutants would be immobilized in the vegetation or buried through aggravation.

Stockpiled and/or used material, refurbished equipment, and experienced workmen would come from the energy industry. The primary clients would be the various levee, drainage, and flood control districts in Louisiana and southeast Texas. Restoration of water quality before discharge may be a requirement for any new programs.

One final alternative is the construction of a pending area for migratory waterfowl (Figure 5-3). Most of the facility would be dredged with the fill being used to construct islands, wetlands, and higher ground for nesting, resting, and breeding activities. The lakes would essentially become fresh, a needed diversity to the estuarine wetlands commonly found nearest the Gulf of Mexico. Overflow structures and control gates would be installed so active manipulation of water levels would be possible. When the area is not functioning as habitat for migratory species, it could be opened to the general public for fishing, canoeing, or other forms of recreation. Only small boats with electric motors would be permitted on the lakes. In all cases, the sites and material to be used must be tested to be certain it is not contaminated with hazardous or toxic substances, including radioactive particles.

### 4. Use of Obsolete OCS Structures for Inshore Reefs and Shore Protection

The problem of what to do with old offshore oil and gas platforms has been investigated by the federal government and Gulf Coast states (see Jones 1986 and the included bibliography for a greater discussion of the concepts). This section acknowledges this work and applies the concept at a tangent to the originally proposed projects.

The artificial reefs program involves the submergence of abandoned ships and structures in selected locations to provide hard-bottom habitat for fish, thereby enhancing the opportunities for recreational and commercial fishing. Florida has taken the lead in implementing the first of these man-made reefs, and the project has been very successful. An estimated 1500 structures will be abandoned by the year 2000, most off the Louisiana coast. The National Fisheries Enhancement Act of 1984 provides for the establishment of standards for the reefs and directed the National Marine Fisheries Service to create a national plan. The U.S. Army Corps of Engineers was given the responsibility for establishing permitting guidelines for artificial reefs. It is important to consider how these reefs can serve multiple uses within the study area. Although artificial reefs in the nearshore Gulf enhance fisheries resources, some obsolete structures could be located to help in the fight to retard shoreline erosion and marsh loss in the bays and inland areas. Two concepts are discussed below.

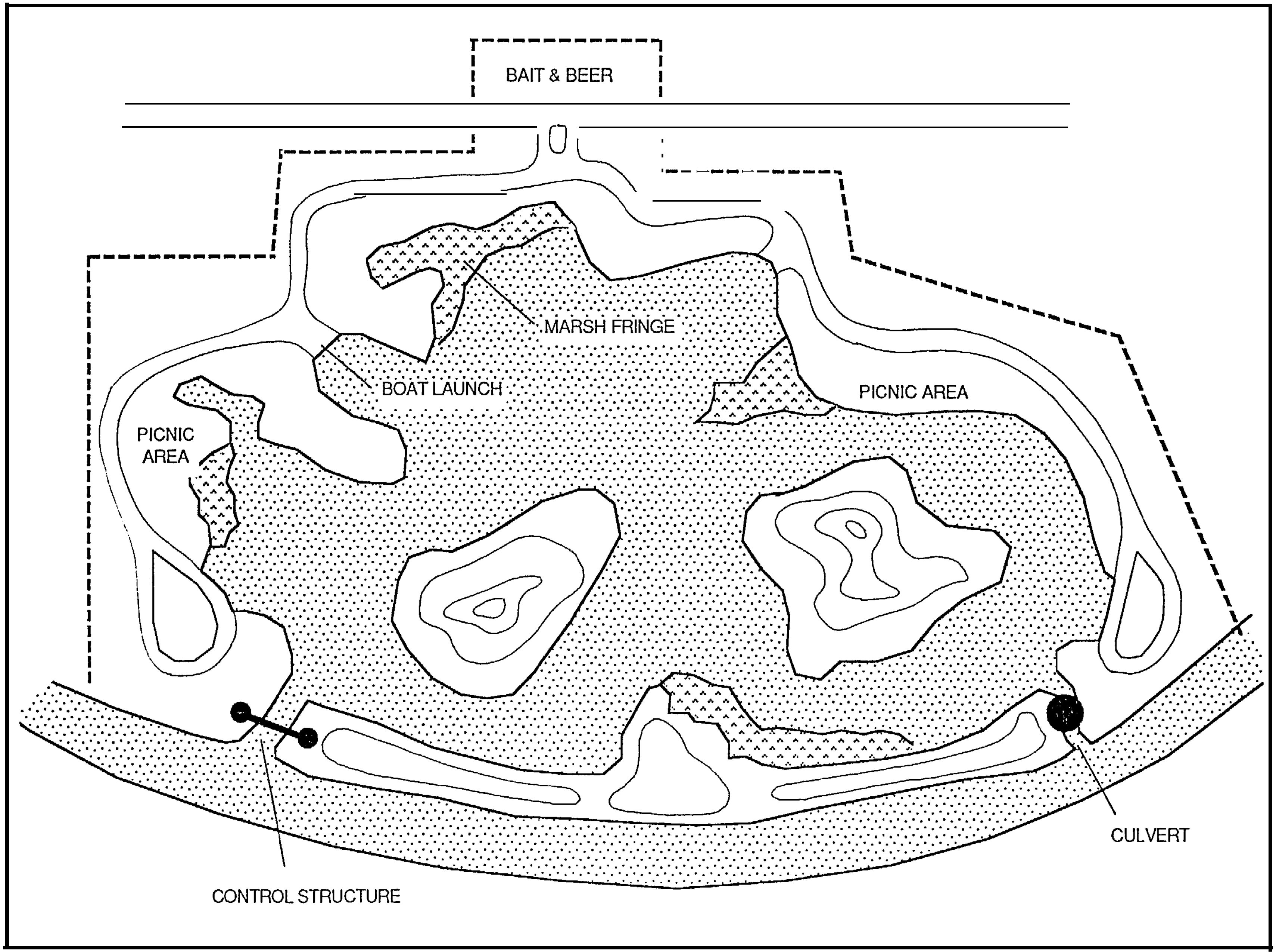



**Figure 5-3. Pond for recreation and migratory waterfowl.**

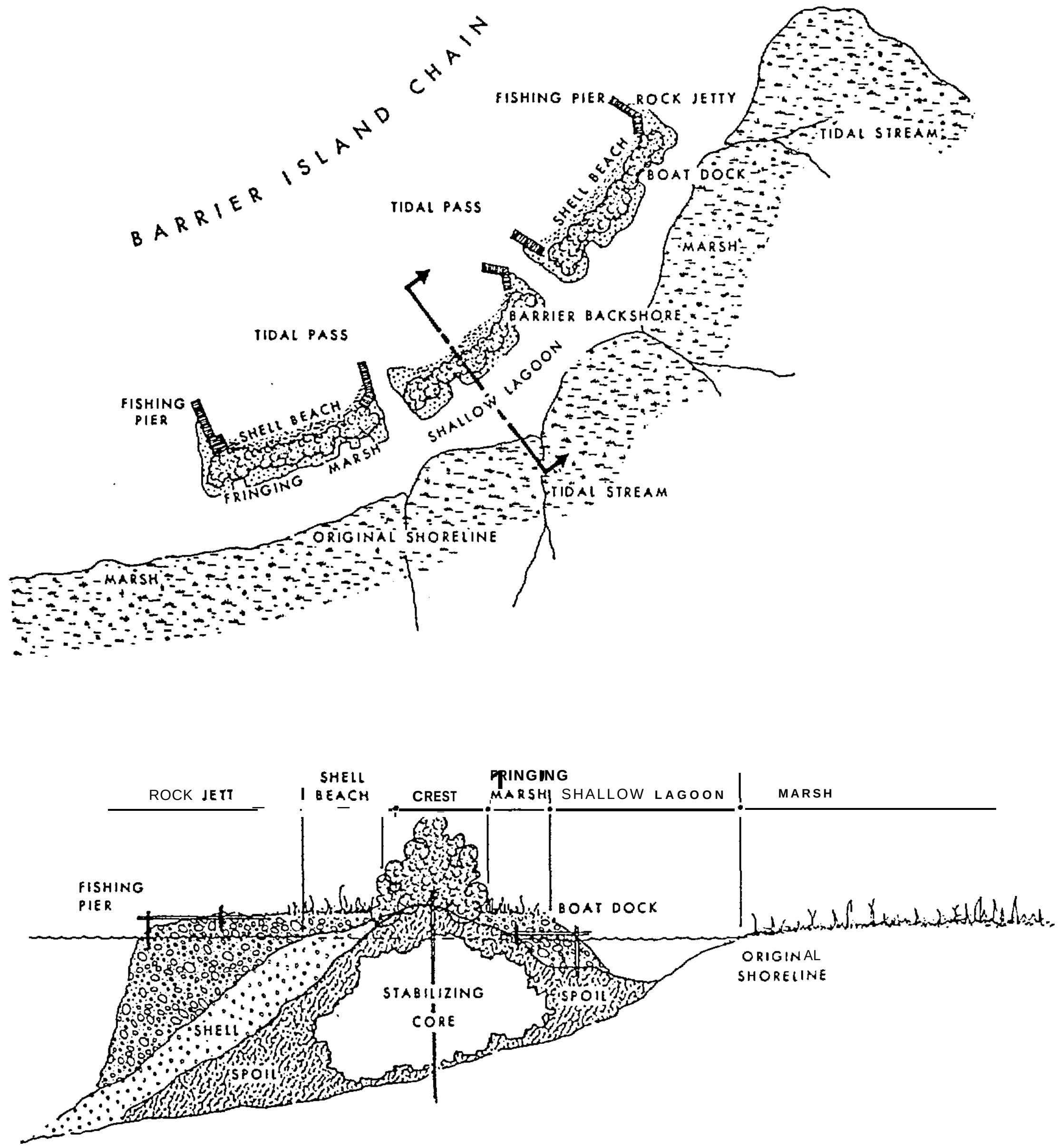



Figure 5-4. Configuration of proposed man-made barrier islands (after **Gagliano** et al. 1973).

Building artificial barrier islands along eroding shorelines of inland lakes and bays (Gagliano et al. 1973) is not a new concept (Figure 5-4). What is innovative in this proposal is the application of obsolete boats, barges, and rigs as the core of the islands. Sands, silts, or shell would be placed around the structure as part of the island complex. The beach, island, lagoon, and marsh continuum forms a varied array of fish and wildlife habitats, provides recreational opportunities, and helps prevent erosion on adjacent shorelines (Figure 5-4).

Another option exists for using the rigs in the shallow nearshore. States manage public seed oyster grounds in many coastal basins. This entails hardening of the bottom by applying Rangia and oyster shells periodically. The small seed oysters that attach to this clean, firm substrate are moved to private leases for further growth. Natural oyster reefs produce fewer commercial-size oysters than do managed beds because these latter beds are worked regularly. As clusters form, they are broken and the larger individual oysters are harvested, a practice that promotes growth by reducing crowding. Over long periods, the reefs will grow both horizontally and vertically in synchronization with prevailing currents and waves. Natural oyster reefs tend to buffer the energy of marine forces. In addition to management of state water bottoms for commercial production, the establishment of reefs for living erosion control structures should be considered. After careful study of present and projected hydrologic conditions, OCS platforms, barges, and boats would be placed in preferred locations. These metal clusters would form hard substrate for oyster attachment.

Planning and implementation of either of the above concepts is in the hands of state agencies. Funding would come from the private industry, which has responsibility for removing platforms. The U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service have permit and review authority. State agencies may collect and disperse funding to small contracting companies with certified "environmental management work units" described elsewhere in this report.

## D. More Intensive Management of Coastal Resources

### 1. Machinery and Facilities for Wetlands Management

Universities and the private sector are investigating the potentials for intensely managing wetlands by controlling the hydrology. Applied studies of wetland management continue and can be expanded through this program. Some of the equipment not being used for the OCS could be applied to the efforts.

Assuming that money is available, idle equipment could be obtained by the state or universities at auctions or repossession sales or acquisition could be directly from the owner. Before sites or equipment are obtained, they must be clean of hazardous or toxic substances, including radioactive particles, so that agencies will not become liable for injury resulting from the use of the machinery and facilities. All equipment purchases must comply with state bid laws. Either vocational-technical students or unemployed workers could refurbish these items under supervision of the new owners. The boats, barges, draglines, and assorted pieces of equipment would then be assigned to experimental aquiculture or wetlands management projects.

Private and public sector scientists often cannot complete wetland management studies or do not initiate extensive efforts because they lack the equipment and manpower for constructing and maintaining the experimental plots. This obstacle can be overcome by using available surplus machinery and the skilled unemployed labor force.

### 2. Facilities and Equipment for Research

Aquiculture has become a very important research effort along the Gulf Coast. Conferences (Reigh 1987; Chamberlain et al. 1985; Lock 1987), specialized research by the Federal government (Homziak and Lunz 1983), and newsletters (Louisiana State University, Annual; Texas Agricultural Extension Service, Annual) document the significant amount of research that is being accomplished in the profession. Articles appear on financing, species, genetics, water quality management, feeding, harvesting, and recreation for many species, such as, prawns, alligators, catfish, crawfish, crabs, and other fish. Ideas from throughout the world are shared by the research community. The Gulf Coast region is building on this accumulated knowledge, and the available OCS-related facilities offer the opportunity to expand on this data.

Idle facilities and surplus equipment could be transferred to the research groups working on the coastal erosion problems. Before the facility or equipment is accepted by the research group, tests that demonstrate that the facility or equipment is clean of any toxic or hazardous substances, including radioactive particles, should be completed. Thus, universities could obtain title to a parcel of land with buildings, and an all-weather parking and service area, accessible by all modes of transportation. Each complex would become a satellite campus or work station with dormitories, laboratories, kitchens, shops, and equipment storage areas.

Crewboats or supply boats could be converted to research vessels for offshore or wetlands use. Barges with living quarters and work space could be placed throughout the wetlands and serve as on-site laboratories and bases of operation for wetlands, aquatic, and marine research. Thus, graduate students and professors would have onsite facilities available for extended periods of research in remote areas. More valuable time could be dedicated to the sampling and measuring tasks and detailed observations by eliminating unnecessary travel time to and from the sampling sites. Sample sites may include pipeline canals containing fixed or floating cages for prawns or selected fish or wetlands that have been impounded by spoil banks or roads. Researchers can take advantage of the environmental modifications in the coastal zone to study aquiculture potential.

This arrangement presents several advantages for the higher educational system. Initial investments are less than if the facilities had been acquired on the real estate market. The infrastructure (gas, electricity, water, roads, sewage treatment) are in place and should allow for almost immediate occupancy. No additional federal or state environmental permits should be necessary; therefore, a costly and time-consuming process would be avoided. The availability of such facilities and the potential for analyzing samples as soon as possible after collection would directly benefit research efforts. Barge-mounted facilities could be moved to a safer location before a storm, saving expensive equipment and instruments with a minimum of effort and time. Industries may realize a tax savings by donating to an educational or other nonprofit institution, such as the Nature Conservancy. The availability of more numerous, small-scale research stations could enable high school and other special interest groups to conduct research projects on estuarine resources in their region.

A discussion of potential uses cannot be limited to only the positive aspects; some obstacles must also be considered before full implementation of the proposal. First, each state must establish the appropriate mechanism, as provided by law, for the transfer of the facility or equipment. For example, if acquisition is through purchase, state or county (parish) bid laws dictate the methods of properly conveyance. Once in the possession of the university, all equipment or facilities must be inspected and, if necessary, refurbished to make them safe and clean for occupancy and use. This could be a demanding and expensive undertaking, a possible factor which might make the idea infeasible for an institution. Because the buildings and vessels were constructed for the oil and gas industry, they probably should be modified to meet the needs of the research community. Laboratories must be assembled, living accommodations created, and a long-term plan developed for financing the operations, maintenance, and security of the system. Of course, there must be a demand for the conversion to a research facility before substantial action would be taken.

### 3. Fishing and Crabbing Piers

Throughout the coastal zone, the intricate network of bayous, rivers, and bays and the extensive marsh and beach shoreline provide welcome opportunities for individual and family or group recreation. Fishing and crabbing are two activities that can be engaged in for many hours by all ages and with relatively little expenditure for equipment.

In some areas of the Gulf Coast, public access to fishing and crabbing sites is provided by fishing piers, such as the Copano Bay and Port Lavaca Causeways in Texas; the old LA 1 bridge over Caminada Pass at Grand Isle, Louisiana; and a few fishing piers on the Mississippi coast. However, the dense congregation of fisherman along railroad tressels, frontage road bridges and culverts, and even along drainage canals, especially in coastal Louisiana, indicates that the demand for this type of recreation exceeds the opportunities where it can be undertaken safely, i.e. removed from train and vehicular traffic.

All state and local coastal zone programs cite recreation as being one of the most acceptable, multiuse ventures to be undertaken in the coastal zone. The money invested in this type of activity is considerable and is often factored into formulas for calculating the value of particular wetlands or renewable resources. Therefore, given the need, and in consideration of the value, enhancement of public recreational opportunities is a desirable goal for federal, state, and local governments to foster in terms of direct implementation or through funding and/or guidance to private entrepreneurs.

Development of standardized types of fishing platforms or piers should fit the environment. Consideration should be given to: (a) the type of fishing to be done; (b) minimizing environmental degradation from overuse; and (c) knowledgeable environmental planning to handle not only the population using the pier but also the traffic, comfort stations, and solid waste disposal needs associated with pier utilization.

The types of fishing facilities include the following:

a. moored barges and wide foot-bridges associated with water courses;

b. large, commercial or public piers extending into gulf, bay, lagoon or large lake; and

c. large, commercial or public walkway-piers extending into closed or semi-enclosed embayments.

Wide Foot Bridges or Moored Barges. The wide foot-bridges are examples of public works projects which could be undertaken by state or local governments to provide additional recreational opportunities for local inhabitants. Using clean surplus OCS materials and local labor could reduce the costs of such projects in addition to enhancing recreational fishing or even supplementing subsistence fishing for segments of the local population. In developed areas, these bridges could be near public transportation lines or accessible by foot, bicycle, or motorized vehicle. Where feasible, such as near artificial levee-borrow canal areas, parking could be provided inside the levee and the bridge could extend from the batture over the borrow canal and into the marsh (Figure 5-5). On wide canals, barges could be spudded perpendicular to the canal bank on one or both sides, and a passageway constructed to allow small boats to pass between the barges or the barge and the canal bank. A foot bridge constructed through the marsh to the lakeshore where a shell beach existed or was constructed would provide additional fishing and crabbing opportunities. If the water is sufficiently deep, a surplus barge could be permanently spudded along the canal bank to serve as another fishing platform. The batture along the canal could also be landscaped to provide for picnicking or expanding access to the canal for fishing. Such a site could also serve as a nature trail for educational group-lectures.

Because this site is in an urban or semi-developed area, it would be heavily utilized. Therefore, the site would have to be patrolled on a regular basis to insure the safety of the fishermen, to prevent buildup of trash, and to deter vandalism,

Large Commercial Piers. For much of the study area, fishing in the Gulf or interior bays is impossible without a boat because there are few fishing piers extending into deeper water. Construction of a long, "T'-shaped pier into the gulf or bay-lagoonal system would enhance fishing opportunities and, thereby, become a tourist attraction bringing money to the local economy (Figure 5-6). The pier could be constructed with state or local funds or even through private enterprise. A small fee could be charged to cover the cost of construction and maintenance for a public concern or to provide profit for a private concern.

Construction of this type of pier could utilize clean surplus OCS materials such as welded pipe joints for support frames. Note that all materials should be clean and free of hazardous or toxic materials, including radioactive particles, before being used. The deck of the pier could be constructed of metal decking from OCS production platforms. OCS barges and/or construction equipment could drive the modular pier footing. A local industry could be set up using OCS-trained construction personnel and surplus OCS materials to mass produce modular components for pier construction, thus lowering pier costs.

To enhance revenue, piers should be constructed at the gulf terminus of major state roads near resort communities, OCS supply/service bases, or other OCS facilities. This would lower transportation costs for getting pier materials to the site and would utilize local, skilled construction personnel and the OCS materials.

Walkway-Pier. A third type of pier that could be constructed of OCS surplus materials would be the elevated walkway-modified "T''- shaped pier shown in Figure 5-7, A and B. This facility would be constructed from a major state or local highway through or into the coastal zone. The walkway-pier could be part of a major recreation site, such as a public or commercial day or overnight picnic/campground (Figure 5-7, A) off a major road near an interior bay or lake. The area would have ample parking, camping, and picnicking facilities, as well as sewerage and solid waste disposal facilities. OCS-related businesses

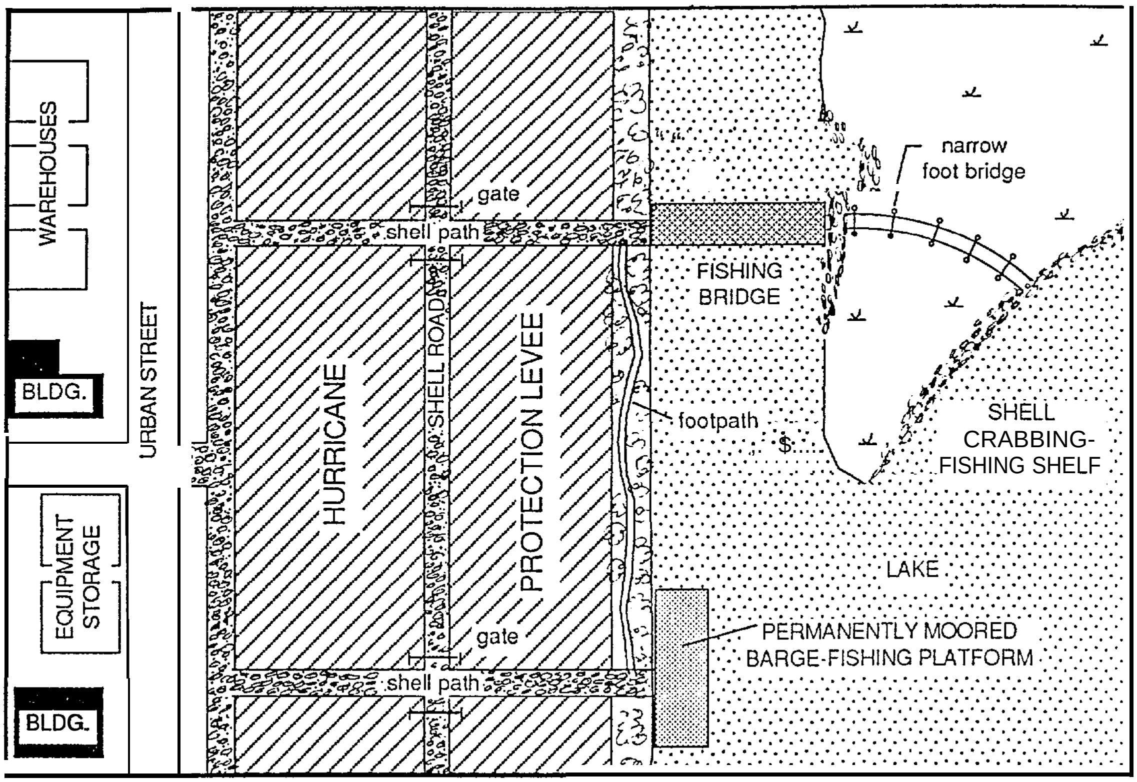



**Figure** 5-5. Creation of fishing and crabbing access points along urban-wetland interface utilizing surplus oil/gas materials.

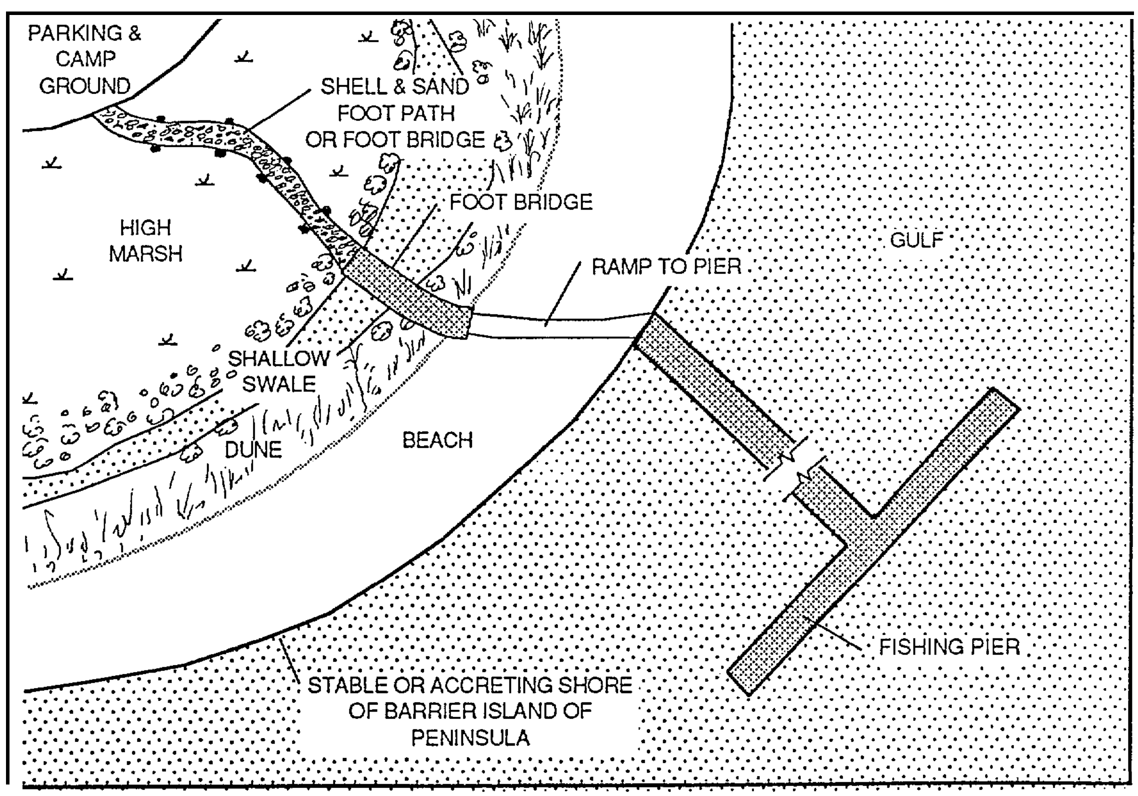
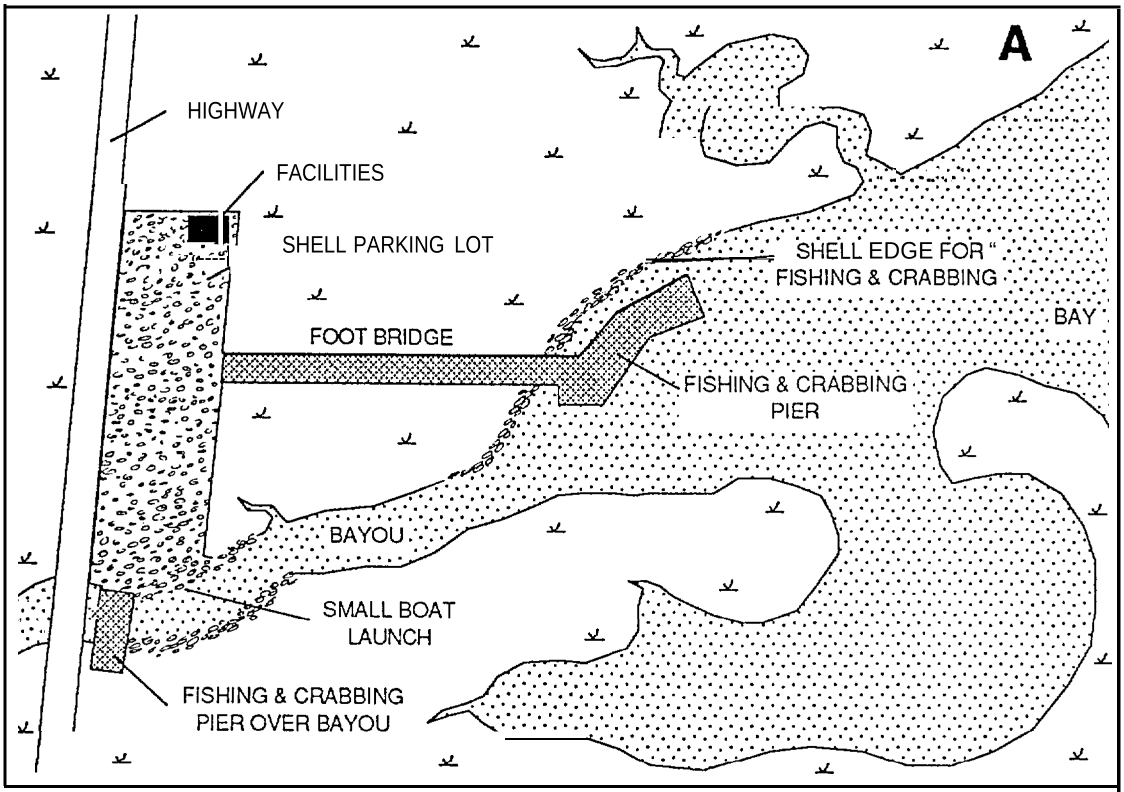



Figure 5-6. Long fishing pier on Gulf of Mexico constructed from surplus oil/gas materials.



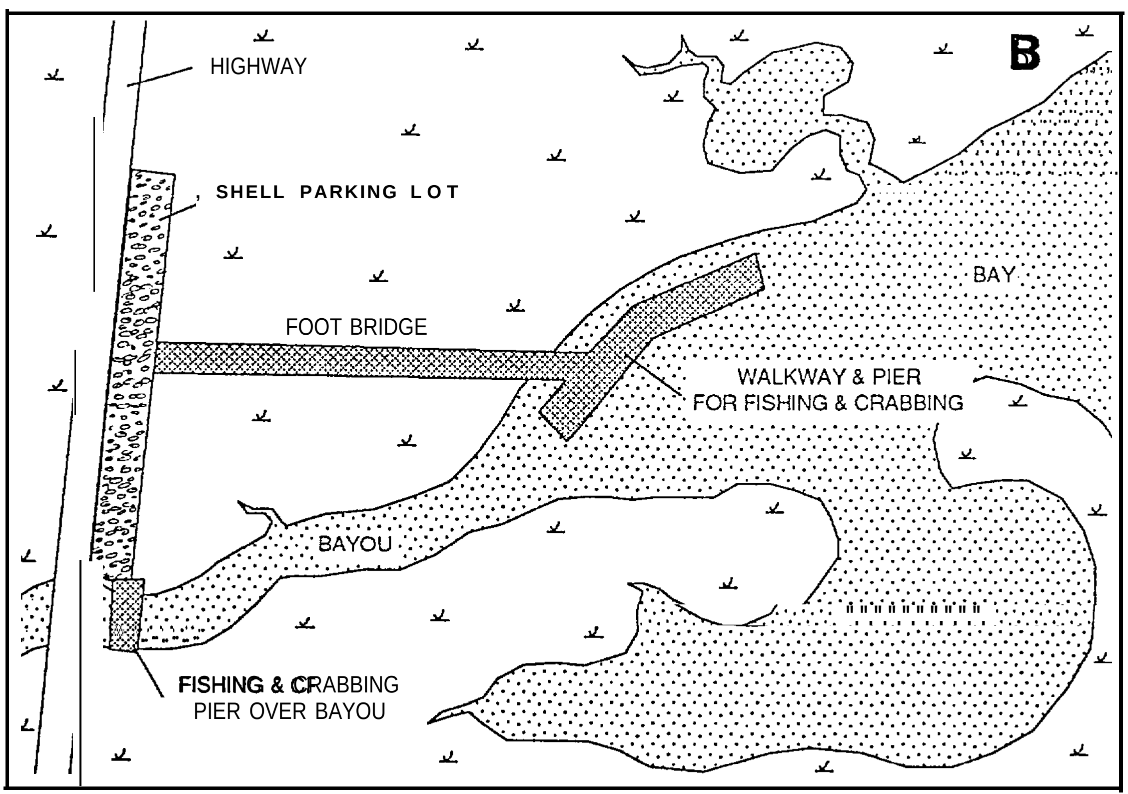




Figure 5-7. Piers from recreational fishing and crabbing.

that were developed along low-lying portions of narrow natural levees would provide a prepared camping-parking space serviced by utilities.

Elevated walkways through the marsh provide access to fishing areas along interior lakes and bays and across narrow, tidal channels. By using metal-mesh decking, light could penetrate through the walkway, thereby minimizing the impact of the walkway on the marsh. Placing clean, unpolluted shell along the open water body shore would provide additional fishing sites. If space was available, a small boat ramp could be constructed at one end of the parking area. Additional walkways over nearby bayous on tidal channels would maximize the fishing opportunities at such sites.

Where no suitable area exists or where it is too expensive to construct a major picnicking-campground site, a small parking area can be constructed for off-road parking during the day. An elevated walkway-pier of the same size as that shown in Figure 5-7, A or smaller could be constructed over the marsh to extend over bayous, tidal channels or along the bay or lakes (Figure 5-7, B). The materials and manpower needed to build these structures would be available from OCS facilities, such as pipe and platform construction yards and service/supply bases. These piers could be constructed with government or private funds and operated either free or with a small fee for maintenance and upkeep. The profitability of a site would probably depend upon its location with regard to population centers and travel time.

ALI of these structures would attract large numbers of people; some mostly local and others, tourists. The private operator or local governing body would have to ensure that these areas were patrolled to prevent vandalism and to keep the facilities safe, clean, and sanitary. For larger facilities, a guard should be stationed. The smaller facilities could be monitored by frequent patrolling by local law enforcement officers and sanitation crews. Privately constructed facilities would also charge a competitive fee. All sites would have to meet local, state, and federal regulations regarding safety and sanitation. Furthermore, construction of these facilities would require various permits, such as Section 404, Section 10, and state environmental permits, depending upon the type of construction and location.

## E. Miscellaneous Industries

### 1. Reeveling Metals

Recycling metals has become a significant industry during the past several years. Collecting aluminium cans from beaches, parks, and roadways provides a source of modest income, recreation, and exercise for many people. Small recycling companies (scrap yards) have been in existence for many years, dealing mainly in brass, copper, iron, and steel. Abandoned OCS rigs, barges, boats, and other hardware are a good source of metal, if no alternative use can be found for these items. For example, the scrap value of rigs once onshore can be $40,000 (Sage 1986). The overall value depends on several variables, such as distance offshore, condition, and need to clean hazardous or toxic substances, including radioactive particles, from the scrap before processing.

A potential exists for setting aside some of this scrap for use in wetlands management projects. Coordination between federal and state agencies, the rig or boat owner, and the scrap dealer is necessary. Conservation agencies responsible for the installation and operation of water control structures in the coastal zone would prepare specifications for the dimensions and weight of sheets of steel that could be used as part of a structure. Most water control structures require wing-walls that extend 10 to 20 ft into the undisturbed banks asaprotection against lateral erosion. Normally, these aremade ofeither sheetpile or pressure-treated planks bolted to piling. In the suggested case the wings would be made of scrap steel bolted or tack-welded together. Experience indicates that the sheets should be 3/8 in or 1/2 in thick, 3 to 4 ft wide, and 15 to 25 ft long. Anything larger is not necessary and may exceed the working capacity of commonly used, barge-mounted equipment. Plates would be segregated by size and stockpiled for eventual selection and installation when needed.

An alternate approach to resource allocation is possible. A former onshore support base makes an ideal collection point for scrap metal that could be used for the construction of water control structures or shoreline protection structures. According to this scenario, a group of companies with an OCS interest (such as the responsibility for removing rigs) would organize a recycling company to be staffed by unemployed offshore workers and furnished with surplus OCS equipment. The main function of the company would be to dismantle and stockpile metals for other uses. The consortium would also supply raw material for local steel manufacturers. For example, in Louisiana there is only one steel mill, Bayou Steel, located on the Mississippi River near LaPlace. Each year the mill produces 786,000 tons of billets and small structural steel members from 800,00 tons of scrap. Perhaps either this mill or others in the region could use OCS scrap to manufacture metal products for applications addressing renewable resource loss in the study area.

One steel product that will be almost essential in the fight against coastal erosion is interlocking steel sheetpile. This product has been used for raising levee crests in areas were the soil foundation conditions would not support additional weight. The substantial cost of the sheetpile has in some cases rendered flood control plans uneconomical. Also, smaller weights of sheetpile are used as dams, bulkheads, seawalls, wave barriers, weirs, or water control structure components. Since the states in the study area have a stake in the future of their coasts, each should encourage production of interlocking steel sheetpile. It would be a logical step for the newly formed group of OCS companies to capitalize this new industry. For example, in Louisiana a number of applicable programs through the Department of Economic Development encourage this type of development (training programs, tax advantages and credits, and pro-business incentives [Louisiana Department of Commerce n.d.])

### 2. Fabrication of Water-control Structures

Control of surface water resources will continue to be an important aspect of environmental management in the coastal zone. Many types of water control structures are presently in use (Figure 5-8). Debates have been ongoing as to the best design for structures. Now may be an opportune time to resolve the conflicts.

Unemployed marine engineers working in cooperation with wetlands ecologists could develop improved water control structures and erosion-deterrent devices. Mathematical and/or hydrologic model studies could be performed at universities or federal research facilities, such as the Waterways Experiment Station, Vicksburg, Mississippi. Once preferred designs are identified, units could be fabricated and installed as part of a wetlands management research project in the study area. Intensive data collection and analysis programs will give direction to the types of structures that result in the greatest benefits when used in the coastal zone. Selected structures can then be manufactured.

Existing small businesses could expand on the former supply bases. Surplus materials could be used to the extent possible along with other equipment, and unemployed welders

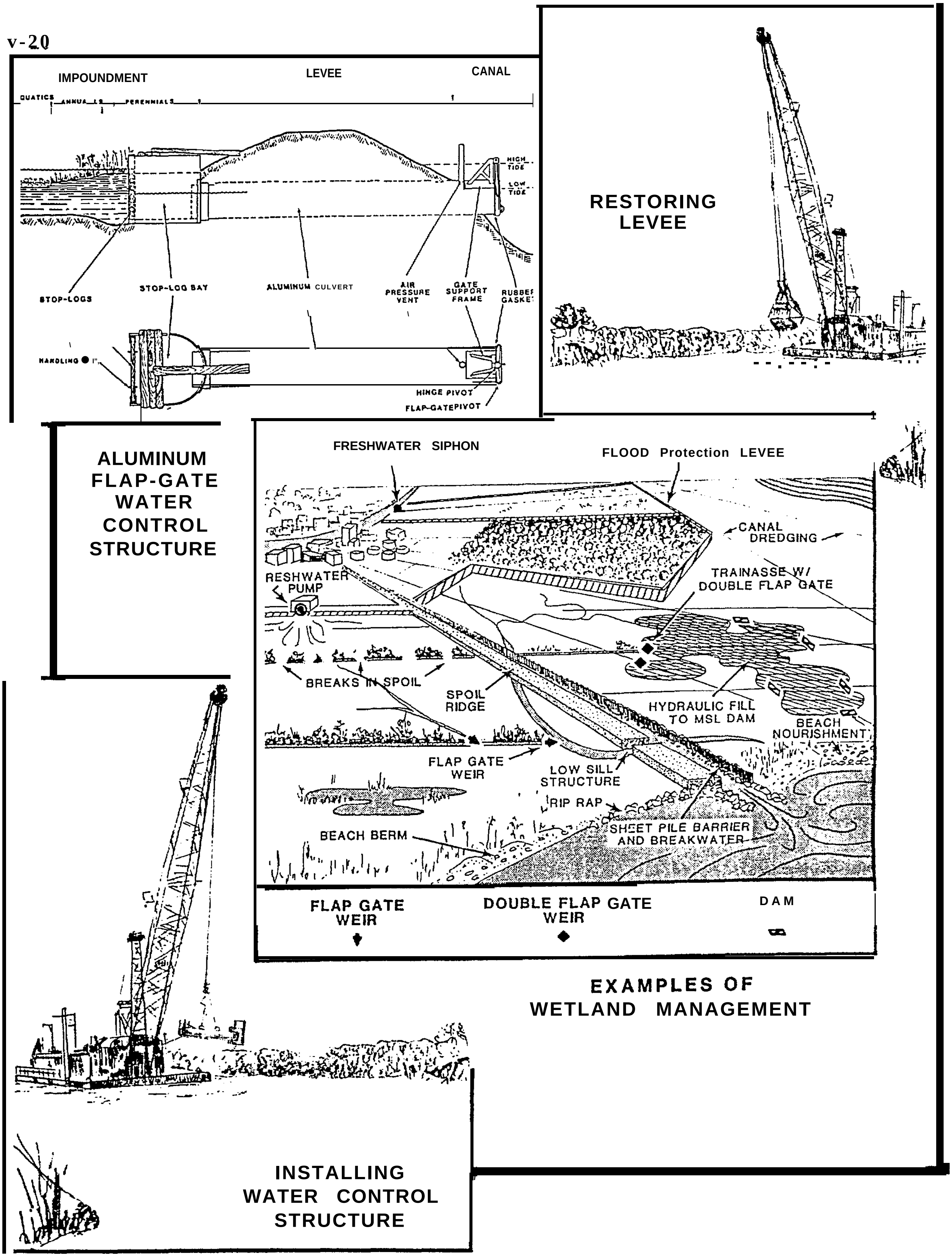



**Figure** S-8. Selected components of a wetland management program which could employ OCS personnel and make use of equipment and materials.

and machinists could be hired to mass produce water control structures and/or components for federal and state conservation agencies and the private sector. Specialists with a knowledge of pipeline protection could be employed to maximize the working life of the structures. The basic structures or components could be stockpiled or sold by lot to management contractors (as described). Special runs for larger or custom-modularized structures are also a possibility. Erosion-deterrent devices, such as tetrahedrons made by cutting and welding old drill pipe, could be produced in standard sizes and weights for several wave energy situations. These could be stockpiled for emergency situations.

The state department charged with the protection and enhancement of the fish and wildlife resource is the most experienced in working with this type of hardware and logically would be the most appropriate for overseeing the project.

### 3. Food Processing Facilities

In Louisiana, high economic hopes are directed toward the establishment of large-scale seafood processing plants. For many years the state has been producing and selling the raw product at a low price to out-of-state companies for processing. The present industry is primarily comprised of fishermen and wholesale companies that buy from the fishermen and sell to seafood markets or restaurants. The main products are shrimp, crabs, oysters, and several species of highly prized fish (e.g. speckled trout, redfish, flounder). These species comprise only a small fraction of the total commercial fisheries value.

The general idea is to promote construction of large processing plants which would produce “ready to cook’ or “heat and serve” type seafood products. Gourmet style entrees or portions would be made from choice fillets while the popular “fish stick” product could be made from underutilized species such as Atlantic croaker. A product for the world market would be surimi, a paste made of flesh from a variety of species. Surimi is used in the same manner as soy beans, to make edible portions with many flavors and textures. Japanese businessmen have recently toured Louisiana looking for opportunities to construct such a facility. Vietnamese are shrimping and trawling and then processing species for the U.S. and Asian markets.

Many of the abandoned onshore support facilities would provide ideal settings for major seafood processing plants, assuming the sites are not contaminated with hazardous or toxic substances. Sites are cleared, graded, have all-weather surfaces, and would not require the modification of additional wetlands in the coastal zone. Potential plant locations are on existing multimodal transportation networks that connect to the Interstate highway system or ports for shipment to foreign markets. Deep-draft boats from the Gulf of Mexico can dock at the site and unload directly to the plant, eliminating an intermediate handling step that adds cost to the product. Once packaged, the product can be placed in trucks or railroad cars and transported to the markets in a matter of hours or, at the most, a few days. Utilities, such as gas, electricity, water, telephone, and sewage, are in place, reducing the need for expensive construction costs and possible delays in placing the plant in service. In addition, existing buildings can be renovated for office space or for processing.

To a limited degree the private sector is pursuing this course, and it is most appropriate for them to take the lead. The public sector can aid in this program by advertising the availability of sites and the advantages of using what is already there. If it does not already exist, the state could publish a map showing the location of available sites, a table giving the characteristics of each site (for example, acreage, buildings, capacity of utilities, transportation network, price, owner), and a brief description of the advantages of the site.

## 4. Retreation-oriented Activities and Businesses

Coastal wetlands throughout the study area are deteriorating rapidly and becoming open water. For Louisiana, the shoreline is projected to be very far inland (Figure 2-7); therefore, many of the areas that were intensively used for marsh recreation will be in the open water. For example, camps previously surrounded by wetlands now exist as islands stabilized by bulkheads and riprap. A trip along the Empire Canal leads through camp clusters and by individual sites that are no longer near marshes. Similar problems are appearing in lower Terrebonne and Lafourche Parishes. Police juries need to be considering where these activities will be accommodated in the future because it is anticipated that people will still desire access to the coastal zone.

An opportunity exists to utilize abandoned OCS facilities while simultaneously promoting the parish's coastal zone program. A parish can acquire facility sites on a selective basis and set these aside for future marinas, camp clusters, boat launches with parking areas and sanitary facilities, or other recreational uses. All of these uses require access to navigable waterways, all-weather surfaces for vehicle movement and parking, location on a highway, and sufficient areas for commercial services. By procuring these areas as they become available, the parish guarantees sites for recreational needs in the future as demand for access continues to grow at an increasing rate. A recent report (Office of Sea Grant Development 1988) provides a generic approach for evaluating the practicality and feasibility of recreation projects in a coastal setting and can serve as one methodology for initiating more detailed studies of the proposed concepts.

The presence of these tracts will relieve the pressure to fill, dredge, or otherwise modify nearby wetlands. Lafourche Parish can serve as a case study for this discussion. Lafourche, with an approved local program, has identified environmental management units (EMU) which are dedicated for development, limited development, or conservation. For example, the Leeville EMU is classified as a conservation unit by the parish. This EMU is predominantly wetlands that are crossed by a transportation corridor (Louisiana Highway 1) flanked by industrial oil and gas support facilities. Goal 5 of the parish plan for the Leeville EMU is to encourage continued industrial concentration in the Leeville area. The parish will continue to encourage intensive land use and development of the transportation corridor through the EMU. Policy 7 for the EMU states:

Permanent human residential habitation should be discouraged throughout this EMU due to problems of storm flooding, wind damage, and lack of adequate public utilities. Recreational camps are encouraged provided provision is made for adequate disposal of solid waste and sewerage effluent as per parish and state health regulations.

Development should be encouraged on those sites already reclaimed because of the greater ease of providing public services, such as solid waste collection, sewage treatment, and disposal of industrial materials as recommended by Policy 8. Finally, the parish is striving to reduce those activities (channelization, spoil disposal) in the Leeville EMU that will result in the loss of additional wetlands.

Within the South Lafourche A EMU, which is that portion of the parish surrounded by levees, the coastal document guidance for more intensive use is even more clearly stated. One goal is to encourage continued development of commercial, industrial, and residential development. Policy 7 reinforces the goal by stating:

Recreational access to wetlands, lakes and bayous surrounding the South Lafourche levee system should be maintained and expanded through the parish and state recreation programs. This includes construction of boat ramps and/or marina areas to facilitate access to the wetland recreational resources.

As a first step, the Lafourche Parish Coastal Commission could actively encourage use of abandoned facilities through an education program. The parish could compile and publish a booklet on how to use these areas for recreation facilities. This would basically outline, in a step-by-step approach, the use of old facilities for new purposes. A booklet may identify federal, state, local, and private sources of funding for the developer and how to learn about the procedures for applying. Environmental permits would be required; therefore, appropriate application forms should be furnished in the project packet. These application packets would include the papers necessary for the U.S. Army Corps of Engineers Section 404 and Section 10 permits, the Environmental Protection Agency National Point Discharge Elimination System Permit, the Coastal Use Permit from the Louisiana Department of Natural Resources, and the various local permits and certificates needed. The parish might consider negotiating fees for the handling of sewage and solid wastes. Finally, the development packet would offer suggestions for reducing adverse impacts that may result from development of a project. Preferred site design techniques would include raising ground surface with fill from the channels and basins, elevating structures above the 100-year flood level, allowing for circulation within the channels and harbor in order to maintain water quality, limiting activities to those less susceptible to flood damage, and providing the necessary, basic public services to assure a healthy and safe project. Several examples are presented to illustrate the suggested approach.

Scenario One represents a concentrated/protected recreational use facility (Figure 5-9). This schematic shows a variety of water related, recreational uses. Dredged material from the basin and channels will be used to raise the overall land surface elevations over a large portion of the property. Along the highway, parcels are set aside for commercial activities, such as, motels, boat sales, service stations, and groceries. Boat sale facilities may have an area for rental of larger boats that could be used for day or overnight fishing in the surrounding wetlands. The motel is strategically placed to take advantage of the highway, and access to and a view of the freshwater basin. The freshwater basin was incorporated as an alternative attraction because many people, particularly families with small children, like to fish and paddle on small water bodies. The day-use park is for the general public to enjoy and could have smaller boats for rent. In the center of the main boat basin are boat houses for large craft and house-type accommodations. A boat yard provides small engine repair and maintenance, fuel, parts, some hull work, and facilities for launching boats by either a ramp or an electric sling. A large part of the site is set aside for camp-type structures, which are characteristic of the gulf coast region. Living areas would be raised on piers and would be built to Federal Emergency Management Agency (FEMA) specifications for storm resistance. The first floor remains as open space for general storage, parking, picnic tables, and seafood boils.

Another scenario involves dedicating the facility to high intensity recreation for weekend or vacation visitors who have their own accommodations. The plan (_Figure 5-10) shows a large number of recreational vehicle (RV) sites with water access. Two orientations are proposed: sites on canals where a power boat can be docked in conjunction with the rental space; or, sites on the smaller and quieter ponds where the group can relax away from the bigger boats and the greater amount of activity. Within the complex is a boat launch and water frontage for shoreline fishing or crabbing. Full services, including electricity, water,

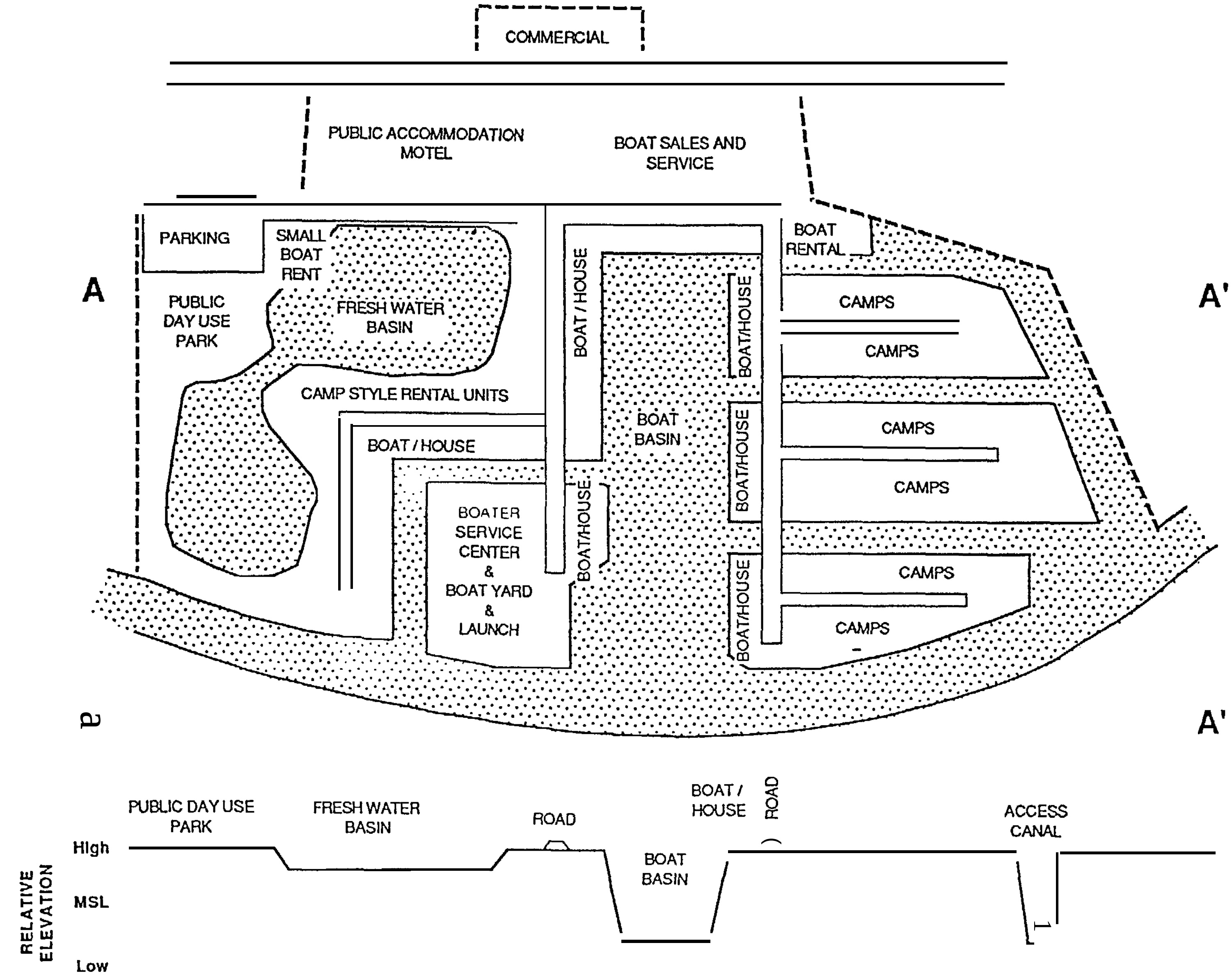



Figure 5-9. Concentrated/protected recreational use facility.

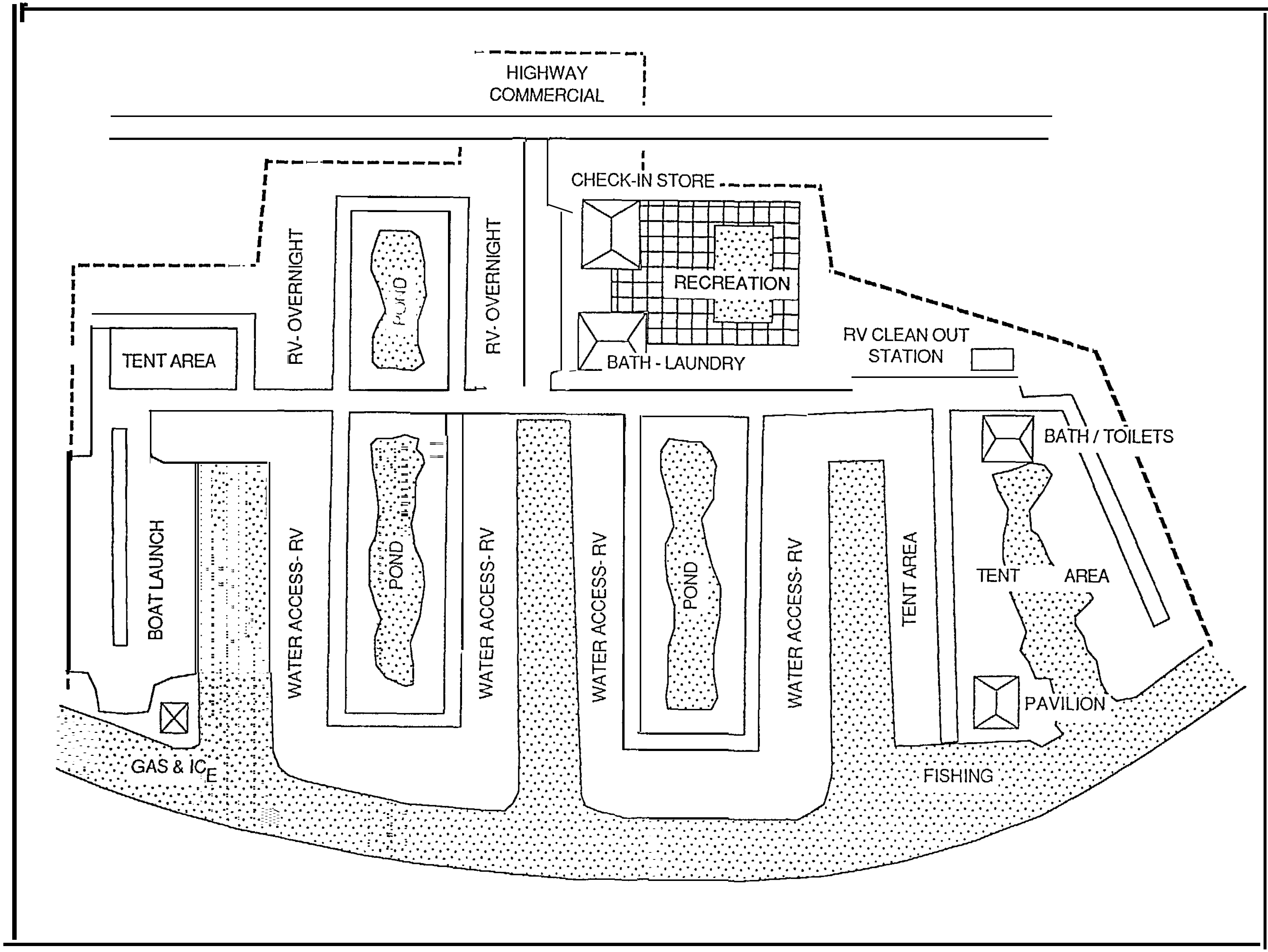



Figure 5-10. Water-oriented camper park.

and sanitary hookups, are offered. Camping modes are segregated with areas for tents, pop-up trailers, and the more elaborate motor homes and trailers.

Scenario three would dedicate the facility to active and passive day uses for which most communities always seem to have a need. The higher ground, nearest the highway (Figure 5-11), accommodates tennis, basketball, and racquetball courts and multipurpose ball fields. A two-lane roadway would meander through a planted forest of oaks and perhaps pines sheltering picnic tables and fireplaces. The lowest ground, adjacent to the waterway, would be a cypress swamp, an ecosystem which is unique to the lower coastal region because it naturally occurs further into the interior. Boardwalks would lead the visitor through the cypress to fishing platforms built into the channel. A small boat launch with parking spaces would be available for those who desired access to the surrounding coastal wetlands.

### 5. Public Sector Uses

Parish and state governments need adequate facilities and sites for locating future public services, such as sewage treatment plants, recycling centers, storage yards, or parking and repair shops for county (parish) vehicles. Abandoned or unused facilities seem to offer the ideal setting for these types of activities (Figure 5-12) if they do not contain hazardous or toxic substances, including radioactive particles. Most sites have buildings, workshops, all-weather surfaces, and storage yards for commercial and industrial activities. Immediate access to utilities, power, sewage lines, water, and transportation systems is another favorable characteristic. Sites are most commonly associated with industrial land uses, thus avoiding potential conflicts with adjacent parcels. In fact, some of the surrounding businesses may benefit from this type of proposed facility.

It is anticipated that most local governments know what the demand for services will be in the future. In fact, the planning staff probably has an existing plan in the files which, with some minor modifications, will serve as the basis for a revised infrastructure program. Once the local authority has determined that an abandoned facility will serve its needs, the property can be acquired in a bank repossession sale, as a consequence of nonpayment of back taxes, or on the open market. Purchasing by one of these means could result in a significant savings for the local government because of a lower price and the presence of existing buildings and facilities. In addition, there should also be a reduction in cost for engineering services and environmental permits because most sites are already significantly modified and permitted for industrial uses.

A final scenario depicts a model of a recycling/treatment plant (Figure 5-13). This scheme divides the site into two sections with the portion nearest the highway elevated and the remainder sloping toward the navigation canal. A recycling facility makes use of the railroad and is in proximity to available tracts for related industries.

The need for space for a sewage treatment plant is certainly becoming more important as the regulations on discharges are being more rigorously enforced by the EPA. Either a conventional system can be engineered and constructed or a more advanced, though more radical, design can be proposed. Overland flow of tertiary-treated effluent is possible and is being used in other parts of the country. The effluent passes from one cell to another through a series of aerobic environments until it trickles into the navigable waterway. Cells could also be developed with water hyacinths or roseau cane (more cold-weather-resistant than the hyacinths), to treat the effluent moving from the site to the canal.

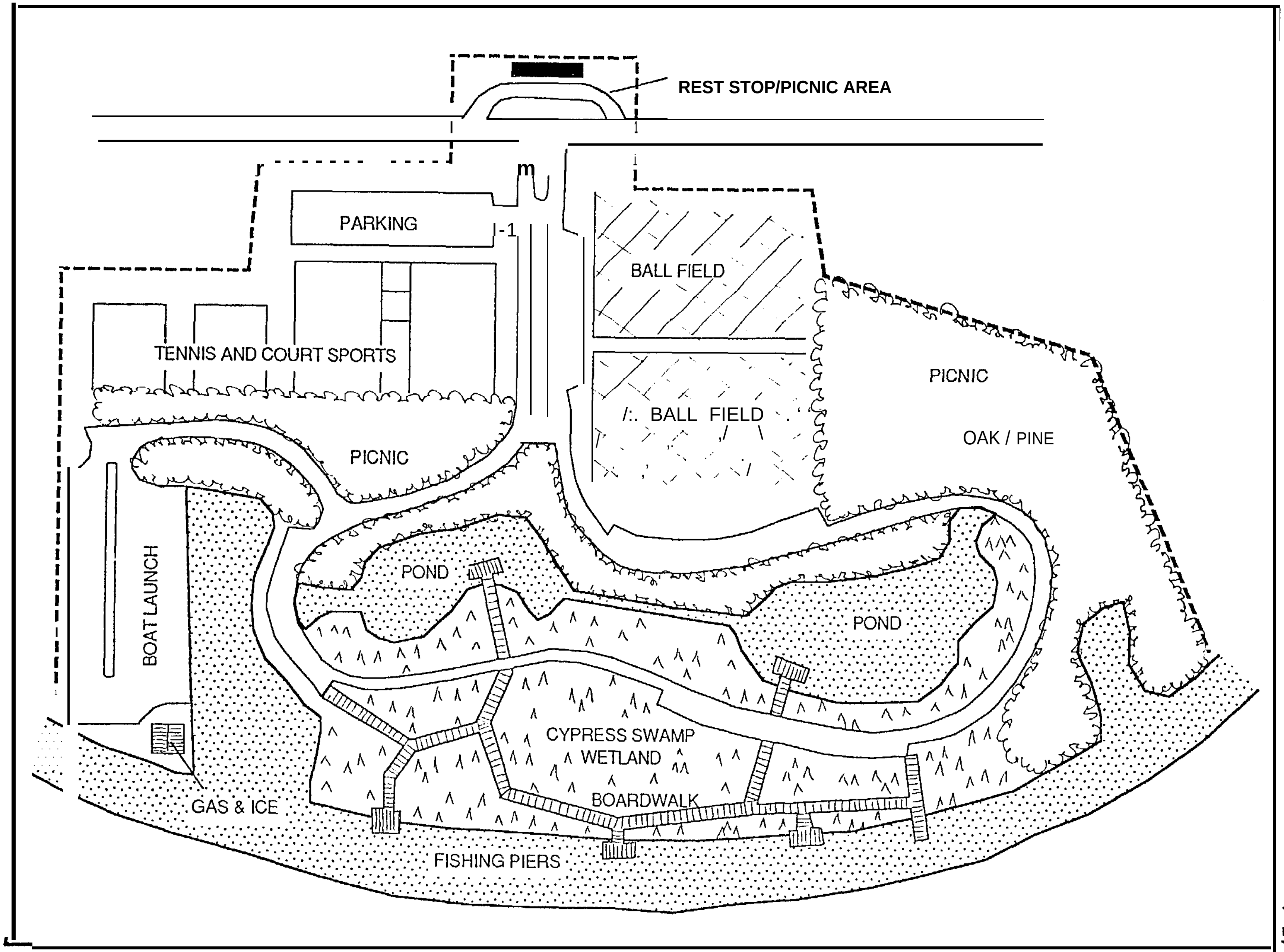



Figure 5-11. Multiuse park.

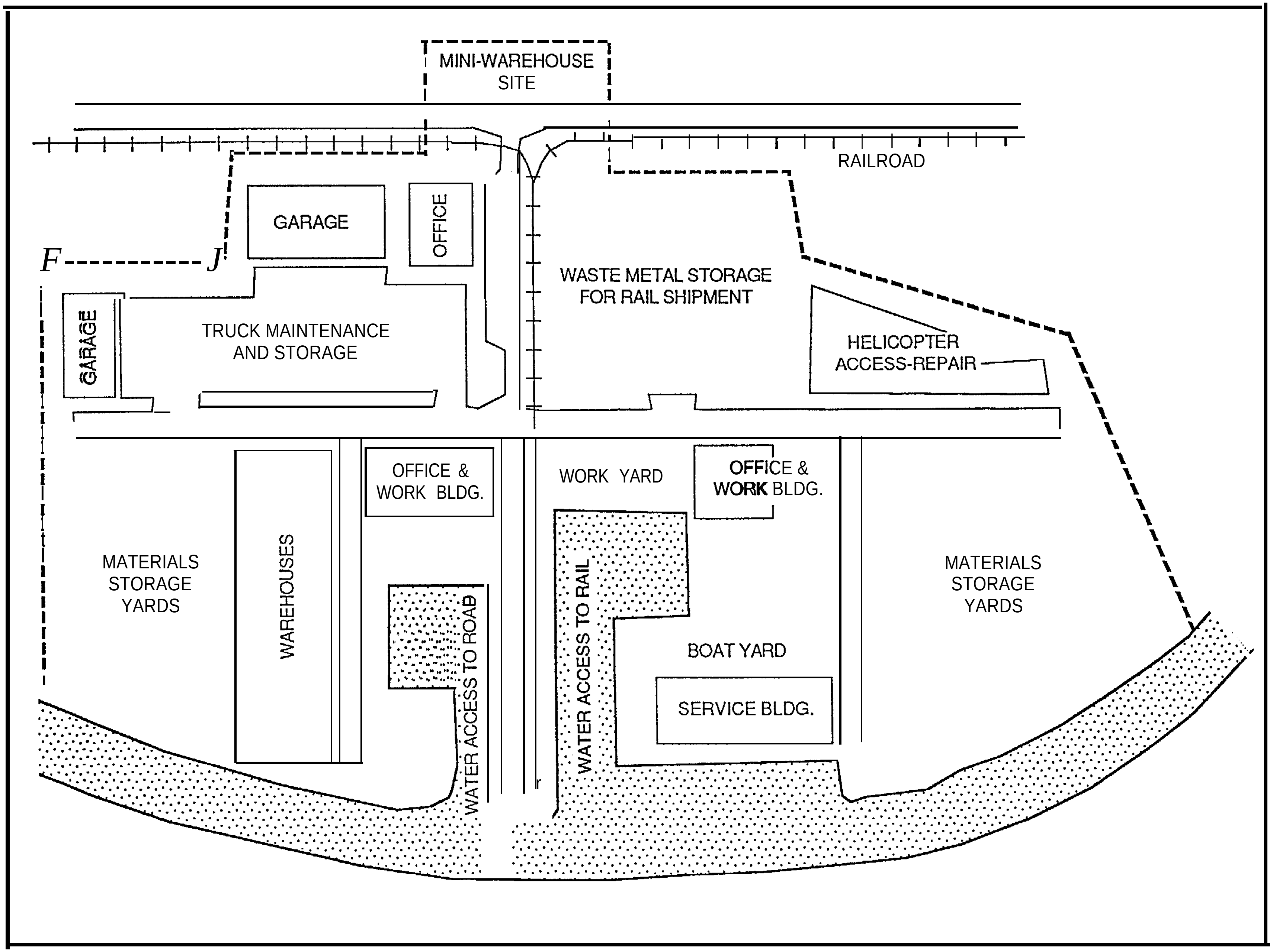



Figure 5-12. Public works maintenance and storage area.

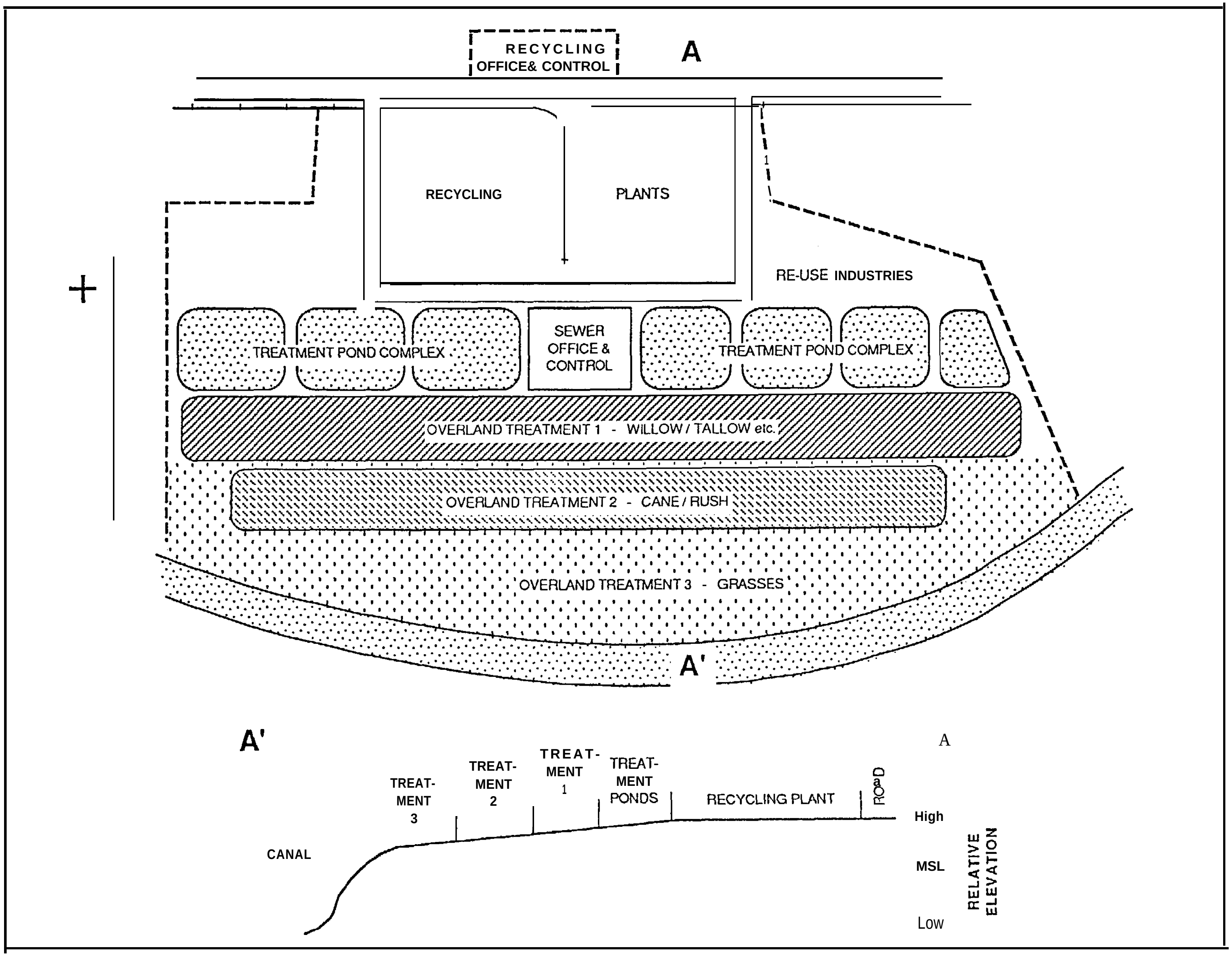



Figure 5-13. Model **of recycling/treatment** plant.

County and local governments must still comply with the state bid law when such purchases are made, and obtain appropriate federal and state environmental permits. All of these can be time-consuming and costly, but are really insignificant when compared to the usual high cost of engineering services.

### 6. Future Industrial or commercial Parks

Counties (parishes) or states could purchase selected, unpolluted sites and reserve them for future industrial/commercial parks, Local governments should be investigating the pollution status of tracts and planning for the long-term interrelationships of conflicting land uses and the potential for resolving these conflicts by developing a plan for growth. One way to cluster incompatible uses is to create the industrial/commercial park. Figure 5-14 suggests how such a complex may appear. Basins would be dredged and the excavated material used to raise the elevations of the tracts that are developed. The core of the project is the integrated transportation network of navigable waterways, roads, and railroads, an approach that closely imitates the Almonaster-Michoud Industrial District in eastern New Orleans. Scale is the primary difference between the existing and proposed projects.

The project site could serve as a base for processing fish products, operating as a supply base and home port for a fishing company; provide space for displaced shipyards or businesses as the wetlands deteriorate; and be readily available as a safe harbor for use by the regional fishing fleet during tropical storms. A variation on this theme would have the project oriented toward serving the transient fishing fleet by providing supplies, repairs, fuel, and other items. Parcels along the highway would serve road-oriented traffic, the weekend fisherman or the vacation-minded family.

Available unused or underutilized facilities can become an integral element during extraction of nonenergy mineral resources from the OCS. The Office of Strategic and International Minerals, a part of the Minerals Management Service, in coordination with the states is formulating a leasing program for the Exclusive Economic Zone along the nation's coasts. MMS-sponsored studies are being conducted by the Bureau of Economic Geology, University of Texas at Austin, Mississippi Mineral Resources Institute, Geological Survey of Alabama, Louisiana Geological Survey, and the private sector to identify the distribution and value of nonenergy minerals (excluding salt and sulphur) on the Outer Continental Shelf. Of particular interest are heavy minerals (for example, zircon, tourmaline, ilmenite, and brotite [Cranton and Woolsey 1988]), shell, sand, and gravel (Smith and John 1988). Included within the study effort will be a market analysis to establish those resources that have potential for extraction in the foreseeable future. The focus of the program is on the scientific and technical aspects of the marine resource.

Should any of the studies indicate a feasible industry, the onshore infrastructure and environmental modifications resulting from OCS activities can only be considered as positive elements that will contribute to more. rapid development at a reduced environmental impact. Because many of these unused facilities are on navigable waterways and have road and/or railroad connections, they offer excellent ports for transshipment of extracted minerals. Some of the OCS-related tracts are of sufficient size to provide space for stockpiling of materials, such as shell and gravel. Buildings can be refurbished for offices, and surplus heavy equipment can be used in the yards. Most support facilities offer significant advantages and must be seriously evaluated during the planning process. For example, additional canals or modifications of wetlands are virtually eliminated, factors which result in reduced engineering, environmental, and construction costs. An opportunity exists through long-term planning at the county (parish) level to direct these

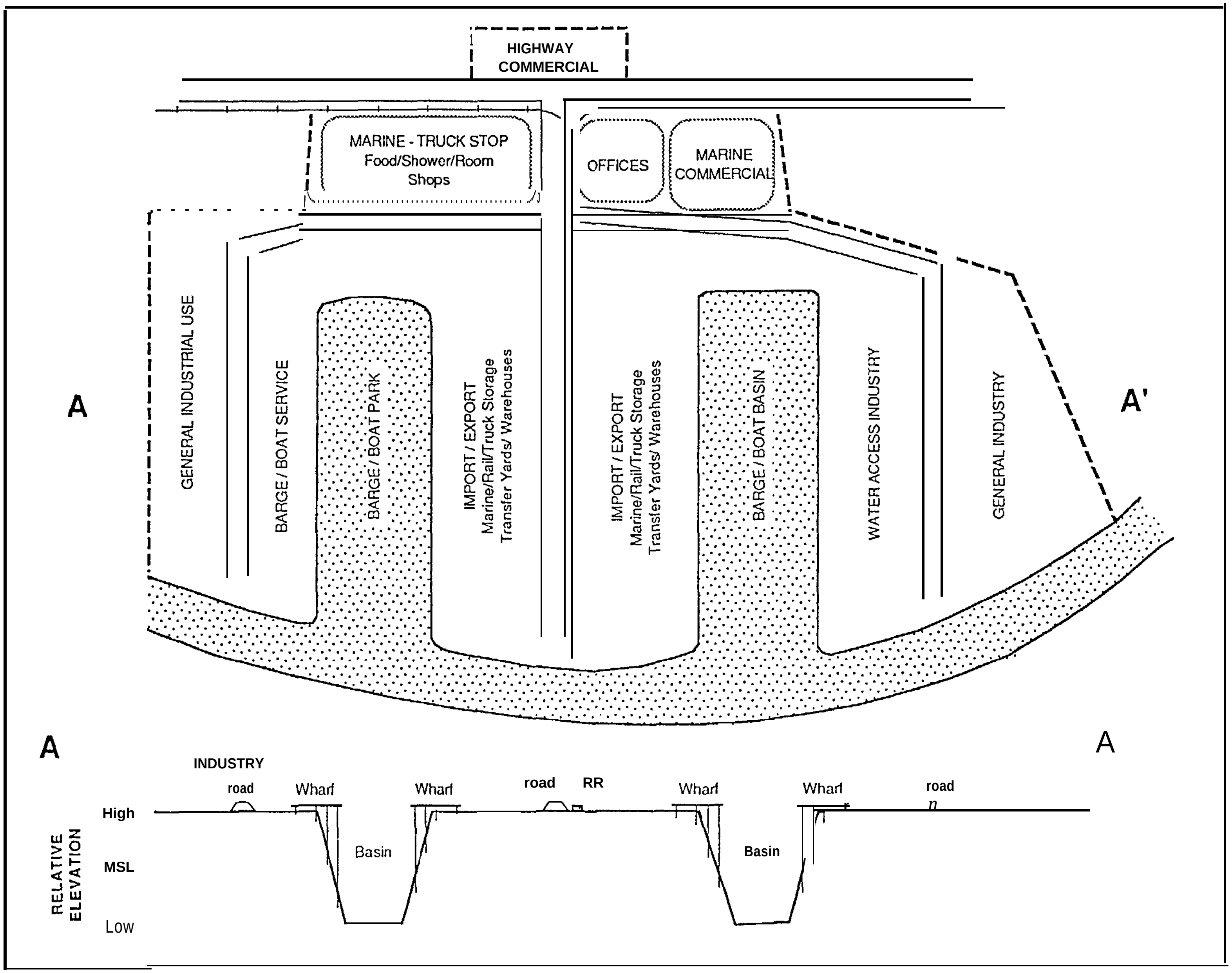



Figure 5-14, Industrial/commercial park complex.

activities to the available sites. One part of the economic package is in place for development of an industry in deep ocean mining.

### 7. Nurseries for Wetland Plants

There is a growing demand within the study area for wetland plants which can be transplanted for a variety of uses including: (a) facilitation of conversion of one marsh zone to another in areas of saltwater intrusion (primarily fresh to brackish or saline marshes), (b) accelerated reclamation of a dredge material disposal area or disturbed wetland area to prevent erosion and degradation of water quality, and (c) shoreline and dune stabilization to retard erosion. At present, Florida has the majority of commercial nurseries along the Gulf Coast. Plants must either be ordered from these nurseries or transplanted from local wetlands. In areas of high land loss, such as coastal Louisiana, transplanting from the wild is often not desirable because it can negatively impact the marsh. Purchasing nursery plants and transporting them from Florida can be prohibitively expensive.

Abandoned OCS facilities such as oil storage sites or service/supply bases could function as local distribution centers for nursery stock (Figures 5-15 and 5-16). These storage and service/supply bases are often located along transportation routes and/or navigable waterways, thus allowing for easy distribution of transplants. The leveed overflow ponds and pits or the impounded and often flooded marsh areas must be cleaned of any toxic or hazardous materials, including radioactive particles, or debris. A layer of silty sand could be pumped or trucked in and leveled with a marsh-buggy-mounted backhoe. One possible source of fill could be stock piles of dredged material from channel maintenance. This substrate would be ideal for mechanized transplanting of plant sprigs or seeds because it would be firmer than most natural marshes yet permit easy extraction for transplanting of newly rooted plants. Water salinities and depths could be regulated within the leveed areas with pumps so as to maximize plant growth and to develop the salinity tolerance required for site-specific transplants.

Such operations would serve numerous purposes. First, they would bean economical and non-destructive source for a variety of transplants customized for a particular transplant site. Second, potential nursery sites are abundant in areas containing OCS support activities. These sites could be made functional in a short period of time using local OCS support personnel and equipment. The expertise for starting and continuing a wetland transplant nursery is available in local parishes and counties through Soil Conservation Service extension services. Third, supervisory labor would come from local citizens displaced by the downturn in the petroleum-based economy. Manual labor could be provided through vocational programs in public schools.

## F. Summary

Numerous OCS-related facilities and infrastructure have been idled as a result of the decreased activity in the petroleum industry. These components are distributed throughout the study area, but are concentrated in nodes around the major ports. Private sector initiatives of converting vessels to other uses or changing the orientation of an industrial site have put people back to work. But there are opportunities for short- and long-term private, commercial, industrial, and recreational projects and public works projects that protect and enhance the renewable resources of the coastal zone.

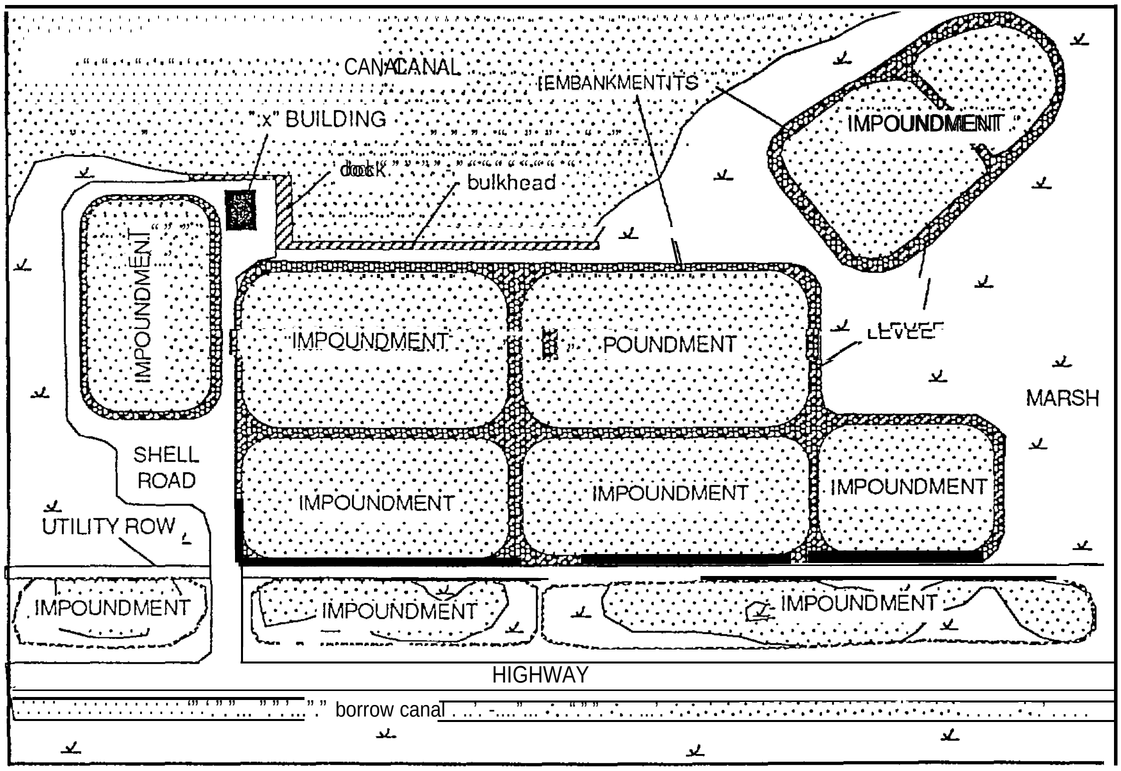



Figure 5-15. OCS storage **facility** converted to wetland nursery with controlled water levels.

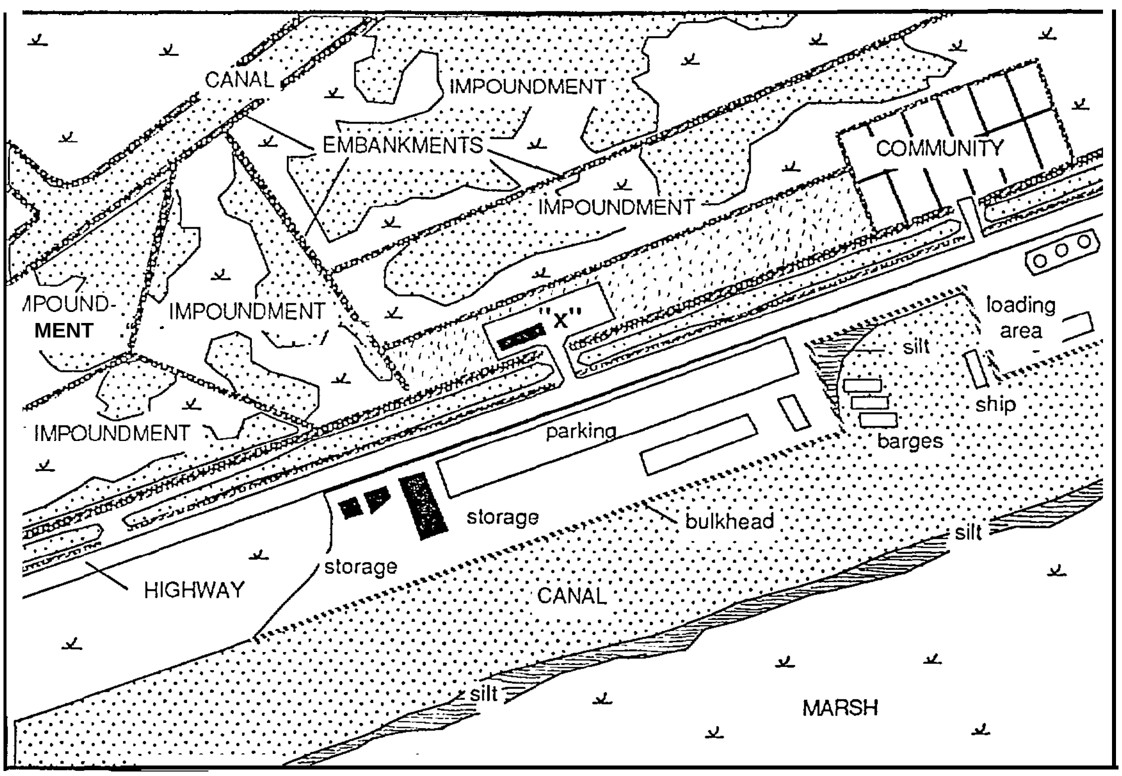



Figure 5-16. OCS service or supply base and segmented **impound-ments.**

The purpose of this report is to identify realistic and practical alternative uses for abandoned or underutilized OCS-related facilities and infrastructure. Table 5-1 summarizes materials concerning the proposed alternatives. An effort requires the cooperation of public and private sectors. The next step should be a meeting of selected individuals who can make decisions that will result in the implementation of certain alternatives.

## Table 5-1. Summary of Material on Each Alternative.

| Alternative | Regional Application | Lead Responsibility | Permits | Direct: Demand for Work force Short-term | Direct: Employment Opportunities Long-term | Comments |
|---|---|---|---|---|---|---|
| Surplus pipe & machinery | C | USACE, LA. | Environmental | High | Low | Enhances wetlands in remote areaa. Material and skilled personnel available. |
| Shell and aggregate | A, B, C, D | States | Environmental | Low | Low | Stabilizes shores and bottoms; provides habitat. Recycles a resource. |
| Wetlands management | B, C, D | States | Environmental | High | Low | Enhances wetlands function and values. Utilizes skilled personnel. |
| Reefs and shore protection | A, B. C, D | States | Environmental | Low | Low | Utilizes obsolete rigs; retards erosion and providea aquatic habitat to support commercial and recreational activities. |
| Research - wetlands mgt. | A, B, C, D | Universities | NA | Low | Low | Provides equipment to universities. |
| Research - other | A, B, C, D | Universities | NA | Low | Low | Provides equipment for research. |
| Fishing & crabbing piers | A, B, C, D | Local | Environmental | High | Low | Applies unused material and facilities to recreation. |
| Recycling metals | A, B, C, D | Private | Commercial | Low | Low | Reduces solid waste. |
| Water-control structures | A, B, C, D | Private | Industrial | Low | Low | Employs skilled personnel to manufacture needed components. |
| Food processing facilities | A, B, C, D | Private | Commercial | Low | High | Employs unskilled work force; expansion of economy into processed foods. |
| Recreation facilities | A, B, C, D | Private | Commercial | Low | Low | Provides opportunity for recreational businesses and uses abandoned facilities. |
| Public sector uses | A, B, C. D | Local | Commercial | Low | Low | Utilizes available land and facilities; compatible with previous uses. |
| Industrial/commercial parks | A, B, C, D | Local/private | Commercial | High | High | Utilizes existing modified sites; consolidates industrial activities to minimize land-use conflicts; enhances appeal for future development. |
| Wetland plants nursery | A, B, C, D | Private | Commercial | High | Low | Provides a local, less costly source for wetland plants; uses abandoned facilities to stimulate new industry. |

Local = county or municipality
Private = nonpublic

A = Texas Barrier Island System
B = Strandplain-Chenier Plain System
C = Mississippi Deltaic System
D = Mississippi-Alabama System

USACE = U.S. Army Corps of Engineers
LA. = Louisiana
Environmental = Section 404 permit, water quality permits
Commercial . Federal, state, and local permits to operate a business
Industrial = Federal, state, and local permits to operate a business
NA = Not applicable

High = a large workforce of skilled to unskilled individuals is needed
Low = Less than ten individuals comprise the workforce

Direct = applies to proposed activity.
Indirect = applies to activities that result from the project or program.

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