3. AFFECTED ENVIRONMENT/ ENVIRONMENTAL EFFECTS

3.1. DESCRIPTION OF HABITATS

The study area for the Restoration Plan includes all of Louisiana's 20 coastal parishes (Plate 1 of the main report). Each of these parishes contain coastal wetlands as defined by the Task Force.

Chabreck (1972) presented what is probably the most comprehensive study of the vegetation of the Louisiana Coastal Region. The following description of habitats is adapted mainly from his publication. Also, please refer to the "Problems" and "Solutions" sections of the main report which contain discussions about the natural processes that built the wetlands of coastal Louisiana and that cause changes and deterioration of these wetland habitats.

The Louisiana coastal area originated mainly from alluvial deposits of the Mississippi River and its distributaries. Over many centuries, these deposits have accumulated to form a broad, flat plain. The coastal region has been divided into two segments on a basis of origin and physiography. The area east of Vermilion Bay, occupying two-thirds of the coastal region, is designated as the Deltaic Plain. The Deltaic Plain is the site of the various active and abandoned river delta systems. Over approximately the last 8,000 years the Mississippi River has altered its course periodically, forming new deltas with each move. The older deltas, having had more time for compaction, subsidence, and wave modification, show greater stability. The area west of Vermilion Bay has been named the Chenier Plain and was formed by river sediment swept westward by long-shore currents in the Gulf of Mexico.

Daily tidal fluctuations along the Louisiana coast range from a few inches to about 2.5 feet. Tidal levels are greatly influenced by winds, with north and west winds causing below normal water levels and east and south winds causing elevated water levels. High pressure systems with strong northerly winds during winter can push water levels in the coastal wetlands more than 2 feet below normal for several days. At such times, marshes openly connected to tidal channels become practically dry. Conversely, low pressure systems in the Gulf of Mexico that produce strong southeast winds can push tidal levels several feet above normal and cause extensive flooding of coastal wetlands.

The climate of the Louisiana coast is influenced greatly by the area's subtropical latitude and its proximity to the Gulf of Mexico. Prevailing southerly winds in the summer provide moist, semi-tropical weather with numerous afternoon thunderstorms. Whenever westerly or northerly winds interrupt the prevailing moist conditions during summer, hotter and dryer weather results. During the winter, the

coastal area is subjected to alternating cold continental air and warmer tropical air, causing drastic variations in climatic conditions. Rainfall is plentiful in coastal Louisiana with the maximum average rainfall occurring in July and the lowest in October. Average annual rainfall for the New Orleans area is about 60 inches.

Tropical storms and hurricanes occasionally strike the Louisiana coast. These storms can cause tremendous destruction to the wetlands by physical force and by pushing saltwater far into freshwater zones which can cause vegetation to die off.

Natural marsh exists where plants grow and sustain themselves on properly elevated substrate. However, shallow, interspersed open water areas are typically included in the concept of a marsh. These interspersed open water areas are commonly referred to as ponds whether they are tidally drained or not. The interspersion of ponds and streams collectively within a given marsh area establishes the ratio of open water to marsh. This ratio greatly influences utilization by various aquatic and wildlife species. Since wetland vegetation provides the primary food substance and cover for most fauna, the conversion to total open water systems typically discourages biological diversity and long-term productivity. In many areas of coastal Louisiana, marsh loss (conversion of marsh to open water) is often accompanied by increased salinities.

The most notable relief features located in the Louisiana coastal area are forested areas located on natural levee ridges along abandoned distributaries, relic Indian mounds and middens, elevated salt domes, and artificial levees and canal banks.

Coastal marshes are subdivided into four vegetative types based on the classification first reported by Penfound and Hathaway (1938). The four marsh types are fresh, intermediate, brackish, and saline. The vegetation occurring in a particular coastal area is determined mainly by the salinity regime of the area, although soil elevation and soil type also help determine vegetation types. Salinity ranges and means in parts per thousand (ppt) found by Chabreck (1972) for the four coastal marsh types are as follows:

Marsh Type	Range (ppt)	Mean (ppt)
Fresh	0.1 - 6.7	<3.0
Intermediate	0.4 - 9.9	3.3
Brackish	0.4 - 28.1	8.0
Saline	0.6 - 51.9	16.0

The ranges shown illustrate the drastic salinity variation that occurs in the coastal marshes of Louisiana. It is for this reason that marsh types are classified by vegetative composition and not by salinity levels. The means shown are similar to those reported by other authors.

Chabreck (1972) recorded 118 species of vascular plants in all marsh types. The species found in the greatest amount overall was saltmeadow cordgrass (*Spartina patens*), making up about one-fourth of the vegetation in the coastal marshes. Other major species found were saltmarsh cordgrass (*Spartina alterniflora*), maidencane (*Panicum hemitomon*), and bulltongue (*Sagittaria lancifolia*). Species richness or biodiversity of the coastal marsh systems increases from salt to fresh marsh and dominance decreases.

The saline marsh is dominated by saltmarsh cordgrass along with saltgrass (*Distichlis spicata*), black rush (*Juncus roemerianus*), saltwort (*Batis maritima*), and saltmeadow cordgrass. Chabreck identified 12 additional species of emergent vegetation from this habitat type. Aquatic vegetation does not usually occur in saline waters along the Louisiana coast. However, widgeongrass (*Ruppia maritima*) may occur in saline marshes bordering on the brackish marsh zone and in saline areas where tidal flow has been decreased by structures or other changes in hydrology. Seagrass beds occur in waters behind some barrier islands, especially the Chandeleur Island chain. Seagrass species occurring in this area include shoalgrass (*Halodule beaudettei*), turtlegrass (*Thalassia testudium*), and manategrass (*Cymodocea filiformis*). Other wetland types associated with saline marsh include scrub/shrub wetlands, which are usually dominated by black mangrove (*Avicennia germinans*) or eastern false-willow (*Baccharis halimifolia*), shell reefs, tidal flats, streams, and ponds.

In the brackish marsh, saltmeadow cordgrass is dominant. Saltmarsh cordgrass, saltgrass, black rush, three-cornered grass (*Scirpus olneyi*), and leafy three-square (*Scirpus maritimus*) are also common in this zone. Other wetland types associated with brackish marsh are scrub/shrub wetlands, dominated by eastern false-willow, tidal flats, streams, and ponds. Notice that the species are practically the same as for saline marsh, only the order of dominance is changed. Often brackish marshes have a distinctive "hummocky" appearance associated with the clumped growth of saltmeadow cordgrass. Aquatic plants that commonly occur in brackish marsh waters include widgeongrass, Eurasian watermilfoil (*Myriophyllum spicatum*), muskgrass (*Chara vulgaris*), coontail (*Ceratophyllum demersum*), and dwarf spikerush (*Eleocharis parvula*). Forty species of plants were identified from brackish marsh by Chabreck.

The intermediate marsh type is the most difficult to identify. It lies in the transition zone between brackish and fresh marsh. Saltmeadow cordgrass is usually the dominant vegetation along with bulltongue, three-cornered grass, roseau or common reed (*Phragmites australis*), bullwhip (*Scirpus californicus*), sawgrass (*Cladium jamaicense*), Walter's millet (*Echinochloa walteri*), and deer pea (*Vigna luteola*). Aquatic plant species found in intermediate marsh waters include widgeongrass, dwarf spikerush, muskgrass, Eurasian watermilfoil, coastal waterhyssop (*Bacopa monnieri*), and southern naiad (*Najas guadalupensis*). Fifty-four species were identified from intermediate marsh by Chabreck.

In the fresh marsh, the dominant species are maidencane, bulltongue, spikerushes (*Eleocharis sp.*), pennywort (*Hydrocotyle sp.*), pickerelweed (*Pontederia cordata*), and alligatorweed (*Alternanthera philoxeroides*). Other common plants are bullwhip (*Scirpus californicus*) and cattail (*Typha sp.*). Fresh marshes are often very diverse with different species of grasses and broad-leaved annuals waxing and waning throughout the growing season. Some fresh marshes, on the other hand, consist of nearly pure stands of maidencane. Aquatic plants commonly found in fresh marsh waters are common duckweed (*Lemna minor*), coontail, Eurasian watermilfoil, southern naiad, muskgrass, water hyacinth (*Eichornia crassipes*), sago pondweed (*Potamogeton pectinatus*), white waterlily (*Nymphaea odorata*), *Elodea*, fanwort (*Cabomba caroliniana*), and American lotus (*Nelumbo lutea*). Other wetland types associated with both fresh and intermediate marshes are scrub/shrub wetlands dominated by eastern false-willow and wax myrtle (*Myrica cerifera*). Chabreck documented 93 species of plants occurring in the fresh marshes of coastal Louisiana.

Cypress-tupelo swamp contains a mixture of bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), and red maple (*Acer rubrum*) along with various understory plant species. Swamps with fairly open canopies sometimes support fresh marsh and scrub/shrub species as groundcover. Very often the water surface in cypress-tupelo swamps is covered by common duckweed, alligatorweed, and sometimes water hyacinth. Extensive coastal swamps are found in the Pontchartrain, Barataria, Terrebonne, and Atchafalaya Basins where there generally occupy the area between fresh marshes and developed areas of higher elevation. Healthy cypress swamps occur only in fresh water areas where the salinity range does not normally exceed two parts per thousand.

3.2. ITEMS NOT CONSIDERED SIGNIFICANT

Coastal Louisiana contains a wealth of natural, cultural, and human resources. Many of these resources, though important, would not be significantly affected by any of the projects proposed for the Restoration Plan. Some of these resources are listed as follows.

Louisiana has a Natural and Scenic Stream Program which provides protection to 47 streams, 25 of which are located in Louisiana's coastal parishes. Some of the projects listed in the Restoration Plan would occur in the vicinity of these streams, especially Bayous Penchant, Des Allemands, Trepagnier, La Branche, Dupre, and the Lake Borgne Canal. Certain projects could require a permit issued by the Louisiana Department of Wildlife and Fisheries pursuant to the Natural and Scenic Stream Program for work in or adjacent to these streams. The Louisiana Natural and Scenic Stream Program would afford protection to these streams sufficient to prevent significant adverse effects. Furthermore, it is highly unlikely that any project would be promoted that would diminish the natural and scenic attributes of a listed stream.

Farming operations are not expected to be significantly affected. There is, however, at least one proposal to restore an area that was once marsh, but is now used for pasture, back to marsh (East Eden Isles Restoration, PPO-4). Generally, no farm lands will be expropriated to implement the CWPPRA projects. Easements to build structures, deposit dredged material, and divert sediments into a privately owned area would have to be granted by willing landowners. In some cases, expropriation may be necessary to "cure" title such as when ownership is uncertain or when landowners cannot be located. See Section 3.3.11., Property Ownership and Values, for additional discussion.

Air quality would not be significantly affected by the proposed projects. During construction of many projects, heavy machinery and tugboats would be used to move materials. Exhaust gases would be emitted from this equipment but due to the remote nature of the areas where construction would occur, no adverse impacts to human health are expected. Air quality is considered to be good in coastal Louisiana except for the developed corridor along the Mississippi River and in the industrialized area around Lake Charles, Louisiana.

Isolated stands of bottomland hardwood forest (BLH) occur within areas affected by some proposed projects; however, these forests are generally not regarded as coastal wetlands. In coastal Louisiana this habitat type typically occurs along active and abandoned distributary channels in the Deltaic Plain and on the relic seashores (chenier ridges) of the Chenier Plain. The BLH found within project areas would normally not be directed disturbed. Marsh management and hydrologic restoration projects may affect BLH, if it occurred in the project area, by controlling water levels and saltwater intrusion but the effects would likely be minimal and for the most part, beneficial. Freshwater diversion and sediment diversion projects sometimes require removal of BLH in the path of outfall channels, however, normally the effects are relatively minor compared to benefits expected from such projects.

Shrub/scrub habitat is found in fresh to saline areas at elevations sometimes only slightly higher than marsh. Generally any area within or around a marsh with higher elevation supports either scrub/shrub or swamp habitat. Scrub/shrub is also found in association with some cypress-tupelo swamps where the canopy cover is open enough to support it as an understory. The impacts of projects on scrub/shrub would be similar to its effect on the marsh or swamp that the scrub/shrub is associated with.

3.3. SIGNIFICANT RESOURCES AND EFFECTS OF ALTERNATIVES

3.3.1. Introduction. A resource is considered significant if it is identified in the laws, regulations, guidelines, or other institutional standards of National, regional, and

local public agencies; if it is specifically identified as a concern by local public interests; or if it is judged by responsible Federal agencies to be of sufficient importance to be designated as significant. This section discusses each significant resource found in the study area, listed previously in Table 1, Summary of Comparative Impacts of Proposed Projects. The significance of each resource and existing conditions are described, then the effects of no-action and the various alternatives are discussed. Effects of operation and maintenance activities are included under the effects of alternatives.

The long-term effects of most proposed project types is largely unknown. One reason is that most existing coastal restoration projects have only recently been constructed. Monitoring of many restoration projects is ongoing but the data have not been synthesized and published to any large degree. Monitoring of projects constructed through the CWPPRA will provide valuable information to be used to plan and refine future projects. Much of what is written in the following discussion of project impacts is the professional judgement of the preparers of this report and other professionals employed by the Task Force agencies.

The project type for which the most research data is available is marsh management. However, Cahoon and Groat (1990) pointed out that the existing scientific data base on the ecological effects of managing marshes is currently limited. Acquiring the needed information will likely be difficult, take time, and be expensive. Perhaps researchers have turned their attention to this project type because it is probably the most common form of coastal wetlands project constructed to date; because of the controversy surrounding its affect on aquatic resources; and because of its often inconclusive effects on emergent vegetation.

Project-specific effects of large freshwater diversion projects are contained in two EIS's prepared by the USACE, New Orleans District. These reports are entitled; 1) Mississippi and Louisiana Estuarine Areas, Mississippi and Louisiana (Bonnet Carré Freshwater Diversion), and 2) Louisiana Coastal Area, Louisiana, Freshwater Diversion to Breton Sound and Barataria Bay (Caernarvon and Davis Pond Freshwater Diversions). No EIS's have been prepared for the other project types, although a draft EIS is under preparation for the West Bay Sediment Diversion project (FMR-3) from the First Priority Project List.

Prior to passage of the CWPPRA, the USACE, New Orleans District announced its intention to prepare a Programmatic EIS for marsh management due to the large number of Section 404(b)(1) permit applications received that, cumulatively, have the potential to significantly affect the environment. The impetus for this effort arises from the District's Section 404 regulatory responsibilities. The EIS will evaluate and disclose the issues and impacts associated with marsh management and will examine the several definitions of marsh management. Work on this document is currently on

hold due to lack of funds but will resume to a limited degree when funding from the EPA is made available to the USACE, New Orleans District in late 1993.

The U.S. Fish and Wildlife Service's National Wetlands Research Center is currently conducting a multi-year, comprehensive study of marsh management. They are collecting data from managed and unmanaged (control) marshes. The results of this designed experiment will likely greatly extend our current knowledge of active marsh management in Louisiana coastal marshes. The field work is expected to be completed sometime in 1996.

3.3.2. Coastal Marsh.

3.3.2.1. Existing Conditions. The main purpose of the CWPPRA is to address the problem of coastal wetland loss. The CWPPRA did not specifically mention vegetated wetlands, but the Task Force has interpreted the act to speak mainly to the protection and restoration of emergent wetland vegetation, especially coastal marsh. In the early 1930's there was approximately 8,511 square miles of land in an area that approximates the CWPPRA study area as defined by the Task Force. Since that time, over 1,500 square miles (960,000 acres) or about 18 percent of these coastal lands, the vast majority of which are marsh, have been lost to open water. The most current published estimate of land loss is 20.0 square miles per year in the Deltaic Plain and 5.4 square miles per year in the Chenier Plain for a total of 25.4 square miles per year for coastal Louisiana (Dunbar et al., 1992). The reasons for this tremendous loss rate are varied and numerous. The problems that appear to be causing the majority of the loss are: a high rate of compaction and subsidence of unconsolidated sediments; a lack of sediment and freshwater inputs caused by levee systems along major rivers; saltwater intrusion and associated tidal scour caused in part by canal and channel dredging; global sea level rise; erosion by wind-blown waves and vessel traffic; and a general, natural degradation of abandoned deltas of the Mississippi River aggravated by many of the previously mentioned problems.

3.3.2.2. No-action. Coastal wetland loss is expected to continue but the actual rate of future marsh losses cannot be predicted accurately. A conceptual presentation of how the coastline of Louisiana may look in the year 2040 is presented in Figure 2 of the Executive Summary. How all the factors controlling loss rates precisely interact is largely unknown and, thus, precludes predicting future loss rates with a high degree of accuracy. However, the more recent trend is a loss rate lower than the high rate of loss experienced in the 1958-1974 time period. In order to estimate a no-action scenario for each basin, a Task Force subcommittee determined that the 1974-1990 loss rate might best represent future losses. The basin-specific rate of loss was applied to the existing amount of marsh in each basin to roughly estimate how much wetland might be lost in the next 20 and 50 year time periods. Wetland loss

projections are contained in the basin chapters of the main report and in the basin appendices.

Reduced losses are expected in the near future partly as a result of changing economic forces (reduced canal dredging in support of petroleum extraction operations) and the implementation of freshwater diversion projects that at least locally will help to restore historic salinity regimes and add sediments and nutrients to sediment-starved basins. Additionally, the SCS would, under their existing authorities, be expected to continue to work with landowners and surface lease holders to plan and implement small watershed management plans. The State of Louisiana would also continue to evaluate and implement projects that would tend to further diminish wetland loss rates, if only on a local scale.

Landowners and surface lease holders have had to contend largely on their own with the problem of marsh loss and diminished habitat quality. Many have pursued acquisition of the necessary Federal and state permits to install and operate the structures necessary to conduct marsh management despite the rather large financial commitment often associated with successfully implementing, operating, and maintaining permitted projects. Herke (1979) estimated that 250,000 acres of Louisiana coastal marshes were already under marsh management. Spicer et al. (1986) estimated that over 600,000 acres were under some form of management. Between 1981 and 1984 the SCS developed 86 marsh management plans that if implemented would affect about 664,000 acres of private and corporately owned properties (Spicer et al., 1986).

Private landowners and surface lease holders would likely continue to try and protect their properties with the limited funds available to them. Thus, private landowners, surface lease holders, the Louisiana's Coastal Wetlands Trust Fund and various, often uncoordinated Federal initiatives would continue to represent the bulk of the effort to bring coastal wetland loss under control. The CWPPRA is a significant factor in that it serves to prioritize candidate projects relative to the larger goal of wetlands restoration and provides a funding mechanism to achieve that goal. It provides a unique opportunity for a speedy and positive effort at coastal wetlands restoration. Proponents of projects that are not selected for immediate implementation pursuant to the CWPPRA can be expected to vigorously pursue implementation through all other available means.

3.3.2.3. Marsh Management. Passive management has been and, on a limited basis, is still applied where the desire is primarily to suppress environmental extremes. Passive management structures are fairly effective at reducing the erosive force of water flowing over the surface of marsh soils; creating conditions conducive to the growth of submerged aquatic vegetation by decreasing water turbidity (when wind fetch is not a problem); maintaining a minimum water level throughout a year; and, in some cases, dampening salinity extremes.

Passive management structures can, except under unusual storm conditions, affect how much sediment is transported into and out of managed areas and retained within managed areas. In some instances, passive management structures may be used to shunt sediments or nutrient-laden waters into marshes or open water areas. If structures are located on all water routes influencing a passively managed area, mineral sediment input and accretion can be diminished (Cahoon 1990a, Reed 1992). Retention of sediments (organic and mineral) already within the managed area is probably enhanced by passive structures.

The effect of passive management structures on controlling marsh loss rates is not definitive (Chabreck and Nyman, 1989) and the effects of fixed crest weirs on emergent marsh plant species are not always clear (Chabreck and Nyman, 1989; Craft and Kleinpeter, 1989; Meeder, 1989; Turner et al., 1989; Sweeney et al., 1990). Turner et al. (1989) reported that passive structures can stress marsh plants through their effect on marsh soils. Slotted weirs and rock weirs, because of their greater exchange capacities, are presumed to reduce the potential for adverse effects on marsh soil conditions and promote more sediment, nutrient, and fisheries exchange compared to fixed-crest weirs.

More control than that available through passive management must be exerted on the hydrology of marshes that are subject to higher and more variable salinity regimes or have eroded substrates, especially when the goal is to affect marsh loss rates. Active management provides managers with the capability to reduce water levels and impose salinity controls under favorable meteorological conditions. With these capabilities, they can attempt to: 1) establish or invigorate the growth of emergent marsh plant species on existing or eroding substrates or substrates that would otherwise be covered by water; and/or, 2) create soil and water level relationships that are conducive to establishing or invigorating the growth of submerged aquatic vegetation. The goals of most active management projects are to: 1) reduce erosion -- by stabilizing marsh substrates and reducing erosive wave and tide energies along pond and open water edges; and, 2) increase productivity -- by increasing the amount of plant matter produced in the area and creating habitat to support larger numbers of marsh-dwelling species.

Establishing and maintaining marsh vegetation on surfaces capable of being exposed favorably affects erosion rates by slowing or halting the rate that remaining marsh soils are lost to open water. An added favorable effect occurs when marsh vegetation actually reclaims eroded areas by reestablishing marsh substrate elevations. Both effects represent success in addressing erosion rates with active marsh management. The first is a goal of most active management efforts. The second is highly desirable, but extremely difficult to achieve even on a small scale and, thus, typically serves as the ultimately hoped-for management achievement.

Attempting to affect marsh erosion rates by aggressively applying methods traditionally used for somewhat different purposes represents an extension of technology. Typically, the consequences of such extensions must be presumed to some degree. Presumptions are often based on professional insight or inferences drawn from available documentation of approximately similar situations. Thus, accurately predicting the actual impacts can be the subject of debate between involved interests. Partially in recognition of the developing debate over the effects of marsh management, Cahoon and Groat (1990) edited a document that consisted of: 1) a general literature review of marsh management; 2) several papers on studies specifically designed and conducted to develop a field research-based comparison of selected attributes of managed and unmanaged Louisiana marshes; and, 3) a summary and synthesis of the Louisiana studies.

In their literature review, Hartman and Cahoon (1990) reviewed over 300 articles related to management of marshes, including articles from Louisiana, South Carolina, and Florida. They observed that only about 9 articles dealt specifically with the effect of management on marsh loss rates. However, their review also revealed a relatively recent comparative, system-wide study of managed (for waterfowl) and unmanaged marshes in South Carolina. With the Louisiana field studies reported in Cahoon and Groat (1990), the South Carolina study provides a frame of reference for discerning universal, as well as unique and possibly site-specific responses, between managed and unmanaged marshes.

The South Carolina study (DeVoe et al., 1986), integrated and interpreted the findings of several authors and reported: 1) the composition and dynamics of the plant and animal assemblages between managed and adjacent tidal areas were structurally, functionally, and temporally different; 2) seasonal indices of carbon and nutrient dynamics were measurably different; 3) the dynamics of some attributes of the managed areas were sometimes out of phase with the adjacent tidal areas; 4) overall levels of productivity were similar between managed and unmanaged areas but primary production in unmanaged marshes came mostly from emergent vegetation while in managed marshes it came mostly from submerged aquatic vegetation, benthic algae, and phytoplankton; and, 5) shorebirds and waterfowl used the managed areas much more than adjacent tidal areas. The authors commented that differences between the managed and unmanaged areas were correlated with water transfer and movement rates; that the basic ecological processes occurring in managed and unmanaged areas were similar; and, that managed areas, tidal creeks, open wetlands and small parcels of high ground that comprised the general vicinity (of which the study locations were a part) collectively formed an integrated and productive ecological system.

Some of the field studies conducted for the Cahoon and Groat report described differences observed between two managed and two unmanaged marshes in Louisiana. Boumans and Day (1990) reported that the flux of some materials

between the managed and unmanaged marshes can be accentuated or moderated by meteorological conditions (rainfall, wind speed, and direction). Cahoon (1990a) reported that: 1) vertical accretion and organic matter accumulation rates were measurably less in the managed marshes; and, 2) bulk density and organic matter content of soils differed between the managed and unmanaged marshes. Flynn et al. (1990) suggested that the response of marsh vegetation to active management could be linked to chemical and physical attributes of soils in managed and unmanaged marshes. They concluded that plant growth and productivity in the same two managed and unmanaged marshes were stimulated when water levels were temporarily lowered to below the marsh soil surface (successful draw-down) but suppressed if the reverse was true (unsuccessful draw-down). The marsh soil changes associated with active management observed by Flynn et al. had been previously observed by others.

Sweeney et al. (1990), also presented in Cahoon and Groat (1990), compared marsh-to-water ratios from 16 managed areas located throughout coastal Louisiana with their respective control areas. They found that management (both passive and active) did not have an adverse affect but neither did management induce any overall positive changes. Proponents of management tend to discount this study. They maintain that the study was flawed because of shortcomings with control areas and other technical factors and that favorable differences in marsh-water ratios were underestimated. They also maintain that managed areas exhibit favorable differences in other desirable attributes not looked at by Sweeney et al. Opponents of marsh management maintain that design shortcomings in the study were not critical and tend to accept the Sweeney et al. study as evidence that management does not appreciably affect marsh to water ratios. Also, they feel that management's overall impact cannot be comprehensively determined until other important ecological attributes are considered.

In their summary and synthesis of Louisiana studies, Cahoon and Groat (1990) observed that differences in tidal influences, water-level patterns and the degree of water exchange between managed and unmanaged systems were primarily responsible for primary production differences in managed and unmanaged Louisiana marshes. Cahoon (1990b,c) came to the same conclusion. Clearly, many of the structural, functional and primarily shorter-term effects of marsh management in coastal Louisiana and South Carolina are at least coincidentally similar.

3.3.2.4. Hydrologic Restoration. Hydrologic restoration is expected to decrease the rate of marsh loss within the area of project influence by restoring historic, natural water flow patterns to the extent practicable. These projects are most appropriate in marshes being subjected to unnaturally high tidal fluctuations due to canal or channel dredging. Reducing the effect of tidal scour while continuing to allow a somewhat reduced level of tidal exchange would contribute to a reduction in tidal erosion rates within the project area. These projects are not expected to cause shifts to fresher

marsh types, but rather reduce marsh loss rates in deteriorating areas. No significant amount of marsh would be created or restored strictly by hydrologic restoration, although some projects categorized as such contain other features such as marsh creation with dredged material which would cause new marsh to develop.

3.3.2.5. Hydrologic Management of Impoundments. This type of project would be used to restore wetland vegetation within areas that have previously been impounded by levee systems and the existing water control systems for these areas are inadequate. Pumps would normally be used for water level control but adjustable structures used for active marsh management may be utilized where conditions warrant. Pumps offer very precise water level control and should produce the optimal marsh to open water ratio available for a given area. For instance, if the project area is relatively flat with little relief, a very high percentage of marsh vegetation could be established. If, however, the area varies in elevation by more than a few inches, the lower areas may remain open water, while the majority of the area could become revegetated with marsh grasses. The primary goal of most of the proposed projects of this type would be to create optimal conditions for wildlife and freshwater fisheries resources. Tidal exchange through closable structures would likely be incorporated into the design of projects to allow some access and use of the impounded area by estuarine fisheries species if tidal exchange would not negatively affect wetland vegetation in the impounded area.

3.3.2.6. Sediment Diversion. The effect of sediment diversion projects would differ considerably, depending on the existing condition of their receiving areas. Sediment diversions in the active Mississippi and Atchafalaya River deltas would be expected to develop marsh and other wetland communities basically the same as that which currently occurs in these deltas, mainly fresh marsh. Sediment diversions that are proposed for the Barataria and Breton Basins would cause a significant shift in salinity regimes and changes in wetland types. At the proposed diversion sites in these basins, brackish to saline marsh is found up to the back levees protecting the developed strips of land along the Mississippi River from storm-induced tidal flooding. Large-scale sediment diversions, as proposed for these sites, would cause new delta lobes to develop, replacing the existing brackish to saline marsh near the diversion sites with fresh to intermediate marsh and establishing a more natural gradation of fresh to saline habitats.

Sediment diversion is the only type of project that is capable of restoring large areas of marsh in a natural manner. Marshes created by these projects would be similar to the marshes found in the active Mississippi and Atchafalaya River Deltas. These marshes are extremely productive, supporting vast populations of fish and wildlife resources. Sediment diversions, and freshwater diversions and marsh creation with dredged material projects to a lesser extent, are the types of projects that offer the best opportunities for building new marshes or restoring deteriorated marshes to offset the loss of marsh in other areas where prevention of marsh loss would be

inordinately expensive. Also, these projects are the primary methods by which the massive quantities of sediments that are transported by the Mississippi River and now lost to the deep water of the Gulf of Mexico can be used to preserve, restore, and create coastal wetlands.

The Atchafalaya and Mississippi Rivers transport a finite amount of sediment. Diversion of sediment to a certain area would cause less sediment to be deposited downstream of the diversion site. Diversion of the majority of the Mississippi River into the Breton Sound or Barataria Basin, with maintenance of the existing navigation channel through Southwest Pass, would cause some of the existing active delta to undergo deterioration due to sediment deprivation. It would take many years for a new delta, the size of the existing one, to form in the Breton Sound or Barataria Basin.

3.3.2.7. Freshwater Diversion. Freshwater diversions benefit marsh by combatting saltwater intrusion and adding nutrients and fine-grained sediments into the estuarine systems. Freshwater diversions slow the rate of marsh loss in their receiving areas and, in the case of the larger diversions, develop marsh in the shallow open water areas near the diversion outfall. In some cases, such as for the Caernarvon Freshwater Diversion where brackish marsh extends nearly up to the structure, a shift in marsh type is anticipated in an area around the structure. In other cases, such as for the Bonnet Carré and Davis Pond diversions, no shift in marsh type is anticipated.

Water input through diversion structures is sometimes not possible when most needed in outfall areas because of low river stages. Conversely, when it is possible for diversions to provide large quantities of water, the areas that would receive it may not need additional water at that time.

Freshwater diversions are also proposed from the GIWW and from the upper Mermentau Basin where water stage is held artificially high by locks and control structures. These diversions are different from the river diversions in that they would generally carry less sediment and nutrients and would benefit marsh in their receiving areas mainly by reducing salinity levels. Diversion of sufficient quantities of water from the upper Mermentau Basin would also help decrease the high erosion rates occurring around Grand and White Lakes and would help wetland vegetation that is currently stressed from the elevated water levels.

3.3.2.8. Outfall Management. Benefits for outfall management projects usually include both marsh preservation and creation components above and beyond what would be expected from operation of freshwater diversion without outfall management. By routing outflow across and through deteriorated marsh and shallow open water, opportunities for sediments to settle out and reach an elevation suitable for the establishment of wetland vegetation are enhanced.

Outfall management would increase average water levels within the managed area during periods of moderate to high flow through diversion structures. Raising water levels is necessary to deliver sediment into the deteriorated marshes. The effect of the elevated water levels is unknown. Some would argue that existing vegetation would become stressed and begin to die back while others would argue that the high nutrient content and oxygen level of the diverted waters would cause increased vegetative vigor even under elevated water level conditions. Freshwater diversions from river systems could not be operated at moderate to high flows throughout the year due to varying river stages, therefore even if high water levels stressed vegetation, it would likely be able to recover during low-flow periods, and probably even increase in areal extent due to elevated substrate from sediment deposition.

There is some concern about the impact of Caernarvon Outfall Management project (BS-3A) on freshwater retention time and distribution of flows in the upper basin and how it will affect the diversion's ability to maintain target salinity levels in the middle and lower basin. The Caernarvon diversion was justified on its projected benefits to fish and wildlife resources by maintaining favorable salinity levels in the middle to lower areas of the Breton Sound Basin.

3.3.2.9. Marsh Creation with Dredged Material. In some cases, marsh would be created in shallow open-water areas, whereas other projects would nourish deteriorating marsh, which is undergoing conversion to open water, with a thin layer of dredged material. Dredging may be associated with normal maintenance of a navigation channel where the CWPPRA would provide funds for the incremental cost of using material beneficially, or dredging may be dedicated specifically for the purpose of marsh creation.

Minello et al. (1992) studied habitat utilization of natural and artificially created marshes in the Galveston Bay area. Their data collection was limited to the spring season, at time of heavy utilization of the marsh by aquatic species. The created marshes were 2-5 years old at the time of sampling. Stem density and above-ground biomass of smooth cordgrass was consistently higher in the created marshes but macro-organic matter in the upper soil layer was significantly lower. Densities of polychaetes (marine worms) and amphipods (small crustaceans) were positively correlated with levels of macro-organic matter. This suggests that newly created marshes, with less organic matter in the soil, support less benthic organisms. Natural marshes consistently had higher numbers of grass shrimp, brown shrimp, and other decapod crustaceans with blue crabs being the only exception. Densities of fish were found to be similar between natural and created marshes; however, species diversity was higher in natural marshes. It is important to note that these marshes were recently established. There is considerable evidence that created marshes become increasingly similar to natural marshes over time.

Unconventional materials such as red mud, shredded tires, and composted yard waste have been suggested for use in coastal wetlands restoration as a way to increase substrate elevations to the point which would support marsh vegetation. The effect of these materials on coastal wetlands vegetation and animal species is unknown. There are questions about the possible release of toxic substances that should be answered through testing or small-scale demonstration projects before widespread use of these materials is attempted.

3.3.2.10. Barrier Island Restoration. Barrier island restoration involves creation and restoration of marsh, dune, beach, and other habitats on barrier islands. Projects would use sand dredged from either back-bay or offshore sources to increase the vertical height of existing islands and extend their back-side mangrove wetlands and marshes. The marshes created on the back-side of the islands are highly utilized by high salinity estuarine aquatic species and avian species. These back-side marshes and mangroves also provide a platform for natural landward migration of some of the barrier islands. While some barrier islands are eroding and migrating, others, such as the Isles Dernieres are simply eroding landward.

Although marsh is created, the overall purpose of barrier island restoration is to maintain the barrier island ecosystems and the estuarine and marsh ecosystems behind the islands. Studies indicate that some barrier islands provide protection to mainland marsh areas by decreasing wave energies, by reducing tidal amplitude, and by moderating salinity levels. The ability of barrier islands to produce these effects is dependant on the distance the barriers are from the mainland, the condition of the mainland marsh, the configuration of the barriers, and other complex factors. The functions and values of barrier islands in Louisiana have not been clearly defined. One of the items proposed as a priority study under the CWPPRA is a comprehensive study of the role and functions of Louisiana's barrier islands and the best method for their restoration.

This type of project does not include structural protection of barrier islands. That type of project is covered under the following section.

3.3.2.11. Shoreline Erosion Control with Structures. Various materials may be used to provide structural stability to eroding shorelines. Some materials that have successfully been used are rock, concrete rip-rap, clam shells, oyster shells, crushed limestone, treated wooden timbers, used tires, and concrete and steel sheet piling. These materials can be placed either directly on or adjacent to the shoreline or in a segmented breakwater located out from the shoreline. Segmented breakwaters can act to trap sediment, creating marsh and other wetland habitat between the breakwater and the shoreline in sediment-rich areas. Erosion control structures placed adjacent to the shoreline are generally assumed to reduce existing shoreline erosion rates to zero. Some of these projects derive substantial marsh preservation

benefits by protecting large areas of marsh and open water that would be captured by a bay, lake, or channel if the shoreline protecting them would erode.

Hard structures, especially those constructed with rock or concrete rip-rap have been used with various levels of success along the gulf shoreline, including the gulf shoreline of some barrier islands. Jetties constructed at the mouths of passes for navigation purposes often interrupt the littoral drift process and cause sediment deposition on one side of the structures while the shoreline on the other side of the structures suffers from sediment starvation and erosion. Jetties and groins are not normally proposed for shoreline erosion control along the gulf shoreline, although conceptual ideas are included for some of the barrier islands in the Barataria Basin. Certainly, proposals for these structures would require extensive study to determine their suitability to correct the erosion problem on these islands.

Segmented breakwaters constructed by the State of Louisiana at Holly Beach to control erosion are apparently working well. A area that had been experiencing severe erosion problems appears to be stabilized and sediments are accumulating behind the breakwater. Shoreline erosion rates to the east and west of the breakwater are apparently not increasing. This project appears to be a success, however it was carefully planned and designed for the site. Another effort at stabilizing the gulf shoreline on East Timbalier Island has not been as successful. The corporation that owns the island attempted to stop shoreline erosion by hardening the shoreline with rock. The shoreline continued to erode behind the rock and now the rocks are located in the Gulf of Mexico hundreds of yards out from the island's vegetated natural shoreline. Whether the rock has or continues to reduce the amount of erosion that would otherwise be occurring is unknown. These examples point out that the use of any hard structures along the gulf shoreline requires thorough evaluation before construction.

3.3.2.12. Vegetative Plantings. Planting of vegetation along eroding shorelines would typically involve introducing rhizomatous plant species capable of withstanding wave action and inundation. Existing marsh behind the planted vegetation would be protected from wave and tidal erosion. No adverse effect on existing marsh would be expected. The actual amount of protection provided to existing marsh would depend on several factors including density of plantings; survival and expansion rates of introduced plants; and wave energy at the site. Plantings may slow the rate of shoreline erosion in some areas while in other areas, the plantings may completely arrest shoreline erosion or even cause the shoreline to prograde out into shallow open water.

Vegetative plantings may also be used in broken marsh or shallow open water areas within marshes, not necessarily to prevent shoreline erosion, but to re-establish emergent vegetation. Native plant species that are adapted to standing water

conditions, especially giant cutgrass, would be introduced into areas where they have not colonized naturally.

3.3.2.13. Terracing. Terracing would create geometric patterns of marsh in shallow open water areas. Although relatively small acreage of marsh would be created compared to other restoration efforts, the configuration of the marsh, with extensive marsh-water interface, would be very productive for a variety of fish and wildlife species. Normally little to no existing marsh would be directly impacted but erosion of existing marsh within and surrounding the terracing would be reduced due to lower wave energy.

3.3.2.14. Sediment Trapping. Sediment trapping projects would create marsh by slowing water currents and causing deposition of sediments. These projects normally rely on seed and plant fragments from nearby wetlands to colonize the sediments being deposited although vegetative plantings are sometimes an integral part of the project. Sediment trapping can be used to develop marsh adjacent to the trapping structure and along a marsh edge being protected by the structure. Sediment trapping projects, depending on their configuration, could also reduce erosion of existing marsh by reducing wave energy.

Wave dampening fences, such as hay bale fences, can be used to dampen wave energy in shallow, open water environs whether or not there is sufficient sediments being moved through the area. They can also be used to protect newly established plantings.

3.3.2.15. Herbivore Control. Additional trapping to reduce high concentrations of nutria and muskrat would certainly enhance vegetative growth, especially those species of vegetation preferred by the animals. As currently envisioned, herbivore control efforts would be concentrated in areas where there is ample evidence that high concentrations of animals are causing marsh stress and loss. The emerging deltas in Atchafalaya Bay have been proposed for herbivore control specifically because there is evidence that the animals are retarding the growth of the deltas and because the deltas are owned by the state. State ownership makes it easier to regulate harvests and obtain accurate harvest records than for private property.

3.3.3. Cypress-Tupelo Swamp.

3.3.3.1. Existing Conditions. Virtually all of the cypress-tupelo swamp in coastal Louisiana is second growth forest. Some relatively small areas of the second growth swamp are being harvested for timber and mulch products. In many areas, the swamps bear scars of past logging activities; logging canals, ditches, abandoned railroad spurs, and the stumps of felled trees. Large areas of cypress swamp have been killed during the latter part of this century by saltwater intrusion. Other

swamps are showing signs of stress; no regeneration, stunting, and conversion to marsh and open water. Often, prolonged flooding is suggested as the cause of cypress swamp deterioration and lack of regeneration. Ideal conditions for cypress swamps include periodic drying of the swamp floor on the order of once every 1 to 3 years to allow for regeneration to occur. Some of the coastal swamps virtually never undergo drying of the swamp floor because they are connected directly with the tidal system and subsidence has lowered the soil elevation. Some areas containing cypress with open canopy with marsh vegetation as an understory are more functionally a marsh.

3.3.3.2. No-action. Coastal swamps would continue to slowly deteriorate from prolonged flooding, subsidence, saltwater stress, and lack of regeneration. Loss of cypress swamp is difficult to determine because the loss is usually a gradual deterioration of the cypress and tupelo trees and conversion of the area into marsh and open water. Cypress swamps in the Pontchartrain and Barataria Basins would be protected to a degree from saltwater intrusion by the freshwater diversions already authorized for those basins under separate authorities.

3.3.3.3. Marsh Management. Although the name of this project type does not include swamp, active water level management (which active marsh management really is) could significantly benefit areas of cypress swamp that are being affected by prolonged high water levels. Passive or active marsh management may be used to reduce saltwater intrusion and tidal scour in swamps. Active management may also be used to reduce water levels and salinities which would promote cypress regeneration. If water levels were successfully lowered to encourage cypress regeneration, nutria herbivory would have to be controlled to prevent destruction of seedlings.

Many of these stressed swamps are tidally influenced, and the only way to control water level is to block the tidal influence with low-level levees and utilize water control structures or pumps to draw down water levels. Such measures are rarely practical; however, it is being proposed for a portion of the Verret Subbasin of the Terrebonne Basin. The cypress swamps and fresh marshes in parts of the Verret Subbasin are deteriorating due to chronically high water levels. A system of floodgates and pumps is proposed along the southern boundary of the basin to relieve the high water problems (XTE-32). Although this project is listed as hydrologic restoration in the Terrebonne Basin report, it can be considered to be a management project since water levels would be actively managed.

3.3.3.4. Hydrologic Restoration. Some cypress swamps are suffering from high water and soil salinity levels because of increasing tidal influence. These swamps could benefit from reducing tidal exchange, however precautions would have to be taken to assure that projects would not cause an increase in average water levels that could also stress the swamps.

3.3.3.5. Hydrologic Restoration of Impoundments. There are areas of cypress swamp that appear to be deteriorating due to prolonged flooding caused by roads, railroad embankments, or levees. Hydrologic restoration of these areas by providing outlets through or under these barriers would likely relieve some of the flooding problem and increase viability of the swamp.

3.3.3.6. Sediment Diversion. Sediment diversion projects could be used to invigorate swamps where subsidence has reduced soil elevation. Cypress and tupelo trees that occur in areas where the water levels remain too high suffer stunting and can die-off. Getting significant amounts of sediments to flow through a swamp and settle-out in a thin layer would be an engineering challenge that has not yet been attempted. A possible negative impact that could occur would be increased flooding of the swamps and surrounding low, developed lands if hindrances to drainage exist. Most sediment diversion sites proposed in the Restoration Plan do not contain swamps in the outfall areas. Some cypress trees may eventually colonize the lands created by these diversions, but faster growing species would predominate. Cypress planting could be used to help establish cypress stands in the outfall areas, if desired.

3.3.3.7. Freshwater Diversion. Freshwater diversions could greatly benefit existing cypress swamps, especially in the Pontchartrain, Barataria, and Terrebonne Basins by retarding saltwater intrusion and introducing fine-grained sediments and nutrients. In the case of some proposed freshwater diversions, such as the Hero Canal Diversion (BA-13), some cypress swamp would need to be destroyed to provide for outflow channels.

3.3.3.8. Outfall Management. Wherever cypress swamp occurs in the outfall of a freshwater diversion project, outfall management could be used to direct freshwater flows through the swamp to nourish the system with nutrients and sediment. Additional sediments could help to establish desirable understory species and promote cypress regeneration.

3.3.3.9. Marsh Creation with Dredged Material. There are no proposals in the Restoration Plan to develop cypress swamp on dredged material although some cypress seedings may be planted or cypress may naturally colonize some of the marsh creation efforts in the freshwater areas. Cypress forest could be developed on dredged material placed at proper elevation in fresh water areas, but it would take many years for a viable cypress swamp to develop.

3.3.3.10. Barrier Island Restoration. Cypress swamps would not be affected except to the extent that barrier islands moderate salinity levels within estuaries, which in theory could benefit swamps stressed by high salinity levels.

3.3.3.11. Shoreline Erosion Control with Structures. Some of the shoreline erosion control projects would protect cypress swamp as well as marsh.

3.3.3.12. Vegetative Plantings. Some of the vegetative planting would protect cypress swamp as well as marsh. Some projects may use cypress trees in combination with other species to control erosion.

3.3.3.13. Terracing. Not applicable to cypress swamp.

3.3.3.14. Sediment Trapping. Sediment trapping could be used along with outfall management to encourage sedimentation in cypress swamps in the outfall area of freshwater diversions.

3.3.3.15. Herbivore Control. Scientific experiments in the Pontchartrain and Terrebonne Basins have proven that nutria are seriously affecting regeneration of cypress. Unprotected seedlings planted in these areas experienced virtually 100 percent mortality. Any reasonable method to reduce nutria populations in cypress swamps would likely have a positive effect on natural regeneration and planting efforts.

3.3.4. Submerged Aquatic Vegetation.

3.3.4.1. Existing Conditions. Submerged aquatic vegetation (SAV), like emergent marsh plant species, grows only where favorable water depth and soil elevation relationships exist or can be established, and then only if nothing else, including salinity, is prohibitive. SAV serves several important ecological functions. It removes toxic materials from the water, it is a food source for a number of both fish and wildlife species, it disperses wave energy, it helps retain sediment, it can remove toxic materials from the water, and it contributes organic material for wetland maintenance. SAV also fuels the food chain by providing a surface for growth of epiphitic algae and bacteria which are grazed upon by herbivorous invertebrates. They in turn are fed upon by organisms higher in the food chain. SAV also provides shelter and escape habitat for small forage fish and invertebrates. Included under the category of SAV, in this report, are floating aquatic plants like duckweed and water hyacinth and rooted floating plants like American lotus.

Submerged aquatic vegetation occurs mainly in the brackish to fresh marshes and in cypress-tupelo swamps with open canopies. The more saline areas seldom contain any significant amount of SAV, with the notable exception of the area behind the Chandeleur Island chain where extensive areas of seagrasses occur. The seagrasses found near the Chandeleur Islands are of different species than those found in the brackish and fresh areas of Louisiana and require clear, high salinity waters with a sandy substrate for their survival. Many areas of brackish marsh contain widgeon grass, a desirable native species, commonly used for food by waterfowl. Eurasian watermilfoil has become well established in some lower salinity brackish areas. It is an exotic species usually considered undesirable by recreational boaters and

fishermen because it can become so dense that it can restrict boat usage. It is, however, used as a food item by several species of waterfowl.

The occurrence of SAV in specific areas is sometimes cyclic and otherwise difficult to predict. It would be especially difficult to predict the species that would become established as a result of a project in intermediate and fresh marshes because any one of a number of species, either desirable or undesirable, could colonize suitable habitat.

3.3.4.2. No-action. Increased tidal amplitude, tidal scour, and saltwater intrusion as a result of deteriorating marshes and barrier islands would decrease SAV coverage. High tidal energies in fresh and brackish areas causes increased turbidity levels from resuspension of bottom sediments and organic matter, creating a condition that is not conducive to SAV establishment and survival. Most species of SAV grow best in areas of little to no water movement, so the more open the coastal marsh system becomes, the less SAV is expected to occur.

3.3.4.3. Marsh Management. Marsh management, whether active or passive, is generally considered to increase an area's potential to support SAV (Larrick and Chabreck, 1976). The potential is related to management's ability to reduce tidal fluctuations, which can lead to reduced turbidity levels (Chabreck and Nyman, 1989). Production of SAV can be a primary, secondary, or unintended but desirable, consequence of marsh management. The benefits of increased SAV are largely related to improved waterfowl habitat, improved habitat for some fishery species, increased plant productivity, and reduced wave energy.

3.3.4.4. Hydrologic Restoration. Hydrologic restoration projects would increase the potential of an area to support SAV by decreasing tidal energy and turbidity levels. The amount of SAV and the species that would colonize a particular area would depend mainly on the salinity ranges that would occur after project implementation and on the substrate of the water bottom.

3.3.4.5. Hydrologic Management of Impoundments. These projects would very likely increase SAV coverage through optimization of water levels within project areas.

3.3.4.6. Sediment Diversion. High suspended sediment concentrations in diverted flows would prevent widespread establishment of SAV in the direct path of the diversions. Using the active deltas of the Mississippi and Atchafalaya Rivers as an example, SAV often becomes established in the calm, protected areas formed between bifurcations in a growing delta. Usually coverage of SAV begins to expand rapidly after rivers fall in the summer and water clarity increases. By early winter sizable areas of SAV can become established, providing food for wintering waterfowl, but the vegetation dies back during winter and spring.

While SAV commonly occurs in the brackish and lower salinity marshes of Louisiana, only the area behind the Chandeleur Islands supports seagrass beds. Uncontrolled Diversion of the Mississippi River into either the Barataria or Breton Sound Basin (PMR-6), the critical project for the Mississippi River Delta Basin, could potentially negatively affect these seagrass beds by increasing turbidity levels. This is a potential significant negative effect that would have to be evaluated before project implementation.

3.3.4.7. Freshwater Diversion. The effect of freshwater diversion projects from major river systems on SAV appears to be undocumented. The EIS written for the Bonnet Carré Freshwater Diversion stated that existing SAV in Lake Pontchartrain and behind the Chandeleur Islands would not be adversely affected. The Caernarvon and Davis Pond EIS did not address effects to SAV. Increased turbidity and nutrients from freshwater diversion projects would likely have negative effects on SAV. Nutrients would tend to increase plankton production which would tend to decrease light penetration through the water column and shade-out SAV. On the other hand, the fertilizing effect of the nutrients could increase the growth of aquatic plant species that can survive in somewhat turbid water. The net effect is not clear and would certainly depend on the existing conditions in an area of proposed freshwater diversion.

The freshwater diversions proposed from the Mermentau Basin would not carry as much suspended sediment as diversions from the major river systems and may have a greater potential to increase SAV in their receiving areas by lowering salinity levels.

3.3.4.8. Outfall Management. Very high turbidity levels are common in the Mississippi and Atchafalaya Rivers during high water periods in winter and spring. The high turbidity and cool temperatures during this time of year would prevent widespread coverage of SAV in outfall areas under management. However, the high nutrient and sediment load of these turbid waters would have a fertilizing effect and during the summer and fall, when river stages are low and water clarity increases greatly, SAV would likely be able to become established and expand within outfall areas.

3.3.4.9. Marsh Creation with Dredged Material. Marsh creation projects could either increase, decrease, or have no effect on coverage of SAV depending on specific project conditions. Projects implemented in areas of existing SAV would reduce its aerial extent by replacing SAV with emergent vegetation. After a period of several years, small ponds developing within the marsh creation areas may begin supporting SAV. Created marsh could be configured in such a way as to encourage the development of internal ponds that could support SAV.

3.3.4.10. Barrier Island Restoration. No direct effects to SAV. The Chandeleur Islands, where the only seagrasses in Louisiana are found, are not proposed for

restoration since they are designated as a wilderness area under the National Refuge System. Indirect benefits would occur to the extent that barrier islands maintain the integrity of a basin's estuarine ecosystem.

3.3.4.11. Shoreline Erosion Control with Structures. Structures built on a shoreline would not directly affect SAV except when the structures prevent a wash-out occurring between a large water body or channel and an internal marsh pond behind the shoreline. In such case, SAV occurring in the marsh pond would be protected from loss by the shoreline erosion control structure. Erosion control structures constructed as a breakwater, out from the shoreline, can provide calm, protected areas sometimes suitable for SAV. Suitable conditions would include a fairly low sediment transport rate in the area and ample protection from wave energy.

3.3.4.12. Vegetative Plantings. No direct effect except when used to prevent washout of a shoreline protecting marsh ponds containing SAV.

3.3.4.13. Terracing. One the primary goals of terracing is to increase SAV. This is accomplished by reducing fetch across shallow open water areas. The small protected areas within the terraced area provides suitable conditions for establishment of SAV.

3.3.4.14. Sediment Trapping. Sediment trapping is not usually designed to increase SAV. Areas containing sufficient sediments to warrant sediment trapping are usually too turbid to support any significant amount of SAV. However, depending on site-specific conditions, sediment trapping may create shallow protected areas suitable for colonization by SAV.

3.3.4.15. Herbivore Control. Nutria are known to graze SAV. Reduction of high nutria populations could result in increased coverage of SAV.

3.3.5. Wildlife Resources.

3.3.5.1. Existing Conditions. The high vegetative productivity of Louisiana's coastal swamps, marshes, and barrier islands provides support for a wide variety of wildlife. The traditional economy of coastal Louisiana was based, to a large degree, on harvestable resources of which wildlife played a significant part. Harvestable wildlife continue to be very important to the region, both for commercial and recreational purposes. Populations of all wildlife species that use the wetlands of coastal Louisiana are being adversely affected by the continued loss of habitat. There are no species of wildlife that stand to gain from the continued loss of wetlands.

3.3.5.2. No-action. Wildlife populations are expected to diminish as coastal wetlands are lost. Species directly dependent on the marsh are expected to undergo the greatest losses.

3.3.5.3. Marsh Management. Active management has been shown to have the potential to be an economically plausible, logistically feasible, and technologically proven way to manage for waterfowl, furbearers, and alligators. Habitat can be improved by encouraging the growth of annual seed producing plants and increasing submerged aquatic vegetation.

The growth of submerged aquatic vegetation, especially when associated with a stable water level in the fall, is attractive to waterfowl. Diminished water level fluctuations improve furbearer habitat and stabilized water levels in the fall and winter provide reliable access by boat, thereby facilitating fur harvests. Thus, the sought-after benefits to wildlife resources arise as the biological consequences of actions designed to affect other specific components of the marsh system.

Marsh management projects implemented under the CWPPRA will focus on arresting marsh losses. However, with the potential to affect how much and what kind of marsh plant communities occur within managed areas, it follows that it is sometimes possible to affect the animal species dependent upon those same managed plant communities. Therefore, it is not at all unreasonable to expect, and certainly understand, why managers often favor actions to enhance economic or recreational interests through marsh management.

3.3.5.4. Hydrologic Restoration. Hydrologic restoration would benefit wildlife species to the extent that the projects preserve marsh or swamp habitat upon which wildlife species depend. No adverse impacts to any wildlife species are anticipated.

3.3.5.5. Hydrologic Management of Impoundments. This type of project would benefit wildlife by restoring optimal hydrology conditions within impounded areas. Chronically high water levels in some impounded areas limit the exposed land available for wildlife species while other impoundments have been subjected to forced draining which has lowered the habitat value of these areas for wetland-dependent wildlife.

3.3.5.6. Sediment Diversion. The large areas of marsh that could be restored by sediment diversion would provide habitat suitable for a variety of wildlife species. Wildlife species that would inhabit the wetlands restored by sediment diversions would be very similar to species assemblages currently found in the active Mississippi and Atchafalaya River deltas. Productivity of existing wetlands nourished by the sediments and nutrients introduced by the diversion would increase, further benefitting wildlife populations. Construction of projects would

require removal of wildlife habitat but the areas impacted by construction would be minimal compared to the habitat developed by the projects.

3.3.5.7. Freshwater Diversion. Freshwater diversions help preserve wetland habitats that support wildlife species and in some cases cause a shift to fresher wetland communities near the diversion sites. Wildlife species that are suppressed by the lack of suitable fresh and intermediate marsh would expand in the area of the freshwater diversion structure's outfall. Construction of projects normally results in elimination of relatively minor amounts of wildlife habitat compared to the amounts benefitted by the projects.

3.3.5.8. Outfall Management. Most effects similar to hydrologic restoration projects. In addition to those effects, outfall management would tend to expand habitat for wildlife that require fresher conditions.

3.3.5.9. Marsh Creation with Dredged Material. Created marsh would provide valuable nesting, shelter, and forage habitat for a variety of wildlife species. Marsh creation efforts can be custom designed for specific areas to produce a settled soil elevation suitable for colonization by particular plant species and hence by wildlife species that utilize that type of habitat. For instance, dredged material could be placed in a series of circular islands with a slightly higher elevation in the center of each island to provide protected areas of scrub/shrub for wading bird nest sites and escape areas for terrestrial wildlife during high water events. Temporary negative effects to wildlife populations could occur during dredging operations from disturbance of existing marsh around or within marsh creation areas.

3.3.5.10. Barrier Island Restoration. In Louisiana, barrier islands provide critical nesting sites for a variety of shorebirds, wading birds, and other avian species. Terns, gulls, brown pelicans, black skimmers, egrets, and herons are some of the better known nesters. The islands also are home to resident birds. Relatively few species of amphibians, reptiles, and mammals use these islands. Barrier island restoration is expected to help ensure continued habitat for these species. Timing of restoration efforts in areas used by colonial nesting birds to avoid disturbance to these species during their nesting season would be necessary.

3.3.5.11. Shoreline Erosion Control with Structures. Projects would preserve wildlife habitat from erosion. Marsh edge, which is a primary feeding area for some avian species, would be considerably altered by structures placed directly adjacent to shorelines. Segmented breakwaters would have a less dramatic effect on the existing shoreline allowing continued use by wading birds.

3.3.5.12. Vegetative Plantings. Only beneficial effects on wildlife species are anticipated as a result of decreased erosion of their habitat.

3.3.5.13. Terracing. Terracing is expected to benefit wildlife species by providing feeding, nesting, resting, and escape cover. No adverse impacts to wildlife expected.

3.3.5.14. Sediment Trapping. Wetlands developed by sediment trapping would benefit wildlife with no adverse effects anticipated.

3.3.5.15. Herbivore Control. Reduction in the numbers of herbivores that are causing marsh and swamp degradation would preserve and enhance those habitats and their associated wildlife populations. In the long-term, even populations of the herbivores would be maintained by the preservation of their habitat.

3.3.6. Fisheries Resources.

3.3.6.1. Existing Conditions. Much has been written about the value of coastal wetlands to estuarine-dependent fisheries. The young of most economically important gulf coast species depend on shallow, protected areas of the estuaries for food and shelter. Access to and use of marsh vegetation has been shown to be especially important to the young juveniles of many species for both food and shelter Minello and Zimmerman, 1983; Zimmerman and Minello, 1984; and Zimmerman et al., 1984). Adults of many economically important finfish species, such as red and black drum, spotted seatrout, and southern flounder, also periodically use the marsh areas as feeding habitat.

Even though many thousands of acres of marsh have been lost in coastal Louisiana, commercial harvest and recreational catches of most important species have not diminished drastically. Catch reductions reflected in Louisiana landings statistics often result from commercial fishery closures, quotas, gear restrictions, or other limitations on specific species, and do not necessarily reflect a decrease in the quantity of fish available. Since the mid-1980's, many new laws and regulations have been enacted to limit the recreational and commercial harvests of economically important species including spotted seatrout, red drum, black drum, and mullet. Although regulations on shrimp harvest have remained essentially unchanged, little growth in the production of shrimp has occurred since the mid-1970's even though fishing effort peaked during the 1980's. Because loss of habitat and fishing pressure have caused, or are expected to cause fishery declines, the Gulf of Mexico Fishery Management Council has implemented Department of Commerce approved fishery management plans for shrimp and red drum in the Gulf of Mexico.

One hypothesis to explain continued high fisheries production is that, as the once vast, largely unbroken marshes have deteriorated from various causes, tremendous amounts of organic detritus were released into the estuarine system, driving high levels of primary productivity. Additionally, vast amounts of marsh-water interface and shallow, protected lagoons and ponds were formed which are prime areas for

growth and development of estuarine species. At the same time, saltwater intrusion into previously lower-salinity areas was increasing the amount of estuarine open water area available to salinity-dependent estuarine species. All these factors have combined to produce very high and probably unsustainable levels of estuarine fishery productivity.

In addition to providing nursery habitat for estuarine-dependent fish and shellfish, fresh and low-salinity coastal wetlands also provide habitat for resident freshwater species. Common species include largemouth bass, crappie, bluegill, redear sunfish, warmouth, blue catfish, and channel catfish. Because these species are intolerant of brackish waters, they are either displaced or killed when fresh and low salinity coastal wetlands become saltier. Since 1956, over 50 percent of Louisiana's coastal fresh marshes have been lost to open water or have converted to more brackish environments. These losses have resulted in severe declines in associated freshwater fish populations.

3.3.6.2. No-action. If marsh and other coastal wetland loss is allowed to continue unchecked, overall fishery production is likely to drop substantially below current levels. Browder et al. (1988) reported on the relationship between brown shrimp catch and wetland interface. Based on their analysis, shrimp yields will decline when interface declines, possibly beginning about 1995.

Operation of the Caernarvon, Davis Pond, and Bonnet Carré Freshwater Diversions will restore some fresh and low salinity conditions in their associated outfall areas. Despite these positive results, fresh and low salinity marshes will continue to be lost throughout the rest of coastal Louisiana, although the rate of loss would not be as rapid as in the past. Fresh marsh losses will result in proportional reductions in freshwater fish populations.

3.3.6.3. Marsh Management. The effects of passive management structures on fishery resources has been and is the subject of much research and discussion. There are experimental and survey data sets that support the conclusion that resident fish species tend to be beneficially impacted. Beneficial effects result presumably from protecting or expanding the extent of submerged aquatic vegetation in managed areas and possibly from a reduction in the number of migratory-estuarine competitors and predators and altered salinity regimes. Many of those same data sets support the conclusion that some estuarine-dependent migratory species are adversely impacted.

Any passive structure can be a physical or behavioral impediment to fish movement. Some types of passive structures can restrict the movement of fish species more than other types of structures (Herke et al., 1984). If passively managed areas can be accessed by fisheries through routes without structures, usage of the area is likely not appreciably diminished. However, when passive structures are located in a fashion

that precludes the unobstructed movement of organisms into managed areas, the impact can be significant (Herke, 1979).

Studies conducted on a brackish marsh system in the Calcasieu Basin controlled by a fixed-crest weir (Herke et al., 1984) showed that management can substantially reduce production of migratory estuarine species. Even though the average size of individual organisms emigrating from managed areas is generally larger than in open systems, the number of organisms is much lower. The Herke et al. study showed a reduction of more than 50 percent in the number of individuals of most species leaving an experimental marsh management area. The results reported in the study by Herke et al. are not unique to Louisiana. Similar findings have been reported from South Carolina (DeVoe and Baughman, 1986). There is also a suggestion that not all migratory estuarine species are favorably impacted when the extent of submerged aquatic vegetation is increased in managed areas.

Fixed crest weirs in general are not used as much as they once were. Slotted weirs, variable-crest weirs, rock weirs and flap-gated culverts, individually as well as in various combinations, are now used instead because of the greater management potential they provide. Although these structures also diminish aquatic species movements in and out of managed areas, the amount of reductions are less than what commonly occurs with a fixed-crest weir (Rogers et al., 1987; Rogers et al., 1992a). How much reduction occurs, one kind of structure relative to all others, has been quantified for some (Rogers et al., 1987 and 1992a; Herke et al., 1987) but not for all possible combinations.

Periodic water level reduction is a very controversial aspect of active marsh management, primarily because in many cases, access to managed areas is prohibited during drawdown periods and use of actively managed areas by migratory estuarine fish is therefore reduced. However, in the short-term, water level reduction is the mechanism by which habitat conditions can be stabilized, expanded, or qualitatively improved for some estuarine fisheries resources. In the long term, the expectation is that wetland habitat supportive of migratory fish can be maintained or increased through active management, whereas comparable unmanaged areas would disappear quicker and provide diminishing value.

Undertaking a water level draw-down (Phase 1), even if only once every three years (the current practice), could adversely and significantly affect migratory estuarine-dependent fishery resources. All movement into an area would be virtually eliminated for the duration of the draw-down. Fishery movements out of a managed area during a draw-down would occur only during those progressively more infrequent situations when water could be discharged from the area by gravity.

Given the differences in project locations and operational schemes, it is difficult to predict the effect of active management on freshwater and resident estuarine fishes.

Reduced frequency of stressful salinity events, more cover in the form of submerged aquatic vegetation, possibly more emergent vegetation, and reduced competition and predation from migratory estuarine species are some reasons how freshwater and resident estuarine species could be benefitted. Conversely, extensive drawdowns could result in stressful water quality conditions that would likely reduce resident fish populations.

Phase 2 operations can also affect fishery resources because ingress and egress can occur only on a limited basis during this phase. The restrictive effect may be more pronounced during the three to four months of winter. Some management plans provide for the retention of water levels to facilitate other activities during these months. During those several months, water level control structures are typically set at elevation equal to or slightly less than marsh level. Thus, movements of the relatively few migratory estuarine-dependent fishery species that use the marshes during these months are precluded to a large degree from accessing or leaving such managed areas except when storm tides occur.

Another possible effect of management that may occur is a different fish species assemblage inside a managed area than outside. Such a difference was recently documented for a managed area in coastal Louisiana (USFWS, 1991). This effect has also been observed and reported in managed South Carolina brackish marshes (Wilkinson, 1987; Wenner et al., 1986). DeVoe and Baughman (1986) concluded that the operational schedule of the water control structures is an isolating mechanism that gives rise to differences in fish populations between managed marshes and nearby creeks. Rogers et al. (1992b) advanced a similar explanation as to why different fish communities become established in actively managed brackish marshes in Louisiana.

Structural and functional fish community differences that arise as an often unintended consequence of installing the water control structures can be measurably and materially reversed. Physically removing structures, or undertaking actions that have the effect of removing the structure (permanently locking flap-gated culverts open), can be equally effective (DeVoe and Baughman, 1986). Hoese and Konikoff (unpublished manuscript) suggest that naturally-occurring, high water events that inundate managed areas tend to diminish or offset differences in fish community composition between managed and unmanaged areas.

Improved habitat conditions for estuarine organisms, stemming partly from the enhanced growth of SAV, is sometimes claimed as a benefit of marsh management. Habitat conditions for and the population sizes of resident fish species were reported to improve in one managed area (USFWS, 1991). However, improvement of fisheries habitat has not been a principal reason for electing to undertake marsh management. Some landowners are very interested in maintaining fisheries resources usage of managed areas but, historically, provisions to diminish the adverse impacts of water

control structures on the ingress and egress of fisheries into and out of managed marshes are typically included as project components to the extent that they do not appreciably reduce or compromise other management objectives.

3.3.6.4. Hydrologic Restoration. These projects normally allow unimpeded fishery access through natural tidal channels although some natural channels which have enlarged due to erosion, tidal scour, or dredging would sometimes be constricted back to more historic dimensions. Tidal influence which is unnaturally high due to canals, eroded banks, and ditches would be brought back to natural levels. Depending on the types of structures used and their location, some projects could reduce the use of project areas by migratory, estuarine-dependent fishery species. Effects would vary, depending on site-specific conditions. Over the long-term, projects are expected to reduce marsh loss rates, resulting in higher fishery habitat values than for unprotected areas. Projects located in fresh and low salinity areas would likely improve water quality and foraging habitat for freshwater and resident estuarine fish through stabilization of the hydrologic regime and enhanced production of submerged aquatic vegetation.

3.3.6.5. Hydrologic Management of Impoundments. Depending upon the operation of structures and pumps to be installed for the project and the existing conditions of the site, project effects could range from minimal to significant. If a project would re-establish tidal connection with an existing impoundment, even if only periodically, migratory estuarine species would benefit from this increase in nursery habitat (assuming that the organisms would be allowed to exit the area). On the other hand, other projects would not allow any tidal exchange and would therefore not affect estuarine fisheries species. Fishery access would continue to be blocked from impounded areas. Effects on resident freshwater species within the impounded areas is difficult to generalize because of considerable differences in project sites and operational schemes possible. Projects would be expected to increase populations of resident fish species in areas that are currently being used for pasture, whereas fish populations could decrease in areas that are suffering from chronic high water problems.

3.3.6.6. Sediment Diversion. Depending on the area, sediment diversions may or may not greatly affect fishery resources. The diversions proposed in the active Mississippi River delta (below Venice on the west bank of the river and below Baptiste Collette Bayou on the east bank) would discharge into habitat that is already fresh. Although there would be some displacement of aquatic organisms, the effects would be much less than for diversions proposed upstream for the Barataria and Breton Sound Basins, which would discharge directly into brackish and saline marshes. These diversions would cause a significant shift of estuarine species away from the fresh conditions established by the diversions, at least during periods of high river flow. Harvest of some species that favor higher salinity estuaries, such as brown shrimp, could be reduced. Other species that prefer lower salinity estuaries

for juvenile growth and development, such as blue crab, white shrimp, and menhaden, could provide increased harvests. In the fresh and low salinity areas in the outfall of diversions, freshwater fish populations would establish.

The purpose of sediment diversions is to build vegetated marsh which supports fishery resources. From an overall perspective, sediment diversions are expected to provide long-term benefits to fisheries resources by providing the vegetated wetland habitat that supports the estuarine ecosystem.

3.3.6.7. Outfall Management. Outfall management would shift flow patterns and salinity regimes near freshwater diversion structures. Freshwater species would be benefitted in the areas of freshwater flow from the exclusion of salt water. Structures used for outfall management could potentially hinder the immigration of estuarine species and thereby reduce usage of the managed area by these species.

3.3.6.8. Freshwater Diversion. Freshwater diversion from the Mississippi River would produce a net positive effect on coastal fisheries. As stated for sediment diversions, productive areas for some estuarine species would be shifted, at least during high flow periods, to a more seaward location. Populations of estuarine species favoring lower salinity environments, like blue crabs, menhaden, and white shrimp, would be expected to increase. Diversions would cause a general shift in estuarine species away from the diversion sites where freshwater species could become established if salinities do not reach high levels during low-flow periods.

3.3.6.9. Marsh Creation with Dredged Material. Marshes created or restored by use of dredged material would remove shallow water habitat. In some areas, especially the East Coast of the U.S., this would be considered a detrimental effect, but in Louisiana, with its massive wetlands loss problems, there is no shortage of shallow water habitats. The created marsh would provide organic detritus to the estuarine system and critical marsh edge habitat for aquatic species.

3.3.6.10. Barrier Island Restoration. Barrier islands separate the gulf from the bays and sounds. Without barrier islands these bays and sounds would become more like shallow near-shore gulf which has a different species assemblage. Many of the economically important species harvested in Louisiana are taken from the larger bays where they occur as sub-adults. Other species spend their adult life in the larger bays or in the near-shore gulf. Barrier islands moderate tidal energy and salinity regimes within the bay systems. Species adapted for living in the surf zone would benefit from barrier island restoration because their habitat would be preserved by these projects.

Where effective in moderating tidal exchange, barrier island projects could prolong the life of upper-basin fresh and low-salinity environments. In such cases, freshwater

fish populations in those areas would likely be maintained for a longer period of time before these areas would convert to more brackish habitats.

3.3.6.11. Shoreline Erosion Control with Structures. A long-term positive impact on fisheries resources would be expected by a reduction in the marsh erosion rate, protection of interior marsh from washing out through shoreline breaks, and the habitat provided by the structures themselves. Short-term impacts would occur during construction by physical disturbance of the area.

3.3.6.12. Vegetative Plantings. A positive effect on fisheries is expected by the preservation of marsh edge habitat, a reduction in the marsh erosion rate, and protection of interior marsh from washing out through shoreline breaks.

3.3.6.13. Terracing. Projects are expected to benefit fisheries resources by creating marsh edge habitat and protected aquatic areas with increased coverage of submerged aquatic vegetation. Short-term, construction-related adverse impacts would normally be minor.

3.3.6.14. Sediment Trapping. Temporary, usually minor disturbances would occur to aquatic species during construction. Long-term positive effects anticipated from preservation and development of marsh.

3.3.6.15. Herbivore Control. No direct effect on any fishery species except oysters (see Section 3.3.8.15.). Indirectly, herbivore control would benefit fisheries by preserving marsh.

3.3.7. Threatened and Endangered Species.

3.3.7.1. Existing Conditions. The Endangered Species Act of 1973 (as amended) provides protection for species identified as threatened or endangered. The USFWS and the NMFS administer the Act. Federal agencies are required to consult with the USFWS and the NMFS to determine if proposals are likely to adversely affect protected species and, if so, develop plans to avoid, minimize, or otherwise address potential conflicts with threatened and endangered (listed) species. Table 2 provides a list of the threatened and endangered species known to occur in the coastal wetlands and waters of Louisiana. Although American alligator is listed, it is biologically neither endangered or threatened. It is classified as "threatened due to similarity of appearance" meaning that other reptiles of similar appearance are threatened and endangered. A regulated commercial harvest of wild alligators is allowed in Louisiana. Discussions that follow do not include effects to alligators. The red wolf, although listed in the table, is generally considered to be extirpated in the wild in Louisiana. Cameron and Calcasieu Parishes are the locations of the last known, naturally occurring, wild individuals of this species. No critical habitat for

TABLE 2
THREATENED AND ENDANGERED SPECIES FOUND IN THE COASTAL WETLANDS OF LOUISIANA

(E=Endangered; T=Threatened; CH=Critical Habitat determined)

Mammals		
Panther, Florida (Felis concolor coryi)	E	Entire state
Whale, Right (Eubalaena glacialis)	E	Coastal waters
Whale, Finback (Balaenoptera physalus)	E	Coastal waters
Whale, Humpback (Megaptera novaeangliae)	E	Coastal waters
Whale, Sei (Balaenoptera borealis)	E	Coastal waters
Whale, Sperm (Physeter catodon)	E	Coastal waters
Wolf, Red (Canis rufus)	E	Cameron and Calcasieu Parishes[1/]
Bear, Louisiana Black (Ursus americanus luteolus)	T	Entire state
Birds		
Curlew, Eskimo (Numenius borealis)	E	Entire state
Eagle, Bald (Haliaeetus leucocephalus)	E	Entire state
Falcon, Arctic Peregrine (Falco peregrinus tundrius)	T	East, South
Pelican, Brown (Pelecanus occidentalis	E	Coast
Plover, Piping (Charadrius melodus)	T	Coast
Warbler, Bachman's (Vermivora bachmanii)	E	Entire state
Woodpecker, Ivory-billed (Campephilus principalis)	E	Entire state
Reptiles		
Alligator, American (Alligator mississippiensis)	T(S/A)[2/]	Entire state
Turtle, Kemp's (Atlantic) Ridley (Lepidochelys kempii)	E	Coastal waters
Turtle, Green (Chelonia mydas)	T	Coastal waters
Turtle, Hawksbill (Eretmochelys imbricata)	E	Coastal waters
Turtle, Leatherback (Dermochelys coriacea)	E	Coastal waters
Turtle, Loggerhead (Caretta caretta)	T	Coastal waters
Turtle, Ringed Sawback (Graptemys oculifera)	T	Pearl and Bogue Chitto Rivers
Fish		
Pallid Sturgeon, Scaphirhynchus albus	E	Mississippi River & tributaries
Gulf Sturgeon, Acipenser oxyrhynchus desotoi	T	Pearl River & Lake Pontchartrain tributaries

1/ Red wolves are considered extirpated in the wild. Cameron and Calcasieu Parishes are the last known areas supporting a wild population.

2/ For law enforcement purposes the alligators in Louisiana are classified as "Threatened due to Similarity of Appearance". They are biologically neither endangered nor threatened. Regulated harvest is permitted under State law.

threatened or endangered species has been designated in Louisiana, although critical habitat has been proposed for the Louisiana black bear.

Louisiana has a relatively large nesting population of bald eagles. In the 1992-93 nesting season, 65 active nests were recorded, and the nesting population is continuing to expand. The center of the nesting activity is located in the area around Avoca Island in the general vicinity of Morgan City, Louisiana, but nests are scattered throughout the coastal cypress swamps and fresh to intermediate marshes in the coastal area.

The Louisiana Natural Heritage Program maintains a database of plant and animal species that are considered rare or in danger of extirpation within Louisiana. Many of these locally rare species are found in the coastal wetlands and depend on the wetlands for their survival. Although these species are not specifically protected by law, government agencies are urged to consider them when planning projects. Some of the proposed Restoration Plan projects would preserve habitats where some of these species are found.

3.3.7.2. No Action. Continued loss of coastal wetlands would cause habitat loss and a decrease in food supply for several listed species including bald eagles, Arctic peregrine falcons, brown pelicans, piping plovers, loggerhead sea turtles, and Kemp's ridley sea turtles. The other threatened and endangered species occurring in Louisiana's coastal wetlands and coastal waters are either transient or do not rely as heavily on coastal wetlands for habitat or food sources.

3.3.7.3. Marsh Management. Project construction sites would have to be checked for presence of bald eagle nests. Any potential effects to nesting eagles could most likely be avoided by scheduling construction during the non-nesting season. Other species would probably not be affected directly by individual projects; however, the cumulative effect of marsh management projects could be a decrease in the nursery habitat available for some migratory estuarine species which provide food for brown pelicans and sea turtles. The NMFS has expressed concern that marsh management projects, cumulatively, could affect sea turtles by reducing their food supply and by affecting their access to shallow, open-water portions of managed areas, especially those areas located along the rim of the Gulf of Mexico. Sea turtles, especially Kemp's ridleys and loggerheads, are known to enter Louisiana's estuaries, but apparently have never been abundant in this area and nowadays occur infrequently. Marsh management projects are typically not located in the saline and highly brackish areas where these turtles are more likely to be found.

3.3.7.4. Hydrologic Restoration. Project construction sites would have to be checked for presence of bald eagle nests. Any potential effects to nesting eagles could most likely be avoided by scheduling construction during the non-nesting season. Other species would probably not be adversely affected, however each project would have

to be evaluated individually. Long-term beneficial effects to wetland-dependent threatened and endangered species would be expected from restoration and preservation of wetlands.

3.3.7.5. Hydrologic Management of Impoundments. Effects similar to hydrologic restoration.

3.3.7.6. Sediment Diversion. Project construction sites would have to be checked for the presence of bald eagle nests. Any potential effects to nesting eagles could most likely be avoided by scheduling construction during the non-nesting season. Projects would also have to be assessed for their potential to affect feeding areas of eagles and other listed species. If a brown pelican nesting colony is located in the outfall of the diversion, a biological assessment would likely be required to determine the effect on the breeding colony. Other species would probably not be adversely affected, however each project would have to be evaluated individually. Long-term beneficial effects to listed species would be expected from creation and preservation of wetlands.

3.3.7.7. Freshwater Diversion. Effects similar to sediment diversion.

3.3.7.8. Outfall Management. Effects similar to hydrologic restoration.

3.3.7.9. Marsh Creation with Dredged Material. Effects similar to hydrologic restoration. Additionally, effects of dredging on listed aquatic species would require evaluation. Restriction of dredging to a certain time of the year may be necessary to avoid potential negatives impacts to listed species.

3.3.7.10. Barrier Island Restoration. Several listed species are found on and near barrier islands. Brown pelicans use barrier islands for nesting and resting. Piping plovers feed on the tidal flats around barrier islands. Although not a major nesting area, a small number of loggerhead sea turtles nest on the Chandeleur Islands. The Chandeleurs comprise part of the Breton National Wildlife Refuge, a wilderness area that is not the subject of any CWPPRA project proposals. Barrier island restoration projects would require evaluation to determine if brown pelicans, piping plovers, or sea turtles would be affected. The potential for adverse effects can be often be minimized or eliminated by limiting construction to certain times of the year. Long-term beneficial effects would be expected from preservation of the islands and associated wetlands.

3.3.7.11. Shoreline Erosion Control with Structures. Bald eagle nests near specific project sites or other listed species in the area may require limiting of construction to certain times during the year. Projects along the gulf shoreline would have to be evaluated for their potential to effect sea turtles. Otherwise no adverse impacts to

listed species is anticipated. Long-term beneficial effects would be expected from preservation of wetlands.

3.3.7.12. Vegetative Plantings. Effects similar to shoreline erosion control with structures.

3.3.7.13. Terracing. Effects similar to shoreline erosion control with structures.

3.3.7.14. Sediment Trapping. Effects similar to shoreline erosion control with structures.

3.3.7.15. Herbivore Control. No direct effect on listed species. A reduction in the numbers of herbivores (nutria and muskrat) that have become overpopulated would help preserve and enhance stressed wetlands and thereby have beneficial effects on the threatened and endangered species that depend on the wetlands for their life requisites.

3.3.8. Oyster Leases.

3.3.8.1. Existing Conditions. Louisiana is one of the Nation's top oyster producers. The average annual harvest from 1988 to 1992 was 10 million pounds of oyster meats (approximately 2 million sacks) within average annual value of $30 million. Oyster production in Louisiana is from both private leases and from State-maintained water bottoms. Approximately 357,000 acres of water bottoms are leased for oyster culture in Louisiana. Fishermen pay the State two dollars per acre per year for the leases which the fishermen are allowed to sell or otherwise transfer. Lease terms are for fifteen year periods. In order to maintain productive leases, fishermen sometimes spread cultch material for oyster larvae attachment and spread seed oysters taken from State maintained water bottoms.

Oyster leases cover nearly all water bottoms available for lease that are capable of producing oysters. In addition, many areas that have remained closed to harvest for pollution reasons and that are presently unsuitable for oyster production are leased. Fishermen are normally compensated for seismic and other oil and gas activities that affect their leases. They also have the right to sue for damages to their leases.

As Louisiana's marshes have deteriorated and reverted to open water, vast shallow, open water areas, much of which is located in areas suitable for oyster culture, have developed. Vast acreage of these subsided marsh areas have been leased to oyster fishermen. The area between Port Sulphur and Buras, in Plaquemines Parish, is the most obvious example.

Oyster fishermen and their representatives have expressed concern over CWPPRA projects affecting leases. They have raised the issue that oyster reefs provide desirable habitat for various important fishery species and that oyster leases should not be sacrificed for emergent vegetation. The Louisiana Department of Wildlife and Fisheries, the agency responsible for managing the oyster industry, has begun including statements in new and renewed leases that the State shall not be liable for damages to oyster leases resulting from implementation of wetlands restoration projects. The legality of this disclaimer statement has not been challenged. The issue of whether oyster fishermen would be compensated and how they would be compensated for losing their leases to the effects of CWPPRA projects is a major unresolved issue. Either during the design of projects or during any subsequent evaluations of required Federal permits, the LDWF will be consulted, either directly or indirectly through the Louisiana Department of Natural Resources, concerning the occurrence of oyster leases within areas proposed for restoration.

3.3.8.2. No-action. The amount of water bottoms capable of supporting oysters is continuing to increase as marshes are lost to open water and salinity regimes move farther inland. Also, the organic material released from the deteriorating marshes is contributing to high fertility rates in the estuaries and high production of planktonic organisms and organic detritus for oysters to feed upon. While the areas suitable for oysters are increasing, pollution problems limit the areas where they can be harvested. The net effect is that the harvestable oyster zone is being squeezed between polluted areas and areas too high in salinity. Oyster production is expected to increase substantially as a result of the Caernarvon, Davis Pond, and Bonnet Carré Freshwater Diversion projects.

3.3.8.3. Marsh Management. Normally, marsh management is only proposed for areas that are entirely under private ownership, even the water bottoms. It is unlikely, but possible there could be cases where oyster leases occur within areas proposed for marsh management.

Marsh management would be detrimental to any oysters within the managed area because of reductions in tidal flow. Oysters develop and grow best in areas of moderate to high tidal velocities and the lentic (still water) conditions created by marsh management would create a situation unsuitable for commercial oyster production.

3.3.8.4. Hydrologic Restoration. Hydrologic restoration projects could be either beneficial or detrimental to oyster production, depending on the conditions of the specific site. In areas where salinity is too high, causing disease and predator problems, hydrologic restoration could produce a more suitable situation for oysters. However, the potential for hydrologic restoration projects in the high salinity habitats is less likely than in brackish areas where canals have altered the natural hydrology. In these brackish areas, it is very difficult to generalize about the effects of hydrologic

restoration. If existing salinity levels are in the high range for oyster production, hydrology restoration, which reduces salinity levels, would tend to benefit oysters. If existing salinity levels are in the optimal to low range for oysters, hydrologic restoration could negatively impact oyster production. Also, reduced tidal circulation could negatively impact oysters which depend on tidal currents for food.

3.3.8.5. Hydrologic Management of Impoundments. No oysters leases nor substantial amount of oysters would be located within existing impoundments therefore no effects on these items would be expected.

3.3.8.6. Sediment Diversion. Sediment diversions would cause a detrimental effect to any oyster leases occurring in their immediate outfall areas. Oysters beds are capable of withstanding only very small quantities of sediment and being completely non-mobile, oysters can be easily suffocated by siltation. The large-scale sediment diversions proposed as long-term supporting projects and critical projects for the Breton, Barataria, and Mississippi River Delta Basins are especially likely to produce significant adverse impacts to oyster leases and State reserved water bottoms. Saline areas on the periphery of the outfall from sediment diversions could become more conducive to oysters from reduced salinity levels and nutrient input from the diversions, however existing brackish areas along the periphery would likely become too fresh for oyster production. The overall impact of a sediment diversion on oyster production would depend on site-specific conditions. Sediment diversions in the Atchafalaya Delta would not significantly impact oysters or oyster leases.

3.3.8.7. Freshwater Diversion. Discussion under this section will be limited to diversion of water from the Mississippi River. The types of freshwater diversions proposed from the Mermentau Basin would not significantly affect oyster production because of the lack of suitable habitat in the receiving areas. Proposals for diversion of Atchafalaya River water into western and northern Terrebonne Basin could impact oysters in the middle and southern parts of the basin if the diversions were large enough. If this were the case, impacts would be similar to those discussed for Mississippi River diversions.

The three major freshwater diversions from the Mississippi River that were authorized for construction before passage of the CWPPRA were economically justified mainly by their benefits to oysters. Other freshwater diversions constructed by local interests in Plaquemines Parish were built with the specific intention of benefiting wetland habitat and its dependent fish and wildlife resources. The Caernarvon Freshwater Diversion became operational in the spring of 1991 but construction of the Bonnet Carré and Davis Pond Diversions has not been initiated. These projects would restore favorable salinity levels in the historic oyster producing areas where saltwater intrusion has caused increased salinity levels. As saltwater has encroached into the coastal wetlands of Louisiana, the oyster production zone has expanded into areas that were previously too fresh. These areas, although

productive, are not as well suited for oyster production because of poor substrate and proximity to pollution sources. The problem is that some oyster fishermen have come to expect continued production from their leases in the areas closer to diversions. Fishermen who maintain leases on the outer (high salinity) fringe of the productive oyster zone and the fishermen who rely on harvest of oysters from water bottoms reserved by the State on the seaward side of the leased zone, would greatly benefit from freshwater diversion by restoration of favorable salinity regimes in these areas. Oyster leases closer to the diversions could be negatively impacted by reduced salinity levels. Effects would depend upon the operational scheme developed for each freshwater diversion project.

3.3.8.8. Outfall Management. Outfall management is usually proposed for the immediate outfall of freshwater diversion projects. As such, these areas are not generally well suited for oyster production due to existing low salinity levels. Therefore, adverse effects to oyster leases are normally not expected. In unusual cases, such as near the Bayou Lamoque diversion in Plaquemines Parish, oyster leases occurring adjacent to the main outflow channel are now bypassed because the banks of the outflow channel contain the fresh water until in reaches the open bay system. The conceptual plan for Bayou Lamoque Diversion outfall management would involve the distribution of outflow into marshes and lagoons adjacent to the outflow channel which could possibly cause negative effects to some of the oyster leases near the channel while potentially benefitting others located farther away.

3.3.8.9. Marsh Creation with Dredged Material. These type projects are very site specific and therefore impacts to oyster leases for individual projects would be much easier to determine as compared to a freshwater or sediment diversion. Obviously, any oyster leases or oyster beds located in an area of marsh creation would be destroyed by sediment deposition and conversion of the area to vegetated wetlands. In some cases, nearby leases could be affected by runoff of sediments from the marsh creation sites and by altered hydrology in bayous and other tidal streams. Silt screening devices and other features could be used to minimize adverse effects.

3.3.8.10. Barrier Island Restoration. Restoring barrier islands would not significantly impact oyster leases or productive oyster areas except when they occur in the borrow areas or if oyster leases occur immediately behind the islands where dredged material is to be placed. Productive oyster areas would not be expected in the immediate vicinity of eroding barrier islands because of shifting sands and high salinity conditions, but may be present in the bays behind the islands.

3.3.8.11. Shoreline Erosion Control with Structures. The only known potential for impacts to oyster leases from this type of project is from the excavation of flotation canals through open water areas that may be required for equipment access to shoreline sites. Excavation of access routes, disposal of the dredged material, and

turbidity caused by dredging and vessel traffic would have the potential to adversely impact oyster leases and oyster beds that the access routes cross.

3.3.8.12. Vegetative Plantings. Little potential for impacts to oyster leases is expected from this type of project. Temporary wave-dampening devices proposed for some of these projects may have a minor, very localized negative effect if oysters were located very near to a shoreline erosion control site.

3.3.8.13. Terracing. No impacts to oyster leases are expected. No projects are proposed for oyster producing areas.

3.3.8.14. Sediment Trapping. Normally, sediment trapping devices would not be proposed in areas capable of supporting oysters. In order to be successful, sediment trapping devices need to be placed in areas of high turbidity and sediment transport.

3.3.8.15. Herbivore Control. Oyster harvest areas, whether they are private leases or State maintained water bottoms, are subject to pollution-related harvest restrictions. The LDWF and Louisiana Department of Health and Hospitals monitor the water quality in oyster producing areas across the coast. The concentration of bacteria, especially *Escherichia coli* which is associated with animal feces, in the water is the primary parameter used to determine whether or not areas should be opened or closed for oyster harvest. Circumstantial evidence suggests that the waste generated by high concentrations of nutria and muskrat can cause elevated bacteria counts. If this assumption is true, reducing their populations could benefit the oyster industry by allowing more areas to be opened for harvest. It should be noted that the bacteria do not harm the oysters or restrict their population, only the areas that they can be harvested. The bacteria can be harmful to humans only if the oysters are eaten raw.

3.3.9. Water Quality.

3.3.9.1. Existing Conditions. Water quality in Louisiana's wetlands ranges from highly turbid, nutrient-laden waters in some fresher marshes and swamps to clear, saline waters near the barrier islands. Generally, the estuarine waters of Louisiana are turbid from suspended sediments and high plankton densities associated with high nutrient levels. Urban and agricultural runoff causes high coliform bacteria in some areas. Very high suspended sediment concentrations are found in waters around the Mississippi and Atchafalaya River deltas except during low flow conditions when water clarity increases. Increased salinity levels, caused by a variety of factors including navigation channels and the loss of barrier islands, have contributed to the marsh and swamp loss in recent decades and continue to contribute to wetland loss. Toxic pollution is not considered to be a major problem in the coastal wetlands except for very isolated spots near major industrial centers.

3.3.9.2. No-action. The only significant changes expected in water quality would be from the two freshwater diversion projects to be implemented under separate authorities. The salinity regimes of the Pontchartrain and Barataria Basins will be altered by freshwater introduction in the upper parts of these basins. High suspended sediment concentrations in the diverted river water will increase turbidity levels in large parts of these basins. No increase in toxic pollution levels is expected although the projects will be extensively monitored for water quality parameters.

3.3.9.3. Marsh Management. The effect of the marsh management on water quality attributes are inconclusively documented. Management's effect on some water quality attributes, such as temperature and dissolved oxygen, have seldom if ever been reported. Childers and Day (1990) concluded that several the dynamics of several water quality attributes respond to a number of variables and successional stage.

The effect that management has on salinity has received attention because salinity affects the composition and health of marsh communities. Most of the information currently available is related to how management affects average salinity levels within managed marshes, but even the more rigorously administered data collections derived from recently implemented management plans are not definitive regarding the effects of active management on average salinity levels.

However, unlike passive management, active management provides the manager with some capability to control how salty the water gets inside the managed area. This is important because if the upper limits of salinity can be suppressed, then vegetation can be protected from the stressful or toxic conditions of the higher salinity events. Attempts to suppress salinity in managed areas involve reconfiguring water control structures to restrict or eliminate saltier-water inputs for as long as outside salinity levels remain a potential problem. This selective control of salinity is called a salinity safeguard. It is a feature of many active management plans and would be considered for any management projects constructed under the CWPPRA.

3.3.9.4. Hydrologic Restoration. No significant effects on water quality would be expected. Salinity levels in restored areas may be reduced and water clarity may be improved.

3.3.9.5. Hydrologic Management of Impoundments. No significant changes in water quality would be expected.

3.3.9.6. Sediment Diversion. Significant changes in water chemistry would be expected for sediment diversions from the Mississippi River discharging directly into existing brackish and saline areas. There would be a shift from the typical brackish and saline conditions to a freshwater condition similar to that found in the active river deltas.

3.3.9.7. Freshwater Diversion. Effects would be similar to sediment diversion.

3.3.9.8. Outfall Management. During periods of low flows and when freshwater diversion structures are not operated, the managed areas would likely have lower salinity levels than if no outfall management were in place. This is because outfall management would reduce the tidal exchange within the managed areas, in some cases, and therefore would conserve the fresh, diverted waters within the managed area.

3.3.9.9. Marsh Creation with Dredged Material. Construction of projects would cause temporary increases in turbidity levels. Runoff from unconsolidated dredged material may cause localized, elevated turbidity levels until the dredged material becomes vegetated.

Proposal to use material dredged from potentially contaminated waterways or use of unconventional materials, such as "red mud", would require that contaminant-related issues be addressed before projects are implementation. The degree of testing necessary would depend on site specific conditions and scope of the proposed projects.

3.3.9.10. Barrier Island Restoration. Effects would be similar to marsh creation with dredged material.

3.3.9.11. Shoreline Erosion Control with Structures. Increased turbidity levels during construction would be likely. Over the long-term, a decrease in turbidity from prevention of erosion may occur.

3.3.9.12. Vegetative Plantings. Decrease in turbidity from prevention of erosion may occur.

3.3.9.13. Terracing. Decrease in turbidity would be likely.

3.3.9.14. Sediment Trapping. No significant changes in water quality would be expected.

3.3.9.15. Herbivore Control. Controlling nutria and muskrat populations may reduce bacteria levels.

3.3.10. National Wildlife Refuges, State Wildlife Management Areas, and National Parks.

3.3.10.1. Existing Conditions. Twenty-one National wildlife refuges (NWR's), State wildlife management areas (WMA's), and State wildlife refuges (SWR's), and one

National park are located in Louisiana's coastal wetlands. Table 3 displays the names, location, size, and habitat type of each of these areas. Most of the National and State wildlife refuges are managed primarily for migratory waterfowl. Some of the more unique areas are as follows. The Breton National Wildlife Refuge, consisting of the Chandeleur and Breton Islands, is a wilderness area composed of a chain of barrier islands heavily used by colonial nesting birds. The recently acquired Bayou Sauvage National Urban Wildlife Refuge, which supports large numbers of migratory waterfowl and resident wading birds, alligators, and terrestrial animals, is located within the city limits of New Orleans and will likely experience large numbers of visitors once infrastructure is developed. The Shell Keys National Wildlife Refuge consists solely of shifting shell reefs in the Gulf of Mexico south of Marsh Island that are used by nesting birds.

Many of the NWR's, WMA's, and SWR's have existing features designed to maintain and optimize habitat conditions. Marsh management with structures and/or pumps is an important component of refuge operations in the Chenier Plain. Less intensive management is possible in most of the Deltaic Plain because of poor soil conditions and more open and remote setting of the refuges. Small-scale sediment diversions (crevasses) have been implemented on the refuges in the active Mississippi River delta.

Projects proposed for refuges, management areas, and the National park would compete for available CWPPRA funds on an equal basis with projects on private lands. The CWPPRA makes no distinction between public and private lands.

3.3.10.2. No-action. Refuges, management areas, and the National park would continue to be managed and maintained to the extent possible with funds available. Funding levels often fall far short of that necessary to manage areas optimally.

The Bonnet Carré Freshwater Diversion, previously authorized under another authority, would reduce saltwater intrusion problems in the Manchac and Joyce WMA. The tidally-influenced portion of the Bayou Sauvage NWR and the Biloxi WMA would be enhanced with nutrient and sediment-laden freshwater. The Davis Pond Freshwater Diversion, also already authorized, will benefit the Jean Lafitte National Park and Salvador WMA by providing nutrient and sediment-laden freshwater to increase vegetative vigor and combat saltwater intrusion.

3.3.10.3. Marsh Management. Most of the refuges in the Chenier Plain already have subunits under marsh management. Projects are proposed to fund specific maintenance requirements of these management systems and also to upgrade their management potential.

3.3.10.4. Hydrologic Restoration. Hydrologic restoration projects would be most appropriate for the management areas and refuges located in the Deltaic Plain. The

TABLE 3
NATIONAL WILDLIFE REFUGES, NATIONAL PARKS, AND STATE WILDLIFE MANAGEMENT AREAS AND REFUGES

BASIN	NAME OF AREA[1/]	ACRES[2/]	HABITAT TYPE
Pontchartrain	Bayou Sauvage NWR	18,397	Fresh marsh, brackish marsh
Pontchartrain	Manchac WMA	8,325	Fresh to intermediate marsh, cypress swamp
Pontchartrain	Joyce WMA	15,609	Fresh marsh, cypress swamp, scrub/shrub wetlands
Pontchartrain	Pearl River WMA	34,896	Fresh and intermediate marsh, cypress swamp
Pontchartrain	Biloxi WMA	39,583	Brackish and saline marsh
Pontchartrain and Breton	Breton NWR	6,923	Barrier islands, mangrove, saline marsh
Mississippi	Delta NWR	48,800	Fresh and intermediate marsh
Mississippi	Pass a Loutre WMA	66,000	Fresh and intermediate marsh
Barataria	Jean Lafitte National Park	10,000	Fresh and intermediate marsh, cypress swamp
Barataria	Salvador WMA	31,000	Fresh marsh
Barataria	Wisner WMA	21,621	Saline marsh
Terrebonne	Terrebonne Barrier Island Complex SWR	3,200	Barrier islands, saline marsh
Terrebonne	Point au Chien WMA	30,037	Fresh to brackish marsh
Atchafalaya	Atchafalaya Delta WMA	125,375	Fresh marsh, scrub/shrub
Teche/Vermilion	Shell Keys NWR	<100	Shell reefs south of Marsh Island
Teche/Vermilion	Marsh Island SWR	79,000	Mostly brackish marsh, some saline marsh
Teche/Vermilion	State SWR	15,000	Mostly brackish marsh, some saline marsh
Mermentau	Cameron Prairie NWR	9,621	Fresh marsh
Mermentau	Lacassine NWR	32,625	Fresh marsh
Mermentau	Rockefeller SWR	84,000	Fresh to saline marsh
Calcasieu/Sabine	East Cove Unit of Cameron Prairie NWR	15,000	Mostly brackish marsh, some intermediate marsh
Calcasieu/Sabine	Sabine NWR	125,000	Fresh to saline marsh

[1/] NWR=National Wildlife Refuge, WMA=Wildlife Management Area, SWR=State Wildlife Refuge
[2/] Acres refers to all lands and waters within refuge, park, or management area boundary

Biloxi, Point au Chien, and Wisner WMA could likely benefit from this type of project.

3.3.10.5. Hydrologic Management of Impoundments. Several of the refuges and management areas have existing impoundments that are being managed with various levels of intensity. The recently designated Bayou Sauvage Refuge could probably benefit most from this type of project. Years ago, much of what is now the refuge was enclosed within the hurricane protection levees for New Orleans. Inadequate control of water levels within this impounded area has caused the loss of the enclosed freshwater wetlands. Two projects which have already been approved through priority project lists, would involve installation of pumping facilities to optimally manage water levels.

3.3.10.6. Sediment Diversion. Sediment diversions could significantly affect Breton NWR, Delta NWR, and the Pass a Loutre WMA. Additional small-scale sediment diversions could be constructed in Delta NWR and Pass a Loutre WMA to develop fresh marsh. A large-scale diversion off the main stem of the Mississippi River is proposed for the Benny's Bay area of Delta NWR (PMR-5). This project would build thousands of acres of fresh marsh within the refuge. On the other hand, uncontrolled diversion of the Mississippi River into the Barataria or Breton Sound Basin (PMR-6) would result in rapid deterioration of the existing active delta including the Delta NWR and Pass a Loutre WMA due to a reduction in sediment input. Another delta would eventually form in the Barataria or Breton Sound Basin, depending on which basin is selected for the project, but it would take many years to develop. Diversion of the Mississippi River into the Breton Basin would also have to be assessed for its effect on seabird nesting colonies and seagrass beds in the Breton NWR.

3.3.10.7. Freshwater Diversion. Some of the freshwater diversions proposed for the Mermentau Basin could benefit refuges located there, especially the East Cove Unit of Cameron Prairie NWR.

3.3.10.8. Outfall Management. Only the Salvador WMA would be included in any proposed outfall management plan. The Davis Pond Diversion Outfall Management project (BA-10) would direct freshwater and sediment flows from the Davis Pond Freshwater Diversion into the Salvador WMA.

3.3.10.9. Marsh Creation with Dredged Material. Marsh creation with dredged material has been proposed for the Delta NWR (PMR-8). Material dredged from the Southwest Pass navigation channel would be deposited in a large area of subsided marsh north of Pass a Loutre. The Atchafalaya Delta WMA would benefit from the projects proposed to beneficially use dredged material in this area for wetland creation (XAT-6, 7, and 11C). Dredging for the specific purpose of creating marsh and plugging canals is an integral component of the Marsh Island project (TV-5/7) and would provide benefits to the Marsh Island SWR.

3.3.10.10. Barrier Island Restoration. No projects proposed for the Breton NWR, the only barrier islands that are publicly owned. Some of the islands in the Isles Dernieres chain are leased by the State of Louisiana to form the Terrebonne Barrier Islands Refuge complex. Several projects are proposed to restore these islands.

3.3.10.11. Shoreline Erosion Control with Structures. This type of project is proposed for many of the refuges, management areas, and also the Jean Lafitte National Park. It is especially appropriate to control erosion of shorelines, canal banks, or levees that protect large areas of marsh from saltwater intrusion.

3.3.10.12. Vegetative Plantings. Vegetative plantings alone and in combination with other types of projects could be successfully implemented on a number of publicly owned areas, wherever conditions are suitable.

3.3.10.13. Terracing. The only constructed terracing project is in the Sabine NWR. The soils found in the Chenier Plain are better suited to this type of project than the poorer soils of the Deltaic Plain. Terracing projects could be implemented on several NWR's and WMA's.

3.3.10.14. Sediment Trapping. Sediment trapping is proposed for the Pass a Loutre WMA (MR-2). Fencing would be erected in the shallow ponds between distributary channels perpendicular to current flows. Previously constructed pilot projects have been successful in establishing emergent vegetation. Sediment trapping could be implemented on other WMA's, NWR's, and SWR's where sediments are being transported, especially Delta NWR and Atchafalaya Delta WMA.

3.3.10.15. Herbivore Control. A herbivore control program, similar to that proposed for the CWPPRA, was implemented for a few years on the Jean Lafitte National Park. Trappers were paid a bonus for each nutria they trapped. The program has been discontinued due to lack of funds. The wetlands of the NWR's, WMA's, SWR's, and the Jean Lafitte State Park in the Deltaic Plain all have problems with high populations of nutria. If a herbivore program is implemented, an inventory of existing herbivore problem would probably be necessary to identify areas in most need of population reductions.

3.3.11. Property Ownership and Values.

3.3.11.1. Existing condition. Estimates show that approximately eighty percent of the State's coastal wetlands are privately owned, with the remaining areas owned and managed by local, State, and Federal agencies. This private property includes a large expanse of wetland which extends southward from the urbanized areas to the Gulf of Mexico. It has a relatively low market value as compared to the more urbanized areas, but it has been identified as valuable for its public purposes, primarily its use

as fish and wildlife habitat. In the past, resource conservation and protection programs have included private lands where public benefits and improvements have been identified. Many of the program benefits may be off-site and contribute to public interests; however, the right of public access to private lands included in such projects has not been a requirement for participation on behalf of cooperating landowners.

Act 451 of the 1990 Louisiana Legislature [R.S. 41:213.7(E)(1-2)] addresses the use of public funds for coastal restoration projects on private lands. The Act states in part that it:

> ... creates no rights in the public for use, access or any vested interest in privately owned lands or waters which are the subject of wetlands conservation projects, nor does the Act alter or modify historic Civil Code law concerning accretion, erosion, dereliction and subsidence.

A Louisiana Attorney General's opinion (92-472) states that, "The jurisprudence of our state, even in the absence of this new statutory language, supports the exclusion of the public at large from private lands and waters affected by the expenditure of public funds for authorized purposes unless a private landowner agrees otherwise with respect to such use".

Any easements or other real estate documents acquired by the Federal government for CWPPRA projects will not change the legal rights of the landowner to deny public access. Neither will CWPPRA projects be forced upon unwilling landowners. The LDNR has stated that it will not participate in projects that are opposed by affected landowners. The LDNR has made specific reference to the Act 6 of the 1989 Louisiana Legislature (R.S. 49:213.6) that prohibits the use of Coastal Wetlands Trust Fund money from being used to build coastal restoration projects on unwilling landowners' properties. The Trust Fund is used to cost share CWPPRA projects. The State has conceded that condemnation would be considered for circumstances where the title to property is unclear or where landowners cannot be located.

Unrelated to the issue of public access the CWPPRA states that:

> ... The Secretary (of the Army) shall not fund a coastal wetlands restoration project unless that project is subject to such terms and conditions as necessary to insure that wetlands restored, enhanced, or managed through that project will be administered for the long-term conservation of such lands and waters and dependent fish and wildlife populations.

This statement has been interpreted by the USACE to require lead Task Force agencies to obtain easements on any private lands where structures would be built or where a significant change in potential land use would occur. Easements would be

necessary to insure that projects remain functional throughout their expected lives. Depending on the type of project and its features, easements may be necessary for construction and maintenance of levees, channels, and structures, as well as for borrow and disposal of dredged material, and flowage of waters.

The issue of wetland and water bottom ownership in coastal Louisiana is very controversial and unsettled. The same Attorney General's opinion referenced earlier (92-472) contains some important information about lands created or restored by coastal restoration projects. The following discussion, excerpted from the opinion, is necessarily long so as not to leave out any important information. The opinion states that:

> First of all, it should be recognized that the waters, beds and bottoms of natural navigable waterbodies are public things owned by the state and subject to public use, such as the sea, the seashore, rivers, lakes and streams. The banks of navigable rivers or streams, however, are private things which are subject to a right of public use. The bank of a navigable river or stream is the land lying between the ordinary low and the ordinary high stage of water.
>
> Consequently, on navigable rivers and streams, public ownership rights extend only to ordinary low water, while the public right of use extends to the ordinary high water stage. Under well-settled Louisiana jurisprudence, the servitude of public use is not for the use of the public at large for all purposes, but merely for purposes that are incidental to the navigable character of the stream, which traditionally, has been limited to such purposes as landing on the shore, to fish, to shelter oneself, to moor ships, to dry nets and the like. Thus, private ownership of such riparian lands is burdened with the right of public use incidental to navigation purposes. The public at large does not have the right to hunt, to trap, to camp, to construct facilities, to erect pilings or other structures, or to conduct other activities on the banks of navigable rivers without permission of the riparian owner.
>
> As to lakes, bays, and arms of the sea, the state owns the beds and bottoms up to the ordinary high water mark of 1812, in contrast to rivers and streams, where the state owns only to the ordinary low water mark. Therefore, the shores of navigable lakes are public things to the high water mark and subject to public use.
>
> It should be noted, however, that since the time of state sovereignty, 1812, there have been enormous changes in the size, shape and configuration of land and water forms, land/water contacts and the characteristics and appearance of formerly natural navigable water bodies throughout the state. These changes have affected rivers and streams, as well as lakes, bays, and arms of the sea. Consequently, many land/water boundaries defining private/public

boundaries are now submerged and may be determined only by complex and technical analysis of land and water elevation data, including reference to current and historical tide gauge data. As a result of these changes, what appears as a river bank at the present time may be (have been) geographically located in the bed of a naturally navigable lake at the time of sovereignty and, thus, insusceptible of private ownership. Conversely, the banks of rivers and streams may have accreted substantially, extending private riparian ownership into a formally navigable bed.

In some areas, difficult factual and legal analysis will have to be undertaken to determine the relevant aspects of form, ownership and boundary in connection with proposed projects and otherwise. One potential problem area which may arise in connection with coastal restoration and vegetation projects is that of the rights to accretion, the ownership of which in Louisiana varies depending on the classification of a waterbody as either a navigable river or stream, or as a lake, bay, arm of the sea or seashore, as explained above.

Accretion formed as alluvion or dereliction on a navigable river or stream belongs to the owner of the bank, but subject to the right of public use as described above. However, accretion formed as alluvion or dereliction on the shore of the sea or lakes belongs to the state. Thus, should vegetation or restoration projects lead to the formation of alluvion, these historic rules of property law long followed by Louisiana courts will likely be deemed to apply in the event a controversy results in litigation.

It should also be mentioned that erosion on a navigable river, stream, lake or seashore belongs to the state. These rules of accretion and erosion apply even where the change is an indirect result of the artificial works of man. According to some decisions, the changes must be slow and imperceptible, as distinguished from sudden or instantaneous changes. Other cases lead to the conclusion that artificial works which result in rapid development of accretion may also result in application of the usual rules of property, as enunciated above.

Should accretion form as alluvion from a coastal restoration or vegetation project on a navigable river or stream, it would belong to the owner of the bank, subject to the right of public use defined by the Civil Code. Any accretion forming as alluvion or dereliction on lakes, bays, arms of the sea and the shore of the sea belongs to the state and is subject to public use up to the ordinary high water mark of 1812. Thus the public would have the right to use these areas, but go no further. Such accreted or exposed areas should not be regarded as points of entry or access to riparian lands in any regard.

Based on the above information, it is apparent that ownership of created and restored wetlands will depend on site-specific information and final determination may depend on legal proceedings.

Coastal wetlands can be used for various purposes. The traditional purposes include livestock grazing (especially cattle), fur trapping, alligator trapping, hunting, and fishing. More recent uses have been associated with oil, natural gas, and sulphur extraction. Pipeline, access canals, pumping and transfer facilities, roads, and other structures have been constructed throughout the coastal wetlands.

Property values are influenced by a wide variety of factors such as economic development potential, erosion rates, subsidence rates, urban amenities, access to transportation systems, proximity to recreational opportunities and scenic landscapes, and the level of flood protection. All other things being equal, the unit values of protected land tends to be higher than unprotected land. This is particularly significant in areas where a wide variety of interests compete for a limited amount of land. The potential for expansion of the urbanized areas in coastal Louisiana is limited by the surrounding wetlands.

3.3.11.2. No-action. Continued loss of wetlands would only increase the controversy over ownership of water bottoms and disappearing wetlands. Wetland-dependent uses would continue to decline as wetlands are lost. The value of properties susceptible to erosion, subsidence, and increased flooding would decline. Although scarcity of a resource increases its value, in this instance the offsetting loss of productive characteristics would be expected to predominate. In addition, as the harvest of fish and wildlife for commercial and recreational purposes declines, the value of properties associated with these activities would also decline.

3.3.11.3. All Action Alternatives. Easements for various project-induced changes to land values and uses would be obtained for projects prior to construction. The easements would be specific for each project type and for site-specific circumstances.

Property values, including the value of fish and wildlife habitat in restored wetland areas, could be maintained; or at least they would tend to decline at slower rates. Since a large percentage of the coastal wetlands are privately owned, it is quite possible that some conflict will arise between private property owners and the State of Louisiana regarding ownership of the newly created wetlands. The legal definition of navigable waterways must be addressed for individual cases to determine if blocking or restricting access through channels would unlawfully restrict public access through navigable channels into areas proposed for restoration or management.

3.3.11.4. Marsh Management. Easements would be obtained by the lead Task Force agency only on structure sites. Easements would not normally be obtained on the

areas under management. Future land uses would be expected to remain similar to existing conditions within specific management areas.

Marsh management projects implemented under the CWPPRA will be designed and operated to provide the widest range of benefits and to afford access by migratory estuarine species and by the public when the public has a legal right to access the area through navigable waters.

3.3.11.5. Hydrologic Restoration. Easements would be obtained only for structure sites. Land use would not be expected to change significantly. Projects could give landowners increased control over public access into the restoration area by reducing the numbers of access points.

3.3.11.6. Hydrologic Management of Impoundments. Depending on the existing condition and the ownership of the impoundment, easements may or may not be necessary for the entire impoundment. If the impoundment is privately owned, a flowage easement would probably be necessary for the entire impoundment. The two projects of this type that have already been approved through priority project lists are on public property, a National wildlife refuge, and therefore would not require easements.

3.3.11.7. Sediment Diversion. Large-scale sediment diversions would cause changes in land and water use of the outflow areas. New areas of land would be formed by the emerging deltas. Easements would be obtained on privately held areas that are predicted to be substantially effected. Access canals could be silted-in requiring frequent dredging to maintain access to oil and gas wells and other installations. Open water would be converted into land and there could be controversy regarding ownership of the newly created lands. A vivid illustration of the uncertainty over land and water ownership is the outflow area of the West Bay sediment diversion project from the First Priority Project List. During title searches to determine ownership of the outflow area it was determined that taxes are still being paid by private individuals and corporations on lands that had turned to open water decades ago. The State also claims ownership of these water bottoms but does not have the resources to determine where the property line lies between State water bottoms and private property.

3.3.11.8. Freshwater Diversion. In the case of diversions from the Mississippi River, easements would normally be obtained only for the structure site and outflow channel, not for the entire area influenced.

The USACE operates a number of control structures to control saltwater intrusion in the Mermentau Basin. These structures prevent intrusion of salt water into the wetlands as well as into waters used for irrigation for agriculture (primarily White Lake), especially rice farming, an activity of considerable economic importance in

southwest Louisiana. Because the Lakes Subbasin is virtually surrounded by natural ridges, highway embankments, and the above-mentioned structures, drainage from the area is a significant problem. The problem is exacerbated by the basin's hydrology. USACE records indicate that water levels within the subbasin exceeded gulf levels only 26 percent of the time for the period from 1987 to 1990. This small window of opportunity makes drainage from the subbasin very difficult. There are two consequences of this problem; high water levels in the Lakes Subbasin stress wetland vegetation and cause increased erosion, and inadequate freshwater input to the Chenier Subbasin permits saltwater intrusion.

3.3.11.9. Outfall Management. Access to oil and gas wells and other installations may be adversely affected by these projects. Provisions to allow access to active wells would probably have to be designed into projects. Easements would be obtained for any areas on private property substantially altered by CWPPRA projects. Outfall management projects may require flowage easements over the entire management area.

3.3.11.10. Marsh Creation with Dredged Material. Dredged material disposal easements would be obtained for areas of private property that would be substantially altered by the projects. Use of property could change considerably, with an increased possibility hunting, trapping, and grazing of livestock on newly created wetlands.

3.3.11.11. Barrier Island Restoration. Easements would be obtained to dispose of dredged material on private properties. Existing land uses would be preserved.

3.3.11.12. Shoreline Erosion Control with Structures. Easements would be obtained to place rock or other materials on private properties. Existing land uses would be preserved.

3.3.11.13. Vegetative Plantings. Easements would be obtained or agreement with the landowner would be signed to plant vegetation on private properties. Existing land uses would be preserved.

3.3.11.14. Terracing. Easements would be obtained to dredge and create terraces on private properties. Land use not expected to change significantly although more hunting and fishing opportunities may occur.

3.3.11.15. Sediment Trapping. Easements would be obtained to place structures on private properties. No change in land use would be expected.

3.3.11.16. Herbivore Control. No easements would be required. No change in land use would be expected.

3.3.12. Flood Protection.

3.3.12.1. Existing Conditions. Flooding problems in coastal Louisiana are caused by any combination of three factors: local rainfall, high river stages, and tidal flooding. Flooding from local rainfall is a problem restricted mainly to the developed metropolitan areas, especially New Orleans. Much of the city is below sea-level and is surrounded by a levee system that protects the developed areas not only from high water on the Mississippi River but also from normal, daily tidal levels. Large pumping stations, including the largest in the world, are used to remove local rainfall from the city and discharge into the lakes, swamps, and marshes surrounding the metropolitan area. Levee systems protect the more densely populated areas of the coast from river and tidal flooding, but many of the rural communities in the coastal area are not protected and rely on gravity drainage to remove excess rainfall.

There is widespread opinion among the general public and many professionals that coastal wetlands provide protection from storm surge and thereby lower stage increases experienced in communities inland from the coast. This seems logical based on gauge readings taken during hurricanes which in general show decreasing peak stages the farther distance from the gulf the gauges are located. The degree to which coastal wetlands can ameliorate tidal surge is probably dependent on the extent and configuration of the wetlands and the path and strength of particular storms.

3.3.12.2. No-action. Existing levee systems would be maintained and upgraded as needed to provide populated areas with protection from hurricane flooding. Additional hurricane protection levees would likely be constructed especially on the west bank of the Mississippi River in the vicinity of New Orleans and in Terrebonne and Plaquemines Parishes. Long-term effects of global sea level rise coupled with regional subsidence would make gravity drainage systems work less efficiently and would subject unprotected areas to greater chances of flooding.

3.3.12.3. All Action Alternatives. Coastal wetlands are assumed to provide a buffer against storm-generated tidal surges. All action alternatives have creation, protection, or restoration of coastal wetlands as a primary project purpose. The protection afforded from storm surge by individual projects (especially the smaller-scale projects) would be negligible, but cumulatively, all of the projects implemented by the CWPPRA would add to the tidal surge buffering capability of coastal wetlands.

3.3.12.4. Marsh Management. See All Action Alternatives (Section 3.3.12.3.). Also, Boumans and Day (1990) reported that the construction of canals and levees for marsh management or other purposes can cause water level amplification in adjacent areas. Levees can also hinder storm water runoff from within a watershed. Given that the vast majority of marsh management projects are protected with only low-level levees or natural ridges, it is not anticipated that these projects would contribute to flooding of higher, developed areas. In unusual situations, such as when marsh

management areas are surrounded by levees that are higher than enclosed or adjacent developed areas, there could be a potential for flooding problems.

3.3.12.5. Hydrologic Restoration. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.5. Hydrologic Management of Impoundments. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.6. Sediment Diversion. Diversions would be constructed so as not to directly affect existing flood protection systems. Large-scale sediment diversions proposed for the Breton and Barataria Basins have the potential to increase the risk of flooding in unprotected communities of these basins. The higher up in the basin the diversions would be located, the higher the risk of potential flooding. This is due to the average stage increases expected in outfall areas. Diversions in lower parts of these basins or within the active deltas of the Mississippi and Atchafalaya Rivers would have much less potential to increase flooding because of the diversion's proximity to the gulf. Also see All Action Alternatives (Section 3.3.12.3.).

3.3.12.7. Freshwater Diversion. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.8. Outfall Management. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.9. Marsh Creation with Dredged Material. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.10. Barrier Island Restoration. Barrier islands can provide some hurricane flood protection benefits by providing a hydrologic barrier to storm surge associated with these tropical weather systems. The degree of protection has not been determined for the barrier islands of Louisiana, but public opinion, especially in the Terrebonne and Barataria Basins, is that the barrier islands provide critical flood protection.

3.3.12.11. Shoreline Erosion Control with Structures. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.12. Vegetative Plantings. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.13. Terracing. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.14. Sediment Trapping. See All Action Alternatives (Section 3.3.12.3.).

3.3.12.15. Herbivore Control. See All Action Alternatives (Section 3.3.12.3.).

3.3.13. Navigation and Other Forms of Transportation.

3.3.13.1. Existing Conditions. New Orleans, the largest metropolitan city in the coastal area, is located at the gateway to the entire Mississippi Valley. It marks the approximate center of the nation's largest deep-draft port complex. The three major deep-draft navigation channels within the coastal area are the Mississippi River which serves New Orleans and Baton Rouge, the Calcasieu River which serves Lake Charles, and the Mississippi River Gulf Outlet (MRGO) which also serves New Orleans.

The Mississippi River navigation channel provides a 45-foot channel from the gulf to a point between New Orleans and Donaldsonville, Louisiana at mile 181 above Head-of-Passes, and a 40-foot channel from this point through the Port of Baton Rouge (mile 236 above Head-of-Passes). The entire channel up to Baton Rouge is authorized to 55-feet, with designs for deepening to 45-feet between Donaldsonville and Baton Rouge being finalized. The Mississippi River from Baton Rouge to below New Orleans is easily the area of highest traffic density in the U.S. In 1990, this deep-draft channel handled 169 million tons of foreign traffic, more than two and one-half times the next closest channel or waterway. Grain exports represent the largest tonnages on the Mississippi River, accounting for nearly half of the U.S. total.

The Calcasieu River navigation channel provides for a 40-foot channel from the gulf to Lake Charles, a distance of approximately 34 miles. In 1990, Lake Charles ranked 11th for U.S. ports in foreign traffic (24 million tons). Crude oil imports dominate deep-draft traffic at Lake Charles accounting for 70 percent of total foreign traffic.

The MRGO provides New Orleans with a second deep-draft channel. This 36-foot channel handled 5.6 million deep-draft tons in 1990. The majority of the port's container facilities are located along the MRGO and the MRGO accounts for approximately 90 percent of all New Orleans container traffic.

There are numerous channels serving shallow-draft traffic in the coastal area representing hundreds of miles of navigable waterways. The most significant waterway, other than the Mississippi River, is the Gulf Intracoastal Waterway (GIWW). The GIWW, west of the Mississippi River, handled 68 million tons in 1990. The principle commodities are refined petroleum products, chemicals, and crude oil. Somewhat unique to the coastal area are the nine shallow to medium-draft coastal ports and channels which primarily serve the offshore oil industry and, to a lesser extent, the commercial fishing fleet. These facilities, while not necessarily producing impressive annual tonnage statistics, move numerous high-value cargoes to and from drilling and production platforms in the Gulf of Mexico. The timely delivery of these cargoes is vital to the petroleum industry.

Vessel wakes cause extensive erosion and loss of marsh and swamp along the banks of many Federally-maintained navigation channels in Louisiana. These channels have also contributed to loss of coastal wetlands by allowing salt water and tidal action to intrude farther into the fresher habitats. Some of the most notable examples of navigation channels with erosion problems are the Mississippi River Gulf Outlet, the Houma Navigation Canal, Freshwater Bayou, the Gulf Intracoastal Waterway, and the Calcasieu Ship Channel.

Pipelines are the primary carriers of petroleum products imported, produced, and refined in the coastal zone. Over 14,000 miles of onshore and 2,000 miles of offshore pipelines are located in the area. Also located in this vulnerable region is the Louisiana Offshore Oil Port, Inc., which began operations in 1981. This 700 million dollar offloading facility supplies 15 percent of the country's imported oil, moved from ships unloaded at a floating terminal 18 miles south of Grand Isle, through pipelines, to storage caverns in the Clovelly salt dome. Oil is then transferred from the salt caverns to a system of seven pipelines serving refineries along the Gulf Coast and in the Midwest. Other terminals in the area contribute another 15 percent to the supplies of imported crude oil, for a State total of about 30 percent of U.S. imports.

Other transportation facilities in the project area include main-line railroads, Federal interstate highways, and numerous other U.S., state, and local highways, an extensive oil and gas pipeline network, and commercial airports. The Southern Pacific, Illinois Central, and Amtrak lines traverse much of the area, and service is further extended via spur lines along the alluvial ridges as far south as the Gulf Intracoastal Waterway and along the Mississippi River below New Orleans. The primary east-west highway routes are Interstates 10 and 12, and U.S. Highways 90 and 190. Major north-south routes include Interstates 49, 55, and 59, and U.S. Highways 51, 61, and 165.

3.3.13.2. No-action. Unchecked subsidence and erosion of the coastal wetlands would increase the cost of maintaining channels, railroads, roadways, and other public facilities. Most of the maintained channels in coastal Louisiana were either cut through land or follow natural waterways instead of traversing open bays and lakes. These routes were chosen to avoid the high siltation rates that occur in channels going through shallow open water areas from movement of bay bottom sediments into the channels. As the marsh, swamp, and higher banks of these channels continue to subside and erode forming open water bodies, increased maintenance dredging of channels is likely to be necessary. Also, as wetlands erode and subside, the cost of maintaining Federal, State, and local highways will increase.

3.3.13.3. Marsh Management. Structures and levees built for management purposes restrict the shallow-draft boat traffic that could otherwise pass through unobstructed bayous and canals. While small boats can pass over structures used for passive management during average to high tidal conditions, structures used for active marsh management usually preclude boat traffic except that boat bays are normally

provided in areas of high boat traffic. The dredged material embankments typically associated with navigation canals quite frequently serve as ready-made boundaries for delineating candidate management areas. In many cases the embankments are in good enough repair to be used as they exist, thereby cutting costs.

3.3.13.4. Hydrologic Restoration. These type projects would have the potential to restrict navigation usage of waterways leading into the managed areas. Normally, boat bays are included in the design of structures across the larger channels to allow small boat access; however, passage of larger vessels could be impeded.

3.3.13.5. Hydrologic Management of Impoundments. No effect on navigation would occur due to the existing isolation of impoundments from the tidal system.

3.3.13.6. Sediment Diversion. The smaller sediment diversions in the active deltas of the Mississippi and Atchafalaya Rivers would not individually remove enough water and sediment to adversely affect navigation in the river channels. Shallow-draft navigation in outfall areas could be adversely affected if active oil or gas wells requiring maintenance are present. The larger sediment diversions, such as the West Bay Diversion from the First Priority Project List, have the potential to significantly affect deep-draft navigation in the major river channels. As originally proposed, the West Bay Diversion would involve dredging a deep cut in the bank of the Mississippi River below the terminus of the mainline levee system. Subsequent studies have shown that soil conditions in the area present a possibility of the diversion cut enlarging during flood events. Enlargement of the diversion cut could result in a disproportionate amount of water removed from the river. The ability of the river channel to move sediments downstream would be diminished because of the reduced flow. Sediments would accumulate faster than normal at the major deposition points at Head of Passes and in Southwest Pass, the navigation channel. A worst-case scenario would be the temporary inability of dredges to maintain project depth in the navigation channel during a high water event, which could seriously impact deep-draft navigation using the Mississippi River. During high river stages, sedimentation is very rapid and dredging is difficult because of high flow velocity.

Additional sediment diversions are proposed as long-term critical or supporting projects for the Barataria, Breton Sound, and Mississippi River Delta Basins. The critical project for the Mississippi River Delta Basin involves rerouting the majority of the river's flow into the shallow waters to the Breton Sound or Barataria Basins. Extensive studies would be necessary before this proposal could be implemented.

3.3.13.7. Freshwater Diversion. The two concerns, applicable to diversions from the Mississippi and Atchafalaya Rivers, would be siltation in channels located in the receiving areas from river-borne sediments and also increased sediment deposition in the rivers from which diversion occurs. Freshwater diversions normally take a disproportionate share of the water to sediment ratio and therefore could cause

sediments that would otherwise be carried along with the river current to settle at the bottom of the navigation channel. Freshwater diversions from the Lake Subbasin of the Mermentau Basin into other areas should not have a significant effect on navigation.

3.3.13.8. Outfall Management. These type projects, in their attempt to cause fresh water to flow through shallow, open water areas and across deteriorated marshes, normally require the closure or restriction of waterways, especially oil and gas access canals and pipeline canals and therefore could restrict small boat traffic. Projects would have to be designed to accommodate access to active wells and other oil and gas installations.

3.3.13.9. Marsh Creation with Dredged Material. This type of project would normally not impact navigation in dredged channels. Marsh creation is usually proposed for shallow open water or deteriorated marsh where only very shallow draft vessels can pass. Less commonly, marsh creation is proposed for abandoned oil well access canals and pipeline canals. Although many of these canals are located on private property, they are commonly used by fishermen and other commercial and recreational users for transiting through coastal wetlands. In some cases, created marsh could create a hinderance to small commercial and recreational vessels that normally use these canals.

3.3.13.10. Barrier Island Restoration. Possible interference with navigation during construction from long pipelines used to transport dredged material. No long-term effect on navigation.

3.3.13.11. Shoreline Erosion Control with Structures. The banks of most navigation channels in Louisiana are eroding and causing damage to marsh and swamp. The most effective, widely accepted method to stabilize the banks of these channels is to armor them with rock or other hard material. Several projects to protect these eroding banks have been proposed. Concern has been expressed by navigation interests that rock dikes can pose a navigation hazard if the land behind the dike erodes or otherwise is lost. If that were to occur the dike would be situated in what appears to be an open bay. If the dike is not maintained and it subsides, it could present an underwater hazard to navigation.

3.3.13.12. Vegetative Plantings. No effect on navigation.

3.3.13.13. Terracing. No effect on navigation.

3.3.13.14. Sediment Trapping. No effect on navigation.

3.3.13.15. Herbivore Control. No effect on navigation.

3.3.14. Recreation Opportunities.

3.3.14.1. Existing Conditions. The extensive vegetated wetlands, water bodies, and beaches of Louisiana's coastal area are ideally suited for outdoor recreational activities. The biological wealth and productivity of these natural resources support many species of native plants and animals, and provide for a variety of consumptive and non-consumptive recreational pursuits.

Major recreational activities occurring in the coastal areas include sport fishing (the most popular); waterfowl, big game, and small game hunting; recreational shrimping, crabbing, and crawfishing; boating; swimming; sailing; picnicking; camping; water-skiing; and observing wildlife.

There are limiting factors on the potential recreational use of these abundant resources. These limiting factors include private land ownership, lack of public access, competition with commercial activities such as commercial fishing and shrimping, and mineral exploration and extraction. The ever-increasing loss of the wetland resource itself is also a factor limiting potential recreational use.

Privately owned, and some public, boat launching facilities are found throughout the coastal area. Generally, these facilities are located along the developed ridges of land that extend into the marshes or along coastal highways. Jean Lafitte National Historical Park and Preserve, and Bayou Segnette and Grand Isle State Parks are heavily used public recreation areas located within the coastal wetlands. Additionally, numerous National wildlife refuges, and State wildlife refuges and management areas are located within the study area.

Freshwater fish species sought after by anglers include largemouth bass, crappie, blue catfish, channel catfish, bluegill sunfish, and redear sunfish. A large and steadily growing number of anglers fish for largemouth bass in the low salinity marshes where productivity rates are high and large numbers of bass are found. Inshore and near-shore saltwater anglers' preferred species include spotted seatrout, red drum, southern flounder, black drum, sheepshead, Atlantic croaker, and sand seatrout. Crabs, shrimp, and crawfish are also a significant part of the recreational fishery. Waterfowl hunting is very popular activity in the coastal wetlands. Reduced bag limits and below average fall flights of popular duck species in recent years has somewhat depressed participation in the sport. Goose hunting is a very popular sport, especially in the western part of the coast. Big and small game animal species, such as white-tailed deer, swamp rabbits, and gray and red squirrels, are pursued as well, but to a much lesser degree.

Numerous marsh camps, serving as seasonal or weekend bases of operation, are used by many local and out-of-state recreationists as a starting point for various outdoor activities. Many of these camps, which are only accessible by boat, serve as

clubhouses for the coastal area's numerous fishing and hunting clubs. Other camps are privately owned and used almost exclusively for family oriented recreation. Several thousand such camps are located in the coastal area.

The primary users of the recreation resources of the study area are residents of southeastern Louisiana. Current estimates indicate that several million user-days of recreational activity occur in the coastal parishes annually. A study completed in 1984 for the Louisiana State University Center for Wetland Resources (Bertrand, 1984) estimates the 180,000 licensed saltwater sports fishermen in the State annually spend $181 million on fishing and have nearly a billion dollars invested in boats, gear, camps, and other equipment. The study estimates the total annual economic impact of fishing related expenditures at over half a billion dollars. A later analysis, produced by the Sport Fishing Institute, put the total economic impact at nearly $900 million for the year 1985 (Sport Fishing Institute, 1988). In recent years, the economic importance of this recreational group has come to play in the increasing competition between commercial and recreational fishermen. A prime example is the case of red drum, a species with both sport and commercial value. A ban on commercial harvest was implemented in the late 1980's and remains in effect although retention of red drum by recreational fishermen is allowed. Commercial quotas have been implemented on other economically important species.

Louisiana is located at the southern end of the Mississippi Flyway, a major waterfowl migratory route. Nearly 70 percent of the ducks and geese that use the flyway overwinter in Louisiana's marshes. The economic value of the hunting provided by the flyway exceeds $10 million annually. Waterfowl hunting, when combined with recreational fishing supported by Louisiana's wetlands exceeds 3 million annual user days.

Beach-related activities are limited in coastal Louisiana because of the lack of hard, sandy beaches. Grand Isle, Elmer's Island, and Fourchon Beach in southeast Louisiana and the Hackberry Beach to Constance Beach area of southwest Louisiana are the only gulf beaches in Louisiana accessible by vehicle. While these beaches may not be as aesthetically pleasing as the white sand beaches of other gulf coast states, they are nevertheless enjoyed by thousands of Louisiana residents. Beaches and barrier islands accessible only by boat are also very popular recreation areas especially for fishing.

3.3.14.2. No-action. The recreational potential of the coastal wetlands and barrier islands is in many ways directly proportional to the quantity of wetlands available. The potential for recreational use will therefore diminish as the wetlands are lost. This is certainly true of game species which are directly dependent upon the vegetated wetlands for their entire life cycles. Somewhat less distinct is the relationship between fishery resources and the wetlands. Even though many thousands of acres of coastal wetlands have been lost, recreational fishery harvest for

most species remains high. This is at least partly due to the vast new areas of shallow estuarine waters that have developed as a result of marsh loss and tremendous quantities of organic plant material that has entered the estuarine system. The problem here is that eventually, a point will be reached where organic input will diminish and the remaining fragmented marshes will no longer be capable of supporting the quantities of estuarine species we have become accustomed to harvesting. As the resources decline, controversy and conflict over allocation of the limited resources would increase.

3.3.14.3. Marsh Management. The possibility that public access for recreational purposes into managed areas could be restricted and controlled by landowner or surface lease holders could become a public resource usage issue. It has been a concern in past marsh management activities. The basis for the concern is that waters subject to Federal jurisdiction (tidal waters and wetlands) are often encompassed within areas brought under management. Decisions regarding this issue will likely be reflected in the language of easements that are acquired for CWPPRA projects as well as conditions incorporated into any necessary Federal permits.

Data from a closely monitored active marsh management project suggest that after several years of management the fishery within the managed area shifts towards a species assemblage more tolerant of freshwater. No such comparable data is available for a passively managed area. How much of a shift can be induced through active management at this one site remains to be determined. Overall, recreationists would likely respond to any such shifts by fishing for different species.

The water control structures of managed areas, especially actively managed areas, have proven to be popular and predictably successful sites for fishing. The structures are typically easily accessible sites at which estuarine organisms can be caught in great quantities as they exit the managed area or feed upon organisms exiting the managed area. Recreational harvest around water control structures is likely to continue or possibly expand if more areas are brought under management.

We have acknowledged in Section 3.3.5.3. that marsh management can make an area more attractive to waterfowl. Increased opportunities for waterfowl harvest would therefore likely be expected. In addition, stabilized water levels during hunting seasons provide reliable access by boat, thereby facilitating recreational hunting activities.

3.3.14.4. Hydrologic Restoration. This action would restore natural water flow patterns to the degree practicable and therefore foster natural productivity. Access for recreational use of the restored area could possibly be reduced by construction of plugs and structures. Projects are expected to reduce tidal flows into the restored areas creating a more favorable condition for growth of submerged aquatic

vegetation. Submerged aquatic vegetation would attract more waterfowl and increase the potential for hunting opportunities.

3.3.14.5. Hydrologic Management of Impoundments. These projects would offer increased recreational usage due to optimization of water levels within restored areas for fish and wildlife resources.

3.3.14.6. Sediment Diversion. Significant displacement and redistribution of recreational activities would occur from major sediment diversions. Probably the greatest perceived adverse impact by recreational fishermen would be the changes that would occur to their favorite fishing spots. Saltwater fishing would be displaced away from the sources of sediment diversion and would be at least partially replaced by a freshwater fishery. Long-term fishery production would be increased by the addition of new wetlands and preservation of existing wetlands with sediment input. Waterfowl are expected to be attracted to the deltas formed by these diversions to feed upon the desirable plant species that colonize these areas. Terrestrial game animals would colonize the newly formed deltas, providing hunting opportunities.

3.3.14.7. Freshwater Diversion. Affects would be similar to sediment diversion except that relatively little new land would be formed and displacement of fisheries would not be as great.

3.3.14.8. Outfall Management. This action would increase the natural productivity of the outfall area through sediment and nutrient input. Recreational access of the managed area may be somewhat reduced by construction of plugs in the major canals leading into the managed areas.

3.3.14.9. Marsh Creation with Dredged Material. This action would create wetlands that will proportionately increase the recreation potential for both aquatic and terrestrial habitats. Short-term adverse effects to recreational fishing opportunities in the immediate vicinity of dredging operations could occur from increased turbidity levels and construction activities.

3.3.14.10. Barrier Island Restoration. Barrier islands have a high rate of utilization for recreational activities, especially bird watching, camping, and fishing. Another popular form of recreation that these islands provide is spearing flounders at night by walking in the clear, shallow waters around these islands. The barrier islands also protect the estuarine ecosystems in the bays behind the islands and protect the fishermen in the bays from large gulf waves. Overall, barrier islands provide substantial direct and indirect benefits to recreational users and restoration of deteriorating islands would preserve and enhance recreational use. Short-term disruption of some recreational activities may occur during construction of projects.

3.3.14.11. Shoreline Erosion Control with Structures. Projects would preserve the wetland habitat that recreationally important species depend upon for their life functions. Adverse short-term, construction-related impacts could occur from construction activities and increased turbidity levels.

3.3.14.12. Vegetative Plantings. Projects would preserve the wetland habitat that recreationally important species depend upon for their life functions. There would be negligible adverse impacts expected from planting activities.

3.3.14.13. Terracing. This type of project would potentially increase harvestable wildlife and fishery resources by providing nesting areas for bird species and marsh edges critical to early life stages of fish species. Projects also would provide shallow, protected waters suitable for establishment of submerged aquatic vegetation which would attract waterfowl and thereby increase hunting opportunities.

3.3.14.14. Sediment Trapping. Restoration and expansion of wetlands in eroded and subsided areas would provide quality habitat for wildlife species. Developed wetlands would provide important marsh edge for survival and growth of fishery species.

3.3.14.15. Herbivore Control. Prevention of intense grazing would allow better nesting and foraging conditions for desirable wildlife. Protection of wetlands from overgrazing would maintain the recreational uses of the resource.

3.3.15. Cultural Resources Including National Register Sites.

3.3.15.1. Existing Conditions. The coastal wetlands are known to contain numerous historic and prehistoric archeological sites. These sites span the human occupation sequence of the State and represent Louisiana's long cultural heritage. Over three hundred archeological sites are known for the Breton Sound Basin alone.

The prehistoric sites in the area are predominantly Indian shell middens situated along the natural levees of rivers and bayous and the surrounding shorelines of the numerous coastal lakes. Archeological evidence indicates that these prehistoric Indians gathered both freshwater and brackish water shellfish available in the nearby waters. These sites were habitation areas as well as camp sites for shellfish processing.

Historic sites in the coastal zone tend to be located along the natural levees of bayous used as transportation routes. Types of historic sites include domestic buildings, boat landings, hunting and fishing camps, shipwrecks, military fortifications and so forth. Many of these properties have been determined eligible to or listed on the National

Register of Historic Places that was established in 1966 by the National Historic Preservation Act, as amended (NHPA).

The NHPA was enacted to ensure that the country's historic resources would be considered in any Federal project and Federally assisted or permitted projects. Section 106 of this act states that all Federal agencies "take into account" how their proposed actions would affect any historic or archeological property. A Federal undertaking includes a wide variety of actions such as construction activities, rehabilitation and repair projects, permits, and demolition to name a few. Federal agencies are required to consider alternatives to avoid, mitigate, or minimize adverse impacts on historic properties (any prehistoric or historic district, site, building, structure, or object eligible for inclusion in the National Register). The Federal agency involved in the proposed project is responsible for initiating and completing the Section 106 review process. The Federal agency confers with the State Historic Preservation Officer (an official appointed in each state to administer the National Historic Preservation Program) and the National Advisory Council on Historic Preservation (Advisory Council).

There are five basic steps in the Section 106 review process. These are:
1. Identify and Evaluate Properties;
2. Assess Effects;
3. Consultation;
4. Council Comment; and
5. Proceed

Step 1 Identify and Evaluate Properties. The lead Federal agency is responsible for reviewing all available documents, maps, and cultural resource databases to determine the level of cultural resource survey coverage as well as the presence or absence of prehistoric and/or historic resources in a project area. If survey coverage is non-existent or additional information is needed, the Federal agency may conduct additional work. All cultural resources located in a project area are then evaluated for significance using National Register of Historic Places criteria. The Federal agency and the State Historic Preservation Officer (SHPO) decide whether the properties are eligible for listing to the National Register.

Step 2 Assess Effects. Following identification and evaluation of cultural resources, the Federal agency is responsible for determining the effect of its proposed action/activity on significant cultural resources. This determination of effect is made in consultation with the SHPO.

There are three possible determinations:

a. No effect. This determination is made when the agency's proposed action will have no effect on cultural resources in the project area. The agency notifies the SHPO. If the SHPO does not object, the project may proceed.

b. No adverse effect. In this case there could be an effect to a cultural resource, but the effect is not harmful. The agency obtains SHPO concurrence and submits to the Advisory Council a determination of no adverse effect. The project may proceed.

c. Adverse effect. This is when it has been determined that the proposed action could have a harmful effect on a cultural resource. The agency is required to begin the consultation process.

Step 3. Consultation. The purpose of consultation is to find acceptable ways to reduce the harm to a cultural resource so the project may proceed. This may involve such measures as avoiding the cultural resource or mitigating the adverse effect. The Federal agency and the SHPO are the consulting parties. The Advisory Council determines their own level of involvement in this step. When the consulting parties agree upon steps to avoid or mitigate harm, they sign a Memorandum of Agreement (MOA). If an agreement cannot be reached, the Federal agency may submit documentation to the Advisory Council for comments.

Step 4. Council Comment. After consultation, the Federal agency submits the signed MOA to the Advisory Council for review. The Advisory Council has the option to sign the MOA, request changes, or chose to issue written comments on the proposed activity. If an agreement was not reached in consultation by the SHPO and the agency, the Advisory Council will submit written comments to the agency regarding the proposed action.

Step 5 Proceed. If agreement was reached and a MOA was signed then the agency can proceed with the project. If an MOA was not signed then the Federal agency must take into account the Advisory Council's written comments.

3.3.15.2. No-action. Land surfaces in the coastal zone would continue to erode and in some instances could cause loss of cultural resources. Many of these fragile archeological sites in the wetlands may be adversely impacted by destructive natural forces such as subsidence and erosion. Other destructive forces attributed to man such as wave action from passing vessels and construction activities would also continue to destroy cultural resources in these areas.

3.3.15.3. All Action Alternatives. The various proposed actions may or may not have an adverse impact on cultural resources. Each proposed action must be examined on a project by project basis. Cultural resources evaluations are made on site specific as well as project specific information and plans. Maps indicating the location of cultural resources and cultural resources survey coverage are checked against the location of the proposed wetlands restoration projects. Cultural resources investigations conducted for some of the projects on the First and Second Priority Project Lists have identified the location of archeological and historical sites. A cultural resources evaluation of each of the proposed wetlands restoration projects

will need to be conducted as soon as plans and specifications are known and well in advance of actual construction to avoid project delays. In some cases project designs could destroy, damage, or obscure archeological sites by construction activities. These cultural resource investigations will identify any significant cultural resources which may be at risk and allow time for project designs changes to avoid adverse impacts. The site specific nature of these resources demand this type of action. In some instances the proposed action may actually help to preserve and protect cultural resources. Coastal lands are eroding rapidly and the protection of these lands by the various CWPPRA projects may protect sites in the long run by stopping or slowing down land erosion.

Three major types of actions predominate these proposed erosion measures. These are: 1). sediment diversion or re-deposition, 2). dredging of some type, and 3). building of structures. Sediment diversion may or may not have a adverse impact on historical and archaeological sites. Increased sediment flow may cause a direct impact on any site in the immediate area, while in some cases it could provide sediment around an area acting as a buffer to further erosion. Depositing sediment on top of a known site can change the environment in which a the site has survived. This may or may not be an adverse impact. An assessment will need to be on a case by case basis. Dredging a waterway could impact any prehistoric or historic shipwrecks in the area. Submerged cultural resources surveys are conducted in areas with a high probability of containing shipwrecks. Construction of erosion devices such as weirs or dikes, or the building or removal of canal banks can adversely impact any prehistoric or historic site in the immediate impact area. In all cases these actions need to be examined on a project by project basis.

Each year, projects will be selected for implementation through priority project lists. The CWPPRA Task Force recognizes their responsibility regarding cultural resources management and the Section 106 process. This process can be very lengthy and complicated. The Natural/Cultural Resources Section of the U.S. Army Corps of Engineers, New Orleans District has been coordinating with the State Historic Preservation Office regarding cultural resources investigations associated with CWPPRA projects and Section 106 requirements. As a result of this year-long coordination, the CWPPRA Task Force has entered into a agreement with the State Historic Preservation Office which establishes procedures to follow in meeting cultural resource compliance. A copy of the signed agreement is provided as Appendix A to this EIS.

3.3.15.4. Marsh Management. Dredging and filling and building of structures has a moderate potential to affect cultural sites. Also see Section 3.3.15.3.

3.3.15.5. Hydrologic Restoration. Effects similar to marsh management.

3.3.15.6. Hydrologic Management of Impoundments. Effects similar to marsh management.

3.3.15.6. Sediment Diversion. Dredging and filling and building of structures has a moderate potential to affect cultural sites. Effect of sediment deposition would have to be determined for each site.

3.3.15.7. Freshwater Diversion. Effects similar to marsh management.

3.3.15.8. Outfall Management. Effects similar to marsh management.

3.3.15.9. Marsh Creation with Dredged Material. Effects similar to marsh management.

3.3.15.10. Barrier Island Restoration. Effects similar to marsh management.

3.3.15.11. Shoreline Erosion Control with Structures. Effects similar to marsh management.

3.3.15.12. Vegetative Plantings. Negligible effects to cultural sites expected.

3.3.15.13. Terracing. Effects similar to marsh management.

3.3.15.14. Sediment Trapping. Little potential for impacts to cultural sites.

3.3.15.15. Herbivore Control. No effects to cultural sites.

3.3.16. Socioeconomic Items.

3.3.16.1. LAND USE.

3.3.16.1.1. Existing Conditions. The majority of the land within the 20-parish project area is wetland, and is subject to heavy rainfall, spring flooding, and periodic hurricanes. These conditions, along with continued land loss from erosion, subsidence, sea level rise, and other factors, have tended to limit many types of development. In contrast, the soil conditions, mild climate, water resources, and abundant natural resources of the Gulf Coast have attracted economic development such as agriculture, commercial fisheries, and petroleum related activities. This has led to population growth and consequent demands for housing, streets, roads, bridges, institutions, and all of the various land use requirements normally associated with the growth of communities and metropolitan areas. The unique drainage conditions of the area have required construction of an extensive network of levees

and pumps to protect development. Table 4 displays estimated land use and land type by parish for the project area as of 1980. In view of the continued and ongoing loss of wetlands, the table is not intended to reflect the current wetland acreage, but the general land use conditions in the coastal region. In 1980, the State of Louisiana estimated that more than 4.8 million acres, or about 57 percent, of almost 8.5 million acres of the land in the project area were wetland. Almost 1.4 million acres, or about 65 percent, of the land area now considered the New Orleans Metropolitan Statistical Area (MSA) was wetland and 85 percent of the Houma MSA was classified as wetland. While the total land area of the Lake Charles MSA was estimated to be only 16 percent wetland, Cameron Parish, immediately south of Lake Charles was estimated to be 80 percent wetland.

Residents have depended upon the barrier islands along the Louisiana shoreline, the coastal wetlands, and an extensive network of levees and pumps for protection against the frequent threat of storm damage. The natural levees and cheniers and, to a lesser extent, reclaimed wetlands adjacent to the elevated ridges are intensely developed for either agricultural or urban purposes. Based on the 1980 estimate, about 5.5 percent was developed for residential, transportation, industrial, and other urban purposes. About 22.5 percent was agricultural land and 13.9 percent was forest land not including forested wetlands.

Table 5 shows the estimated number of wetland acres lost between 1932 and 1990 in the basins considered in this study. Valuing the lost acreage is difficult; considerable controversy exists as to the per acre value of wetlands. Estimates have been published that compute the value based on various wetland functions. The published figures range from a capitalized value of $9 per acre for the wave barrier function to $6480 per acre (1984 dollars) for archeological or historic use (Anderson and Rockel, 1991). It is more difficult to determine the marginal value of wetland acreage lost since not enough is known about the effects that these large losses imply for productivity, i.e., it is unknown if the lost acres were either more or less productive than those currently in existence.

Given that these limitations in knowledge exist, it is possible to arrive at a rough approximation of the value of lost acreage by capitalizing the forecasted future earnings per acre of wetlands currently in existence. In 1992, the Corps undertook an analysis of the earning power of wetlands as recreational, real estate, and commercial fish and wildlife resources for its unpublished Land Loss and Marsh Creation Study. If we capitalize the value of the 900,000 acres lost for all basins using the earning power per acre computed in that study, approximately $400, and the current Federal discount rate, the lost acreage would be valued at nearly $4 billion. As part of an on-going CWPPRA effort, an input-output analysis will be undertaken in an attempt to quantify wetland functions and account for the flow of goods and services which are dependent on them. For example, the impact of the purchases that a commercial

TABLE 4
1980 ESTIMATES OF LAND USE IN THE LOUISIANA COASTAL AREA

PARISH/MSA[1/]	TOTAL LAND AREA	RESIDENTIAL LAND	COMMERCIAL & SERVICE LAND	INDUS-TRIAL LAND	TRANS., COMM., & REL. SRVS.	MIXED URB. & BLT-UP LAND	AGRICULT. LAND	FOREST LAND	STRIP MINES & QUARRIES	TRANSI-TIONAL AREA	WETLANDS & BEACHES
Baton Rouge MSA[1/]											
ASCENSION	187,689	13,204	1,359	3,413	2,149	62	73,961	40,586	232	772	51,351
LIVINGSTON	417,151	27,042	1,328	185	2,054	77	43,474	289,818	1,019	2,116	70,038
Houma MSA	1,504,729	24,030	5,127	2,362	1,869	3,398	175,904	1,730	15	1,313	1,288,981
LAFOURCHE	705,377	12,787	2,054	571	834	1,004	121,573	1,622	15	488	564,469
TERREBONNE	799,352	11,243	3,073	1,791	1,035	2,394	54,331	108	-	865	724,512
Lafayette MSA[1/]											
ST. MARTIN	486,370	11,567	571	1,467	1,421	201	125,001	74,578	-	1,900	269,664
Lake Charles MSA	691,077	29,621	4,649	10,224	4,448	1,421	315,948	208,043	216	6,733	109,774
CALCASIEU	691,077	29,621	4,649	10,224	4,448	1,421	315,948	208,043[2/]	216	6,733	109,774
New Orleans MSA	2,131,081	124,817	25,544	25,374	23,844	13,049	202,453	307,223	5,790	24,032	1,378,955
JEFFERSON	204,522	30,579	7,475	6,116	4,355	4,602	2,456	124	154[3/]	1,220	147,441
ORLEANS	115,719	26,702	8,942	2,517	4,602	4,386	664	7,722	108	1,405	58,671
PLAQUEMINES	502,788	7,768	2,008	4,510	3,691	1,313	19,012	13,853	1,745[3/]	5,591	443,297
ST. BERNARD	282,096	6,502	1,127	1,637	31	46	1,915	7,923	170	5,622	257,123
ST. CHARLES	176,444	4,849	1,127	4,386	1,405	865	20,865	571	77	1,869	140,430
ST. JAMES	151,472	5,035	402	3,382	1,189	61	52,601	1,560	77	541	86,624
ST. JOHN BAPTIST	141,031	5,220	571	2,363	2,224	278	23,505	726	46	664	105,434
ST. TAMMANY	557,009	38,162	3,892	463	6,347	1,498	81,435	274,744[2/]	3,413	7,120	139,935
Non-MSA Parishes											
ASSUMPTION	218,745	5,143	463	649	587	155	74,299	2,069	-	124	135,256
CAMERON	799,786	2,069	386	5,529	293	201	139,581	2,873	1,112[3/]	880	646,862
IBERIA	375,238	11,367	2,363	1,498	865	463	121,110	15,691	201	93	221,587
ST. MARY	399,098	7,104	1,189	2,425	1,761	4,093	96,693	1,745	-	278	283,810
TANGIPAHOA	508,732	25,729	3,351	942	5,791	479	158,778	231,425[2/]	4,695	2,486	75,056
VERMILION	738,272	12,479	1,050	973	432	170	377,862	21,899	46	479	322,882
TOTAL STUDY AREA	8,457,968	294,172	47,380	55,041	46,114	23,769	1,905,064	1,177,680	13,326	41,206	4,854,216

1/ MSA- Metropolitan Statistical Area. Baton Rouge MSA also includes East and West Baton Rouge Parishes. Lafayette MSA also includes Acadia, Lafayette, and St. Landry Parishes.
2/ Includes Shrub and Brush Rangeland: Calcasieu, 5,884 acres; St. Tammany, 2,826 acres; and Tangipahoa, 170 acres.
3/ Includes Sandy Areas other than Beaches: Cameron, 1,112 acres; Jefferson, 154 acres; and Plaquemines, 618 acres.
SOURCE: State of Louisiana, Department of Transportation and Development; and Louisiana Office of State Planning. Preliminary and unpublished.

fisherman makes on boats, bait, ice, etc., can be traced throughout the economy using this type of analysis.

3.3.16.1.2. No-action. If no action is taken there will be continued loss of land along coastal Louisiana, including the shoreline and in areas further inland as well. As shown in Table 5, the forecast is for over 700,000 acres to be lost by the year 2040. Valuing these acres in the same manner as above yields a value of approximately $3 billion for these wetlands. As shown in the table, the loss varies from basin to basin. Only one basin actually gains acreage over the period. The total land area lost, 3.2 million acres, represents 38.2% of the total land area as shown in Table 4.

TABLE 5
HISTORIC AND PROJECTED WETLAND LOSSES

Basin	Historic Acres Lost[2/] 1932-1990	Without Project Forecast of Acres Lost[2/] 1990-2010	1990-2040	Value of Acreage Lost[1/] (in Thousands $) 1990-2010	1990-2040
PONTCHARTRAIN	67,000	58,000	132,000	261,000	594,000
BRETON SOUND	45,000	13,000	33,000	59,000	149,000
MISS. RIVER DELTA	113,000	21,000	54,000	95,000	243,000
BARATARIA	198,000	76,000	175,000	342,000	788,000
TERREBONNE	202,000	88,000	220,000	396,000	990,000
ATCHAFALAYA	8,000	(7,000)	(19,000)	(32,000)	(86,000)
TECHE/VERMILION	42,000	15,000	37,000	68,000	167,000
MERMENTAU	104,000	40,000	99,000	180,000	446,000
CALCASIEU/SABINE	122,000	22,000	55,000	99,000	248,000
TOTAL	901,000	326,000	786,000	1,467,000	3,537,000
Average per Basin	100,000	36,000	87,000	163,000	393,000

1/ Value of marsh acres taken from Land Loss and Marsh Creation Feasibility Study, USACE, New Orleans District, Unpublished.
2/ Data from USACE GIS database,1993.

Direct and indirect economic impacts of wetland losses may further reduce the development potential of nearby non-wet areas. For instance, reduced employment following wetland loss makes surrounding areas less attractive not only for residential development, but also for retail businesses, since potential customer bases would be eroding over time (see section on Business and Industry). The increased incidence of flooding from the loss of protective marshes would also make the nearby non-wet areas less attractive for residential, commercial, and industrial development.

3.3.16.1.3. Future With CWPPRA Projects. If projects are implemented that reduce the current level of land loss, the nature of existing land use may be maintained, or at least sustained for longer periods of time as the pattern of subsidence, erosion, and

effects of periodic storm damages continues. It is estimated that 65% of the forecasted wetlands losses can be prevented by implementation of the projects, reducing the expected losses discussed above by $2 billion.

3.3.16.2. BUSINESS AND INDUSTRY.

3.3.16.2.1 Existing Conditions. As stated in the prior section, the soil conditions, mild climate, water resources, and abundant natural resources of the Gulf Coast have attracted various types of economic development. These resources support diverse activities that are economically important to the State of Louisiana and the Nation. Historically, agriculture, commercial fisheries, and petroleum-related activities have played a major part in the economy and development of the area. From large-scale plantation-based agricultural enterprises to small-scale fishing and trapping operations, the early settlers took advantage of coastal Louisiana's natural resources and location. Indigo and sugar cane, followed by cotton and rice, were the primary crops cultivated. Timber export occurred as well. Later activities expanded to include greater development and exploitation of the transportation assets inherent in the Mississippi River and the access it provided to domestic and foreign markets. To this base, modern development has added service, manufacturing, and resource sectors featuring major ports, oil and gas exploration and refining, chemical and petro-chemical production, ship and oil rig construction, tourism, and commercial and recreational fishing. Economic stimulus is provided to the region by several industries directly dependent on wetlands. The jobs and income created by these businesses provide economic benefits to the area, including taxes to support infrastructure, and thus increase the well-being and quality of life for residents. Commercial and recreational fishing are discussed in more detail in separate sections of the EIS.

The most significant commercial center within the project area is New Orleans, well known for its port activities and tourism; however, smaller commercial centers including Houma, Lake Charles, and Morgan City have developed along other alluvial ridges. The latest (1987) Census of Manufactures, Wholesale Trade, Retail Trade, and Census of Service Industries indicated that the number of establishments, sales, receipts, employment, and/or value added by manufacture in the project area varied from 45 to 58 percent of the State total. Further inland, in the more protected areas, tourism, manufacturing, retail and wholesale trade, and the various services normally required by large urban centers are found.

Louisiana is also a primary producer of energy resources. The State provides about 15 percent of the Nation's crude petroleum and over 20 percent of its natural gas supplies. The combined value of these two products averaged $16 billion annually for the period 1986-1991. Nearly 90 percent of this output is extracted from the coastal area and adjacent offshore waters. Abundant supplies of crude petroleum

and natural gas, fresh process water, and nearby water transportation account for the concentration of refining and petrochemical manufacturing facilities located in the project area, primarily along the Mississippi and Calcasieu Rivers. These industries, which rank Louisiana as the Nation's third largest chemical producer, ship commodities valued at nearly $50 billion to domestic markets annually. There were over 90,000 refining and refining-related jobs in the State during 1992. While the economic growth generated by development and expansion of energy related industries along the coastal zone has not continued during the 1980's, the area remains an important source of domestic production and industrial processing.

Tourism has also played a significant role in the regional and local economies. Ecotourism, especially swamp and bayou tours, is a new industry which capitalizes on Louisiana's abundant natural resources. According to Louisiana tourism officials, the expenditures, payroll, and tax receipts in the 20-parish project area were estimated at $4.1 billion in 1991. The tourism industry produces approximately 61,000 jobs, and visitors to New Orleans alone number 11-12 million persons annually.

3.3.16.2.2. No-action. Figure 2 of the Executive Summary presents an estimate of where the coastline of Louisiana may be in 50 years. Included within the area which would be lost according to the figure are numerous businesses and industries which would be impacted directly. Indirect impacts to business and industry would include the effects of wind and water damage to inland metropolitan areas currently protected by coastal wetlands. Areas directly impacted by land loss would include a large portion of the wetlands east of Atchafalaya Bay, essentially undeveloped and with limited industrial and commercial use, but in close proximity to the metropolitan areas of Houma and New Orleans. Portions of the Lafayette and Lake Charles metropolitan areas and other cities and towns west of Atchafalaya Bay would also be indirectly affected by wetland loss. By 2040 some 19 towns and villages with a combined population in 1990 of 23,000 people could require relocation.

Businesses and industries directly impacted (displaced) would include commercial seafood and fur dealers; light manufacturing and processing facilities; retail, wholesale, and service facilities; construction companies; port operations; trucking companies; and various enterprises supporting oil and gas production. If the coastal economy recovers from the downturn experienced during the 1980's, additional growth would probably occur in areas that are either directly or indirectly at risk, requiring additional relocations of businesses and industries which may either expand or establish between 1990 and 2040.

While all of the businesses and industries in the project area may not anticipate continued growth to the year 2040, they no doubt anticipate at least enough return on their investment to meet their opportunity costs. In addition to the difficulties in accurately measuring flood damage frequency rates under dramatically changing

environmental conditions, a wide variety of factors make a precise quantification of impacts to business and industry (and population and socio-economic growth) highly speculative. These factors include fluctuating prices due to improvements in technology, the availability (or lack of availability) of natural resources worldwide, international market structures, and changing political policies, just to mention a few.

Commercial fisheries and wildlife operations, ecotourism, and related business activity dependent on the wetlands could become increasingly unstable as resources are depleted. In addition, economic activity related to mineral and energy production could continue to decline as more economically recoverable resources are found elsewhere and alternative sources of energy are developed. As drainage conditions also change and areas become more vulnerable to flooding, the cost of commercial activities in flood prone areas may increase, forcing marginally productive operations to relocate or close.

3.3.16.2.3. Future With CWPPRA Projects. Projects that reduce the rate of land loss which has been occurring over the past several decades, or that build new wetlands, would assist businesses and industries operating in coastal Louisiana in maintaining current levels of activity. This would be due in part to the prevention of increased costs associated with operating businesses in a deteriorating and more flood-prone environment.

3.3.16.3. COMMERCIAL FISHING AND TRAPPING.

3.3.16.3.1. Existing Conditions. The wetlands within the study area represent a natural resource of immense regional and National economic value. Louisiana's tidal marshes make up approximately 64 percent of the total along the Gulf of Mexico (U.S. portion) and nearly 40 percent of the coastal marshes in the continental United States. As shown in Table 6, Louisiana, on average, accounted for 20 percent of U.S. commercial fisheries landings for the period 1984-1991. The fishing ports in Louisiana include four of the country's ten largest. The State ranked second only to Alaska in total pounds landed and third to Alaska and Massachusetts in the value of total landings.

One of the difficulties in accurately measuring the significance of the commercial fishing industry has been its comparatively fragmented structure, in part due to the number of people who supplement their primary source of income as part-time fishermen, and whose sales are not always included in the NMFS statistics. Important species include shrimp, oyster, blue crab, and menhaden. Combined, these four species account for 98 percent of the annual catch value. The USACE, New Orleans District's 1984 study, Louisiana Coastal Area, Louisiana, estimated commercial fisheries influenced by Louisiana wetlands. It included both estimates by NMFS and estimates of unreported harvests of blue crab, shrimp, and oysters. Based

on this evaluation, correction factors were applied to the preliminary NMFS estimates of the commercial harvests influenced by Louisiana wetlands. Table 7, on the following page, shows an updated estimate of the amount of marine fisheries which may be influenced by Louisiana's coastal wetlands. When adjusted for unreported landings, the value approaches one billion dollars.

TABLE 6
U.S. AND LOUISIANA COMMERCIAL LANDINGS
1984 - 1991
(Thousand Pounds)

YEAR	LOUISIANA	U.S.	% OF U.S.
1984	1,931,027	6,437,783	30
1985	1,704,498	6,257,642	27
1986	1,699,321	6,030,634	28
1987	1,803,944	6,895,726	26
1988	1,356,466	7,192,553	19
1989	1,227,941	8,463,080	15
1990	1,061,228	9,403,571	11
1991	1,192,539	9,484,194	13
TOTAL	11,976,964	60,165,183	20

Source: U.S. Department of Commerce, National Marine Fisheries Service, 1984-1991.

As discussed in one of the industry's major trade journals (National Fisherman Magazine, April 1991), professionals in the field indicate that the productivity of marine fisheries are significantly dependent on the quality and quantity of marine fishery habitat and that in some cases this habitat has been declining at an alarming rate. Dr. James Chambers of the NMFS indicates that degradation and habitat loss are contributing to fishery declines which, unlike overfishing, could "...lead to permanent population effects." In the same article, Dr. R.E. Turner of Louisiana State University indicates that the:

> "... productivity of the Gulf shrimp fishery is directly proportional to the total area of intertidal marsh habitat.... We haven't really seen a decline in catch yet, because there's been a tremendous increase in effort with several times more fishermen and larger and more efficient boats."

Although a decline in shrimp harvest has not been observed in Louisiana, a decline in total commercial landings in Louisiana has occurred. As seen in Table 6, Louisiana landings have dropped from 1.9 million pounds in 1984 to 1.2 million in 1991, while U.S. landings have increased from 6.4 million to 9.4 million pounds.

In addition to the problems associated with declining production, overfishing, and the adverse impacts of deteriorating estuaries, the Gulf commercial fishing industry

TABLE 7
ESTUARINE-DEPENDENT COMMERCIAL FISHERIES HARVEST AND VALUES GULF OF MEXICO AND LOUISIANA COASTAL AREA

Species	1983-1990 Average Landings Per Year[1/] (pounds)	Correction Factors for Unreported Landings[2/]	Average Corrected Landing (pounds)	1992 Normalized Price[3/] $	1992 Gross Exvessel Value[4/] $
Blue Crab	61,740,498	2.00	123,480,996	0.58	71,618,978
Shrimp	247,554,500	2.00	495,109,000	2.17	1,074,386,530
Oyster	21,614,731	1.90	41,067,989	2.61	107,187,451
Menhaden	1,739,444,500	1.00	1,739,444,500	0.05	86,972,225
Croaker	307,383	1.00	307,383	0.58	178,282
Black Drum	7,032,894	1.00	7,032,894	0.44	3,094,473
Red Drum	3,500,956	1.00	3,500,956	1.15	4,026,099
Catfish	5,754,891	1.00	5,754,891	0.60	3,452,935
Flounder	1,473,552	1.00	1,473,552	1.04	1,532,494
King Whiting	669,077	1.00	669,077	0.37	247,558
Mullet	25,011,536	1.00	25,011,536	0.41	10,254,730
Sea Crab	135,484	1.00	135,484	0.21	28,452
Sea Trout Spotted	2,704,407	1.00	2,704,407	1.16	3,137,112
Sea Trout White	516,460	1.00	516,460	0.54	278,888
Sheepshead	3,514,347	1.00	3,514,347	0.23	808,300
Spot	272,907	1.00	272,907	0.29	79,143
Finfish	6,773,194	1.00	6,773,194	0.23	1,557,835
Total Gulf of Mexico	2,128,021,317		2,456,769,573		1,368,841,485
LA Coastal Area[5/]	1,361,933,643		1,572,332,527		876,058,551

[1/] Published and unpublished data for the years 1983–1990 were provided by the U.S. Department of Commerce, National Marine Fisheries Service.

[2/] The Correction Factors are based on information provided by the LA Dept. of Wildlife and Fisheries.

[3/] The 1992 Normalized Prices are calculated by applying the 1992 CPI for food to the exvessel value of 1983–1990 catches.

[4/] The Gross Exvessel Value is based on 1992 normalized prices and the 1983–1990 average corrected landing.

[5/] Gulf of Mexico landings allocated to the LA Coastal Area are based on the relative abundance of estuarine marsh habitat.

has experienced the effects of growing competition from Alaska and imports from developing countries. Seafood harvests in Alaska increased from about 1.0 billion pounds in 1980 to more than 5.5 billion pounds in 1988. Increases in imports have also impacted the industry. Shrimp imports, for example, have increased from 319.6 million pounds (heads-off) in 1982 to 632.8 million pounds in 1991 (NMFS, 1992). About 70 percent of the Nation's shrimp landings have been at Gulf ports (not including unreported landings).

Other major species influenced by the productivity of the wetlands include oysters, blue crab, mullet, black and red drum, sea catfish, trout, flounder, and a variety of other finfish. According to a 1991 study prepared for the Louisiana Seafood Promotion and Marketing Board, oyster production in Louisiana ranges from nine to thirteen million pounds annually, with a dockside value of more than $30 million. This represents 25 to 40 percent of the U.S. total.

Approximately 80 percent of the annual oyster production in Louisiana is harvested from more than 300,000 acres of oyster reefs under commercial lease from the state to private operators. The amount of waterbottoms and oyster reefs leased to private operators has increased from 110,000 acres in 1970 to 230,000 acres in 1980, to more than 300,000 acres in 1989. Despite the increase in acres used in production, output has remained largely stable since the early 1970's, indicating a decrease in productivity per acre (Keithly, 1991). Increased prices for oysters during this time period are partially due to a significant decline in oyster production along the East Coast, especially in Chesapeake Bay.

Production of blue crab in Louisiana has increased from an annual harvest averaging 15 million pounds during the early 1970's to over 50 million pounds in the late 1980's. This harvest represents as much as 25 percent of the domestic supply in some years. A similar increase has also occurred in the value of blue crab. The availability and variety of seafood have been important to the regional economy, particularly the New Orleans restaurant and tourism industry.

The increasing popularity of recreational sport fishing has had a negative impact on commercial fishing. Competition and hostility has arisen between the recreational and commercial fishermen concerning the allocation of resources. The current commercial ban on redfish is a prime example. Overfishing by commercial and recreational fishermen in the Gulf of Mexico resulted in a ban on all harvest of red drum from Federal waters since 1986. Commercial fishing of the species in State waters is prohibited as well. While commercial fishermen are prohibited from harvesting red drum in State waters, recreational fishermen can harvest 5 red drum per day. Commercial fishermen have repeatedly voiced their resentment toward recreational fishermen at public hearings, resulting in heated confrontations between the two groups. In the fishing communities across coastal Louisiana little else can cause as much controversy as the subjects of limited entry, fishing bans,

moratoriums, license limitation, and individual quotas. Despite the intense conflict that has arisen in the fishing industry, the fishing resources still support a wide range of related businesses such as processors and canners, shippers, wholesale and retail operations, restaurants, boat building and repair yards, net and gear builders, icehouses, and commercial marinas. According to a recent study, the commercial fishing industry in Louisiana creates 90,000 jobs and has a economic impact of $1.5 billion (Keithly, 1991).

Although much less important in terms of their economic significance, furbearers and alligators are also commercially harvested for pelts, hides, and meats. After years of closed seasons, alligator hunting is now legal, and production has increased. Louisiana produces more wild furs and hides than any other State in the U.S., valued at nearly $20 million annually. This represents 40 percent of the production in the U.S. From 1972 to 1992 the annual harvest of alligator skins increased from 1,350 to an estimated 24,036. The value of an average skin has increased from approximately $55 in 1972 to more than $405 in 1991. The total commercial value of the alligator harvest (including meat and skins) has increased from about $75,500 to more than $13.5 million (LDWF, unpublished data).

While the harvest and value of alligators have increased, the harvest of furbearers has declined. During the 1945-46 season, for example, an estimated 8.3 million muskrat pelts were taken in Louisiana. During the period 1978-1991 an average of 256,692 muskrat pelts were taken per year, significantly less than the 1945 season. Table 8 displays the average takes and value of commercial wildlife for the period 1978-1991. As reported by the LDWF, a variety of factors have caused the sharp decline in demand for fur; among them a doubling of worldwide production of ranch mink, several mild winters, market saturation, shifts to alternative products, general economic conditions, and other factors such as the animal rights movement. The decline in demand for furbearers has become an increasing concern not only to the fur industry but landowners who have experienced adverse effects from the overpopulation of certain furbearers. The overpopulation of nutria caused significant damage to rice and sugarcane crops during the 1950's and 1960's. Recently, the overpopulation of muskrat and nutria has been identified as an additional cause of damage to marsh vegetation and subsequent wetland loss (Cochran, 1991).

3.3.16.3.2. No-action. The traditional pattern of commercial fishing and trapping is likely to change as the productivity of the wetlands decline. Increasing government regulations and restrictions combined with a declining resource base could make it difficult for fishermen and trappers to continue to earn a living from these traditional occupations. As the fishing resources decline, controversy and conflict over allocating the limited resources will increase. Declines in commercially harvested wildlife would be expected from the loss of nearly 800,000 acres of coastal wetlands that would occur without intervention.

TABLE 7
COMMERCIAL WILDLIFE TAKES & VALUE
1992 NORMALIZED PRICE[1/]

Type	# of Pelts	Normalized Price to Trapper[1/] $	Average Gross Value $
Furbearer Pelts[2/]			
Nutria	804,392	5.15	4,142,620
Muskrat	256,692	3.54	908,690
Raccoon	158,851	11.08	1,760,070
Mink	31,805	13.99	444,950
Opossum	25,046	1.45	36,320
Otter	5,037	24.37	122,750
Skunk	154	1.73	270
Red Fox	861	30.50	26,260
Gray Fox	2,441	29.62	72,300
Bobcat	2,208	57.55	127,070
Beaver	1,258	6.13	7,710
Coyote	1,269	11.65	14,780
TOTAL Pelts	1,290,017		7,663,790
	Pounds	Price/Foot	
Furbearer Meats[2/]			
Nutria	472,843	0.067	31,680
Raccoon	642,949	0.594	381,910
Opossum	28,931	0.326	9,430
TOTAL Meat	1,144,723		423,020
TOTAL Furbearer Pelts & Meats			8,086,810
	# of Hides	Price/Foot	
Alligator[2/]			
Alligator Hides	22,298	41.67	6,643,480
Alligator Meat	213,700	11.48	2,453,280
TOTAL Hides & Meats			9,096,760
TOTAL Commercial Harvest (Furbearers & Alligators)			17,183,570

[1/] The 1992 Normalized prices as calculated by NOD using historical data and the Producer Price Index for "Hides, skins, leather, and related products" (code 04) for the period 1978 through March 1992 (1982 = 100). Sources of price index: U.S. Dept. of Labor, Bureau of Labor Statistics, unpublished reports furnished by Office of Prices and Living Conditions; "Summary Data from the Producer Index News Release" April 1992; and "Producer Price Indexes" June 1992.

[2/] Based on the estimated takes of furbearers for seasons 1978–79 through 1990–91 and the harvests of wild alligators 1984 through 1991, from unpublished data reported by the Louisiana Department of Wildlife and Fisheries.

Declines in commercial fishing and trapping would cause a reverse in the positive impacts that the industry currently has on the local and national economies. Spending by consumers on commercial fishing and trapping goods produces personal income for both commercial fisherman and trappers as well as workers in related industries. Losses of income from a reduced level of sales of commercial and trapping products, as with any other types of goods, would result in direct and indirect negative impacts on the economy.

Direct, or first-round impacts, are those which result from purchases of a particular product by the consumer. Indirect, or second-round impacts, are those which result when beneficiaries of first round payments spend their earnings. The secondary impacts could be widely disbursed geographically. Equipment and supplies are often obtained from producers far beyond wetland areas, and sales of the catch take place throughout the country. Consequently, if wetland losses occur as anticipated, jobs and income could be negatively impacted far from the local economy in which the original catch and sales take place.

3.3.16.3.3. Future With CWPPRA Projects. Commercial fishing and wildlife industries would benefit to the extent that restoration projects reduce wetland deterioration. As discussed under sections dealing with transportation impacts and displacement impacts, individual fishermen may suffer negative impacts as certain areas of oyster leases and shrimp grounds move seaward from freshwater and sediment diversions. Some fishermen may have to travel further or relocate their base of operation, while others will be positively impacted by decreased travel time.

Some restoration projects have the potential to reduce migratory, estuarine-dependent species' access and use of marshes. Marsh management projects probably have the greatest potential to reduce fisheries access, followed to a lesser degree by hydrologic restoration and outfall management. All projects implemented under the CWPPRA will maximize overall benefits to wetlands, including dependent fish and wildlife resources. Projects that would eliminate fisheries access would, in all likelihood, not be implemented. Even though these types of projects may reduce fisheries access and hence may reduce production of estuarine fisheries resources from managed areas, the projects are expected to maintain and possibly increase vegetative cover and habitat quality within the project boundaries. The projects are therefore expected to provide habitat usable by commercially important species over the long-term, compared to the deteriorating conditions that would continue to occur without such projects.

3.3.16.4. POPULATION AND EMPLOYMENT.

3.3.16.4.1. Existing Conditions. Although important for their natural resources, the wetland areas remain largely unpopulated. The population centers are

predominantly within areas which are protected from hurricanes. Table 9 summarizes the population trends in the 20-parish study area during the past three decades. As shown in the table, the total population in the area increased only 0.8 percent to 2,103,243 between 1980 and 1990. The total population of Louisiana showed an increase of only 0.3 percent during the same period. Although the total population of the study area slightly increased, the population in some parishes decreased dramatically. For example, in Orleans parish the population dropped 16 percent from 1970 to 1990. The parishes of Jefferson, Plaquemines, St. James, and St. Mary experienced population losses from 1980 to 1990. Ascension and Livingston Parishes, which are part of the Baton Rouge MSA, were less affected by the softening of the economy in southeast Louisiana and enjoyed population increases of 16.3 percent and 19.9 percent, respectively. St. Tammany Parish, which is included in the New Orleans MSA, showed an increase of 30.3 percent during the 1980's. This growth is due to a shift in population from the more urban environment of Orleans and Jefferson parishes; St. Tammany parish is more rural, and has a reputation for good public schools, less crime, and affordable housing. Single-family residential construction dominates the growth which has occurred in this parish.

Although the unemployment rate in the 20-parish area has improved considerably since the trough of the mid-1980's, it continues to remain comparatively high. As of January 1993, the labor force in the area totaled 908,300, with an unemployment rate of 8.6 percent. The U.S. unemployment rate is currently about 7 percent. Although the port and related activities have remained a significant part of the local economy, employment opportunities in these segments declined somewhat. Total employment in the service industries, including tourism and convention trade, has increased in recent years. Commercial fishing is an important source of secondary employment and income for a large segment of the area work force. Keithly and Liebzeit (1987) report that the total number of full-time commercial fishermen in Louisiana increased from about 9,379 in 1960 to 15,039 in 1980. Table 10 provides a recent estimate of the total number of jobs in the study area covered under the Louisiana Employment Security Law and the general classifications of employment. The data presented in the table are based on total wages paid and reflect the majority of employment in the 20-parish area.

TABLE 9
TOTAL POPULATION FOR METROPOLITAN STATISTICAL AREAS (MSA) AND PARISHES IN THE PROJECT AREA

	1960	1970	1980	1990
Baton Rouge MSA[1/]				
Ascension	27,927	37,086	50,068	58,214
Livingston	26,974	36,511	58,806	70,526
Houma MSA				
Lafourche	55,381	68,941	82,483	85,860
Terrebonne	60,771	76,049	94,393	96,982
MSA total	116,152	144,990	176,876	182,842
Lafayette MSA[2/]				
St. Martin	29,063	32,453	40,214	44,097
Lake Charles MSA				
Calcasieu	145,475	145,415	167,223	168,134
New Orleans MSA				
Jefferson	208,679	338,229	454,592	448,306
Orleans	627,525	593,471	557,927	496,938
Plaquemines	22,545	25,225	26,049	25,575
St. Bernard	32,186	51,185	64,097	66,631
St. Charles	21,219	29,550	37,259	43,437
St. James	18,369	19,733	21,495	20,879
St. John	18,439	23,813	31,924	39,996
St. Tammany	38,643	63,585	110,869	144,508
MSA total	987,605	1,144,791	1,304,212	1,286,270
Non-MSA Parishes				
Assumption	17,991	19,654	22,084	22,753
Cameron	6,909	8,194	9,336	9,260
Iberia	51,657	57,397	63,752	68,297
St. Mary	48,833	60,752	64,253	58,086
Tangipahoa	59,434	65,875	80,698	85,709
Vermilion	38,855	43,071	48,458	50,055
TOTAL PROJECT AREA	1,556,965	1,796,189	2,085,980	2,103,243

1/ The current Baton Rouge MSA also includes East and West Baton Rouge Parishes.
2/ The current Lafayette MSA also includes Acadia, Lafayette, and St. Landry Parishes.

Source: U.S. Department of Commerce, Bureau of the Census.

TABLE 10
EMPLOYMENT BY INDUSTRIAL GROUPS IN THE TWENTY PARISH PROJECT AREA

INDUSTRIAL GROUPS	PERSONS EMPLOYED	PERCENT OF TOTAL
AGRICULTURE	6,336	0.8
MINING	28,493	3.5
CONSTRUCTION	50,517	6.2
MANUFACTURING	91,797	11.3
TRANSPORTATION	71,952	8.9
WHOLESALE TRADE	45,698	5.6
RETAIL TRADE	156,853	19.3
FINANCE	38,893	4.8
SERVICES	284,498	35.0
PUBLIC ADMINISTRATION	37,499	4.6
TOTAL	812,566	100.0

Source: Louisiana Department of Labor, Employment and Total Wages Paid by Employees Subject to Louisiana Employment Security Law, Third Quarter 1992.

3.3.16.4.2. No-action. While the high unemployment rate caused by the decline of the oil and gas industry is not expected to continue indefinitely, employment and population growth related to the oil and gas industry are not expected to soon return to their pre-recession levels. Recent data show that the population in the coastal region, as well as in other areas in the State and Nation, has grown more slowly than originally projected. As an example, the Bureau of Economic Analysis (BEA) Regional Projections to 2040, published in October 1990, estimates that the population in the New Orleans MSA will reach 1.24 million by the year 2000. This is a downward revision from the 1985 OBERS projection of 1.41 million. Tables 11 and 12 show the BEA population and employment projections in the project area for the period 2000 to 2040. The study area as a whole is projected to increase only one percent between 1990 and 2040. On the parish level, the BEA projects several of the parishes will decline in population by the year 2040 as compared to the 1990 population. Since the BEA estimates do not take into account a decline in economic activity related to loss of wetlands, the projected population and employment in the Louisiana coastal zone are not likely to increase as much as projected. Employment and population associated with the harvesting and processing of commercial fish and wildlife and recreational resources could decline as the wetlands which support these industries decline. As much as 23,000 people currently living in coastal Louisiana could be displaced due to relocation requirements resulting from wetland loss over the next 50 years. Also, as environmental conditions change, an additional number of residents may decide to move further inland to avoid the effects of periodic storms.

TABLE 11
PROJECTED POPULATION BY PARISH

Parish	2000	2010	2020	2040
Ascension	57,700	57,500	58,100	57,100
Assumption	22,200	22,000	22,200	21,800
Calcasieu	166,300	165,900	168,000	165,900
Cameron	9,200	9,300	9,500	9,400
Iberia	68,200	68,100	68,900	67,700
Jefferson	454,700	460,000	469,500	467,000
Lafourche	87,400	88,600	90,600	90,000
Livingston	70,700	70,800	71,900	71,100
Orleans	486,100	478,400	481,100	473,200
Plaquemines	24,600	24,300	24,500	24,100
St. Bernard	67,800	68,800	70,300	70,000
St. Charles	43,200	43,700	44,700	44,300
St. James	20,500	20,400	20,600	20,200
St. John	41,100	42,000	43,100	43,000
St. Mary	55,700	54,100	54,000	52,600
St. Martin	45,500	46,600	47,800	47,500
St. Tammany	150,400	156,300	161,800	162,400
Tangipahoa	86,600	87,800	89,700	89,000
Terrebonne	98,900	100,500	102,800	102,200
Vermilion	49,000	48,300	48,500	47,500
Total Study Area	2,105,800	2,113,400	2,147,600	2,125,900
Total Louisiana	4,224,300	4,241,400	4,313,000	4,270,000

Source: U.S. Department of Commerce, Bureau of Economic Analysis, BEA Regional Projections to 2040.

TABLE 12
PROJECTED EMPLOYMENT BY PARISH

Parish	2000	2010	2020	2040
Ascension	25,000	25,400	24,400	22,800
Assumption	5,900	5,900	5,600	5,200
Calcasieu	76,200	76,500	73,200	68,300
Cameron	5,100	5,100	4,800	4,500
Iberia	29,000	28,900	27,500	25,500
Jefferson	236,200	241,300	233,100	219,500
Lafourche	31,400	31,800	30,600	28,700
Livingston	15,000	15,400	14,900	14,000
Orleans	332,100	327,300	310,100	287,800
Plaquemines	18,400	17,800	16,800	15,400
St. Bernard	19,400	19,800	19,100	18,000
St. Charles	19,500	19,700	18,900	17,600
St. James	7,800	7,700	7,300	6,700
St. John	13,000	13,400	13,000	12,200
St. Mary	28,800	28,100	26,400	24,300
St. Martin	15,200	15,900	15,500	14,700
St. Tammany	50,700	53,300	52,300	49,700
Tangipahoa	31,600	31,800	30,500	28,400
Terrebonne	43,700	44,100	42,400	39,700
Vermilion	17,400	17,000	16,000	14,700
Total Project Area	1,021,400	1,026,200	982,400	917,700
EPR-Project Area[1/]	49%	49%	46%	43%
Total Louisiana	2,033,400	2,045,000	1,960,200	1,832,200
EPR-Louisiana[1/]	48%	48%	45%	43%

[1/] EPR = Employment Participation Rate (Total Employment divided by Total Population)
Source: U.S. Department of Commerce, Bureau of Economic Analysis, BEA Regional Projections to 2040.

3.3.16.4.3. Future With CWPPRA Projects. The implementation of wetland protection and restoration projects would have a positive impact on economic developments which are dependent on or related to wetlands. The projects would have a stabilizing effect on employment and associated population elements. Employment on project construction of otherwise unemployed or under-employed labor would also be realized.

3.3.16.5. PERSONAL INCOME.

3.3.16.5.1. Existing Conditions. In 1990, per capita personal income in the project area was $15,610, somewhat higher than per capita personal income for the State, which was $14,530. As in other areas of the State and Nation, incomes have generally been higher in the metropolitan areas than in non-metro and rural areas. An important source of income and employment, particularly in more rural communities, has been commercial and recreational fishing, along with the sales and service sectors which support these industries.

3.3.16.5.2. No-action. The BEA projects that per capita personal income in the study area will increase from $12,470 in the year 2000 to $14,820 by 2020, and $17,400 by 2040 (1982 price levels). Per capita personal income for the State is projected to increase from $12,142 in 2000 to $14,346 by 2020, and $16,948 by 2040, again at 1982 price levels. Although the BEA data projects the per capita income of the study area to exceed the State average, the data does not account for decreases in fish and wildlife resources associated with wetland losses. The prospects of income opportunities may decline in the rural areas experiencing continued depletion of natural resources.

3.3.16.5.3. Future With CWPPRA Projects. To the extent that proposed plans can help to maintain resources and activities otherwise depleted due to wetland losses, projects could help to maintain personal incomes and social well-being of the area. Since many of the economic conditions of the area are unrelated to changes in wetland resources, a quantitative analysis of exactly how any particular project feature or combination of features is likely to impact personal income is problematic.

3.3.16.6. INFRASTRUCTURE, TAX REVENUES, AND PUBLIC FACILITIES AND SERVICES.

3.3.16.6.1. Existing Conditions. The unique drainage conditions of the area have required construction of an elaborate network of levees and pumps to protect the infrastructure in the coastal area. Tax revenues collected in the project area provide funds needed to construct and maintain flood protection systems, as well as to fund

roads, bridges, fire and police protection, port facilities, and other necessary public facilities and services.

The area's tax base is dependent on economic activity which includes oil and gas production, commercial and recreational fishing, and tourism. Smaller communities tend to be unincorporated, and are supported by various State, regional, or parish revenue authorities. The four largest sources of revenue for the State -- the sales tax, the individual income tax, the general severance tax, and the gasoline tax -- provide 75 percent of total State revenues. The study area provided $535 million in State sales tax revenues in fiscal year 1993. The State also depends on severance tax revenues generated by mineral production. The study area provided $297 million of severance tax revenues in Fiscal Year 1993, representing 67 percent of total statewide collections. Each parish's contribution to both state sales tax and severance tax revenues is detailed in Table 13.

TABLE 13
1992 LOCAL AND STATE TAX REVENUES
GENERATED BY PARISHES IN THE STUDY AREA

	Local Revenues		State Revenues	
	Property Taxes	Sales Taxes	Severance Taxes	Sales Taxes
Parish	$	$	$	$
ASCENSION	17,488,000	31,891,000	1,282,000	20,866,000
ASSUMPTION	4,614,000	4,553,000	2,088,000	1,190,000
CALCASIEU	61,395,000	75,770,000	7,993,000	43,824,000
CAMERON	12,816,000	0	24,271,000	537,000
IBERIA	11,472,000	21,544,000	19,520,000	10,637,000
JEFFERSON	123,998,000	202,995,000	10,609,000	154,444,000
LAFOURCHE	22,381,000	15,980,000	36,241,000	7,539,000
LIVINGSTON	8,112,000	13,983,000	3,284,000	5,387,000
ORLEANS[1/]	215,070,000	89,279,000	133,000	195,903,000
PLAQUEMINES	19,433,000	10,529,000	77,893,000	3,839,000
ST. BERNARD	11,498,000	21,756,000	7,027,000	6,135,000
ST. CHARLES	40,946,000	26,165,000	4,380,000	9,190,000
ST. JAMES	13,570,000	8,493,000	814,000	5,065,000
ST. JOHN	14,685,000	15,053,000	269,000	4,772,000
ST. MARTIN	9,231,000	5,708,000	11,047,000	2,720,000
ST. MARY	19,084,000	16,885,000	20,787,000	7,810,000
ST. TAMMANY	40,005,000	155,994,000	353,000	17,924,000
TANGIPAHOA	10,288,000	27,332,000	271,000	12,930,000
TERREBONNE	25,324,000	24,681,000	32,870,000	16,599,000
VERMILION	11,375,000	10,171,000	36,065,000	7,364,000
STUDY AREA TOTAL	692,785,000	778,761,000	297,197,000	534,675,000
STATE TOTAL	1,167,560,000	N/A	44,866,000	1,518,003,000

[1/] 1993 property tax data used for Orleans Parish only
Sources: Louisiana Tax Commission, Louisiana Department of Revenue and Taxation, and local sales tax agencies

Two major sources of local revenues are also depicted in the table. The economies and tax bases of fishing villages scattered throughout the coastal area depend on activities related to commercial and recreational fishing, hunting, and trapping. As reported by the Louisiana Tax Commission, the total assessment of all property in the project area for Fiscal Year 1992 was $8.3 billion, which represents 53 percent of the State total of $15.6 billion. This translated to a fair market value of property in the study area of approximately $72 billion, yielding parish and local taxes of $693 million in 1992. Also shown in Table 13 are parish and local portions of sales tax collections which provided $779 million to governments in the study area in Fiscal Year 1993.

Income taxes contribute significant revenues to both state and Federal governments, but these revenues are not reported directly at the parish level. An estimate of Louisiana personal income tax revenues based on average taxes paid in three-digit zip codes in the study area is $373.5 million for 1990. Estimates of Federal tax revenues generated by the study area in 1990 and 1991 are $3.3 billion and $3.6 billion, respectively. Assuming that the study area provided at least half of the statewide gasoline tax revenues, they would have exceeded $186 million in Fiscal Year 1991.

Considerable infrastructure investment and real estate assets exist in the parishes of the study area. The Twenty-Fifth Biennial Report of the Louisiana Tax Commission shows that approximately $67 billion dollars of taxable real estate assets, personal property, and property of public service corporations are contained in these parishes. In addition, tax exempt property amounts to another $5.5 billion, and investment in flood control, hurricane protection, navigation, and transportation infrastructure totals $32.6 billion, bringing a total of approximately $105 billion in property in the twenty parish study area.

3.3.16.6.2. No-action. As the wetlands decline, private property and infrastructure will become more vulnerable to hurricane damage. In the near term, a further decline of the area's economic base and property values could cause continued deterioration of tax revenue, thereby reducing the ability of state and local governments to maintain public facilities and services. This would also hinder continued development of the State's fish and wildlife resources, the majority of which are currently located in the study area.

3.3.16.6.3. Future With CWPPRA Projects. Implementation of CWPPRA projects would help maintain a large portion of existing fisheries productivity and related employment opportunities, thereby contributing to the area tax base and public facilities and services. Effects would tend to be more significant for communities where commercial fishing and wildlife activities are a major source of employment and income. Although less significant, the tax base and public facilities in urbanized areas could also benefit by continued revenues at seafood markets and restaurants.

Since indirect economic impacts would be felt throughout the economy, the effect of the loss of wetlands would be magnified beyond the direct economic impacts on fishing, wildlife, and property values.

3.3.16.7. COMMUNITY COHESION.

3.3.16.7.1. Existing Conditions. Community cohesion generally refers to those forces which create a social bond within a community. It may be characterized through many forms, including religion, ethnic background, education, income, recreation, or other factors considered of mutual economic or social benefit. The availability of an abundant source of fish, shellfish, and wildlife, for both commercial and recreational purposes, has been important to a broad spectrum of groups throughout the coastal area. The history of the region has been heavily influenced by a wide variety of traditions ranging from those of native Americans, the earliest Spanish, French, and English settlers, African descendants, the French "Acadians" by way of Nova Scotia, and various other immigrants who have been drawn to U.S. port cities. The cooperative efforts of the citizens of local communities and regions within the project area during flood emergencies and hurricane evacuations have also contributed to the overall community cohesion of groups within the project area.

3.3.16.7.2. No-action. Under the no-action scenario, mutual interests and economic viability of the communities along the coast could decline. In many communities within the project area, the decline of the oil industry and resultant outmigration has reduced the number of families previously supporting schools, churches, and other social/cultural institutions that contribute to community cohesion. Commercial fishing and related businesses remain a major factor in many small villages. In extreme cases, some smaller communities are physically threatened by erosion directly or indirectly due to significant increases in the risk of tidal and storm flooding. There is a general consensus within the larger community of coastal Louisiana that the current rate of land loss needs to be controlled.

3.3.16.7.3. Future With CWPPRA Projects. To the extent marsh protection, creation, and restoration helps maintain commercial and recreational fish and wildlife resources, flood protection, and other factors important to communities along the project area, the various alternatives under consideration would help maintain community cohesion, particularly in small communities and in the rural areas. Plans and programs which protect the urbanized areas further inland will have positive impacts on community cohesion within the larger community as well.

3.3.16.8. DISPLACEMENT OF PEOPLE AND BUSINESSES.

3.3.16.8.1. Existing Conditions. People and businesses historically locate where resources are available to support them. Displacement occurs due to changing economic conditions, whether from depletion of natural resources, changing environmental conditions, or from changes in demand for a particular resource (e.g., conversion of farmland for use in residential development). During the 1980's, displacement of people and businesses occurred largely from the decline in oil activities and fluctuations in port activities. This resulted in a significant increase in outmigration.

3.3.16.8.2. No-action. The rate of outmigration of people and businesses is expected to decline as the area adjusts to changes in oil production and as port activities recover. However, the coastal area will begin to experience displacement of people, businesses, and farms as the impacts of land loss and subsidence continue apace. Drainage problems associated with land loss include changes in salinity levels affecting irrigation.

Persons displaced by land loss could include those in communities south of the anticipated 2040 shoreline, communities immediately adjacent to the 2040 shoreline, and communities where road service would no longer appear feasible. Total direct displacement could be as much as 23,000 people based on the 1990 census. Other, possibly greater displacement may occur as a result of the disruption of economic activities, including oil and petro-chemical industries, ports, commercial and recreational fishing, and commercial sales and services which have developed as a result of these basic industries. Loss of jobs in commercial fishing, for instance, could be in the range of 50-80,000 persons if the entire industry eventually collapses. Table 14 summarizes the estimated 1990 population of communities likely to experience population displacement by the year 2040 if no action is taken.

TABLE 14
ESTIMATED 1990 POPULATION OF COMMUNITIES WITH DIRECT POPULATION DISPLACEMENT BY 2040

Barataria	1,160		Johnson Bayou	150	(est.)
Boudreau	150	(est.)	Lacombe	6,523	
Chauvin	3,375		Lafitte	1,507	
Cocodrie	500	(est.)	Leeville	175	(est.)
Cypremont	150	(est.)	Montegut	1,784	
Delacroix	150	(est.)	Pilot Town	150	(est.)
Dulac	3,273		Point Barre	150	(est.)
Fourchon City	50	(est.)	Theriot	150	(est.)
Grand Isle	1,455		Yscloskey	2,000	(est.)
Holly Beach	150	(est.)	TOTAL	23,002	

Sources: U.S. Dept. of Commerce, Bureau of the Census, "1990 Census of Population and Housing, Louisiana" 1990 CPH-1-20; and USACE, NOD estimates of population in rural communities reported by the census as part of voting districts, but not reported as part of identifiable communities.

3.3.16.8.3. Future With CWPPRA Projects. The CWPPRA projects will create jobs and stimulate the economy in the coastal parishes while simultaneously protecting the natural resources upon which many of the local economies depend. The projects as a whole will decrease the rate of displacement through its positive impacts on the fishery economy and its related infrastructure. On a smaller scale, some parts of the fishery economy and individual fishermen may be negatively impacted as certain fish and shellfish producing areas are displaced seaward. Some fishermen may have to travel further to land their catch, and as a result could relocate their operational base as well as their place of residence.

3.3.16.9. DESIRABLE COMMUNITY AND REGIONAL GROWTH.

3.3.16.9.1. Existing Conditions. Historically, some of the activities which have driven regional and community growth have centered around oil and gas production, tourism, port operations, and fishing and hunting. Development of the area's energy resources during the 1950's and 1960's was instrumental in the expansion of industrial growth in surrounding communities. More recently, saltwater sport fishing has become an important stimulus to local and regional economies. In the last thirty years this activity has gained in popularity due to the advancements in affordable and reliable power sources for small boats and the advent of fiberglass boat hulls. As discussed in recreation opportunities, some estimate that recreational fishing has an annual economic impact of nearly one billion dollars.

Community and regional growth would not have been possible without construction of an extensive network of levees and floodgates along the Mississippi River for flood protection and maintenance dredging of the river sufficient to accommodate deep-draft navigation and waterborne commerce as far up river as New Orleans and Baton Rouge. Numerous lesser flood control, hurricane protection, and navigation projects have also been developed in response to public officials seeking support for continued desirable community and regional growth. The population, employment, and income developments discussed in previous sections are reflections of these past growth trends.

3.3.16.9.2. No-action. While public officials and other community leaders express many different views regarding future needs and opportunities for community and regional growth, all seem to indicate that desirable community and regional growth will depend, in part, on maintaining an adequate level of flood and hurricane protection. Future growth in the project area will depend on local and regional commitment to develop natural and human resources in the area. The socioeconomic projections referred to previously indicate that population and employment growth in the coastal region is not expected to reach National growth rates, indicating that a certain amount of outmigration is expected to continue.

3.3.16.9.3. Future With CWPPRA Projects. To the extent that the CWPPRA projects help to maintain employment and income stability sufficient to support the tax base and public facilities and services of the various communities of the region, projects would ultimately benefit community and regional growth.

3.3.16.10. NOISE.

3.3.16.10.1. Existing Conditions. Noise is essentially sound without value, intrusive, or otherwise objectionable. General standards for measuring noise have been developed and quantified by the U.S. Department of Housing and Urban Development (HUD). Average weighted sound levels are expressed in decibels (dbl). HUD has estimated that noise levels which are greater that 65 Ldn (noise level, day/night) are "normally unacceptable". It has estimated that any level greater than 75 Ldn is unacceptable without adequate protection. The U.S. Occupational Safety and Health Administration (OSHA) requires employers to assist their employees in protecting themselves against the effects of unacceptable noise levels. OSHA standards apply within areas where future projects might develop. Since the coastal wetlands are largely unpopulated, threats to human health in areas where projects might develop seems unlikely.

3.3.16.10.2. No-action. No significant adverse impacts from noise are anticipated.

3.3.16.10.3. Future With CWPPRA Projects. No significant adverse impacts from noise are anticipated due to the remote location of most project sites. Construction activities associated with project alternatives would be subject to OSHA regulations and any related State and local health standards.

3.3.16.11. AESTHETICS

3.3.16.11.1. Existing Conditions. Aesthetic characteristics of the 20-parish project area include the unique historical structures and urban and rural landscapes that reflect the lifestyles and traditions of different groups within communities along the coast; the vast expanse of wetlands largely unpopulated except by a wide variety of birds and other wildlife; the winding bends of the Mississippi River; and the extensive network of other rivers, bayous, canals, lakes, and bays which lead to the barrier islands and Gulf of Mexico.

3.3.16.11.2. No-action. Much of the wetlands and its resources considered aesthetically pleasing will continue to be adversely impacted by destructive natural forces such as subsidence and erosion. If the pattern of land loss continues and causes a growing threat to developments further inland, the cost of maintaining resources with aesthetic value which could not easily be moved further inland would

tend to increase. As the cost of protection or relocating becomes prohibitive, the value of those aesthetic resources would tend to decline or be lost. An example of this impact might be the loss of the aesthetic qualities of an historic residence which could no longer be maintained due to the cost of protection against storm damages.

3.3.16.11.3. Future With CWPPRA Projects. The CWPPRA could help maintain the current level of aesthetic values of the coastal region in Louisiana to the degree that the projects help in maintaining the aesthetic qualities of the beaches, wildlife refuges, parks and recreational facilities, historic residences, commercial developments, and other properties within the study area.

3.4. CUMULATIVE IMPACTS OF ALTERNATIVES

3.4.1. Introduction. In contrast to the typical projects and plans that EIS's are written for, the Restoration Plan will not add to the cumulative adverse effect that human development has had on the natural environment. Rather the plan seeks to halt and reverse many of the cumulative effects that have occurred from human activities, but this cannot be accomplished without affecting established infrastructure.

The Restoration Plan will contribute to the cumulative beneficial effects of coastal wetlands restoration efforts that have previously been constructed and are being constructed under separate Federal authority and by State, local, and private interests. Nearly all of the projects that make up the State's Coastal Wetlands Conservation and Restoration Program are included in the Restoration Plan.

The Restoration Plan is composed of a multitude of individual projects. These projects may interact with or be dependent upon other projects, offer substitute approaches to restoring a specific area, or they may be independent of other projects. As stated earlier in this report, many of these projects are very conceptual and in some cases, are no more than a statement that something is needed in a certain area. Preliminary cost and benefit data have been developed for some projects in an attempt to satisfy the language of the CWPPRA; that projects in the Restoration Plan be ranked according to their cost-effectiveness at creating, restoring, protecting, and enhancing wetlands. Unfortunately there was not the time or manpower available to develop costs and benefits for all projects in the plan. Preliminary cost and benefit information have been developed for most short-term critical and supporting projects. Descriptions of the projects included in the Restoration Plan are summarized in the basin summary chapters of the main report and discussed in more detail in the appendices. At this point in the development of the plan we know that the proposed projects far exceed the funds available through the CWPPRA. Which projects will

ultimately be funded and constructed is unknown. It is therefore, very difficult to discuss the overall effects of the Restoration Plan. The implementation of all projects in any basin is highly unlikely. The effects of projects, either individually or in groups, will be addressed in specific NEPA documentation for those projects before they are constructed.

Project proposals were divided into several categories; short-term and long-term projects considered critical to the restoration of the basin, short-term supporting projects capable of being implemented within five years, and long-term supporting projects that would take longer to implement or lacked sufficient detail for evaluation. Supporting projects contribute to the restoration of a basin but are not critical to the overall success of the restoration effort. Additionally some demonstration projects were proposed to test new technologies or research unknown aspects of marsh restoration. Basin teams considered various strategies for each hydrologic basin and chose projects critical to restoration of each basin. Critical projects were chosen for their ability to achieve the key objectives developed for each basin.

The eventual effects of basin plans will essentially be a compilation of the effects of the various projects that are constructed. The general effects of various projects types have already been discussed. The following sections include a general overview of the restoration plans developed for each of the hydrologic basins. Each basin section includes a table showing how many projects of each type are proposed. These tables are meant to give the reader an indication of the approach that will be taken towards restoration of each basin, based on the types of projects proposed. Refer to the basin summaries of the main report and its appendices for additional information about individual projects.

3.4.2. Pontchartrain Basin.

The plan selected for the Pontchartrain Basin includes incorporation of the previously authorized Bonnet Carré Freshwater Diversion project and implementation of bank stabilization and marsh creation along the Mississippi River Gulf Outlet as short-term critical projects. Also included in the critical, short-term portion of the plan are projects to preserve the land bridges between Lakes Borgne and Pontchartrain and between Lakes Maurepas and Pontchartrain through shoreline stabilization and hydrologic restoration. Other critical areas would be preserved through shoreline stabilization, hydrologic restoration, and marsh creation. A large number of other projects, mainly in the categories of shoreline stabilization and hydrologic restoration, are designated as supporting projects. Several small freshwater diversion projects are proposed in the long-term critical phase of the plan. Long-term projects awaiting studies to develop new and more cost effective technologies include creation of new

barrier islands along the outer marsh fringe and introduction of large quantities of sediment into the basin upper and lower basin areas.

One-hundred and twenty projects have been proposed for the Pontchartrain Basin. Of these, 45 have been eliminated or deferred because they were either the same as another project, they would not benefit wetlands, their benefits could be accomplished by a less costly strategy, or there was simply not enough known about their potential costs and benefits. The 75 projects that comprise the basin restoration plan are classified as shown in Table 15.

Table 15
Number of Projects Proposed for the Pontchartrain Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Marsh Management (MM)	1					1
Hydrologic Restoration (HR)	5		3	8	1	17
Hydro. Mgmt. of Impoundments (HM)	2			1		3
Sediment Diversion (SD)		1				1
Freshwater Diversion (FD)	1	5				6
Outfall Management (OM)	1					1
Marsh Creat. w/ Dredged Material (MC)	2	1	3	2	3	11
Barrier Island Restoration (BI)		1				1
Shoreline Prot. w/ Structures (SP)	13		9	1	1	24
Vegetative Plantings (VP)					1	1
Sediment Trapping (ST)			4			4
Combination FD/HR	1			1		2
Combination SP/MC	1					1
Combination OM/MC			1			1
Combination HM/MC			1			1
TOTAL	27	8	21	13	6	75

3.4.3. Breton Sound Basin.

This basin contains a series of somewhat parallel abandoned distributary ridges separated by brackish and saline marshes, interspersed with numerous lakes, ponds, and lagoons. The marshes of the upper basin will benefit substantially from the recently constructed Caernarvon Freshwater Diversion project. Management of the outfall from existing freshwater diversions and the enhancement of over-bank flow from the Mississippi River below the terminus of the Mississippi River levee system form the basis of the basin restoration plan. Additionally, large scale hydrologic restoration projects are proposed to help reduce tidal flows. Eighteen projects were proposed for the basin. Five of the projects are not included in the plan because they were either not appropriate, not implementable, or duplicated another project. The remaining 14 projects are categorized as shown in Table 16.

Table 16
Number of Projects Proposed for the Breton Sound Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Hydrologic Restoration (HR)			1	2		3
Sediment Diversion (SD)		1	1	1		3
Outfall Management (OM)	1		4			5
Shoreline Prot. w/ Structures (SP)					1	1
Barrier Island (BI)				1		1
TOTAL	1	1	6	4		13

3.4.4. Mississippi River Delta Basin.

Planning for the Mississippi River Delta Basin concentrated on beneficial use of the tremendous volume of sediment transported by the Mississippi River while recognizing that the needs of the entire coast of Louisiana are linked to the sediments in the river. The plan selected for the basin involves large-scale uncontrolled diversion of the Mississippi River to distribute the majority of the river's sediment load into a shallow estuary (either the Barataria or Breton Sound Basin) for creation of a new delta while maintaining deep draft navigation in the river. This action would require a significant amount of study to determine its feasibility. Also, an orderly deterioration and retreat of the existing delta would have to be provided for. Acknowledging that this effort would take considerable time to implement, supporting projects are included in the basin plan to prevent further deterioration of the existing delta in the near term. The supporting projects would enhance wetland development in the existing delta and actively counter the impacts of encroaching

marine processes following diversion of the river. The projects proposed for the basin are categorized as shown in Table 17.

Table 17
Number of Projects Proposed for the Mississippi River Delta Basin by Project Type and Designation

Project Type	Project Designation				
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	TOTAL
Hydrologic Restoration (HR)				1	1
Sediment Diversion (SD)	1	1*	3	1	6
Marsh Creation with Dredged Material (MC)			2	2	4
Vegetative Plantings (VP)			1		1
Sediment Trapping (ST)			1		1
TOTAL	1	1	7	4	13

* This project is for uncontrolled diversion of the Mississippi River

3.4.5. Barataria Basin.

The selected plan for the Barataria Basin is somewhat complex compared to the other basins. The plan would make use of nearly all types of proposed projects but concentrate efforts towards a combined sediment and freshwater diversion with hydrologic restoration component and a barrier island restoration component. One-hundred and nine were proposed for the basin. Thirty-six projects have been eliminated from the plan mainly because they were duplicates of other projects. The numbers of projects remaining in the plan in each category are shown in Table 18.

Table 18
Number of Projects Proposed for the Barataria Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Marsh Management (MM)			1			1
Hydrologic Restoration (HR)	1	2	7	3		13
Hydro. Man. of Impoundments (HM)			1			1
Sediment Diversion (SD)		6			1	7
Freshwater Diversion (FD)	1	9				10
Outfall Management (OM)	2	5	1			8
Marsh Creat. w/Dredged Mat. (MC)			3		1	4
Barrier Island Restoration (BI)	4		4	2		10
Shoreline Prot. w/Structures (SP)			8	9	2	19
TOTAL	8	22	25	14	4	73

3.4.6. Terrebonne Basin.

The Terrebonne Basin has been divided into four subbasins. Restoration of the Timbalier Subbasin involves barrier island restoration and hydrologic restoration along the alignment of a proposed hurricane levee system. In the Penchant Subbasin, freshwater, sediment, and nutrients from the Atchafalaya River would be used in concert with a system of hydrologic restoration projects. Lowering chronically high water levels of the Verret Subbasin through a large-scale water level management project is proposed. In the last two basins, the plan must be implemented in concert with appropriate flood protection measures. The Fields Subbasin is relatively small and healthy. Any problems that would develop in this basin would likely be addressed through marsh management or hydrologic restoration.

Ninety-eight projects have been proposed for the basin. Of those, 27 were dropped from the plan because they were either not implementable, they duplicated other projects, or they have already been implemented. The projects currently proposed for the Terrebonne Basin are categorized as shown in Table 19.

Table 19
Number of Projects Proposed for the Terrebonne Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Marsh Management (MM)	2		3	1		6
Hydrologic Restoration (HR)	12	2	1	2	2	19
Sediment Diversion (SD)		2	1	1	1	5
Freshwater Diversion (FD)		1				1
Marsh Creat. w/Dredged Mat. (MC)	1	1	3	5	3	13
Barrier Island Restoration (BI)	9		1			10
Shoreline Prot. w/Structures (SP)	1		2		1	4
Vegetative Plantings (VP)			2	1		3
Sediment Trapping (ST)			1		2	3
Combination MM/HR	3					3
Combination FD/HR	1	1				2
Combination SP/MC			1			1
Combination HR/MC	1					1
TOTAL	30	7	15	10	9	71

3.4.7. Atchafalaya Basin.

Similar to the Mississippi River Delta Basin, restoration planning efforts for the Atchafalaya Basin concentrated on maximizing the beneficial use of river-borne sediments. The Atchafalaya Basin is the only basin where significant growth of new

wetlands has occurred in recent years and also because its existing wetlands are relatively stable. Opportunities to maximize the beneficial use of sediments include manipulation of the river's flow between its two main outlets and its two active deltas and marsh creation with dredged material. Table 20 shows the distribution of project types and categories proposed for the basin.

Table 20
Number of Projects Proposed for the Atchafalaya Basin by Project Type and Designation

Project Type	Project Designation				
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	TOTAL
Sediment Diversion (SD)			1	2	3
Marsh Creation with Dredged Material (MC)			1		1
Shoreline Protection with Structures (SP)			1		1
Combination SD/MC	2	1		1	4
TOTAL	2	1	3	3	9

3.4.8. Teche/Vermilion Basin.

The restoration plan for the Teche/Vermilion Basin is composed mainly of shoreline protection projects along with hydrologic restoration. A long-term strategy for this basin involves the capture of annual spring-time inputs (fresh water and sediment) from the adjacent Atchafalaya River; however, projects have not yet been developed to support this strategy. Twenty-seven projects have been proposed for the basin, of which none have been eliminated. The projects proposed for the basin are categorized as shown in Table 21. Three areas within the basin have been identified as having critical wetland loss problems. The best method for addressing the problems are not known at this time, but the basin plan calls for development of projects to deal with the problems. Efforts to address the three critical areas are listed in the table under the category of "unknown".

Table 21
Number of Projects Proposed for the Teche/Vermilion Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Hydrologic Restoration (HR)		2				2
Freshwater Diversion (FD)	1					1
Shoreline Prot. w/ Structures (SP)	1	2	6	2	1	12
Vegetative Plantings (VP)			1	1		2
Sediment Trapping (ST)	1					1
Combination SP/HR	5					5
Combination SP/ST/VP			1			1
Unknown	3					3
TOTAL	11	4	8	3	1	27

3.4.9. Mermentau Basin.

Two distinct subbasins make up the Mermentau Basin; the Lakes Subbasin in the north and the Chenier Subbasin in the south. The most critical wetland problem in the Lakes Subbasin is excessively high water levels. The restoration plan for the basin includes large scale measures to improve freshwater discharge from the Lakes Subbasin. These structures would also provide fresh water to relieve saltwater stress on interior wetlands of the Chenier Subbasin. Treatment of critical areas of loss with hydrologic restoration and shoreline protection projects is also proposed. Fifty-one projects are proposed for the basin. No projects have been eliminated. The numbers of project by type and category are shown in Table 22.

Table 22
Number of Projects Proposed for the Mermentau Basin by Project Type and Designation

Project Type	Project Designation					
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	Demo	TOTAL
Marsh Management (MM)			1	1		2
Hydrologic Restoration (HR)			7	3		10
Freshwater Diversion (FD)	7			1		8
Marsh Creat. w/ Dredged Material (MC)			3			3
Shoreline Prot. w/ Structures (SP)			20		1	21
Vegetative Plantings (VP)			2	2	1	5
Terracing (T)			1			1
Combination SP/HR			1			1
TOTAL	7	0	35	7	2	51

3.4.10. Calcasieu/Sabine Basin.

The restoration plan for the Calcasieu/Sabine Basin provides for protection of wetlands by a perimeter protection plan which would protect the interior wetlands from the gross hydrologic alterations of the basin. Projects that target specific areas of interior wetlands will be used to enhance and restore deteriorated wetlands. Eroding shorelines of Sabine Lake, Calcasieu Lake, and the Gulf of Mexico would be protected from further erosion and hydrologic restoration would be used to maximize freshwater and sediment input and limit saltwater intrusion into interior wetlands.

One-hundred and twenty-seven projects were considered for the basin. Twenty-six projects were eliminated from the plan, mainly because they were essentially duplicates of other projects. Three of the projects eliminated made up one of the strategies considered for the basin which consisted of three locks to reduce tidal flows in the main channels that allow saltwater to enter the basin: the Sabine River, the GIWW (west of Calcasieu Lake), and the Calcasieu River. One-hundred and one projects remain on the basin's restoration plan. No demonstration or critical long-term projects are proposed. The projects are categorized as shown in Table 23.

Table 23
Number of Projects Proposed for the Calcasieu/Sabine Basin by Project Type and Designation

Project Type	Project Designation				
	Critical Short-term	Critical Long-term	Supporting Short-term	Supporting Long-term	TOTAL
Marsh Management (MM)	2		6	3	11
Hydrologic Restoration (HR)	18		15	5	38
Freshwater Diversion (FD)	1		5	1	7
Marsh Creation with Dredged Material (MC)			3	1	4
Shoreline Protection with Structures (SP)	8		11	4	23
Vegetative Plantings (VP)			3	1	4
Sediment Trapping (ST)			5	3	8
Terracing (T)			1		1
Combination FD/HR	1			1	2
Combination HR/MM	1				1
Combination MC/HR	1				1
Combination SP/HR	1				1
TOTAL	33	0	49	19	101

3.4.11. Coast-wide.

Approximately 433 projects are included in the Restoration Plan at the present time. The number is an approximation because some projects may duplicate other projects, some projects could be separated into several smaller projects, and some small projects could be combined into a larger, more comprehensive project. The number of projects of each type are displayed in Table 24. The table offers a somewhat oversimplified view of the Restoration Plan and is intended only to show the relative numbers of projects proposed for the plan. Please refer to the basin summary chapters of the main report and to the basin appendices for detailed information on individual projects.

Table 24
Total Number of Projects Proposed for the Restoration Plan by Project Type

Project Type	Number of Projects Proposed	Percent of Total
Marsh Management (MM)	21	4.8
Hydrologic Restoration (HR)	103	23.8
Hydrologic Management of Impoundments (HM)	4	1.0
Sediment Diversion (SD)	25	5.7
Freshwater Diversion (FD)	33	7.6
Outfall Management (OM)	14	3.2
Marsh Creation with Dredged Material (MC)	40	9.2
Barrier Island Restoration (BI)	22	5.1
Shoreline Erosion Control with Structures (SP)	105	24.2
Vegetative Plantings (VP)	16	3.7
Terracing (T)	2	0.5
Sediment Trapping (ST)	17	3.9
Herbivore Control (HC)	0	0.0
Combination MM/HR	4	1.0
Combination HR/FD	6	1.4
Combination HR/MC	2	0.5
Combination HR/SP	7	1.6
Combination SD/MC	4	1.0
Combination MC/SP	2	0.5
Combination OM/MC	1	0.2
Combination HM/MC	1	0.2
Combination SP/VP/ST	1	0.2
Unknown	3	0.7
Total	433	100.0

3.5. COMMITMENTS OF RESOURCES.

Section 102(C)V. of the National Environmental Policy Act requires that Environmental Impact Statements disclose any irretrievable and irreversible

commitments of resources expected from implementation of a proposed action. This language is probably more pertinent for projects that would cause a detrimental effect to the environment. In the case of the CWPPRA, public funds will be expended on a large number of projects that vary in their degree and ease of reversibility. Most likely, public funds would not be retrievable in the sense that project features (structures) would not be marketable to the private sector.

Most of the projects that are proposed for the CWPPRA are reversible. Structures built for freshwater diversion, marsh management, hydrologic restoration, outfall management, shoreline erosion control, and sediment trapping could normally be removed or rendered inoperable for less cost than for project construction. The effects of these projects on the environment will also, for the most part, be reversible. This is important because there is always the unlikely case where a project may cause unanticipated adverse effects that outweigh benefits. In such case, a change or modification in project operation would likely be initiated rather than termination of the project. Other projects like marsh creation with dredged material, barrier island restoration, and terracing would be much more costly and difficult to reverse but the odds of constructing one of these projects that does not produce net environmental benefits is highly unlikely. Large-scale sediment diversion projects from the Mississippi River would require a commitment of resources that would not easily be reversible. Although such diversions may be relatively easy to close off and render inoperable during periods of low river flow, they would be not be closable during high water and flood stages. Upon closure, conditions and resources of the project area would begin reverting back to pre-project conditions.

3.6. MONITORING OF IMPLEMENTED PROJECTS.

Section 303(b) of the CWPPRA requires monitoring of implemented projects to evaluate the effectiveness of each project in achieving long-term solutions to arresting coastal wetlands loss. A scientific evaluation of the effectiveness of projects in creating, restoring protecting, and enhancing coastal wetlands is also required by the act.

Procedures for monitoring CWPPRA projects were developed by a work group composed of Task Force agency representatives. The Louisiana Department of Natural Resources will be responsible for managing the monitoring program. Procedures for determining variables to be monitored, standardizing monitoring procedures, and reporting of data have been tentatively determined. Refer to the Monitoring and Evaluation Section of the main report for a detailed description of the monitoring program.

4. LIST OF PREPARERS

NAME	EXPERTISE	RESPONSIBILITY
Richard Boe USACE, New Orleans District, Planning Division, Environmental Analysis Branch	Estuarine Fishery Biology	EIS Coordinator, Major Author
Robert Bosenberg USACE, New Orleans District, Planning Division, Environmental Analysis Branch	Regulatory Functions Management, Biology	Marsh Management, Description and Effects
Joan Exnicios USACE, New Orleans District, Planning Division, Environmental Analysis Branch	Historic Archeology	Cultural Resources
Robert Lacy USACE, New Orleans District, Planning Division, Economics and Social Analysis Branch	Economics	Socioeconomic Items
Lisa Leonard USACE, New Orleans District, Planning Division, Economics and Social Analysis Branch	Economics	Socioeconomic Items
Dave Carney USACE, New Orleans District, Planning Division, Environmental Analysis Branch	Wildlife Biology	Review and Comment

5. PUBLIC INVOLVEMENT, REVIEW, AND CONSULTATION

5.1. PUBLIC INVOLVEMENT PROGRAM AND STUDY HISTORY.

The background for this study actually began before passage of the CWPPRA with the Louisiana Comprehensive Coastal Wetlands Study. That study, which proceeded to the end of the reconnaissance phase, set the stage for many of concepts embraced by the CWPPRA Restoration Plan. The Comprehensive Study, funded through regular USACE authorities, proposed the use of a non-standard benefit-cost ratio to be used to prioritize projects similar to that used for prioritizing CWPPRA projects. Also, the Comprehensive Study involved all of the same agencies involved with implementation of the CWPPRA Restoration Plan.

To assist in implementing the requirements of the CWPPRA, the Task Force established the Technical Committee and the Planning and Evaluation Subcommittee. Each of these bodies contains the same representation as the Task Force--one representative from each of the five Federal agencies and one from the State. The Planning and Evaluation Subcommittee is responsible for the actual planning of projects and preparation of this Restoration Plan, as well as the other details involved in the CWPPRA process (such as development of schedules, budgets, etc.); the subcommittee lays the groundwork for all decisions which will ultimately be made by the Task Force, and makes recommendations to the Technical Committee. The Technical Committee reviews all materials prepared by the subcommittee, making revisions as it deems appropriate. The Technical Committee then makes recommendations to the Task Force. The Technical Committee operates at an intermediate level between the planning details considered by the subcommittee and the policy matters dealt with by the Task Force, and often serves to formalize procedures or formulate policy for the Task Force.

The Planning and Evaluation Subcommittee established several working groups to assist in evaluating projects for priority project lists and the Restoration Plan. The Environmental Work Group was charged with estimating the benefits (in terms of wetlands created, protected, enhanced, or restored) associated with various projects. The Engineering Work Group reviewed project cost estimates for consistency. The Economic Work Group performed the economic analysis which permitted comparison of projects on the basis of their cost effectiveness. The Monitoring Work Group established a standard procedure for monitoring of CWPPRA projects and developed a monitoring cost estimating procedure based on project type.

The Planning and Evaluation Subcommittee also established a basin team for each of the nine hydrologic basins in the coastal area. The nucleus of each team consisted of representatives of the five Federal Task Force agencies and the State, and it was these six members who voted on team recommendations. However, team meetings

frequently involved additional agency representatives, scientific advisors, consultants, and local interests. The basin teams helped crystallize the comprehensive restoration plans for the basins. They also serve as the first level of screening for proposed priority project list projects.

One of the earliest Task Force efforts at public participation was the establishment of the Citizen Participation Group (CPG) by the Task Force to coordinate the preparation of the First Priority Project List with the interested public. The stated purpose of the CPG is to maintain consistent public review and input into the plans and projects being considered by the Task Force and to assist and participate in the public involvement program. The CPG is composed of organizations that represent the interests of the environmental community, oil and gas industry, agriculture, commercial fishing, recreational fishing, navigation, landowners, and public advocacy groups, all of which are active in Louisiana. The CPG meets at its own discretion, but many times meets in conjunction with other CWPPRA committees and work groups. The membership of the CPG is shown below.

Membership of the Citizen Participation Group

Gulf Coast Conservation Association	Coalition to Restore Coastal Louisiana
Gulf Intracoastal Canal Association	Lake Pontchartrain Basin Foundation
Louisiana Association of Soil and Water Conservation Districts	Louisiana Farm Bureau Federation, Inc.
	Louisiana Landowners Association
Louisiana League of Women Voters	Louisiana Nature Conservancy
Louisiana Oyster Growers and Dealers Association	Louisiana Wildlife Federation, Inc.
	Midcontinent Oil and Gas Association
New Orleans Steamship Association	Oil and Gas Task Force (Regional Economic Development Council)
Police Jury Association of Louisiana	
Organization of Louisiana Fishermen	Ex Officio Member: U.S. Senator John Breaux

While the agencies represented by the Task Force possess a tremendous amount of expertise regarding Louisiana's coastal wetlands problems, the Planning and Evaluation Subcommittee was concerned that there was no mechanism for incorporating into the process a very valuable resource: the State's scientific and academic community. The subcommittee therefore retained the services of a scientific advisor, who selected a team of scientists to work with the basin teams in the preparation of the 2nd Priority Project List. A team of scientists from Louisiana universities was later retained to review the comprehensive Restoration Plan.

Even with its widespread membership, the Citizen Participation Group cannot represent all of the diverse interests affected by Louisiana's coastal wetlands. The CWPPRA public involvement program provided an opportunity for all interested parties to express their concerns and opinions and to submit their ideas concerning the problems facing Louisiana's wetlands.

The first step in the program comprised two series of scoping meetings held by the Task Force in October and November 1991--one series for coastal zone parish officials and another series for the general public. The purpose of these scoping meetings was to identify wetland loss problems throughout the coastal zone and potential solutions to those problems. Literally hundreds of ideas were submitted to the Task Force through the scoping meetings. Exhibit 2 of the main report is a compendium of those proposals. All of the ideas presented in those meetings have been evaluated during the planning process; most of them have been incorporated into the Restoration Plan. The schedule of scoping meetings was as follows.

Parish Scoping Meetings (for parish officials)

October 8, 1991	Crowley, La.	Calcasieu, Cameron, Iberia, and Vermilion Parishes
October 16, 1991	New Orleans, La.	Jefferson, Orleans, Plaquemines, St. Bernard, and St. Charles Parishes
October 16, 1991	New Orleans, La.	Livingston, St. James, St. John the Baptist, St. Tammany, and Tangipahoa Parishes
October 17, 1991	Thibodaux, La.	Ascension, Assumption, Lafourche, St. Martin, St. Mary, and Terrebonne Parish

Public Scoping Meetings

October 21, 1991	Lake Charles, La.
October 22, 1991	Abbeville, La.
October 24, 1991	Houma, La.
October 28, 1991	Mandeville, La.
November 6, 1991	Belle Chasse, La.
November 7, 1991	New Orleans, La.

The public involvement program continued with a series of public meetings held in June 1992. At these meetings, the conceptual plans which had been developed for the basins were presented to the public along with the candidate projects for the 2nd Priority Project List. These meetings provided the first opportunity for review of the conceptual plans. Public meetings were held as shown below.

Public Meetings for 2nd Priority Project List and Conceptual Basin Restoration Plans

Date	Location	Hydrologic Basins
June 16, 1992	Morgan City, La.	Atchafalaya, Teche/Vermilion
June 18, 1992	Belle Chasse, La.	Barataria, Breton Sound, Mississippi River Delta
June 23, 1992	Houma	Terrebonne
June 25, 1992	Lake Charles	Mermentau, Calcasieu/Sabine
June 30, 1992	New Orleans	Pontchartrain

The October-November 1991 scoping meetings were the first stage in the process of plan formulation, the process by which the Task Force agencies identified coastal wetlands problems and developed solutions to those problems. The process continued with a series of basin plan formulation meetings, which began in February 1992 and ran through May 1992. These were not formal public meetings but they were attended by representatives of the Task Force agencies, members of the scientific community, representatives of the Citizen Participation Group, private consultants, parish officials, and members of the general public. These were very intense planning sessions, consisting of four three-day meetings with a two-day follow-up for each. Each set of meetings began with a description of the geologic and geomorphic features of the basins being considered, as well as the hydrology. Further background involved descriptions of vegetative types. Projections for the future of each basin were presented. Finally, the coastal wetlands problems and their causes were discussed in detail, and strategies were developed for dealing with those problems on a basin-by-basin basis. These strategies were molded into conceptual plans, plans which would serve as a guide in selecting and evaluating projects both for Priority Project Lists and for the Restoration Plan. Consistency with these conceptual plans became an important criterion by which projects were judged. During these meetings, many of the ideas submitted in the 1991 scoping meetings were integrated into the conceptual plans. The basin teams refined the conceptual plans over the next year to produce the comprehensive restoration plan presented in this report. Everyone present at the basin plan formulation meetings had the opportunity to participate in the process which ultimately led to development of the restoration plan. The meetings followed the schedule below.

Basin Plan Formulation Meetings

Date	Location	Hydrologic Basins
February 4-6, 1992	Baton Rouge, La.	Pontchartrain
February 12-13, 1992	New Orleans, La.	(follow-up)
March 17-19, 1992	St. Francisville, La.	Barataria, Breton Sound, Mississippi River Delta
March 25-26, 1992	New Orleans, La.	(follow-up)
April 7-9, 1992	Baton Rouge, La.	Terrebonne, Atchafalaya, Teche/Vermilion
April 15-16, 1992	New Orleans, La.	(follow-up)
April 28-30, 1992	Abbeville, La.	Mermentau, Calcasieu/Sabine
May 6-7, 1992	New Orleans, La.	(follow-up)

The public involvement program continued with a series of public meetings held in June 1992. At these meetings, conceptual plans which had been developed for the basins were presented to the public along with the candidate projects for the 2nd Priority Project List. These meetings provided the first opportunity for public review of the conceptual basin plans. Public meetings were held as shown below.

Public Meetings for 2nd Priority Project List
and Conceptual Basin Restoration Plans

Date	Location	Hydrologic Basins
June 16, 1992	Morgan City, La.	Atchafalaya, Teche/Vermilion
June 18, 1992	Belle Chasse, La.	Barataria, Breton Sound, Mississippi River Delta
June 23, 1992	Houma	Terrebonne
June 25, 1992	Lake Charles	Mermentau, Calcasieu/Sabine
June 30, 1992	New Orleans	Pontchartrain

During the latter half of 1992 and the first half of 1993, the Task Force's efforts were focused primarily on integrating all of the information gathered through the planning and public comment process into a comprehensive Restoration Plan. The draft version of the Restoration Plan and accompanying EIS was distributed to the public in mid-July 1993 and the notice of EIS availability was published in the Federal Register on July 16, 1993. The Task Force held a series of public meetings in coastal Louisiana during July and August 1993. These meetings were designed to solicit comments from the public on candidate projects being evaluated for the 3rd Priority Project List and to present the draft Restoration Plan and specific plans for restoring each basin.

Public Meetings for the 3rd Priority Project List
and for Presentation of the Draft Restoration Plan

Date	Location	Hydrologic Basins
July 27,1993	Larose, La.	Barataria Basin
July 28, 1993	Belle Chasse, La.	Breton Sound and Mississippi Delta Basins
July 29, 1993	New Orleans, La.	Pontchartrain Basin
August 9, 1993	Houma, La.	Terrebonne Basin
August 10, 1993	Morgan City, La.	Atchafalaya and Teche/Vermilion Basins
August 12, 1993	Cameron, La.	Mermentau and Calcasieu Basins

The formal public hearing for comments on the EIS was held on August 11, 1993 at the New Orleans District office of the USACE. Written comments were presented by the EPA and by Dr. Charles G. Groat, Ph.D. of Louisiana State University. Several others presented oral comments.

5.2. REQUIRED COORDINATION.

A Notice of Intent to prepare an EIS for the CWPPRA was published in the Federal Register on March 24, 1992. A preliminary draft version of the Restoration Plan and EIS was distributed to the Task Force agencies for their review and comment in April

1993. After intensive and extensive discussions and coordination among the Task Force agencies and others, the draft version of the Restoration Plan and EIS was distributed in July 1993 for public review and comment. The Notice of Availability of the draft EIS was published in the Federal register on July 16, 1993. The public hearing on the Draft EIS was held on August 11, 1993 at the New Orleans District office of the USACE.

5.3. STATEMENT RECIPIENTS.

The following elected officials, agencies, businesses, libraries, and interested parties were sent either a copy of the draft Restoration Plan or a notice of its availability. Those that were sent a notice of availability were sent a copy of the report upon request. Also, all that are listed below have either been sent a copy of the final Restoration Plan or a notice of its availability. The agencies, businesses, groups, and individuals listed in bold provided written responses or comments on the draft report. Comments and responses are contained in Appendix J.

CONGRESSIONAL DELEGATION
Honorable J. Bennett Johnston
Honorable John B. Breaux
Honorable William Jefferson
Honorable Jerry Huckaby
Honorable Bob Livingston
Honorable Richard H. Baker
Honorable Jimmy Hayes
Honorable Billy Tauzin
Honorable Jim McCrery
Honorable Clyde C. Holloway

STATE OFFICIALS
Honorable Edwin W. Edwards, Governor
Honorable Melinda Schwegmann, Lieutenant Governor
Honorable W. Fox McKeithen, Secretary of State
Honorable Bob Odum, Commissioner of Agriculture and Forestry
Honorable Richard Ieyoub, Attorney General

FEDERAL AGENCIES
Advisory Council on Historic Preservation, Washington, DC and Golden, CO
Department of Agriculture,
- Soil Conservation Service, Washington, DC
- Soil Conservation Service, State Conservationist, Alexandria, LA
- Soil Conservation Service, Field Offices in the Coastal Parishes
- Regional Research Center, New Orleans, LA
- Forest Service, Planning & Budget Staff Unit, Atlanta, GA

Department of Commerce,
- **Office of Ecology and Conservation, Washington, DC**
- National Marine Fisheries Service, Habitat Conservation Division, Field Office, Baton Rouge, LA

FEDERAL AGENCIES (Continued)

Department of Commerce (Continued),
- **National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, FL**
- National Marine Fisheries Service, Restoration Center, Silver Spring, MD

Department of Energy, Office of Environmental Compliance, Washington, DC
Department of Health and Human Services, Centers for Disease Control, Atlanta, GA
Department of Housing and Urban Development, Fort Worth, TX
Department of Interior,
- Cameron Prairie National Wildlife Refuge, Bell City, LA
- Geological Survey, Baton Rouge, LA and Reston, VA
- Honorable Bruce Babbitt, Secretary
- Fish and Wildlife Service, Gulf Coast Fisheries Coordinator, Ocean Springs, MS
- Fish and Wildlife Service, Division of Habitat Conservation, Arlington, VA
- Fish and Wildlife Service, Field Supervisor, Lafayette, LA
- Fish and Wildlife Service, Lower Mississippi Valley Joint Venture, Vicksburg, MS
- Fish and Wildlife Service, Regional Director, Atlanta, GA
- Lacassine National Wildlife Refuge, Lake Arthur, LA
- Minerals Management Service, New Orleans, LA
- National Park Service, Jean Lafitte Historical Park, New Orleans, LA
- **Office of Environmental Affairs, Washington, DC**
- Sabine National Wildlife Refuge, Hackberry, LA
- Southeast Louisiana Refuges, Slidell, LA
- National Wetlands Research Center, Lafayette, LA

Department of Transportation, Coast Guard, New Orleans, LA and Washington, DC
Environmental Protection Agency,
- Coastal America Program, Washington, DC
- Office of Federal Activities, Washington, DC
- **Region VI, Federal Activities Branch, Dallas, TX**

Federal Emergency Management Administration, Washington, DC and Denton, TX
Federal Highway Administration, Baton Rouge, LA

STATE AGENCIES

Department of Agriculture & Forestry,
- Office of Agriculture and Environmental Sciences
- Office of Forestry

Department of Culture, Recreation and Tourism,
- Division of Outdoor Recreation
- State Historic Preservation Officer

Department of Environmental Quality,
- Secretary
- Inactive and Abandoned Sites
- Solid and Hazardous Waste
- Office of Water Resources

Department of Health and Hospitals, Office of Health Services and Environmental Quality
Department of Natural Resources,
- **Office of Coastal Restoration and Management, Assistant Secretary**
- Coastal Restoration Division
- Coastal Management Division, Consistency Coordinator
- Louisiana Geological Survey

Department of Transportation and Development,
- **Chief Engineer**

STATE AGENCIES (Continued)

Department of Transportation and Development (Continued),
Division of Flood Control and Water Management
Department of Wildlife and Fisheries,
Secretary
Habitat Conservation Division, Natural Heritage Program
Division of Administration, State Land Office
Louisiana Attorney General's Office, Assistant Attorney General
Louisiana Board of Commerce and Industry, Research Division
Louisiana Mosquito Control Board
Louisiana Sea Grant Legal Program
Louisiana State Planning Office
Louisiana State University,
Center for Coastal, Energy, and Environmental Resources, Dr. Ivor Van Heerden et al.
Center for Coastal, Energy, and Environmental Resources, Dr. Charles G. Groat
Center for Wetland Resources
Center for Wetland Resources, Ports and Waterways Institute
Coastal Studies Institute
Department of Geography and Anthropology
Louisiana Tech University, Dept. of Economics and Finance, Dr. J. H. Jones
Office of the Governor, Dr. Len Bahr, Technical Coordinator for Coastal Activities
Southeastern Louisiana University, Dept. of Biological Sciences, Mr. Gary Shaffer, Hammond, LA

PARISHES, CITIES, and TOWNS

Assumption Parish Government, C. J. Savoie, Napoleonville, LA
Calcasieu Parish Office of Planning and Development, Mr. Paul Rainwater, Lake Charles, LA
Cameron Parish Police Jury, Ms. Tina Horn, Cameron, LA
Honorable Emmett Hardaway, Mayor, Berwick, LA
Honorable Timothy Matte, Mayor, Morgan City, LA
Iberia Parish Government, Ms. Ruth Fontenot, New Iberia, LA
Jefferson Parish, Dr. Mary Curry
Jefferson Parish, Mrs. Marnie Winter
Jefferson Parish Environmental Impact Officer, Mr. Foster Voelker, Harahan, LA
Lafourche Parish Council, Mr. Roy P. Francis, Cut Off, LA
Lafourche Parish President, Mr. Steve Wilson, Thibodaux, LA
Livingston Parish, Theriot, Alex and Associates, Denham Springs, LA
New Orleans City Planning Council, Ms. Patricia Thompson, New Orleans, LA
Plaquemines Parish Government, Mr. Rodney Barthelemy, Port Sulphur, LA
Plaquemines Parish Land Department, Belle Chasse, LA
St. Bernard Parish Planning Commission, Mr. Chris Andry, Chalmette, LA
St. Charles Parish Council, Mr. Earl Matherne, Hahnville, LA
St. James Parish Council, Ms. Mary Ann Champton, Convent, LA
St. John the Baptist Parish, Mr. Patrick McTopy, Laplace, LA
St. Martin Parish Manager, Mr. Gerard Durand, Jr., St. Martinville, LA
St. Mary Parish Council, Mr. Derhyl Hebert, Franklin, LA
St. Tammany Department of Development, Gibb Farrish, Covington, LA
Tangipahoa Parish Government, Mr. Jeff Schneider, Loranger, LA
Terrebonne Parish Council, Waterways and Permit Committee, Houma, LA
Terrebonne Parish Planning Office, Mr. Dean Babin, Houma, LA
Vermilion Parish Police Jury, Mr. Michael Bertrand, Abbeville, LA

LIBRARIES
Louisiana State University Library
Tulane University Library
University of New Orleans Library
St. Mary Parish Library
Iberia Parish Library
New Orleans Public Library
Louisiana Office of Commerce and Industrial Research Library
Terrebonne Parish Library
Vermilion Parish Library

ENVIRONMENTAL
Alliance of Concerned Citizens of Louisiana, Matthews, LA
Association of Louisiana Bass Clubs, Thibodaux, LA
Barataria-Terrebonne National Estuary Program, Thibodaux, LA
Bonnet Carré Rod and Gun Club, Environmental Committee, Norco, LA
Bicycle Awareness Committee of New Orleans, New Orleans, LA
Cactus Clyde Productions, Baton Rouge, LA
Clio Sportsman's League, Harahan, LA
Coalition to Restore Coastal Louisiana, Baton Rouge, LA
Ducks Unlimited, Inc., Jackson, MS
Environmental Defense Fund, New York, NY
Friends of the Earth, Seattle, WA
Governor's Advisory Council on Bicycling, New Orleans, LA
Gulf Coast Conservation Association, New Orleans and Baton Rouge, LA
Gulf of Mexico Fisheries Management Council, Tampa, FL
Gulf States Marine Fisheries Commission, Ocean Springs, MS
Lafayette Natural History Museum and Planetarium, Lafayette, LA
Lake Pontchartrain Basin Foundation, Metairie, LA
League of Woman Voters, Baton Rouge, LA
Louisiana Audubon Council, Baton Rouge, LA
Louisiana Nature and Science Center, New Orleans, LA
Louisiana Wildlife Federation, Baton Rouge, LA
Orleans Audubon Society, New Orleans, LA
National Audubon Society, Austin, TX and Tavernier, FL
National Wildlife Federation, Washington, DC
Natural Resources Defense Council, New York, NY
North Shore Coast Watch, Covington, LA
Orleans Audubon Society, New Orleans, LA
Sierra Club Legal Defense, New Orleans, LA
Sierra Club, Delta Chapter, New Orleans, LA
Sierra Club, Honey Island Group, Lacombe, LA
Sierra Club, Mr. Tyronne Foreman, New Orleans, LA
South Louisiana Environmental Council, Houma, LA
Tickfaw River Basin Group, Springfield, LA
The Fund for Animals, Jefferson, LA

OTHER GROUPS, AGENCIES, AND INDIVIDUALS
Dr. Nick Accardo, Franklin, LA
Mr. Tim Allen, Houma, LA

OTHER GROUPS, AGENCIES, AND INDIVIDUALS (Continued)

Mr. Bob Ancelet, Louisiana Department of Wildlife and Fisheries, New Orleans, LA
Aries 27 Building and Landscaping, Mr. Tom Aicklen, Lacombe, LA
Mr. J. Paul Armentor, New Iberia, LA
Atchafalaya Basin Levee District, Port Allen, LA
Avoca, Inc, New Orleans, LA
Bayou Lafourche Freshwater District, Thibodaux, LA
H. J. Broussard, Jr., New Iberia, LA
Dr. Robert Chabreck, Baton Rouge, LA
CMS Environmental Services, Mr. Larry Campbell, New Orleans, LA
Coalition of Coastal Parishes, Mr. Steve Wilson, Thibodaux, LA
Coastal Environments, Inc., Dr. Sherwood M. Gagliano, Baton Rouge, LA
R. W. Collins, Houma, LA
Colorado State University Library, Mr. Fred C. Schmidt, Fort Collins, CO
Conrad Industries, Mr. J. Parker Conrad, Morgan City, LA
Continental Land and Fur Company, Mr. George A. Strain, New Orleans, LA
Mr. Herman Crawford, Gibson LA
Mr. Donald Doyle, New Orleans, LA
Environmental Science and Engineering, Inc., Mr. William J. Elzinga, St Louis, MO
Fina-LaTerre Oil Company, Houma, LA
Mr. Robert Fritchey, New Orleans, LA
Gibbens and Blackwell, Attorneys at Law, New Iberia, LA
Glen Canyon Environmental Studies, Mr. Dave Wegner, Flagstaff, AZ
Mr. Robert D. Gorman, Thibodaux, LA
Gulf Intracoastal Canal Association, Mr. Vernon Behrhorst, Lafayette, LA
Gulf South Engineers Inc., Houma, LA
Kemp and Associates, Inc, E. Burton Kemp III, P.G., Bay St. Louis, MS
Lake Pontchartrain Sanitary District, New Orleans, LA
Landau Associates, Mr. Dale Stirling, Edmonds, WA
Dr. Mary C. Landin, USACE-WES, Vicksburg, MS
Mr. Harvey Latiolas, New Iberia, LA
LBJ School of Public Affairs, University of Texas, Ms. Susan Hadden, Austin, TX
Lee Wilson and Associates, Mr. Lee Wilson, Santa Fe, NM
Mr. Benjamin W. Leigh, P.E., Baton Rouge, LA
Louisiana Farm Bureau Federation, Inc., Dr. Ron Harrell, Baton Rouge, LA
Louisiana Farm Bureau Federation, Inc., Ms. Linda Zaunbrecher, Gueydan, LA
Louisiana Land and Exploration Company, New Orleans, LA
Louisiana Landowners Association, Mr. Newman Trowbridge, Franklin, LA
Louisiana League of Women Voters, Ms. Charlotte Fremaux, Metairie, LA
Louisiana Nature Conservancy, Mr. David Pashley, Baton Rouge, LA
Louisiana Oyster Growers and Dealers Association, Mr. Mike Voisin, Houma, LA
Mr. Karl Mapes, Louisiana Department of Wildlife and Fisheries, Slidell, Louisiana
Captain O. T. Melvin, Larose, LA
Mid-Continent Oil and Gas Association, Baton Rouge, LA
Middle South Services, Inc., Environmental Affairs Section, New Orleans, LA
Mr. Gregory B. Miller, Metairie, LA
National Rifle Association, ILA, Allen R. Hodgkins, III, Washington, DC
Mr. Robert Ness, Morgan City, LA
New Orleans Steamship Association, Mr. Channing F. Hayden, New Orleans, LA
Phillips Petroleum Company, Houston, TX
Pivach Agency, Mr. George Pivach, Jr., Belle Chasse, LA

OTHER GROUPS, AGENCIES, AND INDIVIDUALS (Continued)
Port of New Orleans, Mr. Robert B. Hughes, New Orleans, LA
Kerry Rodriquez, Plaquemine, LA
Mr. Roy Rogge, Metairie, LA
St. Bernard Sportsmen's League, Charles (Pete) Savoye, President, Chalmette, La
St. Mary Land and Exploration Company, Denver, CO
SAIC, Mr. Bob Wheeler, Falls Church, VA
South Central Planning and Development, Thibodaux, LA
State Times/Morning Advocate, Outdoor Editor, Baton Rouge, LA
STRA, Mr. Edward Satler, Arlington, VA
T. Baker Smith and Son, Inc, Houma, LA
Tennessee Gas Pipeline, Inc, Houston, TX
Terrebonne Fishermen's Association, Dulac, LA
The Times Picayune, Mr. Mark Schleifstein, New Orleans, LA
Thompson Marine Transportation, Morgan City, LA
Freddie Trosclair, Jr., Cutoff, LA
Tulane Law School, New Orleans, LA
Virginia DOT, Environmental Division, Mr. Bill Beuter, Richmond, VA
Waldemar S. Nelson and Company, Mr. Carl B. Hakenjos, New Orleans, LA
Walk Haydel Association, New Orleans, LA
Wetlands and Wildlife Management, Mr. Allan Ensminger, Deridder, LA
Dr. Mary White, Louisiana State University, Baton Rouge, LA
Ms. Patricia Willging, New Orleans, LA
Williams, Inc., Patterson, LA
Woodward-Clyde Associates, Baton Rouge, LA

Note: The persons, agencies, businesses, and groups listed in bold type provided comments on the draft report. Their comments are reproduced and responded to in Appendix J, Public Views and Responses.

5.4. PUBLIC VIEWS AND RESPONSES.

The public's view of the efforts of the Task Force in developing the Restoration Plan and of the Restoration Plan itself has been generally supportive. Various interest groups have advised caution before implementing certain projects or types of projects because of potential waste of funds or adverse impacts. Some of the major comments on the draft Restoration Plan (Plan) and EIS are listed as follows:

- The draft report lacks an implementation strategy for the Plan.
- Marsh management projects should not be implemented under the Plan.
- The Plan should emphasize long-term, comprehensive solutions.
- The Plan should take a more offensive strategy. It should not concentrate on defensive efforts.
- The Mississippi River Gulf Outlet should be modified or closed.
- There needs to be more public accountability for expenditure of funds.
- The Plan does not adequately consider the rights of public access.
- There should be increased involvement of non-agency scientists.

- Plan should concentrate on the natural processes of marsh building and maintenance.
- Projects should produce broad public benefits.
- EIS's should be written for each hydrologic basin.

Over 200 pages of comments on the draft report were received. By far, the largest volume of comments received was from cooperating agencies and their contractors. The main report and basin plans have been essentially rewritten as a result comments received both from the public and from Task Force agencies and their contractors. All Task Force agencies had input into the rewrite of the main report, basin plans, and executive summary. Meetings with Task Force agencies were held to discuss and resolve their comments on the EIS. EIS has not been substantially changed, although sections pertaining to marsh management have been revised considerably as a result of extensive comments on the treatment of that type of project.

All comments received on the draft report, along with responses, are provided in Appendix J, Public Views and Responses.

6. LITERATURE CITED

Anderson, R. and M. Rockel. 1991. Economic Valuation of Wetlands. American Petroleum Institute. Discussion Paper #065.

Bertrand, A. L. 1984. Marine Recreational Fishermen in Louisiana. Louisiana State University, Center for Wetland Resources, Technical Series 3. LSU-CEFI-84-26.

Boumans, R. and J. W. Day, Jr. 1990. Short-term sedimentation and water and materials flux. In: Cahoon, D. R. and C. G. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Browder, J. A., L. N. May, A. Rosenthal, R. H. Baumann, and J. G. Gosselink. 1988. Utilizing Remote Sensing of Thematic Mapper Data to Improve Our Understanding of Estuarine Processes and Their Influence on the Productivity of Estuarine-Dependent Fisheries. Final Report to the National Aeronautics and Space Administration. Center for Wetland Resources, Louisiana State University, Baton Rouge, La.

Cahoon, D. 1990a. Soil accretion in managed and unmanaged marshes. In: Cahoon, D. R. and C. G. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Cahoon, D. 1990b. Biological consequences of marsh management in coastal Louisiana. In: Cahoon, D. R. and C. G. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Cahoon, D. 1990c. Suitability of marsh management. In: Cahoon, D. R. and C. G. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Cahoon, D. and C. Groat, (eds). 1990. A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4, Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Chabreck, R. H. 1972. Vegetation, Water, and Soil Characteristics of the Louisiana Coastal Region. Louisiana State University, Agricultural Experiment Station. Baton Rouge, LA. Bulletin 664. 72 pages.

Chabreck, R. and J. Nyman. 1989. The effects of weirs on plants and wildlife in the coastal marshes of Louisiana. In: Duffy, W. and D. Clark (eds). Marsh Management in Coastal Louisiana: Effects and Issues - Proceedings of a Symposium. U.S. Fish and Wildlife Service and Louisiana Department of Natural Resources. USFWS Biol. Rep. 89(22). 378 pages.

Childers, D. and J. Day. 1990. Marsh-water column interactions in two Louisiana estuaries, Vol. II, Nutrient Dynamics. Estuaries. 13(4):404-417.

Cochran, A. 1991. New directions for the fur industry. Louisiana Conservationist Magazine, Louisiana Department of Wildlife and Fisheries. 43(2):26-29.

Craft, B., and D. Kleinpeter. 1989. Vegetation and salinity changes following the installation of a fixed-crest weir at Avery Island, Louisiana (1982-86). In: Duffy, W. and D. Clark (eds). Marsh Management in Coastal Louisiana: Effects and Issues - Proceedings of a Symposium. U.S. Fish and Wildlife Service and Louisiana Department of Natural Resources. USFWS Biological Report 89(22). 378 pages.

DeVoe, M. R. and D. S. Baughman, eds. 1986. South Carolina Wetlands Impoundments: Ecological Characterization, Management, Status, and Use. Volume 1 - Executive Summary. South Carolina Sea Grant Consortium, Charleston, SC. Technical Reports SC-SG-TR-86-1 and -2.

DeVoe, M., D. Baughman and J. Whetstone. 1986. Integration and interpretation of CWIP results. In: DeVoe, M. and D. Baughman (eds). South Carolina Coastal Wetland Impoundments: Ecological Characterization, Management, Status and Use. Vol II: Technical Synthesis. Pub. No. SC-SG-TR-86-2. South Carolina Sea Grant Consortium, Charleston, SC. 611 pages.

Dunbar, J. B., L. D. Britsch, and E. B. Kemp, III. 1990. Land Loss Rates, Louisiana Coastal Plain. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. Technical Report GL-90-2, Report 3.

Flynn, K., B. Wilsey, and I. Mendelssohn. 1990. Vegetation and soil responses to marsh management. In: Cahoon, D. R. and C. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Hartman, D. and D. R. Cahoon. 1990. Review of secondary data sources. In: Cahoon, D. R. and C. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Herke, W. H. 1979. Some effects of semi-impoundment on coastal Louisiana fish and crustacean nursery usage. In: Day, J. W., Jr., D. D. Culley, Jr., R. E. Turner, and A. J. Mumphrey, Jr. (eds). Proceedings of the Third Coastal Marsh and Estuary Management Symposium. Louisiana State University, Division of Continuing Education, Baton Rouge, LA.

Herke, W. H., E. E. Knudsen, P. A. Knudsen, B. D. Rogers. 1987. Effects of semi-impoundment on fish and crustacean nursery use: Evaluation of an solution. American Society of Civil Engineers. Proceedings of the Coastal Zone '87 Symposium, Seattle, WA, May 26-29, 1987.

Herke, W., B. Rogers and E. Knudsen. 1984. A Study of the Seasonal Presence, Relative Abundance, Movements, and Use of Habitat Types by Estuarine-dependent Fishes and Economically Important Decapod Crustaceans on the Sabine National Wildlife Refuge. Louisiana Cooperative Fishery Unit, Louisiana State University, Baton Rouge, LA.

Hoese, H. and M. Konikoff. Unpublished. Effects of management on fisheries organisms: The compensatory adjustment hypothesis. Department of Biology, University of Southwestern Louisiana, Lafayette, LA.

Keithly, W. R. 1991. Louisiana Seafood Industry Study, Summary. Prepared for the Louisiana Seafood Promotion and Marketing Board, New Orleans, Louisiana. 32 pages.

Keithly, W. R. and A. W. Liebzeit. 1987. The Louisiana Commercial Fishing Sector: A Review of Commercial Landings, Fishermen and Craft, and Processing and Wholesaling, 1960-86. Center for Wetland Resources, Louisiana State University, Baton Rouge, LA.

Larrick, W. D., Jr., and R. H. Chabreck. 1976. Effects of weirs on aquatic vegetation along the Louisiana coast. Proceedings of the Annual Conference of the Southeastern Association of Game and Fish Commissioners. 30:581-589.

Meeder, J. 1989. Comparisons of salinity, hydrology, and vegetation characteristics between free-flowing and semi-impounded intermediate-to-brackish tidal marsh systems. In: Duffy, W. and D. Clark (eds). Marsh Management in Coastal Louisiana: Effects and Issues - Proceedings of a Symposium. U.S. Fish and Wildlife Service and Louisiana Department of Natural Resources. USFWS Biological Report 89(22). 378 pages.

Minello, T. J. and R. J. Zimmerman. 1983. Fish predation on juvenile brown shrimp, *Penaeus aztecus* Ives: The effect of simulated *Spartina* structure on predation rates. Journal of Experimental Marine Biology and Ecology. 72:211-231.

Minello, T. J. and R. J. Zimmerman. 1992. Utilization of natural and transplanted Texas salt marshes by fish and decapod crustaceans. Marine Ecology Progress Series. 90:273-285.

National Marine Fisheries Service. 1992. Fisheries of the United States, 1991. Current Fisheries Statistics No. 9100.

Penfound, W. T. and E. S. Hathaway. 1938. Plant communities in the marshland of Louisiana. Ecological Monographs. 8:1-56.

Reed, D. 1992. Effects of weirs on sediment deposition in Louisiana coastal marshes. Environmental Management. 16(1):55-65.

Rogers, B. D., W. H. Herke, and E. E. Knudsen. 1987. Investigation of a Weir Design Alternative for Coastal Fisheries Benefits. Louisiana Cooperative Fish and Wildlife Research Unit, School of Forestry, Wildlife, and Fisheries, Louisiana State University, Baton Rouge, LA. 98 pages.

Rogers, B. D., W. H. Herke, and E. E. Knudsen. 1992a. Effects of three different water-control structures on the movements and standing stocks of coastal fishes and macrocrustaceans. Wetlands. 12(2):106-120.

Rogers, D., B. D. Rogers, and W. H. Herke. 1992b. Effects of a marsh management plan on fishery communities in coastal Louisiana. Wetlands. 12(1):53-62.

Spicer, B., D. Clark, and J. DeMond. 1986. Marsh Management and the Louisiana Coastal Resources Program. Miscellaneous Publication, Louisiana Department of Natural Resources, Coastal Management Division. Baton Rouge, LA. 31 pages.

Sport Fishing Institute. 1988. The Economic Impact of Sport Fishing in the State of Louisiana. Sport Fishing Institute, Washington, DC.

Sweeney, K. P., M. Swan, K. M. Wicker, and J. W. Day, Jr. 1990. Evaluation of marsh management effectiveness: Analysis of habitat change. In: Cahoon, D. R. and C. G. Groat (eds). A Study of Marsh Management Practice in Coastal Louisiana, Vols. 1-4. Final Report Submitted to Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-30410. OCS Study/MMS 90-0075.

Turner, R., J. Day and J. Gosselink. 1989. Weirs and their effects in coastal Louisiana wetlands (exclusive of fisheries). In: Duffy, W. and D. Clark (eds). Marsh Management in Coastal Louisiana: Effects and Issues - Proceedings of a Symposium. U.S. Fish and Wildlife Service and Louisiana Department of Natural Resources. USFWS Biol. Rep. 89(22). 378 pages.

U.S. Fish and Wildlife Service. May 23, 1991. Habitat re-evaluation of Fina-LaTerre mitigation bank management area 5 years after implementation. Internal Memorandum, U.S. Fish and Wildlife Service, Lafayette, Louisiana Field Office.

Wenner, C. A., J. C. McGovern, R. Martore, H. R. Beatty, and W. A. Roumillat. 1986. Chapter 14 -- Ichthyofauna In: DeVoe, M. and D. Baughman (eds). South Carolina Coastal Wetland Impoundments: Ecological Characterization, Management, Status and Use. Vol II: Technical Synthesis. Pub. No. SC-SG-TR-86-2. South Carolina Sea Grant Consortium, Charleston, SC. 611 pages.

Wilkinson, P. 1987. Management innovations to enhance the use of impoundments by estuarine transient species. Pages 72-87. In: South Carolina Coastal Wetland Impoundments: Management Implications. Workshop Proceedings. South Carolina Sea Grant Consortium. Technical Report SC-SG-TR-87-1. 87 pages.

Zimmerman, R. J. and T. J. Minello. 1984. Densities of *Penaeus aztecus, Penaeus setiferus*, and other natant macrofauna in a Texas salt marsh. Estuaries. 7(4A):421-433.

Zimmerman, R. J., T. J. Minello, and G. Zamora, Jr. 1994. Selection of vegetated habitat by brown shrimp, *Penaeus aztecus*, in a Galveston Bay salt marsh. Fishery Bulletin. 82(2):325-336.

7. INDEX

EIS
APPENDIX A

Agreement Between the Task Force
and the State Historic Preservation Officer

Procedures Governing Cultural Resources Investigations
for Projects Constructed under the Authority
of the Coastal Wetlands Planning, Protection, and Restoration Act

Management of Cultural Resources for Coastal Wetlands Planning, Protection and Restoration Act Projects

This agreement entered into this 25 day, of June 1993 between the Louisiana Coastal Wetlands Conservation and Restoration Task Force and the State Historic Preservation Officer of the Department of Culture, Recreation and Tourism establishes procedures governing cultural resources investigations for projects constructed under the authority of the Coastal Wetlands Planning, Protection and Restoration Act (PL101-646, Title III).

I. Introduction

Federal agencies are responsible for protecting and preserving historic properties that are significant to the heritage of the United States. The National Historic Preservation Act requires a Federal agency with jurisdiction over a Federal, federally assisted, or federally licensed undertaking to take into account the effects of the undertaking on properties listed, or eligible for inclusion in the National Register of Historic Places. Federal agencies are required to consider alternatives to avoid, mitigate or minimize adverse impacts on historic properties (any prehistoric or historic district, site, building, structure or object eligible for inclusion in the National Register). Under Section 106 of the National Historic Preservation Act, Federal undertakings are subject to review by the Louisiana State Historic Preservation Officer (SHPO) within the Department of Culture, Recreation, and Tourism (CRT), and, if significant sites will be impacted, by the Advisory Council on Historic Preservation.

This agreement governs cultural resources investigations associated with all Coastal Wetlands Planning, Protection and Restoration Act projects (PL 101-646, Title III). The act establishes a Louisiana Coastal Wetlands Conservation and Restoration Task Force whose members are: the Secretary of the Army, the Administrator of the Environmental Protection Agency, the Secretary of the Interior, the Secretary of Commerce, the Secretary of Agriculture, and the Governor of the State of Louisiana. The act requires that for each project undertaken, one of the Federal agencies must be identified as the lead agency, with responsibility for implementation of that project.

On 20 May 1993 the Task Force met and considered adoption of the procedures. Colonel Diffley, Chairman of the Task Force, proposed that the Task Force adopt the procedures for management of cultural resources as recommended by the Planning and Evaluation Subcommittee and Technical Committee, and that the Chairman of the Task Force execute the agreement with the appropriate state

agencies on behalf of the Task Force. Mr. Donald Gohmert, Soil Conservation Service, moved that the procedures be adopted. Mr. David Fruge, U.S. Fish and Wildlife Service, seconded the motion. The motion was adopted unanimously.

II. Guidance

Under this agreement state and federal agencies are responsible for compliance with the following historic preservation and cultural resources laws and regulations:

- National Historic Preservation Act of 1966 as amended;
- Archeological Resource Protection Act of 1979;
- Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation as published in the Federal Register on September 29, 1983;
- 36 CFR 79 "Curation of Federally-Owned and Administered Archeological Collections";
- Louisiana's Comprehensive Archeological Plan dated October 1, 1983;
- The Advisory Council on Historic Preservation's regulation 36 CFR Part 800 entitled, "Protection of Historic Properties";
- Native American Grave Protection and Repatriation Act;
- Cultural Resources Code of Louisiana; and
- Louisiana Unmarked Human Burial Sites Preservation Act.

III. Procedures

A. General

Procedures to accomplish cultural resources management and historic preservation responsibilities will depend on the inhouse professional archeological capabilities of each lead agency. Whenever possible, lead agencies will cooperate with other members of the Task Force to achieve compliance with historic preservation laws and regulations. Agencies without professional archeologists should use the professional archeological services of other Task Force agencies whenever possible. This will allow for the development of a consistent and cost effective method to meet Federal requirements and project schedules.

Projects will follow one of the following three procedures:

- Procedure A for lead agencies with professional archeologists on staff,
- Procedure B for lead agencies using the services of other Task Force member agencies with professional archeologists on staff, or
- Procedure C for lead agencies lacking professional archeologists on staff and not using the services of other Task Force members.

B. **Procedure A: Agencies with archeologists on staff**

(1) **Responsibilities of the lead agency**

- A lead agency with professional archeologists on staff will identify and evaluate historic properties and develop methods to minimize adverse impacts on these properties. The lead agency will recommend the level of investigation following accepted scientific procedures. This may require a variety of studies including but not limited to archeological survey and testing, architectural surveys, historical research, and underwater investigations. When no cultural resources investigations are recommended for a project, the SHPO will be notified in writing. Project maps and a description of the proposed project will be provided and the SHPO will comment on the recommendation.
- When the lead agency recommends cultural resources investigations, the agency will complete the necessary work and submit management summaries, and draft and final reports to the SHPO for review and comment. Reports will meet the standards of the Cultural Resources Code of Louisiana, Chapter 3. Final reports will be submitted to the SHPO within four months of receiving the review comments on the draft report.

(2) **Responsibilities of the SHPO**

- For these lead agencies, the SHPO will review and provide comments on all reports within ten working days. A management summary will be an adequate document for review by the SHPO. A management summary is an interim report based on a cultural resources investigation of a project area. It will summarize the methodology and results of the investigation and include either recommendations for additional work or a conclusion that no further work is necessary. Requirements for a management summary are in Appendix A.
- The SHPO will review all recommendations that historic properties are eligible for the National Register of Historic Places. Mitigation plans for National Register sites will be coordinated with the SHPO.

C. **Procedure B: Lead agencies without archeologists utilizing archeological services of Task Force agencies**

(1) **General**

- Lead agencies without archeologists on staff will insure that each project is in compliance with historic preservation laws and regulations. Section 106 compliance and required cultural resources investigations can most effectively be accomplished by entering

into a cooperative agreement with a Task Force agency capable of offering professional archeological services.

- Identification and evaluation of historic properties may require a variety of studies including but not limited to archeological surveys, architectural surveys, historical research, and underwater archeology.

(2) Responsibilities of the lead agency

- The lead agency will be responsible for funding cultural resources investigations and Section 106 coordination with the SHPO and the Advisory Council on Historic Preservation. The lead agency will initiate coordination with a Task Force agency with inhouse archeological capabilities, oversee completion of archeological investigations, and provide current information on plan formulation, real estate requirements, and project scheduling.
- The lead agency will ensure that necessary cultural resources investigations are completed and will submit management summaries, and draft and final reports to the SHPO for review. Reports will meet the standards of the Cultural Resources Code of Louisiana, Chapter 3. Final reports will be submitted to the SHPO within four months of receiving the review comments on the draft report.
- When no cultural resources investigations are recommended for a project, the SHPO will be notified in writing. Project maps and a description of the proposed project will be provided, and the SHPO will comment on the recommendation.

(3) Responsibilities of the agency providing archeological services

- The Federal agency providing archeological services will identify, evaluate, and make recommendations for avoidance of adverse impacts on significant historic properties. This may require a variety of studies including but not limited to archeological surveys, architectural surveys, historical research, and underwater archeology. This agency will complete the necessary work and submit management summaries, and draft and final reports to the lead agency.
- The agency providing archeological services will provide technical assistance for each step of the cultural resources process (evaluate the need for cultural resources investigations, develop scopes of work, review proposals, review reports and recommendations). This agency will be responsible for administration of contracts, including development of cost estimates, negotiation with contractors, monitoring of contractor efforts in the field and production of the final report on each project.

(4) **Responsibilities of the SHPO**

- For these lead agencies, the SHPO will review and provide comments on all reports within ten working days. A management summary will be an adequate document for review by the SHPO.

The SHPO will review all recommendations that historic properties are eligible for the National Register of Historic Places. Mitigation plans for National Register sites will be coordinated with the SHPO.

D. Procedure C: Lead agencies without archeologists and not utilizing archeological services of Task Force agencies

(1) **General**

- Lead agencies without professional archeologists on staff generally lack the capability to provide adequate technical review before draft reports are submitted to the SHPO. Lead agencies will be required to identify a qualified individual or firm specializing in cultural resources investigations and enter into a contract to provide necessary services. The lead agency will contract with a firm either on the SHPO's list of Contracting Archaeologists or able to meet the National Park Service professional qualification standards in 36 CFR Part 61, Appendix A.
- For the SHPO to adequately review recommendations and findings of cultural resources investigations a full report will be required. Management summaries are not acceptable.

(2) **Responsibilities of the lead agency**

- All projects will be submitted to the SHPO for review as early in the planning process as possible. Project maps and a description of the proposed project will be provided and the SHPO will recommend whatever cultural resources investigations are necessary.
- The lead agency will be responsible for funding cultural resources investigations and Section 106 coordination with the SHPO.
- The lead agency will be responsible for administration of contracts including funding, development of cost estimates, negotiation with contractors, monitoring of contractor efforts in the field, curation of collections, and production of the final report on each project. The agency will be responsible for coordination with project planners and engineers.
- Upon determination of the need for cultural resources investigations, the lead agency will supervise the production and delivery of draft and final reports to the SHPO for review and comment. Reports are required to meet the standards of the

Cultural Resources Code of Louisiana, Chapter 3. Final reports will be submitted to the SHPO within four months of receiving the review comments.

(3) **Responsibilities of SHPO**

- For those lead agencies without a full-time professional archeologist and not utilizing the services of a Task Force member, the staff of the SHPO will provide technical assistance for each step of the cultural resources process (evaluate the need for cultural resources investigations, develop scopes of work, review proposals, review reports and recommendations).
- The SHPO will review all recommendations that historic properties are eligible for the National Register of Historic Places. Mitigation plans for National Register sites will be coordinated with the SHPO.

IV. Information Needs

- For lead agencies to effectively manage the historic resources under their jurisdiction, it is necessary to have a complete understanding of the resources that are present. This requires that archeologists have access to current data on the location of archeological sites, standing structures and areas previously surveyed.
- CRT will work with agencies to provide access to data necessary for planning purposes, including site forms, the Louisiana Computerized Archeological Database (L-CAD), archeological survey maps, site location maps, and standing structure survey data.
- Agencies will protect sensitive data on the location of the cultural resources of Louisiana. These data contain confidential information about the location and character of historic properties and could result in destruction of sites if disclosed to the public. This information will be restricted to professional archeologists within agencies and will not be released to others in the agency or outside the agency.
- Federal agencies will work with CRT to investigate methods to automate the information housed at CRT and federal agencies to more effectively manage historic properties.

This Agreement shall become effective upon the signature of all Parties.

For the Task Force

By: _____
Michael Diffley
COLONEL, U. S. Army
Chairman
Date: 28 May 93

For the Department of Culture,
Recreation and Tourism

By: _____
Mark H. Hilzim
Secretary
Date: 6/28/93

By: _____
Gerri Hobdy
State Historic Preservation Officer
Date: 6/25/93

Appendix A
DIVISION OF ARCHAEOLOGY
MANAGEMENT SUMMARY GUIDELINES
FOR REVIEW AND COMPLIANCE PROJECTS

The topics listed below are to be included in each management summary. Each topic should be addressed briefly but in sufficient depth that a reader unfamiliar with the project could assess its impact on cultural resources. It is expected that a more detailed treatment of these topics will be made in a final report. These guidelines are to be regarded as minimum requirements. The management summary is not to be viewed as a substitute for a final report.

At the least, the management summary must include:

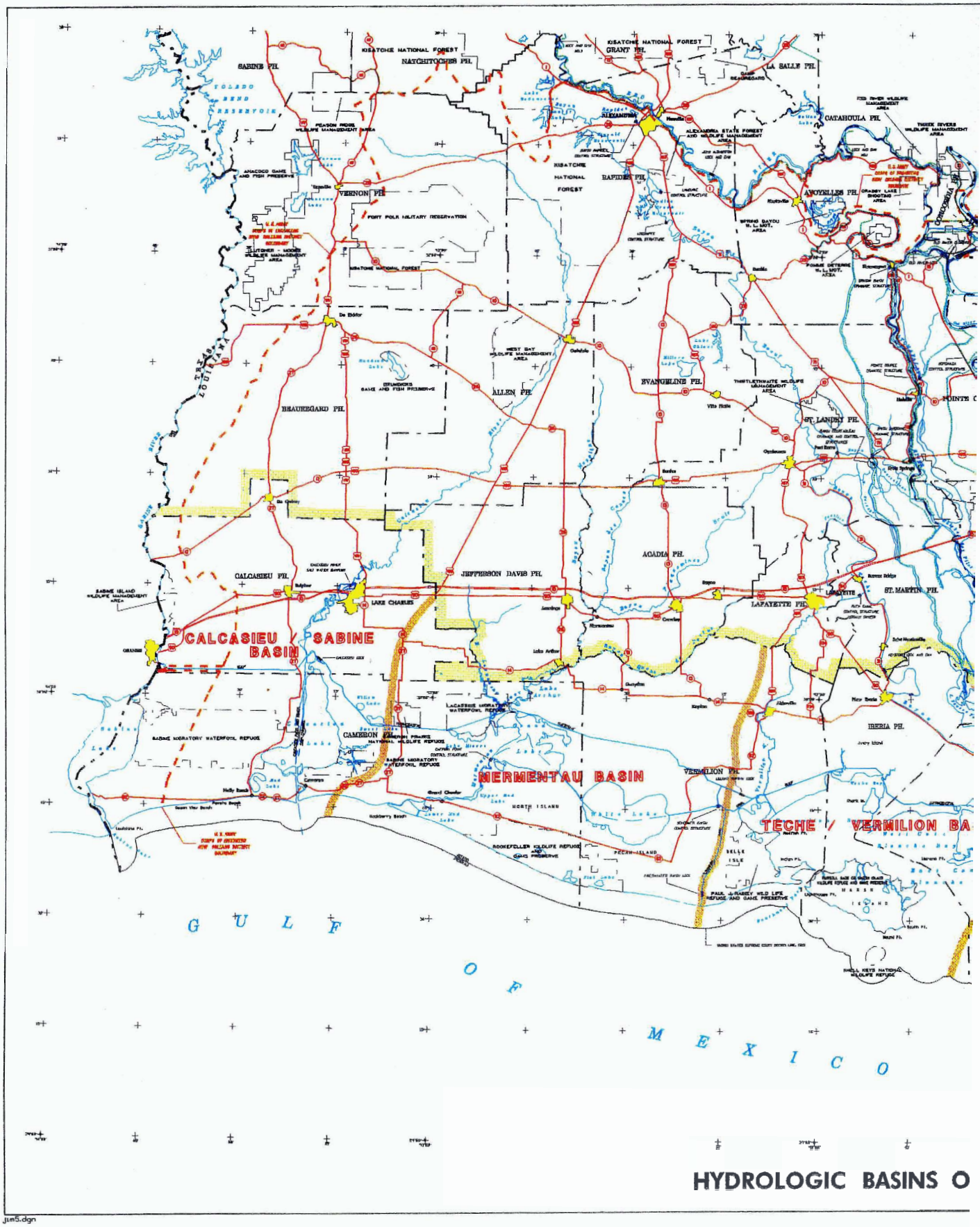
1) Project Description
   - type of project
   - map of project area
   - dates of fieldwork

2) Methodology
   - description of methodology
   - archival sources reviewed
   - archeological techniques used
   - sampling strategy employed

3) Results
   - number, size, and location of all sites and test units
   - brief description of each site and unit
   - at least one line drawing of a representative unit or a shovel test profile from each site
   - preliminary artifact analyses including counts and types of artifacts, for example, number of Coles Creek Incised sherds
   - preliminary assessment of cultural/temporal affiliation of each site
   - preliminary site interpretations

4) Direction of Research
   - description of analytical techniques to be used in the full analyses
   - location where the artifacts and associated records will be deposited upon completion of the final report
   - indication of when the final report will be completed

5) Recommendations
   - any recommendations for additional work will require detailed justifications



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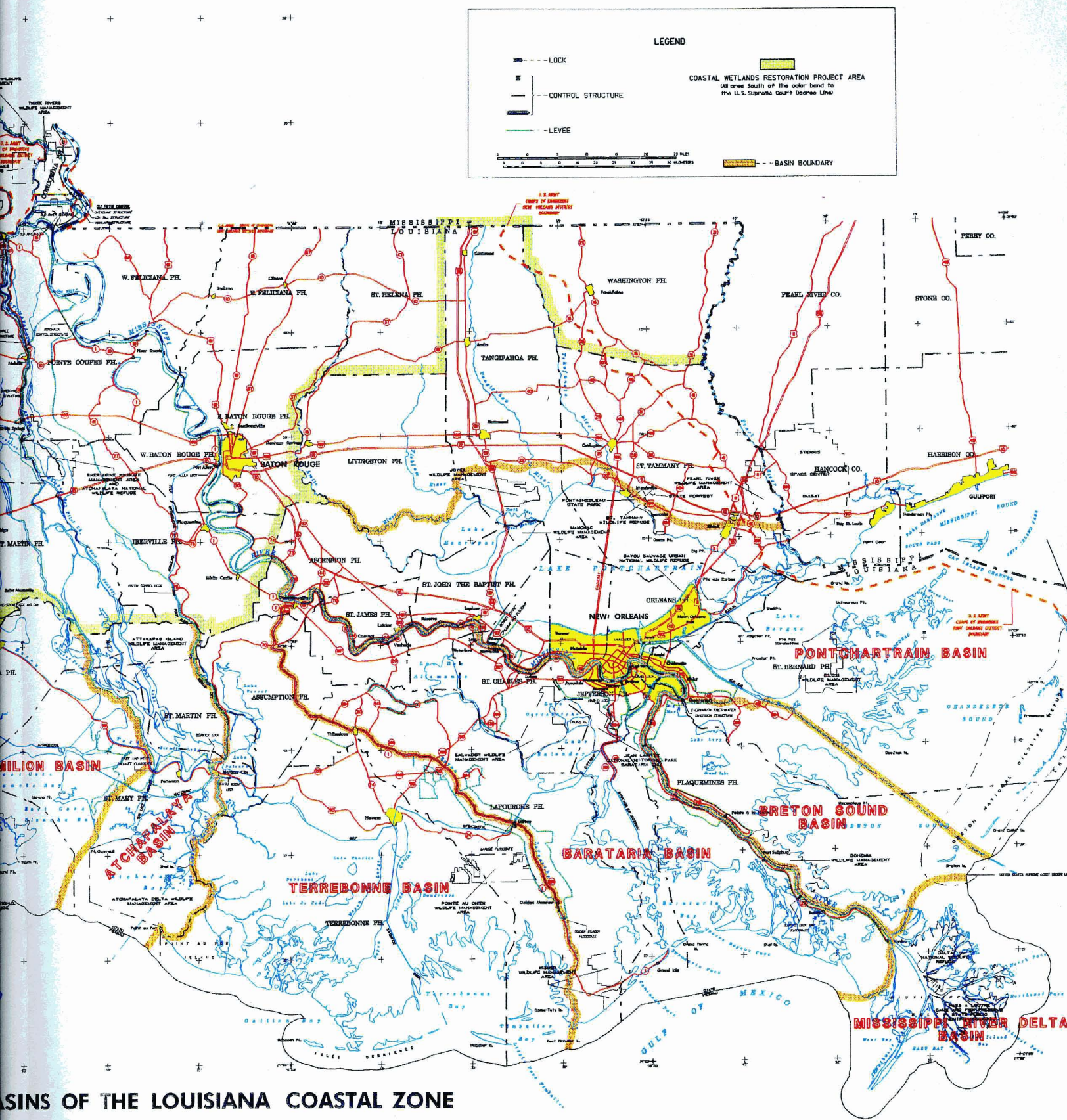

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